UNIVERSITY OF CALIFORNIA SAN DIEGO

Economy, Society, and Small-Scale Industry: Social Approaches to Middle Islamic Period Copper Production in Southern Jordan

A dissertation submitted in partial satisfaction of the requirements for the degree Doctor of Philosophy

in

Anthropology

by

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The Dissertation of Ian William Nasser Jones is approved, and it is acceptable in quality and form for publication on microfilm and electronically:

Chair

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DEDICATION

To my father, Bill, my grandmother, Fernee, and my grandfather, Leo. I wish you were still here, but the love of the past each of you inspired and encouraged in your own way lives on.

And to my mother, Kimm, who has always pushed me to pursue my goals and supported me when I fell. Without you, I wouldn’t be here.

EPIGRAPH

"One has moved only to a world where the devoted household commonplaces cast shadows that are empires" — Robert Duncan, "Unkingd by Affection?" (1966)

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

ASKP – Archaeological Survey of the Kerak Plateau
ASUG – Archaeological Survey of Upper Galilee
BDS – Burj Dolomite Limestone Shale
CBRL – Council for British Research in the Levant
DBM – Deutsches Bergbau Museum, Bochum
DoAJ – Department of Antiquities of Jordan
EI2 – Brill's *Encyclopedia of Islam*, Second Edition
EJVS – Eastern Jordan Valley Survey
ELRAP – UC San Diego Edom Lowlands Regional Archaeology Project
FBRS – Faynān-Buṣayra Regional Survey
HMGPW – Hand-Made Geometrically Painted Ware
IAA – Israel Antiquities Authority
JHF – Jabal Hamrat Fidan Project
JSHS – Jisr Sheikh Hussein Survey
KEN – Khirbat al-Nuḥās
KF – Khirbat Faynān
KHI – Khirbat Ḥamrā Ifdān
KNA – Khirbat Nuqayb al-Asaymir
LCAL – UC San Diego Levantine and Cyber-Archaeology Laboratory
MBS – Massive Brown Sandstone
NRA – Jordanian Natural Resources Authority
PCAMPI – Pottery of the Crusader, Ayyubid, and Mamluk Periods in Israel (Avissar and Stern 2005)
SGNAS – Southern Ghors and Northeast 'Arabah Archaeological Survey
TBAS – Tafila-Busyra Archaeological Survey
WAG – Wādī al-Ghuwayb Survey
WAJ – Wādī al-Jāriya Survey
WFD – Wādī Fidān District Survey
WFLS – Wādī Faynān Landscape Survey
WYS – Wādī Yābis Survey

LIST OF FIGURES

LIST OF TABLES

PREFACE

Where possible, I transliterate Arabic, Persian, and Turkish words using the *International Journal of Middle East Studies* (*IJMES*) "Transliteration System for Arabic, Persian, and Turkish." There are four exceptions to this. First is the letter *'ayn*, which I transliterate as a single open-quote, or inverted comma ('), rather than the special character ("modifier letter left half ring") used in the *IJMES* system. Likewise, the letter *hamza* is transliterated as a closing single quote, or apostrophe ('), rather than the special character ("modifier letter right half ring") used in *IJMES*. The second are words ending with a long *alif* followed immediately by *tā' marbūṭa*. In these cases, the final *tā' marbūṭa* is rendered as "h" rather than "a," in keeping with common practice. Examples include the region of al-Sharāh, in southern Jordan, and the city of Ḥamāh. Third, contractions of the definite article and inseparable prefixes are generally ignored — e.g. *wa al-iqbāl* would be written out, rather than the elided form *wa-l-iqbāl* — although this comes up rarely. Fourth, *IJMES* generally does not add diacritics to personal names or toponyms. I do here, but where a place or person has a common modern English spelling, I use that instead, with long vowels and *'ayn* marked where appropriate — e.g. Aleppo instead of Ḥalab, Saladīn instead of Ṣalāḥ al-Dīn, Medīna instead of Madīna. Ancient and medieval place names are used where appropriate to the period under discussion — e.g. Phaino is used to refer to the Roman and Byzantine settlement at Khirbat Faynān, but not the Iron Age or Middle Islamic settlements. Hebrew toponyms are transliterated as they appear in recent publications, including diacritical marks.

There are several difficulties with attempting to apply a uniform transliteration system to an archaeology dissertation, however. First, for readers without a working knowledge of Arabic, the *IJMES* system can be slightly confusing, as the definite article is always rendered *al-*, and assimilation to sun letters is not indicated. Non-Arabic speakers should be aware that when the definite article *al-* is followed by *tā'* (t), *thā'* (th), *dāl* (d), *dhāl* (dh), *rā'* (r), *zayn* (z), *sīn* (s), *shīn* (sh), *ṣād* (ṣ), *ḍād* (ḍ), *ṭā'* (ṭ), *ẓā'* (ẓ), *lām* (l), or *nūn* (n), the *lām* in the definite article is not pronounced and instead the following letter is doubled. As an example, the word for copper, *al-nuḥās,* is actually pronounced *an-nuḥās*. Despite this possible confusion, the *IJMES* system is preferable as it more accurately renders written Arabic, where the definite article is likewise always written *al-* regardless of the following letter. Note also that the Arabic definite article (whether rendered "al-" or "el-") is ignored in the alphabetization of works cited (e.g. "al-Nuwayrī" is alphabetized under N, "El-Zein" under Z, and so on).

Second, Jordanian archaeological sites are usually named in local Arabic dialects, and many archaeologists working in Jordan speak little Arabic and often seem to be of Lawrence's (1991: 21) opinion that systems of transliteration are "helpful to people who know enough Arabic not to need helping, but a wash-out for the world" and like him "spell [their] names anyhow, to show what rot the systems are." This leads to a situation where toponyms are given in reports as transcriptions of local pronunciations, rather than transliterations of Arabic names. Generally it is possible to determine a sensible transliteration, but occasionally attempts to do so lead to more confusion when other, nearby sites have similar names, e.g. in the case of Tall Abū Ghūrdān, which is often called Tall Abū Qa'dān, a conflation with a nearby site called Tall al-Qa'dān. This stems from the facts that most reports use the transcription Tell Abu Gourdan (see Kaptijn 2009: 26) and that both *qāf* (q) and *ghayn* (gh) are pronounced like the English letter "g" in many (particularly rural) Jordanian dialects. An attempt has been made here to appropriately transliterate all Arabic toponyms, but given these problems minor errors are inevitable. Likewise, multiple toponyms are occasionally used to refer to the same site, as in the case of Khirbat Nuqayb al-Asaymir, occasionally also called al-Furn. Where multiple names are used in the modern archaeological literature, these are given in a note on their first appearance in the text.

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I have been incredibly lucky, over the course of my dissertation research, to have worked with many incredibly talented people, each of whom has contributed in some way to the final shape of this work. I owe the greatest thanks to my advisor, Thomas E. Levy. He first encouraged me to work on the material from KNA as I was planning my M.A. thesis, and his guidance since has been invaluable in shaping my research design. In particular, I thank him for his generosity and encouragement during the 2011 and 2012 ELRAP field seasons, during which the bulk of the fieldwork reported here was conducted. Tom's unique ability to make the most of any situation led to several modifications of the 2012 field season plan. This allowed me to conduct much more independent research than I had anticipated, which Tom generously supported. His advice and productive comments on my writing have been a constant help during my time at UC San Diego, and have been essential in bringing the dissertation to its present form. In short, this dissertation, and the work behind it, would simply not have been possible without him.

I am also grateful to the members of my committee — Guillermo Algaze, Joe Hankins, Hasan Kayalı, and Babak Rahimi — for their support and for useful comments on and suggestions for my work, particularly at the research proposal stage, but also in courses and conversations before and since. Each has had a tremendous positive influence on my work, and I continue to be delighted by the fact that they were all willing to serve on my committee.

The fieldwork at the core of this dissertation was conducted as part of the UC San Diego Edom Lowlands Regional Archaeology Project (ELRAP), directed by Thomas E. Levy and Mohammad Najjar. I am grateful for the autonomy Tom and Mohammad gave me to conduct my own research as part of their project, and for their permission to use a wide range of material from ELRAP and its predecessor, the Jabal Hamrat Fidan (JHF) Project, as part of the present work. Thanks are also due to the current and former graduate students of the UC San Diego Levantine and Cyber-Archaeology Lab (LCAL), who provided support in the field and close friendship at home and abroad: Sowparnika Balaswaminathan, Marc Beherec, Kathleen Bennallack, Erez Ben-Yosef, Aaron Gidding, Matthew Howland, Kyle Knabb, Brady Liss, Adolfo Muniz, Ashley Richter, and Matthew Vincent. Many additional people participated in the research reported here, and I owe thanks to the ELRAP field staff, UC San Diego undergraduates, and volunteers who made this work possible. In particular, I have to give special thanks to Mohammed (Abu Jamil) Qaqish, whose field cooking is truly incomparable, Aaron Gidding and Kathleen Bennallack, who supervised excavations at Khirbat Faynān Areas 16 and 18 (respectively) and were my assistant supervisors at KNA in 2011, and Claire McConnell, my assistant supervisor at KNA in 2012. In addition to the graduate students of the LCAL, I owe thanks to a number of other staff members and students who provided considerable assistance in the field, particularly Lauren Hahn, Anna Shoemaker, Rosemary Yuka Hoshino, James Darling, Kathleen Huggins, Jessica Linback, and Leah Trujillo, and the Khirbat al-Manā‘iyya field staff: Erez Ben-Yosef, Ilana Peters, Yoav Tzur, Fawwaz Ishakat, and Matthew Vincent.

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Within the Department of Anthropology, my administrative home at UC San Diego, I owe particular thanks to Nikki Gee, the Graduate Program Coordinator, without whom I could not have navigated the university’s bureaucracy, and Paul Goldstein, the Director of Graduate Studies during much of my doctoral research, who was always supportive. I also owe thanks to my fellow graduate students in Anthropology, who made the experience of being at UC San Diego much more pleasant. In addition to the members of the LCAL, with whom I share a particularly close bond, I would also like to thank Kiri Hagerman, Misha Miller-Sisson, Nancy Peniche-May, Lauren Hahn, Adam Schneider, Alicia Boswell, Alexis Tucker, Jess Novak, Andrew Somerville, Mikael Fauvelle, Matthew Sitek, Giacomo Gaggio, Kari Hanson, Ben Volta, Sarah Baitzel, Megan Pitcavage, John Dulin, and Josh Nordin, among many others, for their camaraderie. This is also an appropriate place to acknowledge the members of the Anthropology Dissertation Writing Practicum, who helped motivate me to write during the years I was able to attend. I owe particular thanks to the 2016 incarnation of the group, made up of Natasa Garic-Humphrey, Sarah Baitzel, Sowparnika Balaswaminathan, Kathleen Bennallack, Waqas Butt, Erica Fontana, Kiri Hagerman, Raquel Pacheco, and Alexis Tucker, whose comments substantially improved early drafts of several chapters.

I have had the opportunity to be involved in a number of other excellent programs at UC San Diego, and owe thanks to everyone who helped me navigate the bureaucratic maze of interdisciplinary research. In the Department of History, I owe particular thanks to Dorothy Wagoner, former Program Coordinator for the Judaic Studies Program, and Sally Hargate, Undergraduate and Graduate Student Affairs Coordinator. I am grateful to all of the wonderful people I interacted with in the Center of Interdisciplinary Science for Art, Architecture, and Archaeology (CISA3) at the Qualcomm Institute at the California Institute for Telecommunications and Information Technology (CalIT2), particularly while I held an NSF Integrative Graduate Education and Research Traineeship (IGERT) in CISA3's Training, Research and Education in Engineering for Cultural Heritage Diagnostics (TEECH) program. In particular, I must thank the program PIs, Falko Kuester, Thomas E. Levy, and Maurizio Seracini, as well as Alex Hubenko, Vanessa Pool, Dominique Rissolo, Julie Matsuda, Xuemei Wang, and all of my fellow IGERT Trainees and Associates, who made the program the strange and beautiful experiment it was. I also thank Margie Burton, of the UC San Diego Center for Cyber-Archaeology and Sustainability and the Levantine and Cyber-Archaeology Lab, for her advice and assistance in the later stages of my research.

My home away from home was the Making of the Modern World (MMW) Program in Eleanor Roosevelt College (ERC), where I taught for most of my time at UC San Diego. I was incredibly fortunate to be able to work with so many amazing people in MMW, and it would be impossible to thank everyone I should. My first experience in the program was with Jackie Giordano, to whom I owe great thanks for her guidance during my first years as an inexperienced teacher. Since then, I have had the pleasure of working with Eberly Barnes and Heidi Keller-Lapp, both of whom are inspiring mentors and supportive and flexible supervisors. Although my interactions with Matthew Herbst, Program Director, were unfortunately limited, he was always friendly and approachable, interested in everything that was going on with MMW TAs and, of course, quite supportive. I am often still surprised by how little bureaucratic nonsense there seemed to be in MMW, and for this I have to thank Mollie Martinek, former Program Coordinator and Vilaya Roberts, former Program Assistant and current Program Coordinator. All of these people made the MMW office incredibly welcoming and pleasant, something that cannot be said for many university offices. I am very grateful for all of the excellent professors I have had the opportunity to work with in MMW. In particular, I must thank Edmond Chang, with whom I've worked more times than either of us probably cares to count, as well as Babak Rahimi, Richard Cohen, David Jordan, Janet Smarr, Frank Biess, Patrick Patterson, Tara Carter, Amanda Bevers, and Charles Chamberlain, all of whom are incredible lecturers. I owe thanks, as well, to all of the amazing TAs I had the opportunity to work with in MMW. You were all a pleasure to work with, and I learned a lot from working with you. Of course, several groups deserve particular thanks. First, everyone who organized and invited me to communal grading events, particularly Emily Goodman, Sascha Crasnow, Sowparnika Balaswaminathan, Kyle Knabb, Kiri Hagerman, Ben Smuin, Mike Lettieri, Melissa Cohen, and (way back in the mists of time) Lauren Hahn. I doubt it ever made the grading go faster, but it was certainly more pleasant. Second, everyone who helped me procrastinate with interesting conversation in the TA office, especially Emily Pace, Alicia Boswell, Misha Miller-Sisson, Steve Griffin, Haleema Welji, Leanne Williams, Tim Shea, Pat Adamiak, Bariş Taşyakan, Ellen Kozelka, Joel Palhegyi, Robert Terrell, Reuben Silverman, and Megan Pitcavage.

This work is, of course, not only a product of my time at UC San Diego, but a longer process of becoming an archaeologist. In this respect, I must acknowledge my formative experiences as an undergraduate in the Department of Anthropology at the University of Massachusetts Amherst. In particular, I would like to thank Michael Sugerman, whose courses are in many ways responsible for my interest in trade and ordinary people. My interest in medieval sugar men, on the other hand, is probably a coincidence, but you never know. I also owe much to my first field experience at Tell es-Safi, and would like to thank Aren Maeir and his team, especially Amit Dagan, for all they taught me.

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Appendix 1 contains unpublished material co-authored by Dr. Brita Lorentzen. The dissertation author was the primary author of this material.

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ABSTRACT OF THE DISSERTATION

Economy, Society, and Small-Scale Industry: Social Approaches to Middle Islamic Period Copper Production in Southern Jordan

by

Ian William Nasser Jones

Doctor of Philosophy in Anthropology

University of California San Diego, 2018

Professor Thomas E. Levy, Chair

The period between the fragmentation of the ʿAbbāsid empire in the 10th century AD and the formation of the Mamlūk state in the 13th century was one of considerable social, economic, and political change in the Levant. The period is marked by competition and shifting alliances among centralizing polities and autonomous local elites, a situation that makes archaeological investigation both difficult and rewarding.

This dissertation examines the tension between autonomy and centralization within the Ayyūbid polity (ca. 1186-1263 AD) through the lens of industry, focusing specifically on copper production. The Ayyūbid copper production system in southern Jordan is reconstructed using data from systematic archaeological excavations and surveys in the arid lowlands of Faynān, including new excavations at two early 13th century copper production sites: Khirbat Nuqayb al-Asaymir (KNA) and Khirbat Faynān. The analysis takes a Braudelian approach, situating the 13th century copper industry within long-term (primarily economic), medium-term (primarily political), and short-term (primarily social) changes in the Faynān region, and southern Jordan more broadly. The primary conclusion of this work is that the short-lived revival of copper production was part of a broader reorganization of the southern Levantine agricultural regime toward industrial-scale production of cane sugar. This reorganization took place, first, under the rule of the Ayyūbid princes of al-Karak in central Jordan, who adopted a local provisioning strategy that provided them considerable autonomy from the regional centers of Cairo and Damascus. Copper production in Faynān ended in the late 13th century, as the region came under the control of the Mamlūk state, and the Levantine sugar industry was integrated into a production system more dependent on Cairo.

Part I: Introduction

1. Introduction to the Dissertation and Key Questions

"It conjures up the sorts of questions one often asks in the presence of romantic ruins. The people who built these empty structures, where did they come from? What sorts of lives did they lead, and why did they leave their homes in this sorry state? Why were they here, what did they do, where did they go? The solutions to such riddles lie like tracings in the landscape around you, for the past of these people is written in the marks they made upon this land."
(Cronon 1992: 29)

The Faynān region of southern Jordan is a copper-rich, semi-arid landscape in the lowlands of Wādī ʻAraba, roughly 30 km south of Wādī al-Ḥasā, the deeply-incised watercourse generally seen as the boundary between central and southern Jordan (Fig. 1.1). Faynān presents an interesting problem for archaeologists and historians of the Islamic period. On one hand, Islamic archaeology is generally seen, with good reason, as a robust and increasingly well-developed "historical archaeology" (compare, e.g., Grabar 1978; Milwright 2010: 10-20). On the other, the historical archaeologist of Faynān has little to work with in terms of the *history* of Faynān.

> Roman mining and smelting of the $3^{rd}/4^{th}$ centuries AD is the only industrial activity attested in the literary record for the Feinan region. Unfortunately, the attestations are not for economic reasons, but rather because of Christian hagiographic interests in the martyrs who happened to work, suffer, and die with other dissidents and criminals in the mines and at the furnaces. (Knauf and Lenzen 1987: 83)

Islamic archaeology in Faynān is, essentially, the historical archaeology of a region absent in the narrative history of the period. Faynān, thus, presents both a challenge and an opportunity. Industrial settlements clearly existed in the region in the Middle Islamic period (1000-1400 AD), and these can only be studied archaeologically.

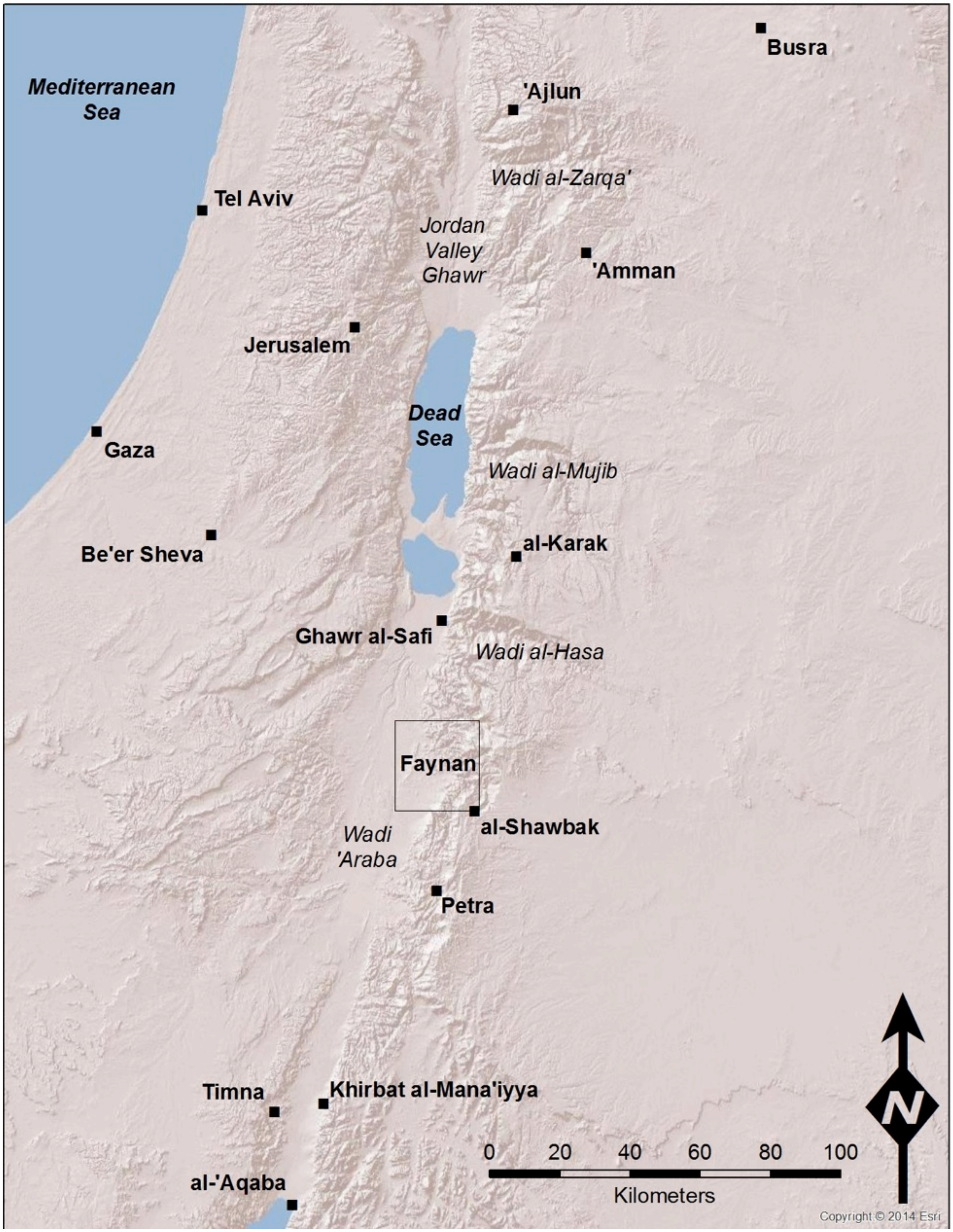

Figure 1.1: Map of the southern Levant, with key sites and geographical features labeled. The rectangle marks the study area for the dissertation, the Faynan region. (Basemap: © 2014 Esri.)

This is actually rather typical of mining regions. A dramatic example is Pyramiden, a Soviet coal mining settlement on Spitsbergen in the Svalbard archipelago. This town was occupied through much of the 20th century, and only abandoned in 1998. The investigators, however, describe the interesting contradiction they were forced to deal with: "Despite being a thoroughly modern community, there are few written records of everyday life in Pyramiden. Thus, in this sense at least, we were encountering what may be described as a 'pre-historic' society" (Andreassen, et al. 2010: 16). Mining regions, then, typify the methodological ground that Deagan (1988) described as "Neither History Nor Prehistory." Much of this is due to the fact that mining regions tend to be marginal, sparsely populated areas that, to apply Cronon's (1992: 39) observation more broadly, "supply distant cities whose inhabitants rarely gave a second thought to their existence." As Cronon (1992) argues, the goal of environmental history — and here, of anthropological, historical archaeology — is to understand the ways in which the history of mining regions is bound up with demand for specific goods in more densely settled areas,[1] with similar relationships between cities/towns and other marginal areas, with systems and technologies of production, distribution, and consumption, and with local relationships between people and their environment.

This dissertation uses archaeological data collected by the UC San Diego Edom Lowlands Regional Archaeology Project (ELRAP)[2] to explore investment and copper exploitation in a peripheral region, Faynān. This follows a cyclical, if uneven, pattern during the

[1] This refers not only to the specific resource being mined, but also the desired final products. To take Cronon's (1992: 48) study as an example, the large copper mine at Kennecott was founded to meet a demand for copper wire, particularly in large cities. The native Ahtna people also used — and, indeed, exported — copper, but to produce different objects, at a different scale, to meet a different demand (Cronon 1992: 40).

[2] ELRAP, a long-term study of copper production in the Faynān region, is directed by Thomas E. Levy and Mohammad Najjar. Fieldwork for the project took place primarily between 2002 and 2015, and between 1997 and 2002 fieldwork was conducted under its predecessor, the Jabal Hamrat Fidan Project (JHF). A retrospective summary of the project's goals and methodology, focusing specifically on the Iron Age, can be found in Levy, et al. (2014a).

period under investigation here, with investment and mining waxing and waning as a result of factors largely external to the region itself. The dissertation traces the history of the region through two of these cycles: a major phase of copper exploitation in the 2nd-5th centuries AD, a gradual decline in the settled population between the 6th and 9th centuries, a revival of mining in the late 12th and early 13th centuries AD, and a period of primarily pastoral use of the area between the 14th and early 20th centuries. The major focus is the second period of external investment and copper mining, and the relationship of this episode to the broader political-economic system of the Ayyūbid polity. This chapter lays out the anthropological (Section 1.1) and historical (Section 1.2) questions posed in the dissertation, followed by a brief discussion of periodization (Section 1.3), and finally explains the structure of the dissertation, including brief summaries of the following chapters (Section 1.4).

1.1. Anthropological Questions

The anthropological questions posed in this dissertation build, first, on the overarching goals of ELRAP, summarized by Levy and Najjar (2007: 102) as “the ‘deep-time’ study of ancient mining and early metallurgy’s effects on social evolution.” The present study is, of course, not concerned with early metallurgy, but is designed to investigate the political, economic, and social impacts of copper mining and production, expanding ELRAP’s major goals into the later historical periods.

One of the key questions concerns the role of metals and other goods in the coalescence and maintenance of political authority (see theoretical background in Section 2.1). What does the integration of copper production into broader systems of production and provisioning tell us about those systems? How do those systems fit into elite strategies for the development and maintenance of political autonomy? What effect does this have on the coalescence of state authority, and how do these strategies differ between minor elites and those at the center? Essentially, the first set of anthropological questions concerns the political-economic aspects of copper production from an elite perspective.

The second group of anthropological questions is concerned primarily with the archaeology of production and labor (see theoretical background in Section 2.2). What activities were involved in the copper production process, and who performed them? These are reconstructed using the complementary techniques of *chaînes opératoires* and behavioral chains. What features made up the broader production system that mines and mining settlements belonged to? These are reconstructed using the concept of the feature system, borrowed from the historical archaeology of the North American West. More broadly, these questions consider what interactions between laborers and the local environment — both “natural” and “built” — were necessary for the production of copper. Beyond this, what was daily life like in mining settlements? Who lived there? How did these people spend their time?

These two groups of questions are, in fact, complementary. Underlying all of them is a broader question concerning the social life of metal producing settlements. How do these settlements fit into larger political, economic, and social systems? Who is involved with them, and in what ways? What do they get from this involvement? This ranges from political elites — who are perhaps the least involved in the day-to-day operation of mining settlements, but benefit the most — as in the first set of questions, to the entire range of those working at the site — including those doing the least desirable tasks, who perhaps benefit the least — as in the second set of questions.

A third set of anthropological questions probes longer-term trends in the archaeology of Faynān, and southern Jordan more generally (see also Section 1.4). How do conceptions of the region's landscape change over time? How is this reflected in our archaeological data? What effect did it have on settlement patterns in the region? What social, political, geographical, or other constraints were most important for determining settlement patterns in a specific period, and how did these change over time? With these questions, I expand ELRAP's goals and consider not only how the Faynān region changed as a metallurgical landscape over the course of several millennia, but also how various aspects of the landscape took on or lost significance as a result of political, economic, and social changes in southern Jordan and beyond.

1.2. Historical Questions

The key historical questions in this dissertation are those concerning the Ayyūbid emirate of al-Karak, and the early 13th century Ayyūbid polity more generally. The history of the Ayyūbid period is summarized in Section 3.6, with a particular focus on modern central and southern Jordan. Of particular interest is the increasing autonomy from the centers of Cairo and Damascus exercised by the Ayyūbid *amrā'* (princes) of al-Karak over the course of the first six decades of the 13th century. While the nature and degree of this autonomy varied, it is nonetheless clearly different from the following Mamlūk system, in which al-Karak could be a hotbed of political unrest, but was always clearly under the control of Cairo. For much of the early 13th century, al-Karak was part of the Ayyūbid political system, but under the effective control of neither of the major centers. The Ayyūbid polity, in this sense, parallels the situation described by Derluguian and Earle (2010) as "strong chieftaincies" within "weak states" (see Section 9.4.1), a comparative line of argument that could, no doubt, fruitfully be pursued elsewhere — perhaps in combination with Chabal, et al.'s (2004) take on the "chiefdom" concept — although it is only suggested as a direction for further work here.

Nonetheless, this frames a key question of the dissertation: what enabled the autonomy (or, put another way, the "strong chieftaincy") of the *amrā'* of al-Karak? The establishment and maintenance of a locally-provisioned production system for sugar is, I argue in this dissertation, a critical component of this answer, and one in which the copper producing settlements of the Faynān region played a role. This leads to the question of why parts of this system, like the sugar factories themselves, were maintained or expanded under the Mamlūks, and other parts, like the copper mines, abandoned. In order to answer this question, it is necessary to consider the administrative changes of the late 13th century, asking in particular how some of these changes may have been aimed at maintaining state control over regional centers like al-Karak, and preventing the emergence of autonomous rule in these areas. The ELRAP excavations at KNA and Khirbat Faynān provide critical archaeological evidence for considering how minor industries not documented in historical sources affected and were affected by these political developments.

As this dissertation also traces certain trends in the Faynān region and southern Jordan over the course of roughly two millennia (see Section 1.4), other historical questions are, naturally, addressed. The first of these, and one for which adequate archaeological evidence is unfortunately still lacking, concerns the nature and timing of the end of copper production at the Roman *metallum* of Phaino, the site of Khirbat Faynān. Indeed, while much work in the Faynān region has focused on the Roman and Byzantine period settlement (e.g. Findlater 2003; Friedman 2008; Friedman 2010; Friedman 2013a; Mattingly 2011; Mattingly, et al. 2007b), this has largely been based on archaeological survey and excavation of mortuary contexts, and changes in the nature of the settlement, particularly in the Late Byzantine period, remain unclear. The evidence from ELRAP's 2011 and 2012 excavations does not allow for conclusive answers to these questions, but does illustrate how the settlement changed during this period, particularly in response to several archaeologically identifiable seismic events.

Another set of questions concerns the nature and dating of the Early Islamic period settlement in Faynān. ELRAP investigations in the region have produced clear evidence for the continuity of settlement into at least the late 8th century, and likely later, at a number of sites. Work published after the completion of much of the present dissertation confirms this argument for Khirbat Ḥamrā Ifdān (KHI; see Section 5.4), one of the sites discussed here (Friedman, et al. 2017). Friedman, et al.'s (2017) work raises additional questions about the Islamization of the region that are considered in Section 8.3, although it must be admitted that the evidence simply does not yet exist to make any conclusive arguments about the nature of religion in Faynān in this period. A related set of questions can also be asked about the industrial settlements of southern Wādī ʻAraba during the Early Islamic period. In particular, when do these emerge, how long do they last, and what prompted their establishment? These are primarily relevant to Khirbat al-Manāʻiyya, and are considered in more detail in the preliminary report of the excavations there (Jones, et al. 2017). In the context of this dissertation, they are also of interest for discussing long-term economic patterns in southern Jordan, and are addressed in Sections 8.2 and 9.2.

The nature of the evidence for the Late Islamic period from ELRAP excavations and surveys makes it difficult to ask specific historical questions. The history of this period is summarized in Section 3.7, and forms the background for the analysis of this material, but the discussion of this period in general tends toward longer-term patterns.

1.3. Islamic Archaeology, Islamic History, and Problems of Periodization

Composing any work on a historical period — especially one as long as a dissertation — requires engagement with the problems posed by periodization. On one hand, this terminology is almost always regionally and temporally specific, requiring unpacking for specialists in other regions or periods. On the other, it has been increasingly recognized in recent decades (most notably, see Davis 2008; Goody 2006) that periodization is never neutral, but implies some type of judgment — political, cultural, economic — about that period. Indeed, this is in some ways the point of periodization. Hirschler (2006: ix), for example, cautions, "the employment of 'neutral' centuries might lead to a periodization devoid of any analytical value." Nonetheless, this requires archaeologists and historians to think about the implications of the chronological terminology they use.

For the Middle East, the adoption of terminology from European history — Classical, Late Antique, Medieval, (early) Modern — has received much of the criticism.[3] Although I use this terminology throughout this work at points and find it useful (see Jones, et al. 2014 for more discussion of this point), several points should be kept in mind. The first is that the term "medieval" is a foreign one to Islamic history (Bahri and Sautman 2009: 175), though this is not necessarily a barrier to using it. Although Bahri and Sautman (2009) note that the term does a poor job of acknowledging the changes that occurred between the 7th and 16th centuries, the division of Islam into "Classical" (i.e. Early Islamic) and "Medieval" (i.e. Middle Islamic) periods is fairly common. The second is that there is a tendency among Westerners to consider the Islamic world as still being medieval,[4] and Arabs and Muslims as "still the 'Saracens' of

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[3] Note the criticism of these terms from the perspective of European archaeology by Champion (1990: 89-90), as well.

[4] Although to be fair, this is not exclusively Western. The rhetoric of the Islamic State (IS) rests to an extent on the notion of reviving ancient conceptions of the caliphate. As Cobb (2014) argues, this is not an indication that the

yesterday's medieval epics" (Bahri and Sautman 2009: 181). This tendency has made brief appearances in archaeological thought, as well. Grabar (1978: 57) noted that one of the difficulties of Islamic archaeology was that "Islam . . . is still a living force in almost all the areas which had, at one time or another, become Muslim."[5] Grabar intended this as a note of caution, but it has at times been adopted in less critical fashion. For example, Insoll's (1999) insistence on the unity of Islam through time and space — sensibly dismissed[6] by Johns (2010) as polemic — seems to set itself up to commit exactly the errors Grabar was wary of (for a similar point about art historical approaches to Islamic archaeology, see Kohl 1995: 240).

Even relatively "neutral," at least insofar as they are commonly accepted, dynastic terms are inherently political. As Borrut (2014) has recently and quite effectively demonstrated, the common dynastic periodization of the Early Islamic period — those periods being *Jāhilīyya*, Rāshidūn, Umayyad and ʻAbbāsid — is itself an ʻAbbāsid claim to power. He asks, following Morony (1981), whether "all of their contemporaries [would] have considered ʻUthmān or ʻAlī 'rightly guided'" (Borrut 2014: 41). Indeed, the concept of a "rightly-guided" caliph seems to require someone like Walīd II to serve as a foil. To some extent, this periodization and the

Islamic world is still medieval, but an argument by the IS that it *should* be. Cobb points out that in order for this argument to work one must ignore most of Islamic history, but at a more basic level this understanding of the early caliphate is, itself, modern. Catlos (2015) has recently suggested that the brutal oppression of religious minorities characteristic of the IS would be out of place in medieval Islam and, in fact, has its roots in European ethnic nationalism. A fuller discussion of this point is beyond the scope of this dissertation — one could, for example, also consider the recent comment by Salman Rushdie that *all* religion is "a mediaeval form of unreason" — but the key points are that this term is somewhat politically charged, and "the medieval" often, unfortunately, imagined rather than understood. This is by no means limited to Islamic history, as recent discussions of white nationalism and medieval European history demonstrate (Elliott 2018; Lomuto 2016; Steel 2018). In a somewhat different sense, one can also see a similar tendency in the Russian philosopher Nikolai Berdyaev's (see Section 1.4) hope for the revival of a "respiritualised 'new Middle Ages'" (Corfield 2007: 147). This issue could, without doubt, be the subject of an entire dissertation on its own.

[5] Arguing this point at all is, to an extent, to fall into this trap, however. Christianity, too, is still a "living force" in the modern world, but no medieval archaeologist would make a point of this. The Levant in clearly not "still medieval." Certain institutions, like the *waqf*, still exist in quite different forms — although arguably *waqf*ication was a process that marked the *end* of the late medieval administrative system (Walker 2007c). Other typical medieval institutions — the *iqṭāʻ*, the sultanate, etc. — do not.

[6] In his review of Milwright's (2010) *Introduction to Islamic Archaeology*, he writes: "While general surveys of Islamic history and of Islamic art and architecture are common, Milwright's introductory survey is the first of its kind — for the moment, I ignore the polemical essay by Timothy Insoll" (Johns 2010: 1187-1188).

geographical divisions it entails — Arabian-Rāshidūn, Syrian-Umayyad, ‘Iraqī-‘Abbāsid — have been questioned for decades now, and in history several alternative chronologies have been proposed, including Goitein’s (1968) Arabism, the Intermediate Civilization, Institutionalized Islam, and the Transition to National Cultures, and Hodgson’s (1974: 96, 234) Late Sâsânî and Primitive Caliphal/“Period of genesis of the civilization,” High Caliphal, Earlier Middle Islamic, Later Middle Islamic, Gunpowder Empires, and Modern Technical Age.

Beyond this, however, is a more specific problem for archaeology. As Adams (1979: 727) argued, “political and ideological changes” — those reflected in dynastic chronologies, for example — are not always paralleled by changes in ceramic style, which are often the basis of archaeological dating. For Jordan, Whitcomb (1992b: 386) addressed this problem 25 years ago by breaking the Islamic period up into three somewhat arbitrary divisions, largely following Hodgson’s major divisions, each with two subdivisions: Early Islamic 1 (600-800 AD), Early Islamic 2 (800-1000 AD), Middle Islamic 1 (1000-1200 AD), Middle Islamic 2 (1200-1400 AD), Late Islamic 1 (1400-1600 AD), and Late Islamic 2 (1600-1800 AD). Whitcomb (1997a: 106; 2001b: 505; 2009: 127) has since proposed several revisions, involving a tripartite division of the two earlier periods and two “transitional” periods: the 7th century, Early Islamic 1 (700-800 AD), Early Islamic 2 (800-900 AD), Early Islamic 3 (900-1000 AD), the 11th century, Middle Islamic 1 (1100-1200 AD), Middle Islamic 2 (1200-1350 AD), and Middle Islamic 3 (1350-1500 AD). I instead prefer the Tall Ḥisbān chronology proposed by Walker and LaBianca (2003: 448, Table 1), which starts from Whitcomb’s (1992b: 386) earlier proposal and instead further subdivides his periods. The Middle Islamic 2 (1200-1400 AD) thus becomes the Middle Islamic IIa (1200-1250 AD), Middle Islamic IIb (1250-1300 AD), and Middle Islamic IIc (1300-1400 AD). Walker and LaBianca (2003: 448, Table 1) also add a later period, the Late Islamic IIb, covering 1800

AD to the present. I further subdivide this in the present work by breaking Whitcomb's Middle Islamic I into three subperiods: Middle Islamic Ia (1000-1100 AD, essentially Whitcomb's later 11th century division), Middle Islamic Ib (1100-1150 AD), and Middle Islamic Ic (1150-1200 AD). The ceramic chronologies for this period are still being refined, and not all of these proposed subdivisions can yet be easily identified. This proposal, nonetheless, seems a better match for the archaeological material from the southern Levant. The Middle Islamic IIa-b transition in the mid-13th century, in particular, includes new lamp styles, new styles of stonepaste wares, the appearance of the Glazed Relief Wares, etc. (see Chapter 6). At sites where more diagnostic wares such as these do not appear, decreasing levels of specificity can be used, e.g. Middle Islamic II, Middle Islamic, Middle-Late Islamic, Islamic, etc.

Of course, for addressing certain questions, dynastic chronologies are, in fact, useful. As examples, Genequand's (2005) analysis of the Umayyad settlement at Qaṣr al-Ḥayr al-Sharqī and Walker's (see, among others, 2003; 2004; 2007c; 2009b) studies of Mamlūk imperial policy in Jordan benefit from the use of dynastic periodization. Likewise, some of the questions I ask in this dissertation benefit from a division of the 13th century politically into Ayyūbid and Mamlūk phases. As I have argued previously (Jones, et al. 2012: 69), Hirschler's (2006: ix) "combination of the different possibilities" is presently the best approach for an anthropological, historical archaeology of the Islamic periods. Throughout the work, I use a combination of calendar years, dynastic terms, archaeological periods, and stratum designations, depending on what is most appropriate for a specific question (or, at least, least awkward). As such, I refer to historical events of the Ayyūbid period, but avoid reference to "Ayyūbid ceramics," preferring instead centuries or archaeological periods. While this can require more effort on the part of the reader, a chart allowing cross-referencing between the various systems is presented in Fig. 1.2.

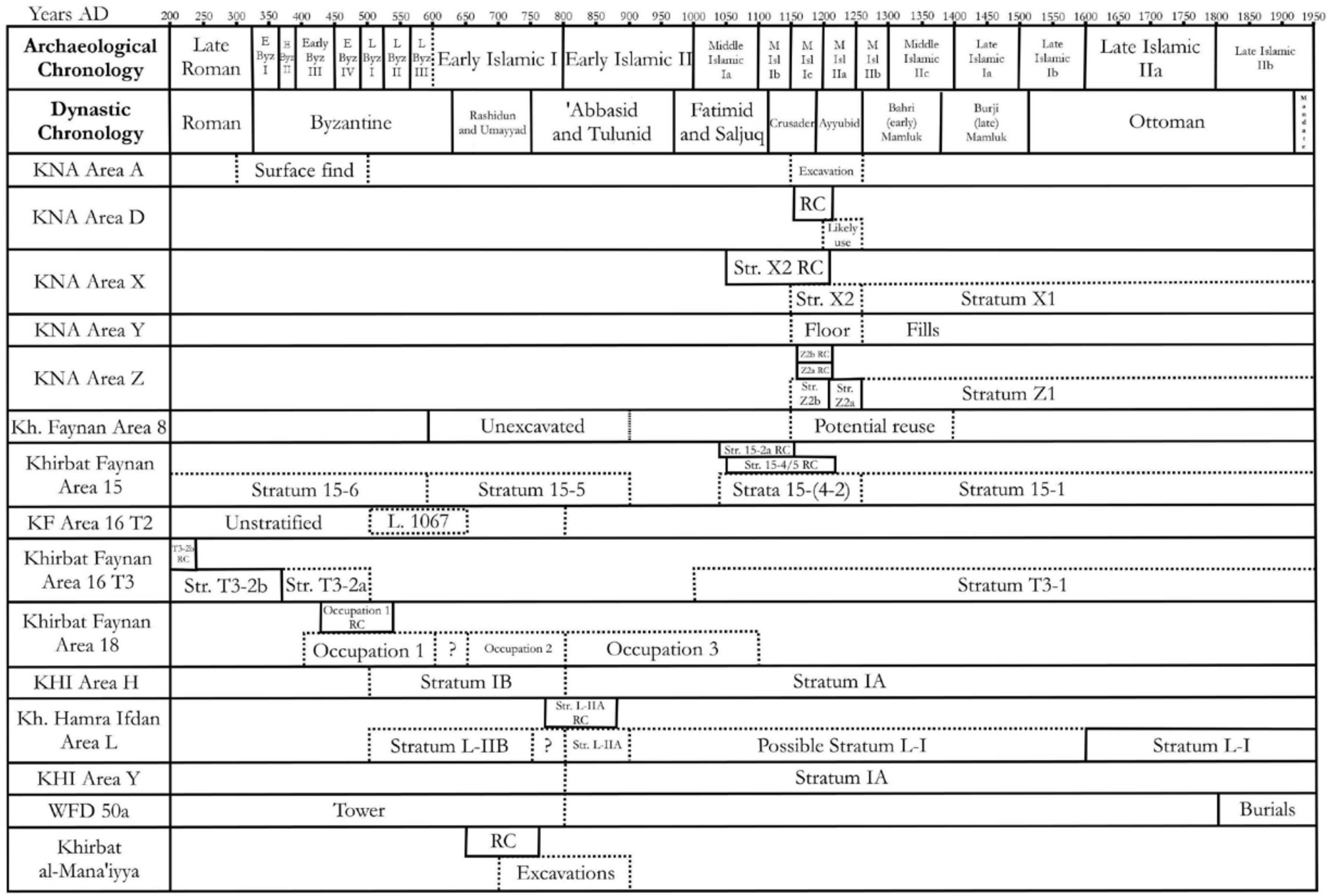

Figure 1.2: Comparative table of absolute dates, archaeological and dynastic periods, and stratigraphic designations for sites in Faynān and Wādī ‘Araba. Roman and Byzantine archaeological periodization follows Parker (1999: 139). For the Islamic periods, see discussion above.

1.4. The *Annales* School, Archaeology, and the Structure of the Dissertation

The structure of this dissertation — and Part III in particular — is inspired by the historians of the *Annales* school. The *Annaliste* framework divides history into three levels, or, perhaps more accurately, understands the movement of history as corresponding to three rhythms.[7] These are generally summarized as *structures* or *longue durée*, *conjonctures* or *moyenne durée*, and *événements* or *courte durée* (Bintliff 1991: 6; Bintliff 2010: 119; Hexter 1979: 109-110). For Braudel, the most commonly read of the *Annalistes*, this order corresponds to the importance of each scale, with the *longue durée* being the most important layer of history (Hexter 1979: 62).[8] As Bintliff (2010: 118) points out, however, the *Annaliste* framework does not assume that the *longue durée* will always be the most important scale on which to understand a historical problem, but rather "it merely asks us to reconstruct the broadest framework for our analysis, so that the precise interplay of time and process can later be allowed to appear for any particular case study." This echoes earlier comments by Hobsbawm (1980: 7), who compared the choice of analytical scale to the choice between a microscope and telescope, arguing, "So long as we accept that we are studying the same cosmos, the choice between microcosm and macrocosm is a matter of selecting the appropriate technique."

Nontheless, the *Annaliste* framework has been adopted in archaeology — and particularly Near Eastern archaeology — primarily in terms of its focus on the *longue durée*, or Hobsbawm's "telescopic" perspective. In the Levant, a specific focus on the *longue durée* is associated in

[7] This division of time is not entirely unique to the *Annales* historians. Braudel (1980: 49-50, 71, 78-79, 208-209) saw similarities in the work of sociologist Georges Gurvitch. The tripartite division into rhythms has even closer parallels in the work of the Russian philosopher Nikolai Berdyaev, who conceived of three levels: cosmic (circular) time, historical (linear) time, and existential ("a dot or point") time (Corfield 2007: 17, 208, 217).

[8] Hexter (1979: 104-105) argues that this focus likely owes to the fact that Braudel spent several years of the early 1940s in a German prison camp, where he completed the first draft of *The Mediterranean* from memory (see also Horden and Purcell 2000: 37). "For Fernand Braudel in a German prison camp, the *événementielle*, the short view, the immediate present, was despair, a powerful enemy not to be faced head on, to be defeated only by ruse, to be put at a distance, to be escaped" (Hexter 1979: 104).

particular with Lawrence Stager and his students (e.g. Schloen 2009a; Stager 1985) — although Schloen (2009b: 1-2) suggests that one of Stager's major divergences from the *Annales* historians, and particularly Braudel, was his embrace of short-term analyses and individual perspectives, in addition to long-term structures, which is relevant to the use of the *Annales* framework in this dissertation, discussed below. Levy (1995; Levy and Holl 1995) likewise applied an *Annaliste* framework to the archaeology of the southern Levant, and tracing social change from prehistory into the Late Islamic period. Other archaeologists, particularly in Jordan, have also adopted it less explicitly; both generally, with English glosses like "deep-time" (Levy 2006; Levy and Najjar 2007),[9] and in terms of specific, geographically structured long-term trends, such as Levy's (2009) "nomadic imperative."

A Brief Digression: "Great and Little Traditions"

Although not the *longue durée* specifically, LaBianca (2007; 2012; LaBianca and Walker 2007; LaBianca and Witzel 2007) has adopted the "great and little traditions" approach of the anthropologist Robert Redfield (e.g. 1955), which has some parallels to the *Annales* approach. As LaBianca, in particular, has adopted the "great and little traditions" approach as a way of avoiding the use of the *Annales* framework, it deserves some attention, at least in comparative perspective. For Redfield (1955: 13-14), it is necessary when conducting anthropological studies of peasant communities to grapple with the fact that "the peasant culture is a half-culture. . . . It *does* require another culture for its continued functioning. The intellectual, and often religious and moral life of the peasant village is perpetually incomplete." This leads him to a distinction between peasant culture and the culture it draws upon, summarized by LaBianca (2007: 276) as,

[9] This usage differs from the more common uses of the term, which tend to refer either to the 19th century "scientific establishment of the prehistoric time span of humanity's life on earth" (Spears 1996: 343) or to the consideration of that time span in terms of even "deeper" geological timescales (Irvine 2014). This usage is not limited to Levantine archaeology, however, and its 19th century sense is explicitly linked to its sense as a gloss of "*longue durée*" in a recent paper considering the political uses and meanings of "deep time" historical analyses (Robbins 2015).

“that between the ‘lettered’ traditions of a ‘learned elite’ and the ‘unlettered’ traditions of the ‘common folk’. The former represent a societ[y’s] ‘great traditions’ whereas the latter its ‘little traditions’.” An example from Islam will suffice to demonstrate how this framework plays out in practice. Citing Gustave von Grunebaum (1955), Redfield (1955: 14) notes that “the cults of local saints” — the “little traditions” of Islam — are often legitimized as orthodox — as part of the “great tradition” — through references to somewhat vague passages in the Qur’ān.

One problem with this dichotomous approach should be immediately obvious to contemporary scholars of Islam, especially those for whom the complexity of religious practice across the Islamic world is a key issue. Focusing on the case just cited, what would one make of the fact that for the Fāṭimids, saints’ cults were not legitimizations of local traditions, but a core aspect of their own attempts to legitimize their Ismāʿīlī Shīʿite caliphate (Williams 1983; Williams 1985)? Indeed, what does one make of the Fāṭimids at all, or Shīʿism generally, in this framework? It is perhaps telling that the Saljūqs are included in LaBianca’s (2007: 283) “Islamic Great Tradition,” while the Fāṭimids are excluded. Beyond this, what does one make of Ṣūfism, which historically has had a rather tenuous relationship with “orthodoxy,” but was, especially in the Middle and Late Islamic periods, “instrumental in spinning a network that bridged between small backwater towns and great urban centers, linking urban and rural communities” (Frenkel 2007: 488)? Is it part of the “Islamic Great Tradition,” despite its deviations from the orthodox? Is it a “little tradition,” despite its connection to the cities? Is it something in between? This tension is at the heart of Antoun’s (1989) critique of the “great and little traditions” approach to Islam, which was also revisited by Lukens-Bull (1999). For Antoun (1989: 43) — following el-Zein (1977) — the division of traditions into two levels is not inherently problematic, but the assessment of the “great tradition” as the more legitimate of the two is. Lukens-Bull (1999: 7) adds to this that, especially in Islam, it is not possible to see either "tradition" as a unified whole. Bradbury (2016) has recently put forward a similar argument for "Islamic" burials specifically, arguing that rural burials represent neither idealized Islamic practice nor strictly local traditions, but rather local adaptations of Islamic norms.

LaBianca (2007: 277) acknowledges Lukens-Bull's (1999) critique, but suggests that, properly used, the "great and little traditions" approach allows for an understanding of the local that the *Annaliste* approach does not, arguing that "the French *Annales* approach . . . tends to overlook the local level in its quest to understand long-term environmental constraints and shorter-term economic and political events." This is a fair criticism of many implementations of the approach, although it should be stressed again, following Bintliff (2010: 118), that the framework itself does not require any assumptions about the scale of analysis that will prove critical to any given analysis. Likewise, this is an issue that advocates of a "post-Braudelian"[10] approach, e.g. Concannon and Mazurek (2016b), have addressed in recent works. It is also worth pointing out that many of the "little traditions" identified by LaBianca (2007: 283-286) for Jordan are not only addressed by *Annaliste* historians, but are even specifically addressed by Braudel (1972) in *The Mediterranean*. Examples include water management (Braudel 1972: 66-75), pastoralism and residential flexibility (Braudel 1972: 85-102, 174-181), and land tenure (Braudel 1972: 75-82). If others — hospitality, honor and shame, and tribalism[11]— are not addressed in as much detail, this is less a weakness of the approach than an indication of Braudel's priorities. These, and others, could easily be addressed within the *Annales* framework.

[10] Ladurie's definition of "post-Braudelian" as one who "would rather accept Braudel 'à la carte' than order the whole menu" (Archambault 1995: 9) is useful in illustrating the range of approaches that can fall under this general term.

[11] On tribalism, however, it is worth noting that Braudel (1972: 20) conceived of Part II of *The Mediterranean* as "the history of groups and groupings." While much of this section focuses on states, civilizations, and other groupings that LaBianca and Redfield would classify as "great traditions," the "little tradition" is not absent.

Temporal Rhythms

Horden and Purcell, in their monumental post-Braudelian work, *The Corrupting Sea*, abandon the tripartite division of temporal rhythms discussed above (see, in particular, Horden and Purcell 2000: 40-45; see also Shaw 2001: 420). While this is a reasonable departure from Braudel, and appropriate to their analysis, the division is, nonetheless, a useful organizing principle, and for this reason I have adopted it in this dissertation. I depart from traditional archaeological uses of the *Annaliste* framework in terms of how I conceive of each of these rhythms, however. In additional to their temporal distinctions, each rhythm serves as a thematic division, inspired by Cronon's (1992: 32) three "elements" of environmental history:

> [T]he ecology of people as organisms sharing the universe with many other organisms, the political economy of people as social beings reshaping nature and one another to produce their collective life, and the cultural values of people as storytelling creatures struggling to find the meaning of their place in the world.

The specific ways in which each rhythm is conceived in this dissertation are described below.

The longest rhythm of history — the *longue durée* — is, as noted above, the one most commonly drawn upon by archaeologists who adopt the *Annales* framework. Generally, this rhythm is seen as including both geological/environmental history — i.e. processes that occur in "geological time" — and sociocultural structures — e.g. worldviews, "civilizational" history, etc. (see Bintliff 1991: 6, Fig. 1.2; Knapp 1992: 11, Table 1.1; Levy and Holl 1995: 4, Fig. 1). Levy and Holl (1995: 7), for example, envision the study of the long-term archaeology of the southern Levant as covering "over one million years of culture change." Sewell (2005: 83-84), in his reworking of the tripartite model, refers to this instead as "teleological temporality," arguing that analysis at this rhythm often assumes a specific direction or end-point for history. This is, of course, not universal, and as a critique of specifically sociological conceptions of the *longue durée* in fact mirrors concerns articulated by Braudel (e.g. 1980: 79) about the sociological avoidance of "historical time." One could point to many archaeological studies — Wengrow and Graeber's (2015) recent discussion of the "origins" of inequality, for example — that successfully avoid this pitfall. Nonetheless, it is the case that long-term analyses can tend toward either teleology or the assumption of stasis.

It is also the case, however, that an understanding of the long-term history of a region is often essential for understanding settlement in a given period and changes over time. Geological history, for example, is quite relevant to archaeology. The formation of Faynān's copper deposits has certainly structured the nature of settlement in the region over the last 10,000 years. As such, this geological history is briefly summarized in Chapter 3 (see, specifically, Section 3.2). Chapter 8, explicitly dealing with the archaeology of the region over the long term, takes a slightly different approach, however. Rather than focusing on sociocultural structures that have remained stable over the long term, this chapter instead traces specific changes over the course of several thousand years. Most of the sections begin with the Hellenistic period (ca. 4th-1st century BC) and continue through the Late Islamic period, with the exception of Section 8.1, on the evolution of Faynān as a mining landscape, which begins in the Iron Age (1200-586 BC). This is, it is worth noting, a rather short timescale compared to many archaeological interpretations of the *longue durée*, e.g. Levy and Holl's (1995: 7), described above. My focus is much more narrow, as the goal of this dissertation is not to write the *histoire totale* of the Faynān region, but rather to answer a set of specific anthropological and historical questions (see Sections 1.1 and 1.2). In this sense, my approach to the long term draws on the *genealogies* advocated by Harding (2005: 97-98), although without adopting his rejection of the temporal rhythms of the *Annales* school.

The middle scale — *conjonctures* or the *moyenne durée* — is described by Bintliff (1991: 6, Fig. 1.2) as including "Social, Economic History; Economic, Agrarian, Demographic Cycles; History of eras, regions, societies; Worldviews, ideologies." In this dissertation, some of this is covered primarily in Chapter 8, "The Long Term," particularly economic and demographic cycles.[12] Likewise, it is worth noting that "history of regions," which essentially characterizes this dissertation, is included at the conjunctural scale. Chapter 9, "Conjunctures," also includes discussion of political history, which in the *Annales* framework is generally placed at the scale of the event. Political history at the scale of the event is summarized in Chapter 3 (particularly Sections 3.4-3.7), but in Chapter 9, the focus is not on the progression of rulers and their specific actions, but political-economic processes playing out over a number of decades, and the structural political changes resulting from or contributing to these processes.

In the last decade, archaeologists have been increasingly interested in the scale of the event (Beck, et al. 2007; Bolender 2010). Much of this has been inspired by Sewell's (1996; 2005) concept of the historical event, and Bintliff (2010) has proposed that this may, likewise, reinvigorate archaeological conceptions of *Annaliste* history.[13] It is, however, worth addressing the concerns of scholars like Grattan (2010) concerning Sewell's conception of events. Grattan (2010: 180) worries that "the adoption of a research focus on the 'event' may really be a thinly disguised 'eventful determinism,'" and suggests that archaeologists need to take a wider view. This seems to be an issue primarily of scope and research questions, rather than a specific problem of "eventful archaeology." For example, Grattan (2010: 184) argues, "Pompeii was destroyed but the wider Roman world was unaffected." This is true, and it would be a mistake to

[12] Sewell (2005: 91-100) refers to his middle scale as "experimental temporality." This designation makes more sense in sociology than in archaeology, although it does call to mind, for example, Michael Smith's (2011; 2017; Smith, et al. 2012) recent work on archaeology and the social sciences other than anthropology.
[13] Sewell's (2005: 83) "three temporalities" do, of course, recall the divisions of the *Annalistes*, but he instead argues that the event is the most appropriate timescale for discussing social change.

suggest that the destruction of Pompeii caused major structural changes in the Roman world. There are, however, two points that must be noted. First, in Sewell's (2005: 100) conception of temporality, this would not be an "event" but a "happening," as he explicitly defines the event as "that relatively rare subclass of happenings that significantly transforms structures." In this sense, a natural disaster — or, as they have recently been termed, a "short-term cataclysmic event" (Mordechai 2018) — may be an event in Sewell's sense of the word, but this cannot simply be assumed. The point is not necessarily that happenings are not worthy of study, but that Sewell's analytical framework explicitly addresses Grattan's concerns. Second, for an archaeologist interested specifically in Pompeii, long-term structures of resilience do little to explain its destruction. As such, happenings can, at the scale of individual sites and small regions, be "eventful" in the sense of causing change, even if these changes are quite minor when viewed at the scale of large regions, empires, and so on.

In Chapter 10, I adopt a conception of the event that collapses events and happenings into a single category. Events as conceived here are not limited to volcanic disasters and other major episodes of change. They can, in this sense, be rather mundane. Hodder's (2000: 21) observation that "archaeological understanding of the long term is built up from traces of the smallest and least significant of acts" is quite relevant here. Most archaeological contexts are, at a basic level, the result of some event of construction, abandonment, destruction, etc. It is, therefore, not only sensible but also necessary for archaeologists to discuss and explicitly theorize this timescale. Chapter 10, therefore, includes a discussion of both local events (e.g. the abandonment of KNA [Section 10.1]) and aspects of labor, daily life, and death at a small-scale (Sections 10.2-10.4). This includes aspects of both the *courte durée* of the *Annalistes*, e.g. events and individuals

(Bintliff 1991: 6, Fig. 1.2), but also of the *longue durée*, particularly those aspects that overlap with LaBianca's "little traditions," discussed above.

Geographies and Temporalities

A critical component of Braudel's work, and one that has certainly not gone unnoticed, is that the analytical focus of his most famous work is a geographical region, the titular "Mediterranean" — or rather, Mediterraneans, as Braudel (1972: 17) recognized that "[t]he Mediterranean is not even a *single* sea." This geographic focus, too, is at least partially responsible for Braudel's focus on the deep, long-term structures that unite the Mediterranean as a region. Many other scholars have adopted Braudel's focus, and Mediterranean Studies is now a subdiscipline in its own right, with its own professional organization and journals (see summary and critique in Alcock 2005). This has influenced how archaeologists and historians engage Braudel, and "the Mediterranean" continues to be the explicit analytical focus of many Braudelian and "post-Braudelian" approaches (e.g. Abulafia 2011; Concannon and Mazurek 2016a; Harris 2005; Horden and Purcell 2000, among many others). However, his focus on the sea, and with it "matters of the environment and material culture before stories of kings and battles" (Wick 2016a: 743), has been applied to other bodies of water, as well, and explicitly or implicitly (post-)Braudelian approaches can be found for both the Red Sea (Power 2012a; Wick 2016b) and the much larger Indian Ocean (Bishara 2016; Chaudhuri 1985; Green 2016; Mathew 2016).[14] Indeed, Braudel's focus on connectivity and the long-term was ostensibly expanded to

[14] Braudel was certainly not the only mid-20th century historian to propose similar geographic foci. Goitein's (1967-1993; 1999) monumental study of the Cairo Geniza, for example, is — quite naturally, given the source material — titled *A Mediterranean Society*, and a later volume is dedicated to the Indian Ocean trade (Goitein and Friedman 2008). The first preliminary report of these studies appeared in 1954 (Goitein 1954).

the entire world in De Landa's (1997) ambitious Braudelian/Deleuzean *A Thousand Years of Nonlinear History*.[15]

In this dissertation, I approach Braudel somewhat differently. My analytical focus is also a geographical region, albeit one much smaller than the Mediterranean. The approach of focusing on smaller regions within a Braudelian framework has some parallels in Horden and Purcell's (2000: 53-88) analysis of "definite places" — Wādī al-Biqā', Lebanon; south Etruria, Italy; al-Jabal al-Akhḍar, Libya; and Milos, in the Cyclades —but my focus is somewhat different. I am more interested in examining this smaller region in its own right, rather than as part of a broader "Mediterranean" or "Red Sea" world. At the most fundamental level, my region is the Faynān region of southern Jordan (see Section 3.2), but it could be also conceived more broadly as Wādī 'Araba. While not seas, both were, at least until recently, landscapes of connectivity and movement (see Bienkowski 2006; Bienkowski 2007).

Temporally, it is worth noting that Braudel's focus was not explicitly the Mediterranean in the *longue durée*, but the Mediterranean during the 16th century AD. The *longue durée* was important not as an object of analysis, but as a tool for understanding the structures of daily life. In this sense, the analysis in this dissertation falls somewhere between Braudel, on one hand, and on the other Horden and Purcell (2000) and many of the archaeologists discussed above. While the largest part of this dissertation focuses on the 12th-13th centuries AD (see Section 3.6), the analysis covers the 6th-19th centuries, or from Late Antiquity into the first half of the Late Islamic IIb (see Fig. 1.2 and Chapter 3). It would not be possible in this space to cover this entire period evenly, and my coverage is determined both by the history of settlement in Faynān itself and by the specific questions I pose in this dissertation (see Sections 1.1-1.2).

[15] De Landa's (1997) work, however, demonstrates the difficulty of successfully applying a geographically broad approach, and despite the title's broad claims, it is effectively a fairly standard (but theoretically interesting) work of European history.

The Structure of the Dissertation

The dissertation is broken up into three parts: Part I, "Introduction," including chapters 1-3; Part II, "Data," including chapters 4-7; and Part III, "Discussion," including chapters 8-11. As noted above, the organization of Part III draws most heavily on the *Annales* framework. Each chapter, other than the current chapter (Chapter 1), is summarized briefly below.

Chapter 2, "Theoretical Background," briefly lays out the anthropological theoretical framework of the dissertation. Section 2.1 introduces key political economic concepts, primarily those related to political centralization and import replacement. Section 2.2 is concerned with producers and production, introducing several concepts critical for Part III, and particularly Chapter 10, including production-provisioning systems, *chaînes opératoires*, behavioral chains, and feature systems.

Chapter 3, "Historical, Archaeological, and Environmental Background," begins with a brief summary of research on the key topics of the dissertation, followed by a discussion of the geology and geography of the Faynān region, with a focus on the geology of the copper deposits. Following this is a summary of several aspects of Islamic period mining and metallurgy, followed by a summary of the history and archaeology of southern Jordan, organized by period and focused primarily on Faynān. This begins with Late Antiquity (Section 3.4) and moves through the Early (Section 3.5), Middle (Section 3.6), and Late (Section 3.7) Islamic periods.

Part II, "Data," begins with Chapter 4, "Islamic Period Copper Smelting Sites." This chapter summarizes the excavations that form the core of the present work, conducted as part of the Edom Lowlands Regional Archaeology Project (ELRAP) — directed by Prof. Thomas E. Levy and Dr. Mohammad Najjar — during the 2011 and 2012 field seasons. The focus of this chapter and the excavation summaries in the following chapter is on architecture and stratigraphy, with finds primarily presented in other chapters. The most important excavations summarized in Chapter 4 are those at the Middle Islamic period copper producing village of Khirbat Nuqayb al-Asaymir (KNA), conducted in five excavation areas during both field seasons (Section 4.1). Section 4.2 covers excavations in Khirbat Faynān Area 15, a copper slag mound dating to the Middle Islamic period, excavated during the 2012 field season. Section 4.3 presents a summary of the excavations at Khirbat al-Manāʿiyya, an Early Islamic period copper smelting camp in southeastern Wādī ʿAraba, excavated by an ELRAP team in 2012. A more detailed preliminary report of this season has been published (Jones, et al. 2017), and it is summarized here due to its importance in understanding shifts in copper production in Wādī ʿAraba during the Islamic period.

Chapter 5, "Excavations and Surveys at Related Sites in the Faynān Region," summarizes work by ELRAP and its predecessor, the Jabal Hamrat Fidan (JHF) Project, at sites in the Faynān region other than smelting sites. It begins with two sections (5.1 and 5.2) on copper mines and road stations recorded during surveys of the Faynān region, primarily the Wādī al-Ghuwayb (WAG) Survey, conducted in 2002, and the Faynān-Buṣayra Regional Survey (FBRS), supervised by Erez Ben-Yosef in 2007. Section 5.3 presents excavations at Khirbat Faynān Areas 16 and 18, conducted in 2011 and 2012. Section 5.4 presents a summary of the "late" periods at Khirbat Ḥamrā Ifdān (KHI), a primarily Early Bronze Age site, with a particular focus on the JHF excavation of an Early Islamic period structure, Area L, during the 2000 field season. Section 5.5 reports on salvage excavations by JHF in 2004 at Wādī Fidān 50a (WFD 50a), a badly damaged Roman-Early Islamic tower and Late Islamic burial. Section 5.6 summarizes mortuary, pastoral, agricultural, and watchtower sites found during various JHF and ELRAP surveys conducted between 1998 and 2015.

Chapter 6, "Ceramics from ELRAP Excavations and Surveys," is a detailed analysis of the ceramics from KNA (Section 6.1), Khirbat Faynān (Section 6.2), KHI and WFD 50a (Section 6.3), and selected survey sites (Section 6.4). Ceramics are given particular attention because they are critical for establishing the date of these sites, for determining the function of specific areas, for reconstructing patterns of exchange and provisioning, and for comparison to other sites. Section 6.5 presents the results of a small petrographic study of ceramics from the Faynān region (and associated ELRAP projects), which was primarily aimed at sourcing.

Chapter 7, "Summary of Non-Ceramic Finds from ELRAP Excavations and Surveys," presents five other categories of finds. Section 7.1 includes a detailed presentation of the coins (and coin-like objects, such as Late Ottoman tokens) from ELRAP surveys and excavations, and a summary of other metal objects, primarily those well enough preserved to be identified with some certainty. Section 7.2 is a summary of the metallurgical debris from KNA and Khirbat Faynān. In addition to descriptions of the key types of this material, it also includes preliminary results of a portable X-Ray fluorescence spectrometry (pXRF) study of slag from KNA, Khirbat Faynān, and Khirbat al-Manā'iyya. Section 7.3 is a summary of stone objects (other than gaming pieces) from KNA and Khirbat Faynān, primarily stone vessels and liturgical objects. Section 7.4 presents glass, beads, and shell, primarily from the Late Islamic burial at WFD 50a. Section 7.5 presents gaming pieces (and possible gaming pieces) from KNA, including one of only two chess pieces found in southern Jordan.

Part III, "Discussion," is divided into three main parts, corresponding to the three rhythms of the *Annales* school. Chapter 8, "The Long Term," traces five themes through several millennia. Section 8.1 considers Faynān's evolution as a mining landscape between the Iron Age and Middle Islamic period. Section 8.2 traces shifts in the orientation of southern Jordan's economy between the Hellenistic and Late Islamic periods. Sections 8.3-8.5 consider the Faynān region as a religious landscape, a landscape of movement, and an agricultural and pastoral landscape.

Chapter 9, "Conjunctures," moves to the *moyenne durée*, considering five shifts playing out on the scale of decades. This begins with Section 9.1, a brief summary of the end of Roman/Byzantine investment in the *metallum* at Phaino, followed by Section 9.2, on the Islamic conquest of southern Jordan, and Section 9.3, which considers the political aspects of the Early Islamic period economy of southern Jordan, focusing on copper production. The key pieces of Chapter 9 are Sections 9.4 and 9.4.1, in which I present my arguments concerning the relationship between sugar production, copper production, and the autonomy of al-Karak (Section 9.4) and the relationship this had to specific aspects of political reform during the early Mamlūk period (Section 9.4.1).

Chapter 10, "Events," considers the scale of the short-term, focusing primarily on the evidence from KNA. Section 10.1 uses the evidence from the excavation of KNA Area X to reconstruct a picture of what the smelting workshop would have looked like on the last day of work prior to the site's abandonment. Section 10.2 draws on the theoretical framework laid out in Section 2.2 to describe the processes of copper production and the broader production-provisioning system to which KNA and associated sites belonged. Section 10.3 is concerned primarily with aspects of daily life at KNA that can be reconstructed from the archaeological evidence. Finally, Section 10.4 considers the Late Islamic burial at WFD 50a as an event or happening, and offers a tentative explanation of some of its unique aspects.

Chapter 11, finally, is the conclusion, and provides a summary of the key arguments running through the dissertation.

Chapter 2: Theoretical Background

In the previous chapter, I introduced the key anthropological questions of the dissertation, as well as the historical theory that structures the layout of the dissertation, and particularly the chapters in Part III. In this chapter, I discuss the anthropological theory at the core of my analysis. This can be broken up into two separate bodies of theory. The first, presented in Section 2.1, deals primarily with political economy and the opposing forces of centralization and maintenance of autonomy in political systems. The second, presented in Section 2.2, is primarily concerned with theories of production and provisioning, as well as the analytical tools for reconstructing these processes.

2.1. Theorizing Middle Islamic Political Economy

State Formation beyond Social Evolution

As Morehart and De Lucia (2015: 4-5) argue in their introduction to their recent edited volume on surplus,

> Social evolutionary approaches to surplus . . . can reduce the utility of the concept among archaeologists examining other aspects of society and change. . . . Even for archaeologists working in sociopolitical cases seemingly closely wedded to the surplus concept, ancient complex societies, its dominant usage limits the ability to reconstruct local people and the strategies of everyday life.

This applies more broadly to many aspects of sociopolitical and political economic organization in archaeology (see Schwartz 2006). While social evolution is an important process, and much valuable archaeological work has been done on the topic (see Marcus 2008), this focus on social evolution, and with it broad-scale sociopolitical organization — e.g. “state-level societies” — rather than political organization, limits the utility of much archaeological theory for the present work.

Marcus's (1998) "dynamic model" provides a good example of this. At a basic level, the dynamic model proposes that state-level societies will not always be organized politically into states, but rather will oscillate between periods of centralization — i.e. state-level political organization — and decentralization — i.e. fragmentation into "former subject provinces [that] should be considered no more than principalities or petty kingdoms" (Marcus 1998: 63). While developed in the context of "archaic states," the dynamic model also seems potentially valuable for studying the Ayyūbid polity, which existed in the period between the 10th century fragmentation of the ʻAbbāsid Empire and the formation of smaller regional states in the 13th century, e.g. the Mamlūk Sultanate and various Mongol khanates. The primary concern of the dynamic model, however, is with the "peaks" of centralization and how these are achieved. The "valleys" of decentralization are explained through "the difficulty of maintaining large-scale inegalitarian structures for long periods of time" (Marcus 1998: 94). This recalls Ronald Cohen's observation — recently applied to Mamlūk state formation by Clifford (2013) — that in order for a state to form, "[f]ission as an inherent quality of political life must be overcome and the continuity of a particular authority structure must be assured" (Cohen 1978b: 59; see also Cohen 1978a: 156; Cohen 1981). Why this is the case is left as an open question or simply assumed — somewhat understandably, due to the focus, noted above, on social evolution and "state formation."

Iannone (2002) attempts to answer the question of why these political structures are difficult to maintain, but in doing so reveals a second problem. He draws on the *Annales* framework, suggesting that the fragility of centralized states is due to a tension between long-term (*longue durée*) decentralized structures of "kinship" and medium-term (*moyenne durée* or *conjonctures*) "cycles" of centralization, or "kingship." This agrees with Braudel's conception of the *longue durée* as the most critical "rhythm" of history (see Section 1.3) and does have some parallels with the Middle Islamic case — Iannone's (2002: 75) discussion of the tension between "kin-based" and "intensive" patterns of agriculture, for example, is broadly paralleled by local resistance to Mamlūk state agricultural policies in the 15th century (Walker 2008). This is not, however, a very satisfying answer to the original question. While the *Annales* framework provides a developed vocabulary for discussing this phenomenon, it does not explain why centralized state institutions are fragile and difficult to maintain, or why "kingship" falls into the cyclical *moyenne durée*. In this sense, Iannone's (2002) revision of the dynamic model brings us to an analytical dead-end. The *Annales* framework predicts that political change will occur at the rhythm of the *moyenne durée*, but does not tell us why this is the case. More problematically, the opposition of long-term "kinship" and medium-term "kingship" masks the fact that *any* sociopolitical order must be maintained. While Marcus (1998: 94) is certainly correct that state-level structures are fragile, the dynamic model also predicts that the opposite is true: states tend to break into smaller principalities or kingdoms, but these smaller polities also tend to coalesce into states. Pauketat (2007: 37), referring to a similar model, asks, "is it even an *explanation* at all? . . . Yes, people seem to have coalesced around administrative centers that later disintegrated. People may have recoalesced subsequently in the same region or elsewhere. This is the pattern. . . . Is it also the process?" In other words, much work on state formation and fragmentation considers *how* these things occur, but this does not necessarily explain *why* they occur.

I propose, following Pauketat (2007), that some consideration of the *courte durée* — *événements* in the short term — is necessary to understand the tension Iannone (2002) describes between the long- and medium-term. This could also be framed in terms of agency — individual motivations, decisions, and actions — which "is as important as macroscale political economy in the organization of interregional interaction networks" (Stein 2004: 907; see also Yoffee 2005: 113-130).[16] The necessity of considering short-term timescales and human agency can be seen in the discussion above. Walker's (2008; 2011b: 239-268) analysis of 15th century Jordan makes clear that it is not simply a "tension" between long-term and medium-term agricultural practices that is important, but a preference for or active resistance to specific agricultural practices by peasants, in combination with competing attempts by the Mamlūk elite, local elites, and peasants to shift the system of land tenure in their favor.

Theorizing the Ayyūbid Polity

In the case of this dissertation, a key question (see Section 1.2) concerns the ways in which certain *amrā'* of al-Karak were able to assert their autonomy from dynastic heads in Cairo and Damascus, and more broadly, how small, semi-autonomous polities maintain their autonomy from larger polities (see Section 1.1). In reference to the above discussion, this could perhaps be rephrased as: why did the Ayyūbid polity fission after Saladin's death, and why were some lower-ranking *amrā'* able to increase their autonomy from the dynastic heads?

One approach to this question might analyze the Ayyūbid case within its specific historical trajectory. It is important to note here, however, that adopting an approach like Insoll's (1999; and see Section 1.4) and trying to identify general features of a "Muslim state" can be counterproductive. It has, of course, been attempted, for example by Lambton (1981: 13; paraphrasing Siegman 1964: 14), who argued, "The basis of the Islamic state was ideological,

[16] Although elites are an important part of this analysis, I would distinguish my approach from Flannery's (1999) "Great Man" discussion of agency in the formation of states. While he offers an interesting — if somewhat polemical — argument about the relationship between structures and agency, my goal here is not to discuss how specific, highly-successful individuals fit certain patterns — or, indeed, to identify additional comparative patterns (Flannery 1999: 14-15) — but rather to consider the role of individual decisions, interactions between individuals, and the constraints imposed by longer-term structures in determining *why* certain patterns play out in specific, historically-contingent ways.

not political, territorial or ethnical and the primary purpose of government was to defend and protect the faith, not the state."[17] This may be the case either as a description of the first Islamic century or an ideal (Lapidus 1975: 364), but it is not adequate as a general description of political formations in the Islamic periods. Lapidus (1975; 1996; see also 2002: 99-102), for example, suggests that by the mid-9th century, a "separation of church and state" had occurred wherein the Caliph lost much of his religious authority, and that in the following centuries, with the breakdown of the 'Abbāsid Empire, the Caliph also lost much of his political authority. The Caliph, of course, continued to be a political player into the 11th and 12th centuries, as Hanne (2007) has argued, but this was regionally specific, and the Caliph's influence in the southern Levant and Egypt was, during the 12th and early 13th centuries, marginal.

The so-called "shadow caliphate" established by the Mamlūks after the Mongol conquest of Baghdād, likewise, cannot be interpreted as "government . . . defend[ing] and protect[ing] the faith," but rather demonstrates the continuing symbolic importance of the caliphate, as it became one among severals tools used by the Mamlūks to legitimate their rule (Fuess 2013: 96; Heidemann 1994; see also Hartmann 1950). In this sense, the Mamlūk "shadow caliphate" was essentially the inverse of Lambton's "Islamic state": a religious institution whose purpose was primarily to protect the state.

[17] Lambton (1981: xiv) also viewed the state as being an inherent part of Islam, arguing, "No Muslim political theory of state therefore asks the question why the state exists." As an ideal or theoretical statement, this may be true, but also fails as a general description. Caton (1990: 95), in his fieldwork in northern Yemen, for example, observed that, "the tribes of Yemen, who until 1962 had for centuries been ruled by a fairly strong imamate, were no strangers to the apparent pax Islamica, but they also feared tyranny (or, to put it differently, the loss of their political autonomy) more than the (apparent) anarchy of their political system." Other examples can, of course, be found, but this demonstrates that autonomy is often valued more than theoretical or idealized conceptions of the state. It is also worth noting the distinctly Khaldūnian nature of Lambton's (1981) conception of the "Islamic state." For Ibn Khaldūn, "the state must already exist within the tribal order if that order is to survive" (Caton 1990: 87), which sounds much like what Lambton proposed, if "Islamic" is substituted for "tribal." Likewise, Ibn Khaldūn's (1967: 120) statement that "Bedouins can acquire royal authority only by making use of some religious colouring" sounds quite similar to Lambton's (1981), and by extension Siegman's (1964), view of Islamic authority.

Indeed, it is more productive to understand this — and other facets of the "Islamic state" — as part of what Bronson (2006: 140) calls "template regeneration," where recentralization is based on "a fully understood, well-recorded model." In the Mamlūk case, "organizational models" could be "borrow[ed]" (Bronson 2006: 142) from the recently fallen ʻAbbāsids and other nearby "states and statelike units" (Bronson 2006: 142) and adapted as necessary. The agency involved in this model — the borrowing and modification of specific "organizational models" — is a necessary component for understanding both the "dynamic" cycles of centralization and decentralization, and the nature of continuity of political institutions.

A better approach, then, would look to the later Mamlūk state and consider how it modified the Ayyūbid system to resolve problems of fissioning and conflict. The traditional view sees Mamlūk political solidarity as based on *khushdāshiyya*, a feeling of "solidarity among *mamlūk*s serving the same master" (Yosef 2013: 335). This is often taken more generally as the principle way the Mamlūk elite conceived of political relationships, and in some cases even as a somewhat artificial substitute for what Ibn Khaldūn calls *ʻaṣabiyya*, or "social cohesion" (Ayalon 1953a: 206-211; Ayalon 1953b: 456; Ayalon 1957: 43-44; Ayalon 1980; Gellner 1990: 121-126; Irwin 2000: 37; on the supposed breakdown of this system, see Levanoni 1994: 382; Levanoni 1995; cf. Clifford 1997: 55; Clifford 2013: 48-54). In other words, in this view, the group solidarity of *mamlūk* cohorts served to limit the ability of elites to challenge the *sulṭān*. Clifford (2013: 216), however, has argued that this is an unsatisfactory answer, as members of the same *mamlūk* cohort often came into conflict to preserve *niẓām* — "order," in this case referring specifically to "constitutional order." He recently suggested, instead, that the Mamlūk state resolved fissioning through clientelism and a commitment among the elites and *sulṭān* to *niẓām* (Clifford 2013). He argues, "in the Mamluk state factionalism usually broke out only when administration broke down, when the regime was perceived by the elite as a whole to be incapable or unwilling to maintain a reasonably equitable distribution of state resources" (Clifford 2013: 215). In other words, this stability was achieved, at least in part, through a shift from the "directe et personnelle" government of Saladin (Mouton, et al. 2015: 107-117), and of the Ayyūbids more generally, to a more centralized, bureaucratic system. This is not a novel idea, and, indeed, was proposed as a general feature of state formation by archaeologists in the 1970s (Wright 1977; Wright and Johnson 1975). Nonetheless, this approach is promising, particularly when applied to changes in specific institutions, and this forms part of my analysis of the Ayyūbid polity. In particular, comparison to the Mamlūk system is essential for understanding the *iqṭā'* — most simply defined as a system of "quasi-feudal tax grants" (Walker 2011b: 36) — and how Mamlūk modifications to this system limited the possibility of "provincial elite" autonomy (see Section 3.6.1).

Another way of answering this question might be to rely on a typology of "provincial elite strategies," which would provide a convenient vocabulary for classifying the actions of the Karakī *amrā'*, including bolstering, resistance, information control, and appropriation (Stark and Chance 2012). These are, of course, better suited to the cases of provincial elites in empires, which is what the typology was developed to classify, but there is also a good deal of overlap. This runs into the same problem as Iannone's (2002) use of the *Annales* framework, however. It provides a vocabulary for discussing elite actions, but collapses a fairly wide range of variation into these categories — the persistence of local ceramic styles and violent uprisings may both be forms of "resistance" (Stark and Chance 2012: 205-209), for example, but it is not clear what explanatory work is done by collapsing them into a single category — and does not explain why certain strategies are successful at some times but not at others.

Rural Import Replacement

It is more useful here to work from the archaeological evidence on the ground — in this case, the mining sites in the Faynān region that form the core of this dissertation — and determine how these fit into the wider political economic system. As I argue in later chapters (see Sections 3.6 and 9.4 in particular), the scale of the Middle Islamic copper industry of Faynān, and the timing of its emergence, makes the most sense when understood as part of a larger system provisioning the lucrative sugar industry (and see below, Section 2.2). The production of copper in Faynān, then, can perhaps best be understood as a strategy of import replacement, or "import-substitution" (see Algaze 2005: 8, 12-14). The concept of import-substitution, "the process of building up manufacturing enterprises to produce goods which were formerly imported," first emerged in development studies (Alexander 1967: 298). Its use in this context sees it primarily as a strategy of industrialization in post-colonial settings (Alexander 1967), and as such it is not particularly applicable to the Middle Islamic case. Debates over the extent to which Latin *Outremer* was "colonial" in a modern sense continue in both academic and non-academic settings (see Prawer 1986; and more recent summaries and critiques in Constable 2001; Tyerman 2011), but there are clear economic differences when compared to 19th and 20th century colonialism, and, more to the point, clear differences in how 20th century and 13th century polities achieved economic goals. It is also worth noting that, within the field of development studies, the import-substitution strategy has generally been seen as discredited for the last several decades (see, e.g., Rodrik 1992). Although some work (e.g. Alavi 1996) has challenged the degree to which it should be seen as completely discredited, it has, as a strategy, largely been replaced by trade liberalization.

Where import-substitution is a top-down strategy to be implemented by governments, Jane Jacobs's (1970; 1984) concept of "import replacement" is not necessarily concerned with policy, but with city institutions — in other words, it is what Taylor (2012: 441) calls a "city-centric," rather than "state-centric" approach. As summarized by Algaze (2005: 8), at a certain point in the development of an economy, "it becomes profitable to replace imports of some commodities subject to scale economies with local production" within a city. As a result of this, people migrate to that city from the surrounding countryside and beyond, which expands both the local economy and the pool of skilled labor.

> The reasons for this have to do with the multiplier effects of increases in productive capacity. One is the creation of linked industries providing production inputs to the initial industry (backward linkages) or adding further value to semi-finished goods produced by those industries (forward linkages) . . . Another effect is the development of related work in sectors providing needed services. (Algaze 2005: 8)

These effects cause something of a snowball effect, leading to further import replacement and settlement aggregation.

Where proponents of import-substitution argued that it was a way of achieving economic growth in the "developing" world, Jacobs instead contends that "import-replacing cities" are the key driver of economic growth in essentially any context. Indeed, she extended this principle back to the Neolithic, arguing that the success of New Obsidian — her fictionalized version of Çatalhöyük — was derived from import replacement (Jacobs 1970: 31).[18] Although the degree to which al-Karak was a "city" during this period is somewhat debatable[19] (see Walker 2011b: 39-

[18] This is not to say that Jacobs's conception of the Neolithic was always accurate, however, as Smith, et al. (2014a) have recently demonstrated for her "Cities First" model.
[19] The degree to which Çatalhöyük is a city is, of course, also debatable, and has, indeed, been the subject of much debate (among many others, see Düring 2013; Emberling 2003: 257-258; Hodder 2006: 98-99; Mazzucato 2016; Smith, et al. 2014a: 1530; Soja 2010; Taylor 2012; Taylor 2015). This debate is rather different, as it concerns the degree to which Çatalhöyük functioned as an urban center, whether this is defined as having an agricultural hinterland, functionally-distinct buildings, or a large, socially heterogeneous population (see Smith, et al. 2014a: 1530). By these measures, al-Karak is without doubt an urban site, which suggests that the import replacement

42), the “import-replacing city” concept is more applicable to this case. Tilly (1986: 398) also argues that Jacobs “profoundly underestimates the importance of the hinterland and of the interaction between city and surrounding area.” This is an important insight here, as well, as I argue that the key economic developments took place not in al-Karak itself, but in the rural areas of Faynān, the Dead Sea *aghwār*, and the Jordan Valley *ghawr*. At least some of the focus on power discrepancy from the development model of import-substitution should also be retained here. While the Ayyūbid case is not “colonial,” as such, conceived more broadly the colonial model is a specific case of an interaction between weaker and stronger polities, and import-substitution a strategy for achieving and maintaining autonomy, both economically and politically. Indeed, it is here that I break with the general use of Jacobs’s import replacement concept. My goal is not to investigate the role of cities in economic growth, or the role of import replacement in the development of the economy of al-Karak, but rather how processes of import replacement contributed to the political autonomy of the *amrā’* of al-Karak in the 13th century. In the following section, I discuss how this can be studied archaeologically by reconstructing systems of production and provisioning.

2.2. Producers and Systems of Production and Provision

Craft Production in Archaeological Theory

Most archaeological studies of craft production owe a great deal to the pioneering work of Earle (1981), D’Altroy and Earle (1985), and especially to Costin’s (1991; 1998; 2001; 2007) significant contributions to this body of theory. Many of the key variables identified by these scholars, and particularly Costin, remain useful for archaeological studies of mineral extraction, as well. Costin (1991: 9) lists four “parameters” of the organization of production: context, concentration, scale, and intensity. These can be briefly defined as the degree of elite

model is applicable here.

sponsorship of (and demand for) labor, the spatial distribution of labor, the "composition of the labor unit" in terms of "size and principles of labor recruitment," and whether producers are part- or full-time specialists, respectively (Costin 1991: 11-16).

Naturally, some of these variables are significantly constrained for copper production by the physical location of copper ore. In most cases, the location of copper smelting sites is determined by proximity to ore sources, regardless of the political context of production. This does not apply to all cases, however. A notable exception is the Late Chalcolithic period in the southern Levant. During this period ore was mined in Wādī ʻAraba — primarily Faynān — but transported up to 100 km to smelting sites in the northern Negev (Hauptmann 1989; Levy 2007: 51; Levy and Shalev 1989: 364-367; see also Rowan and Golden 2009: 43). This relatively long-distance transport points to a particularly "attached" production context, which in turn provides insight into the prestige (and probably magic) associated with the recently discovered technology of transforming copper oxides into metallic copper with fire. While this is not applicable to copper production in all periods, of course, this does demonstrate the utility of investigating these parameters, even when it seems they can be assumed.

Costin (1991: 8-9) also suggests eight "types" of specialist production, ranging from "individual specialization" to "retainer workshop[s]," each corresponding to one of the poles of the previously described parameters. These types are useful, in that they provide a standardized vocabulary for comparative studies of production, and I make occasional reference to them in this dissertation. Their weakness, however, is that their use tends to favor a view of the parameters of production as "dichotomous variants," rather than "continua," which limits the "flexibility and precision" with which a specific case study can be described (Costin 2005: 1038). Clark (2007: 21) makes the same point, noting that fitting specific cases to types often results in “a degradation of crisp information in exchange for vague positioning.” In the analysis presented in this dissertation, the flexibility of viewing each parameter as a continuum is desirable, particularly for analysis of production trends in the longer term. Both Late Roman and Middle Islamic period copper production in Faynān could be classified as attached production, but the degree and nature of elite sponsorship differ in ways only partially captured by the distinction between Costin’s (1991: 9) “retainer workshop” and “nucleated corvée” types.

A second issue is worth addressing here concerning a specific criticism that has been directed at the “attached/independent” continuum, particularly its fairly early articulation by Earle (Earle 1981), Trigger (1974: 100-101), and, even earlier, Childe (1952: 3). Both Clark (2007: 21-22) and Flad (2007: 111) take issue with the conception of the “context” parameter as a continuum, arguing instead that there is a qualitative difference between attached and independent production, and that this is a critical difference between context and the three other parameters of production. This is reflected in attempts to modify this parameter by proposing “embedded” specialization as a third, discrete category (e.g. Ames 1995; Janusek 1999; Saitta 1997). Clark (2007: 22) criticizes studies of specialization that “confuse categorical distinctions . . . for continua” (e.g. Inomata 2001). The issue here may be too literal a view of production context as a “continuum” from more to less attached. Flad (2007: 111) argues that attached and independent production are discrete categories, but that each of these possibilities contains a range of variation, and suggests that context should be viewed as “a parameter comprising many different types that are defined by the relationship between producers and those who control the distribution of products.” In this sense, my description above of the attached specialists in Faynān is in line with this critique, and I certainly agree that analysis of context should not focus on the “degree” to which producers are attached to elites, but the nature of this attachment.

In previous work, another of Clark's (1995: 285-286) key critiques has been that studies of production context tend to overemphasize restrictions on consumption rather than "relations of production" and "rights of alienation over goods." Flad (2007: 110-111) expands this by arguing that the same product can be either utilitarian or prestigious at different times and in different contexts, and that context is not necessarily indicative of utilitarian or prestige good production (contra Costin 1991: 11-12).[20] I, likewise, agree with this point, particularly in the context of this dissertation. Copper was certainly, during the periods under discussion, a mostly "utilitarian" good — although not all copper goods were — but production in Faynān was certainly attached, nonetheless.

Production-Provisioning Systems

The organizational parameters described above are essential for understanding production, but as Costin (2001) argues, organization, despite its centrality to much archaeological craft production theory, is only one aspect of production. In a 2001 paper, Costin (2001: 277) instead proposes the investigation of "craft production systems," which she divides into "six constituent components . . . *artisans, means of production, organization and social relationships of production, objects, relationships of distribution,* and *consumers*" (italics in original). Costin (2001: 277) argues that it is necessary to analyze these components as part of a holistic system, and that each component must be understood in terms of its interactions with the other components in the system. This approach is also paralleled in economic anthropology and sociology, and specifically Ben Fine's (2002; Fine and Leopold 1993) concept of "systems of provisioning." While Fine (2004) intended this primarily as a way of investigating consumption, it is a useful concept even, as is the case of this dissertation, when the starting point is instead

[20] Golden (2009) has raised similar questions, in the context of the southern Levantine Late Chalcolithic, about how archaeologists recognize the distinction between "prestige" and "utilitarian" copper goods, and what this distinction might mean in terms of the raw material content of these objects and the context of their production.

production. Narotsky (2005) — who applies the concept to the provisioning of both goods and services — interprets the approach to require consideration of production, various "paths of provisioning" or distribution, and consumption, as well as the role of institutions — ranging in size from governments to families — in enabling and regulating paths of provisioning. The "systems of provision" approach, then, also proposes a holistic system, but starts from the perspective of consumption, rather than production. One advantage of this starting point, however, is that it recognizes that consumption is not simply what happens after goods are produced and distributed, but is an integral part of how systems of production and consumption are structured, a key point in my analysis of the Faynān copper industry. In this work, I refer to these systems as "production-provisioning systems" to recognize my debt to both bodies of theory, as well as to emphasize the mutually constitutive nature of the components of the system and the consumption of goods and services inherent in the production of goods (e.g. the consumption of both labor and charcoal in copper production). I propose here several ways of addressing these components and their interactions, which I will return to later in the dissertation.

Producers

Two primary questions fall under this component: first, who are the artisans (or, more broadly, the producers), and second, what do they do? Costin (2001: 279-285) proposes three parameters through which these questions can be investigated: specialization, identity, and "principles of recruitment."

The first question — "Who are the producers?" — is best addressed through Costin's (2001) second and third parameters. These are, however, often difficult to address archaeologically. As noted in Section 1.5, the social identity of producers and principles through which they are recruited can, in ideal circumstances, be addressed historically, as in Late Roman and Early Byzantine period Faynān, for which some historical information concerning these issues can be gathered from sources concerned primarily with Christian martyrs condemned to the mines. As Mattingly, et al. (2007b: 333-334) argue, however, this almost certainly paints a misleading picture of the labor force in Faynān during this period, which was likely always made up of a mixture of condemned and salaried laborers. For the Middle Islamic period in Faynān, no directly relevant historical sources are available. While broader studies of Early and Middle Islamic period labor (e.g. Shatzmiller 1994) or historical sources relevant primarily to other regions (e.g. Colin 1954) can be consulted, these present a range of possibilities that must be considered in the context of the available archaeological evidence. Specific historical evidence for labor recruitment practices is considered in Section 3.3, and these possibilities are discussed for Faynān specifically in Chapter 10.

The second question — "What do producers do?" — is best approached through Costin's (2001) first parameter. The "specialization" parameter is not limited to organization, but for Costin (2001: 280-282) is made up of three individual components: intensity, compensation, and skill. Intensity and compensation relate more to my first question, and will be addressed as part of my attempt to determine who the producers in Faynān were. Skill, though, is instead relevant to what producers actually do. I address this issue here through the use of operational or behavioral chains.

Chaînes Opératoires **and Behavioral Chains**

The concept of the *chaîne opératoire* — commonly glossed in English as "operational sequence" — comes from the work of the French anthropologist André Leroi-Gourhan (1993), who was influenced by Mauss's (1973) concept of *enchaînements organiques*, or "techniques of the body" (Dobres 1999: 126-127). For Leroi-Gourhan (1993: 230), the *chaîne opératoire* was less an analytical tool than a conceptual level of human “organizational behavior” operating between a deep-seated genetic base and higher-level symbolic behavior, primarily language use. Behavior at the level of the *chaîne opératoire* takes place “in a state of dimmed consciousness,” but is not “automatism because any accidental interruption of the sequence will set off a process of comparison involving language symbols” (Leroi-Gourhan 1993: 230). *Chaînes opératoires* are, in this sense, learned sequences of action that, over time and with practice, become essentially unconscious. This aspect of the *chaîne opératoire* has since been developed and expanded as the concept of “skilled performance” in activity theory (see e.g. Nardi 1996: 11).

Chaîne opératoire as an analytical technique — that is, the reconstruction of operational sequences — is primarily concerned with the “material sequence(s) of gestural acts through which natural resources were modified (and remodified) into culturally useful objects” (Dobres 1999: 129). The use of *chaîne opératoire* as an analytical technique proceeds by reconstructing all of the gestural steps of a specific activity, based as closely as possible on archaeological data. Documentary evidence, ethnographic analogy, and experimental replication can also be useful in filling in steps that leave no archaeological trace. The technique has successfully been applied to copper metallurgy in Faynān during the Early Bronze Age (Levy, et al. 2002) and to Iron Age copper metallurgy and ceramic production in Faynān (Ben-Yosef 2010; Smith 2009).

Because of their focus on the gestural application of learned, “naturalized” activities, *chaînes opératoires* have also been employed to reconstruct the cognitive dimensions of production. One of the most fully realized of these approaches involves the use of *chaîne opératoire* analysis to reconstruct what Sinclair (2000) terms “constellations of knowledge.” The constellation of knowledge consists of knowledge about raw materials, implements, techniques, and desired end-points, as well as “monitoring criteria,” which are stylistic or functional considerations influencing all aspects of the constellation. In other words, a *chaîne opératoire* can reveal both the operational sequence of an activity and the knowledge and planning necessary to accomplish it.

It is also important to acknowledge Lemonnier's (1986; 1989) contribution of the "technical system" to this body of theory. For Lemonnier (1989), the technical system has four components: matter, objects, gestures, and specific knowledge. Energy can also be included as a fifth component, as suggested by Ben-Yosef (2010: 38), but Lemonnier (1989) treats this as bound up with the first component — matter — rather than a component in its own right. Although the reconstruction of the *chaîne opératoire* relies primarily on the gestural component of the system, each contributes importantly to how the sequence is organized and put into use. Some recent applications of *chaînes opératoires* have integrated the idea of the technical system, and include, as part of the reconstructed sequence, activities and influences on production that are not gestural, but that provide a fuller picture of the system being studied (e.g. Levy, et al. 2012a). The technical system perspective also brings *chaînes opératoires* closest to the similar, but independently developed behavioral chains, explained below.

Lemonnier (1986) also suggests that technical systems operate at three levels in a given society. At the first level, components of a sequence – actions, materials, knowledge, etc. – interact with one another, and are constantly adjusted as any one shifts. At the second, sequences interact with one another, as in the use of the products of one sequence in another sequence. To take the example of copper production, the copper metal produced by the initial production sequence can then be used in sequences related to bronze or brass making, any of these can be used to make finished objects, these finished objects can themselves be recycled, and so on. Finally, at the third level are the attitudes toward and representations of a particular technique or technical system (Lemonnier 1986: 154). The three together represent, in a more abstract way, the production-provisioning systems described above.

Related to *chaînes opératoires* are "behavioral chains," developed independently by Michael Schiffer in the mid-1970s and inspired by early "life history" approaches (for a summary of these from the 1970s to the 1990s, see Holtorf 2002: 50-55). Although there are considerable similarities between the two, the differences are significant. These differences tend to be ignored by many archaeologists, most of whom consider *chaînes opératoires* and behavioral chains to be essentially the same, perhaps because of the increasing number of somewhat different approaches contained within the label *chaîne opératoire* (on these, see Martinón-Torres 2002). The key difference between the two is that behavioral chains focus on objects and what is being done to and with them, where *chaînes opératoires* focus on actors and what they do (Schiffer 1975: 107), a difference which stems in part from the different histories of the two approaches.

Where *chaînes opératoires* focus on the gestural components of techniques, behavioral chains instead trace the "life histories" of components of that technique (Schiffer 1975; Schiffer 1995: 55-66; Schiffer 2010: 22-25). To use the example of copper production, where a *chaîne opératoire* might be used to reconstruct the entire process of copper production, this same goal would required a number of more detailed behavioral chains, each tracing the various activities that act on copper ore, charcoal, and other components of the copper production process. While a *chaîne opératoire* would have to incorporate all of these elements, a behavioral chain would focus explicitly on one of them. Likewise, the behavioral chain for charcoal would be considerably longer than the links involving charcoal in the *chaîne opératoire* for copper production — though a *chaîne opératoire* for charcoal production could also be reconstructed, and would need to be in order to investigate the broader technical system in which copper production is embedded.

In order to reconstruct a behavioral chain, seven variables must be considered for each link. Briefly stated, these are (1) the specific activity being conducted, (2) the energy sources, both human and non-human, required for this activity, (3) the conjoined elements, for example, the containers in which raw materials are transported, (4) the time required to complete the activity and the frequency with which the activity is undertaken, (5) the location, (6) the outputs of the activity, including both desired and waste products, and (7) the additions or deletions from the original object which occur as a result of the activity (Schiffer 1975: 109-112). While it might not be possible to determine all of these things archaeologically for every activity, many can be inferred from ethnographic and historical sources or technical necessity.

Despite some overlap, behavioral chains and *chaînes opératoires* are complementary approaches. If a *chaîne opératoire* represents a single node of a production-provisioning system, a behavioral chain provides a more detailed account of an object involved in that *chaîne opératoire*. Narotsky (1997: 18-19), although she does not reference either body of theory explicitly, makes a similar point in her discussion of technological processes. She describes a multi-level approach consisting of "technical actions" which are put to use in "technical sequences" which are combined as part of an "operative chain," and these operative chains are then combined in a "technological process leading to the desired end-product" (Narotzky 1997: 18-19). To use the example of copper production, a "technical action" might be the use a grinding stone, and this could be put to use in the "technical sequence" of grinding ore, which is one part of the "operative chain" of ore beneficiation, which is in turn part of the "technological process" of copper production. The operative chain, then, is in a sense synonymous with a behavioral chain, and the technological process with a *chaîne opératoire*. As this demonstrates, at least a partial behavioral chain is always necessary when constructing a *chaîne opératoire*, even if this is not explicitly acknowledged. Narotsky's (1997) multi-level approach can also be expanded beyond a single, bounded *chaîne opératoire* describing a single process to the combination of multiple *chaînes opératoires* making up a larger production-provisioning system. This will be expanded in Chapter 10, where several production-provisioning systems will be explained using both approaches.

Mining Feature Systems

The concept of the "feature system" derives from Hardesty's (1990; 1988; 2010) studies of historical mining in the western United States, although essentially the same concept was laid out by Kelly and Kelly (1983) in their study of *arrastras* — a type of ore processing site — even though they do not use the term. The feature system concept has seen some adoption in North Americanist historical archaeology (e.g. Breen and White 2006; Keener 2003; Purser and Shaver 2008) and Australian mining archaeology (e.g. Ritchie 1991). The concept has had very little impact, however, outside of "historical archaeology" narrowly conceived, i.e. as "the archaeology of capitalism" (on this terminology, see Delle 1998; Leone 1995). This is perhaps because Hardesty (1988: 9-10), in his earlier work, proposed that the identification of feature systems begins with the construction of a "historical model" of its use and morphology based on documentary evidence. This does not have to be the case, however. In his most recent summary of feature systems, Hardesty (2010: 16-17) acknowledges that "ethnographic accounts" can be used in the same way. I would suggest that feature systems can also be reconstructed heuristically, by working backwards from archaeological data, particularly for cases that are less richly documented historically, e.g. Middle Islamic period copper mining.

While acknowledging some similarities, Hardesty (1988: 10) contrasts the feature system with Binford's (1964) "activity locus." Binford (1964) conceived of this fairly simply, as a location where a specific activity took place, and this was embraced by early practitioners of "siteless survey" (e.g. Dunnell and Dancey 1983), who felt that the idea of features representing concentrated activity areas offered a viable alternative to the limiting concept of the "site." Feature systems, on the other hand, remove the spatial restrictions of the activity locus. Where the activity locus can be an entire site, a feature within a site, or, for "siteless" approaches, a non-site concentration of artifacts representing a specific activity, the feature system can be an entire site, or it can be a collection of sites, features within a site, and offsite features representing a system dedicated to a specific activity (Hardesty 1988: 9-11). Most importantly, "[f]eature systems may include archaeological features that are widely dispersed geographically" (Hardesty 2010: 17). A copper production feature system may include mines, tailings/waste piles, installations for ore processing, roasting, and smelting, roads, and distribution centers, among other things, depending on the specific feature system being reconstructed. A key methodological advantage of feature systems, then, is that they presuppose little about the scale, form, or organization of the system being studied.

The feature system also adds a temporal dimension not present in activity loci: the same activity locus may contain features belonging to more than one feature system (Hardesty 1988: 12), and "a single archaeological feature may play a role in more than one feature system" (Hardesty 2010: 19). While Hardesty (2010: 19-20) primarily has contemporary feature systems — e.g. a waste dump forming part of both a household feature system and mining feature system — in mind, he also notes that mining regions often have "'layers' of feature systems" of different ages, each representing a particular "episode" of that activity (Hardesty 2010: 20-21). This is particularly applicable to the Faynān region, where Iron Age, Roman, Middle Islamic, etc. mining feature systems can be identified. Indeed, for the Iron Age, at least two smelting feature systems can be identified, as the political organization of mining changed dramatically during this period (see Ben-Yosef 2010; Ben-Yosef, et al. 2010; Ben-Yosef, et al. 2014b). While Hardesty's (2010: 20) suggestion that mining sites often display "horizontal stratigraphy," rather than vertical stratigraphy, tends to hold up in Faynān (see Chapters 4 and 5), this is not always the case, and certain features — particularly mines — were certainly part of multiple, non-contemporary feature systems.[21]

In this dissertation, I use the feature system concept as a way of identifying the archaeologically visible components of the copper production-provisioning system. The feature system also represents the spatial component of behavioral chains. The reconstructed behavioral chains and *chaînes opératoires* also provide a model for heuristically reconstructing feature systems, as well as identifying necessary components of these systems that are no longer archaeologically visible or have not yet been identified. Key components of the Faynān feature systems are introduced in Chapters 4 and 5, and the feature system concept itself will be addressed in more detail in Part III.

[21] The Faynān 7 slag mound also represents an intriguing example of the use of a smelting feature in multiple feature systems. Although primarily dating to the Iron Age, a radiocarbon sample from the top of the mound was dated to the Late Islamic period (see Section 3.1, Table 4.1). What feature system that later reuse might belong to is, as yet, unknown.

Chapter 3: Historical, Archaeological and Environmental Background

3.1. History of Research in the Study Area

History of Research on Islamic Period Southern Jordan

As noted in Chapter 1, for the purposes of this dissertation, southern Jordan is defined roughly as the area south of Wādī al-Ḥasā (see Fig. 1.1). Depending on how broadly one wishes to define "Islamic archaeology," one could perhaps trace the origins of the field in southern Jordan to Musil (1907) who, although not an Islamic archaeologist as such, did attempt to relate the sites he recorded to Early and Middle Islamic period Arabic geographical sources. Glueck (1935), too, recorded many Islamic period sites, including KNA (see Section 4.1), in his survey of southern Jordan, but again was not an Islamic archaeologist as such. Indeed, until the mid-1980s, virtually all archaeological knowledge of the Islamic period in southern Jordan had been derived from surveys — e.g. the large-scale regional surveys conducted by Burton MacDonald (1988; 1992) — very few of which were conducted by Islamic archaeologists. As Walker (2010: 128-129) notes, survey data — especially from central and southern Jordan — continues to dominate discussions of Islamic period settlement throughout Jordan, but without excavation it is difficult to accurately or precisely date the ceramics collected during these surveys. Although arguably surveys specifically targeting Islamic period sites date back at least to Hammond's (1970) survey of al-Ḥabīs in Petra, if Islamic archaeology is defined as investigation of Islamic period sites by an archaeologist whose primary research interests are in the Islamic period, we should place its beginnings in southern Jordan in 1982, with the extension of King, et al.'s (1987; 1989; 1985; 1986) multi-season Survey of Byzantine and Islamic Sites in Jordan to the south.

Although small amounts of Islamic period material were recovered — though not always immediately published — in earlier excavations of sites dating primarily to earlier periods, e.g. Zayadine's (1982) excavations at Qaṣr al-Bint in Petra or Bennett's excavations at Buṣayra in the 1970s (Bienkowski, et al. 2002: 349),[22] the first excavation of an Islamic period site in southern Jordan explicitly aimed at investigating its Islamic phases was Hart's (1987: 45-47) series of probes at Khirbat ʻAyn Janīn, a large village site near Buṣayra. Hart's research focused primarily on the Iron Age, but he investigated Khirbat ʻAyn Janīn primarily "to obtain stratified Medieval material" (1987: 45), although he was not able to precisely date the material he found, beyond suggesting a date in the Mamlūk or Ottoman period.

Excavations at Islamic period sites in southern Jordan conducted by Islamic archaeologists began in 1986, with the start of Whitcomb's (1987) long-running excavations in al-ʻAqaba (Islamic Ayla) and Brown's (1988) excavations at Qalʻat al-Shawbak (Crusader Montreal), followed in 1987 by Brown's (1987) excavations at the Crusader castle of al-Wuʻayra (Li Vaux Moïse) near Petra. While a number of smaller projects have been conducted throughout the south — although almost none have conducted excavations in the lowlands — these early projects have in many ways set the stage for the major research projects of the last several decades. An Italian team, led by Guido Vannini, has since 1986 been investigating the Crusader settlements of southern Jordan (summarized in Vannini 2011), including reinvestigations of al-Wuʻayra (Bini and Bertocci 1997; Tonghini and Desideri 2001; Vannini and Desideri 1995; Vannini and Tonghini 1997) and al-Shawbak (Pruno and Sciortino 2012; Vannini 2007; Vannini, et al. 2013), and renewed investigations have been initiated at Ayla by the Aqaba Castle (De

[22] Other examples could be cited, as well. To quote Whitcomb (1997a: 97, n.3), "The casual mentions of Ayyubid-Mamluk evidence on archaeological sites in Palestine would be difficult to enumerate, let alone evaluate." While this would be less difficult in southern Jordan, there are nonetheless many primarily earlier sites where small amounts of Islamic period material, often unpublished, have been found.

Meulemeester and Pringle 2006) and Islamic Aqaba Projects (Damgaard 2009), as well as the recently completed Aylah Archaeological Project (Damgaard 2013a; Damgaard 2013b). These projects were designed to expand on the initial excavations of Islamic sites in southern Jordan, and have produced crucial evidence for reevaluating some early conclusions about Islamic period settlement in the region. Large-scale excavations, now mostly complete, have also been conducted at Jabal Hārūn, near Petra (Fiema and Frösén 2008; Kouki and Lavento 2013), and al-Ḥumayma, ca. 40 km south of Petra (Oleson 2010; Oleson and Schick 2014), which have provided important stratified Early Islamic period remains.

History of Research on Islamic Period Mining and Metallurgy in the Southern Levant

Research on Islamic period mining and metallurgy in the southern Levant began with the work of Nelson Glueck, who located and described the Middle Islamic period copper smelting sites in the Faynān region — Khirbat Nuqayb al-Asaymir (KNA) and Khirbat Faynān (Glueck 1935: 30-32, 35) — and iron mines and smelting sites in the ʻAjlūn region of northern Jordan — Mughārat al-Warda and Abū Thawwāb (Glueck 1937: 237-238). While he was able to correctly date the copper smelting sites in the Faynān region, he was not able to suggest a date for the sites near ʻAjlūn, beyond noting the presence of "Roman, Byzantine, and mediaeval Arabic sherds" associated with iron slag at Abū Thawwāb (Glueck 1937: 225).

While James Kelso planned to investigate the sites near ʻAjlūn in the early 1960s, health problems prevented him from doing so (Coughenour 1976: 71). The project was, however, revived by Robert Coughenour, who conducted test excavations at the settlement associated with Mughārat al-Warda and survey at Abū Thawwāb in 1976. Based on the excavations and unpublished historical work by Robert Miller,[23] he suggested a very early Ayyūbid date for the

[23] At the time a graduate student at the Institute of Archaeology, University College London, whose dissertation, interestingly, actually focused on 3rd millennium BC flintworking in northern Syria.

sites, roughly contemporary with the beginning of the construction of Qal‘at al-Rabaḍ (‘Ajlūn Castle) by the Ayyūbid *amīr* ‘Izz al-Dīn Usāma in 1184-5 AD (see also Johns 1931: 23-24), and perhaps initially in preparation for the 1187 Battle of Ḥaṭṭīn (Coughenour 1976: 75-76). Deutsches Bergbau-Museum (DBM) teams excavated at the settlement adjacent to Mughārat al-Warda and in the mine itself in 2005 as part of doctoral research conducted by Yosha Alamri (2007; Alamri and Hauptmann 2008; Alamri and Hauptmann 2013), who demonstrated earlier use of the mines during the Chalcolithic, Iron Age, Roman, Byzantine, and Early Islamic periods, and, on the basis of radiocarbon dating, showed that the mines likely continued to be in use at least as late as the Late Islamic Ia, near the end of the Burjī/Late Mamlūk period.

Investigation of the Faynān sites continued in 1984 with surveys by the DBM (Hauptmann, et al. 1985). They investigated the Middle Islamic slag mounds at Khirbat Faynān (Hauptmann 2000: 70, 74) and KNA, which they refer to as al-Furn (Hauptmann 2000: 86-87; Hauptmann, et al. 1985: 171), and dated this industry to the late 13th century AD, or “mamlukisch-türkische,” on the basis of surface ceramics from KNA (Hauptmann, et al. 1985: 190-192). The dating of KNA was later revised, on the basis of numismatic finds (Kind, et al. 2005: 188-189, 179, Table 1), as “Ayyubid and Mameluk” (Hauptmann 2007: 126), though the coin finds also seemed to indicate a slightly later, 14th century AD date for the slag mounds at Khirbat Faynān (Hauptmann 2007: 103). The Wādī Faynān Landscape Survey (WFLS), conducted between 1996 and 2000, revisited the Middle Islamic industry in Faynān, and in the final publication of the survey, Newson, et al. (2007b: 363-365) prefer a slightly later Mamlūk date, which they connect to late 14th-15th century Egyptian monetary policy (this is discussed in detail in Section 3.6; see also Schultz 1998). They support this point with a 15th-17th century cal. AD radiocarbon date from the top of the (primarily Iron Age) Faynān 7 slag mound (Beta-

204412; see Table 4.1 for complete details), and argue that this may even suggest limited smelting by pastoralists during the Ottoman period (Newson, et al. 2007b: 364-366). KNA was again surveyed in 2002 as part of the Jabal Hamrat Fidan Project's (JHF) Wādī al-Ghuwayb Survey (Levy, et al. 2003: 260, 262). The material from this survey formed the core of my MA thesis (Jones 2010) and was published in detail by Jones, et al. (2012), who argued for a primarily Middle Islamic IIa date for the site, likely connected to the emergence of the sugar industry in the Dead Sea *aghwār* and Jordan Valley *ghawr*. The first excavations at KNA and in the Middle Islamic period slag mounds at Khirbat Faynān were conducted by the Edom Lowlands Regional Archaeology Project (ELRAP), directed by Thomas E. Levy and Mohammad Najjar, during the 2011 and 2012 field seasons as part of my doctoral research, and are reported in Chapter 4 of this dissertation.

The Islamic metal industry in the southern Wādī ʻAraba was not recognized as early as those to the north. The Arabah Expedition excavated a Middle Islamic IIc (14th century AD) blacksmith's workshop associated with repairs to the Darb al-Ḥajj — Site 224 — in 1970 (Rothenberg 1972: 224-228), though unfortunately only a very fragmentary publication of this site has appeared. The large copper smelting camp at Be'er Ora — in addition to several other, smaller camps — and the copper mines of Naḥal Amrām were surveyed by the Arabah Expedition in 1960, but dated at that time to the Roman and Byzantine periods (Rothenberg 1962: 61-64; Rothenberg and Cohen 1968: 29-30, 32). The Arabah Expedition conducted excavations at Be'er Ora in 1969, and on the basis of ceramics collected from these excavations revised the date of the site to the 2nd century AD (Rothenberg 1972: 212-223). An Early Islamic period radiocarbon date from the 1982 excavations of Furnace Z at Timna Site 2, however, prompted the Arabah Expedition to reevaluate their older excavations, and radiocarbon dating demonstrated that Be'er Ora was, in fact, primarily an Early Islamic period smelting camp (Rothenberg 1988a). Renewed investigations of the mines at Naḥal Amrām in 1989 likewise demonstrated that these were most heavily exploited during the Early Islamic period (Willies 1990; Willies 1991), although recent research has demonstrated substantial Late Bronze-Iron Age and Nabataean-Byzantine mining activity, as well (Avner, et al. 2018). Since then, additional surveys and excavations have demonstrated that, during the Early Islamic period, an industrial "hinterland" of the city of Ayla existed in the southwestern Wādī ʻAraba, containing a number of copper mines and smelting camps (Avner and Magness 1998; Damgaard 2009; Jones, et al. 2018; Whitcomb 2006b). Until quite recently, however, it was thought that these sites were limited to the southwestern ʻAraba. In 2012, ELRAP conducted excavations at Khirbat al-Manāʻiyya — a copper smelting camp in the southeastern ʻAraba erroneously dated by Ben-Yosef (2012) to the Iron Age — and demonstrated that this small camp also dates to the Early Islamic period. A summary of the published preliminary report of this excavation (Jones, et al. 2017) is presented in Section 4.3 of this dissertation.

It is also briefly worth noting a site in Wādī al-Ṭawāḥīn/Naḥal Roded, ca. 4 km northwest of modern Elat. The site was surveyed by Frank (1934: 261) and later by Glueck (1965b: 15-16), but a connection to metallurgy was first proposed following excavations at the site in 1991, when chemical analysis of powder collected from a pit feature suggested that the millstones from which the site gets its name were in fact used for crushing quartz to exploit a fine-grained, non-visible gold anomaly (Avner and Magness 1998: 44-45; see also Bogoch, et al. 2005; Gilat, et al. 1993). Shaw and Rothenberg (2000) are skeptical of this claim, and it is worth noting that their concerns have not been addressed in the literature on this subject. Nonetheless, a number of archaeologists (Damgaard 2009; Whitcomb 2006b), archaeometallurgists (Hauptmann and

Löffler 2013), and historians (Amar 1997)[24] have accepted this claim. This claim will be addressed in more detail in Sections 3.2.1 and 3.5.

History of Research on Islamic Period Ceramics in Southern Jordan

It is beyond the scope of this dissertation, and certainly of this section, to provide a complete overview of the history of Islamic ceramics research. This is due to both the large scope of the subject and the fact that many of the key research problems of previous decades — e.g. the debate surrounding the so-called "Sāmarrā' Horizon" (for overviews, see Northedge and Kennet 1994; Watson 2014) — are simply irrelevant both to the present dissertation and, arguably, to southern Jordan generally. For broader overviews of Islamic ceramics research, focused primarily on the southern Levant, one should consult the relatively recent and accessible synthetic works by Walmsley (2007a: 49-59) and Milwright (2010: 143-158). This overview provides only a focused introduction to the material from southern Jordan and Israel most relevant to the dissertation (see also discussion in Chapter 6).

Although Islamic ceramics from southern Jordan had been published at least as early as Glueck's (e.g. 1940: 67, Fig. 29) surveys, the first significant research on Islamic period ceramics largely coincided with the first purposive excavations of Islamic period sites, discussed above. While ceramics were published from most of these sites, the first excavations to produce substantial stratified material were Whitcomb's excavations at Ayla/al-'Aqaba, which were published in a series of relatively detailed preliminary reports (Melkawi, et al. 1994; Whitcomb 1988b; Whitcomb 1989a; Whitcomb 1989b; Whitcomb 1989c; Whitcomb 1991a; Whitcomb 2001a). While these reports are very useful, it is important to keep in mind that Ayla, as a center

[24] Amar (1997: 100) notes that the "clearest written evidence" for this gold mining comes from the anonymous 10th century *Ḥudūd al-'Ālam* (1970: 81), which states: "Other sands are those east of which are the Gulf of Barbar and Ayla; south of them, the desert of Buja" and so on. This seems very clearly to refer to the Egyptian Eastern Desert, where substantial gold mining is, in fact, known (see, e.g. Klemm and Klemm 2013). As such, if gold was exploited in Wādī al-Ṭawāḥīn, it is almost certainly not recorded in Early Islamic sources.

of maritime trade, has a ceramic assemblage that is in some periods relatively unique, and this has led to some misunderstandings about the nature of Islamic ceramics in the south, particularly in lesser-known periods. As an example, the section on "Fāṭimid" ceramics in Hendrix, et al.'s (1997) guide to the pottery of Jordan relies almost entirely on the reports from Ayla, and includes types — e.g. the "Sasanian-Islamic" jar or *ḥubb/ḥib,* a southern Mesopotamian type common at sites associated with the Red Sea trade (on the type and sourcing, see Mason and Keall 1991; for the examples from Ayla, see Whitcomb 1988b: 213, Fig. 3) — virtually unknown in Jordan outside of Ayla. Beyond this, a comprehensive final report of these ceramics has not appeared, although the ceramic typology of the Aylah Archaeological Project, which has recently been completed and will soon be released (K. Damgaard, pers. comm.), will fill this lacuna (a preliminary typology is reported in Damgaard and Jennings 2013).

Indeed, final publications of Islamic ceramics have been, unfortunately, exceedingly rare in southern Jordan. Among the first are the fairly recent reports of the Finnish Jabal Hārūn Project (Gerber 2008) and the Ḥumayma Excavation Project (Oleson and Schick 2014), relevant primarily to the Early Islamic period.[25] In southern Israel, the recent final reports of Porath's (2016) excavations at agricultural sites in Wādī ʻAraba and the Late Roman fort at Yotvata (Davies and Magness 2015) likewise illustrate useful Early Islamic period assemblages. For the Late Islamic period, likewise, there is the final report of the excavations at Qalʻat ʻUnayza, an Ottoman *ḥajj* fort located ca. 20 km east of Shawbak (Grey and Petersen 2012). South of Wādī al-Ḥasā, however, there are as yet no final reports of ceramics relevant to the Middle Islamic

[25] This is particularly interesting in the case of the Jabal Hārūn monastery. While the monastery is mentioned in 12th century Crusader sources, and some Middle Islamic period pottery was observed in portions of the site (Fiema 2013: 800), the final report of the pottery contains very little Middle Islamic period pottery, with the latest phase dated to roughly the 10th century. By the early 13th century, Thietmar reports the presence of only two monks at the site, however, and it seems likely that settlement at the site had been contracting since the 10th century (Fiema 2013: 800).

period. If "there is no established chronological ceramic reference framework for southern Transjordan in the Byzantine and Early Islamic periods" (Gerber 2008: 288), this is even more true for the Middle Islamic period, and analysis of these ceramics requires reference to areas outside of southern Jordan and careful consideration of material published in preliminary reports (this comparative material is discussed in more detail in Chapter 6), as well as consideration of the stratigraphy and datable non-ceramic material recovered from a site (discussed in Chapters 4, 5, and 7). It is useful now to move from these short summaries of the history of research on topics relevant to this dissertation to a more detailed summary of the geology and geography of the Faynān region, the key geographical focus of the dissertation.

3.2. Geology and Geography of the Faynān Region

"Surely there is a mine for silver,
and a place for gold to be refined.
Iron is taken out of the earth,
and copper is smelted from ore.
Miners put an end to darkness,
and search out to the farthest bound
the ore in gloom and deep darkness.
They open shafts in a valley away from human habitation;
they are forgotten by travelers,
they sway suspended, remote from people." — Job 28.1-4, NRSV

"Gold is where you find it, as the Bible says." — Variation on a North American prospectors' adage, found in the Nova Scotia Mining Number*, 1903*

3.2.1. Economic Geology of Faynān

The Faynān region's primary geological importance — both for this dissertation and for much other archaeological research in the region, particularly the work by ELRAP and the DBM — lies in its copper ore deposits. Copper ore is found in several geological formations in the Faynān region (Fig. 3.1). The most important of these archaeologically are the formations making up the Cambrian Ramm Sandstone Group. The first is the Burj Dolomite Limestone

Shale (BDS) — referred to simply as the Dolomite Limestone Shale (DLS) in some sources (e.g. Bender 1974: 47-48; Hauptmann 2007: 65) — consisting of two siltstone members and a carbonate member: from top to bottom, the Ṭayyān Siltstone, Numayrī Dolomite, and Ḥanna Siltstone (Rabb'a 1994: 19-21). The majority of copper in this formation occurs in the upper 2 m of the Numayrī Dolomite member (Rabb'a 1994: 47). In the southern portion of the Faynān region, an equivalent copper-bearing unit, the Abū Khushayba Sandstone — the "white fine-sandstone formation" in Bender (1974: 46) — is found in place of the BDS, extending south of Petra to the Nabataean/Roman mines in Wādī Abū Khushayba and Wādī Abū Qurdiya (Barjous 1995; Bender 1974: 149; Hauptmann 2007: 64; Kind 1965: 66-71, 63, Abb. 3; Rabb'a and Nawasreh 2015: 5). The last formation in this group is the Umm 'Ishrīn or Massive Brown Sandstone (MBS) formation — the "massive, brownish weathered sandstone" in Bender (1974: 44-46) — which was mined mainly in the eastern portion of the Faynān region (Hauptmann 2007: 66-67; Rabb'a 1994: 47). Some copper mineralization is also found in joints in the pre-Cambrian volcanic Aḥaymir Suite (Rabb'a 1994: 47), but these deposits are not likely to have been exploited.

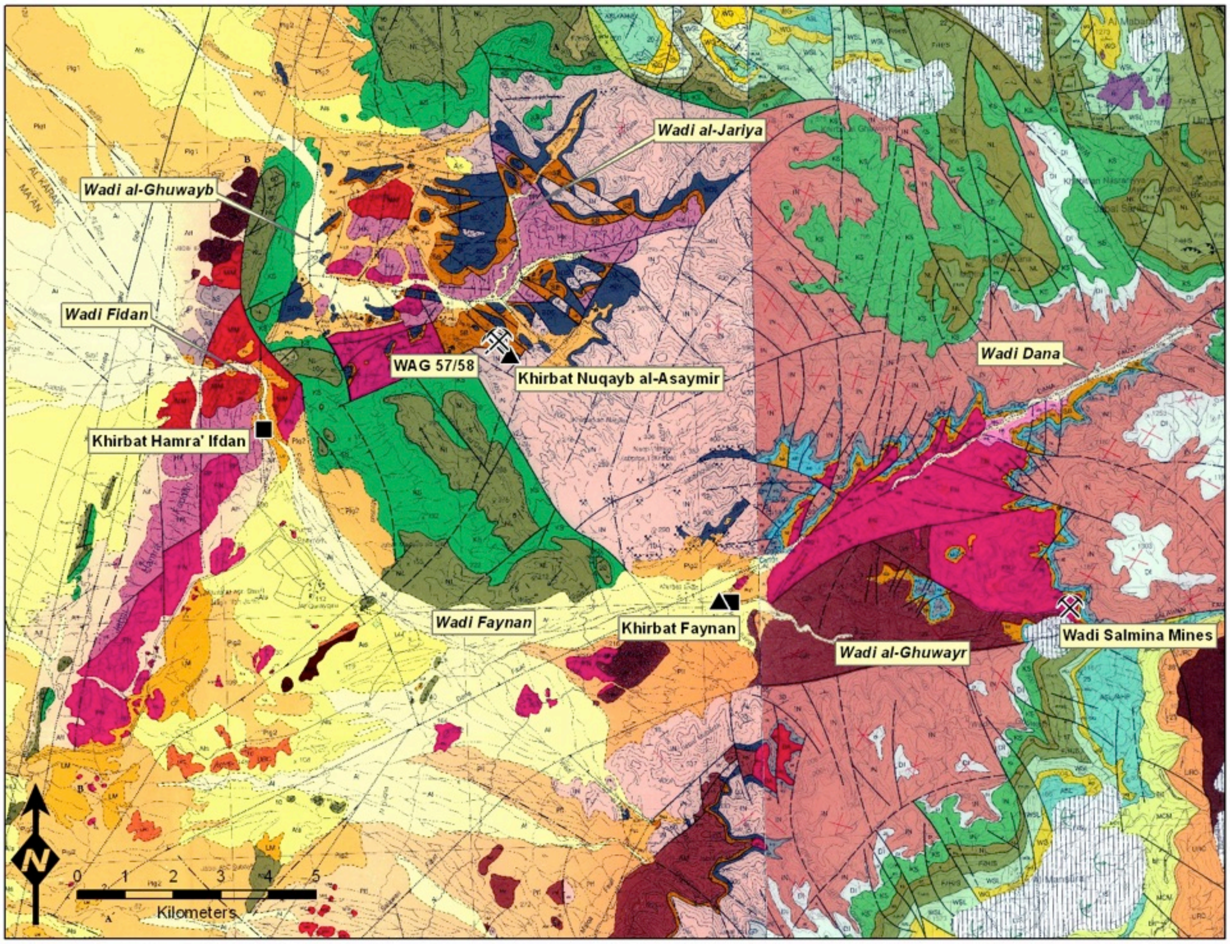

Figure 3.1: Geology map of the Faynān region. The key copper bearing formations are the MBS (light pink on left; pink on right) and the BDS (dark blue on left; split into teal and pale dark blue components on right). (Basemaps: Barjous 1988; Rabb'a 1991.)

Copper is found in these formations primarily in the form of copper oxide ores — mainly paratacamite, chrysocolla, malachite, dioptase, and plancheite in the BDS, and malachite, cuprite, and paratacamite, as well as the sulfide minerals chalcocite and covellite, in the MBS — which allows the ore to be smelted directly without the "roasting" stage necessary for processing sulfide ores (Hauptmann 2007: 68-71). Additionally, in the BDS copper ore is generally found alongside manganese oxides that "give them the qualities of a 'self-fluxing ore,'" eliminating the need to add flux during the smelting process (Hauptmann 2007: 70). This manganese ore contains 8-10% hematite, as well, and it is interesting to note that "[a] recognizable enrichment of Fe oxides and hydroxides (hematite, goethite) is noticeable" in the vicinity of Khirbat Nuqayb al-Asaymir (Hauptmann 2007: 71). This is likely due to the depth of these deposits in the formation. Basta and Sunna (1972:117) quote an unpublished report by Boom and Ibrahim in which they state "«Decrease of manganese goes parallel to an increase of iron» and «The highest manganese content occurs in the upper portion of the ore bodies, while iron and copper ores increased in the lower part»." The implications of this point will be discussed in Sections 4.1.5, 9.4, and 10.2.

These formations also have their equivalents in the southern ʻAraba. The BDS in the central/northern ʻAraba is referred to as the Timna Formation in the southern ʻAraba (Hauptmann 2007: 67, 66, Fig. 4.4; Segev, et al. 1992: 6-9), but the two are otherwise identical. Likewise, Hauptmann (2007: 66-67) describes a copper-bearing formation between the BDS and MBS in Faynān, which he calls "Variegated Sand- and Claystones," and which he identifies as the equivalent of the Shehoret Formation in the southern ʻAraba (see Segev, et al. 1992: 9-11). This formation is, however, not described in the Jordanian NRA geological map (Rabbʻa 1994; Rabbaʻ 1991). While Hauptmann (2007: 66) notes the presence of copper and manganese ore in this formation, he also notes that "[t]hese minor mineralizations show rarely any signs of mining, probably due to their conspicuous hardness." The MBS, however, does not have an exact equivalent in Timna. The formations overlying the Shehoret Formation — the Amir and Avrona Formations of the Kurnub Group — are not Cambrian in date, as is the MBS, but instead are likely Lower Cretaceous (Segev, et al. 1992: 11). The Kurnub Sandstone Group is also present in Faynān, where it overlies the MBS and Dīsī Sandstone Formations (Rabbʻa 1994: 25), though it is not copper bearing in the central/northern ʻAraba. Although they are not the same formation, Ben-Yosef (2010: 100, 103) finds it useful to group the MBS and Amir/Avrona Formations together as the “upper sandstone units,” which is sensible, as they contain essentially the same copper minerals.

The geological similarity between the two mining districts is due to the fact that they derive from the same primary pre-Cambrian ore body (Hauptmann 2007: 67). This consisted primarily of copper-iron sulfides in volcanic rocks, which over time eroded, altered, and were redeposited in a complex process that also involved movement along a number of faults, including the movement of the Arabian Plate about 100 km to the north along the Dead Sea Rift (Hauptmann 2007: 67-68; Segev, et al. 1992: 16; cf. Jarrar, et al. 2008: 308-309, who argue their results do not support this model). Indeed, all of the copper mineralization in Wādī ‘Araba, including not only Faynān and Timna, but also Wādī Abū Khushayba, Wādī Abū Qurdiya, and several other minor deposits, formed in this way (Hauptmann 2006: 125-127).

It has also been proposed that gold could have been exploited on a limited scale in the Wādī ‘Araba. The key evidence for this claim comes from the discovery of a “gold anomaly” in the area of Naḥal Roded/Wādī al-Ṭawāḥīn, to the northwest of Eilat (Amar 1997; Avner and Magness 1998: 44-45; Bogoch, et al. 2005; Gilat, et al. 1993). Analysis of sediment samples from alluvial terraces along the *wādī* revealed the presence of fine, non-visible grains of gold (Gilat, et al. 1993: 434-436), which led the investigators to conclude that the Wādī al-Ṭawāḥīn archaeological site served primarily as a work area for crushing quartz in order to exploit this gold anomaly. The suggestion of a gold industry in Wādī al-Ṭawāḥīn will be discussed from an archaeological perspective in Section 3.5, as, although this has been widely accepted by archaeologists working in the region, Shaw and Rothenberg (2000) also issued a critique of this conclusion that has generally been ignored. It is worth noting that similar evidence for small quantities of very fine gold particles has been found both in Wādī Abū Khushayba (Hauptmann

2007: 156; Hauptmann and Löffler 2013: 83) — leading Meshel (2006) to suggest that the Umm al-ʿAmad mine near Faynān may also have been a source of gold — and a vein of "apatite, uranium, manganese and traces of gold" in the Faynān region (Rabbʿa and Nawasreh 2015: 5). It is unclear if these were exploited in antiquity, but this evidence will, as above, be considered in Section 3.5.

The geological history common to the mineral deposits of Wādī ʿAraba is an important component of the "Long Term" thread of this dissertation (particularly Chapter 8), especially considering the primacy Braudel (1972) gave to environmental considerations. What links Faynān, Timna, and the more minor deposits are relatively easily exploitable copper oxide ores found alongside manganese and iron oxides, which again contributes to the ease of smelting them. It is possible, as well, that a small amount of gold was exploited both in the southern and central ʿAraba. This is, of course, not to overstate the "unity" of the Wādī ʿAraba in terms of copper exploitation. As well be discussed in the following sections (3.4-3.6, in particular), the central and southern ʿAraba have different histories of mineral exploitation, considered both alone and as part of the broader history of mining and metallurgy elsewhere on the Arabian-Nubian Shield — notably the copper-zinc and silver-gold belts of the Najd and Ḥijāz (on these, see Greenwood, et al. 1980). These histories were influenced by political, economic, and environmental factors, all of which often differed between the central/northern and southern ʿAraba. It is, however, productive to compare these mineral resource districts, as their common geological history means that the technology required to exploit the ores of both regions is essentially the same.

Hauptmann (2006: 125) notes that both Faynān and Timna owe their unique preservation to the lack of extensive modern mining, itself due to the fact that "[t]hey were never of major international economic importance, because their ore content was much too low." Modern mining near Timna began in the 1955 and continued into the 1980s, with a hiatus between 1976 and 1980 due to a fall in copper prices (Carta's Official Guide 1983). In 2007, Arava Mines Ltd., a subsidiary of Altos Hornos de México S.A. de C.V. (AHAMSA) began a pilot project in the region with the intention of opening a copper factory (Yager 2010: 48.1), which is now operating (E. Ben-Yosef, pers. comm.). This mining has, however, taken place away from the ancient mines and smelting sites, and has left them mostly intact. Indeed, a larger threat to these sites has been road construction (see, e.g., Rothenberg 1972: 228) and other modern construction activities (Avner and Magness 1998: 42) closer to modern Eilat. In Faynān, no substantial modern mining activities have taken place. The Jordanian Natural Resources Authority (NRA), however, did conduct prospecting activities in the mid-20th century that have left their mark on the landscape, including drilling, road-building, and clearing ancient mine shafts and adits (Barjous 1988; Ben-Yosef, et al. 2014a; Knabb, et al. 2014; discussed in Section 5.1.2). Late 20th century estimates by the Jordanian Natural Resources Authority (1980: 113) placed the ore reserves in Faynān at 25-50 million metric tons, with 200 million metric tons estimated for the Wādī ʻAraba in total. If accurate, this is, in fact, not a particularly low number. For comparison, just under 11 million tons of ore were mined at the Mavrovouni mine in Cyprus between 1929 and 1957 (Wilson and Ingham 1959: 151), which was the most productive mine on the island during this period, and the size of the Cypriot ore bodies in general ranges from 50,000 to 20,000,000 tons (Constantinou 1992: 336).[26] Several additional aspects of the geology of the Faynān region that do not directly concern its copper and iron mineral resources are discussed in the following section, which presents an overview of the geography of Faynān.

[26] These numbers, however, are not directly comparable, as these ore bodies are quite different. The ores of the Wādī ʻAraba are primarily copper oxides, as noted above, while the ores of Cyprus are mostly sulfides.

3.2.2. Geography of Faynān

Faynān as a Region

At a basic level, the Faynān region (or district) refers to the area surrounding Wādī Faynān, a relatively large *wādī* in the central/northern portion of Wādī ʻAraba in southern Jordan. Indeed, the centrality of this *wādī* to the region — and perhaps also its association with the long-running British Wādī Faynān Project (WFP; McQuitty 1998) and Wādī Faynān Landscape Survey (WFLS; Barker, et al. 2007) — has led some scholars simply to equate the *wādī* and the region (e.g. Kafafi 2014; Milwright 2010: 149). As Najjar (2015: 247) notes, however, the region referred to as Faynān by the Edom Lowlands Regional Archaeology Project (ELRAP) encompasses a number of environmentally and geologically diverse *wādī* systems — this dissertation focuses primarily on the Wādī Faynān–Wādī Fidān and Wādī al-Jāriya–Wādī al-Ghuwayb systems — covering over 300 km^2 (Levy, et al. 2014a: 9). As is commonly noted, the Faynān region includes three major phytogeographic zones — Mediterranean, Irano-Turanian, and Saharo-Arabian, as well as areas of Sudanian — wettest on the plateau in the east and becoming generally drier as one moves westward, and downward, into Wādī ʻAraba (Levy, et al. 2014a: 67; Palmer, et al. 2007: 35). It is important to keep these zones in mind when considering the settlement patterns in Faynān, as the eastern and western portions of the region have distinct settlement histories during the period covered in this dissertation, related in part to differences in rainfall and vegetation. While "Faynan copper ore district" (see, e.g. Najjar 2015: 247) is a somewhat cumbersome term, it is geologically accurate (Hauptmann 2006: 125) and does highlight the importance of copper resources in defining the Faynān region, as discussed above (Section 3.2.1). In this dissertation, I prefer to use either "the Faynān region" or, simply, "Faynān" (following Levy and Najjar 2007, among others) to refer to the copper-rich area immediately surrounding Wādī Faynān, from roughly the southern portions of the Wādī al-Ḍaḥal system in the north to the mining district of Umm al-‘Amad in the south, and from the mouths of Wādī Fidān and Wādī al-Ghuwayb in the west to the edge of the Sharāh Plateau (or Edom Plateau) in the east (Fig. 3.2), encompassing the majority of major copper ore resources in the central/northern ‘Araba. While this definition does not include all of the copper mining districts of the central ‘Araba — it leaves out, for example, the mining district of Wādī Abū Khushayba, 40 km southwest of Khirbat Faynān and 12 km southwest of Petra (see Kind 1965: 63-71) — it corresponds fairly closely to the definition of the region used by most projects working in Faynān (see, e.g. Hauptmann 2007; Levy, et al. 2014c).

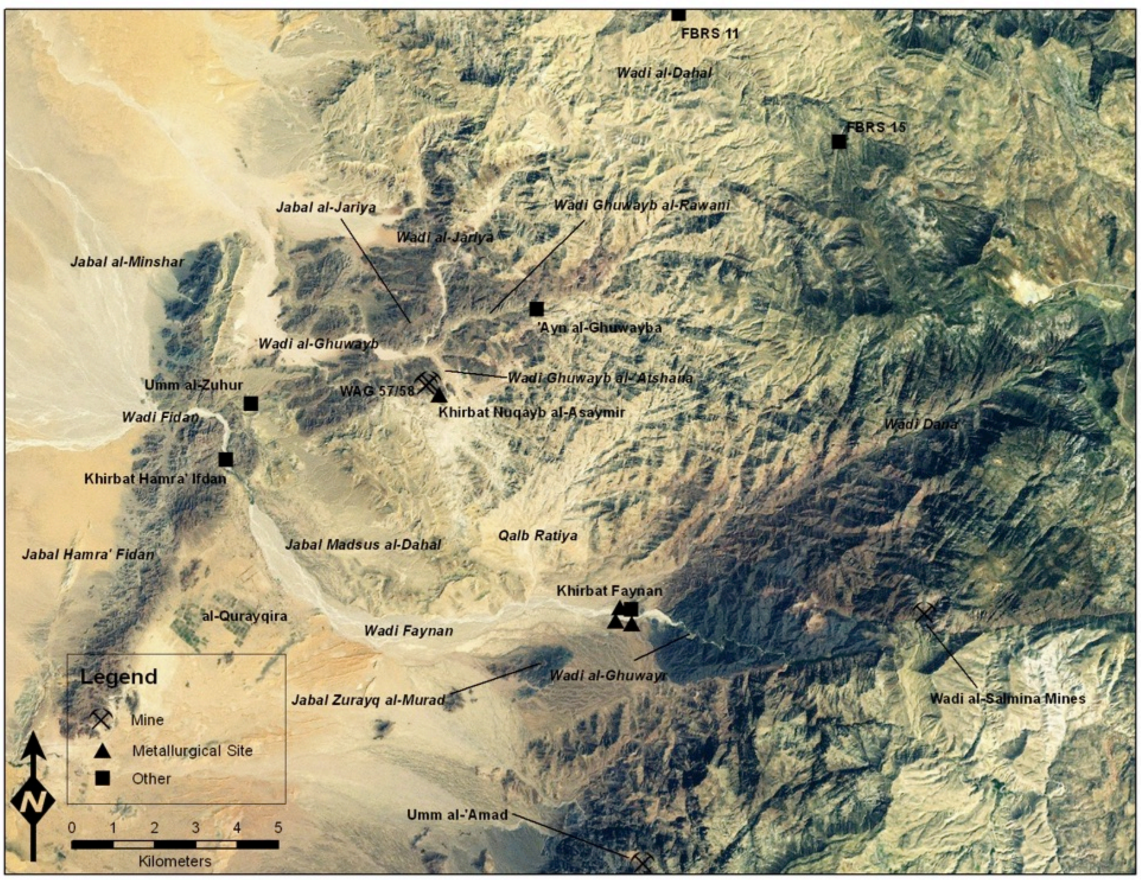

Figure 3.2: The Faynān region, with selected sites and key geographical features labeled. Faynān as depicted here covers slightly more than 600 km^2, a broad definition of the region. (Basemap: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.)

The Origins of the Name “Faynān”

The Arabic name Faynān is likely derived from ancient names for Khirbat Faynān, although, as Kafafī (2014: 263) notes, Weippert suggested it was instead derived from a 6th century BC tribal name. Görg (1982) suggested that the earliest evidence for this name (as “pwnw”) may be found in a 13th century BC Egyptian inscription. Knauf (1987: 37-38) notes that it is also possible to read the initial “p” as the definite article, and the inscription as referring to a different place, but suggests that the reading “pwnw” is more likely. From there, the name appears in the Hebrew Bible as Punon (Num. 33.42-43) and in Latin and Greek sources as Phaino or variations thereon (see Section 3.4; Knauf 1987: 38-40; Najjar and Levy 2011; among many others).

Knauf (1987: 40) makes the suggestion that the name is likely derived from an earlier West Arabian[27] word, preserved as the Arabic *faynān*, meaning “long hair.”[28] In this context, he cites the late 13th century AD dictionary of the North African scholar Ibn Manẓūr (1955: 329), who, among other things, notes that *faynān* as a description of hair is derived from the Arabic word for the branch of a palm tree.[29] Harding (1971: 472), likewise, relates the Ṣafāitic (North Arabian) personal name “FNN” and the Sabaean (South Arabian) family name “FNW” to the Arabic words *faynān* and *afnā*, respectively, both of which he defines as “long-haired.”

It is unclear, however, whether or not the name Faynān was used for either the region or the site by Middle Islamic miners, despite the appearance of the word *faynān* in Ibn Manẓūr’s

[27] Or rather, a linguistic substratum common to both “Canaanite” and “West Arabian” (Knauf 1988: 40). His broader historical-linguistic hypothesis about the origin and spread of these names is well beyond the scope of this dissertation.
[28] This Arabic definition is often repeated without exploration of its historical context, e.g. by Kind, et al. (2005: 169), who give the definition as “luxuriant thick hair.” The author of this dissertation rather prefers this embellished definition, explaining, as it does, his deep personal connection to the Faynān region, but simply “long hair” is likely more accurate.
[29] The Arabic (omitting Ibn Manẓūr’s nunation) reads: *sha‘ar faynān min al-fanan, wa huwa al-ghuṣn* (Ibn Manẓūr 1955: 329).

Lisān al-ʻArab only a few decades later. At present, I am aware of no contemporary Arabic source that refers to the site, and it has long been noted that "Roman mining and smelting . . . is the only industrial activity attested in the literary record for the Feinan region" (Knauf and Lenzen 1987: 83). While it is possible to speculate, based on the persistence of this name into the 20th century, that the site's — and the *wādī*'s — Middle Islamic name was something close to this, this cannot be demonstrated with any certainty.

The Wādī Faynān–Wādī Fidān System

Descriptions of the following *wādī* systems can be found in Barker, et al. (2007) and Knabb, et al. (2014). The following section draws from these sources, and a number of others, where noted. It is important to describe these *awdiyya* in some detail in order to understand patterns of settlement and resource exploitation in the region, as each is somewhat unique in its combination of geological outcrops and phytogeographic zones.

Wādī Faynān

The name of the Wādī Faynān system is discussed above. Wādī Faynān properly refers to the area of the *wādī* system between Wādī Fidān and the area near Khirbat Faynān, where a number of individual *awdīa* — Wādī Ḍānā, Wādī al-Ghuwayr (diminutive of Ar. *ghawr*, i.e. "small depression/valley"), Wādī al-Salawān (Ar. "solace/consolation"?, possibly also derived from *sayl*, "torrent/flood"), and Wādī al-Shayqar/al-Ashayqir (probably derived from Ar. *shaqrā'*, "blonde")[30] — meet and flow westward as Wādī Faynān (see Fig. 3.2). Farther to the west, Wādī Khālid, Wādī al-Abyaḍ, and Wādī Rātiya also join Wādī Faynān from the north. This portion of the *wādī* system consists of a number of geological and ecological zones.

[30] See, e.g., Shuqayrā al-Gharbiyya, on the Karak Plateau, whose name is derived from the color of the soil near the site (Shdaifat and Ben Badhann 2008: 185).

Wādī Ḍānā runs southwest from the plateau, cutting through outcroppings of the MBS, Fīnān Granitic and Ṣalīb Arkosic Sandstone formations, as well as divided outcroppings of the Ḥanna Silstone and Numayrī Dolomite, both components of the BDS. These differentiated BDS outcroppings were exploited in antiquity, and 14 mines have been found in these deposits in the Lower Wādī Ḍānā (Hauptmann 2007: 122).[31] Vegetation in Wādī Ḍānā is relatively sparse (Fig. 3.3), with the exception of fairly dense vegetation clustered around several springs, primarily in the lower portion of the *wādī*. In the upper portion of the *wādī*, the steep slopes are comparatively densely vegetated, as well.

Figure 3.3: Overview of a pastoral feature in lower Wādī Ḍānā, October 2012.

To the south, Wādī al-Ghuwayr flows west from the plateau, primarily cutting through outcroppings of the Ghuwayr Volcanic suite. A perennial spring in the upper portion of the *wādī* causes the valley floor to be fairly densely vegetated, with hydrophilic plants including oleander

[31] I conducted a brief reconnaissance of the Upper Wādī Ḍānā during the 2012 ELRAP field season, but found no evidence for mining or metallurgy in the upper portion of the *wādī*.

and Salicaceae (e.g. willow and poplar) found throughout the *wādī*, except in its lowest portions (Fig. 3.4). Flowing west, it meets Wādī al-Shayqar south of Khirbat Faynān and becomes Wādī Faynān.

Figure 3.4: Vegetation and running water in Wādī al-Ghuwayr, September 2011.

To the west, Wādī Faynān is met by Wādī Khālid, Wādī al-Abyaḍ, and Wādī Rātiya. These *awdīa* cut through the MBS and several outcroppings of the BDS, before flowing over fluviatile gravel deposits into Wādī Faynān. This was a very active mining region in antiquity, and over 100 mines, with dates ranging from the Chalcolithic into at least the Byzantine period, have been found in these *awdīa*, primarily dug into the MBS (Hauptmann 2007: 112-121).

South of where these *awdīa* join Wādī Faynān, and north of Jabal Zurayq al-Muraḍ (Ar. "the pleasant, blue mountain") — an outcropping of the Fīnān Granitic and Ghuwayr Volcanic suites — is the site of WF4, a large agricultural field system, ca. 4.25 km long, covering more than 200 ha (Mattingly, et al. 2007a: 518; Newson, et al. 2007a). These fields were in use during most of the periods of occupation identified at Khirbat Faynān, spanning the Early Bronze Age until at least the Late Byzantine period (Mattingly, et al. 2007a: 518), and formed a critical component of the settlement system in Wādī Faynān.

As Wādī Faynān flows west, it runs to the south of Jabal Madsūs al-Ḍaḥal (Ar. "the concealed, shallow mountain"; possibly also Jabal Madsūs al-Dākhl, Ar. "the concealed inner mountain" [both spellings are given on Rabba' 1991]), a range of hills made up primarily of outcroppings of the Nā'ūr Limestone and Kurnub Sandstone formations, separating the Wādī Faynān–Wādī Fidān and Wādī al-Jāriya–Wādī al-Ghuwayb systems. The *wādī* turns northward as it passes by the village of al-Qurayqira, primarily flowing past deposits of fluviatile gravel on the northeast and aeolian sand and dunes on the southwest before narrowing considerably near the spring of 'Ayn Fidān, at which point the *wādī* is known instead as Wādī Fidān.

Wādī Fidān

Wādī Fidān — sometimes rendered Wādī Fīdān — is perhaps a relatively recent name for the western portion of the Wādī Faynān system. 'Awayaḍ al-Sa'idiyyīn, a resident of al-

Qurayqira and long-time ELRAP staff member, informed me that the original name the Bedouin used was Wādī Ifdān, and that geologists working in the area were the first to call it Wādī Fīdān, the name used now. This is not entirely correct, as H. H. Kitchener's 1883 map gives the name as "Wâdy Fedân" (Ben-Yosef and Levy 2014b: 182, Fig. 3) and Palmer (1871: 458), likewise, refers to "Wády Fiddán," but it is noteworthy that both Glueck (e.g. 1935: 20) and Frank (e.g. 1934: 217) recorded the name "Wādī Ifdān" during their surveys. The rendering "Wādī Fīdān" — with a long *yā'*, rather than a short *kasra* or *fatḥa* — is something of a mystery, however, as the geology map of the area (Rabb'a 1994) refers to the valley as "Wādī Faddān," probably based on the assumption that *ifdān* is a diminutive form of *faddān*, as diminution is a common feature of Bedouin toponyms. 'Awayaḍ did not know for certain from where the name is derived, but offered two possible explanations. The first is that *ifdān* was, in fact, the diminutive of *faddān*, an Arabic term for a pair of oxen, a plow, or — most commonly — a unit of land area (see Palmer 1998: 139). The *wādī* was likely not named for the unit of measurement, but rather for its appearance as it debouches into the Wādī 'Araba; it opens up like land that has been tilled. Second, he suggested that the name Ifdān, like Faynān, might be the Arabicized form of a now-forgotten ancient name of a place or ruler. Given Bedouin naming practices, the first explanation seems more likely, but either is plausible.

The *wādī* itself is made up of the segment of the Wādī Faynān–Wādī Fidān system that narrows as it cuts through the Jabal Ḥamrā' Fidān (Ar. "red mountain of Fidān") range and turns west to debouch into Wādī 'Araba. At the point where the *wādī* narrows, there is a small, perennial spring, 'Ayn Fidān, that flows for several hundred meters along the southern portion of the *wādī*. Because of the spring, this portion of the *wādī* — from its beginning to the large inselberg (or monadnock) of Pleistocene conglomerate on top of which is the site of Khirbat

Ḥamrā’ Ifdān (see Section 5.4) — is marked by denser Sudano-Deccan vegetation, as opposed to the sparser Saharo-Sindian landscape that characterizes most of the *wādī* (see Levy, et al. 2001: 165). In addition to KHI, a number of other patches of Pleistocene conglomerate form terraces along Wādī Fidān, and the 1998 Wādī Fidān District Survey (WFDS) found sites on many of these (Knabb, et al. 2014: 579; Levy, et al. 2001). To the west, and in its northern reaches, south, Wādī Fidān is bounded by the Jabal Ḥamrā’ Fidān range, a series of hills formed by outcroppings of the Fīnān Granitic, Ḥunayk Monogranite and Minshār Monzogranite formations. To the north of Wādī Fidān, this chain of hills continues as Jabal al-Minshār (Ar. “mountain of the saw,” so named because of its jagged hills), made up primarily of outcroppings of the Minshār Monzogranite, As Sadra Granodiorite, and Ghuwayr Volcanic formations (see Figs. 3.1 and 3.2). Because the *wādī* cuts through these two chains of hills, which would otherwise be difficult to pass, it is often referred to as the “Gateway” to Faynān (see, e.g., Knabb, et al. 2014: 579; Levy, et al. 2002: 425; Levy, et al. 2001: 159).

The Wādī al-Jāriya–Wādī al-Ghuwayb System

Wādī al-Jāriya

Wādī al-Jāriya (Ar. “the *wādī* of the female slave”) is the narrow, northeastern portion of the Wādī al-Ghuwayb system, running from Wādī al-Ḍaḥal (Ar. “the shallow *wādī*”) in the north to Wādī al-Ghuwayb in the south. The *wādī* runs through two rather different groups of geological formations. In the north, the *wādī* is quite narrow, and flows through comparatively recent, chalky formations, including the Muwaqqar Chalk Marl, ‘Ammān Silicified Limestone/Al Ḥisā Phosphorite, and the Wādī Umm Ghudrān formation. Roughly 3 km northeast of the Iron Age smelting site of Khirbat al-Jāriya, it widens and begins to cut through the MBS formation (see Knabb, et al. 2014: 581). At the interface of the MBS and the younger, chalky formations — the Jabal Umm Ṣuwwāna, (Ar. "mountain of the mother of flints") — is a water source called Thamīlat[32] al-Jāriya (Ben-Yosef, et al. 2014a: 530, 549, Table 6.1; Knabb, et al. 2014: 581), which would, despite the narrowness of the *wādī*, have facilitated movement up to the plateau along Naqb al-Jāriya. Flowing southward, the *wādī* cuts through the BDS, where many ancient mines were found (see Section 5.1; Jones, et al. 2012: 74-79; Knabb, et al. 2014), and the Ṣalīb Arkosic Sandstone. In its southernmost portion, it narrows considerably — it is "only a few meters wide in some places" (Knabb, et al. 2014: 581) — and cuts through the Ḥunayk Monzogranite formation. To the west of this portion of the *wādī* is Jabal al-Jāriya, an outcropping of the BDS formation. The Iron Age Jabal al-Jāriya pit mine field (see Section 5.1; Ben-Yosef, et al. 2009a; Ben-Yosef, et al. 2014b: 777, Table 12.1, 856-874) exploited copper ore that eroded from this *jabal* into the valley below, and seems to have been a primary ore source for Khirbat al-Nuḥās, south of Wādī al-Ghuwayb. To the south of Jabal al-Jāriya, Wādī al-Jāriya joins Wādī al-Ghuwayb as it flows westward.

Wādī al-Ghuwayb

The name Wādī al-Ghuwayb (or Wādī al-Ghuwayba) is the diminutive of the Arabic word *ghāba*, or forest. Ben-Yosef, et al. (2014a: 498) suggest that the *wādī* takes its name from the grove at ʻAyn al-Ghuwayba, in the eastern portion of the *wādī* known as Wādī Ghuwayb al-Rawānī[33]. It is also worth noting, in this context, that the Manajaʻ, a Ḥuwayṭāt tribe (see Palmer, et al. 2007: 53), currently have a grove of pomegranate and olive trees in Wādī Ghuwayb al-Rawānī (Ben-Yosef, et al. 2013: 279-280), and this entire branch of the *wādī* was likely fairly densely vegetated even before this was planted. Wādī Ghuwayb al-Rawānī flows west, cutting

[32] *Thamīla*, in Arabic, means "a place where water remains," and refers to a small, shallow well dug into a *wādī* bed (Evenari, et al. 1982: 152).

[33] This is the name given by Levy, et al. (2003: 249), and is a reference to this being the "wet" or "flowing" part of Wādī al-Ghuwayb. I have elsewhere given the name as Wādī Ghuwayb al-Ghanī (Jones, et al. 2012: 78, Fig. 9; Knabb, et al. 2014: 581), or the "rich" Wādī al-Ghuwayb, but this is incorrect.

through the Ḥunayk Monzogranite, BDS, and Ṣalīb Arkosic Sandstone formations, meeting with the southern branch of the *wādī* to form Wādī al-Ghuwayb ca. 0.25 km east of where Wādī al-Jāriya joins Wādī al-Ghuwayb. The southern branch of the *wādī* is called Wādī Ghuwayb al-ʻAṭshāna (Ar. "the thirsty Wādī al-Ghuwayb"), a reference to the sparse vegetation of this branch, particularly in comparison to Wādī Ghuwayb al-Rawānī (Fig. 3.5). This branch is covered by fluviatile gravel deposits, and cuts through Ṣalīb Arkosic Sandstone, BDS, and MBS outcrops. Nuqayb al-Asaymir, the route connecting Wādī al-Ghuwayb to Wādī Faynān, meets Wādī Ghuwayb al-ʻAṭshāna in the south, at Rā's al-Naqb (Ar. "the head of the pass"). A small, tributary *wādī* called Wādī Nuqayb al-Asaymir flows west from Wādī Ghuwayb al-ʻAṭshāna to the Iron Age smelting site of Khirbat al-Nuḥās, cutting primarily through the BDS and Ṣalīb Arkosic Sandstone formations. The site at the core of this dissertation — Khirbat Nuqayb al-Asaymir (KNA) — is built in and around this *wādī*, and the primary mines exploited during the Middle Islamic period are in the *wādī*'s western portion (see Section 5.1.1). After Wādī Ghuwayb al-Rawānī, Wādī Ghuwayb al-ʻAṭshāna, and Wādī al-Jāriya come together to form the main channel of Wādī al-Ghuwayb, they flow westward, past outcroppings of the BDS, Ḥunayk Monzogranite, Ṣalīb Arkosic Sandstone, and Fīnān Granitic formations, as well as fluviatile gravel deposits. In its south-westernmost portion, Wādī al-Ghuwayb is linked to Wādī Fidān by the "old road" through Umm al-Zuhūr, a probably ancient road still in use today — including by ELRAP — as the easiest way of reaching Wādī al-Ghuwayb from the villages of al-Qurayqira and Faynān. At this point, the *wādī* turns north, cutting, on the west, an outcropping of Kurnub Sandstone on the eastern portion of Jabal al-Minshār, and on the east passing by Jabal Ḥanna, an outcropping of the Minshār and Ḥunayk Monzogranites, before debouching into Wādī ʻAraba to the north of Jabal al-Minshār.

Figure 3.5: A sandstorm blowing through Wādī Ghuwayb al-ʻAṭshāna. Desert scrub and acacia are visible in the *wādī*.

3.3. Mining and Metallurgy in the Islamic World

Sources of Copper in the Islamic World

Hill and al-Hassan (1998: 2; see also *EI2*, Maʻdin, which adds southern Iran/Fārs Province, northern Iran/Gīlān Province, and Azerbaijan) list the primary sources of copper in the Islamic world (Fig. 3.6) as Spain, eastern Iran — Sīstān in the far southeast, Kirmān, farther north in the southeast, and Ṭūs in the far northeast; to this should be added the recently surveyed polymetallic mines of the Shāhrūd region in Semnān Province, north of the Dasht-i Kavīr, most of which seem to date to the Islamic periods (Roustaei 2012) — eastern Turkmenistan (Merv), eastern Uzbekistan (Bukhārā and Farghāna), and western Afghanistan (Herāt). Additionally, they note that "[t]he copper mines in Cyprus were always an important source" (Hill and al-Hassan 1998: 2). Whether this last source was exploited between the 7th and 20th centuries AD is, however, unclear. Kassianidou (2000: 754) points out that no evidence has been found for copper production anywhere on Cyprus during this period,[34] although historical sources do indicate that the mines were exploited for the production of metal sulfates between the 10th and 16th centuries AD, at least. As evidence that copper was certainly no longer being produced by the Ottoman period, Kassianidou (2000: 754) cites the late 16th century traveller, Jacques de Villamont, who briefly describes the exploitation of copper sulfate, but states that this was the only product of the mines. This can perhaps be extended back to the mid-15th century, as al-Maqrīzī, in his *Kitāb al-Maqāṣid al-saniyya li-ma'rifat al-ajsām al-ma'diniyya,* mentions Cyprus only as a source of white vitriol (Ar. *al-zāj al-abyaḍ*, zinc sulfate) — which he notes is the best type of vitriol (Käs 2015: 98-99). While it is possible that copper was produced on Cyprus between the 7th and 15th centuries AD, no archaeological work on the island has yet found conclusive evidence of this (but see Fox, Zacharias, and Franklin 1987; Given, et al. 1999: 36.) Lead isotope analysis has, however, shown that an 11th or 12th century Italian bronze known as the New York Lion was likely made using Cypriot copper, which does suggest that the mines were active and producing metallic copper during this period (Contadini, et al. 2002: 74, 76; Papacostas 2013: 191-192). At present I would suggest it is safer to assume that Cyprus was not a key source of copper during this period. Some copper does seem to have been produced, but the chronology and intensity of this production activity is unclear.

[34] She confirmed through personal communication in July, 2012 that this was still the case, but added that pending (at the time) radiocarbon dates from Skouriotissa could show later production. These dates have since been published, and do not in fact suggest production any later than the 6th century AD (Shaar, et al. 2015: 204, Fig. 5).

Figure 3.6: Sources of copper and major settlements in western Asia mentioned in the text. (Basemap: © 2014 Esri.)

Interestingly, Hill and al-Hassan (1998) also leave out several major sources. Although they mention that gold was mined in western Arabia (Hill and al-Hassan 1998: 1) — and this was, indeed, the primary metal sought there — they do not mention western Arabia as a source of copper. As Heck (1999) points out, however, the trimetallic ore deposits of western Arabia allowed for the production of gold, silver, and copper during the Islamic period. Evidence for substantial ʻAbbāsid period copper production has been found at al-Nuqra in the western Najd (de Jesus, et al. 1982: 63), and recent archaeological work in the region of al-Bāḥa, south of Mecca, has produced evidence for copper mining and production at roughly the same time (Al-Zahrani 2014; among others — this is not a comprehensive list of copper mining regions in western Arabia). While Heck (1999; 2003) argues that these ore sources were being exploited at the beginning of the Islamic period and played a key role in the formation of the Islamic empire, Power (2012a: 120-124) in a recent reanalysis argues that the mines should instead be seen in association with the ʻAbbāsid reorientation of the empire, and particularly with the establishment of the Darb Zubayda — the ʻIrāqī *ḥajj* route. Whichever initial date is accepted, however, archaeological work at the mining and production sites has produced little evidence of their continued use into the Middle Islamic period — most of the sites seem to have gone out of use in the late 1st millennium AD, although Al-Zahrani (2014: 266) argues that some production may have occurred as late as the 12th century, at which point he thinks most of the associated settlements, both in al-Bāḥa and central Arabia, were abandoned.

Likewise, Hill and al-Hassan (1998) do not mention the Islamic period copper sources on the southeastern Arabian coast. Islamic period copper production sites are known from southern Rā's al-Khayma — e.g. al-Ṣafarfir, ca. 90 km southeast of Dubai and 80 km northwest of Ṣoḥār (Doe and de Cardi 1983: 32-33; Western 1984) — and ʻOmān — e.g. ʻArjā', ca. 30 km west of Ṣoḥār (Weisgerber 1987), Laṣayl (al-Aṣayl), ca. 10 km south of ʻArjā' (Weisgerber 1978: 20-22), Wādī al-Safāfīr, ca. 55 km southwest of Muscat (Ibrahim and ElMahi 1998; Ibrahim and ElMahi 2000), and Mullaq, ca. 100 km southwest of Muscat (Hauptmann 1985: 35; Weisgerber 1981: 186-189). As with western Arabia, the Early Islamic period also represents the peak of copper production activity in southeastern Arabia.[35] While mining largely ceased at the end of this period, copper production — primarily in the form of reprocessing of older slag — continued in the Middle and Late Islamic periods, at least in ʻOmān (Hauptmann 1985: 114-115), though at nowhere near the intensity seen during the Early Islamic period.

[35] DBM surveys in ʻOmān found more than 100 smelting sites, and "nearly all these slags are to be dated in Early Islamic times (9./10. and 13. cent. AD)" (Hauptmann and Weisgerber 1981: 131).

Although Hill and al-Hassan (1998: 2) do mention the eastern Iranian sources, they do not note the likely copper sources of western central Iran. Among these are the copper mines of Vishnavah, ca. 45 km northwest of Kāshān, which were exploited as late as the Ṣafavid period, or 17th century AD (Holzer, et al. 1971), and the famous[36] cobalt mines of Qamṣar, ca. 25 km south of Kāshān, which also contained copper and iron ore (Stöllner 2011: 623).

Other sources, less relevant to the "Islamic world" as such, could perhaps be added to this. On the "edge" of the Islamic world, local copper production has been documented in West Africa, for example at Takedda/Azelik in northern Niger — visited by Ibn Baṭṭūṭa, who noted its importance as a copper mine, in 1353 AD (Dunn 2005: 305) — where copper was likely produced into the mid-15th century AD (Bernus and Gouletquer 1976; see discussion in Herbert 1984: 16-17). Copper production has also been documented farther to the south, at Igbo-Ukwu, in southern Nigeria (Craddock, et al. 1997). From the perspective of the Islamic world, however, sub-Saharan Africa was a source of gold, but a consumer, rather than producer, of copper (Childs and Killick 1993; Herbert 1973; see also Rapoport and Savage-Smith 2014: 515).

Recycling, too, must also be considered, and there is ample evidence for this practice in the "Islamic world." Jones, et al. (2012: 93-94, n. 17) provide several examples of this practice worth revisiting and expanding upon here. The Cairo Geniza indicates a relatively long-distance trade organized around recycling, as old copper would be sent from ʻAdin in Yemen to India, where it would be "worked . . . into new utensils according to order" (Goitein and Friedman 2008: 16). This seems to have continued into the 15th century, at least, as Allan (1984: 91-92) notes that both al-Jawharī and al-Maqrīzī describe copper *fulūs* being shipped to Yemen, among other places, to be recycled (see Section 3.6). A large 11th century copper hoard found at

[36] Abū al-Qāsim (Allan 1973: 112) lists Qamṣar as a source of both *lājvard* — most likely cobaltite (Stöllner 2011: 622) — and a white stone called *qamṣarī*.

Ṭabariyya/Tiberias seems to indicate recycling, as well (Ponting 2008: 59-60; see Section 3.6.2 for discussion of a similar, but smaller, hoard found at Ṭawāḥīn al-Sukkar in Jericho). Burckhardt (1822: 395), in 1812 AD, noted that the fields near al-Karak in central Jordan contained ancient coins, which were purchased by silversmiths and recycled. A similar practice was observed by Wulff (1966: 22-23) in the mid-1960s among Iranian coppersmiths. The practice of recycling has been noted as a problem for sourcing metals, particularly through lead-isotope analysis (Budd, et al. 1996), and this should be kept in mind when evaluating the results of chemical and lead-isotope analyses, such as that of al-Saa'd (2000), who suggests that a group of 14th century AD and later copper-alloy objects, probably from northern Jordan, were made of Wādī 'Araba copper. It is likely that this is the case, but the processes by which this copper came to be part of these vessels are not entirely clear.

Muslim Perspectives on Metals

In his 2012 book, *Metals, Culture and Capitalism*, Jack Goody discusses the ambivalence of ancient sources toward metals, and iron in particular. Citing Aitchison (1960: 1), he states, "[t]he Quran puts the problem in stronger language – 'dire evil resideth in it as well as an advantage to mankind'" (Goody 2012: 140). This is an interesting example of this evidently common ancient sentiment, although this translation of Sura 57:25 is not a common one. The source — not actually credited in either Goody (2012) or Aitchison (1960) — is John Medows Rodwell's 1861 English translation of the Qur'ān. Rodwell (1861: 527, n. 3)[37] also includes the following footnote regarding the translation of "dire evil": "Or, *mighty warlike strength*, but the antithesis requires the rendering given in the text." Most other translations, however, prefer something closer to "mighty warlike strength," while the recent Droge translation presents an

[37] I cite the first edition of his translation here, as it is now widely available in electronic form, but it has been reprinted many times, including a Dover Thrift edition in 2012.

intermediate, and probably optimal, rendering: "And We sent down iron – in which (there is) harsh violence, but (also) benefits for the people" (Droge 2013: 374). This preserves the contrast between the martial and utilitarian uses of iron, but without the strong moral judgment implied in Rodwell's translation.[38]

A somewhat similar ambivalence about copper can, however, be seen in the stories of the City of Brass (or copper; Ar. *madīnat al-nuḥās*). The most embellished version of the story is found in 19th century editions of *The Thousand and One Nights* (*Kitāb Alf Layla wa Layla*) and tells of an expedition commissioned by the Umayyad caliph ʻAbd al-Malik ibn Marwān to locate a group of brass bottles in which King Solomon[39] had imprisoned some rebellious *jinn.* Instead, the expedition comes across the City of Brass, and upon scaling its walls — after several unsuccessful attempts — finds the city full of gold, silver, and jewels, but its inhabitants all dead (*EI2*, Madīnat al-Nuḥās; Fudge 2006; Fudge 2012; Hamori 1971). The moral of the story is spelled out in an inscription found by the party, "telling of how the rich city fell to famine and drought, and all their wealth was for naught, as they starved to death, learning that all the worldly glories, the wealth and the grandeur, will eventually go the way of dust and clay" (Fudge 2006: 91). Although this version of the story is quite late, traditions of a Madīnat al-Nuḥās date back at least as early as the 9th century AD, with many of the elements already combined into similar stories by the 10th century (*EI2*, Madīnat al-Nuḥās; Fudge 2012: 267). On one hand, the moral content of the story is relatively straightforward. Copper, or brass, is here linked with gold, silver, jewels, etc. to represent earthly wealth. While the brass city and its riches are preserved,

[38] The Rodwell translation is an interesting work in its own right, and it is difficult to resist the temptation to speculate about what led Rodwell to this translation. On one hand, he cites parallels from Biblical literature, and might have been working with these in mind. On the other, there is a certain satisfying parallel between his translation of Sura 57:25 and Sura 2:219, which weighs the great sin of wine and gambling against their relatively minor benefits. Also, the word translated as "strength," "might," or "power" (*bā'su*) is very similar to another word that appears in the Qur'ān and is usually translated as "evil" (bi'sa).
[39] As Fudge (2006: 99) notes, Islamic tradition associates Solomon with brass, e.g. the spring of brass or copper (Ar. *ʻayn al-qiṭr*) described in Qur'ān 34.12.

its inhabitants are long dead. A connection can also be seen here to perceptions of exotic, mineral-rich locales as also being in some ways dangerous. As another example, the West African nation of the "*L-x-d*" are described in the 11th century *Book of Curiosities* (*Kitāb Gharā'ib al-funūn wa mulaḥ al-'uyūn*) as cannibals, but also in possession of gold in such a large quantity that they use it as a building material (Rapoport and Savage-Smith 2014: 515). On the other hand, brass serves here as a barrier, keeping the *jinn* in and the travelers out (Fudge 2006: 100; Fudge 2012: 268) — and as Hamori (*EI2*, Madīnat al-Nuḥās) suggests, following Charles Genequand (1992: 330), this has even earlier parallels in an early 8th century AD Greek account of the story of Alexander and the gymnosophists, as well. But beyond this, "when the borders of brass are breached, both jinn and men find appearances on the other side to be deceiving" (Fudge 2006: 100). Men are lured to their deaths by visions of women calling to them, the queen Tadmura, although dead, appears beautiful, and the copper statues at her side are not lifeless metal, but rather traps for those who disregard her written warning (Fudge 2006: 91).[40] The same tension can be found as early as the 10th century AD in the *Rasā'il Ikhwān al-Ṣafā'* (*Epistles of the Brethren of Purity*), where it is made more explicit: "if copper is founded, if Syrian glass is thrown on it, and if it is thrown when it is warm … into water, its resulting colour is similar to the colour of gold; and when it is brought near to fire, it blackens, because fire is the judge among mineral substances that decides between them according to the truth" (Ikhwān al-Ṣafā' 2013: 264). I would argue that this aspect of the tradition — copper as misleading or obfuscating — reflects another thread in Islamic thought concerning the ambiguous position of copper in relation to wealth, or more specifically copper coinage in relation to silver and gold.

[40] We could, as Fudge (2006: 101) does, take this a step farther and see the Madīnat al-Nuḥās story itself as in some ways deceptive, or at least transformative, in the context of Islamic tradition, reimagining King Solomon as solely righteous, rather than repentant, and Mūsā ibn Nuṣayr as a renunciate, rather than driven by greed.

The late 14th-early 15th century Egyptian writer al-Maqrīzī makes this point quite forcefully in his *Ighāthat al-umma bi-kashf al-ghumma* — Allouche translates this title as "Helping the Community (or the Nation) by Examining the Causes of Its Distress" — written in 1405 and translated into English as *Mamluk Economics* (al-Maqrīzī 1994). In this work, al-Maqrīzī posits that one of the root causes of the Egyptian financial crisis at the beginning of the Burjī Mamlūk period was the increasing reliance on *fulūs*, or copper coins — a phenomenon that has led quite a few scholars to refer to the period as an "Age of Copper," though this term is generally no longer used, as it is not particularly accurate (for a partial bibliography of the term, see Bacharach 1976: 32, n. 1). The actual content of his claims regarding Mamlūk monetary policy will be examined in Section 3.6. Here, his claims are relevant primarily in that he does not consider copper to be currency, as such (al-Maqrīzī 1994: 80). He states this quite forcefully on several occasions, noting that the reliance on copper coinage "is an innovation and a calamity of recent origin. It has no root among any community that believes in a revealed religion, nor [does it have] any legal foundation for its implementation" (al-Maqrīzī 1994: 77, square brackets in original) and arguing that "[i]n Egypt, Syria, Arab and Persian Iraq, Persia, and Byzantium, in early and recent times, the kings of these areas, because of their haughtiness and vehemence, their desire to further their power, their blind ambition and megalomania, adopted copper and minted a small quantity of it in small pieces for the purchase of insignificant goods" (al-Maqrīzī 1994: 68).

As Allouche (1994: 20) and Schultz (2003a: 177-178) note, al-Maqrīzī's opinions on copper coins are likely an expression of his adherence to the Shāfiʿī *madhhab*, which tended to view commerce fairly restrictively.[41] While the Ḥanafī *madhhab* could consider copper to be

[41] It is possible that al-Maqrīzī's objection to copper coins might be better read as a Ḥanafī concern about "weighable" goods (Siegfried 2001: 323), which would exclude copper.

money, “[i]n contrast, Shafiʿi denies that *fals* is money at all since it is not accepted by everyone” (Siegfried 2001: 326). Although different *madhāhib* varied in their views of copper coinage, all to a greater or lesser extent view it as being different from gold and silver, and indeed all viewed the question of whether and to what extent it was money as a legitimate one. This reflects something of a class distinction in coinage between high-value currency — the gold *dīnār* and the silver *dirham* — and the petty currency of quotidian transactions — the copper *fals* and the billon *dirham aswad*, or “black dirham” (Heidemann 2015: 48). This can also, in many periods,[42] be conceived as coins whose intrinsic and face values are equal — in some *madhāhib* this is related to whether the coins are “weighables” (Ar. *mawzūnāt*), in the sense that they can be exchanged based on the weight of the metal they contain (Siegfried 2001: 323) — i.e. gold and silver coins, and those worth more in transactions than their intrinsic value, i.e. copper and billon coins (Siegfried 2001: 326). In this context, it is interesting to note that the legal term for the *dirham aswad* is *dirham maghshūsh*, which Heidemann (2015: 49) translates as “alloyed dirham” but in both Arabic and Persian has a literal meaning closer to “deceptive dirham.” While these are, of course, elite concerns — the concerns of the *ʿulamāʾ* — they are nonetheless worth understanding here, both because they are important to historical understandings of monetary policy and because, as will be discussed in Section 3.6, al-Maqrīzī’s work has been invoked by some researchers in the context of Middle Islamic period copper production in Faynān.

Mining, Labor, and the Question of Slavery

Mining is often regarded in both archaeological and historical scholarship as a field where slave labor would have been fairly common. This can be seen in the work of earlier researchers, such as Glueck, who proposed the use of slave labor during the Iron Age at Khirbat al-Nuḥās (1935: 44: 28) and Timna Site 34 — what he calls “Kh. Meneʿîyyeh” — the so-called

[42] The late 14th century will be discussed as an exception in Section 3.6.

"Slaves' Hill" (1935: 44), and noted historical references to Roman slave labor at Khirbat Faynān (1935: 28, n. 61a). These same suggestions continue to appear in recent research, as well. Yekutieli and Cohen-Sason (2010: 48), in a viewshed analysis aimed at cataloguing points from which Timna Site 34 could be observed, refer to the Iron Age Timna Valley as "a landscape of total control." Yekutieli (2007: 77; Yekutieli and Cohen-Sason 2010: 55) has also suggested that slaves would have made up the bulk of the workforce at the Roman period Naḥal Zohar quarry, southwest of the Dead Sea.

Likewise, Nol (2015: 58) suggests that Early Islamic miners in the southern 'Araba were either slaves or *corvée* laborers, perhaps connected to an Early Islamic system of forced labor described by Hoyland (2006: 402). It is particularly interesting to note that the 7th century monk, Anastasius of Sinai, attests that "Cypriot prisoners worked in appalling conditions on public estates" near the Dead Sea (Hoyland 1997: 100; see also Hoyland 2006: 402, n. 37), suggesting that this system was in use, at least in the context of agricultural labor, in 7th century southern Jordan — or southern *Jund Dimashq*, in Umayyad administrative terms. Discussing Islamic Africa, Alexander (2001: 48) posits, "While free men might take part in mining/quarrying, especially in the eastern deserts for gold and precious stones, the bulk of the work was done by chattel-slaves in both state enterprises and private ones," but the only example he provides is 16th-19th century Saharan salt extraction — primarily in modern Mali and Niger. There is, however, earlier evidence for the use of slavery in mineral extraction in Saharan Africa. Al-Qazwīnī, writing in the 13th century, records salt and alum being mined by "the slaves of Masūfa" at Taghāra (Taghāza, Mali), although his description of the organization of labor at this mine is not entirely clear, and suggests that slaves were responsible not only for mining, but also that "[t]hey sell the salt, retain their expenses from the sale price, and pay over the remainder to their Masūfa masters" (Levtzion and Hopkins 1981: 178), a scenario that may not entirely comfortably be classified as "slavery" for the modern observer. More interestingly, Ibn Baṭṭūṭa, writing in the 14th century, records copper being mined and smelted by both "male and female [household] slaves (*al-ʻabīd wa-ʻl-khadam*)" at Takkadā, modern Azelik, Niger (Levtzion and Hopkins 1981: 302).

While not suggesting that slavery played no role in ancient or Islamic mining, I would suggest that its role has been overstated. At Timna Site 34, for example, Sapir-Hen and Ben-Yosef (2014) use the faunal remains from the site to argue that the metallurgical workers engaged in smelting on the hill in fact enjoyed relatively high social status. While suggesting that slaves or other low-status laborers were likely engaged in mining (Sapir-Hen and Ben-Yosef 2014: 786), they nonetheless demonstrate that the status of laborers cannot necessarily be assumed from the perceived difficulty or unpleasantness of the work, or from the physical appearance of a site.

The Roman situation is somewhat more complicated. There is certainly historical evidence that Roman mines and quarries were worked by prisoners — particularly Christians — sentenced to *damnatio ad metallum*: condemnation to the mines (summarized in the specific context of Phaino/Khirbat Faynān in Section 3.4; on the practice generally, see Gustafson 1994; Gustafson 1997; Jones 1987; Millar 1984). While this form of labor was certainly used at Roman mines, the extent to which it was in use is not entirely clear. Cuvigny and Wagner (1986: 64), for example, argue that *damnatio ad metallum* is only rarely attested in Roman Egypt, and even then primarily at one *metallum*: the Mons Porphyrites quarry. The substantial collection of ostraca from Mons Claudianus reveals, instead, a situation where several classes of workers were hired and paid wages to work in the quarries (Bülow-Jacobsen 2009, who also presents ostraca detailing the bureaucratic machinery required to administer the quarry; Cuvigny 1996; Cuvigny 2000). As at Iron Age Timna, faunal analyses suggest access to high-quality food among quarriers at Mons Claudianus (van der Veen 1998).

In the Islamic context, it is likely that the role of slavery has been overestimated, as well. In the context of ʿIrāq, van Bavel, et al. (2014: 271) argue that "freedom of labour probably increased in the early Islamic period, even in the countryside." Shatzmiller (1994: 38-39) suggests the same thing for the central Islamic lands more generally, arguing that, by the Middle Islamic period, the role of slavery in the Islamic world had decreased, and although present in the workforce, this was limited primarily to "domestic and small manufacturing occupations."[43] While slavery and forced labor are documented in, for example, the textile industry (Shatzmiller 1994: 244), the same does not seem to be true of mining, where the available historical sources — e.g. al-Hamdānī's account of silver mining in Khurāsān and Yemen (Dunlop 1957: 41-43) — indicate little division of labor and the active participation of local people as miners (Shatzmiller 1994: 175-176). This is particularly interesting in light of Fenoaltea's (1984) model of slave labor and efficiency, which "predicts that unfree labor will have a special advantage in [effort-intensive activities such as mining]: that it will tend to appear there first and disappear from there last, and tend to displace from there free labor that cannot be similarly driven." The limited evidence available, however, suggests that this model might not accurately predict the contexts in which slavery was most common in the (particularly Middle) Islamic world. In his recent analysis of sugar in the Islamic world, Sato (2015: 38) is, likewise, skeptical of the large role assumed for slaves in the sugar industry, noting that "[t]he slaves of Islamic societies are mainly

[43] This is not, however, to suggest that domestic slavery would have been uncommon, particularly among the wealthy. The ubiquity of slaves in wealthy households is suggested by al-Ghuzūlī, who, in a late Mamlūk-era poem, states, "'The slave is he who has no slaves' (*al-ʿabd man la ʿabīd lahu*)" (Marmon 1999: 9).

house slaves (*ʻabd*, *jāriya*) and military slaves (*mamlūk*), rarely used for farming."[44] All of this highlights a broader issue with the evidence described above suggesting a broader role for slavery in agriculture and mineral extraction: this evidence is either much earlier — primarily from the first *hijrī* century — or primarily from accounts of travelers to West Africa. Both of these contexts are rather different from Middle Islamic Bilād al-Shām. The geographic distance is particularly worth noting. While it may be possible to read Ibn Baṭṭūṭa as representative of broader Islamic perceptions of blackness and slavery (see Insoll 2003: 231-232; Sweet 1997: 147), it is not clear how far beyond Niger his description of the use of household slaves in mining and smelting can be applied.

This brings up a question: by what archaeological correlates can free labor be distinguished from slave labor? The viewshed analyses presented by Yekutieli (2007) and Yekutieli and Cohen-Sason (2010) — drawing on Foucault's (1977: 170-177, 195-230) discussion of "hierarchical observation" and his analysis of Jeremy Bentham's "Panopticon" — cannot, without additional evidence, distinguish between these two possibilities. Friedman (2010: 211) discusses this difficulty in her application of a similar analysis to the Roman *metallum* at Phaino, noting that both slaves/convicts and wage laborers could have posed a "threat of revolt." A more basic economic concern is also at work here: assuming wage laborers are paid for their time — e.g. by the day — a wage laborer "has every incentive to spare himself at his employer's expense, and will do so unless he is adequately supervised" (Fenoaltea 1975: 695). In this case, the degree and nature of surveillance can be used to determine the nature of

[44] Segal (2001: 42-45) agrees, arguing that the late 9th century Zanj Rebellion — which he interprets as a slave revolt — had made clear the dangers of using slave labor in plantation agriculture, though several points of clarification are in order. First, the slaves involved in the Zanj Rebellion seem to have been employed in soil improvement, rather than plantation agriculture as such (Sato 2015: 38; van Bavel, et al. 2014: 271). Second, it has been recognized by scholars for several decades that the Zanj Rebellion was "not a slave rebellion in the strict sense of the word," but rather a somewhat more complex political-religious movement (Talhami 1977: 460). Nonetheless, the broader point — that plantation slavery, while perhaps not unknown, was rare during the Middle Islamic period — is likely correct.

wage labor, in that, where individual workers' contributions can be determined based solely on their output, surveillance is often unnecessary, "but where many persons collaborate individual contributions can be determined only from the input side, and supervision must be direct and continuous" (Fenoaltea 1975: 696).[45] In the absence of additional evidence, then, analysis of systems of surveillance cannot easily distinguish between slavery and wage labor.

Additional evidence is, unfortunately, difficult to find. For the Roman period, many of the markers of slavery were ephemeral, e.g. scarring, branding, and tattooing (Gustafson 1997; Jones 1987; Kamen 2010). The practices can be reconstructed from historical evidence, but do not preserve to aid in the interpretation of archaeologically documented cases. Although rare, a number of material correlates have, however, been suggested for Roman slavery. These primarily take the form of inscriptions, including slave collars (see, e.g. Thurmond 1994) — which seem to have replaced tattoos and brands in the Late Roman/Byzantine period (Kamen 2010: 101) — graffiti (Keegan 2013), tombstones (McKeown 2007: 11), and ostraca. These are rare even during the Roman period, and inscriptions — beyond inscriptions on coins (see Section 7.1) or formulaic inscriptions on ceramics, primarily lamps (see Chapter 6, esp. Section 6.2) — are unknown in Middle Islamic period Faynān. Indeed, for Islamic archaeology generally, Insoll (1999: 158-159) suggests that the slave trade — like the trade in cloth, paper, perfume, and spices — is "a profitable avenue of research . . . closed by the lack of evidence," and Alexander (2001: 44, 56) argues that finding archaeological correlates for slavery "remains one of the last

[45] The same tension is noted by Orr (1996: 82) in the context of modern photocopier maintenance, where he argues that customer satisfaction surveys represent a similar attempt at surveillance, of sorts, by managers who "need to know and show to higher-level managers whether work is being done in an area where they cannot control the worker's knowledge or the worker's schedule, and where there is no particular measurable output." Ancient mining is obviously different in its details — notably its spatial organization — but the comparison highlights the general applicability of Fenoaltea's (1975) observations.

major field problems of the discipline" and refers specifically to "[i]ndustrial/mining employment of slaves" as "[a]rchaeologically unrecognizable."

A secondary problem in establishing correlates is determining exactly what it is that slaves *do*. While al-Qazwīnī's account, described above, indicates a broader range of responsibilities than a modern observer might expect for slaves, this is well within the realm of what is known from both the well-documented Roman system, where slaves "accompanied their owners on short jaunts and long journeys; others, on their own, ran errands, peddled goods, managed businesses separated from their owners' domestic or commercial establishments; some acted as agents in the provinces" (Joshel 2013: 101), and from the Islamic system, where Ibn Ḥajar, writing in the 15th century, likewise records that the slaves of Karimī merchants "engaged in long-distance trade on behalf of their masters" (Marmon 1999: 13). While Ibn Baṭṭūṭa's description of Niger indicates that *'abīd* — generally interpreted as household slaves — could be engaged in copper mining and smelting, it is also unclear, as noted above, to what extent this is relevant to a region as far away as Bilād al-Shām. Without historical evidence, it is difficult to determine the range of activities slaves would have been engaged in.

While faunal analyses, such as those conducted at Timna 34 (Sapir-Hen and Ben-Yosef 2014) and Mons Claudianus (van der Veen 1998), are a promising avenue, they tend to be better correlates of status than of slavery, as such. In other words, finding evidence that smelters were given high-quality cuts of meat suggests that they were not slaves, but if evidence were found, for example, that miners were given low-quality cuts of meat, this would demonstrate a lower status, but slavery would be only one of several possible interpretations. As such, Alexander (2001) is, unfortunately, probably correct that the use of slave labor in mining and metallurgy is not archaeologically distinguishable from the use of low-status wage labor. With this in mind, however, I will, in Chapter 10, consider several possible scenarios concerning the status of miners and other metallurgical laborers in Middle Islamic period Faynān.

3.4. Faynān at the End of Antiquity

The Byzantine period in Faynān is marked by an unfortunate contradiction. On one hand, almost all of the known historical references to Faynān — and the only references to copper production there — date to this period. On the other, these sources are not concerned with many of the questions archaeologists would like to ask, but rather are interested in the hagiography of the martyrs condemned to die in the Roman *metallum* at Phaino[46] (Knauf and Lenzen 1987: 83; see also Chapter 1). One of the most important questions these sources leave unanswered is how long into the Byzantine period copper was produced at Khirbat Faynān.

There are almost as many opinions on this issue as there are scholars who have worked in Faynān, but broadly these can be seen as belonging to one of two camps. Researchers from the DBM have argued that copper production continued through the 5th century, at the latest, while those associated with the WFLS argue for continuous copper production throughout the Byzantine period. Below, I summarize these views and provide an overview of the state of the evidence prior to the work I report in this dissertation.

The German View

The most extreme view on the DBM side was presented by Gerd Weisgerber (2006), in a paper published four years before his death in 2010. For Weisgerber (2006: 25), copper production is "not attested" at Khirbat Faynān after the Late Roman period, though the town of

[46] The town is known by several names in Byzantine sources. Kind et al. (2005: 169) provide a list of the Greek and Latin names used by Eusebius and Jerome, respectively: in Greek, Faino (Phaino) and Fainon, and in Latin, Fenon, Faenon, and Faeno. Freeman-Grenville (2003) occasionally translates Jerome as using the name "Faenum," but this form is not present in the original Latin given by Klostermann ([1904] 1966). Eusebius calls the town Phainón (Φαινών), which Jerome translates into Latin as Faeno (Klostermann [1904] 1966: 114-115), and renders the Biblical name as Phinón (Φινών), which Jerome translates into Latin as Fenon (Klostermann [1904] 1966: 168-169). Najjar and Levy (2011: 32) note several additional ancient names. Here I follow most recent scholarship in referring to the town by the Greek name, Phaino, for both the Roman and Byzantine periods.

Phaino held some religious importance in the early Byzantine period. Following 500 AD, Phaino lost any importance it might have had, and was ultimately destroyed in an earthquake in either 502 or 551 AD — or perhaps abandoned due to an outbreak of the plague in 541 AD — not to be occupied again until the 13th century (Weisgerber 2006: 25).

There are several problems with Weisgerber's view. First, the suggestion that copper production is "not attested" in the Byzantine period at Khirbat Faynān is curious, considering the historical evidence. The *Onomasticon* of Eusebius of Caesarea, primarily concerned with the fate of Christian martyrs at Faynān, notes only that Phinon "is the same as the Phainon where the copper mines are, lying between the city of Petra and Zoor [Zoara, in modern Ghawr al-Ṣāfī]," but Jerome's Latin translation of the work, dated to ca. 390 AD, adds that "[i]t was formerly a city of the princes of Edom, but now a little village in the desert, where copper mines are dug by those condemned to hard labour" (Freeman-Grenville 2003: 93).[47] This seems to indicate that copper production continued at Phaino at least into the late 4th century AD, although perhaps not beyond that.

Second, what is meant by "the town ceased to be important" (Weisgerber 2006: 25) after 500 AD is not entirely clear,[48] but it is difficult to make this case. Certainly Phaino continued to be a bishopric after 500 AD, as a bishop of Phaino was present at a synod in 536 AD (Mattingly, et al. 2007b: 333; Millar 2008: 79). If nothing else, this suggests that the town maintained its religious importance well into the 6th century.

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[47] Jerome's original Latin reads, "fuit autem quondam ciuitas principium Edom, nunc uiculus in deserto, ubi aeris metalla damnatorum suppliciis effodiuntur inter ciuitatem Petram et Zoaram, de quo et supra diximus" (Klostermann [1904] 1966: 169).

[48] I have noted elsewhere (Jones, et al. 2012) that Weisgerber (2006) is perhaps too dismissive of post-Roman settlement at Khirbat Faynān. This is, as I will argue later, certainly true of Middle Islamic copper production there, but also seems to be true of the Byzantine period settlement.

Third, Weisgerber's proposed model of the town's abandonment in the early to mid-6th century due to earthquakes or plague is not tenable. As Whitcomb (1988c) has argued about the 747/8 AD earthquake at Khirbat al-Mafjar, this is at best an oversimplification of a more complicated scenario. To begin with, it is highly unlikely that the earthquake of 502 AD caused damage near Faynān. Russell (1985) notes that this earthquake "affected regions as far south as Ptolemais [modern Acre/'Akko]," more than 250 km north of Faynān. There is no reason to think that it caused damage in southern Jordan. The earthquake of 551 AD is a slightly stronger possibility. Although evidence of this earthquake was not found at Aila/al-'Aqaba (Thomas, et al. 2007), it is commonly regarded as the earthquake that destroyed Petra (Haynes, et al. 2006: 427; Russell 1985: 45), although this too is incorrect (see Section 8.2). Unfortunately, it cannot be the earthquake that destroyed the "monastery" at Khirbat Faynān. Weisgerber (2006: 25-26) argues that the monastery was destroyed in a 6th century earthquake, but it is not entirely clear how he arrives at this date, although he does refer to the numismatic data published by Kind, et al. (2005). He does not, however, consider the dedicatory inscription found in the monastery in the early 20th century, which dates its construction — or, perhaps, reconstruction — to 587/8 AD (Alt 1935: 65; Sartre 1993: 146)[49]. There is no reason to doubt the authenticity of this inscription, and until the monastery is excavated it remains the best piece of evidence for dating this structure. It is entirely possible that Weisgerber is correct in suggesting that the monastery was destroyed by an earthquake, but there are many earthquakes post-dating the 6th century that could be to blame (for these, see Ambraseys, et al. 1994; Ambraseys 2009; Haynes, et al. 2006; Russell 1985; Thomas, et al. 2007). Rucker and Niemi (2010; see also Ambraseys 2009: 216-

[49] Sartre (1993: 146) and Meimaris and Kritikakou-Nikolaropoulou (2008: 160-161), in their more recent analyses, argue that Alt's dating is correct, but note that the inscription might also be read 580/1 or 584/5. This uncertainty, of course, does not affect my key argument; no possible reading of this inscription places the (re)construction of the "monastery" earlier than the late 6th century.

217) also suggest that an earthquake around 597 AD may have been responsible for some of the destructions in southern and central Jordan previously attributed to the 551 AD earthquake. The reference on a tombstone found at the WF3 South Cemetery to 592 AD being "the year during which the people were crying for food (starving), and one-third of the population (or mankind) died" (Meimaris and Kritikakou-Nikolaropoulou 2008: 147) may be relevant to this earthquake, as the disaster in question is not specified, but Meimaris and Kritikakou-Nikolaropoulou (2008: 149) instead interpret this as a reference to an outbreak of plague documented in Antioch in the same year. It may also be the case, then, that the monastery was only in use for a very short time before being destroyed in this earthquake, or that it was damaged in this earthquake and either rebuilt or used in a reduced form. This argument is, nonetheless, tangential to my main point here. Some damage from a mid- to late 6th century earthquake is evident at Khirbat Faynān (see Section 5.3.1), but it is now certain that the site was occupied long after this (see Section 5.3.2).

More reasonable scenarios in this camp have been put forward by Kind, et al. (2005) and Hauptmann (2007). Kind, et al. (2005: 192) argue that copper production stopped, or at least scaled down considerably, between 360 and 370 AD, due primarily to the withdrawal of a military garrison from Phaino. This military garrison is not documented historically, and they argue for its establishment at about 312 AD based on the large number of coins found at Khirbat Faynān dating to this period (Kind, et al. 2005: 189). This could, hypothetically, be linked to the early 4th century military reorganization evident in southern Wādī 'Araba (see Section 8.2), but it is important to keep the lack of evidence for this garrison in mind, particularly given the issues with the collection strategy of this survey (see note 29, below). Likewise, their argument for its withdrawal around 363 AD is based primarily on a lack of coins found at Khirbat Faynān dating to the period 364-378 AD, compared to the preceding and following periods (Kind, et al. 2005:

187).[50] They also suggest that the earthquake of 363 AD — which did cause damage in Petra (Russell 1985: 42) — may have caused mines to collapse near Khirbat Faynān, and that this may explain Jerome's addition to his translation of the *Onomasticon* of a line noting that "the copper mine at Faenum" had "collapsed in our time" (Freeman-Grenville 2003: 64).[51] They argue, however, that the withdrawal of the garrison, and not this earthquake, was the reason copper production ceased (Kind, et al. 2005: 192).[52]

Hauptmann's (2007) argument is slightly more cautious, but similar. He generally agrees with Kind, et al. (2005) that a garrison was established at Phaino around 312 AD, and suggests that "[t]he role of Faynan as one of the large copper production centers in the Southern Levant is generally finished by the end of the 5th century CE" (Hauptmann 2007: 156). While not repeating exactly Kind, et al.'s (2005) argument regarding coin frequencies, this date does seem to be based on the same numismatic evidence, which shows a sharp decrease beginning in roughly 420 AD (Hauptmann 2007: 155). Importantly, both Hauptmann's (2007) and Kind, et al.'s (2005) scenarios leave room for some continuity of copper production, on a reduced scale, after Phaino had ceased to be *primarily* a center of copper production.

Eliminating the arguments that are clearly incorrect, a combined German view could be stated as follows. The peak of copper production at Phaino occurred in the 2nd-4th centuries AD, though this was probably severely disrupted by the earthquake of 363, which caused, at the least,

[50] I have critiqued the methodology of this numismatic survey several times (Jones, et al. 2012: 88, n. 13; Jones, et al. 2014: 183), but it is worth repeating that argument here. While some of the coins described by Kind, et al. (2005) were found during surveys, the majority were purchased from local Bedouin. It is often not possible, based on the published evidence, to tell which coins were purchased and which were surface collected by their team. They trust that the Bedouin who sold them these coins were honest about where they were found, and argue that they had no reason to lie, but at best this calls into question the reliability of their sample.

[51] In the original Latin, Jerome gives the translation, "sed et metallo aeris Faeno" and adds, "quod nostro tempore corruit" (Klostermann [1904] 1966: 115). This is, as Kind, et al. (2005) argue, very likely a reference to damage caused by the earthquake of 363.

[52] Mattingly, et al. (2007b: 333) argue that Kind, et al. (2005) place too much emphasis on this line from Jerome, noting that the coin evidence might also suggest a recovery in the last decade of the 4th century. Their interpretation of Jerome may be part of why Kind, et al. (2005) do not see copper production resuming at the end of the 4th century, but it is also important to note that they specifically reject this as a primary reason.

a major collapse in the mines. The industry itself may have survived this event at a reduced scale, but during the late 4th and 5th centuries, copper production — and imperial investment in Faynān more generally — was scaled back, and it is likely that copper production had entirely ceased by the end of the 5th century. Phaino continued to be important for religious reasons into the 6th century, though what happened after this is uncertain, at least until the resumption of copper production in the 12th century.

The British View

British researchers tend to interpret Byzantine Faynān rather differently. Mattingly, et al. (2007b: 333) argue that settlement at Khirbat Faynān must have continued into the 7th century, pointing out that Phaino is listed in both the mid-6th century *Synecdemus* of Hierocles (1893: 43) and George of Cyprus's (1890: 54, 205) early 7th century *Descriptio Orbis Romani*. This is certainly true, and ELRAP excavations in Khirbat Faynān Area 18, discussed later in this dissertation (Section 5.3.2), confirm that Phaino was occupied into and past the 7th century. It is unfortunate, however, that these sources give no information useful for reconstructing the social or economic conditions at Phaino in the Late Byzantine period. Indeed, these sources give us no indication that their authors knew anything about Phaino other than its name and, broadly, its location relative to other places. Nonetheless, that settlement at Phaino — regardless of the nature of this settlement — continued into the 7th century should probably, at this point, be taken as a given.

Although mining appears to have gone into decline throughout the Roman Empire beginning in the 3rd century (Mattingly 2011: 170-171), the British view sees settlement at Phaino as being more dependent on mining than the German view. In their final report of the WFLS, Mattingly, et al. (2007b: 333) argue that the German dates for the end of copper production are likely too early, but also admit that "at present we cannot with any certainty pinpoint the end of copper production." In other venues, however, researchers associated with the WFLS have made bolder assertions. Mattingly (2011: 191-192), for example, has suggested that during the Byzantine period, Phaino's Christian community "almost certainly continued to work as free labor in the mines," and he implies that this situation may have continued into the late 6th century. Friedman (2008: 54-55; see also Friedman 2013b) argues that, although copper production went into "slow decline" in the 5th century, it likely continued into the 6th, and Phaino may have continued to be an imperial *metallum* until the decline of the region as a whole in the mid- to late 6th century, as argued by Fiema (1992) and described in Section 3.5.

Direct evidence of copper production into the 6th century, however, is lacking. As previously stated, the only slag mound dating to the Roman and Byzantine periods at Khirbat Faynān is Faynān 1, the large mound directly south of Khirbat Faynān on the southern bank of Wādī Faynān/Wādī al-Ghuwayr. Radiocarbon samples collected by the DBM and reported by Hauptmann (2007: 89)[53] suggest that the Faynān 1 slag mound was in use between ca. 100 BC and 320 AD (see Fig. 3.7 and Table 4.1). Even considering the 2-sigma ranges, there is no evidence for any date later than the first half of the 4th century AD, which is in line with all but the most extreme formulations of the German view. Allowing, as Hauptmann (2007: 155) does, an error of up to 100 years for old wood, or as Ben-Yosef, et al. (2012: 63) do, an error of up to 160 years in the case of acacia,[54] this might be read as evidence of copper smelting into perhaps the late 5th century, but probably no later. It is clear from the existing dates, however, that there

[53] Hauptmann (2007: 89) cites Steinhof's 1994 Diplomarbeit (master's thesis) as the source of these dates. Unfortunately, I have not been able to locate a copy of this thesis, which is surprising, given how commonly it is cited by researchers working in Faynān. I rely here on the secondary report of these dates given by Hauptmann (2007: 89), with minor corrections, as noted in Table 4.1.
[54] The charcoal assemblage published by the DBM for the Faynān 1 slag mound (Baierle, et al. 1989: 216, Table 24.1) consists primarily of the relatively short-lived species *Haloxylon persicum*/white saxaul (68.9% by weight) and *Retama raetam*/white broom (14.3% by weight), but acacia is also present (12.1% by weight). Hauptmann (2007: 89), unfortunately, does not provide species identifications for the radiocarbon samples.

is substantial horizontal variation in the slag mound, and the DBM probes do not provide a complete picture of this. Unfortunately, for the present it is the most complete picture available, and this situation is unlikely to be resolved. The top of the Faynān 1 slag mound was bulldozed by the Rashāyda tourism cooperative at some point between the 2009 and 2011 ELRAP field seasons, likely in early 2011, to level the mound for the construction of a tourist camp (Fig. 3.8; Burtenshaw 2013: 256). While the bottom portion of the slag mound is relatively undisturbed, much evidence for the later phases was in the bulldozed portion. Nonetheless, future work should investigate the possibility that the bulldozing exposed sections that would provide a good radiocarbon sequence for the mound.

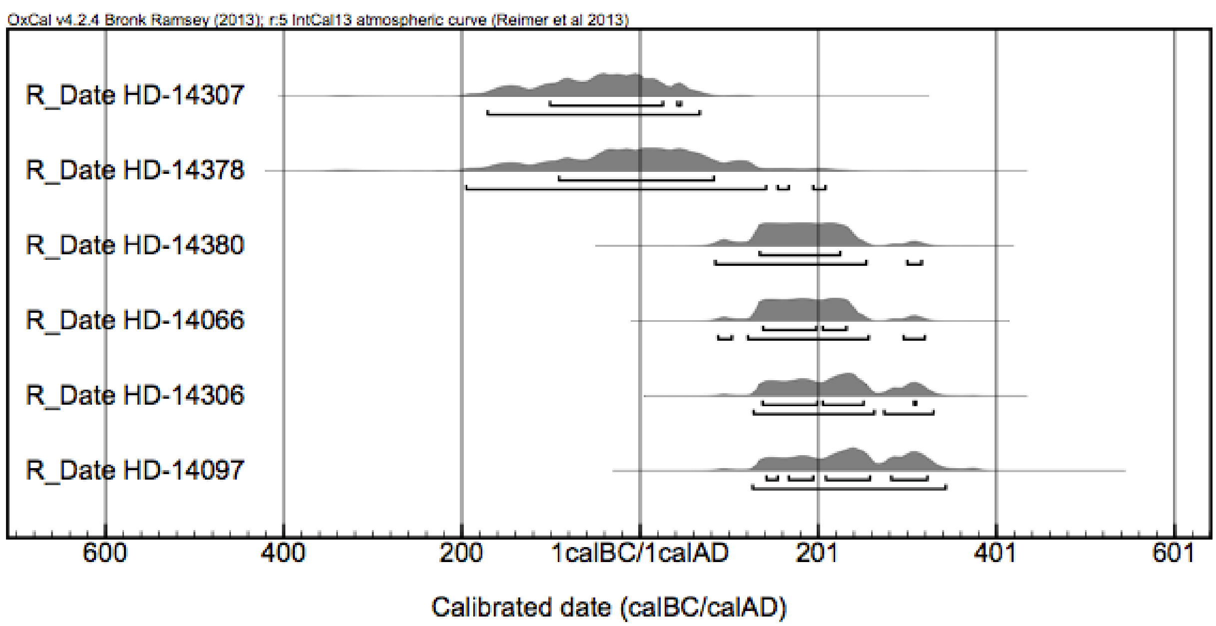

Figure 3.7: Calibrated radiocarbon dates from DBM probe in the Faynān 1 slag mound. (Data from Hauptmann [2007: 89], calibrated to IntCal 13 [Reimer, et al. 2013] using OxCal 4.2 [Bronk Ramsey 2009].)

Figure 3.8: Oblique aerial photo of the Faynān 1 slag mound in late 2011, showing the bulldozed platform and tourist camp. (Photo: Craig Smitheram, courtesy UC San Diego LCAL.)

Claims for copper production continuing into the later Byzantine period, then, rely out of necessity on indirect evidence. Friedman (2008: 55) notes that the WFLS surveyed four mines where Late Byzantine pottery was identified, and to this could be added three additional slag mounds/scatters (Table 3.1; data from Mattingly, et al. 2007a). Dating mines, and even metallurgical sites, on the basis of surface pottery is not always totally straightforward, however, as it is difficult to demonstrate that the site was used for the same purpose in each period represented in the surface pottery. As an example, the ELRAP survey of Wādī al-Jāriya found pottery dating to the Late Islamic II at several mines (Jones, et al. 2012: 74-79; see also Knabb, et al. 2014: Table 7.3). This does not, however, indicate Ottoman exploitation of the copper resources of Faynān, but the reuse of these areas as campsites. The presence of Late Byzantine sherds at a mine, therefore, is not a clear indication of Late Byzantine period mining, especially in the absence of direct evidence for Late Byzantine *smelting*. All seven of the sites listed in Table 3.1 also produced evidence for occupation in periods for which copper production is otherwise known in Faynān, and of these WF891, a slag mound, and WF1511, a possible ore-processing site, both seem to date primarily to the Iron Age. The most intriguing of these seven is WF1315, a small slag mound that yielded primarily "Classical" material, as well as five sherds dating to the Byzantine period or later and two that were dated to the Early Islamic period

(Mattingly, et al. 2007a: 699). While this mound may provide direct evidence for small-scale smelting in the Late Byzantine and Early Islamic periods, more investigation is necessary to demonstrate that smelting was not limited to earlier in the Classical periods.

Table 3.1: Metallurgical sites recorded by the WFLS that yielded Late Byzantine or Early Islamic period sherds. Data: (Mattingly, et al. 2007a).

Site Number	Date	Other Dates	Type
WF1315	Byz+, EIsl	Undistinguished Classical, Late Roman	Slag mound
WF1420	Late Byz+, Byz+	Early Bronze I, Iron Age, undistinguished Classical	Mine tailings
WF1461	Late Byz+, Byz+	Undistinguished Classical, Late Roman	Mine shaft
WF1464	Late Byz+, Byz+	Undistinguished Classical, Nab., Ott.	Slag scatter (crushing?)
WF1478	Late Byz+	Early Bronze, undistinguished Classical	Mine shaft
WF1511	Late Byz+	Iron Age (primary)	Mine tailings (ore processing?)
WF891	Late Byz+	Early Bronze I, Iron Age (primary), Nab., Byz., Ott.	Slag mound

Mattingly, et al. (2007b: 333) argue, additionally, that “[a] large number of the skeletons from the fourth- to seventh-century South Cemetery had very high levels of heavy metals in their bones, suggesting continuing smelting activity and heavy pollution.” This statement relies on the work of Grattan, et al. (2002) — who, it should be noted, do not actually claim that their results are evidence of Late Byzantine copper production — and there are several reasons to be skeptical of this claim.

First, the date of the Faynān South Cemetery is not actually very secure. The excavators note that crosses inscribed on some of the grave markers “effectively date a part of the site to the Late Roman-Byzantine period (A.D. 106-634)” (Findlater, et al. 1998: 69), but suggest a primarily Late Roman-Early Byzantine date, based on the fact that many of the 184 tombstones inscribed with crosses seem relatively early, and some bear crosses disguised as other symbols (Findlater, et al. 1998: 71, 80). In their conclusion, they clarify that they believe the excavated material in fact places the use of the cemetery in the mid-5th to 6th centuries (Findlater, et al. 1998: 82), which to an extent contradicts the dating discussed elsewhere in the paper, but as will be discussed below, datable material was recovered from a relatively small number of tombs. Although the disguised crosses, in particular, might suggest an early date, it is worth noting that the presence of Christian burials does not necessarily indicate that the cemetery went out of use before 634 AD. Evidence for the presence of Christian communities well into the Early Islamic period is increasingly common in southern Jordan (‘Amr, et al. 2000; Fiema and Frösén 2008; Politis 2012b; Schick 1995) — and, indeed, the entire southern Levant. As I will argue in Chapters 9 and 10, the Christian community of Phaino survived beyond this date.

The excavators also note the presence of five inscriptions that they argue place the cemetery in the Early Byzantine period (Findlater, et al. 1998: 80), in particular the tombstone of “Stephanos,” dated by Alt (1935: 70) and Sartre (1993: 144) to 455 AD. Meimaris and Kritikakou-Nikolaropoulou (2008: 147-150), working with the tombstone after its recovery and cleaning during the South Cemetery excavations, were able to better read the difficult parts of the inscription, and instead read the date as 592 AD, which they argue also better fits the paleography and content of the inscription. Of the 10 tombstones from the South Cemetery that they transcribed, Meimaris and Kritikakou-Nikolaropoulou (2008: 147-158) place three in 592 AD, four more broadly in the 6th century, one in the 5th-6th centuries, and two in the 5th century. Although some of these dates are not entirely certain, it is noteworthy that few of the inscribed South Cemetery tombstones date to the Early Byzantine period. Dating evidence from the burials themselves was, unfortunately, rare. Only two of the 45 excavated graves (<5%) — Graves 105 and 107 — produced datable artifacts, and these place them in the 5th-6th and 6th-7th centuries AD, respectively (Findlater, et al. 1998: 78-79).

As the discussion above indicates, the late dates for the South Cemetery are more secure than the early ones, but this does not mean that Mattingly, et al. (2007b: 333) are correct to argue that Grattan, et al.'s (2002) work supports a late date for copper smelting at Phaino. Datable tombs account for a very small percentage of the known tombs, and only the earlier of the two graves bearing grave goods — Grave 105 — was analyzed by Grattan, et al. (2002).[55] Beyond this, only 184 of the 1200 grave markers (ca. 15%) were inscribed with crosses, and only ten Greek inscriptions (<1%) were found. Only five of the excavated graves had inscribed grave markers (Findlater, et al. 1998: 80), and it is not clear from the report which graves these are or what type of inscription the markers bore. Without a more detailed publication, it is not possible to evaluate the specific dates of the tombs analyzed by Grattan, et al. (2002). The same is also true of Abu Karaki's (2000: 90) master's thesis, in which she posits a "high incidence of osteoarthritis and other vertebral pathologies" perhaps indicative of mining in the South Cemetery population, but provides only summary data for these analyses, with no information about their archaeological context. While some evidence does point to a later date for the South Cemetery, this is not universally the case, and indeed at least some of the grave markers point to a 3rd or early 4th century date (Findlater, et al. 1998: 80). This is, then, at best tenuous evidence for Late Byzantine copper production.

Beyond this, it is also worth noting briefly the possibility that the results published by Grattan, et al. (2002) are partially due to post-depositional contamination. Diagenetic uptake of pollutants had already been recognized as a problem by the time of their study, most notably by Pike and Richards (2002), who discuss the problem of diagenetic uptake of arsenic in Oakberg, et al.'s (2000) study of Chalcolithic skeletal material from Shiqmim. Grattan, et al. (2002: 302-

[55] One might argue that Grave 107, a relatively richly adorned female burial, was perhaps thought to be self-evidently not a smelter's burial, except that these things are also true of Grave 105 (Findlater, et al. 1998: 74-78).

303) were aware of these issues, and address them in their discussion of their results, noting primarily that the concentrations they observed in their skeletal material were quite high compared to the surrounding soil. However, in a recent pollution study of Iron Age skeletal material from the Wādī Fidān 40 cemetery, Beherec, et al. (2016: 72) argue that the strategies employed by Grattan, et al. "are an insufficient control for measuring diagenetic uptake" and propose a different set of controls, which allowed them to identify and separate pollution from diagenesis and exposure to pollutants during life in their sample, which initially looked similar to Grattan, et al.'s. In sum, neither the dating of the graves nor the pollution data itself is presently secure enough to provide evidence for Late Byzantine copper smelting in Faynān.

The last source of indirect evidence for Late Byzantine copper smelting comes from a feature adjacent to Khirbat Faynān identified as a "barrage," WFLS site WF5512/5502. Grattan, et al. (2007: 95, Table 4, 97) published a radiocarbon sample from the polluted "Lithofacies 4" dating to 398-534 AD (Beta-203399; see Table 4.1), and Friedman (2008: 55) argued that, as the sample was taken at a depth of 1.74-1.76 m, but the sediment continued to be polluted up to 1.65 m, this likely suggests that large-scale smelting continued into the 6th century. More recently, Grattan, et al. (2013: 3836, 3851) have revised this proposal, arguing that the end of large-scale copper metallurgy should instead be placed at 1.57 m, which they argue should date to roughly the mid-7th century AD. This is an interesting proposal, but it is worth considering that the formation processes of hydraulic features like the barrage are complex — arguably even more complex than those seen in slag mounds — and that several assumptions involved in taking this as evidence of Late Byzantine smelting, including a constant rate of deposition and lack of mixing, are not particularly safe. It is also important to note that the barrage probes have produced other evidence that is difficult to reconcile with our knowledge of settlement in the

Faynān region, for example "Lithofacies 6," which has been dated on the basis of a radiocarbon sample to the Middle Bronze Age II (Grattan, et al. 2007: 95, Table 4; and discussion in Grattan, et al. 2013), a period for which no other evidence of settlement of any kind has been found in the entire Faynān region.

In sum, the British view, unlike the German view, sees both settlement and large-scale copper production at Phaino continuing into the 7th century AD. There is some disagreement within the British view about specific details — e.g. when Phaino ceased to operate as a state-run *metallum* — but most would agree, at least, on this basic chronology. While evidence for the continuity of settlement is quite strong — indeed, the British view tends to understate this continuity — evidence for Late Byzantine copper smelting relies on indirect evidence, primarily from paleoenvironmental/pollution studies.

Reconciling the Views

Overall, the evidence presented here suggests that a middle ground between these two views is likely correct — and evidence presented later in this dissertation (see Section 5.3, in particular) will reinforce this. The British view, as noted here, likely overstates the degree to which copper production continued into the Late Byzantine period. On this point, the German view is likely correct that copper production on a large scale had ceased by the end of the 5th century, if not earlier. The British view, however, is correct in noting that Phaino certainly continued to be occupied into the 7th century AD. Here, however, the British view runs into the opposite problem, which is that an end of settlement at Phaino in the 7th century is unlikely, and rather too early. The view of Newson, et al. (2007b: 363), for example, that the Early Islamic period was characterized by "the use of the valley [Wādī Faynān] by pastoral groups, leaving behind a materially-impoverished and vestigial archaeological record" does not exactly mesh with the material collected by the WFLS, which includes, among other things, Early Islamic II splash-glazed ceramics (Adams, et al. 2007: 809-810, Fig. A5.53, no. 901). Instead, this proposed shift seems to reflect an unfortunate reliance on outdated models of the Islamic conquest, which see the mid-7th century as a period of dramatic change and decline (on these, see Silberman 2001). The goal of the next section (Section 3.5) is to summarize current models of the Islamic conquest and Early Islamic period, and to relate these to southern Jordan in general, and Faynān in particular.

3.5. The Early Islamic Period in the Southern ʻAraba

No compelling evidence has been found for copper production in Faynān during the Early Islamic period. Although Whitcomb (2006b: 242) suggested that hinterland settlements of the city of Zughar (modern Ghawr al-Ṣāfī, on the southeastern side of the Dead Sea) likely formed a system similar to the one in the southern ʻAraba described below, it does not seem that this included Faynān. The brief references to Early Islamic period copper production in Faynān that do exist in the scholarly literature are, on closer scrutiny, not convincing. Weisgerber's (2006: 25) reference to an Early Islamic smelting site "on the eastern side of the Arabah north of Feinan," for example, is a typographic or editorial error. This should almost certainly have read "north of ʻAqaba," and the site in question is, in fact, Khirbat al-Manāʻiyya, an Early Islamic period smelting site test excavated by ELRAP and reported in Section 4.3 of this dissertation.[56] This is not to suggest, however, a general lack of settlement in Faynān during the Early Islamic period. ELRAP excavations and surveys have produced evidence for settlement during this period (summarized in Chapter 5), which allows the nature of this settlement to be reconstructed, albeit in an admittedly still-fragmentary way (see Chapters 8-10). The purpose of this section,

[56] I am indebted to Prof. Ricardo Eichmann, Ingolf Löffler, and Prof. Andreas Hauptmann for their assistance in resolving this error.

however, is to summarize the state of research on the economic impacts of the Islamic conquest. In particular, I will propose a model for the shifting economic geography of southern Jordan between the 6th and 10th centuries AD, which will later be expanded using new data (see Chapter 5).

Models of the Islamic Conquest of Byzantine Palestine and Arabia

The effects of the Islamic conquests — or, following Hoyland (2015: 5), the Arab conquests — were, as one would expect, both far-ranging and multifaceted. In the context of Faynān, I am concerned primarily with the political-economic impacts of the conquest, and in a secondary way with its religious impacts. Of somewhat less concern is the nature of the conquest itself, although this has been a focus of Islamic historians and archaeologists. This debate has revolved in many ways around the use of violence by the Islamic/Arab armies, with proposals ranging from the image of "thundering hordes" responsible for virtually every early 7th century destruction level known archaeologically (for a summary of these, see Silberman 2001) to the peaceful "invisible conquest" suggested by Pentz (1992). It is difficult to address the issue of the violence of the conquest with archaeological evidence. Large earthquakes struck the southern Levant in 551, 633, and 659 AD, and Russell (1985: 51) argues that these destruction levels have likely been attributed to the Persian and Islamic conquests, noting that "[g]iven the geographic extent and general depositional magnitude of these destructions, it would seem that both the Persian army and the forces of Islam invaded Byzantine Palestine and Arabia with bulldozers and destruction balls on wrecking cranes" (see also Whitcomb 1995: 488). The opposite caveat is also important, however. Hoyland (2015: 259, n. 40) points out that the nature of the fighting that would have occurred during the Islamic conquest — primarily "field battles, rather than sieges" — does not generally leave an archaeological signature, and indeed is absent in the case of other archaeologically-documented conquests, e.g. the Vandal invasion of North Africa. On a smaller scale, Avni (2014: 318) compares the Islamic conquest to the conquest of Jerusalem during the First Crusade; the Crusader presence in Jerusalem is visible archaeologically, but this specific event is not. Hoyland's (2015: 63-65) middle-ground proposal seems preferable here: the Islamic conquests were likely neither unexpectedly peaceful nor violent, but probably typical both of Late Antique warfare in general, and of the attempts by a number of Arab (and other) groups to exploit weaknesses at the margins of the Byzantine and Sassanian Empires, specifically.

As argued by Jones, et al. (2014: 178-179), this is unlikely to be relevant in the case of Faynān, as it is unlikely that, by the early 7th century, Phaino was important enough to have attracted the attention of the Islamic armies. While al-Ṭabarī (1993: 107-108) describes a stop by 'Amr ibn al-'Ās at a place called Ghamr al-'Arabat — which should probably be identified with al-Ghamr/Tzofar on the modern Jordan-Israel border (see Fig. 3.9) — Donner (1981: 115-116) suggests that 'Amr's army stopped here on their way to the Negev to gain control over pastoral groups in that region. This stop placed 'Amr's army within 30 km of Phaino — with the Buwayrda springs as a convenient stopping point roughly halfway between the two[57] — but there is no historical indication that 'Amr actually went to Phaino. As such, the fate of Phaino as a town and Faynān as a region must instead be related to broader trends.

[57] Field analysis (my own) of ceramics collected during Kyle Knabb's currently unpublished 2011 survey of the Buwayrda springs indicates the presence of 6th-8th century forms — including Fine Byzantine Ware 1A (see Magness 1993: 193-194) — suggesting occupation at the springs around the time of the conquest. Whether this was sedentary or pastoral occupation is unclear, however, and this awaits further analysis of the material from this survey.

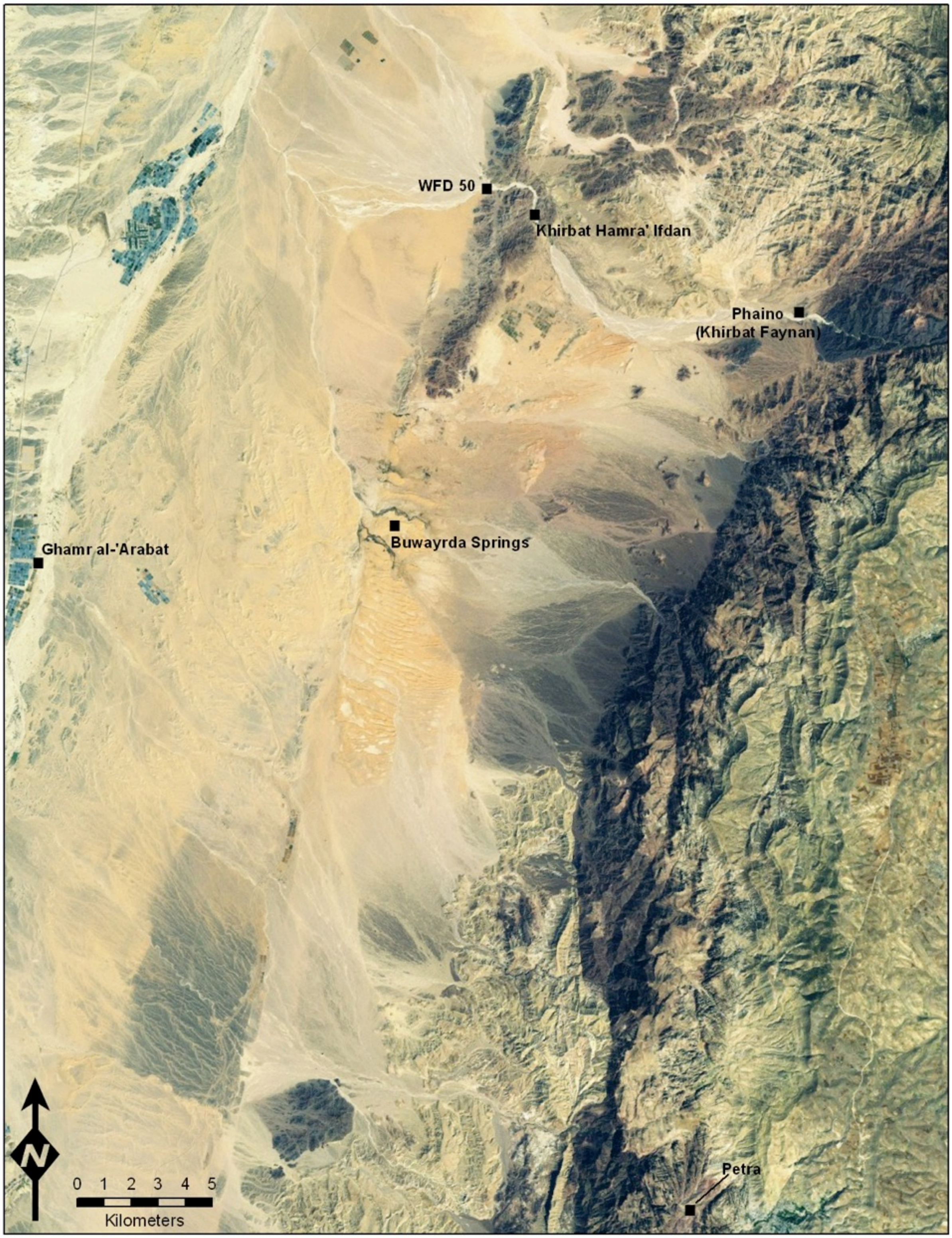

Figure 3.9: Selected Late Byzantine-Early Islamic sites in the central Wādī ʻAraba. (Basemap: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.)

The key debate about the economic impacts of the Islamic conquest concerns the cities, primarily those to the north of *Palaestina Tertia*. As before, the "traditional" scholarly views of this are primarily negative, and see the violence of the Islamic conquest bringing with it "a period of significant decline in the form of the city, the economy, and settlement in general" (Jones, et al. 2014: 180; on these views, see Silberman 2001; Walmsley 2007a: 21-24). A now-classic revision of this view was offered by Hugh Kennedy (1985), who argued — primarily on the basis of data from modern northern Jordan (Byzantine *Arabia*) and Syria (Byzantine *Phoenice Libanensis* and *Syria*)[58] — that the decline of the Classical city, or *polis*, began in the 6th century or earlier, and the transition to the "Islamic city," or *madīna*, was already well underway by the time of the Islamic conquest. Although rarely noted, he also offers a critical caveat to his thesis:

> It should not be imagined that the process of decay of the classical street plan and monumental buildings necessarily meant that the city was less vital or thriving. . . . the intrusion of new building into the open spaces of antiquity after the Islamic conquest may actually indicate increased urban commercial activity and pressure on land in the city centre. (Kennedy 1985: 27)

This in many ways anticipates several reevaluations of his thesis in the last decade, which have primarily argued that the changes in cities described by Kennedy should indeed be attributed to increasing industrial and commercial activity, rather than decline (Avni 2011b; Avni 2014; Walmsley 2007a: 31-47).

Avni (2011b), in fact, argues that "decline" of settlement in a general sense began only in the 9th century AD,[59] and even then this varied regionally, as Ṭabariyya/Tiberias was a larger city in the 10th century than it had been during the Byzantine period (Avni 2011b: 308). This

[58] More recently, he has expanded this analysis to the cities of the Sasanian Empire, noting, however, that these were very different from Byzantine cities in the early 7th century (Kennedy 2006).
[59] Magness (2003), likewise, argues for a late 8th-9th century decline in the Yattir ('Attīr) region, south of modern Ḥūra, ca. 15 km east of Be'er Sheva, in the southernmost part of the Byzantine province of *Palaestina Prima*.

regionalism is an important concern, however. Caesarea Maritima (Qaysāriyya) does, in fact, seem to have gone into decline after the Islamic conquests, likely due more to the desertion of the Christian upper-class than to the conquest itself (Holum 1992; Holum 2011; Patrich 2011). Avni (2014: 54) accepts this, but also notes that, following the decline of settlement in the mid-7th century, "an intensification of settlement around the inner harbour between the eighth and eleventh centuries" followed. It is important, then, to distinguish arguments about the effects of the Islamic conquest in the short-term and in the longer-term. Avni (2011a; 2011b; 2014) and Walmsley (2007a; 2007b) tend to focus on continuities between the 6th and 8th centuries, and do, indeed, successfully demonstrate that the Islamic conquests did not bring about a general or lasting decline in settlement in the southern Levant. As Hoyland (2015: 48-49) notes, however, political decisions of the 7th century did have an immediate, if not lasting, effect: coastal cities, such as Caesarea, tended to be more closely aligned with the Byzantine Empire and "much less acquainted with the Arabs than were the inland cities." As such, they were less attractive as administrative centers during this early phase of Islamic rule. This parallels an argument made by Donner (1981: 111-112, 153) that the Arab armies first conquered the inland regions, moving later to the more difficult and more Byzantine-aligned coastal cities like Caesarea and Gaza. This argument was expanded by Lenzen and Knauf (1987: 38), who note that inland cities whose trade "was linked . . . closely to Arabia," such as Bayt Rā's (Capitolias, north of modern Irbid, in Byzantine *Palaestina Secunda*) would have been more inclined to surrender to the Arab armies without a fight to preserve this relationship, unlike the coastal cities. Both in the short-term and longer-term, then, it is important to consider regional distinctions and the situation of specific places in the 6th and early 7th centuries. The following subsections will expand on arguments put forward in previous papers (Jones, et al. 2014; Jones, et al. forthcoming), first establishing a model of southern Jordan in the late 6th and early 7th centuries, and then discussing the political-economic shifts in the Wādī ‘Araba between the 6th and 10th centuries AD.

The Central Wādī ‘Araba and Petra in the 6th and 7th Centuries

While a summary of research on Late Antique Faynān has already been presented in Section 3.4, in order to understand these shifts, Faynān also has to be considered in the broader context of the central ‘Araba and Sharāh Plateau. The primary comparison must be to Petra, ca. 35 km to the south of Khirbat Faynān and linked via Naqb al-Namala (Ar. “the pass of the ant”) — a pass from Wādī ‘Araba to the plateau, ca. 20 km south of Khirbat Faynān, which is now the main paved road from Faynān to the Petra region (Ben David 2007: 102; Findlater 2003: 176; Robinson 1856: 123) — and a number of smaller passes, e.g. Naqb al-Shudayyid and the pass through Wādī al-Fayḍ (Knabb, et al. 2015: 374). As the most important center in the region, Petra is also the most richly documented, both historically and archaeologically. As will be seen below, Petra’s Late Antique history provides a useful model for the changes that occurred in Faynān in the same period.

Russell (1985: 45) argued that Petra suffered extensive damage in the earthquake of 551 AD and was never rebuilt; instead, “by the end of the 6th century, its ruins had become a quarry for liming and smelting operations.” Although, as will be discussed below, this view is no longer entirely tenable, Fiema (1992; 2001a; 2002) argues that by the late 6th century, Petra had ceased to be an urban center. This would represent a major decline in Petra’s fortunes in a relatively short span of time, as the city was important enough during the 5th century that it was, probably by the middle of that century, made the capital of *Palaestina Tertia* (Dan 1982: 137). This does not seem out of line with the general picture of the 6th century, however, which saw increasing hostility between the Byzantine and Sassanian Empires, decreasing investment in the southern

Levant — at least in terms of defenses, but probably more generally — and outbreaks of plague (Casey 1996; Parker 1999: 143-144). Walmsley (2007a: 90), however, argues that the 6th century decline of Petra may be an example of the "attitude-based [as opposed to evidence based] deductions that continue to dominate archaeological research in south Jordan," noting that parallels to the north would suggest greater continuity during this period than previously thought.

For Walmsley (2007a: 90), a critical point is that the Petra Church was assumed to have been destroyed in the 551 AD earthquake until the discovery of the Petra Papyri — many of which post-date 551 — in the church itself. While this demonstrates that city was not abandoned — and Russell's (1985: 45) argument goes a bit too far — it is not, in itself, evidence that it continued to be a thriving urban center. The available archaeological evidence seems to demonstrate that it was not, in fact. Few of the excavated structures in Petra's city center (see map, Fig. 3.10) show evidence of continuity into the 6th and 7th centuries (Perry and Bikai 2007: 441-442), with the exception of the Pool Complex, to the east of the Great Temple, which was reused during the 6th century as a lime kiln (Bedal 2003: 80-82).[60] Although not directly in the city center, al-Katūta, south of Qaṣr al-Bint and southwest of the city center, was occupied into the 6th or even 7th century (Koçak, et al. 2013). This occupation seems to have been fairly limited, however, as Renel (2013) has recently suggested that most of the area surrounding Qaṣr al-Bint was abandoned in the early 5th century, following a short reoccupation after the 363 AD

[60] Barrett (2008: 106-107, No. 43, 119) has also published an 8th-10th century AD ʻAbbāsid Standard Lamp (on the type, see da Costa 2012: 258-260) from the Upper Temenos of the Great Temple, although it is not clear what sort of reuse this suggests. It is worth making a brief corrective note here. Barrett (2008: 106) refers to this type as an "Umayyad ovoid shaped lamp" and suggests, "The handle can be a cone, a small knob handle or a high, vertical handle, sometimes perforated." This does, indeed, refer to a 7th-early 8th century lamp type — the "Early Channel-Nozzle" type —but the Great Temple lamp does not belong to this group. The photo indicates none of these handles, but rather the tongue handle typical of the ʻAbbāsid Standard lamp, which does not emerge before the mid-8th century (Hadad 1997: 178). As a further note, the "Early Channel-Nozzle" lamp is referred to as Form 4 in Magness's (1993: 255) typology. Barrett's (2008: 107) reference to Magness (1993: 258) Form 5 — the "Channel-Nozzle" type, or da Costa's (2012: 258-260) ʻAbbāsid Standard — indicates, again, that the lamp is in fact an ʻAbbāsid Standard lamp, and not the earlier type.

earthquake. After the 5th century, however, settlement seems to have concentrated in the northern part of the city. The Petra Church was in use until the late 6th century, after which it was heavily damaged in a fire (Fiema 2001c: 94), and the Blue Chapel and Ridge Church were in use into the 7th century (Bikai and Perry 2012: 96). The North Ridge continued to be settled into the 8th century, and between the late 6th and 8th centuries the three ecclesiastical buildings mentioned above were reused for domestic purposes, including both dwelling and food preparation (Bikai 2004; Bikai and Perry 2012; see also lamps published by Barrett 2008: 104, No. 40, 105, No. 41, 107-108, No. 44). It is interesting that the Petra North Ridge Project soundings in domestic structures to the northeast of the Ridge Church have not produced evidence of post-363 AD occupation (Parker 2016), given the evidence of settlement elsewhere on the North Ridge, but further investigation will hopefully clarify this discrepancy. The monastery on Jabal Hārūn continued to be occupied into the Early Islamic period (Fiema and Frösén 2008; see especially Gerber 2008), and is mentioned in the mid-10th century by the geographer al-Mas‘ūdī (1938: 124) as a Christian holy place (Schick 1997: 76). It seems, then, that official/public religious structures were in use into the 7th century, after which Petra's religious community was primarily monastic.

Even during the 6th century, however, religious sources indicate that Petra was a remote and disconnected place. Anastasius I banished several people to Petra — including the patriarch of Antioch, Flavian II, in 512 — and in the late 6th century Justin I banished the bishop of Amida to Petra (Schick 2001b: 2).[61] About this last event, John of Ephesus (1923: 188) notes that Mare, the bishop of Amida, was "sent to a hard and distant place of exile at Petra" (see also Schick 2001b: 2). None of this gives the impression that Petra continued to be a thriving commercial

[61] See Schick (2001b: 3, nn. 29-35) for a comprehensive list of references. Perhaps most interesting in the context of this section is a reference to Flavian's banishment by John of Nikiû, better known for his firsthand account of the Islamic conquest of Egypt (see, e.g., Hoyland 2015: 68-81).

hub into the 6th century. Fiema (2002: 193), however, suggests it is also possible that "Petra was considered a safe and loyal city to house individuals dangerous to the central government," and a recently published study of the Petra Papyri suggests that the city retained some of its former importance in the 6th century (Al-Nasarat and Twissi 2016).

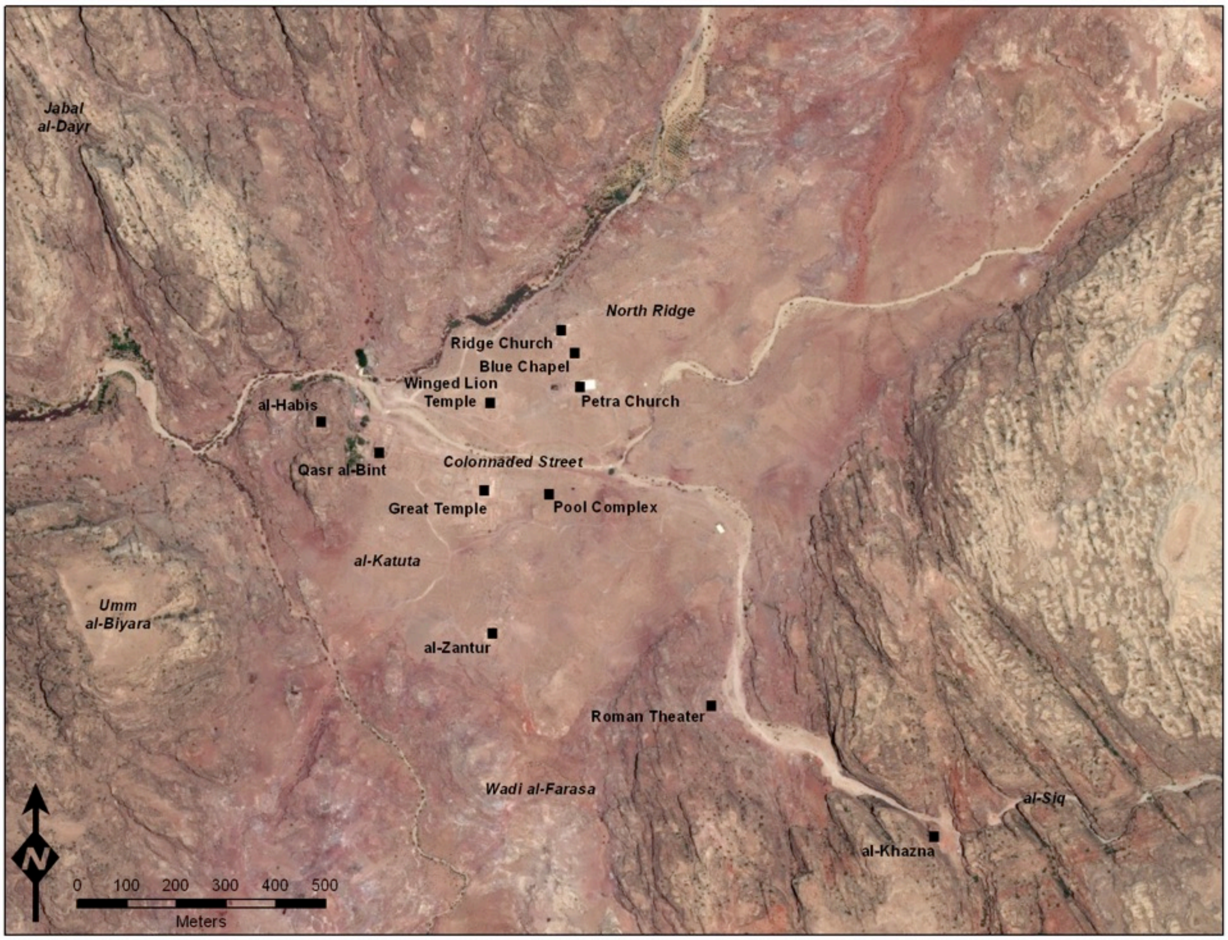

Figure 3.10: Key sites and features within Petra. (Basemap: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.)

Nonetheless, it is also clear that Petra's economy shifted away from trade and toward agriculture. The Petra Papyri provide critical evidence for this shift in the 6th century. These documents do not present a picture of Petra as a thriving center of trade, but rather are concerned with ownership of land (Fiema 2001b: 427) and agricultural activity (Caldwell and Gagos 2007;

Nasarat, et al. 2012). The archaeological evidence, however, is a bit more complicated. In a meta-analysis of survey data from the Petra region, ʻAmr and al-Momani (2011) found that of 28 Byzantine sites — many of which were fairly large agricultural villages, mostly clustered to the east and southeast of Petra — at least 11 continued to be occupied into the Early Islamic period. Indeed, the village of Khirbat al-Nawāfla (see map, Fig. 3.11) — which seems to have been continuously occupied from the 1st century BC into the Late Islamic period — grew fairly substantially during the Late Byzantine and Early Islamic periods (ʻAmr, et al. 2000: 236-237, Fig. 6).[62] The Jabal al-Sharāh Survey, covering the area to the east of Petra, roughly between al-Bayḍa and al-Ṭayyiba, recorded a reduction of settlement between the 6th and 8th centuries (Tholbecq 2001: 405). This reduction seems to be a longer-term trend, however. During the 1st and early 2nd centuries AD, 55% of the 160 surveyed sites were occupied, a number that is reduced to 30% in the 2nd and 3rd centuries, and 10% in the 4th and 5th centuries (Tholbecq 2001: 402-405). By the 6th and 7th centuries, it is below 5%, representing a 50% reduction from the Early Byzantine period (Tholbecq 2001: 405), though it is unclear how this relates to site size or function. Tholbecq (2001: 405) speculates that "the late occupation of the area could be connected to the traditional route through Transjordan along the ancient *Via Nova*," though the fact that the occupied sites were mostly "hamlets," at least one of which had "numerous associated cisterns," supports an agricultural interpretation. To the north, the Brown University Petra Archaeological Project's Petra Area and Wādī Silaysil Survey, covering an area roughly between Petra and al-Bayḍa, found little evidence of Byzantine settlement (Alcock and Knodell 2012; Knodell and Alcock 2013; Knodell and Alcock 2011; Knodell, et al. 2017: 670-671).

[62] It is worth noting that Khirbat al-Nawāfla is also one of very few Byzantine-Early Islamic sites in the Petra "hinterland" for which a preliminary excavation report has been published. The site of Khirbat al-Burāq, ca. 6 km south of Khirbat al-Nawāfla, has also been excavated, but only a brief report has been published (Farajat, et al. 1998), focusing primarily on the Nabataean-Roman period, with comparatively minimal discussion of the Early Islamic period occupation.

Islamic period settlement in their survey area is "almost exclusively Middle to Late Islamic or post-eleventh century" (Alcock and Knodell 2012: 11; see also Knodell, et al. 2017: 671-674). However, OSL and radiocarbon dating of agricultural terraces in the Wādī al-Silaysil/Wādī al-Ghurāb system (i.e. the PAWS survey area) shows that they were being used and maintained "at least until around 800 AD" (Beckers, et al. 2013: 347). Farther to the north, the Wādī al-Fayḍ system, which was only sparsely settled but quite agriculturally active during the Nabataean-Roman period — particularly the late 1st century AD — shows little evidence of exploitation between the 5th and 10th centuries[63] (Knabb, et al. 2015), although sampling of the agricultural terraces themselves — as was done in Wādī al-Ghurāb — might produce a different picture. Lavento, et al. (2007: 151) have suggested that the lack of the Late Byzantine pottery in the fields near Jabal Hārūn may indicate "a change of the cultivation and manuring practices, perhaps to less demanding plants or a more extensive form of agriculture," rather than a lack of activity during this period, and this may be applicable to the Petra region more broadly, particularly considering the evidence from Wādī al-Ghurāb.

[63] The Early Islamic period, in particular, is represented by, at most, a handful of sherds, only one of them closely datable.

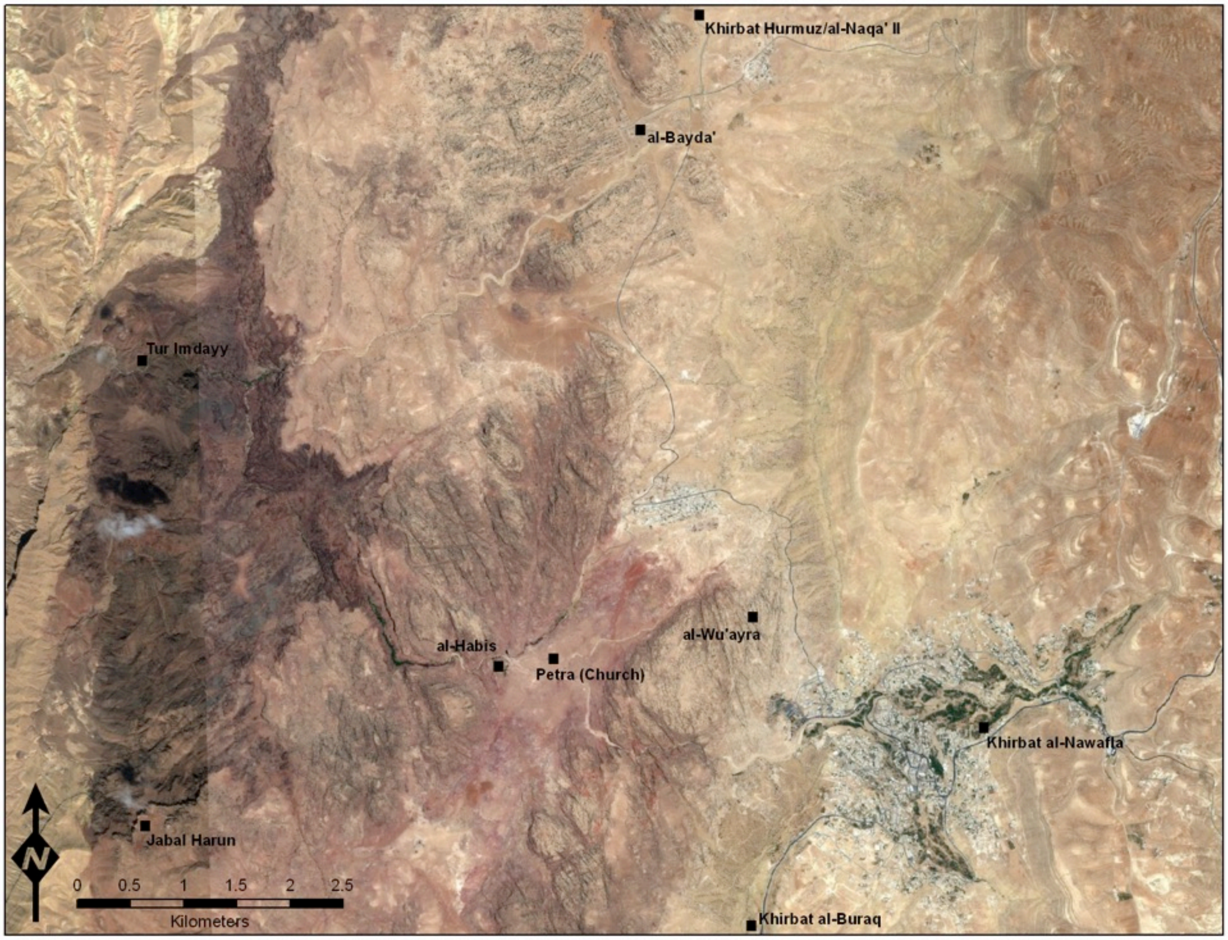

Figure 3.11: Selected sites in the Greater Petra region. (Basemap: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.)

Overall, the evidence largely seems to confirm Kouki's (2009: 41) suggestion that settlement in the Petra region shifted during the late Byzantine period toward "nucleated villages and small towns," with Udhruḥ to the east gradually becoming more important (see map, Fig. 3.12). Udhruḥ, indeed, appears in accounts of the Islamic conquest as surrendering to Muḥammad's army in 630 AD (Hoyland 2015: 39; Schick 1994: 149), while Petra, like Phaino, is absent. Likewise, the construction of *qanāt* systems near Udhruḥ and Maʻān (Abudanh and Twaissi 2010) in the Late Byzantine or Early Islamic period and an Umayyad agricultural estate in Maʻān (Genequand 2003) attest to a shift in investment away from Petra to the east.

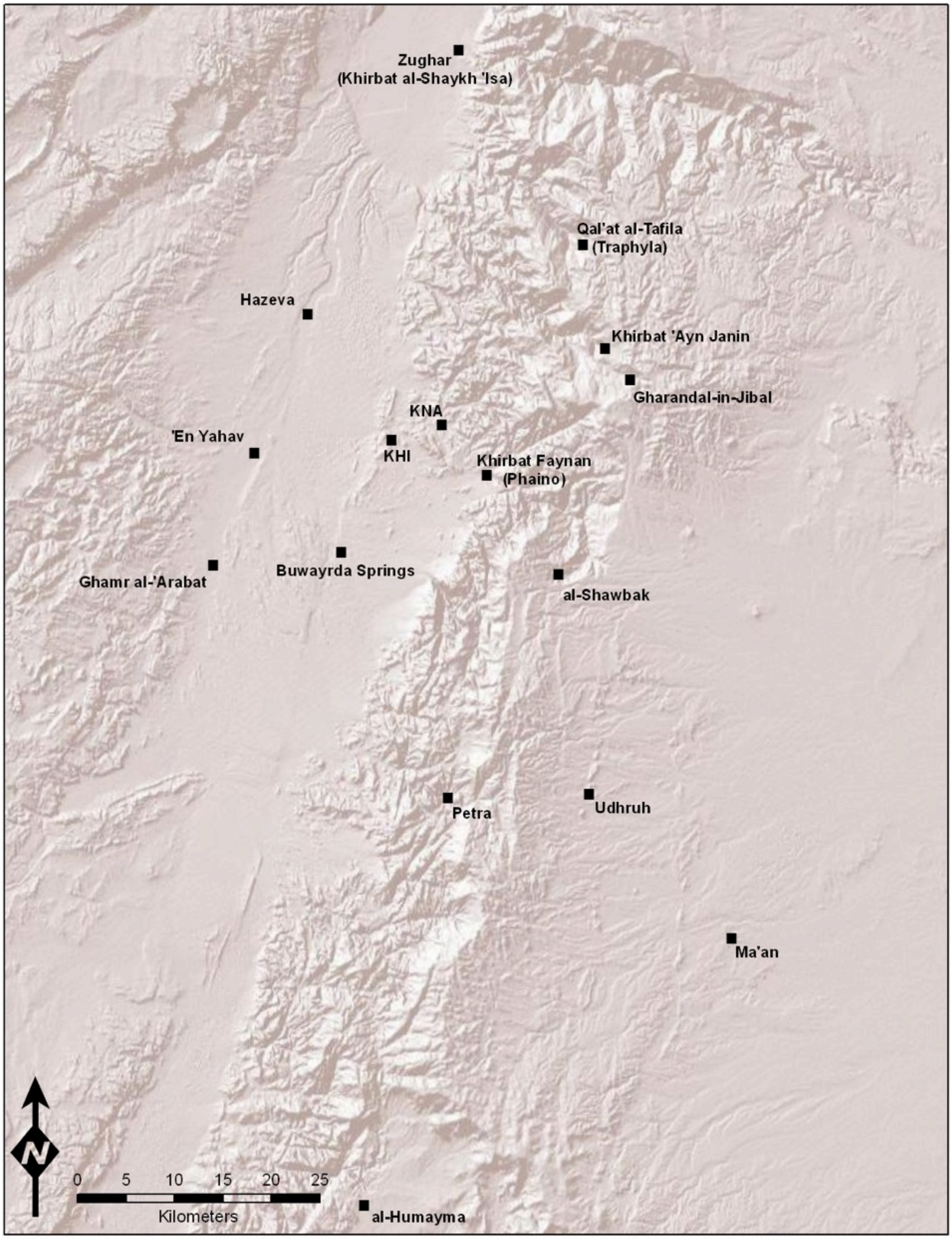

Figure 3.12: Selected sites in southern Jordan and Israel between the Dead Sea and al-Ḥumayma. (Basemap: © 2014 Esri.)

The presence of a *qanāt* system (Lightfoot 1997: 435, Fig. 2; Nol 2015: 59)[64] and Arabic inscriptions (Porath 1987: 109) at ‘En Yahav, ca. 15 km west of Khirbat Ḥamrā’ Ifdān (on KHI, see Section 5.4) and a 7th-9th century agricultural settlement at Naḥal Shaḥaq, ca. 18 km northwest of KHI, near Haẓeva (Avni 2008: 10; Israel, et al. 1995) suggests Early Islamic investment in agriculture to the west, as well, perhaps in Whitcomb’s (2006b: 242) suggested Zughar hinterland. Certainly these sites are relevant to Early Islamic settlement in Faynān, and particularly the Early Islamic areas of KHI (see Section 5.4.2, in particular). Unfortunately, these sites have been published only in preliminary form — and often only in Hebrew — making it difficult to construct a complete picture of the west-central and northwest ‘Araba in this period. The available evidence, as noted, suggests that these features emerged only during the Early Islamic period. As such, this increasing agricultural investment does not contradict the thesis presented here concerning decreasing investment in Petra and surrounding areas during the late Byzantine period, and indeed seems to support the shift in trade and industry presented below.

Fiema (2001b: 432-433) suggests that Petra’s situation during the 6th century may have been “more typical than usually suspected,” with the urban changes that characterize the late Byzantine period Levant simply being more pronounced there (see also Caldwell and Gagos 2007: 427-428). I would argue that this is not the case, however. Many cities — particularly in the north — became less “organized” in the late Byzantine period as the result of an increasing focus on trade and industry (Avni 2011b; Pentz 1992: 49-52; Walmsley 2007a: 31-47). For Petra, this was not the case. Kouki (2009: 50-51) argues that by the beginning of the 5th century, Petra had ceased to be a center of interregional trade, a situation parallel to, although perhaps not exactly contemporary with, the decline of copper production at Phaino (discussed in Section 3.4).

[64] Lightfoot (1997) dates many of the *qanawāt* he presents to the Roman period, but as Nol (2015: 59) notes, they are unlikely to date to any earlier than the Islamic period.

As noted above, Petra's role as an administrative and population center was increasingly filled by Udhruḥ and Maʿān, and the locus of trade shifted increasing toward Ayla (modern al-ʿAqaba; Roman Aila).[65]

The Southern Wādī ʿAraba and Ayla during the Early Islamic Period

The situation in the southern Wādī ʿAraba was rather different. The port of Aila — founded by the Nabataeans in the 1st century BC (Parker 2009) — was by the late 3rd century AD both the base of *Legio X Fretensis* and a center of "commercial traffic from India and Egypt" (Parker 1997a: 21; see also Parker 2013: 740). By the second quarter of the 4th century, it had become a bishopric (Parker 1997a: 21). Unlike Petra, however, Aila continued to be a commercial center through the late Byzantine period. Late 6th century sources continue to mention the spice trade from India and also describe Aila as serving as a stopping point for pilgrims en route to Mount Sinai (Parker 1997a: 21; Schick 1994: 151). As with Udhruḥ, Aila surrendered during the first phase of the Islamic conquest — directly to Muḥammad — in 630 AD (Hoyland 2015: 39). An official of the city, Yuḥannā ibn Ruʿba, met with Muḥammad at Tabūk to negotiate Aila's surrender (Parker 1997a: 21; Schick 1994: 151; Zayadine 1994: 499). While Yuḥannā is commonly identified, following some later Arabic sources, as the bishop of Aila, Schick (1994: 151-152) is skeptical of this claim, noting that this "may be a literary topos, to demonstrate Christian recognition of Muḥammad." Schick (1994: 152) points out that "Yuḥannā ibn Ruʿba is clearly an Arabic name" and suggests that he "may have been an Arab client of the Byzantines, like Farwa ibn ʿAmr al-Judhāmī in Maʿān." Regardless of which is correct, the later Arabic sources note that he negotiated to pay the *jizya* (or "poll tax") of one *dīnār* per adult resident of Aila, amounting to a total of 300 *dīnār* (Schick 1994: 152; Zayadine

[65] In most reports, the Roman city is referred to as Aila, and the Islamic city as Ayla (see explanation in Parker 1997a: 21), a convention I follow here.

1994: 499). Schick and Zayadine disagree on whether this number is an accurate estimate of Aila's population during the early 7th century. Zayadine (1994: 499) argues that it is not, suggesting that Yuḥannā would have underestimated the population for the purposes of negotiation, while Schick (1994: 152) suggests that the number may be reasonably accurate, and if so reflects a drop in population compared to the early Byzantine period.[66]

Whitcomb (1990) argues that the Early Islamic city of Ayla was founded as a *miṣr* (on the phenomenon generally, see, among many others, Harrison 1992; Milwright 2010: 24; Whitcomb 1989b: 173-176; Whitcomb 2012) in roughly 650 AD, probably during the reign of the caliph ʻUthmān. This has recently been questioned by Damgaard (2013a: 42), who suggests an early 8th century date for the walled city, while noting that an earlier "encampment" may have been founded on the same site by ʻUthmān. Either way, the *miṣr* of Ayla was founded to the south of the Roman/Byzantine town of Aila — probably a necessity, as the terms of the treaty drawn up between Yuḥannā and Muḥammad "severely limited Muslim use of the [old] city centre" (Damgaard 2013a: 41) — and during the Early Islamic period certainly overtook it in terms of importance. When this occurred is not entirely clear, as the Roman Aqaba Project found evidence of Early Islamic occupation in their Areas A, J, K, and L, all relatively close to Ayla, in what they refer to as "Byzantine Aila" (Damgaard 2013a: 52; Parker 1998b: 380-387, 391; Parker 1997b: 192). By the late 10th century, however, al-Muqadassī (1896: 64) notes that "[t]he common people call it [i.e. Ayla, which al-Muqadassī calls Wayla] 'Ailah,' but the true Ailah lies near by it and is now in ruins." As Whitcomb (1990: 157) notes, it is fairly certain that al-Muqadassī was referring to the ruins of Roman/Byzantine Aila. The Islamic city, however,

[66] Probably a fairly substantial drop, owing to the absence of *Legio X Fretensis*. Parker (2013: 740) estimates that the legion would have been made up of 1,000-2,000 men, plus their dependents. The legion was, of course, gone by the 7th century, indicated by the fact that either the bishop or an Arab client negotiated the surrender of the city. The date of the legion's departure is unclear, but Parker (1998b: 391) suggests ca. 530 AD, in line with the abandonment of "many forts along the eastern frontier."

continued to flourish. In addition to being "the great port of Palestine and the emporium of the Hijjâz" (al-Muqaddasi 1896: 64), Ayla was also known for its community of religious scholars (Schick 1994: 153), many of them "descendants of the Umayyad *mawālī*" even several centuries after Umayyad rule (Cobb 1995: 428). Ayla's more local economic impacts concern us most here, however.

A number of scholars have investigated Early Islamic Ayla's "economic hinterland" in the southern 'Araba (Avner and Magness 1998; Damgaard 2009; Jones, et al. 2014; Jones, et al. forthcoming; Nol 2015; Whitcomb 2006b). There is a general consensus among these scholars that settlement in the southern 'Araba expanded during the Early Islamic period. The sites that have so far been identified include not only villages and agricultural sites, but also mines, metal production sites, building-stone quarries, and pottery kilns. In the context of this dissertation, it is the mines and metal production sites that are most important, particularly as copper production in Wādī 'Araba during the Early Islamic period seems to have been limited primarily, although not entirely, to the south.[67]

[67] Nol (2015: 55-56, Table 2) argues that copper smelting did occur in the central 'Araba during the Early Islamic period. I would suggest, however, that this likely only occurred in the western central 'Araba. The two sites in Faynān where she notes slag — Khirbat al-Nuḥās and "Feidan," or Khirbat Ḥamrā Ifdān — seem to be derived from King, et al.'s (King, et al. 1989) dating of surface ceramics. KHI will be discussed in Section 5.4, but investigation of the "late" slag mounds in Area E has demonstrated that they date to the Iron Age (Ben-Yosef, et al. 2014b: 850-856). Likewise, excavations in seven areas at KEN have produced no evidence of Early Islamic period occupation (Levy, et al. 2014d). She likewise suggests "mining shafts" are known at or near Khirbat Faynān (Nol 2015: 56, Table 2), but as discussed above (Section 3.4), this is far from clear, and unlikely to be the case. She also suggests that slag is present at Khān 'En Yahav (Nol 2015: 56, Table 2), but in this context cites Yekutieli, et al.'s (2005) report on nearby 'En Yahav. Yekutieli, et al. (2005: 9) assign the "late" slag from this site to the Roman period on the basis of ceramics. While this is not a secure date — particularly as Be'er Ora (discussed below), essentially the "type site" for Early Islamic smelting camps in the southern 'Araba, was initially dated to the Roman and Byzantine periods on the same grounds (Rothenberg 1962: 62; Rothenberg 1972: 222) — more investigation would be required to demonstrate an Early Islamic period (or any other) date. Somewhat anecdotally, however, A. Gidding (pers. comm.) did not note the presence of the distinctive Early Islamic period "ring slag" during a survey at 'En Yahav in 2009. In a recent paper by members of the 'En Yahav team and others, the late slag is described as "Mameluk" without further discussion (Shilstein, et al. 2017: 128). There is, however, evidence for Late Byzantine and Early Islamic period smelting at the nearby sites of Nahal 'Arava 1, 2, and 3 (Nahlieli, et al. 2014). This will be discussed further in Sections 8.2 and 9.3. Nol lists several other sites, but references and toponyms are not provided, making them difficult to evaluate.

As noted in Section 3.1, the Early Islamic period copper industry in the southern ‘Araba was first recognized only in the 1980s, when radiocarbon dates from Furnace Z in Timna Site 2 (see map, Fig. 3.13) demonstrated that it was reused during the Early Islamic period, which prompted radiocarbon dating of Be’er Ora, demonstrating that this site was not Roman or Byzantine, but instead also dated to the Early Islamic period (Rothenberg 1988a). Since then, the outlines of this industry — concentrated primarily in the southwestern ‘Araba — have become more clear. The major mines seem to have been those in Naḥal Amrām, where the most active period of copper mining was the Early Islamic period (Avner, et al. 2018; Willies 1990; Willies 1991). Other mines are known in Naḥal Tsfunot, 2 km to the north of Naḥal Amrām, and farther to the south — to the west of the Gulf of ‘Aqaba — in Naḥal Rehavam, southwest of modern Eilat, in Wādī Tuwayba, and at Jabal al-Marāḥ (Avner and Magness 1998: 40-41, Fig. 1). It is likely that mining also occurred in the Timna Valley during the Early Islamic period, as well, but evidence is rather limited. Rothenberg (1972: 224) suggests “secondary Arabic exploitation of earlier copper mines” at Site 37, in the southern Timna Valley, and Nol (2015: 56, Table 2) lists Site 24A, in the north, as an Early Islamic mine. As noted in Section 3.4, dating mines on the basis of traditional archaeological survey is somewhat problematic, and this problem is compounded in the southern ‘Araba, where ceramics tend to be less common.

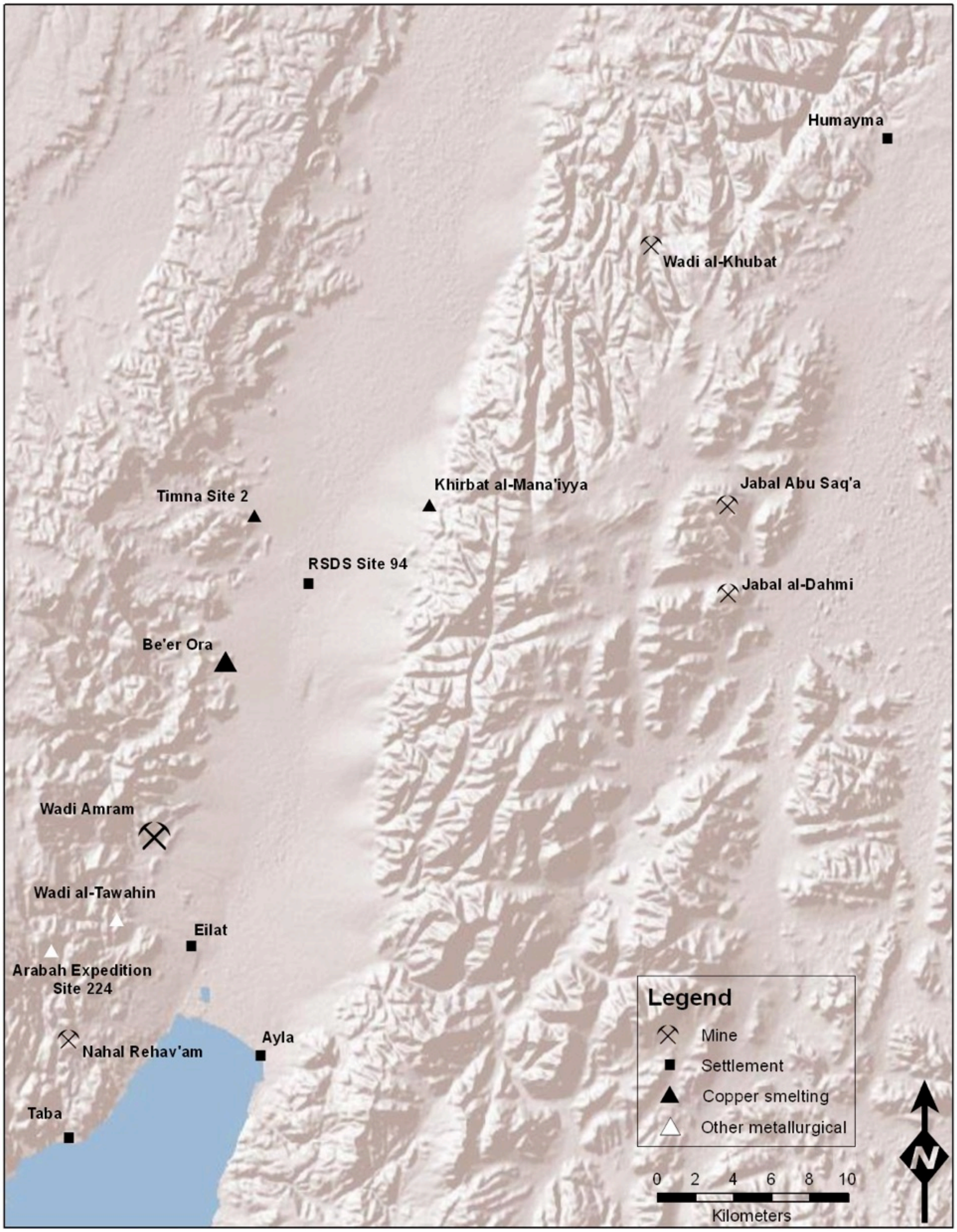

Figure 3.13: Early and Middle Islamic period sites in the southern Wādī ʻAraba, as well as potential mines in the southwestern Wādī ʻAraba. (Basemap: © 2014 Esri.)

The largest Early Islamic period copper smelting site in the southern ‘Araba is certainly Be’er Ora, with an estimated 5,000 tons of slag (Avner and Magness 1998: 42). Avner and Magness (1998: 42) suggest that another smelting site at Umm Rashrāsh, in the modern city of Eilat, would have been "relatively large," but the site was "destroyed in the 1950s," making the claim difficult to evaluate in the absence of accurate estimates of the amount of slag. Smaller smelting sites are known at Tall Ḥāra Ḥadīd (Arabah Expedition Site 4), where an estimated 50 tons of slag was found (Rothenberg 1972: 211 discusses the site as Roman, but it is actually Early Islamic; see Ben-Yosef, et al. 2008: 2876, where this is demonstrated using archaeomagnetic dating techniques), at Arabah Expedition Site 64, south of Be’er Ora (Avner and Magness 1998: 41, Fig. 1, 42; Nol 2015: 56, Table 2), at Arabah Expedition Site 33 in Naḥal Amrām (Avner and Magness 1998: 42; Willies 1991: 113),[68] perhaps at Yotvata (Avner and Magness 1998: 42), at Evrona (Ben-Yosef, et al. 2008: 2872, Table 1; Nol 2015: 56, Table 2), in several of the furnaces at Timna Site 2 (Avner 2014: 146, Table 1, nos. 78-79; Avner and Magness 1998: 57, nos. 2-3; Ben-Yosef 2010: 671-672; Ben-Yosef, et al. 2012: 59, n. 14),[69] at two slag mounds at the foot of Timna Site 34 (Peters, et al. in press), and at several additional sites in the Timna Valley (Sites 11E and 14 are givien in Nol 2015: 56, Table 2). Damgaard (2009: 89) has also suggested that prior to the establishment of these smelting sites near the mining districts, copper may have been produced in Ayla itself, as "copper slag [was] retrieved

[68] Ben-Yosef, et al. (2008: 2876) point out that their archaeointensity results for Site 33 (their Givat Yocheved) are not consistent with a date in the Early Islamic period or Late Bronze Age — both of which were confirmed by previous radiocarbon dates — and instead suggest a date in the Early Roman period. Based on their intensity data (Ben-Yosef, et al. 2008: 2875, Fig. 13) I would also suggest that a Middle Islamic period date is possible. Either of these suggestions would fit the periods during which the larger mine — Site 38 — was in use (Willies 1991: 138), and it is possible that smelting occurred at Site 33, at varying intensities, during all of the periods of mining: Late Bronze Age, Roman/Byzantine, Early Islamic, and Middle Islamic.

[69] On the basis of recent excavations, Erickson-Gini (2014) disagrees with much of this dating, and suggests that Rothenberg’s initial Late Bronze Age dating is more accurate than now accepted. This argument is somewhat tangential to my point here, but it is certain that some furnaces at Site 2 were reused during the Early Islamic period, and very likely that some were constructed, as well.

from the layers under the congregational mosque." This would place this activity earlier than the mid-8th century, the date of the foundation of the mosque[70] (Damgaard 2013b: 79; Whitcomb 2006b: 241; Whitcomb 2007: 24). Smelting — rather than working smelted copper — within the walled city, if that were the case, would be quite unusual. However, Whitcomb (2006b: 241) describes the same objects as "cut fragments of copper, wastage of copper object production within the city." This is a much more likely interpretation, and suggests that even if the fill below the mosque contained slag, it is unlikely to be *smelting* slag.

Gilat, et al. (1993) have also argued that a small gold industry existed during the Early Islamic period in the Wādī al-Ṭawāḥīn, ca. 5 km northwest of modern Eilat. A building excavated at the site contained several quartz-diorite millstones and grinding implements, and analysis of a fine-grained, gray powder from a "bell-shaped" pit located across the *wādī* from the building revealed small quantities of very fine gold particles, which led the researchers to reject previous interpretations of the site as being used to process barite (Frank 1934: 261) or produce millstones (Glueck 1965b: 15), instead concluding that workers in the building ground quartz in order to exploit a "non-visible" gold anomaly (Gilat, et al. 1993: 436). Archaeologists and historians have almost universally accepted this interpretation of the site (e.g. Amar 1997; Avni 2014; Damgaard 2009; Whitcomb 2006b).[71] Likewise, Hauptmann and Löffler (2013: 83) argue for the "great probability" of gold production at the site, at least in part because they believe a similar gold anomaly was exploited in Wādī Abū Khushayba, south of Petra, during the Roman and Byzantine periods. Although he does not directly refer to the Wādī al-Ṭawāḥīn site, Meshel

[70] Whitcomb (2007: 24) suggests that an earlier Umayyad mosque should also exist in the city, but the 8th century mosque was built in a different location, and an earlier mosque has not yet been located. Whitcomb (1993: 239-240) initially thought the Umayyad mosque would be located in Area L, near the southern corner of the city, but excavations demonstrated that this was not the case.
[71] Nol (2015: 55) suggests that Wādī al-Ṭawāḥīn should be dated no earlier than the 10th century, rather later than the other southern 'Araba sites, but does not comment on its function.

(2006) proposes that a gold anomaly similar to that observed at Wādī Abū Khushayba may also have been exploited at Umm al-ʻAmad, near Faynān (see Fig. 3.2). Shaw and Rothenberg (2000), however, have expressed considerable skepticism about gold production in Wādī al-Ṭawāḥīn. Their primary arguments are that it is unlikely such an anomaly could have been discovered or exploited using Early Islamic methods, and that the lack of substantial tailing piles suggests that very little gold could have been produced at the site. Hauptmann and Löffler (2013: 83) address the first point, noting that finely ground tailings found near several Roman mines in the central ʻAraba may point to similar attempts to discover non-visible gold deposits. Likewise, Stöllner, et al.'s (2008) work at Sakdrissi, Georgia may point to exploitation of similar deposits long before the Early Islamic period. Beyond this, unfortunately, Shaw and Rothenberg's (2000) concerns have mostly been ignored. It is possible — especially given the proximity of the Wādī al-Ṭawāḥīn site to the copper mines in Naḥal ʻAmrām, less than 10 km to the north, and building stone quarries in nearby Naḥal Roded (Avner and Magness 1998: 45) — that Wādī al-Ṭawāḥīn was the center of a small and quite unique gold processing industry. It is also worth considering that, given both the size and uniqueness of the site, it may be an example not of an "industry," as such, but rather an experimental attempt to exploit a difficult gold deposit that was, perhaps, judged too costly or inefficient to pursue at a larger scale. The evidence is, realistically, inconclusive, and we should be cautious about interpreting this as evidence of a southern ʻAraba gold "industry."

These sites cluster primarily in the southwestern Wādī ʻAraba. Hinterland industrial sites in the southeastern ʻAraba, by contrast, are much rarer. To date, the most comprehensive survey of the southeastern ʻAraba is Smith's (2014; 1997) Southeast ʻAraba Archaeological Survey (SAAS). In the preliminary report, Smith (1997: 67) states that the survey was marked by a "virtual absence of Early and Late Islamic period sites," with the exceptions of "Early Islamic activity behind Jebel Um Nuseila [east of al-ʻAqaba], which may be related to the collection of raw materials for local glass production" and the large settlement at Ayla. 14 sites definitively dating to the Early Islamic period are included in the final report of the survey (Smith 2014: 160-161), but the pattern that emerges seems to support the interpretations of the preliminary report. Many of the sites are described as pot-drops or ephemeral reoccupations of earlier sites, and many are close to or within the modern city of al-ʻAqaba, suggesting an association with Early Islamic Ayla. In this context, it is also worth noting that the Archaeological Survey for the Red Sea Dead Sea Conveyance Study (RSDS) found a tower (RSDS Site 94) roughly halfway between Khirbat al-Manāʻiyya and Be'er Ora, near the modern Jordan-Israel border, that, although initially a Nabataean-Roman construction, was in use during the Early Islamic period (Ruben and van der Steen 2012: 103).

Khirbat al-Manāʻiyya, reported in this dissertation (Section 4.3) and a new publication in press (Jones, et al. in press), is particularly interesting because it does not conform to this pattern. It is in the southeastern ʻAraba, over 25 km north of Ayla, and is a smelting camp like those reported above in the southwest ʻAraba. Indeed, with an estimated "several hundred tons of slag," it is not only one of the largest Early Islamic period smelting sites in the southern ʻAraba — of sites for which estimates have been published, only Be'er Ora is larger — but one of the largest smelting sites regardless of period (Ben-Yosef 2012: 66). All of the smelting sites in the Timna Valley, as a comparison, are estimated to contain a combined ca. 1,000 tons of slag (Ben-Yosef 2012: 66). Khirbat al-Manāʻiyya was also not surveyed by the SAAS, and this brings up several issues with our current understanding of settlement in the southeastern ʻAraba. First, while the SAAS provides a broad overview of settlement patterns across a large portion of the southeastern ‘Araba, “the study area was not surveyed in its entirety or intensively in all areas” (Smith 2014: 117). Likewise, “only about a quarter of all sites (82 of 330, or 24.85%) yielded more than 20 sherds,” (Smith 2014: 117), which is unsurprising for the southern Wādī ‘Araba, but also means that many of the surveyed sites can only be “tentative[ly]” dated. These problems are compounded for the Early Islamic period, as sherds of this period are easily confused with the Late Byzantine period (Nol 2015: 53) and the settlement pattern in the southern ‘Araba tends to favor locations suitable for extractive and industrial activities, rather than habitation. It is also worth noting that the SAAS identified several small, undated smelting sites near Khirbat al-Manā‘iyya (Smith 2014: 217-219). None of these sites necessarily dates to the Early Islamic period, but this does demonstrate that, without excavation, gaps in our understanding of the metallurgical landscape of the southeast ‘Araba are likely to remain.

The date of the earliest phase of the Early Islamic southern ‘Araba copper industry is something of an open question. It has been the case for several decades that ceramics and other diagnostic artifacts from Early Islamic sites in the southern ‘Araba tend to date to the 8th-9th centuries, while radiocarbon dates from the same sites give a range between the 7th and 11th centuries (Avner and Magness 1998: 51). Unfortunately, Nol’s (2015: 53-55) recent review of this evidence shows that the situation remains the same. The evidence from ELRAP excavations at Khirbat al-Manā‘iyya follows the same pattern (Section 4.3). Reference to the larger West Arabian industry is instructive here. Heck (1999; 2003) argues that the Arabian mining industry was already quite large by the 7th century, and played a pivotal role in the emergence of the earliest Islamic state. Power (2012a), in a recent reevaluation of this evidence, suggests that the situation might not be so clear. Instead, he suggests a possible relationship between the mines and the ‘Abbāsid Darb Zubayda — the route from Baghdād to Mecca — noting that “the steady flow of gold to the mint of Baghdad should not be ignored" when considering the development of this route (Power 2012a: 124). This is interesting in light of the evidence from al-Nuqra — a copper smelting site in the western Najd — which, although limited, points to mineral exploitation primarily during the ʻAbbāsid period (de Jesus, et al. 1982: 63; see discussion in Power 2012a: 123). This leaves us with two models for the southern ʻAraba. On one hand, the expansion of the West Arabian mining industry under the ʻAbbāsids may suggest a mid-8th century date for the establishment of many of Ayla's hinterland settlements. This corresponds to changes in Ayla's urban fabric, noted above, and to its increasing importance as a commercial center during the ʻAbbāsid period, and would suggest that "the Abbasids were highly committed to the exploitation of copper and gold on the Arabian Shield" (de Jesus, et al. 1982: 63) not only along the Darb Zubayda, but into the northern reaches of the Shield, as well. On the other hand, the association of the West Arabian mining industry with the development of the Darb Zubayda could point to a similar connection to the Darb al-Ḥajj al-Shāmī, which saw considerable investment under the Umayyads (Petersen 2012: 9). Given our current knowledge of Early Islamic ceramic typologies in the southern ʻAraba, and Power's (2012a) reevaluation of the western Arabian evidence, Nol's (2015: 53) decision to accept an 8th century date for the emergence of the Early Islamic copper industry in the southern ʻAraba is sensible, although we should presently regard this date as tentative.

It is clearer that this settlement system seems to have gone into decline in the 11th century, a difficult period both for Ayla and the southern ʻAraba and northwest Arabia more generally. The cause seems to have been a combination of raids by the Jarrāḥid tribal polity in 1024-1025 (Power 2012b: 137; Schick 1997: 77; Whitcomb 2009: 123, 129-130) — as well as possible political instability related to the Jarrāḥid rebellion against the Fāṭimids in 1010 (*EI2*, Djarrāḥids; Assaad 1974: 146-155; Hiyari 1975a: 82-88; Walker 2012c: 174-177), whether its cause or result, and which can perhaps be traced back as far as the battle between the Jarrāḥids and Fāṭimids at Ayla in 981-982 AD, which caused the Egyptian *ḥajj* caravan to turn back that year (Gil 1992: 358; Schick 1997: 76) — a major earthquake in 1068 (*EI2*, Ayla; Ambraseys, et al. 1994: 30-31; Ambraseys 2009: 272-276; Poirier and Taher 1980: 2191, Table 1; Power 2012b: 137; Whitcomb 1988a: 6; Zilberman, et al. 2005)[72], region-wide climate change in the 10th and 11th centuries (Ellenblum 2012), and, ultimately, the Crusader conquest of the city in 1116 (Whitcomb 2009: 123). The latest phase identified at Ayla, both by Whitcomb (2009: 427, Fig. 7 [Phase E]) and the Aylah Archaeological Project (Damgaard and Jennings 2013: 480-482 [Phase 1]), seems to end in the late 11th or early 12th century AD, suggesting that occupation of Ayla likely ended with the Crusader attack in 1116 (Whitcomb 1988b: 222). Ayla itself was, at this point, abandoned, and after the Ayyūbid conquest of the city in the late 12th century, settlement instead seems to have focused on the ʻAqaba Castle area, to the south (al-Shqour, et al. 2009; Damgaard and Jennings 2013: 477).[73] Most of the hinterland sites were, by 1116, no longer in use (Avner and Magness 1998: 52; Power 2012b: 137), and any that were still occupied were likely abandoned at this point, as well.

The bustling Early Islamic industrial hinterland of Ayla was, by the time of the Crusades, essentially abandoned. Copper production in Wādī ʻAraba resumed, however, in the late 12th century, following the Ayyūbid conquest of the Crusader territory of Oultrejourdain. Although some copper was produced in the southern ʻAraba during the Middle Islamic period, this was on a small scale. The primary center of the industry had shifted again to Faynān.

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[72] Some of these sources give the date as 1071 or 1072, and Ambraseys, et al. (1994: 31) note that it is commonly misreported as 1067 and 1070, as well. The commonly accepted date is, however, 1068.
[73] Parker (1997b: 192) argues that this shift is part of a longer-term, southward shift in settlement around al-ʻAqaba, which he traces over 5,000 years and suggests is related to changes in the coastline.

3.6. The Middle Islamic Period in Southern Jordan

Specific, informative references to Faynān are not found in sources of the early second millennium AD. The sole specific reference of which I am aware is a formulaic account of the Exodus itinerary[74], drawn primarily from Jerome, *Letter 78*, and found in a number of medieval pilgrimage guides, including those of "Fetellus"[75] (1971: 20) and Anonymous Pilgrim VI ("Pseudo-Beda") (1894: 45). Unfortunately, this account only notes that Selmona and Fynon "are not found in the order of history" (Fetellus 1971: 20).[76] It is difficult to determine whether this means that the original author of this account was unaware of the Byzantine sources for Phaino, notably Eusebius (see Section 3.4),[77] or simply did not find them useful for explaining the names of these two stations (see note 53, above). It is clear, however, that southern Jordan was well beyond the area visited by even the most intrepid Christian pilgrims during this period. Burchard

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[74] It is important to note that the primary purpose of these descriptions of the Exodus itinerary was not to provide an accurate description of the medieval geography of these regions, and so we should not be surprised that they are of little use for understanding Middle Islamic southern Jordan. Rather, these accounts focus primarily on explicating the names of each station and serve a symbolic function in the context of the pilgrimage guides. For the reception of these Exodus itineraries in medieval Europe and their influence on medieval authors, specifically Dante, see Holloway (1985: 110-120). The Jewish National and University Library at Hebrew Union College has digitized an assortment of 15th century and later European maps from the Eran Laor Cartographic Collection illustrating the Exodus itinerary, and these provide interesting background to this problem, as well (http://www.jnul.huji.ac.il/dl/maps/pal/html/). Brown (2013b) discusses similar maps in the context of the European cartographic perception of central and southern Jordan following the loss of this territory by the Crusaders in the late 12th century.

[75] This anonymous early 12th century pilgrimage guide is commonly, but somewhat incorrectly, attributed to Fetellus or Fretellus, a 12th century archdeacon of Antioch (Lock 2006: 40). In fact, most texts include the "core text" — an anonymous pilgrimage guide — as well as additions made in a letter by Fretellus and further additions included after Fretellus's death in the mid-12th century (see Wilkinson, et al. 1988: 12-13, 352-353). Here I follow the practice of most authors in referring to the work as "Fetellus," the name given in the Palestine Pilgrims' Text Society translation. Wilkinson, et al.'s (1988: 181-211) translation, identified as an anonymous *Work on Geography*, attempts to distinguish the material added to the work after the death of Fretellus from the "core text" and the additions made by Fretellus.

[76] The translation found in Wilkinson et al. (1988: 187) omits the sections from Jerome entirely, without any discussion of the points where the two accounts differ.

[77] The author also ignores, rather surprisingly, additional information provided by Jerome himself. While Jerome's explanation of "Phinon" does begin with the line, "Hae duae mansiones, tricesima quinta et tricesima sexta, in ordine historiae non inueniuntur. . ." ["These two stopping places, the 35th and 36th, are not found in the order of history. . ." (my translation)] (Jerome 1954: 84), he goes on to describe these two stations, and relates the name "Phinon" to the word "mouth." This is entirely omitted from the account in Fetellus and Anonymous Pilgrim VI, either because the author of this account had an incomplete version of *Letter 78*, or, as I suggest in the main text, because this explanation of the name Punon did not make symbolic sense to medieval Christians.

of Mount Sion (1971: 59) in the late 13th century, John Poloner (1894: 39) in the early 15th century, and Felix Fabri (1893: 150-153) in the late 15th century all report that their guides were unwilling to take them even as far as the Dead Sea due to the dangers posed by "Arabs" — "Midianites" in Poloner — and wildlife, and Ludolf von Sudheim (1895: 118), in the mid-14th century, was likewise warned by Templar prisoners of war not to travel to the Dead Sea coast, although in this case for fear that he and his companions would "lose [their] lives through its stench." Where these pilgrimage guides do attempt to provide information about the geography of southern Jordan, they are usually hopelessly confused, and unlike the earlier Crusader chronicles regularly conflate Petra, Shawbak and Karak, placing them all in the vicinity of Karak or even farther to the north (see, among many other examples, von Sudheim 1895: 118).[78] Muslim pilgrims are, unfortunately, of little additional help. As an example, Nāṣir-i Khusraw (1888: 58), describing his 11th century *ḥajj*, has nothing to say about the journey between the Karak Plateau and Wādī al-Qurā, near Medīna.

As an interesting aside, Elitzur (2004: 239-240, esp. 239, n. 1) argues that Yāqūt's reference to "al-Daydān" in his mid-13th century *Kitāb Muʿjam al-Buldān* does not refer to al-ʿUlā, in Saudi Arabia — generally identified as Dedan — but rather to Ḍānā, on the plateau to the east of Faynān. This is part of a broader argument he makes, ultimately relating to Eusebius's identification of Biblical Dedan, but is interesting here primarily as a reference to the region of Faynān likely contemporary with copper production at KNA and Khirbat Faynān (see Section 4.1-4.2). Unfortunately, Yāqūt says only that it is "a pleasant town. It was on the road of al-

[78] There are exceptions to this, however. Anonymous Pilgrim VI (1894: 48) is aware of the correct location and basic history of Montreal/Shawbak (but, like many other pilgrimage guides, places "Edom" near Damascus). More amusingly, John Poloner (1894: 40) places Montreal at "Petra in the Wilderness" — *Petra Deserti*, i.e. al-Karak, reflecting the common practice of referring to al-Karak as *Crac de Montreal* (see Pringle 1993: 286) — rather than its correct location at al-Shawbak, but the translator of the work, Aubrey Stewart, states in a footnote that the correct location is Dhībān. Stewart's "correction" is thus even less correct than Poloner's original statement.

Balqā’ . . . from the direction of al-Ḥiǧāz . . . In ruins” (Elitzur 2004: 239). This is perhaps enlightening, as Yāqūt was either not aware of copper production in Faynān or did not consider it worth mentioning, instead noting only the presence of a ruined town on the plateau nearby.

Archaeological Research on Middle Islamic Period Faynān

Although Faynān is not mentioned in Middle Islamic period historical sources, Islamic period copper production has been recognized by archaeologists working in the region since Glueck’s (1935) survey of the region. While a number of researchers have investigated the Middle Islamic smelting areas at Khirbat Nuqayb al-Asaymir and Khirbat Faynān (these research histories are discussed in Sections 4.1 and 5.3, respectively), most of this research has focused on describing the sites and discussing the technical aspects of Middle Islamic period copper production. While these are important considerations, and will be discussed later, few researchers have attempted to discuss the Faynān copper industry in terms of broader trends in Islamic history and archaeology. Beyond my own work, only two other synthetic works have attempted to draw broader conclusions about the Middle Islamic copper industry in Faynān. While I have discussed these works before (Jones, et al. 2012), they are worth considering again here.

First, Gerd Weisgerber (2006: 27), dating the smelting at Faynān to the Mamlūk period (on this, see Section 4.2.1 and further discussion in Sections 9 and 10), dismisses this production phase as “probably not a government initiative but an *ad hoc*, trial-and-error enterprise of no great or long-lasting significance.” As I have already noted elsewhere (Jones, et al. 2012: 90), even on the basis of JHF and ELRAP surveys this view was not tenable. KNA, which Weisgerber acknowledges but does not consider in his analysis, demonstrates government involvement in the industry even through its survey ceramic assemblage (see Section 6.1.1), and the discovery of copper mines in Wādī al-Salmīna (see Section 5.1.2) suggested a much more organized industry than Weisgerber had proposed (Jones, et al. 2012: 90). Additionally, Weisgerber seems to have conflated the success of a mining venture with the degree to which it was a government-sponsored initiative. It is important here to note Bell's (1998: 28) argument that "[t]o describe the mining industry truthfully, historians must keep fixed in mind the reality that most mines are failures. Probably about one in a hundred attempts at mining makes a profit; the other ninety-nine are abandoned as failures." While Bell's focus was the 19th century AD mining industry of Australia, his points are nonetheless valuable here. In order to make judgments about the organization or success of the industry, analyses must be conducted at a scale broader than a single site. This is, in fact, an excellent point in favor of the use of the "mining feature-system" concept (see Section 2.2). Weisgerber's arguments may, however, be more accurate concerning the intriguing evidence for Late Islamic resmelting of slag from the Faynān 7 slag mound (see Section 3.1 and Table 4.1). Even here, some degree of caution must be exercised when considering the degree to which this activity was government-sponsored. To take a recent and local example, the Natural Resources Authority (NRA) prospecting activities in the Faynān region in the mid-20th century AD, although they left an archaeologically visible mark on the landscape and were certainly government-sponsored, did not actually lead to successful copper production.

14th Century Copper Currency and Faynān

Second, Newson, et al. (2007b: 363-365), interpreting the data collected by the WFLS, instead propose a connection between Faynān and Egyptian monetary policy in the mid-14th century AD. While this model is considered briefly by Jones, et al. (2012: 91-92), I will revisit it here in more detail. Newson, et al. (2007b: 364-365) focus primarily on a Middle Islamic IIc date for the Faynān copper industry, noting that although the evidence at the time pointed primarily to an Ayyūbid date for KNA, copper may have been produced through the entire Middle Islamic II,[79] and suggesting that smelting at Khirbat Faynān may have begun only in the 14th century. They argue that the additional production at Khirbat Faynān may have provided enough copper to spur an increase in the weight standard of Egyptian copper currency, and, in turn, this "new monetary system set the tone for the fifteenth century being an 'Age of Copper' in Mamluk territories" (Newson, et al. 2007b: 365). The 15th century was, in fact, likely not an "Age of Copper," as already in 1405 AD, al-Maqrīzī notes that there was a shortage of *fulūs*, and from 1410 into at least the 1420s, several sources describe buckets of "*fulūs*" that consisted primarily of scrap copper, broken iron tools, and lead, as copper coins were in short supply (Allan 1984: 91-92; Bacharach 1976: 41). Al-Jawharī and al-Maqrīzī both argue that this shortage of *fulūs* was due to the fact that they were being shipped to Yemen and a variety of other places to be melted down (Allan 1984: 92), likely due to the value of the copper in a *fals* exceeding the face value of the coin (Kato 2012: 43). Nonetheless, these complaints do, to an extent, reflect the degree to which fluctuations in the price and supply of copper could affect the Egyptian economy, which had become dependent on copper coinage during the 14th century. It is, then, worth considering the Egyptian economy in the Middle Islamic IIc in some detail to determine whether there could, possibly, have been a connection to Faynān.

Al-Maqrīzī (1994: 71) places blame for the shift to a primarily copper currency on Maḥmūd ibn 'Alī, the *ustādār*[80] of the first Burjī *sulṭān,* Barqūq (r. 1382-1399). According to al-

[79] They also note, citing an older paper (Hauptmann, et al. 1992), that "the published accounts of the Bochum team often refer to the Islamic metallurgical activity as 'Mamluk'" (Newson, et al. 2007b: 364). This is true, but largely irrelevant. As I have noted elsewhere (Jones, et al. 2012: 82), the DBM team had already, by the mid-1980s, suggested a primarily 13th century date for KNA (Hauptmann, et al. 1985: 190-192), though as non-specialists in Islamic archaeology, their terminology for these periods is not always precise.

[80] Schultz (1998: 130) glosses this term as "majordomo," which is a reasonable translation into English. Holt (2005: 163) provides "*ustādār*, i.e. *ustādh al-dār*, 'master of the residence,'" which is slightly more unwieldy. A brief

Maqrīzī (1994: 71), Maḥmūd ibn ʻAlī, as supervisor of the treasury, had copper imported from Europe for the sole purpose of minting *fulūs*. He also suggests that, in addition to minting *fulūs* in Cairo, Maḥmūd ibn ʻAlī established another mint in Alexandria solely for the production of *fulūs*, though in fact the Alexandria mint seems to have been established in 1368-9 AD (770 AH), and not in the 1390s (Schultz 1998: 141). The result of this, he argues, was that "[e]xtremely large quantities of *fulūs* came into the hands of the people and they circulated so widely that they became the dominant currency in the country" (al-Maqrīzī 1994: 71). While the specific details of al-Maqrīzī's indictment of Maḥmūd ibn ʻAlī can be debated, Bacharach (1976: 35) argues that "it can be assumed that he exported silver to Europe at a high price, bought large quantities of copper, minted it as fast and made a significant profit." In order to understand the relevance of this event to Faynān, however, it is necessary to sketch out the history of *fulūs* during the entire 14th century.

Schultz (1998) provides a full account of these changes, informed both by history and his numismatic research on several large groups of Egyptian coins. Al-Maqrīzī (1994: 71) states that in 1295-96 AD (695 AH), during the short reign of the *sulṭān* al-ʻĀdil Kitbughā, the *fals* was set to the weight standard of one *dirham*. While none of these *fulūs* of al-ʻĀdil Kitbughā were known when Schultz performed his analysis,[81] he did produce evidence that by the mid-1340s AD (745-56 AH) the *fals* was indeed being struck to the weight standard of one *dirham*, or ca. 3 g (Schultz 1998: 135, Table 1, 147, n. 41). Al-Maqrīzi (1994: 71) argues that this event marks the origin of the exchange of *fulūs* by weight, rather than "by tale," and this seems fairly likely.

account of the specific duties of the *ustādār* is given by Holt (2005: 163). For a more detailed account of this office, see Popper (1955: 93).

[81] This still seems to be the case, although some Damascene issues of al-ʻĀdil Kitbughā, minted at a much lower weight, are known (e.g. Berman 2014: 159, no. 5).

Multiple Mamlūk sources, including al-Maqrīzī (1994: 70) and al-Qalqashandī (Schultz 1998: 134) indicate that in 1357-58 AD (759 AH), during the reign of al-Nāṣir Ḥasan, the weight standard of the *fals* was increased from one *dirham* to one *mithqāl*, or ca. 4.25 g,[82] and the exchange rate set at 24 *fulūs* to the silver *dirham*. Schultz's (1998: 136-137, Table 2) numismatic data likewise confirm that in 1357-8 AD, the average weight of the *fals* increased to 4.2 g. Perhaps most interesting, however, is that between 1391 and 1399 AD (794-801 AH), corresponding roughly to Barqūq's second reign, the average weight of Cairene *fulūs* fell from 4.2 g to 4.12 g (Schultz 1998: 144-145, Table 8). To summarize, from the end of the 13th to the end of the 14th century AD, three major shifts can be observed in the weights of *fulūs* minted in Cairo: (1) in the late 13th century, the *fals* is set to a weight standard of one *dirham*, or 3 g; (2) in the mid-14th century, this standard is increased to one *mithqāl*, or 4.25 g, although the average weight of these coins is closer to 4.2 g; (3) finally, in the late 14th century, this standard is debased, and the weight of the *fals* falls to about 4.12 g.

Newson, et al. (2007b: 365) attempt to link copper production in Faynān to the second of these events, the increase of the Cairene *fulūs* weight standard from one *dirham* to one *mithqāl*. This proposal has the advantage of lining up, to a certain degree, with the five Mamlūk coins collected by Kind, et al. (2005: 179, Table 2) at Khirbat Faynān, all of which were likely minted between 1309 and 1377 AD (709-778 AH). The problem with the proposal, however, is its assumption that the weight standard of the *fulūs* was increased in response to the increasing availability of copper.

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[82] As Schultz (1998: 136; 2003b) discusses, both the *dirham* and the *mithqāl* likely weighed more in 14th century Cairo than their "classical" values of 3 and 4.25 g, respectively. This is not critical to the present discussion, but it is valuable to keep in mind that weight standards fluctuated with respect to both region and period. The Alexandrine *mithqāl*, for example, may have weighed as little as 4 g (Schultz 1998: 141-142).

In order to demonstrate why this is likely incorrect, it is first worth considering why the *fals* would have been minted to a weight standard to begin with. As Schultz (1998: 146) points out, this is a reasonable question, not only because of the low intrinsic value of copper coinage, but also because in most transactions *fulūs* were exchanged "by tale," rather than by weight. Schultz (1998: 146-148), noting that copper coins were in fact exchanged in two different types of transaction, explains the situation using the example of a baker. Most of the baker's business — the selling of relatively small quantities of bread — would be conducted in copper, as is common for small, day-to-day transactions. The baker would, however, buy flour (and other materials) in bulk, and these transactions would be conducted in silver. As such, the baker would need to convert the copper *fulūs* accepted on a day-to-day basis into silver *darāhim*. In these transactions, *fulūs* were exchanged by weight for *darāhim*, in part simply because it was not feasible to count out copper coins in large quantities. Given that *fulūs* simply exchanged at face value in quotidian transactions, this meant that the baker would in fact lose money in these larger exchanges by accepting lower weight copper coins in day-to-day exchanges. Setting a weight standard for *fulūs* eliminates this problem by ensuring that a given weight of copper coins always corresponds to basically the same number of coins.

Assuming a constant exchange rate of *fulūs* to *darāhim* by number, an increase in the weight standard of copper coins would, in fact, reflect a situation where the value of copper had decreased in relation to silver, which could, in turn, reflect a situation similar to the one described by Newson, et al., in which a new source of copper had become available, and copper had become less scarce. This is not, however, the situation that occurred in the mid-14th century. As Schultz (1998: 148) notes, at the same time the weight standard of the *fals* increased from one *dirham* to one *mithqāl*, the exchange rate changed dramatically. Where formerly 72 *dirham* weight *fulūs* had been worth one silver *dirham*, now 24 *mithqāl* weight *fulūs* were worth a silver *dirham*. As Schultz (1998: 148) points out, "[t]his new exchange rate represented a significant increase in the value of copper vis á vis silver." If these rates are illustrated using "classical" values of these weights, in 1296 AD, it took 72 grams of copper to obtain a gram of silver, while in 1358 AD, this exchange rate had been cut in half, and the value of a gram of silver was only 34 grams of copper. As such, it is very unlikely that the shift in the weight of the *fals* is related to the discovery of a new source of copper. Where one could perhaps propose a new source of copper is the third event: the decrease in the weight of *fulūs* to 4.12 g, which would represent a decrease in the value of copper compared to silver (i.e. a larger number of *fulūs* would be required to reach the same weight in exchange for silver). The problems with this are, first, the al-Maqrīzī (1994: 71) explicitly links this event to an influx of European, rather than Levantine, copper, and second, that this is rather late in relation to the previously available evidence from Faynān, as Newson, et al.'s (2007b: 365) suggestion assumes "a newly available source of copper."

As such, Jones, et al. (2012: 91-92) had already dismissed this suggestion in our discussion of the survey data from KNA. It is worth noting, as well, that the dating of the material presented in this dissertation from ELRAP excavations at the Middle Islamic period sites associated with this industry (see Part II), and particularly of the Khirbat Faynān Area 15 slag mound (see Section 4.2), essentially rules out a connection to any events of the 14th century. Instead, in order to understand the revival of the Faynān copper industry, it is necessary to lay out a brief summary of the political and economic history of southern Jordan in the Middle Islamic period.

The Crusader Period in Southern Jordan

Politically, a shift of major importance for the revival of the Faynān copper industry is the arrival of the Crusaders in southern Jordan. An early Crusader expedition occurred in 1100 AD, with Baldwin I[83] leading several hundred soldiers as far south as Petra and stopping at the monastery on Jabal Hārūn (Schick 1997: 78-79). As Schick (1997: 79) notes, the Crusaders did not establish settlements in the region at this point, but "[t]he incident reveals that there was no Fatimid or Seljuq military presence in the area that could stop the Crusaders." This is not surprising, given the situation discussed at the end of Section 3.5. While the Fāṭimids had effectively suppressed the Jarrāḥid revolts at the Battle of al-Uqḥuwāna[84] in 1029 (Gil 1992: 396; Schick 1997: 76), they had lost control of much of the southern Levant to the Saljūqs in 1071, and had only regained it in 1098 (Schick 1997: 76). Not even a year later, in 1099, they lost Jerusalem to the armies of the First Crusade (Boas 1998: 138; Schick 1997: 76). As Schick (1997: 76) notes, "[t]he fighting rarely if ever took place in southern Jordan," and "southern Jordan seldom appears explicitly" in historical accounts of these events. A strong Fāṭimid presence in southern Jordan would, therefore, be unexpected, and although the Fāṭimids had mostly put a stop to the Jarrāḥid rebellions in the early 11th century, it is likely that the Jarrāḥid presence in southern Jordan remained stronger than the Fāṭimid one. It does seem that several years later, in 1106/7, the Saljūqs claimed to control the area, but were prevented from establishing a military presence there by Baldwin (Schick 1997: 79).

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[83] While Baldwin I had, essentially, become King of Jerusalem after Godfrey de Bouillon's death in July of 1100 (Boas 1998: 138), his coronation was not until *after* his return from southern Jordan, on Christmas Day in 1100 (Riley-Smith 1988: 545). There seems to have been some disagreement surrounding his coronation, leading it to take place in Bethlehem, rather than Jerusalem. This was primarily a disagreement between the Patriarch of Jerusalem, who claimed to have been given sovereignty by Godfrey, and members of the Frankish elite who preferred a secular political authority (Runciman 1960: 11). France (1983: 327) cites Ekkehard of Aura, who states, "before the coronation Baldwin was accepted by all, presumably in some form of election, as prince (*princeps*)."

[84] Al-Uqḥuwāna has not been identified, but seems to have been near Lake Tiberias (Gil 1992: 397, n. 50).

The Crusaders established a permanent presence in southern Jordan — the center of Frankish *Oultrejourdain*, or Transjordan (Fig. 3.14) — in 1115 with the construction of Montréal/Crac de Montréal/Qalʻat al-Shawbak (Milwright 2008a: 26; Schick 1997: 80). The next year — as discussed in Section 3.5 — the Crusaders conquered Ayla, though there is no evidence that they established a permanent settlement there. Schick (1997: 80) argues that the fortified settlement of Île de Graye/Jazīrat al-Faraʻūn was built after, rather than during, this expedition, but it seems more likely that the Île de Graye fortification was established in 1116 (Milwright 2008a: 26; Mouton and ʻAbd al-Malik 1995: 81; Whitcomb 1997b: 359, 361). It is difficult to resolve this problem at present, as excavations on Jazīrat al-Faraʻūn have produced evidence primarily for the later Ayyūbid occupation (Pringle 2005: 340).

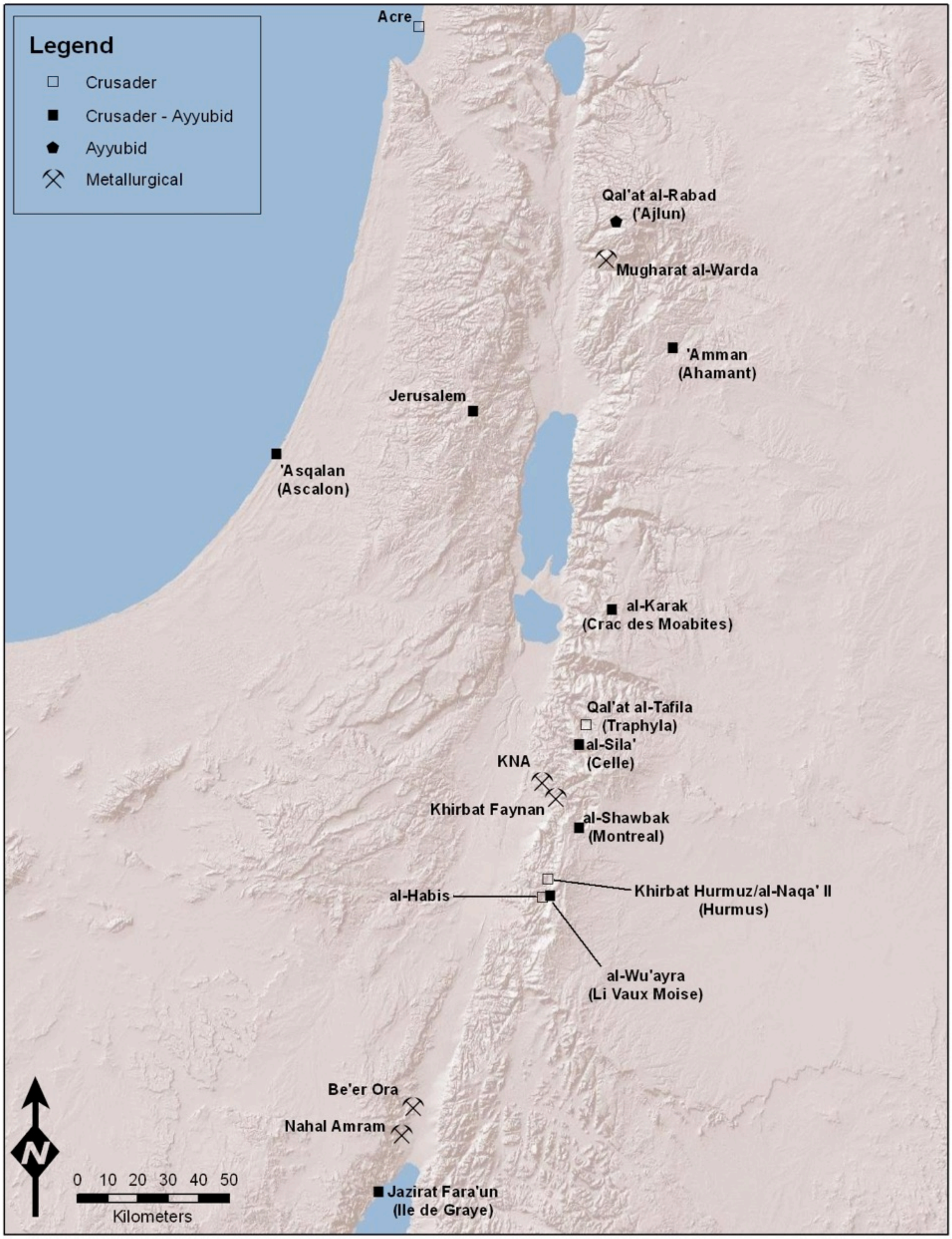

Figure 3.14: Crusader and Ayyūbid fortified settlements in Transjordan (Frankish *Oultrejourdain*) and key sites west of the Jordan Valley. (Basemap: © 2014 Esri.)

Schick (1997: 80) also points out a reference in Ibn al-Qalānisī to a Crusader raid on Wādī Mūsā in 1127 as evidence that the castles of the Petra region, particularly Li Vaux Moïse/al-Wuʿayra, perhaps had not yet been built by this point (see also Pringle 1998: 374; Sinibaldi 2016b: 83). Brown (1987: 269), however, places the construction of al-Wuʿayra in 1115/6, and argues it may have begun as early as 1108 (see also Vannini and Desideri 1995: 511). The Petra region was an area of particular focus for the Crusaders — perhaps because it was rather difficult to control — and in addition to al-Wuʿayra the Crusaders also built the fortress on al-Ḥabīs in Petra (Hammond 1970) and another called "Hurmuz" in Arabic (Frankish "Hurmus"). Suggestions have been made to identify Hurmus with Khirbat Hurmuz/al-Naqʿa II, north of Petra (Kob 1967; Lindner 1999: 491-494), but this identification is very unlikely.[85]

Probably north of al-Shawbak was another fortress called Celle — this can potentially be identified as Khirbat al-Silaʿ/TBAS 134, ca. 6.5 km southwest of al-Ṭafīla (Mayer 1990: 205-206; Milwright 2006: 9, n. 43; Milwright 2008a: 64, 66; see also Hart 1986, who notes the presence of "medieval" material but does not identify the site with Celle), though Brooker and Knauf (1988: 187) instead argue that "*Celle* undoubtedly renders Arabic *qalʿa*" and identify it with al-Ḥabīs,[86] whose original name is otherwise unknown. In this context, it is interesting that neither Glueck (1937: 32) nor MacDonald, et al. (2004b: 276-277) report Middle Islamic pottery at Khirbat al-Silaʿ, but Zayadine (1985a: 167) reports that when he visited the site, "sherds of the

[85] Micaela Sinibaldi (pers. comm.) pointed out to me that the style of masonry and other aspects of al-Naqʿa II indicate that it is not a Crusader site. I visited the site in Nov. 2017, and agree with her analysis. I would suggest that al-Naqʿa II is instead related to the hilltop sites in the region, including Qurayyāt al-Manṣūr and Khirbat al-Qulayʿa.
[86] Hammond (1970: 32) notes that this identification, "although possible, is highly conjectural." If Hammond's (1970: 36) argument, discussed below, is correct, and al-Ḥabīs was destroyed prior to the Ayyūbid conquest of al-Wuʿayra, this identification also cannot be correct, as both Abū Shāma and Ibn al-Athīr record that al-Silaʿ was captured along with al-Wuʿayra in 1188 (Hammond 1970: 32; Zayadine 1985a: 167). Zayadine (1985a: 167) instead proposes to identify al-Ḥabīs with al-Aṣwīt, a location mentioned by al-Nuwayrī. Hammond (1970: 33) argued that al-Aṣwīt should actually be identified as al-Wuʿayra, but Zayadine (1985a: 167) points out that al-Ḥabīs is, in fact, a closer match to the site described by al-Nuwayrī. Nonetheless, the nature of the evidence makes it difficult to establish the original name of al-Ḥabīs either in Latin or in Arabic.

Medieval period [were] most abundant." If Khirbat al-Sila‘ is the correct identification, however, this would make Celle the closest Crusader fortress to KNA and the second closest to Khirbat Faynān after al-Shawbak. Likewise, if the name "Celle" is associated with the toponym al-Sila‘, it is possible that the Crusader site should be identified with nearby Khirbat Qaṣr al-Dayr/TBAS 002-003, which MacDonald, et al. (2004b: 154) suggest "appears to have been a fort and/or watchtower" and at which Middle-Late Islamic pottery was collected (see also Glueck 1935: 100). The site has been extensively damaged by modern agricultural activity, unfortunately, making conclusive statements difficult. Another Crusader fortress, Traphyla or Taphilia, should probably be identified with Qal‘at al-Ṭafīla/TBAS 151, in the modern town of al-Ṭafīla (MacDonald, et al. 2004b: 300-302; Milwright 2006: 10; Milwright 2008a: 66), though little can presently be said about this structure's foundation.[87]

The final episode of Crusader construction relevant to southern Jordan[88] began under Pagan the Butler in 1142, with the establishment of al-Karak/Crac des Moabites/Petra Deserti[89] (Brown 1989: 287, 290; Milwright 2008a: 29). At the same time, the political center of Oultrejourdain was moved from al-Shawbak to al-Karak (Milwright 2008a: 29), a shift that would set the stage for the Ayyūbid political landscape of Jordan, as well.

It does not seem, at present, that the Crusaders established a presence in Faynān, being more interested in controlling the plateau, and with it the *ḥajj* route. While radiocarbon evidence

[87] It is worth mentioning, in this context, Burckhardt's (1822: 407) description of a Late Islamic period tower at al-Ṭafīla, apparently built by the Ḥuwayṭāt after capturing the town during their war with the Jawābra, the tribe in control of al-Ṭafīla when Burckhardt visited.
[88] A seventh Crusader fortress in Oultrejourdain, Ahamant, should probably be identified with modern ‘Ammān, though the specific Crusader building has not been identified (Milwright 2006: 10). The focus of this section is the south, rather than al-Balqā', so this fortification is not discussed in detail here, particularly as very little is known about it.
[89] As Milwright (2008a: 29) notes, surface sherding indicates that al-Karak had essentially been continuously occupied since the Chalcolithic period. It is unclear what the settlement would have looked like when the Crusaders took control, but in the 10th century it seems to have been a Jarrāḥid stronghold, and was conquered by the Fāṭimids in 982-983 (Schick 1997: 76-77).

— particularly from the Khirbat Faynān Area 15 slag mound (see Section 4.2.1 and Table 4.1) — may point to the establishment of the copper industry under the Crusaders, the "old wood effect" seems to explain these dates better, particularly due to the number of demonstrably Ayyūbid artifacts recovered from KNA.[90]

The Ayyūbid conquest of southern Jordan began in 1170-1171, when Saladin captured the Crusader fort on Jazīrat al-Fara'ūn (Pringle 2005: 337). Later sources indicate that Saladin's primary concern in taking the fort was the security of the route from Damascus to Cairo (Pringle 2005: 339), but he was not, at this point, able to conquer the Crusader settlements on the Sharāh Plateau. The motivation for a more focused campaign against the Crusaders seems to have come a little over a decade later. In 1176, Reynald de Châtillon, who had been imprisoned in Aleppo since 1161, was released, and by mid-1177 he had, through marriage, become lord of al-Karak and al-Shawbak (Hillenbrand 2003: 81). In 1181, Reynald attacked the city of Taymā' (Mallett 2008: 144) — or a caravan on the road near Taymā' (Leiser 1977: 88) — and in late 1182 or early 1183, launched five ships on the Red Sea, first reconquering Île de Graye, but with, perhaps, the goal of conquering the cities of Mecca and Medīna (Hillenbrand 2003: 81-82; Leiser 1977; Mallett 2008). Indeed, the attack was stopped by Ḥusām al-Dīn Lū'lū' at Rābigh, a port city between Mecca and Medīna, and some of the Crusader force — whether fleeing or attempting to attack the city — were captured very near Medīna (Mallett 2008: 143). The purpose of these raids has been debated, but Mallett (2008: 150) argues that they were conducted not out of Reynald's hatred for Muslims developed during his captivity, or his greed, but rather that it was part of "a strategy to limit Saladin's strength" in Syria, and may perhaps "have started off as a general pillaging raid" with the primary goal of capturing Ayla — which "Reynald

[90] The Crusader presence in southern Jordan is, however, notoriously difficult to tell apart from the later Ayyūbid presence on the basis of artifacts, and particularly ceramics.

would certainly have regarded . . . as part of his rightful inheritance" — after which a decision was made to make an attempt on Medīna. As Mallett (2008: 150) notes, this makes the most sense of otherwise contradictory elements of the evidence — for example, why Jazīrat al-Fara'ūn, which would not have been a lucrative place to raid, was a key focus — and it is currently the most sensible proposal.

While perhaps successful in the short term, the raid ultimately provoked a forceful response from Saladin, who conducted short sieges of al-Karak in 1183 and 1184, after which a truce seems to have held between the Ayyūbids and Crusaders until Reynald's attack on a caravan in 1187 (Milwright 2008a: 37-38). The 1187 Battle of Ḥaṭṭīn is generally seen as the turning point in the conflict between the Ayyūbids and Crusaders (Boas 1998: 141; Kedar 1992; Milwright 2008a: 37). Reynald was captured during the Battle of Ḥaṭṭīn, and executed by Saladin himself,[91] perhaps as revenge for the humiliation suffered during the earlier Red Sea raid (Hillenbrand 2003: 82; Mallett 2008: 146; Milwright 2008a: 37). After this, the Ayyūbids relatively quickly took control of the Crusader holdings across the southern Levant. Jerusalem fell to Saladin several months later, in October of 1187 (Boas 1998: 141; Kedar and Pringle 2009: 135). Al-Karak surrendered to Saladin in 1188, and al-Shawbak in 1189 (Brown 1989: 290; Brown 2013b: 713; Milwright 2008a: 37), bringing Crusader rule in Oultrejourdain to an end. While the armies of the Third Crusade managed to reestablish a coastal kingdom with its capital at Acre, and the Crusaders held Jerusalem for roughly 15 years in the mid-13th century

[91] This event is described somewhat parenthetically by Saladin himself in the "Ḥaṭṭīn Letter" (Melville and Lyons 1992: 209, 212). Al-Ṣafadī, in his 14th century *Al-Wāfī bi al-Wafayāt*, relates an embellished version of this event in which Saladin gives Baldwin a "goblet of iced water" but denies water to Reynald, instead "enumerat[ing] his treacheries," "cleaving his shoulder" with his sword, and having him beheaded and fed to dogs (Holt 1986: 57).

(Boas 1998: 141), the inland regions, and certainly southern Jordan, remained under Ayyūbid control.[92]

Southern Jordan under the Ayyūbids[93]

Archaeologically, the period of Ayyūbid rule is often difficult to identify. In part, this is because the period is so short, lasting only from 1187-9 until 1263, when Baybars I took control of al-Karak. Indeed, it occupies only a small sub-period of the archaeological chronology used in this dissertation: the Middle Islamic IIa.[94] Beyond this, the pottery of this period "shares so many characteristics with the preceding Crusader period and the succeeding Mamluk periods. . . . this has led to the creation of an 'Ayyubid gap' in the archaeological record at many sites" (Walker 1999: 219). While Walker (1999: 211) argues that the recognition of the longevity of HMGPW has made the "'Ayyubid gap' . . . a falsehood at most sites," it remains difficult to separate HMGPW into sub-periods, and, as discussed in Section 6.1.3, distinguishing "Ayyūbid" HMGPW from Crusader or early Mamlūk is currently difficult, if not impossible. Middle Islamic IIa settlement has been recognized archaeologically, but research has tended to focus, somewhat naturally, on historically documented sites, which also tend to have ceramic assemblages rich in more easily datable luxury wares.[95]

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[92] This did not, of course, prevent the royalty of the Latin Kingdom from claiming these former possessions, and as Brown (2013b: 715) puts it, during the 13th century, Frankish "claims of inheritance based on titles of descent were optimistically recognized."

[93] Of necessity, this section is a brief account of the Ayyūbids, relevant primarily to the argument presented in this dissertation. For longer, book-length accounts, see Humphreys (1977) and Ghawānma (1982). Milwright's (2006) archaeological and historical summary, although now slightly out of date in terms of archaeological research, likewise provides a broader perspective than this section. For the history of Crusader southern Jordan, Mayer (1990) remains a useful source. Hartmann (1911), though quite out of date, still contains some useful information concerning the history of Crusader, Ayyūbid and Mamlūk southern Jordan, though most of this can be found in more recent sources, which are on the whole more reliable.

[94] Strictly speaking, the Ayyūbid period begins in the late Middle Islamic Ic and continues into the early Middle Islamic IIb.

[95] The current Italian excavations at al-Shawbak, however, may demonstrate that this is not the case there. Pruno and Raffaele (2016), in their presentation at the 13th ICHAJ, note that stonepaste (see Section 6.1.1) makes up under 1% of the ceramic assemblage in virtually all of the Italian excavation areas at al-Shawbak.

Much research has been conducted on the former Crusader strongholds, most of which were reoccupied by the Ayyūbids. While the Sharāh Plateau and the *ḥajj* route remained important strategic considerations for the Ayyūbids, they do not seem to have maintained all of the former Crusader fortresses. The Ayyūbid occupation at al-Wuʻayra seems, based on the evidence from the Italian excavations there, to have been quite brief, and the excavators suggest that it ended prior to damage caused by the earthquake of 1201 (or 1202) AD, which caused damage across the Levant (Vannini and Desideri 1995: 527; Vannini and Tonghini 1997: 377-378; on the earthquake, see Ambraseys 2009: 327-337; Ambraseys, et al. 1994: 38-39; Amiran, et al. 1994: 270; Poirier and Taher 1980: 2192, Table 1). The 1201 or 1202 earthquakes are proposed for the Phase V destruction at al-Wuʻayra based on Hammond's (1970: 36) proposal for dating the destruction of al-Ḥabīs, which is in turn based on reference to Kallner-Amiran's (1951) earthquake catalog. This dating is not entirely secure, however, particularly given that the earthquake of 1202 evidently caused little damage in Jerusalem and regions farther south (Ambraseys 2009: 327). A better argument can be made that this damage was caused by the 1212 AD earthquake, which had its epicenter in the Gulf of ʻAqaba and caused substantial damage in southern Jordan (Ambraseys 2009: 337-338; Ambraseys, et al. 1994: 39-40; Amiran, et al. 1994: 270; Poirier and Taher 1980: 1292, Table 1). Because Kallner-Amiran's (1951: 228) catalog does not include the earthquake of 1212, this event would not have been considered by Hammond (1970), and thus was not considered by Vannini and Tonghini (1997: 378). This would, perhaps, extend the Ayyūbid reoccupation of al-Wuʻayra into the early 13th century, matching the dating Brown (1987: 270) proposed for her Phase II. While the precise dating awaits final publication by the Italian team, it is fairly certain that the Ayyūbid reoccupation lasted a quarter of a century at the longest, and was fairly limited in scope — in their preliminary stratigraphic report, Vannini and Tonghini (1997: 375) note that their Ayyūbid Phase IIIa was found in only one of the 10 reported sondages at the site. Al-Ḥabīs was, perhaps, abandoned even prior to the Ayyūbid siege of al-Wuʻayra (Hammond 1970: 36), and was almost certainly not maintained after it (Milwright 2006: 10). Hammond (1970: 36) suggests that al-Ḥabīs was destroyed by the 1156/7, 1170, or 1201/2 earthquakes. The earlier two suggestions would, indeed, rule out an Ayyūbid reoccupation of the site. The 1156/7 earthquake is an unlikely candidate, as it primarily affected northern Bilād al-Shām (Amiran, et al. 1994: 269; Poirier and Taher 1980: 2191, Table 1; Sbeinati, et al. 2005: 371-373), and the likeliest candidates seem to be the earthquakes of 1201/2 or, as with al-Wuʻayra, perhaps 1212. If Hurmuz is to be identified with Khirbat Hurmuz/al-Naqʻa II, the ceramic assemblage reported by Lindner (1999: 494, Fig. 25, 495-497) suggests a history similar to al-Ḥabīs, as both HMGPW and glazed wares, which would be expected in late 12th and early 13th century assemblages, are absent.

As noted above, the fortress on Jazīrat al-Faraʻūn in the Gulf of ʻAqaba was reoccupied by the Ayyūbids, and indeed most of the archaeological evidence from the site dates to the Ayyūbid period. If Jazīrat al-Faraʻūn served an Ayyūbid military function, though, this seems to have been short-lived, as was the case with al-Wuʻayra. In 1217, the German pilgrim Thietmar reports that the inhabitants of the island "were fishermen of the sultan of Babylon, practising neither agriculture, nor war, nor anything military, but only fishing" (Pringle 2005: 344; Pringle 2012: 121). By the early 14th century, Abū al-Fidā' reports that the island "is now abandoned" (Pringle 2005: 344). Little can be said about al-Ṭafīla, though Milwright (2006: 10) suggests that "in the absence of inscriptions[96] or written references to Ayyūbid work . . . it is likely that the structure was not the subject of extensive reconstruction between 1188 and 1263." While Celle

[96] Presently, the only published inscription from Qalʻat al-Ṭafīla is a Greek inscription found in secondary use (Gagos 2004: 422).

has not been conclusively identified, it may have been reoccupied by the Ayyūbids, as al-Dimashqī, writing around 1300 AD, mentions al-Sila‘ as a territory of al-Karak (Milwright 2006: 10, n. 53).

The most important of the Crusader fortifications for the Ayyūbids were the castles at al-Karak and al-Shawbak. Archaeological work has been conducted for several decades at both sites, although rather varied in both scale and scope. Al-Shawbak, ca. 13 km southeast of Khirbat Faynān (as the crow flies), was excavated by Robin Brown (1988) in 1986 — although "clearance operations" had been conducted by the Department of Antiquities in this area between 1979 and 1981 (Brown and Rielly 2009: 174) — and is currently being investigated by an Italian team from the University of Florence (Vannini 2007; Vannini, et al. 2013) as part of their *'Medieval' Petra* Project (Vannini 2011). Brown's (1988: 240-242) excavations focused primarily on the Ayyūbid "Palace Complex," which she suggests was built under the patronage of al-Mu‘aẓẓam ‘Īsā, who ruled al-Shawbak from 1198-1227, though the structure was used into the Mamlūk period,[97] and reused in the late Ottoman period.[98]

Prior to al-Mu‘aẓẓam ‘Īsā, al-Shawbak had been under the control of his father, al-‘Ādil I, who in 1189 was also granted control of al-Karak, al-Salṭ, and al-Balqā’ (Humphreys 1977: 63). While it is difficult, archaeologically, to distinguish between construction at the site between 1189 and 1198 under al-‘Ādil and between 1198 and 1227 under al-Mu‘aẓẓam ‘Īsā, the Italian team suggests that the Palace Complex may have been constructed between 1193 and 1197,

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[97] Phases II (later Ayyūbid) and III (Mamlūk) are represented in only one and three of Brown's nine excavation units, respectively (Brown 1988: 230, Table 1). By contrast, Phase I (earlier Ayyūbid) was found in eight, and Phase IV (Ottoman) in all nine. As Brown and Rielly (2009: 175) note, however, Phase II is primarily a construction phase "with little associated debris." Phase II should probably be dated to later in the 13th century — the "S1" masonry type, which seems to be associated with post-1212 earthquake reconstruction, was not found at all in the Palace Complex (Nucciotti 2007: 44-45) — and may represent only a short phase of use prior to shifts in the castle's use in the 14th century.

[98] This likely extends into the Mandate period, as well, as Brown (1988: 240) points out that "local sources" told her that the East Palace Complex was used as a domestic complex by a local *shaykh* into the late 1920s.

although a date during al-Mu‘aẓẓam ‘Īsā’s control of al-Shawbak is more likely (Nucciotti 2007: 45). Brown (2016: 549-551) notes that “al-‘Adil’s involvement in Transjordan focused on Karak,” and argues that his patronage at al-Shawbak would have been comparatively minimal, particularly as “his activities suggest that he did not expect to administer Transjordan directly.”

While Brown’s excavations focused on the Ayyūbid Palace Complex in the northwestern part of the castle, the Italian team has excavated in several areas of the site. Perhaps most interestingly, in their Area 4000 (near Brown’s “Tower I”), they excavated a Mamlūk period dye workshop, which they relate to late 14th century documents from al-Ḥaram al-Sharīf referring to carpets from al-Shawbak (Vannini, et al. 2013: 373, 376-377; on Shawbakī carpets in the Ḥaram documents, see Lutfi 1985: 295, 326, n. 58; Walker 2011b: 105). This workshop reuses portions of an earlier Crusader chapel, as well as walls constructed during the Crusader and Ayyūbid periods — at least some of them repaired after the 1212 AD earthquake — and based on ceramic analysis seems to have been used from the 14th century until its abandonment in the late 15th century (Vannini, et al. 2013: 366-370). It is interesting that by the end of the 14th century, these productive activities were being conducted within the *qal‘a* itself, and this likewise seems to indicate a shift in the function of Qal‘at al-Shawbak away from its defensive functions, which is also indicated by, for example, al-‘Umarī’s statement, in 1340, that there was no longer a military presence at al-Shawbak (Milwright 2008a: 44, n. 93).[99] These excavations are still ongoing, however, and much of the data relevant to the Middle Islamic IIa remains, for the moment, unpublished. Politically, al-Shawbak changed hands a number of times during the late 12th and early 13th centuries, and was frequently a subject of negotiation between the princes of

[99] Milwright (2008a: 44, n. 93) also cites Ibn al-Jazarī, who “reports that in 1292 the entire citadel of Shawbak was demolished with the exception of the donjon.” This seems fairly clearly to be an exaggeration, but does highlight al-Shawbak’s loss of strategic military importance after the fall of Acre in May of 1291 and the fall of the last coastal Crusader outpost, Château Pèlerin (‘Atlit), in August of 1291 (Boas 1998: 141).

Transjordan and the Sulṭān of Cairo (see, e.g. Humphreys 1977: 193, among others). This will be discussed below, but it is important first to include the context of al-Karak.

Like al-Shawbak, al-Karak was first excavated in 1987 by Robin Brown (1989),[100] although architectural surveys of the site had been conducted as early as 1929 (Brown 1989: 287). Brown's (1989: 289, Fig. 2, 290-292) excavations focused on the southern Palace Reception Hall, which she initially dated to the 14th century reign of al-Nāṣir Muḥammad. The Crusader chapel and sacristy were excavated in 1997 by John R. Lee and Jum'a Kareem, but these excavations remain unpublished (Brown 2012: 165). Marcus Milwright's (2008a: 137-139) dissertation project included analysis of ceramic material from an unstratified deposit cleared by the Department of Antiquities in 1974-1975 — it is, unfortunately, impossible to locate this deposit within the castle, but it was potentially near the entrance in the north — and from Miller's (1991) Archaeological Survey of the Kerak Plateau (ASKP), including another unstratified deposit closer to Brown's excavation in the south of the site, and surface collected material from around the walls. While his dissertation includes a wealth of information about architectural patronage and politics from the early Middle Islamic period into the Ottoman period, this is based primarily on historical evidence. While the ceramics provide a useful catalog of material from the site and demonstrate occupation during the periods he discusses, they are essentially a survey assemblage — and, in the case of the DoA clearance, one for which much contextual data is missing — and must be treated as such.

As noted above, Brown (1989: 292) initially dated the Palace Reception Hall at al-Karak to the early 14th century, during the reign of al-Nāṣir Muḥammad. This would likely make the Reception Hall part of the *qaṣr* built by al-Nāṣir Muḥammad in 1311, and perhaps the Qā'at al-

[100] Brown's (1992) dissertation, likewise, focused on Middle and Late Islamic period settlement patterns of the Karak Plateau (see also Brown 2000), but this will be discussed in the context of ceramic distributions (see Chapter 6).

Nuḥās (Ar. "Hall of Copper") — or Qā'at al-Naḥḥās (Ar. "Hall of the Coppersmith"; see Walker 2011b) — which seems to have displayed copper or copper-alloy decorations (Brown 2013a: 315; Brown 2016: 556). Walker (2011b: 88-89, n. 212) points out that the Palace Reception Hall is unlikely to be the Qā'at al-Nuḥās, as Ibn al-Furāt's description suggests a location in the western, rather than souther, part of the castle, and also notes that the Reception Hall's architecture may suggest an Ayyūbid date. While Brown (2013a: 316; Brown 2016: 556) argues that it is "not necessarily the case" that Ibn al-Furāt's description requires the Qā'at al-Nuḥās to be in the western part of the castle, recent reanalysis of Phase 1a material from her 1987 excavations — in particular, Stefan Heidemann's identification of a coin previously thought to be a 14th century Mamlūk issue as Seleucid (i.e. 2nd-1st century BC) and the identification of a Middle Islamic Ic-IIa lustreware stonepaste bowl (Brown 2013a: 324-325, 321, Figs. 9-10) — does, in fact, suggest a Middle Islamic IIa, rather than Middle Islamic IIc, date for the foundation of the Reception Hall. Given this, the Reception Hall should perhaps be identified with the Qā'at al-Nāṣirī, built between 1229 and 1249, during al-Nāṣir Dā'ūd's reign as *amīr* of al-Karak (Brown 2013a: 332; Brown 2016: 556).

While the location of the Qā'at al-Nuḥās within Qal'at al-Karak remains unclear, Brown (2013a: 315; 2016: 556) suggests that the copper furnishings from which it takes its name were made of copper from Faynān.[101] This was based on my earlier publications (notably Jones, et al. 2012; but also Jones 2016, which was originally presented at the 2012 "Materiality of the Islamic Rural Economy" Workshop at the University of Copenhagen), in which I suggested, on the basis of Kind, et al.'s (2005: 179, Table 1, 188) numismatic data, that copper was likely produced at Khirbat Faynān during the early 14th century. Indeed, Brown's suggestion is particularly

[101] In another somewhat interesting connection, Barqūq, discussed above in the context of 14th century copper currency, lived in the Qā'at al-Nuḥās during his 1389 AD exile in al-Karak, prior to his second reign (Brown 2013a: 315-316; Brown 2016: 556; Walker 2011b: 89; see also al-Bakhīt 1992: 102-103).

appealing, given that two of the five Mamlūk coins published by Kind, et al. (2005: 179, Table 1, Nos. 1384-1385) from Khirbat Faynān are issues dating to the third reign of al-Nāṣir Muḥammad, from 1310-1341.[102] The 2012 ELRAP probe in the Khirbat Faynān Area 15 slag mound (see Section 4.2.1), however, produced no evidence of 14th century copper production, and currently the production at Khirbat Faynān seems contemporary with — and perhaps even slightly earlier than — the 12th-13th century production at KNA. While it is not possible, at present, to entirely rule out this possibility, it now seems quite unlikely.

Politically, the Middle Islamic IIa and IIb are perhaps the most interesting periods in the history of al-Karak and al-Shawbak. As noted above, Saladin granted his younger brother, the future sulṭān al-ʻĀdil I, the *iqṭāʻ* (see Section 3.6.1) of al-Karak — probably including al-Shawbak, al-Salṭ, and al-Balqā'[103] — in 1189, following the Battle of Ḥaṭṭīn and subsequent campaigns in 1187-1188 (Humphreys 1977: 63), in which al-ʻĀdil secured the surrender of al-Karak (Brown 2013b: 713). These holdings remained al-ʻĀdil's after Saladin's death in 1193 (Milwright 2006: 5), in addition to holdings in the western and northern Jazīra, i.e. Diyār Muḍar and Diyār Bakr (Humphreys 1977: 83). Nucciotti (2007: 45) frames this as "nel 1193 la fortezza passò definitivamente nelle mani del fratello di Saladino, al-Malik al-ʻAdil Abu Bakr, che già la deteneva in *iqta* da qualche anno" and argues that this is likely the earliest date at which the Palace Complex at al-Shawbak could have been built. As Brown (2016: 549-551) argues, however, al-ʻĀdil's patronage of al-Shawbak seems to have been minimal in comparison to his patronage of al-Karak — and also of Ḥarrān in Diyār Muḍar, "his normal residence in this period

[102] Of the remaining three, one (Kind, et al. 2005: 179, Table 1, No. 1386) is an issue of Shaʻbān, who, in a 1375 AD *waqfiyya* discussed by Walker (2011b: 154-161) is recorded as endowing the revenue of a number of villages near al-Karak and al-Shawbak to al-Ḥaramayn (i.e. Mecca and Medīna). The remaining two coins (Kind, et al. 2005: 179, Table 1, Nos. 1387-1388) are too corroded to be accurately read, but are listed as "probably Bahri Mamluk."
[103] Humphreys (1977: 63-64, 424, n. 46) refers to "a listing of al-ʻAdil's possessions as of 588/1192" cited by the 13th century historians Ibn Wāṣil and Abū Shāma, which lists these three holdings, and suggests that "[i]t is reasonable to suppose that he received these at the same time as al-Karak," that is, in 1189.

[i.e. the period after Saladin's death]" (Humphreys 1977: 83), where his construction "must have been quite extensive" (Rice 1952: 45), and probably Qalʿat Jaʿbar, on the Euphrates, which he obtained in 1192 and made, along with al-Karak, one of his treasuries (Humphreys 1977: 65-66, 114; Tonghini 1998: 21) — and the Palace Complex, as discussed above, is certainly later. 1193, likewise, seems a rather arbitrary date for when al-ʿĀdil could have constructed such a feature at al-Shawbak. By mid-1192 he had already "set out to establish his government in his new lands" (Humphreys 1977: 66) and was already minting his own currency in Ḥarrān that year (Heidemann 2002: 276).[104] Nonetheless, 1193 is, as Nucciotti (2007: 45) states, an important turning point, as it represents the point at which al-Karak — and with it al-Shawbak and most of Transjordan — first became an entity officially, if not uncontestedly, independent from the sulṭān in Cairo, at the time Saladin's son, al-Afḍal. This situation lasted less than a decade, however, as al-ʿĀdil "proclaimed himself sultan"[105] in 1200 and retained al-Karak and al-Shawbak as his own holdings (Humphreys 1977: 125, 141).

Like Saladin, al-ʿĀdil "divided all [his] territories among [his] sons and other heirs during [his lifetime], retaining for [himself] a general, but extremely effective, supervision of the

[104] The earliest Ḥarrān issue of al-ʿĀdil listed by Balog (1980: 145, No. 358) dates to 589 AH/1193 AD, but this catalog, although it continues to be a crucial source, is now rather out of date. The issue of coinage is not entirely straightforward, however, and Ayyūbid *umarāʾ* were required to act somewhat differently in different holdings. As Balog (1980: 242) notes, al-ʿĀdil, while *nāʾib* of Damascus, did not mint coins there, "as the right of *sikka* belonged to . . . al-ʿAzīz ʿUthmān." During the same period, however, he *did* mint coins in Mayyāfāriqīn (modern Silvan, Turkey) and Ḥarrān (Balog 1980: 140-141, 145), which, like al-Karak and al-Shawbak, he held as *iqṭāʿāt* (Humphreys 1977: 83).

[105] Humphreys (1977: 365) argued that "[t]he meaning and nature of the sultanate constitutes one of the most vexing questions in medieval Islamic studies." While we often speak of a singular *sulṭān* in Cairo or Damascus, Humphreys (1977: 368) points out that "many members of the [Ayyūbid] dynasty had the right to claim the title of *al-sultan*—not because it had been legally conferred on them by some higher authority, but because they all shared to some extent the right to rule in their own names." Indeed, no Ayyūbid *sulṭān* was actually granted that title by the caliph in Baghdād until al-Ṣāliḥ Ayyūb in 1247 (Humphreys 1977: 140, 366). He notes further that "the chroniclers call a *sultan* any Ayyubid prince who governed a major city or region as an effectively independent ruler" (Humphreys 1977: 368), with the caveat that the "effectively independent ruler" of a more minor place might not be called a *sulṭān*. In this light, it is likely that the autonomous princes of al-Karak, discussed below, would not be considered *salāṭīn*. Al-ʿĀdil's claim was, at any rate, to "the head of the dynasty," but it is interesting to note that al-Muʿaẓẓam ʿĪsā called himself *sulṭān* as ruler of Damascus while his father, al-ʿĀdil I, was still *sulṭān* in the sense of being the dynastic head (Humphreys 1977: 367).

whole" (Humphreys 1977: 414, n. 10). In late 594 AH/1198 AD,[106] Sulṭān al-ʿAzīz ʿUthmān made al-ʿĀdil's son, al-Muʿaẓẓam ʿĪsā, *amīr* of Damascus (Humphreys 1977: 108), and with this al-Karak and al-Shawbak, as well. At the time, al-ʿĀdil was governor of Damascus in the theoretically temporary position of *nā'ib*,[107] and this gave him more permanent control (Humphreys 1977: 102, 109), as al-Muʿaẓẓam ruled these territories "under his tutelage" until al-ʿĀdil's death in 615 AH/1218 AD (see also Brown 1988: 242; Humphreys 1977: 381, 384). Unlike his father, al-Muʿaẓẓam ʿĪsā seems to have taken a particular interest in his holdings in Transjordan, and notably in the south (Ghawānma 1982: 180). ʿIzz al-Dīn ibn Shaddād (1963: 80) notes that al-Muʿaẓẓam ʿĪsā "fortified and beautified" al-Shawbak (Brown 1988: 242; see also Ghawānma 1982: 181), and that he planted foreign trees in al-Shawbak's gardens until they were comparable to those in Damascus (see also Brown 1988: 242; Milwright 2006: 17). Brown (2016: 552) suggests that this reference likely refers to the period "when Damascus remained beyond his reach and his principal territorial domain was limited to Palestine and Transjordan," that is, the period between 1198 and 1218, when all of his territories were ruled jointly with al-ʿĀdil. This is likely the period when the Palace Complex was built at al-Shawbak,[108] as well, and also the period during which al-Muʿaẓẓam ʿĪsā was most active as an architectural patron of Jerusalem (Korn 2004: 82-85). It is likely that, if the investigators are correct in dating the *ḥammām* at Khirbat al-Dūsaq, ca. 4 km east of al-Shawbak, to the reign of al-Muʿaẓẓam ʿĪsā (Pascual and March 2015; Vigouroux, et al. 2015), this construction should be placed in this

[106] Brown (1988: 242) gives 1197 AD as the date al-Muʿaẓẓam ʿĪsā was given control of al-Shawbak. This is perhaps a conversion error between *ḥijrī* and Gregorian dates, as early 594 AH would correspond to late 1197 AD.
[107] This term is often translated as "governor," though "deputy" is sometimes preferred (e.g. Escovitz 1983: 147; Holt 1975: 237). Popper (1955: e.g. 90, 93, 102, 104-105) gives the translation "viceroy."
[108] Nucciotti (2007: 45), as above, suggests a date closer to "1208" (probably a typo for 1218), "quando al-Muʿazzam Sharf al-Din ʿIsa, figlio di al-ʿAdil, eredita il castello." There is no particular reason to assume that al-Muʿaẓẓam would have needed to wait until al-ʿĀdil's death to build at al-Shawbak, particularly given that, as noted above (n. 105), he was referring to himself as Sulṭān of Damascus prior to 1218. On the contrary, Brown's (2016: 552) suggestion that al-Muʿaẓẓam's patronage at al-Shawbak should be placed earlier in his career, when al-ʿĀdil exercised greater control over Damascus, seems preferable.

earlier period of his rule. I suggest later that this is a likely candidate for the period during which Middle Islamic period copper production first began in Faynān (see Chapters 4, 9, and 10).

On al-Mu‘aẓẓam ‘Īsā’s death from dysentery in 624 AH/1227 AD (Humphreys 1977: 184), the Sulṭānate of Damascus, as well as al-Karak and al-Shawbak, passed to his son, al-Nāṣir Dā’ūd (Drory 2003; Humphreys 1977: 193; for a more detailed account of his career as *amīr* of al-Karak, see Ghawānma 1982: 231-280). It is here that we see, again, the beginnings of an autonomous Emirate of al-Karak. In 1228, the Sulṭān of Egypt and dynastic head, al-Kāmil, requested that al-Nāṣir Dā’ūd give him al-Shawbak, “which he wanted for an arsenal and storehouse” (Humphreys 1977: 193). While Humphreys (1977: 193-194) suggests that he “would have been well advised to cede the place, since it lay in the extreme south of his possessions and guarded no military road which he was ever likely to use,” he did not, and al-Kāmil’s response was to attempt to bring Damascus under his control through military force. The history of this conflict is interesting, particularly as al-Nāṣir Dā’ūd was in fact quite popular as ruler of Damascus, but the key point here is that, in 1229, al-Nāṣir Dā’ūd surrendered to al-Kāmil (Humphreys 1977: 205-206). Al-Nāṣir Dā’ūd, as part of his surrender, retained Transjordan — with the key exception of al-Shawbak — and parts of inland Palestine, while al-Kāmil took Damascus, coastal Palestine, and al-Shawbak (Humphreys 1977: 206). Nonetheless, the value of al-Shawbak seems to have been such that even in the context of the surrender, al-Kāmil paid al-Nāṣir Dā’ūd 16,000 *dīnār* for it (*EI2*, al-Shawbak; Milwright 2006: 17).[109] After this, al-Nāṣir Dā’ūd ruled a semi-autonomous Emirate of al-Karak, encompassing most of Jordan, except for al-Shawbak, from 1229 until 1249 (Brown 2016: 555; Milwright 2006: 6; see also Walker 2011b: 9). As noted above, he is also the likely patron of the Palace Reception Hall at al-Karak,

[109] Al-Maqrīzī (1980: 210) explains that al-Nāṣir Dā’ūd was given al-Karak and al-Shawbak in exchange for Damascus, and “renounced Shawbak to al-Kāmil, who accepted it.” In this context, the exchange posited by Bakhīt (*EI2*, al-Shawbak) would make sense.

if it is, indeed, to be identified with the Qā‘at al-Nāṣirī (Brown 2016: 555). He added ‘Ajlūn to this territory in 1237, as part of an alliance with al-Kāmil to attempt to retake Damascus from a group of rebellious *umarā’*, although they were unsuccessful in this ultimate goal, in part because al-Kāmil died — also of dysentery — in March 1238 (Humphreys 1977: 234, 237-238).

As Milwright (2006: 6) notes, the 1230s had not been a particularly peaceful period for the Ayyūbid family, and, although "al-Kamil had come very close to recreating the unified empire of his father and Saladin" (Humphreys 1977: 239), after his death the Ayyūbid polity entered a period that Humphreys (1977: 239-281) calls the "Third Civil War." During the brief reign of al-‘Ādil II as *sulṭān*, al-Nāṣir Dā’ūd briefly held his cousin, al-Ṣāliḥ Ayyūb, prisoner in al-Karak, ostensibly to protect him, but largely because he saw "a superb opportunity to gain a new if not altogether willing ally in his struggle to regain Damascus" (Humphreys 1977: 260-261; see also Milwright 2006: 6). Ultimately, however, this was not successful. Al-Ṣāliḥ Ayyūb became Sulṭān of Egypt in 637 AH/1240 AD, after which al-Nāṣir Dā’ūd almost immediately requested control of al-Shawbak, but al-Ṣāliḥ Ayyūb refused and "declared openly that all his commitments to the prince of al-Karak were invalid" (Humphreys 1977: 265). This led to a rather complicated conflict involving al-Nāṣir Dā’ūd, al-Ṣāliḥ Ayyūb, and a number of other Ayyūbid *umarā’* — notably al-Ṣāliḥ Ismā‘īl, *amīr* of Damascus — as well as the Franks and Khwārazmian mercenaries, all of whose allegiances shifted with dizzying rapidity (Humphreys 1977: 265-296). It is not necessary to summarize the entire conflict here, as the key event took place toward its end, when in 647 AH/1249 AD al-Nāṣir offered "to surrender al-Karak to the sultan, on the condition that he grant him in return al-Shaubak and a benefice (*khubz*)[110] in

[110] The term *khubz* is difficult to translate, though "benefice" is not entirely inaccurate. In Ayyūbid and Mamlūk sources, the terms *khubz* and *iqṭā‘* (see below) are used somewhat interchangeably (Sato 1997: 249; Tramontana 2012). It is possible that in this specific case a distinction is being implied between al-Nāṣir's desire to have al-

Egypt" (Humphreys 1977: 296; see also Drory 2003: 173). Al-Nāṣir Dā'ūd, it turns out, did not honor this offer — likely due to a combination of rumors concerning both al-Ṣāliḥ's health and the Seventh Crusade — and later that year fled to Aleppo, perhaps because al-Nāṣir Yūsuf seemed to be his last chance for a successful alliance against al-Ṣāliḥ, although it seems he intended to return to al-Karak (Drory 2003: 173; Humphreys 1977: 296-297). While he was away, two of his sons seized control of al-Karak and surrendered it to al-Ṣāliḥ Ayyūb (Humphreys 1977: 297; Milwright 2006: 6), ending the first period of al-Karak's autonomy. Al-Ṣāliḥ evidently "rejoiced greatly at the taking of Karak," and decorated and had drums beaten in "Cairo and Miṣr,[111]" after which he "sent to Karak a million Egyptian *dīnārs*, and jewels and munitions and weapons" (al-Maqrīzī 1980: 293).

Milwright (2008a: 39) argues:

> Despite the strategic and economic value of the lands east of the [Jordan Valley] Ghawr, it would be unwise to overestimate the power enjoyed by the ruler of this region. Central and southern Jordan did not possess the military resources to challenge seriously the forces of the rulers of Cairo or Damascus. Al-Nāṣir's territorial aspirations were repeatedly thwarted and his continued autonomy in Karak was subject to the will of the sultan in Cairo.

While this is certainly accurate in reference to al-Nāṣir Dā'ūd's reign in al-Karak, it misses several key points. First, al-Karak's strategic position between Cairo, Damascus, and the Crusader polities of the northern Levantine coast meant that, unlike farther flung provinces, it was more difficult for al-Karak to simply remain neutral and maintain its autonomy. Second, al-Ṣāliḥ Ayyūb's role in allowing the autonomy of al-Karak seems no greater than in the case of other minor provinces. Ḍayfa Khātūn of Aleppo refused to join the alliance between al-Nāṣir Dā'ūd and al-Ṣāliḥ Ismā'īl precisely because al-Ṣāliḥ Ayyūb had offered to guarantee Aleppo's

Shawbak as a residence compared to a more strictly formal *iqṭā'* — i.e. a source of tax revenue — in Egypt, but this is not entirely relevant here.

[111] I.e. al-Fusṭāṭ (see Brown 2013b: 714).

autonomy (Humphreys 1977: 266). Likewise, this understates the complexity of Ayyūbid politics during this period. While al-Ṣāliḥ Ayyūb did, with his control of al-Shawbak, thwart al-Nāṣir Dā'ūd's ambitions of controlling all of Transjordan, it is worth keeping in mind that this was a period of civil war, and al-Nāṣir in fact spent much of this period rebelling against Cairo. Third, in a similar vein, al-Nāṣir's goals are relevant to this evaluation. While he certainly was interested in ruling all of Transjordan, one of his key goals was also to regain Damascus (Drory 2003: 166). It is unlikely that an *amīr* of al-Karak — or, indeed, anyone but the *amīr* of Cairo or Damascus — could have made a serious claim to being *sulṭān* in the sense of dynastic head, but al-Nāṣir, nonetheless, could claim to be mostly autonomous as ruler of al-Karak. Fourth, and slightly less compelling, it is difficult not to see al-Nāṣir Dā'ūd, as Drory (2003: 169) puts it, as a "luckless" figure who in slightly different circumstances perhaps could have posed a greater threat to Cairo. Finally, the military power of Egypt, arguably, was not actually drawn from that region. Although the Khwārazmian mercenaries, mentioned above, were rather unreliable allies (Humphreys 1977: 262-290; see also Drory 2003: 162, 172), much of Egypt's military power in fact derived from the *mamālīk* (Clifford 2013: 66-70), who, of course, would be the dominant political force in Egypt and Syria from the 1260s until the Ottoman conquest in 1516, but also played key roles in al-Karak's final autonomous phase.

From 647-early 648 AH/1249-mid-1250 AD, al-Karak was under the control of the Sulṭān of Egypt — first al-Ṣāliḥ Ayyūb, followed by his son, al-Mu'aẓẓam Tūrānshāh (Humphreys 1977: 384). In early 1250, Tūrānshāh, worried about a potential challenge as dynastic head, exiled al-'Ādil II's son, al-Mughīth 'Umar — who was already imprisoned in Cairo — to al-Shawbak (Humphreys 1977: 305). Tūrānshāh, however, was assassinated by a group of Baḥrī *mamālīk* and the first Baḥrī Mamlūk *sulṭān*, al-Mu'izz Aybak, was chosen to replace him (Clifford 2013: 74; Humphreys 1977: 303; Milwright 2006: 6; Milwright 2008a: 40; for a more detailed account of this event, see Thorau 1992: 43-47). Following Tūrānshāh's assassination, the *nā'ib* of Transjordan freed al-Mughīth from prison and brought him to al-Karak, where he was made *amīr* (Humphreys 1977: 305; Milwright 2006: 6; Milwright 2008a: 40; on his career, see also Ghawānma 1982: 283-333). Although initially the *nā'ib*, Badr al-Dīn al-Ṣawābī, remained in power, by August of 1250 — upon his refusal to give up al-Shawbak and al-Karak — al-Mughīth 'Umar was made governor of a somewhat reduced Transjordan by al-Nāṣir Yūsuf, the *amīr* of Aleppo who had recently conquered Damascus, who recognized that he could not mount a siege on al-Karak (Humphreys 1977: 309).

Al-Mughīth's tenure as independent *amīr* of al-Karak was, at least at first, rather more successful than al-Nāṣir Dā'ūd's. He seems to have recognized his leverage with al-Nāṣir Yūsuf, and within a year had conquered the town of Nāblus. While al-Nāṣir quickly reconquered this, he realized that he also needed al-Mughīth's loyalty and in return granted him several former territories of Transjordan — al-Balqā' and the Jordan Valley Ghawr — as well as Bayt Jibrīn and "possibly Hebron" in Palestine (Humphreys 1977: 321). In 655 AH/1257 AD, Aybak was assassinated and his 15-year-old son, al-Manṣūr 'Alī became *sulṭān* (Humphreys 1977: 329-330; Thorau 1992: 52-53). Al-Nāṣir Yūsuf's Baḥrī *mamālīk* wanted him to take advantage of the instability this generated in Egypt, and his inaction seems to have led them to abandon him and, ultimately, declare their allegiance to al-Mughīth 'Umar — without actually telling him first, though he happily accepted their offer (Humphreys 1977: 331; Milwright 2006: 6; Milwright 2008a: 40; Thorau 1992: 53-54). Unlike al-Nāṣir Yūsuf, al-Mughīth 'Umar was favorably inclined toward the idea of invading Egypt (Humphreys 1977: 331; Thorau 1992: 54). Humphreys's (1977: 331-332) summary of the success of this plan is worth quoting in full:

> Why anyone thought that such an expedition could succeed is a mystery: there is no evidence that any faction in Egypt was prepared to support the invaders, while the force finally assembled by al-Mughith was hardly overwhelming—700 cavalry, of whom 300 are termed *muqatila* (presumably Bedouin warriors).
>
> There could be no hope of surprise, for when the Cairo government had learned of the Bahriyya's departure from Damascus, they had assumed that it signaled a new assault on Egypt by al-Nasir. Accordingly by the beginning of Shawwal 655/mid-October 1257 a large contingent had been posted at ʻAbbasa as an advance guard.

Unsurprisingly, the invasion did not succeed. The battle actually went surprisingly well for the invaders at first, but as they realized how much larger the Egyptian army was they fled, and a second attempt, also unsuccessful, was made in 1258 (Humphreys 1977: 332-333; Thorau 1992: 55). Later in 1258, the Baḥrī *mamālīk*, apparently somewhat independently, began raiding al-Nāṣir's territory, prompting al-Nāṣir to respond, ultimately, by mounting a six-month-long siege of al-Karak at Birkat al-Zayzā', after which al-Mughīth was forced to surrender the Baḥriyya to al-Nāṣir (Humphreys 1977: 342-344; Thorau 1992: 55-57).

At the same time, a Mongol conquest of al-Karak was becoming a real possibility. In 1260, the Mongols conquered both Aleppo and Damascus, and according to the contemporary report of Abū Shāma reached as far south in Jordan as "Mawjib al-Karak" (Amitai 1987: 237; Amitai-Preiss 1997: 6), i.e. Wādī al-Mūjib (Amitai 1987: 249, n. 12), only ca. 30 km north of Qalʻat al-Karak. Al-Mughīth seems to have realized the nature of this threat early on. Already in 1254, William of Rubruck (2004 [1900]) had met a representative of al-Mughīth ʻUmar at the court of Möngke Khan who told him that al-Mughīth "wished to become the tributary and friend of the Tartars" (see also Amitai-Preiss 1995: 21; Amitai-Preiss 1997: 5; Milwright 2006: 7), and as the Mongols advanced into southern Bilād al-Shām he realized his position and "submitted voluntarily to the Mongols in order to save himself and his principality" (Thorau 1992: 69; see also Amitai-Preiss 1995: 34), although the early 14th century historian, al-Yūnīnī, argues that al-

Mughīth did this only to buy time (Amitai-Preiss 1997: 6).[112] On Sept. 3, 1260, the Mamlūks achieved their decisive victory[113] over the Mongols at the Battle of ‘Ayn Jālūt, after which the Mamlūk *sulṭān*, Quṭuz, was assassinated — probably by Baybars, the head of the Baḥriyya both during and after their service to al-Mughīth ‘Umar — and replaced by Baybars, who is often regarded as the founder of the Mamlūk state[114] (Amitai-Preiss 1997: 7; Humphreys 1977: 359-361; Thorau 1992: 75-85, and the entire book for a detailed account of Baybars I's career). Earlier that year, the Mongols had captured al-Nāṣir Yūsuf, who had been encamped again at Birkat al-Zayzā' (Amitai-Preiss 1997: 6; Humphreys 1977: 357, 470-471, n. 84; Thorau 1992: 69), and taken him to Tabrīz, where, upon hearing of the Mongol defeat at ‘Ayn Jālūt, the Īlkhānid ruler, Hülegü, executed him (Humphreys 1977: 358; Milwright 2006: 7; Thorau 1992: 77). It would seem that both of these events would have strengthened al-Mughīth ‘Umar's position, but this also drew the attention of Baybars, who was seeking to consolidate his own position. In response, at least theoretically, to raids by al-Mughīth's newly acquired Kurdish troops — the Shahrazūriyya — into Mamlūk territory, Baybars captured al-Shawbak in late 1261,[115] and besieged al-Karak (Milwright 2006: 7; Milwright 2008a: 42; Thorau 1992: 134-

[112] A Mongol governor of al-Karak was appointed, but never actually arrived, due to the Mongol defeat at ‘Ayn Jālūt (Amitai-Preiss 1997: 7-9; see also Milwright 2006: 7).

[113] As Halperin (2000: 229) argues, however, this interpretation makes sense only in hindsight. While this battle does seem to mark the end of the Mongols' conquest of Syria and the beginning of Mamlūk hegemony in the Levant, the Mongol defeat was far from total, and they did not give up the goal of conquering Syria until more than 60 years later.

[114] Clifford (2013: 83-112) argues that, although most scholars of the Mamlūk period would consider Baybars I's reign the beginning of the Mamlūk *state* — the reigns of Aybak and al-Manṣūr ‘Alī, in particular, were rather "Ayyūbid" in nature — his fundamental shift of Egyptian and Syrian politics away from the interests of individual elites and toward the success of the polity is rarely recognized. Indeed, this marks a considerable change in how elites conducted politics, and in how the provinces were managed. As described below, although general "Middle Islamic" trends can be described, interactions between Jordanian locals and the Mamlūk state, as analyzed in much of Walker's (e.g. 2003; 2004; 2008; 2009b; 2011b) work, were rather different from those between Jordanian locals and the Ayyūbid elite.

[115] Al-Maqrīzī places this event in March 1260, before the Battle of ‘Ayn Jālūt (Thorau 1992: 139, n. 2), but this contradicts the date given in a number of other sources, including Ibn Wāṣil, who was not only a contemporary witness of the event, but had been an administrator at al-Karak during the reign of al-Nāṣir Dā'ūd (Hirschler 2014: 141).

135). As always, however, al-Karak proved too difficult to take, and Baybars proceeded through other means. In early 1263, Baybars persuaded al-Mughīth, who was wary of the encounter, to meet him at Mt. Tabor, with the guarantee that he would retain his position in al-Karak. Upon his arrival, however, al-Mughīth was arrested, and probably in early 1264, executed in Cairo (Amitai-Preiss 1997: 10; Milwright 2006: 7; Milwright 2008a: 42; Thorau 1992: 135-136), and al-Karak fell under Mamlūk control. In order to justify this act of oath-breaking, Baybars seems to have produced letters between al-Mughīth and Hülegü plotting an attack on Egypt, in return for which al-Mughīth's territories would be substantially expanded (Amitai-Preiss 1995: 153; Amitai-Preiss 1997: 10). These details may be suspect, but it seems fairly certain that al-Mughīth, again aware of his position — particularly after the events of 1261 — was plotting with the Mongols against the Mamlūks, and that the end result of this was the end of the independent Ayyūbid Emirate of al-Karak (Amitai-Preiss 1997: 10-11). It is also interesting in this context to note a dedicatory inscription found in an unstratified context at al-Karak, with the ruler's name intentionally removed. A date of 651 AH/1253-4 AD was preserved on the inscription, which places it in the reign of al-Mughīth, suggesting an act of *damnatio memoriae* by Baybars in or after 1263 AD ('Amr 1989; see also Milwright 2006: 15) and, if nothing else, Baybars's intense dislike of al-Mughīth. Al-Karak was, thus, the last truly independent Ayyūbid emirate to come under direct Mamlūk control.[116]

As I argue later in the dissertation (see Chapters 4, 9, and 10), copper production likely ceased with Baybars's conquest of al-Shawbak in 1261, if it had not already, and with this the last major phase of copper production in Faynān came to a close (*contra* Jones 2016; Jones, et al.

[116] Ḥimṣ was ruled by the Ayyūbid *amīr* al-Ashraf Mūsā until his death in December 1263 (Thorau 1992: 139), and Ḥamāh was ruled by Ayyūbid princes, including the polymath and memoirist Abū al-Fidā' (see Abū al-Fidā' 1983), through most of the 14th century. The rulers of both places had, however, sworn allegiance to the Mamlūks after the Battle of 'Ayn Jālūt, and as Northrup (1998: 214) states, their continued rule relied on "*de facto* recognition of Mamluk sovereignty."

2012; Newson, et al. 2007b, among others). Why this happened is addressed, in particular, in Section 9.4.1. This is not to say, of course, that al-Karak and al-Shawbak came entirely under the control of Cairo. Already during Qalāwūn's reign, in 1280, Baybars I's son al-Malik al-Sa‘īd Baraka — and, following his death, his brother al-Mas‘ūd Khiḍr — had mounted a revolt from al-Karak, where al-Malik al-Sa‘īd had been exiled, as part of the *nā'ib* of Damascus's attempt to declare himself *sulṭān* (Milwright 2008a: 43; Northrup 1998: 88-90). Likewise, the ties built with the Karakī tribes by Qalāwūn's son, al-Nāṣir Muḥammad, during his periods of exile to al-Karak proved useful to his successful bid for the sultanate (Milwright 2008a: 44; Walker 2011b: 90-91), and indeed, al-Karak's somewhat marginal position as a place of both refuge and exile would continue to influence Mamlūk politics. As Walker (2011b: 35) states, "[b]y the fifteenth century, Kerak had become a hotbed of political discontent, where ambitious amirs struggled for power within their own ranks and against the sultan himself." After the 13th century, however, Faynān seems to have played no role in this. This, likewise, is not to suggest that Faynān was abandoned after the fall of al-Mughīth's Shawbak. As noted above, numismatic evidence (Kind, et al. 2005: 179) suggests some sort of occupation in Faynān during the 14th century. At present, however, there is little indication — archaeological or historical — of what the nature of this occupation might have been. As such, it is difficult to discuss Faynān's role in the political history of southern Jordan after the 13th century, and this background discussion can, for the most part, end in 1263. Several additional political-economic points are worth addressing in more detail, however.

3.6.1. The *iqṭā‘* System

The *iqṭā‘* system is incredibly important in Middle and Late Islamic period history, and also somewhat confusing due to changes over time. At its simplest, it can be described, following

Walker (2011b: 36) as a system of "quasi-feudal tax grants," though "feudal" is used as shorthand here, and should not be taken too literally (see *EI2*, Iḳṭāʿ; contra Poliak 1937 and Poliak 1939; cf. Irwin 1977). Sato (2015: 182) instead glosses the term *iqṭāʿ* as "[t]he land or, rarely, taxes allocated by a great amir or sultan to soldiers in return for military service." These short glosses provide a general sense of the institution, but a more detailed explanation is provided here, as some aspects of the system are non-intuitive or show differences between theory and practice.

Cahen relates the development of the *iqṭāʿ* to a lack of available land under an earlier and more permanent system of land grants called *qaṭīʿa* (see also Lambton 1967: 42), noting that "the effect was no longer to cede possession of land (subject to tithe [i.e. *ʿushr*]) but to delegate the fiscal rights of the state[117] over lands (subject to *kharādj*) remaining juridically in the hands of their former owners" (*EI2*, Iḳṭāʿ). The key issues here are ownership and revocability. Humphreys (1977: 371), in his summary of the general scholarly definition of the term, notes that "*iqtaʿ* refers to the institution of temporary and revocable grants of revenue-producing properties made by a Muslim ruler to his military officers; from the income of these properties they were required to furnish a specified number of fully equipped and trained cavalrymen upon the ruler's call-to-arms." This, in a nutshell, is what can be termed the "theoretical" definition of the *iqṭāʿ*, or the way that the system, in legal terms, was generally *meant* to work.

As Humphreys (1977: 371-372) argues, though, this "is at once too narrow and too simple, for in reality the term '*iqtaʿ*' refers to a group of institutions." These varied, first, in spatial terms. For example, Northrup (1998: 265) argues, following Brett (1984: 52-53), that the Fāṭimid

[117] As discussed in Section 2.1 and demonstrated in Section 3.6, above, I follow Clifford (2013: 46) and Humphreys (1977: 10) in avoiding reference to the Ayyūbid polity as a "state." The specific reasons are covered in Section 2.1, but I bring this up again here to note the influence of this view of the Ayyūbid polity on my understanding of the Ayyūbid *iqṭāʿ*. Given this, the points where this discussion differs from, for example, discussions of the Mamlūk *iqṭāʿ* are not necessarily points of disagreement about the fundamental nature of the institution.

iqṭā' in Egypt was a tax-farming institution where a *muqṭa'* "paid the 'state' for the use of the land." While under the Ayyūbids an "eastern"-type *iqṭā'* was introduced to Egypt, this differed from "its Syro-Jaziran counterpart" in that "the Ayyubid *iqṭā'* was granted only in a few instances on a hereditary basis, and seldom for the lifetime of its holder" (Northrup 1998: 266). Cahen argued that "the Ayyūbid and Mamlūk *iḳṭā'* is characterized by the maintenance of close administrative and financial control of the state over the *muḳṭa'*, who had no real independence and, in short, received a wage, the organization of which was not his concern" (*EI2*, Iḳṭā'), though again, this argument is specific to Egyptian *iqṭā'āt*. In the case of this dissertation, however, our main concern is the Ayyūbid *iqṭā'* in Bilād al-Shām. Second, there is also a distinction between the "formal administrative categor[y]" (Humphreys 1977: 372) of land meeting the "theoretical" definition of *iqṭā'* provided above, and a number of situations that are referred to in sources of the period as "*iqṭā'āt*" despite not conforming exactly to that definition. Humphreys (1977: 372) lists five scenarios that would be referred to as *iqṭā'āt* in Ayyūbid Bilād al-Shām, and these are worth quoting in full:

> the appanages distributed to the princes of the ruling family—these were normally hereditary and implied full powers of local government; 2) the governorships of the major towns, castles, or especially rich and strategic districts which were bestowed on the amirs; 3) villages and other properties whose revenues were assigned to the lesser amirs and some troopers, but the grant of which did not create governmental and administrative rights beyond the collection of rents and tax equivalents; 4) the stipends paid to the high civil and religious dignitaries of the regime—these were presumably drawn on a specific group of properties registered by the *diwan* officials, but do not seem to have conferred any administrative powers over them; 5) the pensions, also drawn from registered groups of properties, which were paid to certain members of the ruling family, including the women.[118]

Irwin (1977: 72) suggests an even broader range of scenarios:

[118] While specific to Ayyūbid Bilād al-Shām, Humphreys (1977: 473, n. 3) notes that similar informal categories are also observed elsewhere, for example by Lambton (1991: 60-66) in Saljūq Persia (see also Lambton 1965).

> The original meaning of the word *iqṭā'* assigned to it by the Arab lexicographers is 'portion' and it is often used in the sources to mean something no more precise than that. *Iqṭā'* was used as a means of maintaining garrisons, as a mark of status, as a formal approval of local notability, as a recognition of *de facto* political authority, as a loose equivalent of the term *wilāya*, and very likely even to designate Frankish fief tenure under Muslim suzerainty.

In other words, we are dealing with a wide range of scenarios, many of them at odds with part or all of the "theoretical" definition. Humphreys' Scenarios 1 and 2 are of particular interest here, and are more simply framed by Tramontana (2012: 115) as "*Iqṭā'/Khubz*[119] as an Estate" — or what al-Tawhih (2012) calls "al-iqṭā' al-idārī," or the administrative *iqṭā'*. We can see this definition at work in the dealings between various Ayyūbid *umarā'*, as, for example, in al-Mughīth 'Umar's refusal to surrender al-Karak and al-Shawbak to al-Nāṣir Yūsuf on the grounds that "he would have no place to go if he gave up these fortresses" (Humphreys 1977: 309). This is not the only possible scenario — indeed, Humphreys (1977: 374-375) argues that "all the most important amirs had townhouses in Damascus" and "an amir normally went to live on his estates only if he had fallen out of favor with the prince" — but it demonstrates that this *could* occur, and in the case of al-Karak seems to have occurred somewhat regularly. Ayyūbid princes seem to have been quite aware that the *iqṭā'* was not simply — or, at least, not always — a grant of tax revenue, and that the realities of these assignments involved factors beyond the will of the dynastic head. With this in mind, claims like Nucciotti's (2007: 45) argument that al-'Ādil could not have built at al-Shawbak while he only held it as *iqṭā'* seem to be too reliant on the "theoretical" definition of the *iqṭā'*. While this definition of *iqṭā'* was in use, the Ayyūbid *iqṭā'*, particularly among important *umarā'*, seems to have been something more permanent, and more often hereditary, than this definition would suggest (Humphreys 1977: 8). This is an important

[119] As noted above, in Section 3.6, n. 110, *khubz* (Ar. "bread") was used as a synonym for *iqṭā'* during the Ayyūbid and Mamlūk periods. Tramontana (2012) explores the situations in which these two terms could be used interchangeably and the variation in usage among different authors during the Middle Islamic II.

consideration when discussing the political economy of this period, particularly in the context of the sugar industry (see Sections 3.6.2, 9.4 and 9.4.1).

A key point is that the institution changed as it was adopted by the Mamlūks. Already during Baybars I's reign, the Syrian *iqṭāʿ* acquires a more temporary character. While, as noted above (Section 3.6), the Ayyūbid princes (*aṣḥāb*) who submitted to Mamlūk rule were allowed to keep their holdings, when they died they were replaced by *nawwāb* (Sato 1986: 86). This shift from a *muqṭaʿ* generally being a prince (i.e. *amīr* or *ṣāḥib*) to a "governor" (i.e. *nāʾib*) is telling when considered in the context of the Ayyūbid political history presented above (Section 3.6). *Nāʾib* was a decidedly temporary post, and implied less control than *muqṭaʿ* would have during this period. The equation of *muqṭaʿ* with *nāʾib* during the later 13th century, then, implies a shift away from the Ayyūbid *iqṭāʿ* to one much more in line with the "theoretical" definition. This process continued with the *rawk* (cadastral survey) of al-Nāṣir Muḥammad in 1313 AD (Irwin 1977: 72-73; Levanoni 1995: 53-55, 143, 171; Sato 1997: 135-152; Sato 2007; Walker 2007c: 178-187; Walker 2008: 81-85; Walker 2011b: 201-204). As Walker (2011b: 201-202) notes, the effect of the *rawk* "was to lay the economic foundations for Mamluk society by reallocating *iqṭāʿ*s among the sultan, amirs, and members of the *ḥalqah* [literally "circle," but here the word refers to non-Mamlūk members of the military]—empowering and enriching the sultan at the expense of the other *muqṭaʿ*s." It is worth noting that this shift was never total, and that "[t]he Mamluk elite—sultans and high-ranking amirs—created for themselves 'personal' *iqṭāʿ*s from the beginning of Mamluk rule, although this process accelerated markedly during the end of the fourteenth century" (Walker 2011b: 199). Nonetheless, for most of the Middle Islamic IIc, at least, the "theoretical" *iqṭāʿ* functioned much more as a "default" than it had during the Middle Islamic IIa. As archaeologists, this is important to keep in mind, particularly given the tendency to lump the Middle Islamic II together as an "Ayyubid-Mamluk" period. For the period at the core of this dissertation, a much broader definition of the *iqṭāʿ* must be used, when compared to work focused on the period of Mamlūk rule, which is particularly important in the context of the Ayyūbid-Mamlūk transition (see Section 9.4.1).

3.6.2. The Sugar Industry and Its Connection to Copper

Sugar was an incredibly lucrative crop during the Middle Islamic period and later, and a number of scholars have written on sugar production in the southern Levant. In economic history, Sato's (2015) recent monograph is the most up-to-date source, and his earlier papers remain useful, although often more focused on Egypt (Sato 2004; Sato 2009; on Syria specifically, Sato 2007). Ashtor's (1977) work on the decline of the sugar industry is, likewise, still important, though not particularly relevant to the argument I make in this dissertation, which concerns the expansion of the sugar industry. Galloway's (1977; 1989) work, while largely supplanted by Sato's for the Islamic sugar industry, is nonetheless still a useful introduction with a broader focus. Earlier sources, for example Deerr (1949-50), while still cited, have largely been superseded by more recent work. In this context, it is worth noting that while Mintz (1985), the classic anthropological work on sugar, remains theoretically important, his discussion of the early history at the core of this dissertation is now quite outdated. More specific discussions are also plentiful, for example Northrup's (1998: 278-280) attempt to describe the industry as it existed during the reign of the Mamlūk sulṭān Qalāwūn. Hamarneh's (1978) work in Arabic provides useful background on the origins of sugar production, but his coverage of the archaeology of sugar production in Jordan is very brief, and now outdated.

Archaeological sources are now quite plentiful, to the point that Cytryn-Silverman (2014: 4054) argues that "Sugar Archaeology" can be seen as its own separate subject within Crusader and Islamic archaeology. Most introductory texts on the "medieval" archaeology of the Middle East include a section on sugar production, with the best and most recent being Milwright's (2010: 70-73). Boas's (1999: 81) is shorter and slightly inaccurate, but a useful introduction. Rosen-Ayalon's (2006: 86) coverage is, unfortunately, too brief and inaccurate a summary to be useful.[120] Burke's (2004) review article on the archaeology of sugar production is now outdated, particularly for southern Jordan, but remains a useful overview of earlier work. Edna Stern's (1999a) Hebrew M.A. thesis, while now also out-of-date, attempts to evaluate the quality of evidence from earlier surveys, making it a useful contribution. Brigitte-Porëe's (1995) work is quite ambitious, but accepts that sugar production occurred at many sites for which the evidence is dubious or non-existent, and includes numerous duplications and other errors that make the work difficult to use. Walker's (2010: 145-150) more recent review is focused on Mamlūk sugar production, but her coverage is somewhat broader than this. Walker's (2011b) monograph on Mamlūk Jordan, while it has no section focusing specifically on sugar production, is nonetheless one of the most useful works of historical archaeology on the subject.

Several regionally specific works on sugar production have also appeared. Abu Dalu's (1995) Arabic paper on the archaeology of sugar production in the Jordan Valley is now somewhat outdated and includes several dubious sites, but also provides a very detailed and useful account of the sugar production process. LaGro's (2002) doctoral dissertation, while focusing on pottery from Tall Abū Ṣarbūṭ, likewise provides useful summary of the history and technology of sugar production. Politis (2013b) has recently published a similar summary, focusing on the industry in the southern Dead Sea *aghwār*. In the context of regionally specific studies, it is also worth noting the body of research on Crusader and Venetian sugar production

[120] A notable omission is Khirbat al-Minya, at which Rosen-Ayalon worked, and which receives its own subheading in the context of Umayyad architecture (Rosen-Ayalon 2006: 44-46). Despite this, the sugar mill 50 m to the east at the Huqoq/Yaqūq Beach site (Cinamon 2012) is never mentioned.

on Cyprus, which is quite developed (Luttrell 1996; Phillips 1986; Solomidou-Ieronymidou 2007; von Wartburg 1983; von Wartburg 1995a; von Wartburg 1995b; von Wartburg 2001).

The Origin and Decline of the Southern Levantine Sugar Industry

The origins of sugar production in the Levant are not entirely clear. The plant itself likely originated near New Guinea, and the method of producing crystalline sugar seems to have been developed in northern India some time after the 1st century AD (Sato 2015: 15-17). From here, both spread northward into China and westward into Iran, ʻIrāq, the Levant, Egypt, and North Africa. Galloway (1977: 180; 1989: 33) argues, following Deerr (1949-50: 74-87), that "sugar followed the Koran," and that Levantine sugar production began as early as the early 7th century. There seems to be no reason to accept quite so early a date, but Waines (*EI2*, Sukkar) notes evidence from papyri that sugar production had expanded from Persia to Egypt by the mid-8th century AD.[121]

By the mid-10th century, al-Muqaddasī (1896: 70-71) refers to sugar cane as a product of Palestine that is "very rare in other countries," but lists sugar only as a key product of Tyre — to this we can likely add other northern coastal cities, such as Ṭarābulus/Tripoli (Sato 2015: 23-24). Other cities that would later become important sugar production centers seem, at this time, to have been producing primarily indigo[122] and dates, as well as rice in the case of Baysān (al-Muqaddasi 1896: 69-71; see also Ibn Ḥawqal 1964: 183; Politis 2013b: 470; Schick 1997: 75; Whitcomb 1992a: 117). While Boas (1999: 81) implies that sugar production was expanded to the Jordan Valley and Transjordan during the 12th century by the Franks, it is not entirely clear that this is the case, as al-Idrīsī (1836: 339), writing in the mid-12th century, lists the main

[121] Canard and Berthier (*EI2*, Ḳaṣab al-Sukkar) mistakenly give the date as the 2nd century AD. This evidence should actually be placed in the 2nd century AH.
[122] During the 19th century, indigo was again a key product of the Dead Sea *aghwār*, and both Burckhardt (1822: 392) in 1812 and Palmer (1871: 461) in 1870 record it being grown there.

product of the Jordan Valley as indigo (see also LaGro 2002: 26). While the Franks do seem to have grown sugar during this earlier period, this was likely limited to the coasts, although it is possible that this production extended to Tiberias/Ṭabariyya, Baysān, and Jericho (Sato 2015: 23). The expansion to the eastern Jordan Valley and Dead Sea *aghwār*, however, seems to have occurred in the late 12th and early 13th centuries, as Yāqūt (1979: IV: 217), writing in the early 13th century, seems to be the first geographer to list sugar as the principle product of the Jordan Valley (LaGro 2002: 26).[123]

During the late 14th and 15th centuries, the southern Levantine sugar industry seems to have gone into decline (Ashtor 1977; Milwright 2010: 72-73; Walker 2007c: 174; Walker 2010: 146; Walker 2011b: 82-85), and tax registers from the 16th century indicate that sugar was no longer being grown at the former centers of production in the eastern Jordan Valley (Walker 2008: 95; Walker 2011b: 84-85). Sugar production has been documented into the late 16th (Walker 2010: 146) or early 17th (Politis 2013b: 469) century, but this later production currently seems to have been concentrated in the western Galilee, for example at Lower Ḥorbat Manot (Stern 2001: 293-299) and Umm al-Faraj (Damati 2011).

The Archaeology of Sugar Production

The most obvious pieces of archaeological evidence for sugar production are sugar mills, or in Arabic, *ṭawāḥīn al-sukkar*. As Politis (2013b: 468) argues, the Arabic terms *ma'aṣir al-sukkar* (i.e. "sugar press") or *maṣna' al-sukkar* ("sugar factory," pl. *maṣāni' al-sukkar*) are more accurate, as the term *ṭāḥūn* (pl. *ṭawāḥīn*) "implies 'grinding' or 'pulverising' (e.g. wheat into flour)." Despite this, I prefer the term "sugar mill" here, not only because *ṭawāḥīn al-sukkar* is a common toponym in the southern Levant, but also because "sugar mill" is the most common way

[123] Politis (2013b: 470) places Yāqūt in the 11th century AD, suggesting an earlier date for the beginning of sugar production in the Dead Sea *aghwār*. This is mistaken, however. Yāqūt's *Mu'jam al-Buldān* was written in the 1220s AD (*EI2*, Yāḳūt al-Rūmī).

of referring to a sugar factory in English (the same term is used for sugar production sites in the Caribbean, e.g., Meniketti 2006; Moreno Fraginals 1976). Sugar mills are known across "the Islamic world," from the large and relatively late mill at Chichaoua (Shīshāwa), Morocco (Berthier 1970) to the 12th (or perhaps even 11th) century sugar mill excavated near the Achaemenid "Chaour" (Shāūr) Palace at Sūsa in Khūzestān (Boucharlat, et al. 1979). A large number of mills and associated sites are known in the southern Levant (see Appendix 3, Table A3.1 and Fig. 3.15), but as Walker (2010: 146, n. 109) and Burke (2004: 112) point out, it is unclear that sugar was produced at all of these sites, as mills or aqueducts, in the absence of sugar pot sherds, are not clear evidence for sugar production. In Appendix 3, I try to strike a balance between including dubious sugar production sites and excluding possible sites by evaluating the quality of the evidence for sugar production at a given site and attempting to distinguish between evidence of production and evidence of distribution or consumption. This section provides a brief account of evidence for sugar production in the southern Levant.

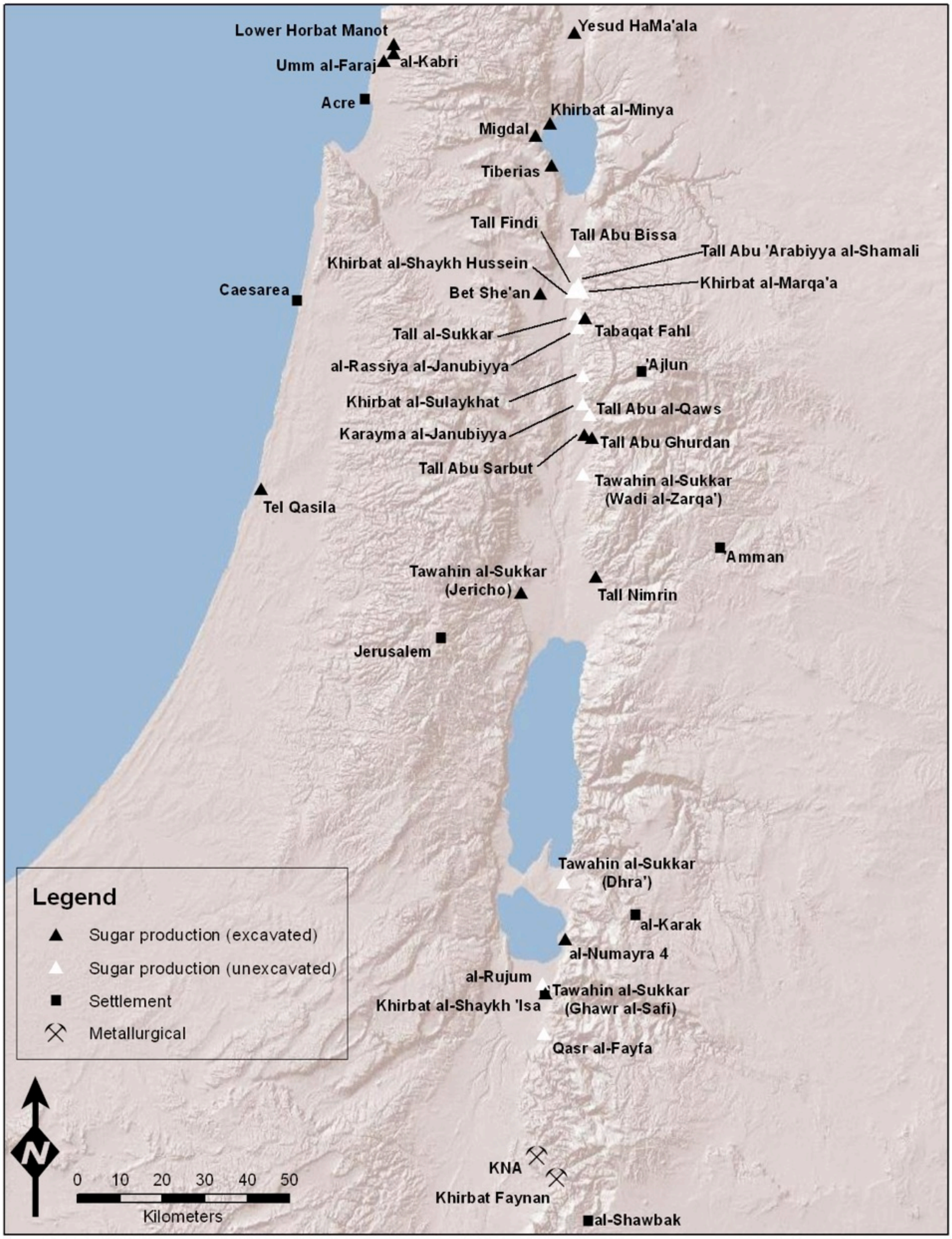

Figure 3.15: Sites in the southern Levant for which evidence for sugar production is ranked as “certain” or “likely” in Appendix 3. (Basemap: © 2014 Esri.)

Sugar production sites are known from a number of surveys of the southern Levant. In the Jordan Valley, the clearest evidence comes from the East Jordan Valley Survey (EJVS), which identified a number of sugar mills and distribution sites, several of which have since been excavated (Ibrahim, et al. 1976; Kareem 2000; Yassine, et al. 1988). The Jisr Shaykh Ḥussayn Project (JSHP) also found more limited evidence for sugar production, particularly at Tall Findī (Kareem 1989; Lenzen, et al. 1987). The Wādī al-Yābis Survey (WYS) also found evidence of sugar production, although this is less clear (Mabry and Palumbo 1988a; Mabry and Palumbo 1988b). While Abu Dalu (1995) lists a number of sites from the Wādī al-'Arab Survey (WAS) as sugar mills, these are much likelier to be later flour mills (Gardiner and McQuitty 1987; Hanbury-Tenison, et al. 1984). Likewise, seven mills were recorded on Wādī al-Sīr during the 'Irāq al-Amīr Survey, but the lack of Middle Islamic period pottery at any of the mills suggests, again, that they are more likely to be flour mills, particularly given their location in the eastern portion of the survey area, fairly far from the Jordan Valley and the probable sugar plantation at Kafrayn (Ji 1998: 601; see also Ji and Lee 1999: 523, Table 2). In the Dead Sea *aghwār*, King, et al.'s (1987) Survey of Byzantine and Islamic Sites in Jordan found evidence of sugar production in the form of both mills and sugar pot sherds, and MacDonald's (1992) Southern Ghors and Northeast 'Arabah Archaeological Survey (SGNAS) built on this and published several of these sites in much more detail. For the Galilee, the sources are unfortunately fewer and farther between. While the publication of the Archaeological Survey of Upper Galilee (ASUG) includes a number of sugar production sites, evidence for sugar production is discussed only rarely, and sugar pot sherds are not reported (Frankel, et al. 2001). For other regions — the Ḥūla Valley in particular — no comprehensive report has been published, and it is necessary to rely on other sources, for example Stern's (1999a) M.A. thesis.

The best evidence, however, comes from excavated sites. Burke (2004) summarizes the excavations at five sites in the southern Levant. I describe these only briefly here, and would direct the reader to Burke (2004) for more information. The first of these is Tall Abū Ghūrdān — often mistakenly called Tall Abū Qa‘dān (see Kaptijn 2009: 26) — a small site at the bottom of Tall Dayr ‘Allā, where sugar production seems to begin during the Ayyūbid period (Franken and Kalsbeek 1975; see also Franken and Ibrahim 1978; Sauer 1976). Second, the site of Tall Abū Ṣarbūṭ, not far Tall Dayr ‘Allā, has been excavated, and sugar seems to have been produced there for most of the Middle Islamic II (de Haas, et al. 1989; de Haas, et al. 1992; LaGro 2002; LaGro 2010; Steiner 1998; Steiner 2008). Third, excavations at Baysān/Bet She’an have produced evidence of sugar production, although publication of this material has unfortunately been patchy (see Hanna 2010; Syon 2004). Note that of the five sites listed by Burke (2004), this is the only one for which I do not consider sugar production “certain” (see Appendix 3, Table A3.1). The fourth is Yesud HaMa‘alah in the Galilee, which dates primarily to the 13th century (Biran and Shoham 1987; Shoham 1983; Shoham 1985), although the unpublished pottery from the site includes much later types that may indicate continuity of production into the late Mamlūk or even Ottoman period. Fifth, Lower Ḥorbat Manot has been excavated by Edna Stern (2001). Burke (2004: 111) states that it “dates to the Ayyubid and Mamluk periods,” but this is rather inaccurate, as the site was controlled by the Crusaders when production began in the 13th century, and production continued into the 16th or 17th centuries AD, or the early Ottoman period (Stern 2001: 281, 293-299). To this, Walker (2010: 147, n. 112) adds the excavations at Ṭawāḥīn al-Sukkar and Khirbat al-Shaykh ‘Īsā in Ghawr al-Ṣāfī, which have produced substantial evidence for sugar production (Jones 2017; Jones, et al. 2000; Photos-Jones, et al. 2009; Photos-Jones, et al. 2002; Politis 2013a; Politis 2013b; Politis, et al. 2005; Politis, et al. 2007; Politis, et al. 2009), including, recently, what seems to be the boiling room of the sugar factory (Politis 2013a: 195-196).

To this, I would add 11 sites that have been excavated and at which I consider evidence for sugar production to be either "certain" or "likely" (see Appendix 3, Table A3.1). At the first four sites, I classify sugar production as "certain," and at the next six "likely." Richard Jones (2017: 30-44), in a recent study published after the compilation of the data presented here, adds some, but not all, of these sites, and presents a slightly different updated picture.

The first of these is Ṭawāḥīn al-Sukkar near Jericho, excavated in 2000 and 20001 by Hamdan Taha of the Palestinian Department of Antiquities (Taha 2001; Taha 2004; Taha 2009). The site is a relatively complete sugar factory, and Taha (see 2009: 183, Fig. 2) was able to identify the pressing room (or "mill house"), boiling installations, storage facilities, and aqueducts, as well as a hoard of copper objects associated with copper slag (Taha 2001: 69-70; Taha 2009: 188) and a bulldozed mound known as Tall al-Nuḥās, which contained a large quantity of copper slag (Taha 2001: 69; Taha 2004: 75). As I have argued previously (Jones, et al. 2012: 93), these, as well as similar finds at Ṭawāḥīn al-Sukkar and Khirbat al-Shaykh 'Īsā in Ghawr al-Ṣāfī (Photos-Jones, et al. 2002: 606; Politis, et al. 2007: 206-207) and at Lower Ḥorbat Manot (Stern 2001: 300), are likely evidence for the repair of copper boiling vessels, discussed below.

Although Taha (2009: 183) dates the pottery only as "Ayyubid/Mamluk," the majority of the published pottery (see Taha 2009: 187, Fig. 7-11) can be dated more specifically to the Middle Islamic IIb-c, or the late 13th-14th centuries AD. The numismatic finds, however, present a different story. Only two of the "[m]ore than 32 coins" have been published, and Taha (2004: 76; 2009: 188) considers them both Ayyūbid. The first, bearing the names "el-'Ādil" and

"Maḥmūd ibn Zinki," he identifies as an issue of the Ayyūbid sulṭān al-ʻĀdil I, and dates to 1199-1218 AD (Taha 2004: 76; Taha 2009: 188). This identification is clearly mistaken, and the reverse legend "Maḥmūd ibn Zankī" indicates that this is an issue of the Zangid ruler Nūr al-Dīn, and should be dated 1146-1174 AD (see comparable coins from Ṣafad in Kool 2015: 93*, 94*, Nos. 5-6; and from Har Ḥoẓevim, near Jerusalem, identified by Berman in Kletter and Boas 2002: 202). This raises the question of whether the "latest" coin bearing the name "eṣ-Ṣaliḥ Ismael" should be considered an issue of the mid-13th century Ayyūbid *amīr*, al-Ṣāliḥ Ismāʻīl, as Taha (2004: 76; Taha 2009: 188) suggests,[124] or an early issue (ca. 1175-1178 AD) of Saladin bearing the name of Nūr al-Dīn's son al-Ṣāliḥ Ismāʻīl ibn Maḥmūd, as found, for example, at Khirbat al-Shamʻa (Hanson and Bates 1976: 164; see also Heidemann 2002: 276, 285, Nos. 71-72; Lane-Poole 1889: 308, No. 608), but without a fuller publication of this coin it is impossible to tell. Zangid coinage at the site would correspond well to the historical evidence for 12th century sugar production near Jericho that Taha (2001: 68; 2009: 181) cites, but some caution must be applied here. First, only two of the coins have so far been published, and as such it is not possible to determine the character of the coin assemblage. The same can also be said of the pottery assemblage; although the published pottery suggests a later date, few pieces have actually been published. Second, the coins were found as part of the copper hoard described above (Taha 2004: 76; Taha 2009: 188), which may suggest that they were no longer in circulation and were present at the site as scrap copper. As such, we can currently say with certainty only that sugar was produced at the site in the late 13th and early 14th centuries AD, although production may have started as early as the mid-12th century, or perhaps even earlier.

[124] His dating suggests that he has conflated al-Ṣāliḥ Ismāʻīl and al-Ṣāliḥ Ayyūb, but the mistake is relatively minor, as the two were contemporaries (see Section 3.6).

The second is Khirbat al-Minya, on the northwestern coast of the Sea of Galilee/Lake Tiberias, better known for its Umayyad *qaṣr* (see Bacharach 1996: 35; Creswell 1989: 93-95; Grabar, et al. 1960; Rosen-Ayalon 2006: 44-46). Cytryn-Silverman (2009: 59, n. 59) refers to "nearby remains of a large sugar factory" at the site, and Cinamon's (2012) excavations at the Huqoq Beach site, ca. 50 m from the entrance of the Umayyad *qaṣr*, have produced evidence of sugar production — mainly in the form of sugar pots — in the late 13th and 14th centuries AD.

The third is al-Kābrī[125] — Frankish Le Quiébre (see Frankel, et al. 2001: 14; Stern 2001: 303) — in the western Galilee. Excavations by Smithline (2004) revealed an 11th century AD feature that he identified as a boiling "installation for sugar production . . . attested to by the unique sugar pots found in close proximity." Smithline (2004) argues that "[t]his is probably the earliest evidence for sugar production in Israel yet uncovered," although the excavations at Umm al-Faraj, discussed below, have now produced equally early evidence. Parts of a 12th century Crusader sugar factory were also discovered in the same excavations.

The fourth is Tall Umm al-Faraj — Heb. Ben ʻAmi and Frankish Le Fierge (see Frankel, et al. 2001: 12; Stern 2001: 303) — ca. 3 km southwest of al-Kābrī in the western Galilee. Excavations by Damati (2011) revealed evidence for sugar production at the site beginning in the Fāṭimid period and lasting into the Ottoman period, suggesting that the site was in use for almost the entire period sugar was produced in the southern Levant, although it is worth noting that the Fāṭimid material was found as fill in and around Crusader period kilns (Damati 2011: 77*). The Crusader period kilns suggest that sugar pots were produced on site, and Damati (2011: 77*) speculates that pottery was produced at the site during the Early Islamic period, as well.

[125] This is not the better-known Tel Kabri, which is ca. 1.5 km to the southwest. As Frankel, et al. (2001: 14) note, the two are sometimes confused.

At the next five sites, sugar production is not certain, but is quite likely. The fifth site is al-Numayra 4 in Ghawr al-Numayra, one of the Dead Sea *aghwār*, roughly halfway between Wādī Karak, near the center of the Lisān Peninsula, in the north, and Ghawr al-Ṣāfī in the south. Salvage excavations were conducted in 1995 by Waheeb (1996: 452-455), after a survey prior to road construction revealed its presence. The excavators found "a basin, a well, waterducts and a pottery kiln," as well as "[q]uantities of sugarpot fragments," and Waheeb (1996: 453) suggests that this indicates that the site was a sugar factory, probably dating to the Middle Islamic II. Unfortunately, only a brief preliminary report of the site has been published. To the best of my knowledge, the site has generally been overlooked by archaeologists and historians interested in sugar production.

The sixth site is Migdal — Magdala, Ar. al-Majdal — located on the northwest coast of the Sea of Galilee/Lake Tiberias, between Tiberias/Ṭabariyya and Khirbat al-Minya. Excavations by Abu ʻUqsa (2001; 2005) and Avshalom-Gorni and Stern (2016) have recovered sugar pot sherds from both the upper (cone) and lower (molasses jar) vessels. The presence of sherds of both parts of the sugar pot, as well as the location of the site, suggests that sugar was produced there.

The seventh site is Ṭabariyya/Tiberias on the west coast of the Sea of Galilee/Lake Tiberias. Excavations in the Area A church on Mount Berenice produced sugar pot sherds and installations likely connected to sugar production in Stratum I, which the excavators date to the Mamlūk period (Hirschfeld 2004: 125). Hartal's (2008) excavations at the Galei Kinneret hotel have recovered sugar pot sherds in contexts that he dates to the Fāṭimid period. Stern (2013: 183, 203) suggests a 12th century date for this context, connected to sugar production at Tiberias while it was under the control of the Hospitaller Order. It does seem likely, however, that sugar was produced in Ṭabariyya/Tiberias as early as the 10th century, as al-Muqaddasī (1896: 27) refers to the consumption of sugar cane by the city's residents (see also Cytryn-Silverman 2009: 38).

The eighth site is Ṭabaqat Faḥl/Pella in the Jordan Valley. McPhillips and Walmsley (2007: 132) report that "[m]ore than ten percent of the Mamluk pottery from the Faḥl assemblage belongs to" their "Sugar Pot Ware" group. They suggest that sugar production took place in nearby Wādī Jirm, several hundred meters to the south, rather than at Ṭabaqat Faḥl itself, but nonetheless, it is fairly clear that the excavations have produced evidence for sugar production nearby. Schumacher (1888: 33) observed a mill at the site, but thought it "was certainly not older than a few centuries," though it is possible that it was, at one time, a sugar mill.

The ninth site is Tall Nimrīn, also known as Tall al-Shūna al-Janūbiyya. Excavations were conducted at the site in 1989, 1990, and 1993, and these recovered many sugar pot sherds (Dornemann 1990: 153; Flanagan, et al. 1992: 103, 105; Flanagan, et al. 1994: 223), indicating a connection to the sugar industry, if not production at the site. The published ceramics indicate a primarily late 13th-14th century date (see Dornemann 1990). The late 14th century Mamlūk sulṭān Barqūq endowed the village of Nimrīn, along with the villages of Kafrayn and Zarā'a, "in their entirety, for his *madrasah*-mausoleum complex in Cairo" (Walker 2011b: 256). While this is not evidence for sugar production, it does suggest that the village remained a lucrative property even as the sugar industry went into decline.

The tenth site is Tel Qasīla, located southwest of the Tel Aviv University campus, near the Eretz-Israel Museum, in Tel Aviv. Excavations at the site in the probable Early Islamic period road inn produced evidence of "dozens upon dozens" of sugar pots — both cones and molasses jars — in a context dated to the Crusader period (Ayalon, et al. 1987-1989: 11*, 19, Figs. 16-17, 20, Fig. 18). Without a known mill at the site, it is not clear that this is evidence for sugar production, as such, but it does demonstrate a clear connection to the sugar industry.

The eleventh is Khirbat al-Yānūḥiyya/Giv‘at Ussishkin in Nahariyya. Limited excavations at the site produced evidence of Crusader period sugar pots, which Lerer (2014) interprets as related to "a sugar factory in the Crusader village of La Noie." Stern, et al. (2015: 98) suggest that the excavations "exposed the remains of the village La Noie, but not the sugar factory," which they place to the north of the village, downhill and closer to Naḥal Ga‘aton. Nonetheless, the evidence indicates with some certainty that the site is related to sugar production.

Taken together, these 16 excavated sites allow for a reconstruction of the history of the southern Levantine sugar industry. Sugar production probably began in the 10th century AD, limited primarily to the Mediterranean coast, including the westernmost portions of the Galilee, and the coast of the Sea of Galilee/Lake Tiberias. Sugar production did expand during the 12th century under the Crusaders, but this was likely concentrated in Galilee, as well. The expansion to the western Jordan Valley, and in particular Jericho, remains a question, but a mid-12th century date is compatible with the present evidence. The industry seems to have expanded dramatically in the late 12th and early 13th centuries, and most of the factories in the eastern Jordan Valley and Dead Sea *aghwār* seem to have been founded during this period. Most, if not all, of the excavated factories were in use from the 13th century into the late 14th century, and Walker (2011b: 84-85) suggests that some of the Jordan Valley production sites — in particular Nimrīn and Kafrayn — continued to expand in the 14th century. By the late 14th century, the industry had gone into decline, and by the end of the 15th century sugar was likely no longer being produced in the Jordan Valley or Dead Sea *aghwār*. The 1538 Ottoman cadastral survey includes "no tax entries for either mills or sugar (in any form) for Nimrin, Kafrin, and Zara'a," all of which seem to have been lucrative "sugar plantations" in the late 14th century (Walker 2008: 95). Sugar production continued into the 16th and perhaps even 17th century, but again concentrated only in the western Galilee and the coast of the Sea of Galilee/Lake Tiberias. The phase that is critical for this dissertation, however, is the expansion of the industry in the late 12th and 13th centuries, when the southern Levant became a major center of sugar production. This will be addressed in more detail in Chapter 9.

The Material Culture of Sugar Production

Abu Dalu (1995: 45-48), Jones (2017: 12-25), and von Wartburg (1995a) provide comprehensive overviews of the implements involved in sugar production, but here I am concerned primarily with a subset of these used after the sugar cane has been cut and pressed. While many of these objects are known archaeologically, descriptions of the sugar production process by al-Nuwayrī (1931) and al-Maqrīzī provide useful information about how they were used. Portions of al-Nuwayrī's description have been summarized or translated into English in a number of sources (Burke 2004: 112; Jones, et al. 2012: 92-94; LaGro 2002: 30-34; Sato 2015: 40-47; von Wartburg 1995a: 85-87; in Arabic, see Abu Dalu 1995: 39-40), and corrections to this based on al-Maqrīzī's account can be found in Sato (2015: 45) and LaGro (2002: 31).

The first vessel that the cane juice was transferred into after pressing was "a large boiler" called a *khābiyya* in Arabic (Sato 2015: 41). Al-Nuwayrī states that this vessel held 3,000 *arṭāl* (pl. of *raṭl*) of cane juice, which Sato (2015: 42) converts to 2,880 kg. This may also be the vessel described by the late 15th century German traveler Arnold von Harff (1946: 99; 2007: 111) as a "great long kettle holding nine or ten pails [or *Eimer*] full [of pressed cane juice]." Nine or ten *Eimer* would be the equivalent of 450-500 liters (see Jones, et al. 2012: 94, n. 18), suggesting a very large vessel, though rather smaller than the one described by al-Nuwayrī. Abu Dalu (1995: 47) suggests that the *khābiyya* was a ceramic vessel. Somewhat confusingly, al-Nuwayrī states that *khābiyya* also refers to low-quality syrup made from a separate boiling of "by-products of the canes that were cleaned and pressed" (see also LaGro 2002: 30; Sato 2015: 43). This may indicate that this juice was only boiled a single time, in the *khābiyya*, because higher quality sugar could not be produced from these parts of the cane. Higher quality sugar would go through two or three boilings after this stage (von Wartburg 1983: 301).

After boiling in the *khābiyya*, the syrup was transferred to another large vessel called a *yaqṭīn*, and filtered into a third vessel called a *dann* (Sato 2015: 42). To the best of my knowledge, these vessels are not known archaeologically. From here, the syrup was transferred to a large copper cauldron called a *dast* (pl. *dusūt* or *dusūt al-naḥāsiyya* [Abu Dalu 1995: 48]), sitting atop a boiler called a *qidr* (pl. *qudūr*; Sato 2015: 42). After the juice was reduced in the *dusūt*, it was transferred into a two-piece sugar pot (Fig. 3.16; see LaGro and de Haas 1991). The upper piece, called the *ublūj* (pl. *abālīj*) in Arabic, was a bell-shaped (Abu Dalu 1995: 47) or cone-shaped ceramic vessel with three holes in its base (Sato 2015: 43). I refer to this piece as the "sugar pot cone." The bottom piece, called the *qādūs* (pl. *qawādīs*) in Arabic, is a bag-shaped (Abu Dalu 1995: 47) jar into which the molasses (Ar. *'asal*) would drip, leaving behind the raw sugar (Ar. *qand*; Sato 2015: 43). I refer to this bottom vessel as the "molasses jar." These vessels, the *abālīj* and *qawādīs*, are the most common evidence for sugar production from both surveys and excavations.

Figure 3.16: Middle Islamic period sugar pot in the ʿAjlūn Castle Museum. Molasses would drip into the lower vessel, or *qādūs*, leaving a cone of sugar behind in the upper vessel, or *ublūj*.

The most important vessel in the context of this dissertation, however, is the *dast*, or copper cauldron. I have previously discussed the significance of and archaeological evidence for this vessel (Jones, et al. 2012: 92-95), and will summarize and expand on this argument here. These vessels are quite rare archaeologically, and I am aware of only four possible examples from the southern Levant: three Crusader vessels found near Bet Zera' (Peled 1999: 256; but see Stern 2001: 305, n. 9, who notes that "there is no conclusive evidence" that these were used for sugar production) and the other probably a Middle Islamic *dast* from Ghawr al-Ṣāfī (Agnoletti 2009). The rarity of these vessels is likely due to recycling, which was presumably common after the sugar factories had gone out of use (see brief discussion in Jones, et al. 2012: 92-93).

Al-Nuwayrī's account states that one *khābiyya* and eight *qudūr* are required for each millstone at a sugar factory (Jones, et al. 2012: 94; Sato 2015: 43).[126] These numbers can be evaluated archaeologically. The *dast* from Ghawr al-Ṣāfī is 102 cm in diameter, and weighs between 150 and 250 kg (Nashef 2009: 141). James and Photos-Jones (2017: 105) argue that this weight estimate "seems highly implausible," but do not provide a more plausible estimate.[127] Konstantinos Politis (pers. comm.), director of the excavations in Ghawr al-Ṣāfī, has, however, confirmed that the estimated weight of the vessel is 150 kg. Actually weighing these vessels is an important next step for this research, but for now it must be kept in mind that the figures below are uncertain and based on estimated weights. It is, nonetheless, possible to determine whether the measured diameter provides a good estimate of the average *dast* by considering the evidence from boiling halls. Boiling halls are not well preserved at the excavated southern Levantine sugar factories,[128] and presently we have to rely on evidence from Cyprus. Excavations at the Lusignan sugar factory at Kouklia *Stavros* near Paphos (Maier, et al. 1984: 326-241; Maier and von

[126] As noted by Jones, et al. (2012: 94, n. 19), LaGro (2002: 29, n. 107) translates this as "one large kettle and 8 smaller ones." While accurate, the distinction between *khābiyya* and *dast* is important here.
[127] An implausible estimate, one might note, is also not out of line with Pietro Casola's (1907: 216) late 15th century description of Cypriot "cauldrons of such a size that if I described them no one would believe me."
[128] Ṭawāḥīn al-Sukkar in Ghawr al-Ṣāfī may soon be an exception, as the boiling hall was excavated by the Department of Antiquities in 2010 and Hellenic Society for Near Eastern Studies (HSNES) in 2012 (Politis 2013a: 195-196). A plan of this structure has not yet been published, however.

Wartburg 1998: 118; von Wartburg 1983; von Wartburg and Maier 1989; von Wartburg and Maier 1991; see also von Wartburg 1995a; von Wartburg 1995b; von Wartburg 2001) and the Hospitaller sugar factory at Kolossi near Limassol (Solomidou-Ieronymidou 2007; see also von Wartburg 2001) have provided clear evidence for the layout of boiling halls. The Venetian sugar factory at Episkopi *Serayia* has also been excavated by the Department of Antiquities of Cyprus, but the plan of its boiling hall is primarily known from a 16th century plan drawing preserved in the Venetian State Archives (Solomidou-Ieronymidou 2007: 71, 73-74; von Wartburg 2001: 313, Fig. 8, 314, Fig. 9). A stoking chamber was excavated in the early 13th century sugar factory at Saranda Kolones in Paphos (Rosser 1985: 89, 91, 95), but the boiling hall itself does not seem to have been found. At Kouklia *Stavros*, a long hall containing eight hearths along its southeastern wall and a ninth on its southwestern wall was found (see plan in von Wartburg 1995a: 89, Fig. 6; von Wartburg 2001: 309, Fig. 3; von Wartburg and Maier 1989: 178, Fig. 1; von Wartburg and Maier 1991: 258, Fig. 2), and von Wartburg (1995a: 104) suggests that up to eight would have been operational at any time. Although the layout of the Kolossi factory is somewhat different, the boiling hall is very similar, with eight hearths along a single wall (Solomidou-Ieronymidou 2007: 79; von Wartburg 2001: 312, Fig. 7). At both sites, each hearth seems to have had spaces for two boiling vessels, each ca. 1 m in diameter, which seems to confirm that the *dast* from Ghawr al-Ṣāfī is of roughly standard size. If this conforms to the layout described by al-Nuwayrī, then the eight *qudūr* he specifies would add up to 16 *dusūt* per millstone (*contra* Jones, et al. 2012: 94). As noted by Jones, et al. (2012: 94), however, this number may be an average, rather than a strict minimum. Based on the number of stoking chambers identified at Lower Ḥorbat Manot, Stern (2001: 303) suggests that 12 "fireplaces" (i.e. spaces for *dusūt*) in six "fire chambers" (i.e. *qudūr*) were in use at the site, and the plan of the Venetian sugar factory at

Episkopi *Serayia* indicates that both "kitchens" had a similar layout of 12 boiling vessels (Solomidou-Ieronymidou 2007: 73, Fig. 9; von Wartburg 2001: 313, Fig. 8).

Nonetheless, 16 *dusūt* — rather than the eight suggested by Jones, et al. (2012: 94) — seems to be a reasonable average for the number in use at a given sugar factory, per millstone. This caveat is important, as some sugar factories are known to have had more than one millstone. Ṭawāḥīn al-Sukkar in Ghawr al-Ṣāfī, for example, had three (Politis 2010: 4). As Jones, et al. (2012: 95, n. 20) note, this makes it the largest sugar factory presently known in the southern Levant, but our knowledge of many other sugar factories is fairly fragmentary, and the possibility that the larger factories would have had multiple millstones should be kept in mind.

Dusūt, as noted above and discussed by Jones, et al. (2012: 92-95), were always made of copper. In fact, the connection between these vessels and copper is so strong that the English term "coppers" became a linguistic skeumorph, as it continued to be used to refer to the (inferior, but much less expensive) iron boiling vessels that replaced copper ones in the 17th century Caribbean (Meniketti 2006: 60-61, 79, n. 24). As Jones, et al. (2012: 93-94) argue, it is likely that, while recycled copper was evidently used to make repairs to these vessels, the purity of the copper was a concern in terms of the quality of the final product, and new copper would have been desirable. Von Wartburg (1995a: 100, n. 23) notes that historical sources complain that these vessels are very expensive, which may be related to this fact.

Jones, et al. (2012: 94-95) present an estimate for the amount of copper that would have been required to provision the late 12th-13th century industry, but the figures presented above, as well as the data compiled in Appendix 3, differ from what they used, and this estimate should be revisited. If 16, rather than eight, *dusūt* is taken to be the average number at a sugar factory, then 2.4-4 metric tons of copper would be required per millstone. The number of sugar mills used in

Jones, et al.'s (2012: 94-95) estimate is slightly too high, and a safer estimate, using the data from Appendix 3, is that between 25 and 30 sugar mills would have been active and potentially connected to al-Karak during the early 13th century. Given these numbers,[129] it would have taken between 64.8 and 128 tons of copper to provision the 13th century sugar industry. This is rather higher than the estimate of 46-78 tons that Jones, et al. (2012: 94) arrived at, but still fairly close to Hauptmann's (2007: 126) estimate of 65-100 tons of copper produced in Faynān during the Middle Islamic period (see also Jones, et al. 2012: 89). This connection will be addressed in more detail in Chapter 9.

A Linguistic Note on Sugar Production

Politis (2013b: 478) has suggested, "[b]ecause sugar was so closely associated with the city of Zughar, it is likely that it gave sugar its name." Politis (2010: 4; Egan and Bikai 1999: 519) has made this claim in several other places, and it now appears in more recent editions of the *Rough Guide to Jordan*[130], but the claim has never been supported with historical or linguistic evidence.

The origins of the Arabic term *al-sukkar* are fairly well understood. The term is derived from the Persian *shakar* (or *shakkar*), which is itself derived from the Sanskrit *sharkarā* and Prakrit *sakkarā* (*EI2*, Sukkar; Sato 2015: 2). From here, the Arabic word spread to most European languages (Sato 2015: 2), generally derived — except in the case of the Iberian languages — from the Italian *zucchero*, as the Arabic article is usually omitted in Italian borrowings (Messner 1992: 453). The etymology, then, is relatively clear, and antedates the importance of Zughar as a center of sugar production. It might be argued that Zughar helps

[129] These estimates assume that three millstones would have been active at Ṭawāḥīn al-Sukkar, and that therefore 48, rather than 16, *dusūt* would have been required.
[130] http://www.roughguides.com/destinations/middle-east/jordan/dead-sea-baptism-site/dead-sea/south-dead-sea-road/

explain the anomalous "g" of the modern English word, but this shift is evident in other English words — for example, "flagon," derived from the Old French *flacon* (*OED*, sugar, *n.*; *OED*, flagon, *n.*[1]) — beyond what this could account for.

I would suggest that this association might also derive from Le Strange's (1890: 291) translation of an excerpt from Yāqūt's entry for the town: "The name of *Zughar*, according to the same authorities, is also spelt *Sughar* and *Sukar*." Connecting Sukar and *al-sukkar* is understandable, then, but incorrect, as the letter Le Strange is transcribing is not *kāf*, but *qāf*. In fact, Yāqūt (1868: 396-397) is making explicit reference to a play on words in al-Muqaddasī (1896: 62) that predates Zughar's association with sugar. Writing in the late 10th century, al-Muqaddasī (1896: 62) — in Le Strange's translation — quips, "The people of the two neighbouring districts call the town Sakar [i.e. *saqar*] (that is, 'hell'); and a native of Jerusalem was wont to write from here to his friends, addressing 'From the lower Sakar (Hell) unto those in the upper Firdûs (Paradise).'" The reference, then, is not to sugar, but rather to the sweltering heat and humidity of the Dead Sea *aghwār*.

This association, then, seems to be a "factoid" in the sense suggested by Yoffee (2005: 7-8): a speculation repeated until it is taken to be true (see also Mailer 1973: 18). Although the connection is appealing for archaeologists working in southern Jordan, the evidence suggests that the word "sugar" is not derived from the name of the town.

3.7. Pastoral Landscapes of the Late Islamic Period — Archaeological, Historical and Ethnohistorical Perspectives

As discussed above, by the end of the 15th century, the heyday of sugar production in the southern Levant was over, and production in the Jordan Valley *ghawr* and Dead Sea *aghwār* had ended. Walker (2010: 128) has argued that "[n]o narrative dominates the archaeological history of Mamluk Syria more than the decline of the countryside in the fifteenth century." She also points out, however, that this view is based primarily on surveys of central and southern Jordan (MacDonald, et al. 2004a; the key large-scale surveys of the south are MacDonald 1988; MacDonald 1992; MacDonald, et al. 2011; MacDonald, et al. 2012b; MacDonald, et al. 2010; Ruben and van der Steen 2012; Smith 2014; see discussion of many of these in Walker 2013a; Walker 2016: 185-186),[131] and that this is "not supported by surveys in other regions of the country" (Walker 2012b: 162). Indeed, as Brown (1992: 109, 110, Map 9) has argued using the historical data discussed below, villages in Jordan were generally concentrated in the north, while central and southern Jordan were much less densely settled. This distinction is important to keep in mind, but nonetheless, the archaeological data does suggest that the Late Islamic period occupation of southern Jordan, and particularly the lowlands, was characterized primarily by pastoral nomadism.

By the time of the 1596-1597 *daftar-i mufaṣṣal*[132] — "detailed registers" (see Hütteroth and Abdulfattah 1977: 1) — the Ottoman *nāḥiyat al-Shawbak* contained a single town entry, al-Shawbak, seven entries for villages, mainly on the plateau, and 12 entries for tribes (Hütteroth and Abdulfattah 1977: 173-174). As Brown (1992: 114) notes, the central Jordanian districts of al-Karak and Jabal Karak were not much more densely settled, but tribes are recorded primarily in Nāḥiyat al-Shawbak (see Brown 1992: 110, Map 9). Following Hütteroth and Abdulfattah

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[131] Many smaller surveys have also been conducted in southern Jordan, and are too numerous to list here (for the region between Faynān and al-Shawbak alone, see, e.g., Adams, et al. 2010; Barker, et al. 2007; Ben-Yosef, et al. 2014a; Findlater 2003; Fujii, et al. 2012; Fujii, et al. 2013; Hauptmann 2007; Hauptmann, et al. 1985; Jones, et al. 2012; Knabb, et al. 2014; Knabb, et al. 2015; Levy, et al. 2003; Levy, et al. 2001).

[132] Walker (2010: 116) argues that there is an over-reliance on the 1596-1597 *daftar*, primarily because it is the only register that has been translated into English and Hütteroth and Abdulfattah (1977) have arranged the data very conveniently. As she points out, however, considering only one register rules out analyses of change over the course of the 16th century (Walker 2010: 116), which would be possible if the earlier registers, e.g. those of 1534 and 1538 (see Walker 2005: 71), were consulted. This is true, and our picture of the south, in particular, would be much improved by this sort of work, which is, unfortunately, beyond the scope of the present dissertation. It is worth noting that Cohen and Lewis (1978) have published translated data from registers as early as the 1520s, but only for specific towns in Palestine. As such, this source is not particularly useful for studies of Jordan.

(1977: 171-174), she estimates the village and town population of the Karak Plateau in 1596-1597 at 3,370 people (Brown 1992: 116, Table 9), and using this method for Nāḥiyat al-Shawbak, we can estimate the population of the villages and towns listed in the 1596-1597 *daftar-i mufaṣṣal* at 1,750, and the tribal population at 2,110. Schick (1998b: 566), however, has argued that the 1596-1597 *daftar* might not be reliable, particularly for issues relevant here, such as "counting nomads," as Jordan "was out of government control after the mid-16th century," suggesting that the 1596-1597 register may simply repeat earlier data. As Walker (2005: 72, n. 19) notes, "the registers clearly show a real development in settlement and agricultural production through the century, so it is doubtful that earlier data was used for these later registers," but Brown (1992: 106) points out that "Ottoman fiscal administration was less efficient in the desert frontier regions, including southern Transjordan," and the registers are likely to be less accurate for these regions. Schick's (1998b: 566) point that the region "was out of government control" is important to keep in mind, however, as al-Karak, led by the al-Tamimiyya tribe, became essentially independent from the Ottoman government in the mid-16th century (Gubser 1973: 14), and maintained this independence despite negotations and "punitive expeditions . . . in 1678/9 and 1710/11" (Russell 1993: 23; see also Gubser 1973: 14). The data in the 1596-1597 registers may, as Walker (2005: 72, n. 19) argues, derive from "local scribes and supervisors," and thus be fairly accurate, but the Ottomans certainly had no real control over the south in the late 16th century. The Faynān region, like much of lowland southern Jordan, was likely inhabited only seasonally, by pastoral nomads, during the Late Islamic Ib. This is difficult to assess without excavation of pastoral sites, and is discussed only briefly in Chapter 8.

The period following this — the Late Islamic IIa, or Middle Ottoman period — however, is more difficult to discuss. As late as 1998, Schick (1998b: 563) could lament, with some justification, that "[t]he Early Ottoman period (16th-17th centuries) in Palestine/Jordan has not yet been fully accepted as a serious topic for archaeological inquiry." For the 16th century, this can be partially addressed with historical evidence, as discussed above, but as Walker (2007b: 115) has pointed out, "for Jordan there is practically no written documentation for the period between 1600 and 1800 AD." Bailey (1980; 1985; 2006; see also Stewart 1986: 10-15) has argued that it is possible to compensate for this lack of written evidence using Bedouin oral history,[133] but notes also that there are limitations to this approach, particularly if we are interested in absolute, rather than relative, chronologies of events. This is complicated by the fact that this period is also difficult to recognize using ceramics, particularly those collected from survey, as ceramics diagnostic of this period are generally limited to pipes and imported wares (Walker 1999: 224; Walker 2009a: 46). More common ceramics tend to be in use for longer periods. It is fairly certain, for example, that ceramics more commonly associated with the Middle Islamic period, particularly Islamic Hand-Made Wares (IHMW) — including Hand-Made Geometrically Painted Wares (HMGPW) — and monochrome glazed wares, continued to be used into the Late Islamic period (Walker 2009a: 40-46), and in Palestine and northern Jordan these continued to be used into the 20th century AD (Einsler 1914; Mershen 1985). The excavations at Ṭūr Imḍayy, a Late Islamic rock shelter near Petra, have demonstrated this for the south, as the majority of the 17th-18th century ceramics are undecorated IHMW sherds that would be difficult to date without excavation (Simms and Russell 1997: 467-468). Likewise, there is increasing evidence that Gaza Ware (or Gaza Gray Ware), most common in the 19th and 20th centuries, was first produced in the 17th century, or perhaps even earlier (Rosen and Goodfriend 1993; Salem 2009: 27-28). The

[133] A very different approach to this data has been suggested by Bienkowski (2007), who suggests that the emotional connection to the landscape — and particularly the Wādī 'Araba — evident in Bedouin poetry can be used to construct a "deep time" phenomenological picture of how this landscape was experienced. This is a useful framework for approaching the Wādī 'Araba as a landscape feature, but its specific application to periods other than the 20th century, when the poems in question were collected, is somewhat speculative.

longevity of these common ceramic types makes it difficult to discuss settlement patterns in central and southern Jordan with any precision. More focused work on the plateau villages would be required to evaluate models of settlement for the Late Islamic period from elsewhere in southern Bilād al-Shām, e.g. Walker's (2016) "liquid landscapes" model from northern Jordan or Salem's (2008) model of "village chiefdoms" in the Janīn region of Palestine, and the same is true for pastoral nomadic land use in both the highlands and lowlands of southern Jordan. Certainly some of the sites in the Faynān region discussed in Chapter 5, and particularly Section 5.6.2, date to this period. At the present state of research, however, a more detailed discussion of the Late Islamic IIa occupation would require a focused project, including test excavations at these sites.

The Late Islamic IIb, however, is much better known, both archaeologically and historically. For the north, this begins with the "richly documented Tanzimat period" in the 1840s, as "[f]or the first time in nearly three hundred years the state became an active participant in the local economic and political sphere" (Walker 2007b: 115). This was not the case for central and southern Jordan, however — or the Negev, for that matter (Bailey 1980: 35) — as the Ottomans were not able to regain control of al-Karak and southern Jordan until the 1890s (Russell 1993: 23, 27).[134] A different source of historical evidence is available for these regions, however, in the form of Western travelers' accounts, beginning with Seetzen's (1854; 1855) expeditions in 1807. These are summarized, primarily for the lowlands of southern Jordan, by van der Steen (2006a; for other regions, see also van der Steen 1995; van der Steen 2004; van der Steen 2006b), and for the Petra region by Russell (1993). As van der Steen (2006a: 245) points

[134] It is interesting to note, in connection to this, a fascinating contract from 1967 delineating the boundaries of the Aḥaywāt and Tiyāha tribes, which states that "the borders . . . were agreed on by the two parties in the time of Ibrāhīm Pasha" (Stewart 1986: 7), son of Muḥammad ʻAlī Pasha. While Stewart (1986: 7, n. 2) argues that this is a scribal flourish, and "does not reflect a Bedouin tradition," the connection to Muḥammad ʻAlī Pasha, rather than the Ottomans, is accurate.

out, these sources "need to be viewed with a critical eye," as these authors' biases clearly influenced their accounts, but if approached with this in mind, they also offer considerable insight into 19th century settlement, economy, and tribal politics.

It is not necessary to rehearse the complex tribal politics described by van der Steen (2006a) and Russell (1993) here, and a somewhat brief description will suffice. For the most part, southern Jordan, or at least the southern region of al-Sharāh, was during the 19th century dominated by the Ḥuwayṭāt tribal confederation. Beginning in the early 19th century, the al-Majālī of al-Karak formed an alliance with Ibn Rashīd, a northern Ḥuwayṭāt shaykh, with the goal of taking control of southern Jordan from an alliance of the remaining Ḥuwayṭāt and the Bidūl, residing in Petra (Russell 1993: 23-24). Several years later, the Ḥuwayṭāt seem to have been split into three groups: the 'Alawīn, the Ḥuwayṭāt ibn Jāzī, and "the followers of Ibn Rashid," who later became the independent Rashāyda tribe (Russell 1993: 24; on this split, see also Palmer, et al. 2007: 52-53), the current residents of the village of Faynān. In the 1860s, the Ḥuwayṭāt ibn Jāzī backed the Liyathna in their successful attempt to take over the Petra region, an event that was immediately devastating for the Bidūl and signaled declining Egyptian control over the region; by the 1890s, the Ottomans had taken advantage of this situation and, to the chagrin of the Ḥuwayṭāt ibn Jāzī, established direct control over much of southern Jordan (Gubser 1973: 19-20; Russell 1993: 27). In the Faynān region, it is also worth noting that the 'Amarīn, the current residents of the village of al-Qurayqira, had — in addition to their claim to the region of al-Bayḍa, north of Petra (Russell 1993: 26) — control of much of western Faynān, ranging from the Buwayrda springs in the south (Robinson 1856: 155-156) to Wādī Fidān, and probably the regions north of this, as well (Palmer 1871: 456-458). The 'Azāzma, many of whom now also reside in the Faynān region, were in the 19th century primarily in control of regions west of Wādī ‘Araba (Bailey 2006: 251, 252, Fig. 21.1; Marx 1967: 9, 12; van der Steen 2006a: 149), a fact reflected in their current low status in Faynān, as most arrived following the 1948 war.

Economically, the region depended primarily on “a combination of agriculture, pastoralism and trade,” particularly the *ḥajj* trade (van der Steen 2006a: 249). Burckhardt (1822: 437) noted that Ma‘ān depended entirely on the *ḥajj* trade, which enabled the town to purchase wheat and barley from al-Jibāl and al-Sharāh, to the west, and pointed out that the disruption of the Syrian *ḥajj* in 1803 had left the town in a rather difficult position (see also van der Steen 2006a: 247). In addition to this, trade on the Egyptian *ḥajj* route, as well as north-south trade on the Sharāh Plateau and east-west trade with Gaza were important, though there seems to have been no north-south trade in the lowlands (van der Steen 2006a: 249). The lowlands were particularly important for seasonal grazing of flocks during winter and spring (van der Steen 2006a: 249), and the Faynān region would have been of particular importance for grazing, though some evidence of Late Islamic agricultural activity has likely been found in Wādī al-Jāriya (see Section 5.6.2).

Finally, although the dedicated archaeological surveys of the 20th century, beginning with Musil (1907) provide much more description of the features that most interest archaeologists, particularly in the Faynān region, the 19th century accounts occasionally include interesting descriptions of features still visible on the landscape today that do not appear in the later sources. Of note is Palmer’s (1871: 458) description of the arch at Umm al-Zuhūr (Fig. 3.17), which he states was considered a *walī*, or holy man’s tomb, at the time. This provides an interesting glimpse into the religious landscape of Faynān in this late period, and will be considered again in Chapter 8.

Figure 3.17: Arch at Umm al-Zuhūr.

This overview of the geology, geography, and history of Faynān and the surrounding region provides the necessary background for the data and discussion that follows. In particular, the discussion in Part III of the dissertation — Chapters 8, 9, and 10 — will synthesize this background and the data presented in Part II — Chapters 4, 5, 6, and 7. Drawing on the *Annales* framework (see Section 1.4), Part III will present the history of Faynān at three different rhythms: in Chapter 8, the long-term, or regional-scale changes on the scale of centuries; in Chapter 9, conjunctures, or political and economic changes on the scale of decades; and in Chapter 10, "events," or the short-term history of daily life.

Part II: Data

Chapter 4: ELRAP Excavations at Islamic Period Copper Smelting Sites

This chapter presents detailed reports of UC San Diego Edom Lowlands Regional Archaeology Project (ELRAP) excavations at two Middle Islamic period copper smelting sites in the Faynān region — Khirbat Nuqayb al-Asaymir and Khirbat Faynān — as well as a summary account of ELRAP excavations at an Early Islamic copper smelting site in the southeastern Wādī ʻAraba — Khirbat al-Manāʻiyya. These excavations were conducted to test hypotheses about the role of copper production during the Islamic period. Although the distinction between these sites and the related sites discussed in Chapter 5 is somewhat artificial, the distinction is analytically useful in the context of this dissertation, as the data from the copper smelting sites — and particularly the Middle Islamic period copper smelting sites — form the core of the argument that follows.

4.1. Khirbat Nuqayb al-Asaymir

Khirbat Nuqayb al-Asaymir[135] (Ar. "the ruin of the small, dark/brown pass") — henceforth KNA — is the largest and best-preserved Middle Islamic period copper smelting site in Faynān — and probably in the entire Levant (Fig. 4.1). The site is a sparsely settled copper producing village covering ca. 7 hectares, located near the intersection of Wādī Ghuwayb al-ʻAṭshāna and Wādī Nuqayb al-Asaymir, at the northern end of Nuqayb al-Asaymir, the ancient path connecting Wādī al-Ghuwayb to the eastern portion of the Wādī Faynān system.[136] KNA is also ca. 1 km southeast through Wādī Nuqayb al-Asaymir from the large, Iron Age copper production center at Khirbat al-Nuḥās.

[135] As noted in Section 3.2.2, diminutive names — in this case, *nuqayb* instead of *naqb* — are a common feature of Bedouin toponyms.
[136] Most of the path is, as of 2012, passable with a four-wheel drive truck. The one portion that is not is the pass near the Bronze Age copper production site of Rā's al-Naqb, though this is still passable on foot.

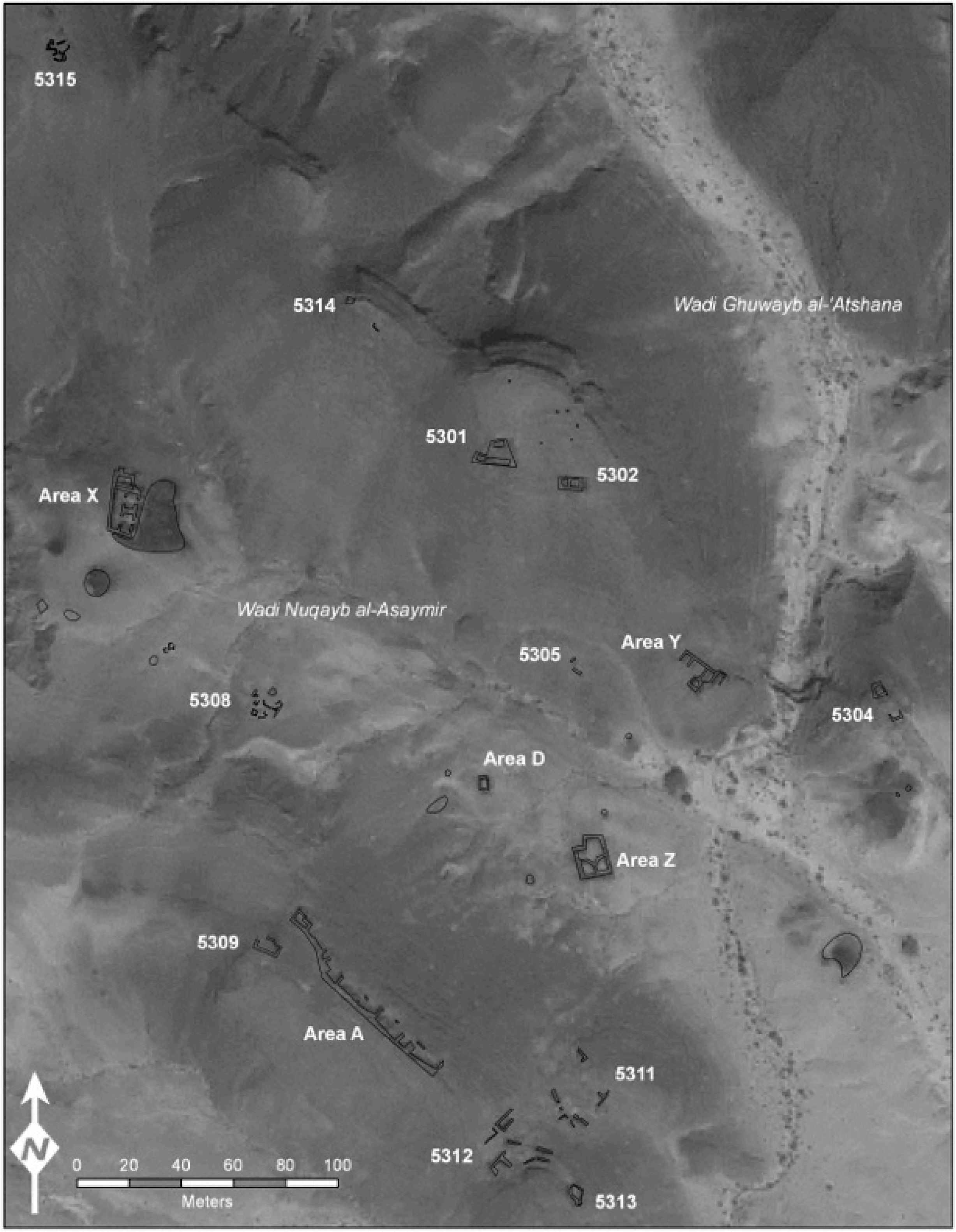

Figure 4.1: Excavation areas and survey features at KNA. (Background image: IKONOS satellite imagery courtesy of GeoEye. GeoEye data is owned by GeoEye, Inc. All rights are reserved by GeoEye, Inc.)

Although the region of Nuqayb al-Asaymir was visited by Musil (1907: 298-299), he does not seem to have visited the site itself. Glueck (1935: 30-32; 1940: 65-66), however, visited the site during his 1934 survey of southern Transjordan and dated it to the "medieval Islamic" period. In the early 1980s, KNA was surveyed by a team from the Deutsches Bergbau-Museum (DBM), who refer to the site as al-Furn (Ar. "the oven" or "the furnace"), rather than KNA. They refined the date, somewhat incorrectly, as "Mamlukisch-türkisch" (Hauptmann, et al. 1985: 190-192). Hauptmann (2007: 126-127) has since proposed a revised Ayyūbid-Mamlūk date on the basis of numismatic finds published by Kind, et al. (2005: 188). King, et al. (1989: 202) attempted to visit the site in 1983, but were told by their local informants that Nuqayb al-Asaymir was the name of a sub-region of Faynān, rather than an archaeological site. This is interesting, given that the DBM team visited the site in roughly the same period, but it is possible that King's informants referred to the site by a different name or were simply less familiar with the archaeological landscape of Wādī al-Ghuwayb. The site that King, et al. (1989: 202) discuss under the "Khirbet Nuqayb el-Asaymir" heading — "a scatter of sherds, including one of early Bronze Age and one of Iron Age date" — is probably located near Rā's al-Naqb, an Early Bronze and Iron Age smelting site located at the head of Nuqayb al-Asaymir, ca. 2.75 km southeast of KNA (see Hauptmann 2007: 123-126 for discussion of this site). A Jabal Hamrat Fidan Project (JHF) team systematically surveyed and KNA — numbered WAG 53 in their report — during the 2002 Wādī al-Ghuwayb Survey (Levy, et al. 2003). The material collected during this survey formed the basis of my MA thesis (Jones 2010), and was published by Jones, et al. (2012), who proposed an early 13th century (Middle Islamic IIa, or later Ayyūbid) date.

ELRAP began a new investigation of the site during the 2011 field season with excavations in Area X (preliminary discussions of this season have appeared in Jones 2016;

Levy, et al. 2012b), and continued during the 2012 season with excavations in Areas A, D, Y, and Z. The following sections (4.1.1-4.1.6) provide a detailed report of these excavations, as well as a summary of additional survey data.

4.1.1. KNA Area A

Area A (numbered Building 5310 during the JHF WAG Survey) is a ca. 90 m long building complex located on the northern slope of KNA's southern hill (Fig. 4.1, 4.2), overlooking the valley (Wādī Nuqayb al-Asaymir) containing the site's major buildings. The rooms are open to the north, and most consist of two parallel walls built against the hillside, which forms the southern wall of most of the rooms.

Figure 4.2: Area A in 2002, looking northeast. (Photo: Courtesy UC San Diego LCAL.)

Several of the rooms also have single-course walls on their northern sides. Construction techniques at KNA are generally utilitarian, but in Area A these can better be characterized as opportunistic. The walls are built of unworked brown shale — which can be found eroding out of the hillside the building sits on — in a makeshift manner, laid dry with random coursing (Fig. 4.3).

Figure 4.3: Mid-excavation photo of Wall 004, showing haphazard coursing. (Photo: Thomas E. Levy, courtesy UC San Diego LCAL.)

Based on the building's layout (see Fig. 4.1), the construction techniques, and the ceramic assemblage from the 2002 WAG Survey — made up primarily of hand-made sherds, with only one glazed sherd present — I hypothesized that this building might have been housing for workers — probably the higher-status smelters, rather than miners — at KNA. A 6 x 4 m square (Fig. 4.4) was excavated in this building during the 2012 ELRAP field season to test this hypothesis.

Figure 4.4: Final top plan of the 2012 Area A probe. (Map: Matthew Vincent.)

Deposits in Area A were quite shallow, and the excavators reached bedrock at a depth of only ca. 50 cm throughout the square. As Howland (2014: 43, Fig. 6; Howland, et al. 2018: 66, Fig. 6) demonstrates, this is due to the fact that erosion in this area was "extreme" (on a scale of "minimal" to "extreme"), and it is very likely that much material originally present in Area A has since eroded into the wadi below. This is exacerbated by the fact that the excavated room in Area A, unlike some of the rooms mentioned above, does not have the single course wall on its northern side that may have prevented some of this erosion. Nonetheless, the results of the 2012 excavation contribute substantially to our understanding of the building and the site more broadly.

Due to the shallow nature of the deposits, no stratigraphy was evident in Area A. Although changes in sediment composition were observed (Fig. 4.5), these seem to belong to a single phase or even a single episode of use.

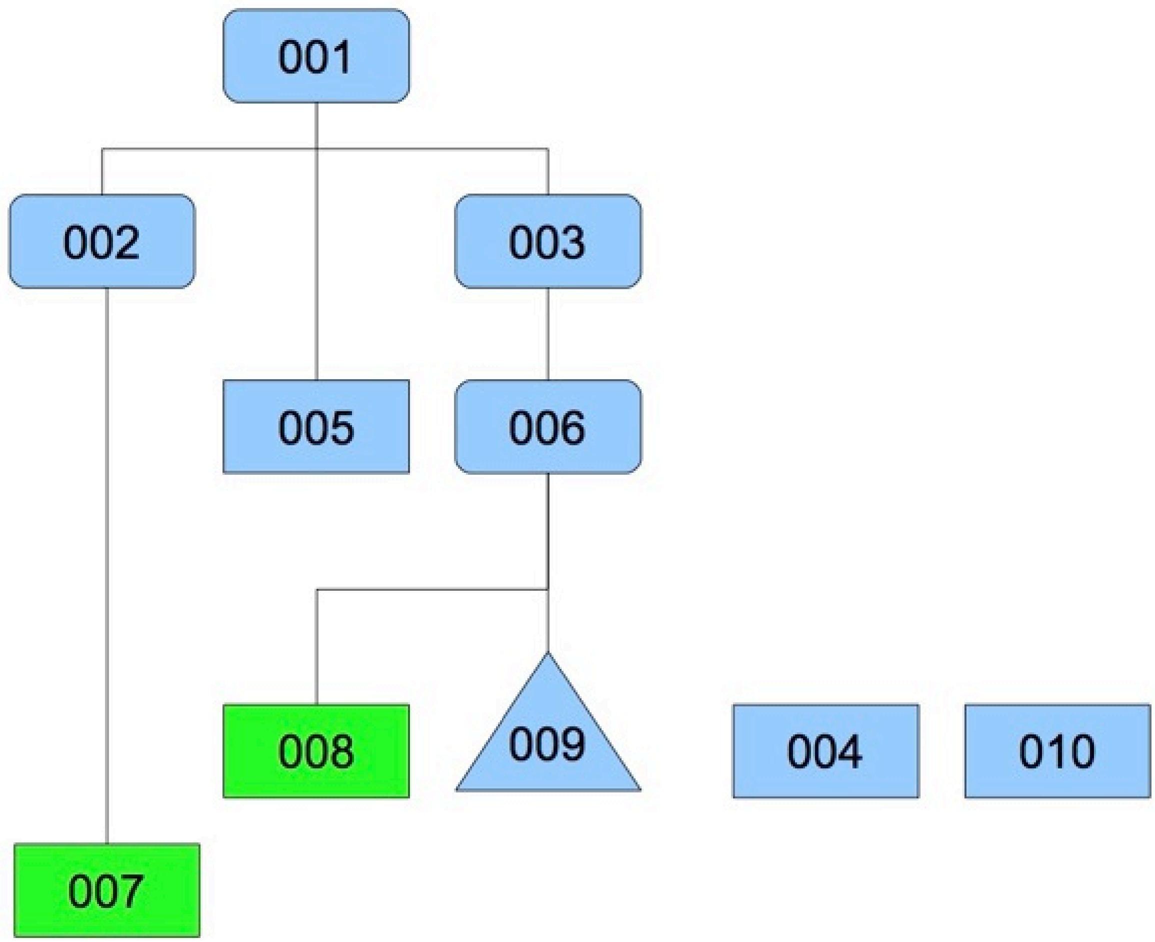

Figure 4.5: Harris matrix of the 2012 Area A probe.

The excavated room is divided into two split "levels" (Fig. 4.6), likely due to the slope of the underlying bedrock. Wall 005, a two-course wall built of brown shale, divides the lower level, consisting of L. 002 and L. 007, from the upper level. Due to the fact that the wall was built in a makeshift manner out of the bedrock material, it was difficult to define clearly across the entire square. Its visibility at both edges and the presence of collapse in the center suggest that the wall continued across the entire square, however.

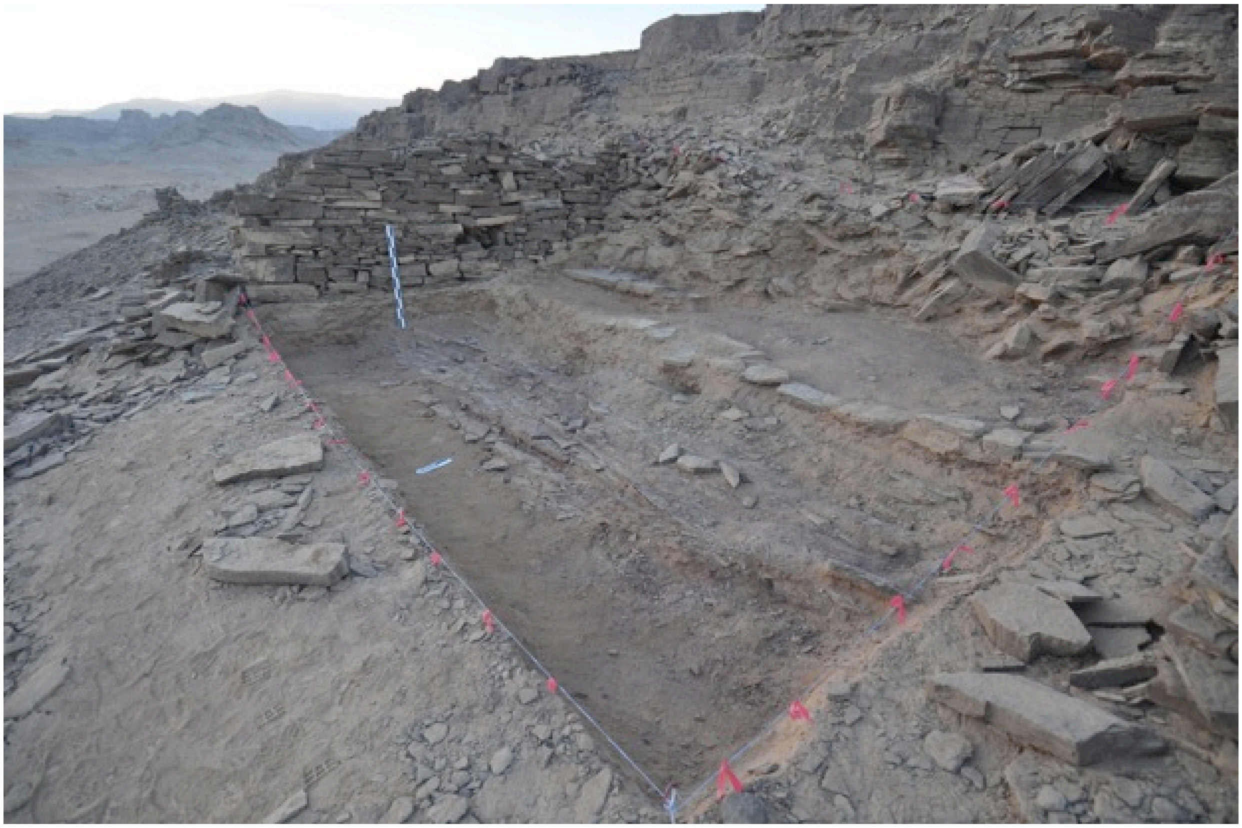

Figure 4.6: Mid-excavation photo of Area A showing two "levels" north and south of Wall 005. (Photo: Thomas E. Levy, courtesy UC San Diego LCAL.)

Only two of the three exterior walls were within the boundaries of the excavation. These were Wall 004 — the eastern north-south wall — and Wall 010 — the southern east-west wall, which covers only the eastern half of the square. The hillside to the south serves as a wall in the western half of the square, and Wall 010 seems to have been built to correct for the unevenness of this hillside. In addition to this, there is also a small platform, L. 009, which abuts Wall 010 (Fig. 4.7) and likely served as a support for the wall, given how prone this area is to erosion. Its surface, however, is also low enough to have served another function within the room, e.g. as storage or a working surface.

Figure 4.7: Mid-excavation photo showing platform L. 009, with meter scale resting on it. (Photo: Thomas E. Levy, courtesy UC San Diego LCAL.)

The lower level of the square, specifically L. 002, produced evidence of a fire that likely extended across the entire square. Primarily this consisted of burnt shale, but sherds of burnt pottery were found, as well (the specific types are discussed in Sections 6.1.1 and 6.1.3). Some small concentrations of burnt stone were also found in the upper level, but not to the extent that they were found in L. 002. Given that evidence of this fire was not found in any of the four other excavation areas, this event was likely limited to Area A — and perhaps other unexcavated areas of the southern hillside — and did not affect the entire site. The implications of this destruction are discussed in Section 10.1.

The fact that significant quantities of imported Syrian stonepaste wares were found in Area A — though given that only ca. 30 ceramic sherds were found in Area A, including from surface collection, "significant" is a relative term — complicates the hypothesis that the area served as workers' housing. Milwright (2006: 21) has argued that, in southern Jordan, the presence of these wares suggests the presence of "political elites." On one hand, it is possible that the hypothesis should simply be rejected. On the other, the possibility that certain metallurgical laborers were elites must also be addressed, as Sapir-Hen and Ben-Yosef (2014) have recently argued for the Iron Age at Timna. This is explored in more detail for the Middle Islamic period in Section 10.2.

Despite the evidence for a fire, no carbonized organic remains suitable for radiocarbon dating were found in Area A. The type of stonepaste wares found in this area, however, suggests a date in the Middle Islamic Ic-IIa, or the second half of the 12th century and first half of the 13th century AD (see Section 6.1.1). This is consistent with most of the other ceramics found in Area A — though they cannot be dated as specifically — and with the dates from other areas of the site. Notably, however, a fragment of a Late Byzantine period (ca. 5th-7th century AD) Carinated Oval Lamp (Reg. 32818) was surface collected prior to excavation in Area A (see Section 6.1.4). There is no reason, however, to date the architecture or any of the excavated remains to the Byzantine or Early Islamic periods on the basis of this find.

4.1.2. KNA Area D

Area D (numbered Building 5307 during the JHF WAG Survey) is a small (ca. 5 x 4 m), rectangular building located near the center of the site, in Wādī Nuqayb al-Asaymir (Fig. 4.1, 4.8). Based on its small size and location, Area D was hypothesized to be a subsidiary building of Area Z. During the 2012 ELRAP excavation season, a 2 x 1 m probe was conducted in conjunction with the larger excavations in Area Z in order to determine the Area D building's function.

Figure 4.8: Post-excavation photo of Area D. (Photo: Thomas E. Levy, courtesy UC San Diego LCAL.)

As is typical for many of the excavation areas at KNA, only a single stratum was identified in Area D before reaching sterile sediment. Other than a steady increase in the compactness of fills, no major stratigraphic changes were observed until the floor, L. 409, was reached. Two interesting features, however, were identified. The first is L. 411, a stone installation in the southern portion of the probe, likely extending into the unexcavated area to the west. L. 411 is likely a collapsed set of steps down to the floor of the building, though it may also be a collapsed bin. The other, L. 410, is an ash lens evident only in the northwest corner of the probe, i.e. the center of the building (Fig. 4.9).

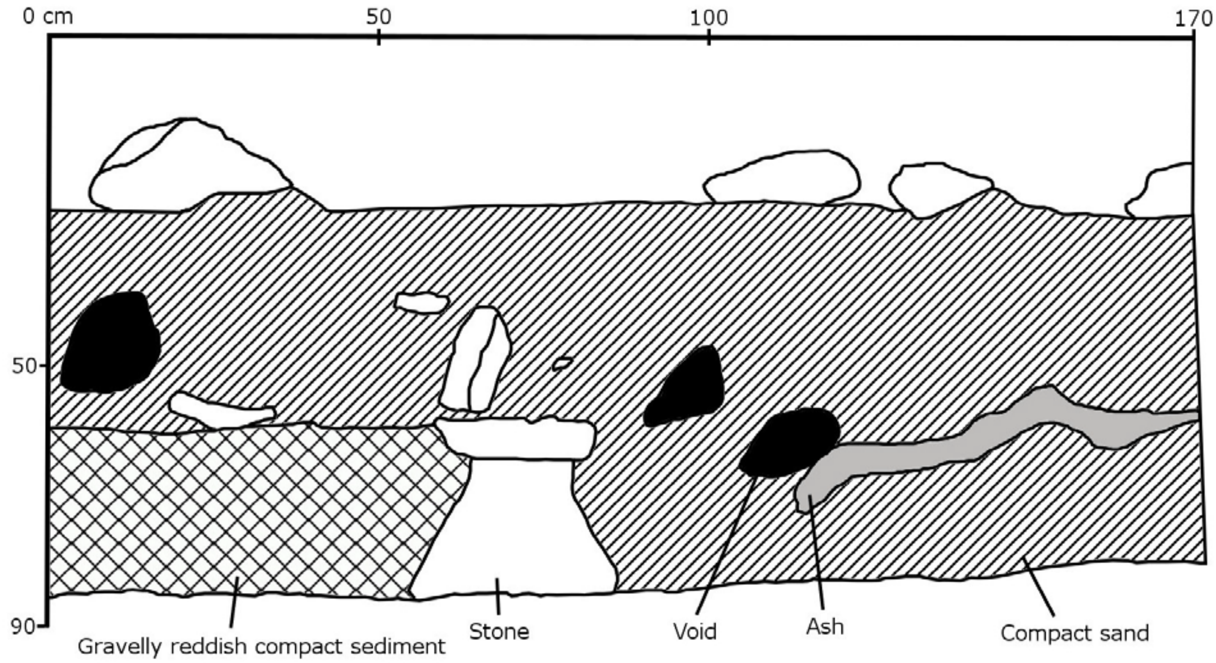

Figure 4.9: Section drawing of the western baulk of the KNA Area D probe, showing the L. 410 ash lens on the right side. (Illustration: Rebecca Asch, digitized by IWNJ.)

This locus contained the only pottery found during the probe in Area D: five sherds of unpainted hand-made ware, likely from a storage jar or cooking pot (see Section 6.1.3). The ash, pottery, and some charcoal finds from this locus suggest that it may have been a hearth. A radiocarbon sample was taken from the floor, L. 409, but could not be processed. A sample from a fill, L. 402, however, was processed, and produced a calibrated date of 1155-1215 AD (see Table 4.1 for complete information), in line with the Middle Islamic Ic-IIa date of the site's main occupation.

Other than the five sherds of hand-made pottery, finds in Area D were limited to minimal quantities of charcoal and copper ore, and a large number (n>150) of land snail shells (likely genus *Allopeas*[137]). The lack of finds makes it somewhat difficult to suggest a function for the Area D building. However, given the nature of the finds — primarily the "hearth" in L. 410 —

[137] This identification is my own. A conclusive identification will require additional analysis by a faunal expert.

the most likely function seems to be a small “oven-house” constructed during the Stratum Z2a modifications of the Area Z building. While Area D differs from the examples of these features discussed by McQuitty (1994), it should also be noted that few examples of Middle Islamic oven-houses have been published, and none that I am aware of have been identified at non-urban industrial sites. As such, the unique aspects of Area D — in particular, its distance from any other building at KNA — may, in fact, reflect the unique nature of the site.

4.1.3. KNA Area X

Area X (numbered Building 5300 during the JHF WAG Survey) is a five-room building in the westernmost portion of KNA, and was the key copper smelting area at the site (Fig. 4.1, 4.10).

Figure 4.10: Photo of KNA Area X and adjacent slag mounds in 2002, looking southwest. (Photo: courtesy UC San Diego LCAL.)

It measures ca. 22 x 11 m[138], not including the associated mounds of copper slag to its east, making it the largest single building at KNA (the Area A complex is, however, larger). The walls of the Area X building are still standing to a maximum height of more than 2 m, reflecting a higher quality of construction than other buildings at KNA. Although still made primarily of local brown shale, as well as sandstone, the coursing is much more regular than any other building at the site, and includes chinking stones inserted at semi-regular intervals (Fig. 4.11).

[138] Glueck (1935: 31) gives a length of only 17 m for the western wall, but this does not include Room 5, which extends the length of this wall to 22 m.

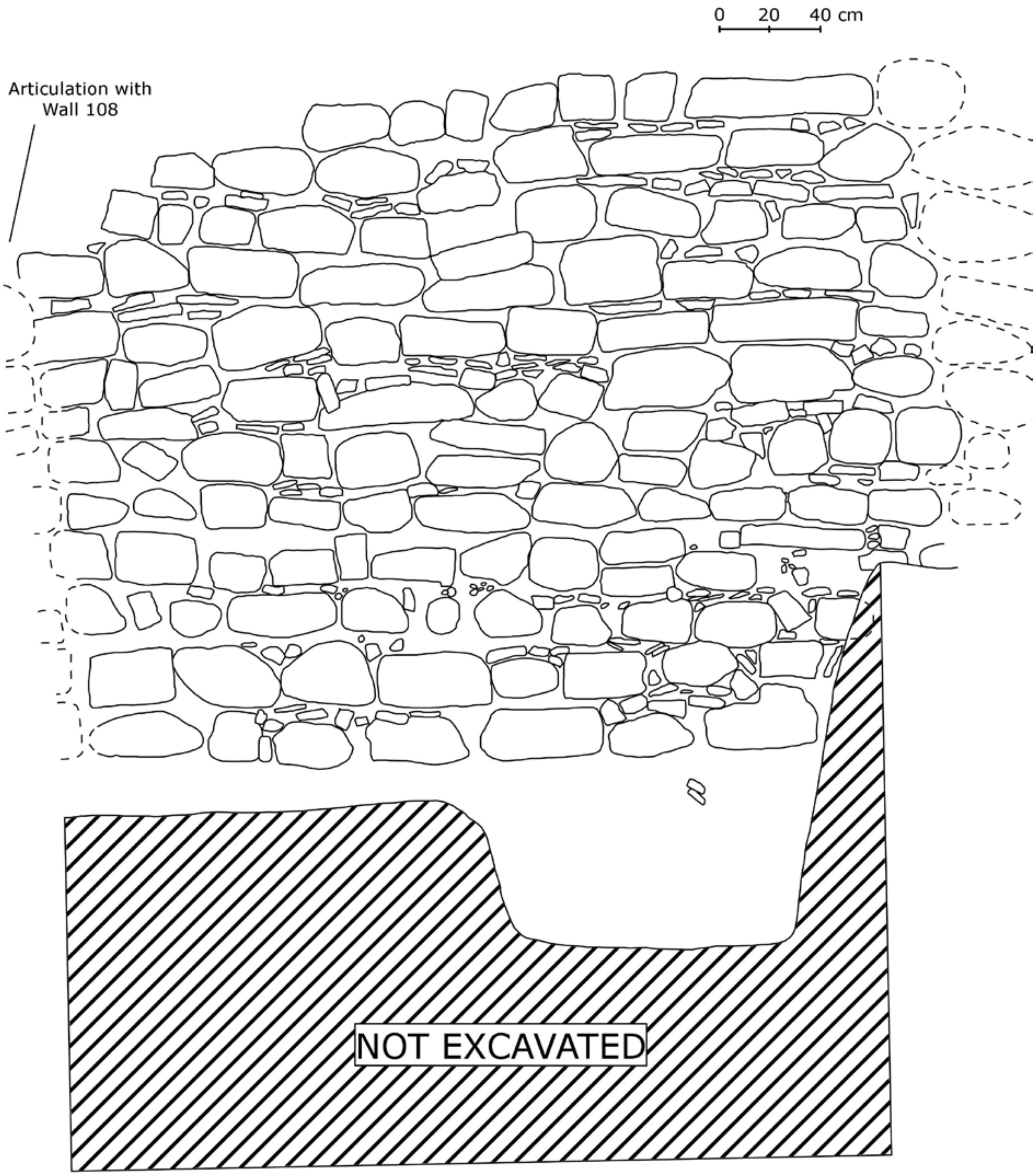

Figure 4.11: Drawing of northern wall of KNA Area X, Wall 105. (Illustration: Lauren D. Hahn, digitized by IWNJ.)

Glueck (1935: 31) somewhat hyperbolically compared this technique with the masonry at Qaṣr Kharāna, one of the so-called Umayyad “desert castles,” located ca. 55 km southeast of

‘Ammān. This led Glidden (1941: 118) to conclude, incorrectly, that KNA dated primarily to the Umayyad period. The initial, unpublished JHF Project report on the 2002 survey, likewise, suggested that several buildings at KNA, including Area X, might date to the Late Byzantine/Early Islamic period. As discussed below, however, the excavation in the building produced no evidence for a date earlier than the Middle Islamic I.

The building was chosen as the first at the site to excavate primarily to test a hypothesis put forward by Hauptmann (2007: 126-127), who suggested that it may have been a “shaft-house,” or a building whose primary feature is a covered mineshaft. The geology of the area, which is somewhat complex, makes this a plausible suggestion (see Fig. 3.1). Area X itself is built on wādī sediments that likely cover the Ṣalīb Arkosic Sandstone (SAS) formation, a geological layer below the two copper-bearing formations in Faynān. However, outcroppings of the copper-bearing Burj Dolomite Shale (BDS) formation are present to the north and south, and to the west, as Wādī Nuqayb al-Asaymir approaches Khirbat al-Nuḥās, the BDS formation is present at lower elevations than at KNA itself. WAG 57 and WAG 58, the mines in the western portion of Wādī Nuqayb al-Asaymir that provided most of the ore for KNA, are at lower elevations than KNA, and Area X’s proximity to this drop in elevation suggested that Hauptmann’s hypothesis was worth considering.

To test this hypothesis, a 7 x 3 m square was excavated along the northern (L. 105) and western (L. 108) walls of Room 3 during the 2011 ELRAP field season (Fig. 4.12).

Figure 4.12: Post-excavation aerial photograph of Area X with rooms labeled. (Photo: Craig Smitheram, courtesy UC San Diego LCAL; map: Matthew Vincent.)

This square was initially planned as 5 x 2.5 m (half of a 5 x 5), but was extended to investigate several features partially revealed on the edges of the square, including a short wall or working surface in the southern portion of the square and a roughly circular ashy installation in the northeastern portion. The results of the excavation, in fact, support Glueck's (1935: 31) suggesting that the Area X building housed furnaces. It is, however, possible, that Room 5 — which is somewhat different from the rest of the building and appears to have been added after its initial construction — housed a mineshaft. Further excavation would be required to determine whether this is the case.

Results of the 2011 excavation in Area X have been published previously (Jones 2016; Levy, et al. 2012b: 426-430), but are presented in more detail here. Like all excavation areas at KNA other than Area Z, stratigraphic distinctions could not be made in Area X. Other than two topsoil loci placed in Stratum X1 (L. 101 and 102) and two sterile loci in the basal Stratum X3 (L. 129 and L. 135), all loci in Area X belong to a single stratum, X2. Unlike other areas at KNA, however, this is not due to the shallow nature of the deposits in Area X, but rather is related to site formation processes. The Area X building was cleaned at regular intervals, and debris from the building was likely dumped on the slag mounds outside. As such, while few artifacts were recovered during the 2011 excavation (and future excavation of the Area X slag mounds would likely provide significant insight into the material culture of Middle Islamic period copper production), the results provide a view of a specific "event" (discussed in Section 10.1) at KNA: the last smelting operation conducted before the site's abandonment.

Stratum X1

The Stratum X1 topsoil loci, L. 101 and L. 102, contained primarily loose sediment and wall collapse. Finds were very limited, and consisted primarily of few body sherds and small pieces of slag and charcoal. Use of Area X during this phase was very ephemeral, and likely limited to mobile pastoralists passing through Wādī Nuqayb al-Asaymir. Architectural modifications during this phase of reuse were minimal compared to Area Z Stratum Z1, but likely involved the construction of Wall 116, a short wall enclosing the area between Walls 108 and 113. It is not possible to date Stratum X1 beyond suggesting that it represents ephemeral reuse between the late 13th and 20th centuries AD.

Stratum X2

The majority of the material recovered in Area X belonged to Stratum X2, the phase corresponding to the last smelting operation conducted in the Area X building. Architectural remains in this stratum consisted primarily of short stone installations (L. 126, 128, and 140), which likely functioned as working surfaces. Additionally, a very complete, stone-built shaft furnace (L. 120) was found, abutting Wall 108; this feature is discussed in detail in Section 4.1.3.1, below. Part of a lined pit or circular installation, L. 132, was found in the northeast corner of the square, contemporary with the Stratum X2 surface (L. 117 in this part of the square). The function of this installation is unclear, as only a portion was found in the excavated square, but it is noteworthy, as the majority of glass shards found in the square were recovered from the top of this feature. The construction of the building itself should be placed in this stratum, as well, as the foundations of Walls 105 and 108 were reached while excavating the Stratum X2 surface, L. 117.

The most common finds in Stratum X2, by far, were fragments of wood charcoal, found primarily in two furnace charges, L. 138 and 139. Species identification has been conducted on a large number of these samples by Dr. Brita Lorentzen of the Malcolm and Carolyn Wiener Laboratory for Aegean and Near Eastern Dendrochronology at Cornell University. The results of this analysis are discussed in Sections 10.1 and 10.2 and summarized in Appendix 1. Beyond this, finds were limited primarily to small quantities of pottery (see Sections 6.1.2 and 6.1.3), glass, iron objects (see Section 7.1), copper slag (see Section 7.2), and copper ore. Of particular interest in B. 50015, a large metal object found on surface L. 117, in the northwest corner of the building, although much of the object was recovered from L. 106 and L. 115, the overlying metallurgical fills. This object is a large lump of copper and iron, and its placement in the corner of the building, rather than the slag mounds outside, suggests that it was not a waste product, but an intermediate product set aside for further refining prior to the abandonment of Area X. The implications of this object are discussed in more detail in the following section, 4.1.3.1, and in Section 7.2. The remaining features of Stratum X2 have direct bearing on my reconstruction of the furnace's operation, and are discussed in Section 4.1.3.1.

Stratum X2 should be dated to the 12th or early 13th centuries AD. A piece of *Haloxylon* charcoal from the L. 139 charcoal charge produced a calibrated date of 1049-1210 AD (see Table 4.1 for complete information). This range is constrained by the limited ceramics finds from Stratum X2, however, which suggest, at the earliest, a date in the mid-12th century (see Section 6.1.3 for discussion). The radiocarbon date from Stratum X2 is somewhat earlier than radiocarbon dates from Area Z Stratum Z2 (see Section 4.1.5), but when ranges of error, the potential "old wood" effect (see Section 3.6 for discussion), and the low number of samples are taken into account, comparison becomes somewhat difficult. Given the primarily metallurgical natures of Strata X2 and Z2a, it is reasonable to suggest that they are contemporary.

Stratum X3

Stratum X3 is a layer of sterile wādī sediment below the Stratum X2 floor. Similar strata were recorded as basal layers in Areas Z and D, as well. Stratum X3 was reached only in a stratigraphic probe in the northwest corner of the building. A pit feature, L. 135, was recorded in this stratum and interpreted as likely being an animal burrow. No finds were recorded in Stratum X3.

4.1.3.1. The Copper Smelting Furnace in KNA Area X

The most interesting feature of Area X is L. 120 (Fig. 4.13), a shaft furnace abutting the western wall of the building, Wall 108 (see also Jones 2016: 116-119; Levy, et al. 2012b: 428-429).

Figure 4.13: Furnace L. 120, partially excavated. (Photo: Thomas E. Levy, courtesy UC San Diego LCAL.)

Before excavation, this feature appeared simply to be a collapsed pillar, and it is likely that a similar, unexcavated installation 5 m south of L. 120 is a second furnace. Glueck (1935: 31), in fact, thought that the building had a total of six furnaces, although without excavation of these features it is difficult to determine whether they all served this function. The dimensions of

L. 120 are 1 x 1.6 m, with a slag pit, L. 125, of about 0.75 m in diameter to its east. The permanent, rear portion of the furnace — the western portion abutting Wall 108 — was built of local brown shale from the BDS formation, the same stone used in the construction of the Area X building. On the eastern side of the furnace is a facing made of granite and clay. While the clay would have been replaced after each smelting operation, the granite portion of the facing would have been more permanent, though it likely required replacement at somewhat regular intervals. Between the permanent portion of the furnace and the facing was a layer of red soil, which FTIR analysis revealed to be an iron-rich, clayey loess. This material was used as a mortar to join the two portions of the furnace. This mortar layer is now quite decayed, and has run-off into the slag pit, L. 125, as well as an adjacent metallurgical layer, L. 137 (Fig. 4.14).

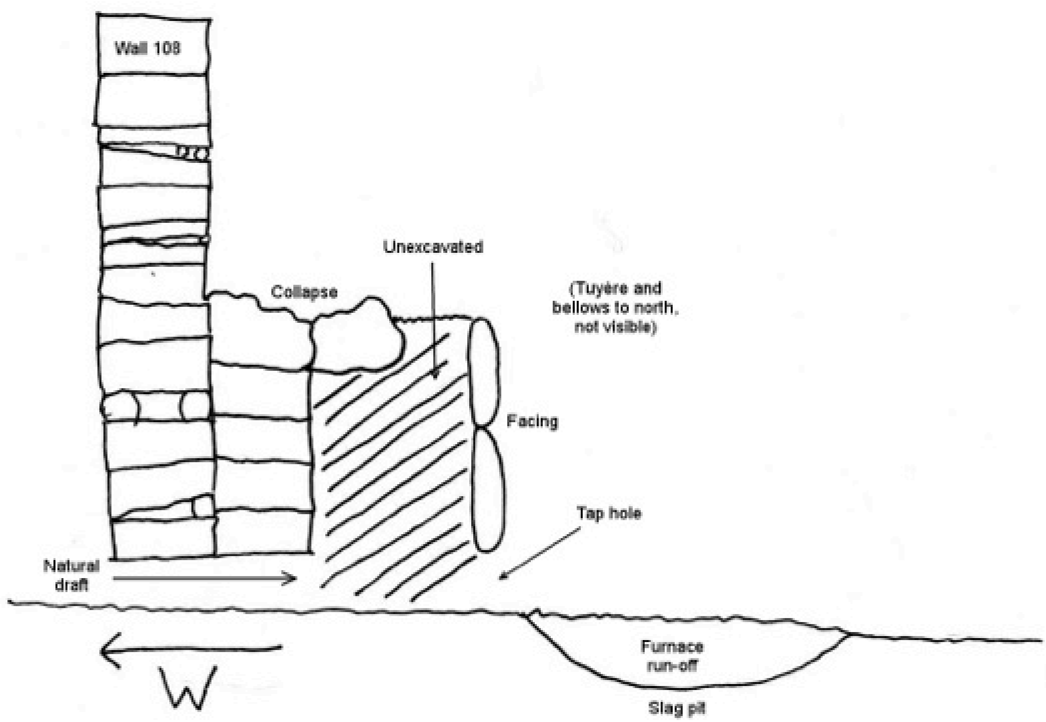

Figure 4.14: Schematic illustration of L. 120 furnace.

Overall, the furnace itself bears a strong resemblance to Early Islamic II shaft furnaces found in ‘Omān, particularly those recorded by Weisgerber (1987: 155, Fig. 74) at ‘Arjā’ Site 103 (Fig. 4.15). These have a similar reconstructable facing, although they are built against hillsides, rather than in a separate building, as at KNA. This suggests, on the one hand, that this furnace form was both widespread and long-lived in the Islamic world, and that, on the other, specific technological advances — discussed below — made the hillsides surrounding KNA a less desirable location for furnaces than the Area X building, despite the durability and thermal insulation offered by building furnaces into bedrock (see Weisgerber 1987: 154).

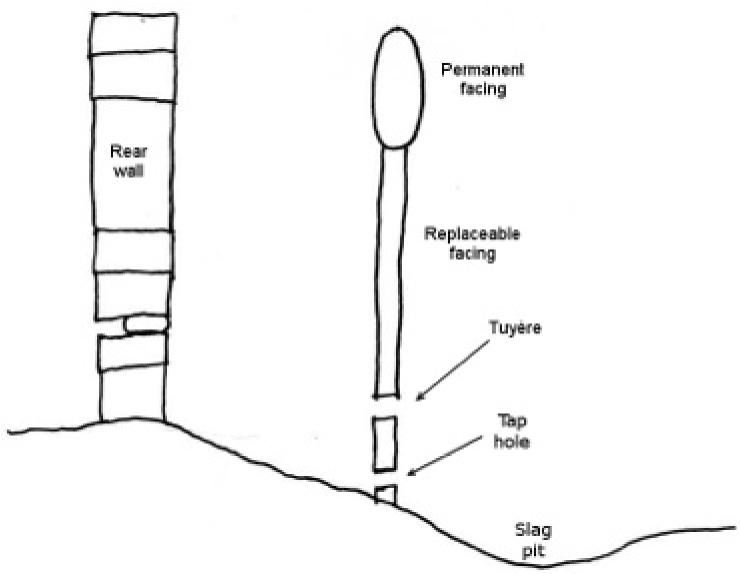

Figure 4.15: Schematic illustration of Early Islamic shaft furnace at ‘Arjā’ Site 103. (Illustration: IWNJ after Weisgerber [1987: 155, Fig. 74].)

Two additional similarities are also worth discussing. First, the KNA furnace bears interesting superficial similarities to stone-built, mortar-lined smelting furnaces recorded by Rothenberg (1990: 16-35, 71) at Timna Site 2, which he dated to the Late Bronze Age. The dates of these furnaces, particularly Furnace I and Furnace Z, continue to be somewhat controversial. Radiocarbon dates from Rothenberg’s (1990: 71) own excavations suggest that both furnaces were at least reused during the Early Islamic period, and a recent radiocarbon date “from the interior of an identical furnace at Nahal ‘Amram” (Avner 2014: 131, 146, Table 1.89) places the use of that furnace in the 7th-9th centuries AD. Ben-Yosef (2010: 671-672) has argued that, considering both the radiocarbon dates and the furnace technology[139], it is possible that both furnaces were not only reused, but also initially constructed during the Early Islamic period. Erickson-Gini (2012; 2014), however, on the basis of her recent excavations at Timna 2, argues that Rothenberg’s Late Bronze Age dating is largely correct. While Erickson-Gini’s (2014: 55, Table 1) excavations did produce Late Bronze Age radiocarbon dates, it is important to note that the furnaces she excavated were not shaft furnaces, but rather furnace types that most scholars engaged in this debate would agree date uncontroversially to the LBA. This debate is still unresolved, and the furnace at KNA is, regardless, not an exact parallel for the furnaces at Timna 2.

Second, several things about KNA are anomalous for a copper production site. First, B. 50015, the large copper-iron object recovered from the northwestern corner of the building, is strikingly similar to an iron bloom, although much more cupriferous. Second, ironworking certainly took place in Area Z during Stratum Z2a (see Section 4.1.5). The shaft furnace, L. 120, is also not, in principle, entirely different from a medieval bloomery furnace (Fig. 4.16). Hauptmann (2007: 126-127), who collected smaller pieces of copper-iron alloy from Area X, argued that these might be an indication of iron production at KNA. This might also explain the site’s location, near particularly iron-rich copper deposits (Hauptmann 2007: 71). As Hauptmann (2007: 207) notes, however, iron is often observed in copper, increasing as technology advances as “a sign of higher temperatures and stronger reducing conditions in the (each time larger) furnaces.” The question of whether this iron can be easily and usefully separated from the copper

[139] In particular, the presence of ring slag is an anomaly for pre-Islamic furnaces (see Section 4.4), but the construction of these furnaces is also somewhat different from other furnaces at Timna 2.

is one that is debated among archaeometallurgists. In the southern Levant, much of this debate has focused on objects found at Timna Site 200 (the "Hathor Temple"). Gale et al. (1990) suggested that iron objects found during excavations at Timna 200 were likely produced from iron refined out of a copper-iron alloy. Merkel and Barrett (2000) demonstrated that this was likely not the case for these artifacts in particular, and Craddock (1995: 255-256) argues that iron containing the amounts of copper suggested for the Timna 200 artifacts would have been useless, suggesting that refining of copper-iron alloys is an unlikely scenario for early iron production. Little work has been done to investigate whether this would be possible with a relatively advanced technology, however. Hauptmann (2007: 208) notes that, with a technology like that in use at KNA, iron blooms could potentially form in the bottom of copper smelting furnaces, and argues that both metals could be relatively easily separated from one another. He is of the opinion that this did not happen at KNA, however, as "it is unlikely that the material would have been treated as waste to such a large extent" if it had (Hauptmann 2007: 208). I would argue that Hauptmann has misinterpreted this material, in part because his conclusion is based on survey collection, rather than excavation. He collected "several kilograms of nut-sized lumps of copper-iron-alloys," but it is important to note that all of these were collected from the interior of the building, rather than the slag mounds outside (Hauptmann 2007: 126). Given the results of the 2011 excavation, these were in all likelihood associated with the final smelting operation recorded in Stratum X2. As I argue in Section 4.1.3, the fact that this material was deposited in the corner of the building, rather than dumped on the slag mounds outside, suggests that it was *not* treated as waste at all. As such, it is likely that this material was subjected to a refining process resulting in the production of both copper and iron (see also Section 4.1.5).[140]

[140] It is perhaps also worth mentioning that a very rare alternative scenario is presented by Craddock and Meeks (1987: 193-202), who discuss an intentional copper-iron alloy used in late 1st millennium BC *ramo secco* bars found

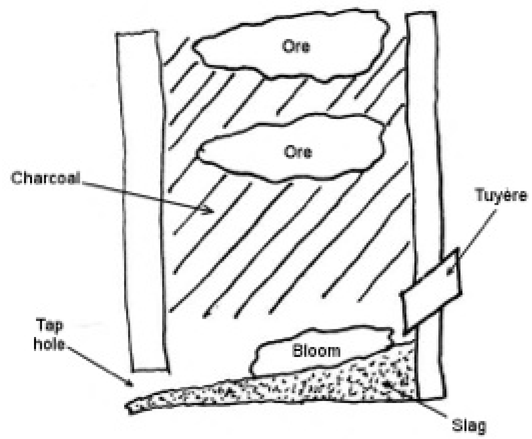

Figure 4.16: Schematic illustration of idealized bloomery furnace. (Illustration: IWNJ after Harvey [1989: 44, Fig. 2] and Sauder and Williams [2002: 128, Fig. 3].)

4.1.4. KNA Area Y

Area Y (numbered Building 5303 during the JHF WAG Survey) is a small building complex on a short hill in the northeastern portion of the site, overlooking Wādī Nuqayb al-Asaymir to the south, Wādī Ghuwayb al-Aṭshāna to the east and north, and Building 5304 to the east (Fig. 4.1, 4.17). The standing architecture consists primarily of a two-room building and numerous adjoining walls. These walls are not as well preserved, but some of them may have been related to additional rooms or independent features. Area Y was chosen for further investigation based on the ceramic assemblage from the 2002 WAG survey. 6% of the sherds collected in Area Y were from Syrian stonepaste wares, making this area the richest in these luxury ceramics at KNA. Based on this, and following Milwright's (2006: 21) arguments about these wares in southern Jordan, I hypothesized that this building was an elite structure.

in Italy. The resulting metal is nearly impossible to shape, however, and its use seems to have been limited to currency (Craddock and Meeks 1987: 201). Although examples of similar alloys are known from 1st millennium AD contexts, they are exceedingly rare, and it is incredibly unlikely that they were produced at KNA.

Figure 4.17: Mid-excavation photo of Area Y, looking southeast over Wādī Ghuwayb al-ʻAṭshāna. (Photo: Thomas E. Levy, UC San Diego LCAL.)

In order to test this hypothesis, a 3.5 x 2 m square was excavated in the northernmost room of the building during the 2012 ELRAP field season (Fig. 4.18). This excavation was initially planned as a 2.5 x 2.5 m square (a quarter 5 x 5), but the architecture of the building necessitated the adoption of a non-standard size. As in the excavation of Area A, on the opposing hillside, deposits in Area Y were very shallow, and the excavators reached bedrock at depths of little more than 0.25 m throughout the square.

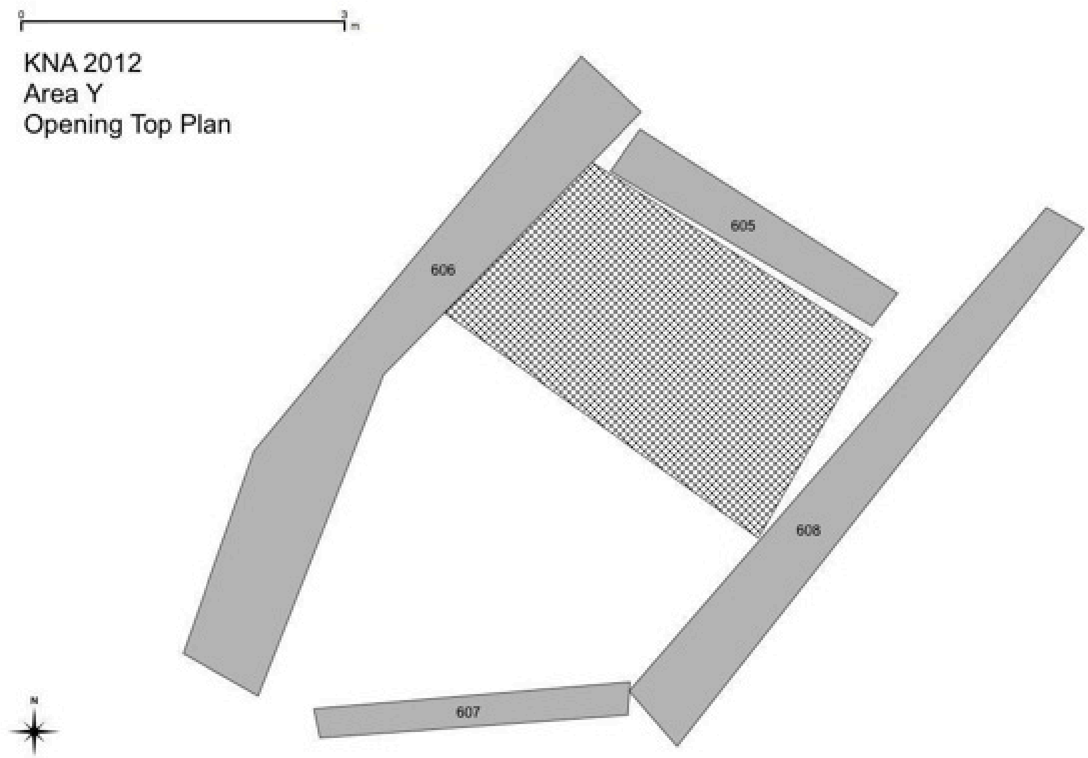

Figure 4.18: Top plan of Area Y showing location of excavation square in building.

The wall construction in Area Y is very similar to the makeshift/opportunistic shale construction in Area A. Unlike Area A, however, it was possible in Area Y to distinguish two potential building phases. The first building phase — Y1b — includes Walls 607 and 609, and likely also Wall 608. During this phase, it is possible that the room was open on its northern side. The second phase — Y1a — saw the construction of Wall 605, the room's northern wall. It is unclear, however, if Wall 605 was built to enclose the room, or to replace an existing damaged wall.

This phasing, unfortunately, was not evident in the excavated area. Due to the shallow nature of the deposits, it was not possible to make meaningful stratigraphic distinctions. Early clearance of the wall collapse and topsoil revealed some modern refuse, but also sherds of undecorated hand-made wares, which are difficult to date, but could quite easily belong to KNA's main late 12th-13th century occupation. Interestingly, however, the ceramic assemblage from the floor, L. 609, was different from the topsoil and fills. In this locus, wheel-made and HMGPW sherds were found, in addition to unpainted IHMW (see Section 6.1.3). It is difficult to determine if this distinction is chronologically meaningful, however, in part due to the current state of research on Islamic hand-made wares. Other than ceramics, finds in Area Y were limited to a single shard of glass.

The finds from the 2012 excavation are surprising when compared to the survey assemblage. Where the 2002 survey found a relatively high percentage of stonepaste wares in Area Y, the 2012 excavation recovered no glazed wares at all. The significance of this difference is not entirely clear. Given that Area Y, like Area A, is a hillside building, erosion is a tempting explanation. Howland's (2014: 43, Fig. 6; Howland, et al. 2018: 66, Fig. 6) work, however, shows that erosion in Area Y is fairly minimal compared to other hillside areas. Likewise, it is unlikely that the stonepaste sherds recovered in 2002 eroded into Area Y from the nearby hillside buildings — 5301 and 5302 — where few ceramics were recovered during the 2002 survey. Material from these buildings tends to erode into Wādī Nuqayb al-Asaymir or the area around Building 5305 (Howland 2014: 45, Fig. 8; Howland, et al. 2018: 69, Fig. 7), rather than Area Y. It is possible, given the shallow nature of the deposits in Area Y, that stonepaste was overrepresented in the surface assemblage (i.e. that the majority of the stonepaste in Area Y was on the surface), or that the room partially excavated in 2012 happened to contain less stonepaste than other parts of the area.

Regardless of the explanation, the initial hypothesis that Area Y was an elite domestic area does not receive much support from the 2012 excavation. Certainly the building's function was non-metallurgical, but further excavation would be required to determine with certainty whether it was a domestic structure. More recently it has been reused as an animal pen. This is evident in the post-Phase Y1a deposits (i.e. primarily in the Wall 605 collapse), but it is also possible that the Phase Y1a modifications coincide with a shift toward this function. The lack of stratigraphy, unfortunately, makes it difficult to date the building's architectural phases.

4.1.5. KNA Area Z

Area Z (numbered Building 5306 during the JHF WAG Survey) is one of the largest buildings at KNA, at ca. 16 x 12 m (Fig. 4.1, 4.19). It occupies a fairly central position at the site, in the main valley near the intersection of Wādī Nuqayb al-Asaymir and Wādī Ghuwayb al-'Aṭshāna. Like most buildings at KNA, the Area Z building is built primarily of the local brown shale, belonging to the BDS unit, that makes up the hills surrounding the site, with smaller quantities of limestone, sandstone, and granite. Although it is a large, centrally-located building, its walls are not particularly well-constructed. Unlike the fairly regular chinked construction of the Area X building, the exterior walls of the Area Z building are randomly coursed, suggesting that not as much care was taken in selecting or preparing pieces of shale to use. The construction is, however, less haphazard than in Areas A and Y.

Figure 4.19: Photo of Area Z in 2002, looking north. Area Y is visible on the hill in the background. (Photo: UC San Diego LCAL.)

Two long exposures were excavated during the 2012 ELRAP season: a 13.5 x 2.5 m square along the eastern wall of the building, Wall 253, and a 7.5 x 2.5 m exposure along the southern wall, Wall 254, for a total of 52.5 m^2 (Fig. 4.20). The rationale behind this wide exposure was to determine the functions that this large, central building would have served, as well as to investigate the interesting architecture of the building, with its two curved walls — Wall 217 and Wall 260 — splitting the southern portion of the building into two quadrantal rooms (Fig. 4.21). Additionally, the building's survey ceramic assemblage was one of the largest and most diverse at KNA, with a higher than average percentage of undecorated wheel-made wares (28%, compared to 18% in the overall KNA survey assemblage). As such, Area Z seemed to be a promising building to excavate in order to answer lingering questions about the date and nature of the site. The excavation did prove to be quite valuable, particularly as Area Z was the only excavation area at KNA where stratigraphic distinctions could be made. Three building phases were identified, which allowed for the separation of two primary strata, one of which can be further subdivided into two substrata (Fig. 4.22).

Figure 4.20: Map of the 2012 Area Z excavation area. White line indicates the extent of the excavation. (Photo: Matthew D. Howland, courtesy UC San Diego LCAL, map: IWNJ.)

Figure 4.21: Photo of the quadrantal rooms divided by Walls 217 and 260, taken during the 2002 WAG Survey. (Photo: courtesy UC San Diego LCAL.)

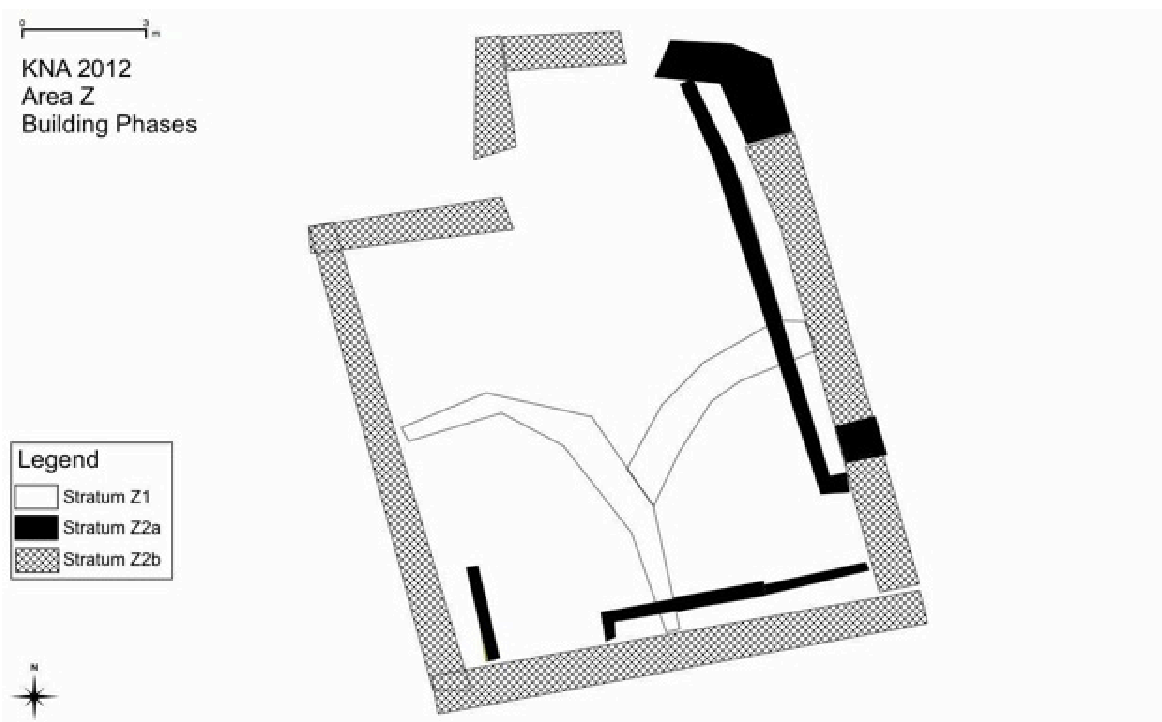

Figure 4.22: Top plan of Area Z showing the three building phases.

Stratum Z1

Stratum Z1 is the latest building phase in Area Z, consisting primarily of Walls 217 and 260 — the curved walls separating the southern portion of the building into quadrantal rooms — as well as the topsoil loci. Very little was recovered from Stratum Z1, and given this, it is difficult to date this phase, beyond pointing out that it post-dates Stratum Z2a. The amount of time that lapsed between the two building phases remains an open question, although based on parallels for this type of reuse elsewhere in Jordan, it is reasonable to suggest that at least several centuries had elapsed. It is likely that the Stratum Z1 building modifications were performed by Bedouin passing through Wādī al-Ghuwayb, and Walls 217 and 260 were perhaps built as a hunting blind. A similar feature was recorded in Stratum I (post-1918) in the Roman legionary barracks at al-Lajjūn (Groot 1987: 308-309)[141] — though unfortunately no plans or photographs of this feature were published — and it is likely that these features are fairly common in Jordan, but rarely reported due to their late date. Similar Late Islamic features, although built much higher, were also recorded at Khirbat al-Mu'allaq (Lindner, et al. 1996: 115-116, Figs. 6-7). The limited archaeological evidence suggests that, whatever its intended purpose, Stratum Z1 was used only sporadically.

Stratum Z2

Stratum Z2 is the primary Middle Islamic Ic-IIa use phase of the Area Z building. This stratum can be subdivided into two building phases and substrata — Z2a and Z2b — which will be discussed separately below. This separation is only possible near the walls of the building, however, where "bin" features were constructed in Stratum Z2a, covering an earlier Stratum Z2b phase. Away from the walls, toward the center of the room, no clear separation is evident, and it is not entirely possible to determine whether the material should be dated to Stratum Z2a or

[141] I thank Dr. Ben Saidel for pointing out this connection.

represents a mixture of Stratum Z2a and Z2b.

Unfortunately, many of the most interesting Stratum Z2 finds were recovered from the areas where the two substrata cannot be distinguished. Among these are a group of complete ceramic vessels — two hand-made jugs (B. 40198 and B. 40199; see section 6.1.3) and a wheel-made juglet (B. 40197; see Section 6.1.2) — a set of potential gaming pieces (see Section 7.5), and the majority of metal objects from Area Z, including a corroded iron blade (B. 40342), a copper clasp (B. 40122), and three copper *fulūs*, one of which (B. 40156) is legible and dates to 609-610 AH/1212-1214 AD (see Section 7.1). Several small stone installations — L. 226 and L. 240 — were also found in Stratum Z2, although the presence of Palestine oak (*Quercus calliprinos*) charcoal in L. 240 (see Appendix 1) suggests a connection to the Stratum Z2a metallurgical activities.

Stratum Z2a

The primary architectural elements making up Stratum Z2a are a series of bins constructed along the walls of the original Stratum Z2b building. Three of these bins were excavated — one only partially — and they are bounded by Walls 213(=262), 216(=222), 243, 278, and 300. Additionally, in order to seal the bins, Wall 259 was added to Wall 253, narrowing the northeastern entrance of the building, and the eastern entrance in Wall 253 was filled with shale (L. 246; Fig. 4.23). It is also possible that the southwestern corner of the building — portions of Walls 254 and 255 — had collapsed and been haphazardly reconstructed, though it is not entirely clear if this reconstruction belongs to Stratum Z2a or Z1. If this repair did, indeed, occur between Strata Z2b and Z2a, the earthquake of 1212 AD, which caused considerable damage in al-ʻAqaba and damaged al-Karak (Poirier and Taher 1980: 2192, Table 1), is a potential candidate for what caused the damage in the Area Z building. This matches the Stratum

Z2 coin evidence nicely, and is a reasonable assumption currently.

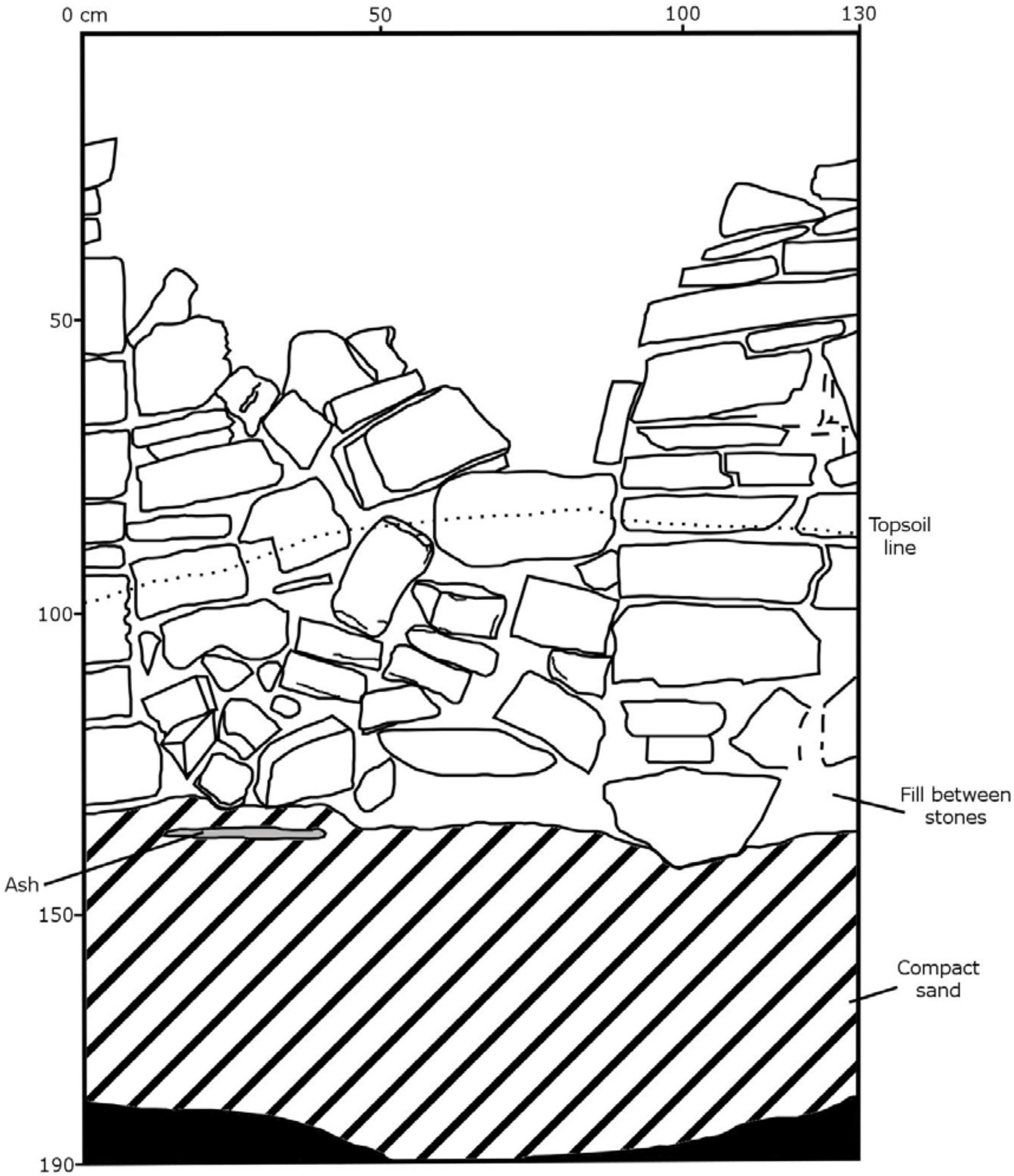

Figure 4.23: Drawing of L. 246 filling doorway in Wall 253. (Illustration: Kathleen Huggins, digitized by IWNJ.)

The bins themselves served a variety of functions, most of which seem to have been related to metallurgy. Bin 1 (Fig. 4.24), the northeastern bin bounded by Walls 216(=222) and 243, shows evidence of being connected to blacksmithing or perhaps to a refining process. The topmost loci in this bin contained high concentrations of ash (L. 220) and wood charcoal (L. 221), and immediately below these was a thin layer (L. 230) composed primarily of small chunks of iron. L. 220 and several of the fill loci above it also contained many fragments of blacksmithing slag and cinders (see discussion in Section 7.2). Immediately in front of the bin was a small channel (L. 225) cutting L. 218 and L. 224, and around the channel a concentration of metallurgical debris.

Figure 4.24: Mid-excavation photo of Bin 1 before removal of Wall 216, showing layers of metallurgical debris. (Photo: Thomas E. Levy, courtesy UC San Diego LCAL.)

Diagnostic ceramics from this bin include a relatively complete mold-made slipper lamp and black-under-clear underglaze painted stonepaste wares, both typical of the Middle Islamic Ic-IIa (see Sections 6.1.1 and 6.1.4). A radiocarbon sample taken from L. 221 was processed, and produced a calibrated date of 1157-1215 AD (see Table 4.1 for complete information).

Bin 2 and the excavated portion of Bin 3 were different from Bin 1, but very similar to one another. Little charcoal was recovered from either bin, but both contained a thick layer of compact ash directly above the original bin surface. Little was found in either bin, but the presence of small quantities of high-quality copper ore suggests a connection to metallurgy.

The building's function during Stratum Z2a seems to have been related to iron production, but contemporary iron production contexts for comparison are fairly rare.[142] Geographically, the closest is Arabah Expedition Site 224, a 14th century blacksmith's workshop near the modern Israel-Egypt border (Rothenberg 1972: 226-228).[143] The Stratum Z2a building is laid out rather differently, however, and in particular there is no evidence for the large, central furnace visible at Site 224. Farther away, a 9th-10th century crucible steel (Per. *pūlād* and Ar. *fūlādh*) workshop has been excavated at the site of Merv in modern Turkmenistan (during the Early Islamic period it was considered part of Greater Khurāsān).[144] The layout of the steel workshop is very different from the Stratum Z2a building (Herrmann, et al. 1997: 10, Fig. 5)[145], but it is interesting to note that there is evidence of copper alloy casting in the same workshop (Herrmann, et al. 1996: 17), suggesting that the simultaneous production of iron and copper was not unheard of in the Islamic world.[146] A plaster-lined stone basin was also found in a 9th-10th century iron workshop at al-Baṣra in Morocco (Morgan 2009: 297-298, Fig. 6.4). Although it could have served as a quenching pool, "its direct association with the iron furnace features" instead suggests some function in an earlier stage of the production process, although it is

[142] In addition to the cited examples, I am preparing material related to iron production at Khirbat al-Minya for publication. At the time of writing, this is in the preliminary phase.
[143] Although the 14th century date is reasonable, its accuracy is difficult to evaluate. The Arabah Expedition completely excavated the blacksmith's workshop at Site 224, but unfortunately the only publication is the brief report cited here. While the report states that the site was dated by pottery to the 14th century, none of this pottery has been published. Given the state of Middle Islamic ceramics research in 1972, this date should be considered, at best, tentative.
[144] These excavations are summarized briefly by Simpson (2001). A detailed archaeometallurgical investigation has been published by Feuerbach, et al. (2003).
[145] Evidence for crucible steel production also tends to be very distinctive (see Alipour and Rehren 2014).
[146] It is likely that iron was also being produced in this area, in addition to copper and crucible steel (Herrmann, et al. 1999: 13), but a separate iron workshop has not been published. Primary iron smelting probably did not occur at Merv, however, as the surrounding area has no iron deposits (Herrmann and Kurbansakhatov 1994: 70).

unclear what this might be (Morgan 2009: 298). Although its form is rather different from the Stratum Z2a bins, it is nonetheless an interesting parallel.

Stratum Z2b

This stratum represents the earliest occupation in Area Z, and consists architecturally of the external building walls — excluding Wall 259, a Stratum Z2a addition — and a small stone platform, L. 299, abutting the center of Wall 254 on the interior (northern) side. The plan of the building was more open during this phase, and had at least one additional entrance in the eastern wall, which was blocked during Stratum Z2a by L. 246. It is unclear what function the semi-circular stone platform, L. 299 (Fig. 4.25), may have served. It is also unclear whether it was initially semi-circular, or if the installation was initially larger, but only the portion covered by the Stratum Z2a bin has survived.

Figure 4.25: L. 299, the semi-circular installation found below Bin 2. (Photo: Thomas E. Levy, courtesy UC San Diego LCAL.)

Better evidence for the Stratum Z2b occupation comes from the northeastern corner of the building, where a deep pit (Fig. 4.26) — consisting of L. 233, L. 242, L. 282, L. 286, L. 290, L. 293, and L. 297 — was found, partially covered by a Stratum Z2a bin wall (Wall 216[=222]). This pit seems to have served alternately as a hearth and trash pit, as several stone installations surrounded by ash and charcoal were found between layers of food waste. The food waste layers are made up primarily of charcoal, with alternating concentrations of animal bone and relatively complete chicken eggshells (Fig. 4.27), along with infrequent textile fragments. Analysis of the charcoal from the pit shows an assemblage that differs substantially from the metallurgical areas at KNA (see Appendix 1). Ceramics were fairly common in the Stratum Z2b pit, and include hand-made cooking wares, plain wheel-made wares, and Syrian stonepaste wares (see Sections

6.1.1, 6.1.2, and 6.1.3).

Figure 4.26: Stone installation surrounded by charcoal and ash in Stratum Z2b pit, L. 293.

Figure 4.27: Sample of chicken eggshells from Stratum Z2b pit, L. 242. (Photo: Leah Trujillo, courtesy UC San Diego LCAL.)

Overall, the finds from Stratum Z2b indicate a domestic, public, or culinary function — or perhaps some combination of the three. This may suggest that a slightly different copper production process was in use at KNA during Stratum Z2b, or alternately that another building at KNA may have served a similar function to the Stratum Z2a building during this earlier phase.

Stratum Z3

Stratum Z3 consists of the sterile wādī sediment below Stratum Z3. It is the typical basal layer of the excavation areas in the site's main valley, and was also found as the lowest stratum in Area X — Stratum X3 — and as the basal layer in Area D.

4.1.6. Unexcavated Buildings and Features at KNA

In order to understand the place of the excavated buildings at the site, it is also necessary to provide a brief description of the unexcavated buildings and features. Fifteen distinct features

— numbered 5300 (Area X)-5314 — were recorded at KNA during the 2002 JHF WAG Survey. These features are described by Jones (2010) and Jones, et al. (2012). An additional feature — Building 5315 — was found during the 2011 ELRAP excavation season, and recorded during the 2012 season. This section provides a complete list of survey features — correlated, where applicable, to their excavation area designations — and descriptions of unexcavated features.

Building 5300

Excavation Area X (see Section. 4.1.3).

Building 5301

Building 5301 (Fig. 4.28) is a terraced, potentially domestic structure built on the south slope of the site's northern hill. It is built, fairly haphazardly, of local brown shale. Few artifacts were collected in this building during the 2002 survey.

Figure 4.28: Eastern wall of Building 5301 in 2002. (Photo: courtesy UC San Diego LCAL.)

Building 5302

Building 5302 (Fig. 4.29), like Building 5301, is a small, terraced, potentially domestic structure located on the southern slope of the site's northern hill. It is built, fairly haphazardly, of local brown shale. Two small storage bins are built into the building's southern wall (Fig. 4.30). Only a single sherd was collected in this building during the 2002 survey.

Figure 4.29: Building 5302 in 2002. Surveyors can be seen (top left) collecting from Building 5305. On the south side of Wādī Nuqayb al-Asaymir (top center), Area D is just visible. (Photo: courtesy UC San Diego LCAL.)

Figure 4.30: Storage features in Building 5302. (Photo: courtesy UC San Diego LCAL.)

Building 5303

Excavation Area Y (see Section 4.1.4).

Building 5304

Building 5304 (Fig. 4.31) is a building complex located on a small hill in the northeastern part of the site. An unnamed tributary wādī separates it from Area Y. The buildings are constructed primarily of local brown shale. Jones, et al. (2012: 74) suggested that the building served a function related to copper metallurgy, as the WAG surveyors recorded a concentration of copper slag on the hillside near the building (visible in Fig. 4.31). Closer observation of this feature during the 2011 and 2012 excavation seasons, however, demonstrated that this material, while easily mistaken for slag, is in fact eroded (or crushed) shale, much of it likely burnt. As such, the function of Building 5304 is not entirely clear, although it is possibly related to the production of wood — particularly *Haloxylon* — charcoal.

Figure 4.31: Building 5304 in 2002, looking southeast. (Photo: courtesy UC San Diego LCAL.)

Building 5305

Building 5305 (Fig. 4.32) is a small, poorly-preserved building located on a small hill on the northern side of Wādī Nuqayb al-Asaymir, roughly halfway between Building 5302 and Area Z. It is built primarily of local brown shale, and only two short walls are standing. Very little material was collected in this building during the 2002 survey.

Figure 4.32: Poorly preserved standing architecture of Building 5305 in 2002. (Photo: courtesy UC San Diego LCAL.)

Building 5306

Excavation Area Z (see Section 4.1.5).

Building 5307

Excavation Area D (see Section 4.1.2).

Feature 5308

This is a group of single-course stone features in the western part of the site, located ca. 100 m south-southwest of Area X (Fig. 4.33). Given the preservation of the other buildings in the main KNA valley, it is unlikely that Feature 5308 is an eroded building associated with the main Middle Islamic period occupation, and instead it seems to be a later Bedouin addition to the site. Several of the features, at least, appear to be Bedouin graves. Despite this — and likely due to patterns of erosion at the site — much Middle Islamic period material was collected during the

2002 survey, including a corroded and illegible Islamic copper *fals* (Jones, et al. 2012: 88, Fig. 20; see Section 7.1 for discussion).

Figure 4.33: 2002 photo of the single-course stone lines making up Feature 5308. A surveyor can also be seen at the top of the hill in Building 5309 (top left). (Photo: courtesy UC San Diego LCAL.)

Building 5309

This is a small building located at the top of the site's southern hill, above Area A (Fig. 4.34). It consists of a single, roughly rectangular room, and is built of local brown shale and limestone. While a domestic or administrative function is possible, its location at the top of the hill makes observation — either of the production buildings or the approach to the site from the south, or both — a tempting explanation.

Figure 4.34: Building 5309 in 2002. (Photo: courtesy UC San Diego LCAL.)

Building 5310

Excavation Area A (see Section 4.1.1).

Buildings 5311 and 5312

This is a building complex located on the southeastern part of the site's southern hill (Fig. 4.35). While recorded as separate buildings during the 2002 survey, both features seem to form part of the same domestic or administrative building complex. The structures are built primarily of local brown shale, and are fairly eroded. Nonetheless, much material was collected during the 2002 survey, and additional material was surface collected during the 2012 excavation season (see Sections 6.1.1, 6.1.2, and 6.1.3).

Figure 4.35: Photo of the Feature 5312 building complex in 2002, showing relatively poor preservation. (Photo: courtesy UC San Diego LCAL.)

Building 5313

This building is located just to the east of Building 5312, and could perhaps be considered part of the 5311/5312 building complex (Fig. 4.36). It is treated as a separate building here as it likely served a different function. Glueck (1935: 30, and compare his Fig. 13 to Fig. 4.36) referred to the building as "bottle-shaped" and suggested it may have been a furnace, but there is nothing, other than its presence at KNA, to suggest a direct connection to metallurgy.[147] The view it commands of Wādī Ghuwayb al-ʻAṭshāna, instead, suggests that it functioned as a watchtower.

[147] KNA is certainly not the only site where Glueck misidentified buildings as furnaces. As Ben-Yosef, et al. (2014b: 799) note, "This problem plagued Glueck's interpretations at other archaeometallurgical sites along the Arabah Valley as he was probably following the misinterpretations of one of his mentors: Sir W. F. Petrie in Sinai."

Figure 4.36: Photo of round room in Building 5313 in 2002. (Photo: courtesy UC San Diego LCAL.)

Building 5314

Building 5314 (Fig. 4.37) — the final building recorded at KNA during the 2002 survey — is a small, rectangular structure built on the sheer northern side of the site's northern hill. It is built primarily of local brown shale. Its size and impressive view of the northern approach to the site suggest that it, like Building 5313, functioned as a watchtower.

Figure 4.37: Building 5314 in 2002, showing the steep drop into the valley to the north. (Photo: courtesy UC San Diego LCAL.)

Building 5315

Building 5315 (Fig. 4.38) sits on a ridge 150 m north of Area X and 150 m northwest of Building 5314. Despite its proximity to other buildings at KNA, it was not recorded during the 2002 survey, likely because it is somewhat difficult to reach and is not visible from any other structure at the site. Its presence was noted during the 2011 excavation of Area X, and it was mapped during the 2012 excavation season using a Magellan ProMark 3 real-time kinematic (RTK) GPS system, while a two-person survey team collected surface artifacts. The building itself is a very shallow structure built directly on the shale hilltop, and it is rather poorly preserved, consisting of incomplete, single-course wall lines and a better-preserved stone feature of uncertain function (Fig. 4.39). The artifacts collected from this building include Middle or Late Islamic period hand-made ceramics (see Section 6.1.3), the *rukh* (rook) of a chess set (see

Section 7.5), and technical ceramics and slag. The function of Building 5315 is not entirely certain, but its location is unique in offering clear views of much of KNA, of the mines — WAG 57 and 58 — in Wādī Nuqayb al-Asaymir (for these, see Section 5.1.1), and of the northern approach to the site.

Figure 4.38: Building 5315, looking east over KNA's northern hill, with Wādī Ghuwayb al-'Aṭshāna in the background.

Figure 4.39: Stone feature at Building 5315. The portion of Wādī Nuqayb al-Asaymir containing the WAG 57 and 58 mine sites is visible below, at the top of the photo.

4.2. ELRAP Excavations at Middle Islamic Khirbat Faynān

Khirbat Faynān (Ar. "the ruin of Faynān")[148] is the modern toponym for the ruins of the Roman and Byzantine town of Phaino (Φαινω)[149], and, likely, the Biblical site of Punon. The site itself is a *tall* located at roughly the point where Wādī Faynān and Wādī Ḍānā meet (Fig. 4.40). ELRAP conducted two seasons of geophysical survey and excavation at the site in 2011 and 2012. Due to the size and complexity of the site, during the initial phase of the project, a system of 28 100 x 100 m grid squares was established, each of which contain 100 10 x 10 m squares (Fig. 4.41). The large (100 m^2) grid squares correspond to "areas" of the site, and the small (10 m^2) grid squares to "squares."

[148] See Section 3.2.2 for further discussion of the name Faynān.
[149] See Section 3.4 for further discussion of the ancient name of the town. A number of ancient sources give slightly differing names, but I follow most modern scholars in referring to the Roman/Byzantine town as Phaino.

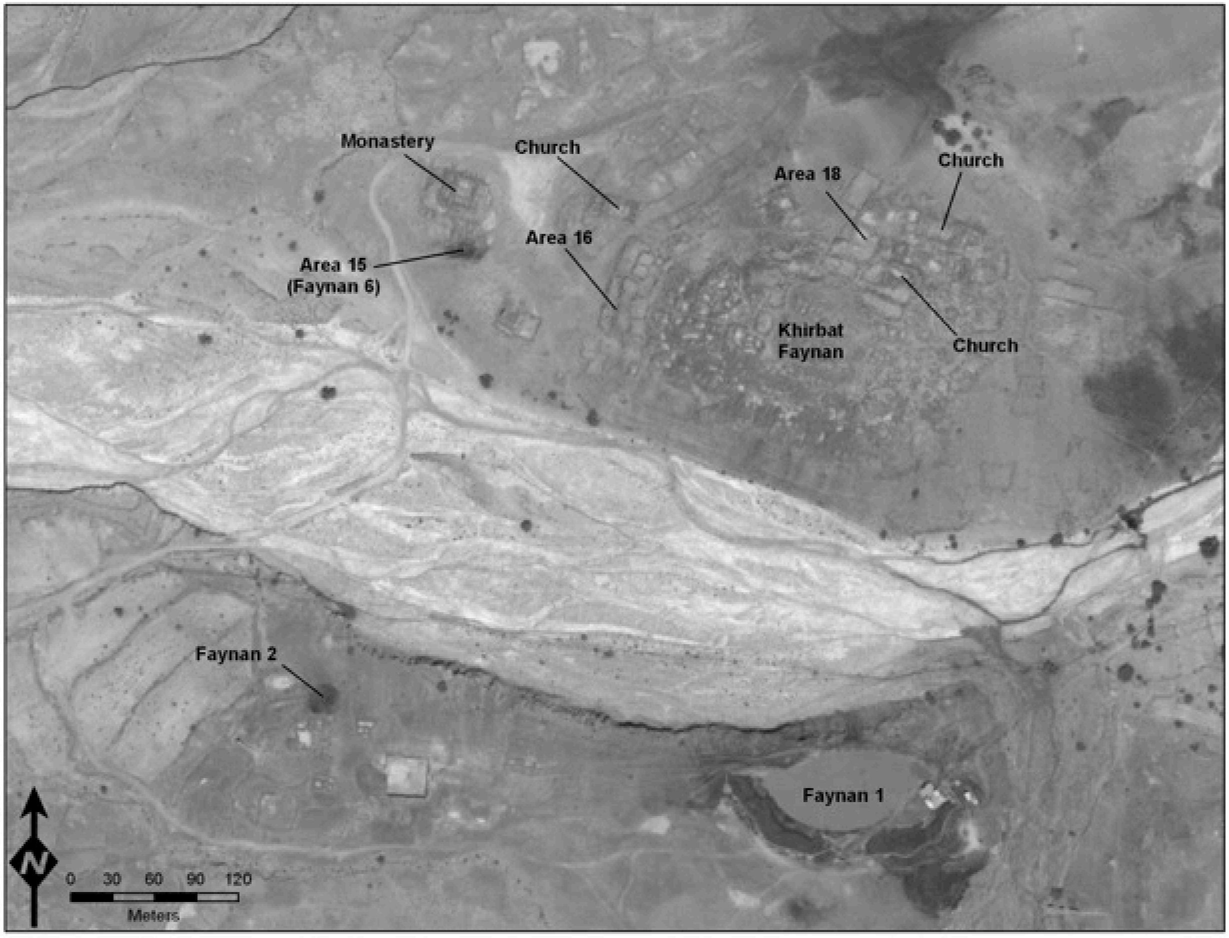

Figure 4.40: Map of Khirbat Faynān features discussed in this dissertation. (Basemap: Esri, DigitalGlobe, Earthstar Geographics, CNES/Airbus DS, GeoEye, USDA FSA, USGS, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.)

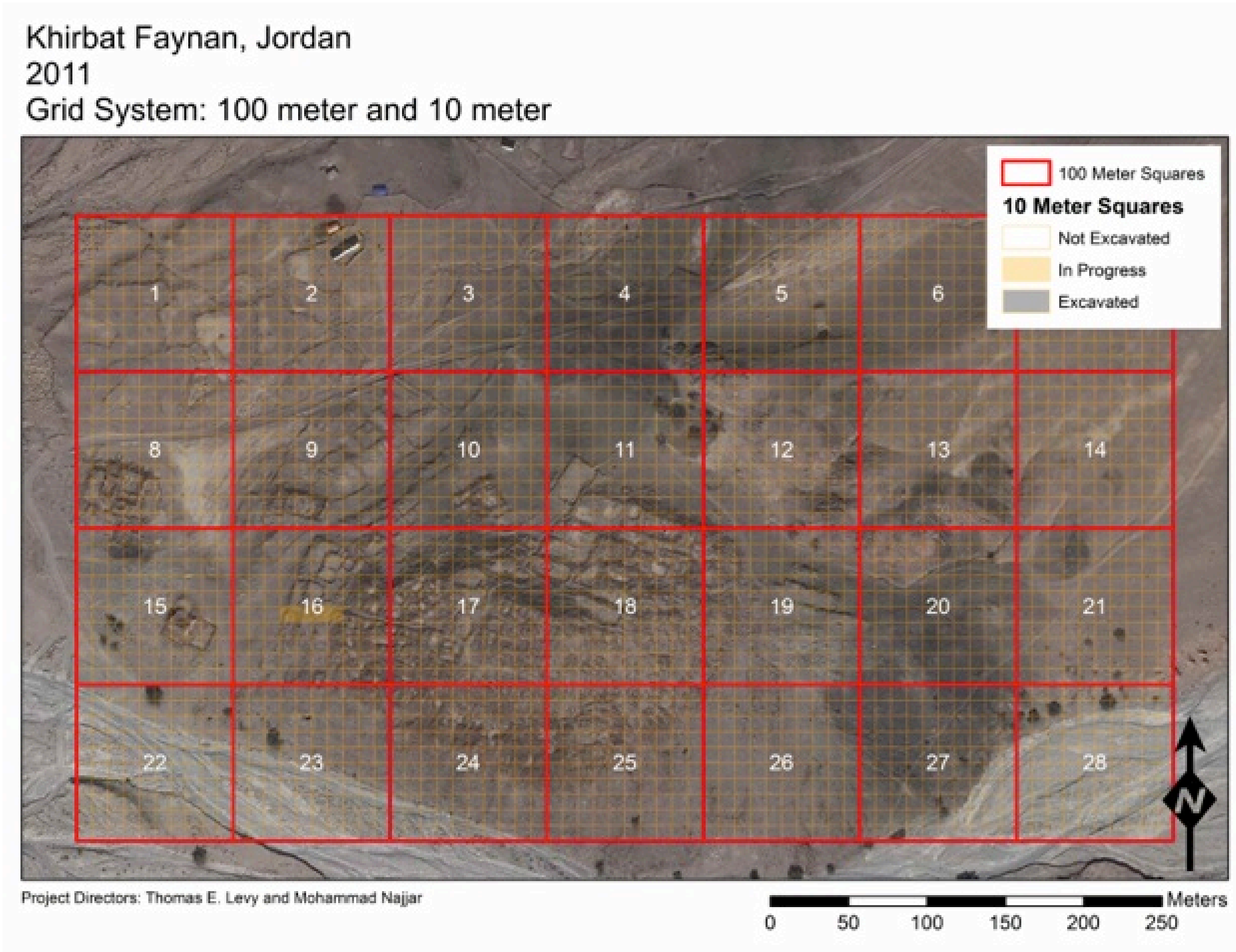

Figure 4.41: Map of ELRAP excavation area grid for Khirbat Faynān. (Map: Matthew Vincent, courtesy UC San Diego LCAL.)

ELRAP conducted excavations in three areas of the site over the course of these two field seasons, but only one of these excavation areas — Area 15 — is relevant to the present chapter. The remaining two — Areas 16 and 18 — will be discussed in Chapter 5, along with the history of research at the site, which has focused primarily on the pre-Islamic periods.

4.2.1. Khirbat Faynān Area 15

Area 15 is a Middle Islamic period slag mound adjacent to the Area 8 monastery (Fig. 4.42). It is also known in DBM publications as Faynān 6 (see Hauptmann 2007: 103). Hauptmann (2007: 103) estimates that it contains only "a few tons of slag," but it is not actually much smaller than the Faynān 2 slag mound, which he estimates contains "some 50 t."

(Hauptmann 2007: 97). A small excavation — consisting of a 3 x 2 m probe as well as a 1 x 1 m stratigraphic probe to determine the relationship of the slag mound to the exterior wall of the Area 8 monastery — was conducted in Area 15 during the 2012 ELRAP field season. The primary rationale behind this excavation was to determine the dating, length, and intensity of Middle Islamic period copper production at Khirbat Faynān. Specifically, a key goal was to determine whether Hauptmann's (2007: 103) 14th century AD date, based on numismatic evidence published by Kind, et al. (2005: 179, 188), was correct (see also discussion in Section 3.6; Jones 2016; Jones, et al. 2012). As discussed below, analysis of material from this excavation has required pushing the date of the Area 15 slag mound back by roughly two centuries.

Figure 4.42: Area 15 slag mound prior to excavation in 2012. Rock collapse associated with the Area 8 "monastery" is visible on the left. (Photo: Thomas E. Levy, courtesy UC San Diego LCAL.)

The stratigraphy of Area 15, like any slag mound, is rather complex, as its formation processes involve many episodes of copper production, refuse disposal, abandonment, etc. In Area 15, it is possible to group much of the minor stratigraphic variation (Fig. 4.43) into six major strata, shown as a Harris matrix in Fig. 4.44. These form the basis of the present discussion.

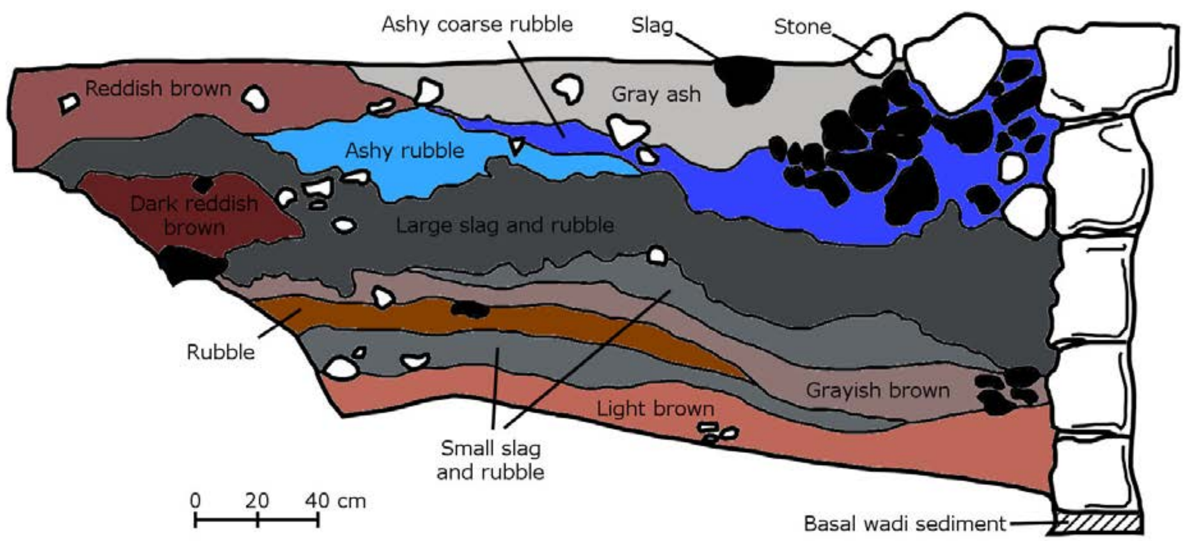

Figure 4.43: Profile drawing of west section of Area 15 excavation, showing complexity of production and abandonment layers and articulation with wall of Area 8 monastery. (Illustration: Ashley M. Richter, digitized by IWNJ.)

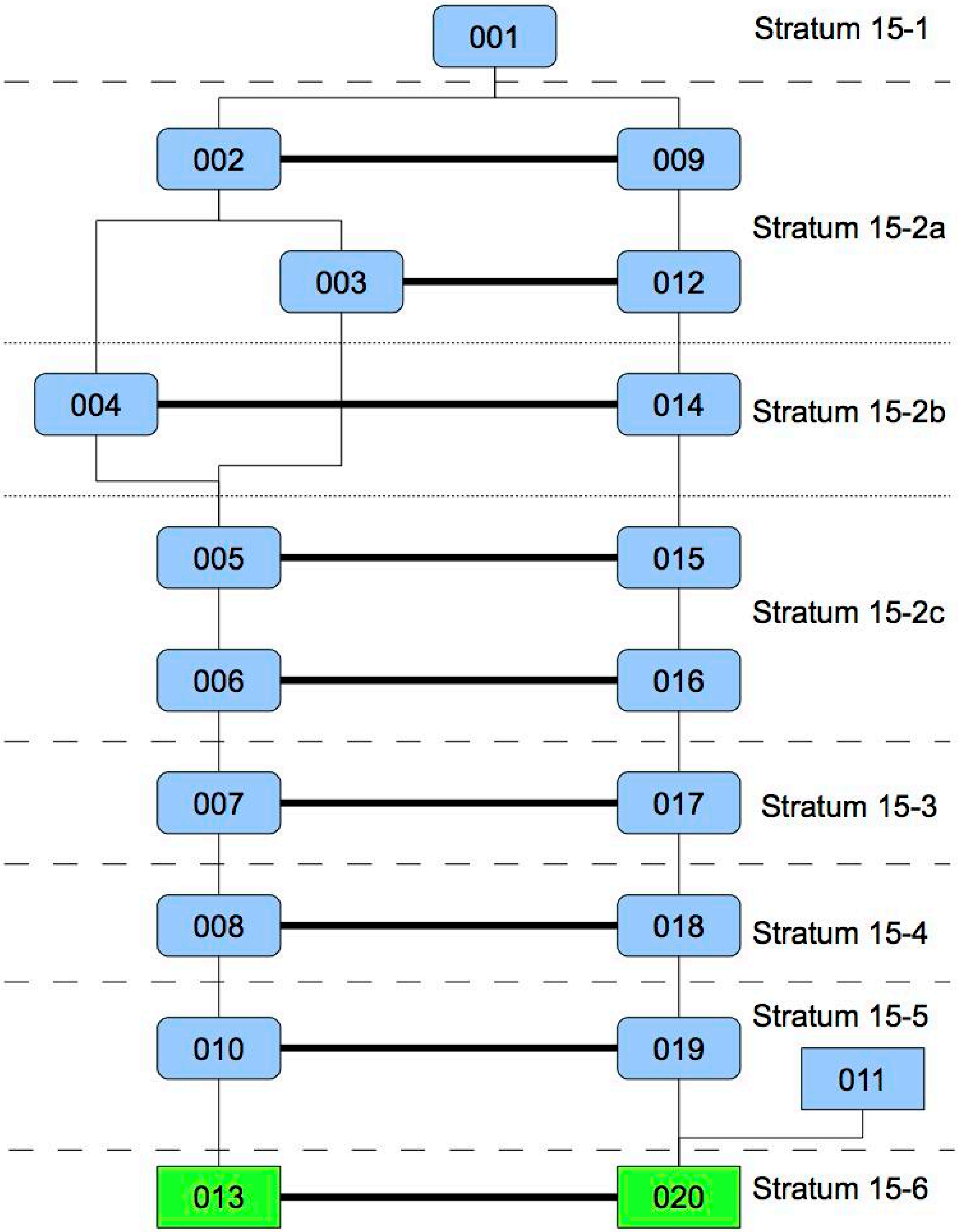

Figure 4.44: Harris matrix of 2012 Area 15 slag mound probe.

Stratum 15-1

This stratum corresponds to the surface of the slag mound, and consists primarily of the topsoil loci. Finds were limited almost exclusively to modern refuse and surface copper smelting debris, mostly slag with smaller quantities of furnace fragments and technical ceramics. Pottery finds were very infrequent, but included hand-made wares of the Middle or Late Islamic period.

Stratum 15-2

Stratum 15-2 corresponds to the primary copper production phase in Area 15. A minor hiatus in production divides this stratum into three substrata.

Stratum 15-2a is the smallest and latest phase of copper production in the Area 15 slag mound. It is primarily visible in the higher, southeastern section of the probe — closer to the center of the slag mound — and appears to represent a relatively short production phase. Finds in this substratum were limited primarily to metallurgical debris, including large quantities of slag, technical ceramics, copper ore, charcoal, and pieces of sandstone with a bluish-green, cupriferous "glaze"[150] on one side (see Section 7.2). These pieces of sandstone were also found in KNA Area X, and the best interpretation of them, at present, seems to be that they are fragments of the replaceable portion of the furnace facing. Although no furnace was found in Area 15, the similarity of the fragments from KNA Area X to these suggests that a similar smelting technology was in use. A radiocarbon sample from L. 012, in this substratum, was processed, and produced a calibrated date of 1042-1155 AD (see Table 4.1 for complete information). This suggests, *contra* Hauptmann (2007: 103) and Kind, et al. (2005: 179, 188), that copper production in Area 15 did not continue into the 14th century.

[150] These glazes look remarkably similar to ceramic glazes, and at first glance these facing fragments are easily mistaken for worn stonepaste sherds. This phenomenon is not unique to the furnaces in use during the Middle Islamic period, however. Hauptmann, et al. (2000), for example, have suggested that similar furnace glazes observed in Early Bronze Age contexts in Faynān and Timna could be related to the development of glaze technologies in Egypt.

Stratum 15-2b is a minor disruption in copper production, although its exact nature is, at present, unclear. A disruption is evident in the eastern part of the southeastern section, but the western side of the section contains a concentration of discarded technical ceramics and furnace facings in Stratum 15-2b. It is possible that this substratum does not represent a hiatus in copper production in Area 15, but rather a shift in which portion of the slag mound was in use, possibly corresponding to a decrease in production intensity. In order to clarify this subphase, further excavation would be necessary.

Stratum 15-2c is the largest of the copper production levels in Area 15, and the latest to be clearly visible across the entirety of the southwestern section of the probe. Horizontally, the substratum varies between concentrations of slag and charcoal and ashy fills containing relatively little slag. Slag in this substratum is generally found in smaller pieces than in Stratum 15-2a, suggesting more crushing and reprocessing to extract additional copper. Technical ceramics and fragments of furnace facings were found in this substratum — though in lower concentrations than the potential furnace dump in the western portion of Stratum 15-2b — as were several concentrations of copper ore and pieces of mixed copper and iron. These mixed metal objects are similar to those found in KNA Area X (see discussion in Section 4.1.3.1 and 7.2) and, again, likely indicate that a similar smelting technology was in use. This also provides some support for Hauptmann's (2007: 96) suggestion that a piece of iron "of 15 kg containing over 15 wt.%"[151] copper, surface collected from the Faynān 1 slag mound should, in fact, be dated to the Middle Islamic, rather than Roman, period. Finally, very small amounts of glass, bone, and pottery were found in this substratum. Notably, Middle Islamic HMGPW was present,

[151] This is a very high percentage of copper, and likely reflects a connection to the smelting process in use at KNA and, evidently, Khirbat Faynān. However, it is worth noting that relatively high amounts of copper are not entirely unknown in ancient iron artifacts. Yener (2000: 70), for example, reports a Bronze Age iron ring that contains roughly 73% iron and over 6% copper from Tepecik in Anatolia.

as were several residual Byzantine/Early Islamic sherds near Wall 011, the external wall of the monastery.

Stratum 15-3

Stratum 15-3 corresponds to a major hiatus in copper production during the Middle Islamic period. This stratum is composed primarily of a tan-colored gravelly fill, and in contrast to the strata directly above and below, slag and other metallurgical debris are rare, although a single iron nail was found. Ceramic finds, again rare, include both Middle Islamic period and residual Byzantine/Early Islamic sherds. It is unclear how long this hiatus lasted, due primarily to the overlapping radiocarbon dates from the earliest and latest production layers, but it seems to have been fairly significant, as it is deeper, especially in the southeastern section, than some of the production layers (e.g. Stratum 15-4).

Stratum 15-4

Stratum 15-4 corresponds to the earliest copper production phase evident in Area 15. This phase seems to have been shorter and less intense than the Stratum 15-2 phases — especially Stratum 15-2c — and it does not extend across the entire excavated area. As with the later copper production strata, finds consisted primarily of waste from the copper production process, especially slag. Ceramic finds were very rare and limited to residual Byzantine/Early Islamic sherds. A radiocarbon sample from the bottom of this stratum (recorded as being from the top of L. 019, a Stratum 15-5 locus, but in fact from the transition between L. 018 and L. 019)[152] produced a calibrated date of 1052-1220 AD (see Table 4.1 for complete information). This date overlaps almost entirely with the date processed for Stratum 15-2a — and, in fact, is slightly later than that date — suggesting that the entire use of the slag mound took place between the mid-

[152] My interpretation of the date would be no different if it were, in fact, from late Stratum 15-5. It is much more likely an early Stratum 15-4 date, however.

11th and mid-13th centuries (with some leeway for the "old wood" effect and similar issues). These also overlap considerably with the radiocarbon dates from KNA, suggesting that copper production occurred at both sites at roughly the same time.

Stratum 15-5

Stratum 15-5 is a pre-metallurgical phase (though the higher portions of the stratum are difficult to separate from Stratum 15-4), likely contemporary with the Area 8 monastery, which places its beginning in the late 6th century AD. Like Stratum 15-3, Stratum 15-5 is characterized by a tan-colored, gravelly fill, although metallurgical finds were more common in the higher portions of the stratum due to the previously mentioned mixing. Ceramic material was slightly more common in this stratum than in others, particularly near the wall of the monastery, and consists primarily of Late Byzantine/Early Islamic sherds.

The wall of the Area 8 monastery, Wall 011, was constructed during this phase. Although only one course was visible on the surface, excavation revealed a total of five courses. The wall is built primarily of dressed and semi-hewn limestone boulders, with cobbles and large pebbles inserted as chinking stones.

Stratum 15-6

Stratum 15-6 is the basal layer in Area 15, and is typical of the basal layers recorded in other areas at Khirbat Faynān, notably Area 16 (discussed in Section 5.3.1). This layer is characterized by a compact reddish fill with a uniformly heavy concentration of wādī cobbles throughout. Wall 011 is built directly on top of this layer, suggesting that the earliest use of this portion of the site dates to the late 6th century AD, though more excavation, particularly in Area 8 itself, would be required to determine this more conclusively.

4.3. ELRAP Excavations at Khirbat al-Manā‘iyya

Khirbat al-Manā‘iyya is the only smelting site discussed in this chapter not located in the Faynān region. Instead, it is located in the southeast Wādī ‘Araba, 30 km north by east of al-‘Aqaba and ca. 3.5 km south of the modern Bedouin village of al-Qaṭar (Fig. 4.45). Test excavations were conducted at the site during the 2012 ELRAP field season (Fig. 4.46). This section summarizes the results of these excavations, as they are relevant to questions concerning long-term change in southern Jordan's economy (see Section 8.2) and the role of copper production in the political economy of Early Islamic southern Jordan (see Section 9.3). A full report of the 2012 excavations, including a discussion of the site in the context of the Early Islamic copper industry of the southern ‘Araba and northwest Arabia, has been published by Jones, et al. (2017; see also Jones, et al. 2014; Jones, et al. 2018).

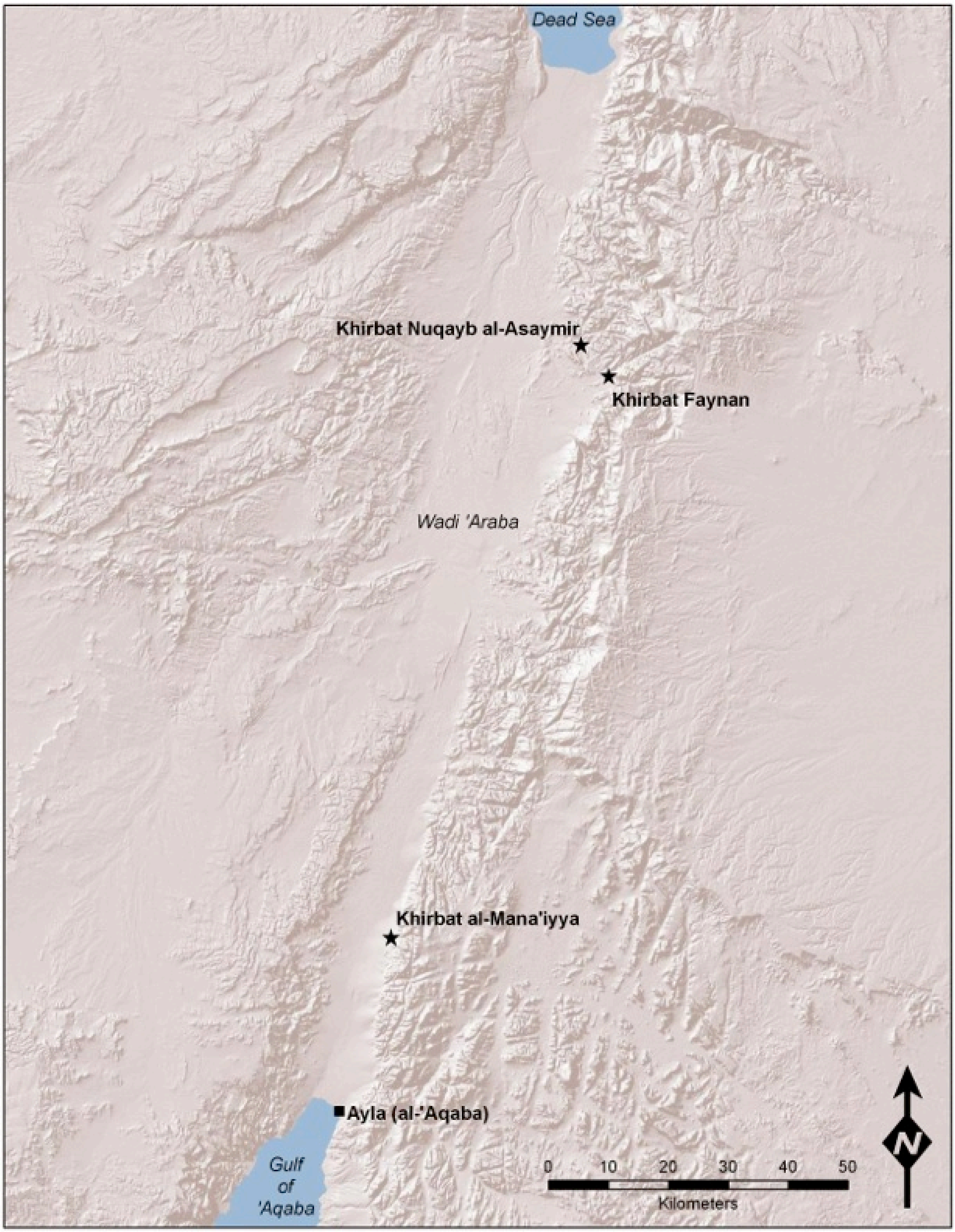

Figure 4.45: Location of Khirbat al-Manāʻiyya in relation to Islamic period copper smelting sites in Faynān. (Basemap: © 2013 ESRI.)

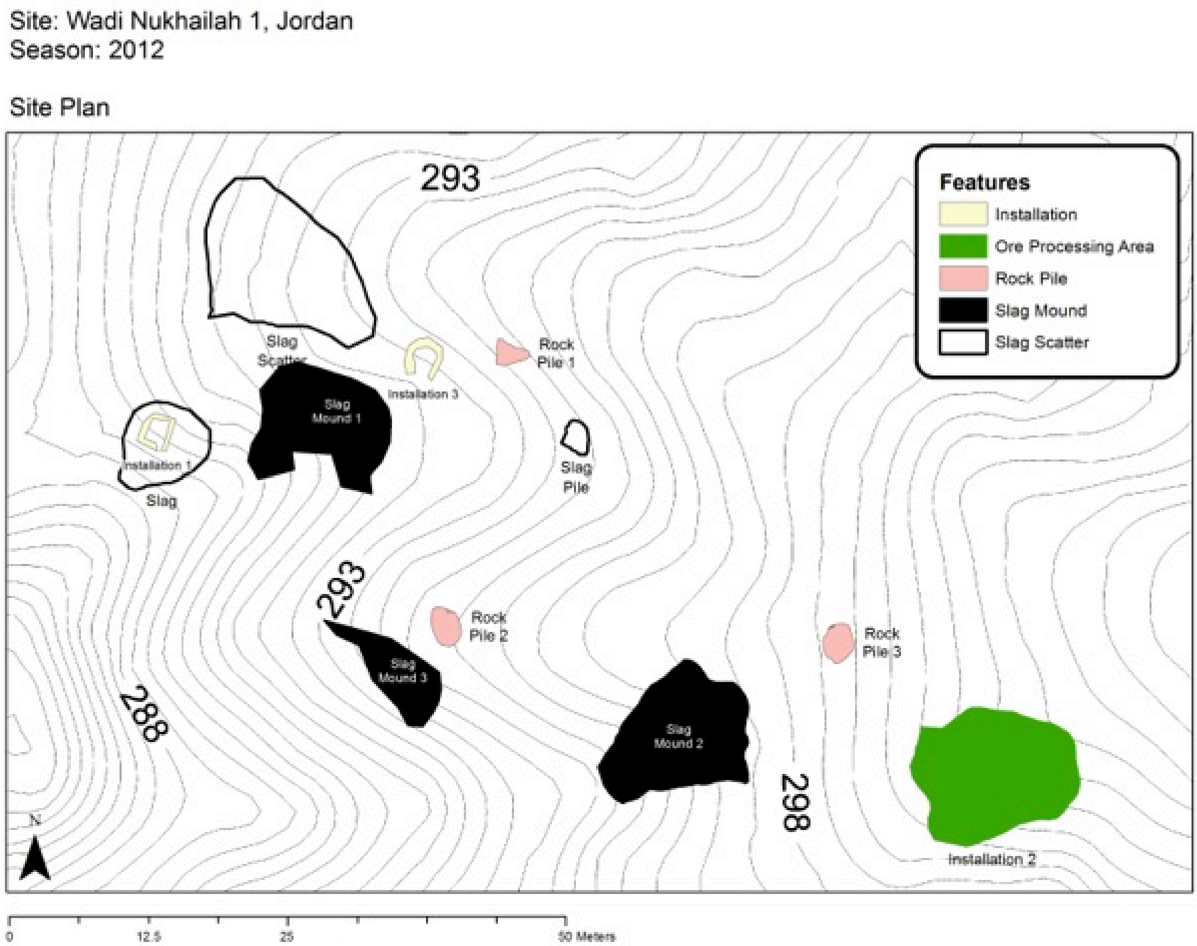

Figure 4.46: Plan of Khirbat al-Manāʿiyya, showing excavation areas discussed below and several other features. (Map: Matthew Vincent, courtesy UC San Diego LCAL.)

The site itself is a small copper smelting camp (Fig. 4.47) located to the south of Wādī al-Nukhayla[153] (Ar. "the wādī of palm trees"). It was first published in detail by Ben-Yosef (2012), who noted that the site had not been previously published. This is not entirely incorrect, but several scholars have, in fact, previously mentioned the site in print. The Royal Jordanian Geographic Centre geology map of the Wādī Raḥma region shows an "ancient smelting site" in this location (Ibrahim 1989), although the name of the site is not specified. The associated publication does not include a description of the site, but does include data from chemical

[153] This is a fairly common toponym, as discussed in more detail by Jones, et al. (2017). In particular, it is important to note that the Wādī al-Nukhayla discussed here is ca. 25 km south of the Wādī al-Nukhayla recorded by the Southeast ʿAraba Archaeological Survey (SAAS) near Wādī Gharandal (see Smith 2014: Figs. 4.2, 4.46).

analyses performed on several pieces of slag collected there (Ibrahim 1991: 107). Weisgerber (2006: 25) likely visited the site and assigned it, correctly, to the Early Islamic period, but he did not publish a description and an editing error unfortunately renders his brief reference to its location useless.[154] Notably, however, the site falls outside of the zones intensively surveyed by the Southeast ʻAraba Archaeological Survey (SAAS) (Smith 2014), and, as such, it was not visited by that team (for the broader implications of this point, see Jones, et al. 2017: 308, 310).

Figure 4.47: Photo of Khirbat al-Manāʻiyya (foreground) showing proximity to the imposing mountains of southern Jordan (background). (Photo: Thomas E. Levy, courtesy UC San Diego LCAL.)

Ben-Yosef's description, however, also contains a major error. He too hastily assigned

[154] Weisgerber (2006: 25) noted briefly that Early Islamic slag had been "identified by the author on the eastern side of the Arabah north of Feinan." In the course of trying to visit this site in 2015, I discovered that this is an error in the text, and that the site in question is in fact in the southeastern ʻAraba — the text should instead read "north of ʻAqaba," or perhaps "south of Feinan" — and matches the description and location of Khirbat al-Manāʻiyya. I am indebted to Dr. Ricardo Eichmann, Ingolf Löffler, and Dr. Andreas Hauptmann for their help in determining the identity of this site.

the site an Iron Age date based on a supposed absence of ring slag[155], the diagnostic product of the bowl furnace-based copper production process used during the Early Islamic period (Ben-Yosef 2012: 68). While few complete ring slags are visible on the surface, pre-excavation reconnaissance in 2012 quickly established the presence of ring slag, and the results of the six probes conducted at the site confirm an Early Islamic date.

Slag Mound 1

The largest of the five probes was conducted in Slag Mound 1, where a 2 x 3 m square was opened (Fig. 4.48). The probe revealed two features built in the mound out of slag: a semi-circular, five-course wall (L. 003) and, at the southern edge of the square, a straight wall built of both stone and slag (L. 007). Other structures built of slag are known in the southern ‘Araba, notably the slag-built *muṣallā* at Be’er Ora (Rothenberg 1988a; Sharon, et al. 1996), but they are usually not found in slag mounds. L. 003 and L. 007 are, therefore, somewhat unique, and may simply have been built to contain slag as it was dumped into the mound. Finds from Slag Mound 1 were typical of a slag mound excavation, consisting primarily of medium to large slag and technical ceramics. A layer of fairly large ring slag fragments (L. 006) found below L. 003 confirms an Early Islamic date for the slag mound. Notably, the only ceramics collected at Khirbat al-Manā‘iyya were surface collected from Slag Mounds 1 and 2 (for illustrations, see Jones, et al. 2017: 304, Fig. 9).

[155] Ring slag and its dating are discussed in more detail in Jones, et al. (2017: 298-299). The key point for the present discussion is that ring slag is a reliable indicator of an Early Islamic period date. Avner and Magness (1998: 52-53, n. 7) suggest that it may appear as early as the “Nabataean period,” and both Rothenberg (1990: 60) and Erickson-Gini (2014: 76) argue that it is a local tradition that first appears in the Late Bronze Age. There is, however, very little evidence for ring slag before the Early Islamic period, and essentially none if the contentious furnaces at Timna Site 2 are excluded (for a summary of the debate surrounding these furnaces, and an argument that they may date to the Early Islamic period, see Ben-Yosef 2010: 671-672).

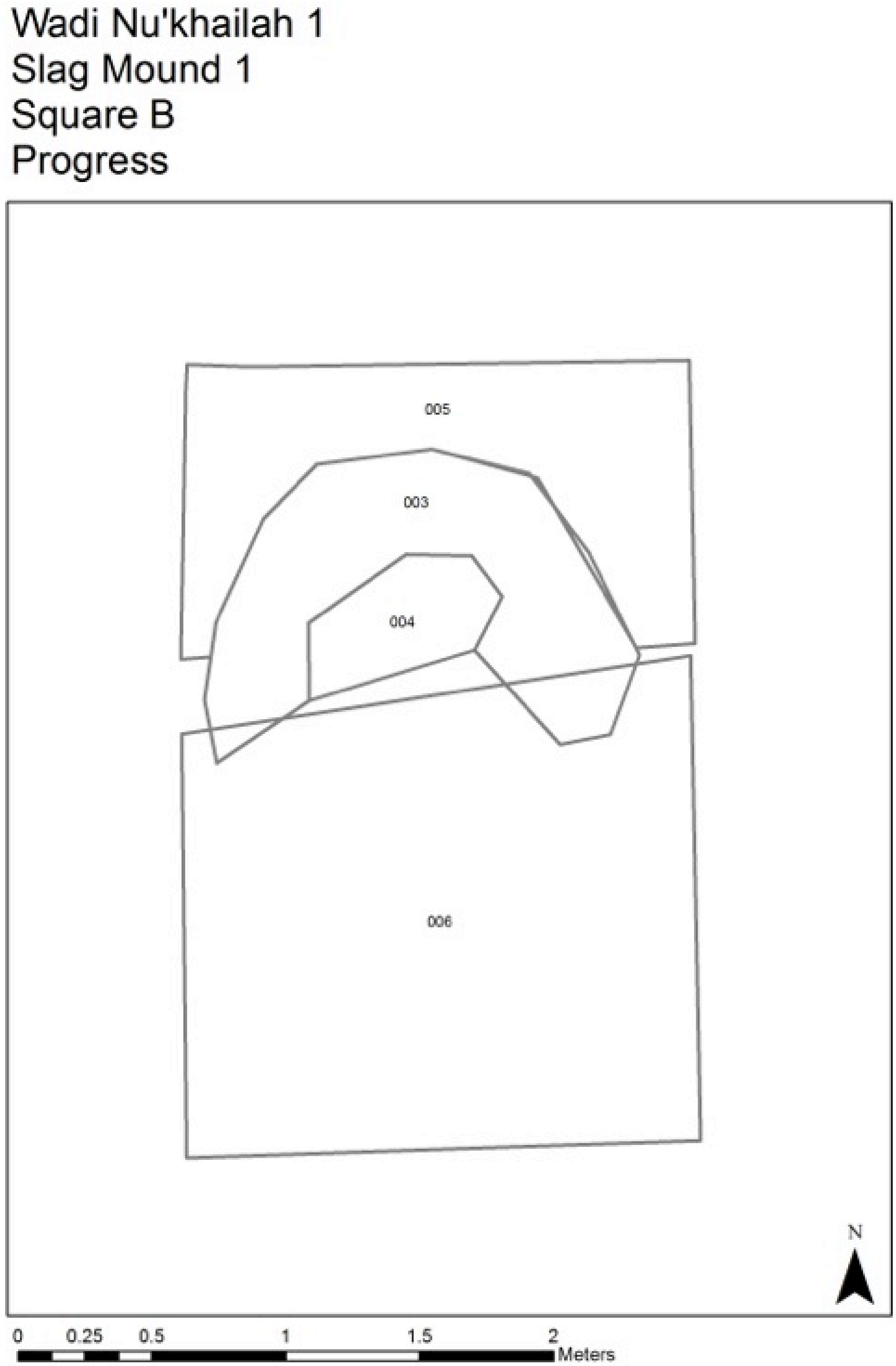

Figure 4.48: Mid-excavation top plan of Khirbat al-Manāʿiyya Slag Mound 1 probe, showing semi-circular wall built of slag (L. 003). (Map: Matthew Vincent, courtesy UC San Diego LCAL.)

Installation 1

Installation 1 is a ca. 2 x 2 m square building 8 m west of Slag Mound 1 (Fig. 4.49). The plan of the building is typical of Early Islamic sites in the southern ʻAraba, and similar structures are known at Be'er Ora (Yisrael 2002: 126, Fig. 163) and Eilat (Rapuano 2013: 130, Plan 1), where they are found individually and as part of linear units, although none of these longer, linear building complexes was found at Khirbat al-Manāʻiyya. In order to clarify the function of the building, two 1 x 1 m probes were conducted, one inside and one outside of the building. Finds were very rare — only a single hammerstone and a small amount of charcoal were recovered — and deposits in both probes consisted of only a shallow, ashy layer before bedrock was reached. Unfortunately, the nature of the finds makes it difficult to determine the function of the building. Possibilities include a residential unit, metallurgical installation, hearth, or animal pen, but the lack of finds suggests one of the latter two possibilities.

Figure 4.49: Pre-excavation photo of Installation 1. (Photo: Erez Ben-Yosef.)

Installation 2

Installation 2 is an ore crushing area, ca. 12 m in diameter, located in the eastern portion of the site. Many small pieces of copper ore were found on the surface, and a 1 x 0.5 m probe was conducted to recovered larger pieces of ore for laboratory analysis. None were recovered, however, and finds in this area were limited primarily to small pieces of ore, as found on the surface.

Furnace Probes

Furnace Probes 1 and 2 were both 1 x 1 m probes conducted in the northern part of the site. A layer of ash and burnt rock was found at a depth of 1-2 cm in both probes, indicating a high-temperature fire, and furnace fragments were also recovered in Furnace Probe 2. A radiocarbon sample taken from Furnace Probe 1 was processed, and produced a calibrated date of 654-758 AD (see Table 4.1 for complete information).

Table 4.1: List of radiocarbon dates referenced in this dissertation. Previously published dates have been taken from the sources cited as uncalibrated dates BP. All dates calibrated to IntCal 13 (Reimer, et al. 2013) using OxCal 4.2 (Bronk Ramsey 2009).

Site	Context	Lab #	Uncal. BP	Cal. AD	Period	Project	Reference
KNA	Area D, B. 50004, L. 402	AA-104588	874 ± 26	1155-1215 AD (1σ), 1045-1224 AD (2σ)	MIsl I-IIa	ELRAP	Unpublished
KNA	Area X, B. 50115, L. 130, S. X2	AA-99135	891 ± 38	1049-1207 AD (1σ), 1035-1219 AD (2σ)	MIsl I-IIa	ELRAP	Unpublished
KNA	Area Z, B. 40132, L. 221, S. Z2a	AA-104587	871 ± 26	1157-1215 AD (1σ), 1046-1242 AD (2σ)	MIsl I-IIa	ELRAP	Unpublished
KNA	Area Z, B. 40450, L. 296, S. Z2b	AA-104586	868 ± 26	1159-1214 AD (1σ), 1047-1245 AD (2σ)	MIsl I-IIa	ELRAP	Unpublished
Khirbat Faynān	Area 15, B. 10078, L. 012, S. 15-2a	AA-102544	928 ± 39	1042-1155 AD (1σ), 1023-1189 AD (2σ)	MIsl I	ELRAP	Unpublished
Khirbat Faynān	Area 15, B. 10119, L. 019, S. 15-4/5	AA-102545	871 ± 39	1052-1220 AD (1σ), 1042-1253 AD (2σ)	MIsl I-IIa	ELRAP	Unpublished
Khirbat Faynān	Area 16, B. 90475, L. 1103	AA-99134	1846 ± 40	127-229 AD (1σ), 71-312 AD (2σ)	Rom.-Early Byz.	ELRAP	Unpublished
Khirbat Faynān	Area 16, B. 10739, L. 127	AA-102547	1824 ± 41	134-235 AD (1σ), 83-323 AD (2σ)	Rom.-Early Byz.	ELRAP	Unpublished
Khirbat Faynān	Area 18, B. 10114, L. 020	AA-102546	1582 ± 40	424-536 AD (1σ), 396-565 AD (2σ)	Byzantine	ELRAP	Unpublished

Table 4.1: List of radiocarbon dates referenced in this dissertation, continued.

Site	**Context**	**Lab #**	**Uncal. BP**	**Cal. AD**	**Period**	**Project**	**Reference**
Khirbat Faynān	Barrage, Lithological Unit 5, ~260 cm	Beta-203401	1800 ± 40	138-313 AD (1σ), 94-338 AD (2σ)	Rom.-Early Byz.	WFLS	(Grattan, et al. 2007: 94)
Faynān 1	Section L3, 0.3-0.6 m	HD-14307	2031 ± 50	102 BC - 47 AD (1σ), 172 BC - 68 AD (2σ)	Hell./Nab.-Rom.	DBM	(Hauptmann 2007: 89)[156]
Faynān 1	Section 3, 0.25-0.4 m	HD-14378	1991 ± 72	92 BC - 84 AD (1σ), 196 BC - 209 AD (2σ)	Hell./Nab.-Rom.	DBM	(Hauptmann 2007: 89)
Faynān 1	Section 15, 4.6-4.8 m	HD-14380	1828 ± 34	135-225 AD (1σ), 85-317 AD (2σ)	Rom.-Early Byz.	DBM	(Hauptmann 2007: 89)
Faynān 1	Section 12, 2.9-3.3 m	HD-14066	1822 ± 31	139-232 AD (1σ), 88-320 (2σ)	Rom.-Early Byz.	DBM	(Hauptmann 2007: 89)
Faynān 1	Section L9, 1.05-1.4 m	HD-14306	1801 ± 34	138-311 AD (1σ), 128-330 AD (2σ)	Rom.-Early Byz.	DBM	(Hauptmann 2007: 89)
Faynān 1	Section R2, 0.4-0.8 m	HD-14097	1790 ± 40	143-323 AD (1σ), 127-344 AD (2σ)	Rom.-Early Byz.	DBM	(Hauptmann 2007: 89)

[156] Hauptmann cites Monika Steinhof's diplomarbeit, "Untersuchungen an Holzkohlen aus eisenzeitlichen Schlackehalden in Khirbet en-Nahas (Wadi Arabah, Jordanien)" as the source for these dates. I have, unfortunately, been unable to locate a copy of this thesis, and correspondence with several researchers who cite it has revealed that they have not, in fact, seen it, and instead have relied on Hauptmann's dates. I have taken the raw dates as provided by Hauptmann and recalibrated them to IntCal 13 (Reimer, et al. 2013) using OxCal 4.2 (Bronk Ramsey 2009). HD-14380, given as 828±34 in Hauptmann (2007: 89), has also been corrected here to 1828±34, which matches the calibrated dates Hauptmann provides.

Table 4.1: List of radiocarbon dates referenced in this dissertation, continued.

Site	Context	Lab #	Uncal. BP	Cal. AD	Period	Project	Reference
WF 5512/5502	Khirbet Member/Atlal Member probe, south of Khirbat Faynān Barrage	Beta-203399	1610 ± 40	398-534 AD (1σ), 351-546 AD (2σ)	Byzantine	WFLS	(Grattan, et al. 2007: 94-95)
WF 5512/5502	Khirbet Member/Atlal Member probe, south of Khirbat Faynān Barrage	Beta-203400	1870 ± 40	82-211 AD (1σ), 59-239 (2σ)	Roman	WFLS	(Grattan, et al. 2007: 94-95)
WF 5741	Atlal Member 1491, between Khirbat Faynān Barrage and Wādī Ḍānā "Braid Plain" (the primarily Iron Age Faynān 7 slag mound)	Beta-204412	430 ± 40	1429-1485 AD (1σ), 1413-1624 AD (2σ)	LIsl I-IIa	WFLS	(Grattan, et al. 2007: 94; Mattingly, et al. 2007b: 289 [lab number given as Beta-203412 in this source]; Newson, et al. 2007b: 364 [uncalibrated date given as 530±40 BP in this source, but discussion clearly indicates that this is a typographic error])

Table 4.1: List of radiocarbon dates referenced in this dissertation, continued.

Site	**Context**	**Lab #**	**Uncal. BP**	**Cal. AD**	**Period**	**Project**	**Reference**
Khirbat Hamrā Ifdān	Area L, B. 45110, L. 3016, S. IIA	AA-68208	1200 ± 39	773-880 AD (1σ), 689-950 AD (2σ)	EIsl I-II	ELRAP	Unpublished
Khirbat al-Manā'iyya	Furnace 2, B. 220, L. 1	AA-104585	1331 ± 28	654-758 AD (1σ), 650-766 AD (2σ)	EIsl I	ELRAP	Unpublished

Chapter 5: Excavations and Surveys at Related Sites in the Faynān Region

Copper production cannot be understood in a vacuum, and in order to reconstruct a mining feature system (see Section 2.2), a broader regional approach must be taken, investigating a variety of sites and contexts both directly and indirectly involved in the copper production process. This chapter presents summary reports of Edom Lowlands Regional Archaeology Project (ELRAP) and Jabal Ḥamrat Fidān Project (JHF) excavations at three sites with Early Islamic period occupations — Khirbat Faynān, Khirbat Ḥamrā Ifdān, and Wādī Fidān 50a — and surveys of Wādī Fidān, Wādī al-Ghuwayb, Wādī al-Jāriya, and the hilly area separating Wādī al-Jāriya from the Sharāh Plateau to the east. Absent here, however, is discussion of data from the ELRAP Wādī al-Fayḍ Expedition (see Knabb, et al. 2015), a survey of the steppe terrain west of Shawbak, between Wādī ʻAraba and the plateau. While Middle and Late Islamic sites were found quite commonly in the Wādī al-Fayḍ region, they are not directly related to the arguments presented here about the role of the Faynān region in broader Levantine political-economies (but cf. Hübner [2004], who argues for an Iron Age connection between Faynān and Wādī al-Fayḍ), and will be presented in a different venue. As noted in the introduction to Chapter 4, the distinction between the sites presented in this chapter and the smelting sites discussed in Chapter 4 is somewhat artificial. Nonetheless, as the smelting sites are most relevant to the questions posed in Part III, the distinction is analytically useful.

5.1. Copper Mines

A large number of copper mines have been discovered by most of the survey projects working in Faynān (Barker, et al. 2007; Ben-Yosef, et al. 2009a; Ben-Yosef, et al. 2014b;

Glueck 1935: 33; Hauptmann 2007; Kind 1965: 59-61; Knabb, et al. 2014). Indeed, as Hauptmann (2007: 2) notes, the presence of copper mines in the region of Faynān was noted on European maps as early as the early 18th century (Fig. 5.1; d'Anville 1732), though the location of these mines was determined not by fieldwork, but by reference to historical sources, primarily Eusebius. Of the known mines, relatively few seem to have been used during the Middle Islamic period. Several caveats apply here, however.

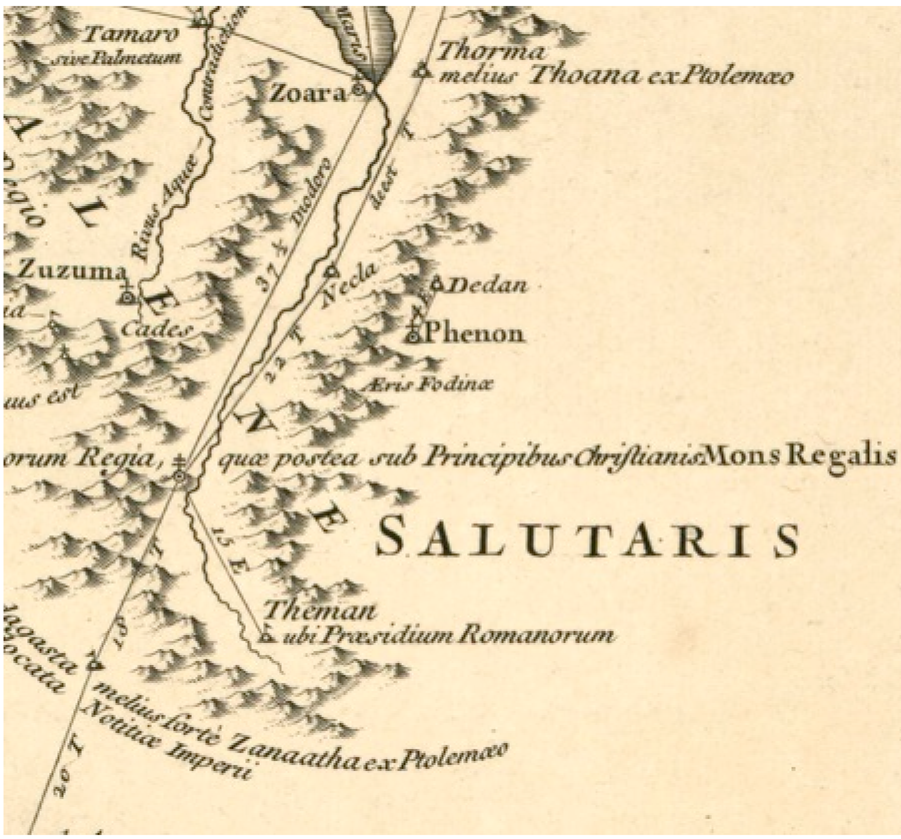

Figure 5.1: Detail of southern Jordan in d'Anville's (1732) *Patriarchatus Hierosolymitanus*, showing the location of "*Æris Fodinæ*" (copper mines) near Faynān. Note that the locations and distances depicted are derived primarily from historical sources, rather than field research. (Image: Bilbiothèque nationale de France, in the public domain.)

First, unlike many other types of site, it is often difficult to date mines on the basis of surface collected ceramics or portable artifacts, and this is generally the dating method employed during archaeological survey. This difficulty can be the result of both a lack of diagnostic artifacts found at a mine — note, for example, the relatively large number of mines dated as "unknown" by Knabb, et al. (2014: 617-622, Tables 7.2-3) on the basis of a lack of portable artifacts — or the presence of artifacts at a mine unrelated to mining activities, for example the Late Islamic ceramics found at a number of mines in Wādī al-Jāriya (Jones, et al. 2012: 74-79; Knabb, et al. 2014: 610). While alternative methods of dating can be used — e.g. optically-stimulated luminescence (OSL) dating, which was used by ELRAP to date the Jabal al-Jāriya pit mine field (Ben-Yosef, et al. 2014b: 864-874) — these are generally expensive and often require excavation. As such, there are many mines in the Faynān region that are not at present very securely dated, and it is possible that some of these mines may have been used during the Middle Islamic period.[157]

Second, the fact that both the Jabal al-Jāriya pit mine field (Ben-Yosef, et al. 2009a) and the Wādī al-Salmīna mines (Section 5.1.2; see also Jones, et al. 2012: 90) were first recorded only in the last decade suggests that our knowledge of mine sites in Faynān remains incomplete. Given that Middle Islamic miners — and particularly those working at Khirbat Faynān — seem to have been willing to cover a distance of several kilometers over relatively difficult terrain, it is quite possible that the hilly — and comparatively poorly-surveyed — steppe areas near the plateau contain addition unrecorded Middle Islamic period mines.

Interestingly, as the discussion below (Sections 5.1.1-2) will indicate, the Middle Islamic miners exploited the copper deposits of both the Burj Dolomite Limestone Shale (BDS) and the Umm 'Ishrīn/Massive Brown Sandstone (MBS) units. Post-Chalcolithic copper exploitation in Faynān is generally characterized by exploitation of only one of these — the BDS during the Early Bronze and Iron Ages, and the MBS during the Roman period (Hauptmann 2007: 146). It

[157] Uzi Avner (pers. comm.) has speculated based on his research in the southern 'Araba that the Roman gallery mine at Umm al-'Amad may have been reused during the Islamic period. This is possible, but there is presently no evidence to support such a proposal. Najjar and Levy (2011: 34-35), in fact, have suggested the opposite: that the bulk of the mining at Umm al-'Amad and at similar mines farther to the south in Wādī Abū Khushayba occurred prior to the Roman annexation of Nabataea.

is possible that the heavy exploitation of these resources during the Iron Age and Roman period may have necessitated the exploitation of both to produce the amount of copper desired by Middle Islamic miners.

Several ore sources in the southern ʻAraba that could have been exploited by the Early Islamic smelters at Khirbat al-Manāʻiyya have also been published. The most important of these are the mines in Naḥal ʻAmrām, ca. 15 km south of the Timna Valley and ca. 20 km southwest of Khirbat al-Manāʻiyya. Survey work in 1989 revealed that the most intensive mining activity in Naḥal ʻAmrām had taken place during the Early Islamic period (Rothenberg 1999: 162-166; Willies 1990; Willies 1991), and work by Avner, et al. (2018) has clarified the chronology of these mines, particularly concerning their use in the Classical periods. Early Islamic mines have also been found west of the Gulf of ʻAqaba, near modern Ṭābā, ca. 10 km southwest of modern ʻAqaba (Avner and Magness 1998: 40). However, given their distance from Khirbat al-Manāʻiyya — they are nearly 40 km to the southwest — they are unlikely to represent one of its ore sources. Smaller ore sources are known closer to Khirbat al-Manāʻiyya, as well, ca. 12 km to the east near Jabal Abū Saqʻa and Jabal al-Daḥmī (Ibrahim 1991: 102) and ca. 15 km to the north in Wādī al-Khubat (see discussion in Ben-Yosef 2012: 69, n.8; Haviv 2000: 219). These sources have not been surveyed, however, and in particular it is unclear if the copper deposits east of Khirbat al-Manāʻiyya were ever actually exploited in antiquity, nor is any of these sources much closer to Khirbat al-Manāʻiyya than the sources in the Timna Valley or Naḥal ʻAmrām. The southern ʻAraba sources are not discussed below, however, as ELRAP has not conducted archaeological surveys at these mines.

5.1.1. WAG 57 and 58

WAG 57 and WAG 58 are mine sites located in Wādī Nuqayb al-Asaymir (Fig. 5.2), between KNA and the large Iron Age copper smelting site of Khirbat al-Nuḥās (see maps, Figs. 3.1 and 3.2). They were first recorded during the 2002 JHF Wādī al-Ghuwayb Survey, and have been published previously, both as part of the preliminary survey report (Levy, et al. 2003) and as part of my analysis of the Islamic material from this survey (Jones, et al. 2012). WAG 57, located ca. 200 m northwest of KNA Area X, consists of 11 probable mine shafts and three tailing piles (Fig. 5.3), while WAG 58, ca. 120 m to the northeast of WAG 57, consists of three probable mine shafts (Fig. 5.4). All of the mines at WAG 57 and 58 are dug into the BDS formation. Few ceramics were recovered from either site: a single mold-made lamp fragment, probably dating to the Middle Islamic period, was collected at WAG 57, and primarily Iron Age ceramics were found at WAG 58 (Jones, et al. 2012: 74; Knabb, et al. 2014: 618, Table 7.3). Nonetheless, their proximity to KNA Area X — as well as the iron-rich BDS ores present in Wādī Nuqayb al-Asaymir (see also Hauptmann 2007: 71) — indicate that these were the primary ore sources exploited for copper (and iron) production at KNA.

Figure 5.2: The portion of Wādī Nuqayb al-Asaymir containing the mines, WAG 57 and WAG 58. The black piles in the center of the photo are a combination of mine tailings and naturally eroded material. (Photo: courtesy UC San Diego LCAL.)

Figure 5.3: A probable adit at WAG 57. (Photo: courtesy UC San Diego LCAL.)


Figure 5.4: Probable filled mineshaft at WAG 58. (Photo: courtesy UC San Diego LCAL.)

While the mines were also used — perhaps experimentally (B. Liss, pers. comm.) — during the Iron Age (Ben-Yosef, et al. 2014b: 795; Knabb, et al. 2014: 618, Table 7.3; Levy, et al. 2003: 260), they are unlikely to have been a major source of ore for Khirbat al-Nuḥās. Instead, the primary ore source for the Iron Age smelters was the large Jabal al-Jāriya pit mine field, on the northern side of Wādī al-Ghuwayb (Ben-Yosef, et al. 2009a; Ben-Yosef, et al. 2014b: 856-874). The Middle Islamic period, then, likely represents the most intensive period of exploitation at the Wādī Nuqayb al-Asaymir mines.

5.1.2. Wādī al-Salmīna

During the 2009 ELRAP field season, a small survey was conducted of the hilly terrain between the village of Ḍānā and Wādī Ghuwayr, ca. 13 km east of Khirbat Faynān (see maps, Figs. 3.1 and 3.2), led by Erez Ben-Yosef. The team recorded four mines dug into the MBS formation[158] in the upper part of the small Wādī al-Salmīna (Fig. 5.5), with some evidence for other filled shafts nearby. The four clearly visible mines seem to have been cleared during modern prospecting conducted by the Jordanian Natural Resources Authority (NRA) in the 1970s. The geology map for the region (Barjous 1988) shows NRA copper drill holes only in the vicinity of the lower Wādī Ḍāna, Wādī Khālid, and Wādī Rātiya. The Royal Jordanian Geographic Centre (RJGC) geology maps are not, however, a complete record of NRA activities in the region, and other ELRAP surveys have documented NRA prospecting and road-clearing not recorded on the RJGC maps in several other parts of Faynān (see Ben-Yosef, et al. 2014a; Knabb, et al. 2014). The RJGC geology map does, however, show mines near Wādī al-Salamīna — it places them on the BDS, rather than the MBS or SAS, but many of the locations shown on these maps are approximate — suggesting that these mines were, indeed, found and cleared by the NRA.

[158] The geology map booklet for the al-Shawbak region (Barjous 1992: 61) indicates that the copper-bearing sandstone deposit in this region is the Sālib Arkosic unit (SAS), rather than the MBS, and there is, indeed, a small outcropping of the SAS near Wādī al-Salmīna, in addition to a much larger MBS outcropping. The key point here, however, is that the mines are dug into a copper-bearing sandstone formation, and not the BDS.

Figure 5.5: Wādī al-Salmīna terrain, looking roughly southwest from Mine 1. (Photo: Erez Ben-Yosef, courtesy UC San Diego LCAL.)

In the area around Mine Shaft 1 (Fig. 5.6) the survey team found a dense scatter of IHMW, which is presently the only dating evidence for the Wādī al-Salmīna mines. Although the previous caveats about the difficulty of dating mines apply, it is reasonable to conclude that the primary period of exploitation of the Wādī al-Salmīna mines was the Middle Islamic period.

Figure 5.6: Wādī al-Salmīna Mine Shaft 1. (Photo: Erez Ben-Yosef, courtesy UC San Diego LCAL.)

In the lower part of Wādī al-Salmīna, the survey team found a small, poorly-preserved, rectangular structure eroding into the wādī. The portions that were still standing indicate a rectangular structure built primarily of limestone. Finds were limited to a limestone block with a cupmark (Fig. 5.7), several pieces of copper ore, and a shard of glass. While no diagnostic artifacts were recovered, the presence of copper ore suggests a connection to the mines in the upper portion of the wādī, and it is likely that this building also dates to the Middle Islamic period.

Figure 5.7: Cupped limestone block at the Wādī al-Salmīna structure. 58mm Canon lens cap shown for scale. (Photo: Erez Ben-Yosef, courtesy UC San Diego LCAL.)

5.2. The Road Stations

Roads are a critical element of the infrastructure of a mining settlement, and as such are critical for analysis of systems of provision and mining feature systems (see Sections 2.2 and 10.2). This section does not list all of the roads likely in use in Faynān during the Islamic period — a more comprehensive selection is presented in Section 10.2 (see Fig. 10.6), with some inferred based on the necessity of transporting goods from one site to another or on the basis of GIS analysis — but instead presents evidence from the 2007 ELRAP Faynān-Buṣayra Regional

Survey (FBRS) for the continued use of two road stations or watchtowers along two potential roads linking Faynān to the plateau. For a comprehensive overview of the FBRS goals, methodology, and results, see Ben-Yosef, et al. (2014a).

5.2.1. FBRS 11

FBRS 11 is a defensive site — probably a watchtower — near the Wādī al-Ḍaḥal,[159] overlooking a former portion of the ancient Naqb al-Ḍaḥal (Ben-Yosef, et al. 2014a: 532). While the ancient road had been observed and photographed fairly recently (Ben-David 2009: 727), when the FBRS team surveyed the site in 2007, they instead found that the ancient road had been built over by a modern dirt road, FBRS Road Segment 18 (Ben-Yosef, et al. 2014a: 532, 515, Fig. 6.10).

FBRS 11 itself is not well preserved, making description of the building difficult, but its position above the road and the substantial amount of collapse (Fig. 5.8) makes its identification as a watchtower likely. Sherds of African Red Slip Ware Form 57 (on the type, see Hayes 1972: 91-93) suggest a foundation during or prior to the Early Byzantine period, while sherds of IHMW and Gaza Ware (see Section 6.4) indicate reuse during the Late Islamic II (probably Late Islamic IIb). It is unclear based on the material collected at the site whether FBRS 11 was also reused during the Middle Islamic period, however.

[159] Ben-Yosef, et al. (2014a: 548, Table 6.1) list the Arabic toponym as Wādī Ẓaḥal. The correct name is, however, Ḍaḥal (Ar. "shallow").

Figure 5.8: Collapsed structure at FBRS 11. (Photo: Erez Ben-Yosef, courtesy UC San Diego LCAL.)

5.2.2. FBRS 12

FBRS 12 (Fig. 5.9) is a large structure located on the bank of Wādī al-Ḍaḥal, ca. 1.5 km west of FBRS 11 and overlooking another connected segment of the modern dirt road built over the former Naqb al-Ḍaḥal, FBRS Road Segment 19 (Ben-Yosef, et al. 2014a: 532, 515, Fig. 6.10). The site itself is a large structure — perhaps an inn or watchtower — that has been substantially damaged by erosion of the terrace on which it was built (Ben-Yosef, et al. 2014a: 532).

Figure 5.9: Overview photo of FBRS 12, showing standing square structure on left and substantial collapsed structure on the *wādī* terrace to the right. (Photo: Erez Ben-Yosef, courtesy UC San Diego LCAL.)

The majority of the recovered ceramics dated to the Iron Age (Ben-Yosef, et al. 2014a: 532), but an IHMW "elephant-ear" handle and a sherd of a 20th century porcelain coffee cup indicate reuse during the Late Islamic IIb-modern period, perhaps contemporary with the reuse of FBRS 11. Given the dates of FBRS 11 and 12, it seems likely that this segment of Naqb al-Ḍaḥal went out of use during or not long after the Byzantine period, and came back into use again only in the Late Islamic II, perhaps relating to the increasing agricultural use of the area (see also Ben-Yosef, et al. 2014a: 532).

5.2.3. Qaṣr Karayim bin ʻAlī (FBRS 13)

Qaṣr Karayim bin ʻAlī, or FBRS 13, is an inn, defensive structure or farmhouse (on this last possibility, see Ben-Yosef, et al. 2014a: 528) situated on a modern road between Wādī al-

Ḍaḥal and Wādī al-Khanzīra, ca. 4 km west of Buṣayra and ca. 8.5 km northwest of Gharandal. The site was previously surveyed as part of the Ṭafīla-Buṣayra Archaeological Survey (TBAS) and published as TBAS Site 62 (MacDonald, et al. 2004b: 213-214). The TBAS team suggest that the site was a caravanserai, and list the site's Arabic toponym as Qaṣr Karayim bin ʿAlī. The building itself is unevenly preserved, but the walls, particularly in the south of the building, still stand as high as five courses in places. The walls are built primarily of semi-dressed limestone blocks on top of a foundation of undressed limestone boulders, with chinking stones inserted at uneven intervals (Fig. 5.10).

Figure 5.10: Standing wall at Qaṣr Karayim bin ʿAlī. (Photo: Erez Ben-Yosef, courtesy UC San Diego LCAL.)

The TBAS collected Iron Age II and Byzantine ceramics, as well as sherds of probably Middle Islamic bichrome HMGPW (MacDonald, et al. 2004b: 213). The FBRS collected additional Iron Age sherds, as well as several sherds of a monochrome green-glazed jug (on the dating of this jug, see Section 6.4). It is unclear if the modern road recorded by the FBRS overlies an ancient road, or if Qaṣr Karayim bin ʻAlī would previously have been a stop on Naqb al-Ghuwayba, though the latter possibility seems more likely.

5.2.4. FBRS 15

FBRS 15 is a watchtower located on a tributary of Wādī al-Ḍaḥal, overlooking FBRS Road Segment 22, a segment of the ancient Naqb al-Ghuwayba (Ben-Yosef, et al. 2014a: 526, Fig. 6.20e, 528). The site itself is not very well preserved, but the foundations of a large structure built of undressed limestone blocks are still visible (Fig. 5.11).

Figure 5.11: Large limestone blocks at FBRS 15. (Photo: Erez Ben-Yosef, courtesy UC San Diego LCAL.)

The ceramics collected by the FBRS team indicate that the site is probably an Iron Age foundation, but sherds of IHMW and, most interestingly, turquoise-glazed stonepaste were also found. Stonepaste is not commonly found on survey in Faynān and the surrounding region (see discussion in Section 6.1.1), and although only one sherd was found at FBRS 15, this likely indicates some connection to KNA. Based on this, it seems fairly certain that Naqb al-Ghuwayba was in use during the Middle Islamic Ic-IIa, connecting Faynān to the plateau, and from there perhaps to Gharandal, al-Ruwāth, al-Ṭafīla, or directly to al-Karak.

5.3. Khirbat Faynān

As previously discussed, in Section 4.2, Khirbat Faynān is the Arabic name for the ruins of the Roman and Byzantine town of Phaino, and likely also the Biblical site of Punon (mentioned in Num. 33.42-43). By way of introduction to the ELRAP excavations at the site, the present section presents a brief history of research conducted at the site. While some repetition of material from the research history of the Faynān region (Section 3.4) is inevitable, this section is narrowly focused on research conducted at Khirbat Faynān.

Although, as noted in Section 5.1, the presence of copper mines in the region had first been recognized by European cartographers in the early 18th century (d'Anville 1732), the first archaeological investigation of Khirbat Faynān itself was conducted by the Dominican priest Marie-Joseph Lagrange (1898), founder of the École Biblique, in the late 19th century. While primarily interested in the identification of the site with Biblical Punon and Byzantine accounts of *damnatio ad metallum* (see Section 3.4), Lagrange also presents a brief description of Khirbat Faynān, as well as an entertaining account of his journey to the site from al-Shawbak through Ḍānā.

The Czech orientalist Alois Musil (1907: 293-298) visited the site in 1898[160]. He described the major Roman and Byzantine buildings and published a sketch plan of the major features of the site. In addition to this, he also surveyed the copper mines of Wādī Ratiya, but he did not describe them in any detail.

In 1932, Fritz Frank (1934: 221-225) visited the site during his survey of the Wādī ‘Araba. Although, as Knauf and Lenzen (1987: 83) note, “his ability to read surface pottery was non-existent,” he nonetheless mapped the site and its individual buildings in much greater detail than Musil, and correctly identified it as the center of settlement in the region during the Roman and Byzantine periods. Frank also recorded a number of Greek inscriptions at Khirbat Faynān, which were first published by Alt (1935: 64-72; and see Section 3.4 for additional discussion and a complete bibliography).

Glueck (1935: 32-35) visited the site slightly later, and collected ceramics from both the summit and slopes of the *tall*. Although one could raise a number of quibbles with his dating of particular periods, it is impressive that even in the 1930s Glueck correctly identified most of the major periods of occupation of Khirbat Faynān in a broad sense. Of particular importance for this dissertation, he was the first to suggest that copper smelting likely occurred at Khirbat Faynān during the Middle Islamic (“mediaeval Arabic”) period (Glueck 1935: 32), though later German researchers, discussed below, would be the first to conclusively demonstrate this and identify the Middle Islamic period production areas.

Archaeometallurgical research at the site began with the German surveys published by Kind (1965: 62, 72-73), who investigated Khirbat Faynān, along with a number of other metallurgical sites in the Wādī ‘Araba reported by previous surveys. Kind’s interest in Khirbat

[160] He actually attempted to visit the site in 1896, but his guide, anxious to arrive at their destination in al-Karak, recommended postponing the visit for a year (Musil 1907: 156-157).

Faynān was primarily its Late Roman occupation, though he also addressed its identification as Biblical Punon, and his work set the precedent for the later comprehensive research on the mining landscapes of Faynān conducted by researchers affiliated with the Deutsches Bergbau-Museum (DBM).

The surveys by the DBM, beginning in the 1980s (Hauptmann, et al. 1985), focused primarily on gaining a detailed understanding of the history of Faynān as a mining landscape. Work at Khirbat Faynān, therefore, involved both detailed survey of the seventeen copper slag mounds surrounding the site (Hauptmann 2007: 94-109), as well as the mines and metallurgical sites in the surrounding wādīs: Wādī Ghuwayr, lower Wādī Ḍānā, Wādī Khālid, Wādī Ratiya, and Wādī al-Abyaḍ (Hauptmann 2007: 111-122). The DBM researchers were also the first to identify the Faynān 2 and Faynān 6 (in the ELRAP grid system, Khirbat Faynān Area 15; see Section 4.2.1) slag mounds, specifically, as the primary loci of copper production during the Middle Islamic period (Hauptmann 2007: 97, 103). Weisgerber (2006: 22-27), in a synthetic work, in fact attempted to trace the history of copper exploitation at Khirbat Faynān past the traditional Iron Age and Roman period foci into the Middle Islamic period, although the conclusions presented in this dissertation contradict his view of the 6th-13th centuries (see Sections 3.4 and 3.6, in particular). In addition to specifically archaeometallurgical work, researchers affiliated with the DBM teams also published a small catalog of coins from the Faynān region, most of them likely from Khirbat Faynān (but see Section 3.4 for serious caveats about the nature of this collection), and several works on the place of Khirbat Faynān in Iron Age and Roman history (Geerlings 1985; Knauf and Lenzen 1987).

In the early 1990s, the British Institute at Amman for Archaeology and History (BIAAH) — now the Council for British Research in the Levant (CBRL)-affiliated British Institute in

Amman (BIA) — initiated the Wādī Faynān Project (a brief account of the early years of this project is given by McQuitty 1998). Preliminary ground survey of the site was conducted in 1994-1995 (Ruben, et al. 1997), and an excavation of the Late Roman-Early Byzantine South Cemetery was conducted in 1995-1996 (Findlater, et al. 1998). The preliminary survey was followed by the large-scale Wādī Faynān Landscape Survey (WFLS) from 1996-2000 (Barker, et al. 2007). While the settlements, metallurgical sites, and mining districts surrounding Khirbat Faynān were included in this survey, a major focus was also the agricultural landscape surrounding the site, including a particularly large and complex field system, designated WF4 by the WFLS. As one of the major foci of the WFLS was landscape and environment, many of the publications of associated researchers have focused on paleoecology (Hunt and el-Rishi 2010; Hunt, et al. 2007) and ancient pollution (Grattan, et al. 2007; Grattan, et al. 2002; Grattan, et al. 2013; Pyatt, et al. 2000, among many others). In addition to this, however, a major focus of affiliated researchers has been the nature of the Roman and Byzantine mining settlement, and a considerable body of research now exists exploring the nature of labor and government control at the *metallum* of Phaino (e.g. Friedman 2010; Friedman 2013a; Mattingly 2011; Mattingly, et al. 2007b; Perry, et al. 2011, among many others).

ELRAP began work at Khirbat Faynān during the 2011 field season, with geophysical survey (Novo, et al. 2012) and excavation (Levy, et al. 2012b: 430-435) on the western slope of the *tall*, Area 16 (see Figs. 4.40 and 4.41 for maps and Section 5.3.1 for discussion). This work was expanded during the 2012 field season with excavation in Area 15 (see Section 4.2.1), Area 18 (see Section 5.3.2), and additional excavation in Area 16 (see Section 5.3.1). Unfortunately, developments in local tribal politics beyond the control of the excavators stopped work at

Khirbat Faynān midway through the field season.[161] Of the three open areas, only work in Area 15 could be completed according to plan. Given these circumstances, work at the site under ELRAP is unlikely to resume; however, as the following sections will illustrate, these incomplete excavations nonetheless provide important insights into the site's settlement history.

Given the nature of the ELRAP excavations, it is not, at present, possible to suggest a site-wide stratigraphy for Khirbat Faynān. Residual sherding in fills provides evidence for periods of occupation to which no excavated loci can yet be assigned, including the Iron Age, Early Hellenistic period, and perhaps the Persian period. Additionally, while the five 14th century Mamlūk coins collected by Kind, et al. (2005: 188) suggest Middle Islamic IIc settlement at the site, the exact nature of this occupation remains enigmatic. Further excavation at Khirbat Faynān would be required to clarify these issues. As such, this discussion refers only to local strata in areas where stratigraphic distinctions can be made.

5.3.1. Area 16

Excavations in Khirbat Faynān Area 16 were opened during the 2011 ELRAP field season as part of the pilot season of work at the site. The 2011 excavations were designed to clarify the stratigraphy of the *tall* — though in fact they revealed that Area 16 generally lacks vertical stratigraphy — and consisted initially of a 5 x 40 m step-trench down the side of the *tall* (Fig. 5.12). On the ELRAP grid system, this corresponds to half of four 10 x 10 m grid squares, numbered 16.54-16.57. During the season, the decision was made to extend the excavation in Square 16.57 to include the entire 10 x 10 m grid square, making the total area excavated in 2011 250 m^2. During the 2012 ELRAP season, two additional 10 x 10 m grid squares, 16.27 and 16.37, were opened, but only portions of these squares, defined by architecture, were excavated.

[161] While work at Khirbat Faynān stopped, this allowed for more work to be accomplished than had been planned at KNA (see Section 4.1) and a primarily Late Neolithic site, WFD 61.

Both seasons were supervised by Aaron Gidding, with assistance from Kathleen Bennallack and the author during the 2011 season. A preliminary report of the 2011 season at Khirbat Faynān has been published (Levy, et al. 2012b: 430-435), and the present section expands substantially on this report’s coverage of the post-Iron Age material. A report of the 2012 season is currently in preparation.

Figure 5.12: View of the western side of Khirbat Faynān, showing step-trench excavated in 2011. (Photo: Craig Smitheram, courtesy UC San Diego LCAL.)

The slopes of Area 16 are terraced, and four terraces were excavated during the 2011 and 2012 field seasons: Terrace 1, containing Square 16.54; Terrace 2, containing Square 16.55; Terrace 3, containing Squares 16.56, 16.37, and 16.27; and Terrace 4, containing Square 16.57 (Fig. 5.13). Terraces 1 and 4, however, are not relevant to the present discussion, and can be summarized briefly. Excavations in Terrace 1 — probably not a true terrace, but the 10 x 5 m area below the *tall*'s lowest terrace — revealed very little material, none of which, other than a surface find potentially dating to the Iron Age, could be dated. Terrace 4, on the other hand, was divided into two parts. Just below topsoil in the eastern portion of the square, a substantial Early Bronze Age III occupation was revealed. This is, incidentally, the highest elevation excavated in Area 16, demonstrating the horizontal "stratigraphic" variation in this area. The western portion of the square, on the other hand, consists of an intentional fill reinforcing Wall 1049, the eastern wall of Terrace 3 Room 1. This fill was rich in Iron Age pottery — indeed, the vast majority of the Iron Age pottery recovered in Area 16 came from this fill — with a smaller number of Classical sherds. It is likely that this fill and the construction of Wall 1049 date to the Roman period.

Figure 5.13: Aerial photograph of 2011 excavations in Area 16 with terraces labeled, prior to excavation of the Early Bronze Age buildings in Terrace 4. (Photo: Craig Smitheram, courtesy UC San Diego LCAL.)

Terrace 2

The primary feature of Terrace 2 is a two-room building, with walls built primarily of limestone, basalt, and granite rubble. The construction seems to have involved the occasional reuse of earlier materials, as evidenced by three stone bowl fragments found in the wall collapse. Excavation of the wall collapse produced a mixed ceramic assemblage — probably washed down from higher on the *tall* — containing sherds dating to as early as the Iron Age and as late as the Early Islamic period. The fill below this collapse produced few finds, but the recovered ceramics were primarily Roman and Byzantine, with fewer Iron Age sherds. The latest material below the collapse dates to the late 6th century AD, including a relatively complete but crushed Late Roman D Form 9a bowl, dated ca. 550-600 AD (see Section 6.2.2.1, R. 8811). The relative absence of ceramic material in the building compared to Terrace 3 is not surprising, as previous researchers have suggested, on the basis of the large number of Classical sherds found in the WF4 field system, that domestic buildings at Khirbat Faynān were likely cleared out on a regular basis and the waste used to manure[162] the fields (Mattingly, et al. 2007b: 343; on this phenomenon generally, see Bintliff and Snodgrass 1988; Bintliff and Sbonias 2000; Gallant 1986; Wilkinson 1982; Wilkinson 1989, among others). This observation may help date the primary phase of use of the building to the Late Roman-Early Byzantine period, as this period is particularly well-represented in the ceramics recovered from WF4 (Mattingly, et al. 2007a: 518). Given the material in the collapse, this structure was likely destroyed in a late 6th century earthquake. The earthquake of 551 AD (on this event, see Ambraseys, et al. 1994: 24-25; Amiran, et al. 1994: 266; Russell 1985: 44-46) is perhaps possible, but the presence of LRD Form 9, in particular, suggests that a later date is more likely, with the 597 AD earthquake suggested by Rucker and Niemi (2010) being a strong possibility.

[162] More accurately, probably both manuring and composting were being practiced.

One other aspect of this building is particularly interesting. The northern and western walls, Wall 1046 and 1047, respectively, are of similar construction — largely matching the description above — and both seem to have been built in the Roman period. The eastern wall, Wall 1124, however, is of somewhat different construction: in addition to limestone, basalt, and granite, it also contains some sandstone and chert, and it has a flat face only on its western, interior side. Although Walls 1046 and 1047 form an exterior corner, Walls 1046 and 1124 do not, and form only an internal corner; Wall 1046 abuts a fill to the east. Excavation of the fill east of Wall 1124 produced material primarily dating to the Early Bronze Age, including a fairly complete store jar found resting against the wall. Terrace 2, then, contains a Roman building reusing an earlier, probably Early Bronze Age, wall.

Terrace 3

Terrace 3 was the only terrace excavated across multiple squares: 16.56 in 2011, and 16.37 and 16.27 in 2012. The 2011 excavations consisted of a 5 x 10 m square, which revealed three rooms: the largest, Room 1, in the eastern half of the square, Room 2, in the southwestern quarter, and Room 3, in the northwestern quarter. The 2012 excavations, which begin 10 m to the north of 16.57, were initially intended to expose additional areas of the Early Bronze Age settlement found on Terrace 4 during the 2011 season. Instead, these excavations revealed that Terrace 3 curves eastward as it continues north, and the exposed portions of 16.37 and 16.27 clearly belong to this terrace (Fig. 5.14). While these excavations were cut short, they nonetheless provide additional evidence for the destruction of the terrace buildings, discussed below.

Figure 5.14: Extension of Terrace 3 being excavated during the 2012 field season. (Photo: Thomas E. Levy, courtesy UC San Diego LCAL.)

Four main strata were identified in Terrace 3, two of which can be subdivided, in certain areas, into several substrata. These are discussed individually below, beginning with the most recent.

Stratum T3-1

This stratum consists of the topsoil found across the terrace. Middle-Late Islamic IHMW sherds found in 16.56 may suggest reuse of Terrace 3 in these periods, but the majority of sherds are residual. Iron Age sherds are particularly common, especially in 16.56, suggesting wash from the fill reinforcing Wall 1049, to the east.

Stratum T3-2a

Stratum T3-2a is a layer of stone collapse found across all of Terrace 3. In 16.37 this collapse is found together with a heavy concentration of ash. Ceramics associated with this stratum in Rooms 1 (L. 1037) and 3 (L. 1033) included sherds of several 3rd-5th century African Red Slip Ware forms (see Section 6.2.2.1), suggesting that this collapse may be associated with the historically attested earthquake of 363 AD (see Section 3.4; Russell 1985: 42).

Stratum T3-2b

In most of Terrace 3, Stratum T3-2b is the only identifiable pre-collapse T3-2 substratum. Occupation in this stratum seems to be have occurred in association with copper smelting at Phaino during the Roman and Early Byzantine periods. As such, it is relevant to this dissertation primarily for dating purposes, and only a short summary description is presented here. In 16.56, T3-2b is a sandy fill, often containing small green flecks, and in Room 3 a Stratum T3-2b surface could be defined. In 16.37 and 16.27, it consists, instead, of a heavy concentration of ash and charcoal. A radiocarbon sample from the bottom of this stratum in 16.37 (L. 127) produced a calibrated date of 134-235 AD (see Table 4.1 for complete information), largely in line with the date suggested above for the collapse of the walls. In 16.56 Room 3, a Stratum T3-2b floor (L. 1102) was found, associated with a bread oven[163] (L. 1103; Fig. 5.15). A radiocarbon sample

[163] Following Ebeling and Rogel (2015), I avoid the common but anachronistic designation of this feature as a *ṭābūn*.

was also taken from the oven, and produced a calibrated date of 127-229 AD (see Table 4.1 for complete information). Early Byzantine pottery recovered from a probable surface in Room 1 (L. 1065), however, suggests that use of this stratum continued into the 4th century, at least in that room.

Figure 5.15: Excavation of Stratum T3-2b in Room 3. The north arrow is placed roughly in the center of the bread oven. (Photo: Thomas E. Levy, courtesy UC San Diego LCAL.)

Stratum T3-2c(?)

This substratum was found only in 16.56 Room 3. While the L. 1103 bread oven was used in conjunction with the Stratum T3-2b floor, L. 1102, its base sits in a pit dug down to a previous probable floor, L. 1117. Pottery and other small finds from this stratum (not analyzed for this dissertation) suggest a date in the Late Hellenistic-Early Roman period. The Stratum T3-3 stone collapse (discussed below) was not found in this room, suggesting that it had been cleared before the use of the room in T3-2b or T3-2c. If the clearance occurred between Strata

T3-2b and T3-2c, the early 2nd century date suggested below for Stratum T3-3 fits, but Stratum T3-2c should likely be considered Stratum T3-3b. If the clearance occurred prior to Stratum T3-2c, the Stratum T3-3 collapse is likely related to an earlier event. Presently there is no way to decide between these two possibilities, but I tentatively designate this substratum T3-2c, as it was only found directly below Stratum T3-2b.

Stratum T3-3

This stratum is a second layer of stone collapse below Stratum T3-2. It was found only in 16.56 Rooms 1 and 2, although it was likely also present in Room 3, but cleared at some point. Dating this collapse is difficult. It is possible that this destruction is related to an archaeologically-attested earthquake that probably occurred in the first decade of the 2nd century AD (Ambraseys, et al. 1994: 20; Russell 1985: 40-41), but the Stratum T3-3 collapse may have occurred earlier, and for other reasons.

Stratum T3-4

This stratum consists of three sterile substrata, which were only found in a deep stratigraphic probe in the center of 16.56: a loose, sterile fill (T3-4a), a compact, sterile fill (T3-4b), and the basal *wādī* gravel layer (T3-4c). No finds were recovered from any of these substrata.

Terrace 3 Stratigraphic Summary

For reference, the stratigraphy of Area 16 Terrace 3 can be summarized as follows:

Stratum T3-1 — Middle to Late Islamic Period (?)

Stratum T3-2a — 4th century AD

Stratum T3-2b — 2nd-4th century AD

Stratum T3-2c(?) — 2nd century BC-2nd century AD

Stratum T3-3 — 2nd century AD (?)

Stratum T3-4 — Sterile

5.3.2. Area 18

Investigations in Khirbat Faynān Area 18 began at the end of the 2011 ELRAP field season, when material was sieved from the backdirt of a looter's pit (Fig. 5.16) that had been noted during a LiDAR survey of the northern side of the *tall*. My initial readings of the recovered ceramics suggested a Byzantine date for Area 18, and excavations were undertaken during the 2012 field season to investigate the nature of the building complex, which was thought to be either a cistern or underground tomb — this latter possibility suggested by skeletal material recovered from the looter's backdirt.

Figure 5.16: Photo of the looted cistern opening in Area 18 at the end of the 2011 field season. The pile of grayish sediment in the foreground is the looter's backdirt. The shadow shows the presence of the LiDAR survey team and equipment. (Photo: Thomas E. Levy, courtesy UC San Diego LCAL.)

The 2012 investigations consisted of a 5 x 5 m excavation square to the west of the cistern opening and a 1.5 x 2 m probe (defined by architectural features) to the south of the cistern opening, both supervised by Kathleen Bennallack, as well as clearance of the cistern itself, supervised by Thomas E. Levy and Mohammad Najjar (Fig. 5.17). Because the excavations in this area had to be cut short, and floors were not reached in the majority of the excavated square, it is not yet possible to suggest a stratigraphic scheme for this area. Three major occupation periods can, however, be proposed, which will be discussed here from most recent to oldest.

Figure 5.17: Plan of 2012 excavations in Area 18. (Photo: Matthew D. Howland, courtesy UC San Diego LCAL; map: IWNJ).

Occupation 3, found primarily in the 1.5 x 2 m probe east of the main excavation area, seems to have been associated with reuse of the area for lime burning. A thick layer of white ash and charcoal (L. 006) was found here, in association with a concentration of marble finds, including hundreds of white mosaic tesserae. Preliminary flotation from this locus revealed the presence of legumes, barley, and olives, which may also suggest food preparation. Multiple episodes of reuse may be represented by Occupation 3, however, especially as the locus below L. 006, L. 013, also contained substantial quantities of ash and charcoal (Fig. 5.18). Regardless, the marble finds are nonetheless suggestive of lime burning. Based on the ceramics recovered from L. 006, notably a mid-8th-9th century splash-glazed bowl (see Section 6.2.1), Occupation 3 should not be dated any earlier than the Early Islamic Ic, and probably should be placed in the Early Islamic II. In previous decades, Occupation 3 would perhaps have been explained as an Arab squatter occupation (e.g. Tsafrir 1988: 27; but cf. Arce 2003, who notes that limekilns are generally associated with episodes of construction).[164] This explanation no longer holds up entirely, however, as the Hellenistic Pool Complex, or *paradeisos*, at Petra had already been reused as a limekiln during the 6th century AD (Bedal 2003: 80-82). This reuse in Area 18 is not, then, necessarily evidence for a new population occupying Khirbat Faynān during the Early Islamic period.

[164] See also Figueras (2004: 47), who, writing about the church complex at Ḥorvat Karkur ʻIllit, in the northern Negev, wonders, "Who were the people who took shelter in the ruins of a church complex towards the middle of the seventh century CE, but who contributed nothing innovative in the way of pottery, and who still used Greek letters to mark their storage amphorae? More perplexing, who were these individuals who had no respect for the mosaic floors of the church and who used fragments of burial inscriptions for a purpose other than honoring the dead?" On these questions, see Section 8.3.

Figure 5.18: Dark, ashy fill in L. 013. Ash and charcoal lenses associated with L. 006 are visible in the baulk above the small stone ledge, visible at the top of the photo. (Photo: Thomas E. Levy, courtesy UC San Diego LCAL.)

Interestingly, the doorway linking the 1.5 x 2 m probe with the main 5 x 5 m excavation square seems to have been blocked at some point between Occupations 2 and 3 (Fig. 5.19). It is unclear if this was intentional modification of the space, as seen, e.g. in the 8th century occupation of the Northern Church at Rehovot-in-the-Negev (Tsafrir 1988: 27), or if this material collapsed into the doorway. Two earthquakes, in particular, are potential sources of damage: the earthquake of 746[165] (Ambraseys 2009: 230) — or 747 (Ambraseys, et al. 1994: 26) or 748 (Russell 1985: 47-49) — or the earthquake of 757 (Russell 1985: 49). Russell (1985: 49)

[165] Tsafrir and Foerster (1992: 231) correctly note that "[t]he exact date of this earthquake is controversial," pointing out that every year between 746 and 749 has been suggested as a possibility. Based on numismatic evidence from Bet She'an, they suggest that 749 AD is the correct date. Ambraseys (2009: 230-238), however, has more recently proposed that the confusion results from the conflation of three separate earthquakes: one in 746 AD, which affected the southern Levant, another in 749/750 AD, which primarily affected Mesopotamia, and a third in 757 AD, which again affected the southern Levant.

notes that it is unclear whether the 757 earthquake would have affected southern Jordan — although it did cause damage in Jerusalem (Ambraseys 2009: 236) — but the 746 (or 747/8) earthquake was quite powerful. Its epicenter was the northern Dead Sea region, near ‘Ammān, but it caused damage as far away as Damietta, was “strongly felt” in al-Fusṭāṭ, and was perhaps felt as far to the north as Manbij, ca. 80 km northeast of Aleppo (Ambraseys, et al. 1994: 26). It is plausible, then, that this earthquake would also have caused damage in Faynān, and the dating, in a broad sense, fits the dates suggested for Occupations 2 and 3. Nonetheless, given that the two events are only separated by a decade, it is safer to suggest that the destruction is associated with a mid-8th century earthquake.

Figure 5.19: The Area 18 excavation square during exposure of L. 009 and L. 013. The white arrow points to the Occupation 3 blockage of the doorway between the main excavation area and the probe. (Photo: Thomas E. Levy, courtesy UC San Diego LCAL.)

Most of the loci associated with use of Area 18 as a cistern complex belonged to Occupation 2, as the excavation was cut short prior to reaching Occupation 1 loci in most of the excavated area. The layout of the excavated area is difficult to determine. The southern portion of the 5 x 5 m square contained two small pillars (Fig. 5.20) opposite one another, with the northern pillar likely forming part of a wall (Wall 026). It is not clear, however, whether the area between was part of an interior room or courtyard. East of this is a set of plastered steps leading to the 1.5 x 2 m probe. A large stone counterweight was found in the 1.5 x 2 m square, adding weight to the identification of the large feature as a cistern, rather than tomb complex. The ceramics and related finds from Occupation 2 are typical of a 6th-8th century assemblage (see Sections 6.2.2 and 7.3). Of particular note are a rim sherd of a Red-Brown Ovoid Amphora, an Egyptian form that first appears in the Levant in the mid-7th century, from L. 021, and the rim of an 8th-9th century schist bowl from L. 018.

Figure 5.20: Reused architectural elements in the southern Occupation 2 pillar. (Photo: Thomas E. Levy, courtesy UC San Diego LCAL.)

Occupation 1 consists of the construction of the cistern complex itself. Little diagnostic material was recovered from the cistern clearance, and this consisted primarily of Late Roman Amphora sherds (see Section 6.2.2). Of particular importance, however, is a sherd recovered from L. 011, a leveling fill below the flagstone floor associated with the cistern. A body sherd (R. 39174) of Late Roman D (or Cypriot Red Slip) provides a *terminus post quem* for the construction of the floor in the 5^{th}-7^{th} centuries AD (see Section 6.2.2.1). In the main 5 x 5 m excavation square, the corresponding floor was only reached in L. 020, the lowest locus of a stratigraphic probe in the southwest corner. A radiocarbon sample from the fill directly above the floor (B. 10114) produced a calibrated date of 424-536 AD (see Table 4.1 for complete information). This suggests a date for the construction of the floor — and probably of the entire complex — in the 5^{th}-6^{th} centuries AD. During clearance of the cistern, it was revealed that its walls had been covered in painted plaster (Fig. 5.21), although it was fairly fragmentary, and thus it was not possible to deduce what the design might have been. This does not, however, call into question the identification of the feature as a cistern, as other cisterns have been found with painted designs, most notably the 6^{th} century Nilotic scene painted in a large cistern at Salamis in Cyprus (Taylor 1933; Whitehouse 2009).

Figure 5.21: Fragment of painted plaster recovered from looter's backdirt in Area 18 in 2011.

It is unclear how the skeletal material recovered from the looter's backdirt relates to the occupations described above. It is fairly certain that these burials postdate the use of the cistern for water storage, which suggests a post-Occupation 2 date. This would also correspond with skeletal material encountered in the highest levels of Area 18 during preparation of the area for geophysical survey by Alex Novo and Matthew Vincent. Whether this use postdates Occupation 3 is unclear, but this, too, seems likely.

While more excavation would be required to clarify the stratigraphy of Area 18, informative parallels can be drawn with Dayr ʻAyn ʻAbāṭā, a monastery complex in Ghawr al-Ṣāfī. There, a cistern was built in the 5th century to augment the site's larger reservoir, but was repurposed and used for burials at the end of the 7th century, then later as a dump, and following this was again reused for burials (Politis 2012a: 122, 148). While the cistern complex in Area 18 went through a slightly different phase of reuses, the general pattern is similar, and the comparison indicates that even relatively major repurposing does not necessarily indicate a new population at the site.

5.4. Khirbat Ḥamrā Ifdān

Khirbat Ḥamrā Ifdān (henceforth KHI, and also WFD 120; Fig. 5.22, 5.23) is a large site located on an inselberg ca. 25 m above the channel of Wādī Fidān. The primary occupation at the site was its use as a copper-casting center during the Early Bronze III-IV (ca. 2700-2000 BC; Hauptmann, et al. 2015; Levy, et al. 2002), and it was also a minor center of copper smelting during the early Iron Age (12th-10th century BC; Ben-Yosef, et al. 2014b: 850-856).[166] This section, however, reports on reuse of the site in the Roman-Early Islamic periods. Surface-collected and excavated ceramics (see Section 6.3) also indicate reuse of the site during the Late Islamic (and perhaps Middle Islamic) period, as well. Excavations at the site have not produced substantial evidence of this reuse, however, so it is discussed only briefly here.

[166] A scarab bearing the name of the Egyptian pharaoh Sheshonq I — and potentially associated with his late 10th century BC military campaign through the southern Levant — was surface collected at KHI in 2006 (Levy, et al. 2014b). Although it does not bear directly on the present discussion, it is — as only the second artifact found in the southern Levant bearing Sheshonq I's name — perhaps the most noteworthy find from KHI.

Figure 5.22: View of Khirbat Ḥamrā Ifdān from cliff to west, taken during the 1999 excavation season. (Photo: Thomas E. Levy, courtesy UC San Diego LCAL.)

Figure 5.23: Map of excavation areas at Khirbat Ḥamrā Ifdān. (Photo: WorldView-2 satellite, image copyright Digital Globe, Inc. GIS data compiled by Aaron Gidding, courtesy UC San Diego LCAL; map: IWNJ).

Frank (1934: 220) surveyed the site, which he called Maḥamma Ifdān (Ar. "the protected/defensible site of Ifdān"),[167] in 1932. His plan of the site indicates that he was primarily interested in the Area L inn/[168]domestic structure, and he dated the entire site, on the basis of ceramics, to the Roman period (Frank 1934: 220, Plan 17). Glueck (1935: 20-22) visited the Jabal Ḥamrā Fidān region in 1934, but did not survey the site referred to here as KHI. The site he calls KHI is, instead, the Iron Age site known in ELRAP reports as Rujm Ḥamrā Ifdān (RHI),[169] or WFD 77a (see Adams 1992 for an in-depth discussion of the confusion surrounding Glueck's identification; see Smith, et al. 2014c for a report of excavations conducted by ELRAP in 2004 at RHI). Raikes (1980: 55) visited KHI — which he refers to as Site F — in the late 1970s. Although primarily interested in earlier periods, he noted the presence of Roman pottery at the site and discussed the Area L inn, which he erroneously connected to Roman copper production, suggesting that it "resembles a barrack-block, for the factory workers" (Raikes 1980:

[167] See, e.g., Modern Standard Arabic *maḥmī*, "protected."

[168] In English reports, this structure and others like it are often referred to as "caravanserais." Cytryn-Silverman (2010b: 5-42) discusses the various Arabic and Persian terms for inns, demonstrating that the words *funduq*, *khān*, *caravanserai*, *ribāṭ*, and occasionally even *qal'a* — these last two more commonly referring to specific types of defensive structure — are not quite interchangeably used in historical sources to refer to inns. Noting that the word *caravanserai* refers to a particular function an inn could serve, she suggests that "rural inn" or "road inn" should be preferred as a general term in English sources, despite the long use of "caravanserai" as a general term (Cytryn-Silverman 2010b: 42). I follow this advice here, and refer to these structures in a general sense simply as "inns," except when discussing the interpretations of previous scholars (see, e.g., Section 5.2.3).

[169] To confuse matters further, Glueck (1935: 20) refers to a third site as Rujm Ḥamrā Ifdān and Frank (1934: 220) to a fourth as Rujm Ifdān. Smith (2009: 269) justifies the decision to refer to Glueck's KHI as RHI by noting that "the original Nabataean Rujm Hamra Ifdan never materialized in future surveys." Interestingly, however, the final report of the ELRAP RHI excavations presents a somewhat confused version of this problem, noting that "[t]his site was first identified by Nelson Glueck . . . as Rujm Hamra Ifdan, a Nabataean watchtower" (Smith, et al. 2014c: 724), and arguing that Glueck simply confused its location with that of KHI. Clearly this is not the case, as Glueck did not visit KHI, and the site is so named due to later researchers assuming it, incorrectly, to be Glueck's KHI. It is unclear how this confusion entered the text of the final report, particularly as the authors present Smith's justification later on the same page, but this confusion aside, Glueck's RHI is quite clearly a third site. (Several other points of the research history in Smith, et al. [2014c] are somewhat inaccurate, as well, but these are irrelevant to the present discussion.) Adams (1992: 177) argued that Glueck's RHI had likely been destroyed by gravel quarrying in the 1970s, offering some support for Smith's justification for using that name to refer to Glueck's KHI. I think it is very likely, however, that Glueck's RHI is WFD 50a (see Section 5.5 below). Frank's Rujm Ifdān is easier to identify, and I am quite certain that it is WFD 617, a Late Hellenistic-Roman watchtower recorded during the 2004 ELRAP Wādī Fidān Survey. Its proximity to 'Ayn Fidān matches Frank's (1934: 220) description, and the slag mound mentioned by Frank could easily be WFD 614, a slag mound ca. 25 m from WFD 617. This discussion is primarily of historical interest, however, as ELRAP has adopted RHI as the toponym for WFD 77a/Glueck's KHI.

55). King, et al. (1989: 204) visited the site — which they assumed to be Glueck's KHI and refer to as Khirbat Fidān, Qal'at Fidān, or simply Fidān — in 1982. They correctly identified most of the periods of occupation at the site, but suggested both that "the Early Islamic component is negligible" and "[t]he Mamluk period was one of increased activity" (King, et al. 1989: 204). The discussion below suggests that this is not the case, but King's survey reports should be read with the state of research on Islamic period ceramics in the 1980s in mind.[170] The Southern Ghors and Northeast 'Arabah Archaeological Survey (SGNAS) also visited KHI, which they numbered Site 30, in 1985 and 1986 (MacDonald 1992). They, too, assumed it was Glueck's KHI, and correctly identified most of the periods of occupation at the site, though their substantive discussion focuses primarily on the Early Bronze Age (MacDonald 1992: 69, 252). Adams (2002) conducted probes at the site in 1990 and 1992 to investigate the Early Bronze Age settlement. It was surveyed again — and assigned the number WFD 120 — in 1998 as part of the JHF Project's Wadi Fidan Survey (Levy, et al. 2001). JHF conducted large-scale excavations at KHI during the 1999 and 2000 field seasons (Levy, et al. 2002), and work at the site has continued under ELRAP with excavations of the Iron Age slag mound in Area E in 2007 (Ben-Yosef, et al. 2014b: 852-855) and a probe in Area Q to clarify the site's Early Bronze Age stratigraphy in 2011 (Levy, et al. 2012b: 430). Most recently, excavations were conducted in the northern part of the site in 2013 by a Barqā Landscape Survey team. Relevant to the discussion here, they found Roman-Islamic pottery and a papyrus fragment that they date on paleographic grounds to between the late 7th and mid-8th centuries AD (Friedman, et al. 2017). This was published after most of the discussion in this dissertation was written, but their proposed dating

[170] As another example, King's (1989: 204) discussion of Rujm Fidān — Glueck's Rujm Ḥamrā Ifdān (see n. 169 above) — notes the presence of Fāṭimid sherds. Without illustrations, it is difficult to guess what ceramic types this refers to, as even given the present state of research sherds of the 10th-11th century are quite difficult to identify.

fits well with the ceramic (see Section 6.3) and numismatic (see Section 7.1) data from JHF/ELRAP excavations at the site.

The present section reports primarily on the JHF excavations conducted in 1999 and 2000. The most relevant evidence comes from the 2000 excavation in the Area L inn or domestic structure (Section 5.3.2), but Areas H (Section 5.3.1) and Y (Section 5.3.3) also produced substantial evidence for reuse in Late Antiquity. While some Byzantine-Early Islamic material was also found in the topmost loci of Areas C, D, and E, these contexts are shallower and mixed, and there is little to report beyond the ceramics (see Section 6.3).

One final point is worth discussing before reporting on these excavations. Levy, et al. (2002: 428) proposed a site-wide stratigraphic scheme for KHI with the following divisions: Stratum I (Iron Age, Byzantine, and Islamic), Stratum II (Early Bronze Age IV), Stratum III (Early Bronze Age III), and potentially Stratum IV (Early Bronze Age II). While this system is appropriate for the central area of the site, where most work has been conducted, it does not work as well for the southern portion, particularly Areas E and L. As the excavation in Area L is particularly important for the present discussion, I treat the 2002 stratigraphy as a local stratigraphy for Areas H and Y, and use a different system in Area L.

5.4.1. Area H

Area H is the northeasternmost of the areas excavated by JHF and ELRAP at KHI (see Fig. 5.23). Seven 5 x 5 m grid squares were opened during the 1999 season, and an addition six during the 2000 season, for a total of 325 m^2. The majority of the excavated material from Area H belongs to Stratum III, dated by excavation supervisors, Michael Homan and Sarah Malena, to the EBA III. The EBA material is not discussed here, however. This has been summarized by Levy, et al. (2002), and further analysis appears in Gidding's (2016) Ph.D. dissertation. This section is limited to material from Stratum I, dating to the post-Early Bronze Age periods. This stratum can be further subdivided into two substrata.

Stratum IA

Only one feature in Area H was assigned to Stratum IA: Wall 2002, a 25 m long, two-course, curvilinear wall, which continues to the south into Area Y as Wall 2515 (Fig. 5.24). This wall likely formed part of an animal enclosure. Although Area L and Wall 2002 have no particular architectural similarity, the excavators initially suggested that Wall 2002 was used during the Late Byzantine-Early Islamic period, forming part of the larger Area L inn or domestic complex. The lack of datable artifacts from Stratum IA makes this uncertain, however. Given the "late" pastoral features known from other sites in the Faynān region — e.g. the Stratum Z1 modifications to the Area Z building at KNA (see Section 4.1.5) — it is possible that Wall 2002 is a later feature, and perhaps dates to the Middle or Late Islamic periods, both of which are represented in the surface ceramics at KHI.

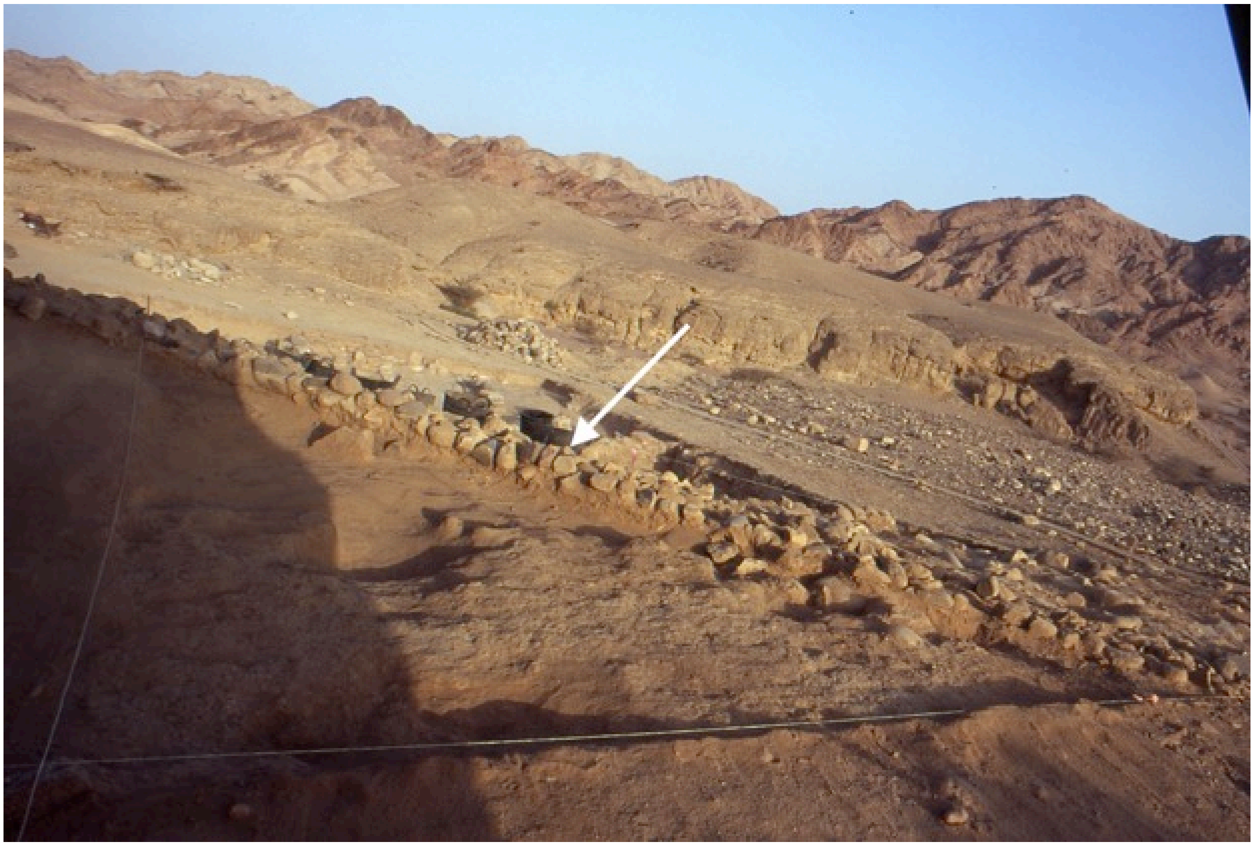

Figure 5.24: Photo of Stratum IA in Area H, mid-excavation. The white arrow points roughly to the midpoint of Wall 2002. (Photo: Thomas E. Levy, courtesy UC San Diego LCAL.)

Stratum IB

In Area H, Stratum IB consisted of two primary types of feature: reused Early Bronze Age domestic structures (Structures 67, 68, and possibly 71) and metallurgical installations (Structures 51, 66, 70, and possibly 71). The excavators suggested a Byzantine date for both types of feature.

The domestic structures yielded primarily Late Byzantine-Early Islamic pottery, in addition to substantial quantities of residual Early Bronze Age material, suggesting that they are contemporary with Area L Stratum L-IIB (discussed below, Section 5.4.2). It is not clear, however, how these features in Area H relate to the Stratum L-IIB inn in Area L. It is possible that they represent a settlement supporting the inn, or that they were reconstructed for a specific purpose related to the functioning of the inn, e.g. storage. The shallow nature of the deposits and limited amount of material recovered present difficulties for interpreting these structures.

The metallurgical installations, however, represent a chronological problem. If they are, in fact, contemporary with the domestic reuse of Area H, they would provide the only evidence for copper production in the Faynān region during this period (see Jones, et al. 2012: 70; Jones, et al. 2014: 182-185). As will be discussed later in the dissertation (see Section 8.2), political-economic factors make large-scale Early Islamic period copper production in Faynān unlikely, but it is more difficult to rule out small-scale smelting of the kind that might be represented in Area H. Comparison to the ELRAP excavations in the KHI Area E slag mound is informative, however. There, archaeomagnetic dating demonstrates that smelting activities took place during the Iron Age, despite the fact that the excavations produced little diagnostic Iron Age pottery (Ben-Yosef, et al. 2014b: 852-855). On this basis — and in the absence of Early Islamic period ring slag (see Section 4.3) — I would suggest that the Stratum IB metallurgical installations are not contemporary with the domestic structures, but are instead contemporary with Area E Stratum E-II (see Ben-Yosef, et al. 2014b: 855, Table 12.10).

The fact that Stratum IB seems to contain features dating both to the Iron Age and the Late Byzantine-Early Islamic period is not entirely surprising, given that the shallow Stratum I deposits across the site generally contain mixed material dating to the Iron Age-Late Islamic period. The mixed nature of these deposits makes it difficult to suggest a revised stratigraphy, beyond suggesting that, in Area H, Stratum IB should be broken up into two phases: Stratum IB Phase 1, dating to the Iron Age, and Stratum IB Phase 2, dating to the Late Byzantine-Early Islamic period.

5.4.2. Area L

Area L is the southeasternmost of the areas excavated by JHF and ELRAP at KHI (see Fig. 5.23). The structure is visible on the surface of the site, and has been noted by most researchers since Frank (see, in particular, 1934: Plan 17). Two 5 x 5 m grid squares were excavated during the 2000 JHF field season, and a third 3 x 4 m square opened to investigate the exterior wall of the building, for a total of 62 m^2 (Fig. 5.25). These excavations were supervised by Lisa Soderbaum and Soraya Vorster. Three stratigraphic phases were identified in these excavations, but as noted in Section 5.3, these do not correspond to the "site-wide" stratigraphic scheme proposed by Levy, et al. (2002), and are instead treated here as local strata. Of these, Stratum L-IIIA contains primarily Early Bronze Age IV material — although an Iron Age I radiocarbon date was taken from this stratum (see Ben-Yosef, et al. 2014b: 778, Table 12.2) — and Stratum L-IIIB dates to the Early Bronze Age III, corresponding roughly to Strata II-III in the site-wide stratigraphic scheme,[171] and as such they are not discussed here. This focus of this section is instead the post-Iron Age strata, L-I and L-II.

[171] It is unclear, however, that Stratum L-IIIA in particular is equivalent to site-wide Stratum II. The fact that charcoal from this stratum produced an early Iron Age radiocarbon date suggests that this stratum may instead be an Iron Age dump of primarily Early Bronze Age material (this point is discussed in further detail in Ben-Yosef, et al. [2014b: 775, Table 12.1]). Whether Stratum L-IIIB represents a clean Early Bronze Age occupation or another post-EBA dump is a question beyond the scope of the present dissertation.

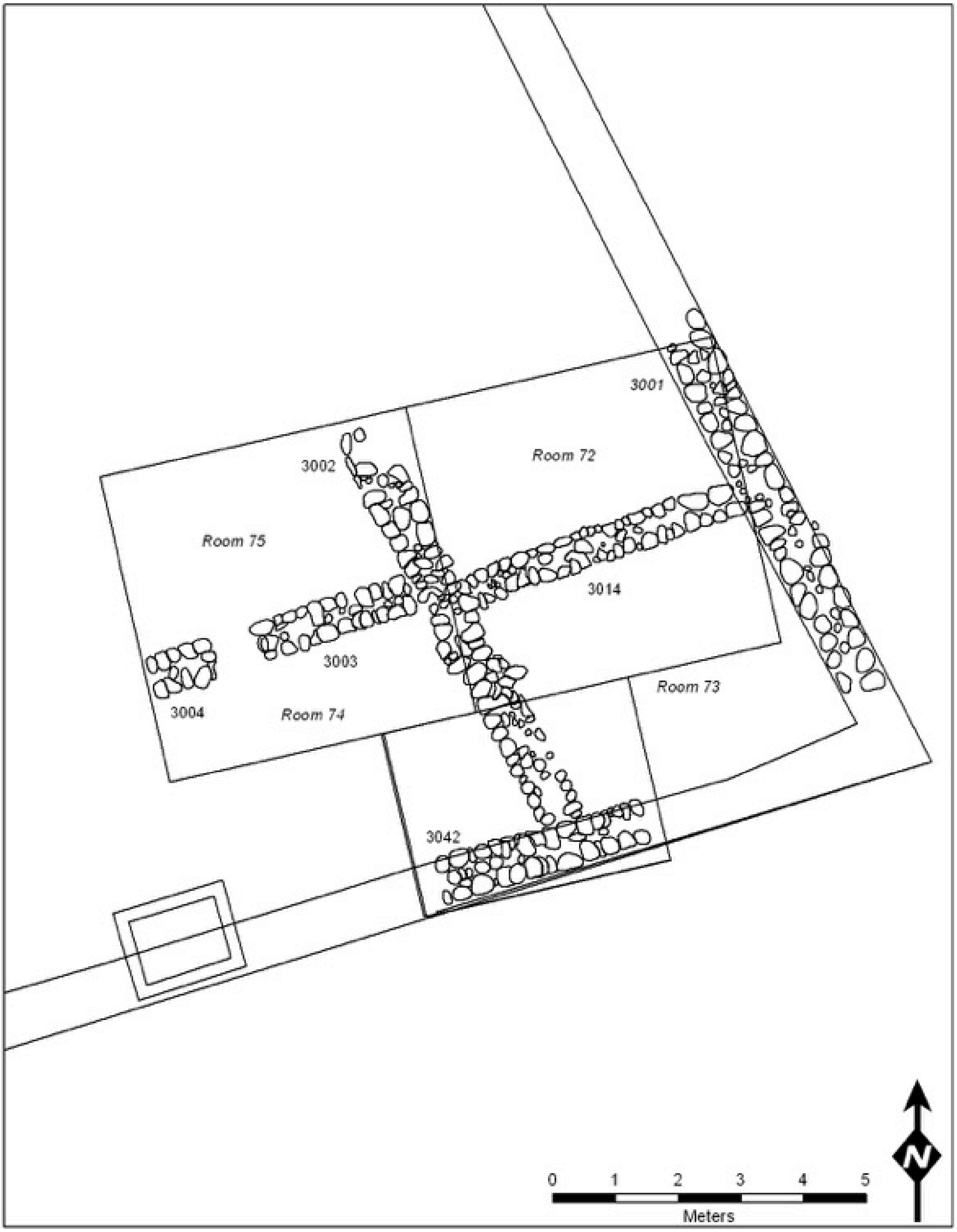

Figure 5.25: Plan of excavations in KHI Area L. Wall locus numbers are marked in standard font and room numbers in italics.

Stratum L-I

Stratum L-I corresponds to reuse of Walls 3002, 3003, and 3004 (see Fig. 5.25). Architecturally, this stratum is limited primarily to a single course of stones added to these walls. There are no floors associated with Stratum L-I, and loci assigned to this stratum are primarily sandy fills of fairly mixed material. Datable artifacts were uncommon, but sherds of Middle to Late Islamic IHMW were recovered from L. 3011. Sherds of Late Islamic period Gaza Ware were also recovered from L. 3010[172] (see Section 6.3).

Stratum L-II

This is the main occupation phase associated with the Area L building. The excavators assigned Strata L-IIA and L-IIB to the same stratum on the grounds that they thought both dated to the "Roman/Byzantine" period. As the discussion below explains, this is not the case, and it is likely either that Stratum L-II should be divided into two major strata, that a major stratum is "missing" between L-IIB and L-IIIA, or possibly both. The nature of the excavations, which did not reach beyond Stratum L-IIB except in two probes (Fig. 5.26), and the unfortunately somewhat confused treatment of the stratigraphy in the excavation report both make it difficult to determine the actual stratigraphy of the Area L building, and further excavation would be necessary to clarify this. As such, and to avoid confusion with previously published reports of Area L, I follow the stratigraphy assigned by the excavators, but note where this is likely incorrect.

Stratum L-IIA

This substratum is the only phase certainly corresponding to the primary use of the building as an inn or domestic structure. The finds from the three rooms adjacent to the exterior

[172] The excavators initially assigned L. 3010 to Stratum L-IIA. Given the presence of Gaza Ware, however, this is difficult to accept. It is unclear, though, whether L. 3010 should be entirely reassigned to Stratum L-I, or if the locus above, L. 3006, was simply closed prematurely.

walls — Rooms 72-74 — consisted primarily of ceramics. In all three rooms, a layer of compact sediment and organic material was found, suggesting a collapsed thatched roof, and below this, collapsed mudbrick (Fig. 5.26). Ash layers were found fairly commonly in this stratum, likely associated both with the collapse of the roof and use of the building. The northwesternmost excavated room — Room 75 — instead contained a layer of animal dung, suggesting that animals were kept in this room, and that it perhaps forms part of a larger open central courtyard. The best dating evidence for Stratum L-IIA comes from L. 3016, in Room 73. Ceramics of the 8th-9th century were found in this locus (see Section 6.3), and a radiocarbon sample was processed and produced a calibrated date of 778-882 AD (see Table 4.1 for complete information). Stratum L-IIA should, therefore, be dated to the late 8th-9th centuries AD, or the Early Islamic Ic and Early Islamic IIa.

Figure 5.26: Photo of excavations in Area L, showing collapsed Stratum L-IIA thatch and mudbrick in Room 73 (bottom left), a patch of crushed slag used as a Stratum L-IIB leveling fill in Room 74 (top left), and deep probes in Rooms 72 and 75 (bottom and top right, respectively). (Photo: Thomas E. Levy, courtesy UC San Diego LCAL.)

Stratum L-IIB

Stratum L-IIB is crucial for understanding the architectural history of the Area L building, but it is unfortunately quite difficult to make sense of based on the 2000 excavations. The material collected from this substratum is similar to the material from Stratum L-IIA, and includes ash, mudbrick collapse, and evidence of an earlier thatched roof. Crushed copper slag was found below a mudbrick floor in Room 74 (L. 3028; Fig. 5.26), and was probably used as a leveling fill. This practice is fairly common in Faynān, given the ubiquity of copper slag in the region, and is known from at least as early as the Iron Age, e.g. at Khirbat al-Nuḥās Area W (Levy, et al. 2014d: 186). Overall, Stratum L-IIB seems likely to be an earlier phase of use of its main Stratum L-IIA use.

Dating this substratum is somewhat difficult, however. The best dating evidence comes from L. 3022, in Room 72, where a fairly complete 6th-8th century AD Large Candlestick Lamp (see Section 6.3) was collected. Unfortunately, the excavators assigned L. 3022 to *both* Strata L-IIA and L-IIB. It is unclear why this locus was not closed and a new one opened when Stratum L-IIB was reached, but whatever the reason, it complicates the dating somewhat. The lamp was collected from the lower portions of the locus, however, suggesting that it probably should be assigned to Stratum L-IIB, and the earlier date is a reasonable one.

There is, however, another issue with the dating of this stratum. First, while the construction of most of the walls in the excavation area can be dated to Stratum L-IIB, the central north-south wall — Wall 3002 — predates this phase. Unlike the other walls, its construction involved the digging of a foundation trench into Stratum L-IIIA, and its bottom several courses are built of much larger stones than the upper courses or any of the other walls. The excavators suggested that this earlier phase may have been part of an earlier Roman defensive structure — perhaps a *castellum* — and this date is supported by the presence of residual Early Roman sherds in Stratum L-II, though it is difficult to suggest a function based on a partial exposure of only one wall. Likewise, the Stratum L-II courtyard — Room 75 — contained two small walls that the excavators assigned to Stratum L-IIB. They noted, however, that these probably belong to an earlier phase, suggesting that there is a "missing" pre-inn, Roman stratum between L-IIB and L-IIIA.

A Reinterpretation of KHI Area L

Construction of the Area L building seems to have begun in the Early Roman period (for lack of a better designation, Stratum L-IIC), although evidence for this phase is quite fragmentary. At this stage, the building seems to have been a smaller defensive structure, rather than an inn or domestic building.

This structure was expanded and repurposed in Stratum L-IIB. While dated by ceramics to the 6th-8th centuries AD, architectural parallels — e.g. to the (much larger) early 8th century inn[173] at Qaṣr al-Ḥayr al-Gharbī (Creswell 1989: 136-137, Fig. 78; Schlumberger 1986: 5-6, Pl. 15-16), the Site A "fortress" or "palace" at al-Rabadha (al-Rāshid 1986: 26-27), and, much closer to Faynān, the probable Umayyad residential structures at al-Mutrāb and Khirbat al-Samrā in Maʻān (Genequand 2003: 29-31, Figs. 6-9), and Structure ג at ʻEn Marzev, dated by pottery to the mid-8th-11th centuries AD, and by coins to the late 9th-mid-11th centuries (Ariel and Berman 2016: 1-2; Porath 2016: 54*, Plan 17, 58*-66*, 71*, Plan 18.3) — suggest a date probably no earlier than the mid-7th century.[174] It is worth noting, however, the slightly less close similarity to

[173] Though the excavators refer to this structure as a *khān*, it is, by Cytryn-Silverman's (2010b: 76) definition, an inn. As Cytryn-Silverman (2010b: 74-76) notes, the layout of inns was quite variable during the Early Islamic period. See, for example, the rather different Early Islamic period inn discovered at Tall Qaṣīla in Tel Aviv (Ayalon, et al. 1986-1987).

[174] The plan of Area L is also superficially similar to the Iron Age fortress of Rā'as al-Miyāh al-Sharqī, located in the hills to the north of Wādī al-Ghuwayb, ca. 2 km northeast of ʻAyn al-Ghuwayba (Ben-Yosef, et al. 2009b: 832,

the Late Byzantine "pilgrim's hostel" at Jabal Hārūn in Petra (Fiema 2013: 798; Lahelma and Fiema 2008: 10), particularly in light of the Late Byzantine religious landscape of Faynān (see Section 8.3.). Likewise, Structure B at ʻEn ʻAvrona (Porath 2016: 14*, Plan 6, 71*, Plan 18.1), to which Area L also bears some architectural similarities, seems to have been built in the 6th century AD, based on coin evidence, though its primary period of use was the Early Islamic period (Ariel and Berman 2016: 1; Porath 2016: 34*, Table 1). At some point, probably before the mid-8th century, parts of this structure collapsed — perhaps as a result of one of the mid-8th century earthquakes (Ambraseys 2009: 230; Ambraseys, et al. 1994: 26; Russell 1985: 47-49; Tsafrir and Foerster 1992) — and were rebuilt in Stratum L-IIA. This phase of use dates to the mid-8th-9th centuries AD, although it is unclear exactly when Stratum L-IIA ends.

Finally, portions of the structure were reused again — probably seasonally, by Bedouin — in the Middle-Late Islamic period.

The stratigraphy of Area L can, therefore, be summarized as follows:

Stratum L-I — Middle to Late Islamic period (use in the 17th-20th centuries AD is certain)

Stratum L-IIA — mid-8th-9th centuries AD

Stratum L-IIB — 6th-8th centuries AD (probably mid-7th-8th, see below)

"Missing" phase, Stratum L-IIC(?) — 1st-2nd centuries AD

Stratum L-III — Early Bronze and Iron Ages

Fig. 12; Ben-Yosef, et al. 2014a: 518, Fig. 6.13a,c). ELRAP investigations at Rāʼs al-Miyāh al-Sharqī indicate that construction of the fortress was incomplete when it was abandoned (Ben-Yosef, et al. 2014b: 832-834), however, suggesting that the observed plan may differ from the intended plan. Regardless, as demonstrated by the discussion above, excavations at KHI Area L rule out an Iron Age foundation — and, vice versa, test excavations at Rāʼs al-Miyāh al-Sharqī rule out a post-Iron Age foundation. More importantly, the similar "*bâtiment nord*" at Qaṣr ʻAyn al-Sill, near al-Azraq, has been dated on the basis of surface ceramics to the 6th-7th centuries, but has not been excavated (Elter and al-Jbour 2013: 643).

5.4.3. Area Y

Area Y is the excavation area directly south of Area H (see Fig. 5.23), and consists of 12 5 x 5 m grid squares excavated by Yoav Arbel during the 1999-2000 JHF field seasons, for a total of 300 m^2. Material from Stratum I, the post-Early Bronze Age levels, was limited primarily to the six eastern grid squares, with the exception of the Stratum IA burial, discussed below.

Stratum IA

The only notable architectural feature of Stratum IA found in Area Y was Wall 2515, the southern extension of Wall 2002 (see Section 5.4.1; Fig. 5.24). They form part of the same feature, probably a Middle-Late Islamic animal pen.

The other Stratum IA feature is a Late Islamic burial in Structure 22, an Early Bronze Age structure in the western half of Area Y. The body was oriented east-west, facing south, and wrapped in a burial shroud. The location of the burial in Structure 22 suggests, on the basis of patterns observed in the Negev, a date in the mid-19th century or later (see Section 5.6.1).

Stratum IB

Stratum IB features were fairly limited in Area Y. Two short, parallel, single-course walls — Walls 2501 and 2514 — were found, but it is not clear whether they originally formed part of a larger structure, and no associated artifacts were recovered with which to date them. The only other Stratum IB feature is L. 2502, a concentration of copper slag. As discussed in Section 5.4.1, this feature is likely contemporary with Area E Stratum E-II, and therefore should be placed in Stratum IB Phase 1 and dated to the Iron Age.

5.5. Wādī Fidān 50a — A Classical Watchtower and Late Islamic Burials at the Mouth of Wādī Fidān

Wādī Fidān 50 (WFD 50) is the largest site found during the 1998 JHF Wādī Fidān District Survey (Levy, et al. 2001: 175, Table 2). It is a settlement or rural inn covering more than 2.5 ha on the southern bank of Wādī Fidān. The published date is "Roman/Byzantine" (Levy, et al. 2001: 175, Table 2),[175] but based on the excavation discussed below, it is likely that the site was occupied both earlier and later, as well. Aerial photographs taken by the Institut Géographique National (IGN) in 1978 show that the area surrounding the site was severely damaged by bulldozer activity (Fig. 5.27), probably related to construction of the southern portion of Highway 65 — the Dead Sea Highway — in the late 1970s. This damage, unfortunately, makes it difficult to determine the site's exact layout or function. Despite this, the majority of the site, including a large central building, is still intact as of May 2015, although not particularly well-preserved in most places.

[175] The ceramics collected during the 1998 JHF WFD Survey are not in the ELRAP storerooms in San Diego, and could unfortunately not be located for reanalysis.

Figure 5.27: 1978 aerial photograph of Wādī Fidān showing bulldozer damage to the area around WFD 50 and WFD 50a. (Background image: Institut Géographique National.)

Wādī Fidān 50a (WFD 50a) is (or was) an associated site located in the northeastern corner of WFD 50, ca. 140 m northeast of the center of the main site. It consists primarily of a small watchtower, or *castellum*, and a well. As noted previously (Section 5.4, n. 169), a compelling case can be made that WFD 50a is Glueck's (1935: 20) Rujm Ḥamrā Ifdān, though ELRAP now uses that name to refer to Glueck's Khirbat Ḥamrā Ifdān, WFD 77a (see Smith, et al. 2014c). Glueck (1935: 20) described the site as "situated on the south bank of the Wâdī Ifdân, at the point where the *wâdī* emerges from the long chain of hills of the Jebel Ḥamr Ifdân, among which we were able to find a number of important ancient sites.[176] … It may have been a Nabataean watch-tower." This corresponds fairly well to the location of WFD 50a, and it is also interesting to note that Adams (1992: 177) thought the site "may in fact now be lost to us, since this portion of the wadi suffered most from the extensive gravel quarrying undertaken in the late 1970s," as WFD 50 and WFD 50a were, in fact, damaged — though not destroyed entirely — by these activities, as evidenced by the IGN aerial photographs discussed above. Glueck's (1935: 20) estimate of an hour to get between the site and his KHI (RHI/WFD 77a) also seems to fit WFD 50a, which is ca. 1.5-1.75 km (depending on the route taken) from RHI, through the rocky and somewhat difficult terrain of Wādī Fidān. Glueck's (1935: 20) measurement of the wall lengths — 6.2 m — does not match ELRAP's — 6.8 m — but it is possible that this is due to disturbance of the walls from bulldozer activity. It is possible that Glueck's RHI was another structure in this general area, but it seems much likelier that Glueck's RHI is, in fact, WFD 50a. Raikes (1980: 44, 43, Fig. 3) seems to mention the site, noting that it is "a small ruined stone tower" and pointing out that "recent gravel-digging operations" revealed human remains, all of which is consistent with identification as WFD 50a. As Raikes was primarily interested in earlier periods, however — and was not a trained archaeologist — he does not describe the site in more detail than this. King, et al. (1989: 204) also visited the site, which they refer to as Rujm Fidān, in 1982. They noted that the site "has been badly damaged in recent times," and argued that the primary occupation took place in the "Roman-Nabataean, the Roman and the Byzantine periods," with a smaller Islamic period occupation "represented by only a very few Fatimid[177]

[176] As Adams (1992: 177) also notes, it is difficult to reconcile this statement with the fact that Glueck only describes two sites in the entire Wādī Fidān.

[177] Without ceramic illustrations, it is unclear what King, et al. (1989) identified as Fāṭimid at WFD 50a. While it is possible that they did collect 10th-11th century ceramics at the site, the state of Islamic ceramics research in southern Jordan was not very good in the 1980s, and the 10th-11th centuries in particular virtually unknown. Although this situation has improved in the last 15 years, even in the late 1990s, Schick (1997: 81) noted the continued difficulty of identifying ceramics of this period in southern Jordan (see also Section 5.4, n. 170).

and Mamluk sherds" (King, et al. 1989: 204). Most recently, Findlater's (2003: 179-180, 421, Table 23) Dana Archaeological Survey visited the site, which they numbered DAS 182. They were not able to date the site, however, and Findlater's (2003: 179-180) description relies primarily on Glueck and King, et al.

The JHF Project was the next to record the site, during the 1998 WFD Survey. By this point, the damage to the *castellum* was so extensive that the surveyors noted the presence of a well, but only a "possible" watchtower, although the published preliminary report identifies the site, correctly, as a watchtower (Levy, et al. 2001: 175, Table 2). In early 2003, the Jordan Valley Authority revealed that they planned to construct a dam across Wādī Fidān, and the JHF team conducted a series of salvage excavations during the 2003 field season at several of the key sites threatened by this plan (Levy 2003).[178] The 2004 JHF field season expanded on this effort, and a salvage excavation was conducted at WFD 50a, supervised by Jim Anderson, in order to date the structure and determine its plan. Unfortunately, the bulldozer damage the site sustained in the late 1970s was quite substantial. As such, many of the contexts were heavily disturbed, and far less architectural information could be recovered than had been hoped.

5.5.1. Area T

Two 5 x 5 m squares were opened in Area T, for a total of 50 m^2 (Fig. 5.28). Although heavily disturbed by bulldozed activity, the excavated loci could be broken into two major groups. One of these (L. 200, 202, 208, 213, and 214) was associated with a group of Late Islamic IIb burials, although the bulldozer activity had mixed human remains and artifacts from a number of graves together, and destroyed any evidence of the graves themselves. Raikes (1980: 44) documents that burials associated with WFD 50a had been disturbed by bulldozer activity —

[178] The dam, it is worth noting, was never actually built. At the time, however, the JVA indicated that they planned to complete the project by December 2005 (Levy 2003: 5).

and perhaps also erosion due to flooding — prior to 1977. The other group of loci (L. 200, 201, 203-207, 209-213, and 215) were primarily associated with the Roman and later *castellum*. At least two loci, L. 200 and 213, contained mixed material from both phases of use, and these loci — in particular L. 213, where bulldozer scoring was visible — had clearly been disturbed by bulldozing.

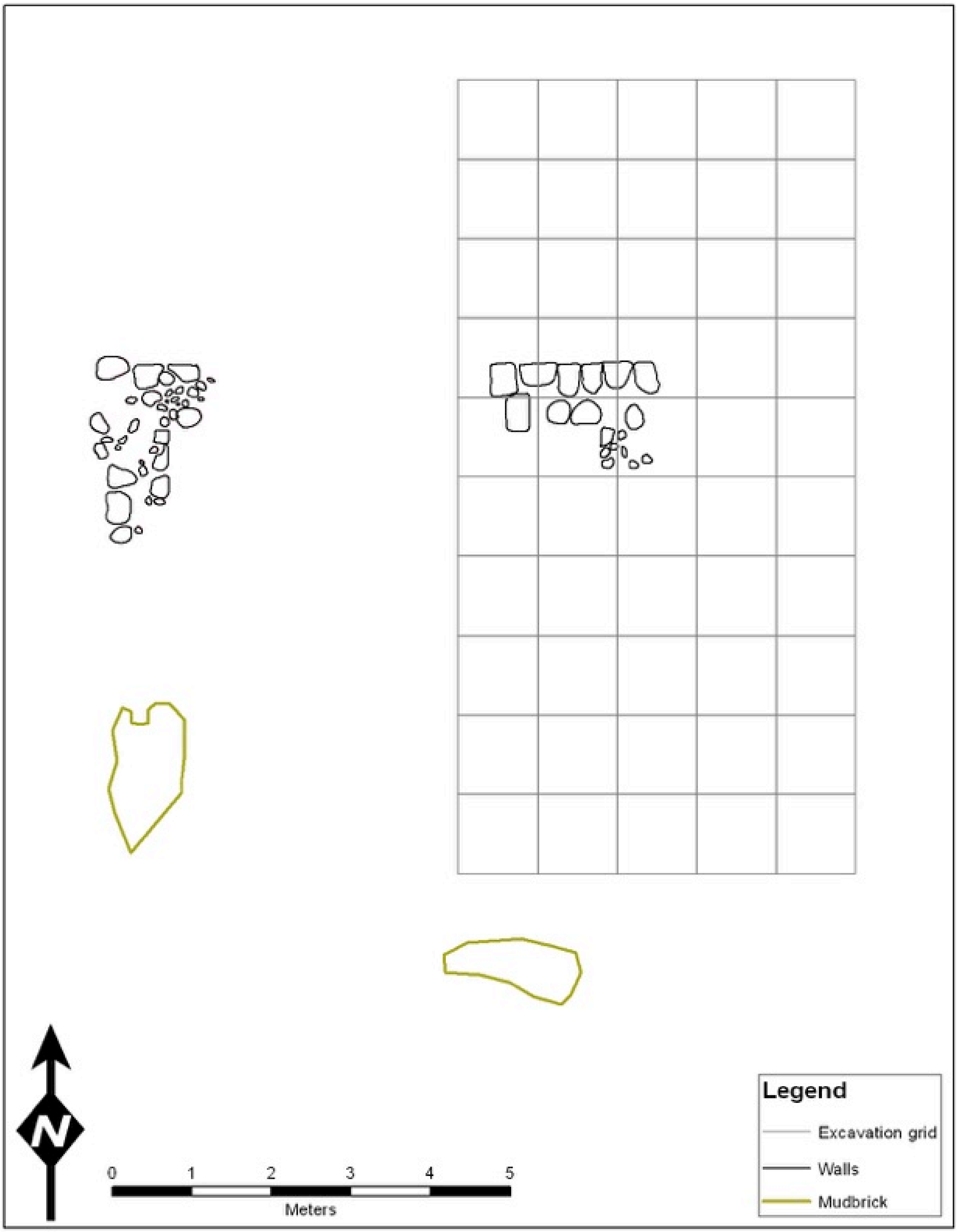

Figure 5.28: Plan of 2004 excavations in WFD 50a Area T.

Although the material from this excavation is clearly mixed, treating it as a survey assemblage provides a number of insights into the history of the site, and of the western Wādī Fidān more generally.

The Late Islamic IIb Burials

Beginning with the Late Islamic burials, Kenneth Mayes, JHF Project bioarchaeologist for the 2004 field season, identified the remains of four individuals from the excavations at WFD 50a: two young or middle-aged adults, one infant — represented by only two bone fragments — and one fetus — represented by only a single bone fragment. The presence of the remains of multiple individuals suggests that this represents multiple graves that had been disturbed by bulldozing. A number of small finds were associated with these loci, including wood, metal objects and pottery associated with the earlier occupation. However, a fragment of a glass bracelet (see Section 7.4), textile fragments, a mother of pearl pendant bearing Christian iconography (see Section 7.4), an assortment of beads (see Section 7.4), and six mid-19th century Ottoman coins and tokens punched with a hole for use as personal adornment (see Section 7.1) were likely associated with the burials themselves. As Walker (2001: 59) notes, this assemblage of grave goods is "rather typical of a tribal assemblage," and similar goods have been found associated with Late Islamic burials at Tall Ḥisbān (Walker 2001) and Tall al-Ḥaṣī (Eakins 1993: 57-69). At least one of the burials in Area T was likely that of a woman, as evidenced by the presence of textile fragments in the holes of two copper tokens found in L. 208. As noted by Granqvist (1965: 62) in her study of burial customs in the Arab village of Arṭās, near Bethlehem, early 20th century women's burial clothing often included a "[p]iece of green material lined with white used as a hood, *wuqā*. All women, married and unmarried, wear such a hood in the future life. Coins, cheap ones, are attached to the hood over the forehead and nose" (see also Walker

2001: 59).[179] Because of the damage to the site, however, little more can be said about the context of the burials.

The *castellum*

Like the Late Islamic burials, the contexts associated with the *castellum* were badly disturbed by bulldozer activity. Nonetheless, the excavation produced valuable information about the tower's architecture. A single wall, Wall 209 (Fig. 5.29), was found in the excavation square and measured by the excavators as 6.8 m long. The wall is quite substantial, and was built using the *opus quadratum* technique with mortar and a rubble core. As Friedman (2008: 204) notes in her discussion of WFD 50a, this construction technique is uncommon in Jordan, and suggests a Late Roman/Early Byzantine date for the tower's construction. The excavations also revealed that the building had a mudbrick floor, which was surprisingly well-preserved in some loci, particularly L. 212, where an L-shaped portion of the floor was found (Fig. 5.30). Mudbrick fragments, likely disturbed by bulldozer activity, were found in most of the loci associated with the *castellum*.

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[179] Walker (2001: 59) suggests that "[t]his practice may have grown out of the practice of burying women with their everyday head and face veils, which were covered with coins. Such coins weighed down the veils and kept them close to the face." This is a sensible explanation, though it is worth noting that the inclusion of coins in burials is a common Mediterranean practice. As an example, three Ottoman *aķçe* and two *mangır* (on the Ottoman monetary system, see Pamuk 1997; Pamuk 2000) — a set of coins somewhat similar to those found at WFD 50a — were found in a grave in the Vodoča Necropolis in Macedonia (Maneva 2012: 100, 105). Maneva (2012: 100) interprets the *mangır* "as a grave gift, i.e. 'Charon's obol,'" which refers to the Greco-Roman "custom of placing a coin in the mouth of the deceased as a payment to the boatman Charon for ferrying the soul across Acheron or Styx" (Stevens 1991: 215). Travaini (2004: 160) argues that this term is often misused, and that coins found in graves likely carried a much wider variety of meanings. The specific northern Mediterranean custom is less relevant here than the broader point that the Late Islamic practice may not simply be skeumorphic. In this context, the presence of a 14th century Mamlūk *fals* next to a burial in al-Ramla may hint at similar meanings in Middle Islamic period Palestine (Gorzalczany 2014: 228), although coins generally seem to be much rarer in burials of this period.

Figure 5.29: Wall 209 at WFD 50a after excavation. (Photo: courtesy UC San Diego LCAL.)

Figure 5.30: Stratigraphic probe excavated through a mudbrick floor, L. 212. (Photo: courtesy UC San Diego LCAL.)

The presence of a well near WFD 50a raised an additional architectural question. Because only three of the building's four walls were found during excavation, the excavators suggested that the tower may have been rectangular, rather than square, in order to enclose the well. Friedman (2008: 204) notes in this context that, while rare, rectangular towers are not unknown in Jordan. If the identification of WFD 50a as Glueck's RHI is accepted, however — and, as discussed in Section 5.5, there are compelling reasons to do so — this question can be answered, as Glueck (1935: 20) gives the dimensions of the building as "6.20 metres square." The discrepancy between the 6.2 m measured by Glueck and the 6.8 m measured by the JHF team can perhaps be explained by the bulldozer damage to the site. The well could not be dated, and it is possible either that it was not enclosed by the *castellum* or that it was dug after the construction of the *castellum*.

Both pottery (see Section 6.3) and small finds (see Chapter 7) were recovered from loci associated with the *castellum*, but it is unclear exactly which contexts these are associated with. The recovered pottery, however, reveals that the site continued to be used into the Early Islamic I. This brings up the question of whether the associated settlement, WFD 50, was also occupied into the Early Islamic period. Reanalysis of the ceramic material collected during the 1998 JHF survey could perhaps have answered this question, but this material was, unfortunately, not available for reanalysis as part of this project. Additional research at WFD 50 would, therefore, be necessary to determine whether it, too, has a longer settlement history than the preliminary report of the 1998 survey indicated (Levy, et al. 2001: 175, Table 2).

5.6. Other Sites from ELRAP and JHF Surveys in Faynān

This section presents data from ELRAP and JHF surveys in Faynān for sites that have not been excavated and, while relevant here, are not critical for later discussions of changing uses and meanings of the landscape (Chapter 8) or the construction of Middle Islamic period mining feature systems (Section 10.2). As such, these sites are generally not described in detail individually, but rather are treated as "types" here.

5.6.1. Cemeteries

Islamic cemeteries are found quite frequently in the Faynān region. Generally these are simple Bedouin cemeteries, with little, if any, datable material recovered during surveys. As such, they are difficult to date with any precision, particularly as many grave types have long histories of use in the Faynān region (see, e.g. Creighton, et al. 2007: 115-123). The following section, then, lists sites of likely Islamic date classed as "cemeteries" — based primarily on grave orientation[180] and/or associated pottery — during ELRAP/JHF surveys in Faynān. The choice to ignore potential but uncertain burials classed as "cairns," "circular features," etc. (on the "intentionally vague" nature of these terms, see Knabb, et al. 2014: 590, 598) is intentional, as the goal of this section is only to provide a brief summary of known cemeteries recorded during ELRAP surveys, even if the dating of these sites is necessarily imprecise. Cemeteries of likely Roman-Byzantine date are also included here, though in Faynān this dating, like the dating of cemeteries to the Islamic period, is generally imprecise.

Two general types of Islamic cemeteries can be discussed for the Faynān region: first, independent cemetery sites and, second, cemeteries or individual burials reusing ancient sites. These are discussed in this order in the following section. To these could perhaps be added a third type: more "formal" cemeteries adjacent to and contemporary with ancient settlement sites. While several cemeteries of this type, and of quite secure Roman and Late Antique date, are also known in the Faynān region, these tend to be found in the immediate vicinity of Khirbat Faynān — e.g. the Faynān South Cemetery, which was excavated by Wādī Faynān Project researchers in 1996 (Findlater, et al. 1998) — and as such they have not been systematically surveyed by ELRAP.

Probable Islamic cemeteries in the Wādī al-Ghuwayb and Wādī al-Jāriya system include WAG 1, WAG 25 (Fig. 5.31), WAG 35, WAG 56, WAG 103, WAJ 517, possibly WAJ 524 (Levy, et al. 2003: 251-258, Tables 1a and 3a), WAJ 562, possibly WAJ 567, WAJ 589 and WAJ 599, WAJ 630, and possibly WAJ 638 and WAJ 650. A small number of cemeteries that

[180] Prior to the early 20th century, Bedouin graves were oriented east-west, "identical to the orientation of the Bedouin tent" (Kressel, et al. 2014: 21). Musil (1928: 670-671) observed that the bodies of the deceased were generally placed with their heads to the west, facing south. During the 20th century, the "formal" Islamic custom of orienting graves toward Mecca superseded these earlier customs (Kressel, et al. 2014: 21).

may date to the Roman and Byzantine periods were found in Wādī al-Jāriya, as well, including WAG 1, WAG 35 (Levy, et al. 2003: 251, Table 1a), WAJ 564, WAJ 566, and WAJ 592.

Figure 5.31: Small Bedouin cemetery at WAG 31. (Photo: courtesy UC San Diego LCAL.)

The most interesting of these for the present discussion is WAG 56 (Fig. 5.32), located just southeast of KNA in Wādī Ghuwayb al-ʻAṭshāna, directly below the cliff containing the 5311/5312/5313 building complex (see Section 4.1.6). As noted by Jones, et al. (2012: 79), the ceramics collected at WAG 56 consisted almost entirely of IHMW bearing a strong resemblance to that collected at KNA. The assemblage, which includes 176 sherds of IHMW, is much larger than usual for a cemetery site in Faynān, suggesting that a substantial portion of this ceramic material may, instead, relate to KNA, given the proximity of the two sites. It is unclear, then, whether this cemetery was in use during the 12th-13th centuries, or postdates metallurgical activities at KNA.

Figure 5.32: Graves at WAG 56, a cemetery located in the *wādī* east of KNA. (Photo: courtesy UC San Diego LCAL).

Probable Islamic cemeteries in the Wādī Fidān system include WFD 21, possibly WFD 54, WFD 55, WFD 65, WFD 68, WFD 124 (Levy, et al. 2001: 175-176, Table 2) and possibly WFD 616. A number of cemeteries of unknown date were also recorded during the 1998 and 2004 Wādī Fidān Surveys, but they are not included here, as there is no particular reason to think they date to the Islamic period. Cemeteries of the Iron Age — e.g. WFD 40 (Beherec, et al. 2014) — and earlier are known in Wādī Fidān, and, as mentioned previously, few grave types are diagnostic of a specific period. Interestingly, a fairly large number of cemeteries possibly dating to the Roman and Byzantine periods were also found in Wādī Fidān, including WFD 18, WFD 24, WFD 54, WFD 65, WFD 69, WFD 106, WFD 118, WFD 124 (Levy, et al. 2001: 175-176, Table 2), as well as seven potential cemeteries classed as “cairn fields” during the 2004

WFD Survey. These differ from the more "formal" cemeteries near Khirbat Faynān, mentioned above, however, and instead perhaps represent continuity of pastoral traditions of burial in Wādī Fidān during these periods.

The second type of cemetery — cemeteries or individual burials reusing ancient sites — is, according to Kressel, et al. (2014: 185), a relatively recent phenomenon related to the gradual sedentarization of the Bedouin beginning in the mid-19th century. Many of the burials discussed previously likely belong to this type, including the probable burials in KNA Feature 5308 (Section 4.1.6) — and perhaps WAG 56, as well — Khirbat Ḥamrā Ifdān Area Y (Section 5.4.3), and WFD 50a Area T (Section 5.5.1). Additionally, a recent cemetery, used by the ʻAzāzma Bedouin, was observed in Khirbat Faynān Area 15 (Fig. 5.33), between the monastery and slag mound to the north, and tower to the south.[181]

[181] Former ELRAP staff member Muḥammad Dafaʻāllah, of the ʻAzāzma, noted that his aunt was buried in this cemetery.

Figure 5.33: *Wasm* mark engraved on a stone in the Area 15 cemetery. (Photo: Thomas E. Levy, courtesy UC San Diego LCAL.)

An Islamic cemetery of slightly different appearance (Fig. 5.34) was also found during the 2015 Jabal al-Minshār Survey at Rabṭat al-Jāmūs (Ar. "the place where buffalo are tied," loosely translated)[182], a primarily Nabataean-Roman settlement site in the Wādī ʻAraba north of Wādī al-Ghuwayb (probably SGNAS Sites 226-227, although the toponym is recorded as SGNAS Site 228 [MacDonald 1992: 272-273]). The one Islamic sherd collected at the site suggests, potentially, a late Early Islamic II date for the site. While this is not entirely clear, the cemetery is rather different in construction from the majority of the cemeteries known in the

[182] This is a somewhat strange name for a site in Wādī ʻAraba. While the water buffalo seems to have been introduced into the southern Levant during the Early Islamic period (Amar, et al. 2010: 10; Amar and Serri 2005), it tended to be kept in the wetter regions near the coast and Jordan Valley *ghawr* (Franz 2011: 31; see also Barakat 2015: 125, n. 73, who describes a document recording the sale of what seem to be two buffalo in al-Salṭ in 1898).

Faynān region. While this may suggest an earlier date, the cemetery's location near the Nabataean-Roman settlement suggests that this is a Type 2, and therefore fairly late, cemetery.

Figure 5.34: Graves at Rabṭat al-Jamūs, an Islamic cemetery next to a Roman settlement to the northwest of Wādī al-Ghuwayb. (Photo: Mohammad Najjar, courtesy UC San Diego LCAL.)

5.6.2. Pastoral Sites, Agricultural Sites, and Sites of Unknown Function

Agricultural Features

Agricultural features dating to the Islamic period are uncommon in Faynān, though this can likely be partially explained by the difficulty of recognizing continuous Late Byzantine-Early Islamic use of some agricultural features. This is, for example, quite likely to be the case for the extensive field systems surrounding Khirbat Faynān, where at least some use in the Early Islamic period is nearly certain, but the extent of this use unclear (see Newson, et al. 2007a).

The only agricultural feature of fairly certain Islamic date recorded by ELRAP in Faynān is WAJ 576 (Fig. 5.35), a site in northern Wādī al-Jāriya, ca. 5.5 km north of KNA. As noted by

Jones, et al. (2012: 80-81), the only find from the site was a body sherd of IHMW, making a precise date difficult to establish. We suggested there that a connection to KNA was unlikely, and a later, perhaps relatively recent date, for the site seems preferable. There is, however, no way to establish this without further research.

Figure 5.35: WAJ 576, a Middle-Late Islamic agricultural feature in northern Wādī al-Jāriya. (Photo: Kyle A. Knabb, courtesy UC San Diego LCAL.)

Beyond this, a number of Roman-Byzantine agricultural sites were recorded during the 1998 JHF Wādī Fidān Survey. Agricultural features including terraces and channels were recorded at WFD 34, WFD 37, and WFD 80, and a “garden system” was recorded at WFD 83 (Levy, et al. 2001: 175-176, Table 2). It is unclear whether any of these sites continued to be used into the Early Islamic period, but given the evidence for continued use of WFD 50a, it is reasonable to suggest that continuity of settlement in Wādī Fidān into the Early Islamic period is more substantial than previously assumed.

Campsites, Rock Shelters, and Storage Features

Campsites and related features — what might be termed features of mobile pastoralism[183] — were commonly recorded during ELRAP surveys. Many of these features, however, are of quite recent date, for example the WAG 6 campsite and associated feature at WAG 7 and WAG 9. These were recorded as abandoned campsite features during the 2002 WAG Survey (Levy, et al. 2003: 251, Table 1a), but during the later part of the 2002 field season, a family had set up their winter camp on these features. The same camp was observed in use during later seasons, including 2009, 2011, and 2012, and it is likely still in use. While modern use of a camp does not, of course, rule out earlier use — Wādī Abū Sidra[184] (WAS) 1, for example, recorded during the 2015 Jabal al-Minshār Survey, was a large modern campsite with ceramic evidence for numerous previous periods of occupation — campsites are only discussed here if there is clear evidence for use prior to the mid-20th century. This, of course, may exclude Islamic camp sites with no datable surface artifacts — the excavations at Ṭūr Imḍayy, north of Petra, for example, recovered very few ceramics, datable or otherwise, in late 18th-19th century levels[185] (Simms and Russell 1997: 465, Fig. 6, 467, Table 2) — but the evidence from Faynān does suggest that these are more likely to be late 20th century camps. The exceptions to this general rule are sites

[183] Animal pens should probably also be included in this category, though these were often recorded in broader categories, such as "architectural fragment" or "circular feature" on ELRAP surveys.

[184] This is a small *wādī*, and local team member ʻĀwayaḍ al-Saʻidiyyīn was aware of no standard name for it. He suggested this name, "the *wādī* of the father of the *sidra* plant," on the basis of a prominent plant at its head. *Sidra* is the Arabic word for several members of the genus *Ziziphus* (Mandaville 2011: 246), with roots in Classical Arabic (e.g. Qur'ān 34:16). WAS 1 is actually in Wādī ʻAraba, and not Wādī Abū Sidra itself, but was named based on its proximity to ʻAyn Abū Sidra.

[185] Ṭūr Imḍayy also produced a substantial Late Islamic lithic assemblage, including a number of reused prehistoric lithic tools (Kuijt and Russell 1993). This may suggest that some of the campsites and related features in Faynān assigned to prehistoric periods on the basis of lithic finds — e.g. WFD 109 — may have unrecognized Late Islamic occupations or even date entirely to the Late Islamic period.

recorded during the 1998 WFD Survey. The surveyors designated the 7th-20th centuries AD "Islamic," without further subdivision, and for reasons discussed above (Section 5.6) it was not possible to revise the ceramic dating from 1998 for this project. Therefore, all campsites, rock shelters, and storage sites dated to the Islamic period on this survey are listed below.

The Middle to Late Islamic campsites from Wādī al-Ghuwayb and Wādī al-Jāriya have been discussed previously by Jones, et al. (2012). These include WAG 42, WAG 43 (Fig. 5.36), WAG 45, WAJ 525, WAJ 528, and WAJ 562. It is difficult to precisely date most of these sites, as the finds consisted primarily of undecorated IHMW. WAG 42 and WAJ 525 (Fig. 5.37), however, can be dated to the Late Islamic II on the basis of finds of Gaza Ware, while an HMGPW base collected at WAG 43 suggests an earlier — perhaps Late Islamic I — date (Jones, et al. 2012: 79-80). Beyond this, several mines in northern Wādī al-Jāriya — WAJ 601, WAJ 609, WAJ 613, and WAJ 626 — were reused in the Late Islamic period (Jones, et al. 2012: 74-79). While the nature of this reuse is not clear for every mine, tent clearings and storage features at WAJ 626 (Fig. 5.38; Jones, et al. 2012: 78-79, Fig. 10) indicate that it was reused as a campsite.

Figure 5.36: Probable Middle Islamic campsite at WAG 43. (Photo: courtesy UC San Diego LCAL.)


Figure 5.37: Overview of Late Islamic campsite at WAJ 525. (Photo: courtesy UC San Diego LCAL.)

Figure 5.38: Storage feature associated with campsite near mine tailings at WAJ 626. (Photo: Kyle A. Knabb, courtesy UC San Diego LCAL.)

Islamic period campsites recorded during the 1998 WFD Survey include WFD 12 and WFD 102, and Roman-Byzantine period campsites were recorded at WFD 48 and WFD 49. Islamic period rock shelters were recorded at WFD 35 and WFD 43, and Roman-Byzantine rock shelters at WFD 74 and WFD 108. Islamic storage features were recorded at WFD 25, WFD 36, and WFD 66, and Roman-Byzantine storage features at WFD 26 and WFD 38 (Levy, et al. 2001: 175-176, Table 2).

Sites of Unknown Function

Sites of unknown function dating to the Islamic period are not very common, in part because these sites are often also of unknown date. One site in particular, however, is difficult to fit into any of the categories used here: WFD 628. The site itself consists of a lithic and pottery scatter on the western side of Wādī Fidān, ca. 850 m southeast of Khirbat Ḥamrā Ifdān. Of particular note is a sherd from a 7th century AD basin (see Section 6.4). This may have simply been dropped while being transported through Wādī Fidān, but this might also suggest a more permanent use of this portion of the *wādī*, perhaps associated with the Khirbat Ḥamrā Ifdān Area L inn, not attested by the visible archaeological remains.

5.6.3. Watchtowers

The evidence that WFD 50a was used into the Early Islamic period (Section 5.5) suggests the possibility that this is also true for other watchtowers in Faynān. It is worth noting again at the outset of this section that this dissertation is primarily concerned with the role of this system following the end of Phaino's role as an imperial *metallum*. The *metallum* system itself has been summarized by Mattingly (2011), and Friedman (2010) has explored the specific role military architecture played in this system, taking a Foucauldian perspective on the *perception* of surveillance watchtowers and other defensive structures would have created. A number of sites critical to that infrastructure are left out of this section. In particular, the building at the summit of Khirbat Faynān (Friedman 2010: 207), and perhaps several other towers at the site, e.g. the one in Area 18; the "mining control site" at Khirbat Ratiya (Mattingly, et al. 2007b: 319-321); and also Khirbat al-Ghuwayba, although it is not entirely clear that this site had a military function (Ben-Yosef, et al. 2014b: 846). Instead, this section focuses specifically on watchtowers in Wādī Fidān, which clearly continued to function as a landscape of movement (see Section 8.4) even after that movement ceased to have a connection to the copper trade.

In addition to WFD 50a, Friedman (2010: 209) refers to two additional sites as Roman watchtowers: WFD 77a and WFD 617. WFD 77a, ELRAP's RHI, is an Iron Age watchtower overlooking northern Wādī Fidān and the "Old Road" leading to Umm al-Zuhūr, Wādī al-

Ghuwayb, and beyond (Smith, et al. 2014c). While Friedman (2010: 209) acknowledges that there is little evidence for post-Iron Age occupation at the site, she nonetheless suggests that it was likely reused during the Roman and Byzantine periods. It is worth noting in this context, however, that neither the 1998 WFD Survey (Levy, et al. 2001: 176, Table 2) nor the 2004 excavations (Smith, et al. 2014c) produced any evidence of post-Iron Age occupation at the site. While the site is optimally located to monitor parts of Wādī Fidān and the pass to Wādī al-Ghuwayb, there is no evidence that it served this function in the Roman period or later. Instead, I suspect that Friedman's (2010: 209) suggestion is another result of the confusion surrounding the names of the sites located by Glueck (1935) and Frank (1934) in Wādī Fidān.

WFD 617 (Fig. 5.39), as noted above (Section 5.4, n. 169), is almost certainly Frank's (1934: 220) Rujm Ifdān. Friedman (2010: 209) notes that it "yielded Roman and Byzantine pottery," but much of this material is fairly early, and it is likely that WFD 617 was built prior to establishment of the *metallum* at Phaino, perhaps in the 1st centuries BC-AD. Nonetheless, it continued to be used in the Roman and Byzantine periods. It is not clear from the survey assemblage whether it continued to be used during the Early Islamic period, but this portion of Wādī Fidān clearly did, and it is possible that, as at WFD 50a, excavation would produce Early Islamic material not evident during the survey. It is perhaps also worth noting the potential Roman watchtower in KHI Area L, which was modified in the Early Islamic period as an inn (Section 5.4.2).

Figure 5.39: Wall at WFD 617, Frank's Rujm Ifdān. The nearby slag mounds at WFD 614 are visible in the background. (Photo: courtesy UC San Diego LCAL.)

Friedman (2010: 209) notes two additional fortified sites in Wādī Fidān that she refers to as "guardhouses": WFD 97 and WFD 619. She argues that WFD 97 would potentially have been associated with WFD 77a, and WFD 619 with WFD 617. The suggestion that WFD 619 is a guardhouse associated with WFD 617 is sensible, as the two sites are quite close to one another and do seem to be related to one another. I would suggest, however, that this is not a plausible interpretation of WFD 97. While the site is clearly a Roman/Byzantine fortified structure, it is located nearly 0.5 km southeast of WFD 77a. As such, the two sites do not seem to be directly related, regardless of whether WFD 97 is interpreted as a watchtower or some other type of fortified site.

Chapter 6: Ceramics from ELRAP Excavations and Surveys

This chapter presents Late Antique and Islamic period pottery from ELRAP excavations and surveys at many of the sites discussed in Chapters 4 and 5, as well as several additional sites with relevant finds. In addition to dating evidence, the ceramics also provide proxy evidence for the economic networks in which Faynān was involved in a given period, crucial for the long- and medium-term analyses in Chapters 8 and 9. The chapter is organized first by site, rather than period, type, functional category, etc. Because few Late Antique and Islamic period types are found at multiple ELRAP sites, this leads to little overlap in the discussion below and results in a structure more similar to Chapters 4 and 5, although different from Chapter 7. A concordance of the ceramic and non-ceramic finds by locus is presented in Appendix 2 to facilitate comparison between these chapters. Ceramics from KNA are discussed first, in Section 6.1, followed by ceramics from Khirbat Faynān in Section 6.2. Section 6.3 covers the late ceramics from ELRAP/JHF excavations in Wādī Fidān, beginning with Khirbat Ḥamrā Ifdān and followed by WFD 50a. Section 6.4 covers a small selection of ceramics from the 2004 ELRAP survey of Wādī Fidān and the 2007 Faynān-Buṣayrā Regional Survey. The first two sections are broken up into four subsections, covering, in order, glazed wares, wheel-made wares, hand-made wares, and lamps. Within each subsection, and where relevant, open forms are discussed first, followed by closed forms, and then cooking wares.

Analysis and Presentation

In the field, ceramics from each basket — usually the material collected from a specific locus in a single day — are separated into two groups: diagnostics — generally rim sherds, but more broadly sherds that can be identified with reasonable certainty as belonging to a specific type — and non-diagnostics. This occurs during daily "table readings" along with preliminary dating. In the Levantine and Cyber-Archaeology Laboratory at UC San Diego, diagnostic sherds are weighed, and rim diameter and completeness calculated for each (except, of course, in the case of non-rim diagnostics). Non-diagnostics are separated into groups of undecorated body sherds, handles, bases, decorated sherds, and "other special." Body sherds are then divided into groups of hand-made, wheel-made, and cooking wares. Counts and weights are calculated for each group. Counts are performed after checking for joins, and joining sherds are counted as a single sherd. As such, the counts are not raw counts, but essentially a measure of the maximum number of vessels represented (see Millett 1979: 77; Orton 1982: 1). In practice, this makes little difference in the context of the current work. The number of sherds from the contexts under discussion is quite low, and the focus here is not on quantitative analysis. Indeed, for most of the contexts discussed in this chapter, *all* diagnostic sherds are discussed and presented.

The results of the analysis presented here were entered into ELRAP's proprietary database and inventory management system, ArchaeoSTOR (see Gidding, et al. 2013). This structures certain aspects of the presentation. ArchaeoSTOR assigns each basket a unique "artifact" number. Within this artifact, each diagnostic sherd is assigned a "registration" number. These numbers are assigned sequentially as diagnostics are created in the database, and as such each registration number is unique across all ELRAP excavations and surveys. This number is used to identify almost all of the sherds discussed in this chapter. The exceptions to this are complete vessels, which are registered as "special finds" in the field and given their own basket numbers. In these cases, the basket number, rather than artifact number, is used.

Contextual information is provided in the text for each sherd under discussion. This consists of the site name or abbreviation, excavation or survey area, and stratum, when relevant. When multiple strata were not identified in an excavation area, the locus is provided instead. If a sherd was surface collected, this is stated in the same place. Detailed contextual information is provided in the tables associated with each figure, as are, for some sherds, fabric and decor descriptions. The descriptive terminology used in the fabric descriptions is meant to be as accurate as possible given that most are based on macroscopic analysis. As an example, while the term "grog" is sometimes used in macroscopic fabric descriptions, "argillaceous inclusion" is more accurate, as grogs cannot generally be distinguished from clay nodules, etc. at the macroscopic level. I do, however, use some terms of convenience, e.g. "temper." It is often difficult, particularly for fabrics that have not been assigned to known petrofabrics, to distinguish, for example, intentionally added sand temper from sand present in the raw material (Rice 1987: 410). The terms "nonplastic" and "inclusion" are perhaps preferable (Rice 1987: 411), and I commonly refer to inclusions, as well. The terms "chaff tempered" and "straw tempered" are often used to describe Islamic hand-made wares. While these materials are used for tempering ceramics (see e.g. Manning 2011), the direct addition of chaff as temper is not the only potential source of plant matter inclusions in pottery. The use of animal dung to "sour" clay, either to increase its workability (London 1981: 193) or its ability to hold its shape before firing (Skibo, et al. 1989: 135-136), can also add plant matter. Robert Mason (pers. comm.) commented that the plant matter present in the hand-made petrographic samples discussed in Section 6.5.1 appeared "digested," and suggested that it likely derived from dung tempering/souring, rather than the direct addition of chopped chaff or straw. As such, I prefer the term "vegetal inclusions" here. Fabric descriptions are provided for each illustrated sherd in the tables accompanying figures. For sherds that are not illustrated, fabric descriptions are given in Appendix 2.

Sources

A brief summary of the state of Islamic ceramics research in southern Jordan is presented in Section 3.1, the key takeaway from which is that this is still a relatively young field, and much remains uncertain about post-7th, and particularly post-10th century ceramic material in this region. No multi-period guide or typology exists for the region, and, as noted, Hendrix, et al.'s (1997) guide to the pottery of Jordan is now rather out-of-date and limited by a prior lack of published material.[186] For the Middle Islamic period, Avissar and Stern's (2005) *Pottery of the Crusader, Ayyubid, and Mamluk Periods in Israel* (*PCAMPI*) includes synthetic coverage of many types found across the region, and as such is consulted often below, but it is focused primarily on coastal assemblages, which are rather different from those found in southern Jordan. For the Roman through Early Islamic periods, Magness's (1993) *Jerusalem Ceramic Chronology* remains a very valuable source, although it is somewhat out of date and its coverage is limited primarily to excavations in Jerusalem. More detailed discussion of sources used for comparison follows in the main section for each site below.

6.1. Ceramics from Khirbat Nuqayb al-Asaymir

As will be shown below, nearly all of the ceramics from KNA belong to a single period of occupation, dating to the Middle Islamic Ic-IIa. For this period, the number of sites in southern Jordan from which parallels can be drawn is quite low. While the number of excavations has increased, particularly in recent years, the number of monograph-length reports on these sites is essentially zero. A recent exception is Grey, et al.'s (2017) report on the ceramics from Khirbat al-Shaykh ʿĪsā and Ṭawāḥīn al-Sukkar in Ghawr al-Ṣāfī, but it must be kept in mind that this is the final report of the first season of trial excavations at these sites in

[186] A number of gazetteers of varying geographical and temporal coverage have also been published (e.g. Herr and Trenchard 1996; Milwright 2000; Milwright 2001; Pringle 1981), but these are of little use for standardizing discussion of specific wares.

2002. While preliminary reports of six of the seasons that followed have appeared in *ADAJ* (Politis 2013a; Politis 2017; Politis, et al. 2005; Politis, et al. 2007; Politis, et al. 2009), the ceramics have been only minimally published, and the forthcoming final report will undoubtedly fill many gaps in the final publication of the 2002 season. To this can perhaps be added Reem Al Shqour's (2015) doctoral dissertation on Qal'at al-'Aqaba, but this remains unpublished and the assemblage is rather different from KNA's. Some Middle Islamic period material is also discussed in the final reports from al-Ḥumayma (e.g. 'Amr and Oleson 2013: 133, Fig. 5.48) and Jabal Hārūn (Sinibaldi 2016a), but earlier periods are better represented.[187]

For the most part, however, discussion of Middle Islamic period ceramics in southern Jordan must rely on preliminary reports. The most relevant to KNA are the Ayyūbid phases at the Crusader fortresses on the plateau — al-Shawbak and al-Wu'ayra — excavated in the 1980s by Robin Brown (1987; 1988) and since then by Italian teams (Tonghini and Vanni Desideri 2001; Vannini 2007; Vannini and Tonghini 1997; Vannini and Vanni Desideri 1995). The recent publications and presentations by Pruno (2016; Nucciotti and Pruno 2016; Pruno and Ranieri 2016; Pruno and Sciortino 2012) on the pottery of al-Shawbak are particularly interesting, but still quite preliminary. Ongoing work on the wheel-made pottery from al-Shawbak by Raffaele Ranieri will be particularly relevant to KNA, but is still in a very early phase. The preliminary reports of the excavations at Gharandal (Walmsley and Grey 2001), on the plateau ca. 20 km northeast of KNA, and Khirbat al-Nawāfla ('Amr, et al. 2000) in Wādī Mūsā also remain important. The excavations of the Islamic Bayḍā Project were initially devised to investigate this period (Sinibaldi 2009b; Sinibaldi and Tuttle 2011), but have instead revealed evidence primarily for Late Islamic period settlement (Sinibaldi 2015). Nonetheless, Sinibaldi's (2013a; 2013b;

[187] See also the Islamic period ceramics from Ṭawīlān, which consist entirely of HMGPW, most of which was surface collected (Hart 1995: 60, 271, Fig. 6.39).

2016a) work on other Middle Islamic period assemblages in the Petra region is quite important, particularly for discussion of hand-made wares, and several other sites in the Petra region have produced small amounts of relevant pottery, e.g. Wādī Farasa East (Schmid 2004b; Schmid 2012) and Qaṣr al-Bint (Zayadine 1982). Hart's (1987: 45-47) soundings at Khirbat 'Ayn Janīn evidently uncovered stratified material, but he excavated only two 2 x 2 m probes, and only a handful of hand-made ceramic finds were published. It would seem that the excavations produced evidence of several phases in the Middle and perhaps Late Islamic periods, but little attempt has been made to date the material beyond this. Aleksandra Węgrzynek is now investigating the Middle and Late Islamic period pottery from Qaṣr al-Dayr and Piotr Makowski the Middle Islamic period pottery from Khirbat al-Dharīḥ, but both of these projects have only recently begun.

As such, this section must draw fairly heavily on published material from other regions. Within Jordan, the most detailed publication for the Middle Islamic period is Walker's (2012a) report on the pottery from Tall Ḥisbān. The material from Khirbat Fāris is important, and has been known for some time (Johns, et al. 1989; McQuitty and Falkner 1993; McQuitty, et al. 1997), but a final report has not yet appeared. The ceramics from al-Karak are, of course, directly relevant to the broader argument of this dissertation, but their publication is somewhat problematic. Brown's (1989) publication of the ceramics from her 1987 excavations is excellent, although now rather dated, and recent reanalysis has shown that what she published as Phase I and dated to the Middle Islamic IIc likely spans two subphases, Phase 1a, dating to the Middle Islamic IIa, and Phase 1b, dating to the Middle Islamic IIc (Brown 2013a: 320-321, 324-325). This new phasing can be applied to the earlier report, as detailed contextual information was published, but unfortunately only a single published sherd comes from Phase 1a, the phase most relevant for comparison to KNA. Milwright (2008a) published a detailed analysis of a large assemblage of pottery from the site, but, as discussed in Section 3.6, these sherds all came either from unstratified contexts or contexts for which stratigraphic information had been lost. While it is, nonetheless, a useful report, it must essentially be treated as a surface assemblage.

Beyond Jordan, the most relevant material, particularly for the wheel-made wares, comes from Jerusalem. In particular, Tushingham's (1985) detailed report on the excavations in the Armenian Garden includes many parallels for the glazed and wheel-made wares at KNA, as well as the lamps. Tushingham (1985: 108) identified two phases of Middle Islamic occupation here: an Ayyūbid phase, dated to "A.D. 1212/14–1219/27," and a short Mamlūk occupation in "the last quarter of the 14th century." As Mason (2004: 224-226) points out, the Ayyūbid dates are derived from historical references to the construction and destruction of Jerusalem's city walls (Tushingham 1985: 115-116). Probes outside of the main excavation area, however, did not show the same destruction episodes, and Mason (2004: 224-226) argues that the missing portions of the walls visible in the main excavation area were "not necessarily of sufficient note to have an historical reference." Instead, he points to the fact that most of the coins from the Ayyūbid phase are actually Zangid, many of them issues of Nūr al-Dīn (see also Section 3.6.2) dating to 1162-1175 AD, with the latest coin from a sealed context being an issue of al-ʿĀdil I (see Section 3.6), dating to the period 1199-1218 AD (Mason 2004: 224-226). On this basis, and given the "abraded" state of many of the examples, he suggests that the stonepaste wares (his primary interest; see Section 6.1.1 for further discussion) from the Armenian Garden should be dated to the second half of the 12th century, rather than the first quarter of the 13th (Mason 2004: 224-226). The excavations at KNA do not necessarily provide support for this view, unless the radiocarbon evidence is given precedence over the numismatic data, which is problematic. As discussed in the following section, Section 6.1.1, in the southern Levant the stonepaste wares of the late 11th and 12th centuries seem to occur in relatively late contexts. This is not surprising, given the nature of ceramic deposition, but the distinction between dates of production and dates of use must be kept in mind here. Adams (1979: 742) observed that at pottery production sites, new types often replace old ones almost immediately, while at "habitation sites" this process can take up to 50 years, which would explain the "late" dates for these types in the southern Levant.

I also make reference to assemblages from coastal Levantine Crusader sites, but these must be interpreted with some caution. Common wares found at these sites were primarily produced at different centers — e.g. Acre and Beirūt — from those found at KNA (but see Wheel-Made Group 6 in Section 6.5.1), and the range of imported Mediterranean wares is much wider. As such, these parallels should be viewed primarily as additional support for stronger parallels at sites closer to KNA. Where they are the only or among few parallels, they should be viewed as fairly weak. I draw comparison to sites beyond the southern Levant either for parallels for imported wares or to illustrate more general trends. Some key sources are relevant primarily or exclusively to specific types, and are discussed in the section to which they are relevant.

6.1.1. Glazed Wares

Syrian Underglaze Painted Stonepaste Wares

Stonepaste is a ceramic material made up of roughly 80% quartz, 10% clay, and 10% crushed glass (Mason 2004: 8, 14). The term "stonepaste" is derived from a direct translation of the modern Persian term for people who make these vessels, *sangīnah-sāz*, or "stone paste potter" (Wulff 1966: 165, 374). They are also commonly referred referred to "as 'quartz-frit,' 'fritware,' 'faience,' 'artificial paste,' and 'kashi'" (Mason 2004: 8), as well as "soft-paste wares" (Avissar and Stern 2005: 26), "soft paste porcelain" (Wade Haddon 2005: 279; Wulff 1966: 146), “siliceous-paste” wares (Rugiadi 2011), and “composite-bodied” wares (Wade Haddon 2005: 279). As Mason (2004: 8) points out, however, the term stonepaste is “technically the most acceptable. For instance ‘quartz-frit’ and ‘fritware’ are unsuitable terms for this material as it does not actually include frit;[188] neither is it significantly more ‘artificial’ than some clay ceramics.” Tushingham (1985: 143), likewise, noted,

> “faience” . . . did not adequately describe the ware and was in danger of implying equivalences with western wares, which could be misleading. The term “majolica”, as well as having similar connotations, designates a ware that is normally brown covered by a white opaque glaze; “frit” tends to draw a parallel between this Islamic ware and ancient Egyptian frit, which is a type of glass. The term “soft-paste”, however, has its own dangers; it can be confused with “soft-paste porcelain” and this, of course, would be equally misleading.

Because of this, I follow Mason (2004) in preferring the term “stonepaste.”

The key source for these ceramics is Mason’s (2004) study of lustre-painted wares, which also includes “related” wares, such as the underglaze-painted wares discussed here. This is without doubt the most detailed work on these wares, although, as noted in Section 6.1, the dates of some of his types may be later in the southern Levant than the fairly narrow production dates he proposes. Beyond this, another critical work is Tonghini’s (1998) study of the ceramics from Qal‘at Ja‘bar on the Euphrates in northern Syria. Based on this assemblage, she proposed a chronology for these wares from the 11th century into the 14th. Jenkins-Madina’s (2006) study, based primarily on museum objects, is not particularly relevant for dating, but presents a range of illustrated complete vessels, as well as useful discussion of production techniques and a typology of decorative motifs. Venetia Porter’s (1981; Porter and Watson 1987) earlier work on these ceramics has largely been superseded, but her publication of the ceramics from the Great Mosque

[188] The material added to the body is commonly referred to as frit in recipes for the material, e.g. Wulff (1966: 165), in his ethnographic description of the process, and Allan (1973: 113, 118-119), in his translation of Abū al-Qāsim’s description. Mason and Tite (1994: 77), however, argue that “[t]he nomenclature for the added glassy inclusions produces some confusion, as it is often called frit elsewhere, but it would be preferable to describe it as glass fragments.”

of al-Rāfiqa/al-Raqqa (Porter 2004c), also on the Euphrates in northern Syria, remains useful. The Ḥamāh type series for stonepaste wares, published by Riis and Poulsen (1957), is still commonly referenced in discussions of these wares. Because of this, I make reference to it here, but it is important to keep Mason's (2004: 222) caveat regarding the Ḥamāh excavations in mind:

> Unfortunately, the site appears to have been riddled with pits, which posed an intractable problem for the excavators; the published reports are not entirely clear about what findings were obtained; and the pottery is for the most part published without profile drawings or photographs of the vessel reverse. Hence, what was an important and extensively excavated site is of very limited use.

Although not stated directly, the *PCAMPI* stonepaste typology (Avissar and Stern 2005: 26) seems to be derived from the Ḥamāh typology. *PCAMPI* Type I.2.3.1 is the equivalent of Ḥamāh Types VII and VIII, the so-called "Raqqa wares" (Riis and Poulsen 1957: 157, 178), *PCAMPI* Type I.2.3.2 is the equivalent of Ḥamāh Type IX, the so-called "Rusafa wares" (Riis and Poulsen 1957: 182), *PCAMPI* Type I.2.3.3 is the equivalent of Ḥamāh Type XI (Riis and Poulsen 1957: 202), and *PCAMPI* Type I.2.3.4 is the equivalent of Ḥamāh Type XII (Riis and Poulsen 1957: 224). This typology is broadly accurate, but most of these wares can be dated much more precisely than these categories allow. As such, while the Ḥamāh and *PCAMPI* types are referenced here, particularly because they are commonly referenced by other scholars, for dating I rely primarily on Mason (2004) and Tonghini (1998).

Incidentally, the type of stonepaste ware found at KNA is commonly referred to as "Raqqa ware." While this was a production center for these wares — and, indeed, kilns have been found at al-Rāfiqa/al-Raqqa (Milwright 2005) — they were produced at a number of other sites, notably Damascus (Mason 2004), which is probably the source for most, if not all, of the stonepaste at KNA. As discussed in Section 6.5, petrographic analysis of a stonepaste sherd from the site indicates an origin in Damascus.

As in the 2002 KNA survey assemblage (Jones, et al. 2012: 85-86), stonepaste wares make up the bulk of the glazed wares in the excavated assemblage from the site, although glazed wares in general are much less common than unglazed. This makes KNA something of an anomaly in southern Jordan. Milwright (2006: 20), reviewing the published evidence for Ayyūbid period occupations, points out that "[w]ith the exception of Shawbak . . . the area south of the Wadi al-Hasa appears to have been the least economically developed part of Jordan. . . . imported wheelthrown and glazed wares are very rare." This is certainly the case, as a brief discussion of the distribution of these wares in southern Jordan will demonstrate.

At al-Shawbak itself, stonepaste wares seem to be rare. Brown (1988: 237, 238, Fig. 12.30) published only a single sherd from the site, found in Phase III, which she dates to the Mamlūk period, although Milwright (2006: 23) suggests, correctly, that the assemblage would also support a late Ayyūbid date (see also the discussion of Tall Ḥisbān Stratum 4 in Section 6.6). Brown (1988: 237) identifies the sherd as Ḥamāh Type XI (see Riis and Poulsen 1957: 202-224), which is not a particularly useful identification for dating, as it includes Mason's (2004: 100) Syrian Stonepaste-bodied Group 6 (SSB6), dating from the mid-12th to mid-13th centuries AD, the later blue-and-black wares, primarily dating to the 13th and 14th centuries AD, and the turquoise-and-black wares, primarily dating to the mid- to late 14th century (see Milwright 2008b). The sherd from al-Shawbak itself is rather small, and preserves only black paint and little identifiable decoration. The ceramics from the more recent Italian excavations at the site are not yet well published, but in a recent conference paper, Pruno stated that stonepaste makes up less than 1% of the assemblage in virtually all of their excavation areas (Pruno and Ranieri

2016). Only a few stonepaste sherds from these excavations have been published, often from poor contexts. One, for example, is a surface collected sherd of 14th century blue-and-black ware (Walker 2007a),[189] and another is a residual sherd of mid-12th-13th century blue-under-turquoise stonepaste,[190] found in an Ottoman context (Pruno 2009; on the context, Area 6000 U.S. 6079, see Molducci and Pruno 2007: 63). A small number of very worn late 12th century stonepaste sherds from the 12th-13th century "transition phase between Crusader and Ayyubid domination of the castle" have recently been published (Pruno 2016: 237-239, Fig. 4),[191] although the exact context of individual sherds is not provided (and exterior designs, if present, are not clearly illustrated). The assemblage would seem to be similar to that found at KNA (see below), but is comparatively small and, as already mentioned, quite fragmentary, with no rim sherds present.

The pottery from the Italian excavations at al-Wuʻayra has, likewise, not been published in final form. Based on preliminary reports, however, stonepaste wares seem to be found only in Phase III, the later Crusader period, while in Phase IV — the Ayyūbid abandonment phase — and later, only monochrome glazed and sgraffito wares are found (Tonghini and Vanni Desideri 2001: 710; Vannini and Tonghini 1997: 382). Monochrome glazed wares appear already in Brown's (1987: 284) al-Wuʻayra Phase IB, dating to the later Crusader period, but she did not find stonepaste wares at the site at all. The stonepaste wares from the Italian excavations almost all belong to an early group of incised wares — the so-called "Tall Minīs" group, or Mason's Syrian Stone-paste Bodied Group 1 (SSB1), dating to 1075-1125 AD (Mason 2004: 96-97; see also Porter and Watson 1987) — with only one sherd of underglaze-painted stonepaste found

[189] Based on the published photograph and description, it is not entirely clear why this sherd has been definitively assigned to the 14th century. As noted above, the production of blue-and-black wares began already in the 13th century, and the motif on the published sherd would not be out of place on earlier polychrome under colorless glaze or blue and black under colorless glaze vessels (KNA Types 2B and 2C). I have not seen this sherd in person, however, and the exterior has not been published, so I provide the published date here.
[190] Pruno (2009) describes the fabric as "fine sandy-cream colored clay," but this is almost certainly stonepaste.
[191] Note that the captions for Fig. 3 and Fig. 4 have been swapped, and Fig. 4 is labeled "HMPW," which refers to Fig. 3.

(Vannini and Tonghini 1997: 382). Tall Minīs ware is an early type for Phase III, particularly if Pringle's (1998: 374) proposed post-1127 construction date for al-Wu'ayra is correct (see also Schick 1997: 80; Sinibaldi 2016b: 83), as opposed to the early dating proposed by the excavators. This may be typical of the Middle Islamic Ic-IIa in the southern Levant, as the same phenomenon seems to occur with the later 12th century underglaze-painted wares in Jerusalem, discussed in Section 6.1, and at KNA, described below. Beyond al-Shawbak, underglaze-painted stonepaste wares that can be definitively dated to the late 12th and early 13th centuries AD have only been found at two sites outside of Faynān: Khirbat al-Shaykh 'Īsā (Grey, et al. 2017: 125, Fig. 6.5.37-39)[192] and al-Rujūm (MacDonald 1992: 237, Pl. 32.d, 241, Pl. 35.c-e), both probably associated with the medieval town of Zughar (Whitcomb 1992a: 116).

The typology presented below breaks this ware up into groups based on glaze chemistry, glaze color, paint color, diagnostic decorative motifs, and occasionally form. This typology should be regarded as provisional, particularly given the small size of the KNA assemblage. It must be kept in mind that some types are represented at the site by only a single sherd. Likewise, the types are, for the most part, not chronologically significant. Instead, they are an attempt to combine the ware types of Tonghini's Qal'at Ja'bar typology with the diagnostic decorative motif types of the Mason typology, and to facilitate ease of comparison between reports using these typologies and reports using the Ḥamāh or *PCAMPI* typologies.

Type 1 — Black (or polychrome?) paint under colorless alkali-lead glaze

Dating: Uncertain, mid-12th century AD?

[192] As noted in Section 6.1, ceramics from the post-2002 excavations at Khirbat al-Shaykh 'Īsā are not yet well published. The published stonepaste wares from these seasons (Politis, et al 2005: 319, Fig. 10), however, are later, dating to the Middle Islamic IIb-c. The published examples include both blue-and-black wares, with a "petal" motif on their exterior that dates to the late 13th century on analogous Iranian wares (Mason 2004: 128, 130), and turquoise-and-black wares, dating to the second half of the 14th century (Milwright 2008b).

General Parallels: Qal‘at Ja‘bar Ware U, “*fritware ?* (*intermediate fritware* or *fritware 2*), colourless glaze” (Tonghini 1998: 93), but see discussion below

Example: KNA, Area A, L. 006. R. 38597. (Fig. 6.1.1)

Parallels: Khirbat al-Shaykh ‘Īsā: same base form, but very likely a colorless alkali glaze (Grey, et al. 2017: 124, 122, Fig. 6.5.38); al-Shawbak: same base form, but very likely a colorless alkali glaze, late 12th century AD (Pruno 2016: 238, Fig. 3, second from bottom left)

Discussion: The only example of this type found at KNA — R. 38597 — is made up of two connecting sherds of a high, gently splayed ring base. The center of the bowl is painted in a black or polychrome design under a thick, colorless glaze, but a patina has formed over the glaze, making it difficult to see the underglaze painting. Based on form and decoration, this base would likely have been identified as belonging to Type 2. Portable X-ray fluorescence (pXRF) analysis of the sherd, however, revealed a high[193] lead content in the exterior glaze. In her analysis of the pottery from Qal‘at Ja‘bar, Tonghini (1998: 41-46) found that lead was present in the glazes on “fritware 1” and “intermediate fritware” vessels, but not on vessels of “fritware 2,” to which most of the underglaze painted types discussed below belong. This suggests that, on technical grounds, R. 38597 should be considered part of a separate type.

One possibility to consider is that R. 38597 is not a Syrian product. Both Egyptian and Persian glazes are characterized by relatively high lead contents (Mason 2004: 72, Table 4.3, 135, Table 6.5). Neither of these origins is likely, however. In Egypt, stonepaste bodies went out of use except on incised vessels in the late 11th century, and they are not found with underglaze

[193] “High” is meant here in a relative sense. The pXRF analysis was conducted to test for the presence or absence of lead in the glaze, but these results have not been calibrated to a reference standard and thus are not directly comparable to known alkali-lead glazes. The lead content is quite high in comparison to the alkaline glazes generally found on Syrian stonepaste wares — including most of the examples from KNA — which contain no lead or only trace amounts (see Mason 2004: 102). There is reason to suspect, as noted in the discussion below, that the “intermediate” alkali-lead glazed group includes both an earlier, higher-lead type and a later type with a somewhat lower lead content (Tonghini 1998: 43), but this is still uncertain, and testing this hypothesis would require laboratory analysis beyond the scope of the present research.

painting (Mason 2004: 78). Likewise, Persian underglaze painted stonepaste vessels are alkaline glazed, with alkali-lead glazes generally found in combination with other types of decoration (Mason 2004: 134). As such, there is no reason to suspect that a non-Syrian origin is likely, though petrographic and further chemical analyses would help confirm this.

Instead, it is more likely that this vessel should be placed in Tonghini's (1998: 42-46) "intermediate fritware" group, which she tentatively dates to the late 11th-mid-12th century AD. Underglaze painting is, however, also not generally found on this type (Tonghini 1998: 43-44). The transition, however, between "intermediate fritware" and "fritware 2" is still not entirely well understood. Tonghini (1998: 43) discusses a lustre painted sherd with a "fritware 2" body, but with a lead content somewhat lower than "intermediate fritware" in its glaze. She suggests,

> There is thus reason to suspect the existence of yet another group of fritware, which probably represents the passage between the *fritware 1*/*intermediate fritware* manufacturing technique and *fritware 2* manufacturing technique. Further research is needed to clarify this point, but, for the time being and in consideration of the presence of lead in the glaze, this type of fritware is treated as belonging to the *intermediate fritware* type. (Tonghini 1998: 43)

It seems quite likely that R. 38597 belongs to this intermediate group between "intermediate fritware" and "fritware 2," and should perhaps be considered an early example of Type 2, and dated accordingly.[194]

[194] Al-Saad (2002: 807) identified a "high lead glaze" at Khirbat Dūḥala apparently associated with underglaze painted sherds. Unfortunately, the context of these wares is unclear, and the sherds themselves are neither adequately described nor illustrated. As such, it is unclear if they may be associated with this type, or belong to earlier or later types.

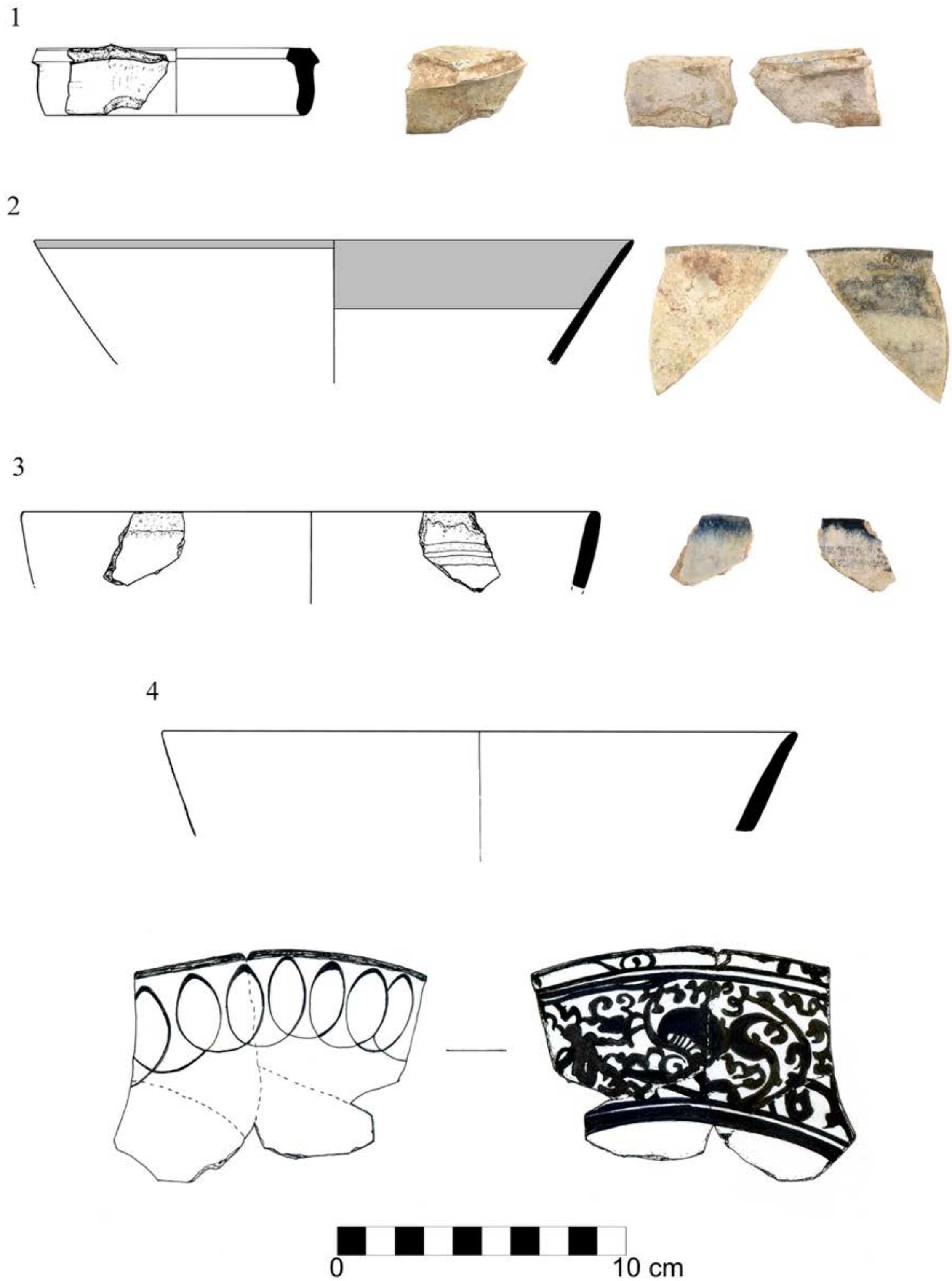

Figure 6.1: Diagnostic glazed stonepaste sherds from KNA. (Illustrations: Donna Walker, except 6.2, by IWNJ.)

Table 6.1: Descriptions of sherds illustrated in Figures 6.1 and 6.2.

#	Reg.	Site	Area	Locus	Str.	Type	Ware Color	Décor	Notes
Fig. 6.1.1	38597	KNA	A	6	-	Type 1 Bowl (Base)	-	Colorless glaze int. and ext.; underglaze painting on int., design obscured by patina	Stonepaste body
Fig. 6.1.2	38600	KNA	Z	288	Z2a	Type 2B Bowl	10YR 9.5/1 White	White slip, colorless glaze int. and ext.; underglaze painting in blue-gray on int. and ext.	Stonepaste body
Fig. 6.1.3	38601	KNA	A	6	-	Type 2C Bowl	7.5YR 8/3 Pink	White slip, colorless glaze int. and ext.; underglaze painted cobalt blue line on int. and ext. rim, two black lines below rim on int.	Stonepaste body
Fig. 6.1.4, 6.2	38596	KNA	Z	223	Z2(b)	Type 3B Bowl	2.5Y 9/1 White	Black and blue paint under turquoise (GLEY 1 7/2 Pale Green) glaze; ext. “knot-back” motif, int. thick vegetal band	Stonepaste body

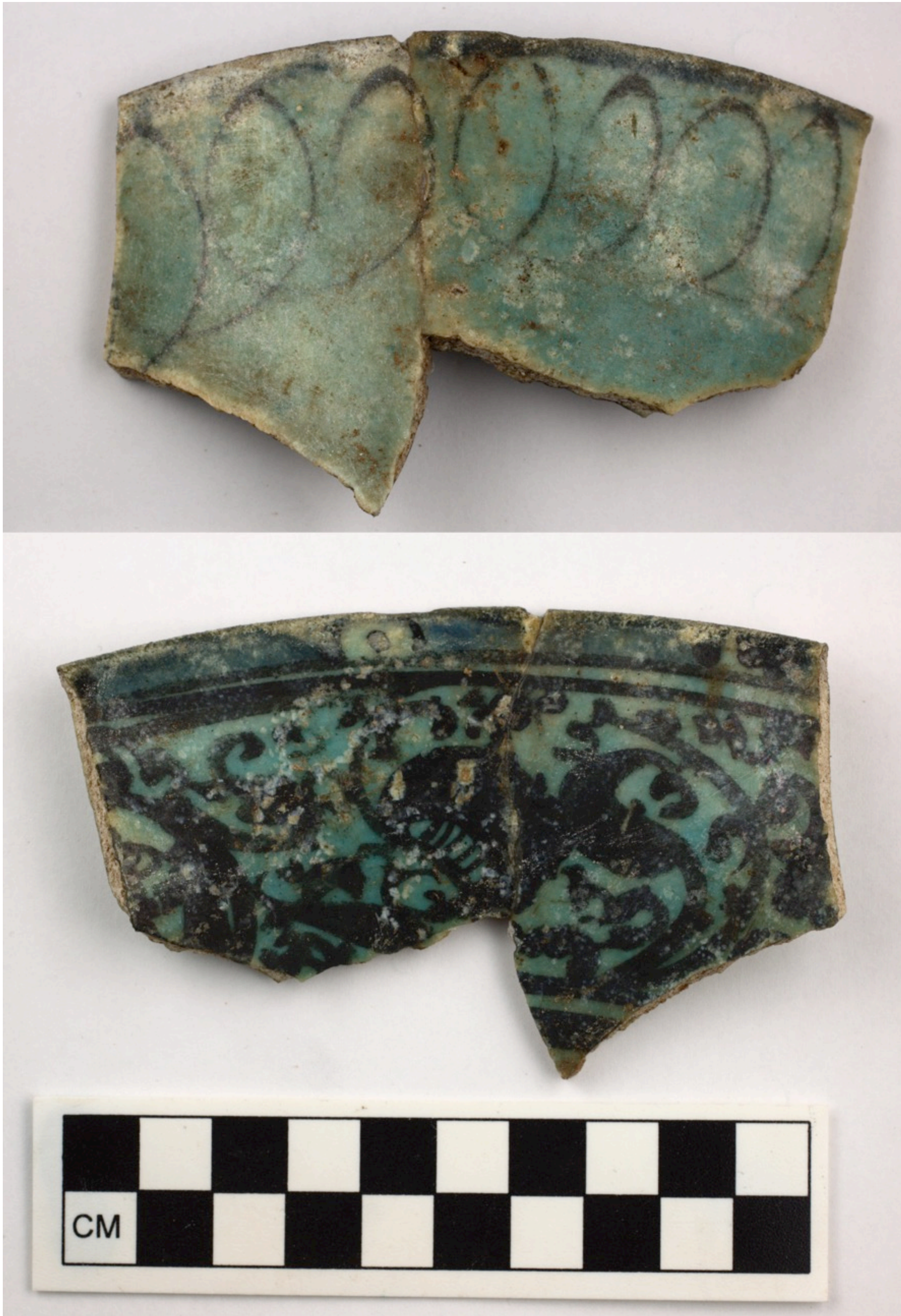

Figure 6.2: Color photograph of R. 38596. (Photos: Leah Trujillo, courtesy UC San Diego LCAL.)

Type 2 — Black paint under colorless alkali glaze

Dating: Mid-12th-13th centuries AD

General Parallels: *PCAMPI* Type I.2.3.1, "Soft-Paste Ware Painted in Black or Blue under Transparent Turquoise or Colorless Glaze" (Avissar and Stern 2005: 26); Ḥamāh Type VIIIc, "Raqqa Ware" (Riis and Poulsen 1957: 181-182); Qal'at Ja'bar Ware AG, "*fritware 2*, black painted decoration under colourless glaze" (Tonghini 1998: 93)

General Discussion: Sherds categorized in this group do not preserve their exterior decoration, and as such cannot be placed in one of Mason's (2004) Syrian Stonepaste-bodied (SSB) Groups. Given the general character of the KNA assemblage, it is likely that these sherds belong to vessels of the SSB4 ("arc-back") group, KNA Subtype 2A (see below).

Examples: KNA, Area Z, Stratum Z2a. R. 38587 (small).

KNA, Area Z, Stratum Z2(a). R. 38602 (small, glaze very cloudy). (Fig. 6.3.1)

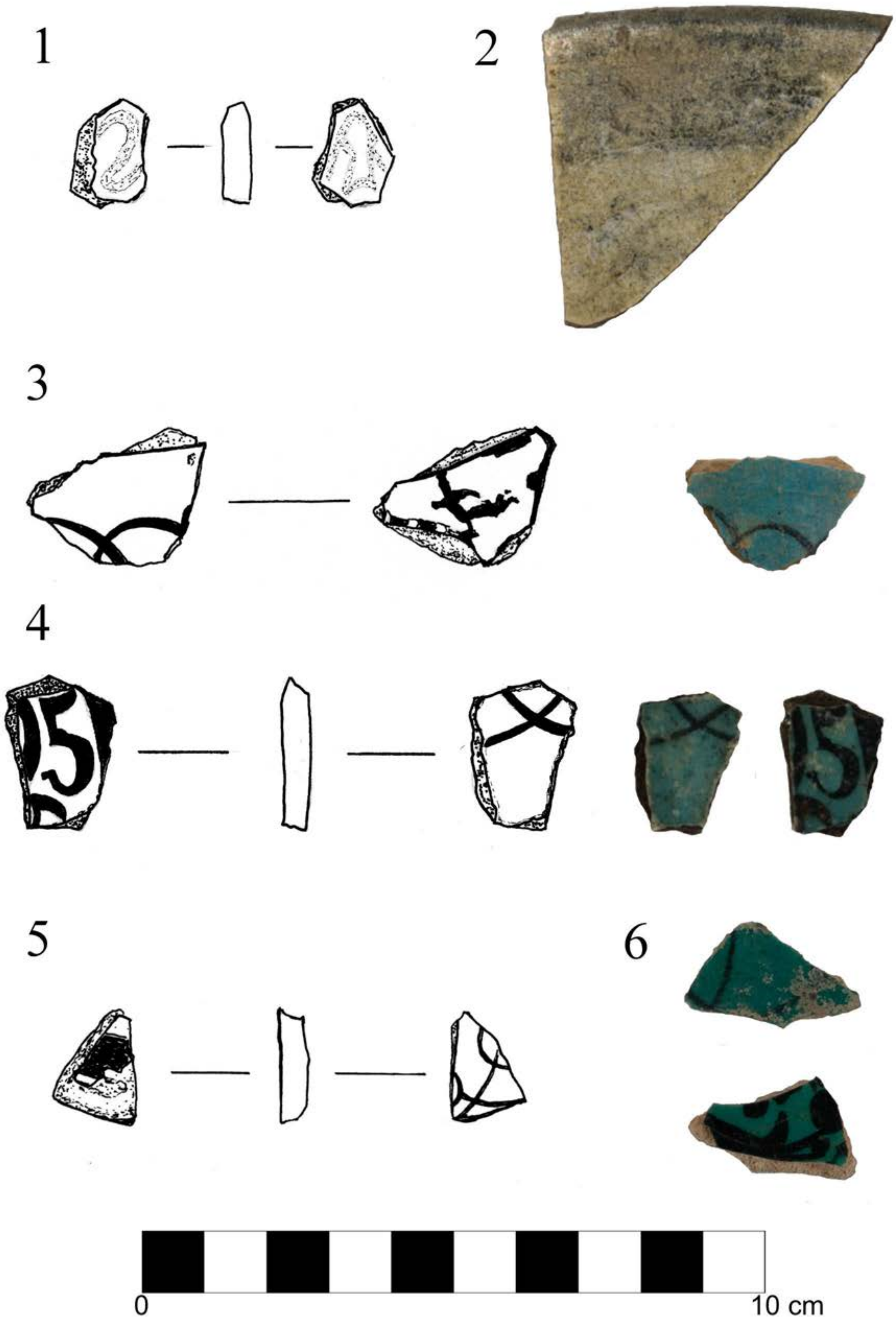

Figure 6.3: Glazed stonepaste sherds from KNA. (Illustrations: Donna Walker.)

Table 6.2: Description of sherds illustrated in Figure 6.3.

#	Reg.	Site	Area	Locus	Str.	Type	Ware Color	Décor	Notes
Fig. 6.3.1	38602	KNA	Z	210	Z2(a)	Type 2 Bowl (body)	-	Colorless glaze int. and ext.; underglaze painting on int., design obscured by patina	Stonepaste body
Fig. 6.3.2	33004	KNA	Z	268	Z2(a)	Type 2B Bowl	2.5Y 8.5/1 White	White slip, colorless glaze int. and ext.; underglaze painting in blue-gray on int. and ext.	Stonepaste body
Fig. 6.3.3	38603	KNA	Z	249	Z2a	Type 3A Bowl (body)	7.5YR 8/4 Pink	Turquoise glaze int. and ext.; underglaze painting in black on int. and ext. and blue on int.; "knot-back" motif on ext., int. design obscured by thick patina	Stonepaste body
Fig. 6.3.4	32816	KNA	Z	210	Z2(a)	Type 3A Bowl (body)	Charcoal blackened	Turquoise glaze int. and ext.; underglaze painting in black on int. and ext.; "knot-back" motif on ext., arabesque (or vegetal) motif on int.	Stonepaste body
Fig. 6.3.5	32809	KNA	A	1	-	Type 3C Bowl (body)	2.5Y 8.5/1 White	Turquoise glaze int. and ext.; underglaze painting in black on int. and ext.; "arc-back" motif on ext., thick line on int.	Stonepaste body

Table 6.2: Description of sherds illustrated in Figure 6.3, continued.

#	Reg.	Site	Area	Locus	Str.	Type	Ware Color	Décor	Notes
Fig. 6.3.6	41209	KNA	Building 5313	Surface	-	Type 3C Bowl (body)	2.5Y 9.5/1 White	Turquoise glaze int. and ext.; underglaze painting in black on int. and ext.; “arc-back” motif on ext., vegetal motif on int.	Stonepaste body

Type 2A — Black paint under colorless alkali glaze with "arc-back" motif

Dating: ca. 1150-1200 AD

General Parallels: Mason Syrian Stonepaste-bodied Group Four (SSB4) — "arc-back" (Mason 2004: 98-99); *PCAMPI* Type I.2.3.1, "Soft-Paste Ware Painted in Black or Blue under Transparent Turquoise or Colorless Glaze" (Avissar and Stern 2005: 26); Ḥamāh Type VIIIc, "Raqqa Ware" (Riis and Poulsen 1957: 181-182); Qal'at Ja'bar Ware AG, "*fritware 2*, black painted decoration under colourless glaze" (Tonghini 1998: 93)

Example: KNA, Building 5313, Surface Collection. R. 41208.

Discussion: This is a small body sherd from the side of a bowl. Two bands of black paint are preserved on the interior, and the exterior preserves part of an arc-back or knot-back motif, although not preserved completely enough to determine which.

Type 2B — Polychrome blue, red and black paint under colorless glaze with "knot-back" motif

Dating: ca. 1150-1200 AD, with the earlier part of this range more likely

General Parallels: Mason Syrian Stonepaste-bodied Group Four (SSB4) — "arc-back" (Mason 2004: 98-99); *PCAMPI* Type I.2.3.2, "Soft-Paste Ware Painted in Black, Blue, and Red under Transparent Colorless Glaze" (Avissar and Stern 2005: 28); Ḥamāh Type IX, "Ruṣāfa ware" (Riis and Poulsen 1957: 182-198); Qal'at Ja'bar Ware AI, "*fritware 2*, brown, red, blue, green painted decoration under colourless glaze" (two of these colors are usually used along with black; Tonghini 1998: 47, 93)

General Discussion: Mason (2004: 99) suggests a date of 1150-1200 AD for the "arc-back" group, to which these vessels belong. Instead of the standard "arc-back" design, however, these sherds have a "knot-back," a very similar motif that Mason (2004) discusses primarily in the context of Persian pottery. He dates Kāshān Lustre-painted Group Three (the "knot-back" group) to ca. 1150-1175 AD (Mason 2004: 124, 129), which may indicate that the "knot-back" motif is slightly earlier than the "arc-back," although the relationship between the Syrian and Iranian groups is not certain.

Examples: KNA, Area Z, Stratum Z2(a). R. 33004. (Fig. 6.3.2)

KNA, Area Z, Stratum Z2a. R. 38600. (Fig. 6.1.2)

Parallels: al-Fusṭāṭ: "knot-back" motif and colors, but interior design is different (Mason 1997b: 182, Fig. 12, no. FUF.99); Qal'at Ja'bar: "knot-back" motif, but in "Ware Y" — black paint under turquoise glaze — with different interior designs (Tonghini 1998: Fig. 65.a, Fig. 66.d); al-Rāfiqa/al-Raqqa, Great Mosque: "knot-back" motif, but black paint under turquoise glaze, late 12th-early 13th centuries AD (Porter 2004c: 41, Taf. 10.a, top left); al-Rujūm: "knot-back" motif, but black paint under turquoise glaze, and similar but not identical interior motif (MacDonald 1992: 241, Pl. 35.c); al-Ruṣāfa: "knot-back" motif, but overall design is different (Logar 1991: Abb. 5.14; Logar 1995: Abb. 6.9)

Discussion: Two non-connecting sherds of this type were found in different loci in KNA Area Z, but it is extremely likely that they belong to the same vessel, a biconical — or, rather, "proto-biconical" (see Mason 2004: 19, Fig. 2.2, 98) — bowl. The decor on both sherds is heavily worn, and only easily visible when wet. The rim is covered in a band of blue paint, roughly three times as big on the interior as the exterior. A thin "knot-back" motif is executed on the exterior in black or blue paint, extending into the band of blue paint at the rim. On the interior, the band of blue paint is broken up at intervals by an unpainted circle, with a smaller circle of blue paint inside, and a thick dab of red paint inside this. This motif is not commonly discussed in the literature, but broad parallels for the design can be seen in a vessel from al-Ruṣāfa (Logar 1995: Abb. 6.7), and, although executed as a much larger motif, in a vessel found at Bet She'an (Avissar and Stern 2005: 145, Pl. IX.4). It may be a simplified version of the "kufesque-band" motif (Mason 2004: 113, Fig. 5.4.SS.12), and sparser versions of this motif have been found, for example, at Ḥamāh (Riis and Poulsen 1957: 171, Fig. 545). A similar blue band painted on the rim was found on a turquoise glazed arc-back or knot-back sherd at Shumaymīs (identified as 13th-14th century, but stylistically earlier; Shaddoud 2014: Pl. 213.11). Below this band is a ca. 1 cm thick band of blue paint with a silhouetted pseudo-calligraphic design. This may be related to Mason's (2004: 113) "kufesque-band" or "calligraphy-band" motifs, but is not exactly paralleled by either one. The same motif is found on polychrome under clear stonepaste wares from Ḥamāh (Riis and Poulsen 1957: 185, Fig. 603) and black and blue under turquoise wares from KNA (see R. 41213), as well as, potentially, black under turquoise wares from Qalʿat Jaʿbar (Tonghini 1998: Fig. 65.d).[195] A simplified "kufesque-band" motif, although somewhat different from the one on this example, is also found on a black under turquoise arc-back sherd from al-Rāfiqa/al-Raqqa (Milwright 2005: 214, Fig. 12.9). Both interior bands of blue paint are likely outlined in black, although this is difficult to say for certain given how worn the designs are. Below this is a vegetal design in blue paint that is difficult to make out, given the preservation of the sherds, but is likely Mason's (2004: 113) "big-eye" motif.

Type 2C — Black and blue paint under colorless glaze, probably with "line-back" motif

Dating: ca. 1150-ca. 1250 AD

[195] Although parallels are uncommon, this motif may be quite widespread. A similar motif is seen, for example, on probably Ghaznavīd (i.e. late 10th-12th century) sgraffito wares found at Udegram, in the Swāt region of northern Pakistan (Manna 2006: 233, Fig. 7, top).

General Parallels: Probably Mason Syrian Stonepaste-bodied Group Six (SSB6) — "line-back" (Mason 2004: 100); *PCAMPI* Type I.2.3.1, "Soft-Paste Ware Painted in Black or Blue under Transparent Turquoise or Colorless Glaze" (Avissar and Stern 2005: 26-27); Ḥamāh Type XIa (Riis and Poulsen 1957: 202-204); Qal'at Ja'bar Ware AH, "*fritware 2*, black painted decoration with blue under colourless glaze" (Tonghini 1998: 93)

General Discussion: Mason (2004: 100) notes of the "line-back" group that "a narrow time span for this style may not be suggested at this time," and a relatively wide dating of ca. 1150-ca. 1250 AD seems most reasonable.

Example: KNA, Area A, L. 006. R. 38601. (Fig. 6.1.3)

Parallels: Ḥamāh: similar interior motif (Riis and Poulsen 1957: 203, Fig. 688); Qal'at Ja'bar: Ware AH, different interior motif (Tonghini 1998: Fig. 70.b)

Discussion: R. 38601 is a small rim sherd of a biconical or "proto-biconical" (see Mason 2004: 19, Fig. 2.2, 98) bowl, surface collected from KNA Area A. It has a colorless glaze, under which a band is painted in blue on the interior and exterior rim. Below the interior band are two small, parallel bands of black paint. No exterior decoration is visible, which may suggest a "line-back" motif below the break, although other motifs would be possible, given the size of the sherd. The bichrome blue and black paint is also typical of the "line-back" group (Mason 2004: 100; for some complete examples, see Jenkins-Madina 2006: 160, No. MMA45, 161, No. MMA46). It is worth noting, as well, that the size of the sherd makes it uncertain that the decoration actually is bichrome, and it is possible that this is a bichrome portion of a polychrome vessel. A similar upper interior motif is found on a polychrome "arc-back" vessel held at the Freer Gallery (Jenkins-Madina 2006: 105, No. W128). While "arc-back" decor would be visible on a sherd the size of R. 38601, it is possible that it belongs to SSB5, the "dash-back" group, dated ca. 1175-1200 AD (Mason 2004: 99). Because little of the decoration is preserved, it is safest to date this sherd according to the fairly broad "line-back" dating, while also noting that it is not certain that it actually belongs to this group.

Type 3 — Black paint under turquoise glaze

Dating: Mid-12th-13th centuries AD

General Parallels: *PCAMPI* Type I.2.3.1, "Soft-Paste Ware Painted in Black or Blue under Transparent Turquoise or Colorless Glaze" (Avissar and Stern 2005: 26-27); Ḥamāh Type VII, "Raqqa ware" (Riis and Poulsen 1957: 157-178); Qal'at Ja'bar Ware Y, "*fritware 2*, black painted decoration under turquoise glaze" (Tonghini 1998: 93)

Examples: KNA, Area Z, Stratum Z2(a), R. 32821 (small)

KNA, Area Z, Stratum Z2b. R. 32833 (small)

KNA, Building 5313, Surface Collection. R. 41211 (small, very worn)

KNA, Building 5313, Surface Collection. R. 41218 (small)

Discussion: An example of this type with a very fragmentary *naskhī* inscription ("*…sk…"* ?) was surface collected from Building 5312 during the 2002 survey (Jones, et al. 2012: 87, Fig. 19, top left).

Type 3A — Black paint under turquoise glaze with exterior "knot-back" motif

Dating: ca. 1150-1200 AD, with the earlier part of this range more likely

General Parallels: Mason Syrian Stonepaste-bodied Group Four (SSB4) — "arc-back" (Mason 2004: 98-99); *PCAMPI* Type I.2.3.1, "Soft-Paste Ware Painted in Black or Blue under Transparent Turquoise or Colorless Glaze" (Avissar and Stern 2005: 26-27); Ḥamāh Type VII, "Raqqa ware" (Riis and Poulsen 1957: 157-178); Qalʻat Jaʻbar Ware Y, "*fritware 2*, black painted decoration under turquoise glaze" (Tonghini 1998: 93)

General Discussion: As above (see *Type 2B*), these vessels belong to Mason's (2004: 99) "arc-back" group, dated 1150-1200 AD, but instead have a similar "knot-back" motif. Mason (2004: 124, 129) dates Kāshān Lustre-painted Group Three (the "knot-back" group) to ca. 1150-1175 AD, which may indicate that this design should be placed in the earlier part of the "arc-back" range.

Example: KNA, Area Z, Stratum Z2a. R. 38603. (Fig. 6.3.3)

Parallels: Ḥamāh: "squiggly-line" motif, black under turquoise (Riis and Poulsen 1957: e.g. 179, Figs. 575-576); Ḥarrān: 12th-early 13th century AD, black "squiggly-line" motif under "peacock-blue" glaze (Rice 1952: 68, Fig. 14.9-10)[196]; Jerusalem, Armenian Garden: Ayyūbid, arc-back with "squiggly-line" interior motif (Tushingham 1985: 392, Fig. 40.8); Jerusalem, Knights' Palace Hotel: Stratum IIIc, late 12th-early 13th century AD, "squiggly-line" motif, black under turquoise, but "dash-back" motif (Weksler-Bdolah and Avissar 2015: 86*, Fig. 17.8)[197]; Qalʻat Jaʻbar: "knot-back" motif, black under turquoise (Tonghini 1998:, Fig. 65.a, Fig. 66.d), "squiggly-line" motif, black under turquoise (Tonghini 1998: Fig. 66.l)

Discussion: R. 38603 is a body sherd from a stonepaste bowl. The exterior preserves part of a "knot-back" motif, while the interior, although quite worn, preserves part of a horizontal "ladder" band of "squiggly-line" designs, all executed in black paint under a turquoise glaze.

Example: KNA, Area Z, Stratum Z2(a). R. 32816. (Fig. 6.3.4)

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[196] Rice (1952: 68) identified this as an exterior motif on these vessels, suggesting that these are closed forms.
[197] Mason (2004: 99) dates the "dash-back" group to roughly 1175-1200 AD.

Parallels: Ḥamāh: black under tuquoise, vegetal motif? (Riis and Poulsen 1957: 158, Fig. 496); Jerusalem, Armenian Garden: Ayyūbid, “knot-back” motif with small, simple interior “floriated *alif-lām*”[198] design (Tushingham 1985: 396, Fig. 44.4)

Discussion: This is a small sherd of a black-under-turquoise “knot-back” bowl. Only a small portion of the vessel is preserved, but the interior motif is either a vegetal or arabesque design. The preserved motif is similar, although certainly not identical, to a motif on a vessel from Ḥamāh (Riis and Poulsen 1957: 158, Fig. 496), which is also only partially preserved.

Type 3B — Black and blue paint under turquoise glaze with exterior “knot-back” motif

Dating: ca. 1150-1200 AD, with the earlier part of this range more likely

General Parallels: Mason Syrian Stonepaste-bodied Group Four (SSB4) — “arc-back” (Mason 2004: 98-99); *PCAMPI* Type I.2.3.1, “Soft-Paste Ware Painted in Black or Blue under Transparent Turquoise or Colorless Glaze” (Avissar and Stern 2005: 26-27); Ḥamāh Type VII, “Raqqa ware” (Riis and Poulsen 1957: 157-178); Qal‘at Ja‘bar Ware Y, “*fritware 2*, black painted decoration under turquoise glaze” (Tonghini 1998: 93)

General Discussion: As above (see Types 2B and 3A), these vessels belong to Mason’s (2004: 99) “arc-back” group, dated 1150-1200 AD, but are instead decorated with a similar “knot-back” motif. Mason (2004: 124, 129) dates Kāshān Lustre-painted Group Three (the “knot-back” group) to ca. 1150-1175 AD, which may indicate that this design should be placed in the earlier part of the “arc-back” range.

Example: KNA, Area Z, Stratum Z2(b). R. 38596. (Fig. 6.1.4, Fig. 6.2)

Parallels: Ḥamāh: interior motif paralleled on exterior of single-handled pot (Riis and Poulsen 1957: 177, Fig. 570); Qal‘at Ja‘bar: “knot-back” motif, black under turquoise (Tonghini

[198] This is the term Jenkins-Madina (2006: 169) uses to describe her “Pattern 13.”

1998: Fig. 65.a, Fig. 66.d); al-Rāfiqa/al-Raqqa: black and blue paint under "greenish" glaze, "arc-back" or "knot-back" motif, late 12th-early 13th century AD (Milwright 2005: 212, Fig. 11.13); al-Rāfiqa/al-Raqqa, Great Mosque: "knot-back" motif, black paint under turquoise glaze, late 12th-early 13th centuries AD (Porter 2004c: 41, Taf. 10.a, top left); al-Rujūm: "knot-back" motif, black paint under turquoise glaze, similar but not identical interior motif (MacDonald 1992: 241, Pl. 35.c); al-Ruṣāfa: black paint under turquoise glaze, apparently a close parallel but interior decor not well preserved (Logar 1992: Abb. 15.15), "arc-back" motif with simpler interior rim decor, but a similar design (Logar 1992: Abb. 15.14), "knot-back" motif, but overall design is different (Logar 1991: Abb. 5.14; Logar 1995: Abb. 6.9); Shumaymīs: blue band on rim, exterior "arc-back" or "knot-back" motif in black under turquoise glaze, identified as 13th-14th century, but stylistically earlier (Shaddoud 2014: Pl. 213.11)

Discussion: R. 38596 is a large sherd of a biconical or "proto-biconical" (see Mason 2004: 19, Fig. 2.2, 98) bowl. The exterior is decorated with a "knot-back" design executed in black paint and a blue band around the rim. The interior is decorated with a blue band interrupted by an unpainted circle outlined in black, and with a black dot in its center, similar to the rim design on R. 33003, R. 38600 and R. 41213. Another design is found on the right edge of the rim, although it is difficult to make out. It is possible, as suggested above, that this may be a sparse or simplified version of the "kufesque-band" motif (Mason 2004: 113, Fig. 5.4.SS.12). Below this, framed by bands of black paint, is a ca. 4 cm thick band of vegetal decoration executed in black.

Type 3C — Black paint under turquoise glaze with exterior "arc-back" motif

Dating: ca. 1150-1200

General Parallels: Mason Syrian Stonepaste-bodied Group Four (SSB4) — "arc-back" (Mason 2004: 98-99); *PCAMPI* Type I.2.3.1, "Soft-Paste Ware Painted in Black or Blue under Transparent Turquoise or Colorless Glaze" (Avissar and Stern 2005: 26-27); Ḥamāh Type VII, "Raqqa Ware" (Riis and Poulsen 1957: 157-178); Qal'at Ja'bar Ware Y, "*fritware 2*, black painted decoration under turquoise glaze" (Tonghini 1998: 93)

General Discussion: Mason (2004: 99) suggests a date of 1150-1200 AD.

Examples: KNA, Area A, L. 001. R. 32809. (Fig. 6.3.5)

KNA, Building 5313, Surface Collection. R. 41209. (Fig. 6.3.6)

Parallels: al-Burj al-Aḥmar: Phase E, late 14th-20th centuries AD (but clearly residual), parallel for interior decoration and glaze (Pringle 1986a: 153, 154, Fig. 51.81); Ḥamāh: (Riis and Poulsen 1957: e.g. 173, Fig. 549); Jerusalem, Armenian Garden: Ayyūbid, similar, but not an exact parallel (Tushingham 1985: 386, Fig. 34.34); Quṣayr al-Qadīm: surface context, similar decor with "kufesque-band" motif (Whitcomb 1982: 143, Pl. 51.e)

Discussion: These are small body sherds of stonepaste bowls, decorated on the interior with a foliage motif and the exterior with an arc-back or knot-back motif, although it is not preserved completely enough to determine which.

Type 3C1 — Black paint under turquoise glaze with exterior "arc-back" motif and overhanging ledge rim

Dating: ca. 1150-1200

General Parallels: Mason Syrian Stonepaste-bodied Group Four (SSB4) — "arc-back" (Mason 2004: 98-99); *PCAMPI* Type I.2.3.1, "Soft-Paste Ware Painted in Black or Blue under Transparent Turquoise or Colorless Glaze" (Avissar and Stern 2005: 26-27); Ḥamāh Type VII, “Raqqa ware” (Riis and Poulsen 1957: 157-178); Qal‘at Ja‘bar Ware Y, “*fritware 2*, black painted decoration under turquoise glaze” (Tonghini 1998: 93)

Discussion: This type was not found in excavations at KNA, but one rim sherd was surface collected from the hillside north of Area A during the 2002 survey (Jones, et al. 2012: 87, Fig. 19, bottom right).

Type 3D — Black and blue paint under turquoise glaze with exterior “arc-back” motif

Dating: ca. 1150-1200

General Parallels: Mason Syrian Stonepaste-bodied Group Four (SSB4) — “arc-back” (Mason 2004: 98-99); *PCAMPI* Type I.2.3.1, “Soft-Paste Ware Painted in Black or Blue under Transparent Turquoise or Colorless Glaze” (Avissar and Stern 2005: 26-27); Ḥamāh Type VII, “Raqqa Ware” (Riis and Poulsen 1957: 157-178); Qal‘at Ja‘bar Ware Y, “*fritware 2*, black painted decoration under turquoise glaze” (Tonghini 1998: 93)

Example: KNA, Building 5313, Surface Collection. R. 41213. (Fig. 6.4.1)

Discussion: The decoration of R. 41213 almost exactly parallels R. 33004 and R. 38600. The key differences are the glaze color, apparent lack of red paint, and arc-back, rather than knot-back, exterior motif. Beyond this, however, the same band of blue paint, broken up by unpainted circles, covers both sides of the rim, although on R. 41213 it is clearly outlined in black. Likewise, below this is the same ca. 1 cm thick band of blue paint with a silhouetted pseudo-calligraphic design, though again outlined in black. Below this is a vegetal motif, although the sherd is not preserved well enough to determine the exact motif.

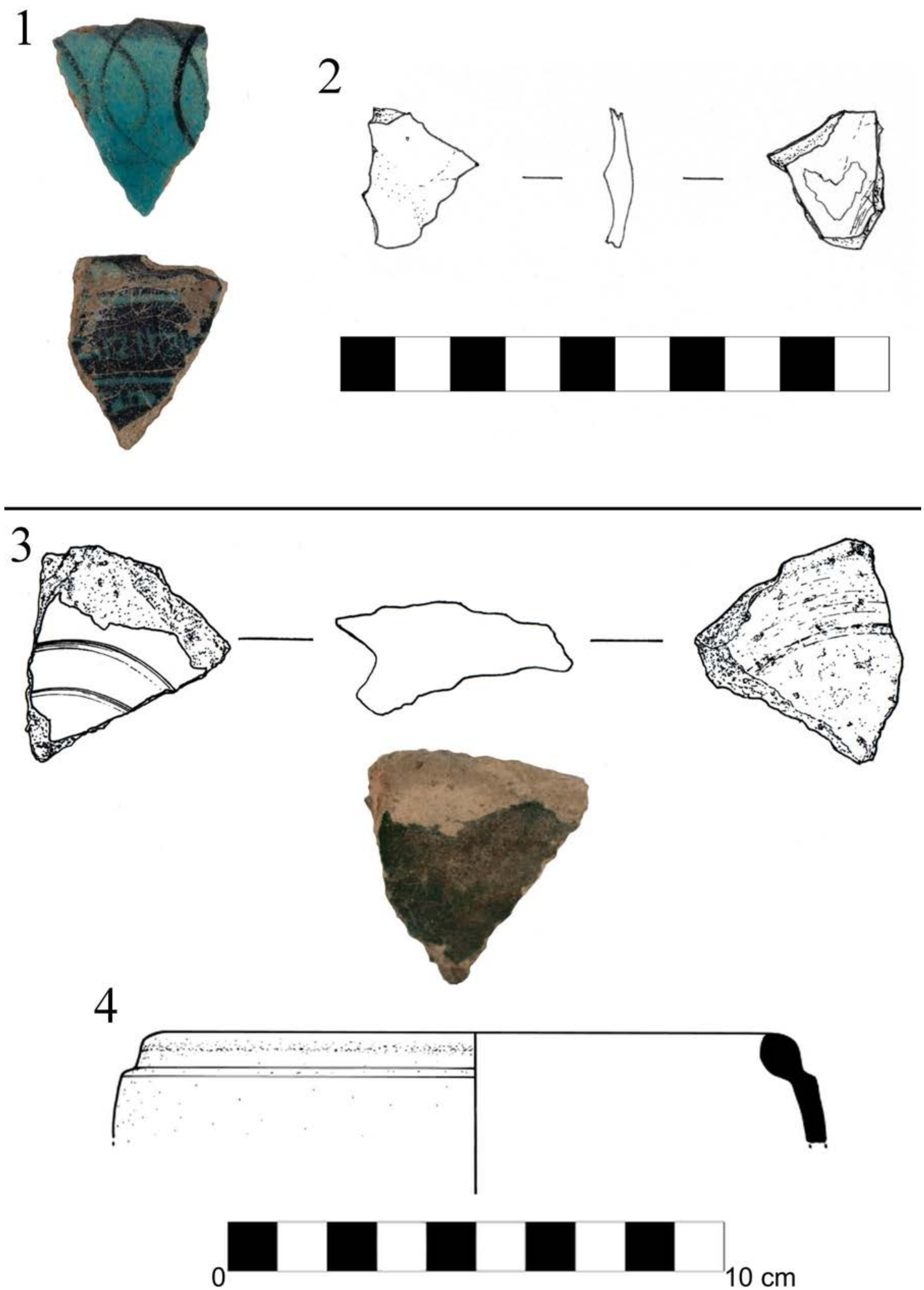

Figure 6.4: Stonepaste and other glazed sherds from KNA. (Illustrations: Donna Walker.)

Table 6.3: Descriptions of sherds illustrated in Figure 6.4.

#	Reg.	Site	Area	Locus	Str.	Type	Ware Color	Décor	Notes
Fig. 6.4.1	41213	KNA	Building 5313	Surface	-	Type 3D Bowl	2.5Y 9/1 White	Turquoise glaze int. and ext.; black and blue underglaze paint on int. and ext.; “arc-back” motif on ext., pseudocalligraphic band and vegetal/arabesque motif on int.	Stonepaste body
Fig. 6.4.2	38278	KNA	Building 5311	Surface	-	Type 3F Bowl (body)	2.5Y 9/1 White	Turquoise glaze int. and ext.; blue underglaze painting on int., design very worn	Stonepaste body
Fig. 6.4.3	38599	KNA	A	Surface	-	Monochrome Glazed Bowl	7.5YR 5/2 Brown	Green glaze on int. (GLEY 1 5G4/2 Grayish Green)	Core: 2.5YR 7/6 Light Red
Fig. 6.4.4	38275	KNA	Building 5311	Surface	-	Beirūt(?) Glazed Cooking Ware	2.5YR 5/6 Red	Glaze not present on this sherd, perhaps due to wear	Core and ext.: 10R 5/6 Red

Type 3F — Blue paint under turquoise glaze

General Parallels: *PCAMPI* Type I.2.3.1, "Soft-Paste Ware Painted in Black or Blue under Transparent Turquoise or Colorless Glaze" (Avissar and Stern 2005: 26-27)

Example: KNA, Building 5311, Surface Collection. R. 38278. (Fig. 6.4.2)

Discussion: Sherds belonging to this type may simply be fragmentary examples of Types 3B or 3D.

Type 4A1 — Black paint under manganese purple glaze with exterior "arc-back" motif and overhanging ledge rim

Dating: ca. 1150-1200

General Parallels: Mason Syrian Stonepaste-bodied Group Four (SSB4) — "arc-back" (Mason 2004: 98-99); Qal'at Ja'bar Ware AK, "*fritware 2*, black painted decoration under aubergine glaze" (Tonghini 1998: 93)

Discussion: This type was not found in the excavated assemblage at KNA, but a relatively complete rim/body sherd was surface collected from Area Z during the 2002 survey (Jones, et al. 2012: 84, Fig. 17.9, 85-86, 87, Fig. 19, bottom center, and see references there).

Monochrome Green Lead Glazed Ware

Dating: 12th-13th century AD

General Parallels: *PCAMPI* Type I.1.3, "Monochrome Glazed Bowls I" (Avissar and Stern 2005: 10-11); Monastery of St. Mary, Carmel: "Monochrome Glazed Wares," 13th century (Pringle 1984: 99-101); Tall Ḥisbān: "Shallow Bowl with High Carination and Low Ring Foot," Middle Islamic IIa (Walker 2012a: 551, 549, Fig. 4.14.7)

General Discussion: Monochrome glazed wares are quite rare at KNA, and only a single example — a "wedge" base — was found during the 2011 and 2012 ELRAP excavation seasons, discussed below. A similar base was also found at KNA by a DBM team (Hauptmann, et al. 1985: 192, Abb. 31.6), though the form is different from the example discussed below.

Example: KNA, Area A, Surface Collection, R. 38599 (Fig. 6.4.3)

Parallels: Bet She'an, Youth Hostel: Stratum II, "Ayyūbid-Mamlūk" (Avissar 2014: 121, Fig. 37.1; on the dating of this context, see Sion 2014: 122*); Khirbat Malkā: surface collected, but dated Mamlūk based on parallels at Yoqne'am (Walker 2005: 80, Fig. 8.2)

Discussion: The one example of this ware collected during the 2011 and 2012 seasons at KNA is a low ring/"wedge" base in a reduced grayish-brown fabric, with an oxidized light red core in the preserved portions of the vessel's walls. A dark green glaze has been applied over a very thin white wash. The thinness of the slip calls to mind Avissar and Stern (2005: 10) Type I.1.3.1, "Bowls with Molded Rim," a late 12th-early 13th century type, although they cite only parallels in coastal Israel. Few close parallels have been found for the form of this base on a monochrome-glazed bowl. The examples cited above from the Bet She'an, Youth Hostel excavations (Avissar 2014: 121, Fig. 37.1) and Northern Jordan Survey (Walker 2005: 80, Fig. 8.2) are of a different fabric than the KNA example, but have a similar, although not exactly parallel, low ring base. Low ring bases, for which some parallels are given in "General Parallels," above, are consistent with the late 12th-13th century date proposed for KNA in general. The form is similar to some bases found on Glazed Slip-Painted bowls — e.g. at Acre, Knights' Hotel: Type BE.GL.4, "Beirut Glazed" slip-painted ware, 12th-13th century (Stern 2012: vol. 1: 44-47, vol. 2: 53, Pl. 4.21.3); Ṣūbā/Belmont Castle: Phase D, Ottoman, but possibly residual (Knowles 2000b: 110, 111, Fig. 7.6.91); and Tel Yoqne'am: Type 44, Stratum III, Crusader

(Avissar 1996: 97, Fig. XIII.32.1) — as well, and an example of the Glazed Slip-Painted type was likely collected at the site during Glueck's (1940: 67, Fig. 29.1) survey, although only a black-and-white photograph was published, with no accompanying description. This type appears in the mid-12th century and likely continues in some form into the Ottoman period (Avissar and Stern 2005: 19-22). The form of R. 38599 is also rather similar to a smaller, Mamlūk period unglazed jug base found at Khirbat al-Ni'āna (de Vincenz and Sion 2007: 43, Fig. 12.40), though that jug is fired to red, and the differences in type, size, and decoration are worth keeping in mind. Indeed, formal comparisons should be interpreted with caution, as parallels could also be suggested to the "wedge" base typical of Mason's (2004: 25, 30, 51, Fig. 3.7) late 8th century Baṣra Opaque-glazed Group Two, 10th-12th century alkaline glazed wares from Crac des Chevaliers/Ḥiṣn al-Akrād (Shaddoud 2014: Pl. 64.5), and so on.

Turquoise Glazed Earthenware

Dating: 8th-12th centuries AD(?)

General Parallels: Buṣrā: Stratum 22, 9th-12th century AD, and Stratum 13, late 12th-early 13th century AD (Berthier 1985: 32-33, Figs. 73-75); Qal'at Ja'bar: late 11th-12th or perhaps 13th century AD (Tonghini 1998: 55-57, Fig. 76-81); al-Shawbak: (Sinibaldi 2007: 74, 72, Fig. 50)[199]; Tall Ḥisbān: Stratum 4, Middle Islamic IIa (Walker 2012a: 549, Fig. 4.14.9, 551); al-Wu'ayra: Phase I, early Crusader (Vannini and Tonghini 1997: 382, not illustrated)

Example: KNA, Area A, L. 002. R. 32828.

Discussion: Walker (2012a: 551) notes, "Although this ware is well known from pottery readings, there is very little of it published." The finds from KNA unfortunately do little to

[199] This is a group of eight small sherds that seem to have been fashioned into roughly circular gaming pieces. Detailed descriptions are not provided, and from the photos it is also possible that these may be turquoise glazed stonepaste, but the description of the ware as "rosato" (i.e. pink) suggests that they belong to this group (see description in Sinibaldi 2007: 74).

remedy this situation. R. 32828, the only example of this ware found at KNA, is very worn, possibly having been damaged in a fire.

Glazed Cooking Wares

a) Carinated Holemouth Cooking Pot with Thickened Rim

Dating: 12th century AD

General Parallels: *PCAMPI* Type II.2.1.1, “Globular Cooking Pots with Thickened Rim” (Avissar and Stern 2005: 91); Yoqne‘am Type 6 Cooking Pot (Avissar 1996: 135)

General Discussion: At Yoqne‘am, Avissar (1996: 135) considers the Type 6 Cooking Pot to be a continuation of the Early Islamic period Type 5 (and probably Type 2) Cooking Pots. The rim is angled farther inward on the Type 6 Cooking Pots, but otherwise they are quite similar to earlier forms.

Example: KNA, Building 5311, Surface Collection. R. 38275. (Fig. 6.4.4)

Parallels: Acre, Knights’ Hotel: “Beirut Cooking Ware I,” 12th century AD (Stern 2012: vol. 2: 41, Pl. 4.15.1); Beirūt, Downtown: Phase I, Fāṭimid? (El-Masri 1998: 114, Fig. 4.10); Caesarea Maritima: Crusader, 12th-13th century AD (Brosh 1986: 79, Fig. 4.7); Yoqne‘am: Type 6 Cooking Pot, 11th-12th century AD (Avissar 1996: 136, Pl. XIII.93.2)

Discussion: This type is glazed, but the rim is generally not, and R. 38275 does not preserved any glazed portions of the vessel. A single body sherd of the same ware with drips of glaze was, however, collected during the 2002 survey of KNA (Jones, et al. 2012: 87), also from Building 5311.

R. 38275 differs from most of the parallels cited above in several ways. First, it is rather smaller in diameter than most cooking pots with this type of rim, although it is certainly within the range of similar Middle Islamic period wheel-made cooking pots. Second, the thickened portion above the carination is shorter. It is likely that this is a factor of both regional and chronological variation.

As with many of the types found at KNA, this ware is not common in southern Jordan. Unglazed examples of wheel-made, globular cooking pots dated "Fatimid-Ayyubid" have been found at Gharandal (Walmsley and Grey 2001: 153, 154, Fig. 9.5), but the illustrated example has a flat, out-turned rim. A glazed, out-turned example was also surface collected at SGNAS Site 75 (Fayfā, "Western Segment"; MacDonald 1992: 187, Pl. 7.8, for description of site, see 256).

6.1.2. Wheel-made Wares

As Sinibaldi (2013b: 174) states, "[u]nglazed, wheel-thrown pottery is present in large quantities at several sites in Jordan during the Islamic period, but is still very poorly documented both in Petra and Jordan, and this is currently the hardest class to assess for its presence and value in the archaeological record." While she is speaking in the context of archaeological survey, where the paucity of published Middle Islamic period wheel-made wares makes it difficult to separate wheel-made sherds of this period from those of earlier periods,[200] this also poses a problem for excavated assemblages. Beyond the problem of establishing parallels — relevant to both survey and excavation assemblages — it is difficult to determine if the quantity of wheel-made wares in the KNA assemblage is, in fact, atypically high for southern Jordan.

Compared to the assemblage from al-Wuʻayra (Vannini and Vanni Desideri 1995: 529, Table 1), for example, the percentage of wheel-made wares in the excavated assemblage from KNA is quite high. Fine ware and amphora sherds — as opposed to Nabataean and Roman-

[200] It is worth noting in this context that virtually every unglazed wheel-made sherd collected during the 2002 survey at KNA (see Jones, et al. 2012: 83-84, Fig. 17.1-8) was initially dated to the Early Islamic period by the original surveyors. This is understandable, given the lack of published Middle Islamic period parallels, but as Jones, et al. (2012: 83) argue, the majority should be dated to the Middle Islamic period. This has since been confirmed by excavation, as can be seen in this section.

Byzantine wheel-made sherds — made up 9.6%[201] of the stratified assemblage at al-Wuʻayra (Vannini and Vanni Desideri 1995: 529, Table 1), mostly concentrated in Phase IV (the early 13th century abandonment phase) and later (Vannini and Tonghini 1997: 380, Fig. 15). Compared to Middle Islamic period al-Bayḍā, where hand-made wares make up 99% of the assemblage (Sinibaldi 2009b: 450), the percentage of wheel-made sherds at KNA looks even higher. The percentage of wheel-made wares at KNA is comparable to the percentage of "wheel-made cream wares" (35.4%) in Phase 1a of Brown's (2013a: 320, Table 2) excavations at al-Karak, but rather low when storage fabrics are added (also 35.4%, for a total of 70.8% of the assemblage), and exceptionally low compared to Phase 1b, where wheel-made cream wares and storage wares make up a combined 88.4% of the assemblage.[202] Compared to the Mamlūk period cistern at Khirbat Fāris (McQuitty, et al. 1997: 207, Fig. 10) on the Karak Plateau, where wheel-made wares were 65% of the assemblage, the percentage of wheel-made wares at KNA is likewise quite low.

There are several problems with these comparisons, however. There are, without doubt, regional distinctions in these patterns, particularly between central and southern Jordan. Likewise, as the excavations at al-Wuʻayra show, the frequency of wheel-made wares varies throughout the Middle Islamic period, suggesting that neither al-Bayḍā nor the cistern at Khirbat Fāris may be directly comparable to KNA. Beyond this, quantitative data is available for very few Middle Islamic period assemblages in southern Jordan, which makes it difficult to establish a "typical" pattern.

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[201] This number is based on minimum number of forms. The percentages based on raw sherd counts, which are more comparable to the maximum vessel numbers presented here for KNA, are lower (see Vannini and Tonghini 1997: 380, Fig. 15).

[202] For al-Shawbak, Brown (1988: 237) reported that "[w]heel-thrown cream wares . . . first appear in Phase III," which she dated to the Mamlūk period, although as discussed in Section 6.1.1, this phase may actually be later Ayyūbid. Her excavations produced very little Phase II (Ayyūbid) material for comparison. Ranieri's investigation of the wheel-made wares from the Italian excavations (see Section 6.1) will undoubtedly clarify the chronology and ubiquity of these wares at al-Shawbak.

In the following section, a number of parallels come from regions relatively distant from southern Jordan, including from sites on the northern Coastal Plain and in the Galilee. While this is, to some extent, justified by the lack of published parallels for many of these forms in southern Jordan, these must nonetheless be interpreted with caution, as many are no doubt the products are different production centers from those found at KNA. Quantitative data is presented in Table 6.4.[203]

Table 6.4: Comparative quantitative ceramic data from the 2002 survey and 2011-2012 excavations at KNA.

	Hand-Made	Wheel-Made	Glazed	Other	Total
2002 Survey (count)	907	344	20	28	1299
2002 Survey (%)	70%	26%	2%	2%	100%
2011-2012, all contexts (count)	204	190	21	140	555
2011-2012, all contexts (%)	37%	34%	4%	25%	100%
2011, Area X (count)	6	22	0	1	29
2011, Area X (%)	21%	76%	0%	3%	100%
2012, Area A (count)	23	1	5	7	36
2012, Area A (%)	64%	3%	14%	19%	100%
2012, Area D (count)	5	0	0	0	5
2012, Area D (%)	100%	0%	0%	0%	100%
2012, Area Y (count)	29	12	0	0	41
2012, Area Y (%)	71%	29%	0%	0%	100%
2012, Area Z (count)	73	140	9	74	296
2012, Area Z (%)	25%	47%	3%	25%	100%
KNA, all (count)	1111	534	41	168	1854
KNA, all (%)	60%	29%	2%	9%	100%

Wheel-made Buff/Cream Wares

Open Forms

a) Deep, Rounded Bowls

[203] The category "Other" in Table 6.4 includes mold-made wares, technical ceramics, and certain pieces counted separately during in-field pottery analysis, including non-diagnostic decorated sherds. As this includes categories of decoration that occur on both hand-made and wheel-made vessels, this should not skew the numbers substantially in one direction or the other. This should, however, be kept in mind when interpreting the Area Z counts, as only 10 of the 74 "other" sherds belong to mold-made lamps.

Dating: Middle Islamic Ic-IIa, perhaps continuing throughout the Middle Islamic II

General Parallels: *PCAMPI* Type II.1.1 "Small Plain Bowls" (Avissar and Stern 2005: 82-83)

General Discussion: This type of bowl is closest to Avissar and Stern's (2005: 82) Type II.1.1.3, "Deep, Crude Bowls," which they date primarily to the Mamlūk period, while noting, "simple crude, plain bowls have also been found in Ottoman assemblages." These Mamlūk period vessels tend either to be conical (e.g. Cytryn-Silverman 2010a: 121-122, Ph. 9.26-27, 197, Pl. 9.28.2-3; Toueg and Stern 2016: Fig. 3.4) or carinated (e.g. Cytryn-Silverman 2010a: 121-122, Ph. 9.28-29, 197, Pl. 9.28.1; Grey 2000: 88, Fig. 6.1.26, 90; Kletter 2009: Fig. 8.1-5; Milwright 2008a: 362, Catalogue Page 15.4-5; Torge 2011: 105, Pl. 9.6-10, 14-16; Tushingham 1985: Fig. 41.1-6), with some hemispherical examples known. Plain, carinated bowls are also known in Ayyūbid and earlier assemblages, however. Examples have been found in a late 12th-early 13th century context in the Jerusalem, Street of the Tannery excavations (Lavi 2014: Fig. 9.7), in an Ayyūbid (mid-12th-early 13th century) context in the Jerusalem, Armenian Garden excavations (Tushingham 1985: 386, Fig. 34.18), and in an early 12th century context at Har Ḥozevim (Kletter and Boas 2002: 194, Fig. 19.13), although all are in a finer fabric.[204] All of the examples from KNA are of an incurving hemispherical form that differs from the three forms typical of Mamlūk period assemblages, discussed below.

Examples: KNA, Area Z, Stratum Z2(b). R. 38285.

KNA, Area Z, Stratum Z2(b). R. 38294.

KNA, Area Z, Stratum Z2(b). R. 38297 (base, probably of this type).

KNA, Area Z, Stratum Z2. R. 38576.

[204] An example from the al-Ramla, Marcus Street excavations (Arnon 2007: 42. Fig. 1.5) was dated to the Early Islamic period, but the vessel was recovered from a topsoil locus and has likely been misdated.

KNA, Area Z, Stratum Z2. R. 38577. (Fig. 6.5.1)

KNA, Area Z, Stratum Z2. R. 38573. (Fig. 6.5.2)

KNA, Area Z, Stratum Z2. R. 38571. (Fig. 6.5.3)

Parallels: Acre, Messika Plot: Crusader, a basin, but with similar incurving rim (Stern 2012: vol. 2, Pl. 4.4.5); ʻAmmān Citadel: Area B, Building C, Stratum III destruction, 11^{th} century AD (Northedge 1992b: 147, Fig. 151.1); Jerusalem, Armenian Garden: Ayyūbid or earlier (Tushingham 1985: 387, Fig. 35.3); Jerusalem, Mūristān: 11^{th}-mid-13^{th} century AD, but finer fabric (ʻAdawi 2009: Fig. 4.5); Jerusalem, The Old City, Aderet Eliyahu Yeshiva: Crusader, possibly glazed (Zelinger 2014: Fig. 8.7); Jerusalem, Site S.1: Phases 4, Mamlūk/Ottoman and 2, Ottoman (Prag 2008: 259, Fig. 173.1, 173.3, 267, Fig. 175.9, 175.11); al-Ramla, Ha-Palmah Street: "unclear context," but probably Middle Islamic IIc or later (Kletter 2009: Fig. 8.6); al-Ramla, Marcus Street: Type 1.1a, "Hemispherical bowl Iron Age II style," 8^{th}-9^{th} century AD? (Arnon 2007: 38-39, 42, Fig. 1.1 [topsoil locus], 85, Fig. 21.1 [fill below Stratum III floor, 8^{th}-9^{th} century AD]); al-Ramla, North of the White Mosque: "Buff Ware," 8^{th}-9^{th} century AD (Cytryn-Silverman 2010a: 155, Pl. 9.5.1-2, 211, Pl. 9.35.2, 12); Tall Abū Ghūrdān: Phase H, Ayyūbid, smaller diameter than KNA examples (Franken and Kalsbeek 1975: 124, Fig. 34.31; for dating, see Sauer 1976: 94)

Discussion: The majority of unglazed, wheel-made bowls at KNA belong to this type, which is clearly related to *PCAMPI* Type II.1.1.3, but is likely an earlier or local type (or perhaps both). Close parallels are uncommon, and reflect the ongoing uncertainty in the dating of Middle Islamic period unglazed wares. Of the comparanda cited above, some are relatively dubious. The example from the Armenian Garden is part of a group (see Tushingham 1985: 387, Fig. 35.2-6) that Tushingham (1985: 111) suggests may be "Byzantine or Early Arab," as they are not known "from any indisputably mediaeval context in the Armenian Garden." While the parallel cited above is closer than the rest of the group to the KNA examples, it is possible that this group and the "Iron Age II style" bowls from the Marcus Street excavations in al-Ramla (Arnon 2007: 38-39) represent an earlier, superficially similar type unrelated to the other comparanda and the examples from KNA. In the al-Ramla, North of the White Mosque excavations, the same shape is found in the Early Islamic II in Buff Ware, and the Middle Islamic Ia (on this dating, see Cytryn-Silverman 2010a: 138) in "Middle Islamic Common Ware I," a "[r]ed to brown (7.5YR 5/4) gritty ware . . . resembling cooking wares" (Cytryn-Silverman 2010a: 119). This is a relatively simple form, and it seems likely that it was produced throughout the Early and Middle Islamic periods, at least, in a number of fabrics. The late examples from Jerusalem, Site S.1 may indicate continuity of this form into the Late Islamic period, but the Ottoman examples, in particular, are smaller than the KNA examples and in a very different fabric.

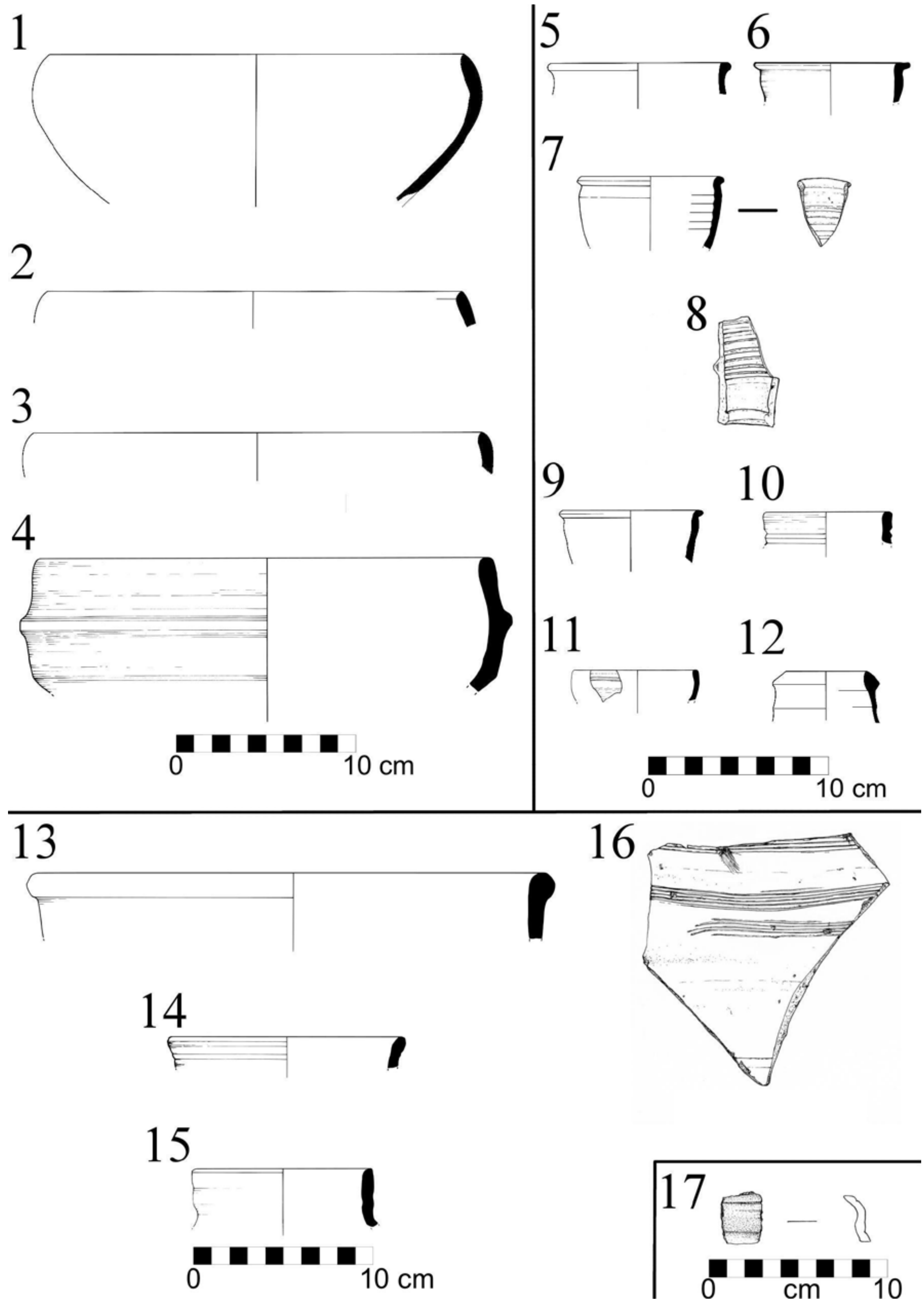

Figure 6.5: Wheel-made ceramics from KNA. 1-4: bowls, 5-12: jugs, 13-16: jars, 17: casserole lid. (Illustrations: Donna Walker, except 1-3, 5, 9, and 12, by IWNJ.)

Table 6.5: Descriptions of sherds illustrated in Figure 6.5.

#	Reg.	Site	Area	Locus	Str.	Type	Ext.	Int.	Core	Fabric	Notes
Fig. 6.5.1	38577	KNA	Z	228	Z2	WM Bowl	2.5Y 8/4 Pale Brown	2.5Y 7/4 Pale Brown	2.5Y 7/1 Light Gray	Sandy temper, some calcareous inclusions, minimal vegetal temper	
Fig. 6.5.2	38573	KNA	Z	228	Z2	WM Bowl	5YR 7/4 Pink	7.5YR 8/4 Pink	10YR 7/2 Light Gray	Well-levigated fine sand temper, common fine calcareous flecks	
Fig. 6.5.3	38571	KNA	Z	228	Z2	WM Bowl	5YR 7/4 Pink	5YR 8/4 Pink	2.5Y 7/1 Gray	Sandy temper, some small calcareous inclusions	
Fig. 6.5.4	38281	KNA	Building 5311	Surface	-	WM Bowl	-	-	-	-	
Fig. 6.5.5	38574	KNA	Z	228	Z2	WM Jug	10 YR 7/4 Very Pale Brown	10 YR 7/4 Very Pale Brown	10 YR 7/4 Very Pale Brown	Hard-fired, sandy temper, some calcareous inclusions	

Table 6.5: Descriptions of sherds illustrated in Figure 6.5, continued.

#	Reg.	Site	Area	Locus	Str.	Type	Ext.	Int.	Core	Fabric	Notes
Fig. 6.5.6	32819	KNA	Z	220	Z2a	WM Jug	5YR 7/4 Pink	5YR 7/6 Reddish Yellow	2.5YR 6/6 Light Red	Well-fired, well-levigated fine sandy temper, few fine calcareous inclusions	
Fig. 6.5.7	32831	KNA	Z	233	Z2(b)	WM Jug	10YR 7/3 Very Pale Brown	10YR 7/4 Very Pale Brown	10YR 6/2 Light Brownish Gray	Hard-fired, well-levigated sandy temper, few calcareous inclusions	
Fig. 6.5.8	38293	KNA	Z	223	Z2(b)	WM Jug (neck)	-	-	-	-	Probably a non-connecting sherd of same vessel as R. 32831
Fig. 6.5.9	38570	KNA	Z	228	Z2	WM Jug	10YR 8/4 Very Pale Brown	2.5Y 8/4 Pale Brown	10YR 7/2 Light Gray	Well-fired, well-levigated sandy temper, some fine calcareous flecks	

Table 6.5: Descriptions of sherds illustrated in Figure 6.5, continued.

#	Reg.	Site	Area	Locus	Str.	Type	Ext.	Int.	Core	Fabric	Notes
Fig. 6.5.10	38558	KNA	Z	230	Z2a	WM Jug	10YR 8/4 Very Pale Brown	10YR 8/4 Very Pale Brown	10YR 7/4 Very Pale Brown	Well-fired, well-levigated sandy temper, some fine calcareous flecks	Deep ribbing on ext. of neck
Fig. 6.5.11	32812	KNA	Z	206	Z2	WM Jug	5YR 7/6 Reddish Yellow	5YR 7/6 Reddish Yellow	5YR 6/6 Reddish Yellow	Well-fired, well-levigated sandy temper, few fine calcareous flecks	
Fig. 6.5.12	38307	KNA	Z	292	Z2a	WM Jug	5YR 7/6 Reddish Yellow	7.5YR 7/4 Pink	2.5YR 6/6 Light Red	Well-fired, well-levigated sandy temper with many fine calcareous flecks, few small vegetal voids	Reddish-cream slip int. and ext.
Fig. 6.5.13	32811	KNA	Z	206	Z2	WM Jar	2.5Y 8.5/2 Pale Yellow	2.5Y 8.5/2 Pale Yellow	2.5Y 8/2 Pale Yellow	Well-fired, sandy temper, few visible inclusions	
Fig. 6.5.14	38565	KNA	Z	Surface	-	WM Jar	5YR 8/4 Pink	5YR 8/4 Pink	2.5YR 7/6 Light Red	Well-fired, sandy temper	

Table 6.5: Descriptions of sherds illustrated in Figure 6.5, continued.

#	Reg.	Site	Area	Locus	Str.	Type	Ext.	Int.	Core	Fabric	Notes
Fig. 6.5.15	41224	KNA	X	Surface	-	WM Jar	10YR 7/3 Very Pale Brown	10YR 7/3 Very Pale Brown	10YR 7/3 Very Pale Brown	Well-fired, well-levigated sandy temper, fine calcareous and black flecks, some small mineral voids	Traces of red slip on int.
Fig. 6.5.16	38304	KNA	Z	276	Z2(a)	WM Jar (body)	Uneven, 2.5YR 6/8 Light Red to 7.5YR 8/3 Pink	2.5YR 6/8 Light Red	Uneven, gray to 2.5YR 6/8 Light Red at margins	Fine sand temper, plentiful fine calcareous flecks, few reddish (argillaceous) inclusions, few med. vegetal voids	Ext. slip (7.5YR 8/3 Pink); comb incised on ext.
Fig. 6.5.17	41227	KNA	X	136	X-2	WM Brittle Cooking	2.5YR 6/8 Light Red	2.5YR 6/8 Light Red	2.5YR 4/6 Red	Semi-metallic, fine sand temper	Int. and ext. slip

b) Carinated, Ridged Bowls

Examples: KNA, Building 5311, Surface Collection. R. 38281. (Fig. 6.5.4)

KNA, Building 5311, Surface Collection. R. 38276.

KNA, Building 5311, Surface Collection. R. 38277.

Discussion: This vessel is an uncommon carinated, ridged bowl. I have found no exact parallels for this type, although the fabric is typical of Middle Islamic wheel-mades at KNA. A similar form is found on 13th century monochrome glazed vessels at the Monastery of St. Mary of Carmel (Pringle 1984: 101, Fig. 6.31-32, 102, Fig. 7.33, 7.35) and Qal'at al-Ṣubayba (Boas 2001: 128, Fig. 197.14-15), but these are likely northern Italian imports (see Avissar and Stern 2005: 73-74). R. 38281 is most likely a variant, perhaps early, of the post-Crusader carinated bowl group identified by Wightman (1989: 65) in the Jerusalem, Damascus Gate assemblage. In particular, one example has a similar ridge below the rim, but the carination begins at this point, as is typical for Middle Islamic bowls with high carination (Wightman 1989: 249, Pl. 55.6). By contrast, the carination on R. 38281 begins ca. 3 cm below the ridge.

Closed Forms

Thin-walled, metallic jugs and juglets with flat base

Dating: Middle Islamic Ic-IIa, perhaps continuing later

General Parallels: *PCAMPI* Type II.4.2.3 "Jugs with Straight Neck" (Avissar and Stern 2005: 109-111)

General Discussion: The general parallel cited above is a large and somewhat vaguely defined group, including both glazed and unglazed types. Avissar and Stern (2005: 111) suggest, "earlier, Ayyubid jugs have flat or disk bases while the later, Mamluk jugs have ring bases."

Bases are, unfortunately, preserved on few of the examples from KNA, but where they are, they are, predictably, the flat, "Ayyūbid" type.

a) Everted-rim juglet

Example: KNA, Area Z, Stratum Z2(a). B. 40197. Complete Vessel. (Fig. 6.6)

Parallels: Jerusalem, Armenian Garden: Ayyūbid (Tushingham 1985: 389, Fig. 37.17, 390, Fig. 38.29); Khirbat al-Nawāfla: Early ʻAbbāsid (ʻAmr, et al. 2000: 245, Fig. 15.1)

Discussion: The key example of this type at KNA is B. 40197, part of a group of three complete vessels found in Area Z L. 235. The handle had been removed from this example, and it was in use as a stopper inserted into an HMGPW jug. The fabric and rim form are fairly typical of the closed wheel-made vessels found at KNA, and several parallels for both the shape of the vessel and the handle attachment are found in the Jerusalem, Armenian Garden assemblage, cited above under parallels. The handle attachment, rarely preserved on vessels at KNA, largely matches Tushingham's (1985: 145) description of typical "Ayyūbid" jugs from the Armenian Garden, with "their handle running from the middle of the neck to the shoulder." Note that the handle attaches in this way on the parallel cited below from Faḥl/Pella (Walmsley and Smith 1992: Pl. 125.4) for the "Flat or triangular rim jug with slightly bulbous neck." The parallel from Khirbat al-Nawāfla is interesting, as it is very similar to B. 40197, but dated by the excavators to the Early ʻAbbāsid period. They do not, however, cite parallels to support this dating, nor is the stratigraphy of this area described in enough detail in the report (ʻAmr, et al. 2000: 241-247) to evaluate the stratigraphic dating of the context this vessel was found in. Given the long and continuous occupation at the site, it is possible that this context has been misdated and should instead be placed in the Middle Islamic period, although it is also possible that the vessel from Khirbat al-Nawāfla is, in fact, a similar but earlier form.

Figure 6.6: Complete wheel-made jug, B. 40197. (Photograph: Leah Trujillo, courtesy UC San Diego LCAL.)

b) Flat-rim jug with ridged neck

Examples: KNA, Area Z, Stratum Z2(b). R. 38295.

KNA, Area Z, Stratum Z2. R. 38574. (Fig. 6.5.5)

KNA, Area Z, Surface Collection. R. 38591 (but with rounded triangular rim; see Jones, et al. 2012: 84, Fig. 17.5; possibly a store jar rim; see Gorzalczany 2016: 91, Fig. 31.4)

Parallels: Jerusalem, Armenian Garden: Ayyūbid (Tushingham 1985: 392, Fig. 40.29, 34)

Discussion: R. 38295 and R. 38574 are small rim sherds of flat-rim jugs. Although the ridge is not preserved on either sherd, the portion of the neck that is preserved suggests that they belong to the ridged neck type. A more complete example of this type was also found in the 2002 KNA survey assemblage and published by Jones, et al. (2012: 84, Fig. 17.2).

c) Flat or triangular rim jug with slightly bulbous neck

Examples: KNA, Area Z, Stratum Z2a. R. 32819. (Fig. 6.5.6)

KNA, Area Z, Stratum Z2(b). R. 32831. (Fig. 6.5.7)

KNA, Area Z, Stratum Z2(b). R. 38293 (probably non-connecting neck sherd of R. 32831). (Fig. 6.5.8)

KNA, Area Z, Stratum Z2. R. 38570. (Fig. 6.5.9)

Parallels: Jerusalem, Armenian Garden: Ayyūbid (Tushingham 1985: 390, Fig. 38.28, 30, 392, Fig. 40.35-36); Kutla I: surface collection, dated Ayyūbid (Lindner 1999: 489, Fig. 17B, second up from bottom left); Ṭabaqat Faḥl/Pella: a painted jar, but similar rim form, Ayyūbid/Mamlūk (Walmsley and Smith 1992: Pl. 125.4)

Discussion: This type is similar to the one discussed above, but the neck has a small bulge, rather than a ridge, and curves in slightly under the rim. A flat-rim example with a pinched spout, also found on several of the examples cited above from the Armenian Garden, was found during the 2002 survey at KNA and published by Jones, et al. (2012: 84, Fig. 17.1). Ridged (see above) and “slightly bulbous” neck jars continue into the Middle Islamic IIb and later (i.e. the Mamlūk period), although the rim forms usually differ. An example fairly close to the flat-rim type discussed here was found in a Mamlūk context at Khirbat al-Niʿāna (de Vincenz and Sion 2007: 42, Fig. 12.2), but with a thicker rim. Most of the examples in the al-Niʿāna assemblage (see de Vincenz and Sion 2007: 42, Fig. 12), however, tend toward more typical Mamlūk period rim types. A relatively complete rim/neck, R. 32831, was found in Stratum Z2(b) in Area Z at KNA and shows that the handle of this type attaches at mid-neck, as noted above for Ayyūbid jugs from Jerusalem.

d) Plain-rim jug with ridged neck

Example: KNA, Area Z, Stratum Z2a. R. 38558. (Fig. 6.5.10)

Parallels: Jerusalem, Armenian Garden: Ayyūbid (Tushingham 1985: 390, Fig. 38.27); Jerusalem, Khirbat Bayt Mazmīl/Qiryat Ha-Yovel: dated Mamlūk, but from surface collection (Levi 2012: Fig. 3.13)

Discussion: This type has a plain, teardrop-shaped rim, with a series of ridges on the neck. It is not possible, due to the preservation of R. 38558, to determine how many ridges were originally present, though two complete ridges and a partial gouge are visible now. Exact parallels for this type have not been found, but the example cited above from the Jerusalem, Armenian Garden excavations is a close parallel for the rim. While it does not have the ridges of R. 38558, these are found on other Ayyūbid jugs from the Armenian Garden (e.g. Tushingham 1985: 389, Fig. 37.1, 7, 392, Fig. 40.31).

e) Plain-rim jug

Example: KNA, Area Z, Stratum Z2. R. 32812. (Fig. 6.5.11)

Parallels: Jerusalem, Armenian Garden: Ayyūbid (Tushingham 1985: 389, Fig. 37.10)

Discussion: R. 32812 is a small sherd, probably from a simple, plain-rim, slightly bulbous-neck jug. Because the sherd is so small, the possibility should also be considered, especially given the fabric, that this is instead a sherd of Magness's (1993: 193-195) Fine Byzantine Ware (FBW) 1B, dated mid-6th to late 7th or early 8th century AD. This date is broadly in line with the few other "residual" sherds found at KNA. It is possible that these suggest short-term or pastoral occupations at KNA prior to the establishment of the copper mining village (see Ch. 8).

Jars

a) Club-rim Storage Jar

Dating: Middle Islamic

Example: KNA, Area Z, Stratum Z2. R. 32811. (Fig. 6.5.13)

Parallels: al-Karak: Phase 1b, Mamlūk (Brown 1989: 299, 302, Fig. 7.28; compare to revised contextual data in Brown 2013a: 319, Table 1), unstratified (Milwright 2008a: 356, Catalogue Page 9.3); al-Rujūm: surface collection (MacDonald 1992: 236, 238, Pl. 33.i)

Discussion: This is a large jar or krater. The published parallels are generally of a smaller diameter and, with the exception of the example from Brown's excavations at al-Karak, from unstratified contexts.

b) Everted-rim jug or jar

Example: KNA, Area Z, Surface Collection. R. 38565. (Fig. 6.5.14)

Discussion: This is a small rim sherd of a wheel-made jug or jar. The fabric is fairly similar to thicker examples of the Thin-walled Metallic Jug group, but with a coarser sand temper. The form is reminiscent of everted examples of *PCAMPI* Type II.4.2.3 "Jugs with Straight Neck" (Avissar and Stern 2005: 111), but these do not generally have the ridges present on R. 38565. No exact parallels for this form have been found in Middle Islamic period assemblages, and the only sherd found at KNA was surface collected.

Varia

a) Lightly Rouletted Vessel

Example: KNA, Area Z, Stratum Z2b. R. 32830.

Discussion: R. 32830 is a body sherd of a buff/cream ware vessel. The form is uncertain, but a jar or perhaps jug seems likely. The fabric is sandy, with frequent small calcareous flecks, and fired hard with a gray core and a cream slip. It is decorated with two lightly rouletted bands. Parallels have not been found, but the fabric is typical of the Middle Islamic buff/cream wares found at KNA.

Wheel-made Red Wares

a) Bulbous Neck Ibrīq

Dating: 13th-15th century AD

General Parallels: *PCAMPI* Type II.4.2.1 "Jugs with Plain Swollen Neck" (Avissar and Stern 2005: 108-110)

Example: KNA, Area Z, Stratum Z2a. R. 38307. (Fig. 6.5.12)

Parallels: Jerusalem, Armenian Garden: Ayyūbid (Tushingham 1985: 389, Fig. 37.1, 392, Fig. 40.28); Jerusalem, Damascus Gate: Ayyūbid (Wightman 1989: 69, 253, Fig. 59.3-4); Jerusalem, Site R.I: Ayyūbid (Prag 2017: 147, Fig. 3.24.7); al-Karak: unstratified (Milwright 2008a: 360, Catalogue Page 13.12); al-Qubayba/Emmaus: mid-12th-mid-13th century AD, not an exact parallel (Bagatti 1947: 111, Fig. 26.3); Ṣūbā/Belmont Castle: Phase E, early 20th century AD, but almost certainly residual, as parallels cited are Middle Islamic Ic-IIa (Grey 2000: 89, 88, Fig. 6.1.6)

Discussion: Only sherds of the neck and rim of this type were found at KNA, but the parallels for these sherds indicate that the complete vessel is an *ibrīq*, or spouted jug. The examples from KNA are in a reddish-orange fabric, with a cream slip, typical for this type. The bulbous neck curves inward and comes to a teardrop-shaped rim. While Avissar and Stern (2005: 110) date this type to the 13th-15th century, in the Armenian Garden excavations, the incurving teardrop or triangular rim appears only in Ayyūbid contexts, while an outcurving rim type appears in both Ayyūbid (e.g. Tushingham 1985: 392, Fig. 40.26) and Mamlūk (e.g. Tushingham 1985: 393, Fig. 41.37, 394, Fig. 42.13) contexts.

Other Wheel-made Storage Wares

a) Simple Thinned-rim Jar

Dating: Mid-12th-mid-13th century AD

General Parallels: al-Qubayba/Emmaus: mid-12th-mid-13th century AD (Bagatti 1947: 106-108, Fig. 24.4, 8); Yoqne‘am: Type 11 Jar, Crusader-Mamlūk (Avissar 1996: 151, Fig. XIII.118)

General Discussion: Avissar (1996: 151) considers this type one of “the last remnants of the traditional Palestinian bag-shaped jar” and notes that it is quite rare at Yoqne‘am.

Example: KNA, Area X, Surface Collection. R. 41224. (Fig. 6.5.15)

Discussion: Only a single rim of this type, R. 41224, was found at KNA, during surface collection outside of Area X. Parallels for the type are rare, but in terms of rim shape, fabric, and surface treatment, this sherd does seem to belong to Yoqne‘am Type 11. It does not have a ridge at the shoulder, but Avissar (1996: 151) notes that this feature is found only "occasionally" on this type.

b) Wheel-made Baggy Jar

Dating: Byzantine-Middle Islamic

Example: KNA, Area Z, Stratum Z2(a). R. 38304. (Fig. 6.5.16)

Parallels: ‘Ammān Citadel: Area C, Building 1, Stratum III destruction, 11th century AD (Northedge 1992b: 143, Fig. 137.4); Ge'alya: late 13th-15th century AD (Gorzalczany 2016: 91-92, Fig. 31.3, 5-6); Tiberias, House of Bronzes: Byzantine-Early Islamic (de Vincenz 2008: 160, 161, Fig. 4.7; but recovered from Stratum II, dating to the Fāṭimid period; see Hirschfeld and Gutfeld 2008: 9, 33); Umm al-Raṣāṣ, Church of St. Paul: Early Islamic (Sanmorí and Pappalardo 1997: 400, Fig. 4.9a)

Discussion: R. 38304 is a body sherd of a baggy jar with comb-incised decoration. The fabric is reddish-orange with a gray core, and white-slipped on its exterior. Wheel-made baggy jars with comb-incised decoration have a rather long life in the southern Levant. Examples can be found as early as the Byzantine period, and they span the entirety of the Middle Islamic period. While rims are diagnostic, none clearly belonging to this type were found at KNA.

Cooking Wares

a) Tall, Carinated Casserole Lid

Dating: Late Roman-Early Islamic, possibly continuing later

General Parallels: Jerusalem: "Casserole Lids" (Magness 1993: 215)

General Discussion: Magness (1993: 215) argues that "[n]o morphological developments are evident" in this form between the late 3rd and 10th centuries AD,[205] but most of the parallels for the tall, carinated variety cited below date from the later part of this range. Schaefer (1989: 38) suggests that, for the Negev, "Byzantine red ware has almost no sand temper," and that heavy amounts of sand temper likely indicate Islamic period "red and buff ware" sherds.

Example: KNA, Area X, Stratum X-2. R. 41227. (Fig. 6.5.17)

Parallels: Dayr ʻAyn ʻAbāṭā: post-6th century? (Grey and Politis 2012: 183, 198, Fig. 404); Ḥorvat Karkur ʻIllit: Late Byzantine-Early Islamic (Nikolsky and Figueras 2004: 195, 198, Fig. 46.1); al-Ḥumayma: mid-6th-7th century AD (ʻAmr and Oleson 2013: 121, Fig. 5.34.1992.0557.01); Jerusalem, Armenian Garden: Byzantine Phase IA, mid-6th century AD (Tushingham 1985: 379, Fig. 27.29, see also 385, Fig. 33.13, dated Early Islamic); Jerusalem, Damascus Gate: ca. mid-7th century AD (Wightman 1989: 13-14, 176-177, Fig. 16.11); Khirbat al-Ḍaḥal/SGNAS Site 211: not carinated, but similar rim and fabric, surface collection, dated "Roman-Umayyad," but with late 6th century parallels given (MacDonald 1992: 225, Pl. 25.16); Khirbat al-Dharīḥ: 6th-7th century AD (Waliszewski 2001: 104, Fig. 5.2); Khirbat Fāris: 11th-12th century AD (Johns, et al. 1989: 88, Fig. 24.24); Rehovot-in-the-Negev: 6th-7th century AD (Rosenthal-Heginbottom 1988: 92, 93, Pl. V.217); WFLS, Site WF288: "Trench 1, Layer 5," Early Byzantine/late 4th-5th century AD (Tomber 2007: 458, Fig. A2.7.71)

Discussion: Schaefer's (1989: 38) suggestion that heavily sand-tempered red wares continue to be produced into the Mamlūk period is interesting in light of the clearly Middle

[205] Baly (1962: 294), discussing the pottery from Nessana/ʻAwja al-Ḥafīr, suggested an even broader date of "Hellenistic-Arab," but this is now clearly too early.

Islamic period context in which this example was found, but the parallels for this form are primarily earlier, and heavily sand-tempered red wares are known in earlier contexts, for example the parallel from the Damascus Gate excavations provided above. One should note, however, the presence of a parallel in an 11th-12th century AD context at Khirbat Fāris (Johns, et al. 1989: 88, Fig. 24.24). While Khirbat Fāris has a Classical occupation, as well, the presence of a complete lid in this context suggests that it is not residual, and that the type may have continued to be used into the 2nd millennium. A Byzantine-style casserole was also found at the Monastery of St. Mary of Carmel and identified as a 12th-13th century product (Pringle 1984: 97, 100, Fig. 5.5).

If the sherd is to be identified as early, however, it must be kept in mind that, as with other 1st millennium AD types found at KNA (see Section 6.1.4, in particular), only a single sherd of this type was collected at the site, in a Middle Islamic context (Area X, L. 136) containing several early HMGPW sherds (see Section 6.1.3). As with other "early" sherds at KNA, this should be interpreted with caution. The vast majority of material from Area X, including L. 136, is assigned to Stratum X-2, dating to the 12th-13th centuries AD (see Section 4.1.3), and the example cited above from Khirbat Fāris suggests that this sherd, too, is perhaps not out of place in a 12th century context. While an earlier phase of use is perhaps possible, the ELRAP excavations produced no evidence of this. Excavation in the slag mounds on the eastern side of the Area X building would be required to determine whether this sherd might indicate an earlier phase of use, which is not evident due to the practice of clearing out the Area X building. It is more likely that the presence of this sherd indicates either use of the area around Wādī Ghuwayb al-ʻAṭshāna unrelated to the structural remains in Area X (see Section 6.1.4 for further discussion), a 12th-13th century date for the sherd, or use of earlier sherds for other purposes, e.g. their use in masonry at al-Wuʻayra (Vannini and Tonghini 1997: 381).

6.1.3. Hand-made Wares

Hand-made pottery is one of the most critical and, unfortunately, vexing indicators of Middle-Late Islamic period occupation at an archaeological site. While a rough chronology of these wares is generally understood, and progress has been made on the dating of certain types — e.g. the Hand-made Geometrically Painted Wares (HMGPW), discussed below — many issues remain unresolved. Some forms, particularly of cooking wares, may be quite long-lived (see discussion in Cooking Wares, Section b, below). For Israel, Avissar and Stern (2005: 88) argue that undecorated hand-made bowls "cannot be dated according to form, only by stratigraphic context." Dating through changes in fabric may actually be more productive, but, as discussed below, these are regionally specific, and published fabric typologies have not yet been established. In the sections below, parallels for specific forms are often fairly minimal, except for unique vessels or where very close parallels are known.

Hand-made Geometrically Painted Wares (HMGPW)

Dating: ca. 11th-19th centuries AD

General Parallels: *PCAMPI* Type II.1.4.2 "Geometric Painted Handmade Bowls" for open forms (Avissar and Stern 2005: 88-90); *PCAMPI* Type II.4.4 "Handmade Jugs and Jars with Geometric Painted Decoration" for closed forms (Avissar and Stern 2005: 113-116); ʻAmmān, Citadel: (Anastasio and Botarelli 2014); Dhībān: (Porter, et al. 2010: 20, Fig. 10.7-11; Porter, et al. 2005: 208, Fig. 8.4, 11, 14, 17-18; Tushingham 1972: Fig. 7.30, 33-34, Fig. 8.15-18, 26, 29, 32-33; Winnett and Reed 1964: Pl. 13.6-7, Pl. 54.1, Pl. 61.1-9, Pl. 64.8-10, Pl. 67.3, 14, 18); Dhrā' al-Khān: (Kareem 2000: 82-83, and see figure references in text); Gharandal: (Walmsley and Grey 2001: 156, Fig. 10.6-9, 159, Fig. 11, 160, Fig. 12.5-10); Jarash: (Lichtenberger and Raja 2016: 66-67); al-Karak: (Milwright 2008a: 349-352, Catalogue Pages 2-4)[206]; Khirbat Fāris: (Johns, et al. 1989: 90, Fig. 25.28, 31-34, 91, Fig. 26.38-43, 92, Fig. 27.49, 52, 55, 57; McQuitty 2007a: 167, Fig. 2; McQuitty and Falkner 1993: 56, Fig. 19, 57, Fig. 20, 58, Fig. 21.46-47; McQuitty, et al. 1997: 205, Fig. 8, 211, Fig. 14, 218, Fig. 19.25, 26-30, 220, Fig. 20); Khirbat al-Shaykh ʻĪsā/Zughar: (Grey, et al. 2017: 126-129, Fig. 6.6.50-54, Fig. 6.7.55-61; MacDonald 1992: 235, Pl. 31.g-l; Politis, et al. 2007: 206, Fig. 15-16); Nitl: (Hamarneh 2006: 21, Fot. 12-13, 427, Fig. 2, 428, Fig. 3, 429, Fig. 5, 433, Fig. 10.4-5, 446, Fig. 17.2, 447, Fig. 18.2-6, 448, Fig. 20, 449, Fig. 21.2, Fig. 22.1, 450, Fig. 24.1, 451, Fig. 25.6-8, 454, Fig. 30.1); Rujm al-Kursī: (Khadija 1992); al-Rujūm(/Zughar?): surface collection (MacDonald 1992: 239, Pl. 34.a, c-g, j-l, r-s); al-Shawbak: (Brown 1988: 236, Fig. 11.2-7, 10-15, 238, Fig. 12.16-26, 239, Fig. 13.42-45, 241, Fig. 14.47-48; Pruno and Ranieri 2016; Pruno and Sciortino 2012: 34, Tav. 5.2-3; Sinibaldi 2007: 71, Fig. 48); Ṭabaqat Faḥl/Pella: (McPhillips and Walmsley 2007: 150, Fig. 10; Walmsley and Smith 1992: Pl. 125.6-7, Pl. 126.1-4); Tall Abū Ghūrdān: (Franken and Kalsbeek 1975: 167-203); Tall Abū Ṣarbūṭ: (LaGro 2002: 55-84, 253-310; LaGro 2010); Tall Ḥisbān: see, in particular, the Stratum 4 (Middle Islamic IIa) HMGPW (Walker 2012a: 552-562, Fig. 4.15, 4.16, 4.17.1-7); Tall Nimrīn: (Dornemann 1990: 172-173, Pl. I-II.1); al-Wuʻayra: (Brown 1987: 283, Fig. 9.20-25, 286, Fig. 10.29-35, 38-39; Tonghini and Vanni Desideri 2001: 712, Fig. 7.a, 717, Fig. 18; Vannini and Vanni Desideri 1995: 536, Fig. 20.1-14; Vannini and Tonghini 1997: 381, Fig. 17.b-c)

General Discussion: Hand-made Geometrically Painted Wares, or HMGPW, are most often discussed by Levantine archaeologists as a Levantine phenomenon. It is interesting to note, however, that similar types of hand-made, painted ceramics are found throughout much of the

[206] Brown's (1989: 301, Fig. 6.26-27) excavations at al-Karak produced only a few fragmentary HMGPW sherds.

"Islamic world" in the 2nd millennium AD, with distinct but broadly contemporary groups known in Central Asia (Franke 2015: 84, 241, Fig. 38; Gascoigne and Bridgman 2010; Kalter 1997; Scerrato 1959: 51, Fig. 57, 52, Fig. 58; Sourdel-Thomine 2004: 41), southern Iran (Priestman 2005; Sumner and Whitcomb 1999: 320-322; Tampoe 1989: 26-27; Whitcomb 1991b; Whitehouse 1968: 15-16), southeastern Arabia[207] (de Cardi and Doe 1971; de Cardi, et al. 1975; Hansman 1985; Kennet 2004: 70-76; Mitsuishi and Kennet 2013; Petersen and Grey 2010: 49-50; Petersen and Grey 2012: 286-287; Power 2015: 7-10), North Africa, and Nubia (Whitcomb 1997a: 103, n. 28). One of the few archaeologists to remark on this pattern is Whitcomb (1997a: 103, n. 28), who notes, "such a widespread style would be labeled an archaeological 'horizon,' had it occurred in a prehistoric or early historic period."

In the southern Levant, "the distribution of HMGP ware has come to be more or less synonymous with Middle Islamic settlement" (Walker 2010: 123). Grabar, et al. (1978: 201, n. 20) noted that it "has been recorded on nearly every medieval site in Syria and Mesopotamia," which is true enough that Johns (1998: 68) allows that they "may be excused the exaggeration." Its distribution is, in fact, not entirely even in the Levant, which has led to suggestions that it is primarily associated with village, rather than town or city, settlement (Brown 2000; François 2002: 162; Johns 1998: 79-83; Vezzoli 2011: 264) or that it is primarily diagnostic of non-Crusader settlement (van der Steen 1997-1998; Whitcomb 1997a: 103). The former is likely to be at least partially correct, although HMGPW is certainly found in larger towns and cities. The latter, however, does not hold up for southern Jordan, where HMGPW is found in association with Crusader occupations at sites such as al-Wuʿayra (Brown 1987: 277-279; Tonghini and Vanni Desideri 2001: 711), although it does seem to be true of the coastal sites.

[207] This slightly later ware — called Julfār Ware, after the ancient name for Rāʾs al-Khayma — also seems to have traveled along the Indian Ocean trade routes to the west, and has been found in Yemen (Hardy-Guilbert and Rougeulle 1997: 138) and east Africa (Kennet 2004: 71), as well.

In a chapter published nearly 20 years ago, Johns (1998) laid out a number of unresolved research problems for HMGPW, including its dating, social meaning, and patterns of production, distribution, and consumption. Much of this research still remains to be done, but recent petrographic work suggests that multiple modes of production were likely active at the same time — including both "local workshops" and more centralized "production centers" — that "regional and possibly intra-regional distribution are clearly indicated," and that these patterns likely shifted throughout the period HMGPW was produced (Gabrieli, et al. 2014: 225).

Dating HMGPW remains difficult. Johns (1998: 65) suggested of its emergence that "the earliest date reasonably claimed is in the second half of the 12th century." Painted hand-made wares occur already in the 10th-11th century "Tupperwares" found at Ayla (Whitcomb 1988b: 216, Fig. 5.a-b, e), but it is not clear how these relate to later HMGPW, which does seem to emerge during the mid-12th century elsewhere in the southern Levant. In northern Jordan and Palestine, at least, its production continued into the 19th century, probably evolving into several 20th century painted wares, although the 19th century forms are often clearly distinguishable from earlier HMGPW (Walker 2009a: 44). Ottoman (i.e. 16th century and later) HMGPW may be identifiable by a decrease in quality (Walker 2009a: 44), but this is not entirely clear. In the south, HMGPW is relatively uncommon in Ottoman period assemblages — note that it is absent in the Ottoman period assemblages at sites as diverse as Ṭūr Imḍayy, a rockshelter (Simms and Russell 1997); Khirbat al-Nawāfla, a village ('Amr, et al. 2000); and even the rich assemblage from Qal'at al-'Unayza, a *ḥajj* fort (Grey and Petersen 2012). HMGPW sherds in the Phase IV (Ottoman) assemblage from al-Shawbak, however, do seem to indicate a shift toward less dense, more loosely executed designs (Brown 1988: 241, Fig. 14.47-48; see also Pruno and Sciortino 2012).

It is, however, very difficult to precisely date HMGPW within its late 12th-15th century "classic" range. Sauer (1973: 62), based on preliminary analysis of pottery from Tall Ḥisbān, suggested that bichrome HMGPW might only date to the earlier part of this range (i.e. the Middle Islamic II), but Brown (1980: 125) had already, nearly 40 years ago, pointed out that this suggestion was speculative, and recent research suggests that bichrome HMGPW was produced into the Late Islamic Ia, at least (Gabrieli, et al. 2014: 200; LaGro 2010: 57). On the basis of her analysis of the Tall Ḥisbān ceramics, Walker (2012a: 561) likewise argues that "there seems to be no justification for Sauer's original suggestion that bi-chrome HMPW preceded its monochrome variety." Shifts over time in the paint colors used in monochrome HMGPW seem to hold up better, however. LaGro (2010: 55) has suggested a shift in paint color over time based on the HMGPW from Tall Abū Ṣarbūṭ in the Jordan Valley, with red being the dominant color in Phase 10 (probably early Ayyūbid),[208] brown fairly well represented in this phase, and black virtually absent. By Phase 50 (radiocarbon dated to the 14th-early 15th century AD), black and brown are more common, with red becoming increasingly uncommon. By Phase 100 (late Mamlūk), black is the dominant color, making up over 60% of the HMGPW assemblage, with brown making up just under 40%, and red virtually absent. Gabrieli, et al. (2014: 221) have argued that "blue-black decoration" emerges only in the late 13th or 14th century AD, which seems to agree with the sharp increase observed in black HMGPW sherds in Phase 50 at Tall Abū Ṣarbūṭ.[209]

[208] Frustratingly, de Haas, et al. (1992), LaGro (2002; 2010), and Steiner (2008) all use different systems to refer to the same phases at Tall Abū Ṣarbūṭ, making it difficult to compare between reports. Here I follow the phasing and dating provided in LaGro's (2002: 7-10) doctoral dissertation.

[209] Interestingly, Sinibaldi (2009b), in her study of the ceramics from al-Bayḍa, Wādī Farasa, and al-Wuʻayra — all in the Petra region — discusses only red, brown, and bichrome red and brown sherds. This is somewhat surprising, as al-Bayḍa was occupied during the early 14th century and probably later (Sinibaldi 2015: 163; Sinibaldi and Tuttle 2011: 448). It is unclear if black-painted HMGPW is absent at al-Bayḍa, but if so, this may indicate the "local" character of the assemblage, as Gabrieli, et al. (2014: 221) suggest that blue-black HMGPW is a product of specialist workshops.

Other decorative elements seem to change less over time. LaGro (2010: 57, 64) argues that several stylistic groups emerge fairly late — notably, the loosely executed "free style" seems to emerge in Phase 50, and the "blank spaces between painted areas" (where, like Silhouette Ware, the designs are executed in negative space) type is present only in Phase 100 — but that the most common decorative groups are found commonly in each phase. For the most part, "changes in the design elements are scarcely discernible" (LaGro 2010: 43), and other attempts to categorize the motifs found on HMGPW — e.g. Khadija's (1992) study of the HMGPW from Rujm al-Kursī in 'Ammān or Van Deuren's (1997: 166, Fig. 130) preliminary work at al-Lāhhūn — have not traced any changes in these motifs over time. Some changes in form can also be observed over time, but it is often difficult to identify the specific vessel form a sherd belongs to, and as Sinibaldi (2009b: 462) notes, some forms — particularly regionally-specific forms — seem to be produced for remarkably long periods, which are not yet fully known.

Sinibaldi (2009b: 460, 462) suggests that technology and "production processes" — in particular, fabric and surface treatment — may be more useful for classifying and dating HMGPW (and hand-made wares in general) than archaeologists have previously realized. As such, she has developed a typology of hand-made ceramic fabrics for the Petra region. Unfortunately, published descriptions have so far appeared for only four fabrics: Fabric A1, a broadly-defined, probably local fabric that seems to have been used not only in the Middle and Late Islamic periods, but in earlier periods as well (Sinibaldi 2013b: 190, 192, n. 1; Sinibaldi 2016a: 203-205); Fabric A2, a 10th-12th century fabric with calcite and mineral inclusions, as well as a small amount of vegetal temper; Fabric C2, a probably 10th century calcite-tempered fabric (Sinibaldi 2016a: 203-205); and an unnamed, heavily calcite-tempered fabric that seems diagnostic of the Late Islamic II (Sinibaldi 2013b: 171). As the full fabric typology has not yet been published, comparison to her fabric groups is presently rather difficult.

In the following discussion, I have, for the most part, not attempted to find formal or stylistic parallels for each of the sherds presented, except where close published parallels are known in southern Jordan. It can be assumed from the above discussion that the majority of HMGPW sherds from KNA have formal and decorative parallels in a wide range of 12th-15th century assemblages in the southern Levant, many of which are provided in "General Parallels," above. The general parallels listed above are not comprehensive; instead, I have listed large and well-published assemblages, focusing primarily on the 12th-14th centuries in Jordan. Detailed fabric and surface treatment descriptions are provided in the tables associated with figures.

Open Forms

a) Flat-rim Bowls

Example: KNA, Area A, Surface Collection. R. 32813. (Fig. 6.7.1)

Discussion: R. 32813 is a rim sherd from an HMGPW bowl with a tan/cream slip. The top of the rim is painted in a solid band of purple-brown paint, and the interior has a worn, probably "free-style" design executed in purple-brown. The "free-style" motif emerges in Phase 50 (14th-early 15th centuries AD) at Tall Abū Ṣarbūṭ (LaGro 2010: 57), which may suggest a Late Islamic date for this sherd. Similar "free-style" motifs are, however, found executed in a similar color already in Stratum 4 (Middle Islamic IIa) at Tall Ḥisbān (Walker 2012a: 560, Fig. 4.17.1) and on bowls (Walker 2012a: 567, Fig. 4.19.2-3) in Stratum 3A (Middle Islamic IIb). A bowl form similar to R. 32813, although with more typical HMGPW motifs, is also found in Stratum 4 (Walker 2012a: 553, Fig. 4.15.4).

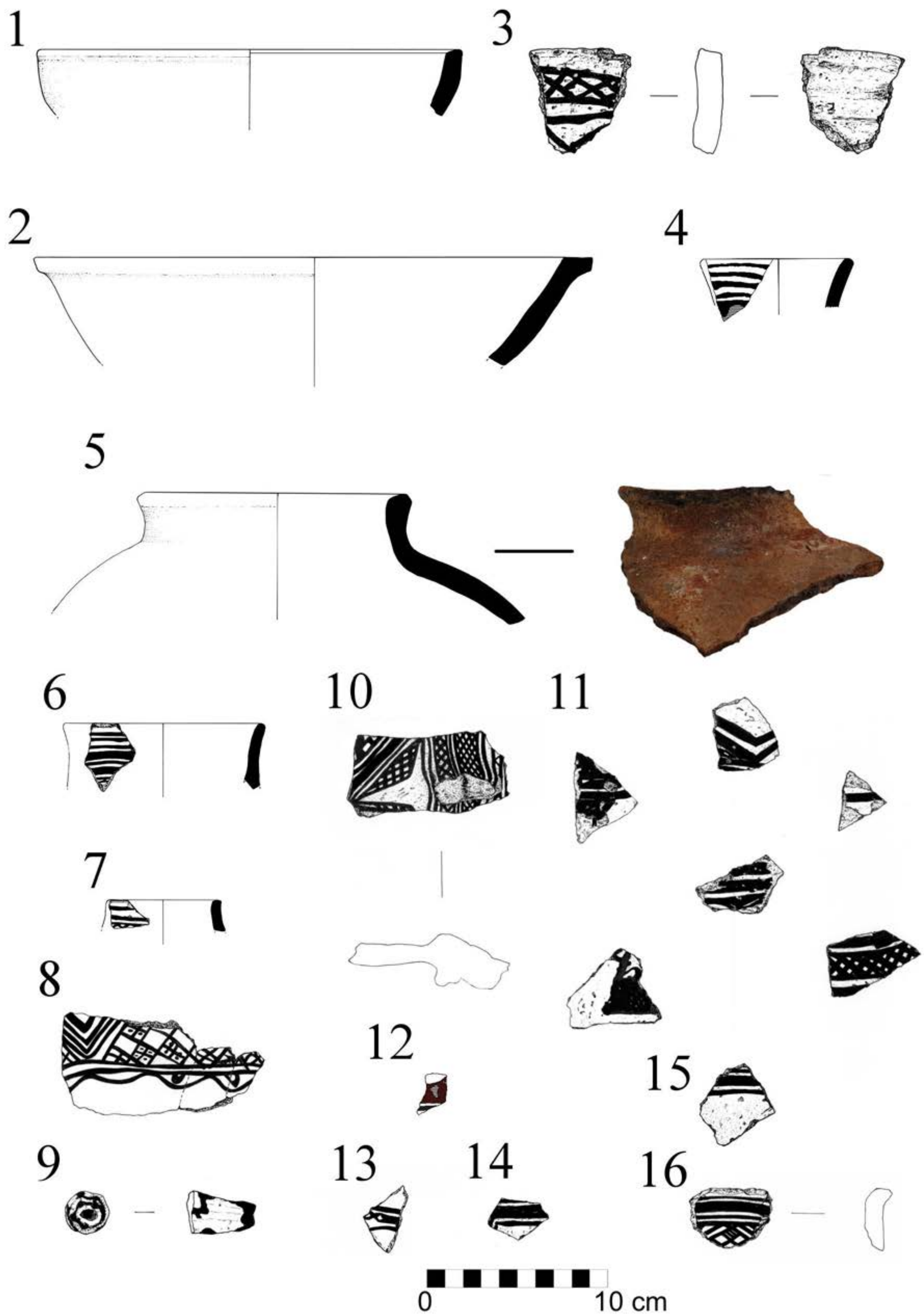

Figure 6.7: Hand-made Geometrically Painted Wares (HMGPW) from KNA. (Illustrations: Donna Walker, except 4 and 12, by IWNJ.)

Table 6.6: Descriptions of sherds illustrated in Figure 6.7.

#	Reg.	Site	Area	Locus	Str.	Type	Ext.	Int.	Core	Fabric	Décor	Notes
Fig. 6.7.1	32813	KNA	A	Surface	-	HMGPW Bowl	10YR 7/4 Very Pale Brown	10YR 9.5/2 Pale Orange Yellow	Black-gray	Overfired, fine to coarse vegetal and quartz temper, large rocky inclusions	Worn lines of dark purplish-brown paint; rim entirely painted	Décor not illustrated; thick white slip on int.
Fig. 6.7.2	38299	KNA	D	404	-	HMGPW Bowl or Basin	5YR 7/6 Reddish Yellow to 5YR 6/6 Reddish Yellow	5YR 6/6 Reddish Yellow	Black	Hard-fired, some cracking, fine vegetal temper, common fine to large white calcareous inclusions, common poorly sorted quartz sand, some fine mica flecks	Blob of dark purplish-brown paint on rim	Décor not illustrated; tan slip on ext.
Fig. 6.7.3	38283	KNA	Building 5315	Surface	-	HMGPW Basin	2.5YR 6/6 Light Red	5YR 7/6 Reddish Yellow	Black	Hard-fired, med. quartz sand temper, some med. vegetal temper	Crosshatch design in brownish-red paint	Diameter uncertain; slipped int. and ext.

Table 6.6: Descriptions of sherds illustrated in Figure 6.7, continued.

#	Reg.	Site	Area	Locus	Str.	Type	Ext.	Int.	Core	Fabric	Décor	Notes
Fig. 6.7.4	38575	KNA	Z	228	Z2	HMGPW Jug	2.5 YR 7/6 Light Red	7.5 YR 8/6 Reddish Yellow	Black	Hard-fired, rare fine vegetal temper, very rare calcareous inclusions	Five lines of black paint (5 YR 5/1 Gray)	Slipped int. (10 YR 6/2 Light Brownish Gray) and ext. (10 YR 6/3 Pale Brown)
Fig. 6.7.5	41205	KNA	X	137	X-2	HMGPW Jar	Patchy, 5YR 7/6 Reddish Yellow	7.5 YR 5/6 Strong Brown	Black	Overfired, crumbly, fine vegetal temper, poorly-sorted calcareous and rocky inclusions	“Hook-and-line” design in red paint	Worn ext. cream slip
Fig. 6.7.6	32823	KNA	Z	204	Z2a	HMGPW Jar	2.5YR 6/6 Light Red	2.5YR 6/6 Light Red	Black	Overfired, fine to med. Vegetal temper, single large argillaceous inclusion	Scallop and band design in black paint	Flaky red int. and ext. slip

Table 6.6: Descriptions of sherds illustrated in Figure 6.7, continued.

#	Reg.	Site	Area	Locus	Str.	Type	Ext.	Int.	Core	Fabric	Décor	Notes
Fig. 6.7.7	32834	KNA	Z	233	Z2b	HMGPW Jar(?)	7.4 YR 8/4 Pink	7.5 YR 7/4 Pink	Black	Hard-fired, fine vegetal temper, few fine calcareous inclusions	Three thin lines of black paint (10 YR 4/1 Dark Gray)	Slipped int. (2.5 Y 4/1 Dark Gray) and ext. (10 YR 7/4 Very Pale Brown)
Fig. 6.7.8	38569	KNA	Y	604/609	-	HMGPW Jar (body)	-	-	-	-	Chevron, crosshatch, and scallop motif in black paint	
Fig. 6.7.9	38564	KNA	Z	266	Z2(a)	HMGPW Ibrīq (spout)	7.5YR 7/4 Pink	7.5YR 8/4 Pink	Uneven, 7.5YR 8/4 Pink to black	Hard-fired, fine to med. Vegetal temper, some fine quartz and calcareous inclusions	Two wavy lines of brown paint	Tan ext. slip
Fig. 6.7.10	32815	KNA	Z	223	Z2(b)	HMGPW Jar(?) (body)	7.5 YR 7/4 Pink	5 YR 7/4 Pink	Black	Hard-fired, fine vegetal temper, few flinty and calcareous inclusions	HMGPW motif in black	Slipped ext. (10 R 6/6 Light Red)

Table 6.6: Descriptions of sherds illustrated in Figure 6.7, continued.

#	Reg.	Site	Area	Locus	Str.	Type	Ext.	Int.	Core	Fabric	Décor	Notes
Fig. 6.7.11	32806	KNA	Z	211	Z2a	HMGPW (body)	-	-	-	-	HMGPW motifs in black	Group of 5 HMGPW body sherds
Fig. 6.7.12	38309	KNA	Z	261	Z2(a)	HMGPW (body)	7.5YR 8/4 Pink	5YR 7/6 Reddish Yellow	Gray	Fine vegetal temper	Bichrome lines of brown-black and reddish-brown paint	
Fig. 6.7.13	38588	KNA	Z	250	Z2a	HMGPW (body)	2.5YR 7/4 Light Reddish Brown	Black	Uneven, black to buff	Hard-fired, fine vegetal temper, fine calcareous inclusions	Three lines of black paint	Slipped ext. in pinkish red
Fig. 6.7.14	39169	KNA	Z	Surface	-	HMGPW (body)	10R 6/6 Light Red	Black	Uneven, black to 10YR 8/4 Very Pale Brown	Overfired, fine vegetal temper, some fine calcareous inclusions, few black inclusions	Three lines of black paint	Slipped ext. (10 R 6/6 Light Red)

Table 6.6: Descriptions of sherds illustrated in Figure 6.7, continued.

#	Reg.	Site	Area	Locus	Str.	Type	Ext.	Int.	Core	Fabric	Décor	Notes
Fig. 6.7.15	39170	KNA	Z	Surface	-	HMGPW (body)	10R 6/8 Light Red	Black	Uneven, black to 10YR 8/4 Very Pale Brown	Overfired, fine to med. vegetal temper, some fine calcareous inclusions	Three lines of black paint	Slipped ext. (10R 6/8 Light Red)
Fig. 6.7.16	38594	KNA	A	Surface	-	HMGPW (body)	5YR 8/4 Pink	7.5YR 8/4 Pink	Black-gray	Hard-fired, fine to med. vegetal temper, some calcareous inclusions	Reddish-brown crosshatch motif	

b) Deep Bowls

Example: KNA, Area D, L. 404. R. 38299. (Fig. 6.7.2)

Discussion: R. 38299 is most likely the rim of a deep bowl, although little of the rim is preserved, and the proposed stance is not entirely certain. It is tempered with vegetal material, poorly sorted calcareous inclusions and sand, with some very fine mica flecks visible. The exterior is covered with a crust of salt, but does not seem to be painted. The top of the rim is decorated with a loosely executed line of purple-brown paint, and the interior has drips of paint in the same color. This is perhaps an intentional design, as on a jug from Phase D (Ottoman) found at Ṣūbā/Belmont Castle (Grey 2000: 98, Fig. 6.5.104), but these are clearly part of a larger motif of lines and linear series of dots, while the dots on R. 38299 are not, and seem simply to be drips.

c) Basins

Example: KNA, Survey Building 5315, Surface Collection. R. 38283. (Fig. 6.7.3)

Discussion: This is the squared rim of a basin or another large open form. The interior is decorated with a loosely executed crosshatch band and another design below this that has been mostly broken off, both executed in dark brown paint. The rim is decorated with a zigzag pattern in dark brown paint. The looser quality of the design may hint at a Late Islamic period date for this example (see Walker 2009a: 44), which is broadly in line with the emergence of the "free-style" motif in Phase 50 (14^{th}-early 15^{th} century AD) at Tall Abū Ṣarbūṭ (LaGro 2010: 57). Certain other surface collected sherds at KNA (see below) should probably also be dated similarly.

Closed Forms

a) Straight-necked Bulbous Jugs

Examples: KNA, Area Z, Stratum Z2(a). B. 40199. Complete Vessel. (Fig. 6.8)

KNA, Area Z, Surface Collection. R. 38274.

Parallels: Petra, Wādī Farasa East: unstratified (Schmid 2004b: 184, Fig. 43, see also Fig. 44; more recent discussion can be found in Schmid 2012: 84, 94, Fig. 24; Sinibaldi 2009b: 460, 457, Fig. 14); al-Shawbak: 13th-14th century AD? (Sinibaldi 2007: 71, Fig. 48; Sinibaldi 2009a)

Discussion: B. 40199 is a complete vessel, found as part of a group of three complete vessels in KNA, Area Z, L. 235, a Stratum Z2(a) locus. It is an HMGPW jug, painted in black over an orange-red slip. On the neck are alternating bands of solid, crosshatched and lozenge designs, while the body has curving bands of zigzag and crosshatch designs that form triangular spaces around and opposite the handle. Below these bands is a six-pointed star. The handle is painted with a zigzag design. A relatively complete sherd of the same type of vessel (R. 38274), including a complete handle, was surface collected prior to the Area Z excavations.

As noted above, the form of this jug is paralleled by a partial jug found at Wādī Farasa East in Petra (Schmid 2004b: 184, Fig. 43), although the shoulder of the jug from Wādī Farasa East is rounder, and the decorative motifs slightly different. Notably, the design on the Wādī Farasa East jug is executed in red, rather than black, paint (Sinibaldi 2009b: 460). Sinibaldi (2009b: 460) notes, "Parallels in Jordan for the jug from Wādī Farasa are unknown." Despite the differences noted above, B. 40199 should likely now be seen as a parallel for this vessel. Another vessel recovered from the same cistern context at Wādī Farasa East (Schmid 2004b: 184, Fig. 44) is a slightly closer parallel for the body decorative motif on B. 40199, but the decoration on its neck is very different. A somewhat similar jug with a filter, but again with different decorative motifs, was also found at al-Shawbak and dated to the Middle Islamic IIb-c (Sinibaldi 2009a).

Figure 6.8: Photograph of complete HMGPW jug, B. 40199. (Photograph: Leah Trujillo, courtesy UC San Diego LCAL.)

b) Flared-rim Jugs

Example: KNA, Area Z, Stratum Z2(a). B. 40198. Complete Vessel. (Fig. 6.9)

Discussion: This is the second of the two HMGPW jugs found as part of a group of three complete vessels in KNA, Area Z, L. 235, a Stratum Z2(a) locus (the other is B. 40199, discussed above). This vessel is larger than B. 40199, but it cannot be discussed in the same level of detail, as it is much more poorly preserved. The body is very worn, and few decorative elements can be identified: a band of a zigzag design below the shoulder and, above this, what appears to be a crosshatched band, both executed in black paint on a red slip. Other partial designs can be seen, but not identified. The rim is quite damaged, as this vessel was found with the third vessel in this group, a wheel-made juglet (B. 40197; see Section 6.1.2), inserted into it as a stopper (Fig. 6.10).

Example: KNA, Area Z, Stratum Z2. R. 38575. (Fig. 6.7.4)

Discussion: This is a small rim sherd from a narrow, flared-rim jug. The exterior and interior are covered with a brown slip, and the exterior is decorated with a somewhat loosely executed linear design in dark reddish-brown paint.

Example: KNA, Building 5313, Surface Collection. R. 41217.

Discussion: This is a heavily worn sherd of a flared-rim jug. The exterior is decorated with a crosshatch design executed in black paint, as well as a band of solid black below the rim. The interior of the rim is decorated with a hollow scalloped motif. Traces of red slip are visible on the interior.

Figure 6.9: Complete HMGPW flared-rim jug, B. 40198. (Photograph: Leah Trujillo, courtesy UC San Diego LCAL.)

Figure 6.10: Group of complete vessels (B. 40197-40199) in situ, showing wheel-made jug (B. 40197) inserted into HMGPW jug (B. 40198) as a stopper. (Photograph: Thomas E. Levy, courtesy UC San Diego LCAL.)

b-1) Flared-rim Jugs with Filter

Example: KNA, Building 5313, Surface Collection. R. 41219.

Discussion: R. 41219 preserves the rim and neck of a red-slipped jug with a band of "X" shapes in boxes and a triangular crosshatch design in black paint. Only the edge of the filter is preserved.

c) Flared-rim Jar

Examples: KNA, Area X, L. 136. R. 41226. (Fig. 6.11)

KNA, Area X, L. 137. R. 41205. (Fig. 6.7.5)

Parallels: Gharandal: "Early Handmade Painted Ware," 11^{th}-12^{th} centuries AD(?), similar "line and hook" motif, but a much smaller and finer vessel (Walmsley and Grey 2001: 156, Fig.

10.6); al-Wuʻayra: Phase I or II, early 12th century AD, a jug, but similar "line and hook" motif (Tonghini and Vanni Desideri 2001: 712, Fig. 7.a)

Discussion: R. 41226 consists of three non-connecting body and base sherds of a large red-painted jar, while R. 41205 is a large sherd of the rim and shoulder of the same vessel. The vessel has a tan/cream slip and is painted in red, and overall is very worn. Just below the rim, a red "line and hook" motif is preserved. While other painted motifs can be identified on R. 41205, they cannot be made out due to the sherd's preservation. Triangular, linear, and hook motifs are also visible on R. 41226, but again cannot easily be made out as the sherds are quite worn. Parallels are not common, but it does seem possible that this is a relatively early type, perhaps dating to the Middle Islamic Ib-c, particularly given the state of erosion of the examples from Area X.

Figure 6.11: Connecting body sherds of HMGPW jar (R. 41226) from Area X, showing red-painted "early" style of decoration.

d) Bulbous Jugs or Jars

Examples: KNA, Area A, L. 003. R. 32807.

KNA, Area A, L. 001. R. 32810.

e) Everted-rim Jars

Example: KNA, Building 5313, Surface Collection. R. 41207.

Discussion: This is a heavily worn sherd, and although traces of black paint are visible on the interior of the rim, it is not possible to make out any motif. Traces of red slip are visible on the exterior.

f) Various Jugs or Jars

Example: KNA, Area Z, Stratum Z2a. R. 32823. (Fig. 6.7.6)

Discussion: R. 32823 is the rim of a flared-rim jug or jar, although little of the actual rim is preserved. The sherd is red-slipped on the interior and exterior. The exterior decoration consists of a scalloped band below the rim, below which are three solid bands of alternating width. Below this is a band probably containing a crosshatch design, though it is poorly preserved. The motif is monochromatic, executed in black paint. Traces of black paint are preserved near the rim on the interior. This probably would have been a circular dab of paint ca. 1 cm in diameter, common on these vessels.

Example: KNA, Area Z, Stratum Z2a. R. 32836.

Discussion: R. 32836 is made up of eight non-connecting sherds of the same HMGPW vessel, a jug or jar decorated with crosshatch, diamond lozenge, and checkerboard motifs in black paint. It is difficult to determine the exact form of the vessel based on the preserved sherds, but the preserved handle attachment indicates a squared handle, as on the Straight-necked Bulbous Juglet type discussed above.

Example: KNA, Area Z, Stratum Z2b. R. 38590 (neck sherd, no rim).

Discussion: This sherd is from the neck of an HMGPW jug (or perhaps a jar). It is decorated with a crosshatch motif between two horizontal lines, executed in brown paint on a tan slip.

Example: KNA, Area Z, Stratum Z2b. R. 32834. (Fig. 6.7.7)

Discussion: This is a small sherd preserving only a small portion of a squared rim. The overall shape and decoration suggest a closed vessel, likely a jug or perhaps a jar. It is decorated on the exterior with two thin, horizontal bands of dark brown paint over a tan slip. The motif below this seems to be a crosshatch design, but is poorly preserved. Traces of brown paint are visible on the interior, but no motif can be made out.

Example: KNA, Area Y, L. 604 and L. 609. R. 38569. (Fig. 6.7.8)

Discussion: R. 38569 consists of five connecting body sherds of a jar or jug. Its slip (self-slip?) has been fired unevenly, ranging from orange to cream. It is monochrome painted in black, although this has faded to brown in places. The design is a scalloped band, and underneath this a wide band alternating between a wide herringbone pattern and a diamond-lozenge pattern.

Example: KNA, Building 5313, Surface Collection. R. 41206.

Discussion: This is a small, heavily worn sherd of a jug or jar rim. Traces of purplish-brown paint are visible on the top of the rim and the exterior of the vessel.

g) Abārīq *(Spouted Water Jugs)*

Discussion: HMGPW *abārīq* are relatively common in the Middle Islamic period. Examples have been found at Tall Abū Ṣarbūṭ (LaGro 2010: 82, 84, 85, Fig. 13), in Middle Islamic IIa and IIb levels at Tall Ḥisbān (Walker 2012a: 560, Fig. 4.17.6-7, 570, Fig. 4.20.1), in Ayyūbid through Ottoman contexts at Ṣūbā/Belmont Castle (Grey 2000: 98, Fig. 6.5.107-109), from the Mamlūk cistern at Khirbat Fāris (McQuitty, et al. 1997: 211, Fig. 14.13, 218, Fig. 19.30), and from an unstratified context at al-Karak (Milwright 2008a: 351, Catalogue Page 4.12-13), among others.

Example: KNA, Area Z, Stratum Z2(a). R. 38564 (spout). (Fig. 6.7.9)

Parallels: Khirbat Fāris: Mamlūk (McQuitty, et al. 1997: 218, Fig. 19.30)

Discussion: R. 38564 is a partial, or perhaps just short, spout of an HMGPW *ibrīq*. It is painted in a zigzag pattern in brown paint, although this design is worn. Although the form is not rare, there do not seem to be published parallels for this design on a spout. The parallel cited above from Khirbat Fāris is, however, a fairly close formal parallel.

Varia

a) Incomplete rim with red linear decor

Examples: KNA, Area Z, Stratum Z2(a). R. 38308, R. 38310, R. 38311 (all non-connecting sherds of the same rim).

Discussion: Only the top of the rim is preserved on these sherds, making it difficult to determine the vessel form, although a closed form seems likely. These sherds have a black core with pinkish-brown margins and a pinkish self-slip. Traces of a linear design in red paint are visible on the top of the rim, as well as dots of red paint on the interior. It is not possible, given their preservation, to determine if these should actually be categorized as Linear Red-Painted Ware (LRPW), but the fabric is fairly typical of HMGPW.

b) Handle with zigzag decor

Example: KNA, Area Z, Stratum Z2. R. 38578.

Discussion: A fairly common motif, and one found on more complete vessels at KNA, for example, B. 40199, the complete vessel discussed above.

c) Handle attachment with black crosshatch and linear decor

Example: KNA, Area Z, Stratum Z2(b). R. 32815. (Fig. 6.7.10)

Discussion: R. 32815 preserved a handle attachment and part of the body of the vessel. A crosshatch and linear motif is executed in black paint over a red slip. The orientation of the original vessel is difficult to determine. One possibility is that this is the neck of a jug, but the shape of the handle attachment and the way in which the painted crosshatch decor continues onto the handle makes this unlikely. Instead, this seems to be a body sherd of a large jar or jug.

d) Bichrome reddish-brown and dark brown or black body sherds

Examples: KNA, Area Z, Stratum Z2a. R. 32806. (Fig. 6.7.11)

KNA, Area Z, Stratum Z2(a). R. 38309. (Fig. 6.7.12)

e) Monochrome brown-painted body sherds with square lozenge and dot decor

Example: KNA, Area Z, Stratum Z2(a). R. 38561.

f) Monochrome black-painted body sherds with linear decor

Examples: KNA, Area Z, Stratum Z2a. R. 38588. (Fig. 6.7.13)

KNA, Area Z, Surface Collection. R. 39169. (Fig. 6.7.14)

KNA, Area Z, Surface Collection. R. 39170. (Fig. 6.7.15)

Example: KNA, Area Z, Stratum Z2a. R. 32817.

Discussion: This is a body sherd with a linear design executed in black paint over a cream slip. Possible crosshatch and scallop motifs are also present, but are too worn to identify. The sherd is overfired to the point of being metallic and discolored, suggesting possible fire damage, which likely has affected the colors discussed here.

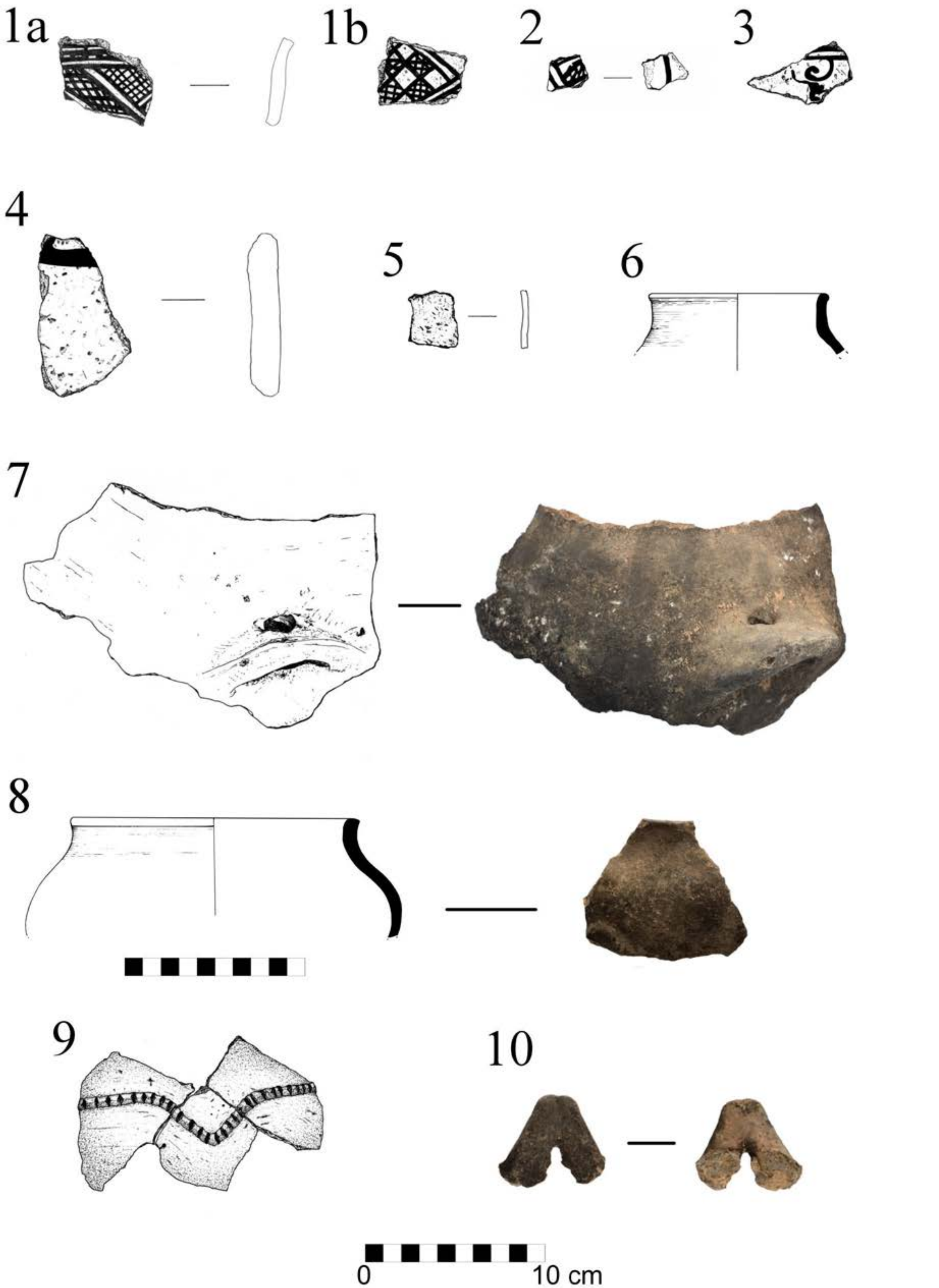

Figure 6.12: HMGPW (1-5), IHMW jar (6), and IHMW cooking pot (7-10) sherds from KNA. (Illustrations: Donna Walker.)

Table 6.7: Descriptions of sherds illustrated in Figure 6.12.

#	Reg.	Site	Area	Locus	Str.	Type	Ext.	Int.	Core	Fabric	Décor	Notes
Fig. 6.12.1a-b	38612	KNA	D	Surface	-	HMGPW (body)	5YR 6/8 Reddish Yellow	Uneven, 10YR 6/3 Pale Brown to 10YR 5/2 Grayish Brown	Black	Hard-fired, fine to med. Vegetal temper, common quartz sand, common fine black inclusions, one visible argillaceous inclusion	Crosshatch HMGPW motif in black paint	Slipped int. (patchy, 5YR 5/8 Yellowish Red) and ext. (5YR 6/8 Reddish Yellow)
Fig. 6.12.2	32835	KNA	Z	233	Z2b	HMGPW (body)	5YR 6/4 Light Reddish Brown	Black	Black	Overfired, fine vegetal temper, some fine calcareous temper	Fragmentary linear and crosshatch motif in black paint	Red-orange ext. slip
Fig. 6.12.3	38579	KNA	Z	Surface	-	HMGPW (body)	7.5YR 7/4 Pink	Black	Black	Overfired, fine to med. vegetal temper, some unevenly-distributed fine quartz sand, common fine to med. black inclusions	“Hook-and-line” design in purplish-brown paint	Slipped ext. (10R 6/8 Light Red)

Table 6.7: Descriptions of sherds illustrated in Figure 6.12, continued.

#	Reg.	Site	Area	Locus	Str.	Type	Ext.	Int.	Core	Fabric	Décor	Notes
Fig. 6.12.4	38280	KNA	Building 5311	Surface	-	HMGPW (body)	2.5YR 6/8 Light Red	5YR 4/2 Dark Reddish Gray	Uneven, GLEY1 7/N Light Gray to black	Fairly coarse, overfired, med. vegetal temper, some large mineral voids	Broad line of brown paint	Red-orange ext. slip, burnished on ext.
Fig. 6.12.5	32814	KNA	A	Surface	-	HMGPW (body)	Uneven, 5YR 7/6 Reddish Yellow to 5YR 4/6 Yellowish Red	Black	Black	Overfired, fine to med. vegetal temper, fine to med. calcareous temper	Heavily-worn design in dark brown paint	Décor not illustrated due to poor preservation; slipped ext. (5YR 7/6 Reddish Yellow to 5YR 4/6 Yellowish Red)
Fig. 6.12.6	38284	KNA	Building 5315	Surface	-	IHMW Jar	5YR 7/6 Reddish Yellow	5YR 7/6 Reddish Yellow	Black	Relatively fine, hard-fired, med. quartz sand temper, few vegetal voids	Possible traces of black paint, but uncertain	

Table 6.7: Descriptions of sherds illustrated in Figure 6.12, continued.

#	Reg.	Site	Area	Locus	Str.	Type	Ext.	Int.	Core	Fabric	Décor	Notes
Fig. 6.12.7	38305	KNA	Z	293	Z2b	IHMW Cooking	5YR 7/6 Reddish Yellow	7.5YR 7/6 Reddish Yellow	7.5YR 6/4 Light Brown	Poorly-levigated sandy temper, common fine to med. calcareous inclusions	-	Ext. smoothed, ext. soot-blackened
Fig. 6.12.8	38273	KNA	Z	223	Z2(b)	IHMW Cooking	Soot-blackened	2.5YR 7/6 Light Red	Black	Fine to med. sand temper, some fine vegetal voids, some med. to large calcareous inclusions	Ext. applied “nicked cordon”	
Fig. 6.12.9	38598	KNA	Z	223	Z2(b)	IHMW Cooking (body)	Soot-blackened	2.5YR 7/6 Light Red	Black	Fine to med. sand temper, some fine vegetal voids, some med. to large calcareous inclusions	Ext. applied “nicked cordon”	

Table 6.7: Descriptions of sherds illustrated in Figure 6.12, continued.

#	Reg.	Site	Area	Locus	Str.	Type	Ext.	Int.	Core	Fabric	Décor	Notes
Fig. 6.12.10	N/A	KNA	Z	223	Z2(b)	IHMW Cooking (handle)	Soot-blackened	2.5YR 7/6 Light Red	Black-gray	Fine to med. sand temper, some fine vegetal voids, some fine calcareous inclusions	-	Handle of vessel to which R. 38273 and 38598 belong

g) Monochrome black, brown, or red-painted body sherds with crosshatch decor

Examples: KNA, Area A, Surface Collection. R. 38594. (Fig. 6.7.16)

KNA, Area D, Surface Collection. R. 38612. (Fig. 6.12.1a-b)

KNA, Area X, Surface Collection. R. 41225.

KNA, Area Z, Stratum Z2b. R. 32835. (Fig. 6.12.2)

KNA, Area Z, Stratum Z2b. R. 38582.

h) Monochrome reddish-brown-painted body sherds with "line and hook" decor

Example: KNA, Area Z, Surface Collection. R. 38579. (Fig. 6.12.3)

i) Monochrome red-painted body sherds with "free-style" or LRPW decor

Example: KNA, Area Z, Stratum Z2a. R. 38306.

j) Thickly-potted red-slipped body sherds with monochrome brown "free style" decor

Examples: KNA, Building 5311, Surface Collection. R. 38279, R. 38280. (Fig. 6.12.4)

Discussion: These are thickly-potted HMGPW body sherds. The fabric is overfired, with frequent small to medium vegetal voids and occasional small calcareous and quartz inclusions. They are slipped on the interior and, when present, exterior in red-orange and painted in thick "free style" (see LaGro 2010: 64-65) designs in brownish-black paint. This motif first appears in Phase 50 (14^{th}-early 15^{th} century AD) at Tall Abū Ṣarbūṭ (LaGro 2010: 57), and suggests perhaps a Late Islamic period date for these sherds at KNA (but see above, under Open Forms, for a discussion of earlier evidence from Tall Ḥisbān).

k) Monochrome black or dark brown painted body sherds, red slip, worn decor

Examples: KNA, Area A, Surface Collection. R. 32814. (Fig. 6.12.5)

KNA, Area Z, Stratum Z2(a). R. 38560.

Unpainted Islamic Hand-made Wares (IHMW)

Unpainted IHMW made up 93% of the hand-made assemblage from the 2002 survey, and 65% of the entire ceramic assemblage (Jones, et al. 2012: 82). It is somewhat surprising, therefore, that they make up only 27% of the excavated assemblage, and only 6% of the diagnostic sherds. There are several possible explanations for this, including misidentification of worn HMGPW sherds as unpainted IHMW in the survey assemblage, but it seems most likely that at least some of the survey assemblage belongs to a late phase contemporary with Strata X-1 and/or Z-1 (se Sections 4.1.3 and 4.1.5). Loci belonging to these phases were few and quite ephemeral, and the phase may in fact primarily be represented by surface artifacts and architectural modifications. Unpainted IHMW is represented in the excavated assemblage, but is clearly a smaller component of the Middle Islamic IIa ceramic assemblage at the site than previously thought.

Closed Forms

a) Red-slipped IHMW jar or jug with flared rim

Example: KNA, Area Z, Stratum Z2a. R. 38589.

Parallels: al-Wuʻayra: Phase IA, early Crusader (Brown 1987: 281, Fig. 8.7)

Discussion: R. 38589 is the rim of a jar or jug in a thin, fairly hard-fired fabric, with a flaking red slip. Given its state of preservation, it is not clear whether this vessel is unpainted IHMW, or an example of HMGPW from which the paint has flaked off. The parallel from al-

Wuʻayra, identified by Brown (1987: 280) as a bowl, is not an exact formal parallel, but the ware description is quite similar.

Example: KNA, Area Z, Stratum Z2b. R. 38585.

Discussion: This is a sherd of a vessel with a reddish-brown slip and slightly flaring rim. The rim is, unfortunately, not preserved well enough to stance, and the vessel form is not entirely certain, though it is quite likely to be a jar.

b) Unslipped flared-rim IHMW jar

Examples: KNA, Survey Building 5315. R. 38282, R. 38284. (Fig. 6.12.6)

Discussion: R. 38282 and R. 38284 are sherds of an unslipped IHMW jar tempered with poorly-sorted quartz sand, argillaceous inclusions, and vegetal material. They may be two non-connecting sherds of the same vessel, as rim shape, color, and even inclusions can often vary across a single hand-made vessel. The fabric is relatively fine, but as with the tongue handle surface collected from Building 5313 (see below), the quartz tempered fabric has parallels in likely Late Islamic hand-made vessels from sites in northern Wādī al-Jāriya (Jones, et al. 2012: 75), and it is possible that this type should be dated to the Late Islamic period.

c) Club-rim IHMW jar

Example: KNA, Building 5313, Surface Collection. R. 41214.

d) Cream-slipped IHMW jar or jug

Example: KNA, Area Y, L. 603. R. 44795.

Discussion: R. 44795 consists of a flat base and five non-connecting body sherds of an IHMW jar or jug. This vessel is made of a very friable fabric, firing red at its exterior margins with a black core and unevenly fired cream slip.

e) Small, fine IHMW jar

Example: KNA, Area Z, Stratum Z2. R. 38584.

Discussion: A somewhat unique piece, R. 38584 preserves a small segment of a squared rim and a strap handle. The fabric is fine for IHMW, and differs from much of the IHMW at KNA in its firing. Its fabric contains many fine argillaceous/iron oxide and calcareous inclusions, and is fired to a light pink, with a uniform gray core. In many ways the firing is more typical of wheel- and mold-made sherds found at KNA.

Varia

a) Tongue Handle

Example: KNA, Building 5313, Surface Collection. R. 41212.

Discussion: Cooking pots with tongue handles have a long life in southern Jordan. The earliest examples seem to come from Khirbat al-Mu‘allaq, where they have been found in a context radiocarbon dated to "AD 785-1015" (Lindner 1999: 480, 481, Fig. 5A). Similar vessels have been dated to the early Ottoman period at Khirbat al-Nawāfla (‘Amr, et al. 2000: 253, Fig. 26.1-2). The poorly sorted quartz temper of R. 41212 has parallels in likely Late Islamic hand-made vessels from sites in northern Wādī al-Jāriya (Jones, et al. 2012: 75), and it is possible that this sherd is related to later use of KNA, particularly as it was surface collected.

b) Peaked-rim vessel

Example: KNA, Area Z, Stratum Z2(a). R. 38583.

Discussion: This is a sherd of a squared rim, turning upwards at one end. Because the rim is broken here, it is difficult to determine the original shape, but it seems that the rim is raised to a peak. A similar peaked rim is found at Tall Abū Ghūrdān in Phase K, dating probably to the Middle Islamic IIb (Franken and Kalsbeek 1975: 201, Fig. 74.20; on the dating, see Sauer 1976: 94). A peaked rim with a thumb impression was also found on an Ottoman period cooking bowl at Yoqne'am (Avissar 2005: 67, Fig. 2.20.8).

Uncertain Types

a) Hand-made Basin with Applied Rope Decoration

Dating: Uncertain, perhaps 12th-13th century AD

Example: KNA, Area Z, Surface Collection, R. 38566

Parallels: 'Ammān Citadel: "Ayyubid or early Mamluk" (Northedge 1992b: 147, Fig. 152.6); Yoqne'am: Type 33 Bowl, Crusader-Mamlūk (Avissar 1996: 130, Fig. XIII.86.10)

Discussion: This type is represented by a single body sherd surface collected from KNA Area Z. The fabric is not typical of Middle-Late Islamic period hand-made ceramics and, as such, the parallels cited above are suspect. The firing is somewhat similar to the Wheel-made Baggy Jar type, discussed above (Section 6.1.2), but in a much coarser fabric with poorly sorted inclusions. Several wheel-made basins from al-Karak were found in Milwright's (2008a: 283, 342) Fabric 19, which is similar in both firing and inclusions to the fabric of R. 38566. Given the proximity of KNA to Khirbat al-Nuḥās, and considering R. 38566 was surface collected, the fabric may also suggest a date in the Iron Age. Similar decorative motifs are known in the Iron Age, e.g. at Dhībān (Tushingham 1972: 125, Fig. 2.58), though I have not found parallels in southern Jordan.

Hand-made Cooking Wares

General Paralles: *PCAMPI* Type II.2.2 “Handmade Cooking Pots” (Avissar and Stern 2005: 94-95)

a) Hand-made Globular Cooking Pot with Pierced Low Horseshoe Handle

Dating: Late 11th(?)-early 13th century AD[210]

Example: KNA, Area Z, Stratum Z2b. R. 38305. (Fig. 6.12.7)

Parallels: ‘Ammān Citadel: 11th century destruction (Northedge 1992b: Fig. 151.2); Jerusalem, Old City, Street of the Tannery: Stratum I, late 12th-early 13th century AD (Lavi 2014: Fig. 9.9)[211]; Kafr Kanna: pre-Phase I, pre-Mamlūk (Barbé and Shapiro 2012: 63*, Fig. 3.7)[212]; Neta‘: Mamlūk? (Abadi-Reiss 2017: Fig. 26.14); Petra, Wādī Farasa: Tomb 7, 11th-13th century AD, similar handles, but not pierced (Sinibaldi 2009b: 458, Fig. 18); Tall Abū Ṣarbūṭ: “Handle 2” (LaGro 2002: 121-122, 349, Fig. 5.7); al-Wu‘ayra: Phase III, mid- to late 12th century AD, but finer ware and a larger handle, more similar to contemporary wheel-made cooking pots (Vannini and Tonghini 1997: 380, Fig. 16); northern Levant: al-Rāfiqa/al-Raqqa: 12th-13th century AD (Milwright 2005: 205, Fig. 6.11)

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[210] This type is easily distinguishable from the high-handled (*PCAMPI* Type II.2.2.2; Avissar and Stern 2005: 94-95) and “elephant-ear” handled (see Walker 1999: 221; Walker 2012a: 562) cooking pots characteristic of the Mamlūk and Ottoman periods. As with many Islamic hand-made wares, however, similar features can be present on vessels of quite different age. Crowfoot (1932: Pl. III, Fig. 10), for example, published a 20th century cooking pot from al-Jīb with handles somewhat similar to the type described here, although angled higher, as in the later, Mamlūk type (see also a nearly identical 20th century example from Sinjil in Frierman 1975: 49-50, Fig. 87), and a low handle from the late Ottoman period was found at al-Qubāb (Ein Gedy 2006: 62*, Fig. 8.3). Both of these can be distinguished on technical and decorative grounds from the earlier type discussed here, but the degree to which this represents continuity or evolving tastes remains an open question.

[211] Lavi (2014: Figs. 5-8) identified three Stratum I subphases, all of which seem, on the basis of the published ceramics, to date to the Middle Islamic Ic-IIa, or late 12th-early 13th century AD. Two lamps were found in Stratum I and dated to the ‘Abbāsid and Fāṭimid periods (Lavi 2014: Fig. 9.13-14), but from the illustrations would fit better in the late 12th-early 13th century Slipper Lamp with High Tongue Handle group (see Section 6.1.4). The HMGPW vessels that Lavi (2014: Fig. 9.10-11) dates to the mid-13th-mid-14th century AD would, likewise, not be out of place in a late 12th-early 13th century assemblage.

[212] Barbé and Shapiro (2012: 63*) cite as parallels only the later, high-handled and “elephant ear” handle types, which are not close parallels for the Kafr Kanna handle.

Discussion: R. 38305 preserves much of the globular body of a hand-made cooking pot, with a thick pierced horseshoe handle. Unfortunately, no fragments of the rim were preserved, though a small preserved portion of the neck indicates an out-turned rim. The handle is an upturned, short horseshoe handle with a hole pierced through it at its attachment to the body.

This handle form seems to be a predecessor of the later upturned horizontal strap handles, which date to the Middle Islamic IIb-Late Islamic Ia (e.g. Avissar and Stern 2005: 95, Fig. 40.4), though it is not as common as this later type. The Cooking Pot with Pierced Low Horseshoe Handle seems to come into use around the mid-11th century AD, as an example was found in the Stratum III destruction level at the ʿAmmān Citadel, which has been tentatively attributed to the earthquake of 1068 AD, but Northedge notes that this assemblage also has 12th century parallels, and that the destruction may have occurred as late as the earthquake of 1202 (Northedge 1992a: 160-161; Northedge 1992b: Fig. 151.2; on the earthquakes, see Ambraseys, et al. 1994: 30-31, 38-39). Most of the parallels are later, and this type of handle seems to have been most popular during the late 12th and early 13th centuries, or the Middle Islamic Ic-IIa. This handle type seems to have been replaced by the typical Mamlūk types in the mid-13th century. While the example from Netaʿ (Abadi-Reiss 2017: Fig. 26.14) has been dated to the Mamlūk period, it is important to note that this is from an unstratified cistern context and has been dated stylistically. At Tall Ḥisbān, the typically Mamlūk "elephant ear" handled cooking pot is present already in Stratum 3A, dating to the Middle Islamic IIb (Walker 2012a: 562, 563, Fig. 4.18.3), although the Low Horseshoe Handle type is not present in the published assemblage from Ḥisbān at all. Nonetheless, at present there is no convincing evidence for use of this type after the mid-13th century AD.

b) Hand-made Globular Cooking Pot with "Nicked Cordon" and Triangular "Cat's Ear" Handle

Dating: 12^{th}-16^{th} centuries AD?

Examples: KNA, Area Z, Stratum Z2(b). R. 38273 (Fig. 6.12.8), R. 38272, R. 38598 (Fig. 6.12.9) (various non-connecting sherds of the same vessel).

KNA, Area Z, Surface Collection. R. 38567.

Parallels: al-Karak: similar, but not identical, handle (Milwright 2008a: 349, Catalogue Page 2.4); Khirbat al-Nawāfla: early Ottoman, handles solid, but a similar shape ('Amr, et al. 2000: 253, Fig. 26.1); al-Rujūm: similar, but not identical, handle (MacDonald 1992: 238, Pl. 33.n); Tall Abū Ghūrdān: similar, but not identical, handle, Phase L, early Mamlūk? (Franken and Kalsbeek 1975: 201, Fig. 74.26; for dating, see Sauer 1976: 94); Tall Abū Ṣarbūṭ: similar nicked cordon (LaGro 2002: 355, Fig. 5.28); Ṭawāḥīn al-Sukkar, Ghawr al-Ṣāfī: Early Handmade Plain Ware, late 10^{th}-11^{th}/12^{th} century AD, similar nicked cordon but solid handles, described as "transitional" between early and late styles (Grey, et al. 2017: 132-133, Fig. 6.9.77); Yoqne'am: similar nicked cordon, Mamlūk (Avissar 1996: 138, Fig. XIII.98.8)

Discussion: There are few exact parallels for this type. The closest example is the early Ottoman vessel from Khirbat al-Nawāfla ('Amr, et al. 2000: 253, Fig. 26.1), which may suggest that this type is rather long-lived, as suggested by Sinibaldi and Tuttle (2011: 445) for related types. The rim form is similar to a 12^{th} century cooking pot from al-Wu'ayra (Brown 1987: 283, Fig. 9.17), but is fairly common on Middle Islamic period cooking pots. Likewise, "nicked cordon" designs appear on hand-made cooking pots as early as the 11^{th} century AD (Walmsley and Grey 2001: 158), but as noted above may continue into the Late Islamic period. These perhaps derive from similar decorations on Early and Middle Islamic period wheel-made cooking pots (e.g. Northedge 1992b: Fig. 137.5, Fig. 141.2). The handles may be diagnostic, but no particularly close parallels have been found for the triangular "cat's ear" handles on the KNA example (Fig. 6.12.10).

6.1.4. Lamps and Other Wares

The key source for lamps of the Early and Middle Islamic period is Hadad's (1997; 1999; 2002b) typology of the oil lamps from Bet She'an. The *PCAMPI* typology (Avissar and Stern 2005) for the Middle Islamic period largely follows Hadad's, and I prefer their descriptive names to Hadad's numerical types here. It is worth noting that the chronology first identified by Tushingham (1985: 151) for the mold-made lamps from the Armenian Garden is essentially the same proposed by Hadad for these types. For the Late Antique and Early Islamic periods, da Costa's (2012) work on the lamps from Dayr 'Ayn 'Abāṭā is a critical source for southern Jordan. While she also discusses lamps of the Middle Islamic period, there are some issues with her analysis of this material, discussed below. For the Late Antique period, Grawehr's (2006) typology of the lamps from al-Zanṭūr is now a standard source, as well, but only a single lamp of this period was found at KNA.

Late Antique Lamps

South Jordan type

Dating: 4th-6th centuries AD (perhaps continuing as late as 8th)

General Discussion: This is a particularly common lamp type in southern Jordan. Da Costa (2012: 242) argues that it "is clearly the dominant lamp in eastern *Palaestina Tertia* in the Byzantine period." Given its ubiquity, it is interesting that only one example (R. 8212) was found during the ELRAP excavations at Khirbat Faynān, though as noted in "Parallels," below, the type was well represented in the WFLS assemblage.

Example: KNA, Area A, Surface Collection, R. 31018.

Parallels: Dayr ‘Ayn ‘Abāṭā: 5th-8th century (da Costa 2012: 239-249, and see extensive comparanda there); Khirbat al-Nawāfla: Late Roman/Early Byzantine (‘Amr, et al. 2000: 244, Fig. 14.2); Khirbat Fāris: Stage 4a, Byzantine, but from 8th century context? (McQuitty and Falkner 1993: 55, Fig. 18.14, 59); Naḥal ‘Amram, Mine 35/29: (Avner, et al. 2018: 164, Fig. 10.19); Petra, al-Katūta: “Slipper Lamps”, context dated to “first three quarters of the sixth century AD” (Khairy 2013: 64-67, 70, Fig. 10); Petra, al-Zanṭūr: Typ L, “Peträisch-Frühbyzantinische Lampen” (Grawehr 2006: 340-349, and see extensive list of published comparanda there); WFLS, various sites: “Carinated Oval Lamps” (Bailey 2007: 813-816, esp. no. 71); Yotvata: 4th-5th century AD (Davies and Magness 2015: 99, Fig. 2.10.1-2)

Discussion: A single sherd from an early (4th-5th century AD) South Jordan type lamp was surface collected from the slope south of the square prior to excavation in KNA Area A. This sherd was one of only a handful of pre-Islamic sherds collected at KNA, and as such should be interpreted with caution. No clear evidence of pre-12th century occupation was found in any of the five ELRAP excavation areas at KNA, and it is likely that the presence of this sherd indicates use of the area around Wādī Ghuwayb al-‘Aṭshāna — probably travel along Nuqayb al-Asaymir — unrelated to the structural remains at KNA, perhaps related to the Classical occupation at Khirbat al-Ghuwayba, though this latter is not yet well understood (Ben-Yosef, et al. 2013: 281-283; Ben-Yosef, et al. 2014b: 842).

Early Islamic Period Lamps

‘Abbāsid Standard type

Dating: late 8th-11th centuries AD

General Parallels: Bet She'an: Hadad Type 37/Preliminary Type 1 (Hadad 1999: 203-213; Hadad 2002b: 95-105); Dayr ʻAyn ʻAbāṭā: "Abbasid Standard" type, "usually ninth-tenth centuries AD, or 750–eleventh century AD" (da Costa 2012: 258-264; see also Type 28 in da Costa 2001: 246-247); Jerusalem: Magness Oil Lamp Form 5, "Channel-Nozzle Oil Lamp," 8th-10th century (Magness 1993: 258-259); Jerusalem, Piscina Probatica/Pool of Bethesda: (Arndt 1987); al-Ramla (South): Type 2 (Tal and Taxel 2008: 154). Range outside of southern Levant indicated by examples found at: al-Ḥawrā' (ca. 250 km northwest of Medīna): 8th-9th century AD (al-Ghabbân 2011: 393-394, 432, Fig. 170); al-Fusṭāṭ: Type A, 9th-10th century AD (Kubiak 1970: 3-6); Baʻlabakk/Baʻalbek (Sarre 1925: 131, 132, Abb. 59)

General Discussion: This is a very common Early Islamic II (and Middle Islamic Ia) oil lamp type, and it is distributed widely across the southern Levant and farther. It is very uncommon in Faynān, and known only from a single possible example, discussed below. Because of these factors, only a partial list of parallels is given above.

Example: KNA, Area Z, Stratum Z2(a), R. 32822. (Fig. 6.13.1)

Parallels: ʻAmmān Citadel: Early ʻAbbāsid (Northedge 1992c: Fig. 149.1); Bet She'an: Hadad Type 37, "Zoomorphic Decoration" group (Hadad 2002b: 101, No. 452); Dayr ʻAyn ʻAbāṭā: "Abbasid Standard" type, Arndt Group IV (da Costa 2012: 262, No. 112, 289, Fig. 566); Jabal Hārūn: 8th-9th century AD (Gerber 2008: 291, Fig. 2.2b, 303, Fig. 7.163a, 311, 322); Jerusalem, Piscina Probatica/Pool of Bethesda: Arndt Group IV (Arndt 1987: Fig. 5.84); Yoqneʻam: Lamp Type 2, 8th-10th century (Avissar 1996: 194, Fig. XV.23); see, however, a similar lamp from al-Karak: Phase 1b, Mamlūk (Brown 1989: 299, 301, Fig. 6.25; compare to revised contextual data in Brown 2013a: 319, Table 1), another from WFLS, Site WF886: South Jordan type, Late Byzantine (Bailey 2007: 816, Fig. 78), and various South Jordan lamps from

Petra, al-Zanṭūr with comparable features (e.g. Grawehr 2006: 345, Figs. 502-503, 346-347, Figs. 510, 513).

Discussion: Two adjoining sherds of this lamp were found in KNA Area Z, L. 209, along with a probably Middle Islamic period slipper lamp shoulder (R. 32820) and a sherd of black under turquoise stonepaste ware (R. 32821). It has not been possible to find parallels for some of the specific stylistic features of this example — e.g. the double row of dots — but the ʻAbbāsid Standard group encompasses a wide range of decoration. Given that this lamp is somewhat unique, and potentially earlier than the other pottery in this locus, it is also possible that it belongs to a similarly decorated earlier type. A Late Roman-Early Byzantine lamp with decoration similar to the ʻAbbāsid Standard type was found at Tall Ḥisbān, for example (Gerber 2012: 483, Fig. 3.97.27, 488-489). A somewhat similar lamp fragment, perhaps belonging to a Middle Islamic period slipper lamp, was also found in Phase 1b (Mamlūk) at al-Karak (Brown 1989: 299, 301, Fig. 6.25). Given the ubiquity of the ʻAbbāsid Standard type in the southern Levant, however, it is likely that the KNA lamp belongs to this type, despite its relative rarity in Faynān (but note also a similar South Jordan type lamp surface collected from WFLS Site 886; Bailey 2007: 816, Fig. 78). It is unclear at this stage whether the presence of this lamp suggests some continuity of the type into the late Middle Islamic I. The type is found in Stratum 5B (Middle Islamic I) at Tall Ḥisbān (Walker 2012a: 542, Fig. 4.13.33-35, 545-546), but the published pottery from this stratum seems to contain many residual Early Islamic II sherds from Stratum 5A (Walker 2012a: 546), and it is not entirely clear that much of this material should be assigned even to the 11th century, much less the 12th. Beyond this, it is also possible that this could suggest an earlier Middle Islamic I foundation for KNA, though this possibility is unlikely.

As with R. 31018, this may indicate use of Nuqayb al-Asaymir for transportation during the 8th-11th centuries, or may simply indicate use of an old but still functional lamp.

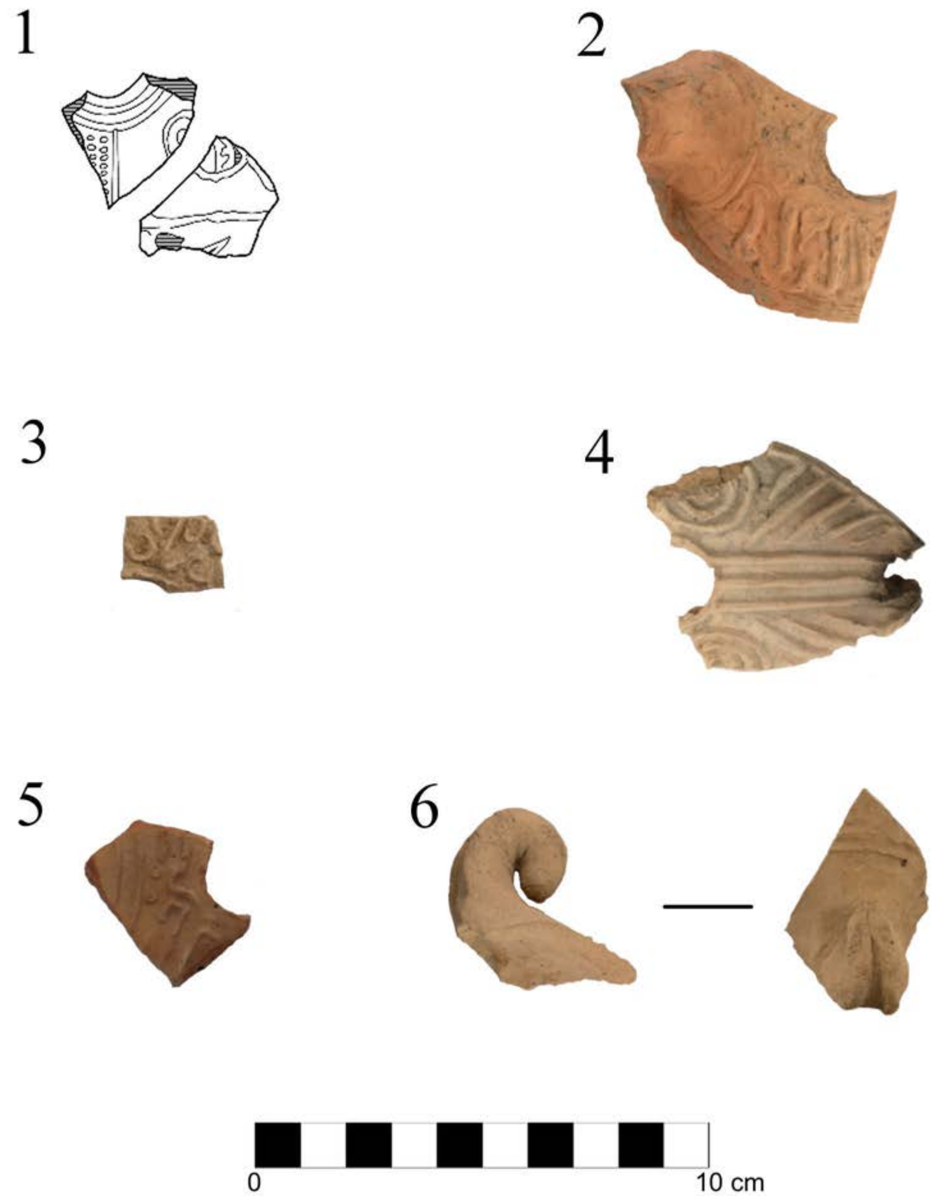

Figure 6.13: Lamps from KNA. (Illustration 1: Sarah Hudson, Photographs: Leah Trujillo, courtesy UC San Diego LCAL, except 5, by IWNJ.)

Table 6.8: Descriptions of sherds illustrated in Figure 6.13.

#	Reg.	Site	Area	Locus	Str.	Type	Ext.	Int.	Core	Fabric	Notes
Fig. 6.13.1	32822	KNA	Z	209	Z2(a)	Abbāsid Standard Lamp	Uneven, 7.5YR 8/4 Pink	2.5YR 7/6 Light Red	Gray	Sandy temper, some fine calcareous inclusions	
Fig. 6.13.2	38593	KNA	Z	230	Z2a	High-Tongue Handle Lamp	2.5YR 7/8 Light Red	2.5YR 7/6 Light Red	7.5YR 8/4 Pink	Slightly friable, well-levigated fine quartz and calcareous sand temper	Partial inscription reads "*al-dā'im*" (see text)
Fig. 6.13.3	33005	KNA	Z	268	Z2(a)	High-Tongue Handle Lamp	10YR 8/4 Very Pale Brown	10YR 8/4 Very Pale Brown	2.5YR 7/6 Light Red	Few visible inclusions	
Fig. 6.13.4	38604	KNA	Z	276	Z2(a)	High-Tongue Handle Lamp	5YR 8/4 Pink	7.5YR 8/4 Pink	5YR 7/4 Pink	Friable, fine sandy temper, some fine calcareous inclusions	
Fig. 6.13.5	41215	KNA	Building 5313	Surface	-	High-Tongue Handle Lamp	7.5YR 8/4 Pink	5YR 6/8 Reddish Yellow	10R 7/6 Light Red	Well-fired, fine sandy temper, some fine calcareous inclusions	
Fig. 6.13.6	38592	KNA	Z	Surface	-	High-Tongue Handle Lamp	10YR 7/4 Very Pale Brown	7.5YR 7/6 Reddish Yellow	7.5YR 7/6 Reddish Yellow	Sandy temper, some fine calcareous inclusions	

Middle Islamic Period Lamps

Slipper Lamp with High Tongue Handle

Dating: Late 12th-early 13th century AD

General Parallels: *PCAMPI* Type III.2.1.1 “Lamps with a High Tongue Handle” (Ayyūbid; Avissar and Stern 2005: 126-127); Acre, Knights’ Hotel: 12th-13th century AD (Stern 2012: vol 1: 37, vol. 2: 32, Pl. 4.11.10); Bet She’an: Hadad Type 44/Preliminary Type 8 (Hadad 1999; Hadad 2002b: 109-112); Dhībān: probably of this group, but mixed context (Tushingham 1972: 84, 144, Fig. 7.48); Jerusalem, Armenian Garden: “Slipper form with high looping handle” (Tushingham 1985: 147); Jerusalem, Jaffa Gate: “high tongue handle,” incorrectly dated as Mamlūk (Rapuano 2014: 506, Fig. 2.17); al-Karak: (Milwright 2008a: 295-296, 363, Catalogue Page 16.16(?), 16.19)

General Discussion: Da Costa (2012: 264) — and Sinibaldi (2013a), whose discussion largely follows da Costa’s — refers to this type, slightly archaically, as the “Emmaus type lamp,” referring to the publication of a number of similar lamps from excavations in the 1940s and earlier at al-Qubayba, a candidate for the location of Biblical Emmaus (Bagatti 1947: 139-144, 140, Fig. 34, Pl. 28).[213] Da Costa (2012: 264) questions Hadad’s (1999; 2002b) division of the tongue-handled slipper lamps into two types on the basis of handle form, arguing that the “division does not seem to hold at other sites, such as the Armenian Garden in Jerusalem.” This is, however, not the case, as Tushingham (1985: 151), on the basis of material from the Armenian Garden, suggested this exact distinction, noting,

> The evidence from the Garden excavations is that these slipper lamps with high looping handles began at least as early as Ayyubid times, but then with arabesque or calligraphic ornament. The Mamluke type is a development in which the

[213] Incidentally, the “Muslim Oil Lamps from Emmaus” discussed by Gichon and Linden (1984) are from a different site and are Middle-Late Islamic period pinched saucer lamps, and not the slipper lamps described here.

> handle actually touches or is pressed against the body; the ornament now tends to be geometric.

The distinction, as Avissar and Stern (2005: 126-128) describe, does seem to hold at most sites.

The distribution of these lamps, as noted by Avissar and Stern (2005: 128), seems to be primarily within "areas under Ayyubid rule." As noted above, however, similar lamps were also found in Crusader contexts at Acre. Stern (2012: vol. 1: 37) argues that because these lamps "do not bear Arabic inscriptions and are decorated only with floral designs, it can be assumed that the makers and users of this type of lamp in Acre were Franks and not Muslims." This is not necessarily the case, as Stern also cites parallels for this type at Ṣūbā/Belmont Castle in a post-Crusader context (Knowles 2000a: 121, 118, Fig. 8.1.25-26), but it does seem to be the case that the type is much rarer at Crusader sites, and that lamps with Arabic inscriptions do not seem to occur at these sites at all.

While it is tempting to refer to the earlier type as "Ayyūbid" and the later as "early Mamlūk," this is not exactly the case. A Bent Handle Lamp was found in Stratum 4 (Ayyūbid/Middle Islamic IIa) at Tall Ḥisbān (Walker 2012a: 560, Fig. 4.17.14), for example. The later type, then, seems to emerge in the later Ayyūbid period, and there is very likely some overlap between the two types. The emergence of the Bent Handle type is likely an indicator of the transition between the Middle Islamic IIa and IIb, which does not seem to map exactly to the Ayyūbid-Mamlūk transition (see Section 6.6). It is worth noting that one of the lamps from the 2002 KNA survey assemblage, initially identified as a High Tongue Handle Lamp, is more likely an early example of a Bent Handle Lamp (Jones, et al. 2012b: 86, Fig. 18.1).

a) Naskhī *inscription with vegetal motif*

Example: KNA, Area Z, Stratum Z2a. R. 38593. (Fig. 6.13.2)

Parallels: Abū Ghūsh: (de Vaux and Steve 1950: 144, Fig. 33.1); ‘Atlīt/Château Pèlerin: surface collection (Johns 1932: Pl. LIII, Fig. 2.9); Jerusalem, Mt. Zion: (Bagatti 1970: 241, Fig. 12.6); al-Qubayba/Emmaus: (Bagatti 1947: 140, Fig. 34.8); Ṭawāḥīn al-Sukkar, Ghawr al-Ṣāfī: vegetal motif uncertain (Grey, et al. 2017: 128, Fig. 6.7.64)

Discussion: R. 38593 preserves the rear right side of a lamp bearing an Arabic inscription with a vegetal fill. The handle attachment is preserved, but little of the handle is present. The parallels cited above are not exact parallels for the mold used for R. 38593, but the overall design is very close. Only the last word of the inscription is preserved on R. 38593, “*al-dā’im*” (Ar. “forever”). This is part of the typical inscription found on these lamps, “*al-‘izz al-dā’im wa al-iqbāl li-ṣāḥibuhu*,”[214] “prosperity forever” and “happiness to its owners” (Hadad 2002b: 109; see also Johns 1932: 129, Fig. 29).

b) Vegetal motif

Example: KNA, Area Z, Stratum Z2(a). R. 33005. (Fig. 6.13.3)

Parallels: Acre, Knights’ Hotel: 12th-13th century AD (Stern 2012: vol 1: 37, vol. 2: 32, Pl. 4.11.10); Bet She’an, Youth Hostel: identified as a worn pseudo-inscription, but the motif is similar, late 12th-early 13th century AD (Nagorsky 2014: 20*, Fig. 11.1); Dayr ‘Ayn ‘Abāṭā: worn, but likely a vegetal motif (da Costa 2012: 264, 291, Fig. 583); Jerusalem, Armenian Garden: two lamp fragments and a mold, Ayyūbid (Tushingham 1985: 389, Fig. 37.6, 390, Fig. 38.17, 391, Fig. 39.24); Jerusalem, Knights’ Palace Hotel: Stratum IIIc, late 12th-early 13th century AD (Weksler-Bdolah and Avissar 2015: 88*, Fig. 18.10); al-Qubayba/Emmaus: (Bagatti

[214] De Vaux and Steve (1950: 145) instead give “*al-iqbāl li-ṣāḥibuhu — al-sa‘d al-dā’im*,” which they translate as “Prospérité à son possesseur — Bonheur éternel.” This is, however, incorrect, and “al-‘izz” should be read in place of “al-sa‘d” on the lamps from Abū Ghūsh, as well.

1947: 140, Fig. 34.8); Ṣūbā/Belmont Castle: Phase C, "Ayyubid and Mamluk" (Knowles 2000a: 121, 118, Fig. 8.1.25-26)

Discussion: R. 33009 is a small sherd of a High Tongue Handled Lamp with a thin vegetal motif. The parallels cited above are not exact, but bear similar motifs. Given the size of R. 33009, it is worth noting that spiraling vegetal motifs can also be found on lamps bearing inscriptions, as at al-Qubayba/Emmaus (Bagatti 1947: 140, Fig. 34.8), Abū Ghūsh (de Vaux and Steve 1950: 144, Fig. 33.1), and KNA (R. 38593).

c) Spiral motif

Examples: KNA, Area Z, Stratum Z2(a), R. 38604 (Fig. 6.13.4), R. 38586 (very small sherd of same fabric)

Parallels: Dhrā al-Khān: 13th-15th century, but somewhat dubious, as sherd is quite fragmentary (Kareem 2000: 191, Fig. 52.2); Jerusalem, Knights' Palace Hotel: Stratum IIIc, late 12th-early 13th century (Weksler-Bdolah and Avissar 2015: 94*, Fig. 22.3-4); Jerusalem, Sites R.I and R.II: Ayyūbid (Prag 2017: 149, Fig. 3.25.5-10, 157, Fig. 3.29.8-9); Ṣūbā/Belmont Castle: "Oval Lamps with Pointed Nozzle: Miscellaneous/Unidentified," Phase B, Crusader (Knowles 2000a: 122, 123, Fig. 8.2.36)

Discussion: This is a fairly rare type, of which only a single example was found at KNA (both registered sherds are likely from the same lamp). Until recently, there were few close parallels for the design. One was found at Ṣūbā/Belmont Castle in Phase B — Crusader, roughly corresponding to Middle Islamic Ib (on the Belmont Castle phasing, see Will 2000: 43). The others were found in the Knights' Palace Hotel excavations in Jerusalem, in Stratum IIIc, dated late 12th-early 13th century, and here they are considered part of the Slipper Lamp with High

Tongue Handle group (Weksler-Bdolah and Avissar 2015: 146). As handles are not preserved on either the KNA or Ṣūbā examples, and only one partially preserved handle was found on a Jerusalem, Knights' Palace Hotel example (where its attachment is somewhat atypical), it was, during analysis, not entirely certain that this type should be categorized as a High Tongue Handle lamp, particularly because of the unique, friable fabric of the KNA example (see Table 6.8). Eight lamps of this type, six with complete handles, were recently published from Kenyon's Jerusalem excavations, however, all from Ayyūbid contexts (Prag 2017: 149, Fig. 3.25.5-10, 157, Fig. 3.29.8-9). The shape of the handle and context confirms that this is a subtype of the High Tongue Handle lamp (some are described as "low curved tongue" handles, but are nonetheless of the earlier "high" shape; Prag 2017: 148, Nos. 8-9). Rather than a difference in date, the fabric of R. 38604 and R. 38586 may suggest a different production center from the other slipper lamps found at KNA, but further petrographic study would be necessary to confirm this. As a note, the much more common "spiral galaxy" (see Wightman 1989: 72) or "whorl" (see Sussman 2007: 70) motif, common on Slipper Lamps with Bent Handles, is a later development, and not a close parallel.

d) Simple pseudo-inscription

Example: KNA, Building 5313, Surface Collection. R. 41215. (Fig. 6.13.5)

Parallels: Bet She'an: (Hadad 2002b: 111, Fig. 481)

Discussion: This is a fragment of the rear portion of a lamp bearing a simple pseudo-inscription. It is paralleled almost exactly by a pseudo-inscription on a High Tongue-Handled (Type 44) lamp at Bet She'an.

e) Inscription or pseudo-inscription

Example: KNA, Area Z, Surface Collection. R. 38568.

Discussion: R. 38568 is a small sherd from the front portion of a lamp. The three parallel lines marking the "channel" area of the lamp are visible. Decoration is only identifiable on one side of the channel area, and consists of either a pseudo-inscription or an embellished *alif* or *lām*. It is also possible that this is an embellished version of the "vertical herringbone pattern set between two lines whose ends are rounded" (Hadad 2002b: 112), which Hadad identified with the later Bent Handle lamp, but this motif is generally not embellished in the manner seen on this sherd.

f) Handles

Example: KNA, Area Z, Surface Collection, R. 38592. (Fig. 6.13.6)

Parallels: Bet She'an: (Hadad 2002b: 111, No. 481); Bet She'an, Youth Hostel: (Nagorsky 2014: 20*, Fig. 11.1, 21*); Dhībān: "Ayyubid Destruction" (Tushingham 1972: 144, Fig. 7.48); Ḥorbat Ma'on/Khirbat Maʻīn: Strata II-I, Middle Islamic (Nahshoni and Seriy 2014: 58*, Fig. 28.2); Jerusalem, Knights' Palace Hotel: Stratum IIIc, late 12th-early 13th century AD (Weksler-Bdolah and Avissar 2015: 88*, Fig. 18.10, 94*, Fig. 22.6); Khirbat Manṣūr al-ʻAqab/Ḥorvat ʻAqav: early Mamlūk? (Boas 2000a: 221, Pl. V.8)

Discussion: This is the only complete handle of a Slipper Lamp with High Tongue Handle found at KNA. The handle is folded over more than is usual for the type, but it is nonetheless distinguishable from the later Slipper Lamp with Bent Handle (Avissar and Stern 2005: 128) or Hadad Type 45 (Hadad 2002b: 112-114) lamp. The handles on the later lamps are bent forward, and many — though not all — touch the body of the lamp. On R. 38592, the handle is set back quite far from the decorative panel, and does not overlap it at all when viewed from above, which is typical of High Tongue Handle lamps (compare, e.g., Nos. 479 and 482 in Hadad 2002b: 111, 113).

g) No decoration preserved

Examples: KNA, Area Z, Stratum Z2(a). R. 42568 (undecorated shoulder and base sherd)

KNA, Area Z, Stratum Z2(a). R. 38559 (undecorated lower shoulder sherd)

KNA, Area Z, Stratum Z2(a). R. 32820 (undecorated lower shoulder sherd)

Mold-made varia

Example: KNA, Area Z, Stratum Z2a. R. 32824.

Discussion: R. 32824 is a poorly preserved sherd of a mold-made vessel. Given the nature of the KNA assemblage, it most likely belongs to a lamp, but other mold-made relief-decorated vessels were produced during the Middle Islamic period. The decoration is very worn, and because of this it is difficult to suggest parallels.

6.2. Ceramics from Khirbat Faynān

Unlike KNA, only a selection of the ceramics from the ELRAP excavations at Khirbat Faynān is presented here. Almost all diagnostic sherds from Areas 15 and 18 are presented. It is not feasible, however, to discuss all of the ceramics from the excavations in Area 16. In part, this is due to the scope and goals of this dissertation. The excavations in Area 16 produced a sequence of ceramics covering the Early Bronze Age to the Late Islamic period, with the majority of material dated between the 1st century BC and 3rd century AD. This early material is not presented here. Likewise, only a selection of the 4th and 5th century pottery is presented. I have focused on well-dated types, primarily the Late Roman Red Slip Wares (see Section

6.2.2.1), as these provide the clearest dates for key contexts in Area 16, notably those associated with the 363 AD earthquake destruction. The only Area 16 loci presented in their entirety are those clearly dating to the 6th century AD or later, particularly those associated with the probable late 6th century earthquake destruction in Terrace 2.

Parallels for the ceramics from Khirbat Faynān and those of Khirbat Ḥamrā Ifdān, discussed in the following section, Section 6.3, are more numerous than those for KNA. The Hayes (1972; 1980) typology for Late Roman Red Slip Wares is well established, and has seen considerable refinement, discussed briefly in Section 6.2.2.1. For the southern Levant specifically, Magness's (1993) *Jerusalem Ceramic Chronology*, while somewhat incomplete and in need of revision in places, remains an excellent source for the most common ceramics of the Byzantine and Early Islamic periods. In southern Jordan, a number of final reports have appeared, some quite recently, relevant to the discussion here. Of particular note are Gerber's (2008; 2016) final reports on the Byzantine and Early Islamic ceramics from Jabal Hārūn, the second volume of the al-Ḥumayma final reports series (Oleson and Schick 2014), and the final report of the excavations at Dayr ʿAyn ʿAbāṭā in Ghawr al-Ṣāfī (Politis 2012b). To this can be added several of the final reports from al-Zanṭūr in Petra (Fellman Brogli 1996; Grawehr 2006), the final report of the Petra Church excavations (Fiema, et al. 2001), the final report of the ceramics from ʿEn Boqeq on the western shore of the Dead Sea (Gichon 1993), and a large number of preliminary reports from the region. Likewise, numerous final and preliminary reports have appeared for nearby regions, including the Negev and central Jordan, which are relevant here. While gaps remain to be filled, particularly in terms of the Early Islamic period, many of the types identified at Khirbat Faynān are well known.

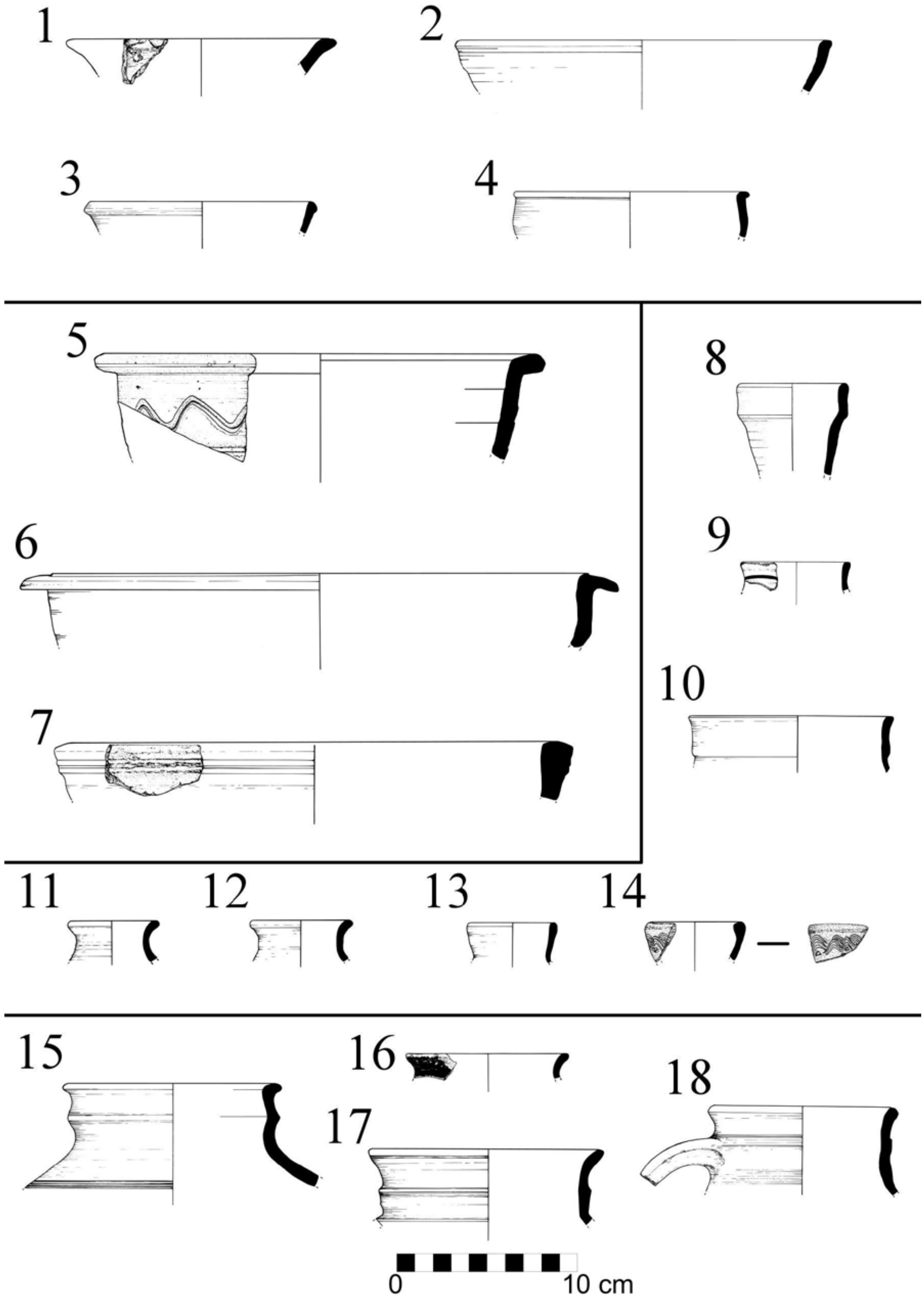

Figure 6.14: Wheel-made ceramics from Khirbat Faynān. 1-4: bowls, 5-7: basins, 8-14: jugs, 15-18: jars. (Illustrations: Donna Walker.)

Table 6.9: Descriptions of sherds illustrated in Figure 6.14.

#	Reg.	Site	Area	Locus	Str.	Type	Ext.	Int.	Core	Fabric	Surface Treatment	Notes
Fig. 6.14.1	31096	KF	18	6	Occ. 3	Splash-Glazed Bowl	-	-	Buff-cream	-	Worn glaze on interior, few drips over rim onto exterior	Glaze very worn; very small sherd, diameter uncertain
Fig. 6.14.2	31738	KF	18	6	Occ. 3	Fine Byzantine Ware Bowl	5YR 6/6 Reddish Yellow	5YR 6/6 Reddish Yellow	2.5YR 6/8 Light Red	Hard-fired, fine sandy temper, few calcareous flecks	Tan slip, faint bands of black paint on rim and body	
Fig. 6.14.3	31078	KF	18	9	Occ. 2	Fine Byzantine Ware Jug	5YR 8/4 Pink	5YR 8/4 Pink	5YR 7/4 Pink	Hard-fired, fine sandy temper, some fine black flecks few calcareous flecks	-	
Fig. 6.14.4	31637	KF	18	9	Occ. 2	WM Bowl	-	-	-	-	-	
Fig. 6.14.5	30917	KF	16	120	T3-2a	WM Basin	2.5YR 6/6 Light Red (fired gray in one spot)	2.5YR 7/6 Light Red	5YR 5/2 Reddish Gray	Hard-fired, fine to med. calcareous and black inclusions, some fine argillaceous inclusions, some med. mineral voids	Incised wavy line on body	

Table 6.9: Descriptions of sherds illustrated in Figure 6.14, continued.

#	Reg.	Site	Area	Locus	Str.	Type	Ext.	Int.	Core	Fabric	Surface Treatment	Notes
Fig. 6.14.6	31083	KF	18	20	Occ. 1	WM Basin	5YR 6/8 Reddish Yellow	5YR 7/6 Reddish Yellow	2.5YR 7/6 Light Red	Hard-fired, fine quartz and fine to med. calcareous sand temper, fine reddish inclusions, rare fine vegetal voids	Orange-tan ext. slip; comb incisions on body visible near break	
Fig. 6.14.7	8783	KF	16	1067	-	WM Basin	10R 6/6 Light Red	10R 6/8 Light Red	10R 6/6 Light Red	Hard-fired, fine to med. quartz sand temper	Slipped int. (7.5YR 8/3 Pink) and ext. (10YR 8/3 Very Pale Brown); two lines incised on rim	
Fig. 6.14.8	7910	KF	16	1045	-	WM Jug	-	-	-	-	Black slip int. and ext.	
Fig. 6.14.9	30892	KF	18	14	-	Coptic Painted Ware Jug	5YR 5/4 Reddish Brown	5YR 5/4 Reddish Brown	2.5YR 5/6 Red	Well-fired, common fine mica	Slipped int. and ext. (5YR 7/6 Reddish Yellow); band of red paint below rim (10R 5/6 Red)	

Table 6.9: Descriptions of sherds illustrated in Figure 6.14, continued.

#	Reg.	Site	Area	Locus	Str.	Type	Ext.	Int.	Core	Fabric	Surface Treatment	Notes
Fig. 6.14.10	30886	KF	18	18	Occ. 2	WM Jug	-	-	-	-	-	
Fig. 6.14.11	31077	KF	18	9	Occ. 2	WM Jug	-	-	-	-	Incised at rim	
Fig. 6.14.12	31684	KF	18	9	Occ. 2	WM Jug	-	-	-	-	-	
Fig. 6.14.13	31097	KF	18	13	Occ. 3	WM Jug	-	-	-	-	-	
Fig. 6.14.14	31856	KF	18	9	Occ. 2	WM Jug	10YR 3/1 Very Dark Gray	7.5YR 4/1 Dark Gray	5YR 7/4 Pink	Well-fired, common fine black inclusions, some fine calcareous flecks	Black int. and ext. slip; wavy comb incising around rim	
Fig. 6.14.15	30890	KF	18	14	-	WM Jar	-	-	-	-	Straight comb incising at shoulder; brownish fabric	

Table 6.9: Descriptions of sherds illustrated in Figure 6.14, continued.

#	Reg.	Site	Area	Locus	Str.	Type	Ext.	Int.	Core	Fabric	Surface Treatment	Notes
Fig. 6.14.16	31740	KF	18	6	Occ. 3	WM Jar/Jug	-	-	-	-	Tan int. slip, black ext. slip (or paint)	
Fig. 6.14.17	8358	KF	16	1045	-	WM Jar	-	-	-	-	-	
Fig. 6.14.18	30887	KF	18	14	-	WM Jar	-	-	-	-	White slip int. and ext.	

6.2.1. Glazed Wares

Splash-Glazed Cream Ware

Dating: late 8th-9th century AD

Example: Khirbat Faynān, Area 18, Occupation 3. R. 31096. (Fig. 6.14.1)

Parallels: Ayla/al-ʻAqaba: late 8th century, "Cream Splash ware" (Whitcomb 1991a: 53, 49, Fig. 2.a-h); Gharandal: 9th-11th century, not illustrated (Walmsley and Grey 2001: 153); Ṭabariyya/Tiberias: 800-950 AD, "Later Matt-Glazed Wares, Type 2" (Stacey 2004: 108-109, Fig. 5.19.9-13); Yoqneʻam: early ʻAbbāsid, "Common Glazed Bowls" (Avissar 1996: 75-78)

Discussion: At Ayla, Whitcomb (1991a: 53) suggested that this was an intermediate form between the earliest "Coptic" Glazed Wares found at Ayla, and the more common, later Ḥijāzī and Fayyūmī wares. He suggested that this was perhaps a creamware derivative of the "Coptic" Glazed Wares, and that a "South Syrian or Palestinian manufacture," probably in al-Ramla, was likely (Whitcomb 1991a: 53). Few scholars, however, have taken up his suggestion that this represents an intermediate type, with the exception of Avissar (1996: 75), who considers it "one of the earliest" glazed groups, though later than Coptic Glazed Ware. More recently, it seems that Tal and Taxel (2008: 128-129) treat this ware simply as a local imitation of "Coptic" Glazed Ware or collapse it into the slightly later "Polychrome Splash-glazed" group, while on the other Stacey (2004: 108) includes it in his "Late Matt-Glazed" group. At Gharandal, Walmsley and Grey (2001: 153) suggest a 9th-11th century date for a polychrome glazed sherd "on 'white' fabric." While the context of this sherd is not provided, it seems most likely to have come from provisional Level 4, dated "c. Late eighth/ninth to tenth centuries" (Walmsley, et al. 1999: 463, Table 1).

Based on fabric, the glazed base from WFLS Site WF475 identified as "?Abbasid Iraqi Splash ware" (Adams, et al. 2007: 809-810, no. 901) almost certainly belongs to this group, as well.

6.2.2. Wheel-made Wares

Fine Byzantine Ware (FBW)

Fine Byzantine Ware (FBW) refers to a variety of 6th-10th century AD forms, typically in a light brown to orange fabric, and commonly decorated with incisions, band burnishing, and, later, painted decoration. The term was coined by Gichon (1974) following his excavations at 'En Boqeq, and a typology established by Magness (1993: 193-201, 236-241) for the material from Jerusalem. Magness's typology forms the basis of the analysis presented below. As the ware is, in fact, more typical of the Early Islamic period than the Late Byzantine period, several scholars have pointed out that the name is somewhat misleading. Walmsley (2007a: 52-53; 2007b: 330) suggests referring to it instead as "Palestinian Fine Table Ware (PFTW)," but this name has not seen wide adoption. Cytryn-Silverman (2013: 107) notes that the term is "for good reason . . . now usually avoided in corpora of the Islamic period," but nonetheless refers to this group only as "what used to be called 'Fine Byzantine Wares.'" Despite this, FBW is still the most common designation for this group of ceramics, and I use the term here to avoid confusion.

Open Forms

Fine Byzantine Ware Bowls Form 2

Dating: mid-7th-10th century AD

General Parallels: Magness FBW Bowls Form 2 (Magness 1993: 198-201)

Example: KF, Area 18, Occupation 3. R. 31738. (Fig. 6.14.2)

Discussion: R. 31738 is the rim of a relatively large, flaring FBW bowl. It belongs to Magness's (1993: 198-201) FBW Form 2, most likely Form 2B. Although Form 2 can, as noted above, date as early as the mid-7th century, the faint bands of black paint on R. 31738 suggest a date in the 8th century or later (see Magness 1993: 193).

Closed Forms

Fine Byzantine Ware Jugs Form 1B

Dating: mid-6th-early 8th century AD

General Parallels: Magness FBW Jugs, Jars and Juglets Form 1B (Magness 1993: 237-239)

Example: KF, Area 18, Occupation 2 collapse. R. 31078. (Fig. 6.14.3)

Nabataean Painted Fine Ware (NPFW)

The chronology of 2nd century BC-4th century AD Nabataean Painted Fine Wares is well established, particularly due to Schmid's (2000) study of the fine wares from al-Zanṭūr in Petra. NPFW is very common at Khirbat Faynān, with a wide range of Schmid Dekorgruppe 2 and 3 vessels represented, and a full discussion of this type is beyond the scope of this dissertation. Here I present only the evidence for Schmid's Dekorgruppe 4, the latest NPFW phase.

NPFW Schmid Dekorgruppe 4

Dating: 4th-6th(?) century AD

General Parallels: Petra, Qaṣr al-Bint: late 4th-early 5th century AD (Renel 2013: 354, Fig. 7.1); Petra, al-Zanṭūr: Dekorgruppe 4, found in 363 AD earthquake destruction layer (Schmid 2000: 38, Abb. 98); al-Zurrāba: kilns, mid-6th century AD ('Amr 1991: 319, Fig. 6)

Examples: KF, Area 16, Stratum T3-2. R. 30592.

KF, Area 16, Stratum T3-3 collapse. R. 9166.

Parallels: Petra, al-Zanṭūr: 363 AD earthquake destruction layer (Schmid 2000: form close to Abb. 96, but decoration as Abb. 95)

Example: KF, Area 18, Occupation 2 collapse. R. 31858.

Parallels: Petra, al-Zanṭūr: 363 AD earthquake destruction layer (Schmid 2000: decoration as Abb. 95)

Discussion: The decoration of this example is similar to R. 30592, but the form is quite different. R. 31858 is a widely flaring bowl, perhaps influenced by African Red Slip forms (see Section 6.2.2.1).[215] Form 67, dating to the late 4th and 5th centuries AD (Hayes 1972: 112-116), seems to be a likely influence, in particular. Late Roman D Form 8, dating to the late 6th and early 7th centuries (Hayes 1972: 378-379; Hayes 1980: 528; Jackson, et al. 2012: 102-103, Figs. 13-14; Johnson 2008: 56-57), is also somewhat similar. It is, however, also quite rare, and would suggest a date that is perhaps too late for this type.

Other Open Forms

Bowls

Carinated Bowls with Bead or Cusp Rim

Dating: Roman, probably Early Roman

Example: KF, Area 15, Stratum 15-4. R. 31079.

Parallels: Khirbat al-Dharīḥ: Nabataean-Roman (Durand and Piraud-Fournet 2013: 429, Pl. 4.11); Petra Church: 2nd-3rd century AD, unslipped (Gerber 2001: 360, Fig. 1.23); WFLS, Site WF4: (Adams, et al. 2007: 784, Fig. A5.36.260, 786, Fig. A5.37.375)

Discussion: Although Roman types are generally not presented in this dissertation, this sherd is discussed because it is from Khirbat Faynān Area 15. As such, although only one

[215] A similar phenomenon has been observed in the 6th-7th century painted "Jarash Bowls" of northern Jordan, although these are more clearly imitations of later ARS forms (Watson 1989).

example is given here, the type is certainly present in the Area 16 assemblage, and is well represented in the WFLS assemblage (see Adams, et al. 2007: 785). In the Area 15 slag mound, it is certainly residual, as this type predates not only the beginnings of copper production in the slag mound, but also the construction of the Area 8 monastery.

Dating: Either 7th century or 2nd-3rd century AD

Example: KF, Area 18, Occupation 2 collapse. R. 31637. (Fig. 6.14.4)

Parallels: Ayla/al-ʻAqaba: Umayyad (Whitcomb 1989b: 179, Fig. 3.m); al-Ḥumayma: 2nd-3rd century AD (Oleson, et al. 2008: 338, Fig. 23.23); Petra Church: 2nd-3rd century AD (Gerber 2001: 360, Fig. 1.23)

Discussion: Given the Area 18 Occupation 2 collapse context of this sherd, a 7th century date is reasonable. The sherd may, however, be residual, given that the shape also has parallels in the 2nd-3rd century. The form is not an exact parallel for any of the vessels cited above, with its softer carination starting above the point where the earlier vessels generally do. Its fabric, likewise, differs from the Nabataean-Roman common wares typically found at Khirbat Faynān.

Basins

a) Magness "Arched-Rim" Basin Form 2

Dating: 6th-7th/early 8th century AD

General Parallels: Magness Arched-Rim Basin Form 2A (Magness 1993: 206-207)

Example: KF, Area 16, Stratum T3-2a. R. 30917. (Fig. 6.14.5)

Discussion: The flat, short rim of this example resembles some of the earlier (late 1st/early 2nd-3rd century AD) shelf-rim basins (Magness 1993: 202). The closest parallel Magness (1993: 206, Fig. 1) illustrates is from a particularly early example of this form, perhaps dating to the late 3rd/early 4th-5th century, which would agree with the proposed dating of Stratum T3-2a (see Sections 5.3.1 and 6.2.2.1).

Example: KF, Area 18, Occupation 1. R. 31083. (Fig. 6.14.6)

Parallels: Khirbat al-Ṣūyyāgh: Late Byzantine/Umayyad (Taxel 2009: 113, Fig. 3.5.5-6, 118, Fig. 3.9.1, 122, Fig. 3.13.2)

Discussion: This is a more typically 6th-8th century Arched-Rim Basin. As Magness (1993: 210-211) notes, in the later 8th through 10th centuries, Flat-Rim and especially Incurved-Rim Basins become the dominant form, replacing the Arched-Rim Basins.

b) Squared-rim Basin

Dating: 6th-7th centuries AD(?)

Example: KF, Area 16, Terrace 2, L. 1067. R. 8783. (Fig. 6.14.7)

Parallels: Ayla/al-ʻAqaba: similar, but not an exact parallel, Phase 5, 7th century AD (Damgaard and Jennings 2013: 388, Fig. 8.D2)

Discussion: Few parallels were found for this basin, but its context would suggest a date in the 6th-7th century AD. Based on the parallel at Ayla, a 7th century date could be suggested, but the rim of the KF example seems to be inspired by both the form and decoration of Phocaean Red Slip Ware (see Section 6.2.2.1), particularly Forms 3 and 10 (see Hayes 1972: 329-338, 343-346), which could suggest a 6th century date, as well.

Closed Forms

Jugs

a) Black-slipped Spouted(?) Jug

Dating: Byzantine-Early Islamic(?)

General Parallels: Petra, al-Zanṭūr: Form B5a, first appearing in Bauphase Spätrömisch I, 4th century AD, but most typical of Bauphase Spätrömisch II, probably 5th-6th century AD (see discussion of the dating of this phase in Section 8.2 of this dissertation; Fellman Brogli 1996: 232, 234, 237, Abb. 727); Ramat Hanadiv: similar, 7th century AD (Calderon 2000b: 144, Fig. 41, 145, Pl.XXIV.63-64); Tall Jāwā: Type J-1 Biconical and Globular Jugs, Early Islamic period (Daviau 2010: 228-232)

Example: KF, Area 16, Terrace 2, L. 1045. R. 7910. (Fig. 6.14.8)

Parallels: Petra, al-Zanṭūr: (Fellman Brogli 1996: 268, Abb. 836)

Discussion: The closest parallel for this type is al-Zanṭūr Form B5a, dating primarily to the 5th-6th century AD. The form may continue beyond this, however. A similar, although not exact, form is seen on 7th century strainer jugs from Ramat Hanadiv, and, as noted above, this type also has somewhat less close parallels in Tall Jāwā Type J-1, a group of Early Islamic period jugs. The fabric is similar to the illustrated example of Type J-1/a (Daviau 2010: 228, Fig. 8.9.4, 230), while the rim form resembles the illustrated example of Type J-1/b, although lacking that type's incised decor (Daviau 2010: 228, Fig. 8.9.5, 231-232). A 5th-6th century dating best fits the context of the sherd, a late 6th century earthquake wall collapse locus.

b) Coptic Painted Ware

Dating: Byzantine-Early Islamic

Example: KF, Area 18, L. 014 (cistern fill). R. 30892. (Fig. 6.14.9)

Discussion: This is a small sherd of an imported Coptic Painted Ware jug, juglet or jar. The fabric is highly micaceous, typical of Nile silt fabrics (see also the RBOA fabric, below), and the pink-orange slip and red paint are typical of Coptic Painted Ware. The sherd is small and fairly worn, making exact parallels difficult to find. In southern Jordan, they seem to appear in the Early Islamic I, although in relatively small quantities, e.g. an early 8th century example at al-Ḥumayma (‘Amr and Oleson 2013: 143, Fig. 5.59.1995.0227.01). While the form of R. 30892 is similar to the al-Ḥumayma example, the decor is somewhat different. The vessel from al-Ḥumayma has a painted line on the rim with curved lines painted below, where R. 30892 has a line painted ca. 6 mm below the rim. This could indicate a slightly earlier date, although Calderon (2000a: 192) suggests that there is little change in this type between the 4th and 8th centuries AD. Sherds of Coptic Painted Ware dating to the Late Byzantine period have been found elsewhere in the southern Levant, e.g. at Ashkelon (Johnson 2008: 95-98), Ḥorbat Ma‘on/Khirbat Ma‘īn (Nahshoni and Seriy 2014: 31*, Fig. 12.8-11) and Ramot Nof, near Be’er Sheva (Ustinova and Nahshoni 1994: 162, 165, Fig. 5.11).

c) Thin-walled brown jug

Dating: probably Byzantine

Example: KF, Area 18, Occupation 2. R. 30886. (Fig. 6.14.10)

Parallels: Nitl: not an exact parallel (Byzantine, Hamarneh 2006: 425, Fig. 1.1)

d) Small flaring jug or flask

Dating: Late Byzantine-Early Islamic

Examples: KF, Area 18, Occupation 2 collapse. R. 31077. (Fig. 6.14.11)

KF, Area 18, Occupation 2 collapse. R. 31684. (Fig. 6.14.12)

Parallels: ‘En Marzev: cup, Early Islamic (Porath 2016: 59*, Fig. 55.1); WFLS, Site WF876: similar, Classical-Early Islamic (Adams, et al. 2007: 777-778, Fig. A5.33.797)

Discussion: The example from ‘En Marzev is slightly larger, and identified as a cup, rather than a jar, but this seems to be the closest parallel for this type. Similar forms with larger diameters, e.g. at Jabal Hārūn (Gerber 2016: 158, Fig. 28.316) and Khirbat al-Ṣūyyāgh (Taxel 2009: 120, Fig. 3.11.8), date to the 6th-8th century, i.e. Late Byzantine-Early Islamic. The form is also similar to a unique vessel identified as a Fine Byzantine Ware amphora at Rā’s Abū Ma‘arūf/Pisgat Ze’ev East A, dated based on similarities to Magness FBW Jar Form 2B to the 6th-early 8th century AD (Rapuano 1999: 181, Fig. 8.114, 196, Table 1). The parallel at ‘En Marzev suggests that the later part of this range is more likely.

e) Small jug with slightly thickened rim

Dating: Late Byzantine-Early Islamic(?)

Example: KF, Area 18, Occupation 3. R. 31097. (Fig. 6.14.13)

Discussion: No exact parallels for this vessel have been found, but the fabric, form, and context suggest a Late Byzantine or Early Islamic period date.

f) Black-slipped jug/bottle with wavy incised decoration

Dating: 7th-8th century AD

Example: KF, Area 18, Occupation 2 collapse. R. 31856. (Fig. 6.14.14)

Parallels: Ḥorbat Ma‘on/Khirbat Ma‘īn: same form, but different fabric and not incised, Early Islamic, i.e. 8th(-early 9th?) century AD (Nahshoni and Seriy 2014: 46*, Fig.21.4); Jabal Hārūn: similar, mixed context, dated “probably transitional/Umayyad” (Gerber 2008: 306, Fig. 8.171), similar, Phase XIV, Early Islamic, but dated “transitional/Umayyad” (Gerber 2016: 148, Fig. 209)

Jars

a) Collared-neck jar with band combing

Dating: Byzantine-Early Islamic

Example: KF, Area 18, L. 014 (cistern fill). R. 30890. (Fig. 6.14.15)

Parallels: Khirbat al-Dharīḥ: similar, Byzantine-Umayyad (Durand and Piraud-Fournet 2013: 425, Pl. 3.DH 96 S2T nord 02.01); Mādabā: similar, but not a close parallel, 5th-6th century AD (Acconci and Gabrieli 1994: 432, Fig. 21.20), similar, 6th century AD (Harrison 1994: 436, Fig. 4.13)

Discussion: R. 30890 is a jar with a collared neck and band combing below the shoulder. While none of the parallels cited above is exact, the closest parallel for the form is the 6th century example from Mādabā, although that vessel is more elaborately decorated than the one from Khirbat Faynān. The parallels cited by Durand and Piraud-Fournet (2013: 424) are somewhat dubious, but they may be correct in suggesting that this is a collared LRA 5 variant. While the form is, again, not an exact parallel, a collared Egyptian or Palestinian LRA 5 with a similar rim was found in an early 8th century context in Beirūt (Reynolds 2003: 730, Fig. 2.3). The fabric and surface treatment are similar to the Combed Brown Ware found at Gharandal, which Walmsley and Grey (2001: 152) date as Terminal Byzantine-Early Islamic.

b) Flared-rim jar (or jug)

Dating: Early Islamic(?)

Example: KF, Area 18, Occupation 3. R. 31740. (Fig. 6.14.16)

Parallels: Ayla/al-ʻAqaba: Early Islamic II (Whitcomb 1988b: 215, Fig. 4.a, 4.e)

Discussion: The rim form of R. 31740 is fairly simple, and trying to date the form based on parallels is perhaps dubious. The form is, however, paralleled in a jar from the "Fāṭimid House"[216] at Ayla (Whitcomb 1988b: 215, Fig. 4.a). The surface treatment, a black slip (or coating of black paint) is also paralleled in the same assemblage on a jar with a different rim form (Whitcomb 1988b: 215, Fig. 4.e). Jars with outcurving necks and "simple rounded rims" are also found in the Early Islamic period assemblage at Jabal Hārūn, primarily in the "church/chapel area" (Gerber 2016: 137). Given the simplicity of the form, it is possible earlier parallels should be sought, as well.

c) Flaring, ledge-neck jar

Dating: Byzantine-Early Islamic

Example: KF, Area 16, Terrace 2, L. 1045. R. 8358. (Fig. 6.14.17)

Parallels: Jabal Hārūn: Phase XI, early/mid-7th-mid-8th century AD and Phase XIII, mid-8th-9th/10th century (Gerber 2016: 135, Fig. 6.82, 156, Fig. 26.285)

Example: KF, Area 18, L. 014 (cistern fill). R. 30887. (Fig. 6.14.18)

Parallels: None found for handled type, but see parallels for R. 8358 for rim form.

Discussion: While Gerber (2016: 181) dates this type to the 4th-7th century AD, she also notes that at Jabal Hārūn it appears "only from transitional/Early Islamic period onwards," which may be relevant to its dating at Khirbat Faynān. L. 1045 is directly above L. 1067, in which sherds of Negev Wheel-Made Lamps were found (see Section 6.2.4), suggesting a similar date to that at Jabal Hārūn.

[216] The phasing of this structure is somewhat complex. It seems to have been built in the late 8th-early 9th century, and the interior walls of the room these vessels came from built in the late 9th-early 10th century. While the building was used until at least the late 11th century, these vessels seem to date to the Early Islamic II. The dating of the building discussed in this note derives from Damgaard's (2013b: 94, Fig. 7) reanalysis of Whitcomb's excavations.

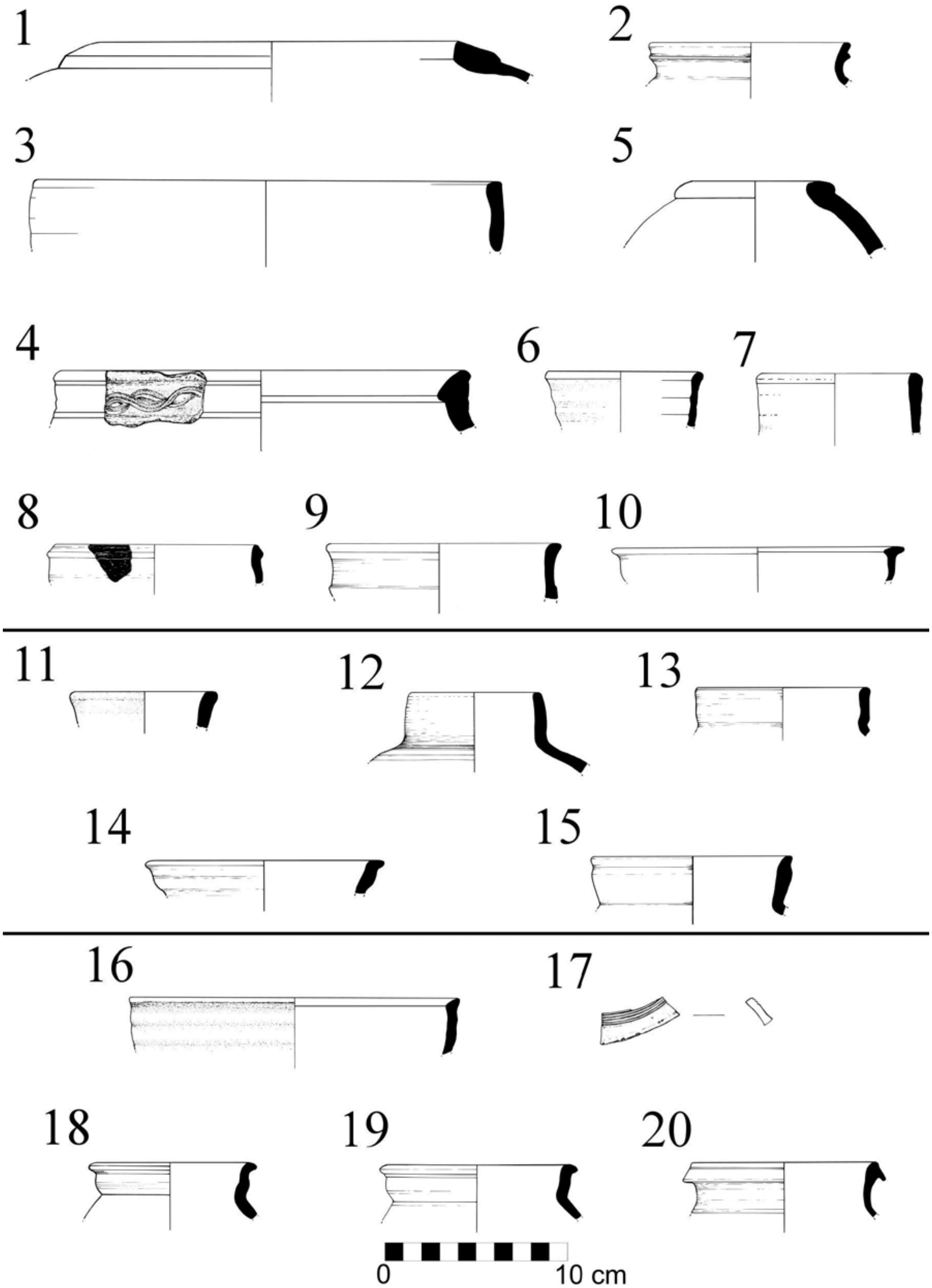

Figure 6.15: Wheel-made ceramics from Khirbat Faynān. 1-10: jars, 11-15: amphorae, 16-20: cooking wares. (Illustrations: Donna Walker.)

Table 6.10: Descriptions of sherds illustrated in Figure 6.15.

#	Reg.	Site	Area	Locus	Str.	Type	Ext.	Int.	Core	Fabric	Surface Treatment
Fig. 6.15.1	31860	KF	18	9	Occ. 2	Holemouth Jar	5YR 4/1 Dark Gray	5YR 4/1 Dark Gray	Uneven, 10R 5/6 Red to black	Hard-fired, fine quartz and calcareous sand temper, few med. argillaceous and mineral inclusions	Slipped int. and ext. (5YR 4/1 Dark Gray)
Fig. 6.15.2	31072	KF	15	17	15-3	WM Jar	-	-	-	-	-
Fig. 6.15.3	30842	KF	16	109	T3-1	WM Jar	2.5YR 6/6 Light Red with black blotches	5YR 6/4 Light Reddish Brown with many black blotches	2.5YR 5/4 Reddish Brown to black	Hard-fired, fine quartz and calcareous sand temper, some fine mineral voids	-
Fig. 6.15.4	8503	KF	16	1028	-	WM Jar	2.5YR 7/6 Light Red	2.5YR 7/8 Light Red	7.5YR 6/2 Pinkish Gray	Hard-fired, fine to med. quartz sand temper	Ext. slip (10YR 8/3 Very Pale Brown); two intersecting wavy lines incised on rim

Table 6.10: Descriptions of sherds illustrated in Figure 6.15, continued.

#	Reg.	Site	Area	Locus	Str.	Type	Ext.	Int.	Core	Fabric	Surface Treatment
Fig. 6.15.5	41169	KF	-	Surface	-	WM Jar	2.5Y 9.5/2 Very Pale Yellow	7.5YR 8/3 Pink	7.5YR 8/3 Pink	Fine quartz sand temper, few fine black and red inclusions	-
Fig. 6.15.6	30891	KF	18	14	-	WM Jar	White	White	Orange	-	White slipped int. and ext.
Fig. 6.15.7	30893	KF	18	14	-	WM Jar	Whie	White	Orange	-	White slipped int. and ext.
Fig. 6.15.8	31087	KF	18	3	Occ. 3	WM Jar/Cooking Pot	Black-gray	Black-gray	Pink-orange	-	Reduced black-gray slip
Fig. 6.15.9	32078	KF	18	0	-	WM Jar	White	White	-	-	White slipped int. and ext.
Fig. 6.15.10	8785	KF	16	1067	-	WM Jar	Black	Black	Orange	-	Reduced black slip
Fig. 6.15.11	32216	KF	18	14	-	LRA 1	-	-	-	-	-
Fig. 6.15.12	8812	KF	16	1043	-	LRA 5	-	-	-	-	-

Table 6.10: Descriptions of sherds illustrated in Figure 6.15, continued.

#	Reg.	Site	Area	Locus	Str.	Type	Ext.	Int.	Core	Fabric	Surface Treatment
Fig. 6.15.13	31593	KF	18	9	Occ. 2	LRA 5	7.5YR 5/3 Brown	5YR 6/6 Reddish Yellow	2.5YR 5/6 Red	Hard-fired, fine sand temper, fine to med. calcareous inclusions, common fine black inclusions	Brownish slip, fired tan on int. and brown on ext.
Fig. 6.15.14	31091	KF	18	8	Occ. 2	LRA 5	2.5YR 6/8 Light Red	2.5YR 6/8 Light Red	2.5YR 6/8 Light Red	Hard, evenly-fired, abundant fine quartz sand	-
Fig. 6.15.15	32163	KF	18	21	Occ. 2	LRA 5/RBOA	5YR 5/6 Red	5YR 5/6 Red	2.5Y 5/1 Gray	Hard-fired, silty fabric, common fine mica, few med. mineral voids, few fine vegetal voids	Traces of pinkish (2.5YR 7/3 Light Reddish Brown) slip
Fig. 6.15.16	8238	KF	16	1043	-	WM Casserole	Pink-tan	Pink-tan	-	-	-
Fig. 6.15.17	31743	KF	18	6	Occ. 3	WM Casserole Lid	Gray	Gray	Reddish	-	Straight comb-incised lines

Table 6.10: Descriptions of sherds illustrated in Figure 6.15, continued.

#	Reg.	Site	Area	Locus	Str.	Type	Ext.	Int.	Core	Fabric	Surface Treatment
Fig. 6.15.18	8822	KF	16	1043	-	WM Cooking Pot/Jar	Pink	Pink	-	Sandy fabric	-
Fig. 6.15.19	8791	KF	16	1067	-	WM Cooking Pot/Jar	Pink	Pink	-	Sandy fabric	-
Fig. 6.15.20	31859	KF	18	9	Occ. 2	WM Cooking Pot	2.5YR 4/2 Weak Red	2.5YR 5/6 Red	2.5YR 5/6 Red	Hard, brittle fabric, common fine sand, some fine calcareous inclusions, few very fine mica flecks	Light ext. slip (2.5YR 4/2 Weak Red)

d) Holemouth jar/pithos

Dating: 7th-8th century AD(?)

Example: KF, Area 18, Occupation 2 collapse. R. 31860. (Fig. 6.15.1)

Parallels: Gharandal: Terminal Byzantine to Early Islamic (Walmsley and Grey 2001: 150, Fig. 8.11)

e) Jar with flaring, ridged rim

Dating: 6th-7th century AD

Example: KF, Area 15, Stratum 15-3. R. 31072. (Fig. 6.15.2)

Parallels: Ḥorvat Karkur ʻIllit: (Nikolsky and Figueras 2004: 189, Fig. 43.7); Jabal Hārūn: "end-6th–mid-7th" century AD (Gerber 2016: 131, Fig. 2.53, 179). More dubious parallels: al-Ḥumayma: mid-7th century, similar rim shape and fabric, but much more outcurving (Schick 2013: 270, Fig. 7.54.1993.0356; see also same vessel in ʻAmr and Schick 2001: 123, Fig. 8.15)

Discussion: This sherd is residual in its Middle Islamic context in the slag mound, but likely dates to the main phase of use of the Area 8 monastery.

f) Large storage jar with simple rim

Dating: 7th-8th century AD

Example: KF, Area 16, T3-1. R. 30842. (Fig. 6.15.3)

Discussion: R. 30842 is a large storage jar with a rim profile similar to some examples of LRA 5 Pieri Type 5 (e.g. Harding 1951: 14, Fig. 3.48; see discussion of LRA 5 types below). Its rim diameter of 26 cm is, however, more than twice as large as the typical range of LRA 5 rims, and as such it is clearly a separate type. It seems to be earlier than its Middle-Late Islamic period T3-1 context, and a date in line with the dating of LRA 5 Pieri Type 5 seems reasonable.

g) Magness Storage Jar Form 4C variant(?)

Dating: late 6th-7th century AD

Example: KF, Area 16, Terrace 2, L. 1028. R. 8503. (Fig. 6.15.4)

Parallels: Magness Storage Jar Form 4C (Magness 1993: 223-225); al-Ḥumayma: similar decoration, mid-7th century AD (Schick 2013: 282, Fig. 7.66.1992.0133.04; see also same vessel in ʻAmr and Schick 2001: 121, Fig. 6.9); Jabal Hārūn: Phase 12, probably 9th-10th century AD, but sherd dated mid-7th century (Gerber 2008: 291, Fig. 2.33, 313), Phase XI, early/mid-7th-mid-8th century AD, but sherd dated to mid-7th century (Gerber 2016: 135, Fig. 6.80, 181); WFLS, Site WF4: similar, Late Byzantine or later (Adams, et al. 2007: 795, Fig. A5.43.243)

Discussion: This is a rim of a vessel probably related to Magness's (1993: 223-225) Storage Jar Form 4C, which is distinguishable primarily by its shortness compared to Forms 4A and 4B. The example from KF is decorated with two wavy, intersecting incised lines. This motif has also been found on storage jars at al-Ḥumayma (Schick 2013: 282, Fig. 7.66.1992.0133.04) and Jabal Hārūn (Gerber 2008: 291, Fig. 2.33), and Gerber (2008: 313) suggests a mid-7th century date for this decoration, which would place this example in the later range of Magness Storage Jar Form 4C.

*h) Molasses Jar (*qādūs*)?*

Dating: Middle Islamic period

Example: KF, Surface Collection (slope below Area 15 "tower"). R. 41169. (Fig. 6.15.5)

Parallels: Mezad Zohar: (Erickson-Gini, et al. 2016: 136, Fig. 11.9); al-Rujūm: surface collection (MacDonald 1992: 238, Pl. 33.b, d)

Discussion: While an unexpected find at Khirbat Faynān, the closest parallels for this vessel are molasses jars of the type commonly found in Ghawr al-Ṣāfī.

i) Plain rim, white-slipped storage jar

Dating: Late Byzantine-Early Islamic

Examples: KF, Area 18, L. 014 (cistern fill). R. 30891. (Fig. 6.15.6)

KF, Area 18, L. 014 (cistern fill). R. 30893. (Fig. 6.15.7)

Parallels: Dayr ʻAyn ʻAbāṭā: similar, identified as LRA 5, late 6th/7th-8th century AD (Grey and Politis 2012: 199, Fig. 423); Khirbat Yājūz: similar, ʻAbbāsid (Khalil and Kareem 2002: 131, Fig. 14.6); Mādabā: similar, 5th-6th century AD (Acconci and Gabrieli 1994: 434, Fig. 22.23); Umm al-Raṣāṣ, Church of St. Paul: Late Byzantine-Umayyad (Sanmorí and Pappalardo 1997: 399, Fig. 3.1, 403, Fig. 5.1); WFLS, Site WF1242: similar, but not a close parallel, Early Islamic (Adams, et al. 2007: 796, Fig. A5.44.601)

Discussion: Parallels for this type are uncommon in southern Jordan. The identification of the parallel at Dayr ʻAyn ʻAbāṭā, cited above, as an LRA 5/Magness (1993: 227-230) Storage Jar Form 6 may indicate some difference from R. 30893, as its fabric differs from the other examples of LRA 5 found at Khirbat Faynān (see below). This may also simply be related to different LRA 5 production centers.

j) Reduced bag-shaped jar or cooking pot

Dating: Byzantine-Early Islamic

Example: KF, Area 18, Occupation 3. R. 31087. (Fig. 6.15.8)

Parallels: Gharandal: Terminal Byzantine-Early Islamic (Walmsley and Grey 2001: 150, Fig. 8.20); Jabal Hārūn: Phase 12, 9^{th}-10^{th} century AD, but dated 4^{th}-5^{th} century on basis of parallels (Gerber 2008: 193, Fig. 3.40, 314)

Discussion: While the context of R. 31087 would suggest a late date, the type is more typically Byzantine, and likely residual in an Occupation 3 context.

k) Small jar with ridged rim

Dating: Late Byzantine-Early Islamic

Example: KF, Area 18, Looter's Backdirt. R. 32078. (Fig. 6.15.9)

Parallels: Jabal Hārūn: similar form, Phase 12, site Phase XIV, 9^{th}/10^{th} century, but dated 6^{th}-early 8^{th} century on basis of parallels (Gerber 2008: 301, Fig. 6.139, 321), similar form, Phase XIV, 9^{th}/10^{th} century, but dated Late Byzantine on basis of parallels (Gerber 2016: 134, Fig. 5.74, 181); Tall Ḥisbān: similar form, Late Byzantine I-II, late 5^{th}-mid-6^{th} century AD (Gerber 2012: 413-414, Fig. 3.70.23); WFLS, Site WF4: similar rim, but smaller diameter cup, Late Byzantine-Early Islamic (Adams, et al. 2007: 780-781, Fig. A5.34.859)

l) T-rim Jar

Dating: 4^{th}-5^{th} century AD(?)

Example: KF, Area 16, Terrace 2, L. 1067. R. 8785. (Fig. 6.15.10)

Parallels: Tall Ḥisbān: Early Byzantine (Gerber 2012: 337, Fig. 3.45.12-15)

Discussion: This is a black-slipped jar with a T/hammer-shaped rim. While the cited parallels from Tall Ḥisbān are not exact parallels, R. 8785 seems to be of a related type, and is probably of the same date, or slightly later.

Amphorae

a) Benghāzī Late Roman Amphora 1 (LRA 1)

General Dating: 4th-7th century AD

General Parallels: Benghāzī: LRA 1 (Riley 1979: 212-215); Keay Type LIII (Keay 1984: 268-278); Peacock and Williams Class 44 (Peacock and Williams 1986: 185-187); Ashkelon: (Johnson 2008: 172-173); Beirūt: (Pieri 2007: Figs. 3-4), Dor 2006 shipwreck: mid-6th-early 7th century AD (Barkan, et al. 2013: 125-127); Horbat Castra: (Haddad 2009: 82, Fig. 3.2-3, 83); Ramat Hanadiv: Amphora Type 1 (Calderon 2000b: 132-133); Rehovot-in-the-Negev: Storage Jar Form 4 (Rosenthal-Heginbottom 1988: 83, Pl. II.125, 86-87, 89, Pl. III.126-130); Yassı Ada: Type YA1 (van Alfen 1996)

Example: KF, Area 18, L. 014 (cistern fill). R. 32216. (Fig. 6.15.11)

Discussion: R. 32216 is a fairly plain jar rim, most likely belonging to an LRA 1, although little is preserved. LRA 1 is a very heterogeneous designation, referring to amphorae produced at a number of sites in Cilicia, Cyprus, and the island of Kos in the Dodecanese, and a full typology has not yet been agreed upon (Demesticha 2014: 171-172). Reynolds (2013: 102) also notes the similarity of some examples of this type to the late "Whitish Clay" amphorae from Sinope, on the southern Black Sea coast. These are not common in the southern Levant, but examples have been found at Horbat Castra (Haddad 2009: 82, Fig. 3.4, 83) and Ramat Hanadiv (Amphora Type 2; Calderon 2000b: 133-135), as well as, apparently, in Jordan (Reynolds 2013: 102). They are rare in Beirūt and areas to the south after the early 6th century (Reynolds 2013:

105). Based on material from Cyprus, Demesticha (2014: 172-173) proposes a division of the LRA 1 into three "generations": LR1/A, dating to the 4th and 5th centuries AD, LR1/B, dating to the late 5th and 6th centuries AD, and LR1/C, dating to the 7th century AD. Pieri proposed a similar scheme based on material from Beirūt (Pieri 2007: Fig. 2) and Gaul (Pieri 2005: 69-85). R. 32216 would belong to the second generation, LR1/B. The rim form is similar to a 6th century example from Dayr al-Barāmūs in Wādī al-Naṭrūn in the western Nile Delta (Konstantinidou 2010: 956, Fig. 4.5). An example from al-Ḥumayma, dating to the mid-7th century, belongs to the third generation, LR1/C (Schick 2013: 264, Fig. 7.49.1993.0261+0279+0317; see also same vessel in ʻAmr and Schick 2001: 118, Fig. 3.4).

Benghāzī Late Roman Amphora 5 (LRA 5)

General Dating: 6th-8th century AD

General Parallels: Benghāzī: LRA 5 (Riley 1979: 224); Magness Storage Jar Form 7(?) or 5A, late 7th-9th/10th century AD or late 6th-early 8th century AD (Magness 1993: 226, 230-231); Peacock and Williams Class 46,[217] "Palestinian" (Peacock and Williams 1986: 191-192); Ashkelon: but all in Egyptian, rather than Palestinian, fabrics (Johnson 2008: 177)

Discussion: LRA 5 is a very general type that can be broken into a number of more precise sub-types. The division of types below relies primarily on Pieri's (2007: Fig. 7) typology for the amphorae from Beirūt. As mentioned above, it is possible that the "Plain rim, white-slipped storage jar" (Jars, section i, above) should also be classified as an LRA 5 type, but they are discussed separately here.

[217] Peacock and Williams (1986: 191-192) Class 46 refers primarily to Benghāzī LRA 4, the earlier Palestinian amphora (Riley 1979: 223), and their discussion and dating reflect this. They list Benghāzī LRA 5 as "unclassified" (Peacock and Williams 1986: 216), but given that the two types seem to be related, it seems appropriate to group Benghāzī LRA 5 into Peacock and Williams Class 46.

b) LRA 5 Pieri Type 3

Dating: 6th century AD

Example: KF, Area 16, Terrace 2, L. 1043. R. 8812. (Fig. 6.15.12)

Parallels: Magness Storage Jar Form 5A, late 6th-early 8th century AD (Magness 1993: 226); Jerusalem, Giv'ati Parking Lot: but shorter rim, 6th-7th century AD (Balouka 2013: 161, Fig. 6.4.6); al-Ramla, Marcus Street: 8th-9th century AD (Arnon 2007: 85, Fig. 22.7); Rehovot-in-the-Negev: Storage Jar Form 1A, 6th-7th century AD (Rosenthal-Heginbottom 1988: 82-84, Pl. II.26); Upper Zohar: mid-6th-mid-7th century AD (Harper 1995: 132, Fig. 16.136; on the dating, see Magness 1999: 195-199)

c) LRA 5 Pieri Type 4 Variant(?)

Dating: 6th-7th century AD

Example: KF, Area 18, Occupation 2 collapse. R. 31593. (Fig. 6.15.13)

Parallels: Ashkelon: Egyptian fabric (Johnson 2008: 177, No. 499); Ayla/al-'Aqaba: Phase 5, 7th century, Egyptian fabric? (Damgaard and Jennings 2013: 489, Fig. 9.C22); Beirūt: early 6th century AD (Reynolds 2005: 606, Pl. 19, Fig. 147); Ḥorbat Ma'on/Khirbat Ma'īn: similar form, but rim incurving, Stratum V, Late Byzantine (Nahshoni and Seriy 2014: 35*, Fig. 15.10); al-Ramla, North of the White Mosque: similar (Cytryn-Silverman 2010a: 149, Pl. 9.2.5, 173, Pl. 9.14.1); al-Ramla, Ramlod Interchange: 8th century, similar form, but white-slipped (Shmueli 2016: 32, Fig. 7.4)

Discussion: The rim form of R. 31593 seems to fall somewhere between Kingsley's (1995: 41, Fig. 2) 6th and 7th century rim/neck forms. While not an exact parallel, note also the similarities to an unidentified jar from Jabal Hārūn Phase XIII (mid-8th-9th/10th century; Gerber 2016: 156, Fig. 26.295, 195).

d) LRA 5 Pieri Type 5

Dating: 7th-8th century AD

Example: KF, Area 18, Occupation 2 collapse. R. 31091. (Fig. 6.15.14)

Parallels: Ḥorvat Karkur ʻIllit: similar, but rim is not flaring (Nikolsky and Figueras 2004: 179, Fig. 36.1); Limyra: Early Islamic, similar rim, but slightly incurving (Vroom 2007: 282, Fig. 10C, 283, 286); Ṭabaqat Faḥl/Pella: same rim form, but an RBOA, see below (Watson 1995: 318, Fig. 9.2)

Discussion: The flaring rim of R. 31091 is closest to Kingsley's (1995: 41, Fig. 2) late 7th century "Abū Mīnā" type. In Pieri's (2007: 7, Fig. 7) Beirūt typology, this form would fall into Type 5, dating to the Umayyad period. Note the presence of a similar rim, but in an Egyptian fabric, in an early 8th century deposit from Beirūt (Reynolds 2003: 727, Fig. 1.16).

e) Red-Brown Ovoid Amphora (RBOA)

Dating: mid-7th-ca. 9th century AD

Example: KF, Area 18, Occupation 2. R. 32163. (Fig. 6.15.15)

Parallels: Magness Storage Jar Form 5B, late 6th-early 8th century AD (Magness 1993: 226-227); Capernaum: but simpler rim, Stratum V, mid-7th century AD (Peleg 1989: 81, Fig. 60.11); Dor, Tantura F: but simpler rim, mid-7th-8th century AD (Barkai, et al. 2010: 90, Fig. 3.6); Horbat Castra: but simpler rim (Haddad 2009: 82, Fig. 3.1); Ḥorbat Maʻon/Khirbat Maʻīn:

Stratum IV, "end of the Byzantine period" (Nahshoni and Seriy 2014: 39*, Fig. 16.25, 27)[218]; Lod: Early Islamic (Haddad 2013: 33*, Fig. 10.6); al-Ramla, Marcus Street: 8th century AD (Arnon 2007: 64, Fig. 12.6); al-Ramla, North of the White Mosque: but simpler rim, Stratum IV, Early Islamic II (Cytryn-Silverman 2010a: 173, Pl. 9.14.1), see also similar rim, but different fabric, Stratum IV-V, Early Islamic I-II (Cytryn-Silverman 2010a: 149, Pl. 9.2.7); Ṭabaqat Faḥl/Pella: (Watson 1995: 318, Fig. 9.4). Outside of the southern Levant, see: Old (Coptic) Cairo: "Silt bag-shaped jars," 8th-9th century AD, and perhaps later (Gascoigne 2007: 166, 173, Fig. 16); Fusṭāṭ, Isṭabl ʿAntar: Umayyad (Gayraud and Tréglia 2014: 371, Fig. 2.4)

Discussion: This form seems to be an Egyptian development of the LRA 5 bag-shaped jar. It is made of a highly-micaceous, reddish-brown Nile silt fabric that is easily distinguishable from Palestinian LRA 5 fabrics. Watson (1995: 319) suggested a strictly Umayyad (i.e. mid-7th-mid-8th century AD) date at Pella, but Taxel and Fantalkin (2011: 89) note that they have been found in late 8th and even 9th century contexts elsewhere in the southern Levant.

Cooking Wares

a) Casseroles

Dating: Late Byzantine-Early Islamic

Example: KF, Area 16, Terrace 2, L. 1043. R. 8238. (Fig. 6.15.16)

Parallels: al-Ḥumayma: 7th century AD (Schick 2013: 276, Fig. 7.60.1992.0591.02; see also same vessel in ʿAmr and Schick 2001: 124, Fig. 9.25)

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[218] The excavators refer to Stratum IV at Ḥorbat Maʿon as "the end of the Byzantine period" (Nahshoni and Seriy 2014: 162), but this terminology is slightly misleading, and the stratum should be considered more generally 7th century. Even taking a strictly dynastic chronology, the presence of RBOA sherds indicates that this phase did not end with the Islamic conquest. The following stratum, Stratum III, is called "Early Islamic" by the excavators, but the pottery from this phase spans much of the 8th century, with the presence of ʿAbbāsid Standard lamps and glazed pottery (Nahshoni and Seriy 2014: 46*-47*, Fig. 21.10-11, 48*, Fig. 22.1) providing a *terminus post quem* for the end of this phase in the late 8th century. There does not seem to be a reason to assume an abandonment of the site between Strata IV and III.

Discussion: Casseroles, while found at most sites, are difficult to date with any precision. As Gerber (2008: 294) notes, this is complicated by apparent regional variation and what seem to be fairly long-lived forms. For Jerusalem, Magness (1993: 211, 214) suggests a shift away from the brittle red cooking fabric toward brown fabrics, which would make R. 8238 a later example. Gerber (2008: 294) proposes a shift from straight to incurving rims in the later 7th century, which R. 8238 would predate, although this dating is not entirely certain. A date in the 6th century best fits the context of R. 8238, a late 6th century earthquake wall collapse locus.

b) Casserole Lids

Dating: Late Byzantine-Early Islamic

Example: KF, Area 18, Occupation 3. R. 31743. (Fig. 6.15.17)

Discussion: As noted in Section 6.1.2, casserole lids are difficult to date with any precision. R. 31743, with its reduced, gray surfaces differs from Magness's (1993: 215) Casserole Lid group, as those are made of red brittle cooking ware. This suggests a slightly later date, but still allows for a wide range. As Gerber (2016: 149) notes, these lids are "ubiquitous at every site" of the Byzantine and Early Islamic periods. Wavy line decoration seems to emerge only in the Early Islamic period (Gerber 2016: 149), but the horizontal line decoration is present already in the Late Byzantine period, if not earlier. Based on context, R. 31743 is likely a later piece, but could also be residual.

c) Everted, Collared-neck Cooking Pot (or jar?)

Dating: Late Byzantine-Early Islamic

Examples: KF, Area 16, Terrace 2, L. 1043. R. 8822. (Fig. 6.15.18)

KF, Area 16, Terrace 2, L. 1067. R. 8791. (Fig. 6.15.19)

Parallels: Khirbat al-Ṣūyyāgh: 6th-7th century AD (Taxel 2009: 123, Fig. 3.14.6); Ma'oz Ḥayyim: unstratified(?), probably late Byzantine (Tzaferis 1982: 234, Fig. 10.14); al-Ramla, Marcus Street: similar, but not as flaring, 8th century AD (Arnon 2007: 89, Fig. 25.9); Rehovot-in-the-Negev: similar, but no exact parallels, Storage Jar Form 1C, 6th-7th century AD (Rosenthal-Heginbottom 1988: 83, Pl. II.59, Pl. II.90); Tall Ḥisbān: cooking pot, Late Byzantine III-IV, mid-6th-mid-7th century AD (Gerber 2012: 452, Fig. 3.85.22)

Discussion: This form is a cooking pot in a sandy, pink fabric with a collared neck and flaring, triangular rim. The best parallels seem to be cooking pots, as the form and fabric are similar to an example from Tall Ḥisbān, cited above, and the form is also similar to an Early Islamic example from Tall Jāwā (Daviau 2010: 221, Fig. 8.7.2). They may also be jars, however, as similar rims were identified on examples of LRA 5 variants (on this type, see above) found at Rehovot-in-the-Negev (Rosenthal-Heginbottom 1988: 83, Pl. II.59, Pl. II.90). The rim form also resembles a Terminal Byzantine-Early Islamic Combed Brown Ware vessel from Gharandal (Walmsley and Grey 2001: 150, Fig. 8.6), but the examples from Khirbat Faynān are smaller and of a different fabric.

d) Magness Cooking Pot Form 4B

Dating: 5th/6th-late 7th/early 8th century AD

Example: KF, Area 18, Occupation 2 collapse. R. 31859. (Fig. 6.15.20)

Paralells: Magness Cooking Pot Form 4B (Magness 1993: 219-220); 'En Boqeq: "Kochtöpfe 15," found in all phases, but most common in Phases III-V, dating to the 7th century AD (Gichon 1993: 223, Taf. 40.41-68; on this dating, see Magness 1999: 194); Ḥorbat

Ma'on/Khirbat Ma'īn: Stratum V, Late Byzantine (Nahshoni and Seriy 2014: 35*, Fig. 15.4); Ḥorvat Karkur 'Illit: (Nikolsky and Figueras 2004: 198, Fig. 46.15); al-Ḥumayma: (mid-7th century AD, Schick 2013: 285, Fig. 7.69.1992.0377.02, 286, Fig. 7.70.1992.0569; see also same vessels in 'Amr and Schick 2001: 124, Fig. 9.20-21)

6.2.2.1. Late Roman Red Slip Wares

The Late Roman[219] Red Slip Wares are distributed widely across the Mediterranean, and because of this they are very reliably dated. Hayes (1972; 1980) published a comprehensive typology of these wares, which remains the standard reference, although it has since been refined by a number of scholars. Because many of these wares are found across virtually the entire Mediterranean — note, for example, the wide variety of African Red Slip forms found at Cartagena, in southeastern Spain (Reynolds 2011a) — it is not feasible to comprehensively cite parallels, nor would it add significantly to the discussion here, the goal of which is primarily to date specific contexts at Khirbat Faynān. Instead, parallels are given first to the Hayes typology, and then to a number of key sites in the southern Levant, primarily in southern Jordan. Where relevant, parallels are also given to Paul Reynolds's (2011b) study of the large assemblage of later Red Slip Wares at Beirūt.

African Red Slip (ARS) Wares

African Red Slip (ARS) Wares are common across the entire Mediterranean, and represent, according to Hayes (1972: 13), "[t]he most important class of Late Roman pottery current in the Mediterranean world." They were produced in a number of workshops in northern and central Tunisia (Baklouti, et al. 2014; Lewit 2011: 316; Mackensen and Schneider 2002;

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[219] Note that Late Roman is meant here in its broader, Mediterranean sense, and not its narrower southern Levantine sense. In terms of the southern Levant, this refers to the Late Roman to Late Byzantine periods (for a brief discussion of this issue, see Jones, et al. 2014: 174), and some of these pottery types continue to be produced and used into the Early Islamic period. I refer to these wares as "Late Roman" here in keeping with the title of Hayes's (1972) definitive work.

Taylor and Robinson 1996) from the 1st century AD until the end of the 7th (Hayes 1972: 13). The ware encompasses a variety of fabrics, generally "orange-red to brick-red," slipped in the same color as the body and often lightly burnished (Hayes 1972: 13-14). At Khirbat Faynān, ARS sherds have been found only in Area 16, in contexts dating to the 3rd-5th century AD. After this period, other Late Roman Red Slip Wares (discussed below) replace ARS at the site.

a) ARS Form 50a

Dating: ca. 230/240-360 AD

Parallels: Hayes Form 50a (Hayes 1972: 69-73; Hayes 1980: 495); Ashkelon: (Johnson 2008: 42); Khirbat al-Shaykh ʻĪsā: (Grey, et al. 2017: 117, Fig. 6.3.1)

Example: KF, Area 16, Stratum T3-2b. R. 30772. (Fig. 6.16.1)

Discussion: Hayes (1972: 72-73) identifies early and late varieties of Form 50a, with the key distinction being the fineness of the fabric. R. 30772 likely belongs to the earlier, finer variety, which would constrain its date further, to ca. 230/240-325 AD.

Example: KF, Area 16, Stratum T3-2a. R. 31327.

Discussion: As noted above, a distinction can be made between early and late varieties of Form 50a on the basis of the fineness of their fabric. R. 31327 belongs to the later, coarser variety, which would date it to ca. 300-360 AD. Formally, the beveled rim of R. 31327 is quite similar to an example of ARS Form 50b found at al-Jalama (Johnson 1988: 145, Fig. 7-6.100), but unlike Form 50b, both the interior and exterior of R. 31327 are slipped (see Hayes 1972: 72).

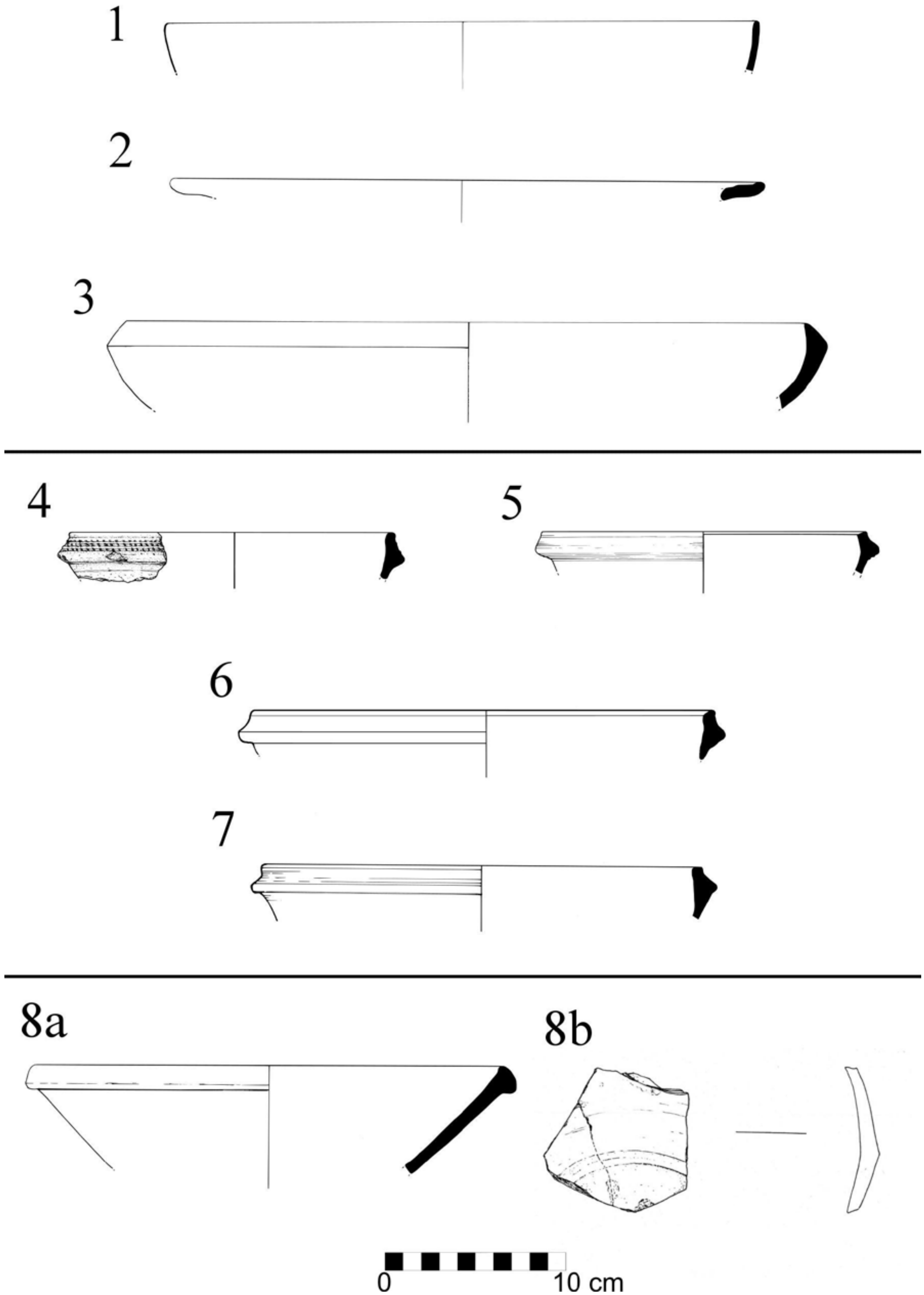

Figure 6.16: Late Roman Red Slip Wares from Khirbat Faynān, 1-3: ARS, 3-7: PRS, 8: LRD. (Illustrations: Donna Walker.)

Table 6.11: Descriptions of sherds illustrated in Figure 6.16.

#	Reg.	Site	Area	Locus	Str.	Type	Ext.	Int.	Core	Fabric	Surface Treatment
Fig. 6.16.1	30772	KF	16	127	T3-2b	ARS 50a	10R 4/6 Red	2.5YR 4/3 Reddish Brown	10R 4/4 Weak Red	Hard fired, few fine calcareous inclusions	Red slipped and burnished int. and ext.
Fig. 6.16.2	9262	KF	16	1033	T3-2a	ARS 59	2.5YR 5/8 Red	2.5YR 5/8 Red	2.5YR 6/8 Light Red	Hard-fired, many fine black inclusions, few fine calcareous inclusions and mineral voids	Red slipped and burnished int. and ext., slip somewhat flaky; grooves incised on rim
Fig. 6.16.3	8514	KF	16	1037	T3-2a	ARS 61a	2.5YR 5/8 Red	2.5YR 5/8 Red	2.5 YR 6/8 Light Red	Some fine calcareous inclusions, few fine reddish inclusions	Red slipped and burnished int. and ext.
Fig. 6.16.4	8782	KF	16	1067	-	PRS 3e	10R 5/8 Red	10R 5/8 Red	2.5YR 5/8 Red	Hard-fired, common fine calcareous inclusions, some fine black inclusions, one visible mica fleck	Red slipped and burnished int. and ext.; rouletting on rim

Table 6.11: Descriptions of sherds illustrated in Figure 6.16, continued.

#	Reg.	Site	Area	Locus	Str.	Type	Ext.	Int.	Core	Fabric	Surface Treatment
Fig. 6.16.5	8786	KF	16	1067	-	PRS 3f	2.5YR 5/8 Red to 10R 4/6 Red on rim	2.5YR 5/8 Red	10R 6/6 Light Red	Hard-fired, common fine calcareous inclusions, few fine black inclusions	Red slipped and burnished int. and ext.
Fig. 6.16.6	31151	KF	18	12	Occ. 1	PRS 3f	2.5YR 5/8 Red	2.5YR 6/8 Light Red	2.5YR 6/8 Light Red	Some fine calcareous inclusions, black inclusions, and mineral voids, few fine mica flecks	Red slipped and burnished int. and ext.
Fig. 6.16.7	8810	KF	16	1043	-	PRS 3h	Red	Red	Red	-	Red slipped and burnished int. and ext.; brownish slip around rim
Fig. 6.16.8a-b	8811	KF	16	1043	-	LRD 9a	Red	Red	Pink-tan	-	Red slipped and burnished int. and ext.; light rouletting on rim

b) ARS Form 58b

Dating: ca. 290/300-375 AD

Parallels: Hayes Form 58B (Hayes 1972: 92-96; Hayes 1980: 499); Ashkelon: (Johnson 2008: 45)

Example: KF, Area 16, Stratum T3-2a. R. 31474.

Discussion: The distinction between Forms 58a and 58b is in the fineness of their fabric, with Form 58b being the coarser of the two (Hayes 1972: 93). Hayes (1972: 96) suggests the same date range for both types.

c) ARS Form 59

Dating: ca. 320-420 AD

Parallels: Hayes Form 59 (Hayes 1972: 96-100; Hayes 1980: 500-501); Ashkelon: (Johnson 2008: 45); Ghawr al-Ḥadītha, Soldier's Grave: ARS 59b (Parker 1994: 386-388, Figs. 1-3); al-Jalama: (Johnson 1988: 147, Fig. 7-7.111); Khirbat al-Tannūr: derived local production (Schmid, et al. 2013: 265, Fig. 18.16.70); Petra, Qaṣr al-Bint: (Renel 2013: 354, Fig. 7.3); Rehovot-in-the-Negev: not illustrated (Rosenthal-Heginbottom 1988: 79, No. 3)

Example: KF, Area 16, Stratum T3-2a. R. 9262. (Fig. 6.16.2)

Discussion: The distinction between Forms 59a and 59b is that in Form 59a, the body of the vessel is incised, while in Form 59b it is undecorated (Hayes 1972: 96). As R. 9262 preserves only the rim of a vessel, it is not possible to determine which type it belongs to, although the rim is closer to those illustrated by Hayes (1972: 98, Fig. 15) for Form 59b.

d) ARS Form 61a

Dating: ca. 325-400/420 AD

Parallels: Hayes Form 61A (Hayes 1972: 100-107; Hayes 1980: 501); Ashkelon: (Johnson 2008: 46); Bet She'an, Youth Hostel: (Avissar 2014: 68, Fig. 2.1); Ghawr al-Ḥadītha, Soldier's Grave: (Parker 1994: 389-391, Figs. 4-6); Tall Ḥisbān: (Gerber 2012: 477, Fig. 3.94.4)

Example: KF, Area 16, Stratum T3-2a. R. 8514. (Fig. 6.16.3)

Discussion: Two sherds of ARS 61a were found at Khirbat Faynān, both in Area 16, but only one is presented here. As Johnson (2008: 46) notes, "The form is very common in the ARS repertoire; however, it is not common at sites in Palestine." Imitations of this form are also found in the ERS assemblage at Aila/al-'Aqaba (Williams 2009: 44, Table 5.3, 69-70, Fig. 16, bottom, Fig. 17, top).

Phocaean Red Slip (PRS) Wares/Late Roman C

Hayes (1972: 323) referred to this ware as Late Roman C in *Late Roman Pottery* and suggested it was produced in Asia Minor, but by the time of the publication of the *Supplement* wasters had been identified in the assemblage from excavations at Phokaia (modern Foça, Turkey) on the western Anatolian coast, and he proposed renaming the ware Phocaean Red Slip (Hayes 1980: 525). Based on chemical analysis, the bulk of the production seems to have occurred at Phokaia (Lewit 2011: 318). Hayes (1972: 323) describes the fabric as "brownish-red, purplish-red or maroon" with a very thin slip in the same color as the body. The ware was also apparently imitated at a small number of sites in western Asia Minor, in a ware Hayes (1972: 408) describes as "light orange or light brown (occasionally fired grey), with a thin slip of a darker shade of the same colour" (see also Vroom 2004: 294). All of the PRS sherds found in the excavations at Khirbat Faynān belong to later subtypes of PRS Form 3 (see Hayes 1972: 329-338; Hayes 1980: 525-526), which is perhaps the most common form of PRS in the southern

Levant. The dating below follows Hayes (1972), but Taxel (2009: 99) has recently argued that, "recent comparative studies show, in a high degree of certainty that the later variants of Hayes' Form 3 continued to exist, at least in Palestine, until the late 6th or even early 7th century," and Lewit (2011: 327) likewise argues, although not referring specifically to Form 3, that PRS "continued to be exported to Syria-Palestine after its conquest by the Arabs."

a) PRS Form 3e

Dating: late 5th-early 6th century AD

Parallels: Hayes Form 3E (Hayes 1972: 332-333, 337-338); Ashkelon: (Johnson 2008: 66); Beirūt: late 5th century AD (Reynolds 2011b: 210, Fig. 2.24, 212, Fig. 4.49-50, 213, Fig. 5.62, 214, Fig. 6.76, 214, Fig. 6.85); Dhībān: late 6th century? (Tushingham 1972: Fig. 11.6); Ḥorvat Karkur 'Illit: probably transitional to Form 3f (Nikolsky and Figueras 2004: 158, Fig. 30.4); Rehovot-in-the-Negev: (Rosenthal-Heginbottom 1988: 81, Pl. 1.12-13)

Example: KF, Area 16, Terrace 2, L. 1067. R. 8782. (Fig. 6.16.4)

b) PRS Form 3f

Dating: 6th century AD

Parallels: Hayes Form 3F (Hayes 1972: 333-335, 338; Hayes 1980: 525-526); Ashkelon: (Johnson 2008: 67); Beirūt: late 5th-6th century AD (Reynolds 2011b: 216, Fig. 7.100-102, 108); Dayr 'Ayn 'Abāṭā: (Grey and Politis 2012: 189, Figs. 274-276, 278-284); Dhībān: late 6th century? (Tushingham 1972: Fig. 11.1, 8?); Ḥorvat Karkur 'Illit: identified as Type 3H, but very similar (Nikolsky and Figueras 2004: 158, Fig. 30.1); Jabal Hārūn: Form 3C or 3F, Phase XI, transitional Late Byzantine-Early Islamic (Gerber 2016: 134, Fig. 4.68, 180), Form 3F, no phase assigned (Gerber 2016: 150, Fig. 20.230, 191); Khirbat al-Shaykh ʻĪsā: (MacDonald 1992: 237, Pl. 32.r); Khirbat al-Ṣūyyāgh: (Taxel 2009: 118, Fig. 3.9.5, 123, Fig. 3.14.10); Rehovot-in-the-Negev: (Rosenthal-Heginbottom 1988: 81, Pl. 1.14); Upper Zohar: (Harper 1995: 23, 127, Fig. 11.20-22)

Examples: KF, Area 16, Terrace 2, L. 1067. R. 8786. (Fig. 6.16.5)

KF, Area 18, Occupation 1 surface. R. 31151. (Fig. 6.16.6)

c) PRS Form 3f variant

Dating and Parallels: See PRS Form 3f, above

Example: KF, Area 16, Terrace 1, Surface Collection. R. 7603.

Discussion: R. 7603 is similar to an example that Johnson (2008: 68, Fig. 204) assigns to "Other Form 3 (not assigned to a specific subtype)." It is within the range of variation for PRS 3f sherds (see e.g. Grey and Politis 2012: 189, Fig. 280), but may be an imitation.

d) PRS Form 3h

Dating: 6th century AD

Parallels: Hayes Form 3H (Hayes 1972: 332, 335, 338)

Example: KF, Area 16, Terrace 2, L. 1043. R. 8810. (Fig. 6.16.7)

Late Roman D (LRD)/"Cypriot Red Slip" Wares

At least since the publication of Hayes's (1972) *Late Roman Pottery*, this type has commonly been referred to as Cypriot Red Slip Ware (CRS). Hayes (1972: 371) notes, however, "The exact source of the ware is unknown, but it was in all probability made somewhere in Cyprus, where examples are commonest." The discovery of kilns with wasters of most, if not all, forms of this ware near Gebiz in southwestern Anatolia demonstrates that this type was not specifically a Cypriot product (Jackson, et al. 2012). As Lewit (2011: 315, n.6) notes, however, “the Cypriot source of exported Late Roman D has still to be disproved, although kiln sites have not yet been identified.” It is worth noting in this respect that Gomez, et al. (1996: 78), although they could not identify a specific source, proposed a western Cypriot origin for the clays used in the vessels they analyzed, and Poblome and Fırat (2011: 51) accept that further “research firmly concludes that CRSW was made on Cyprus.” Poblome and Fırat (2011) propose reverting to the older designation of “Late Roman D” as an “umbrella” term including similar forms in southwestern Anatolian fabrics — such as Sagalassos Red Slip Ware — and Cypriot Red Slip Ware. I use this broader designation here. At Khirbat Faynān, all of the LRD sherds for which a type can be identified belong to Hayes Form 9, dated to the late 6th and 7th centuries (see below). Imitations of this type have been found in Jordan in contexts as late as the ‘Abbāsid period, e.g. at Khirbat Yājūz (Khalil and Kareem 2002: 121, Fig. 9.14).

a) LRD Form 9a

Dating: ca. 550-600 AD

Parallels: Hayes Form 9A (Hayes 1972: 379-382; Hayes 1980: 528-529); Beirūt: late 6th-early 7th century AD (Reynolds 2011b: 216, Fig. 7.115, 218, Fig. 9.140, 221, Fig. 11.168-172, 174); Dayr ‘Ayn ‘Abāṭā: (Grey and Politis 2012: 189, Fig. 271); Ḥorvat Karkur ‘Illit: subtype not identified (Nikolsky and Figueras 2004: 158, Fig. 30.13); Jabal Hārūn: Phase VI, Byzantine, but possibly ARS Form 99c, and Phase XI, transitional Late Byzantine-Early Islamic (Gerber 2016: 128, Fig. 1.8, 177, 155, Fig. 25.282, 194); Khirbat al-Ṣūyyāgh: (Taxel 2009: 114, Fig. 3.6.9, 118,

Fig. 3.9.9, 123, Fig. 3.14.11); Upper Zohar: but No. 34 identified as LRD 9b (Harper 1995: 23, 127, Fig. 11.32, 34)

Examples: KF, Area 16, Terrace 2, L. 1043. R. 8811. (Fig. 6.16.8a-b)

KF, Area 16, Terrace 2, L. 1067. R. 8790.

Discussion: The primary difference Hayes (1972: 379) identifies between LRD Form 9a and Form 9b is that Form 9a has a "low ledge-foot" and Form 9b a "flat base." The examples from KF generally do not preserve their bases, with the exception of R. 8811, which is clearly Form 9a, so this is usually difficult to determine. As Reynolds (2011c: 63) describes, "Hayes distinguished LRD 9A from later variants (9B-C) with respect to its shorter rim, and plainer inner face." Nonetheless, there is some overlap, it seems, between Form 9a and, perhaps, earlier example of Form 9b, and the two are difficult to distinguish. The examples discussed here, however, seem to belong to the earlier Form 9a, as they are not incurving. Note, however, that similar rims have been classified as Form 9b at the production site of Kadırgürü Mevkiisi (Jackson, et al. 2012: 105, Fig. 16.5-6). The evidence from al-Jalama, where 137 sherds of LRD Form 9 were found (Johnson 1988: 160-163),[220] is also interesting in terms of the dating of this type. Johnson (1988: 154) suggests a late 4th century date for the entire LRD assemblage at al-Jalama, but this seems far too early for all types but Form 1, also common at the site.

b) LRD Form 9a/b

Dating: ca. 550-700 AD

Parallels: For Form 9a, see above. Hayes Form 9B (Hayes 1972: 379-382; Hayes 1980: 528-529); Ashkelon: (Johnson 2008: 57); Ayla/al-ʻAqaba: Umayyad (Whitcomb 1989b: 179, Fig. 3.1); al-Ḥumayma: likely Form 9b, but not enough of the base is preserved to determine this with

[220] No distinction is made between LRD Forms 9a and 9b at al-Jalama, and some examples may be misidentified.

certainty, 7th century (Schick 2013: 268, Fig. 7.52.1993.0264.02, identified incorrectly here as "Aqaba basin ware"; see also 'Amr and Schick 2001: 127, Fig. 12.39, where the same vessel is correctly identified as LRD)

Example: KF, Area 18, Occupation 2 collapse. R. 31857.

Discussion: As noted above, Hayes (1972: 379) distinguished LRD Form 9a from Form 9b primarily on the basis of base form. As bases are not preserved on the KF examples, this cannot be determined. He also notes, however, that Forms 9b and 9c "have higher and more incurved rims" (Hayes 1972: 381). The rim of R. 31857 is more incurving, and seems closer to the Form 9b rim, although classified as Form 9a/b here due to the lack of a base. Note also that this rim form is quite similar to those Reynolds (2011c: 64, Fig. 6.54-61) attributes to the late 6th and early 7th centuries at Beirūt.

c) Unknown LRD Form

Dating: late 4th-7th century AD

Example: KF, Area 18, Occupation 1. R. 39174.

Discussion: This is a body sherd of an unknown LRD form, important primarily as it was found in a leveling fill below the floor adjacent to the cistern, and is therefore, until further excavation can be conducted, the best dating evidence for the cistern's construction. It is decorated with long, thinly incised grooves, which, while less common than the shorter grooves found on some of the LRD 9 examples discussed above, are nonetheless found throughout the LRD repertoire. Because the form cannot be determined with any certainty, any date between the late 4th and early 7th centuries is possible.

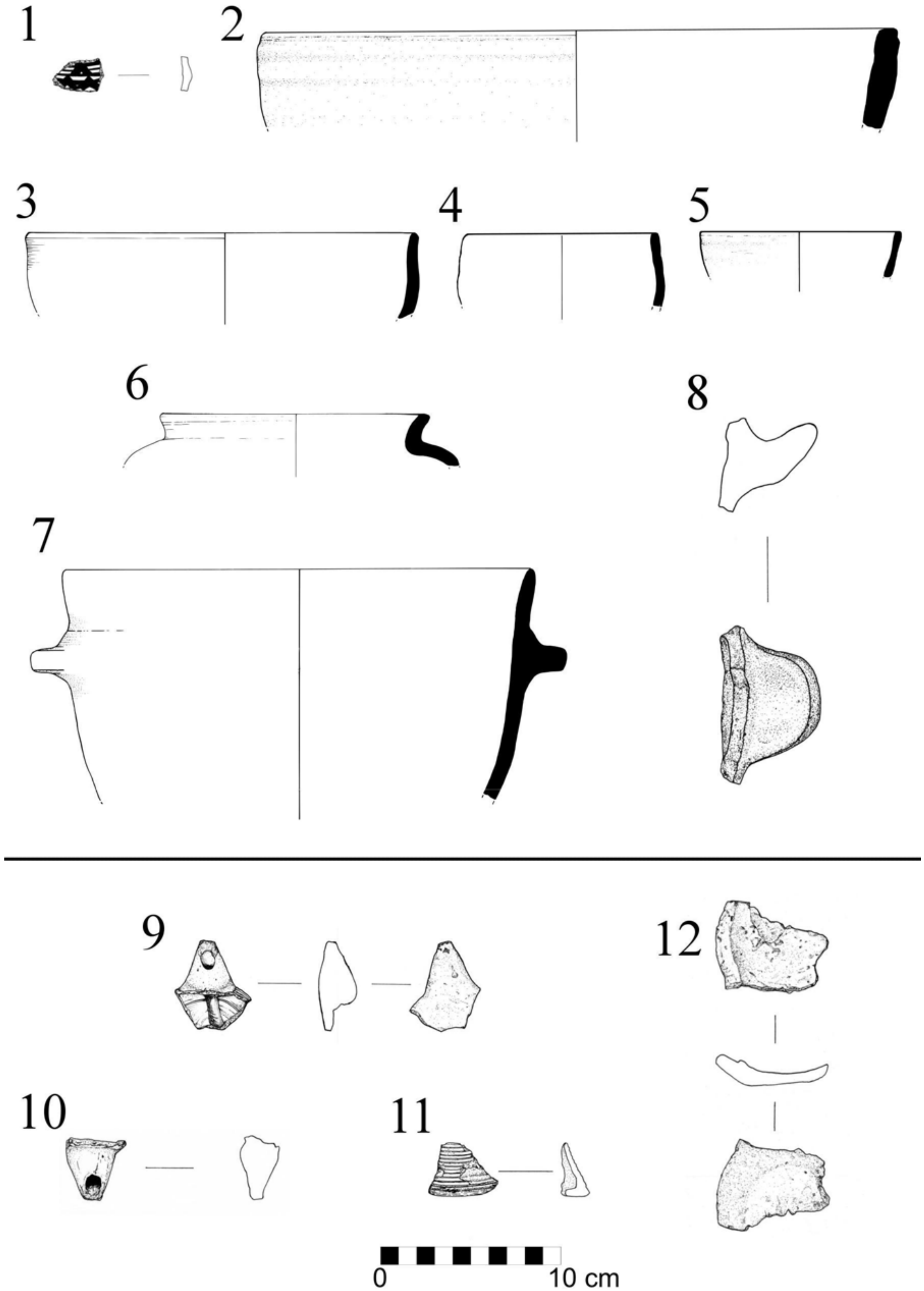

Figure 6.17: Hand-made wares (1-7) and lamps (9-12) from Khirbat Faynān. (Illustrations: Donna Walker.)

Table 6.12: Descriptions of sherds illustrated in Figure 6.17.

#	Reg.	Site	Area	L.	Str.	Type	Ext.	Int.	Core	Fabric	Surface Treatment	Notes
Fig. 6.17.1	39172	KF	15	3	15-2a	HMGPW (body)	Brown-orange	Brown-orange, patchy	Black	Overfired, fine vegetal temper, common fine to med. calcareous and quartz inclusions	Traces of white slip, worn linear motif in brownish paint	Décor is very worn, illustrated motif is somewhat hypothetical
Fig. 6.17.2	31636	KF	18	9	Occ. 2	IHMW Basin	Uneven, 2.5Y 7/4 Pale Brown to 2.5YR 5/8 Red in patches	10YR 8/3 Very Pale Brown	5YR 6/4 Light Reddish Brown	Hard, porous, fine sand temper, few med. quartz inclusions, few med. to large vegetal voids, few mica flecks	-	
Fig. 6.17.3	31741	KF	18	6	Occ. 3	IHMW Bowl	10R 6/8 Light Red	Uneven, 7.5YR 7/4 Pink to gray	Uneven, 10R 7/4 Pale Red to gray	Hard-fired, fine to large vegetal temper, few fine calcareous inclusions, few fine mica flecks	Slipped int. and ext. (7.5YR 8/4 Pink)	

Table 6.12: Descriptions of sherds illustrated in Figure 6.17, continued.

#	Reg.	Site	Area	L.	Str.	Type	Ext.	Int.	Core	Fabric	Surface Treatment	Notes
Fig. 6.17.4	31739	KF	18	6	Occ. 3	IHMW Bowl or Cup	Uneven, 5YR 6/4 Light Reddish Brown to black	5YR 6/4 Light Reddish Brown	Black	Hard-fired, fine sand temper, some fine to large vegetal voids, few fine to large mineral voids, few fine to large calcareous inclusions, some mica flecks	Slipped int. and ext. (5YR 6/4 Light Reddish Brown) with dots of slip paint on int. (7.5YR 5/6 Strong Brown) and ext. (7.5YR 6/4 Light Brown)	Décor not illustrated
Fig. 6.17.5	31742	KF	18	6	Occ. 3	IHMW Bowl or Cup	-	-	-	-	Brown slipped int. and ext., dots of brown slip paint on ext.	Décor not illustrated

Table 6.12: Descriptions of sherds illustrated in Figure 6.17, continued.

#	Reg.	Site	Area	L.	Str.	Type	Ext.	Int.	Core	Fabric	Surface Treatment	Notes
Fig. 6.17.6	8436	KF	16	1001	-	IHMW Jar or Cooking Pot	Uneven, 5YR 6/2 Pinkish Gray to black	7.5YR 6/3 Light Brown	Black	Fine vegetal and calcareous/sandy temper, some fine black inclusions, some mica flecks	-	
Fig. 6.17.7	31685	KF	18	5	Occ. 3	IHMW Cooking Pot	Uneven, 10YR 6/4 Light Yellowish Brown to 7.5YR 5/4 Brown to black	Mostly black	Black	Hard-fired, common med. quartz, some fine calcareous inclusions, some med. to large mineral inclusions, minimal fine vegetal voids	-	
Fig. 6.17.8	39171	KF	15	Surf.	-	IHMW Cooking Pot (handle)	Uneven, 10R 6/4 Pale Red to 7.5YR 7/2 Pinkish Gray	10R 6/6 Light Red	Black	Hard-fired, fine to med. sand and vegetal temper, some fine to med. calcareous inclusions, some small argillaceous inclusions, one large mineral void	Red slipped ext.	

Table 6.12: Descriptions of sherds illustrated in Figure 6.17, continued.

#	Reg.	Site	Area	L.	Str.	Type	Ext.	Int.	Core	Fabric	Surface Treatment	Notes
Fig. 6.17.9	29470	KF	16	102	T3-1	Negev WM Lamp	-	-	-	-	-	Red cooking fabric
Fig. 6.17.10	8820	KF	16	1043	-	Negev WM Lamp	-	-	-	-	-	Red cooking fabric
Fig. 6.17.11	8779	KF	16	1027	-	Negev WM Lamp	-	-	-	Sandy temper	-	Red cooking fabric
Fig. 6.17.12	31067	KF	15	9	15-2a	Unknown lamp (base)	10YR 8/2 Very Pale Brown	10YR 8/2 Very Pale Brown	10YR 8/2 Very Pale Brown to 2.5Y 9.5/1 White	Very friable, fine to med. calcareous temper	-	

6.2.3. Hand-Made Wares

Hand-made Geometrically Painted Wares (HMGPW)

See discussion for this type in Section 6.1.3. HMGPW is rare in the ELRAP assemblage at Khirbat Faynān, but 102 sherds are reported from the WFLS (Tomber 2007: 464, Fig. A2.11.107, see also Fig. 12.11.112).

Example: KF, Area 15, Stratum 15-2a. R. 39172. (Fig. 6.17.1)

Discussion: This is a small, probably HMGPW body sherd. The fabric is primarily tempered with vegetal material, with small calcareous inclusions. The core is black, with orange margins, and traces of a white slip. It is painted with dark brown linear patterns, but the sherd is too worn for these to be made out.

Other Islamic Hand-made Wares (IHMW)

a) Ayla Fāṭimid basin ("Tupperware")?

Dating: 11^{th} century AD(?)

Example: KF, Area 18, Occupation 2 collapse. R. 31636. (Fig. 6.17.2)

Parallels: Ayla/al-ʻAqaba: "Tupperware," Fāṭimid (Whitcomb 1988b: 216, Fig. 5.h, and compare fabrics of Fig. 5.c, g; see also Damgaard 2013b: 91, Fig. 4)

Discussion: R. 31636 is a sherd of a hand-made basin. It is fired to pinkish-brown at the core, with a cream slip, and is tempered with fine sand and some vegetal material, with occasional mica flecks. The fabric is unique, and is certainly not one of the more common Middle or Late Islamic period hand-made fabrics known from the Faynān region, but it is also undoubtedly not a residual Bronze or Iron Age sherd. The closest parallel seems to be to the Ayla Fāṭimid hand-made ware, called "Tupperware" by Whitcomb (1988b). To my knowledge, this would be the only sherd of this ware known outside of al-ʻAqaba, and among very few pieces of evidence for 11th century settlement in Faynān.

b) Bowl with "pie crust" rim

Dating: Early Islamic

Example: KF, Area 18, Occupation 3. R. 31736.

Parallels: Yotvata: late "Negbite ware," Early Islamic (Davies and Magness 2015: 137, Fig. 2.29.3)

Discussion: Although this sherd is very worn, the rim is clearly paralleled by the "pie crust" rim on the vessel from Yotvata. As a general parallel, Davies and Magness (2015: 136) point to Avni's (1996: 51) discussion of the late "Negbite ware" from Naḥal ʻOded. While most of this consists of rather coarse forms, the assemblage also includes a finer hand-made bowl apparently imitating FBW (Avni 1996: 49, Fig. 51.1).

c) Bowl/cup

Dating: Early Islamic II-Middle Islamic(?)

Example: KF, Area 18. Occupation 3. R. 31741. (Fig. 6.17.3)

Discussion: This is a small bowl or cup in cream-slipped IHMW. The fabric is similar to typical Middle Islamic hand-made fabrics in Faynān, but with notable differences, including the white to red core. The form seems to imitate Early Islamic vessels, which may place this type in the early Middle Islamic or even late Early Islamic period.

Dating: Early Islamic II(?)

Example: KF, Area 18, Occupation 3. R. 31739. (Fig. 6.17.4)

KF, Area 18, Occupation 3. R. 31742. (Fig. 6.17.5)

Discussion: These are small bowls or cups of an unusual painted IHMW type. Rather than the typical HMGPW decoration, they are slip-painted with dots of brown and tan. I have not found exact parallels for these vessels, but the form and design seem to imitate vessels of the Early Islamic period, which may suggest a late Early Islamic period, or perhaps even early Middle Islamic period, date. In particular, the design is similar to the decoration on a fine, wheel-made jug dated to the 6th-8th century from the Church of St. Stephen at Umm al-Raṣāṣ (Alliata 1991: 398, Fig. 18.4) and an 8th-9th century painted, black-slipped FBW bowl or cup from Khirbat al-Ṣūyyāgh (Taxel 2009: 141, Fig. 3.28.4). The fabric — particularly the mica/shimmering inclusions — is atypical for the Middle Islamic period in Faynān, and may suggest a coastal production site, perhaps Ayla/al-‘Aqaba.

d) Everted-rim Jar or Cooking Pot

Dating: Middle-Late Islamic

Example: KF, Area 16, L. 1001. R. 8436. (Fig. 6.17.6)

Discussion: R. 8436 is an undecorated IHMW jar of the Middle-Late Islamic period. The rim form resembles cooking pots of this period, but the fabric is not a typical cooking pot fabric.

Cooking Wares

a) Incurved cooking pot with high ledge handles

Dating: Early Islamic II-Late Islamic(?)

Example: KF, Area 18, Occupation 3. R. 31685. (Fig. 6.17.7)

Parallels: Dhībān: dated Ayyūbid, but from "Umayyad destruction" context (Tushingham 1972: Fig. 5.2); al-Ḥumayma: similar form, but different handle position and fabric, 19th-20th century ('Amr and Oleson 2013: 123, Fig. 5.36.1999.0099.01); Jabal Hārūn: different rim form, larger handles, Late Byzantine-'Abbāsid or Fāṭimid-Ayyūbid (Gerber 2008: 295, Fig. 4.91); Khirbat al-Mu'allaq: thicker rim, but similar overall, 11th century? (Lindner, et al. 1996: 124, Fig. 24.15); Umm al-Raṣāṣ, Church of St. Paul: thicker rim and smaller vessel, but similar overall, probably dating between the Early Islamic II and Middle Islamic I (Pappalardo 2002: 409, 427, Fig. 30.11)

Discussion: Unpainted hand-made wares are particularly difficult to date, as noted in Section 6.1.3. Contextually, R. 31685 is from a fill above an Occupation 3 surface in Area 18. While Occupation 3 seems to date to the Early Islamic II, this fill likely contains some later material. An emergence in the Early Islamic II cannot be entirely ruled out for this type, as the parallels above show, but the Middle Islamic Ia seems likelier. The dating of the apparently early "coarse-ware" type at Umm al-Raṣāṣ is relevant here. Gerber (2008: 292) references Late Byzantine and Umayyad/'Abbāsid hand-made vessels from Umm al-Raṣāṣ (Sanmorí and Pappalardo 1997: 399, Fig. 3.6-7), but Pappalardo's (2002: 409) statement that several stonepaste sherds were also found at the site should be kept in mind when considering their date. The fabric of R. 31685 is rather different from the Middle and Late Islamic fabrics known from ELRAP surveys and excavations in Faynān, and from Middle Islamic Ia fabrics in Wādī al-Fayḍ. It should be kept in mind, however, that Middle Islamic Ia fabrics in Faynān are essentially unknown.

b) Cooking pot with tongue handle and solid cordon

Dating: Uncertain, 11th-17th centuries AD(?)

Example: Khirbat Faynān, Area 15, Surface Collection. R. 39171. (Fig. 6.17.8)

Parallels: Khirbat al-Mu‘allaq: 11th century AD? (Lindner, et al. 1996: 124, Fig. 21.5; see the same vessel in Lindner 1999: 481, Fig. 5.A); Khirbat al-Nawāfla: Early Ottoman (‘Amr, et al. 2000: 253, Fig. 26.2); Wādī al-Fayḍ Expedition, Site WFE 24: (currently unpublished)

Discussion: The cooking pot with tongue or lug handles and a solid cordon seems, based on present evidence, to be a long-lived form in southern Jordan. The earliest examples, as noted in Section 6.1.3, have been found at Khirbat al-Mu‘allaq, where they have been found in a context radiocarbon dated to “AD 785-1015” (Lindner 1999: 480). A similar vessel, however, has been dated to the early Ottoman period at Khirbat al-Nawāfla (‘Amr, et al. 2000: 253, Fig. 26.2). At Gharandal, a cooking pot with a similar cordon, but handles closer to the body, was dated to the 11th century (Walmsley and Grey 2001: 154, Fig. 9.6). A cooking pot with a small lug handle, but a similar cordon, was found at al-Bayḍa, which seems to date to the Middle Islamic IIc and later (Sinibaldi and Tuttle 2011: 443, Fig. 15.2; for 14th century dating evidence, see Sinibaldi 2015: 163). As the example from Area 15 was surface collected, its dating is uncertain. The fabric is heavier and differently tempered compared to both probably early and probably late examples of the same type from Wādī al-Fayḍ, but less crude than Late Islamic vessels found in Wādī al-Jāriya (Jones, et al. 2012: 75). The fabric, likewise, differs from the IHMW and hand-made cooking ware fabrics found at KNA (see Section 6.1.3). A date contemporary with the smelting in Area 15 is possible, but a 14th century or perhaps even later date is, as well.

Example: Khirbat Faynān, Area 8 monastery, Surface Collection. R. 44798.

Parallels: See above, R. 39171.

Discussion: This is a sherd of a cooking pot with solid cordon, similar to R. 39171, but in a light, primarily vegetal tempered, white-slipped fabric. This fabric is more typical of the Middle Islamic period fabrics known in Faynān, and likely should be dated to the 12th-14th centuries AD.

c) Red-slipped and burnished globular cooking pot

Dating: Middle Islamic II(?)

Example: KF, Area 8 monastery, Surface Collection. R. 44799

Discussion: R. 44799 consists of three non-connecting sherds of a red-slipped and burnished globular hand-made vessel, most likely a cooking pot. At Tall Ḥisbān, a vessel in a similar fabric, described as a "globular bowl," was found in Stratum 4, dating to the Middle Islamic IIa (Walker 2012a: 560, Fig. 4.17.10). Walker (2012a: 559) notes that "[h]andmade burnished bowls have been variously attributed to the Ayyubid-Mamluk period or the Iron Age," but it should be noted here that the fabric of R. 44799 is distinguishable from both the Iron Age fabrics and the red-slipped and burnished Early Bronze Age fabrics typical of the Faynān region, and bears a much closer resemblance to the typical Middle Islamic period hand-made fabrics with vegetal inclusions. Burnished cooking pots have also been dated to the Mamlūk period at Ṭabaqat Faḥl/Pella (McPhillips and Walmsley 2007: 130-131) and Yoqneʻam (Type 11 Cooking Pot; Avissar 1996: 138, Fig. XIII.98.3-6). Given that this vessel was surface collected, it is possible that it is either associated with the smelting activities in Area 15, and should be dated to the Middle Islamic Ic-IIa, or is associated with later reuse of the monastery and other parts of Khirbat Faynān — hinted at by the 14th century coins published by Kind, et al. (2005: 188) — and should be dated to the Middle Islamic IIb or IIc.

6.2.4. Lamps and Other Wares

Negev Wheel-made Lamp

Dating: early 5th(?)-mid-8th century AD, most common in the 6th-7th century AD

Parallels: Ashqelon: Stratum B, 6th century AD (Haimi 2009: Fig. 3.5); Ashqelon, al-Qabū: late 6th century AD (Haimi 2007: Fig. 2.6); Ashqelon, Third Mile Estate: 6th-7th century AD (Israel and Erickson-Gini 2013: 213-215, Fig. 39.2); Ayla/al-ʻAqaba: Late Byzantine-Early Islamic (Whitcomb 2001a: 303, Fig. 2.e; see also Whitcomb 1994: 26, Fig. b); Barqa (North): Byzantine (Volynsky 2010: Fig. 6); Be'er Shevaʻ: early 5th-early 7th century AD (Sonntag 2012: Fig. 9.10); Be'er Shevaʻ North Train Station: Byzantine-7th century (Israel, et al. 2013: 68*, Fig. 16.1-2)[221]; Bet She'an: Type 31/provisional Byzantine Type 11, Late Byzantine-Umayyad (Hadad 1997: 166; Hadad 2002b: 72-74); Caesarea Maritima: "High-boot shaped lamps ('Tea pot 5')," 5th/6th-7th century AD (Sussman 2008: 251, 283, Fig. 213, 291, Fig. 214); Dayr ʻAyn ʻAbāṭā: only one sherd, a nozzle, early 6th century and later (da Costa 2012: 251-252, 287, Fig. 540); ʻEn Boqeq: mid-6th-late 7th/early 8th century AD (Gichon 1993: 243-244, Taf. 45.16-17; on the dating, see Magness 1999: 191-195); ʻEn Marzev: Early Islamic, 8th century AD? (Porath 2016: 63*, Fig. 57.17); Ḥorbat Be'er Shemaʻ: nozzle sherds only, mid-5th-mid-7th century AD (Erickson-Gini, et al. 2015: 237, Fig. 31.1-2); Horbat Lasan: late 6th-7th century AD (Katz 2012: Fig. 13.13); Ḥorbat Maʻon/Khirbat Maʻīn: Strata V-IV, Late Byzantine and "end of the Byzantine period" (Nahshoni and Seriy 2014: 27*, Fig. 11.36, 39*, Fig. 16.32)[222]; Ḥorvat Karkur ʻIllit: Late Byzantine-Early Islamic (Nikolsky and Figueras 2004: 202, Fig. 47.6-8, 11-16); al-Ḥumayma: 5th-7th century AD (Oleson 2013: 171, Fig. 6.10.1991.0193); Hura: "early phase," 7th-

[221] A similar lamp, but very large, was also found at Be'er Sheva' North Train Station and dated to the late 6th century AD (Israel, et al. 2013: 54*, Fig. 3.9).
[222] As noted in Section 6.2.2, the "end of the Byzantine period" phase at Ḥorbat Maʻon would probably be better termed "7th century."

8th century AD (Peretz 2012: Fig. 6.38); Jabal Hārūn: found in contexts ranging from early/mid-7th through 9th/10th centuries AD (Gerber 2008: 299, Fig. 5.103a, 303, Fig. 7.149a, 157a, 318, 321-322), mid-6th century into the ʻAbbāsid period (Holmqvist 2016: 249-251); Khirbat Baraqa: 6th-7th century AD (Gadot and Tepper 2003: 148-149, Fig. 18); Khirbat al-Dayr: mid-6th-7th century AD (Calderon 1999: 144, Pl. 5.4, 146, Fig. 6); Khirbat Dūḥala: Late Byzantine (Sārī 1992: 271, Fig. 6.2); Khirbat al-Ḥanūna: 6th-7th century AD (Peretz 2008: Fig. 3.15); Khirbat al-Ṣūyyāgh: Late Byzantine/Umayyad (Taxel 2009: 138, Fig. 3.27.7); Naḥal Shaḥaq: 7th-9th century AD (Israel, et al. 1995: 7*, Fig. 6.17); Petra Church: dated "late Byzantine and early Islamic" and "Byzantine" (Khairy 2001: 369, Nos. 13, 16); Petra, Great Temple: 7th century AD? (Barrett 1998: 278, 283-284, Figs. 6.59-60); Petra, al-Katūta: 6th century AD (Khairy 2013: 66, 71, Fig. 13); Petra, North Ridge: collected from drainpipe (Barrett 2008: 105, Fig. 4.40); Petra, al-Zanṭūr: Typ M, "Scheibengedrehte Lampen mit hohem Profil," early 5th century? (Grawehr 2006: 349-351); Rehovot-in-the-Negev: a date of 6th-early 7th century AD is suggested, but this is stratigraphically unclear (Rosenthal-Heginbottom 1988: 81, Pl. 1.21-23); Sede Boqer: "Early Arab" (Nevo 1991: 155, PPL. 7.12), note, however, that the sherd from Sede Boqer "was too small a piece to be drawn," and the illustrated vessel is in fact from Tall al-Rusūm/Tel Mefalsim, near Gaza (Rahmani 1983: 220, Fig. 1.2); Shivta: Late Byzantine (Erickson-Gini 2013: Fig. 12.9); Tall Ḥisbān: nozzle sherds only, 5th-mid-7th century AD (Gerber 2012: 487, 483, Fig. 3.97.20-21); Tel ʻIrit/Tall Wādī al-Zayt: late 6th-early 7th century AD (Eisenberg-Degen 2018: Fig. 7.22-23); Tel Yehud: late 6th-early 7th century AD (Segal 2014: Fig. 4.15); Upper Zohar: mid-6th-mid-7th century AD (Harper 1995: 135, Fig. 19.3-10; on the dating, see Magness 1999: 195-199); WFLS, Site WF4: "Arab-period" (Bailey 2007: 816-817, Nos. 84-88); Zerahya: 6th-7th century AD (Talis 2013: Fig. 15.17)

Examples: KF, Area 16, Stratum T3-1. R. 29470. (Fig. 6.17.9)

KF, Area 16, Terrace 2, L. 1043. R. 8820. (Fig. 6.17.10)

KF, Area 16, Terrace 2, L. 1067. R. 8788.

KF, Area 16, Terrace 2, L. 1027. R. 8779. (Fig. 6.17.11)

KF, Area 16, Terrace 2, L. 1069. R. 9721.

KF, Area 16, Terrace 2, L. 1003. R. 7847.

Discussion: Magness (2003: 17, Fig. 3) dates this type primarily to the Late Byzantine period (or 6th-7th century AD) in the Negev, but da Costa (2012: 251) has argued more recently for a broader dating of early 5th-mid-8th century AD. The earliest examples seem to be those from al-Zanṭūr, nearly all of which were found in what was identified as a 419 AD earthquake destruction context, "Bauphase spätrömisch II" (Grawehr 2006: 350; on the earthquake, see Russell 1985: 42-43). Grawehr (2006: 350) supports this dating by reference to the examples from ʻEn Boqeq (Gichon 1993: 243-244, Taf. 45.16-17) and the Petra Church (Khairy 2001: 369, No. 16), but it it not clear that either of these examples is that early. As noted above, Magness (1999: 193-194) suggests a date no earlier than the mid-6th century for the foundation of ʻEn Boqeq, and the examples cited by Grawehr were found in Phase II, which should likely be dated to the late 6th-early 7th century. One example from the Petra Church was found in a cistern fill and cannot be dated by context, while the other is from a Phase III context, assuming that the "Area III" in "Area III, locus 13C, sounding 30" should in fact be read as "Area II" (Khairy 2001: 369). This locus is the foundation trench of Wall I, about which Fiema (2001c: 23) states, "The ceramics were overwhelmingly from the 1st through 4th centuries A.D., with the 3d-4th century types most common, although a few of what may be early 5th century sherds were found, too. A coin in II.13C is dated to A.D. 350-55." The possibility that this lamp sherd dates to the 6th

century and is intrusive in this otherwise late 4th century trench should be considered, and I would argue that this is methodologically more sound than attempting to "resolve" the date of this sherd with the overwhelmingly earlier material from this context. It is likewise possible, I suggest, that the destruction of al-Zanṭūr Spätrömisch II has been mistakenly attributed to the 419 earthquake, and that the Spätrömisch I and II destructions should be attributed to the earthquake of 363 and the late 6th century earthquake, respectively. This would correspond to the two earthquake destructions in Phase IV and VIII at Jabal Hārūn (Fiema 2016a), among others.[223] There is better evidence that the type continues into the 8th century, particularly given the examples from ʻEn Marzev (Porath 2016: 63*, Fig. 57.17) and Naḥal Shaḥaq (Israel, et al. 1995: 7*, Fig. 6.17). On the basis of Egyptian parallels, Bailey (2007: 816-817) suggests a date in the 9th-10th centuries AD for the examples from the WFLS assemblage, but this is without doubt too late. The examples from the ELRAP excavations at KF come from contexts dating to the 6th-8th century AD.

***South Jordan* type**

Dating: 4th-6th century AD (possibly continuing into 8th)

Example: KF, Area 16, Stratum T3-2a. R. 8212. (Fig. 6.18)

Parallels: No exact parallels for this form, but certain elements are paralleled on examples from Petra, al-Zanṭūr (e.g. Grawehr 2006: 342, Fig. 479, 343, Figs. 489-490, 347, Fig. 512).

Discussion: See initial discussion of this type in Section 6.1.4. In da Costa's (2012: 239-243) typology, R. 8212, with its thick, low relief decoration, would fall into the late type for the South Jordan lamps. At Dayr ʻAyn ʻAbāṭā, the late type was most common in 5th-6th century contexts, continuing into the 8th-9th century (da Costa 2012: 243). Da Costa (2012: 243) notes

[223] See Section 8.2 for a longer discussion of the earthquakes that affected Petra, and southern Jordan more generally, in Late Antiquity.

that it is not entirely clear whether the distinction between the two types is chronological or geographical, but only the early form seems to be present in clean deposits pre-dating the earthquake of 363. As noted in Section 6.1.4, this type was rare in the ELRAP excavations at Khirbat Faynān, and in Area 16, no South Jordan lamps were found in the pre-363 AD Terrace 3 stratum, T3-2b. This does, however, provide further evidence that Stratum T3-2a postdates the 363 earthquake.

Figure 6.18: R. 8212, a South Jordan type lamp from Khirbat Faynān, Stratum T3-2a. (Photo: Aaron Gidding, courtesy UC San Diego LCAL).

Unknown Type

Example: KF, Area 15, Stratum 15-2a. R. 31067. (Fig. 6.17.12)

Discussion: This is the base of a mold-made lamp found in the Area 15 slag mound. The fabric is very friable, and the base is, as a result, very eroded. It is not possible to determine with certainty what type of lamp this base belonged to. The shape and fabric would not rule out a Middle Islamic period slipper lamp (see Section 6.1.4), but it could belong to an earlier type, as well.

6.3. Ceramics from Excavations in Wādī Fidān

This section presents the ceramics from ELRAP/JHF excavations at two sites in Wādī Fidān. Presented first are the ceramics from the 2000 excavations in Khirbat Ḥamrā Ifdān Area L. Following this are the ceramics from the 2004 excavations at WFD 50a, probably Glueck's (1935: 20) Rujm Ḥamrā Ifdān (see Section 5.5).

Khirbat Ḥamrā Ifdān

Fine Byzantine Ware (FBW)

See discussion of this type in Section 6.2.2.

Fine Byzantine Ware Bowls Form 1E

Dating: 8th-9th century AD

Examples: KHI, Area L, L. 3050, Stratum L-IIA. R. 44830.

KHI, Area L, L. 3016, Stratum L-IIA. R. 19888 (small sherd probably from same vessel as above).

Parallels: Magness FBW Bowls Form 1E (Magness 1993: 193-194, 196); Bet She'an, Youth Hostel: 8th-9th century AD (Avissar 2014: 86, Fig. 14.6); Dayr 'Ayn 'Abāṭā: (Grey and Politis 2012: 190, Fig. 303-304); Ṣūbā/Belmont Castle: close parallel for decoration, but different ware, Phase B, Crusader, but clearly residual (Grey 2000: 93, Fig. 6.3.62, 94); al-Ramla, North of the White Mosque: similar, but entire vessel is painted, Early Islamic I (Cytryn-

Silverman 2010a: 108, Photo 9.15, 165, Pl. 9.10.6); Umm al-Raṣāṣ, Church of St. Paul: form not identical, similar band of slip but no paint, from late reuse of church, 9th-10th century? (Pappalardo 2002: 414, Fig. 21.21)

Discussion: R. 44830 is a small bowl or cup with the typical hard-fired, eggshell-thin, red-orange fabric with exterior band-burnishing typical of later FBW. It also has traces of a 2.25 cm band of white slip with an unidentifiable design painted in black below the rim. Grey and Politis (2012: 178) suggest that the painted decoration may have been influenced by Coptic Painted Wares. The context from which this sherd came, L. 3050, is in the small probe south of Wall 3042, outside of the main building. The fact that sherds of what seem to be the same vessel were found in L. 3016 and L. 3050 demonstrates that the two contexts are likely contemporary, but it is not clear why they were found on opposite sides of Wall 3042.

Mahesh Ware

Mahesh[224] Ware was first identified by Whitcomb (1989c) in early ‘Abbāsid levels at Ayla/al-‘Aqaba, and has since become a key indicator of late 8th-9th century occupation, particularly in southern Wādī ‘Araba. A relatively small number of sherds of this type have been found in Faynān, including two possible Mahesh Ware bowl sherds found during the WFLS (Adams, et al. 2007: 780, Fig. A5.34.820, 784, Fig. A5.36.579).

Bowl/Basin

Dating: Late 8th-9th century AD

Example: KHI, Area L, L. 3021, Stratum L-IIA. R. 20006. (Fig. 6.19.1)

Parallels: Ayla/al-‘Aqaba: similar form, but KHI example not comb incised, early ‘Abbāsid (Whitcomb 1989c: 279, Fig. 2.a-b); Elat-Elot: similar form, but KHI example not comb

[224] The name of this ware is taken from an Aramaic execration text in Hebrew letters referring to a demon named Māḥish (translated as “troublemaker”), which was found inscribed on a juglet at Ayla (Whitcomb 1989c: 269, n. 1).

incised, 8th-9th century AD (Avner 1998: 30*, Fig. 12.10-11); ‘En ‘Avrona: Early Islamic (Porath 2016: 26*, Fig. 27.1)

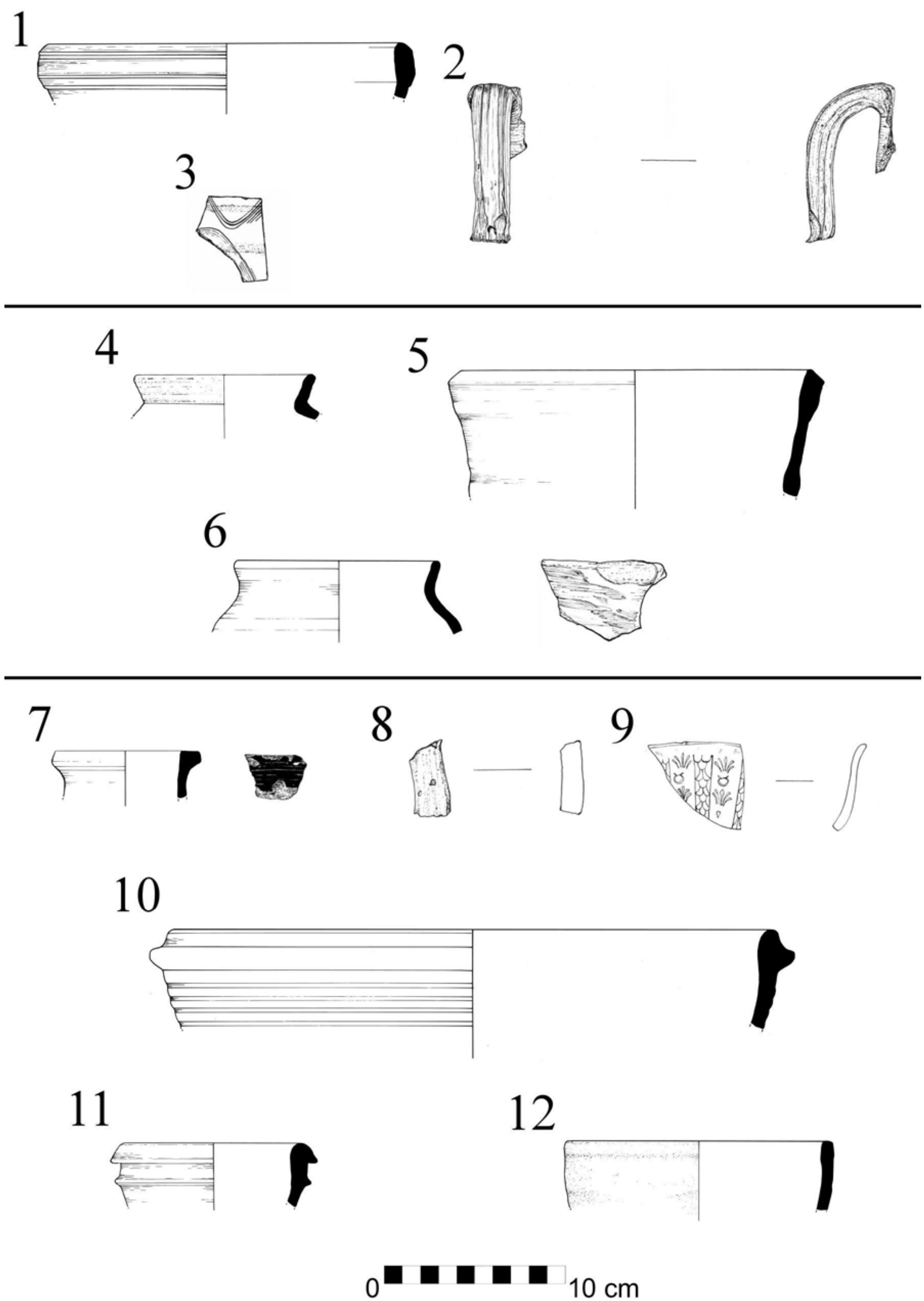

Figure 6.19: Ceramics from KHI (1-3), WFD 50a (4-6), and various survey sites (7-12). (Illustrations: Donna Walker.)

Table 6.13: Descriptions of sherds illustrated in Figure 6.19.

#	Reg.	Site	Area	Locus	Str.	Type	Ext.	Int.	Core	Fabric	Surface Treatment	Notes
Fig. 6.19.1	20006	KHI	L	3021	L-IIA	WM Bowl/Basin	-	-	-	-	-	Mahesh Ware
Fig. 6.19.2	41684	KHI	L	3010	L-I	WM Jug	2.5Y 4/1 Dark Gray	2.5Y 4/1 Dark Gray	2.5Y 4/1 Dark Gray	Hard-fired, common fine black inclusions	-	Gaza Ware
Fig. 6.19.3	20024	KHI	L	3021	L-IIA	Incised vessel (body)	-	-	-	-	Wavy comb incising	
Fig. 6.19.4	41242	WFD 50a	T	211	-	WM Cooking Pot	10R 5/4 Weak Red	2.5YR 6/6 Light Red	Light gray	Sandy temper, some fine calcareous and mineral inclusions	Int. uneven orange to brown-gray slip, ext. uneven dark reddish-brown slip	
Fig. 6.19.5	41235	WFD 50a	T	204	-	WM Jar	Black	10R 6/8 Light Red	Black-gray	Hard-fired, sandy temper, some fine calcareous inclusions	Reduced ext. slip; possible faint wavy line incised on neck	

Table 6.13: Descriptions of sherds illustrated in Figure 6.19, continued.

#	Reg.	Site	Area	Locus	Str.	Type	Ext.	Int.	Core	Fabric	Surface Treatment	Notes
Fig. 6.19.6	41229	WFD 50a	T	204	-	WM Jar	10YR 4/1 Dark Gray	2.5YR 5/2 Weak Red	Black	Hard-fired, evenly distributed fine sand temper	Reduced slip; poorly-preserved white painted décor	
Fig. 6.19.7	18458	FBRS 13	-	Surf.	-	Monochrome Glazed Jug	Dark green	Dark green	Black-gray	-	Green glaze int. and ext.	
Fig. 6.19.8	18460	FBRS 13	-	Surf.	-	Monochrome Glazed Jug (handle)	Dark green	Dark green	Black-gray	-	Green glaze int. and ext.	
Fig. 6.19.9	41177	Kh. al-Ghuwayba	-	Surf.	-	Coffee Cup	White	White	White	-	White glaze int. and ext.; ext. overglaze-painted motif in green, red, black, and gold	
Fig. 6.19.10	19286	WFD 628	-	Surf.	-	WM Basin	-	-	-	-	White slip int. and ext.	"Late" 'Aqaba Ware

Table 6.13: Descriptions of sherds illustrated in Figure 6.19, continued.

#	Reg.	Site	Area	Locus	Str.	Type	Ext.	Int.	Core	Fabric	Surface Treatment	Notes
Fig. 6.19.11	18378	FBRS 11	-	Surf.	-	WM Jar	GLEY 1 4/N Dark Gray	GLEY 1 4/N Dark Gray	5Y 5/1 Gray	Hard-fired, fine quartz and calcareous sand temper, few larger calcareous inclusions, few fine argillaceous inclusions	-	Gaza Ware
Fig. 6.19.12	18357	FBRS 15	-	Surf.	-	IHMW Varia	Uneven, 5YR 6/4 Light Reddish Brown to black	Uneven, 5YR 7/4 Pink to black	Black	Hard-fired, fine vegetal temper, few large vegetal voids, common fine mineral voids, some med. to large calcareous inclusions, few fine mica flecks	-	Diameter uncertain due to peak (not illustrated) on rim

Gaza Ware

Gaza Ware, or Gaza Gray Ware, was once thought to date exclusively to the 19th and 20th centuries AD, but since the early 1990s there has been evidence for its production in the early 18th or perhaps even late 17th century (Rosen and Goodfriend 1993; Ziadeh 1995b: 220). The discovery at Qabāṭiyya of two jars of an apparently early Gaza Ware type containing a coin hoard dated to ca. 1612 AD may push this date back to the early 17th century (Taha, et al. 2006: 14-16). Schaefer (1989: 42) posited that the gray wares found at Tall Jamma represented a Mamlūk period link between the Early Islamic gray wares produced at Bet She'an (discussed below) and Jarash, and Ottoman period Gaza Ware, but it is not clear that this is the case. The most detailed study of Gaza Ware is Israel's (2006) doctoral dissertation in Hebrew, but the best English-language source is Walker's (2009c) edited volume on the ceramics of the Ottoman period.

Closed Forms

Jugs

Dating: Late Islamic II

Example: KHI, Area L, L. 3010, Stratum L-I. R. 41684. (Fig. 6.19.2)

Discussion: R. 41684 preserves a complete handle of a Gaza Ware jug (or jar), with very little of the rim.

Other Closed Forms

Jars

Roman Jar

Dating: 2nd century AD (or slightly later?)

Example: KHI, Area L, L. 3051, Stratum L-II ("Missing" Phase, L-IIC). R. 20000.

Discussion: This is a Roman period storage jar, likely dating to the 2nd century AD. Most of the pottery from this locus was residual Early Bronze Age material, with R. 20000 being the latest sherd. That would place L. 3051 in the "Missing" Phase, Stratum L-IIC. Unfortunately, the locus was outside of the building, in the small probe south of Wall 3042 (see Figs. 5.25-5.26). Likewise, it is directly below a Stratum L-IIA locus, L. 3050, making the relationship between Strata L-IIB and L-IIC somewhat confusing.

Cooking Wares

Thickened Rim Cooking Pot

Dating: 6th-9th century AD

Example: KHI, Area L, L. 3050, Stratum L-IIA. R. 44831.

Parallels: Ayla/al-ʻAqaba: Umayyad (Whitcomb 1989b: 181, Fig. 4.i); Elat-Elot: 8th-9th century AD (Avner 1998: 32*, Fig. 13.8); ʻEn ʻAvrona: Early Islamic (Porath 2016: 30*, Fig. 29.1); Jabal Hārūn: Phase XIII, mid-8th-9th/10th century (Gerber 2016: 156, Fig. 26.287, 194-195); Khirbat al-Dayr: mid-6th-7th century AD (Calderon 1999: 139, Pl.2.2); Rehovot-in-the-Negev: Late Byzantine (Rosenthal-Heginbottom 1988: 91, Pl.IV.175, 92, Ill. 134, 93); Umm al-Raṣāṣ, Church of the Tabula Ansata: similar form, but different fabric, 6th-7th century (Pappalardo 2003: 320, Fig. 28.14)

Discussion: R. 44831 is the complete upper half (including the full rim and both handles) of a 6th-9th century cooking pot with a thickened rim. The rim has parallels with Magness Cooking Pot Form 4C, but the handles are smaller than typical for the Form 4 cooking pots (Magness 1993: 219-220).

Varia

a) Unknown Comb-Incised Vessel

Dating: Probably Early Islamic

Example: KHI, Area L, L. 3021, Stratum L-IIA. R. 20024. (Fig. 6.19.3)

Discussion: This is a comb-incised body sherd. While comb-incised decoration is not, in itself, diagnostic, the context of this sherd suggests a date in the Early Islamic period.

b) Unknown Hand-made Jar

Dating: Islamic(?)

Example: KHI, Area L, L. 3016, Stratum L-IIA. R. 19886.

Discussion: R. 19886 is the rim of a handmade jar (or jug). The fabric differs from most of the Islamic handmade fabrics known from elsewhere in Faynān, although it is not entirely dissimilar to R. 8436, from Khirbat Faynān Area 16 (see Section 6.2.3). The possibility that this is a residual Early Bronze Age sherd should be considered, but it is better preserved than the other EB residuals in this locus, and better fired.

Lamps

Large Candlestick Lamp

Dating: mid-6th-mid-8th century AD

Example: KHI, Area L, L. 3022(A), Stratum L-IIB. B. 45179. (Fig. 6.20)

Parallels: Magness Oil Lamps Form 3A, "Large Candlestick Lamps" (Magness 1993: 251-252); ʻAyn al-Kanīsa/Mt. Nebo: 6th-7th century AD, variant design (Sanmorí and Pappalardo 2000: 428, Fig. 13.2); Bet She'an: Hadad Type 28/Preliminary Byzantine Type 3, dated 5th-mid-8th century AD (Hadad 1997: 159-160, Fig. 20; Hadad 2002b: 66-68); Dayr ʻAyn ʻAbāṭā: Phase IVa, 5th-6th century AD (da Costa 2012: 255-256, 291, Pl. 79.86); Dhībān: Byzantine Phase C, 6th-7th century AD? (Tushingham 1972: Fig. 5.45), 6th century? (Winnett and Reed 1964: Pl.

18.4, Pl. 66.11); Ḥorvat Karkur ʻIllit: Late Byzantine (Nikolsky and Figueras 2004: 202, Fig. 47.2-4, 203, Phot. 208); Ḥorvat Meṣad: Stratum III, Byzantine (Taxel 2012: 141, Fig. 5.32.13); Jabal Hārūn: (Holmqvist 2016: 252, Fig. 16.4, 253, Fig. 17.11-12, Fig. 18); Khirbat Buraykūt/Ḥorvat Berachot: (Tsafrir and Hirschfeld 1979: 313, Fig. M); Khirbat al-Dayr: mid-6th-7th century AD (Calderon 1999: 144, Pl. 5.1-3, 145, Figs. 3-5); Khirbat al-Mukhayyaṭ/Nebo: 6th-7th century AD (Michel 1998: 381, Fig. 11.2-3); Khirbat al-Ṣūyyāgh: Lamp Type 1A, Late Byzantine/Umayyad (Taxel 2009: 108, 121, 3.12.1, 132, 3.22.2, 138, 3.27.1); Mādabā: Byzantine-Umayyad (Acconci and Gabrieli 1994: 438, Fig. 24.62(?), 457, Fig. 38.161-162, 473, Fig. 41.15-17, 474, Fig. 42.6-7, 485, Fig. 47.33-38); Pella: 6th-8th century AD (da Costa 2010: 78, 83, Figs. 23-24); Sāl: (Taʻani and Melhem 1994: 45, Fig. 4.1, 5, Fig. 5); Tall Ḥisbān: Late Byzantine III-IV, late 6th-mid-7th century AD (Gerber 2012: 483, Fig. 3.97.23-25, 488), Umayyad (Sauer 1973: 39, 41-42, Fig. 3.126-127); Tall Jāwā: Early Islamic, Type L-5, variant designs different from the standard designs on B. 45179 (Beckmann and Daviau 2010: 325, Fig. 9.6.4-5, 328-333); Umm al-Raṣāṣ: Byzantine-Umayyad, both standard and variant designs (Alliata 1991: 370, Fig. 3.19, 383, Fig. 10.35-36, 386, Fig. 11.12, 398, Fig. 18.14, 410, Fig. 24.7, 413, Fig. 26.25-27; Pappalardo 2002: 425, Fig. 29.23(?), 435, Fig. 37.5; Pappalardo 2006: 393, Fig. 3.14; see also a review of these lamps in the Umm al-Raṣāṣ and Mt. Nebo region in Pappalardo 2007: 563-568)

Figure 6.20: Large Candlestick Lamp from KHI, Area L, L. 3022(A), B. 45179. (Photo: Aaron Gidding, courtesy UC San Diego LCAL.)

Discussion: This is a Large Candlestick Lamp, dating to the Late Byzantine-Early Islamic I. The name derives from a common decorative element on the large type, a ridge extending from the wick hole to nozzle flanked by braches and resembling a candlestick or possibly a menorah (Magness 1993: 173-174; Rosenthal and Sivan 1978: 116). Part of this motif is preserved on B. 45179, and visible near the fire-blackened nozzle in Fig. 6.20. These lamps are uncommon in southern Jordan, and da Costa (2012: 256) notes that they have previously been found "only at Deir 'Ain 'Abata and Petra."[225] The only examples I have found from Petra are two recently published fragments from Jabal Hārūn (Holmqvist 2016: 252, Fig. 16.4, 253, Fig. 17.11-12, Fig. 18). Holmqvist (2016: 253) notes that candlestick lamps of either type had previously "not been

[225] An earlier (4th-6th century) Small Candlestick Lamp was also found at Khirbat al-Tannūr, a primarily Nabataean cultic site on the southern bank of Wādī al-Ḥasā, some 75 km north of Petra (Barrett 2013: 194, Fig. 17.43; see also the same lamp in Glueck 1965a: 176, Pl. 82b). This type is also quite rare in southern Jordan.

published from Petra." This would make KHI the third site where lamps of this type have been found in southern Jordan.

WFD 50a

Mahesh Ware

See discussion of this type, above.

Unknown form

Example: WFD 50a, Area T, L. 208. R. 44808.

Discussion: This is a body sherd from a basin or jar recovered from the disturbed burial at WFD 50a. Like the other pottery recovered from the "burial" loci, this is likely not associated with the burials, but present due to mixing from bulldozing (see Section 5.5). This is less than certain, however, as demonstrated by the occasional presence of earlier pottery in Late Islamic period burials at Tall al-Ḥaṣī (Eakins 1993: 64). Although the rim of this vessel is not preserved, the somewhat micaceous fabric and shallow, "overlapping" comb incising are typical of Mahesh Ware (see Whitcomb 1989c: 279, Fig. 2a-c). Gerber (2008: 290) likewise points out that "thick bands of incised rounded wavy lines . . . are more often characteristic of the Early Islamic period," although she also argues that it is "very risky to rely only on wavy lines as a chronological indicator." Nonetheless, in combination with the fabric a Mahesh Ware attribution is appropriate.

Cooking Wares

Everted Rim Cooking Pot

Dating: Byzantine-Early Islamic

Example: WFD 50a, Area T, L. 211. R. 41242. (Fig. 6.19.4)

Parallels: Jabal Hārūn: Phase 9 (site Phase XIII), mid-8th-9th/10th century AD, but dated Byzantine (4th-5th century?) on basis of several parallels (Gerber 2008: 303, Fig. 7.160, 322); South Sinai, Wādī Jibāl: 630-700 AD (Calderon 2000a: 189, Fig. 3.47, 216, Fig. 18.11); Umm al-Raṣāṣ, Church of the Tabula Ansata: fairly weak parallel, 6th-7th century (Pappalardo 2003: 319, Fig. 27.6); Yotvata: similar, Early Islamic (Davies and Magness 2015: 125, Fig. 2.23.4)

Discussion: This sherd belongs to a cooking pot (or jar) with short, everted rim. A Byzantine period date could be suggested on the basis of the relatively close parallel at Jabal Hārūn, and it is also worth noting the similarity of the form to a group of larger diameter Nile silt jars from Bī'r Umm Fawākhir in the Egyptian Eastern Desert, dated to the Late Byzantine period (Meyers and Heidorn 2014: 69, Fig. 33.136-137). The examples from Wādī Jibāl and Yotvata seem to suggest a slightly later date, in the first half of the Early Islamic I.

Jars and Amphorae

a) Gaza Amphora (Carthage LRA 4/Benghāzī LRA 3)

Dating: 4th-7th century AD

General Parallels: General: (Dixneuf 2005); Beirūt: (Reynolds 2005: 574-575, 607, Figs. 153-157); Caesarea Maritima: Amphora Type 2 (Blakely 1988: 35, 37-38, 40, Fig. 6.1-4; Riley 1975: 27, 30-31, 29, Fig. 12, 32, Figs. 13-15); Haluza/al-Khalūṣ: (Bar-Oz, et al. 2016: Fig. 6.4-15); Kawm al-Dikka: (Majcherek 1995); Khirbat Baraqa: (Gadot and Tepper 2003: 147, Fig. 17); Tall al-Far'a (South): Amphora Type 1 (Tubb 1986: 51-55, Fig. 1, Fig. 2.1-3)

Example: WFD 50a, Area T, L. 209, western wall probe extension. R. 44812.

Discussion: This is a body sherd of a Gaza amphora, generally dated to the 4th-7th century AD. The fine ribbing may suggest a later (5th-7th century AD) date, but without more of the vessel, and particularly the rim, this is uncertain.

Mayerson (1992) suggested that the tall and short forms could be classified as "Gaza" and "Ashkelon" types on the basis of evidence from papyri referring to *gazitia* and *askalônia*. Whatever distinction these papyri are referring to, however, it does not seem to map onto the geographic distinction in types proposed by Mayerson. Both types are found at production sites across a fairly wide area of the southern Coastal Plain, between Nahal Lachish/Wādī Ṣuqrīr and Nahal Besor/Wādī Ghazza, and the distinctions instead seem to be chronological (Gadot and Tepper 2003: 150-152; Rapuano 2016: 115).

b) Tall-Necked Jar with Black Surfaces

Dating: Early Islamic

Example: WFD 50a, Area T, L. 204. R. 41235. (Fig. 6.19.5)

Parallels: Jabal Hārūn: Phases XI-XIV, early/mid-7th-9th/10th century, but dated 8th century on basis of parallels (Gerber 2016: 146, Fig. 15.175, 147, Fig. 16.203, 156, Fig. 26.292-293, 160, Fig. 30.348)

Discussion: The parallels at Jabal Hārūn, cited above, are smaller in diameter than R. 41235, but the form and fabric are very similar.

c) White-Painted Bag-Shaped Jar

Dating: 6th-8th century AD

General Parallels: Ayla/al-'Aqaba: Umayyad (Whitcomb 1989b: 181, Fig. 4.r); Bet She'an/Baysān, Theater Pottery Workshop: (Bar-Nathan 2011: 232-234, Fig. 11.3); 'En Boqeq:

Type VK9, 7th century AD (Gichon 1993: 140-141, Taf. 20.4-5, 7)[226]; Gharandal: Terminal Byzantine-Early Islamic (Walmsley and Grey 2001: 152, 150, Fig. 8.19); Khirbat al-Mafjar: Period 1, 750-800 AD (Whitcomb 1988c: 55-56, Fig. 1.1A); Mesillot: early 8th century AD? (Porat 2006: 186, Fig. 6.5-6, 188, Fig. 7.1); Nevé Ur: Early Islamic (Shalem 2002: 162, Fig. 10.6-7, 163, Fig. 11.1-3, 5); Pella: Umayyad (Walmsley 1982: 149, 80, Pl.62b, 173, Pl. 146.3, 177, Pl. 148.4, 6); al-Ramla, Marcus Street: (Arnon 2007: 57-58, 59, Fig. 10.5-6); al-Ramla, North of the White Mosque: uncommon (Cytryn-Silverman 2010a: 101-102, 149, Pl. 9.2.12, 165, Pl. 9.10.3, 175, Pl. 9.15.5); Tel Jezreel: (Grey 1994: 53, 55-56, Fig. 6.1-5); Tiberias/Ṭabariyya: 749 AD earthquake destruction level (Stacey 2004: 126, Fig. 5.34.1-2); Yoqne‘am: Storage Jar Type 4 (Avissar 1996: 147-149, Fig. XIII.114)

Examples: WFD 50a, Area T, L. 204. R. 41229. (Fig. 6.19.6)

WFD 50a, Area T, L. 209 (wall core). R. 44813.

Discussion: Grey (1994: 53) noted that the white-painted bag-shaped jar was "confined to northern Palestine and adjacent parts of Jordan," but some examples have been found in the south, for example at Ayla and Gharandal, both listed as general parallels above. Walmsley and Grey (2001: 152) suggest that the painted examples found in the south were likely produced in the north. The distribution of this type would already suggest that this is the case, and evidence for their production has been found at Bet She'an (Bar-Nathan and Najjar 2011: 201).

d) Unknown Byzantine Jar

Dating: 4th-7th century AD(?)

Example: WFD 50a, Area T, L. 213. R. 44809.

[226] As noted in the previous section (6.2.4), the published dates for ‘En Boqeq are too early. While Gichon (1993: 266-269) dates the painted examples of this type to the Byzantine period, all of the painted examples are in phases redated by Magness (1999: 193-194) to the 7th century AD, the dating I follow here.

Discussion: Gerber (2008: 290) suggests that, at Jabal Hārūn, "rounded wavy lines – small bands, not more than 4 lines . . . – belong predominantly to the Byzantine period," although see the caveat above about using wavy lines for dating. Nonetheless, the decoration and fabric of R. 44809 are similar to a sherd from Jabal Hārūn dated to the 3rd/4th-7th century (Gerber 2008: 299, Fig. 5.117, 319).

6.4. Ceramics from Survey Sites

Glazed Wares

Monochrome Glazed Ware

Closed Forms

Dating: Islamic Period

Examples: Qaṣr Karayim bin ʻAlī (FBRS 13), Surface Collection. R. 18458. (Fig. 6.19.7)

Qaṣr Karayim bin ʻAlī (FBRS 13), Surface Collection. R. 18460 (handle of same vessel). (Fig. 6.19.8)

Parallels: Yoqneʻam: Jug Type 17, Early Islamic (Avissar 1996: 164, Fig. XIII.143)

Discussion: This type is represented by two sherd of a green-glazed jug. I have not found close parallels for the form of this vessel, but the fabric seems most closely to resemble an Early Islamic glazed juglet type found at Yoqneʻam. Glazed jugs were, however, present at Yoqneʻam in both the Early and Middle Islamic period assemblages in small quantities (Avissar 1996: 155, 164, 166). As Avissar (1996: 155) notes of the Early Islamic types, they "were obviously not popular." Walker (2009a: 42-44) points out that Hayes published green-glazed spouted jugs dating to the 17th-19th century from Saraçhane in Istanbul, and that the Ottoman "green-glazed pottery of Jordan shares many characteristics of Hayes' 'Turkish coarse wares' sub-group," to which those vessels belong. Due to the lack of close published parallels, and the presence —

albeit minimal — of monochrome green-glazed jugs in assemblages spanning almost the entire Islamic period, from at least the 9th to the 17th centuries, it is difficult to suggest a precise date for this vessel. The presence of HMGPW in the TBAS assemblage from Qaṣr Karayim bin ‘Alī (see Section 5.2.3) may indicate a Middle or Late Islamic period date, but Byzantine sherds were also collected at the site.

Porcelain Coffee Cups

Dating: late 20th century AD

Example: Khirbat al-Ghuwayba, Surface Collection. R. 41177. (Fig. 6.19.9)

Parallels: ASKP, al-Thaniyya: Modern (Brown 1991: 279, Fig. 482); Ḥarrāt al-Khrays, U.A.E.: ca. 1920-1970, coffee cups mostly “early 1970s” (Power 2015: 13, Fig. 9, lower right panel, 26); al-Muḥarraq, Baḥrain: post-1920 (Carter and Naranjo-Santana 2011: 58, Fig. 49)

Discussion: Glazed ceramics of the Late Islamic IIb are not commonly published in Jordan, and 20th century ceramics — what Power (2015: 26) calls the Late Islamic 2c — even less so (but see Boas 2000b; Grey and Petersen 2012; Tsuk, et al. 2016). The only close published parallel from Jordan that I am aware of was published by Brown (1991: 279, Fig. 482) as part of the Archaeological Survey of the Kerak Plateau assemblage. It is increasingly common, however, to see these vessels published in southeastern Arabia (see references above and also Kennet 2004: 70). Based on comparison to these vessels, the porcelain coffee cups found in Faynān are likely imports from Japan (or possibly Europe) and date to the later 20th century.

Wheel-made Wares

al-‘Aqaba Basin

Dating: 7th century AD

General Parallels: Ayla/al-‘Aqaba: “Ayla Ware” (Whitcomb 2001a); Ayla/al-‘Aqaba, Kilns: “Aqaba basins” (Melkawi, et al. 1994: 456, 457, Fig. 8.j, k, n, o)

General Discussion: This type is a white-slipped basin, generally with a ridged rim. It seems to have been produced in Ayla, alongside the common ‘Aqaba amphora, as suggested both by kilns excavated in Ayla (Melkawi, et al. 1994; Whitcomb 2001a) and by a recent sourcing study of amphora sherds from Ẓafār in Yemen (Raith, et al. 2013). Although not as common as the ‘Aqaba amphorae, the distribution of this basin type seems have been equally wide, and similar basins have been found in 5th-7th century contexts at Qānā’/Bī’r ‘Alī in Yemen (Sedov 1992: 113, Fig. 2.5) and Adulis in Eritrea (Zazzaro, et al. 2014: 583, Fig. 32). The amphorae tend to be dated to the early 5th-9th century AD (Parker 2006: 228; Parker 2013: 741; Power 2012a: 29-30; Whitcomb 2001a: 299), but the basins seem to be found primarily in 7th century contexts.

Example: WFD 628, Surface Collection. R. 19286. (Fig. 6.19.10)

Parallels: Ayla/al-‘Aqaba: Umayyad (Whitcomb 1989b: 179, Fig. 3.r; Whitcomb 1994: 24, Fig. c); Ayla/al-‘Aqaba, Kilns: 7th century AD (Melkawi, et al. 1994: 457, Fig. 8.n; see also the same vessels in Whitcomb 2001a: 301, Fig. 1.g-h); al-Ḥumayma: mid-7th century AD (‘Amr and Schick 2001: 126, Fig. 34; see also same vessel in Schick 2013: 265, Fig. 7.50.1993.0264.34); Jabal Hārūn: Phase XIII, 8th-9th century AD (Gerber 2016: 157, Fig. 27.302); WFLS, Site WF4: Late Byzantine (Tomber 2007: 460, Fig. A2.9.80)

Discussion: WFD 628 was identified primarily as a sherd and lithic scatter ca. 0.75 km south of Khirbat Ḥamrā’ Ifdān on the western bank of ‘Ayn Fidān (see Knabb, et al. 2014: 612, 618, Table 7.2). No architecture was recorded at the site, and the presence of this basin sherd likely suggests use of the spring associated with the 7th century settlement at KHI (see Section 5.4).

Gaza Ware

On this ware generally, see discussion in Section 6.3.

Dating: Late Islamic II

Example: FBRS 11, Surface Collection. R. 18378. (Fig. 6.19.11)

Parallels: Kafr Kanna: Ottoman (Barbé and Shapiro 2012: 80*, Fig. 14.4); Nahal ‘Oded: Ottoman (Rosen and Avni 1997: 80, Fig. 7.6.1), Israel (2006: 100) gives a date of 1700-1880 for this vessel; Ramat Hanadiv: Phase I, Late Ottoman (Boas 2000b: 550, Pl. II.1-4); Ramot Nof, Be’er Sheva: similar, Mandate Period (Ustinova and Nahshoni 1994: 174, Fig. 14.13); Ṣūbā/Belmont Castle: Phase E, early 20th century AD (Grey 2000: 91, Fig. 6.2.48, 92)

Discussion: This is the rim of a common type of Gaza Ware jar.

Unpainted Islamic Hand-Made Wares (IHMW)

Peaked-rim vessel

Example: FBRS 15, Surface Collection. R. 18357. (Fig. 6.19.12)

Discussion: See discussion of this type at KNA in Section 6.1.3.

6.5. Petrographic Analysis of Ceramics

The petrographic study described in this section was primarily designed to test the hypothesis that copper produced in late 12th and 13th century Faynān provisioned the sugar industry. The most direct way to test this hypothesis would be to determine the provenance of the large, copper boiling vessels, or *dusūt*, used in sugar factories. Several problems confront us here, however. The first is that copper objects, at the end of their use-life, are readily recyclable. While recent archaeometallurgical theory has recognized the potential of data regarding trace-element loss due to recycling in adding chronological depth to “object biographies” (Pollard, et al. 2014; see also Jennings 2014; and more generally Gosden and Marshall 1999), this is most readily applicable to prehistory. In later periods, other problems of recycling, notably the mixing of copper from multiple sources, make establishing the provenance of copper objects difficult (Budd, et al. 1996). Recycling, and indeed recycling practices that could lead to mixing, are well documented across the Islamic world throughout the Islamic periods (see Section 3.3 and Jones, et al. 2012: 93-94, n.17).

For *dusūt* this may be less of a problem, however. Jones, et al. (2012: 93-94) suggested that these vessels would have been produced with new copper to ensure the taste of the final product (and see Section 10.2). If KNA and KF were provisioning the sugar industry, the use of new copper would be quite likely. Recent, unpublished work suggests this may not always be the case, however. XRF analysis of a possible *dast* from the 2006 excavations in a metal workshop at Khirbat al-Minya demonstrates that it was made of a quaternary *caldarium* (see Section 10.2), and not pure copper (K. Cytryn-Silverman, pers. comm.). If these vessels were made of alloys, and potentially recycled metal, establishing a source through isotopic analysis is even more difficult. Unfortunately, recycling presents another problem in this context: it is quite likely that the vast majority of *dusūt* were themselves recycled, especially after the collapse of the sugar industry in the 15th century (see Section 3.6.2). This is borne out by the archaeological evidence. I am aware of only two published possible examples of these vessels. The first was surface collected near Ṭawāḥīn al-Sukkar in Ghawr al-Ṣāfī (Agnoletti 2009; James and Photos-Jones 2017: 105, Fig. 5.4) and the second surface collected from a field at Beit Zera in the Galilee (Peled 1999: 256, Fig. 5; Stern 1999a: Fig. 104.1).[227] A third, unpublished fragment was found, as noted above, in the 2006 excavations at Khirbat al-Minya. While other small pieces of these vessels have been found by Israel Antiquities Authority excavations, e.g. at Lower Ḥorbat Manot

[227] Stern (1999a: 162) points out that it is not actually certain the vessel from Beit Zera was used in sugar production, and suggests indigo production as another possible use.

(Stern 2001: 300),[228] these come from 13th century Crusader sugar factories almost certainly unrelated to Faynān. In short, the example most likely to be made of Faynān copper — the nearly complete *dast* from Ghawr al-Ṣāfī — came from a surface context, and is of uncertain date.

Ceramic petrography, however, can serve as a proxy of sorts. While not a direct indication of a connection to the sugar industry, ceramic sourcing helps to piece together Faynān's economic connections within the region. There are, of course, some uncertainties in this process. Even if the original source of a vessel is established, the route through which it arrived in Faynān is not certain, and intermediate market sites must have been involved. Nonetheless, certain types of ceramics may be more useful than others. The imported stonepaste wares (see Section 6.1.1) were produced at sites at least as far as Damascus, and their presence at Faynān indicates a connection to al-Shawbak or al-Karak — note also Sinibaldi's (2016b: 92) interpretation of Crusader period al-Wuʿayra — rather than northern Bilād al-Shām. Too much remains uncertain about the typology, production, and distribution of Middle Islamic period hand-made wares for these to be useful indicators (see Section 6.1.3 and Gabrieli, et al. 2014), although they are discussed here. Unglazed wheel-made wares (see Section 6.1.2), however, may be useful in establishing regional connections, in that their mode of production is better understood and they were certainly the products of southern Levantine sites.

Ceramic petrography is a mature discipline, and a number of manuals explaining the goals, methods, and theoretical underpinnings are available. Among fairly recent examples are those by Quinn (2013) and the short introductory work by Peterson (2009). This section follows the methods summarized by Robert Mason (2004), to whom I owe great thanks both for his instruction and guidance and for allowing me the use of his lab at the Royal Ontario Museum to conduct the analyses presented here.

[228] I thank Edna Stern for pointing these out to me.

Section 6.5.1 presents the results of a petrographic study of 35 thin sections. The majority of these (n=32) were taken from sherds collected at KNA and Khirbat Faynān, with two from the Wādī al-Fayḍ Expedition and one from Khirbat al-Manāʿiyya included for comparison. They are separated by type for ease of presentation, although there is some overlap here, particularly between the wheel-made and mold-made groups. The stonepaste group is discussed first, followed by the wheel-made groups, the mold-made groups, the hand-made groups, and finally the technical ceramics group. Note that the numbering of the petrographic groups discussed in this section bears no relation to the group or type numbers discussed above. For example, Stonepaste Group 1, the petrographic group discussed below, was sampled from a sherd belonging to Stonepaste Type 3 in the discussion above. It is likely, however, that most of the stonepaste sherds from KNA, regardless of type, belong to this petrographic group. It is also worth noting that the hand-made ceramics — the largest part of the sample (n=19) — are very heterogeneous, and nearly every sample could be presented as its own group. Further study might show that the groups I suggest should, in fact, be multiple groups. As such, I provide a description for each sample in this section. Note also that this is a preliminary petrographic study, and not a robust, statistically significant sample. The largest group identified below — Hand-Made Group 7 — includes only three samples, and most groups are represented by only one or two. Because of this, the samples are listed individually under each group below. The format first presents the thin section sample number (e.g. TS1), followed by the ELRAP registration number, discussed above. If the sample was taken from a previously published sherd, the old JHF/ELRAP registration number is also provided in square brackets for cross-referencing with the earlier report.

The study presented here is still in a preliminary state, and any conclusions are tentative. The sources of many of the petrographic groups have yet to be established, and further work, including petrographic investigation of clay sources, will be necessary to determine these. Reference is made primarily to Mason and Milwright's (1998) petrographic study of the ceramics from al-Karak and other sites in the region. Despite the preliminary nature of the data, this work provides some insight into the source of the ceramics from KNA and a number of other sites excavated by ELRAP.

6.5.1. The Petrographic Data

Stonepaste Group 1

Petrographic description: Fired stonepaste body, 35% clear quartz, 10% slightly-cloudy quartz, 1% cloudy quartz, 1% very cloudy quartz, trace polycrystalline quartz; modal quartz grain size of 0.15 mm, maximum grain size of 0.4 mm, mean rounded grain size of 0.25 mm.

Sample: TS23, R. 18292 [=Reg. WAG02.251 in Jones, et al. (2012: 87, Fig. 19, bottom left)].

Discussion: Only a single stonepaste sherd from KNA was sampled, and in the future it would be productive to sample more of this group. Although the proportion of clear quartz is slightly lower and the proportion of slightly-cloudy quartz somewhat higher, the composition is essentially consistent with Mason's (2004: 104, Table 5.4) Damascus(?) Petrofabric.[229] The lack of sheared quartz, among other things, distinguishes it quite clearly from the Raqqa-1 Petrofabric (Mason 2004: 105, Table 5.5). The percentages are quite similar to an example in the Damascus(?) ('Karak 20') Petrofabric from al-Karak (Mason and Milwright 1998: 185).

Wheel-Made Group 1

[229] Mason (pers. comm.) had the same assessment after viewing this sample under the microscope.

Petrographic description: Fired clay matrix, 2-7% void, with 15% quartz, undulose to straight extinction, moderately sorted, round to subround with a mean diameter of 0.07 mm; trace amounts of sheared quartz; 3% carbonate, moderately sorted, well-round to subangular, with a mean diameter of 0.11 mm, primarily fine, dark calcite, as well as some coarse calcite with quartz and opaque inclusions; common free forams and some fossil shell, rare dolomite; 3% opaques; ca. 1% phosphates; ca. 1% feldspar, angular to subangular, with a modal diameter of 0.05 mm; trace clinopyroxenes; 1% argillaceous inclusions, mean diameter of 0.02 mm, in sample TS1; trace volcanic glass in sample TS33; trace mica, including one large (0.4 mm) grain of tabular muscovite mica in sample TS1.

Samples: TS1, R. 38293.

TS33, R. 18320 [=Reg. WAG02.223 in Jones, et al. (2012: 84, Fig. 17.1)].

Discussion: This group includes two wheel-made jugs from KNA, fired to buff. Mason and Milwright (1998: 185) report that "free forams are not found in any petrofabric at Karak," but are found in their Shawbak Petrofabric. Faynān Wheel-Made Group 1 is not identical to the Shawbak Petrofabric, as it contains three times more quartz and one-third as much carbonate, as well as a number of trace inclusions not reported for the Shawbak Petrofabric. As Mason and Milwright (1998: 185) took this sample from a kiln tripod, however, the composition may be somewhat unique. At Khirbat Fāris, Abu-Jaber and al Saa'd (2000: 183, Table 3) report fossils only in relatively few HMGPW samples. Al-Shawbak is a possible source for this group, but this is by no means secure. Free forams are found in a number of southern Levantine groups, including the widespread marl clays found everywhere from the Galilee (Shapiro 2013; Shapiro 2014) to the Negev (Goren 1996: 48). Of particular note, given the character of the KNA assemblage, is the fact that free forams are found in several clays of the Jerusalem region (Ben-

Shlomo and Mommsen 2018). The lack of published petrographic analysis of Middle Islamic period ceramics from Jerusalem is a major limiting factor here.

This group is very similar to Wheel-Made Group 2, except for the percentage of quartz and carbonate and the presence of trace mica, Wheel-Made Group 3, except for the percentage of carbonate and presence of phosphates, and Wheel-Made Group 4, except for the percentage of quartz and carbonates and presence of phosphates.

Wheel-Made Group 2

Petrographic description: Fired clay matrix, 5-7% void, with 7-10% quartz, strongly undulose to straight extinction, well-sorted, round to subangular with rare angular grains, with a mean diameter of 0.07 mm; 5-7% carbonate, poor to moderate sorting, well-round to angular, with a mean diameter of 0.05 mm and maximum diameter of 0.2 mm, carbonates are primarily coarse calcite with some fine calcite, plentiful free forams but little fossil shell, trace dolomite or squared calcite; 1-2% argillaceous inclusions, with a mean diameter of 0.4 mm; 1-2% opaques, well-sorted, well-round to subround, with a mean diameter of 0.03 mm and maximum diameter of 0.13 mm; trace feldspar, clinopyroxenes, and phosphates.

Samples: TS3, R. 38576.

TS22, R. 18295 [=Reg. WAG02.228 in Jones, et al. (2012: 84, Fig. 17.8)].

Discussion: See discussion under Wheel-Made Group 1. Wheel-Made Group 2 includes two orange-fired vessels from KNA. This group is very similar to Group 1, except for the percentage of quartz and carbonate and absence of trace mica, Wheel-Made Group 3, except for the percentage of quartz and presence of trace phosphates, and Wheel-Made Group 4, except for the percentage of carbonate, lack of mica, and presence of phosphates.

Wheel-Made Group 3

Petrographic description: Fired clay matrix, 2-7% void, with 20% quartz, strongly undulose to straight extinction, moderate to well-sorted, round to angular, with a mean diameter of 0.05 mm; sample TS28 has trace sheared quartz; 7-10% carbonate, poorly sorted, well-round to sub-round, with a mean diameter of 0.04 mm and maximum diameter of 0.3 mm, carbonates consist of calcite and free forams; 1-2% opaques, poorly to moderately sorted, well-round to sub-angular, with a mean diameter of 0.05 mm and maximum diameter of 0.3 mm; ca. 1% argillaceous inclusions, with a mean diameter of 0.05 mm; trace feldspar and clinopyroxene; a single mica grain was observed in sample TS28; a single possible amphibole grain was observed in sample TS25.

Samples: TS25, R. 38276.

TS28, R. 18005 [=Reg. WAG02.231 in Jones, et al. (2012: 84, Fig. 17.6)].

Discussion: See discussion under Wheel-Made Group 1. This group includes two wheel-made bowl sherds from KNA, both fired to buff. This group is very similar to Wheel-Made Group 1, except for the percentage of carbonate and lack of phosphates, and Wheel-Made Group 2, except for the percentage of quartz and lack of phosphates.

Wheel-Made Group 4

Petrographic description: Fired clay matrix, 2% void, with 5% quartz, undulose to straight extinction, well-sorted, sub-round to angular, with a mean diameter of 0.03 mm; 15% carbonate, moderately sorted, well-round to angular, with a mean diameter of 0.1 mm, carbonates consist of both calcite and dolomite, with some free forams and little fossil shell; 1% opaques, well-sorted, well-round to round, with a mean diameter of 0.04 mm; 1% argillaceous inclusions, with a mean diameter of 0.1 mm, including a grog with trace feldspar inclusions; trace clinopyroxene and mica.

Samples: TS26, R. 17715 [=Reg. WAG02.227 in Jones, et al. (2012: 84, Fig. 17.7)].

Discussion: See discussion under Wheel-Made Group 1. This group includes a single wheel-made jar or bowl from KNA, fired to orange. It is nearly identical to Mold-Made Group 1, except for the percentage of quartz and voids, the carbonate grain size, and the absence of trace isotropics. It is similar to Wheel-Made Group 5, but with a unimodal quartz distribution. Potentially a Moẓa clay fabric (see Cohen-Weinberger, et al. 2016).

Wheel-Made Group 5

Petrographic description: Fired clay matrix, 5% void, with 7% carbonate, moderately sorted, round to angular, with a mean diameter of 0.06 mm, carbonate roughly 50% calcite, primarily dark and fine-grained with occasional feldspar and rare foram inclusions, with fewer coarse-grained calcite and fossil shell, and 50% dark, fine dolomite, as well as trace free forams; 7% argillaceous inclusions, poorly sorted, primarily clay nodules, with a mean diameter of 0.15 mm and maximum diameter of 0.7 mm; 4% bimodal quartz; 3% fine quartz, undulose to straight extinction, well-sorted, sub-angular to angular, with a mean diameter of 0.03 mm; 1% coarse quartz, mostly sheared with strongly undulose extinction, well-sorted, subround, with a mean diameter of 0.2 mm; the lack of rounded grains suggests that the quartz was crushed prior to its addition to the clay; 2% opaques, very well sorted, well-round to sub-round, with a mean diameter of 0.3 mm; 1% mica, very well-sorted, angular, with a mean diameter of 0.03 mm; trace feldspar and clinopyroxenes.

Samples: TS2, R. 38307.

Discussion: Wheel-Made Group 5 includes a bulbous-neck *ibrīq*, fired to red. The distribution of quartz grain sizes distinguishes it from the other KNA groups, but other than its bimodal quartz distribution and carbonate grain size it is quite similar to Wheel-Made Group 4.

Of the KNA fabrics, this is most similar to the likely Karak fabrics published by Mason and Milwright (1998), but it is not identical to any of them. Except for the nature and grain size of the carbonates, the presence of mica, and the trace components, this group is somewhat similar to the 'Karak 12' Petrofabric (Mason and Milwright 1998: 181).

Wheel-Made Group 6 (Beirūt Cooking Ware Group)

Petrographic description: Fired clay matrix, 3-5% void, with 17-20% bimodal quartz; 10% fine quartz, strongly undulose to straight extinction, well-sorted, sub-angular to angular, with a mean diameter of 0.03 mm, this fraction likely crushed; in sample TS7, 7% coarse quartz, a trace amount sheared, strongly undulose to straight extinction, moderately sorted, sub-round to sub-angular, with a mean diameter of 0.11 mm; in sample TS29, 10% coarse quartz, a trace amount sheared, strongly undulose to straight extinction, moderately sorted, round to angular, with a mean diameter of 0.15 mm; 5-7% opaques, moderately sorted, round to sub-angular, with a mean diameter of 0.04 mm in sample TS7 and 0.1 mm in TS29, some reddish and probably iron oxides; 1% carbonate, moderately sorted, sub-round to sub-angular, with a mean diameter of 0.1 mm in TS7, and round to sub-angular, with a mean diameter of 0.04 in TS29, carbonates primarily fine, dark calcite; 1% mica; 1% argillaceous inclusions, well-sorted, sub-round to sub-angular, with a mean diameter of 0.15 mm in TS7; 2% argillaceous inclusions, poorly sorted, round to sub-round, with a mean diameter of 0.35 mm in TS29; trace to 1% epidote(?); trace isotropic inclusions, likely phytoliths, in TS7; trace feldspar in TS29.

Samples: TS7, R. 17763.[230]

TS29, R. 17630.[231]

[230] Unpublished glazed cooking pot sherd surface collected from KNA during the 2002 survey. Same type as R. 38275.
[231] Unpublished glazed cooking pot sherd surface collected from KNA during the 2002 survey. Likely the same type as R. 38275.

Discussion: This group includes two single glazed cooking pot sherds from KNA. The distribution of quartz grain sizes distinguishes it from all other wheel-made fabrics at KNA. The fabric is very similar to Mason and Milwright's (1998: 181) 'Karak 9' Petrofabric, identified in a Widely-Incised Sgraffito Ware bowl (on this type, see Milwright 2003: 87-91). Milwright (2003: 90) suggested "northern Palestine or Jordan" as the probable center of production for Widely-Incised Sgraffito, although this is not the likely origin of Wheel-Made Group 6. Shapiro (2014: 106, 109) noted the similarity of the 'Karak 9' Petrofabric to her Subgroup 1.1 from Khirbat Din'ila, and suggested "the same lithological raw materials may have been used in both cases." At the time, Shapiro (2014: 109) noted that it was difficult to suggest a specific region for the origin of her Group 1, but suggested the Ḥananya Valley in the Eastern Galilee, the Mt. Ḥermon/Jabal al-Shaykh region, the Beirūt region, and northern Jordan as possibilities. Stern and Waksman (2003: 175) suggest Beirūt as the likely production center for the similar, but not identical, cooking wares found at Acre. Stern (2014: 109) suggests that the distinction between the Beirūt group identified at Acre and the groups identified by Shapiro (2014) at Khirbat Din'ila (particularly Din'ila Subgroup 1.3) represents a break in production in the late 13th or early 14th century AD, probably corresponding to a shift from Beirūt to inland centers, perhaps in the Galilee and Ḥula Valley (see Shapiro 2014: 109). R. 38275, the only rim sherd of this type found at KNA, clearly belongs to the earlier, pre-14th century type. Likewise, the quantity of opaques (likely iron oxides) and the probable rare epidote in TS29 point to an association with the Beirūt petrofabric. In the *Levantine Ceramics Project* database, this petrofabric (petrofabric 61) is known as "Lower Cretaceous/Beirut/ferruginous shale and mature quartz" and the southern Jabal Lubnān/Mount Lebanon range suggested as its source (Shapiro and Waksman 2016).

Wheel-Made Group 7 (Mahesh Ware Group)

Petrographic description: Fired clay matrix, 1% void, with 10% bimodal quartz; 5% fine quartz, undulose to straight extinction, moderately sorted, sub-angular to angular, with a mean diameter of 0.02 mm, this fraction likely crushed; 5% coarse quartz, strongly undulose to straight extinction, moderately sorted, sub-round to angular, with a mean diameter of 0.17 mm; 4% feldspar, moderately sorted, sub-angular to angular with trace sub-round, with a mean diameter of 0.09 mm, of which 3% is plagioclase and 1% K-feldspar; trace microcline, well-sorted; 3% opaques, poorly sorted, round to sub-angular, with a mean diameter of 0.11 mm; 2% biotite mica, moderately sorted, with a mean grain size of 0.02 mm and maximum grain size of 0.15 mm; 2% carbonate, poorly sorted, with a mean diameter of 0.06 mm, calcite with some small forams; 1% argillaceous inclusions, well-sorted, round to sub-round, with a mean diameter of 0.17 mm; trace amphiboles and phosphate.

Samples: TS18, R. 44587 [sherd of same vessel as R. 44586, published by Jones, et al. (2017: 304, Fig. 9.2).

Discussion: This group includes an Early Islamic period Mahesh Ware bowl from Khirbat al-Manāʻiyya. It is easily distinguished from the Middle Islamic period Faynān fabrics by its high percentage of feldspar, relatively high percentage of fine mica, and trace amphiboles, and less so by its quartz distribution. Given the concentration of this ware in southern Wādī ʻAraba and the presence of earlier kilns near Ayla/al-ʻAqaba (Melkawi, et al. 1994), it would seem most likely that these were produced in or near Ayla.

Mold-Made Group 1

Petrographic description: Fired clay matrix, 10% void and cracks, with 15% quartz, undulose to straight extinction, well-sorted, angular to subangular with rare subround grains, mean diameter of 0.04 mm; 15% carbonate, poorly-sorted, variable roundness, modal diameter of 0.1 mm and maximum diameter of 0.35 mm, carbonates include both calcite and dolomite, primarily fine and dark, as well as common free forams and fossil shell; 1% opaques, poorly-sorted, well-round to round and sub-angular to angular, with a mean diameter of 0.1 mm; 1% argillaceous inclusions, very well-sorted, round, with a mean diameter of 0.25 mm; trace clinopyroxene, mica, and isotropic inclusions.

Samples: TS9, R. 17662.[232]

Discussion: See discussion under Wheel-Made Group 1. This group includes a single High-Tongue Handle Lamp sherd from KNA. It is distinguished from Mold-Made Group 2 by its high percentage of carbonates. It is virtually identical to Wheel-Made Group 4 except for the percentage of quartz and voids and the presence of trace isotropics. Potentially a Moẓa clay fabric with added quartz temper (see Cohen-Weinberger, et al. 2016).

Mold-Made Group 2

Petrographic description: Fired clay matrix, 1% void, with 4% bimodal quartz; 2% fine quartz, undulose to straight extinction, well-sorted, sub-angular to angular, with a mean diameter of 0.005 mm, this portion possibly crushed; 2% coarse quartz, strongly undulose to undulose extinction, trace straight extinction, well-sorted, round to angular, with a mean diameter of 0.03 mm; 3% carbonate, poorly-sorted, variable roundness, with a mean diameter of 0.03 mm, carbonates mostly fine calcite with some embedded forams, some free forams and fossil shell, little dolomite; 3% opaques, moderately sorted, variable roundness, with a mean diameter of 0.02 mm; 1% argillaceous inclusions, well-sorted, round to sub-round, with a mean diameter of 0.03 mm; 1% phosphates, angular to sub-angular, with a mean grain size of 0.01 mm and maximum grain size of 0.13 mm, primarily from bone; trace feldspar, chert, and isotropic inclusions.

[232] Surface collected from KNA during the 2002 survey, but not published.

Samples: TS32, R. 18326 [=Reg. WAG02.266 in Jones, et al. (2012: 86, Fig. 18, top right)].

Discussion: See discussion under Wheel-Made Group 1. This group includes a single High-Tongue Handle Lamp sherd from KNA. It can be distinguished from Mold-Made Group 1 by its bimodal quartz distribution, low percentage of carbonates, presence of trace feldspar, chert, and phosphates, and lack of trace clinopyroxene and mica. Similar to Mason and Milwright's (1998: 180) 'Karak 7' Petrofabric.

Hand-Made Group 1A (Wādī 'Araba Group A)

Sample TS24, R. 17748.[233]

Petrographic description: Fired clay matrix, 20% void, primarily vegetal, with 10% bimodal quartz; 7% fine quartz, strongly undulose to straight extinction, moderately sorted, sub-angular to angular with trace round, with a mean diameter of 0.03 mm, this portion possibly crushed; 3% coarse quartz, strongly undulose to straight extinction, moderately sorted, round to angular, with a mean diameter of 0.15 mm; 5% carbonate, poorly-sorted, well-round to sub-round with trace angular, with a mean diameter of 0.1 mm and maximum diameter of 0.35 mm, carbonates primarily calcite and free forams, with rare dolomite, larger limestone inclusions have occasional quartz intergrowth and fossils; 1% argillaceous inclusions, moderately sorted, round and sub-angular, with a mean diameter of 0.4 mm, primarily shale and grogs; 1% opaques, poorly sorted, well-round to round; 1% mica, moderately sorted, with a mean grain size of 0.04 mm; 1% igneous rock, well-sorted, sub-round to sub-angular, with a mean diameter of 0.35 mm, primarily granite with trace basalt; trace feldspar and clinopyroxene; possible trace amphiboles.

[233] Unpublished hand-made basin with incised decoration on rim, surface collected from KNA, Area Z during 2002 survey. Possibly a late example.

Discussion: Hand-Made Group 1 is the most likely to be of local production, and is distinguished from all other groups by the presence of igneous rock. In Hand-Made Group 1A this is primarily granite, probably from a unit of the ʻAqaba or ʻAraba complexes (see Rabbʻa 1994: 5-13), and trace basalt. See further discussion of igneous-rock tempered fabrics and their sourcing under Technical/Refractory Group 1, below. Hand-Made Group 1A is distinguished from the other Hand-Made Group 1 subgroups by the percentage of argillaceous inclusions, presence of mica and trace clinopyroxene, as well as the possible trace amphiboles.

Hand-Made Group 1B (Wādī ʻAraba Group B)

Sample TS16, R. 9815.[234]

Petrographic description: Fired clay matrix, 15% void, both mineral and vegetal, with 10% bimodal quartz; 7% fine quartz, strongly undulose to straight extinction, poorly-sorted, variable roundness, with a mean diameter of 0.03 mm; 3% coarse quartz, strongly undulose to straight extinction with trace sheared, poorly-sorted, variable roundness, with a mean diameter of 0.15 mm; 5% carbonate, poorly-sorted, variable roundness, with a mean diameter of 0.21 mm and maximum diameter of 0.4 mm, carbonates primarily calcite and free forams, with rare dolomite, larger limestone inclusions have occasional quartz intergrowth; 3% igneous rock, moderately sorted, sub-angular to angular, with a mean diameter of 0.15 mm, primarily granite; 1% feldspar, poorly sorted, sub-angular to angular, with a mean diameter of 0.08 mm; trace chert, isotropics, and phosphates; possible trace orthopyroxene.

Discussion: As discussed above, Hand-Made Group 1 is the most likely to be of local production, and is distinguished from all other groups by the presence of igneous rock. In Hand-Made Group 1B this is primarily granite, likely of the Fīnān (Faynān) Granitic Suite (see Rabbʻa

[234] Unillustrated IHMW sherd, possibly with plastery white slip, surface collected from Khirbat Faynān, Area 18 during the 2011 season. Possibly a late example.

1994: 11-12 and discussion below). See further discussion of igneous-rock tempered fabrics and their sourcing under Technical/Refractory Group 1, below. Hand-Made Group 1B is distinguished from the other Hand-Made Group 1 subgroups by the absence of argillaceous inclusions and the presence of trace chert, isotropics, phosphates and possible orthopyroxene.

Hand-Made Group 1C (Wādī ʻAraba Group C)

Sample TS15, R. 44585.[235]

Petrographic description: Fired clay matrix, 10% void, both mineral and vegetal, with 15% argillaceous inclusions, poorly-sorted, round to sub-angular, with a mean diameter of 0.25 mm, primarily shale with rare possible grogs; 7% unevenly distributed bimodal quartz; 2% fine quartz, undulose to straight extinction; 5% coarse quartz, strongly undulose to straight extinction with trace sheared, poorly-sorted, variable roundness, with a mean diameter of 0.3 mm; 3% opaques, poorly-sorted, variable roundness, with a mean diameter of 0.2 mm; 1% carbonate, poorly-sorted, well-round to round, with a mean diameter of 0.15 mm, carbonates primarily fine calcite with occasional quartz intergrowth and fossil inclusions, rare dolomite and free forams; trace igneous rock, very well-sorted, sub-angular, with a mean diameter of 0.32 mm, primarily quartz diorite; trace feldspar.

Discussion: As discussed above, Hand-Made Group 1 is the most likely to be of local production, and is distinguished from all other groups by the presence of igneous rock. In Hand-Made Group 1C this is primarily diorite, likely from a unit of the ʻAqaba Complex (see Rabbʻa 1994: 5-11), although present in smaller amounts than the igneous rocks in Hand-Made Groups 1A and 1B. See further discussion of igneous-rock tempered fabrics and their sourcing under Technical/Refractory Group 1, below. Hand-Made Group 1C is distinguished from the other

[235] Unpublished "elephant ear" handle collected from WAJ562 during the 2002 survey. The site is described by Knabb, et al. (2014: 595, 620, Table 7.3) and briefly mentioned by Jones, et al. (2012: 79). This sherd should be dated to the Late Islamic period.

Hand-Made Group 1 subgroups by its high percentage of argillaceous inclusions, lower quantities of igneous rock, and the absence of most of the trace components that characterize those groups.

Hand-Made Group 2A

Sample TS20, R. 41226.

Petrographic description: Fired clay matrix, 20% void, primarily vegetal, with 7% argillaceous inclusions, moderately sorted, with a mean diameter of 0.5 mm and a maximum diameter of 1.2 mm, primarily clay nodules, with less shale, and few grogs; 3% quartz, strongly undulose to straight extinction, with larger grains often sheared, poorly-sorted, sub-round to angular, with a mean diameter of 0.05 mm; 1% opaques, well-sorted, well-round and sub-angular, with a mean diameter of 0.03 mm and maximum diameter of 0.15 mm; trace mica; isotropics common in voids.

Discussion: This group is distinguished from all groups except Hand-Made Group 2B by its complete absence of carbonates and from Hand-Made Group 2B by its quartz distribution, trace components, and presence of vegetal/dung temper. It is worth noting that the two groups are identical other than this, however, and likely share a source.

Hand-Made Group 2B

Sample TS19, R. 44588.[236]

Petrographic description: Fired clay matrix, 7% void, primarily cracks and shrinkage around argillaceous inclusions, with 12% bimodal quartz; 10% fine quartz, undulose to straight extinction, very well-sorted, sub-angular to angular, with a mean diameter of 0.02 mm, this portion possibly crushed; 2% coarse quartz, strongly undulose to straight extinction with some sheared grains, well-sorted, well-round to round and angular, with a mean diameter of 0.9 mm

[236] Unillustrated body sherd of a hand-made cooking pot from KNA, Area Z, Stratum Z2b.

and maximum diameter of 1.4 mm; 10% argillaceous inclusions, poorly-sorted, round to sub-angular, with a mean diameter of 0.33 mm, primarily clay nodules, with less shale, and few grogs; 1% opaques, well-sorted, round and sub-round, with a mean diameter of 0.03 mm; trace feldspar and phosphates.

Discussion: This group is distinguished from all groups except Hand-Made Group 2A by its complete absence of carbonates and from Hand-Made Group 2A by its quartz distribution, trace components, and lack of vegetal/dung temper. As noted above, the two groups are essentially identical beyond these differences, and likely share a source. The lack of carbonates also distinguishes this group from any of the cooking fabrics published by Gabrieli, et al. (2014: 207-210).

Hand-Made Group 3

Sample TS17, R. 31076.[237]

Petrographic description: Fired clay matrix, 10% void, both vegetal and mineral, with 5% quartz, undulose to straight extinction, well-sorted, sub-angular to angular, with a mean diameter of 0.02 mm; 5% carbonate, poorly-sorted, variable roundness, with a mean diameter of 0.15 mm and maximum diameter of 0.5 mm, carbonates mostly calcite, occasionally with quartz intergrowth, rare dolomite, few forams and one fossil shell; 2% argillaceous inclusions, poorly-sorted, round to sub-round, with a mean diameter of 0.25 mm, primarily clay nodules and grogs; 2% opaques, moderately sorted, variable roundness, with a mean diameter of 0.05 mm; trace feldspar, phosphates, and isotropic inclusions.

Sample TS27, R. 17746 [=Reg. WAG02.240 in Jones, et al. (2012: 84, Fig. 16, top left)].

[237] From KF, Area 18, Occupation 2 collapse. A body sherd likely of the same, potentially Early Islamic period type as R. 31739, 31741, and 31742.

Petrographic description: Fired clay matrix, 15% void, primarily vegetal, with 3% carbonate, moderately sorted, round to sub-angular, with a mean diameter of 0.14 mm, carbonates mostly calcite, occasionally with quartz and feldspar intergrowth, few forams; 1% quartz, undulose to straight extinction, one larger grain sheared, moderately sorted, sub-angular to angular, trace sub-round, with a mean diameter of 0.02 mm; 1% opaques, well-sorted, round to sub-round, with a mean diameter of 0.04 mm; trace feldspar, phosphates, and clinopyroxene.

Discussion: Splitting these two samples into separate groups may be justified by the absence of argillaceous inclusions in TS27, but they are otherwise very similar, and seem to derive from the same source. Distinguished from Hand-Made Group 2 by the presence of carbonates, Hand-Made Group 4 by percentage of argillaceous inclusions and absence of free forams, and from Hand-Made Group 5 by nature of carbonates and absence of mica. Distinguished from all other hand-made groups by quartz distribution.

Hand-Made Group 4 (Wādī al-Fayḍ Group)

Sample TS14, R. 18002.[238]

Petrographic description: Fired clay matrix, 20% void, primarily vegetal, with 15% argillaceous inclusions, poorly-sorted, with a mean diameter of 0.8 mm and maximum diameter of 1.5 mm, primarily grogs and shale; 3% carbonate, moderately sorted, well-round to round, with a mean diameter of 0.3 mm and maximum diameter of 0.55 mm, carbonates mostly calcite, with many forams and occasionally with quartz intergrowth, some larger free forams; 2% opaques, well-sorted, variable roundness, with a mean diameter of 0.03 mm; 1% quartz, strongly undulose to straight extinction, poorly-sorted, round to sub-angular, some very fine angular

[238] An unpublished hand-made pot of the Khirbat al-Mu‘allaq type (see Lindner, et al. 1996: 124, Fig. 21-24) from Wādī al-Fayḍ Expedition site WFE103, Khirbat al-Qulay‘a (“Khirbat Gleah”). For a preliminary report of the Iron Age occupation of the site, see Knabb, et al. (2015).

grains, with a mean diameter of 0.05 mm and maximum diameter of 0.2 mm; trace clinopyroxene.

Discussion: Distinguished from essentially all other hand-made groups by percentage and nature of argillaceous inclusions. An origin near Wādī al-Fayḍ, or at least the Greater Petra/al-Shawbak region, seems likely for this group, particularly given the distribution of this vessel type. The only fabric with free forams published by Mason and Milwright (1998: 185) is, as noted above, the Shawbak Petrofabric, to which Hand-Made Group 4 is rather similar. This does not rule out other sources. Abu-Jaber and al Saa'd (2000: 183, Table 2) note the presence of "fossil fragments" in several HMGPW samples from Khirbat Fāris, but these are not definitively local to Khirbat Fāris and unlike the Wādī al-Fayḍ Group contain "abundant" calcite. The Khirbat Fāris samples may belong to Gabrieli, et al's (2014: 211) Petrographic Group 10, a "chalky marl fabric" found at Tall Ḥisbān and potentially sourced from al-Lisān soils.

Hand-Made Group 5 ('Faynān/Wādī al-Fayḍ' Group)

Sample TS8, R. 17661.[239]

Petrographic description: Fired clay matrix, 20% void, primarily vegetal, with 15% carbonate, poorly-sorted, variable roundness, with a mean diameter of 0.02 mm and maximum diameter of 0.1 mm, 2/3 carbonates dolomite rhombs, orange under microscope, 1/3 calcite, primarily coarse calcite, with forams and rarely with quartz intergrowth, but some fine calcite, orange under microscope, some free forams; 5% quartz, undulose to straight extinction, moderately sorted, sub-angular to angular, larger grains round to sub-round, with a mean diameter of 0.03 mm; 1% opaques, poorly-sorted, well-round to round, with a mean diameter of 0.02 mm and maximum diameter of 0.1 mm; trace clinopyroxene and mica.

Sample TS13, R. 28703.[240]

[239] Unpublished deep bowl sherd from 2002 survey, surface collected from Area D. Same vessel form as R. 38299.

Petrographic description: Fired clay matrix, 20% void, primarily vegetal, with 7% quartz, undulose to straight extinction, poorly-sorted, round to angular, with a mean diameter of 0.03 mm and maximum diameter of 0.17 mm; 5% carbonate, poorly-sorted, round to sub-angular, with a mean diameter of 0.04 mm and maximum diameter of 0.3 mm, carbonates mostly dolomite rhombs, orange under microscope, some fine calcite, also orange under microscope, some free forams; 5% argillaceous inclusions, moderately sorted, round to sub-angular, with a mean diameter of 0.04 mm and maximum diameter of 0.3 mm, includes clay nodules, grogs, and shale; 2% opaques, moderately sorted, variable roundness, with a mean diameter of 0.02 mm and maximum diameter of 0.1 mm; 1% mica, well-sorted, with a mean grain size of 0.02 mm; trace phytoliths in voids.

Discussion: Distinguished from essentially all other hand-made groups by the nature of the carbonates (but see Hand-Made Group 6) — possibly indicating replacement by limonite, as in some examples of Goren's (1996: 49) Lower Cretaceous Group. As with Hand-Made Group 3, splitting these samples into two groups may be justified by the absence of argillaceous inclusions in TS8, but the similarities otherwise, and particularly the unique orange dolomite, suggests they belong to a single group. As with Hand-Made Group 4, an origin in the Greater Petra/al-Shawbak region seems likely. Possibly similar, at least as a raw material source, to Cohen-Weinberger and Goren's (2011: 217, Table 10.1, 218-219) Group DL—Clay Rich in Silty Dolomite, although their suggestion of the central Jordan Valley as a source is based on the presence of plagioclase feldspar, absent in Hand-Made Group 5.

Hand-Made Group 6

Sample TS4, R. 38575.

[240] An unpublished hand-made pot of the Khirbat al-Mu‘allaq type from Wādī al-Fayḍ Expedition site WFE103, Khirbat al-Qulay‘a. See n. 238 above.

Petrographic description: Fired clay matrix, 20% void, primarily vegetal, with 22% carbonate, nearly 70% of this dolomite rhombs, yellow-orange under microscope, well-sorted, sub-round to angular, with a mean diameter of 0.02 mm, some of this as part of quartz-rich rock; the remaining 30% fine to coarse calcite, poorly-sorted, round to sub-round, with a modal diameter of .5 mm and maximum diameter of 2.1 mm; 12% bimodal quartz; 10% fine quartz, straight extinction, well-sorted, sub-angular to angular, with a mean diameter of 0.01 mm, this portion possibly crushed; 2% coarse quartz, strongly undulose to undulose extinction with some sheared grains, well-sorted, sub-round to angular, with a mean diameter of 0.2 mm; 1% opaques, well-sorted, round to sub-round, with a mean diameter of 0.03 mm; trace feldspar.

Sample TS6, R. 44579.[241]

Petrographic description: Fired clay matrix, 20% void, both mineral and vegetal, with 17% bimodal quartz; 10% fine quartz, strongly undulose to straight extinction, well-sorted, sub-angular to angular, with a mean diameter of 0.03 mm, this portion possibly crushed; 7% coarse quartz, strongly undulose to straight extinction, well-sorted, round to sub-angular, with a mean diameter of 0.25; 10% carbonate, moderately sorted, sub-round to angular, with a mean grain size of 0.07 mm, ca. 70% dolomite rhombs, orange under microscope, with silt-sized dolomite plentiful throughout matrix, ca. 30% fine to coarse calcite, some as limestone with quartz intergrowth, some free forams; 3% argillaceous inclusions, moderately sorted, round to sub-round, with a mean grain size of 0.4 mm, primarily shale; 2% opaques, well-sorted, round to sub-angular, with a mean grain size of 0.04 mm; trace feldspar and pyroxene.

Discussion: Distinguished from essentially all other hand-made groups by the nature of the carbonates. Sample TS6 is somewhat difficult to classify, and except for the orange dolomite rhombs dominating the carbonate component would likely have been placed in Hand-Made

[241] Unillustrated red-slipped monochrome HMGPW sherd from Khirbat Faynān, Area 15, Stratum 15-2c.

Group 7. Other than this, it is similar to Hand-Made Group 2B, but that group lacks carbonates entirely. The yellow-orange dolomite rhombs may also link this to Hand-Made Group 5, but the two are distinguished by the nature of the calcite, the quartz distribution, and the absence of mica in Hand-Made Group 6. Note the similarity to Gabrieli, et al.'s (2014: 209) Petrographic Group 4d, a cooking fabric for which they suggest sources around the Sea of Galilee and, particularly for examples lacking basalt, "many other regions in Israel (mostly in the south)."

Hand-Made Group 7

Sample TS5, R. 38569.

Petrographic description: Fired clay matrix with plentiful small silt-sized carbonates, 25% void, primarily vegetal, with 10% argillaceous inclusions, moderately sorted, sub-round, with a mean grain size of 0.3 mm, primarily shale; 7% bimodal quartz; 5% fine quartz, straight extinction, very well-sorted, sub-angular to angular, with a mean diameter of 0.02 mm, this portion probably crushed; 2% coarse quartz, straight extinction, well-sorted, round to sub-angular, with a mean diameter of 0.15 mm; 3% carbonate, poorly-sorted, sub-round to sub-angular, with a mean grain size of 0.1 mm, including coarse calcite with occasional quartz intergrowth, some fine, dark calcite, some free forams and plentiful silt-sized dolomite (underrepresented in this count, and plentiful throughout matrix, as noted above); 3% opaques, moderately sorted, round to sub-angular, with a mean grain size of 0.05 mm, including some iron oxides; trace basalt, phosphate, and pyroxene.

Sample TS10, R. 18288 [=Reg. WAG02.242 in Jones, et al. (2012: 84, Fig. 16, top right)].

Petrographic description: Fired clay matrix with plentiful small silt-sized carbonates, 10% void, primarily mineral but some vegetal, with 15% argillaceous inclusions, moderately sorted, round to angular, with a mean grain size of 0.15 mm, primarily clay nodules and grogs; 4% bimodal quartz; 2% fine quartz, straight extinction with trace undulose, well-sorted, round to angular, with a mean diameter of 0.02 mm; 2% coarse quartz, undulose to straight extinction with trace strongly undulose and sheared, moderately sorted, round to angular, with a mean diameter of 0.1 mm; 3% opaques, moderately sorted, round to angular, with a mean grain size of 0.03 mm, including some iron oxides; 2% carbonate, well-sorted, round to sub-round and angular, with a mean grain size of 0.18 mm and maximum grain size of 0.3 mm, mostly fine calcite, some orange under microscope, with little dolomite, some forams, plentiful silt-sized carbonates (underrepresented in this count, and plentiful throughout matrix, as noted above); trace mica, phosphate, and pyroxene.

Sample TS30, R. 17642 [=Reg. WAG02.244 in Jones, et al. (2012: 84, Fig. 16, bottom center)].

Petrographic description: Fired clay matrix, 15% void, both mineral and vegetal, with 10% bimodal quartz; 2% fine quartz, undulose to straight extinction, moderately sorted, sub-round and angular, with a mean diameter of 0.02 mm, this portion possibly crushed; 8% coarse quartz, undulose to straight extinction with trace strongly undulose, ca. 10% of coarse fraction sheared, moderately sorted, round to sub-angular, with a mean diameter of 0.25 mm; 3% argillaceous inclusions, moderately sorted, sub-round to sub-angular, with a mean diameter of 0.9 mm; 2% opaques, well-sorted, well-round to sub-round, with a mean grain size of 0.1 mm; 1% carbonate, mostly fine calcite and silt-sized dolomite; trace phosphates.

Discussion: This group includes three HMGPW sherds from KNA and Khirbat Faynān, including one sample (TS10, notably also the most compact fabric) of possible LRPW. Distinguished from most other hand-made groups by bimodal quartz distribution, from Hand-

Made Group 1 by lack of likely Wādī ʿAraba igneous rock, from Hand-Made Group 6 by percentage and nature of carbonates (as noted above, sample TS6, in particular, would otherwise have been placed in Hand-Made Group 7), and from Hand-Made Group 8 by silty carbonates in matrix. Other than this, quite similar to Hand-Made Group 8. Note the similarity to Gabrieli, et al.'s (2014: 204-207) Petrographic Group 1, a fairly heterogeneous and common group for which one possible provenance is central Jordan.

Hand-Made Group 8

Sample TS34, R. 18294.[242]

Petrographic description: Fired clay matrix, 10% void, both mineral and vegetal, with 5% unevenly distributed, large argillaceous inclusions, poorly-sorted, round to sub-angular, with a mean diameter of 2 mm and maximum diameter of 4.25 mm, primarily shale and clay nodules; 5% opaques, well-sorted, variable roundness, with a mean grain size of 0.25 mm; 5% bimodal quartz; 4% fine quartz, undulose extinction, well-sorted, sub-round to angular, with a mean diameter of 0.07 mm; 1% coarse quartz, strongly undulose extinction with trace undulose and sheared, moderately sorted, round to angular, with a mean diameter of 0.25 mm; 3% carbonate, poorly-sorted, variable roundness, with a mean grain size of 0.5 mm, mostly fine calcite, some coarse limestone with intergrown quartz and rarer fossil inclusions, rare dolomite, some free forams, little fossil shell; 1% biotite mica with a mean grain size of 0.02 mm; 1% iron oxide inclusions; trace clinopyroxene.

Discussion: As noted above, this group is very similar to Hand-Made Group 7 with the exception of the lack of silty carbonates in the matrix.

Hand-Made Group 9

Sample TS21, R. 9829.[243]

[242] Unpublished red-slipped monochrome HMGPW jug sherd surface collected from KNA during the 2002 survey.

Petrographic description: Fired clay matrix, 20% void, primarily vegetal, with 10% bimodal quartz; 5% fine quartz, undulose to straight extinction, moderately sorted, sub-angular to angular, with a mean diameter of 0.03 mm, this portion possibly crushed; 5% coarse quartz, undulose to straight extinction with trace strongly undulose, well-sorted, round to angular, with a mean diameter of 0.07 mm; 3% opaques, poorly-sorted, variable roundness, with a mean grain size of 0.07 mm; 2% carbonate, well-sorted, round to sub-round, with a mean diameter of 0.1 mm, primarily calcite; trace feldspar and clinopyroxene.

Discussion: This group is essentially identical to Hand-Made Group 8, but lacking argillaceous inclusions, mica, and iron oxide inclusions.

Hand-Made Group 10

Sample TS31, R. 18322.[244]

Petrographic description: Fired clay matrix, 15% void, mostly vegetal with some mineral, with 7% argillaceous inclusions, poorly-sorted, round to sub-angular, with a mean diameter of 0.4 mm, primarily shale with few clay nodules; 5% bimodal quartz; 1% fine quartz, strongly undulose to straight extinction, poorly-sorted, sub-angular to angular, with a mean diameter of 0.03 mm, this portion possibly crushed; 4% coarse quartz, strongly undulose to undulose extinction, ca. 10-15% of coarse fraction sheared, poorly-sorted, round to sub-angular, with a mean diameter of 0.23 mm; some quartz part of larger crushed sandstone fragments, occasionally with attached feldspar grains; 2% opaques, well-sorted, round to sub-angular, with a mean grain size of 0.04 mm, possibly underestimated as they are difficult to see in dark matrix; 1% carbonate, well-sorted, sub-round to sub-angular, with a mean grain size of 0.15 mm, mostly coarse limestone with quartz intergrowth and fossils, some fine calcite, trace dolomite; 1% chert,

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[243] Unillustrated HMGPW or LRPW sherd, surface collected from Khirbat Faynān, Area 18 during the 2011 season.
[244] Unpublished undecorated IHMW basin surface collected from KNA, Area A during the 2002 survey. Similar to Reg. WAG02.237 in Jones, et al. (2012: 82, Fig. 15.5). Possibly a late example.

moderately sorted, round to sub-angular, with a mean grain size of 0.17 mm; trace feldspar, mica, pyroxene, and yellow near-isotropic inclusions.

Discussion: Although somewhat similar to Hand-Made Group 8, the chert, sandstone, and trace inclusions make this a somewhat unique group. The chert may suggest a connection to Hand-Made Group 1, as might the undulose quartz present in the sandstone inclusions. Undulose quartz is evidently not typical of the Kurnub formation, found on the Karak Plateau and elsewhere (Abu-Jaber and al Saa‘d 2000: 187), but is typical of the Nubian sandstones found in Wādī ‘Araba (Amireh 1991: 102, 109-110). While distinguished from Hand-Made Group 1 by the lack of igneous rock, Hand-Made Group 10 may share a similar Wādī ‘Araba origin. The raw materials for this group are likely the same as Goren’s (1996: 49, 51) Lower Cretaceous Group, for which he suggests an origin in “Transjordan,” likely somewhere “from Wadi Zarqa to around Wadi Feinan.”

Hand-Made Group 11

Sample TS35, R. 32730.[245]

Petrographic description: Fired clay matrix, 5% void, mineral and fine vegetal, with 13% bimodal quartz; 7% fine quartz, strongly undulose to straight extinction, well-sorted, sub-round and angular, with a mean diameter of 0.08 mm, this portion possibly crushed; 6% coarse quartz, strongly undulose to undulose extinction with trace sheared, moderately sorted, round to sub-angular, with a mean diameter of 0.43 mm; some quartz part of larger crushed sandstone fragments with attached carbonate matrix; 5% carbonate, poorly-sorted, variable roundness, with a mean grain size of 0.45 mm, mix of fine calcite with some quartz intergrowth and smaller dolomite rhombs, some likely replaced by limonite; 1% argillaceous inclusions, poorly-sorted,

[245] Unillustrated bichrome HMGPW sherd from Khirbat Faynān, Area 15, Stratum 15-2c.

well-round, with a mean diameter of 1.4 mm, primarily clay nodules and shale; trace iron oxides, opaques, phosphate, and pyroxene.

Discussion: Rather similar to Hand-Made Group 8, but related to Hand-Made Group 10 by presence of sandstone with undulose quartz (see discussion under Hand-Made Group 10, above). Distinguished from Hand-Made Group 10 by absence of chert and different trace components. Compare to Gabrieli, et al.'s (2014: 211) Petrographic Group 11, represented by an HMGPW sample from Tall Ḥisbān. That group is defined as similar to their Petrographic Group 1, the fairly general Lower Cretaceous group, but with "coarse calcareous inclusions including calcareous sandstone" (Gabrieli, et al. 2014: 211).

Technical/Refractory Group 1

Petrographic description: Clay matrix, with 15-30% voids, cracks, and bubbles; 30% poorly-sorted igneous rock, subround to angular, with a mean diameter of 0.8 mm and maximum diameter of 1.5 mm, in sample TS11 this rock is characterized by inclusions of feldspar, primarily K-feldspar, while in sample TS12 it contained many skeletal pyroxene inclusions; 10-15% poorly-sorted quartz, trace sheared quartz, strongly undulose to straight extinction, well-round to angular, with a mean diameter of 0.18 mm in TS11 and 0.6 mm in TS12; in both samples, quartz is found both free and embedded in sandstone inclusions; 6-11% feldspar; in TS11, 3% K-feldspar, poorly sorted, angular to subangular with a mean diameter of 0.1 mm, 1% plagioclase, moderate sorting, angular to subangular, with a mean diameter of 0.05 mm, and 1% microcline, well-sorted, angular to subangular, with a mean diameter of 0.1 mm; in TS12, 5% K-feldspar, poorly-sorted, angular, with a mean diameter of 0.15 mm, 5% plagioclase, poorly-sorted, angular, with a mean diameter of 0.1 mm, and 1% microcline, moderately sorted, angular, with a mean diameter of 0.2 mm; 5-7% opaques, poorly-sorted, well-round to angular, with a mean diameter of 0.32 mm; 1% argillaceous inclusions (shale), unevenly distributed, well to very well-sorted, subround and subangular, with a mean diameter of 1.1 mm; trace to 1% carbonates, moderately to well-sorted, variable roundness, with a mean diameter of 0.4 mm in TS11 and 0.05 mm in TS12, carbonates primarily fine calcite with rare dolomite; trace to 1% free clinopyroxene; 1% mica in TS11, very well-sorted, angular, mean diameter of 0.03 mm; trace chert in TS12.

Samples: TS11, R. 5746.

TS12, R. 17677.

Discussion: This group includes two tuyère fragments surface collected from KNA. The specialized nature of these ceramics and their composition suggests an origin in Wādī ʻAraba, and probably in Faynān. Of particular note is the high percentage of igneous rock. The K-feldspar rich rock in TS11 may belong to the Ḥunayk or Minshār Monzogranite Units or a member of the Fīnān (Faynān) Granitic Suite, any of which could also be the source of the mica present in this sample (Rabbʻa 1994: 9-12). There are outcrops of the Ḥunayk formation throughout western Faynān, including Jabal Ḥamrā Fidān and the northern side of Wādī al-Ghuwayb (see Fig. 3.1, light purple), several outcrops of the Minshār formation in western Faynān, near the mouth of Wādī Fidān, in Jabal al-Minshār, and west of Jabal al-Jāriya (see Fig. 3.1, bright red), and outcrops of the Fīnān Granitic throughout the Faynān region, including a large outcrop in southern Jabal Ḥamrā Fidān, another ca. 1.5 km west of KNA, immediately to the west of Khirbat al-Nuḥās, and another on the southeastern side of Wādī Ḍānā (see Fig. 3.1, magenta). The likely source of the pyroxene-rich mafic rock in TS12 is the Ghuwayr Volcanic Suite (Rabbʻa 1994: 11). There are outcrops of this formation in northern Jabal al-Minshār, Jabal Zurayq al-Muraḍ, and most of the area around Wādī al-Ghuwayr, to the east of Khirbat Faynān (see Fig. 3.1, dark brown).[246] This group should be compared to Martin and Finkelstein's (2013: 24-25) Petrographic Group 2 ("Igneous-rock-tempered clays"), for which they suggest possible sources "in southern Jordan, in the eastern and southern Arabah and in the southern Sinai." Goren (1996: 53-54) refers to this as the "Arkose Group" and for the EBIV suggests an origin in Faynān. Essentially the same ware was identified at Khirbat al-Nuḥās by Smith, et al. (2014b: 472, 475), who suggest that during the Iron Age it was produced in the vicinity of the site. While shale was not observed in samples of the Arkose Group from Khirbat al-Nuḥās (Smith, et al. 2014b: 472), it is otherwise quite similar. Given that this group includes only technical ceramics at KNA, local production is very likely — note also the locally-produced, hematite-tempered tuyères from the iron production site of Mughārat al-Warda (Al-Shorman 2009: 126-128).

6.5.2. Discussion of Petrographic Data

The attribution of the single stonepaste vessel sampled to the Damascus(?) Petrofabric is unsurprising. As most of the stonepaste sherds from KNA belong to the "arc-back" or "knot-back" groups, and most of the "arc-back" sherds for which petrographic analysis have been conducted belong to the Damascus(?) Petrofabric (Mason 2004: 98-99), it could be assumed on stylistic grounds that most, if not all, of the stonepaste sherds from KNA were produced in Damascus. The fact that 10 out of the 11 stonepaste vessels Mason (2004: 96, 191) sampled from Jerusalem were also of the Damascus(?) Petrofabric added to the likelihood this would be the case. While the stonepaste vessels sampled by Mason and Milwright (1998: 185, 187) from al-Karak were likewise all of the Damascus(?) Petrofabric, it is worth noting that these were dated to the Mamlūk period, when Damascus may have been the only Levantine production center for stonepaste wares. Nonetheless, it seems likely that Damascus was the primary source of stonepaste ceramics for the southern Levant in the Middle Islamic Ic-IIa, as well.

[246] Dikes are potential sources for the rock in both samples, as well (see Martin and Finkelstein 2013: 24).

The petrography of the wheel-made ceramics is somewhat surprising, as it was expected that at least some of the KNA assemblage would have been produced in or near al-Karak. Mason and Milwright's (1998) al-Karak petrofabrics are characterized by a lack of free forams and, often, relatively low amounts of basalt, probably Jabal Shīḥān basalts. Virtually all of the wheel-made samples from KNA had free forams, however, and none had basalt. Wheel-Made Group 5 seems to be closest to the al-Karak petrofabrics, particularly given the presence of only trace free forams, but is not identical to any of the published groups. As noted in Section 6.5.1, an association of at least some of the KNA sherds with al-Shawbak should not be ruled out, given the closer similarity to the Shawbak Petrofabric (Mason and Milwright 1998: 185), but based on only a single sample from al-Shawbak this is very tentative. Jerusalem and several other regions should also be considered as possibilities. Of particular note is the fact that, while wasters of glazed wares (King, et al. 1987: 448) and sugar pots (Grey, et al. 2017: 139-140) have been found at Khirbat al-Shaykh 'Īsā/Zughar, neither of the 'al-Saafi' petrofabrics identified by Mason and Milwright (1998: 185-186) is definitively attributed to that region. The "Quartz Sand and Silt Fabric" that characterizes the sugar vessels analyzed by Joyner (in Grey, et al. 143) seems fairly certain to be a product of Ghawr al-Ṣāfī, and may share a raw material source with some of the KNA vessels, as the quartz and calcareous inclusions of this fabric are shared by several of the KNA wheel-made groups. The raw material sources for Wheel-Made Group 4 and Mold-Made Group 1 are likely the Moẓa clays of the central highlands of Israel and Palestine. Perhaps most intriguing is Wheel-Made Group 6, which, based on visual analysis was suspected to belong to the Beirūt Cooking Ware group (see Stern 2012: I, 41-44). This suspicion appears to be confirmed by the petrographic data, although it is not clear how this should be interpreted, as the only examples of this ware presently known from KNA come from surface contexts, and it is quite possible they are earlier than the site's main occupation. Wheel-Made Group 7, as discussed in Section 6.5.1, includes an Early Islamic period Mahesh Ware sherd from Khirbat al-Manā'iyya, and was likely produced in or around Ayla/al-'Aqaba. As expected, this fabric is easily distinguished from the Middle Islamic wheel-made fabrics from Faynān.

The hand-made groups are somewhat more complicated, and the groups into which I have split these samples are tentative. As I note in the discussion for several of those groups in Section 6.5.1, arguments could be made for including certain samples in different groups, or splitting or combining the groups in other ways. Of the groups, Hand-Made Group 1 and the similar Technical/Refractory Group 1 are very likely to have been produced in Wādī 'Araba. Indeed, production in the Faynān region seems almost certain for Technical/Refractory Group 1, given the specialized nature of the tuyères belonging to this group. It is interesting that the three samples belonging to Hand-Made Group 1 are likely late, and that the only member of Hand-Made Group 1C dates to the Late Islamic period. The residents of Middle Islamic period KNA seem to have sourced their vessels from outside of Wādī 'Araba, while producing technical ceramics locally, while the Late Islamic period residents of the region produced vessels using local raw materials. Hand-Made Groups 10 and 11 seem to be western Jordanian fabrics, given the presence of Nubian sandstone, but it is difficult to pinpoint an exact production center. The Greater Petra/al-Shawbak region is suggested as a possible center for the production of Hand-Made Groups 4 and 5 primarily on the basis of the distribution of the cooking pot forms represented in the Wādī al-Fayḍ Expedition assemblage, although the similarity of Hand-Made Group 4 to Mason and Milwright's (1998: 185) Shawbak Petrofabric may support this attribution, at least for that group. Hand-Made Groups 7-9 may be of central Jordanian origin, but this is by no means certain.

6.6. Summary and Discussion

Several distinct ceramic assemblages are presented in the preceding sections, and each must be discussed separately. The ceramics from Khirbat Nuqayb al-Asaymir make up, with few exceptions, a single-period assemblage dating to the late 12th and early 13th centuries, or the Middle Islamic Ic-IIa. Taken together with the numismatic and radiocarbon data, from both KNA and Khirbat Faynān Area 15, the Middle Islamic period copper industry in Faynān seems to have been relatively short-lived, probably not spanning much longer than the Middle Islamic IIa, or the first half of the 13th century AD (the implications of this are discussed in Part III of the dissertation, particularly in chapters 9 and 10). Presently, the KNA assemblage is fairly unique in southern Jordan. Published assemblages of the Middle Islamic IIa are uncommon, and few have been published in enough detail to allow for adequate comparison. Nonetheless, several things seem to set the KNA assemblage apart.

As noted in Section 4.1 and 6.1.1, the fact that the overwhelming majority of the glazed ceramics are stonepaste is unusual, and following Milwright (2006: 20-21), leads to the conclusion that the administrators of KNA, at least, were of relatively high status. The comparative absence of monochrome glazed wares can be explained in several ways, and determining which of these explanations is correct will require more research at the site. It is possible that this suggests a disparity between the administrators and laborers at the site. While the administrators had access to imported Syrian luxury wares, laborers did not, and were able to afford only very small quantities of monochrome glazed wares produced within the region. It is also possible that at least some of the laborers at KNA were of comparatively high status, as discussed in Section 3.3. While craftsmen were among the “commoners” of Middle Islamic society (Perho 2011: 20),[247] it is also worth keeping in mind that pottery, in general, probably "was not highly valued by Levantine consumers" (Milwright 1999: 517). In other words, while imported stonepaste wares were not "a feature of village life" (Milwright 2006: 20), they may not have been out of reach for well-off craftsmen.

The social function of these wares must also be kept in mind. As albarelli (apothecary jars) and other closed vessels are entirely absent in the KNA glazed assemblage, it is unlikely that any of the stonepaste vessels at KNA were originally containers for valuable goods, as Jones, et al. (2012: 89) suggested (following Milwright 1999: 511; in turn based on an 11th century description of the *sūq* in Cairo by Nāṣir-i Khusraw 1881: 153). The decorated, glazed ceramics present at the site would have been used primarily in the context of receiving guests (Milwright 2003: 103), and it may have been primarily the administrators who needed to receive guests at KNA. HMGPW may have filled the same role at the other end of the social spectrum (Johns 1998: 80-82), and is certainly present at both KNA and Khirbat Faynān, but if copper mining in Faynān was a seasonal activity, as seems likely, it is not possible to say that laborers did not have access to glazed tablewares, but only that, if they did, they generally did not choose to bring them to Faynān. Schmitt and Zeier (1993: 33), in their analysis of a 19th century mining camp in Nevada, found that "faunal and ceramic measures convey very different messages regarding the comparative economic status of a given household's inhabitants." In that case, the ceramic data better matched the known historical data, but it nonetheless should serve as caution against relying on single artifact categories as indices of socioeconomic status. At Iron Age Timna, where ceramics and architecture are generally uncommon, faunal assemblages have been

[247] Some, particularly during the late Mamlūk period, did rise to the status of notables through careers as administrators (Behrens-Abouseif 2011; Herzog 2013; Perho 2011: 31-33), as in the case of Abū al-Khayr al-Naḥḥās, a 15th century coppersmith who, for a time, became a successful Mamlūk administrator (Mortel 1995). As Behrens-Abouseif (2011: 394-395) argues, however, this status "was confined to their scholarship," and apparently was not related to their careers as craftsmen.

convincingly used as a measure of the status of metalworkers (Sapir-Hen and Ben-Yosef 2014). This is further complicated at KNA by the fact that the presumably domestic contexts on the hillsides were very eroded and produced only fragmentary assemblages, making any comparison difficult.

The assemblage as a whole represents something of a starting point for the study of Middle Islamic II ceramics in southern Jordan. The high percentage of wheel-made ceramics may suggest that, as with the Karak Plateau assemblages discussed in Section 6.1.2, this category has been underestimated for sites in southern Jordan. KNA is not a typical Middle Islamic period site for southern Jordan, however, and the variety of ceramics present — although not the quantity of them — certainly seems more typical of towns than villages. As remarkably few villages of this period in southern Jordan have been adequately excavated or published, it is difficult to know how unique KNA's assemblage is for the region. Surface collection of wheel-made sherds dated to the Ayyūbid period at Kutla I (Lindner 1999: 488-489) — a village on Jabal al-Ṣuffāḥa, between Petra and al-Shawbak — indicates that these wares are present at village sites in southern Jordan. As on the Karak Plateau, they may be substantially underrepresented in surface assemblages, but it is not clear to what extent this is the case.

A final point concerning published Ayyūbid/Middle Islamic IIa assemblages should also be considered. The KNA assemblage seems rather different from some of these, with the Stratum 4 (Middle Islamic IIa) assemblage from Tall Ḥisbān (Walker 2012a: 546-562) being a good example. While discussed as Middle Islamic IIa, this stratum also included material from loci that were either transitional Middle Islamic IIa-b or mixed (Walker 2012a: 546). The majority of material comes from a cistern fill (D.6.33), of which a number of loci were dated to the Ayyūbid period on the basis of coins (Walker 2012a: 546). The majority of the sherds presented belong to

D.6.33I, for which the only coin that appears in the final report cannot be closely dated within the Ayyūbid period (Terian 2009: 329, no. 186). A number of sherds, primarily HMGPW, were published from D.6.33H, which can be no earlier than 1236 AD, based on the earliest possible date of the latest closely dated coin from the locus (Terian 2009: 329, no. 184). Several loci from the 1997 and 1998 seasons were also included in the report (Walker 2012a: 546), but the coins from these seasons have not yet been published. At least some of the loci from G.23 and L.2 must be rather late, considering the presence of Glazed Relief Ware (Walker 2012a: 560, Fig. 4.17.12-13) and a Bent-Handle Slipper Lamp (Walker 2012a: 560, Fig. 4.17.14). The presence of black-under-turquoise stonepaste wares may indicate that D.6.33I and D.7.9 are somewhat earlier, but the exterior decoration is either not preserved or not presented on either sherd (Walker 2012a: 549, Fig. 4.14.14-15). The broader point is that while the presented material from Tall Ḥisbān does likely all fall within the Ayyūbid period, at least some seems to be Middle Islamic IIb, if that period is defined as starting in 1250 AD. The same can perhaps be said of the published ceramic assemblage from Ṭawāḥīn al-Sukker in Jericho. While the latest identified coin is an issue of al-Ṣāliḥ Ismāʻīl (r. 1237-1245 AD) — and the earliest is Zangid (see Section 3.6.2) — the ceramics clearly continue into the Middle Islamic IIb, judging from the presence of Glazed Relief Ware, pinprick-decorated wheel-made jugs, and Bent-Handle Lamps (Taha 2015: 66-69, 73). Exactly where to draw the line between the Middle Islamic IIa and IIb is not entirely clear, but it seems to be the case that the transition between the two begins during the Ayyūbid period, and, as such, early and late Ayyūbid assemblages may look somewhat different, with late Ayyūbid assemblages including types more typical of the early Mamlūk period, and early Ayyūbid assemblages likely containing types that seem more typical of the later Middle Islamic I. KNA presently seems typical of an early Ayyūbid assemblage — as does the Ayyūbid phase of the Jerusalem, Armenian Garden excavations (Tushingham 1985) — though continuing work on this period, particularly in Jerusalem, will hopefully help clarify the diagnostic features of Middle Islamic Ic, IIa, and IIb assemblages.

The Late Antique and Early Islamic assemblages from Khirbat Faynān, Khirbat Ḥamrā Ifdān and WFD 50a help clarify the nature of the late 1st millennium AD settlement in Faynān while also raising a number of questions about it. Settlement in Faynān certainly continued into the late 8th or 9th century, and possibly longer, although more focused work is required to investigate this. The differences between these assemblages are worth considering, however. The assemblage from Khirbat Faynān is certainly the largest and most diverse, and parallels, as discussed in Section 6.2, can be drawn to the assemblages in the Petra region — including Jabal Hārūn — to al-Ḥumayma, and to sites in central Jordan. The Mahesh Wares, typical of late 8th and 9th century settlement in southern Wādī ʿAraba, are absent in the excavated assemblage from Khirbat Faynān, but present in the assemblages in Wādī Fidān, to the west. The small size of the assemblages is an issue here, but it is possible that Khirbat Faynān and the Wādī Fidān sites represent different types of settlement with different economic connections during this period. As I have stated previously, "the nature of settlement and the economic transformations that occurred during the Late Byzantine and Early Islamic periods in Faynan are still poorly understood" (Jones 2016: 112), a point with which Friedman, et al. (2017: 292) have recently agreed. It should not, therefore, be assumed that the Wādī Fidān/Faynān system represents a single settlement system. Publication of the ceramics from the Barqā Landscape Project excavations on the northern side of KHI (Friedman, et al. 2017: 285) may clarify this. It is worth noting that similar questions remain to be resolved on a regional level, as well. While most of the excavated sites in southern Wādī ʿAraba have assemblages with strong ties to Ayla/al-ʿAqaba, the Early Islamic pottery from Yotvata is made up primarily of Egyptian imports, with a much lower percentage of pottery from Ayla (Davies and Magness 2015: 77-79). More work in the region remains to be done to understand this finer-scale regionalism.

Chapter 7: Summary of Non-Ceramic Finds from ELRAP Excavations and Surveys

This chapter presents a summary of the non-ceramic finds from the sites discussed in this dissertation, primarily KNA. These finds provide critical dating evidence for the sites discussed in the dissertation, as well as insight into the lives of the people who used them. Unlike Chapter 6, this is not meant to be a comprehensive discussion of all of the finds from these sites, and there are several notable omissions, mentioned below. Unlike the other chapters in Part II, this chapter is not organized by site, but rather by artifact category. Grouping by site would, in this case, lead to considerable overlap in discussion, particularly in Section 7.2, dealing with metallurgical debris. For ease of comparison, a concordance of ceramic and non-ceramic finds by locus is presented in Appendix 2.

The chapter is broken into five sections. The first covers coins and other metal objects. The coverage of coins is comprehensive, and includes essentially every coin (and coin-like object) found during ELRAP excavations and surveys. Relatively few coins have been found by ELRAP in Faynān (12 are discussed here), however, and of these few are legible enough to permit reasonable identification. The metal objects other than coins are not discussed comprehensively. While the majority of the identifiable copper and bronze objects from ELRAP excavations at KNA, Khirbat Faynān, and WFD 50a are presented, unidentifiable lumps of copper, copper alloy, and mixed metal are, for the most part, not. The exception to this is the lump of copper-iron from KNA Area X, B. 50015, presented in Section 7.2. Likewise, given the general state of preservation of iron objects found in Faynān, only a knife blade and two nails from KNA are presented. The second section presents metallurgical debris. Because of the ubiquity of this material at KNA and Khirbat Faynān, it is not possible to provide a comprehensive overview, and instead Section 7.2 presents summaries of several important types of metallurgical debris. The third section presents stone objects other than gaming pieces, limited primarily to stone vessels from KNA and Khirbat Faynān and groundstone from KNA. Although decorative elements from Khirbat Faynān are not discussed in detail, a fragment of liturgical furniture is presented, as well. The fourth section presents glass bracelets, beads, and shell. Glass finds other than bracelets and beads are not presented here, as glass finds were rare at KNA and Khirbat Faynān, and the fragmentary nature of these assemblages demands specialist analysis. Finally, the fifth section presents gaming pieces found at KNA. As in Chapter 6, the "example" line for each object provides contextual information, including site, area, stratum and/or locus, and registration or basket number.

7.1. Coins and Other Metal Objects

Coins

Coins, because of the information they provide and their prevalence in excavations of Classical and later sites, are an important category of artifact. Their most common, and perhaps most important, use is chronological, as they are often the most precisely datable artifacts in a context. Likewise, studied as an assemblage, coin finds can provide considerable insight into the local and regional economies of a period. As Walker (1976: 333-334) argued, this can be the case even for assemblages of coins that seem, at first glance, to be too corroded to be of much use, which applies to many of the coins from Faynān discussed below. Beyond this, coins can also provide insight into the people who used them, including how those people understood the symbolism and value of coinage (Wynne-Jones and Fleisher 2011).[248] This is particularly true for uses of coins "outside their primary regime of value," including contexts where coins were

[248] This has been considered both on the small-scale of individual users of coins, and on very broad scales, as in Wasserstein's (1993) numismatic analysis of "cultural definition" in the "Islamic world."

clearly used for reasons other than monetary ones (Kemmer and Myrberg 2011: 99-100). The Ottoman coins and tokens discussed below fall into this category, and provide insight into the place of coins in Late Islamic life and death. As Lockyear (2012) argues, however, this information is not self-evident in coins, and interpreting numismatic assemblages requires careful consideration of monetary supply, how coins were used, and site formation processes.

When discussing the coins from Faynān, this note of caution is particularly warranted. While Newson, et al. (2007b: 363) have argued that "[t]he absence of any coins [in the Faynān region] relating to the period AD 668-1210 (covering the Umayyad, 'Abbasid, Fatimid, early Seljuq and Frankish phases) is striking and gives added weight to the general absence of diagnostic pottery of this period," several caveats must be considered. First, Faynān, particularly during these periods, was not an urbanized region, and this must be kept in mind when considering coin frequencies. These are not only influenced by the density and pattern of settlement, but also by the degree to which the local economy was monetarized. As such, while coin frequencies are informative, they must be considered against a broader archaeological background. In particular, the absence of Early Islamic coinage does not indicate that Faynān was not settled — it is clear, in fact, that it was (see, e.g., Sections 5.3 and 6.2) — but is instead evidence that the local economy was likely not very monetary. Indeed, Fiema (2015: 759) has proposed that the absence of Early Islamic coins at Jabal Hārūn and al-Ḥumayma may indicate that the economy of much of southern Jordan was not particularly monetarized during this period. It is also worth noting that coins of any period recovered from scientific excavations remain quite rare in Faynān. Second, it must be kept in mind that coins can remain in circulation for long periods after being minted. As an example, analyzing coin frequencies at urban sites in northern Jordan, Walmsley (1999: 336) has suggested "that sixth century Byzantine coins were highly valued and still in wide circulation anything from one to two centuries after their production, a truly frightening revelation for coin-reliant stratigraphical archaeologists." This is not to suggest, of course, a direct parallel to Faynān. In fact, 6th century coins are, based on the available evidence, quite rare in Faynān — rarer, actually, than Early Islamic period (i.e. 640s AD) issues of Constans II in Kind, et al.'s (2005: 179, Table 1) corpus. It is, instead, meant only to emphasize that considerable caution must be exercised when interpreting coin data from an economy like that of Faynān, particularly when the vast majority of available numismatic data is derived not from scientific excavations but rather from a combination of surface collection and purchases from local children (Kind, et al. 2005: 170). Third, this section contains a description of the first coin definitively dating to this period, an Umayyad post-reform issue of the 8th century AD from Khirbat Ḥamrā Ifdān (B. 62079).

In the discussion below, note that the portions of legends in square brackets are not legible, but reconstructed on the basis of other examples of that type. The portions outside of square brackets are legible enough to be read. Where a letter is visible but not clearly legible, the uncertainty of the reading is indicated with a question mark.

Silver

Ottoman

Dating: mid-19th century AD?

Example: WFD 50A, Area T, L. 208. R. 44803. 0.94 g, 2.04 cm.

Description: This coin is heavily worn, and mostly illegible, but it would appear to be a 20 *para* coin of ʿAbd al-Mecīd I (cf. Craig 1966: 746, No. 267), hammered flat and pierced for use as personal adornment, found in the disturbed burial at WFD 50A.

Copper

Late Roman/Early Byzantine

Dating: 4th century AD

Example: Khirbat Faynān, Area 16, Stratum T3-2b, L. 1089. R. 8887. 1.31 g, 1.49 cm.

Description: A small bronze coin (*nummus*). It is relatively worn, although less so than many of the other bronze coins from Faynān.

Obverse: Bust of diademed emperor, facing right. CONSTAN…

Reverse: Two figures, probably Victories, stand facing one another and holding an object. Figure on left is either winged or holding a spear. VICTOR[IA]…

Discussion: This is likely a mid-4th century coin of the Constantinian dynasty. A similar, though much more worn, coin was found at al-Ḥumayma and dated to the 4th century, with the note that it is likely a "VICTORIA AVGVSTORVM issue" (Oleson, et al. 2013: 424, Fig. 12.8.34, 426). Cf. a similar — although not exactly so — mid-4th century issue of Constans in Van Meter (1991: 297, Fig. 57).

Dating: Probably mid-4th century AD

Example: Khirbat Faynān, Area 16, Stratum T3-2b, L. 1073. R. 8730. 2.75 g, 1.90 cm.

Description: Heavily worn bronze *follis*.

Obverse: Bust of emperor. Inscription visible but illegible.

Reverse: Design illegible. [FEL TEMP R]EPAR[ATIO](?)

Discussion: This coin is very heavily worn, and as such the identification is tentative. Nonetheless, it seems likely that this is a coin of the FEL TEMP REPARATIO type of the mid-4th century AD (Kent 1967; Kent 1981: 34-35; Mattingly 1933).

Unidentified Classical

Dating: Nabataean?

Example: Khirbat al-Nuḥās, Area A, L. 23. B. 1098. 0.78 g, 1.05 cm. (Fig. 7.1)

Description: This is a small, heavily worn bronze coin.

Obverse: Illegible

Reverse: Traces of design, but completely illegible.

Discussion: It is difficult to suggest a date for this coin, given its state of preservation. It is possibly a small Nabataean coin, or perhaps a low denomination Roman issue, e.g. a *quadrans*.

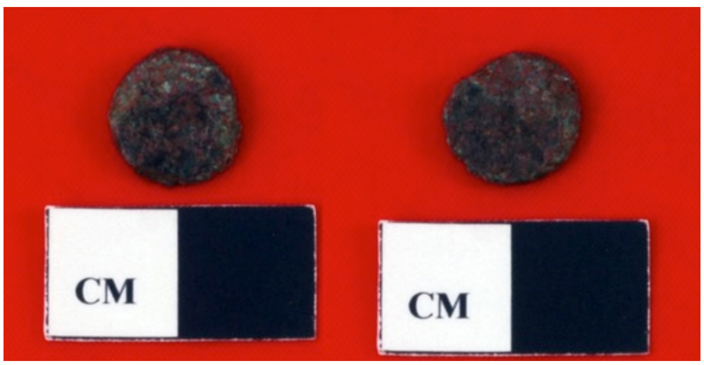

Figure 7.1: B. 1098, an unidentifiable Nabataean or Roman bronze coin found at Khirbat al-Nuḥās. (Photo: Aaron Gidding, courtesy UC San Diego LCAL.)

Dating: Nabataean?

Example: Khirbat al-Nuḥās, Area A, L. 23. B. 1099. 0.65 g, 1.12 cm. (Fig. 7.2)

Obverse: Bust? Heavily worn, and virtually illegible.

Reverse: Traces of design, but completely illegible.

Discussion: It is difficult to suggest a date for this coin, given its state of preservation. It is possibly a small Nabataean coin, or perhaps a low denomination Roman issue, e.g. a *quadrans*.

Figure 7.2: B. 1099, an unidentifiable Nabataean or Roman bronze coin found at Khirbat al-Nuḥās. (Photo: Aaron Gidding, courtesy UC San Diego LCAL.)

Dating: Roman?

Example: Khirbat Faynān, Area 16, Stratum T3-3 collapse, L. 1078. R. 8834. 1.49 g, 1.45 cm.

Description: This is a small, heavily worn bronze coin.

Obverse: Bust of emperor, facing right, mostly illegible. Traces of mostly illegible inscription (…A…).

Reverse: Traces of design, but completely illegible. Traces of circular die mark.

Discussion: This coin is very worn, making identification difficult. It is possibly a Roman period (perhaps 2nd century AD) *quadrans*.

Dating: Uncertain, but Late Roman/Byzantine context

Example: Khirbat Faynān, Area 16, Stratum T3-2b, L. 1089. R. 8886. 1.50 g, 1.27 cm.

Description: This is a small, heavily worn bronze coin.

Obverse: Illegible. Probably bust of emperor.

Reverse: Standing figure? Mostly illegible.

Discussion: This coin is too worn to identify with any certainty. Perhaps a Late Roman or Early Byzantine *nummus*, based on context, but it is possibly earlier and residual.

Late Byzantine/Early Islamic

Dating: Probably 630-642 AD, possibly somewhat later

Example: Khirbat Ḥamrā Ifdān, Area C, L. 1404. B. 16015. (Fig. 7.3).

Description: Worn bronze *dodecanummium*.

Obverse: illegible

Reverse:

I [cross?] **B**

[A]Λ[EΞ]

Discussion: The reverse design indicates that this is an Alexandrian *dodecanummium*, or 12 *nummus* coin. This would indicate only a date of Late Byzantine (i.e. Justinian or later), when this type was first produced (see Phillips 1962: 225). The form of the legible *lambda* on B. 16015, with a bar or serif on top, however, indicates that this is a later issue of Heraclius or possibly Constans II (Phillips 1962: 240). Arab-Byzantine coins with essentially the same reverse design continued to be minted after the Islamic armies took Alexandria, but with the Greek mint name (AΛEΞ [ALEX], i.e. Alexandria) "usually blundered" (Awad 1972: 114; see also Bacharach and Awad 1981: 51-52; Phillips 1962: 240-241). On some types of these later coins, the second letter is rendered as *lambda* with a bar or serif on top (Awad 1972: 115, Pl. XXIII.5-6). These later issues seem not to be particularly common in the southern Levant, but a probably Alexandrian Arab-Byzantine *fals* ("mint name not visible," unfortunately) was found at Nessana/ʻAwja al-Ḥafīr (Goodwin 2005: 70, Fig. 3.13, 73).

Figure 7.3: B. 16015, a 7th century Alexandrian *dodecanummium*. (Photo: Aaron Gidding, courtesy UC San Diego LCAL.)

Umayyad

Dating: 8th century

Example: Khirbat Ḥamrā Ifdān, Area D, Surface Collection, B. 62079.

Description: B. 62079 is a heavily-worn, post-reform Umayyad epigraphic *fals*. While the coin does not bear a legible date, it cannot be any earlier than the coin reform of ʻAbd al-Malik in 77 AH/696-697 AD (on this, see Bates 1989), and an 8th century date is all but certain.

Obverse: [lā ilāha]

illā allāh

waḥd[ahu]

Reverse: muḥammad (barely legible)

[ras]ū[l]

allāh

(traces of dotted circle visible surrounding legend; marginal legend possible but, if present, completely illegible)

Discussion: Tentatively, it seems this coin belongs to Walmsley's (2010: 411, Table 13B) "Anonymous" group, which may suggest a date later in the 8th century (i.e. pre-reform 'Abbāsid,[249] rather than post-reform Umayyad). This is uncertain, both because Walmsley's (2010: 412) suggestion that "plain undated and anonymous issues filled the vacuum before distinctively 'Abbāsid issues began" is very tentative, and because B. 62079 is too worn to definitively assign it to the Anonymous type. Somewhat similar, but much better preserved, examples from Khirbat Yājūz, north of 'Ammān, were dated to the early 'Abbāsid period (Khalil and Kareem 2002: 147). Broome (1985: 18), it is worth noting, suggested the opposite: the anonymous, undated issues were the earliest group of post-reform coins. Compelling evidence has not been provided for either of these arguments. It is worth considering, as well, that there may have been no "vacuum" to fill. Bacharach and Awad (1981: 55) suggested for Egypt that the lack of early 'Abbāsid *fulūs* may have been due to the large quantity of Umayyad *fulūs* remaining in circulation.

Ayyūbid

Dating: 1211-1212 AD/608 AH

Example: KNA, Area Z, Stratum Z2, L. 228. R. 32262. 4.38 g, 2.56 cm. (Fig. 7.4).

Description: R. 32262 is a *fals* of al-'Ādil I, minted in Damascus. The reverse legend allows a clear identification of the coin as belonging to Balog 322-324 (Balog 1980: 136), dating

[249] On the coinage reforms of the 'Abbāsid caliph al-Mā'mūn in the early 9th century, see el-Hibri (1993). That paper unfortunately only discusses gold and silver coins, but copper coins were also affected. This was a complex process, however. The coins from the Bet She'an (Youth Hostel) excavations, for example, include apparently 9th century *fulūs* with both new (post-reform 'Abbāsid) and old (post-reform Umayyad) style inscriptions (Bijovsky and Berman 2014: 102*-104*).

to 1211-1214 AD/608-610 AH. The marginal legend bearing the date is difficult to make out, as the coin is quite worn, but on the obverse the word "*thamān*" can be made out, which would place this coin in Balog 322, dating to 1211-1212 AD/608 AH.

Obverse:

[al-dī]n

[al-malik a]l-'ādil

[say]f

Reverse:

[abū bakr ibn ayy]ū

b

Discussion: While the final *bā'* is not always on a separate line in Balog 322, this is the case on some examples, including the photographed example in Balog (1980: Pl. XV.322).

Figure 7.4: R. 32262, an Ayyūbid *fals* of al-‘Ādil I. (Photo: Aaron Gidding, courtesy UC San Diego LCAL.)

Dating: 1211-1214 AD(?)

Example: KNA, Area Z, Stratum Z-2(a), L. 268. R. 32994. 4.62 g, 2.21 cm. (Fig. 7.5).

Description: This is a mostly illegible *fals*, but fits generally within the range of Ayyūbid coins. It has a circular dotted border on both sides, as R. 32262, and on the reverse seems to have a *bā’* on a separate final line, which would suggest that this is a Damascene issue of al-‘Ādil I belonging to Balog 322-324 (Balog 1980: 136), dating to 1211-1214 AD/608-610 AH.

Obverse:

al-m[alik]…

Reverse:

Mostly illegible

[abū bakr ibn ayyū]

b(?)

Figure 7.5: R. 32994, an Ayyūbid *fals*, probably of al-ʿĀdil I. (Photo: Aaron Gidding, courtesy UC San Diego LCAL.)

Dating: likely Ayyūbid

Example: KNA, Surface Collection, Building 5308. Previously published (Jones, et al. 2012: 88, Fig. 20). 3.91 g, 2.18 cm.

Description: This is a heavily worn *fals*, with a mostly illegible inscription in thin *naskhī* script. A dotted border and marginal inscriptions are present, but the coin is too worn to make out the actual design of the border or the content of the inscriptions.

Obverse:

top line illegible

[a]l-malik al-m … r(?) (or d?)

… lā(?) …

Reverse:

… d(?)

… r(?) (or w?)

… [l]-dīn(?) (or [bak]r ibn?) (or manīn?)

Discussion: Jones, et al. (2012: 88) published this coin as "too corroded to be identified as anything more than an Islamic-period coin."[250] Reanalysis of the coin in ʻAmmān, however, allowed for the very fragmentary reading presented above. While it is still not possible to precisely identify this coin, the style and content of the inscription are compatible with an Ayyūbid (or perhaps later Zangid) date. While not an exact parallel, some comparison can be drawn to the coinage of al-Manṣūr Muḥammad I of Ḥamāh, e.g. Balog 824 (Balog 1980: 249). Kind, et al. (2005: 179, Table 1, no. 1378) tentatively propose the same identification for another heavily worn *fals* found at KNA.

Tokens

Silver

Tokens imitating Ottoman coins

Dating: late 19th century AD

Example: WFD 50A, Area T, L. 202. R. 44804. 0.84 g, 1.94 cm.

Description: This is a silver token imitating an Egyptian one *piastre* coin of ʻAbd al-ʻAzīz. It is pierced for use as personal adornment.

[250] At the time, photographs were sent to Ayda Naghawi, but they did not show enough to be read. As the coin was held in storage in ʻAmmān, I was not able to inspect it in person at the time that article was published, and relied on photographs.

Discussion: The issue date is given as 1277 AH/1861 AD, but the regnal year is given as 17. The correct regnal year for ‘Abd al-‘Azīz would be 1 (or for ‘Abd al-Mecīd I, 22 [see also Craig 1966: 619-620]), indicating that this is a token.

Copper

Late Islamic tokens

Dating: Probably later 19th century AD

Examples: WFD 50A, Area T, L. 202. R. 44800. 0.41 g, 1.49 cm.

WFD 50A, Area T, L. 208. R. 44801. 0.4 g, 1.31 cm.

Description: These objects are similar Late Islamic period copper coin-like tokens from the disturbed burial at WFD 50A. Both tokens feature a five-pointed star at the center, surrounded by a circle of crescent and triangle shapes, and outside of this, at the edge of the token, a rope or vine design. On R. 44800, the larger of the two tokens, the design is more detailed, but otherwise they are nearly identical. Both tokens are punctured for use as personal adornment. A large group of similar tokens was found during excavations at the Athenian Agora (Miles 1962: 59).

Tokens imitating Ottoman coins

Dating: 19th century AD

Example: WFD 50A, Area T, L. 208. R. 44802. 0.6 g, 1.88 cm. (Fig. 7.6)

Description: This is a copper imitation of a gold *altun* of Maḥmūd II (compare to Craig 1966: 746, No. 233). Some traces of gold plating are still visible on the obverse, and a hole is pierced through the token for use as personal adornment.

Discussion: A similar imitation coin, also used for personal adornment, was surface collected at Khirbat Fāris (Johns and McQuitty 1989: 252, and see citations there) and another was found in excavations at the 20th century Templer settlement at Alonē Abba (Mitler 2010). A possible imitation, but in silver, was also found at the Athenian Agora (Miles 1962: 48, Pl. V.62).

Figure 7.6: R. 44802, a 19th century copper token imitating a gold *altun* of Maḥmūd II. (Photo: courtesy UC San Diego LCAL.)

Other Metal Objects

Copper

Bronze armor scale (?)

Example: Khirbat Ḥamrā Ifdān, Area L, L. 3016, Stratum L-IIA. B. 45140. (Fig. 7.7)

Description: B. 45140 is a small (ca. 2.25 x 1.75 cm), rectangular bronze object with a single hole pierced through it.

Discussion: This object seems most likely to be an armor scale. These are not common finds on excavations, although a somewhat similar object from an Early Islamic context at al-

Ramla, Rambam Street was also identified as an armor scale (Amitai-Preiss in Toueg 2017: Fig. 7.1). This object may date to the Early Islamic use of Area L, or may be a residual find from Roman period Stratum L-IIC, when the core of the building was likely a tower.

Figure 7.7: B. 45140, a possible bronze armor scale from KHI, Area L, Stratum L-IIA. (Photo: Aaron Gidding, courtesy UC San Diego LCAL.)

Bronze bell (?)

Example: Khirbat Faynān, Area 16, Stratum T3-2b. R. 8426. 37.04 g, 4.18 cm x 3.44 cm (diameter at widest point). (Fig. 7.8)

Description: R. 8426 is a bronze, bell-shaped object, ca. 4.18 cm tall, including a ca. 1 cm tall loop at its top. There is a small hole (ca. 0.5 cm x 0.4 cm) near the bottom that seems, based on accumulated bronze above it, to have been cast into the object. The interior is mostly smooth, other than casting marks and patina.

Discussion: While this object resembles a bell, it is unclear where a clapper would have attached. Bells of this period often have a hole through the top, allowing the clapper to be hung through the loop at the top of the bell (e.g. Flint 2012: 353, Fig. 755). It is possible that the attachment is no longer preserved on this example, that the bell was meant to be struck with an object, or that it was simply decorative.

Figure 7.8: R. 8426, a bronze bell from Khirbat Faynān. (Photo: Aaron Gidding, courtesy UC San Diego LCAL.)

Bronze clasp

Example: KNA, Area Z, Stratum Z-2, L. 214. R. 32219. 4.02 g, 5.26 cm x 0.55 cm (at widest point). (Fig. 7.9).

Description: This is a finely made bronze clasp, with a loop on one end for attaching to an object (perhaps a garment), and a hook at the other end. It is flat on one side, and decorated on the other. Near the loop end, it is squared and decorated with an X design, with two lines radiating from the center of the X and continuing down the side of the object. Below the X (toward the hook) is a pierced dot, with two dots on each side, one on either side of the incised line. The object narrows as it approaches the hook, with the exception of a circle surrounded by a line on either side, roughly in the object's center. I am aware of no exact parallels for this object, but various aspects of the decoration are paralleled on numerous metal and particularly bone objects beginning in the Byzantine period and continuing into the Middle Islamic. The X design on the loop end is paralleled by the end of an ivory cosmetic applicator found at Tall Ḥisbān (Vollenweider and Platt 2009: 304, Fig. 14.4.13).[251]

Figure 7.9: R. 32219, a bronze clasp found in KNA, Area Z, Stratum Z-2. (Photo: Aaron Gidding, courtesy UC San Diego LCAL.)

Bronze hook

[251] The date of the context in which this object was found, C.5:113, is not provided (Vollenweider and Platt 2009: 303, Table 14.4), but C.5:219 and C.5:217 both contained coins of the mid- to late 4th century AD (Terian 2009: 320, nos. 87, 95) and C.5:134 contained an early 13th century Ayyūbid coin of al-Kāmil Muḥammad (Terian 2009: 328, no. 177).

Example: Khirbat Faynān, Area 16, Stratum T3-2b. R. 8900. 2.13 g, 4.29 cm x 0.25 cm x 0.23 cm.

Description: This is a bronze hook, ca. 4.29 cm long, hammered thin and wrapped around itself at the top to make a loop. At the bottom it is bent at a roughly 90 degree angle to create a hook, ca. 2.10 cm long and slightly thinned at its end.

Bronze pin

Example: WFD 50A, Area T. R. 44823.

Description: This is the end (3.51 cm) of a bronze pin found at WFD 50A.

Discussion: R. 44823 was recovered from the sieve, but the locus of the material being sieved was apparently not recorded (this find was recovered on the first day of excavation at WFD 50A, and it may therefore derive either from surface or bulldozed sediment). It may be associated either with the Late Islamic burial or the Byzantine-Early Islamic occupation of the site, with the latter perhaps being more likely.

Bronze probe/koḥl stick

Example: KNA, Area Z, Stratum Z2, L. 228. R. 32265. 4.20 g, 5.09 cm x 0.42 cm x 0.34 cm (at widest and tallest points). (Fig. 7.10).

Description: Squared length of bronze, thinned and narrowed at one end. It is probably a cosmetic or medical implement.

Figure 7.10: R. 32265, a bronze probe or cosmetic implement found in KNA, Area Z, Stratum Z2. (Photo: Aaron Gidding, courtesy UC San Diego LCAL.)

*Bronze strap/*polycandelon *fragment*

Example: Khirbat Faynān, Area 16, Stratum T3-2a, L. 1022. R. 7225. 3.08 g, 4.40 cm x 0.51 cm x 0.11 cm. (Fig. 7.11).

Description: This is a flat strip of bronze — found in two pieces — which has been curved into a circular strap. One end is pierced by a small bronze pin (ca. 0.66 cm long). The strap is decorated with what appears to be a repeating dot-in-circle design, although this can only be made out on a small portion of the object.

Discussion: It is possible that this is part of a *polycandelon*, or multiple lamp holder. Similar objects have been identified as *polycandelon* fragments at Dayr ʻAyn ʻAbāṭa (Flint 2012: 352, Fig. 737) and Ḥorvat Karkur ʻIllit (Nikolsky, et al. 2004: 243, Phot. 252.b). The pin in the end of R. 7225, however, may suggest a different function.

Figure 7.11: R. 7225, a bronze strap or *polycandelon* piece from Khirbat Faynān. (Photo: Aaron Gidding, courtesy UC San Diego LCAL.)

Copper chain

Example: WFD 50A, Area T, L. 208. R. 44827.

Description: Several fragments of a copper chain associated with the Late Islamic burial at WFD 50A, found associated with an oxidized iron fragment, the original shape of which is not clear.

Discussion: Similar chains were found in the Late Islamic cemeteries at Tall Ḥisbān (Walker 2001: 52, Fig. 7) and Tall al-Ḥaṣī (Eakins 1993: 65).

Iron

Iron blade

Example: KNA, Area Z, Stratum Z-2(a), L. 268. R. 32997. 16.19 g, 7.09 cm x 3.06 cm (at widest point). (Fig. 7.12).

Description: A very corroded iron blade.

Discussion: Assuming L. 268 should be assigned to Stratum Z-2a, it is unclear whether this blade was used in Area Z, or was made or repaired there.

Figure 7.12: Corroded iron blade found in KNA, Area Z, Stratum Z2(a), after cleaning and repair. (Photo: Aaron Gidding, courtesy UC San Diego LCAL.)

Iron nails

Examples: KNA, Area X, L. 136. R. 5884. (Fig. 7.13).

KNA, Area X, L. 137. R. 5885. (Fig. 7.14).

Description: Two iron nails found in KNA Area X.

Discussion: These iron nails were found in KNA Area X, adjacent to the wall stub or working surface found (L. 140) found at the southern end of the square.

Figure 7.13: R. 5884, an iron nail found in KNA, Area X, L. 136. (Photo: Aaron Gidding, courtesy UC San Diego LCAL.)

Figure 7.14: R. 5885, an iron nail found in KNA, Area X, L. 137. (Photo: Aaron Gidding, courtesy UC San Diego LCAL.)

Bullets

Examples: WFD 50A, Area T, L. 200. R. 44828.

WFD 50A, Area T, L. 213. R. 44829.

Description: Two bullets — only the bullets, rather than cartridges — were found at WFD 50A. One, R. 44828, is most likely a .303 caliber copper (or copper alloy) bullet. The second bullet, R. 44829, is a larger caliber — probably 9mm, although it is somewhat difficult to measure due to corrosion.

Discussion: .303 caliber cartridges were found at Ṭūr Imḍayy, where Simms and Russell (1997: 469) suggest that they were used in "Lee Enfield or Mauser-type repeater rifles,"[252] which were introduced to southern Jordan in the late 19th or early 20th century and became common after World War I. Much similar ammunition was also found in World War I-era military trenches near Maʿān (Saunders and Faulkner 2010: 518). Given the lack of a cartridge, however, the identification of R. 44828 as a .303 bullet for a World War I-era repeating rifle is not entirely certain. It is not possible to rule out, for example, that the bullet is actually from a Kalashnikov, which Bedouin in the Levant have had access to since at least the 1960s (see e.g. Schroeder 2006: 93). Interestingly, two bullets of the same calibers found at WFD 50A — .303 and 9mm — were found at Nahal Be'erotayim West, a Bedouin campsite in the southwestern Negev, where they likely date to the 1940s (Saidel and Erickson-Gini 2014: 143, n. 7). Eight .303 British cartridges were also found at Megiddo, in contexts associated with the 1948 Palestine War (Cline and Sutter 2011: 171, Table 1).[253] As no cartridges were found at WFD 50A, it is difficult to date

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[252] The early Mauser-type rifles in fact use 7.65mm bullets (see Saunders and Faulkner 2010: 518), but the two are very similar in size. The 8mm (7.92mm) Mauser cartridge was also already in use during World War I (Cline and Sutter 2011: 171), but is less likely to be mistaken for a .303 British cartridge.

[253] The famous 1918 Battle of Megiddo (see Cline 2000: 6-28) could be ruled out, in this case, as the cartridges were recovered from sediment that had accumulated in Megiddo Area Q since the 1925-1926 University of Chicago excavations in this area of the site (Cline and Sutter 2011: 162-163).

the bullets found there, but it is likely that they post-date the Late Islamic burial. The likeliest date would seem to fall between the end of the 1910s, when World War I-era repeating rifles became common in southern Jordan, and the late 1970s, when WFD 50A was bulldozed as part of gravel digging operations for the construction of the Dead Sea highway.

7.2. Metallurgical Debris

A complete analysis of the metallurgical debris is beyond the scope of this dissertation. Instead, this section presents a very brief overview of several categories of metallurgical debris and the results of preliminary portable X-Ray fluorescence (pXRF) analysis of slag samples from KNA, Khirbat Faynān, and Khirbat al-Manāʻiyya (the copper slag is also presented in Jones, et al. 2017: 309, Table 2).

Furnace Facings

Some furnace facing fragments were found in KNA Area X, but the majority were found in the Area 15 slag mound at Khirbat Faynān. Most are whitish sandstone, and are identifiable as furnace facings by a coating of bluish-green, cupriferous furnace glaze on one side. As noted in Sections 4.1.3.1 and 4.2.1, these are interpreted as parts of a replaceable stone and clay furnace facing, although the stone portion of the facing in place in Furnace 120 in Area X (see Section 4.1.3.1) seems to be granite, rather than sandstone. While no furnace was found in Area 15, the presence of many facing fragments indicates that the furnace was of the same type as found in KNA Area X, which is expected considering that both sites were active at the same time. Stones with attached clay and slag surface collected from Area X during the 2002 survey (Fig. 7.15) may also be fragments of furnace facing.

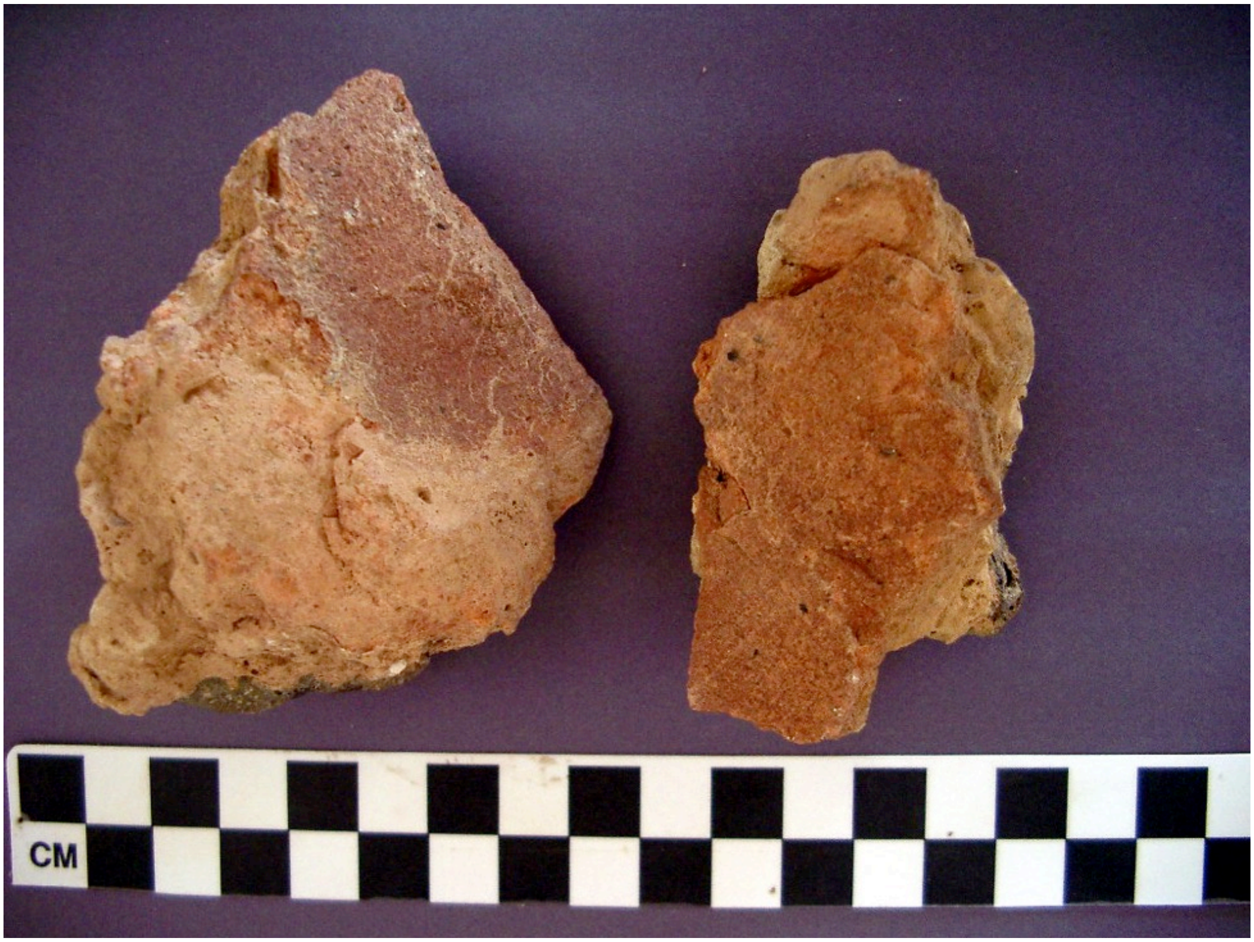

Figure 7.15: Possible furnace facing fragment surface collected from Area X during the 2002 survey. (Photo: courtesy UC San Diego LCAL.)

Mixed Copper-Iron

Example: KNA, Area X, L. 117. B. 50015. (Fig. 7.16).

Description: This is the largest complete part of a lump of mixed copper-iron found on surface L. 117 in KNA Area X.

Discussion: Various portions of the same object were also found above this, in L. 106 and L. 115, as well as smaller chunks in L. 117. Hauptmann (2007: 126) surface collected pieces of the same object from the Area X building during his survey of the site. Contrary to Hauptmann's (2007: 208) analysis, this material does not seem to be metallurgical waste, as such. Instead, its placement inside the building, rather than on the slag mounds outside, seems to indicate that it is an intermediate product, and would have been subjected to further refining processes had the site not been abandoned (see Sections 4.1.3.1 and 10.1 for further discussion).

Figure 7.16: Large portion of B. 50015 *in situ*, with rubber *quffa* for scale.

Tuyères

Examples: KNA, Area X, L. 125. R. 5746.

KNA, Area X, Surface Collection. R. 5554. (Fig. 7.17).

KNA, Building 5308, Surface Collection. R. 17677.

KNA, Area Z, Surface Collection. No reg. or basket. (Fig. 7.18)

Discussion: Tuyère fragments were found during excavation in KNA Area X and Khirbat Faynān Area 15, as well as during the 2002 survey of KNA. Petrographic analysis indicates an origin in Wādī ʻAraba (see Section 6.5.1), and local production in Faynān is likely. The frequency with which tuyère fragments were found in the Area 15 slag mound indicates that they were not replaced as frequently as Iron Age tuyères, although further excavation in Area 15 and the KNA Area X slag mound would clarify this. The tuyère fragment surface collected from Building 5308 (R. 17677) was likely carried or otherwise moved there from Area X. The tuyère surface collected from Area Z may, however, be related to the metallurgical activities in that building. While no tuyère fragments were found during the 2012 Area Z excavations, this might be a factor of the specific installations that were excavated. The northwestern portion of the building may indeed contain metallurgical installations that would have required a bellows system, and it is worth noting that the function of the stone feature north of Area Z's eastern wall (see Fig. 4.19) remains unknown. Early Islamic period tuyères from Khirbat al-Manāʻiyya have been published (Jones, et al. 2017: 303, Fig. 7.a-b), and are comparable in form to those from Middle Islamic period Faynān, although the furnace form was likely different.

Figure 7.17: R. 5554, a tuyère fragment surface collected from Area X prior to excavation in 2011. (Photo: Aaron Gidding, courtesy UC San Diego LCAL.)

Figure 7.18: Tuyère fragments surface collected from Area Z during the 2002 survey. (Photo: courtesy UC San Diego LCAL.)

Slag

Formally, the slag from Khirbat al-Manā‘iyya is the most distinctive, belonging to the "ring slag" type found only during the Early Islamic period in the southern Wādī ‘Araba. These are plates (ca. 60-80 cm in diameter) of slag with a central hole allowing them both to cool more quickly and to be removed from the slag pit easily in a single piece (see further discussion in Jones, et al. 2017: 298-300). As noted in Section 3.5, this type of slag is presently unknown in the central and northern Wādī ‘Araba. The Middle Islamic period slag from Faynān is not as visually distinctive, but is chemically quite distinctive. The slag of this period, which has been discussed in some detail by Hauptmann (2007: 103, 183, 195), is a unique Fe-Mn silicate slag reflecting the iron-rich ore in use during this period (see Section 5.1.1).

Table 7.1: Elemental compositions (in wt-%) of slag samples from Khirbat al-Manāʿiyya (KM), Khirbat Faynān (KF), and Khirbat Nuqayb al-Asaymir (KNA) based on surface readings taken with a portable X-Ray fluorescence spectrometer (pXRF). Column "n" lists the number of readings taken for each sample.

#	Context	n	Type	K	Ca	Ba	Ti	Mn	Fe	Ni	Cu	Zn	Pb
1	KM, SM1, Sq. B, B. 1, R. 35514	5	Cu slag (slagged furnace fragment)	2.54 ± 0.16	6.43 ± 3.98	0.1 ± 0.24	0.11 ± 0.003	5.44 ± 1.4	14.39 ± 10.71	0.06 ± 0.01	0.89 ± 0.35	0.1 ± 0.04	0.01 ± 0.05
2	KM, SM1, Sq. B, B. 119, R. 35486	5	Cu slag	2.53 ± 0.16	11.02 ± 3.01	0.02 ± 0.24	0.11 ± 0.004	6.82 ± 1.79	19.7 ± 11.84	0.05 ± 0.01	2.41 ± 2.81	0.18 ± 0.05	0.12 ± 0.05
3	KM, SM1, Sq. B, B. 33, R. 35519	5	Cu slag (slagged tuyére)	2.52 ± 0.15	3.96 ± 1.58	0.05 ± 0.19	0.11 ± 0.003	4.79 ± 1.44	10.06 ± 13.88	0.06 ± 0.03	4.49 ± 6.91	0.35 ± 0.14	0.15 ± 0.07
4	KM, SM1, Sq. B, B. 36	5	Cu slag	2.61 ± 0.14	11.62 ± 4.78	0.42 ± 0.28	0.12 ± 0.004	7 ± 1.2	18.18 ± 6.53	0.05 ± 0.01	1.55 ± 0.65	0.15 ± 0.04	0.07 ± 0.02
5	KM, Surface, R. 35523	5	Cu slag	2.6 ± 0.17	9.59 ± 2.93	0.11 ± 0.19	0.11 ± 0.003	6.72 ± 1.72	15.58 ± 9.19	0.05 ± 0.01	1.88 ± 1.94	0.13 ± 0.04	0.07 ± 0.03
6	KF, Area 15, L. 5, R. 34015	5	Cu slag	2.88 ± 0.13	9.02 ± 1.55	1.36 ± 0.2	0.13 ± 0.003	21.84 ± 1.95	40.05 ± 4.53	0.05 ± 0.004	0.97 ± 0.37	0.05 ± 0.01	0.04 ± 0.01
7	KF, Area 15, L. 10, R. 33771	5	Cu slag	2.73 ± 0.12	6.67 ± 1.56	1.11 ± 0.21	0.13 ± 0.003	14.94 ± 5.39	21.76 ± 10.43	0.03 ± 0.01	0.64 ± 0.25	0.04 ± 0.02	0.01 ± 0.01
8	KNA, Area X, L. 163, R. 50143	5	Cu slag	2.76 ± 0.1	12.86 ± 6.14	1.13 ± 0.68	0.13 ± 0.01	21.83 ± 2.18	36.44 ± 2.72	0.04 ± 0.003	3.02 ± 2.21	0.09 ± 0.04	0.04 ± 0.01
9	KNA, Area X, L. 167, R. 50147	5	Cu slag	2.98 ± 0.08	9.65 ± 1.19	0.83 ± 0.13	0.12 ± 0.002	17.99 ± 2.65	6.7 ± 1.75	0.07 ± 0.001	0.69 ± 0.31	0.04 ± 0.02	0.05 ± 0.03
10	KNA, Area Z, L. 351, R. 40051	5	Fe (smithing) cinder	2.53 ± 0.16	35.17 ± 5.98	0.08 ± 0.2	0.11 ± 0.002	4.28 ± 0.12	9.05 ± 5.09	0.05 ± 0.02	0.14 ± 0.02	0.01 ± 0.002	-0.01 ± 0.01

Most of the samples presented in Table 7.1 have been published and discussed previously by Jones, et al. (2017: 308, 309, Table 2), and the basic outlines of that discussion are worth repeating here. The study was conducted using a Bruker Tracer III-V+ pXRF spectrometer. For each sample, five 300-second surface readings were taken using instrument settings appropriate for analyzing heavier elements (40 KV, 15 μA, no vacuum, green filter [0.006” Cu, 0.001” Ti, 0.012” Al]). These readings were calibrated using data collected by Ben-Yosef (2010) for Iron Age slag from several sites in Faynān. Following calibration, the means of these readings were calculated, and are presented here for each sample.

Three caveats must be kept in mind when interpreting the data presented here. First, all of these readings were obtained from the surface of the slag, rather than slag crushed into powder. As slag is a heterogeneous material, its composition can vary across the surface of a single sample, and analysis of powdered material provides more accurate results. While five samples were taken across the surface of the samples and averaged in order to address this variation, this has led to large standard deviations for many of the elements relevant to studies of archaeometallurgical slag, including Ca, Cu, and Fe. Sample preparation may also be a larger issue for surface readings, as discussed below for R. 40051. Second, because the readings were all taken using instrument settings for heavier elements, the wt-% of lighter elements such as K, Ca, and Ba is probably underrepresented. Si, a major component of slag, is a very light element and as such is not included in the calibration at all. Third, the fact that the calibration was developed for Iron Age copper slag from Faynan has probably introduced some error, as the composition of Early and Middle Islamic period slag is rather different. This is particularly the case for R. 40051, which is not copper slag, but rather a blacksmithing cinder. While the samples are useful as a starting point, they represent a preliminary stage of research and must be interpreted with caution.

The Ca wt-% numbers for the copper slag from both Khirbat al-Manāʿiyya and Middle Islamic period Faynān are in line with the range for Early Islamic slag from Be'er Ora (Bachmann 1980: 115, Table 7), but considerably higher than samples from Iron Age Timna (Ben-Yosef 2010: 855, Table 8.7). The wt-% of manganese is substantially higher in the samples from Faynān, reflecting the intergrowth of manganese ore characteristic of the Faynān copper ores (Hauptmann 2007: 70). The high iron content in all of the Faynān samples except for R. 50147 seems to reflect engagement with iron-rich copper ore during the Middle Islamic period, as discussed above. The high wt-% of iron in the samples from Khirbat Faynān may indicate the deliberate use of iron oxides as flux, or the mixing of ores from Wādī Nuqayb al-Asaymir and Wādī al-Salmīna.

R. 40051, a probable blacksmithing cinder from KNA Area Z, has not been published previously. The wt-% numbers should not be taken as accurate for this sample, as the calibration for copper slag was also used for this sample, which has undoubtedly introduced error. Nonetheless, several observations about this sample are worth noting. First, although the form of this object resembles a typical plano-convex smithing hearth bottom slag (see Serneels and Perret 2003), the wt-% of iron is lower than would be expected for iron slag (for some examples from the Iron Age Levant, see Veldhuijzen and Rehren 2007: 193, Table 1), particularly given the wt-% of iron in copper slag from KNA. Second, the wt-% of calcium is higher than expected, and indeed is much higher than any other sample presented here. This is to be expected if the object is not a slag but a cinder, or "slag-like" lump of primarily organic material (see Miller and Killick 2004: 24). Although the deliberate addition of lime flux to the furnace charge can increase the Ca content of iron smelting slag (Heimann, et al. 2001: 248-250), the most likely source of the high Ca content is ash (see Tylecote, et al. 1977: 310-311), which would suggest that this is a smithing cinder. At present, and considering these numbers are based on surface readings and not powdered samples, it should also be considered that this sample was simply coated in ash and needed to be better cleaned. Further work, and particularly the analysis of properly crushed samples, will help clarify this.

7.3. Stone Objects Other than Gaming Pieces

Schist Bowls

Although similar vessels appear much earlier on the Arabian Peninsula (see, e.g. David 1996; Reade and Searight 2001) and perhaps in Egypt (Harrell and Brown 2008: 56-57), schist bowls of the type discussed here seem to appear in the southern Levant no earlier than the 8th century AD, and are most common in 8th-9th century contexts (see discussion in Magness 1994). While the beginning date of their range is well established, the end date is less clear. Based on the 1964-1966 excavations at al-Fusṭāṭ, Scanlon (1968: 8) suggested that "the manufacture of soapstone articles seems to have died out about A.D. 900," which is consistent with an 8th-9th century date. This is, however, complicated by the fact that schist bowls were found at Quṣayr al-Qadīm in contexts that seem to date to the 13th and 14th centuries AD (Johnson 1982: 328-329, Pl. 68.p-q; Whitcomb 1979: 208-209, Pl. 72.h-k). Harrell and Brown (2008) have proposed, on the basis of a survey of Egyptian quarries, that schist vessels were produced on the Arabian Peninsula between the 8th and 12th centuries AD, after which Egypt became the primary center for their production. In the southern Levant, they do seem to be relatively rare after the 9th century AD. They have, however, been found in a 10th-11th century AD context in the excavations at al-Ramla, Ben Gurion Street (Eshed 2015: Fig. 3.12), and in Fāṭimid, Mamlūk, and perhaps even Ottoman contexts in the excavations at al-Ramla, North of the White Mosque (see various vessels in Chachy-Laureys 2010: 304-307, 313-316, Pls. 14.3-14.6).

Dating: Certainly 8th-9th centuries AD, perhaps continuing into the Mamlūk period or later

Example: KF, Area 18, Occupation 2. R. 31930. (Fig. 7.19.1)

Parallels: ‘Ammān Citadel: (Harding 1951: Pl. II.18); ‘En Avrona: Early Islamic (Porath 2016: 33*, Fig. 30.4); Ṭabaqat Faḥl/Pella: Umayyad (Walmsley 1982: 77, Pl. 60b)

Example: KNA, Area Z, Stratum Z2a. R. 32251. (Fig. 7.19.2)

Discussion: R. 32251 is the rounded base of a schist bowl. It is fire-blackened, indicating that it was used as a cooking bowl. While most commonly dated to the Early Islamic II, there is, as discussed above, evidence to suggest that these vessels were used through the Middle Islamic period.

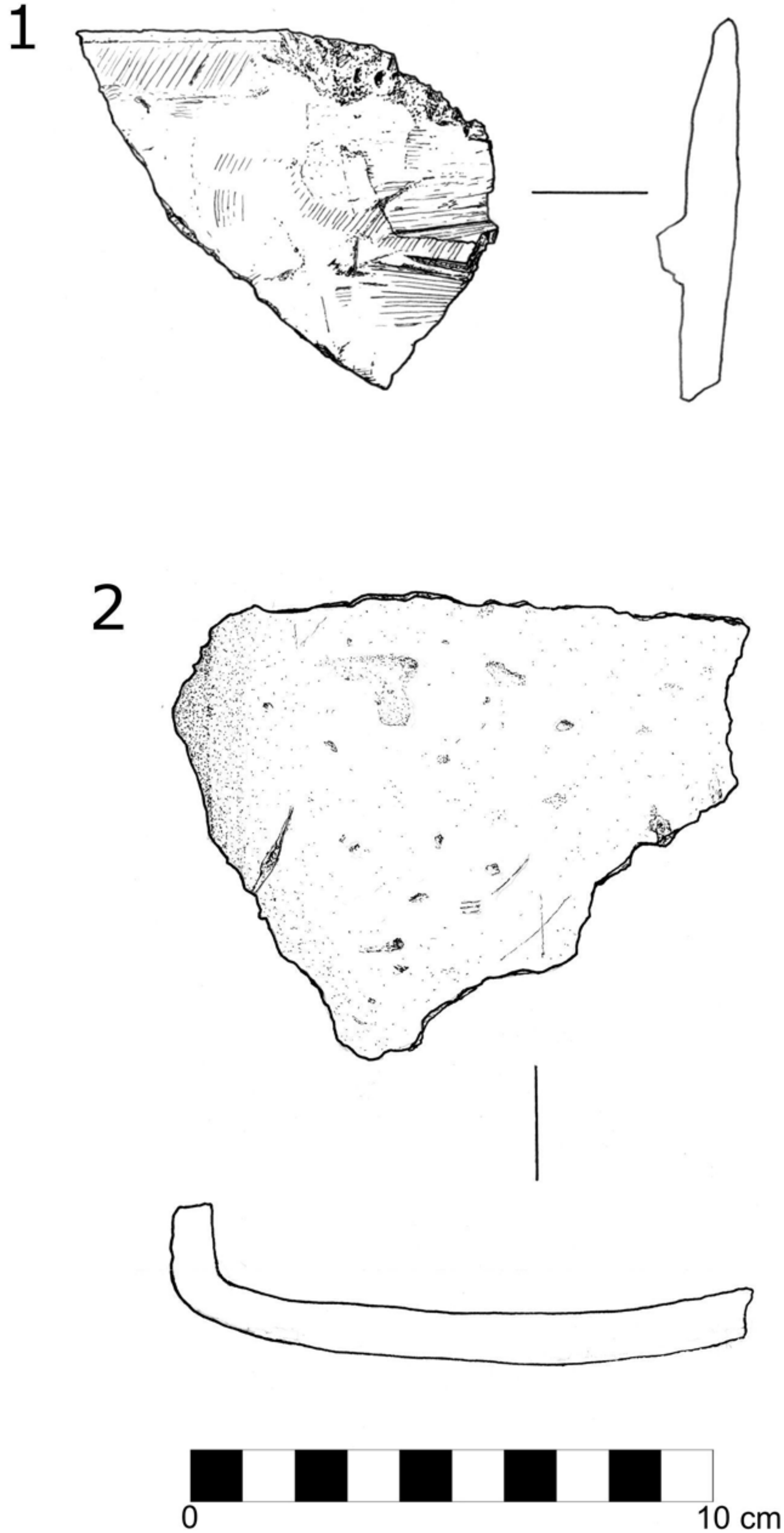

Figure 7.19: Schist vessels from Khirbat Faynān and KNA. (Illustration: Donna Walker.)

Chancel Post or Colonette Capital

Dating: Byzantine

Example: KF, Area 18, Occupation 2. B. 10107. (Fig. 7.20)

Discussion: B. 10107 is a chancel post or colonette capital carved from white stone. This object was likely removed from one of the two churches east of Area 18 (see Fig. 4.40), which suggests that this church went out of use some time prior to the mid-8th century AD. Similar decorative motifs have been found on Byzantine chancel posts at Mampsis (Negev 1988: 96, Ph. 98, 105, Fig. 11.189-190) and a colonette from the Petra Church (Kanellopoulos and Schick 2001: 201, Fig. 23).

Figure 7.20: Chancel post or colonette capital from Khirbat Faynān, Area 18. (Photo: Leah Trujillo, courtesy UC San Diego LCAL.)

Other

Example: KNA, Area Z, Stratum Z2. R. 32253. (Fig. 7.21)

Discussion: On excavation, this object was initially thought to serve some sort of metallurgical purpose (e.g. a square tuyère). After cleaning, this identification became less likely, although it is possible it should be identified as a casting mold. It may also be a straightening or sharpening stone.

Figure 7.21: R. 32253, a possible sharpening or straightening stone from KNA, Area Z, Stratum Z2. (Photo: Leah Trujillo, courtesy UC San Diego LCAL.)

Example: KNA, Area Z, Stratum Z2a. R. 33173. (Fig. 7.22)

Description: This is a piece of white sandstone with several lines scored rather deeply across one surface.

Discussion: This object is probably a sharpening stone.

Figure 7.22: R. 33173, a probable sharpening stone from KNA, Area Z, Stratum Z2a. (Photo: Leah Trujillo, courtesy UC San Diego LCAL.)

Example: KNA, Area Z, Surface Collection. No registration or basket. (Fig. 7.23)

Description: This is a piece of worked, red stone surface collected from Area Z during the 2002 WAG Survey.

Discussion: It is probably a whetstone/sharpening stone, likely associated with the blacksmithing activities that took place in Area Z during the Stratum Z2a phase.

Figure 7.23: Probable sharpening stone surface collected from KNA, Area Z during the 2002 survey. (Photo: courtesy UC San Diego LCAL.)

Example: KNA, Building 5312, Surface Collection. No registration or basket. (Fig. 7.24)

Discussion: This is a grinding slab found in Building 5312 during the 2002 WAG Survey. As metallurgical activities are unlikely to have taken place in Building 5312, and the building is on the opposite side of the site from the Wādī Nuqayb al-Asaymir mines, it is unclear if this object is associated with the Middle Islamic period settlement or the later (Stratum I) pastoral use of the site.

Figure 7.24: Grinding stone surface collected from KNA, Building 5312 during the 2002 survey. (Photo: courtesy UC San Diego LCAL).

7.4. Glass, Beads, and Shell

Glass Bracelets

Dating: Middle-Late Islamic period

Example: KNA, Area A, Surface Collection. R. 30424. 0.69 x 0.73 cm. (Fig. 7.25)

Description: This is a cylindrical glass bracelet found during surface collection prior to excavation in Area A. The core is a translucent light blue, with spiral trails of white and blue wrapped around and fused to the core.

Discussion: The closest parallel for B. 30424 is a bracelet recovered from salvage excavations of the western cemetery at Umm al-Jimāl (Al-Bashaireh 2016: 19, Table 1.S.2). This example was dated to the 8th century AD on the basis of a somewhat dubious parallel in the Israel Museum (Spaer 2001: 199, 368, Pl. 35.467), which differs both in color and, to some extent, technique. As discussed below, an 8th century date is likely too early for R. 30424, and probably for the example from Umm al-Jimāl, as well. Beyond this parallel, R. 30424 seems to correspond most closely to subtype B4 in the al-Ṭūr typology, although blue trails are evidently not found in that subtype (Shindo 2001: 80, Fig. 3, 82). At al-Ṭūr, the type is found most commonly in the earliest phase — the 3rd culture stratum, dating to the 14th and 15th centuries AD — but is also present in the later 2nd culture stratum, dating to the 16th-19th centuries (Shindo 2001: 74, 89, Table 1, 90-91). At Quṣayr al-Qadīm, similar bracelets are found in late 12th-early 14th century contexts (Meyer 1992: 92). Shindo (2001: 82) equates the type to Spaer's (1992: 49, Table 2) Type C3, which she dates "Umayyad and later," but R. 30424 probably belongs to her Type C4, dated to "[m]ost Islamic times." At Tyana/Kemerhisar, these bracelets are categorized as Type 3b, and dated "from the 8th century to the modern age," although at the site they are apparently only found in 11th-12th century contexts (Zanon 2013: 186-187). Walker's (2005: 85) assessment of these bracelets as "notoriously difficult to date" is certainly accurate in this case, and given the wide date range of parallels, it is not possible to determine whether R. 30424 is associated with the primary Middle Islamic Ic-IIa use of Area A, or later reuse of the site. An earlier date can likely be ruled out, however, as Spaer (2001: 199) suggests "later pieces can usually be recognized as having strongly streaked trails."

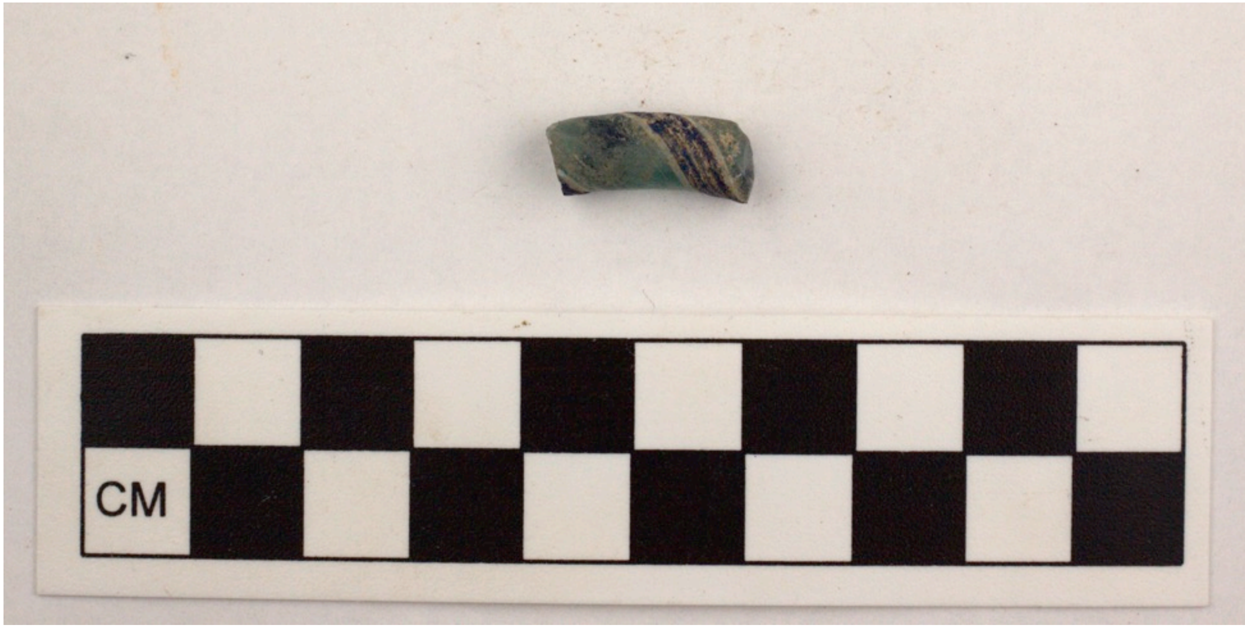

Figure 7.25: R. 30424, a glass bracelet fragment surface collected from KNA, Area A prior to excavation in 2012. (Photo: Leah Trujillo, courtesy UC San Diego LCAL.)

Dating: Probably 19th century AD

Example: WFD 50A, Area T, L. 208. R. 44805. 0.46 x 0.51 cm. (Fig. 7.26).

Description: This is a glass bracelet found in the disturbed burial in WFD 50A. The core is blue, with two multicolored patches (primarily yellow with brown edges and a green stripe) and a white and brownish gray twisted cable on the top side. It is triangular in cross-section.

Discussion: R. 44805 corresponds fairly closely to subtype D2b at al-Ṭūr, Sinai, which is found in all strata at the site and dated between the 14th and 19th centuries AD, with a peak in the 16th-(early) 19th centuries (Shindo 2001: 85-86, 88, 89, Table 1, 90). Shindo (2001: 86) notes that the type is similar to Spaer's (1992: 55, Table 3) Type D3d(a)/(b), dated "Mamluk and later." Based on other finds from the disturbed burial at WFD 50A, however, a mid- to late 19th century date can be proposed for R. 44805.

Figure 7.26: R. 44805, a glass bracelet fragment from the disturbed burial at WFD 50a. (Photo: courtesy UC San Diego LCAL.)

Beads

A number of beads, most of them made of glass, were found at WFD 50A, likely associated with the Late Islamic burial. These are a common feature of Late Islamic burials (Eakins 1993: 57-61; Walker 2001: 59-61). Toombs (1985: 93-100, 214, Pl. 57) developed a typology for beads at Tall al-Ḥaṣī. While the cemetery there seems to be somewhat earlier — Toombs (1985: 116) suggests a date between 1400 and 1800 AD, and the latest legible coin is an issue of Ibrāhīm, dating to the mid-17th century (Betlyon 1986: 68) — his typology is also applicable to the types present at WFD 50A, and as such I rely on it here.

Toombs Type 3

Example: WFD 50A, Area T, L. 204. R. 44819. Diam. 0.59 x 0.55 cm

Description: This is a stone seed bead of Toombs Type 3, the "flat irregular" type. Eakins (1993: 59) defines a "seed bead" as under 3 mm in height, and R. 44819 is 1 mm at its highest point.

Toombs Type 7

Example: WFD 50A, Area T, L. 200. R. 44816. Diam. 0.93 cm.

Description: This is a blue glass spheroid bead, corresponding to Toombs Type 7.

Toombs Type 10

Examples: WFD 50A, Area T, L. 204. R. 44820. Diam. 0.68 x 0.6 cm

WFD 50A, Area T, L. 208. R. 44817. Diam. 0.64 x 0.74 cm

Description: These are cylindrical beads of Toombs Type 10. Although one side on both is nearly flattened, they are not intentionally faceted, as in Toombs Type 12, and instead are simply somewhat irregular. Both beads have a white core with a red exterior, with the exterior of R. 44820 being slightly lighter and more orange, as the exterior red glass portion is slightly thinner.

Toombs Type 16

Example: WFD 50A, Area T, L. 213. R. 44818. Diam. 0.63 cm.

Decription: This is a "double-faceted" cylindrical bead in yellow glass.

Cowrie shell beads

Examples: WFD 50A, Area T, L. 204. R. 44821 (two beads).

WFD 50A, Area T, L. 208. R. 44822.

Description: Three cowrie shell beads were found at WFD 50A, each likely associated with the Late Islamic period burial. These are all cowrie shells with the top cut off to allow them to be strung.

Discussion: Cowrie shell beads were found as part of a necklace in the Field L cemetery at Tall Ḥisbān (Walker 2001: 60, Figs. 17-18) and at Tall al-Ḥaṣī (Eakins 1993: 60-61; Toombs 1985: 100), although more rarely than other bead types.

Eggshells

Chicken

Example: KNA, Area Z, Stratum Z2b. R. 32518 (Fig. 7.27), R. 32710, R. 33973.

Description: Each registration number represents many chicken eggshell fragments from a single locus in the Stratum Z2b pit (see Section 4.1.5).

Discussion: Chicken eggshells make up a fairly substantial component of the food refuse found in the Stratum Z2b pit, which provides some insight into the diet of KNA's residents during the earlier phase of the site's use. While much food was imported to the site, it is likely that this was supplemented with local products, including eggs, perhaps from chickens kept on site (see Section 10.3).

Figure 7.27: A selection of the most complete chicken eggshell fragments from R. 32518. (Photo: Leah Trujillo, courtesy UC San Diego LCAL.)

Ostrich

Example: WFD 50A, Area T, L. 208. R. 44814.

Description: This is a small (ca. 1.8 x 1.8 cm) fragment of ostrich eggshell recovered from WFD 50A, L. 208.

Discussion: Unfortunately, because of the damage to the site (see Section 5.5) it is not possible to determine whether this is associated with the Late Roman-Islamic occupation of the structure or the Late Islamic period burials, as objects associated with both were recovered from L. 208.

Marine Shell

Nacre/Mother of Pearl

Example: WFD 50A, Area T, L. 208. R. 44826. (Fig. 7.28).

Description: This is a small (ca. 2.57 x 2.14 cm) nacre pendant in the shape of a Maltese cross, with a ringed Jerusalem cross inscribed at its center. This is almost certainly associated with the Late Islamic burial.

Discussion: Pinoteau (1983: 107) suggests that the first usage of the Jerusalem cross motif is on a seal of Walter IV, Count of Brienne, which he dates to 1227 AD. This certainly rules out an association of R. 44826 with the Late Byzantine/Early Islamic period occupation of WFD 50A. While it is possible that this is a stray find deposited at the site at some point between the 13th and 20th centuries, it is more likely part of the assemblage from the Late Islamic burial.

Walker (2001: 59) includes nacre pendants as part of the "typical . . . tribal [jewelry] assemblage," and they are found both in the cemetery at Tall Ḥisbān and Late Islamic burials at Tall al-Ḥaṣī (Eakins 1993: 61; Toombs 1985: 100). The Christian character of the pendant from WFD 50A suggests that it was manufactured in or near Bethlehem. Schölch (1982: 40) makes the following observation of Bethlehem's economy in the late 19th century:

> Apart from agriculture and the building industry, the most important source of income was the manufacture of devotional articles and souvenirs. Crosses and rosaries were made of various materials, especially olive wood and kernels of the dum palm which came from the Arabian Peninsula. Quantities of mother-of-pearl were obtained from the Red Sea and made into crosses, rosaries and lockets.

Piatnitsky (2005: 106) cites two 19th-20th century Russian pilgrims who mention the production of nacre devotional objects as the key industry in Bethlehem, and Ktalav (2015: 144) several 19th century English sources pointing to Bethlehem and Jerusalem as the main manufacturing centers for these objects. Ktalav (2015: 144) also suggests that the raw materials were often recycled, as waste from the production of nacre buttons was shipped from Europe to Jaffa, and from there to Bethlehem and Jerusalem. This continued to be an important industry in Bethlehem into the late 20th century; Grace (1990: 101) notes, for example, that ten nacre object factories were operating in Bayt Sāḥūr, ca. 2 km east of Bethlehem, at the time of the IDF blockade in 1989. The Christian character of this find is surprising for lowland southern Jordan in the late Ottoman period, and suggests that the burials at WFD 50a are somewhat unique (see discussion in Section 10.4).

Figure 7.28: R. 44826, a nacre pendant with Jerusalem cross motif from the disturbed burial at WFD 50a. (Photo: courtesy UC San Diego LCAL.)

Example: WFD 50A, Area T, L. 200. R. 44824.

Description: This is a small (ca. 1.35 x 0.4 cm) strip of nacre. It was likely part of a larger object included in the Late Islamic burial, e.g. a pendant, bracelet, or bead, but only a fragment was found.

Unknown

Example: WFD 50A, Area T, L. 211. R. 44825.

Discussion: Seven small fragments of a marine shell (the largest is ca. 3.1 x 1.95 cm). It is unclear whether this is associated with the Late Islamic burial or the *castellum*, but the latter seems more likely, as the shell seems to have been encrusted with mortar.

7.5. Gaming Pieces

Rukh *of a* shaṭranj *Set*

Example: KNA, Building 5315, surface collection during 2012 field season. R. 38290. (Fig. 7.29)

Description: R. 38290 is a carved sandstone object, ca. 3 x 2.75 cm. The top of the object is carved to two sloping points at the exterior corners, with a smaller point carved into the central notch between the two points. Below this point, a circular depression has been drilled, slightly off center, into (presumably) the front face of the object.

Discussion: This stone object is the *rukh* (rook) of a *shaṭranj* (chess) set. The key source for classifying and dating Islamic chess pieces remains Anna Contadini's (1995) art historical study of chess sets from museum collections. She proposes dividing Islamic chess sets into two "style sets": the earlier Style Set A — most typical of the 11th-13th centuries AD, but with examples at least as early as the 9th century and as late as "the fifteenth century and the Ottoman period" — and the later, and less popular, Style Set B — more difficult to date, though it likely emerged during the 13th century (Contadini 1995: 118-121). R. 38290 is a *rukh* belonging to Style Set A. Contadini (1995: 140-141) provides a useful list of the parallels known at the time she published, including 9th century ivory examples excavated at Nīshābūr (1995: 114, Fig. 4), a 12th century glazed stonepaste chess set, perhaps attributable to Nīshābūr, in the Metropolitan Museum of Art (1995: 134, Fig. 46), and 11th-14th century (1995: 123, Fig. 25) and 7th-9th century (1995: 123, Fig. 26) ivory *rukh*s in the Ashmolean Museum, among many others. To these could be added a stone *rukh* excavated at Ḥamāh (Ploug, et al. 1969: 106, 109, Fig. 41.3). The variation in these examples is fairly great, but R. 38290 shares several similarities to the 11th-14th century ivory example in the Ashmolean, including the small central point and circular decoration, though on the Ashmolean example this takes the form of two depressions drilled into the corner points, rather than a single depression drilled into the face, as on R. 38290. Murray (1913: 224) also identifies this shape as the Early Islamic form, and provides a number of examples from European chess sets, including the Ager chessmen (Murray 1913: 766, Figs. 5-6) and Charlemagne chessmen (Murray 1913: Pl. facing 766), as well as an embellished example in the Bargello Museum (Murray 1913: 767, top right fig.).

The majority of the examples that both Contadini (1995) and Murray (1913) consider, however, are elite objects housed in museum collections. Even among the excavated examples, parallels from contexts similar to KNA are quite rare. Among the most relevant are several carved wooden *rukh*s recovered from the 11th century Serçe Limanı shipwreck (Cassavoy 2004: 332-333, Fig. 19.3.GP3-4). These are very simple pieces, and do not bear any of the embellishments found on R. 38290, but demonstrate the presence of chess pieces in non-elite contexts, and carved from cheaper materials than the ivory and rock crystal typical of the elite sets — although Contadini (1995: 117, Fig. 10) does note a fairly simple, probably 11th century, carved stone chess set in the Kuwait National Museum that bears some similarity to the Serçe Limanı pieces. Two similar simple, wooden *rukh*s were found in the excavations at Qaṣr al-Ḥayr al-Sharqī, and radiocarbon dated to 870 ± 120 AD (Grabar, et al. 1978: 189, 291, Figs. 82-83). Another simple example, carved of sandstone, was found in excavations at al-Shiṣur in ʻOmān (Clapp 1999: 197, Fig. 10.1173d; Zarins 2001: 147, Fig. 71, top, second from right). While Clapp (1999: 198) speculates about a very early date for al-Shiṣur chess set, noting that inhabitants of the site "could have whiled away the hours with the newly invented game of chess," he also notes that the pieces likely went out of use as a result of the mid-10th century destruction at the site (Clapp 1999: 261). Zarins (2001: 146), noting the close parallels to the Serçe Limanı pieces, implies a later date. The earliest plausible date, on the basis of ceramics, seems to be the early 9th century (Zarins 2001: 146), rather too late for the inhabitants of the site to be playing the game shortly after its invention.

Overall, R. 38290 seems to represent a late 12th-early 13th century variation on the typical Style Set A form. It is interesting, too, in that it seems to be something of a "modest luxury," to borrow Milwright's (2003) phrase. It is carved of sandstone — a readily available material throughout Jordan, and certainly in Faynān — but is also embellished with a number of decorative features that are not, strictly, necessary, and are indeed not present on the Serçe Limanı and al-Shiṣur examples. While not embellished to the extent that many of the more elite examples presented by Contadini (1995) are, some care was nonetheless taken in carving R. 38290.

Only one parallel that I am aware of for this object has been published in Jordan, making a discussion of the regional context of chess playing somewhat difficult. A carved sandstone object that is most likely a *rukh* was found in a 7th century AD context at al-Ḥumayma (Schick, et al. 2013: 503-504, Fig. 13.18.3), and it may be the oldest chess piece currently known.[254] There are, however, no published Middle Islamic period parallels, although a decorated Mamlūk period object found in 2016 at Tall Ḥisbān may be a gaming piece of some kind (B. Walker, pers. comm.). A marvered glass object from Bet She'an — recovered from a context containing ʿAbbāsid through Mamlūk period pottery, but dated stylistically to the ʿAbbāsid period — has been identified as a chess piece, although it is not a *rukh* (Hadad 2002a: 153, Fig. 2.7, 154).

Beyond the examples from KNA and al-Ḥumayma, only one other Islamic period object from Jordan that has been published as a *rukh*, and it bears some brief discussion here. The object in question is an early 8th century AD carved ivory piece excavated at the Umayyad palace at al-Fudayn, near al-Mafraq in northern Jordan (Bessard 2013: 393, Fig. 5, top center). It is a tall, cylindrical piece of ivory, decorated with several sets of horizontal lines at its top and bottom, and identified as a *rukh* presumably due to "a crenellated tower on its summit" (Bessard 2013: 395). It bears little resemblance to Islamic period *rukh*s of Style Sets A or B, discussed above, and the identification instead seems to rest on its potential similarities to the modern rook, or castle. Kruk (2001: 296), citing Murray (1913: 772), points out that the association between the rook and tower is not attested earlier than the 16th century AD. Kruk (2001) explores the associations the *rukh* had with chariots, fantastic (and dangerous) land animals, giant birds, and camels, but the association with castles is undoubtedly later, and likely a specifically European innovation. In this context, it is worth pointing out that the resemblance George Bass noted between the shape of the *rukh* and the shape of crenellations at the fortress at Kekova, in Turkey (Cassavoy 2004: 333), likely does not reflect that the *rukh* was meant to represent these features,

[254] I thank Prof. John P. Oleson for bringing this object to my attention. A joint publication discussing the importance of this object and the context of chess in Jordan more generally is currently in preparation. Note that a chess set from Afrāsiyāb, Uzbekistan was also dated by its excavators to the 7th century (Contadini 1995: 111).

but more plausibly that these (probably coincidental) similarities may have led to the eventual association of the rook and the castle. The ivory object from al-Fudayn, then, is unlikely to be a *rukh*. Contadini (1995: 138, Fig. 55, 142) — who, it is worth noting, even incorrectly suggests a connection between the *rukh* and castle (Contadini 1995: 115) — discusses a group of similar objects from Manṣūra, Pakistan, also identified as chess pieces. While noting that we cannot rule out the possibility they are chess pieces, she argues that they are more likely to be handles or finials (Contadini 1995: 142). I argue that this is also the case for the "rook" from al-Fudayn. It is, without doubt, not a *rukh*, and much likelier a handle — as suggested by Daviau, et al. (2010: 391) — or finial than a chess piece.[255] If this is the case, R. 38290 is likely to be the second *rukh* known from an Islamic period archaeological site in Jordan (on the significance of the find, see Section 10.3).

[255] I presented R. 38290 as part of a paper at the *13th International Conference on the History and Archaeology of Jordan* in ʻAmmān in 2016, and mentioned the object from al-Fudayn. Several archaeologists approached me after the paper to voice their certainty that the object is a finial.

Figure 7.29: R. 38290, the *rukh* of a *shaṭranj* set surface collected from KNA, Building 5315 during the 2012 season.

Rectangular Die

Context: KNA, Area Z, L. 285, S. Z2(a). R. 33368. (Fig. 7.30)

Description: R. 33368 is a rectangular piece of bone or ivory, 6 cm long, worked on its four long sides and hollow lengthwise through its center. It bears some faint, horizontal markings across some of its sides, but it is not clear if these are intentional markings.

Discussion: R. 33368 has the usual shape of a rectangular die, but without the incised decoration typically present on these objects to mark the sides. It is possible that the horizontal markings represent simple side markings, or if these were indicated in a more temporary medium. Examples of rectangular dice have been found at al-Fusṭāṭ, dating to the 9th century AD (Scanlon 1976: 86, Fig. 14; see also same piece in Contadini 1995: 136, Fig. 51), from Fāṭimid through Ayyūbid contexts in Jerusalem (Prag 2008: 234, Fig. 157.5, Pl. 32, right; Tushingham 1985: 420, Fig. 68.20), and at Ḥamāh (Ploug, et al. 1969: 123, Fig. 47.7, 47.9, 130, 132-133, Fig. 50.1-3). Contadini (1995: 128, Figs. 36-37, 136, Fig. 50, 137, Fig. 54) presents four additional examples, two of which were found at al-Fusṭāṭ.

Figure 7.30: R. 33368, a bone or ivory rectangular die found in KNA, Area Z, Stratum Z2(a). (Photo: Leah Trujillo, courtesy UC San Diego LCAL.)

Quartz wādī pebbles possibly used as makeshift gaming pieces

Context: KNA, Area Z, L. 214, S. Z2. R. 32236. (Fig. 7.31)

Description: This is a concentration of rounded quartz wādī pebbles (and several cobbles) found in the southeastern corner of L. 214. Fig. 7.31 is a photo of the pebbles.

Discussion: There is no way to demonstrate conclusively that these objects were, in fact, used as gaming pieces. Several pieces of evidence point in favor of this interpretation, however. First, the topography of the site makes it unlikely that these objects made their way into the Area Z building through natural site formation processes. As Howland (2014: 45, Fig. 8) demonstrates in his MA thesis, at KNA, material erodes into Area Z primarily from Area A and the Building 5311/5312/5313 complex, both located on the hill to the south and southwest of Area Z (see also Howland, et al. 2018). This hill is an outcrop of the BDS formation, and material eroding from it primarily consists of easily recognizable, sharp chunks of brown shale. Rounded quarts pebbles, by contrast, are found primarily in Wādī Nuqayb al-Asaymir, which runs through the site to the north of Area Z. As this *wādī* is at a lower elevation, material from Area Z erodes into it, rather than the opposite. As such, material from the *wādī* found in the building would have been intentionally brought up. The small number of rounded *wādī* pebbles and cobbles found in the Area Z building, compared to very large numbers of shale chunks, confirms this, as does their concentration in only one locus.

The identification of this particular group of pebbles as gaming pieces stems from their proximity to R. 33368, the rectangular die. While more formal gaming tokens are known from archaeological and museum contexts (e.g. "draughtsmen" from al-Fusṭāṭ, Contadini 1995: 126, Fig. 34-35; a carved backgammon counter from the Serçe Limanı, Cassavoy 2004: 334, 335, Fig. 19.6), simpler makeshift gaming pieces are also known and continue to be seen in modern contexts. Examples include not only "pebbles" but also "bits of pottery, shells, seeds, even pellets of camel, goat, or sheep dung," as well as "bits of stone, brick, or tile" (Cassavoy 2004:

335-336). More locally, an example of this practice has been identified in the University of Florence ‘Medieval’ Petra Project’s excavations in Qal‘at al-Shawbak Area 6000 C, where Sinibaldi (2007: 74, 72, Fig. 50) has suggested that eight worked sherds of turquoise-glazed stonepaste were used as gaming pieces.

Figure 7.31: R. 32236, a group of quartz wādī pebbles from KNA, Area Z, Stratum Z2 possibly used as gaming pieces.

The finds presented in this chapter, and the data presented in Part II generally, are synthesized and discussed in the following chapters, which form Part III of the dissertation. These are organized according to the temporal rhythms of the *Annales* school (see Section 1.4), beginning with the long-term (Chapter 8), moving to conjunctures (Chapter 9), and finally proceeding to the short-term, or quotidian events (Chapter 10).

Part III: Discussion

Chapter 8: The Long Term

This chapter is concerned primarily with five trends in Faynān, and southern Jordan more generally, in the *longue durée*. These trends are 1) the exploitation of copper ore resources in the Faynān region; 2) the economy of southern Jordan, primarily focusing on industry and interregional (or "international") trade; 3) religion in the Faynān region, paying particular attention to sacred landscapes; 4) movement into and out of the Faynān region; and 5) pastoralism and agriculture in the Faynān region. In the context of this chapter, discussion of the long-term is generally limited to a period spanning the Hellenistic period to the Late Islamic IIb, or ca. 400 BC-ca. 1900 AD. In certain sections, e.g. Section 8.1, this is extended farther back to include the Iron Age (ca. 1200-586 BC). This chapter is concerned less with documenting continuity than exploring variation in each of these trends over time. Several of these trends, particularly copper production, industry, and trade, will be considered on shorter timescales in Chapters 9 and 10, as well.

8.1. Faynān as a Mining Landscape

As noted in Chapters 1 and 3, the copper resources of Faynān were the *raison d'être* of much archaeologically documented settlement in the region. This fact has structured much of the research that has taken place in the region, including ELRAP and its predecessor JHF, conceived as a "[d]eep-time study of cultural evolution through the lens of copper ore procurement, metal production and social interaction" (Levy 2006: 18; see also Levy, et al. 2014a), and much of the research conducted by British teams (e.g. Hunt, et al. 2007). A critical point for this dissertation, however, is that not *all* settlement in Faynān follows this pattern. Indeed, it is now possible to demonstrate that there are periods where Faynān was settled but little or no copper was produced in the region.

The key periods of historical and early historical copper production in the region are, according to Hauptmann (2007: 147, Table. 5.3), the Iron Age, Roman period, and Islamic period.[256] This, however, masks considerable variation in the intensity of production throughout these periods. Recent research on Iron Age copper production, for example, has revealed the following pattern: limited copper production begins in the Late Bronze Age, followed by the production of copper at many sites in the Iron Age I into the mid-10th century BC, when most of these sites were abandoned and the industry centralized at Khirbat al-Nuḥās (KEN)[257] and probably Khirbat Faynān. Following a period of intense production, these two sites were abandoned by the end of the 9th century BC, although production at Khirbat Faynān may have continued a bit later. An apparently unsuccessful attempt to revive the copper industry was also made in the Iron Age IIC (Ben-Yosef, et al. 2010; Ben-Yosef, et al. 2014b: 875). A radiocarbon date from a smelting installation in the primarily Iron Age Faynān 5 slag mound (Hauptmann 2007: 89, Table 5.1) suggests that some smelting may have occurred at Khirbat Faynān in the 5th-early 4th centuries BC, corresponding to the Persian period or, allowing for the old-wood effect, perhaps even the early Hellenistic/early Nabataean period (i.e. the late 4th-3rd centuries BC). It is not clear if this is evidence for continuity of smelting from the Iron Age or the beginning of a new production effort, and more research at Khirbat Faynān is necessary to clarify

[256] Copper was also smelted in Faynān during the Early Bronze Age (Adams 2002; Hauptmann 2003; Hauptmann 2007: 147, Table 5.3; Levy 2006; Levy, et al. 2002), and the copper resources of the region were exploited even earlier than this (Hauptmann 1989; Levy, et al. 2001; Levy, et al. 2004: 78). This is omitted from the present discussion both due to scope, and because settlement in the intervening periods, particularly the Middle Bronze Age II-Late Bronze Age I, has not been convincingly demonstrated for the Faynān region (*contra* Grattan, et al. 2013; see discussion in Section 3.4). Discussion of Bronze Age settlement in Faynān is beyond the scope of this dissertation, and the Iron Age, which will be discussed only minimally, is an easier starting point, as the post-Iron Age periods are better known.

[257] In this dissertation, the name of the site has been transliterated according to *IJMES* style, along with all other Arabic toponyms. In most reports, however, the name of the site has been spelled "Khirbat en-Nahas," following Glueck (1935: 26-29), hence the abbreviation KEN.

this point, though a limited number of residual Persian and early Hellenistic sherds were found in ELRAP excavations in Area 16, primarily in Terrace 1 and Terrace 3, Stratum T3-3.

During the Iron Age, copper ore was primarily mined from the BDS. In the earlier part of this period, mines in Wādī al-Jāriya (Knabb, et al. 2014: 603-610; Levy, et al. 2003), Umm al-Zuhūr, Wādī al-Abyaḍ, Wādī Khālid, Wādī Ḍānā, and Wādī al-Ghuwayb (Hauptmann 2007: 115-122, 130-133) were exploited. It is not entirely clear if the Jabal al-Jāriya pit mine field became active only in the later Iron Age IIa, with the establishment of Khirbat al-Nuḥās as a primary center of copper production, but these pit mines have been conclusively dated to the Iron Age, and likely represent the key ore source for KEN (Ben-Yosef, et al. 2009a; Ben-Yosef, et al. 2014b: 856-874). In the Iron Age IIc, new copper mines were opened in the Rās al-Miyāh archaeological complex, north of Wādī al-Ghuwayb, but this production phase seems to have been short-lived and unsuccessful (Ben-Yosef, et al. 2014b: 816-838).

The Roman period peak, likewise, masks a more complex reality. Beyond the possibility of Early Hellenistic production in the Faynān 5 slag mound, Najjar and Levy (2011: 34-35) suggest that the copper mines of Umm al-‘Amad and Wādī Abū Khushayba were active during the pre-annexation (i.e. pre-106 AD) Nabataean period. Radiocarbon evidence from the Faynān 1 slag mound, likewise, suggests that smelting likely began there in the 1st centuries BC and AD (Hauptmann 2007: 89, Table 5.1, see also Table 4.1), although some caution is necessary in interpreting these dates, as they were recovered from contexts only 0.5 m below the surface of the slag mound. Likewise, coins of the 1st centuries BC and AD, ostensibly from Khirbat Faynān, were published by Kind, et al. (2005: 171, Table 1), but see the cautionary notes on this data in Section 3.4 (see, in particular, Section 3.4, n. 50). The Roman production phase, however, seems to have peaked in the 2nd-4th centuries AD, or the Late Roman and Early Byzantine periods. This is most clearly demonstrated by the radiocarbon dates from Faynān 1 (see Table 4.1), the majority of which date to this period. As noted in Section 3.4, it is not entirely clear when this production phase ended, but I would suggest that large-scale copper production lasted perhaps a century after the end of this peak, and had largely ceased by the late 5th century, or the beginning of the Late Byzantine period. A radiocarbon date of 398-534 AD (1σ) from WF 5512/5502 has been argued as evidence for copper production lasting into the 6th or even 7th centuries (Friedman 2008: 55; Grattan, et al. 2013: 3836, 3851), but as I point out in Section 3.4, this involves assumptions about the context of the sample that are difficult to justify. The ELRAP excavations can provide evidence for the continuity of settlement, but were not designed to investigate questions about copper production in the Byzantine period, and, as such, more work at the site is required to arrive at a firmer end date.

During the Classical phase of copper production, ore was primarily mined from the sandstones of the MBS and Abū Khushayba formations. The key mine for production at Khirbat Faynān seems to have been Umm al-ʻAmad (Hauptmann 2007: 94), and the mines south of Petra in Wādī Abū Khushayba and Wādī Qurdiya were active in this period, as well (Kind 1965). In addition to these large mines, smaller Chalcolithic mines were also reopened as part of Roman mining operations in Wādī Rātiya (the "Qalb Rātiya" mining district), Wādī al-Abyaḍ, and Wādī Khālid (Hauptmann 2007: 112-121). Some mining activity in the Roman and Byzantine periods has also been suggested for BDS deposits in Wādī al-Jāriya (Knabb, et al. 2014: 619-622, Table 7.3) and Wādī Ḍānā (Mattingly, et al. 2007b: 312). As mines are difficult to date, patterns of change within the Classical periods can be discussed only tentatively. Mattingly, et al. (2007c: 293) have noted the presence of Nabataean pottery at Khirbat al-Nuḥās, Khirbat al-Jāriya, and

Khirbat al-Ghuwayba,[258] and argue that this may represent small-scale reuse of these smelting sites. This is possible, and may also suggest that the exploitation of older mines in the BDS is an early phenomenon in the Classical periods, though this is not clear. As noted above, copper production is also evident at Faynān 1 already in the late Hellenistic/Nabataean period, and the sandstones of Umm al-ʻAmad and Wādī Abū Khushayba were likely exploited prior to the Roman annexation (Najjar and Levy 2011: 34-35), and certainly continued to be exploited into the Roman and Byzantine periods. It seems likely, as well, that the reopening of Chalcolithic mines to the north of Khirbat Faynān was associated with the peak of copper production in the 2nd-4th centuries AD. This is supported by the fact that Khirbat Rātiya — identified by the WFLS team as the "mining control site" for the mines in Wādī Rātiya, Wādī al-Abyaḍ, and Wādī Khālid — seems to have been established in the Late Roman period and occupied into the Byzantine period (Mattingly, et al. 2007b: 319-321).

There is, as I have argued elsewhere (Jones 2016; Jones, et al. 2017; Jones, et al. 2018), no evidence of Early Islamic period copper production in Faynān, and previous references to production during this period are the result of typographic errors (see Section 3.5). As noted earlier (Chapters 3 and 5, and later in this chapter), settlement in Faynān certainly continued during this period, but for reasons other than the exploitation of copper.

[258] Excavation of a structure at Khirbat al-Ghuwayba in 2009 showed that it was constructed and primarily used in the Nabataean/early Roman period, with some possible reuse, perhaps in the Late Islamic period (Ben-Yosef, et al. 2013: 281-283; Ben-Yosef, et al. 2014b: 842). Ben-Yosef, et al. (2013: 287) point out that, based on this result, "it is not clear if there are any Iron Age structures at the site." The excavated structure, however, is primarily residential or perhaps military in character, and metallurgical activity at the site dates primarily to the early Iron Age (Ben-Yosef, et al. 2013: 288; Ben-Yosef, et al. 2014b: 848). As such, although Khirbat al-Ghuwayba was perhaps part of a larger system of copper production in the Classical periods, it does not seem to be the case that copper was produced at the site in this period. It is also interesting to note the presence of a late Middle Bronze Age II-Late Bronze Age I radiocarbon date in L. 23, a metallurgical layer, although there are no ceramics of these periods at the site, suggesting that the early date is due to the "old wood" effect (Ben-Yosef, et al. 2013: 288; Ben-Yosef, et al. 2014b: 848). Nabataean occupation was also documented in the excavations at Khirbat al-Nuḥās, particularly in Area R, where the upper portions of a large building were partially rebuilt and reused during the Nabataean period (Levy, et al. 2014d: 204-205, 239, n. 83). As with Khirbat al-Ghuwayba, it is not clear that this reuse is associated with copper production at the site.

While copper production certainly resumed during the Middle Islamic Ic, the Middle Islamic Ib remains something of an open question. Potentially early radiocarbon dates from KNA Area X and particularly Khirbat Faynān Area 15 (see Table 4.1), as well as ceramics from KNA Area X with parallels to early Crusader ceramics from al-Wuʻayra (compare décor of R. 41205, Section 6.1.3, Fig. 6.7.5 to Tonghini and Vanni Desideri 2001: 712, Fig. 7.a), may suggest an earlier date than the one I adopt here for the beginning of the Middle Islamic period Faynān industry. At present, this is difficult to evaluate. The difficulties of identifying distinctively "Crusader" ceramics in southern Jordan have been noted since Brown's (1987: 284) excavations at al-Wuayʻra, where she argued of the Crusader period pottery assemblage that "it appears that there is nothing specifically 'Crusader' about it." This has been highlighted by Sinibaldi's recent excavations at al-Bayḍā, where a primarily hand-made ceramic assemblage initially thought to date to the 12th century (Sinibaldi 2009b) has in fact been dated to the 14th century and later (Sinibaldi 2015; Sinibaldi and Tuttle 2011: 448), partially on the basis of numismatic finds. As such, it is possible that copper production in Faynān began in the Middle Islamic Ib.

A Middle Islamic Ic, or even early Middle Islamic IIa, date seems likelier, however, given the present evidence. This may be supported by the fact that evidence for metallurgy, in the form of an iron foundry, is found only in the brief Ayyūbid (i.e. later Middle Islamic Ic) phase at al-Wuʻayra (Vannini and Vanni Desideri 1995: 527; Vannini and Tonghini 1997: 377). As I argue in Section 3.6, historical evidence points to the early Middle Islamic IIa as a likely candidate for the revival of copper production in Faynān, or at least the scaling up of that production. It is possible that production at KNA and Khirbat Faynān both began during this period, or that production at Khirbat Faynān was slightly earlier, with production at KNA adding to it or replacing it in the Middle Islamic IIa. The majority of Middle Islamic period copper production in Faynān seems to have occurred during the Middle Islamic Ic-IIa, as indicated by the numismatic, ceramic, and radiocarbon evidence presented here. It is likely that copper production in Faynān ceased entirely in the early Middle Islamic IIb, following the Mamlūk conquest of al-Karak in 1263 AD. Production into the later 13th and 14th centuries can currently only be assumed on the basis of indirect evidence — e.g. coins found nearby (Kind, et al. 2005: 179, Table 1, 188) and ceramics (see Section 6.2.3), which cannot yet be precisely dated — and this may also indicate, as in the Early Islamic period, continuity of settlement, rather than copper production. A radiocarbon sample dated to the 15th-17th centuries from the Faynān 7 slag mound (WF 5741) may indicate limited (re)smelting during the Late Islamic I or even early Late Islamic IIa, but this is still quite unclear. Pastoral activity in Faynān is quite certain during this period (see also Jones, et al. 2012), but a single radiocarbon date is not sufficient to speculate about the nature or intensity of copper production during this period, if there was any.

During the Middle Islamic period, the BDS, MBS, and possibly the Ṣalīb Arkosic Sandstone (SAS) unit were mined. The key mines for KNA were WAG 57 and 58 (see Section 5.1.1), located northwest of Area X in Wādī Nuqayb al-Asaymir. These mines exploited an outcropping of the BDS that is distinctively enriched in iron due to its depth (Basta and Sunna 1972: 117; see also Hauptmann 2007: 71), leading to the formation of the intermediate Cu-Fe alloys found in Area X. The smithing workshop found in Area Z Stratum Z2a, as well as possibly the large lump of iron found on the Faynān 1 slag mound (Hauptmann 2007: 96), indicate that iron was being produced in Faynān in this period, in addition to copper. At Khirbat Faynān, the primary mines during the Middle Islamic period seem to have been those in Wādī al-Salmīna, located ca. 13 km east of where smelting actually occurred. These mines were dug into the SAS and MBS. While BDS outcroppings were located nearby, it is unclear if these are copper-bearing. In the eastern Wādī Ḍānā, copper deposits in the BDS are replaced by increasingly large manganese deposits (Hauptmann 2007: 70), and it seems likely that this is the case for Wādī al-Salmīna, as well. The exploitation of the SAS and MBS during the Middle Islamic period is also confirmed by ore-bearing sandstone recovered from the excavation in Khirbat Faynān Area 15. The choice of these mines may be explained by the heavy mining activities closer to Khirbat Faynān in earlier periods. Hauptmann (2007: 155) notes that Roman prospection in earlier BDS mines likely showed that little copper remained, prompting the exploitation primarily of MBS deposits during that period. The intensity of Roman mining of these deposits, likewise, seems to have prompted Middle Islamic period miners to exploit the deposits in Wādī al-Salmīna, farther from Khirbat Faynān.

Unlike other copper producing regions, including Timna (see Section 3.2.1), no modern mining operations have taken place in Faynān. The Jordanian Natural Resources Authority (NRA) conducted some prospecting in the region in the mid-20th century (see Basta and Sunna 1972: 111-112, 117), and these activities have left an archaeological signature (see Ben-Yosef, et al. 2014a; Knabb, et al. 2014), but as yet no modern copper production has occurred, though this could change in the future.

In the long-term, then, copper exploitation in the Faynān region is marked by peaks and troughs of intensity. In addition to this, each peak of production — at least after the major Iron Age peak — involved adapting to the reduced availability of copper resources. This is particularly evident in the Middle Islamic period, when smaller, relatively far-off deposits and difficult Cu-Fe ores, requiring a refining stage, were exploited, but is also evident during the Roman period, as Roman prospectors discovered that the BDS deposits had been heavily mined already in the Iron Age.

8.2. The Evolution of Southern Jordan's Economy

This section builds on arguments made previously by Jones, et al. (2014; 2018) concerning shifts in southern Jordan's economy in the 1st and 2nd millennia AD. In this section, I address economic issues primarily related to trade and industry, with briefer discussion of agriculture. Pastoral economies are discussed in Section 8.5.

This section, as with much of this dissertation, is concerned primarily with Wādī ʻAraba, although the relationship between the ʻAraba and other parts of southern Jordan is also discussed. Wādī ʻAraba itself can be into three main subregions: the northern ʻAraba, the area surrounding the Dead Sea *aghwār* and Zughar; the central ʻAraba, or the lowlands near Petra and al-Shawbak, containing Faynān and Bī'r Madhkūr; and the southern ʻAraba, or the hinterland of al-ʻAqaba/Ayla. Each of these subregions underwent distinct economic shifts in the 1st and 2nd millennia AD. At some points, each was connected to the same external trade systems, while at other times they were not. Understanding these shifts and the reasons behind them is critical to understanding the economy of southern Jordan over *la longue durée*.

The Nabataean/Hellenistic Period (4th century BC - 106 AD)

Much of the stage for the early 1st millennium AD economy of southern Jordan was set already by the end of the 1st millennium BC. Certainly by the 4th century BC, the Nabataeans already controlled at least the northern parts of the Arabian incense trade. Diodorus Siculus (XIX, 95-96.1) reports that in 311 BC a general named Athenaeus raided a place called "the rock" (Petra in Greek, but most scholars identify the site of this event as Khirbat al-Silaʻ; on the later occupation of this site, see Section 3.6) and took captives, frankincense, myrrh, and silver, before being tracked down and "manfully punished" by the Nabataeans (Graf 2013a: 35; Diodorus Siculus 1954: 91-95; Wenning 2007: 28; Zayadine 2007: 208). The earliest structures in Petra — identified as domestic structures — were found during excavations beneath Qaṣr al-Bint, and date to the early to mid-3rd century BC, with an earlier phase below this that is not yet well understood (Mouton, et al. 2008: 69). After this, the next earliest datable structure in Petra, found during excavation of the Colonnaded Street, seems to date to the early 1st century BC (Parr 2007: 275). Ceramics dating to as early as the late 4th century BC have, however, been found in the Colonnaded Street and other parts of the city center (Hoffman 2013: 102-103) as well as coins dating to the mid- to late 3rd century BC (Sidebotham in Graf, et al. 2005: 432-435). While it is possible that this represents a final deposition of material that arrived at Petra after being in circulation for a long while, this phase of use likely dates at least as early as the early 2nd century BC, if not earlier (Parr 2007: 278). A 2nd century BC date is in line with Wenning's (2007: 29) proposed dating of the shift of the Nabataean capital from Khirbat al-Sila‘ to Petra. Graf, et al. (2005: 437-438), however, noting the rarity of 3rd century coins minted in Aradus at other sites in Jordan, suggest instead that these finds hint at Petra's status as a center of trade already in the 3rd century BC, with the origin of the settlement likely being earlier (see also Graf 2013b: 32-34). While the origins of the settlement can now be dated with some certainty to at least as early as the 3rd cenutry BC, it is not entirely surprising that many of the earlier structures seem to date to the 1st century BC, as this represents a period of increasing sedentarization in southern Jordan, brought about by "population growth, political centralisation and regional specialisation," as well as increasing trade (Twaissi 2007: 160). Equally importantly, the Nabataeans also developed sophisticated water management techniques in the 2nd and 1st centuries BC (Oleson 2007).

This "regional specialization" also likely included copper production, as the deposition of slag in the Faynān 1 mound seems to have begun during the 1st centuries BC and AD (see Section 8.1 and Table 4.1). There is, however, as mentioned in Section 8.1, also evidence for some 4th-5th century BC smelting in the Iron Age Faynān 5 slag mound (Hauptmann 2007: 89, Table 5.1). It is noteworthy, in connection to this, that Kind, et al. (2005: 181, Table 2) published seven coins from Khirbat Faynān dating to the period 300-100 BC, and 75 dating to the period 100 BC-106 AD. As with Petra, it seems that further excavation at Khirbat Faynān is required to determine the nature of the settlement between the 4th and 1st centuries BC.

The mines in Wādī Abū Khushayba, southwest of Petra, also likely became active during the 1st century BC or AD (Najjar and Levy 2011: 34-35). Johnson (1987: 86-87) suggests that the metallurgical activities identified by Glueck (1935: 80-81) at al-Ṣabrā, south of Petra and ca. 9 km southeast of Wādī Abū Khushayba, also date to the 1st century AD. Copper slag was found both on the surface of the site and in leveling fills during archaeological surveys (Lindner 1992: 202-203, Pl. X.1; Zayadine 1992: 226-227). Work at al-Ṣabrā, however, has not yet provided any evidence of smelting or casting installations (Lindner 1992: 202; Lindner 1993: 264-265; Tholbecq, et al. 2015: 69, n. 26). Johnson (1987: 85-87) also suggests that copper production at two sites in the southern ʻAraba began in the 1st century AD. The first is Ḥafriyat Ghaḍyān, north of Timna, where Glueck (1935: 40) found evidence of copper and perhaps iron production, which he dated to the Nabataean period. As no additional work has been done at this site, it is difficult to evaluate this evidence. The second is Timna Site 200 (the "Egyptian Mining Temple"), where Rothenberg (1972: 177-179) found a later casting installation initially dated to the 1st century AD. The final publication of the site, however, indicates instead a date in the 2nd-3rd centuries AD for this installation (Rothenberg 1988b: 270-271). While metallurgical activity at the site no doubt continued into the 2nd and 3rd centuries, the presence of a Schmid Gruppe 6 undecorated bowl (Gichon 1988: 253, Fig. 87.2), dated at al-Zanṭūr to the mid-1st century AD (Schmid 2000: 147, Abb. 50-51, 97), suggests that production may already have begun in the

Nabataean period.[259] Recent research has also demonstrated that the mines in Naḥal ʻAmrām were active in the 1st century AD (Avner, et al. 2018: in particular, 156, Table 10.1, No. 7) and that smelting occurred at a small site near Yotvata in the 1st century BC or AD (Ben-Yosef, et al. 2008: 2874, Table 2). Interestingly, Nabataean copper production — continuing into the Roman and Byzantine periods — at Bīʼr Naṣīb and other sites in southern Sinai also seems to have started in the 1st century AD (Johnson 1987: 79-84; Rothenberg 1970: 17-18, 21). Strabo (XVI.4.26), probably writing in the late 1st century BC, notes of the Nabataeans that "brass [Gr. *chalkós*, i.e. copper] and iron . . . are not produced in their country" (Strabo 1930: 368-369). Johnson (1987: 84) takes this to mean "that the Nabataeans were not involved to any great extent in the production of copper in the 1st century B.C.," and that large-scale production began in the 1st century AD. A date in the early 1st century AD has also been suggested on the basis of lead and copper isotope analyses of coins (Bower, et al. 2013). This does not, however, rule out small-scale beginnings of Nabataean copper production in the 1st century BC, and further archaeological evidence may contradict Strabo's account, as well.

By the 1st century BC, a specialist class of Arabian traders had emerged among the Nabataeans, as demonstrated by the fact that "the so-called incense road is perfectly covered by finds of Nabataean pottery" (Schmid 2004a: 418, 423). During this same period, the Nabataeans also used other overland routes to reach the Persian/Arabian Gulf, which they seem to have continued to use until the end of the 1st century AD (Schmid 2004a: 419). The earliest "Nabataean" settlement at Madāʼin Ṣāliḥ (Nabataean Hegra) likewise seems to date to the late 1st

[259] Some caution, of course, is required here. Somewhat similar Nabataean-style bowls have been found in 2nd century AD contexts at the Nabataean settlement near Khirbat al-Mudayna al-Thamad (Sidoroff 2013: 76, Fig. 3.4). This settlement is nearly 150 km northeast of Petra, however, whereas Timna Site 200 is ca. 75 km to the southwest of Petra. Beyond this, the bowls at Khirbat al-Mudayna may be local imitations of Petraean products (Sidoroff 2013: 80). The presence of Nabataean cream wares at Timna Site 200 (Gichon 1988: 255-256, Fig. 87.13) may also indicate a slightly earlier date, but these wares no doubt continued to be used into the early 2nd century AD (ʻAmr 1992).

century BC (Rohmer and Fiema 2016: 293), perhaps demonstrating increasing Nabataean control over the northern portions of the Arabian trade routes. This should be interpreted with some caution, however. The earliest settlement at Madā'in Ṣāliḥ dates to the late 3rd or 4th century BC, or perhaps even earlier (Rohmer and Fiema 2016: 292). Rohmer and Fiema (2016: 294), likewise, note that "the transition from Liḥyān to the Nabataeans seems to be a longer and more complex process than was previously thought, at least in the material culture." Graf (2013b: 34) points out that the evidence from Madā'in Ṣāliḥ, and in particular finds of 3rd century Aradus coins, parallels the early evidence from the Petra city center. While direct Nabataean control of Madā'in Ṣāliḥ is somewhat later, it seems clear that southern Jordan's economy was quite connected to that of northern Arabia already by the 3rd century BC, if not earlier.

At the same time as Nabataean control over Arabia was expanding, interactions with the Roman Empire were leading to other economic shifts. The port of Aila (al-'Aqaba) seems to have been founded in "direct response to the threat posed to Nabataean commerce by the Roman annexation of Egypt in 30 BC and their subsequent development of ports on the Egyptian Red Sea coast" (Parker 2009: 685). This, without doubt, set the stage for the development of the southern 'Araba's economy. The widely-distributed 'Aqaba amphora of the Late Byzantine and Early Islamic periods, discussed below (and see also Section 6.4), has its antecedents in the "Ribbed Neck Jars" produced in Nabataean Aila as early as the early 1st century AD (Dolinka 2003: 67, 80). These precursors to the 'Aqaba amphora have been found as far south as Berenike (Barnīs), near Rā's Banās in Egypt, over 600 km south of Aila (Dolinka 2003: 86).

The Nabataeans also began expanding northward in the late 2nd or early 1st century BC (Wenning 2007: 36-37). Some type of Nabataean presence in the Ḥawrān is documented already in the mid-3rd century BC, and by the 1st century BC it seems clear that the Nabataeans exerted some sort of control over the region (Wenning 2007: 37-38). This extended, at several periods, to control of Damascus. The Nabataeans held the city during the early 1st century BC, and 2 Cor. 11.32 mentions an "ethnarch of King Aretas" in Damascus, which some scholars have taken to mean that the Nabataeans controlled the city during the mid-1st century AD (Peters 1977: 266). Taylor (1992: 727) has suggested that a reading of ethnarch as "governor" is likely accurate, and that the "period of Nabataean control over Damascus can probably be placed in the early years of Gaius (37-41), who pursued a policy of granting territory to favoured client-rulers." Milik (1958: 235) suggested that Bostra (Buṣrā) may have replaced Petra as the Nabataean capital in the latest phase of the independent kingdom, during the reign of Rabbel II (71-106 AD). Many scholars have accepted this suggestion (e.g. Bowersock 1973: 139; Peters 1977: 274; Starcky 1955: 103), arguing that the trade routes through Petra were replaced by the Red Sea trade, and because of this the focus of Nabataean overland trade shifted eastward to the Wādī al-Sirḥān route, terminating in Bostra. More recently, however, Fiema (2003) and Wenning (2007: 40) have argued against this view, noting that it is based on very limited evidence. Fiema (2003: 41, 43, 52) argues that, although there may have been a royal residence in Bostra, a 1st century decline in trade through Petra is contradicted both by settlement pattern data and the fact that, in the 1st-3rd centuries AD, Petra was not only a center of the frankincense trade, but incense processing, as well (see also Johnson 1987: 36-71). As such, it seems likely that the situation of Petra when the Romans annexed the Nabataean kingdom in 106 AD was likely not much different than it had been a century before.

The Roman Period (106 AD - ca. 300 AD)

The Roman Empire annexed the Nabataean kingdom as *Provincia Arabia* in 106 AD (on this, see Bowersock 1970; Bowersock 1983: 76-89; Kennedy 1980). As noted above, the effect of this transition on the economy of southern Jordan, and particularly Petra, has likely been overstated by some scholars in the past, and for the most part the 2nd century represented continuity of earlier patterns. As Graf (2007: 174) notes, the effect of the transition to Roman rule even in Petra seems primarily to have been "expansion and remodeling." The city's continuing importance is demonstrated by the Trajanic triumphal arch, dating to 114 AD, that declares the city a metropolis (Bowersock 1971: 232; Bowersock 1982: 198; Bowersock 1983: 84-86), a title that continued to be used into the 6th century (Fiema 2003: 45; Koenen 1996: 187). In general, the early post-annexation period builds on the patterns that had prevailed in the preceding two centuries (Fiema 2003; see also Bowersock 1983: 86).

Some changes, however, did occur almost immediately. Construction of the *Via Nova Traiana*, the large road connecting Aila to Bostra, may have begun as early as 107 AD, the year after the Roman annexation of the province (Graf 1995: 241). Milestones found by the Roman Road Project indicate that the segment of the *Via Nova* between Philadelphia ('Ammān) and Petra was completed in 111 AD, and the segment between Petra and Aila in 112, with the northern segment connecting to Bostra completed in 114 (Graf 1995: 264). The "Incense Road" connecting Petra to Gaza likewise continued to be used into the Early Roman period, and the Romans constructed a paved road (Ben David 2012) and forts (Erickson-Gini and Israel 2013: 28) in the late 2nd century AD. Ben David (2012: 21) argues that the forts and paved roads "were erected as part of Roman military activity in the Negev, and not as part of the Petra–Gaza route," yet some connection between the military activity and trade seems likely. This argument does have some support, however, from the fact that the portion of the road connecting Petra to Wādī 'Araba remained unpaved until the end of the 3rd century (Ben David 2007). Trade along the Petra-Gaza road seems to have stopped in the early to mid-3rd century, as part of the so-called

"3rd century crisis" (Erickson-Gini and Israel 2013: 51), but military activity seems to have continued into the early Byzantine period (Ben David 2012: 21).

Parker (1986: 125) notes that Roman military activity in southern Jordan also seems to have followed preceding Nabataean patterns, although this is not entirely certain and there are some exceptions. In particular, many Nabataean military installations were not reused by the Romans, at least initially, and the Romans built at least some new military installations in the 2nd century (Parker 1986: 125). Parker (1986: 125) places the fortress at Udhruḥ, which Killick (1983: 125) argues was constructed at the same time as the *Via Nova*[260], among these, but a building inscription has since been published placing the construction of the fortress in the early 4th century AD (Kennedy and Falahat 2008). Nonetheless, ceramic and other evidence indicates that Udhruḥ was clearly occupied earlier, and a military presence should not be ruled out. A 2nd century legionary presence in *Provincia Arabia*, alternating between *Legio III Cyrenaica* and *Legio VI Ferrata*, has been demonstrated by Kennedy (1980), though these were based in Bostra, rather than the south, in the 2nd century (Fiema 2003: 44). Dedicatory inscriptions found at al-Ḥumayma (Nabataean Hawara, Roman Hauarra) indicate, however, that detachments of *Legio III Cyrenaica* and possibly *Legio VI Ferrata* were stationed there in the 2nd-early 3rd centuries (Oleson, et al. 2002: 104).

As noted previously, the economy of southern Jordan seems to have undergone a major shift in the mid-3rd century. This is perhaps related to the "3rd century crisis" and the instability brought about by increasing conflict with the Sassanian Empire (Parker 1986: 132), although, as Fiema (2003: 50) notes, this is not entirely clear. Nonetheless, it is clear that the incense trade

[260] Killick (1983: 125) also suggested, following Glueck (1935: 71, n. 190, 76) and others, that the *Via Nova* did not connect to Petra, but rather to Udhruḥ. As Graf (1995: 242-244) points out, however, there is much evidence to suggest that Petra, rather than Udhruḥ, should be placed on the *Via Nova*. More recent work has supported a route connected to Petra, rather than Udhruḥ, but also suggests a route to the east of the one Graf favored (Abudanah, et al. 2016).

along the Petra-Gaza road ended during this period (Erickson-Gini and Israel 2013: 51), which is reflected in the fact that the production of unguentaria in Petra is not attested after the mid-3rd century (Fiema 2003: 50; Johnson 1990: 239, 242). It is also interesting that only eight coins — of more than 1000 dating to the Classical periods and Late Antiquity — dating to the period between the reigns of Septimius Severus (r. 193-211 AD) and Diocletian (r. 284-305 AD) were published by Kind, et al. (2005: 171-172) for Khirbat Faynān, although this may not reflect a decline, as only 10 pre-Severan 2nd century coins were found (Kind, et al. 2005: 181, Table 2). Interestingly, this blow to the Petraean economy seems to have been beneficial for Aila, whose importance increased beginning in the 3rd century (Fiema 2003: 50).

The Byzantine Period (ca. 300 AD - ca. 600 AD)[261]

The break between the "Late Roman" and "Early Byzantine" periods is, from a historical standpoint, somewhat arbitrary. While the 4th century saw numerous critical political changes in the Roman Empire, it is worth noting, as virtually every work on the Byzantine Empire does, that "during nearly all their long history the Byzantines called themselves Romans" (Cameron 2011: 42-43; see also Harris 2006: xiv; Parker 1999: 135; among many others). A number of events have been proposed as "beginnings" of the Byzantine period, including the reign of Diocletian (r. 284-305 AD), the proclamation of Constantine as emperor in 306, the Battle of Milvian Bridge in 312, Constantine's defeat of Licinius and the foundation of Constantinople in 324, the dedication of Constantinople in 330, the death of Theodosius I in 395, the end of the western empire in 476, the reign of Justinian I (r. 527-565), and the reign of Heraclius (r. 610-641)

[261] 600 AD does not, of course, mark the end of Byzantine political control of southern Jordan. This would instead place the end of the Byzantine period in the 630s AD. I use 600 as the division between the Late Byzantine and Early Islamic periods following Whitcomb's (1992b: 386) archaeological chronology. Other chronologies have been proposed, including splitting the two periods at 650 AD (Whitcomb 2001b: 505), which has its merits, or considering the 7th century a "transitional" period that is neither Late Byzantine nor Early Islamic (Whitcomb 2008: 485; Whitcomb 2009: 127).

(Harris 2006: xiv-xv; Parker 1999: 135). While archaeologists working in the southern Levant have traditionally preferred 324 or 330 (Parker 1999: 135), this is not true across the Mediterranean, and in other regions — for example, Greece (e.g. Pettegrew 2007), Cyprus (e.g. Rautman 2008), and even the northern Levant (e.g. Casana 2014) — the 4th to 7th centuries are commonly called "Late Roman," with the Byzantine period beginning with the loss of the eastern provinces to the Islamic conquests during the reign of Heraclius (on this problem more generally, see Jones, et al. 2014: 174). Here, however, I prefer to follow Parker (1999: 135) and begin discussion of the Byzantine period with the reign of Diocletian, as, particularly in an economic sense, this marks a recovery from the crisis of the 3rd century.

Beginning in the reign of Diocletian, and as part of his reorganization of the eastern provinces, many of the Roman forts in the east, on the so-called *Limes Arabicus*, were founded, and during this period the Romans engaged in substantial repairs to the *Via Nova* and other secondary roads (Parker 1986: 135-143). This included roads in the southern ʻAraba (Roll and Avner 2008), and Ben David (2007: 106) places the construction of the paved road from Petra to Wādī ʻAraba in the same period. As noted above, the inscription found at Udhruḥ dates the construction of the fortress to this period (Kennedy and Falahat 2008), and confirms the previously hypothetical transfer of the *Legio VI Ferrata* to the site by Diocletian (see Parker 1986: 142). To the north, Ariotti (2009: 165-169) sees the establishment of Qaṣr al-Bulayda, in the central Dead Sea *aghwār*, as part of this process, and considers it a hybrid military-agricultural settlement "augmenting the limes Arabicus." There are, however, several problems with this interpretation, including the presence of pre-4th century ceramics at the site and the lack of obviously "military" artifacts or architecture (Fiema 2010: 78). To the south, recent work at ʻAyn Gharandal (Roman Arieldela) has uncovered a dedicatory inscription confirming that the fort was built as the base of *Cohors II Galatarum* around the turn of the 4th century (Darby 2015; Darby and Darby 2015: 461, 463). This find also confirmed an early 4th century establishment for the fort at Yotvata (Davies and Magness 2014), already suggested by an inscription dating to this period found at the site in 1985 (Roll 1989), but more recently questioned by Davies and Magness (2011), who had suggested instead a mid-4th century date or later.

The *Legio X Fretensis* was, probably in the late 3rd century, moved from Jerusalem to Aila (Parker 1997a: 21; Parker 2013: 740). Darby (2015: 483) argues that the forts at ‘Ayn Gharandal and Yotvata were likely established to secure water for the arrival of the legion. Ward (2012: 293) has recently argued that the movement of *Legio X Fretensis* to Aila should instead be placed several decades later, at the beginning of the Byzantine period, perhaps to replace *Legio VI Ferrata*, which was moved from Udhruḥ to Egypt at some point before 324 AD. This argument may see some support in an inscription found in secondary use in the Islamic town of Ayla, perhaps originally dating to 324-326 AD (MacAdam 1989: 169). This argument is of secondary importance here, however. More important is the fact that, whether *Legio X Fretensis* arrived in Aila in the late 3rd or early 4th century, this no doubt positively impacted the city’s economy (Parker 2013: 740). In particular, this caused increased demand for Egyptian agricultural products, reflected in the appearance of Egyptian amphorae and Egyptian Red Slip Wares (ERS) at Aila in the 3rd and 4th centuries, which is notable as they do not commonly appear elsewhere in the southern Levant until the 6th century (Parker 2013: 738-740; Williams 2009). This marks a broader shift in the orientation of Aila’s economy. Between the 1st and 3rd centuries, Gazan amphorae make up nearly 50% of the amphora assemblage (n=660) from Areas B, M, and O at the site, with Egyptian amphorae making up about 30% (Parker 2013: 739, Fig. 7). In the 4th century, however, Egyptian amphorae make up over 60% of the much larger amphora assemblage (n=3328) from the church in Area J, with Gazan amphorae making up less than 10% (Parker 2013: 740, Fig. 8). At the beginning of the Byzantine period, then, the volume of trade through Aila seems to have increased substantially, primarily due to a massive increase in trade with Egypt. By the 5th century, production of the ʻAqaba amphora, mentioned above, had begun (Parker 2013: 741). These amphora were widely distributed between the 5th and 7th centuries, and have been found at numerous sites on the African Red Sea coast, in south Arabia, and as far east as the northwestern coast of India (on the distribution of this amphora type, see Raith, et al. 2013: 322, Fig. 1).

The early Byzantine period (and likely the Late Roman period, as well), as noted in Section 3.4, also seems to be the peak period of copper production at Phaino. The overwhelming majority of the coins published by Kind, et al. (2005: 181, Table 2) — 1,265 of 1,395 total, or ca. 91% — date to the period 294-450 AD. While the previously mentioned limitations of this data must be kept in mind (see Sections 3.4 and 7.1), this suggests a notable peak of settlement, and perhaps production, at the site in the 4th century. Whether this is related to the increasing condemnation of Christians to *damnatio ad metallum* documented by Eusebius in the early 4th century and the later condemnation of heterodox Christians to the same fate after the Edict of Milan (see Friedman 2008: 37-40; Mattingly, et al. 2007b: 333; Millar 1984: 140-141; Najjar and Levy 2011) is not entirely clear, but this does seem likely. The copper mines in Naḥal ʻAmrām were also active in the early Byzantine period. Avner, et al. (2018: 173) suggest, in the absence of evidence for direct imperial control of these mines, that "the industry seems to be in the hands of the local population, this time the Nabataeans," which may represent continuity of Nabataean control over the mines from the 1st century onward. This may be the case, but there is no clear evidence for this, either. Nonetheless, the apparent small scale of production and settlement in Naḥal ʻAmrām during this period compared to Phaino suggests that this may be the case.

Petra's role as a center of trade seems to be much diminished by this period, and Fiema (2001a: 112) argues that "no large-scale traffic appear to have occurred there during the Byzantine period," although without doubt trade did occur. Quite early in the Byzantine period, the earthquake of 363 AD caused massive destruction in the city, and destruction layers associated with this event have been found in virtually every excavated building that was occupied in the early Byzantine period (on this earthquake, see Brock 1977; Hammond 1980; Russell 1980; Russell 1985: 42, 51-52). This earthquake is also historically (see Section 3.4) and archaeologically (see Section 5.3.1) attested as destroying mines and structures at Phaino, but does not seem to have put a stop to copper production there.

By the early to mid-5th century, Petra had become the capital of the new province of Palaestina Tertia, formerly Palaestina Salutaris (Dan 1982: 137).[262] Petra seems to have remained the capital of Palaestina Tertia into the 6th century (Fiema 2001a: 112-113; Fiema 2002: 213) or perhaps later, and, based on evidence from Petra Papyri dating to 537, 544, and 579-581 AD, also retained its rather lavish title, "the Antonine imperial colony, the distinguished and native[263] mother of colonies, Hadrianic Petra, Metropolis of the Third Palestine Salutaris"

[262] Prior to this, Petra and Phaino were part of Provincia Arabia, rather than Palaestina (Mayerson 1984). Tsafrir (1986), it is worth noting, proposed an earlier date for locating Petra in Palaestina, based primarily on references in Eusebius, but this debate is beyond the scope of the present work. Palaestina Salutaris seems to have been founded at the end of the 4th century, ca. 390 AD (Mayerson 1984: 230; Mayerson 1988), at which time its capital was perhaps Elusa (Dan 1982: 137). Fiema (2002: 213), however, states that the argument for Elusa being the capital is "quite unsubstantiated," implying that Petra may always have been the capital of Palaestina Salutaris/Tertia. The historical sources unfortunately do not yet allow for an entirely convincing reconstruction of this administrative history. By 409 AD, the province was known as Palaestina Tertia (Dan 1982: 135) and included Petra, while Phaino likely remained in Arabia.

[263] The missing word here is not complete in any of the Petra Papyri, and was initially uncertain. Al-Nasarat and Twissi (2016: 210) fill in this blank with "Holy (?)," one of the possibilities suggested in earlier publications of the papyri. Arjava and Kuehn (2002: 30) had already noted, however, that although both "holy" and "noble" are possible given the legible letters, neither "would be expected for a city." Gagos, et al. (2007: 69-70) were able to

(Arjava and Lehtinen 2007: 138; Arjava and Kuehn 2002: 23; Gagos, et al. 2007: 69; see also Al-Nasarat and Twissi 2016: 210). What exactly this title might have meant at any given time is not entirely clear, however, given that in the early 6th century[264] heretics and other criminals are documented as having been exiled to Petra (Fiema 2001a: 113; John of Ephesus 1923: 188; John of Nikiû 1916: 129-130; John Malalas 1986: 222, 224; Marcellinus *comes* 1995: 37; Schick 2001b: 2; Zacharias of Mitylene 1899: 209). The retention of its title and administrative status is not, of course, mutually exclusive of the likelihood that, by the 6th century, Petra was also something of a backwater.[265] Likewise, it is not entirely clear that Petra retained its administrative importance in the 6th century (Fiema 2002: 214). Fiema (2002: 193) suggests, however, that it is also possible that Petra became a place of exile simply because it "was considered a safe and loyal city to house individuals dangerous to the central government."

The Petra Papyri also provide key insights into Petra's economy, which, following the decline of Petra as a center of trade, had become increasing oriented toward agriculture. Indeed, the Petra Papyri are not generally concerned with trade, but rather land tenure and agriculture (Caldwell and Gagos 2007; Fiema 2001b: 427; Kouki 2009; Nasarat, et al. 2012). Perhaps one of the most interesting of the Petra Papyri — undated, but certainly early 6th century — details the inheritance of agricultural land in Serila and Ogbala[266] and residential property in Petra proper (Koenen, et al. 2013). Based on these documents, Petra's agricultural economy was primarily

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reconstruct this word as "native" through comparison to two Latin inscriptions from the Great Temple listing the same titles.

264 Fiema (2001a: 113) instead states that this occurred "[a]t the turn of the fifth century," but this is almost certainly a typographic error. In Fiema (2002: 193) this is corrected to the reigns of Anastasius I (r. 491-518 AD) and Justin I (r. 518-527).

265 Donner (1982: 190) makes a similar point regarding the possibility that Petra appears on a now lost portion of the Mādabā mosaic map. Essentially, his argument is that Petra was, by the 6th century, a provincial town, but that it was nonetheless on an important road and appears quite often in geographical sources.

266 Neither of these locations can be identified precisely, as Nasarat, et al. (2012: 112) note. Nonetheless, it is likely that some of the associated locations in this papyrus can be identified with places in Wādī Mūsā. If these identifications are accepted, Serila is likely to be "just west of the center" of Wādī Mūsā, and Ogbala in the hills to the east (Falahat and Daniel 2013: 49).

based on growing cereal grains, although vineyards and orchards are also mentioned (Kouki 2009: 47; Nasarat, et al. 2012). Surprisingly, given the substantial evidence (discussed below) for olive oil production in the Petra region throughout the Islamic periods, only a single Petra Papyrus refers to olive oil (Buchholz and Mustonen 2007: 187, 194; Kouki 2009: 47).

As I suggest in Section 3.4, by the end of the 5th century, copper production had likely ceased at Phaino, and certainly it had lost its importance as an imperial *metallum*. Instead, in the Late Byzantine and Early Islamic periods, Faynān seems to have been a religious center, and was also likely engaged in agriculture. It is interesting to consider Late Byzantine Phaino and Petra in light of Fiema's (1992) model of Byzantine investment in southern Jordan. He suggests that this period in southern Jordan is marked by an expansion, but also regionalization and clustering, of settlement, which made the region inefficient to administer, and ultimately led to a favoring of "local political arrangements and military self-sufficiency," leading to "the political and economic abandonment of southern Jordan by the central government" (Fiema 1992: 329-330). These conditions would account for the economic changes seen in both Petra and Phaino. In particular, the large-scale mining operation at Phaino would have been dependent on state investment, and unlikely to continue in its absence.

The regional aspect of this argument is important to note, however, as certainly this situation would not have characterized the entire Byzantine Empire. As a contrary example, the 5th and 6th centuries represent the primary period of gold mining activities at Bīʼr Umm Fawākhir in the Egyptian Eastern Desert (Meyer, et al. 2000; for confirmation of this date based on excavation at the site, see Meyer 2014). Likewise, in cities to the north, the 6th century seems to have been a period of increasing commercial activity (Avni 2011b; Avni 2014; Kennedy 1985; Walmsley 2007a: 31-47), and this seems to hold true for Aila to the south, as well. While commercial activities began to encroach on public spaces in these cities, this was not the case in Petra. Excavations in central Petra have produced evidence for the continued use of a shop on the Roman Street into the 6th and 7th centuries (Fiema 1998: 420-421) and the reuse of the Pool Complex as a lime kiln in the 6th century (Bedal 2003: 80-82), but the economy of the city had, overall, shifted toward agriculture.

The status of Zoara in Ghawr al-Ṣāfī is an interesting question in this light, as well. Certainly a sizable town existed here in Late Antiquity. Albright's (1925: 57; 1924: 3-4) soundings in the 1920s demonstrated a Byzantine period occupation at Khirbat al-Shaykh ʻĪsā and identified the site as Byzantine Zoara, and the later surveys of King, et al. (1987: 447-448) and MacDonald (1992: 104) produced evidence of a Byzantine period occupation, though both note that Byzantine sherds were uncommon compared to those of the Islamic period (see also King 1985: 43). King, et al. (1987: 449; see also King 1985: 43), however, note that various sites in Ghawr al-Ṣāfī were likely related to the settlement at Zoara, and the small number of Byzantine sherds collected at Khirbat al-Shaykh ʻĪsā itself may be due to preservation issues. It is interesting to note that at the nearby Ṭawāḥīn al-Sukkar both survey (MacDonald 1992: 104) and excavation (Grey, et al. 2017: 116-117, Fig. 6.3.1-5) projects have found Byzantine period sherds, and that MacDonald (1992: 104) collected Byzantine sherds at two other sites, SGNAS Sites 65 and 66, in the immediate vicinity of Khirbat al-Shaykh ʻĪsā. Beginning with the 2012 excavations, the current excavation project has also started to reach Late Roman and Byzantine levels at Khirbat al-Shaykh ʻĪsā (Politis 2013a: 196). During the most recent season, a church — potentially identifiable with the church depicted at Zoara on the Mādabā mosaic map — dating to the Byzantine period was found, and another deep sounding produced evidence of Late Roman and Early Byzantine period occupation (Politis 2017: 542-545). That a large church would be found at Zoara is not surprising, given the presence of monasteries to the northeast at Dayr ʿAyn ʿAbāṭa in Ghawr al-Ṣāfī (Politis 2012b) and farther to the northwest at Dayr al-Qaṭṭār al-Byzantī on the Lisān Peninsula (Holmgren and Kaliff 2012; Holmgren, et al. 1997), both of which were founded in the 4th century and continued to be used into the Islamic periods. Nonetheless, continuing archaeological work at Khirbat al-Shaykh ʿĪsā is necessary to clarify the economic status of the city, particularly in comparison to Petra, where churches and a monastery have also been found dating to the Late Byzantine period.

The final Late Antique references to Petra date to the early 7th century. George of Cyprus (1890: 53) lists Petra as the metropolis of Palaestina Tertia, although as Fiema (2001a: 113) implies this may rely on earlier sources, perhaps from the end of the 6th century. As discussed in Section 3.4, George of Cyprus is also the latest premodern source to mention Faynān, which he places in the province of Arabia, rather than Palaestina Tertia (George of Cyprus 1890: 54). The latest source (see Fiema 2002: 195; Schick 2001b: 2) to mention Petra is the *Pratum spirituale* of John Moschos (1992: 24, 95) who refers to the early 6th century banishments discussed above and also describes speaking to a monk from Petra.

It was formerly thought that the earthquake of 551 AD destroyed Petra, after which the city was never rebuilt (Amiran, et al. 1994: 266; Russell 1985: 45; on this earthquake more generally, see Ambraseys, et al. 1994: 24-25). The discovery of the Petra Papyri, however, has made this view untenable, as the latest papyrus postdates 551 by several decades. The more recent revision of the Ambraseys (2009: 201-202) catalog now notes that the earthquake of 551 was likely not responsible for the city's 6th century decline. It is worth noting, however, that many of the structures at Petra do seem to have been destroyed in the later 6th century, including the monastery on Jabal Hārūn (Phase VIII destruction; Fiema 2016a), the Great Temple (Phase

XI; Joukowsky 2017: 24), the Temple of the Winged Lions (Hammond 1996: 7), Qaṣr al-Bint (Zayadine 1985b: 249),[267] perhaps the Main Theater (Phase VII; this destruction is dated to 746-748 AD in Hammond 1965: 65; Hammond 1996: 7 redates the same phase to 551 AD), and possibly the Petra Church[268] (Phase X, "The First Earthquake"; Fiema 2001c: 105-111) and al-Zanṭūr[269] (Bauphase Spätrömisch II; Kolb 1996: 51). Rucker and Niemi (2010) have suggested a date of ca. 597 AD for this earthquake, primarily on the basis of a dedicatory inscription of this date from Areopolis (modern al-Rabba, ca. 10 km north of al-Karak) that refers to rebuilding after an earthquake (Zayadine 1971). This event is also accepted by Ambraseys (2009: 216-217) on the same basis. The exact date of the earthquake, however, remains unclear. It seems quite likely that this is the event responsible for the late destruction of Khirbat Faynān, Area 16, Terrace 2, but its relationship to other areas of the site remains uncertain. In particular, as

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[267] The recent excavations to the northwest of Qaṣr al-Bint proper have proposed an abandonment in the early 5th century AD (Renel 2013: 349), which may coincide with a major flood that also affected the shops along the Roman road (Fiema 1998: 417; Paradise 2011). This does not rule out later 6th century structural damage to Qaṣr al-Bint.

[268] Fiema (2001c: 111) dates Phase X to the early 7th century AD, at the earliest, and 633 AD is the earliest earthquake candidate he proposes. This is based on the presence of "possibly later 7th century sherds" in Phase X and "ceramics considered to be of the early 7th century A.D." in Phase IX (Fiema 2001c: 105, 110). These sherds are not published in the report, however — the latest published example is a sherd of African Red Slip 103B or 99A, dating to the 6th century (Gerber 2001: 364, Fig. 2.2). Betlyon (2001: 390) considers the lack of 7th century coins an indication that the church was not in use during this period. Given the lack of certainty that the sherds found in Phases IX and X date to the 7th century, it seems possible that Phase X could, perhaps, date to the last decade of the 6th century, rather than the early 7th. This is a very tentative suggestion, however. The destruction of the Blue Chapel, on the North Ridge to the north of the Petra Church, is attributed — primarily on the basis of radiocarbon dating — to the earthquake of 748/749 AD (Bikai 2004: 63) — i.e. one of the mid-8th century earthquakes (see Section 5.3.2) — and Bikai and Perry (2012: 96) suggest that the Phase X destruction of the Petra Church should be attributed to the same event. This is also possible, particularly if the "possibly" late 7th century sherds do in fact date to that period.

[269] The excavators attribute the destruction of Bauphase Spätrömisch II to the earthquake of 419 AD (Kolb 1996: 51, 86), and reference Russell (1985: 39, 42-43), who describes the earthquake as affecting Jerusalem and the Galilee, but also suggests that its effects were "[p]robably far more extensive than texts indicate." Ambraseys (2009: 162) suggests a date of 418 AD instead, but also notes that there is little conclusive evidence for the destructive effects of this earthquake. If al-Zanṭūr was destroyed in the earthquake of 419 AD, it currently appears to be the only structure at Petra that was. The other notable 5th century destructions — those in central Petra — are, as noted above (n. 267), probably better attributed to a major flood. The same volume in which a 419 AD destruction is suggested, however, provides some evidence against this date. Bauphase Spätrömisch II produced, among other things, likely 6th century or later basins (Fellman Brogli 1996: 260, Abb. 790), late 5th and 6th century African Red Slip Ware forms (Forms 91C and 93B; Schneider 1996: 140, 149, Abb. 597-598), bowls that seem to be influenced by 6th century ARS forms (e.g. Fellman Brogli 1996: 263, Abb. 810), and a coin dated 450-457 AD (Peter 1996: 98, no. 88, 118, Abb. 222). While earlier material is much more common in this phase, the destruction should nonetheless be dated using the latest material, which suggests a 6th century, rather than early 5th century, date.

discussed in Section 3.4, it is unclear whether the monastery, dated by a dedicatory inscription to 587/8 AD (Alt 1935: 65; Sartre 1993: 146), was built or rebuilt in response to this earthquake (i.e. the earthquake occurred before 588 AD, which seems unlikely if the Petra Church was damaged in this earthquake) or was damaged in the earthquake only a decade after its construction, and if so, whether it was rebuilt following this. What is clear, however, is that this earthquake occurred much later than the economic shifts described here. It did not cause the economic decline of Petra or Phaino, and neither settlement was abandoned following this event.

The Early Islamic Period (ca. 600 AD - 1000 AD)

The economy of Early Islamic period southern Jordan is discussed in great detail in Section 3.5, and it is not necessary to repeat this discussion here. Instead, this section will include discussion of several key points and a summary of the basic trends.

The evidence for continuity of copper smelting in the central ʻAraba following the decline of production at Phaino is somewhat limited. As noted in Section 3.5 (n. 67), clear evidence for Early Islamic period copper production has not actually been found at any of the sites Nol (2015: 56, Table 2) lists for the Faynān region. Evidence for copper production in the Late Byzantine and Early Islamic periods has, however, been found across Wādī ʻAraba in the ʻEn Yahav region, at the sites of Nahal ʻArava 1, 2, and 3/ʻEn Yahav 17, 20, and 25, which the surveyors suggest became active following the end of the Faynān industry (Nahlieli, et al. 2014).[270] Nahal ʻArava 1/ʻEn Yahav 17, in particular, can be dated to the Early Islamic I on the basis of an Umayyad coin found at the site. It is not possible, however, to discuss the scale of production at these sites, as the survey publication does not include estimates of the amount of slag.

[270] Nahlieli, et al. (2014) also suggest that Wādī Faynān "was abandoned at the end of the Byzantine period," a view that is clearly no longer tenable in light of recent research. The connection of the beginning of copper production at ʻEn Yahav with the end of copper production at Phaino, however, does seem reasonable.

Overall, however, the economy of the central ‘Araba seems to have moved toward agriculture. Nol (2015: 65) suggests that dates were the primary products of the region, and that these were “probably traded for long-distance, to Beer Sheva, Ramla or Gaza, or even farther via maritime routes.” The exact destination of these products is still unclear, however, and, following Whitcomb (2006b), the possibility should also be considered that the central ‘Araba sites formed part of the hinterland of Zughar, and their products were distributed primarily through that town. In the mid-12th century, al-Idrīsī (1836: 338) describes dates and grain being shipped north across the Dead Sea to Arīḥā (Jericho) and the Jordan Valley *ghawr* (Le Strange 1890: 66; Schick 1997: 75), and it is possible that the produce of the central ‘Araba moved along this route in an earlier period, as well. It is possible that the road inn or farmhouse at KHI also played a role in this system, particularly if it is to be identified as a farmhouse.

This can be contrasted with the situation in the southern ‘Araba. Agricultural sites are, of course, present in the southern ‘Araba during this period (Avner and Magness 1998: 46-49; Nol 2015: 65). Unlike the central ‘Araba, however, the economy in the south was much more industrial, and included a variety of copper production sites, stone quarries, pottery kilns, and perhaps gold production sites (Amar 1997; Avner, et al. 2018; Avner and Magness 1998; Gilat, et al. 1993; Jones, et al. 2018; Melkawi, et al. 1994; Meshel 2006; Nol 2015; Rothenberg 1999; Shaw and Rothenberg 2000). Ayla, as discussed above, was an important port city already, and seems to have retained this status from the Late Byzantine period into the Early Islamic. Many of its hinterland sites, however, were established later. The copper production sites, in particular, seem to have been established in the 8th century AD (the most recent discussion of this dating is in Jones, et al. 2017; see also Nol 2015: 53-55). This may, as suggested by Jones, et al. (2017), relate to the interests of the ‘Abbāsid Empire. While Heck (1999; 2003) suggested that the gold, silver, and copper mines of north and west Arabia were already established in the 7th century and played an integral role in the development of the earliest Islamic state, Power (2012a) suggests a later development. He points out that the mines seem to be related to the development of the Darb Zubayda — the ʻIrāqī *ḥajj* route — and were mostly founded at the beginning of the period of ʻAbbāsid rule (Power 2012a: 123-124). This is supported, in particular, by the excavations at al-Nuqra — a large copper production site in the northwestern Najd, in modern Saudi Arabia — which demonstrated that the mines were primarily active during the ʻAbbāsid period (de Jesus, et al. 1982: 63). As such, Ayla, already a successful town, seems to have experienced a boom under ʻAbbāsid rule. In the late 10th century, al-Muqaddasī (1896: 64) described Ayla as "a populous and beautiful city, possessing many palm trees, also fish in plenty. It is the great port of Palestine and the emporium of the Hijjâz." This suggests that Ayla remained a prosperous port city throughout the Early Islamic period.

Zughar, to the north, was likewise a prosperous city, but with a rather different economy. Whitcomb (1992a: 117) noted the importance of indigo production to the city, and suggests that several sites in Ghawr al-Ṣāfī, including a reservoir and Ṭawāḥīn al-Sukkar, may originally have been used in the industrial production of indigo dye. Excavations at Khirbat al-Shaykh ʻĪsā have produced evidence of indigo production during the Early Islamic II in the form of large jars used in the production of dye (Politis, et al. 2009: 304, Fig. 21).[271] Likewise, surveys and excavations of the site have produced luxury ceramics rare elsewhere in southern Jordan, including 9th century ʻIrāqī blue-painted, opaque-glazed wares produced in al-Baṣra (Politis, et al. 2009: 307, Fig. 31; on the attribution of this type specifically to al-Baṣra, see Mason 1997a: 22; Mason 2004: 24). As with Ayla, this prosperity certainly continued into the later 10th century, and al-

[271] This vessel is referred to simply as a "storage jar" in this publication (Politis, et al. 2009: 304), but in more recent presentations has been identified as an indigo vat (Gamba, et al. 2016).

Muqaddasī (1896: 62) states that "its commercial prosperity makes of it a little Busrah, and its trade is very lucrative." Albright (1924: 4) thought this comparison "somewhat grandiloquent," but Whitcomb (1992a: 117) argues that "[t]he extensive and profitable trade is unlikely to be hyperbole and the analogy with Basra is worth further consideration." He suggests this may indicate that, like al-Baṣra, Zughar was seen as a place connecting three regions, in this case Filasṭīn, al-Urdunn, and al-Sharāh (Whitcomb 1992a: 117).

In addition to cash crops, the Dead Sea region was also known for the production of minerals. Al-Muqaddasī (1896: 81) mentions "salt in powder" coming from the Dead Sea, and, also writing in the 10th century, al-Tamīmī refers to the harvesting of both salt and sulphur from around the Dead Sea (Amar 1998). Of particular note, Amar (1998: 4-5) suggests that al-Tamīmī refers to the production of Andarānī salt, which may have been exported as far as ʻIrāq, in al-Zāra, on the central eastern Dead Sea coast. While excavations at al-Zāra have produced evidence primarily for Roman and Byzantine period settlement (Clamer 1997; Strobel and Wimmer 2003), survey produced evidence of settlement into the 10th century at the site of al-Zāra 18 (ʻAmr, et al. 1996: 441). This region of central Jordan, too, formed part of the hinterland of Zughar.

Petra, as noted in Section 3.4, had by the Early Islamic period lost any administrative importance it may have retained in the Late Byzantine period. This seems to have been taken over by Udhruḥ, ca. 15 km to the east, and Maʻān, ca. 30 km to the southeast.[272] The *qanāt* systems of the Late Byzantine or Early Islamic period near Udhruḥ and Maʻān (Abudanh and Twaissi 2010) and the agricultural estate in Maʻān (Genequand 2003) suggest the growing importance of these settlements, but archaeological research at both sites has been limited.

[272] Although fairly far to the south, at ca. 40 km south of Petra and ca. 45 km southwest of Maʻān, the ʻAbbāsid family estate at al-Ḥumayma (see Schick 2007) seems to have more in common with settlements like Maʻān than it does with the hinterland settlements of Ayla in the southern Wādī ʻAraba.

Maʻān has only been surveyed, but the surface collection combined with reference to historical sources suggests that it was an Umayyad estate (Genequand 2003: 25-26, 33). While Udhruḥ was excavated, "no substantive publication" was produced, as Schick (1998a: 83) notes. This is unfortunate, as the preliminary report hints that "[e]vidence in the form of ceramics and architecture also suggest the importance of [the Umayyad] period" (Killick 1983: 125), but the discussion of this period is quite limited. The Early Islamic period is, likewise, well-represented in the material collected by the recent Shammakh to Ayl Archaeological Survey (SAAS Site 150; MacDonald, et al. 2016: 262-265). In the late 9th century, al-Yaʻqūbī (1861: 114) refers to Udhruḥ as the capital of al-Sharāh (see also Genequand 2003: 34) and calls its people "*mawālī* of the Banū Hāshim," hinting at its importance in the Early Islamic period. Genequand (2003: 34) suggests that Udhruḥ must have become less important during the 10th century, as al-Muqaddasī (1896: 11, 63) lists the capital of al-Sharāh as Zughar and describes Udhruḥ as "a frontier town between the Hijjâz and Syria." This seems to have occurred fairly late in the 10th century, however, as al-Iṣṭakhrī and Ibn Ḥawqal,[273] dating to the mid-10th century and perhaps slightly later, both identify Udhruḥ as the capital of al-Sharāh (al-Iṣṭakhrī 1870: 58; Ibn Ḥawqal 1967: 173; see also Schick 1997). Nonetheless, this shift may hint at an increasing separation between the northern and southern economies of southern Jordan or simply the increasingly important role of Zughar as the key economic center of the region. It is also worth considering the references in al-Iṣṭakhrī (1870: 58) and Ibn Ḥawqal (1967: 173) to the regions of al-Jibāl and al-

[273] Al-Iṣṭakhrī and Ibn Ḥawqal present very similar information, to the point that Kramers (1954: 196) regarded the two as a single work undergoing a process of revision (see also *EI2*, al-Iṣṭa<u>kh</u>rī). As such, it is somewhat difficult to determine whether Ibn Ḥawqal, writing several decades later, is presenting new information or repeating al-Iṣṭakhrī. The most recent English translation of al-Iṣṭakhrī, misidentified as Ibn Ḥawqal, was produced in the late 18th century (Ibn Ḥawqal 1800). I am aware of no English translation of Ibn Ḥawqal, but Kramers and Wiet translated the work into French in the mid-20th century (Ibn Ḥawqal 1964).

Sharāh being under the control[274] of *al-ʻarab*.[275] Walmsley and Barnes (2002: 486) argue that the shift of the capital of al-Jibāl from ʻArandal (Gharandal) to Ruwāth, documented in the same sources, likely reflects a shift in political power from "traditional urban elites" to "new tribal leaders whose power base lay in other, but equally long established, settlements" and point to a similar shift in the same period from Ma'āb (al-Rabba) to al-Karak. The shift from Udhruḥ to Zughar may reflect the same process.

Petra itself is, as previously mentioned, largely absent from the sources of the Early Islamic period beyond the reference to Jabal Hārūn in al-Masʻūdī (1938: 124; see also Schick 1997: 76). As discussed in Section 3.5, surveys (see, e.g., ʻAmr and al-Momani 2001; ʻAmr and al-Momani 2011; Alcock and Knodell 2012; Beckers, et al. 2013; Knodell and Alcock 2011; Knodell and Alcock 2013; Knodell, et al. 2017; Tholbecq 2001) have found an overall reduction in the number of settlements in the region surrounding Petra during the Early Islamic period.[276] This represents, as ʻAmr and al-Momani (2011: 308) suggest, a shift from "large conglomerations [of settlements] in the Byzantine period to small 'concentrated' by scattered groups," although it is not entirely clear whether this represents a reduction or concentration of the population. Certainly, the economy remained overwhelmingly agricultural, and it is likely

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[274] Kramers and Wiet instead translate this statement as "la majorité de la classe populaire est arabe" (Ibn Ḥawqal 1964: 170), which has somewhat different connotations. The interpretation of this line as reflecting a shift in political control seems much more likely, however.

[275] Walmsley and Barnes (2002: 486) interpret *al-ʻarab* to mean "Bedouin groups." I would suggest that this may be an early reference to the Jarrāḥids, particularly given that their late 10th century "base" was al-Karak (Schick 1997: 76-77), perhaps related to the shift from Ma'āb to al-Karak discussed in the main text. This point is not critical to the main argument presented here, however.

[276] This seems also to be the case for the regions south of Petra, e.g. the area around al-Ṣadaqa, ca. 18 km to the south (al-Salameen, et al. 2008), but the evidence from survey is not entirely clear. MacDonald, et al. (2012b) report no Early Islamic period sherds around al-Ṣadaqa, although they did find Early Islamic period sherds at some agricultural village sites to the west. Notably, they do not report Early Islamic material from ARNAS Site 007/al-Ṣadaqa Site 1, Khirbat al-Ṣadaqa (MacDonald, et al. 2012a: 35-36). Al-Salameen, et al.'s (2008) excavations at al-Ṣadaqa Site 2, the nearby "*castellum*" did, however, produce sherds of the Early Islamic period (see also ʻAmr and al-Momani 2011: 313). Unfortunately, al-Salameen, et al.'s (2008) survey and excavation report does not include any ceramic illustrations, and they do not distinguish between subphases of the Islamic period. The preliminary report mentions a "systematic study" planned for a future date (al-Salameen, et al. 2008: 414), but this has not yet been published.

that olive production became a more important product during the Early Islamic period. Olive presses have been found dating to the 7th century at Khirbat al-Dhbā‘, ca. 8 km south of Petra (‘Amr and al-Momani 2001: 273; ‘Amr and al-Momani 2011: 313; for the subsequent excavations, which produced additional evidence of the Early Islamic period village, see Falahat, et al. 2001; see also MacDonald, et al. 2016: 149-150), and the Early Islamic period at Khirbat al-Nawāfla (‘Amr and al-Momani 2011: 311; ‘Amr, et al. 2000: 244). These examples demonstrate that olive oil was being produced in these villages, leading ‘Amr and al-Momani (2011: 313) to suggest that olive oil was a key product of the region during the Early Islamic period. Realistically, however, it is not yet possible to entirely fill in the gaps between the minimal oil production suggested by the Petra Papyri in the Late Byzantine period and the virtual ubiquity of olive trees in the region by the time of the arrival of the Crusaders, discussed below.

The Middle Islamic Period (1000-1400 AD)[277]

By the beginning of the Middle Islamic I, the southern ‘Araba industrial settlements were likely in decline. Nol (2015: 53) dates most of the sites to “the eighth and early ninth centuries,” but this seems to be too narrow a range. The Wādī al-Ṭawāḥīn site produced two 10th century radiocarbon dates[278] and Be’er Ora as many as two, although the 1σ range of one may be as early as the late 8th century.[279] It should not be expected that the dates of every site in the settlement system should be exactly the same. Some may very well have gone out of use in the early 9th

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[277] As with the division of the Late Byzantine and Early Islamic periods at 600 AD, other proposals have been advanced for the division between the Early and Middle Islamic periods. Whitcomb (2001b: 505) divides the two at 1050 AD, instead, and Whitcomb (1997a: 106; 2008: 485; 2009: 127) considers the 11th century a “transitional” period that is neither Early nor Middle Islamic. This last proposal has some advantages for southern Jordan, where the 11th century is particularly poorly known, but for the sake of simplicity I prefer to discuss this as part of the Middle Islamic period.

[278] RT-1484, 1075 (or 1074)±47, 901-1016 cal. AD 1σ, 778-1035 cal. AD 2σ; RT-1551, 1065±37, 903-1019 cal. AD 1σ, 893-1024 cal. AD 2σ. Original data in Avner and Magness (1998: 57) and Gilat, et al. (1993: 434). Recalibrated by the present author to IntCal13 (Reimer, et al. 2013) using OxCal 4.3 (Bronk Ramsey 2009). See also Avner, et al. (2018: 155-157, Table 10.1).

[279] RT-1742, 1115±45, 888-986 cal. AD 1σ,777-1017 cal. AD 2σ; RT-1949, 1150±45, 778-968 cal. AD 1σ, 770-989 cal. AD 2σ. Original data in Avner and Magness (1998: 57). Recalibrated by the present author to IntCal13 (Reimer, et al. 2013) using OxCal 4.3 (Bronk Ramsey 2009). See also Avner, et al. (2018: 155-157, Table 10.1).

century, with others continuing into the 10th or 11th, as Ayla certainly did. As discussed in Section 3.5, the Ayla region seems to have declined in the 11th century as a result of a series of natural events and political conflicts beginning at the end of the 10th century and ultimately ending with the arrival of the Crusaders in Ayla in 1116. It is likely that Ayla was not entirely abandoned even after this, as al-Idrīsī (1836: 332) describes it as a small town controlled by Arabs — although his source for this information, as discussed below, is not entirely clear. It does not seem to be the case, however, that Ayla/al-ʻAqaba was an important port again until at least the late 13th century.[280] The Egyptian *ḥajj*, from the mid-11th to the mid-13th century, followed a southern route that crossed the Red Sea at ʻAydhāb (Al Shqour 2015: 245-248), and, even after that route began again to pass through al-ʻAqaba, the early Mamlūk *Darb al-Ḥajj al-Shāmī* may have followed a more eastern route through the desert, avoiding the town, as a result of the Crusader occupation in al-Shawbak and Wādī Mūsā (Dauphin, et al. 2015: 33). Whether this is the case is not entirely clear, however. Yāqūt (1979: III: 370) states that the construction of al-Shawbak in 1115 made travel from Egypt to Syria impossible, and Milwright (2006: 3) argues that this would certainly have affected *ḥajj* traffic, as well. Given that, according to Ibn al-Athīr (2007: 316), Saladin and Reynald de Châtillon made a truce that allowed caravan traffic to pass through Crusader territory, and that at one point he "had to arm caravans travelling through Reynald's territory" (Mallett 2008: 146), it seems likely that this situation was temporary, and would not have persisted into the early Mamlūk period.

On the northern end of Wādī ʻAraba, Zughar's fate in the same period was rather different. For Goitein (1983: 45), "The [Cairo] Geniza letters show that, in the eleventh century

[280] Guo (2004: 65, 97) suggests that the Ayyūbids may have sent troops to fight the Crusaders north from Quṣayr al-Qadīm "perhaps through the Gulf of ʻAqaba, or through the Hijaz," and later refers to this as "the probably Quseir-ʻAqaba (or the Hijaz)-Syria route." A route through the Ḥijāz seems more likely, but even if the port continued to be used occasionally in this way, it does not seem to have functioned as a commercial port between the early 12th century and the late 13th century.

at least . . . [Zughar] was an entrepot of the trade between North Arabia and the Mediterranean." As a more specific example, a mid-11th century Cairo Geniza letter mentions Zughar as a source of indigo, but also notes (with some annoyance) that the author's trading partner refused to travel there, as the road there from Hebron (al-Khalīl) was dangerous (Gil 1992: 203, 206; Schick 1997: 75). In the mid-12th century, al-Idrīsī (1836: 339) states that the main crop of the Jordan Valley *ghawr* is indigo, suggesting that although sugar had already been introduced to the southern Levant, it had not yet become the primary cash crop of the Jordan Valley and Dead Sea *aghwār*. As discussed in Section 3.6.2, sugar seems to have taken over during the late 12th and early 13th centuries, and by the early 13th century is described by Yāqūt (1979: 217) as the primary crop of the Jordan Valley *ghawr*.

Walmsley (e.g. 2001a: 554; 2001b: 635; 2008: 499, 531) argues that, by the 11th century, the capital of al-Sharāh had shifted from Udhruḥ to Wādī Mūsā. This process, however, seems to have been more complicated than a simple shift from one town to another. As already discussed, al-Muqaddasī (1896: 11), writing in the late 10th century, places the capital of al-Sharāh at neither of these places, but instead at Zughar. Writing in the mid-12th century, however, al-Idrīsī (1836: 341) again places the capital of al-Sharāh at Udhruḥ.[281] Whether this is an accurate description of the administrative situation in al-Sharāh at the time al-Idrīsī was writing is, however, uncertain. Le Strange (1890: 7) suggested that it was unlikely that al-Idrīsī had personally been to the southern Levant, and so his information was likely drawn from an earlier source. He gives the same capitals as al-Iṣṭakhrī and Ibn Ḥawqal, and therefore may have been drawing on these sources. Nonetheless, the shifts in power, particularly toward the Jarrāḥids, that Walmsley (2008: 531) discusses began already in the 11th century, even if these are not reflected in the capitals

[281] The Jaubert translation gives the Arabic as Adraḥ, but clearly Udhruḥ is meant. The other "lovely district in the south of Palestine" is given as Ḥamāl, and its capital as Darāb (al-Idrīsī 1836: 340-341), which likewise should be corrected to al-Jibāl, with its capital at Ruwāth.

noted by geographers of the period. It is likely that the Jarrāḥid strongholds in the "mountains of al-Sharāt" (*EI2*, Djarrāḥids) included sites in the Petra region, perhaps including the Middle Islamic period fortified hilltop sites in Wādī al-Fayḍ (for general descriptions, see Hübner 2002; Hübner 2004; Knabb, et al. 2015: 370-373). Walmsley (2008: 499) points to the fact that "Crusader sources identify Wadi Musa . . . as the principal object of military activity south of the Dead Sea during the first quarter of the twelfth century" as evidence of this. It is also worth noting that Yāqūt (1979: III: 370), describing the construction of al-Shawbak in 1115, refers to the region as "the land of Rabī'a from Ṭayy'." The "Banū Rabī'a were a branch of the Jarrāḥids" (Hiyari 1975b: 513), and it seems that they were still in control of the region at the time the Crusaders arrived. While it is likely that the Crusaders were drawn to Wādī Mūsā because it was the economic — and perhaps political — center of al-Sharāh, this should not be taken to mean that the Crusaders successfully gained complete control over the area. Usāma ibn Munqidh (2008: 36-37) states that in 1154 — that is, decades after the construction of al-Wu'ayra — he and the other members of his party fled from a group of Franks *to* Wādī Mūsā, which he describes as the territory of the Banū Fuhayd. They are mistreated by the Banū Fuhayd, but eventually escorted to safety by Manṣūr ibn Ghidfal, an *amīr* of the Banū Rabī'a, who seem to have been in control of parts of the area long after it was ostensibly conquered by the Crusaders. Indeed, it is very likely that the impressive number of Crusader fortresses in the Petra region (see Section 3.6) is an indication that the Franks had a difficult time controlling Wādī Mūsā, even more than a decade after, according to Walmsley (2008: 500), the construction of Crac des Moabites (al-Karak) had "completed Crusader domination over the fertile wheat-growing and pastoral lands south of the strategic Wadi Mujib."

Economically, olive cultivation in the region near Petra and al-Shawbak seems to have expanded throughout the Early Islamic period, and by the beginning of the Middle Islamic period was quite widespread. If an 11th century date is accepted for the earlier Islamic phase at Khirbat al-Mu‘allaq,[282] then the lower part of an olive press found on the surface of the site may be archaeological evidence for olive oil production in the Middle Islamic Ia (Lindner, et al. 1996: 115-116; Lindner 1999: 482, Fig. 7). In the mid-12th century, al-Idrīsī (1836: 341) states that al-Jibāl and al-Sharāh produced olives, almonds, figs, and pomegranates "en abondance." In the year 1144, William of Tyre (1986: 722) described the Petra region as "covered with luxuriant olive groves which shaded the surface of the land like a dense forest. From these trees the dwellers in that land derived all their living, as their fathers had done before them" (English translation from William of Tyre 1943: 145). William goes on to describe the Crusaders destroying some of these trees in order to secure the return of al-Wu‘ayra (William of Tyre 1986: 722), hinting at the importance of olive cultivation for the local economy. This continued into the Middle Islamic II, as well, as documented by the olive presses dating to this period found in Wādī Mūsā at Khirbat al-Nawāfla (‘Amr, et al. 2000: 244) and al-Jī/Gaia (‘Amr and al-Momani 2001: 268). During the Middle Islamic IIc, al-Shawbak was known for its carpet production,

[282] Unfortunately, the dating of Khirbat al-Mu‘allaq is not entirely clear. Lindner (1999: 480) published a radiocarbon date of "calibrated AD 785-1015," but unfortunately did not provide the raw date, the calibration curve used, or the standard deviation reported. The sample itself was "taken from the *ṭābūn* in Stratum III" (Lindner, et al. 1996: 126). A juglet from Stratum IV was, likewise, tentatively dated to the Early Islamic period (Lindner 1999: 480; Lindner, et al. 1996: 120-121, Fig. 15). A pre-11th century date for Stratum III would be too early, given the presence of hand-made wares, and Lindner (1999: 480) suggests that the Khirbat al-Mu‘allaq pottery is contemporary with "Phase I of Brown's excavations," or the 12th century. McQuitty (2008: 553), however, suggests that "some of the illustrated forms . . . are suggestive of a later date," and discusses them as Ottoman. This dating is also followed by MacDonald, et al. (2016: 152-153), who date similar wares collected at the site (SAAS Site 32) to the Late Islamic period. Sinibaldi and Tuttle (2011: 445) caution, however, that these forms seem to be very long-lived in the Petra region, and accept an 11th century date for Khirbat al-Mu‘allaq while also noting that this type of pottery can likely not be dated based on form or decoration alone. Like Sinibaldi and Tuttle (2011), I would place the earlier Islamic occupation of Khirbat al-Mu‘allaq in the 11th century, particularly given the published radiocarbon date. This is complicated by the fact that Musil (1907: 283-284) was informed that the village was occupied in the early 19th century (see also Lindner, et al. 1996: 111). As such, it is likely that both Middle and Late Islamic ceramics are represented in the assemblage. The olive press may, therefore, be associated with either one of these occupations, or even both.

according to 14th century Ḥaram documents (Lutfi 1985: 295, 326, n. 58; Walker 2011b: 105), and this has also been confirmed archaeologically through the discovery of a dyeing workshop in Area 4000 of the site (Vannini, et al. 2013: 373, 376-377).

At some point in the late 12th or early 13th centuries — perhaps, as suggested in Section 3.6, during the period 1198-1218 AD, when al-Mu'aẓẓam 'Īsā ruled his southern Levantine holdings jointly with his father, al-'Ādil I — the copper industry in Faynān was revived. It is possible that this occurred first at Khirbat Faynān, and that the village at Khirbat Nuqayb al-Asaymir was built slightly later, but the dating evidence does not point conclusively to this (see Sections 4.1 and 4.2, Table 4.1). It is very likely that iron was produced in Faynān, as well, at least during the later Middle Islamic IIa. The industry was relatively short-lived, however, and ELRAP excavations at both sites produced no evidence for copper production later than the mid-13th century. Metallurgical activity in the same period has also been identified in the Petra region. An installation identified as an iron foundry was constructed at al-Wu'ayra in Phase IIIa (late 12th-early 13th century AD) and used through the Phase IV abandonment in the early 13th century (Vannini and Vanni Desideri 1995: 526-527; Vannini and Tonghini 1997: 376-377). The collapse above this (Phase V) is attributed to an early 13th century earthquake (Vannini and Vanni Desideri 1995: 527; Vannini and Tonghini 1997: 378),[283] to which minor destruction and rebuilding at KNA at the beginning of Stratum Z2a might also be attributed (see Section 4.1.5). As such, iron production at al-Wu'ayra seems to be contemporary with the earlier production phase at KNA, probably predating the production of iron in Faynān. A blacksmith's workshop was also active in the village of Khirbat al-Nawāfla during the Middle Islamic period, engaged primarily in the production of utilitarian goods and agricultural tools ('Amr, et al. 2000: 246, 250, Fig. 21).

[283] See discussion of the dating of this event in Section 3.6. While the excavators suggest a date of 1201 or 1202 AD, 1212 AD is likelier.

Some copper production also occurred during the Middle Islamic period in the southern ʻAraba, although its scale and precise date are not clear. Willies identified Mamlūk reuse of the copper mines at Naḥal ʻAmrām, but the ceramics from this survey were not actually published, and the two publications suggest somewhat contradictory dates of "Mamaluk (12th-14th centuries)" (Willies 1991: 138) and "Mamluk and Ottoman" (Willies 1990: 14). This reuse of these mines may explain the several 14th century and later brass objects that al-Saaʻd (2000) argues were made of Wādī ʻAraba copper, but this is not clear. Some reuse of Be'er Ora seems to have occurred in the Middle Islamic I, as the upper layers of the slag-built *muṣallā* produced an 11th-12th century radiocarbon date[284] (Sharon, et al. 1996: 112). Avner and Magness (1998: 42) and Avner, et al. (2018: 174) argue for limited smelting at Be'er Ora in the Mamlūk period on the basis of what they identify as a 13th century AD radiocarbon date. These sources seem, however, to have left the initial digit off of the original date — evidently recovered from a "cultic installation" at the site — as it was published in the Reḥovot Radiocarbon Date List (Segal and Carmi 1996: 98) not as "730±55" but "3750±55," which would place it in the Early Bronze Age IV.[285] This discrepancy has never been addressed, and even if the later date is correct, the context does not necessarily indicate smelting.

By the late 13th century, al-ʻAqaba — or ʻAqabat Ayla, as it was known at the time (see Whitcomb 1997b) — was again an important stop on the *Darb al-Ḥajj al-Maṣrī* (on this route generally, see Tamari 1982). Al-ʻAbdarī, who made the *ḥajj* in 1289, reports that ʻAqabat Ayla had a large seasonal market catering to the *ḥajj* pilgrims, and this market is described by a

[284] Rt-1740, 915±50, 1040-1163 cal. AD 1σ, 1024-1215 cal. AD 2σ. Original data in Segal and Carmi (1996: 98); see also Avner and Magness (1998: 57). Recalibrated by the present author to IntCal13 (Reimer, et al. 2013) using OxCal 4.3 (Bronk Ramsey 2009). See also Avner, et al. (2018: 157).

[285] Rt-1825, 3730±55, 2203-2036 cal. BC 1σ, 2293-1966 cal. BC 2σ. Original data in Segal and Carmi (1996: 98); apparently misquoted in Avner and Magness (1998: 57), Avner (2014: 146), and Avner, et al. (2018: 157). Recalibrated by the present author to IntCal13 (Reimer, et al. 2013) using OxCal 4.3 (Bronk Ramsey 2009).

number of other late 13th and 14th century sources, including Ibn Rushayd and Ibn al-Furāt (Al Shqour 2015: 248, 252). Walker (2006: 65) argues that the Mamlūks "formalized [the] relationship" between commerce and the *ḥajj* "by combining pilgrimage routes with market institutions," and the seasonal market at ʻAqabat Ayla should be interpreted with this in mind. According to Ghawanmeh (1986: 314), customs collected on trade through al-ʻAqaba in the Mamlūk period amounted to 3,000 *dīnār* per year, and the "tolls" collected at Jisr al-Ḥasā from caravans traveling from al-ʻAqaba to Damascus amounted to 10,000 *mithqāl* (over 40 kg)[286] of gold. The numerous renovations and improvements to the route near al-ʻAqaba commissioned by Mamlūk (and, later, Ottoman) *salāṭīn* (see, e.g., Rothenberg 1972: 226; Al Shqour 2015: 248-254; Tamari 1982: 505-525; Whitcomb 1997b: 360) likewise indicate the relationship between the *ḥajj*, commerce, and the legitimacy of the ruler. A blacksmith's workshop — Arabah Expedition Site 224 — found near the *Darb al-Ḥajj*, several kilometers southwest of Wādī al-Ṭawāḥīn, seems to be associated with one of these renovation projects, probably commissioned by the Mamlūk sulṭān al-Nāṣir Ḥasan in 1355 AD[287] (Rothenberg 1972: 226; Tamari 1982: 521). Ghawanmeh (1986: 314) proposes that a late 13th century proclamation of Qalāwūn aimed at attracting foreign commerce would have increased maritime trade through al-ʻAqaba at roughly the same time the seasonal markets associated with the *ḥajj* would have increased overland trade.

The Late Islamic Period (1400-ca. 1900 AD)[288]

[286] The exact weight of the Syrian *mithqāl* during the Mamlūk period is uncertain. The Egyptian *mithqāl* was roughly 4.3 g, but the Syrian equivalent may have been lower (Schultz 2003b).

[287] In the reading of this inscription published by Rothenberg (1972: 226), the date is suggested to be 747 AH, or 1346 AD. Tamari (1982: 521, n. 26) calls this reading "absolutely distorted and faulty," and instead reads it as 756 AH, or 1355 AD, a reading I follow here. A discrepancy of 9 years hardly matters in the context of the present discussion, of course.

[288] As before, 1900 AD is a somewhat arbitrary date. Whitcomb (1992b: 386) ends his Late Islamic II in 1800 AD, where Walker and LaBianca's (2003: 448) "Late Islamic IIb-modern" period lasts from "1800 CE-today." I do not intend to discuss the 20th century here, and my discussion of the entire period, and particularly the Late Islamic II (1600-1900 AD), will be fairly brief, in keeping with the general focus of this dissertation.

Ibn Iyās, writing in the early 16th century, describes a customs house at al-ʻAqaba where maritime trade was taxed (Ghawanmeh 1986: 314; Al Shqour 2015: 249). It is likely, as implied by Ghawanmeh (1986: 314) and Walker (2011b: 106-107), that this customs house existed in al-ʻAqaba much earlier, probably for the majority of the Mamlūk period. Interestingly, Ibn Iyās (1960: 774) also notes the presence of "mines of yellow copper [i.e. brass]"[289] near al-ʻAqaba (see also Abu Mustafa 2006: 17), although it is not entirely clear from his description if these were active when he was writing. If it is the case that the mines in Naḥal ʻAmrām were worked during the "Mamluk and Ottoman" periods, as Willies (1990: 14) suggests, Ibn Iyās may be referring to them. What it clearer is that al-ʻAqaba retained its importance as a port throughout the later Mamlūk period, and indeed for much of the Ottoman period. It did not lose this importance until the mid-19th and early 20th centuries, when it was bypassed first by the Suez Canal and then the Ḥijāz Railway (Al Shqour 2015: 254-279, 281).

By the Late Islamic period, the economy of Faynān was primarily pastoral (see Section 8.5). As noted in Section 3.1, a Late Islamic I radiocarbon date from the Faynān 7 slag mound (see Table 4.1) may suggest that limited smelting — or, perhaps, resmelting — occurred in the late Mamlūk or even early Ottoman period (Newson, et al. 2007b: 364). This was not a substantial aspect of Faynān's Late Islamic period economy, however, and how best to interpret this date is still unclear.

Most scholars accept, as discussed in Section 3.6.2, that by the end of the Middle Islamic period the sugar industry had gone into decline, and Ottoman tax records show that by the 16th century it was no longer being grown at the former centers of production in the eastern Jordan Valley *ghawr* (Ashtor 1977; Milwright 2010: 72-73; Walker 2007c: 174; Walker 2008: 95; Walker 2010: 146; Walker 2011b: 82-85). In southern Jordan, sugar production seems to have

[289] "*maʻdin al-nuḥās al-aṣfar*". On the meaning of this term, see Aga-Oglu (1944: 222).

ended in Zughar at some point in the late 14th or early 15th century, as burials dating to the late 15th century were found during excavations at Ṭawāḥīn al-Sukkar in Ghawr al-Ṣāfī, indicating that the largest sugar factory in the region had gone out of use by this point (Politis 2013b: 478). Certainly this continued to be an agricultural region, as did the regions to the north, but less is known archaeologically about the Late Islamic period in the Dead Sea *aghwār*. As noted in Section 3.6.2, by the 19th century indigo was again being grown in the region, as documented by several travelers of the period (Burckhardt 1822: 392; Palmer 1871: 461).

As discussed in Section 3.6, by the end of the 16th century, southern Jordan was not very densely settled. Using the method adopted by Brown (1992: 114) for estimating population size based on the 1596-1597 *daftar-i mufaṣṣal* records published by Hütteroth and Abdulfattah (1977: 173-174), the Nāḥiyat al-Shawbak had a village and town population of roughly 1,750, and a tribal population of 2,110, although this last number, in particular, is very unlikely to be reliable. The tax revenue numbers are, perhaps, more relevant here. All are based on the figures given by Hütteroth and Abdulfattah (1977: 172-174). The total tax revenue of Nāḥiyat al-Shawbak in 1596-1597 was 84,700 *aḳçe* (see also Milwright 2008a: 117), which can be compared to a total of 134,400 *aḳçe* for Nāḥiyat al-Karak (see also Milwright 2008a: 112). Of this revenue for al-Shawbak, 51,000 *aḳçe* were collected from towns and villages, with 33,700 coming from tribes. In discussing southern Jordan, it is perhaps relevant to include Ṭafīla, Ghawr al-Ṣāfī, and Ghawr al-Mazra‘a, all of which are included in Nāḥiyat al-Karak. The total revenue of these villages was 24,500 *aḳçe*. Brown (1992: 116, Table 9) also calculates a "total agricultural tax" for Karak Plateau settlements, which is 116,080 *aḳçe* for 1596-1597. For Nāḥiyat al-Shawbak, this number is 47,820 *aḳçe*, and for al-Ṭafīla and the *aghwār,* 23,620. In terms of specific products, taxes on wheat, barley, and "goats and bee hives" are listed for all towns and villages in Nāḥiyat al-

Shawbak. Many were also taxed for vineyards and fruit trees. Only four villages, including al-Ṭafīla, technically part of Nāḥiyat al-Karak, are listed as growing olives. Of these, the most productive is the village of Shāmīt, where a total revenue of 9,000 *aķçe* is given for olives, vineyards, and fruit trees. The next largest is al-Ṭafīla, with a total of 2,500 *aķçe* in the same category. Water mills were also taxed in al-Shawbak, Shāmīt, and al-Ṭafīla. In addition to wheat, barley, and "goats and bee hives," the villages in the *aghwār* were also taxed for summer crops and water buffalo. While only a snapshot of a specific year in the late 16th century, this gives a good indication of the types of crops grown in southern Jordan in the Late Islamic period: primarily grains, with grapes, olives and fruit grown in the highlands and summer crops in the areas around the Dead Sea.

Certainly, many of these crops continued to be important in the Petra region into the 19th and 20th centuries. Musil (1907: 39, 150, 283, 314-316, 318) notes that figs, grapes, and olives were growing there when he visited in 1898, and Glueck (1935: 84) likewise noted olive and fig trees marking agricultural terraces near Khirbat al-Dabdaba, ca. 5 km northeast of Petra and ca. 2.5 km east of al-Bayḍa. An olive press dating to the early 20th century was restored as part of the archaeological project at Khirbat al-Nawāfla ('Amr, et al. 2000: 250), demonstrating olive oil production at the site from the Early Islamic period until almost the present day. From at least the late 18th century on, much of the produce of this region would have been consumed in Ma'ān. Burckhardt (1822: 437) described Ma'ān as being entirely dependent on the *ḥajj* trade, as their grain was purchased primarily from al-Jibāl and al-Sharāh, and he notes that the disruption of *ḥajj* traffic in the early 19th century posed serious problems for the town (see also van der Steen 2006a: 249). At the end of the 19th century, Musil (1907: 39) likewise records that the inhabitants of the village of al-Jī, in Wādī Mūsā, sold grains, vegetables, and fruit at a tidy profit in Ma'ān.

Summary

By the beginning of the Hellenistic period, or the 4th century BC, southern Jordan was linked to the Arabian incense and spice trade. Over the course of the next several centuries, the Nabataeans became key players in this exchange, gradually increasing their control over the northern portions of the Arabian trade routes and gaining political control of regions as far north as Damascus. The annexation of Nabataea by the Romans in 106 AD at first seems to have simply intensified already existing economic enterprises. Petra remained a center of trade and incense processing, with a fertile agricultural hinterland, and Phaino seems in this period to have transitioned from a relatively small-scale copper production site to an imperial *metallum*. Petra's role as the center of the incense trade, however, seems to have ended during the crisis of the 3rd century. Following this it remained a productive agricultural region and retained its administrative status, becoming the capital of Palaestina Tertia. The overland trade, however, was supplanted by maritime trade through Aila, whose economic importance increased through the Byzantine period. Copper production at Phaino intensified at the end of the 3rd century, but likely ceased by the end of the 5th century as a result of decreasing imperial support in the region. The status of Zoara is not entirely certain, but it is likely that its economic importance increased during the Byzantine period, as well. The central part of southern Jordan, and particularly the plateau, seems to have been organized primarily around agricultural estates in the 7th and early 8th centuries, and after this agriculture seems to have continued to dominate the economy.

By the late 8th century, southern Jordan was largely split into two major economic zones: one in southern Wādī ʻAraba, consisting of Ayla and its hinterland, and one in the northern ʻAraba and Dead Sea *aghwār*, consisting of Zughar and its hinterland. Judging from imported ceramics, trade was largely oriented toward southern maritime routes, with Egyptian ceramic imports gradually being outnumbered by southern ʻIrāqī (and, in Ayla, Chinese) ones. Zughar, however, also traded northward across the Dead Sea to Jericho and other places in the Jordan Valley *ghawr*.

The Crusader conquest of Ayla in 1116 seems to have been the last in a long series of political changes and natural disasters throughout the 10th and 11th centuries that brought about the end of the southern ʻAraba industrial settlements and led to Ayla being superseded by other Red Sea ports. Zughar, however, retained its importance, and southern Jordan's economy reoriented toward the north. The revival of the copper industry in Faynān in the 12th century reflects this fact, as copper likely traveled northward to sugar producing areas in the Dead Sea *aghwār* and Jordan Valley *ghawr* — now the key pieces in the economy of al-Karak. All of the ceramic imports in Faynān in this period likewise reflect a northern orientation, with wheel-made wares likely coming from Jerusalem and al-Karak, and virtually all glazed wares from Damascus.

The end of copper production in Faynān in the mid-13th century reflects a much broader reorientation of the political economy. Sugar, without doubt, remained the most important part of the southern Levantine economy into the late 14th century, at least, but the region was also integrated into the larger Mamlūk state. This meant that copper, and probably a variety of other goods, were now probably easier to import than produce locally, particularly as al-Karak was unlikely to again become autonomous given the early Mamlūk reorganization of the *iqṭāʻ* system (see Section 3.6.1). At the same time, ʻAqabat Ayla's economic status again increased as a result of two Mamlūk efforts: first, the formal linkage between the *ḥajj*, which passed through al-ʻAqaba, and government commercial institutions, and second, Qalāwūn's efforts to promote international trade.

The decline of the sugar economy greatly reduced the economic importance of the Dead Sea *aghwār*, and Zughar in particular, but it is important to consider what this might have meant for local people, as well. Walker (2009b: 60), writing primarily about the "*waqf*-ication" of land during the Mamlūk period, points out that "only the creation of large estates dedicated to cash crops . . . caused potential conflict" between rural people and Mamlūk state officials. As such, the decline of sugar production may have been seen as positive by local people, who could return to growing traditional crops on that land. While al-'Aqaba retained its commercial importance for most of the Late Islamic period, the construction of alternative routes — the Suez Canal and Ḥijāz Railway — in the mid-19th and early 20th centuries saw its importance decline. Ma'ān, however, became increasingly important as a stop on the *ḥajj* route, and indeed the residents of the town were able to support themselves primarily through the trade this brought, a situation that continued into the 20th century.

8.3. Shifts in Faynān's Religious Landscape

This section will consider shifts in both religious practice and the sacred landscape of Faynān from the Classical period into the Late Islamic period. A full consideration of excavations in the Faynān region would, of course, allow these shifts to be traced back farther, from the Iron Age II mortuary complex at Wādī Fidān 40 (Beherec, et al. 2014; Levy, et al. 2005) to the Pre-Pottery Neolithic A "ritualised gathering place" at Wādī Faynān 16 (Mithen, et al. 2011) and its associated burials (Mithen, et al. 2015). This earlier material has been omitted for scope.

Sacred Landscapes and Sacred Spaces

Little can presently be said about the religious landscape of Faynān in the Nabataean/Hellenistic and Early Roman periods. Cerainly Khirbat Faynān was occupied during this period, as attested by finds of residual pottery during ELRAP excavations, surface pottery collected by the WFLS (Tomber 2007), and a coin dating to as early as the beginning of the 3rd century BC (Kind, et al. 2005: 171). This occupation is, however, not very well known. ELRAP excavations at Khirbat Faynān only reached potential deposits of this period — Stratum T3-2c — in a small area (see Section 5.3.1), providing little information about religious practices at the site. The 1998 Wādī Fidān survey identified a "Roman/Byzantine" "cultic" site — WFD 29 — and several potentially "Roman/Byzantine" mortuary sites (Levy, et al. 2001: 175-176, Table 2), but the exact nature of this "cultic" site, consisting of a long wall line on a hill, is unclear. Likewise, it is unclear that any of these sites is Nabataean/Hellenistic or Early Roman. As it was not possible to consult the 1998 WFD survey material for this dissertation, it is unfortunately not possible to clarify the dating of these sites here.

Nabataean temples have been found at a fairly large number of sites other than Petra in southern and central Jordan — including Wādī Ramm (Tholbecq 1998: 241-247), al-Ḥumayma (Oleson, et al. 2008: 310, 312-316; Oleson 2010: 59), Khirbat al-Dharīḥ (Villeneuve 2011), Khirbat al-Tannūr (McKenzie, et al. 2013), Dhāt Rā's (Edinger 2004; Wenning 2003), Khirbat al-Nakhīl (Kareem 1999: 191-193), al-Qaṣr/Qaṣr al-Rabba[290] (Glueck 1939; Gysens and Marino 1997; Gysens 2008: 53; Gysens and Marino 2001), Khirbat al-Bālū'a (Ninow 2008), al-Riyāshī al-Shimālī (Atiat 2005), and Dhībān (Tushingham 1972: 27-34) — as well as in the Sinai, Negev, and Ḥawrān (Erickson-Gini 2015: 319). Given this, it stands to reason that if Phaino was a Nabataean settlement of much size or importance, it likely had a temple in this period, as well. The religious significance of high places and other natural features to the Nabataeans (see e.g. Erickson-Gini 2015: 318-319; Reeves 2016) suggests that some features of Faynān's landscape

[290] Note also the presence of a Late Roman temple at al-Rabba, ca. 5 km south of al-Qaṣr (Gysens 2002: 498; Gysens 2008).

may have held religious significance during this period. One interesting possibility is FBRS 27, a primarily Iron Age "cultic" site with no architectural features (Ben-Yosef, et al. 2014a: 517, 521, Fig. 6.15). Looking across Wādī al-Ghuwayb from FBRS 27, one sees FBRS 52, a prominent dome-shaped rock where "a few ephemeral architectural features" and some potentially Early Bronze Age body sherds were noted (Ben-Yosef, et al. 2014a: 517). While the majority of the pottery collected at the site is clearly Iron Age, one of the published sherds (Ben-Yosef, et al. 2014a: 522, Fig. 6.16.6) seems likelier to be Late Hellenistic/Nabataean,[291] perhaps suggesting some continuity of this sacred space from the Iron Age into the Classical periods.

Given Phaino's status as an imperial *metallum* during the Roman period, the presence of a temple is quite likely. Comparison can be drawn in this respect to imperial quarries in Egypt. At Mons Porphyrites, "two (or probably three) temples dedicated to Egyptian deities" — evidently Isis, Serapis, and Isis Myrionomos — were found (Peacock and Maxfield 2001: 11-12), and Mons Claudianus also had a temple of Serapis (van der Veen 1998: 115), as well as, perhaps, several earlier temples or shrines (Kaper 1998: 146). While Kind, et al. (2005: 169) include temples in the list of public buildings they argue Phaino did not have, it is presently only possible to say that none of the buildings at Khirbat Faynān have been identified as temples. The degree to which the Roman settlement has been covered by Late Antique structures is not presently known, and it is possible, given the later religious importance of the town, that a pagan

[291] Ben-Yosef, et al. (2014a: 522) cite as a parallel Smith and Levy's (2014: 306) BL2, a shallow platter bowl dating to the later Iron Age II. As the illustrated vessel is an everted closed form, most likely a jar, its identification as a shallow platter bowl is certainly incorrect. Similar, although not identical, forms can be found in Hellenistic and Early Roman contexts in Petra at Rā's Sulaymān (Mouton and Renel 2013: 140, Fig. 7.18), Jabal Numayr (Tholbecq and Durand 2013: 216, Fig. 11.D), al-Zanṭūr (Schmid 2000: Abb. 306-309), and the Petra Church (Gerber 2001: 360, Fig. 1.8), and a somewhat similar krater rim is found in the Early Roman IV at Tall Ḥisbān (Gerber 2012: 264, Fig. 3.22.8). The form of the sherd from FBRS 27 is, as noted previously, not exactly paralleled by these examples, but nonetheless they belong to what Gerber calls a "common concept" (Gerber 2008: 288) or "pottery *koine*" (Gerber 2016: 130). Ben-Yosef, et al. (2014a) do not include fabric descriptions, but if the fabric of this sherd is similar to Iron Age fabrics, as suggested by their dating, it is possible that it is relatively early for this type. The lack of exact parallels, however, certainly leaves open the possibility that the sherd is, in fact, late Iron Age.

temple at the site may have been intentionally destroyed, as might have been the case with the Petra Small Temple (Reid 2005: 110-111). As Fiema (2016b: 545) points out, however, this does not seem to have been a common occurrence, and it is perhaps more likely that a pagan temple at the site would simply have gone out of use and possibly been later repurposed or built over.[292] More excavation at sites of this period in Faynān, and particularly at Khirbat Faynān, will be necessary to clarify the nature of Nabataean and Roman religion in the region.

As noted in Sections 1.5 and 3.4, the only historical references to copper production in Faynān are primarily concerned with the fates of Christian martyrs condemned to *damnatio ad metallum* at Phaino (see Knauf and Lenzen 1987: 83). These primarily come from the works of Eusebius of Caesarea, with some additions by Jerome, who translated the *Onomasticon* into Latin. Some of these accounts are discussed by Najjar and Levy (2011: 36), and Friedman (2008: 283-284) has compiled a complete list of the references to Faynān in Eusebius's works. Of particular interest is a reference in the "short version" of *Martyrs of Palestine* to a group of early 4th century Christians "in the neighbourhood of the copper mines in Palestine . . . who used great boldness, so as even to build houses for church assemblies," although based on the "long version" they may have been in Zoara, rather than Phaino (Eusebius of Caesarea 1927: 396; see also Mattingly 2011: 189). It is quite possible that church buildings existed at Phaino prior to Edict of Milan, given the number of Christians present there, however unwillingly. A probable church of this period, dating to "ca. 300 CE," has been excavated at Aila and suggested to be the earliest known church in the world (Parker 1998a; Parker 2007: 364). Parker (1998a) notes, however, that other churches would have been constructed in the late 3rd and early 4th centuries,

[292] Note, for example, the Roman temple at Tall Ḥisbān, which was apparently destroyed in the earthquake of 363 AD, and then went out of use entirely for nearly a century or longer, until a church was constructed on the same location in the later 5th century (Storfjell 1994: 110).

but may have been destroyed during the period of persecution. As before, the current state of research at Khirbat Faynān makes it difficult to discuss this, beyond speculation.

During the Byzantine period, Phaino seems to have had at least five churches — as many as at al-Ḥumayma and one more than is known at Petra (Schick 2001a: 583). One of these, the "South Church" — located on the eastern side of Wādī al-Shayqar — was destroyed by agricultural activity in the mid-1990s, but a smaller building identified as a chapel — not counted as one of the five churches here; if it is a church, it would be the sixth at the site — was found nearby (Freeman and McEwan 1998; see also Mattingly, et al. 2007a: 526). The remaining four churches are at Khirbat Faynān proper, two on its north side and two — including the Area 8 monastery — on the west side (see Fig. 4.40; Mattingly, et al. 2007a: 513-514).[293] Of these, a precise date can be suggested only for the Area 8 monastery, which, as discussed in Section 3.4, has been dated by a dedicatory inscription to 587 or 588 AD (Alt 1935: 65; Sartre 1993: 146). If the South Church was, indeed, associated with the WF2 settlement and WF3 "South Cemetery," as suggested by Mattingly, et al. (2007a: 526), then the South Cemetery's 5th-6th century AD date (Findlater, et al. 1998; see also Meimaris and Kritikakou-Nikolaropoulou 2008: 147-159) can perhaps also be applied to the South Church. This, combined with the fact that Phaino was a bishopric into the 6th century (Mattingly, et al. 2007b: 333; Millar 2008: 79), suggests that Phaino was an important Byzantine religious center. While Mattingly, et al. (2007a: 513-514) note that Phaino had an important Christian community in Late Antiquity "[d]espite its association with Christian persecutions in the fourth century," Mattingly, et al. (2007b: 333) are likely correct in suggesting that "the settlement evidently achieved the status of a bishopric and centre of pilgrimage" precisely because of its association with the Great Persecution. While there

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[293] Note that the orientation of the map in Mattingly, et al. (2007a: 514) is inaccurate, and the north arrow points northeast. Compare to Fig. 4.40.

is presently no historical or archaeological evidence for pilgrimage to Faynān, the interpretation of the monasteries at Dayr ʻAyn ʻAbāṭā (Politis 2012a: 136) and Jabal Hārūn (Fiema 2016b: 551-552) as centers of pilgrimage suggests that this was also one of the functions the Area 8 monastery would have served.

As none of the churches at Khirbat Faynān have been excavated — with the exception of an interior corner of the Area 8 monastery revealed during excavations of the Area 15 slag mound (see Section 4.2.1) — direct evidence for their periods of use is not available. Some inferences can be drawn, however, from the excavation of the Area 18 cistern complex (see Section 5.3.2). It is reasonable to assume some connection to the religious community at Khirbat Faynān, particularly given the proximity of Area 18 to the two churches on the northern side of the site. The earliest floor reached during the excavation was built at the same time as the churches for which dates can be suggested, in the 5th or 6th century AD, and this is a reasonable date for the construction of the complex. Occupation 2, the primary occupation of the area, lasted into the 8th century AD, likely coming to an end in one of the mid-8th century earthquakes, like the Petra Blue Chapel (Bikai 2004: 63). It is not clear if this earthquake also marks the end of the monastic community at Khirbat Faynān, and excavations in Area 8 would be required to determine this. If this were the case, it is likely that the remaining members of the community moved to the monasteries at Dayr ʻAyn ʻAbāṭā or Jabal Hārūn, both of which continued to be occupied into the Middle Islamic I.

Into the 8th century, at least, the residents of Khirbat Faynān seem primarily to have been Christians. This is not surprising, as archaeological evidence for Christian religious practice is common in southern Jordan during the Early Islamic period (Schick 2001a). Whether this would have remained the case into the Early Islamic II is difficult to determine, as the Early Islamic II is quite poorly known in Faynān. Judging from the excavations at Khirbat al-Nawāfla, the villages of the Petra region seem to have been mixed Christian and Muslim communities during the Early Islamic II (‘Amr and al-Momani 2011: 311; ‘Amr, et al. 2000: 241). Very few mosques have been found near Petra, however. The only two examples currently known are both at al-Bayḍā, and these seem to date to the Middle Islamic II or later (Sinibaldi in Corbett, et al. 2016: 660).

Evidence for Muslim religious practice, however, has been found at Khirbat Nuqayb al-Asaymir. Hauptmann (2007: 126) mentions a “mosque” or *muṣallā* found “[f]orty meters south” of Area X. This is a small, open structure built of stone. Its walls were mapped during the 2002 WAG survey (contra Jones, et al. 2012: 74), but it was not assigned a building number, nor were artifacts collected from it. It is probable, given its proximity to Area X, that this served as a place of prayer for miners and smelters at KNA, similar to the slag-built mosque or *muṣallā* at Be’er Ora (Rothenberg 1988a; Sharon, et al. 1996). Similar open mosques are found in the Negev (Avni 1994; Avni 2007), southern ‘Araba (e.g. the one previously mentioned at Be’er Ora), and northern Jordan (Helms 1990: 73-82; King, et al. 1983: 393), appearing, according to Avni (2007: 134-135), in the mid- to late 8th century.[294] As Avni (1994: 91) notes, however, similar open mosques continued to be used into the 19th and 20th centuries (Avner 2007: 27, 28, Fig. 11; Doughty 1979: 236; Finkelstein and Perevolotsky 1990: 69; Zarins, et al. 1980: 23, Pl. 11).[295] Because of this, it is not possible to state with certainty that this feature is associated with the Middle Islamic period occupation at KNA, although this is very likely. Certainly, however, pastoralists passed through — and continue to pass through — the site after it was abandoned by

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[294] Avni (1994: 94), however, suggests an earlier date of late 7th or early 8th centuries for the earliest examples. Realistically, it is difficult to date many of these structures, particularly if they have not been excavated. Certainly many seem to date to the mid- to late 8th century, but this does not rule out an earlier date for others. This point is largely tangential to discussion of the open mosque or *muṣallā* at KNA, but has implications for the processes of Islamization in the region. See the cautionary notes on “historical interpretations” by Whitcomb (1998: 101-102).

[295] The Ottoman army also built open mosques called *namāzgāhlar*, one of which was at one time present at Qal‘at al-Burak, near Bethlehem (Hawari, et al. 2000: 103).

the miners, and perhaps used this open mosque or *muṣallā*, as well. It is even possible that the small structure was built in this later period, perhaps contemporaneous with Stratum Z1 (see Section 4.1.5).

Several other open cultic installations have been found on surveys in Faynān, though their dating is not entirely clear. WFD 105, a site located in a saddle northeast of Khirbat Ḥamrā Ifdān, was published as an Islamic cultic site (Levy, et al. 2001: 176, Table 2). It seems that the dating is based on identification the structure as an open mosque, but this is unlikely, as it seems to be oriented to the west, rather than the south. This may indeed be a cultic feature associated with pre-Islamic religious practice in Faynān, but it is not clear what period this is actually associated with, as no artifacts were collected at the site. Another, WAJ 596, north of Khirbat al-Jāriya on the western side of Wādī al-Jāriya, is a multi-period site dating to the Iron Age, "Roman/Byzantine," and Islamic periods (Knabb, et al. 2014: 592, 620, Table 7.3). In addition to cairns and a tent clearing, the site also has a circular feature, ca. 5 m in diameter, built of standing stones. One side is flat, and has a large stone in its center (Knabb, et al. 2014: 594, Fig. 7.27). It is unfortunately not possible, given the data collected, to reconstruct the orientation of this feature without revisiting the site, but if the flat side is on the south, there is a strong possibility that this is an open mosque. Unfortunately, dating of the site relies primarily on body sherds, and it is not possible to suggest a precise date within the Islamic periods.

Natural features of the landscape likewise continued to maintain ritual significance into the Late Islamic period. Palmer (1871: 458), who traveled through the region in the mid-19th century, records that the natural arch at Umm al-Zuhūr (see Fig. 3.17) was considered by local people to be a *walī*, or the tomb of a holy man.[296] This is a set of meanings that is difficult to

[296] The present author has heard archaeologists working in the region relate the same feature to a miraculous story connected to T. E. Lawrence, which may also be relevant to changing conceptions of the sacred.

access archaeologically. Bienkowski (2007: 45; see also Bienkowski 2006), drawing on 19th and 20th century Bedouin poetry collected and translated by Bailey (1991), argues that one way landscapes are understood in these poems is “as a *sacred/symbolic landscape*: the presence of ancestors’ tombs, holy men’s tombs as the location of celebrations, sacred trees, wells and springs.” In the absence of historical accounts of these meanings, however, the specific features that had these meanings are uncertain. Certainly features of the natural landscape of Faynān would have been parts of sacred landscapes for the entire period covered in this section, but few can be identified with certainty presently.

Cemeteries

I include only a brief discussion of burial in Faynān here. For a much more detailed discussion of burial practices in Faynān, focused on the Iron Age but considering longer-term trends, see Beherec’s (2011) dissertation.

As noted in Section 5.6.1, three basic types of post-Iron Age cemeteries are found in the Faynān region. The first — more “formal” Christian cemeteries — are found primarily in Wādī Faynān, around the settlement at Khirbat Faynān. Three of these, including the excavated WF3 South Cemetery (Findlater, et al. 1998), were found in close proximity to Khirbat Faynān, with one to the west (WF479) associated with other settlements and another to the north (WF437) that does not seem to be associated with any large settlement (Mattingly, et al. 2007b: 326-327).

The second type of cemetery, often consisting of groups of “cairns” or “circular features,” is found quite commonly in most parts of Faynān. While some of these cemeteries can be dated based on the orientation of tombs or surface artifacts, others cannot, and cemeteries of this type are found from the Classical to the Islamic periods, and likely earlier, as well. The cemeteries of this type that are likely to date the Islamic periods are listed in Section 5.6.1, but fuller listings of these sites for all periods can be found in the reports of the Wādī Fidān Survey (Levy, et al. 2001), Wādī al-Ghuwayb and Wādī al-Jāriya Survey (Levy, et al. 2003), and Wādī Faynān Landscape Survey (Mattingly, et al. 2007a), as well as several others (Adams, et al. 2010; Friedman 2008: 82-83; Knabb, et al. 2014; MacDonald 1992). The long period over which cemeteries of this type were used — and, indeed, the fact that some, e.g. WF775 (Mattingly, et al. 2007a: 635; Mattingly, et al. 2007b: 326-327), were used in multiple periods — suggests continuity of pastoral burial practices over the long term in Faynān.

The third type, cemeteries or burials reusing portions of ancient sites, is, according to Kressel, et al. (2014: 185), a phenomenon of the mid-19th century and later. Many burials of this type have been identified in the Faynān region, including at KNA Feature 5308 (Section 4.1.6), probably WAG 56, Khirbat Ḥamrā Ifdān Area Y (Section 5.4.3), WFD 50a Area T (Section 5.5.1), and in Khirbat Faynān Area 15.[297] Certainly these Islamic period burials and cemeteries should be dated to the 19th century or later, in line with Kressel, et al.'s (2014: 185) dating. This is not the only period during which burials are found reusing parts of earlier sites in Faynān, however. Iron Age burials have also been found at Wādī Fidān 4 (Beherec, et al. 2014: 673-676; Levy 2009: 153; Münger and Levy 2014: 742-745), an Early Bronze Age I site, and Wādī Fidān 61 (Hoff and Levy 2015; Howland, et al. 2014; Münger and Levy 2014: 742), primarily a late Neolithic site. Given the placement of these burials near the mouth of Wādī Fidān, the "Gateway to Faynān," one reasonable interpretation is that they may be related to territorial claims, but the fact that relatively few burials are placed at earlier sites also suggests that these places had specific meanings attached to them. What caused this practice to be meaningful during the Iron

[297] To this could also be added the burials in the Khirbat Faynān Area 18 cistern after it went out of use. It is difficult to suggest a date for these burials, however, as the associated material was recovered from looters' backdirt.

Age II and Late Ottoman period, but not other periods, would be a productive avenue for further research.

As with the sacred landscapes discussed previously, meaning can be connected to the archaeologically known landscape only in a general sense. It is possible that further archaeological research at Khirbat Faynān may help answer questions about the relationship of burial practices and pilgrimage at the site, but presently this is unclear, and none of the known burials at the site seems to have been marked as associated with martyrdom. Following Bienkowski (2007: 45), at least some of the second and third types of burial may have been associated with tombs of ancestors and holy men, and may even have served as spaces for meeting and celebration. As before, however, it is not clear which sites these may have been, in particular.

8.4. Faynān as a Landscape of Movement

This section briefly explores the ways in which people moved into, out of, and through Faynān, as well as the ways in which specific groups of people attempted to limit these various forms of movement. The types of movement and types of restriction that occurred at any given time reflect what Ingold (1993: 153) calls "taskscapes," defined as "pattern[s] of dwelling activities" that occur in and constitute landscapes. In a certain sense, the "feature system" concept discussed in Section 2.2 can be seen as a way of reconstructing a "snapshot" of a taskscape — or, more accurately, the traces of a taskscape "congealed" in a landscape (Ingold 1993: 162) — at a particular point in time.[298]

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[298] Hicks (2016: 4) has recently summarized one of Ingold's key points as follows: "*Taskscapes* do not involve labour, but 'dwelling activities.'" It would seem more accurate to note that labor is a "dwelling activity," as Ingold (1993: 164-171) ends his paper with a long description of a painting depicting a harvest, explicitly considering the way in which this labor takes place as part of the taskscape. Moreover, a deeper consideration of labor and the ways in which movement can be restricted may begin to address the criticism that Ingold's argument ignores "power, inequality, and the historical specificity of social relations" (Hicks 2016: 8; see also Bender 2001: 83-85).

Certainly, the most persistent type of movement through Faynān in the long term involves the use of the region seasonally by pastoral groups. The large number of campsites found on archaeological surveys (Knabb, et al. 2014: 594-597; Levy, et al. 2003; Levy, et al. 2001; Mattingly, et al. 2007a), and dating to virtually all of the periods of occupation in the region, attests to this fact. Certainly there was also some connection between movement and sacred landscapes discussed in the previous section (Section 8.3). The natural arch at Umm al-Zuhūr, for example, is on the side of the "old road" linking Wādī Fidān and Wādī al-Ghuwayb. Pastoral use of the Faynān region will be discussed in more detail in the following section (Section 8.5), but it is interesting to consider when and how movement through the landscape was limited, as well.

The common designation of Wādī Fidān as the "Gateway to Faynān" suggests its importance in facilitating movement into and out of the region between the Jabal Ḥamrā Fidān and Jabal al-Minshār ranges (see Section 3.2.2). This, in turn, hints at the fact that Wādī 'Araba was more commonly a landscape of movement than a border (see Bienkowski 2006). It is interesting that most of the infrastructure built to limit or monitor movement into and out of the Faynān region through Wādī Fidān dates to the Iron Age and Roman period (Sections 5.4.3, 5.5, and 5.6.3; Findlater 2003: 179-180; Friedman 2010: 208-209; Friedman 2008: 208-213; Levy, et al. 2001; Smith, et al. 2014c), the most intensive periods of copper production. The placement of these defensive sites indicates that monitoring movement into Wādī al-Ghuwayb, and from there presumably to Khirbat al-Nuḥās was a key concern in the Iron Age, while during the Roman period the passage south through Wādī Fidān to Phaino was more important. These defensive structures limited certain types of movement through the region, but also supported others. It is critical, for example, to understand the *castellum* at Wādī Fidān 50a not as an isolated defensive structure, but in association with the large *caravanserai* settlement at WFD 50, the largest site found during surveys of Wādī Fidān (Levy, et al. 2001: 175, Table 2). In other words, the function of WFD 50a was not simply to monitor movement, but to ensure the safety of caravans entering Faynān from Wādī ʻAraba, stopping at WFD 50, moving from there to Khirbat Faynān, and then back again to the ʻAraba. As Friedman (2008: 187) notes, these two functions are interrelated, as ensuring the safety of caravans moving into and out of Faynān would also have involved preventing the entry of "brigands" into the region.

This type of movement remained important even after copper production ceased to be important at Phaino. Ceramic evidence indicates that WFD 50a was used at least into the 6th century AD, and probably later (see Section 6.3), and the same dating may well apply to WFD 50. Certainly if Phaino continued to be a site of pilgrimage into the 8th century (see Section 8.3), this traffic would likely have been supported by infrastructure in the surrounding region. If Khirbat Ḥamrā Ifdān Area L (see Section 5.4.2) is indeed an inn, rather than an agricultural estate, it may have taken over this role at some point in the 6th or 7th century, although further research at both sites would be necessary to confirm this.

The roads to the east, between Faynān and the plateau, would also have been monitored and controlled during the Iron Age and Roman period (see Ben-Yosef, et al. 2014a). In the context of this dissertation, however, it is particularly important to note that this was also the case during the Middle Islamic period. Two sites that may have been watchtowers — Qaṣr Karayim bin ʻAlī (FBRS 13; see Section 5.2.3) and FBRS 15 (see Section 5.2.4) — were in use during the Middle Islamic period. FBRS 15 is of particular interest here, as it is more certainly identified as a watchtower and its Middle Islamic occupation can be dated to the late 12th or 13th centuries on the basis of stonepaste collected at the site (see Section 5.2.4). Perhaps unsurprisingly, trade associated with KNA was oriented toward the plateau and the road linking al-Shawbak with al-Karak and other sites to the north. Indeed, copper production in the late 12th and 13th centuries was concentrated entirely in the eastern parts of Faynān, with the mines at WAG 57 and 58 representing the westernmost known pieces of this feature system. Western Faynān was certainly not abandoned in this period, and people without doubt continued to move through Wādī ʻAraba, but this activity was largely separate from copper production in the east, and there is little evidence of Ayyūbid investment in or concern about movement in Wādī Fidān or western Wādī al-Ghuwayb. Instead, any potential threat from this direction seems to have been mitigated locally, as demonstrated by the presence of watchtowers — Buildings 5313, 5314, and probably 5315 — at KNA itself (Section 4.1.6; see also Jones, et al. 2012: 74).

The movement of workers, and particularly of miners, would also have been monitored and controlled. In the Late Roman and Byzantine periods, miners working to the north of Phaino were monitored from Khirbat Rātiya (WF1415), an administrative complex with two towers overlooking the mines of Qalb Rātiya (Friedman 2008: 219-223; Mattingly, et al. 2007a: 712; Mattingly, et al. 2007b: 319-321). As noted in Section 3.3, this type of surveillance is consistent with both slavery and free labor, and it is likely that the labor force at Phaino consisted of both. For the Middle Islamic period, Jones, et al. (2012: 74) suggested a similar purpose for Buildings 5313 and 5314 at KNA, noting, "these may have functioned as much to keep the workers in as to keep intruders out." The more recent mapping of Building 5315 (Section 4.1.6) adds support to this interpretation. This building most likely served as a watch-post overlooking Wādī Nuqayb al-Asaymir. In addition to monitoring the northwestern approach to the site from Khirbat al-Nuḥās, this position would also have provided an excellent view of miners working at WAG 57 and 58.

Overall, the majority of infrastructure for controlling movement in the Faynān region is associated with periods of copper production. This is not surprising, of course, as copper production requires certain types of movement — particularly the movement of goods into and out of the production sites — to be facilitated and other types of movement to be restricted or at least monitored. It is likewise not surprising that pieces of the Classical period infrastructure continued to be used after Phaino ceased to be a center of copper production, as pilgrim traffic would likewise need to be facilitated, although not monitored to the same extent. The periods during which this infrastructure was active also seem to correspond to the periods of the most intensive sedentary settlement in the Faynān region, as well. The movement of pastoralists through the region, however, was more constant, and leaves different traces in the landscape. These will be discussed in more detail in the following section.

8.5. Pastoralism and Agriculture in Faynān

Theorizing Mobile Pastoralism in Southern Jordan

Archaeologists working in southern Jordan, particularly Thomas E. Levy, have argued that the long term history of the region is marked by a "nomadic imperative," meaning that over "the course of the past three millennia, the socioeconomic structure of nomadism has provided an important, if not special, adaptive advantage to life in this semi-arid and arid region of the southern Levant" (Levy 2009: 147; Levy, et al. 2014a: 66; see also LaBianca 2015: 1497; Levy 2004; Porter 2004b: 377-379). The ubiquity of campsites and other pastoral features in archaeological surveys of the Faynān region (e.g. Barker, et al. 2007; Ben-Yosef, et al. 2014a; Jones, et al. 2012; Knabb, et al. 2014; Levy, et al. 2003; Levy, et al. 2001; MacDonald 1992) would suggest that this is, indeed, the case. In much of Jordan, this is argued, following LaBianca (2006: 4; 1990), to be a cyclical phenomenon corresponding to changes in the "food system": periods of increased agricultural production tend also to be periods of increasing sedentarization and urbanization, whereas periods of increasing reliance on pastoralism tend also to be periods of increased mobility. LaBianca (1990: 41-42, 243; 2006: 6-9) relates this to the role of external (or "imperial") influences, arguing that periods of increasing imperial investment and interest tend also to be periods of increasing agricultural intensification, sedentarization, and urbanization, and vice versa. Similar cyclical patterns of sedentary settlement, it is worth noting, had already been suggested by Glueck (1935: 137-138), who also attributed them primarily to "political and economic factors,"[299] rather than environmental ones (see also Bartlett 1989: 62). LaBianca (1990: 243) makes the important point, however, that a shift from intensification and sedentism to pastoral nomadism should not be seen as collapse, but rather "a form of resistance . . . to the shortsighted and often exploitative undertakings of those at the center of sedentary power." In the language of resilience theory, agro-pastoralism and intensive agriculture may both be relatively stable "adaptive cycles," with agro-pastoralism "remembered" in the "reorganization" phase following the decline of imperial power, interest, investment, etc. (Redman 2005: 72-73). The "nomadic imperative," then, is not meant to imply that nomadism is somehow "timeless" and unchanging, but that it is a durable and effective strategy, and has been adopted, "remembered," and adapted by a variety of people in southern Jordan — and certainly beyond — over the course of several millennia.

As with most things, the distinction between nomads and villagers is not a set of binary categories, but more of a continuum (Khazanov 1994; McQuitty 2007b; Porter 2004a: 74; Rosen 2008: 118), and the Khaldūnian "notion that rise and fall of civilizations is to be understood in

[299] These factors are, however, rather different from the ones LaBianca has in mind. Glueck (1935: 137-138) suggested that sedentary settlement in the Negev would be quite possible, if only the population had "the courage, ability, and determination of its former [Byzantine period] inhabitants, other economic and political conditions being approximately equal." In fact, these "other economic and political conditions" are critical, as LaBianca (2006) argues.

terms of an opposition between nomad and sedentary" (Irwin 1997: 467) should be resisted here. Indeed, as Barth (1973: 12) argued, it is more productive to think of a distinction in "types of activity" rather than "groups of people." As LaBianca (2006: 9) notes, local traditions in Jordan were marked by "mixed agro-pastoralism" and "residential flexibility," in the sense that "one had to know how to live in a house, in a cave, or in a tent." This has several implications for Jordan, particularly in the Middle and Late Islamic periods.

First, to quote Alison McQuitty, "agriculture was and is practised from a tent" (McQuitty, et al. 1997: 183). McQuitty is here referring to the situation at 19th century AD Khirbat Fāris, where people lived in tents and used houses primarily for storage (McQuitty, et al. 1997: 183). In Faynān, however, there is also evidence that people who were primarily mobile pastoralists practiced agriculture to some extent, as demonstrated by a likely Middle-Late Islamic period agricultural terrace, WAJ 576, found in northern Wādī al-Jāriya (Jones, et al. 2012: 80-81). Evidence for a mixed agro-pastoral economy has also been found in the Iron Age in Wādī al-Fayḍ, to the south (Knabb, et al. 2015). Indeed, it seems to be the case that the Wādī al-Fayḍ communities emerged to avoid — or "escape" (LaBianca 1990: 243) — exploitation by the sedentary central power at Buṣayra (Knabb 2015: 277-283).

Second, it is clear that village-dwelling populations can also be mobile. Bethany Walker, drawing a term from studies of early modern Greece (e.g. Forbes 2007; Sutton 2000), refers to the "liquid landscapes" of Late Islamic northern Jordan (Walker 2014; Walker 2016; see also Walker 2011c; Walker 2013a). She identifies three ways in which villagers could be mobile: "normative mobility," i.e. movement to another place while maintaining connections to the original place, often with regular movement between the two, "limited mobility," i.e. forced population transfers, and "whole-scale mobility," i.e. a permanent move from one place to another (Walker 2014: 331-343). The distinction between the short-term moves implied by "mobility" vs. the permanent moves implied by "migration" is important to keep in mind (Walker 2014: 326), but the critical point here is that villagers could and often did make short-term moves to cope with disasters or respond to labor shortages (Walker 2011c: 161). Agriculture and pastoralism, and nomadism and sedentism, then, are not only complementary (see Banning 1986: 29-30; Barth 1956; Khazanov 2001: 15; Rosen and Avni 1993: 197),[300] but were also adopted to different degrees and at different times to address specific situations.

Pastoralists and the Population of Phaino

Anne Porter (2004a: 74), writing about the rather different context of Bronze Age Tall al-Banāt, argues, "We do not have a model for the ancient Near East as yet that shows firstly, how individuals may belong to one arena or the other, one arena *and* the other, without intrinsically altering their conception of themselves as pastoralist." She gives the example of an ʻAdwānī *shaykh* whose house in ʻAmmān had a *dīwān* divided into "Bedouin authentic" and "contemporary" halves (see Shyrock 1997: 53-55) as an example of how sedentary, and even urban, strategies may coincide with pastoral/nomadic identities, and how this may leave archaeological traces. This raises questions about the nature of pastoralism in Faynān, particularly during the Byzantine period, that cannot yet be answered. Certainly, as demonstrated by evidence from the Negev, pastoral nomads played a role — primarily as guides — in

[300] The complementarity of more nomadic and more sedentary groups should, of course, be kept in mind. Nucciotti and Pruno (2016: 319, n. 15), for example, have recently asked, "How could a building tradition be preserved in an area where, for instance, the Iron age funerary area of wadi Fidan, attests to an almost generalized nomadic lifestyle of local populations?" The question can be answered by pointing out that the mobile pastoralist groups of Wādī Fidān did not exist in isolation. Evidence from the burials themselves indicates some sort of contact with the Egyptian empire (Münger and Levy 2014), but beyond this, in the eastern part of Faynān, large-scale construction occurred in roughly the same period at Khirbat al-Nuḥās, and probably at Khirbat Faynān, as well. Beyond this, the focus on complementarity should not be taken to mean that there is no competition between groups that have adopted different strategies. Barth (1973: 17-18), for example, proposes a general model for the Middle East wherein primarily pastoral tribes and urban elites compete for power, with agricultural villagers caught in the middle. As with most systems, it should not be surprising that both conflict and complementarity are present.

pilgrimage and trade in the later Byzantine period (Rosen 2008: 128-129; Rosen and Avni 1993: 197). Haiman (1995), however, also identifies a "wave" of sedentarization in the northern Negev in the Late Byzantine period. The specifics of this model are, for the present argument, less important than the point that during the Late Byzantine and Early Islamic periods, the relationships and boundaries between sedentary and (semi)nomadic groups were shifting (see Jones, et al. 2017). Who, by the Late Byzantine period, made up Phaino's population? Isotopic studies of skeletal remains from the South Cemetery burials indicate that they were overwhelmingly "local" (Perry, et al. 2009; Perry, et al. 2011), but beyond this the composition of the population is unclear.[301] Certainly some of these people were descendants of people who had migrated, often unwillingly, to work in the mines, but it seems very likely that some were also the descendants of mobile pastoralists who settled at Phaino, and that they adopted a more pastoral lifestyle again as the settlement at Phaino "declined." How these people's identities intersected with other mobile pastoralist groups in the Faynān region during this period remains an open question.

The Ayyūbids in Southern Jordan and the Role of Tribal Relations

There is little doubt that Middle Islamic period mining in Faynān was a government-organized venture, and its connection to the Ayyūbids of al-Karak in particular will be explored in more detail in Section 9.4. While Faynān is not mentioned in any historical sources of this period (see Sections 1.5 and 3.6), historical sources detailing the political history of the Ayyūbid

[301] Perry, et al. (2009; 2011) take the British view (see Section 3.4) of settlement at Khirbat Faynān, and argue that their results indicate that Phaino was a locally-organized copper mining settlement in the Late Byzantine period. As I have argued (e.g. Sections 3.4, 8.1, and 8.2), copper production at Phaino is not likely to have continued past the end of the 5th century. As such, while the earlier burials may be contemporary with the latest phases of copper production — and mining may indeed have been locally organized for much of the 5th century — this is not true for all of them. The majority of the published inscriptions have been dated to the 6th century (see Section 3.4). The isotopic data itself is still quite important, but as I do not subscribe to the British view, I consider it less relevant to questions about the organization of mining and more relevant to broader questions about the nature of the population after the town ceased to be a center of copper production.

Levant and the nature of Ayyūbid administration (see Sections 3.6 and 9.4) greatly assist in exploring this connection. It is, by contrast, more difficult to reconstruct the ways in which pastoralists would have been involved in this process. Milwright (2006: 8-9) argues that the Ayyūbid *mihmandār*[302] of al-Karak mentioned by al-Maqrīzī "acted as a liaison between the ruler and the local bedouin, and would have been an important officer in regions where the tribes wielded considerable economic and military power," particularly during the reign of al-Mughīth 'Umar. Faynān, and indeed much of the south, would have been one of those regions. As argued in Section 8.2, already by the Fāṭimid period the south seems to have been mostly under tribal control. Historical sources indicate that this situation persisted during the Crusader period in Wādī Mūsā, and it is unclear how much authority the Franks exerted outside of the fortresses and the areas in Petra under their direct control. That the Ayyūbids would have faced the same situation is to be expected; indeed, Franz (2008: 137) argues that these areas were mostly under Bedouin control from the later 8th century until the reign of Baybars I.

The nature of this relationship, however, is not entirely clear. Certainly one benefit for the Ayyūbids would have been the relative safety of the mining settlements, and the ability to extract copper at all. It is possible that patterns of resource use also reflect negotiations between the Ayyūbids and local tribal groups. In particular, the declining use of acacia charcoal at Khirbat Faynān Area 15, and its relatively low use overall at both sites compared to plateau species (see Appendix 1), may reflect the influence of bedouin attitudes toward acacia and other desert plants, probably rooted in their importance to pastoral economies (Bailey and Danin 1981: 145). This has also been proposed as an explanation for charcoal provisioning strategies in the Iron Age in Faynān (Ben-Yosef and Levy 2014a: 900-902) and woodland management strategies,

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[302] The *mihmandār*, more generally, was a court official responsible for greeting "[l]esser dignitaries and diplomatic emissaries" (Stowasser 1984: 15).

particularly the preferential use of acacia deadwood, in southern Wādī ʻAraba during the Early Islamic period (Jones, et al. 2017). This is particularly likely considering ethnographic accounts, which indicate that pastoral nomadic groups are often key producers of charcoal (Horne 1982; Rabinowitz 1985). Indeed, Rabinowitz (1985) argues that charcoal production was one of the most important aspects of the 19th century Bedouin economy in Sinai. Some caution is necessary in interpreting these patterns, however. Hobbs (1989: 98-100, 109) records a prohibition on cutting down acacia trees for charcoal among the Khushmān of the Egyptian Eastern Desert in the late 20th century, when such trees were scarce in the region, but also points out that this scarcity was likely due to the same group over-harvesting the trees for charcoal in the early 20th century. Nonetheless, the pattern of charcoal use observed in Faynān may reflect a mutually beneficial scenario, where local pastoral nomads were paid for the charcoal necessary for producing copper, and at the same time were able to select the species used for fuel. It is reasonable to assume that local guides were also involved in locating the Wādī al-Salmīna ore sources, and may also have been involved in mining, ore crushing, or other types of metallurgical labor. The participation, documented by Mohammed (1973), of modern Sudanese pastoral nomads in seasonal cotton picking shows that this type of arrangement can be mutually beneficial and desirable. In addition to being paid for these services, local tribal groups would also likely have increased their political favor with the Ayyūbids of al-Karak and local officials in al-Shawbak.

Reuse of Earlier Structures

Although evidence of Late Byzantine and Early Islamic period settlement was found in several excavation areas at KHI, contemporary architecture was found only in Area L. It seems likely that, in the other areas, this phase consists primarily of the reuse of Early Bronze Age structures. This phenomenon was also observed at Rekhes Nafha 396 and 23 other Early Bronze Age sites in the Negev Highlands, where Saidel (2005: 254) suggests they were reused “most likely for animal husbandry.” A similar reuse seems to be the case at KHI, but likely connected to the farmhouse or road inn in Area L. The presence of Gaza Wares at KHI suggests a pattern of pastoral reuse as late as the 19th or 20th centuries AD.

It is worth noting here the presence of a small number of Late Byzantine and Early Islamic sherds at KNA. While some of these (e.g. R. 32812 and R. 41227) may be later types or types that continue to be used into the Middle Islamic Ic, others (R. 31018 and R. 32822) are certainly earlier. This may indicate short-term or pastoral occupations at the site during the Late Byzantine and Early Islamic periods. Considering this, it is interesting that the highest densities of sherds in the survey assemblage identified as potentially “early” were collected from the most eroded buildings at the site, e.g. 5304, 5308, and 5312 (see Section 4.1.6). It is possible, although by no means certain, that some of these features of the site may predate the primary Middle Islamic period occupation. The presence of relatively “fine” types and cooking wares does not rule out such a use, as these were also found in similar contexts at Rekhes Nafha 396 in the Negev Highlands (Saidel 2005: 246, Fig. 5).

More certainly, excavations demonstrated that several of the areas at KNA were reused by pastoralists following the primary Middle Islamic period occupation. This is most clearly demonstrated by the striking Stratum Z1 modifications to Area Z (Section 4.1.5), which seem to parallel 20th century modifications to the Roman fort at al-Lajjūn (Groot 1987: 308-309), ca. 17 km northeast of al-Karak. This was also evident in the more minor Stratum X1 modifications in Area X (Section 4.1.3), which consisted primarily of the addition of several shallow walls. Later reuse was clearly evident in the post-Stratum Y1 level in Area Y (Section 4.1.4), but this did not involved any modifications to the building identifiable during excavation, although the building clearly seems to have housed animals, perhaps quite recently, after its use in the Middle Islamic period.

Clean loci containing datable artifacts were, unfortunately, not found associated with these later phases, and because of this it is difficult to suggest a date for this phase of use. The discrepancy between the frequency of unpainted hand-made wares in the survey and excavated ceramic assemblages is, however, informative. The 2002 survey assemblage was 65% unpainted hand-made wares, and these wares made up 93% of all hand-made sherds found at the site (Jones, et al. 2012: 82). Hand-made wares of all types, by contrast, make up only 26% of the excavated assemblage from the 2011 and 2012 seasons. A possible explanation for this, and the most likely, is that some of the unpainted IHMW from the surface, previously published as late 12^{th}-13^{th} century, is probably later and associated with pastoral reuse of the site. Several surface collected "free-style" HMGPW sherds (R. 32813 and R. 38283) may suggest that pastoral reuse occurred already in the Middle Islamic IIb-c, although R. 32813 also has parallels dating to the Middle Islamic IIa. The fact that the surface assemblage contains a much higher proportion of unpainted IHMW, but is completely lacking in chibouks (tobacco pipes) — which appear in the Levant in the early Late Islamic IIa, or 17^{th} century (see Walker 2009a: 46) — and Gaza Ware — which may appear as early as the 18^{th} century (see Rosen and Goodfriend 1993) — may suggest a date in or around the Late Islamic Ib, or 16^{th} century AD, for much of the reuse of KNA. The mine tailings at WAJ 609, WAJ 613, and WAJ 626 are characterized by IHMW sherds in a somewhat coarser fabric, including sherds of unslipped, high "elephant-ear" handles (Jones, et al. 2012: 74-75), a type Walker (2017: 351) places in the 16^{th} century. These sites, too, seem to have been reused in the Late Islamic Ib, although the distinction in fabric between the sherds found at the Wādī al-Jāriya sites and those found at KNA may indicate some chronological difference.

Pastoralism and Agriculture over the Long Term

Surveys of the Faynān region (e.g. Barker, et al. 2007; Ben-Yosef, et al. 2014a; Jones, et al. 2012; Knabb, et al. 2014; Levy, et al. 2003; Levy, et al. 2001; MacDonald 1992) have revealed the presence of campsites and other pastoral features dating from at least the Early Bronze Age into the Late Islamic IIb-Modern period. These are present across the entire region, indicating that pastoralists, to some extent, lived in and moved through the region throughout most of its history, although not always evenly.[303] In the Iron Age, for example, campsites are limited primarily to the northeastern parts of Faynān, e.g. Wādī al-Jāriya (Knabb, et al. 2014: 594-597), although cemeteries (Beherec, et al. 2014) and other features (see Levy, et al. 2001) in the southwestern parts of Faynān were used by pastoral nomads. The best-documented period in terms of pastoral features is the Late Islamic II, as distinctive sherds of this period — in particular chibouks and Gaza Ware — are often found at campsites and other pastoral features, including storage features and animal pens (Jones, et al. 2012: 74-81). As sedentary settlement in Faynān is often initially driven by external investment and interest in copper production, it is not surprising that settlement patterns in the region reflect a primarily pastoral economy following the withdrawal of copper miners in the mid-13th century. Certainly the area was used by pastoral nomads during this period, and continued to be used afterward, but the nature of Middle and Late Islamic ceramics research (and the lack of excavation at campsites) makes it difficult to discuss these patterns until the appearance of more easily datable ceramic forms in the Late Islamic II.

[303] The exception to this is the Middle Bronze Age II-Late Bronze Age I, for which no evidence of settlement of any kind has been found in Faynān. The Persian and Early Hellenistic periods are, likewise, mostly absent, but the identification of residual sherds of these periods in Khirbat Faynān Area 16 indicates some continuity of settlement, although this is not yet well understood.

Agricultural features, by contrast, show more specific patterning. A Late Islamic terrace, WAJ 576, was found in northern Wādī al-Jāriya (Jones, et al. 2012: 80-81), and smaller agricultural and "garden" features were found in Wādī Fidān (Levy, et al. 2001). These features likely reflect a mixed agro-pastoralist economy, leaning more heavily toward pastoralism in Late Islamic Wādī al-Jāriya, and perhaps more toward agriculture in Roman-Early Islamic Wādī Fidān. The area around Khirbat Faynān, however, is covered by larger field systems, with the largest, WF4, covering more than 200 hectares (Newson, et al. 2007a: 143). Surface survey indicates that the systems were used from the Early Bronze Age until the Early Islamic period, with peaks coinciding, unsurprisingly, with peaks in settlement at Khirbat Faynān (Newson, et al. 2007a: 169-174). Of course, these systems show uneven use and evolution over time. Excavation in two of the smaller field systems, WF442 and WF443, indicates that they were used primarily during the Iron Age and Early Roman period, although the method used to date this activity — optically-stimulated luminescence (OSL) — does not allow for precise periods of use to be suggested (Knabb, et al. 2016: 97). Interestingly, phytolith analysis suggests that during these periods, these field systems were used for growing date palms as well as cereals, with the larger field systems probably being used primarily for cereal cultivation (Knabb, et al. 2016: 96, 98). Later small-scale cultivation of cereals, perhaps associated with mixed agro-pastoralism, was also evident, and it is likely that flocks of animals also grazed in these fields (Knabb, et al. 2016: 98). The overall pattern that emerges from comparing evidence for pastoral and agricultural features, then, is one in which intensive agriculture occurred primarily near Khirbat Faynān, and coincided with periods of more intensive settlement and, often, copper production. By contrast, a mixed agro-pastoralist economy is evident across the Faynān region, leaning more heavily toward sedentary agriculture in certain periods — e.g. the Roman-Early Islamic periods — and more heavily toward mobile pastoralism in others — e.g. the Late Islamic period.

Chapter 9: Conjunctures

This chapter considers the history of southern and central Jordan on what might be termed the chronological mesoscale, the *moyenne durée* of the *Annales* school. On this scale, the primary concern here is with political economy. This was addressed on longer timescales in the previous chapter, but here the focus is not on general trends and shifts, but rather the relationship between specific political and economic systems. In particular, this chapter addresses 1) the relationship between the Roman and Byzantine state and copper production at Phaino, focusing primarily on the withdrawal of state investment and the effects this had on the imperial *metallum*; 2) the effects of the Islamic Conquest on southern Jordan; 3) the Early Islamic period industrial settlements of southern Wādī ʻAraba, their relationship to the ʻAbbāsid Empire, and the causes of the system's decline; and 4) the relationship between sugar and copper production during the Ayyūbid period — one of the core arguments of this dissertation — and the ways in which this system was brought under Mamlūk control in the later 13th century.

9.1. The End of Roman Imperial Investment in Faynān

As discussed in Section 3.4, no consensus has yet been reached on when Phaino ceased to be an imperial *metallum*, and whether copper production ceased entirely or declined more gradually as this occurred. A variety of dates, ranging from the 4th to 7th century AD, have been proposed, some more plausible than others. As I have argued previously (Sections 3.4 and 8.2), based on currently available evidence, the most reasonable scenario seems to be a relatively slow decline through the 5th century, with copper production at the site coming to an end entirely at some point before 500.

Political and economic factors seem to have played at least some role here. As discussed in Section 8.2, in general settlement shifts in much of southern Jordan during the Byzantine period seem to have made the region more difficult to administer and more self-reliant, which in turn seems to have led to the withdrawal of imperial investment (Fiema 1992: 329-330). Likewise, the shifting of trade away from Petra toward Aila, on the one hand, and cities and towns to the north and east on the other, may also have affected Phaino. Certainly these shifts happened unevenly, but it is the case that both Phaino and Petra underwent major economic shifts during the Byzantine period.

The local environment and possible resource degradation must also be kept in mind, however. This is paralleled elsewhere in the Roman Empire. The large-scale copper and silver mines in southern Spain, for example, seem to have gone into decline due to the exhaustion of the more accessible deposits — and perhaps the charcoal sources — rather than broader political factors (Rothenberg and Blanco-Freijeiro 1981: 174-175). In Faynān, the reopening of Chalcolithic mines in Qalb Rātiya and other areas to the north of Khirbat Faynān, as well as, possibly, the opening of mines in the BDS (see Section 8.1) may be due to the exhaustion of the larger mines like Umm al-ʻAmad to the south. The relatively late date of Khirbat Rātiya suggests that these mines were opened later, and that the earlier southern mines were not able to meet the demand of the Late Roman and Early Byzantine industry at Phaino. While a larger charcoal assemblage from the period would be quite useful, the apparent reliance on local desert plants — particularly saxaul, but also white broom, acacia, and ephedra (Baierle, et al. 1989: 216, Tab. 24.1) — may not have been sustainable after several centuries.

These two explanations are not mutually exclusive, but instead would likely have been mutually reinforcing. As Petra became less important as a center of trade, the imperial government would have become less willing to invest in the copper industry at Phaino, particularly as it became increasingly difficult to maintain and less lucrative.

9.2. Southern Jordan and the Islamic Conquest

As I point out in Section 3.5, it is difficult to connect the Islamic conquest to Faynān, primarily because Phaino was not an important enough place by the 7th century to appear in the later narrative sources documenting these events. As the conquest and its effects are discussed in detail in Sections 3.5 and 8.2, only several points are necessary to expand here.

First, Fiema's (1992) economic model of the conquest of southern Jordan is worth considering here. He proposes that the apparent ease with which southern Jordan was conquered is related to the withdrawal of state investment and interest in the Late Byzantine period, primarily due to decreasing trade through the region. The Islamic conquest, in this model, may then be part of the same set of processes responsible for the end of copper production at Phaino. This model, of course, is not entirely complete, and must be understood as part of the larger argument set out in Sections 3.5 and 8.2. The conquest of Aila, for example, seems to have been related to the withdrawal of the state, but this is not necessarily indicative of declining trade. Aila's trade during this period seems, in fact, to have been quite active, but also oriented to the south. This is related to the processes that occurred at the same time in the central 'Araba and al-Sharāh plateau, particularly concerning shifting state interests, but the local manifestation of this was different in the southern 'Araba. Nonetheless, for the central 'Araba, Fiema's (1992) model remains reasonable, and explains the absence of Phaino and other nearby sites from historical accounts of the conquest.

It is also partly for this reason, as discussed in Section 3.4, that the "British view" of copper production at Phaino coming to an end with the Islamic conquest is untenable. On one hand, much of the evidence points to an earlier date for the end of the copper industry. On the other, there is little evidence that the Islamic conquest had much effect on Phaino. Certainly the historical sources, which do not mention Phaino at all, give little reason to suspect it would have. Beyond this, however, settlement clearly continued at the site into the 7th, 8th, and even 9th centuries, as demonstrated by ELRAP excavations in Area 18 (see Section 5.3.2). While the nature of this settlement is not entirely clear, owing to the small scale of excavations and the unfortunate fact that they were cut short, this was without doubt a sedentary occupation with clear — if, perhaps, not particularly strong — access to the Egyptian trade. It seems very likely, as discussed in Section 8.3, that the site was primarily a religious center, and perhaps a center of pilgrimage, during the 6th century, and given patterns in the rest of southern Jordan, this seems unlikely to have changed during the Early Islamic period, although a gradual decline, and perhaps a shift of the religious population to surrounding centers, is evident. Overall, the effect of the Islamic conquest on southern Jordan, particularly during the 7th century, seems to have been relatively minor.

9.3. The Economy of Early Islamic Southern Jordan

The economy of Early Islamic southern Jordan, with a particular focus on copper mining, has already been addressed in some detail in Sections 3.3, 3.5, and 8.2. In this section, I am concerned primarily with the political economic aspects of this industrial activity. Particularly, this section addresses the implications of the uncertainty surrounding the initial date of this industry's emergence and the specific combination of circumstances leading to its decline. This is certainly not a complete account of the economy of southern Jordan during the Early Islamic period, but rather a highly-focused one, and a number of interesting issues, e.g. the questions of monetarization raised in Section 7.1, cannot be adequately addressed here.

As noted already in Sections 3.5 and 8.2, the uncertainty surrounding the establishment of the southern ʻAraba mining industry is paralleled by debate about the much larger mines in the

Ḥijāz and Najd. These regions and mines should, of course, not be strictly equated with one another. The mines of the Ḥijāz and Najd are often bimetallic or trimetallic, where the mines of the southern ʻAraba were copper mines, essentially without exception. Because of this, particularly in the Ḥijāz, gold and silver were more economically important than copper. Nonetheless, copper was mined in the Ḥijāz and Najd, and specific copper production sites have been identified.

As discussed in Section 3.5, in the southern ʻAraba the chronological problem is primarily related to the discrepancy between radiocarbon dates from smelting sites, which suggest that the sites date from the 7th-11th centuries AD, and the much narrower dating suggested by ceramics from the same sites, which date primarily to the 8th and 9th centuries. These dates are also paralleled in debates about the mines of the Ḥijāz and Najd, although based there on different types of evidence. Heck (1999; 2003), as noted in Section 3.5, proposed that these mines were active already in the early 7th century, which is partially a response to Crone's (1987: 87-95) argument that pre-Islamic Meccan trade did not involve silver or gold.[304] He notes that radiocarbon dates from smelting sites in northwest Arabia suggest production primarily in the 10th-13th centuries — but also cites 7th-9th century radiocarbon dates —and that artifacts found at these sites generally date to the 9th-10th centuries, but relying on narrative sources, he arrives at earlier dates in the 7th-10th centuries (Heck 1999: 380-382). Power (2012a: 123-124), however, points to the generally ʻAbbāsid dating, and suggests that the mines and the Darb Zubayda are likely related. Because of the very limited nature of archaeological work on metallurgical sites in Saudi Arabia, it remains difficult to resolve this problem. The most recent work seems to be Al-Zahrani's (2014) excavations at mining sites in the region of al-Bāḥa in the

[304] It is worth noting, however, that Crone (1987: 94) acknowledges that gold was mined in Arabia during the Early Islamic period. Her broader thesis is that trade was not responsible for the emergence of Islam, a point beyond the scope of this discussion.

southern Ḥijāz. While he claims that production occurred from the 7th-12th centuries (Al-Zahrani 2014: 28), this seems to be based primarily on historical evidence, and it is not clear from the presentation of his results that the excavations produced evidence for this entire range. Nonetheless, it seems reasonable to assume that mining did occur in the 7th century in the Ḥijāz and Najd, and that this was expanded considerably by the ʻAbbāsids following the establishment of the Darb Zubayda.[305]

In the southern ʻAraba, as noted above, the situation is almost reversed. Narrative sources are essentially lacking concerning mining in the region, but archaeological work has been more intensive. Nonetheless, the minor discrepancy between the radiocarbon and pottery dating of the sites remains, even in recent excavations. As Jones, et al. (2017: 305) have recently suggested, comparison to Arabia suggests two possible answers. One possibility is that the ʻAbbāsid interest in the mineral resources of Arabia (see e.g. de Jesus, et al. 1982: 63), discussed in Section 3.5, extended to southern Wādī ʻAraba, as well, and that the smelting sites emerged primarily in the later 8th century. The second is that the southern ʻAraba industrial sites were active already in the 7th century, but perhaps still connected to investment in the *ḥajj* routes, in this case the Umayyad investment in the *Darb al-Ḥajj al-Shāmī* (see Petersen 1994: 48-49; Petersen 2012: 9). While either scenario is possible, and the dates from Khirbat al-Manāʻiyya unfortunately do not resolve this problem, an 8th century date, as I argue in Section 3.5, is more reasonable. This takes into account not only the currently available ceramic evidence (for the Khirbat al-Manāʻiyya ceramics, Jones, et al. 2017: 304, Fig. 9), but also, as Jones, et al. (2017: 304-305) suggest,

[305] Similar dating issues have also been noted for silver mines in Yemen (Peli and Téreygeol 2007: 196). While these have not yet been resolved, based on the results of excavations at al-Jabalī/al-Raḍrāḍ, a similar scenario seems likely. The mines were probably active already in the 7th century — and perhaps earlier, during the Sassanian period (Merkel, et al. 2016: 108) — and production expanded in the later 8th and 9th centuries. According to al-Hamdānī, the mines at al-Raḍrāḍ were abandoned toward the end of the 9th century, but radiocarbon evidence indicates that they were exploited again during the Middle Islamic period (Peli and Téreygeol 2007: 196).

possible bias from the “old wood” effect. Radiocarbon dates from smelting sites in the southern ‘Araba, including Khirbat al-Manā‘iyya, have generally been from wood charcoal samples. Consulting the recent table of southern ‘Araba radiocarbon dates compiled by Avner, et al. (2018: 155-157, Table 10.1), one finds that *all* of the dates presented for the Early Islamic period are from charcoal. In their analysis of Iron Age radiocarbon dates from Timna Site 30, Ben-Yosef, et al. (2012: 52-53, 63) found that charcoal samples could produce dates “up to 160 years” earlier than short-lived samples from the same contexts. The fact that the radiocarbon dates suggest an earlier date, then, is not surprising, and is likely related to the difficulty of obtaining short-lived samples from these sites. The late 8th-9th centuries also seem to be a period of expansion at Ayla, although it is also certainly the case that Ayla was an active port and manufacturing center in the 7th century (Damgaard and Jennings 2013: 483-484). It is therefore reasonable to assume that the industrial hinterland of Ayla is primarily associated with this expansion phase, potentially benefitting from the encouragement of the ‘Abbāsid Empire. While the late 9th and early 10th centuries remain difficult to identify at Ayla (Damgaard and Jennings 2013: 483-484), the port’s economy seems to have expanded through the 10th century (Whitcomb 2009). At least some of the southern ‘Araba industrial sites remained active into this period, as well, as suggested by the radiocarbon evidence.

A wide variety of events are discussed in Section 3.5 as possible contributors to the decline of this system. These include region-wide climatic events in the late 10th and 11th centuries, the Jarrāḥid rebellion in 1010 and political instability following this event, raids on Ayla by the Jarrāḥids in the 1020s, the earthquake of 1068, conflict between the Fāṭimids and Saljūqs in the later 11th century, and finally the Crusader conquest of Ayla in 1116. Ellenblum (2012) would attribute essentially all of these events to the episodes of cold affecting this period, and in particular the 11th century. While the Jarrāḥids appear mostly in the background of his book, named on maps but otherwise discussed only as nameless "Bedouin," the Saljūq incursions into Iran (Ellenblum 2012: 61-87) and a number of similar cases are attributed explicitly to these cold years. Given the region-wide nature of these changes, a decline in maritime trade can likely be added to the problems Ayla faced. Climate is an important factor, and is likely the root cause of much of the political instability and conflict that characterizes the 11th century. My goal here and in Section 3.5, however, is to understand the specific series of events that led to the decline of Ayla and its industrial hinterland, and perhaps more importantly to its reduced role during the 12th century and much of the 13th. Indeed, the Jarrāḥid focus, as far as settlement, on the plateau regions of al-Karak, al-Jibāl, and al-Sharāh seems to have influenced the Crusader interest in the same regions, and the Ayyūbid interest after them. While perhaps related to climate — the Negev became too dry to sustain its previous agricultural settlements (Ellenblum 2012: 6), as southern Wādī 'Araba likely did, as well, and the decrease in maritime trade may have made Ayla a less attractive place to settle — other factors also seem to have come into play, notably the *ḥajj* traffic passing through the plateau regions, which could be taxed, raided, or otherwise exploited, and which was protected by the Ayyūbids. All of these factors combined to shift southern Jordan's economy northward during the 11th and 12th centuries.

9.4. Sugar, Copper, and the Rise of al-Karak

One of the most critical points of this dissertation is the proposed connection between the Middle Islamic copper industry in Faynān, the sugar industry of the Jordan Valley *ghawr* and Dead Sea *aghwār*, and the autonomy of al-Karak within the Ayyūbid political system. The archaeology and history of this period have been summarized in considerable detail in Section 3.6 and its subsections, and I refer the reader there for additional detail. In this section, I present a synthetic argument for the connection between these three based on the theoretical, archaeological, and historical background presented in Sections 2.1 and 3.6 and the evidence from my research in Faynān presented in Chapters 4-7.

The suggestion that the Faynān copper industry was connected to the sugar industry was first advanced by Jones, et al. (2012), who made this argument primarily on the basis of their dating of surface collected material from KNA, which they placed primarily in the Middle Islamic IIa. The excavations at KNA and Khirbat Faynān confirmed this dating to a greater degree than anticipated. Prior to excavation in Khirbat Faynān Area 15, the coins published by Kind, et al. (2005) seemed to indicate that smelting at Khirbat Faynān occurred primarily in the 14th century. Hauptmann (2007: 103) and Newson, et al. (2007b: 364) discuss Middle Islamic period copper production at Khirbat Faynān primarily as a 14th century phenomenon, and I accepted that this was likely, hypothesizing that production either moved to Khirbat Faynān from KNA or that production was expanded from one center (KNA) to two (KNA and Khirbat Faynān) in the late 13th or early 14th century (Jones 2016: 122-124; Jones, et al. 2012: 88-89). Radiocarbon, ceramic, and coin evidence from the excavations at KNA, however, points exclusively to the 12th and 13th centuries, and particularly to the Middle Islamic IIa (see Sections 4.1, 6.1, and 7.1, and Table 4.1). More surprisingly, radiocarbon dates from Khirbat Faynān Area 15 demonstrate that production at the two sites was contemporary (see Section 4.2.1, Table 4.1). The increase in the percentage of Palestine oak at KNA Area Z from Phase Z2b to Phase Z2a likewise seems to be contemporary with the decrease over time of Palestine oak charcoal in the Khirbat Faynān Area 15 slag mound (see Appendix 1), with more desirable wood[306] being increasingly taken for iron production at KNA, providing additional evidence that both sites were

[306] Of the taxa considered by Marston (2009: 2195, Table 2) that are present in Faynān, *Quercus* is the most caloric by volume, although not by weight or per hectare (see Engel and Frey 1996).

active for essentially the same period. As the connection between copper and sugar was initially proposed on the basis of the timing of copper production in Faynān matching the growth of the sugar industry in the late 12th and 13th centuries, the excavations provide additional support for this claim. Other implications of this dating will be discussed below.

Direct evidence for a connection to the sugar industry unfortunately remains elusive. The small petrographic study conducted as part of this dissertation (Section 6.5) certainly suggests connections to al-Karak, among other sites to the north, but this proxy evidence is not definitive. The possible *qādūs* sherd found at Khirbat Faynān (see Section 6.2.2) is, likewise, suggestive of a connection, but the identification of this sherd is somewhat uncertain, and the presence of a single *qādūs* sherd does not necessitate a connection to the sugar industry, particularly as sugar was, without doubt, not being produced in Faynān. Lead-isotope sourcing remains attractive as a possible future direction, particularly given that *dast* fragments have recently been found in Ghawr al-Ṣāfī, solving the issue of sampling from museum quality complete objects (Konstantinos Politis, pers. comm.; for further discussion of future research possibilities, see Chapter 11).

The fact that copper production in Faynān took place exclusively during the Ayyūbid period demands at least some explanation. The initial dates for the Middle Islamic period industry in Faynān, discussed above, suggest a connection to the sugar industry, and certainly this explains the motivation for the establishment of the mines in Faynān. As Jones, et al. (2012: 95), following Coughenour (1976: 75), argued, this might also be related to attempts by the Catholic Church to ban European trade with Muslims, beginning with the Third Lateran Council in 1179, and extending into the early 14th century. It is not clear how often these bans were taken seriously, however, and the frequency with which they were repeated (and the fact that the

Pisans and Venetians made treaties with the Ayyūbids) suggests that they generally were not. Even when enforced, the key prohibitions were usually on trade in iron, arms, and wood. General prohibition of trade was rare, although this did occur. The Fourth Lateran Council of 1215, for example, banned all trade with Muslims for a period of four years (Schroeder 1937). It is possible that these prohibitions caused periodic disruptions in trade with Christian Europe, and that this played some role in the establishment of the Faynān copper industry, but the primary motivations were instead internal to the Ayyūbid polity.

The most plausible scenario for the emergence of the Faynān copper industry is one where the industry emerged during the period 1198-1218 AD, when al-Mu‘aẓẓam ‘Īsā ruled al-Karak and al-Shawbak jointly with al-‘Ādil I (who was, at first, *nā’ib* of Damascus, but later Sulṭān of Cairo; see Section 3.6). This is supported by the fact that the majority of coins found at KNA date to this period, while none are definitively earlier (see Section 7.1). Al-Mu‘aẓẓam ‘Īsā invested heavily in his holdings in the southern Levant during this period, and while it is likely that the majority of copper was used by the sugar industry, the motivation at this stage may not have been a scarcity of imported copper, but rather al-Mu‘aẓẓam ‘Īsā's interest in making the most of his southern *iqṭā‘āt*, where he was able to exercise more direct control. Whatever the specific reasons, certainly some combination of the prohibitions mentioned above, the continued presence of the Crusaders on the Levantine coast, political disputes within the Ayyūbid polity, and al-Mu‘aẓẓam ‘Īsā's interest in investing in al-Karak and al-Shawbak made it profitable to replace imported copper with local production to provision the sugar industry (see the theoretical background for this in Section 2.1). The addition of iron production, evident in Area Z at KNA, may relate to an increased need for iron during al-Mughīth ‘Umar's attempted raids on Egypt (see Section 3.6), but may also have been an earlier development, spurred much more locally by experimentation with the iron-rich ores of Wādī Nuqayb al-Asaymir. This process of import replacement was not only beneficial for the local economy, but for the *amrā'* of al-Karak, as well. The economic autonomy of this locally provisioned system also allowed for the increasing political autonomy of successive *amrā'* of al-Karak. This was without doubt also influenced by the political ambitions and preferences of local Karakīs, which continued even into the Mamlūk period, demonstrated most dramatically by the actions of locals in freeing Barqūq from prison during his exile in al-Karak between his first and second reigns in the late 14th century (Milwright 2008a: 45-46; Walker 2011b: 94). The end of al-Karak's autonomy from Cairo was not due to any economic failure of this system, but rather to the assassination of the last independent *amīr* of al-Karak, al-Mughīth 'Umar, and the subsequent institutional changes to the *iqṭā'* system during the early Mamlūk period.

While some idea of the revenues of the southern Levantine sugar industry during the Ayyūbid period would be useful in the context of this argument, this is difficult to calculate. Al-Yūnīnī gives the price of a *raṭl* of sugar in Damascus in 1300 AD as 20 dirhams (Guo 1998: I:160, II:121), which Ouerfelli (2008: 327) uses to calculate the value of a *qinṭār* as 270 dīnārs. These figures cannot be taken as indicative of prices during the Ayyūbid period, however, as al-Yūnīnī gives this price in the context of describing prices in Damascus as unusually high in that year. Considering he describes prices of all commodities as high, however, the value of sugar compared to other agricultural products may be more applicable to earlier periods. If his ratios are taken to be standard, sugar was worth twice as much per *raṭl* as honey (10 dirhams in 1300), more than three times as much as olives (six dirhams),[307] and four times as much as *dibs* (five

[307] The text actually says "*zayt*," or oil, but because oil is mentioned previously in the same section, Guo (1998: I:160, n. 317) suggests that the word should be read as "*zaytūn*," or olives. This is a sensible correction. In the text, oil is valued at 1 dirham for 2.5 *awqiyyāt* ("ounces") (Guo 1998: I:160, II:121). According to Eychenne (2013: 614),

dirhams) (Guo 1998: I:160, II:121). Certainly this indicates that sugar production was lucrative in comparison to other agricultural goods, yields being equal. It is likely, too, that yields were not equal. Al-Nuwayrī states that for Egypt, a *faddān* (0.637 ha) of sugar cane yielded 15-26 *qanāṭir jarwī*[308] — 1,450-2,418 kg — of raw sugar (Sato 2015: 46), which is ca. 2,275-3,795 kg/ha. While it is more difficult to find contemporary estimates for yields of other agricultural products, comparison to Roman and modern estimates for olive yields is informative. For Late Antique northern Syria, Van Limbergen (2015: 178) estimates yields of 575-2,875 kg/ha, depending on year (for similar estimates for the northern Mediterranean, see Goodchild 2007: 269, Table 6.6). Safrai (1994: 122) gives figures of 1,000-3,000 kg/ha for Palestinian villages in the 1950s, and argues that Roman production would have been closer to the lower end of this, ca. 1,300 kg/ha, with harvests every other year. As such, it seems that sugar was not only more valuable by volume, but likely also more efficient by area cultivated, although comparison to yields and prices of other cash crops (e.g. indigo and sesame) would be useful in the future, as well. The actual revenue of the industry, however, is very difficult to calculate, particularly given how few sugar factories have been excavated and published. Sato (2015: 28, 118) provides estimates from cadastral surveys cited in narrative sources for the amount of land in Upper Egypt on which sugar was grown (about 1,500 *fadādīn* in al-Fayyūm in the 13th and 14th centuries), but similar figures are difficult to obtain for the southern Levant. Estimates based on the number of sugar

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the 14th century Damascene *awqiyya* was 1/12 of a *raṭl*. Al-Yūnīnī's price of 1 dirham for 2.5 *awqiyyāt* of oil would, therefore, be the equivalent of 4.8 dirhams per *raṭl*.

[308] The *qinṭār jarwī* was the standard Egyptian unit of weight for measuring sugar. Sato (2015: 46) follows Hinz (1955: 25), who lists the weight of the *qinṭār jarwī* as 96.7 kg. Both Hinz (1955: 25) and Ashtor (1982: 473-474) provide alternate numbers based on Italian sources, however, many of which are slightly lower. I follow Sato's (2015: 46) estimates here, but this range of variation should be kept in mind. According to the lowest value listed by Ashtor (1982: 473), Sato's low-end estimate would instead be 1,355 kg per *faddān*, but most of the possible values provide numbers closer to Sato's. Note also, when comparing to al-Yūnīnī's prices from Damascus, that the Damascene *qinṭār* was heavier, weighing somewhere between 175 and 180 kg (Ashtor 1982: 476-477).

factories may be possible, but would require more research on the dating of sugar factories than has yet been conducted.

Even without this data, however, it is clear that sugar production was quite lucrative, and explains the motivation for establishing the Faynān copper industry. It would be reasonable to assume that when the Mamlūks conquered al-Karak in 1263 this industrial activity would have continued, as sugar production did. The fact that this is not the case indicates that a specific political-economic situation made copper production in Faynān an attractive prospect in the early 13th century, but not the late 13th century. The Church prohibitions on trade were repeated after the fall of Crusader Acre in 1291, and in the 1320s the Venetians likewise banned trade with Muslims, although these prohibitions, like the previous ones, seem to have been fairly commonly ignored (Ashtor 1983: 17-63; Jones, et al. 2012: 95). European copper, therefore, was likely no more (or no less) available in the Middle Islamic IIb-c than it had been in the Middle Islamic IIa. It seems to be the case, however, that as the *iqṭāʿāt* were broken up, the *iqṭāʿ* system reformed, and most of the lucrative sugar estates came under the control of the *sulṭān* of Cairo, the autonomy of the system was no longer a concern. In this case, European copper may have been cheaper than maintaining the production sites in Faynān. This may particularly have been the case as the ore (and perhaps even charcoal) sources that the Ayyūbid production system relied on were exhausted, as seems to have happened to the deposits exploited during the Iron Age and Roman period (see Sections 8.1 and 9.1). It may also be the case that, as many of the sugar factories were already established, the sugar industry's demand for copper decreased, as well. Nonetheless, the centralization under the Mamlūks should not be overlooked, a point explored in the following subsection.

9.4.1. The Coalescense of the Mamlūk State

I am certainly not the first to point out the historical difficulty archaeologists have had separating the Ayyūbid and Mamlūk periods, particularly on the basis of data from surveys (Walker 1999: 211). While work on dating this material, as noted previously (see Sections 3.6 and 3.6.1), is progressing, the inability to distinguish distinct periods continues to affect archaeological interpretations (see Section 1.3). The older "Ayyūbid-Mamlūk" terminology is no longer commonly used — in part because the key indicator of settlement in this period, Hand-Made Geometrically Painted Wares (HMGPW), likely predate the Ayyūbid period and certainly continued to be produced into the Ottoman period (see Section 6.1.3) — but has been replaced, out of necessity, with the more accurate but even more vague terms Middle Islamic and Middle-Late Islamic. Much recent work has also focused specifically on the Mamlūk period, both because its length allows for easier identification of specifically Mamlūk period ceramics and because many recent excavation projects have focused on this period in particular. Unfortunately, it remains the case that the period of Ayyūbid rule is either consciously or unconsciously lumped into the Mamlūk period, with the assumption that early Mamlūk administration in the southern Levant for the most part continued earlier Ayyūbid practices (see also Section 3.6.1). There was, of course, considerable continuity between the Middle Islamic IIa and IIb, but there were also administrative changes and reforms during the early years of Mamlūk rule that are important for understanding the transition between these periods.

It is not uncommon for archaeologists and historians to refer to the "Ayyūbid state" or even "Ayyūbid empire." There is a logic to this, as the Ayyūbid political system was spread out over Egypt, Syria, and Yemen, and was conceived of as a single system ruled, ostensibly, by the dynastic head. Michaudel's (2007) characterization of the polity as a "bipolar" empire, with its poles in Cairo and Damascus, is better, as it recognizes the competition between these two centers, but this still masks the considerable autonomy that could be exercised by rulers of regional centers. Clifford (2013: 46), in contrast, characterized the Ayyūbid polity not as a state, but rather a "chieftaincy." While "confederation" or perhaps even "weak state" might be better terms (see Derluguian and Earle 2010), this nonetheless emphasizes the rather decentralized nature of Ayyūbid authority and the autonomy of smaller regional centers. For Clifford (2013), the mid-13th century represents a period of centralization and Mamlūk state formation, beginning during the reign of the Ayyūbid sulṭān al-Ṣāliḥ Ayyūb (r. 1240-1249) and continuing into the early Mamlūk period, culminating with the reign of Baybars I. Clifford's (2013) arguments concerning the development of clientelism and principles of *niẓām* in the early Mamlūk state are summarized in Section 2.1, but here I instead consider the centralization of the Mamlūk state and the specific administrative changes that came with it in light of al-Karak's autonomy under al-Mughīth 'Umar.

As noted in Section 3.6, while al-Karak was the last of the autonomous Ayyūbid emirates to be brought under Mamlūk control, not all of the Ayyūbid emirates were placed under direct Mamlūk control in the same way. In parts of Syria, Ayyūbid *amrā'* became governors of their former holdings, particularly in Ḥamāh, which had Ayyūbid governors through much of the 14th century. This entailed swearing allegiance to the Mamlūks (Northrup 1998: 214), but nonetheless allowed certain Ayyūbid *amrā'* to maintain some degree of power. Al-Mughīth 'Umar, by contrast, was assassinated, and al-Karak brought under direct Mamlūk control. Certainly several factors are important in this distinction. Al-Karak, unlike Ḥimṣ and Ḥamāh, lies directly between the two "poles" of Ayyūbid power in Cairo and Damascus, and it controlled the Syrian *ḥajj* route, the importance of which is certainly emphasized by the events of the Crusader period.

Beyond this, there was, of course, the personal animosity Baybars may have bore toward al-Mughīth ʻUmar, described in Section 3.6. The key fact, however, seems to be the economic autonomy described in the previous section, which allowed for al-Karak's political autonomy. As Derluguian and Earle (2010: 72) argue, "states become possible only where and when bottlenecks on economic flows can be legitimately monopolized by the power elites who have realized the need and the possibility to become robust state elites." The success of the Mamlūk centralization of the Ayyūbid system may in fact have depended on bringing al-Karak, and with it the lucrative sugar estates of the Jordan Valley *ghawr* and Dead Sea *aghwār* under the direct control of Cairo. The success of al-Karak made it not only an attractive target, but also a necessary one.

With this is mind, the changes to the *iqṭāʻ* system in the later 13th century described in Section 3.6.1 were among the most important reforms in ensuring the durability of the Mamlūk state. This is not to downplay Clifford's (2013) assessment of the role of clientelism and *niẓām* in the early Mamlūk state. These certainly fall into general categories, e.g. "a new unifying identity", that Derluguian and Earle (2010: 52) identify as necessary for the success of states. The reforms made the *iqṭāʻ* a more effective instrument of clientelism, but equally importantly subverted attempts to secure autonomy. While an *amīr* could hope to amass political and economic power in a somewhat politically marginal location like al-Karak under the Ayyūbid *iqṭāʻ* system, this was not the case with the Mamlūk *iqṭāʻ*. The temporary nature of the Mamlūk *iqṭāʻ* and its incorporation into the broader system of clientelism helped ensure that power stayed centralized in Cairo. This centralization should, of course, not be taken in a totalizing sense. Walker (2013b: 314) has pointed out that the Mamlūk state seems to have been, based on the regionalism evident in material culture and texts, "more a fractured entity, socially and culturally, than a homogenous whole.” Nonetheless, the autonomy that the *amrā’* of al-Karak — and in particular al-Mughīth ‘Umar — were able to achieve during the Ayyūbid period did not emerge again until the later Ottoman period.

Chapter 10: Events

This chapter is concerned with the archaeology of Faynān at a fine scale — *événements*/events or *la courte durée* of the *Annales* school. As noted in Section 1.4, my definition of events differs both from Braudel (e.g. 1972) and Sewell (2005), in that events are conceived in this chapter neither as political minutiae nor short-term "happenings" resulting in major changes to social, economic, and political structures. Instead, this chapter explores what might be termed "quotidian events," or events on the scale of "lived lives" (see e.g. Hodder 2000). The excavations at KNA, because of the site's short occupation, present a unique opportunity to explore the history of the Faynān region at this rhythm, at least for the Middle Islamic period.

Three of the four sections of this chapter are focused primarily on KNA, both because excavations at the site produced the best evidence for events and because the events of the Ayyūbid period are most relevant to the overall argument of the dissertation. The first of these sections describes the event that can be discussed most clearly for KNA: the last day of work at the site. This draws primarily on the 2011 excavation of Area X, which revealed the state of the workshop on the day it was abandoned. The next section focuses on the process of copper production itself, beginning with reconstructions of the *chaîne opératoire* for copper production and behavioral chains for copper and charcoal, followed by a reconstruction of the Middle Islamic IIa copper production feature system. The last of these three sections uses data from all of the excavation areas at KNA to reconstruct several aspects of daily life at the site, including the status of the residents and how they spent their leisure time. The final section of the chapter moves from the Middle Islamic period copper industry to the Late Islamic burial at WFD 50a, and offers a tentative explanation of the unique Christian iconography on one of the associated grave goods.

10.1. The Last Day of Work at KNA

Relatively few artifacts were recovered from the 2011 excavations in Area X at KNA due to the fact that the building was cleaned out by the laborers at the site, apparently on a regular basis, and the material dumped onto the slag mounds outside the building (on this, see Section 4.1.3; Jones 2016). The positive side of this limited assemblage is that it provides evidence for a single event, the last day of work at the site. While Hodder (2000: 21) is correct in pointing out that all archaeological contexts are formed from the "traces" of often-mundane events, it is fairly rare to have such complete traces of a single event. In this section, I summarize the layout of the workshop based on the evidence from the excavations in 2011, and reconstruct several aspects of the last day of work at the site.

The Workshop

The layout of the workshop is presented in Figure 10.1, which provides a schematic illustration of the excavated square in Area X, with the location of key installations and artifacts marked. Several features are of particular note: the furnace itself (L. 120), the charcoal charges (L. 138 and L. 139), installations/possible working surfaces (L. 132 and L. 140), and the large mixed copper/iron object (B. 50015). The view of the layout and use of the workshop presented here is, of course, inherently limited by the fact that only the westernmost 3 m of Room 3 were excavated. While Room 2, as discussed briefly below, can be assumed to have served a similar function, other parts of the building — particularly the collapse between Rooms 1 and 4 and the "annex" in Room 5 — require additional information to discuss adequately. Nonetheless, a detailed, if not entirely complete, picture of the organization of the furnace area can be reconstructed from the excavated square.

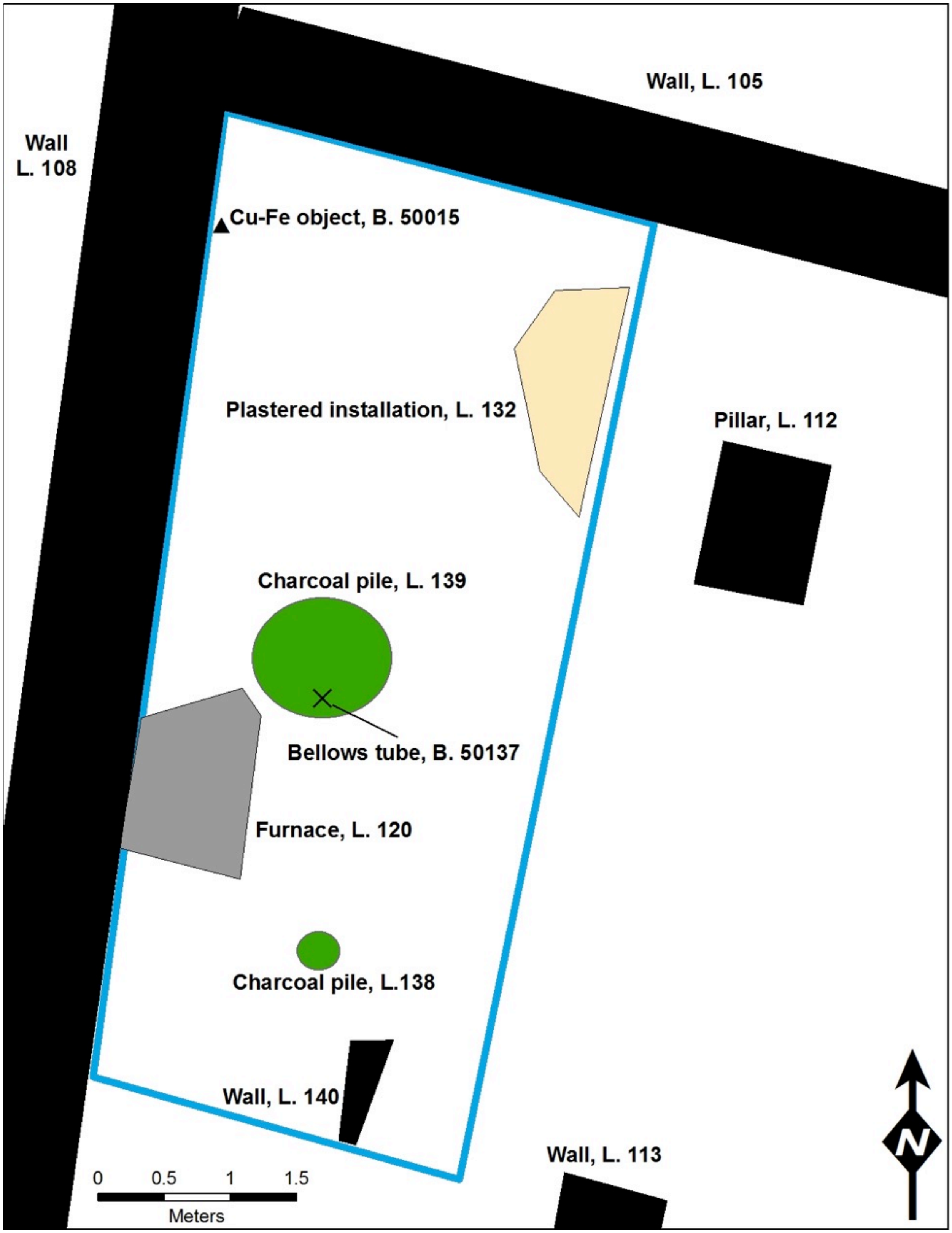

Figure 10.1: Schematic plan of key features recorded during the 2011 excavation in KNA Area X.

The key feature of the workshop is the smelting furnace (L. 120) abutting Wall 108, with its slag pit to the east in L. 125. A second pillar abutting Wall 108 in Room 2 (see Fig. 4.12) may be a second smelting furnace, as it resembles L. 120 prior to excavation. Preliminary Fourier-transform infrared spectroscopy (FTIR) analysis performed in the field by Lauren Hahn indicated the presence of clay in samples from L. 125, which may indicate that the slag pit was lined. Much of what was excavated from the slag pit seems to have eroded from the furnace, however, so this clay may also have come from the clay-rich red mortar joining the removable granite facing to the permanent portions of the furnace. An opening was found in the exterior of Wall 108 behind L. 120 (Fig. 10.2) and a partial, unfired clay bellows tube, B. 50137 (Fig. 10.3), was found on surface L. 131 in front of L. 120. Taken together, these indicate that the furnace was stoked by both manual bellows and wind, which generally blows eastward into the site through Wādī Nuqayb al-Asaymir.

Figure 10.2: Opening in exterior face of Wall 108, on the western side of KNA Area X, probably built as an air intake for Furnace 120. (Photo: Thomas E. Levy, courtesy UC San Diego LCAL.)

Two piles of charcoal were found to the northeast and southeast of the furnace, in L. 138 and L. 139. L. 139 was by far the larger of the two, containing hundreds of pieces of charcoal, as opposed to dozens in L. 138. L. 138 may, therefore, be charcoal dropped while being carried to L. 139, an "overflow" pile of extra charcoal, or the remnants of a larger pile, most of which had already been added to the furnace charge. The composition of the two piles is fairly similar. They are made up primarily of *Haloxylon persicum* (white saxaul), a desert plant that grows in the *awdiyya* surrounding KNA, with quite substantial quantities of *Quercus calliprinos* (Palestine oak). Smaller quantities of juniper, acacia, tamarisk, *Retama raetam* (white broom), pistachio, and Salicaceae (probably both poplar and willow) are present. Particularly surprising are three pieces identified as *Cercis siliquastrum*, or Judas Tree, which to my knowledge are the only examples of this species identified in any metallurgical context — or, indeed, any context — in Faynān[309]. The exact significance of this is not clear, and may simply represent opportunistic use of a tree near oak stands on the plateau. This assemblage is unique, in that it does not represent the charcoal used in a single phase, but rather the charcoal in use during a single smelt, demonstrating that a variety of highland and lowland species were in use at the same time. Excavation in the Area X slag mound would help determine whether a shift away from oak took place, as also seen in Khirbat Faynān Area 15 (see Section 9.4). This might also be useful in explaining the high amounts of white saxaul, which in Engel and Frey's (1996: 39) study provided "the least amount of wood per hectare." Where present in metallurgical contexts in Faynān, the species generally makes up a relatively low percentage of the charcoal assemblage, except in the Roman-Byzantine period Faynān 1 slag mound (Baierle, et al. 1989: 216, Tab. 24.1) and in Area X.

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[309] Analysis of the charcoal, as stated in Section 4.1.3, was performed by Dr. Brita Lorentzen of the Malcolm and Carolyn Wiener Laboratory for Aegean and Near Eastern Dendrochronology at Cornell University. For a fuller summary, see Appendix 1.

Figure 10.3: B. 50137, part of the unfired rear portion of a bellows tube, found on surface L. 131 in front of Furnace 120 in KNA Area X.

The absence of similarly large quantities of ore near the furnace suggests several possibilities. As the entire building was not excavated, it is possible that ore was stored farther from the furnace, in Rooms 1, 2, or 4. It may also be the case that ore was beneficiated near the mines in Wādī Nuqayb al-Asaymir, was perhaps further dressed and crushed near the tailing piles southwest of Area X (see Fig. 4.1; Jones, et al. 2012: 75, Fig. 4), and added to the furnace charge as available with charcoal from L. 138 and L. 139. Lastly, it is possible that the small amounts of ore recovered represent the remnants of a larger pile already added to the furnace charge, which may also explain the size of L. 138, as noted above. Completely excavating the furnace in the future would determine whether this is the case.

Two installations that may have been working surfaces were found in the excavated area. One, L. 140, is the end of a short wall uncovered in the southern extension of the square. It likely has an unexcavated portion extending past the southern boundary of the square. Its possible function is unclear, but its location indicates some connection to the smelting process. The presence of iron nails nearby in L. 136 may also suggest a structural function. The other, L. 132, is a surface or shallow basin lined with plaster. Unfortunately, only a small portion of the installation was found in the excavated square, and further excavation would be required to clarify its function. Glass shards found in the fill directly above the surface potentially indicate the presence of a small storage vessel or lamp, but the glass from the site has not yet been analyzed.

In the northwestern corner of the building, B. 50015 (Fig. 10.4), a lump of mixed copper and iron, was found on surface L. 117 (see Section 4.1.3). Its placement in the corner of the building, rather than on the slag mound outside, indicates that this was not being treated as waste material, but rather a usable intermediate product of the smelting process. Whether further processing, e.g. crushing, would have occurred in Area X prior to the object being taken to Area Z is not entirely clear, and this is another question that could potentially be answered by further excavation in Area X. This does indicate, however, that by the time of the final smelting operation at the site, an iron-rich copper ore was being used, probably with the goal of producing both metals.

Figure 10.4: Lump of mixed copper/iron (B. 50015) *in situ* in KNA Area X, resting on surface L. 117.

The Last Smelting Operation

Based on the evidence for how the workshop was set up at the time of the site's abandonment, it is possible to reconstruct several aspects of the last smelting operation conducted at KNA. It is unfortunately not possible, based on the excavated evidence, to determine the exact stage of the smelt at which Area X was abandoned. Nonetheless, several suggestions can be made based on the state of the workshop. The size disparity between the two charcoal piles might, as suggested above, indicate that the furnace had already been charged between the placement of the piles and the abandonment of the workshop. The fact that B. 50015 had been placed in the corner of the building likewise suggests that some smelting had occurred after the building had last been cleaned out. Copper slag, while not a common find in Area X, was nonetheless present. While certainly some residual slag would have been present in the workshop at any given time, taken together this evidence indicates that smelting had occurred since the last time the workshop was cleaned. Unfortunately, excavation of the slag pit itself did not clarify this issue, due to the quantity of material that had eroded from the furnace into the pit following the site's abandonment. Completely excavating and dismantling the furnace would, however, provide a fairly conclusive answer to this question. In addition to investigating the presence of a charcoal and ore charge, it would also be possible to determine whether the bluish-green cupriferous furnace "glaze" had developed on the removable facing (see Section 4.2.1), which would indicate whether the furnace had been used since the last time it had been refaced. This would be a worthwhile task for an additional season at the site, and would certainly answer the question of the stage of the smelt at which the workshop was abandoned.

The evidence from the workshop indicates more clearly, however, that the abandonment of the workshop was not planned. The ceramic and glass assemblages in Area X, which are both small and primarily made up of quite worn fragments, would not necessarily indicate this, but the state of the workshop suggests it is the case. The large piles of charcoal — containing over 1,000 fragments of charcoal in total, some of them rather large — would likely not have been found in the workshop if the smelters had not planned to continue their work. Certainly some extra charcoal may have been left behind in the case of a planned abandonment, but the amount present suggests that the workshop was still being provisioned with it. The fact that the furnace was found with its removable facing intact likewise suggests that additional work was planned. At Early Islamic period 'Arjā', in 'Omān, the replaceable clay furnace facings had to be reconstructed after every smelting operation (Weisgerber 1987: 155). While the Area X furnace is, as noted in Section 4.1.3.1, constructed using a slightly different technique, the presence of a likely replaceable granite facing again suggests that further smelting was planned in the workshop. B. 50015 follows the same pattern. It is likely, if production were being intentionally ceased due to a decline in the productivity of the mines or some similar factor, that all partially processed metal would have been refined first. In this case, one would not expect to find dozens of kilograms of partially processed copper and iron — between B. 50015 and related chunks found nearby — in the corner of the building. That these were set aside for further processing that never occurred indicates, again, that the site was abandoned quickly while work was ongoing. While it is possible that these may be waste products, the fact that they were placed in the corner of the building, rather than dumped on the slag mound outside, suggests otherwise. Even Hauptmann (2007: 126, 208), who expresses some skepticism that these indicate copper production and who thought these objects were "obviously waste material," admitted that the "several kilograms" he found on the surface during survey "might indicate further stages in the metal processing." Particularly in light of the excavations in Area Z, this is a more reasonable interpretation.

Based on all of this, it is likely that work at KNA was abandoned rather suddenly, rather than intentionally shut down based on decreasing yields, increasing costs, or both. It is not entirely clear why the site was abandoned, but several events in the early 1260s, toward the end of al-Mughīth ʻUmar's independent rule in al-Karak, might be suggested. Certainly the sudden arrest of al-Mughīth ʻUmar in 1263 and the passage of al-Karak into Mamlūk control (see Section 3.6) may have been the cause of this abandonment. Given the proximity of Faynān to al-Shawbak, the Ayyūbid administrators at the site would have heard of this event relatively quickly. It is also possible that the site was abandoned several years before in 1260, when the Mongols advanced into Jordan as far south as Wādī al-Mūjib. While they did not reach al-Karak, much less southern Jordan, it is possible that the site may nonetheless have been abandoned in favor of the relative safety of al-Shawbak, and not reoccupied during the uncertainty that followed. Likewise, it is possible that the site was abandoned due to a natural disaster and, perhaps for the reasons listed above (decreasing yields, increasing costs) not reoccupied afterward. The only potential earthquake of the later Ayyūbid period, however, is the possible Egyptian earthquake of 1262. Ambraseys (2009: 346) relates a reference by al-Qalqashandī[310] to an earthquake in 1262 that affected "Egypt and south Palestine," but argues that this is more likely a mistaken reference to the major Hellenic Arc earthquake of 1303, which affected much of the eastern Mediterranean (on this earthquake, see Ambraseys 2009: 355-362). Following al-Mughīth 'Umar's death, there are several additional possibilities. In 1284, an earthquake was felt in Damascus, and in 1287 another in Ṣafad (Ambraseys 2009: 351), although neither of these is likely to have caused major damage in southern Jordan. In 1293, however, a larger earthquake caused damage in al-Karak (Ambraseys 2009: 353). While this seems too late a date for the abandonment of KNA, given that most of the diagnostic material from the site suggests an early 13th century date, it is nonetheless possible that production continued until this point, and was not resumed afterward, as the administrative changes of the early Mamlūk period had made copper production in Faynān unnecessary. The earlier events seem likelier possibilities, however, and given the dating evidence from the excavations, I would suggest that the site's last day of work should be placed in the early 1260s. Of course, it is also possible that the site was abandoned due to local factors not recorded in narrative sources, which would be difficult to reconstruct. The destruction observed in Area A (see Section 4.1.1) — but not in other areas of the site — may

[310] Actually, the text says "Al-Qalanisi," but the title of the cited work indicates that al-Qalqashandī is meant. As Ibn al-Qalānisī died in the mid-12th century, his works mention neither of these earthquakes.

hint at a local conflict, but fires start for a variety of reasons, and without further excavation in Area A it is not possible to pinpoint the specific cause of this one.

10.2. Reconstructing Middle Islamic Period Processes of Copper Production

This section presents a reconstruction of the copper production system in Faynān during the Middle Islamic IIa using the theoretical approaches to production laid out in Section 2.2. I begin by reconstructing a partial *chaîne opératoire* for copper production, followed by more detailed behavioral chains for copper and charcoal. The section closes with a discussion of the Middle Islamic period mining feature system in Faynān.

Chains of the copper production process

The partial *chaîne opératoire* for copper production presented in Fig. 10.5 draws on a less complete *chaîne opératoire* presented in an earlier publication (Jones 2016: 120, Fig. 6.7) and a *chaîne opératoire* for Iron Age copper production reconstructed by Ben-Yosef (2010: 893, Fig. 9.7B; see also simplified version in Levy, et al. 2012a: 211, Fig. 21.11), with some additions, eliminations, and replacements as appropriate both for the different focus of this dissertation and the different processes in use during the Middle Islamic period. It begins with five separate activities: mining, charcoal production, clay gathering, temper gathering, and “bellows components” gathering. Ben-Yosef (2010: 893, Fig. 9.7B) lists the bellows components as “skin, ropes, etc.,” but at KNA evidence may point to bellows made of cloth, rather than skin (Jones 2016: 118). Other ways of arranging these early stages would be possible. Ben-Yosef (2010: 893, Fig. 9.7B), for example, divides the gathering of “furnace” and “refractory” clays into separate steps. Likewise, many of the steps presented here summarize more complicated processes, or processes not directly part of the copper production process. This is evident when comparing the behavioral chains for copper and charcoal (Tables 10.1 and 10.2) to the *chaîne opératoire* (on the distinction between the two, see Section 2.2).

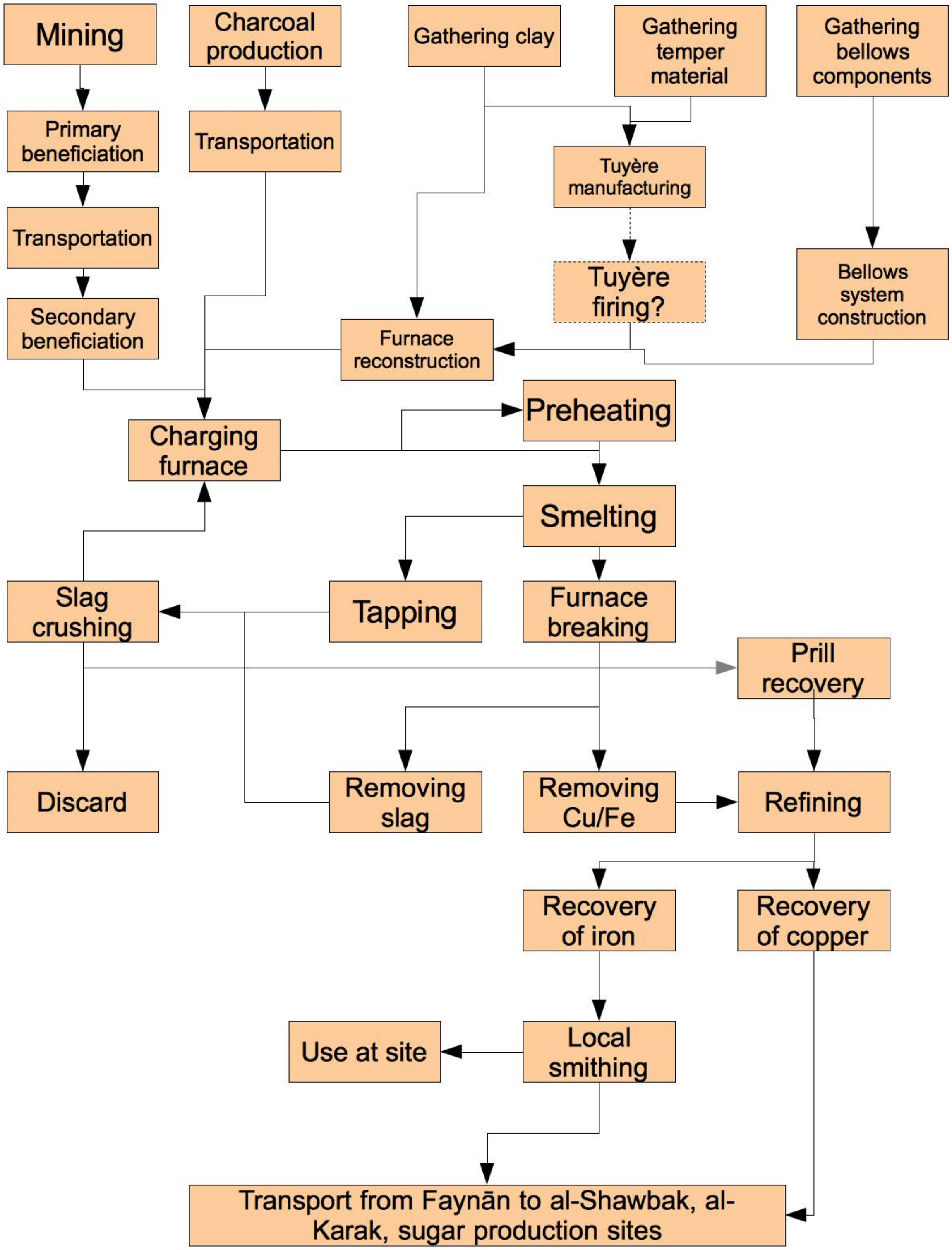

Figure 10.5: Partial *chaîne opératoire* for copper production.

Table 10.1: Behavioral chain for copper.

Activity	Energy sources (social units)	Energy sources (non-human)	Conjoined elements	Time and frequency	Location	Outputs	Additions	Deletions
Mining	Miners		Baskets; hammers/picks; lamps; ropes (Avner, et al. 2018; Weisgerber 1987)	Probably daily during production season	Mines, for KNA: primarily WAG 57 and WAG 58, for Khirbat Faynān, primarily mines in Wādī al-Salmīna	Waste rock		
Transporation	Miners		Baskets; ropes; windlasses (Avner, et al. 2018; Weisgerber 1987)	Probably daily during production season	From mine shafts to surface			
Primary beneficiation	Mine workers		Hammers; grinding implements	Probably daily during production season	Adjacent to mines	Tailings		Gangue
Transportation	Mine workers	Pack animals?	Baskets; ropes	Probably daily during production season	From mines to smelting sites			

Table 10.1: Behavioral chain for copper, continued.

Activity	Energy sources (social units)	Energy sources (non-human)	Conjoined elements	Time and frequency	Location	Outputs	Additions	Deletions
Secondary beneficiation	Mine workers		Hammers; grinding implements	Probably daily during production season	At KNA, near waste piles south of Area X (see also Hauptmann 2007), at Khirbat Faynān specific location unknown	Tailings		Gangue
Transportation	Mine workers		Baskets; ropes	Probably daily during production season	From secondary beneficiation areas to smelting locations, at KNA Area X, and at Khirbat Faynān Area 15 and Faynān 2			
Storage			Uncertain; possibly bins or other storage features	Uncertain, probably no longer than several days	Near furnaces			
Charging	Smelters		Charcoal; crushed slag(?); flux; furnace	Probably daily during production season	Smelting furnace	Spilled ore		

Table 10.1: Behavioral chain for copper, continued.

Activity	Energy sources (social units)	Energy sources (non-human)	Conjoined elements	Time and frequency	Location	Outputs	Additions	Deletions
Smelting	Bellows workers; smelters	Fire	Bellows; charcoal; flux; furnace	Probably daily during production season	Smelting furnace	Copper; Cu-Fe alloy; slag		Gangue; oxygen
Removal from furnace	Smelters		Hammers to break up furnace facing?	Following each smelting operation	Smelting furnace			
Storage				Unknown	Near smelting furnace; documented in northwest corner of KNA Area X			
Transportation	Site workers		Baskets; ropes; storage vessels(?)	Unknown	From smelting area to refining area, at KNA from Area X to Area Z	Spilled metal chunks and prills		
Refining	Metalworkers	Fire	Charcoal; prills recovered from crushed slag	Unknown, perhaps daily during production season	Refining areas, at KNA, Area Z	Copper; iron; slag		Impurities, including Fe (for Cu)

Table 10.1: Behavioral chain for copper, continued.

Activity	Energy sources (social units)	Energy sources (non-human)	Conjoined elements	Time and frequency	Location	Outputs	Additions	Deletions
Transportation	Administrators; traders	Pack animals	Baskets; ropes; storage vessels(?)	Unknown	From smelting sites to sugar production sites; possibly al-Shawbak or al-Karak in between			
Casting	Metalworkers	Fire	Charcoal; crucibles; molds	Unknown	Near sugar production sites	Cauldrons; possibly other copper/bronze objects	In vessels other than cauldrons, possibly lead, zinc, or tin (Craddock 1979; al-Saa'd 2000)	
Use in boiling	Sugar factory workers	Fire	Bagasse; cane juice; charcoal; clarifiers (gypsum, lime, potash?) (Jones 2017)	Probably daily or more often during sugar harvest; probably several months each year (Jones 2017)	In boiling rooms at sugar factories	—[311]		

[311] From the perspective of the sugar production process, the outputs include ash; industrial waste; *maḥlab* (Photos-Jones 2017; Sato 2015).

Table 10.1: Behavioral chain for copper, continued.

Activity	Energy sources (social units)	Energy sources (non-human)	Conjoined elements	Time and frequency	Location	Outputs	Additions	Deletions
Recycling	Coppersmiths	Fire	Additional scrap copper; charcoal; crucibles; furnace; molds	At end of vessel's use life	Coppersmithing workshops; likely many locations	Copper vessels/objects; slag?	Alloying metals; contaminants; trace minerals from other sources (Ponting 2008)	Trace elements lost to oxidation (Bray and Pollard 2012)
Discard		Water; wind; etc.	Sediment	Once, when/if object entered archaeological record	Unknown			

Table 10.2: Behavioral chain for charcoal.

Activity	Energy sources (social units)	Energy sources (non-human)	Conjoined elements	Time and frequency	Location	Outputs	Additions	Deletions
Harvesting	Bedouin?; other laborers		Adzes; axes; knives; saws?; other cutting tools?	Unknown, but production likely coincided with mining season	Multiple; desert species available throughout Faynān; juniper possibly from Wādī Ghuwayb al-Rawānī; *Salicaceae* and oleander from Wādī al-Ghuwayr; oak and similar species from plateau	Cut wood; wood chips; wood dust; pollen, etc.		Leaves; needles,
Pit charging	Bedouin?; other laborers		Pit lining; soil	Construction of the pit likely took one day, with the wood loaded after it was complete (Horne 1982)	Likely near place of harvest	Dropped pieces of wood		

Table 10.2: Behavioral chain for charcoal, continued.

Activity	Energy sources (social units)	Energy sources (non-human)	Conjoined elements	Time and frequency	Location	Outputs	Additions	Deletions
Carbonization	Bedouin?; other laborers	Fire		Between carbonization and waiting for the fire to go out, 2-6 days, depending on the size of the charge (Horne 1982)	Charcoal pit near place of harvest	Ash; charcoal (Braadbaart and Poole 2008)		Moisture; volatiles (Braadbaart and Poole 2008; Théry-Parisot, et al. 2010)
Removal	Bedouin?; other laborers		Bags; baskets; other vessels?	After fire had been extinguished	Charcoal pit near place of harvest	Dropped charcoal		
Transportation	Bedouin?; other laborers; traders	Pack animals	Bags; baskets; other vessels?; rope	Probably on a regular basis during mining season	From charcoal production sites to copper production sites; desert species were likely carbonized very close to smelting sites, while plateau species traveled over a long distance	Dropped charcoal		

Table 10.2: Behavioral chain for charcoal, continued.

Activity	Energy sources (social units)	Energy sources (non-human)	Conjoined elements	Time and frequency	Location	Outputs	Additions	Deletions
Storage			Bags; baskets; other vessels?; storage area	Unknown length of time between arrival at site and use in smelting/other metallurgical operation	Store room			
Transportation	Site workers; smelters?		Bags; baskets; other vessels?	Before each smelting/other metallurgical operation	From store room to smelting or refining building	Dropped charcoal		
Storage				Immediately before each smelting/other metallurgical operation	Near smelting furnace or other metallurgical installation (i.e. in piles, like Area X L. 138 and L. 139)			
Charging	Smelters		Copper ore; crushed slag?; flux; furnace	Probably daily during production season	Smelting furnace	Dropped charcoal		

Table 10.2: Behavioral chain for charcoal, continued.

Activity	Energy sources (social units)	Energy sources (non-human)	Conjoined elements	Time and frequency	Location	Outputs	Additions	Deletions
Smelting	Bellows workers; smelters	Fire	Bellows; copper ore; flux; furnace	Probably daily during production season	Smelting furnace	Ash; carbon monoxide		Carbon
Removal from furnace	Smelters		Hammers to break up furnace facing? Partially-processed metal and slag in which some unspent charcoal is embedded	Following each smelting operation	Smelting furnace			
Discard	Smelters		Ash; metal chunks; prills; slag; unsmelted ore`	Uncertain, perhaps following each smelting operation	From smelting furnace to slag mound	Dropped charcoal		

The steps on the left side of the figure, mining and charcoal production, were likely somewhat continuous processes during the copper production season, but the steps on the right may have occurred only at certain intervals. The rate at which tuyères were replaced is unclear in Middle Islamic Faynān. In earlier periods in Faynān, and also at Early Islamic 'Arjā', where the tuyère was placed in the removable facing of furnaces (Weisgerber 1987: 155), replacement was quite frequent, and possibly occurred with each smelting operation. The evidence from Middle Islamic Faynān, however, is less clear. While technical ceramics were fairly common in Khirbat Faynān Area 15, obvious tuyère fragments were noted less frequently in the field, with most concentrated in Stratum 15-4 (see Section 4.2.1). Conclusions about the nature of the refractory ceramic assemblage will be tentative, however, until a more detailed archaeometallurgical study of this material is conducted. While the slag mound at KNA Area X has not been excavated, only two tuyère fragments were collected at the site: one from the surface of the slag mound (B. 50118) and one from Building 5308 (R. 17677). As such, it is not clear from the frequency with which they have been found that they were replaced each time the furnace was used. Certainly the rear portions of the bellows system, which were not exposed to the heat of the furnace, would have been replaced less frequently.[312] While the rear portions of the bellows tube were unfired (see B. 50137, Fig. 10.3), the tuyères themselves likely were. This step, following Ben-Yosef (2010: 893, Fig. 9.7B), is presented as uncertain, as no installations for firing have been found. The preserved tuyères have clearly been fired, but as Tylecote (1981: 114-115) points out, this step is not strictly necessary for smelting tuyères. Rothenberg (1990: 49) and Ben-Yosef (2010: 704, 920) suggest that Iron Age tuyères were pre-fired in kilns, in which case those installations could be identified archaeologically. It is not clear why this should be the case, however,

[312] This, too, is information that would be included in a behavioral chain, but is difficult to represent visually in a reconstructed *chaîne opératoire.*

particularly as tuyères are coarse enough to be open fired (see e.g. Tite 2008: 219-220) and apparently were expected to need replacement regularly. If the tuyères were open fired, rather than kiln fired, it is unlikely that firing installations would be preserved, which perhaps explains their absence.

From these initial preparation steps, most of the following steps lead either to furnace reconstruction or furnace charging, which in fact likely took place several times over the course of a smelting operation. Once the furnace was fully reconstructed and charged, smelting would take place. Merkel (1990) has experimentally reconstructed the smelting process for ostensibly Late Bronze Age shaft furnaces at Timna, much of which is relevant here. The smelting step (and related steps) of the *chaîne opératoire* could likely be expanded into its own *chaîne opératoire*, and while a second *chaîne* is not presented, several additional steps are worth summarizing here. First, the furnace needed to be preheated, which may have been accomplished by charging the furnace with iron-rich slag or flux (Merkel 1990: 110). Following this, the furnace would be charged with charcoal, ore, and flux "until the tuyeres started to block with slag," at which point the slag was tapped and allowed to run out (Merkel 1990: 112), potentially along with some molten copper. Bamberger and Wincierz (1990: 133) suggest based on experimental results using "a technique described by Agricola" that multiple charging and tapping cycles could be conducted without rebuilding the furnace by allowing the copper and slag to run out together, but Merkel (1990: 112-113) points out that this complicates the smelting process, as slagging of the furnace walls changes the necessary flux-to-ore ratio. Nonetheless, it is quite possible that Middle Islamic smelters were aware of this and able to adjust accordingly in order to get multiple taps out of a single rebuilding operation. Following the smelting operation, the furnace front would be broken and the copper and furnace slag removed. Merkel (1990: 115) notes that in his smelting experiments, the copper produced was quite rich in iron, and required further refining, a familiar problem in the context of KNA Area X. The iron content was generally between 10 and 20%, but in experiments where the copper was "post-heated," this increased to more than 40% (Merkel 1990: 112, 115). While Merkel (1990: 115) considers it "unlikely that metallic iron could have been recovered easily from the refining process," he also suggests that this is possible under the right refining conditions. Given the presence of B. 50015 in Area X, a refining stage was certainly necessary to separate copper from iron, and the evidence for blacksmithing in Area Z seems to indicate either that both metals were recovered during this process or — although this is somewhat less likely — that in the later (Stratum Z2b) phase of the site's use, iron rather than copper was the intended product of smelting. Future analyses of the iron and iron slag may provide further insight into how this process worked.

Following the breaking of the furnace, the furnace slag would also be removed. At this point, the slag would also be crushed to recover copper prills and for use in the furnace charge as a flux, particularly, as noted above, during the preheating stage. Ben-Yosef's (2010: 893, Fig. 9.7B) *chaîne opératoire* also includes use of crushed slag as a temper in domestic and technical ceramics and as a building material. Crushed slag is, indeed, found as a temper in certain Iron Age hand-made ceramics (the so-called Negebite Ware) and technical ceramics, but the practice of slag tempering seems to be limited to this period (Al-Shorman 2009: 256-258; Martin and Finkelstein 2013; Smith and Levy 2008: 80-81; Smith and Levy 2014: 410). The refractory ceramics from KNA subjected to petrographic study (see Section 6.5.1) contained igneous rock inclusions that on macroscopic inspection can appear similar to slag, but no actual slag inclusions. Al-Shorman (2009: 259) points out that for the Roman period, temper for tuyères seems to have chosen more deliberately to withstand the higher furnace temperatures of this period, which were no doubt also approached or surpassed during the Middle Islamic period. He also notes, however, that Middle Islamic period iron tuyères from Mughārat al-Warda contain crushed hematite as temper largely for the same reason slag was used during the Iron Age — it was locally available — and this seems not to have negatively affected their refractory performance in furnaces reaching slightly higher temperatures (Al-Shorman 2009: 239, 259-260). Whatever the reason, slag was not used as a tempering material in the Middle Islamic period. Likewise, the use of crushed slag as a leveling fill was quite common in Iron Age II Faynān, particularly at Khirbat al-Nuḥās, where Stratum V consists of a crushed-slag leveling fill in virtually every area of the site, with the exceptions of Areas M and T (Levy, et al. 2014d: 92, Table 2.1). No fills of this type were found at KNA, and slag, crushed or otherwise, was not used as a building material. As such, following the removal of prills, any slag that was not used as flux would have been discarded on the slag mound.

Following the refining stage, copper — likely cast into ingots, although no molds or casting installations were found — would have been transported to sugar production sites, perhaps via al-Shawbak or al-Karak, and likely recast into *dusūt* there, although the exact locations where *dusūt* were cast are not presently known. Certainly copper-working occurred near sugar production sites, as demonstrated by a possible early Mamlūk period copper-working installation at Khirbat al-Shaykh ʻĪsā (Politis, et al. 2007: 206-207), by Tall al-Nuḥās near Ṭawāḥīn al-Sukkar in Jericho, where "[c]onsiderable amounts of copper slag" were evidently found (Taha 2001: 69), and beyond the Ayyūbid sphere at Lower Ḥorbat Manot (Stern 2001: 287) and Kouklia-*Stavros* (von Wartburg and Maier 1991: 260). While I argue that the bulk of the copper produced in Faynān was used in the production of *dusūt*, it is probable that at least some was also used in the production of other objects. For these, the copper may have been alloyed with other metals, particularly lead, zinc, and tin. Tin bronzes were relatively uncommon during the Islamic periods, and instead the most likely combinations are brass and leaded copper (or copper alloys) known in Latin as *caldarium*,[313] including quaternary Cu-Pb-Sn-Zn alloys (al-Saa'd 2000; Craddock 1979). Lead was generally added to copper or copper alloys when cast, as copper-lead alloys have lower melting points and are more fluid than those without lead (Craddock 1979: 75). Despite being cast, it is unlikely that copper used in *dusūt* was alloyed, however.[314] As Jones, et al. (2012: 93-94) argue, copper would have had advantages over alloys in the sugar production process — due both to its more even distribution of heat and "properties affecting coagulation of impurities" in sugar (Meniketti 2006: 62) — and one motivation of opening the mines in Faynān may indeed have been the unsuitability of recycled copper due to concerns about impurities. At least some iron was smithed at KNA, and some of the tools produced were used at the site. It is not certain whether some of this was also transported from Faynān to the plateau, but this seems likely, particularly if iron production increased in the mid-13th century for use in arms.

The behavioral chains for copper and charcoal (Tables 10.1 and 10.2) demonstrate the additional level of detail this approach provides. In addition to a more complete list of steps that each material went through, the behavioral chains provide information about how and when each step was accomplished and what it produced. While individual behavioral chains could, and eventually should, be produced for each type of material involved in the process of copper

[313] As suggested by their name, these alloys were also common during the Roman period. A Roman period installation used in the casting of this alloy has been identified at Tel Dor through archaeometallurgical analysis (Eliyahu-Behar, et al. 2009). They have a much longer history than this, however. Their origins should perhaps be placed in the Aegean, where intentional copper-lead alloys are found already in the Early Bronze Age (Mangou and Ioannou 1997: 69).

[314] A recent (and unpublished) chemical analysis of a possible *dast* from Khirbat al-Minya suggests this may not be the case, however. This vessel is made of a quaternary *caldarium* (K. Cytryn-Silverman, pers. comm.). A vessel made of the same metal was also found at Lower Ḥorbat Manot (Stern 2001: 287).

production, chains for copper and charcoal are presented here, as these materials are the most critical for the arguments presented in this dissertation.

Copper production feature systems

The features from which the tentative 13th century copper production feature system presented here have been reconstructed are shown on the map in Fig. 10.6. The key features are, of course, the major smelting settlements, KNA and Khirbat Faynān. Both of these sites can be further broken up into features that each played a different role in the feature system. At KNA, this is relatively straightforward, as most, if not all, of the mapped features are contemporary with Middle Islamic period smelting at the site (see Fig. 4.1). Smelting itself occurred in Area X, with smelting waste dumped on the slag mounds outside the building's western entrance. Secondary ore processing/beneficiation occurred at several small features to the south of this building, where there also seems to have been a small, open-air mosque or *muṣallā*. The function of Area X Room 5 is still unknown, but it likely served a function related to metallurgy, and Hauptmann's (2007: 126-127) suggestion that the building may have housed a mineshaft cannot be entirely ruled out (see Section 4.1.3 and Fig. 4.12). In a later phase, refining and smithing activities took place in Area Z. Cooking (and dining) took place in Area Z in the site's early phase, and later in Area D. Area Y may have served as an animal pen — perhaps a chicken house (see e.g. Banning and Köhler-Rollefson 1986: 162) — although it is difficult to determine whether the building served this function during the Middle Islamic IIa, or only during a later phase of pastoral reuse (what could be called site-wide Stratum I). Although the excavation produced only a limited amount of material, a domestic function still seems likely for Area A, and this is likely also the case for Buildings 5301 and 5302, to the north of the wādī. Buildings 5311-5315 all seem, on the basis of their locations, to be related to surveillance of various operations and the approaches to the site, and the same can probably be said for Building 5309. Building 5304's function is still uncertain, but a connection to charcoal production is possible.

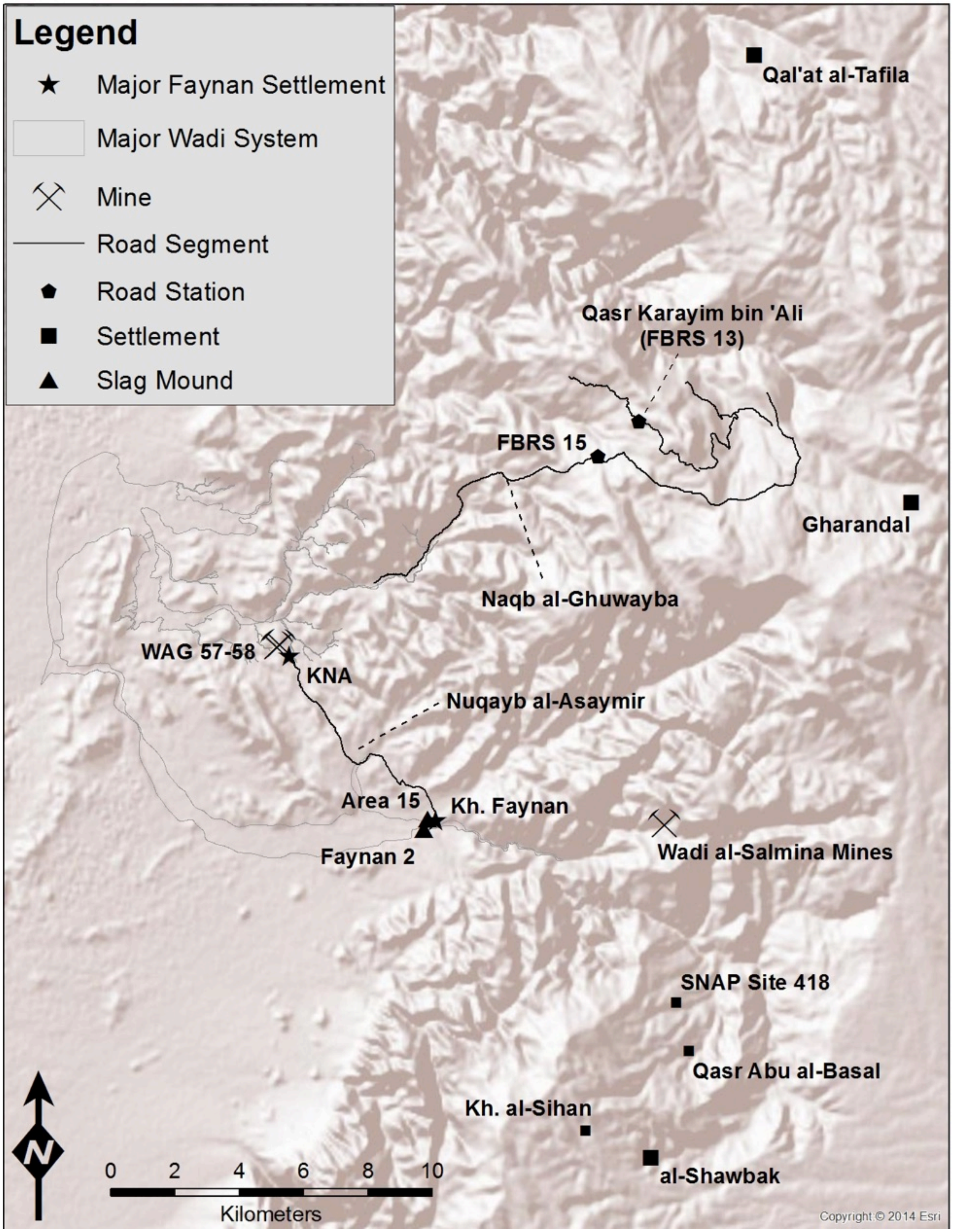

Figure 10.6: Map of sites and features making up the Middle Islamic IIa copper production feature system in and around Faynān. (Basemap: © 2014 Esri.)

At Khirbat Faynān, these features are not as easy to identify due to the site's longer history of settlement (see Fig. 4.40). Two slag mounds — Faynān 2 and Area 15 — can be definitively attributed to the Middle Islamic period. Smelting must have occurred nearby, but unlike KNA, furnaces have not yet been identified at the site. A number of ore processing installations were identified by the WFLS (Sites WF158, WF492, WF605, WF1510, and WF1511), but Middle Islamic sherds were not collected at any of them (Mattingly, et al. 2007a: 552, 589, 609, 729). King, et al. (1989: 203-204, 210-211) collected sherds that they identified as dating to the Mamlūk period from several areas of Khirbat Faynān, as well as from Tall al-Mirād, ca. 3 km to the southwest, but it is unclear if or how these areas may have been related to copper smelting, or if they are associated with the Middle Islamic IIc activity at Khirbat Faynān.

The mines for both sites have been identified, although other ore sources may have been used. At KNA, WAG 57 and 58 (see Section 5.1.1), several hundred meters northwest of Area X in Wādī Nuqayb al-Asaymir, were the key ore sources. For Khirbat Faynān, the more distant Wādī al-Salmīna mines (see Section 5.1.2) seem to have been the primary sources. Charcoal would have been sourced from the plateau (the area around al-Shawbak, Gharandal, and Qal'at al-Ṭafīla), the lowlands around the smelting sites, and the *awdiyya* in between (e.g. Wādī al-Ghuwayb, Wādī Ḍānā, and Wādī al-Ghuwayr). The exact locations of charcoal production (with the possible exception of KNA Building 5314) are, however, unknown. Clay sources for technical ceramics, as discussed in Section 6.5.1, would have been local to the Wādī 'Araba region, and likely to Faynān, but the specific sources (and the features where tuyères were fired) are unknown.

Water for KNA would perhaps have been sourced from 'Ayn al-Ghuwayba, ca. 3.25 km to the northeast, now the closest perennial spring to the site. Due to variations in the water table, however, there may have been water closer to the site during the Middle Islamic period. Levy, et al. (2014a: 28-29) point out that, when Glueck (1935: 29) visited Khirbat al-Nuḥās in 1934, he mentioned a small spring across from that site on the northern bank of Wādī al-Ghuwayb, which was no longer there when the JHF/ELRAP team began investigating the site. An Iron Age well was excavated near Khirbat al-Nuḥās in 2002, and this suggests that the water table was higher in this period than now (Levy, et al. 2014a: 28-29). While wells have not been found near KNA, it is possible that the water table was also higher than present during the Middle Islamic period, and sources closer than ʻAyn al-Ghuwayba were in use. Khirbat Faynān would have relied on water from ʻAyn al-Ghuwayr. Today, water from this spring can be seen in the lower reaches of Wādī al-Ghuwayr (see Fig. 3.4), and it is possible that during the Middle Islamic period, the Roman aqueduct would have been functional, bringing water to the reservoir ca. 50 m southeast of Faynān 2 (see Fig. 4.40; Mattingly, et al. 2007b: 318). The Byzantine cistern in Area 18 (see Section 5.3.2) — and there are potentially others at the site — may have provided another source of water, assuming it was still functional. The presence of this preexisting infrastructure for water collection at Khirbat Faynān may explain why this location was chosen for smelting, rather than somewhere closer to Wādī al-Salmīna.

Within the Faynān region, several roads would have been critical to the production system. The first is Nuqayb al-Asaymir, the road connecting KNA to Khirbat Faynān. A somewhat hypothetical reconstruction is presented in Fig. 10.6, working from portions that are preserved and visible on satellite photographs today. Although the portion near Rā’s al-Naqb was not passable by truck during a visit in 2012, this is the route Glueck (1935: 32) took from KNA to Khirbat Faynān in 1934, a trip he describes as taking a little over two hours. The two sites would, without doubt, have been connected by this road during the Middle Islamic period. The second would have been through Wādī al-Ghuwayr, which also would have connected Khirbat Faynān to al-Shawbak (Friedman 2008: 117). Ore must have been brought to Khirbat Faynān from the mines in Wādī al-Salmīna along this road.

The Shawbak North Archaeological Project (SNAP) has surveyed the area of the plateau between the high, eastern portions of Wādī al-Ghuwayr and al-Shawbak and found evidence for Middle Islamic period settlement in this region (see also Fujii, et al. 2012; Fujii, et al. 2013; Yamafuji, et al. 2015).[315] Many of these sites (e.g. Sites 408-410, 412, 415-417) are in cultivated areas, and consist primarily of sherd concentrations in fields (Yamafuji, et al. 2015: 74-76, 78-80). Architectural remains were found at a number of sites, however, including Site 418 (04055) and Qaṣr Abū al-Baṣal (Site 433/04040), a site along Wādī al-Bustān apparently described by Glueck (1935: 94) as a Nabataean tower, but also containing the standing remains of a Late Islamic village and Middle Islamic period sherds (Yamafuji, et al. 2015: 80). Whether sites like this one and Khirbat al-Ṣiḥān (Site 713/07008), with standing Late Islamic period remains (Yamafuji, et al. 2015: 151-152; see also Glueck 1935: 89; Hart and Falkner 1985: 270, no. 105), would have been villages in the Middle Islamic period — and the degree to which they may have been involved in the movement of copper, charcoal, etc. between Faynān and the plateau — is presently unclear.

[315] Glazed sherds have been published from only two of the SNAP sites, Sites 503 and 504 (Yamafuji, et al. 2015: 98, Fig. 2.138, 99, 102, Fig. 2.141, 105). A glazed sherd was also mentioned as having been found at Khirbat al-Ṣiḥān (Site 713/07008), but was not illustrated or described in any report (Fujii, et al. 2012: 168). The glazed sherds — essentially all monochrome glazed — are all dated by the team to the Late Islamic period, by which they mean Ottoman (Yamafuji, et al. 2015: 5, Table 1.1). Parallels for these sherds are not provided, nor is the rationale for their dating explained (likewise, photographs or more detailed descriptions of the glaze would be useful, but are not provided). It is remarkable — particularly for southern Jordan — that six Ottoman glazed sherds would be found, but this may be explained by the proximity of the sites to Qalʿat al-Shawbak. Nonetheless, it is surprising that this is the case when Middle Islamic period glazed sherds were not collected from any site. Certain forms would seem to suggest an earlier date (e.g. Yamafuji, et al. 2015: 102, Fig. 2.141.56), but I have not seen these sherds in person and the forms are fairly simple.

Site 504, ca. 1 km east of Qalʿat al-Shawbak, is particularly interesting, as both glazed pottery and slag — identified by the surveyors as iron slag — were collected there (Yamafuji, et al. 2015: 100). Sherds dated to the Early Bronze Age III, Iron Age II, Nabataean, Roman, Byzantine, and Late Islamic periods were collected at the site, however, and it is unclear which of these periods the slag is associated with (Yamafuji, et al. 2015: 97).

The other external route would have been Naqb al-Ghuwayba, which would have linked KNA to sites on the plateau near Gharandal and al-Ṭafīla. The presence of a glazed, turquoise stonepaste sherd at FBRS 15, a watchtower on this road, indicates that it was in use during this period, and likely shows a connection to KNA (see Section 5.2.4). The dating of Qaṣr Karayim bin ʻAlī (FBRS 13) is less certain, but that site may also be connected to this travel, particularly if it is to be identified as an inn or defensive structure, rather than a farmhouse (see Section 5.2.3).

The Middle Islamic copper production feature system, then, is made up of features located primarily in the eastern lowlands of Faynān and the *awdiyya* between the lowlands and the plateau. The western plateau was a source of charcoal and also the initial destination for copper leaving Faynān. The western lowlands of Faynān do not, however, seem to have been part of this feature system. Settlement is evident in this part of Faynān during the Middle Islamic period, but none of the documented features are clearly connected to copper production. If copper was transported primarily via the plateau, and not through Wādī ʻAraba, it makes sense that the features making up the copper production feature system would be concentrated primarily in areas of Faynān closer to the plateau. This may also constrain the potential sources of raw materials for technical ceramics suggested in Section 6.5.1. On the other hand, it is possible that western Faynān was part of the feature system in ways that are more difficult to recognize, e.g. the production of charcoal from desert species, provisioning of meat from pastoralists, etc. It seems reasonable, in any case, to suggest that Ayyūbid investment in Faynān was concentrated in an area to the east of a line drawn between WAG 57 and Jabal Zurayq al-Muraḍ (see Fig. 3.2), and that if areas farther to the west were part of the copper production feature system, this was primarily through the involvement of local pastoralist groups, as discussed in Section 8.5.

10.3. Daily Life in Mining Settlements

The Status of the Residents

The status of the various residents of KNA and Khirbat Faynān during the Middle Islamic IIa is difficult to determine at the present stage of work, but is an important question. The presence of individuals of high-status at KNA is demonstrated by the presence of imported stonepaste wares (see Sections 6.1.1 and 6.6). It can perhaps be assumed that these wares belonged to KNA's administrators, and the absence of these wares at Khirbat Faynān — although possibly an artifact of the limited excavation that has been conducted there — may indicate that smelting there was administered from KNA.

It is possible that some of the mining workforce in Faynān may have been made up of Crusader prisoners of war. The use of prisoners of war and "condemned criminals" as labor has been suggested for Late Byzantine (i.e. 14th-15th century AD) iron smelting in Macedonia (Nerantzis 2009: 29). Thietmar, one of the few medieval pilgrims to visit the area south of the Dead Sea (see Section 3.6), described "captive French, English and Latins" working as "fishermen of the sultan of Babylon" on Jazīrat al-Fara'ūn in 1217 AD (Pringle 2012: 121). Likewise, Ludolf von Sudheim (1895: 117-118), visiting the area around Jabal al-Sudūm (Mount Sodom) in the mid-14th century, records an encounter with Templar prisoners of war who had apparently been captured at the siege of Acre in 1291, and since then "sawed wood here and there in the mountains for the Soldan's service." It is certainly possible that prisoners of war would also have been sent to Faynān as miners or to do other labor. Regardless of their exact identity, miners can perhaps be assumed to have been of lower status than smelters.

The status of smelters is somewhat uncertain. Archaeological work on earlier periods and ethnographic accounts indicate that smelters were often accorded a relatively high status, and the process of smelting itself associated with magic (Ben-Yosef 2016; Budd and Taylor 1995; Sapir-Hen and Ben-Yosef 2014). Nonetheless, this does not seem to be universal. Nerantzis (2009) has argued that 14th-15th century AD smelters in Macedonia would have been of relatively low social status, but this argument is specific to conceptions of labor and "profane activities" in Late Byzantine society. As discussed in Section 6.6, craftsmen were not among the elite of Middle Islamic society unless they were also scholars, but they could certainly be among the ranks of respectable commoners. While goldsmiths were "subordinate" due to the "usurious" nature of trade in that metal (Lapidus 1967: 83), the status of those working with copper may have been slightly higher.

It is reasonable, then, to propose that the residents of KNA belonged to three distinct social strata. The administrators were the highest, and likely belonged to the Ayyūbid elite. Next were the smelters, who may have been relatively high-status commoners. The other laborers at the site, and particularly the miners, were the lowest, and this group may have included Crusader prisoners of war or perhaps slaves (see Section 3.3).

Architecture at KNA

Construction techniques at KNA are fairly haphazard in all buildings except Area X, and even here the architecture should be described as functional, made of material available at the site with little embellishment (see Section 4.1). This is, of course, consistent with the site's nature as an industrial settlement. It was not necessary to invest much in construction at a site that would only be seasonally occupied, and whose main purpose was copper mining and production. The fact that the most attention was paid to the construction of Area X is consistent with this, as the furnaces were the most important features of the site.

None of the excavated buildings had stone roofs, judging from the lack of collapse in all of the excavation areas. Most of the buildings likely had thatch roofs, which are fairly common in Jordan and Palestine throughout the Middle and Late Islamic periods and into the 20th century (see e.g. Lancaster and Lancaster 1997; McQuitty 2007a: 161; Walker 2011a: 191; Ziadeh 1995a: 1005). The pillars in the central portion of Area X, for example, indicate that the building must have been at least partially roofed, although it is not clear if the area near the furnace(s) would have been (see Fig. 4.12). If Area D is to be identified as a *tābūn* house, it was likely roofed in the same manner (see Ebeling and Rogel 2015: 333-335).

Within the site, the architecture of Area A stands out as being rather unique. Unlike the other areas, it consists of a long chain of rooms, similar to some of the "modular" structures found in the Early Islamic period (see Whitcomb 2006a; and discussion in Jones, et al. 2017: 302, 311). While the topography of the hillside certainly played a role in the shape of the building, the connection between the modular Early Islamic period architecture and the "tent architecture" of nomadic groups (Whitcomb 2006a: 31-32) is relevant here. This is particularly the case as Area A seems only to have been walled on three sides, with the northern side, facing Wādī Nuqayb al-Asaymir, apparently left open (see Fig. 4.6). Area A seems not to have been roofed in the same way as the other buildings, but may instead have been covered in tents. This does not necessarily imply a connection to nomadic groups, however; Ibrahim (1984: 47), for example, proposed that *qā'āt* in al-Fusṭāṭ were roofed in this way, as well. Indeed, it is possible that Area A would have served as a more pleasant space for the administrators of the site — and perhaps even a reception space. The limited assemblage from this area makes it difficult to determine this conclusively, but the presence of glazed wares, including stonepaste, suggests that this is a possibility.

Gambling in Middle Islamic Faynān

Among the most intriguing finds from KNA are those related to games and, likely, gambling: the *rukh* of a *shaṭranj* (chess) set surface collected from Building 5315 and the rectangular die and quartz wādī pebbles from Area Z (see Section 7.5), perhaps part of a makeshift *nard* (backgammon) set. Taken together, these provide evidence for gambling being a common leisure activity at the site. A modern observer might find it unusual for evidence of chess to be taken as evidence of gambling, but the medieval version "was usually played for a stake," and indeed was often played with dice (Murray 1913: 209-210, 474).

The presence of chess and backgammon pieces at KNA recalls an early 14th century episode in which the Ḥanbalī scholar Ibn Taymiyya — on his way to the mosque and apparently being pursued by a group of attackers — stopped in front of a blacksmith's shop to disrupt a game of chess by knocking the board over (Little 1975: 107; Schallenbergh 2007: 525).[316] Ibn Taymiyya's dislike of the game is also evident from the story of an event that occurred several years earlier, while he was imprisoned in Cairo. According to Ibn ʻAbd al-Hādī, he was disappointed that the inmates spent their time playing chess, backgammon, and other games of chance, and managed to turn them instead to spiritual pursuits (Little 1975: 107; Schallenbergh 2007: 525-526). In his writings, Ibn Taymiyya explicitly states that chess is *ḥarām*, but this was not a universal position, and the general opinion of the Shāfiʻī *madhhab* — the dominant

[316] This event is described by Ibn Taymiyya's student, Ibn ʻAbd al-Hādī. Little (1975: 107) refers to the game in question as backgammon, but Schallenbergh (2007: 525) provides a transliteration of the relevant line, and Ibn ʻAbd al-Hādī refers to *al-shaṭranj*, and not *nard*.

madhhab in Bilād al-Shām[317] (Hirschler 2008: 102; Walker 2009b: 63) — is that chess is not *ḥarām* but *makrūh*, provided it is not played in public and no bets are placed (Schallenbergh 2007: 529). Nonetheless, the opinion of religious scholars toward chess — and certainly toward gambling — is generally negative. The degree to which these religious opinions may have mattered in daily life seems rather low, however. Holt's (1973: 530) description of the Mamlūk sulṭān al-Lājīn's last night is particularly relevant here: "On the night of 11 Rabīʿ II/eve of 16 January 1299, the sultan, who had fasted all day, was playing chess with his imām, some courtiers and the Ḥanafī chief judge also being present." Certainly this does not seem to indicate a general religious prohibition.[318]

It is somewhat misleading, likewise, to approach religious attitudes toward chess only from the perspective of Middle Islamic Bilād al-Shām and Egypt. European Christian attitudes were equally mixed, and reasons for opposing chess and other games rather similar to those held by Muslim authorities (Bubczyk 2015). To give several examples, an 11th century bishop of Florence was penalized by the Church for playing chess, on the grounds that, despite the bishop's statement to the contrary, chess was included in the prohibition on gambling, probably suggesting that the bishop was playing chess with dice (Bubczyk 2015: 27-28; Murray 1913: 408-409, 414-415). Likewise, "In 1272, Louis IX ordered his officials to prosecute anyone who played games, enjoyed the company of prostitutes, or swore," and his "uncompromising stance on games became a certain tradition in the French royal house" (Bubczyk 2015: 38-39). Crusader sources also tend to take a negative attitude toward gambling, both because it was a distraction

[317] The Shāfiʿī *madhhab* was dominant in Bilād al-Shām, but not the only one. Among the constructions in Jerusalem during al-Muʿaẓẓam ʿĪsā's joint rule with al-ʿĀdil (see Section 3.6) is Sūq al-Maʿrifa, a Ḥanbalī *muṣallā* (Jarrar 1998; Korn 2004: 83). Al-Muʿaẓẓam ʿĪsā himself was, likewise, "a fervent supporter" of the Ḥanafī *madhhab* (Korn 2004: 83).

[318] At the same time, the association of chess with the ruler's death in the sources for this story may be meant to imply that it could be a distraction from mortal danger. Similarly, Jean de Joinville links the death of al-Ṣāliḥ Ayyūb to his fondness for chess (Lapina 2013: 126).

from the effort of crusading and because they saw it as linked to a number of other negative personality traits (Lapina 2013: 123-128). This, of course, did not stop the Crusaders from gambling, and game boards — particularly for Nine Men's Morris — have been found at many Crusader sites (Lapina 2013: 122, n. 5; Sebbane 1999).

In the context of KNA, these religious concerns are unlikely to have been relevant. While the *muṣallā* south of Area X indicates that members of the KNA community engaged in prayer, there is also ample evidence that Muslims of the period — both commoners and elites — gambled in their leisure time. The evidence that workers gambled in their spare time at a place as remote as Faynān should not, therefore, be surprising. What is perhaps surprising is that enough of the makeshift *nard* set was collected to make it identifiable. Sebbane (1999: 287, 289) suggests for the Crusader period, "It is also reasonable to surmise that most of the 'boards' were scratched into the earth, for the sake of the game that took place on the ground, with stones and smooth pebbles serving as counters. Obviously, nothing survived from these games." At KNA, the cache of smooth wādī pebbles and die provide evidence that this is the case, and suggest that the evidence for this, even at KNA, is rather fragmentary.

Diet in Middle Islamic Faynān

Unfortunately, neither faunal nor non-charcoal botanical analysis has yet been conducted on the material recovered from KNA. This is planned for the future, and will certainly provide valuable information about how the residents of the site lived. Some insights have been gained, however, from preliminary in-field identification of material from the Stratum Z2b pit in Area Z (see Section 4.1.5). In particular, chicken eggshell fragments (see Section 7.4) were among the most common finds in the food waste layers, suggesting that chickens were kept at the site. As suggested in Section 10.2, Area Y may have served as a chicken house, although this is not certain. Likewise, some fish bones were found in the same food waste layers, although the specific species cannot be determined without specialist analysis. Nonetheless, this indicates that food was not only being produced locally, but also being imported, probably from the Red Sea. Detailed analysis of all of the material from the site, including faunal and botanical material from outside of the pit contexts, may in the future allow for some discussion about access to specific types of food by the different social groups at the site (discussed above), but the nature of the excavated areas makes this difficult, and further excavation may be necessary to determine this.

10.4. Archaeology and Events of the Late Islamic Period

The archaeological evidence for the Late Islamic period in Faynān comes primarily from surveys or surface contexts, and it is difficult to reconstruct specific events on the basis of this data. This is not to say that specific events — pot drops, the selection and reuse of campsites, etc. — cannot be assumed, but rather that it is often difficult to date these events with any precision within the Late Islamic period. The exception to this is the Late Islamic burial at WFD 50a, which, although it was badly disturbed by bulldozer activity, can be dated with some certainty to the late 19th century AD or later.

Dating burials on the basis of coins used as jewelry is difficult, and provides, at best, a very rough *terminus post quem*. Simpson (1995: 247, n. 142) notes that the "Crusader" cemetery at Tel Mevorakh, dated on the basis of a coin found in one of the burials (see Stern 1978: 5), is likely much later, for example. Likewise, a single burial from the cemetery at Abū al-Naml in northern Jordan contained coins with dates ranging from 1691 to 1773 AD (Mershen 1991: 138). This is further complicated by the fact that the majority of coin-like objects from the burial at WFD 50a are not actually coins, but tokens. Nonetheless, the burial must date to the period between the beginning of the reign of ʻAbd al-ʻAzīz in 1861 AD and the bulldozing of the site, evident in aerial photographs taken in 1978 (see Section 5.5). It can be assumed that the burial was old already at the time of the bulldozing, and the late 19th century character of many of the objects found during the excavations best supports a late 19th or early 20th century date.

The grave goods from the burial include glass bracelets, beads (made of glass, stone, and cowrie shell), silver and copper coins and tokens, a nacre pendant (and other nacre and shell objects), a copper chain, and possible a bronze pin (see Sections 7.1 and 7.4). These objects are all typical of the grave goods generally associated with Late Islamic period burials (Simpson 1995: 245-247; Walker 2001: 59). Some of the materials and colors of these objects serve "folk" religious functions, generally preventing illness or the evil eye, or promoting good luck and other positive qualities (Simpson 1995: 246).

The most interesting find is R. 44826, a nacre/mother of pearl pendant in the shape of a Maltese cross, on which is inscribed a ringed Jerusalem cross (see Section 7.4). As noted in Section 7.4, nacre pendants are a common find in Late Islamic period burials. For example, a triangular nacre pendant with a denticulated lower edge — apparently the middle portion of a larger necklace — was found at Tall Ḥisbān (Walker 2001: 59, Fig. 16), and several roughly-shaped, elongated pendants were found at Tall al-Ḥaṣī (Eakins 1993: 197, Pl. 85; Toombs 1985: 216, Pl. 59a.43, 220, Pl. 62c.1, 228, Pl. 68c). Crosses, however, have not been published in any Late Islamic burial assemblage. The Ottoman period nacre devotional object industry in Bethlehem has been discussed by a number of scholars (see e.g. Grace 1990: 101; Ktalav 2015; Norris 2013; Piatnitsky 2005: 106; Schölch 1982: 40), but they seem primarily to have been pilgrimage souvenirs, and these sources offer little insight into why a nacre cross would be found in a Late Islamic period burial in Faynān. It may be that the material or color were the most important features of the object, but Simpson's (1995: 246) observation that "items with amuletic significance were preferred grave-goods" would suggest that the design is significant. While there were Christian pastoralist groups in Jordan during the Ottoman period, they were concentrated primarily on the Karak Plateau, for example al-Ḥijāzīn and al-'Akasha, who settled in the village of al-Simākiyya in the early 20th century (Young, et al. 2001). Palmer (1871: 456-458), who passed through Wādī Fidān in the later 19th century, describes interactions primarily with the 'Amarīn, who still live in the region today. It is, of course, possible that a woman from a Christian tribe married a Muslim al-'Amarīn man, as this would be permitted by both religious traditions (see Haddad 1992: 87). Although unlikely, this may be the best explanation for the presence of this unique object in the WFD 50a burial.

This chapter has presented a reconstruction of four different events of the Middle and Late Islamic periods in the Faynān region. One of these, the last day of work at KNA, was an event in the Sewellian sense of causing major change, in that this was not only the end of the metallurgical settlement at KNA, but, despite possible resmelting activities at Khirbat Faynān during the Late Islamic period and attempts at revival in the mid-20th and early 21st century, the last major episode of copper production in the region. The other three are, instead, "quotidian events," or the activities of daily life. Two of these were relevant to Middle Islamic period copper production. The first was the reconstruction of the processes and systems of production, key features of the everyday lives of laborers in Faynān, and the second other aspects of the daily lives of laborers — their statuses, their dwellings, their recreational activities, and their diets. The last section presents an explanation of unique features of the Late Islamic burial at WFD 50a. While a one-time event, in terms of the specific burial and its unique characteristics, this is also relevant to larger questions about the role of burials in Late Islamic society and their presence in

Faynān, addressed in Section 8.3. In the following chapter, the conclusion of the dissertation, I will consider the interplay of these three rhythms in more detail.

Chapter 11. Conclusion

The combination of original field work, analysis of previously unpublished "legacy data," new laboratory studies, and the judicious application of anthropological, archaeological, and historical theory in this dissertation has led to a wide range of contributions to the Islamic archaeology of the southern Levant. In addition to two seasons of original field work, conducted in 2011 and 2012 under the auspices of the UC San Diego Edom Lowlands Regional Archaeology Project, this dissertation has brought together material from excavations and surveys conducted by ELRAP and its predecessor, JHF, between 2000 and 2015. This mass of data has allowed for analysis of social and economic change in the Faynān region on multiple temporal scales, following the *Annaliste* model of history.

The three temporal rhythms explored in Part III — and, indeed, in the entire dissertation — lead to three complementary analytical foci. The longest scale highlights long-term changes both enabled and constrained by environmental, geographical, and other "structural" factors. The middle scale is most appropriate for political and economic changes occurring on the scale of decades, processes in which Faynān was often only marginally involved. The shortest scale brings us to the level of actual human lives, and is appropriate for investigating the "quotidian events" of work, leisure, life, and death. I conclude the dissertation by summarizing the previously discussed analysis of each of these scales, and laying out directions for future work appropriate to these three rhythms.

The *Longue Durée*

The long-term trends explored in the dissertation, and particularly in Chapter 8, contribute to an understanding of changes in settlement and resource exploitation in the Faynān region, particularly during the period between the Roman-Byzantine copper production phase and the Late Islamic period, previously rather poorly understood. The first of these traced shifts in copper production in the Faynān region over the course of roughly three millennia. Three peaks of decreasing intensity can be observed in the region, corresponding to production in the Iron Age, Roman-Byzantine period, and Middle Islamic IIa. Each of these peaks involved the establishment of a unique feature system, influenced by preference, the local environment, and constraints imposed by the exhaustion of resources in preceding systems. This last point is particularly important for understanding ore preferences in these systems, and particularly the reliance on the relatively distant mines of Wādī al-Salmīna — in the hills ca. 13 km east of Khirbat Faynān — and the iron-rich ore of Wādī Nuqayb al-Asaymir during the Middle Islamic IIa. The iron enrichment of the Wādī Nuqayb al-Asaymir ores may have been exploitable, particularly in the later phases of production at KNA and Khirbat Faynān, but the use of these two sources must also have been influenced by the exhaustion of the best BDS sources in the Iron Age and MBS sources in the Roman-Byzantine period.

Situating Faynān within the economic shifts in southern Jordan traced in Section 8.2 allows for a more complete understanding of the interactions between local, regional, and "international" economies. The presence, nature, and scale of copper production in Faynān varied on the basis of factors external to the region itself. At a very coarse level, these long-term economic changes can be summarized as follows. The early 1st millennium AD saw a shift from the overland routes of the Nabataeans to maritime routes oriented south from al-ʻAqaba. Copper production in Phaino was an important part of the economic system of southern Jordan as long as imperial investment in the region surrounding Petra made this possible, but the shift from the overland to maritime routes made production here a less attractive prospect once this investment was withdrawn. When copper production in southern Jordan resumes during the Early Islamic period, it is not in Faynān, but instead in southern Wādī ʻAraba — the area surrounding Ayla/al-ʻAqaba — which became a small-scale extension of the great trimetallic mining complex of the Ḥijāz and Najd, reflecting the southward orientation of Ayla's trade. By the arrival of the Crusaders in the early 12th century, these mines had gone out of use — some probably centuries earlier — due to a combination of environmental, political, and economic factors, some local to the region of al-ʻAqaba and some affecting much of the Middle East. The revival of copper production in Faynān in the late 12th or early 13th century reflects, on a larger scale, the orientation of southern Jordan's economy toward the north, and specifically toward the Ayyūbid centers of al-Karak and, to an extent, Damascus. The end of this production phase, however, was not the result of collapse, but rather a major reorientation of the political-economic system of central and southern Jordan, discussed in more detail below.

Additional long-term trends are useful in understanding settlement in the Faynān region when copper was not being produced there, and why infrastructure built to support copper mining was maintained or abandoned in later periods. The religious landscape of Faynān is particularly important to consider in order to understand the continuity of settlement in the region into the Early Islamic period, several centuries after copper production at Phaino ended. It is precisely the continued association of the place with the martyrdom of Christians condemned to the mines that seems to have driven this settlement. The religious aspects of the landscape may also explain the maintenance of specific features in the Wādī Fidān/Faynān system, and in particular the tower at WFD 50a. The features that were maintained are, for the most part, those facilitating movement through the landscape, perhaps indicating some association of Faynān with a minor pilgrimage. Comparison to the Middle Islamic IIa infrastructure of movement is instructive. Where Roman copper mining was clearly linked to routes running through Wādī

‘Araba, which were at least partially maintained into the Early Islamic period, during the Middle Islamic period copper was not transported on these routes, but instead exclusively on routes climbing to the plateau, and from there northward to al-Karak and the sugar producing regions.

Finally, at a coarse level, the intensity of agricultural activity in Faynān fluctuates with the density of settlement and, in turn, the intensity of copper production. These are not necessarily linear relationships, and, as discussed above, sedentary occupation in Faynān is not always associated with copper production. Nonetheless, at Khirbat Faynān, the peak period of settlement density and agricultural intensity seems to be the Late Roman-Early Byzantine peak of copper production, as well. Within the Faynān region, this type of agricultural activity is limited to the area immediately surrounding Khirbat Faynān, but smaller-scale gardens and agro-pastoral features are found in Wādī Fidān and Wādī al-Jāriya, indicating a mixture of modes of subsistence in the region in many periods. More work on the Faynān field systems will help in dating their use, but presently it is not clear that they were used during the Middle Islamic period. Instead, it is likely that grain and vegetables, as well as fish and possibly meat, were imported to feed the miners. Chickens may have been raised at KNA for eggs, and meat may have been provisioned from local pastoralists, but local products likely represented only a supplemental contribution to the miners’ diets. The distinction between this and the large-scale Roman agriculture reflects a clear difference in provisioning systems, and indeed in approach to investment in mining and the infrastructure supporting it. Further work on the animal bones and non-charcoal botanical remains from KNA will help clarify these patterns.

The *Moyenne Durée*

The excavations presented in this dissertation provide insight into five conjunctures, defined here as political-economic changes on the scale of decades, discussed primarily in

Chapter 9. The first of these is the end of Roman copper production at Phaino, which probably resulted from some combination of ore exhaustion, fuel source exhaustion, and the more general withdrawal of Byzantine investment in southern Jordan. Rather than a specific event, the end of the industry seems to have been a gradual process, and did not result in the abandonment of the settlement, but instead a major reorganization, with its new focus being religion rather than metallurgy. A second gradual process is framed as the Islamic conquest in the early 7th century AD. Like the first, it is also not an event, at least in Faynān, which is not mentioned in any of the later narrative accounts of the conquest. Indeed, Fiema's (1992) model of a gradual decline beginning with the withdrawal of imperial investment in the Late Byzantine period seems more applicable than a decline beginning with the Islamic conquest. The establishment of the Early Islamic settlement at Khirbat Ḥamrā Ifdān complicates this, however, and although sedentary occupation had clearly declined in Faynān by the 10th century, this was not a linear process. A comparison between the 6th, 7th, and 8th centuries would be instructive in this regard, but is not possible at the current state of research. No doubt this is an important future direction for the Faynān region, and will open up a number of questions that we presently do not have the data to answer, particularly regarding the Islamization of Faynān and the degree of continuity of the Christian community at Phaino into the Early Islamic period.

The third conjuncture is the development of the economy of southern Wādī 'Araba during the Early Islamic period and their relationship to the mines of the Arabian Peninsula. Power (2012a: 123-124) argues that the Najdī mines emerged in association with the development of the Darb Zubayda during the 'Abbāsid period, and the southern Wādī 'Araba mines seem to have been established as part of the same process. This does not necessarily indicate the direct involvement of the 'Abbāsid state in mining itself, but rather the development of industrial and agricultural hinterlands around major nodes of the *ḥajj* routes — which were the product of direct state investment — in combination with the continued flourishing of the Red Sea and Indian Ocean trade. The decline of this system is still not totally understood, particularly because copper smelting took place primarily in small camps, many of which may not have been intended as long-term ventures. As such, the abandonment of specific camps may not indicate the decline of the system overall, although it does seem that the majority were in use primarily in the late 8th-9th century. Nonetheless, it is clear that these industrial settlements were in decline in the early 2nd millennium AD due to a combination of political, economic, and environmental factors. By the early 12th century, none seem to have been operating. This was not limited to the industrial settlements, either, and between the late 11th and late 13th centuries, Ayla/al-ʻAqaba was of much less importance than it had been in the late 8th-10th century.

The fourth and fifth conjunctures are core arguments of the dissertation. The most critical is the fourth, the establishment of copper production in Faynān to provision sugar production in the Dead Sea *aghwār* and Jordan Valley *ghawr*, which in turn supported the political autonomy of Ayyūbid al-Karak from the dynastic centers of Cairo and Damascus in the 13th century. I argue for a connection between copper production and sugar production on the basis of both chronology and scale, as production in Faynān begins at the same time as the sugar industry expands to become the dominant cash crop of the region, and the amount of copper produced corresponds rather closely to the amount the sugar industry would likely have required, at least in this initial phase. Demonstrating this connection with more certainty will require additional work, some of which is now in its preliminary stages. In particular, compositional analysis and sourcing of *dast* fragments — some of which are now known from excavations at Ṭawāḥīn al-Sukkar in Ghawr al-Ṣāfī and Khirbat al-Minya — is necessary to determine the extent to which

Faynān copper was used to produce these vessels. In a more general sense, more work will clarify the relationship between sugar factories and the metallurgical workshops found — at excavated factories, almost without exception — nearby. The repair of *dusūt* and agricultural tools would have been necessary at any sugar factory, but whether *dusūt*, in particular, were produced in these workshops is not clear. The chronology of the early phases of the sugar industry, likewise, requires additional investigation. There is no reason to doubt that a major expansion of the industry occurred in the late 12th or early 13th century, but the presence of Zangid material at Ṭawāḥīn al-Sukkar in Jericho (see Section 3.6.2) suggests that this process had begun already in the mid-12th century in at least some regions.[319]

Although these points remain open, the expansion of a locally provisioned sugar industry is a compelling explanation for how the autonomy of al-Karak was established and maintained. Given that al-Karak had no port,[320] the fact that necessary materials for the sugar industry could be obtained locally meant that the Ayyūbid *amrā'* of al-Karak could benefit from the sugar factories within their *iqṭā'āt* without having to rely on copper imported through ports outside their control. This import replacement contributed to the increasing economic importance of an otherwise marginal region, and on a political level gave the *amrā'* of al-Karak a political autonomy that, perhaps most importantly, would have allowed them to maintain a force of *mamālīk*, limiting the power the dynastic head could exert on them. This is particularly evident during the reign of al-Mughīth 'Umar in the mid-13th century, the peak of al-Karak's autonomy,

[319] This requires a deeper type of analysis than the presence or absence of material dating to a specific period at a sugar factory. Pottery dating as early as the 8th century has been found at Ṭawāḥīn al-Sukkar in Ghawr al-Ṣāfī (Politis 2015: 37), but during this period it may have functioned instead as part of the indigo industry. Nonetheless, it is quite possible — indeed, likely — that sugar production also began in Ghawr al-Ṣāfī before the 13th century expansion.

[320] As discussed in Sections 3.6 and 8.2, much remains uncertain concerning the nature of the settlement at al-'Aqaba in the Ayyūbid period. Even if the site did have a port in the early 13th century, it is not clear that it would have been included in the *iqṭā'āt* of al-Karak or al-Shawbak. Indeed, its position on the *ḥajj* route from Cairo may suggest that this would not have been the case.

but as a process can be traced back to al-Muʿaẓẓam ʿĪsā in the first decades of the 13th century. This is also relevant to the fifth conjuncture, the establishment of Mamlūk rule in al-Karak. While the coalescence of the Mamlūk state was a multifaceted process, much of which is not relevant to the present argument, the changes to the nature of the *iqṭāʿ* system at the beginning of the Mamlūk period seem, at least in part, to have been intended to prevent similar systems from emerging. In particular, the shift away from the "*iqṭāʿ* as estate" and toward what I have called the "theoretical *iqṭāʿ*" (see Section 3.6.1) would have limited the degree of autonomy a *muqṭaʿ* could have achieved.

The *Courte Durée*

The short-term also played a critical role in the dissertation, and particularly in Chapter 10, which focused primarily on "events." These are defined not only in Sewell's (2005: 100) sense of "that relatively rare subclass of happenings that significantly transforms structures" — and, indeed, "events" of this type are primarily discussed in Chapters 8 and 9 — but also as analysis on the scale of lived human lives. The first event discussed is "The Last Day of Work at KNA," reconstructed on the basis of the ELRAP excavations in Area X in 2011. The workshop was cleaned out after every smelting operation, with the debris dumped on the slag mounds outside of the building, meaning that the excavations produced evidence of the last smelting operation conducted in the workshop, or "the last day of work." The layout of the excavated portion of the workshop can be reconstructed with some precision, but further work is required to understand the overall layout of the building. Returning to completely excavate the furnace, L. 120, would also provide information about the stage of the process at which the workshop was abandoned, and the amount of ore and fuel used in a smelting operation. The exact reason for the site's abandonment is not clear, but it is plausibly the result the death of al-Mughīth ʿUmar in

1263 and the subsequent changes to the *iqṭāʿāt* of al-Karak and al-Shawbak. Other possibilities were also suggested in Section 10.1, however, including the threat of attack by the Mongols in 1260, an earthquake, unknown local factors, or the exhaustion of ore or fuel resources.

The second short-term quotidian event concerns the processes of copper production in use during the Middle Islamic IIa in Faynān. These were reconstructed using the complementary techniques of *chaînes opératoires* and behavioral chains (see Section 2.2) on the basis of excavations at KNA and Khirbat Faynān, as well as inference from other excavated copper production sites — particularly Iron Age sites in Faynān excavated by ELRAP teams — and ethnographic studies of copper production. This provided the evidence required to understand what types of work were necessary at the site, and on what general timescales, but continued work in Faynān — particularly more complete excavation in KNA Area X and a more detailed study of the archaeometallurgical remains from Khirbat Faynān Area 15 — would no doubt allow for a more complete reconstruction of the *chaîne opératoire* of Middle Islamic period copper production. Related to the processes of copper production are the production-provisioning systems of which copper producing settlements were part. These were reconstructed using the concept of mining feature systems (see Section 2.2), drawing on evidence from surveys of the region, including several conducted by ELRAP teams. These reconstructions are somewhat tentative, and excavation at some of the sites known only from survey would be required to determine their exact nature and chronology. Despite the fact that some specifics remain uncertain, the basic picture of the 13th century copper production feature system is now in place.

The third short-term theme is "Daily Life in Mining Settlements." This analysis was based almost entirely on the ELRAP excavations at KNA, and particularly the 2012 excavations in Area Z, which yielded the richest assemblage at the site. This section — Section 10.3 —

focused on four aspects of daily life at KNA. The first is the status of the different residents of the site. Although tenuous, a three-tiered hierarchy can be reasonably reconstructed, with the Ayyūbid administrators on the highest tier, followed by smelters and, probably, smiths, and finally, at the lowest level, miners and other laborers. The second topic is the architecture of KNA, indicative of the site's industrial purpose. The architecture shares some features in common with contemporary village sites, but with a clear focus on function over aesthetics, perhaps most clearly illustrated by the fact that the most effort went into the construction of Area X, the smelting workshop, while the domestic structures were more expediently — and, occasionally, haphazardly — built. The third aspect is gambling at KNA. Evidence of both *shaṭranj* (chess) and *nard* (backgammon) were found at the site, and these are likely more typical pastimes of laborers — particularly in rural settings — than is commonly realized or discussed in archaeological literature, despite the opinions and rulings of religious elites. Leisure and recreation are an understudied aspect of life in the rural southern Levant during the Islamic period, and the discussion of these finds from KNA provides a starting point for broader work in the future. The final aspect of daily life addressed in Section 10.3 is diet, and future specialist analysis here will be particularly useful. At the present state of work, it can be said that most of the grain at the site was grown outside of the Faynān region, while chickens were likely kept for eggs at KNA. Fish were imported, perhaps from the Red Sea, although specialist analysis is required to determine this source, as well as the types of meat eaten at the site and the overall contribution of any of these foods to the diets of the site's residents.

The final events discussed in Chapter 10 are the Late Islamic period burials at WFD 50a. Although heavily disturbed by bulldozing, the recovered artifacts allow for a date in the late 19th or early 20th century to be suggested for these burials. The assemblage is for the most part typical of female burials of this period, with the exception of a unique nacre cross. This object requires some explanation, and may hint at otherwise undocumented intermarriage between Muslim and Christian tribes during this period.

A Brief Epilogue

We end in a rather different Faynān from the one we started in, yet we can see in Faynān's modern history many of the same issues relevant to earlier periods. In particular, the alternation between periods of semi-nomadic agropastoralist use of Faynān and more intensive settlement spurred by external interest and investment can be seen again by the mid-20th century. Prospecting efforts by the Jordanian Natural Resources Authority in the 1950s and 1960s ultimately did not lead to the revival of mining, due primarily to the quality of the remaining ore (Section 3.2.1; see also Palmer, et al. 2007: 44), but this has not entirely diminished interest in the mineral resources of the region, as demonstrated by the "road construction for the possible renewal of mining work" that led to the emergency 3D documentation of the Umm al-ʻAmad mine during the 2011 ELRAP field season (Levy, et al. 2012b: 442). More relevant, however, is the history of the village of al-Qurayqira. While it can be seen as part of national attempts to settle and regulate the Bedouin dating back to the early 20th century (Massad 2001: 58-59), this is not entirely accurate. The village was in fact founded in the mid-1970s by an entrepreneur who started an agricultural cooperative with the ʻAmarīn and Saʻidiyyīn tribes (Lancaster and Lancaster 1999: 154-155; Palmer, et al. 2007: 45). While the village — and the agricultural system — outlasted this particular agreement, external and government investment are important in maintaining the present sedentary, agricultural settlement system in the Faynān region (see Darmame, et al. 2011). Local interests and initiatives play a large role in this, as well, and the interaction between the local and external is important in understanding modern settlement in the region. This is, of course, also true for the periods discussed in this dissertation. As such, the *Annales* inspired framework used here can also help us to understand modern Faynān not as a deviation from the region's history, but as part of its longer-term history.

Appendix 1: Summary of Charcoal Analysis Conducted by Brita Lorentzen

This appendix presents summary tables of charcoal species identifications for Khirbat Nuqayb al-Asaymir Areas X (Table A1.1) and Z (Table A1.2), and Khirbat Faynān Area 15 (Table A1.3). This analysis was performed by Dr. Brita Lorentzen of the Malcolm and Carolyn Wiener Laboratory for Aegean and Near Eastern Dendrochronology at Cornell University. The following tables provide the percentage (by fragments) of the total charcoal assemblage each taxon represents in a given stratum. The total number of fragments in a stratum is given as n=x in the box next to the stratum number. A fuller description and discussion of the charcoal assemblages from KNA and Khirbat Faynān is planned for future publication. For the results of analysis of charcoal from Khirbat al-Manāʿiyya, see Jones, et al. (2017: 306-308).

Appendix 1 contains unpublished material co-authored by Dr. Brita Lorentzen. The dissertation author was the primary author of this material.

Table A1.1: Percentage of charcoal assemblage by fragments for each taxon found at Khirbat Nuqayb al-Asaymir, Area X.

Str. X1	n=235
Taxon	%
Quercus calliprinos	42
Juniperus phoenicea	50
Acacia raddiana/tortilis	<1
Haloxylon persicum	8

Str. X2	n=2281
Taxon	%
Quercus calliprinos	24
Juniperus phoenicea	29
Acacia raddiana/tortilis	<1
Acacia sp.	<1
Tamarix sp.	<1
Haloxylon persicum	35
Retama raetam	3
Ziziphus sp.	<1
Pistacia atlantica	<1
Cercis siliquastrum	<1
Salicaceae cf. *Populus*	1
Salicaceae cf. *Salix* sp.	<1
Chenopodiaceae	3
Indeterminate	4

Table A1.2: Percentage of charcoal assemblage by fragments for each taxon found at Khirbat Nuqayb al-Asaymir, Area Z.

Str. Z1	n=23
Taxon	%
Quercus calliprinos	65
Juniperus phoenicea	4
Indeterminate	30

Str. Z2 (substratum not identifiable)	n=486
Taxon	%
Quercus calliprinos	78
Juniperus phoenicea	<1
Acacia cf. *raddiana/tortilis*	<1
Tamarix sp.	1
Haloxylon persicum	10
Salicaceae cf. *Populus*	<1
Vitex sp.	<1
Chenopodiaceae	2
Indeterminate	8

Str. Z2(a)	n=2382
Taxon	%
Quercus calliprinos	75
Juniperus phoenicea	1
Acacia cf. *raddiana/tortilis*	6
Acacia sp.	<1
Tamarix sp.	<1
Haloxylon persicum	<1
Retama raetam	2
Fabaceae cf. *Retama raetam*	<1
Pistacia atlantica	<1
Rosaceae-Maloideae	<1
Chenopodiaceae	<1
Bark cf. *Quercus calliprinos*	4
Indeterminate	11

Table A1.2: Percentage of charcoal assemblage by fragments for each taxon found at Khirbat Nuqayb al-Asaymir, Area Z, continued.

Str. Z2a	n=3177
Taxon	%
Quercus calliprinos	68
Juniperus phoenicea	1
Acacia raddiana/tortilis	<1
Acacia cf. *raddiana/tortilis*	<1
Acacia sp.	<1
Tamarix sp.	8
Haloxylon persicum	<1
Retama raetam	2
Fabaceae	<1
Ziziphus sp.	<1
Pistacia atlantica	1
Phoenix dactylifera	<1
Alhagi graecorum	<1
Moringa peregrina	<1
Ephedra sp.	<1
Salicaceae	<1
Chenopodiaceae	<1
Bark cf. *Quercus calliprinos*	3
Fruit	<1
Indeterminate	14

Str. Z2(b)	n=299
Taxon	%
Quercus calliprinos	12
Acacia cf. *raddiana/tortilis*	1
Tamarix sp.	54
Retama raetam	18
Phoenix dactylifera	<1
Ephedra sp.	5
Chenopodiaceae	6
Indeterminate	4

Table A1.2: Percentage of charcoal assemblage by fragments for each taxon found at Khirbat Nuqayb al-Asaymir, Area Z, continued.

Str. Z2b	n=1671
Taxon	%
Quercus calliprinos	1
Juniperus phoenicea	<1
Acacia cf. *raddiana/tortilis*	<1
Tamarix sp.	57
Retama raetam	1
Pistacia atlantica	<1
Phoenix dactylifera	5
Ephedra sp.	7
Salicaceae cf. *Salix*	<1
Chenopodiaceae	3
Indeterminate	7

Table A1.3: Percentage of charcoal assemblage by fragments for each taxon found at Khirbat Faynān, Area 15.

Str. 15-1	n=19
Taxon	%
Juniperus phoenicea	11
Tamarix sp.	89

Str. 15-2a	n=724
Taxon	%
Quercus calliprinos	38
Juniperus phoenicea	2
Acacia raddiana/tortilis	<1
Tamarix sp.	29
Retama raetam	<1
Nerium oleander	1
Ficus sp.	1
Salicaceae cf. *Populus*	17
Salicaceae cf. *Salix* sp.	10
Indeterminate	3

Str. 15-2b	n=146
Taxon	%
Quercus calliprinos	82
Juniperus phoenicea	1
Acacia raddiana/tortilis	3
Tamarix sp.	6
Salicaceae cf. *Populus*	4
Salicaceae cf. *Salix* sp.	3

Table A1.3: Percentage of charcoal assemblage by fragments for each taxon found at Khirbat Faynān, Area 15, continued.

Str. 15-2c	n=896
Taxon	%
Quercus calliprinos	74
Juniperus phoenicea	1
Acacia raddiana/tortilis	2
Tamarix sp.	5
Tamarix cf. *aphylla*	<1
Retama raetam	1
Ziziphus sp.	3
Nerium oleander	1
Ficus sp.	<1
Rhamnus sp.	<1
Salicaceae cf. *Populus*	3
Salicaceae cf. *Salix* sp.	1
Salicaceae	2
Indeterminate	7

Str. 15-3	n=331
Taxon	%
Quercus calliprinos	70
Juniperus phoenicea	<1
Acacia raddiana/tortilis	8
Tamarix sp.	3
Retama raetam	3
Ziziphus sp.	1
Ficus sp.	<1
Salicaceae cf. *Populus*	2
Salicaceae cf. *Salix* sp.	2
Indeterminate	10

Table A1.3: Percentage of charcoal assemblage by fragments for each taxon found at Khirbat Faynān, Area 15, continued.

Str. 15-4	n=387
Taxon	%
Quercus calliprinos	68
Juniperus phoenicea	1
Acacia raddiana/tortilis	20
Tamarix sp.	1
Tamarix cf. *aphylla*	<1
Retama raetam	4
Nerium oleander	1
Rhamnus sp.	1
Salicaceae cf. *Salix* sp.	<1
Salicaceae	4

Str. 15-5	n=119
Taxon	%
Quercus calliprinos	70
Juniperus phoenicea	3
Acacia raddiana/tortilis	19
Tamarix sp.	3
Retama raetam	1
Ziziphus sp.	2
Salicaceae cf. *Salix* sp.	2

Appendix 2: Concordance of Finds by Locus

This appendix presents a concordance of the ceramic and non-ceramic finds from the excavated sites discussed in this dissertation. This allows for easier comparison between Chapters 6 and 7, and provides an overview of the assemblage from each context. It is important to note that this is not a complete list of the finds from each locus, but a list of the finds discussed in Chapters 6 and 7. The following tables present lists of finds from Khirbat Nuqayb al-Asaymir (Table A2.1), Khirbat Faynān (Table A2.2), Khirbat Ḥamrā Ifdān (Table A2.3), and WFD 50a (Table A2.4) discussed in the dissertation, organized first by excavation/survey area and then by locus.

Each table follows the same standard format. Areas are listed in bold in the tables, and loci in italics. Where applicable, the stratum (or terrace) of each locus is listed in the box to the right of the locus number. For each find, the registration (diagnostic barcode) number, bulk registration (artifact barcode[321]) number, basket number, EDM[322] number, type of artifact, figure number (if illustrated in the dissertation), and a description are provided. Dashes indicate information unavailable for or not assigned to a find. For potsherds not illustrated in Chapter 6, detailed fabric descriptions are provided in the tables below. For illustrated sherds, fabric descriptions are provided in the tables accompanying figures in Chapter 6.

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[321] For the distinction between "diagnostic" and "artifact" barcode numbers in the ELRAP system, see the introduction to Chapter 6.

[322] EDM in this case is the "Electronic Distance Measurer" number, a reference to ELRAP's total station based recording system. The ELRAP digital recording system assigns an EDM number to each point or polygon shot with the total station (see Levy and Smith 2007: 51). This number is not used in the dissertation, as in practice it is redundant with the basket number. It is provided here to facilitate comparison to earlier ELRAP/JHF publications and the UC San Diego ELRAP ArchaeoSTOR database (http://archaeostor.ucsd.edu).

Table A2.1: Concordance of finds from Khirbat Nuqayb al-Asaymir.

Area A						
Surface						
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
-	30424	0	0	Glass	7.25	Glass bracelet, Middle-Late Islamic
-	31018	0	0	Ceramic	-	Body and handle; mold-made Byzantine South Jordan type lamp
32813	32193	0	0	Ceramic	6.7.1	Rim; HMGPW flat-rim bowl
32814	32193	0	0	Ceramic	6.12.5	Body sherd; monochrome HMGPW; uncertain design in brown paint over red slip
38594	33533	0	0	Ceramic	6.7.16	Body sherd; monochrome HMGPW; reddish-brown crosshatch motif
38599	30912	0	0	Ceramic	6.4.3	Base; monochrome green lead glazed
L. 001						
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
32809	32191	1	1	Ceramic	6.3.5	Body sherd; black-under-turquoise glazed stonepaste; arc-back
32810	32191	1	1	Ceramic	-	Body sherd; HMGPW monochrome bulbous jug; triangular crosshatch and assorted geometric designs in dark brown paint; red slip, black core

Table A2.1: Concordance of finds from Khirbat Nuqayb al-Asaymir, continued.

L. 002						
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
32828	31019	10006	6	Ceramic	-	Body sherds; turquoise glazed; micaceous fabric with few calcareous inclusions; highly-friable, fire damaged?
L. 003						
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
32807	32305	10009	9	Ceramic	-	Body sherd; HMGPW bulbous jar/jug; geometric design in dark brown paint over tan slip; black core; common fine vegetal temper with some med. Calcareous inclusions
L. 006						
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
38597	32190	10039	39	Ceramic	6.1.1	Base; black-under-colorless glazed stonepaste; alkali-lead glaze
38601	32214	10062	62	Ceramic	6.1.3	Rim; black-and-blue-under-colorless glazed stonepaste; line-back? Context not certain.
Area D						
Surface						
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
38612	33530	0	0	Ceramic	6.12.1a-b	Body sherds; monochrome HMGPW; black crosshatch motif

Table A2.1: Concordance of finds from Khirbat Nuqayb al-Asaymir, continued.

L. 404						
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
38299	33537	50010	1010	Ceramic	6.7.2	Rim; HMGPW deep bowl
Area X						
Surface						
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
-	5554	0	0	Technical Ceramic	7.17	Tuyère fragment
41224	5917	50167	187	Ceramic	6.5.15	Rim; unglazed WM thinned-rim storage jar
41225	5916	50168	188	Ceramic	-	Body sherd; monochrome HMGPW; crosshatch motif in purplish paint over red slip; black core; common fine to med. Vegetal temper, some fine to med. Calcareous inclusions (and few large), common fine to med. Red and black argillaceous inclusions; smoothed on interior
L. 117	Str. X-2					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
-	5472	50015	31	Metallurgical	7.16	Large lump of mixed copper and iron

Table A2.1: Concordance of finds from Khirbat Nuqayb al-Asaymir, continued.

L. 125	Str. X-2					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
-	5746	50118	138	Technical Ceramic	-	Tuyère fragment (Petrographic sample TS11)
L. 136	Str. X-2					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
41226	5878	50146	166	Ceramic	6.11	Body sherd; (early?) HMGPW jar (Petrographic sample TS20)
41227	5878	50146	166	Ceramic	6.5.17	Rim; red brittle ware casserole lid
-	5884	50152	172	Metal	7.13	Iron nail
L. 137	Str. X-2					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
-	5885	-	-	Metal	7.14	Iron nail
41205	5915	50158	178	Ceramic	6.7.5	Rim; (early?) HMGPW flared-rim jar
Area Y						
L. 603						
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
44795	34687	80007	30007	Ceramic	-	Base/body sherds; IHMW jug/jar; cream slip; black core; very friable; common fine to med. vegetal temper, some large mineral voids, some fine calcareous inclusions (and rare large), some med. to large argillaceous inclusions

Table A2.1: Concordance of finds from Khirbat Nuqayb al-Asaymir, continued.

L. 604/L. 609						
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
38569	34702	80010	30010	Ceramic	6.7.8	Body sherds; HMGPW jar/jug; connecting sherds found in both loci
Area Z						
Surface						
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
38274	32235	0	0	Ceramic	-	Rim; HMGPW straight-necked bulbous jug; worn geometric design in brown paint, red slip, black core, common fine vegetal temper with few argillaceous and calcareous inclusions
38565	33546	0	0	Ceramic	6.5.14	Rim; unglazed WM everted-rim jug/jar
38566	33174	0	0	Ceramic	-	Body sherd; basin with applied/incised rope décor; tan slip; uneven gray to red core; common small to med. black inclusions, common small to large argillaceous/iron oxide inclusions, common small to large calcareous/shell inclusions, common small to large mineral voids
38567	33174	0	0	Ceramic	-	Body sherd with handle; IHMW cooking pot with nicked cordon; black core; common fine quartz sand and some fine vegetal temper, few med. mineral inclusions
38568	33174	0	0	Ceramic	-	High Tongue Handle Slipper Lamp with partial inscription or pseudo-inscription

Table A2.1: Concordance of finds from Khirbat Nuqayb al-Asaymir, continued.

Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
38579	34117	0	0	Ceramic	6.12.3	Body sherd; monochrome HMGPW; purple-brown “line and hook” motif
38591	34815	0	0	Ceramic	-	Rim; unglazed WM flat-rim jug with ridged neck
38592	32238	0	0	Ceramic	6.13.6	Handle; High Tongue Handle Slipper Lamp
39169	35220	0	0	Ceramic	6.7.14	Body sherd; monochrome HMGPW; black linear décor
39170	35220	0	0	Ceramic	6.7.15	Body sherd; monochrome HMGPW; black linear décor
-	-	-	-	Technical Ceramic	7.18	Tuyère fragment
-	-	-	-	Stone	7.23	Sharpening stone/whetstone
L. 204	Str. Z2a					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
32823	32572	40055	355	Ceramic	6.7.6	Rim; HMGPW jug/jar
32824	32572	40055	355	Ceramic	-	Unknown mold-made vessel sherd; decoration very worn, but probably a slipper lamp
L. 205	Str. Z2a					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
32817	32213	40017	317	Ceramic	-	Body sherd; monochrome HMGPW; worn black linear design applied directly to body; black core; friable; fine to coarse vegetal temper, some mica

Table A2.1: Concordance of finds from Khirbat Nuqayb al-Asaymir, continued.

L. 206	Str. Z2					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
-	32253	40091	391	Stone	7.21	Casting mold or straightening/sharpening stone
32811	32536	40048	348	Ceramic	6.5.13	Rim; unglazed WM club-rim storage jar
32812	32536	40048	348	Ceramic	6.5.11	Rim; unglazed WM plain-rim jug
L. 209	Str. Z2(a)					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
32820	32552	40050	350	Ceramic	-	Slipper lamp lower shoulder; no decoration preserved
32821	32552	40050	350	Ceramic	-	Body sherd; black-under-turquoise glazed stonepaste
32822	32552	40050	350	Ceramic	6.13.1	Body sherd; ‘Abbāsid Standard(?) type lamp
L. 210	Str. Z2(a)					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
32816	32103	40083	383	Ceramic	6.3.4	Body sherd; black-under-turquoise glazed stonepaste; knot-back
38602	32550	40051	351	Ceramic	6.3.1	Body sherd; black-under-colorless glazed stonepaste
L. 211	Str. Z2a					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
-	32251	40060	-	Stone	7.19.2	Base; schist bowl
32806	32593	40053	353	Ceramic	6.7.11	Body sherd; bichrome HMGPW

Table A2.1: Concordance of finds from Khirbat Nuqayb al-Asaymir, continued.

L. 214	Str. Z2					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
-	32219	40122	422	Metal	7.9	Bronze clasp
-	32236	40133	-	Stone	7.31	Collection of quartz wadi pebbles, probably used as makeshift gaming pieces
L. 218	Str. Z2(a)					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
38560	33529	40109	409	Ceramic	-	Body sherd; HMGPW; worn black geometric design over burnished red slip, with dot of purple-brown paint on interior; gray core; common fine vegetal and quartz sand temper
38561	33529	40109	409	Ceramic	-	Body sherd; HMGPW; lozenge-and-dot motif in black paint applied directly to body; black core; common fine vegetal temper, some fine to large calcareous inclusions
42568	33529	40109	409	Ceramic	-	Slipper Lamp base/shoulder; no decoration preserved
L. 219	Str. Z2a					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
32836	32237	40120	420	Ceramic	-	Body sherds; HMGPW jug/jar; black geometric design over pink slip; black core; common fine sand temper, some fine vegetal voids, mica, and calcareous inclusions

Table A2.1: Concordance of finds from Khirbat Nuqayb al-Asaymir, continued.

L. 220	Str. Z2a					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
32819	32574	40111	411	Ceramic	6.5.6	Rim; unglazed WM flat-rim jug with slightly bulbous neck
L. 221	Str. Z2a					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
38587	34771	40143	443	Ceramic	-	Body sherd; black-under-colorless glazed stonepaste
L. 223	Str. Z2(b)					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
32815	32310	40124	424	Ceramic	6.7.10	Handle attachment; HMGPW vessel
38272	32273	40164	464	Ceramic	-	Rim; IHMW cooking pot; large spot of purple-brown paint on interior near rim
38273	32273	40164	464	Ceramic	6.12.8	Rim; IHMW cooking pot
38285	33550	40141	441	Ceramic	-	Rim; unglazed WM deep, rounded bowl
38293	33550	40141	441	Ceramic	6.5.8	Neck sherd; unglazed WM triangular-rim jug with slightly bulbous neck (Petrographic sample TS1)
38294	33550	40141	441	Ceramic	-	Rim; unglazed WM deep, rounded bowl
38295	33550	40141	441	Ceramic	-	Rim; unglazed WM flat-rim jug with ridged neck
38297	33550	40141	441	Ceramic	-	Base; unglazed WM deep, rounded bowl
38596	32263	40146	446	Ceramic	6.1.4, 6.2	Rim; black-and-blue-under-turquoise glazed stonepaste; knot-back
38598	32234	40139	439	Ceramic	6.12.9	Body sherd; IHMW cooking pot; nicked cordon

Table A2.1: Concordance of finds from Khirbat Nuqayb al-Asaymir, continued.

L. 228	Str. Z2					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
-	32262	40156	456	Coin	7.4	Bronze *fals* of al-ʻĀdil I, 1211-1212 AD, Damascus mint
-	32265	40162	462	Metal	7.10	Bronze probe or koḥl stick
38570	38563	40151	451	Ceramic	6.5.9	Rim; unglazed WM triangular-rim jug with slightly bulbous neck
38571	38563	40151	451	Ceramic	6.5.3	Rim; unglazed WM deep, rounded bowl
38573	38563	40151	451	Ceramic	6.5.2	Rim; unglazed WM deep, rounded bowl
38574	38563	40151	451	Ceramic	6.5.5	Rim; unglazed WM flat-rim jug with ridged neck
38575	38563	40151	451	Ceramic	6.7.4	Rim; HMGPW flared-rim jug
38576	38563	40151	451	Ceramic	-	Rim; unglazed WM deep, rounded bowl (Petrographic sample TS3)
38577	38563	40151	451	Ceramic	6.5.1	Rim; unglazed WM deep, rounded bowl
38578	38563	40151	451	Ceramic	-	Handle; HMGPW; zig-zag design in black paint over pink slip; black core; friable; some fine calcareous temper, few fine vegetal voids
38584	32308	40131	431	Ceramic	-	Rim; fine IHMW jar; pink fabric with light gray core; common fine vegetal temper, common fine to med. Argillaceous/iron oxide inclusions, some fine calcareous inclusions, very little fine flint

Table A2.1: Concordance of finds from Khirbat Nuqayb al-Asaymir, continued.

L. 229	Str. Z2b					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
38585	34745	40158	458	Ceramic	-	Rim; IHMW jar; reddish-brown slip; black core; common med. Quartz sand temper with calcareous inclusions, few fine vegetal voids
L. 230	Str. Z2a					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
38558	34754	40175	475	Ceramic	6.5.10	Rim; unglazed WM plain-rim jug with ridged neck
38559	34754	40175	475	Ceramic	-	Slipper lamp lower shoulder; no decoration preserved
38593	32357	40183	483	Ceramic	6.13.2	High Tongue Handle Slipper Lamp with *naskhī* inscription and vegetal motif
L. 231	Str. Z2b					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
-	32518	40242	542	Shell	7.27	Group of chicken eggshells from pit

Table A2.1: Concordance of finds from Khirbat Nuqayb al-Asaymir, continued.

L. 233	Str. Z2b					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
32830	32569	40177	477	Ceramic	-	Body sherd; unglazed WM lightly rouletted buff/cream vessel
32831	32569	40177	477	Ceramic	6.5.7	Rim; unglazed WM triangular-rim jug with slightly bulbous neck
32833	32569	40177	477	Ceramic	-	Body sherd; black-under-turquoise glazed stonepaste
32834	32569	40177	477	Ceramic	6.7.7	Rim; HMGPW jug/jar
32835	32569	40177	477	Ceramic	6.12.2	Body sherd; monochrome HMGPW; black crosshatch motif
L. 235	Str. Z2(a)					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
-	32359	40197	-	Ceramic	6.6	Complete vessel; unglazed WM everted-rim juglet
-	32358	40198	-	Ceramic	6.9	Complete vessel; HMGPW flared-rim jug
-	32360	40199	-	Ceramic	6.8	Complete vessel; HMGPW straight-necked bulbous jug
L. 242	Str. Z2b					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
-	32710	40267	567	Shell	-	Group of chicken eggshells from pit

Table A2.1: Concordance of finds from Khirbat Nuqayb al-Asaymir, continued.

L. 249	Str. Z2a					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
38603	32715	40288	588	Ceramic	6.3.3	Body sherd; black-under-turquoise glazed stonepaste; knot-back
L. 250	Str. Z2a					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
38588	32861	40274	574	Ceramic	6.7.13	Body sherd; monochrome HMGPW; black linear décor
L. 261	Str. Z2(a)					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
38308	32862	40297	597	Ceramic	-	Rim; HMGPW vessel; worn red paint over light red slip; black core; some fine to coarse vegetal temper, minimal med. calcareous inclusions and fine sand
38309	32862	40297	597	Ceramic	6.7.12	Body sherd; bichrome HMGPW
38310	32862	40297	597	Ceramic	-	Rim; HMGPW vessel; worn red paint over light red slip; black core; some fine to coarse vegetal temper, minimal med. calcareous inclusions and fine sand
38311	32862	40297	597	Ceramic	-	Rim; HMGPW vessel; worn red paint over light red slip; black core; some fine to coarse vegetal temper, minimal med. calcareous inclusions and fine sand

Table A2.1: Concordance of finds from Khirbat Nuqayb al-Asaymir, continued.

L. 265	Str. Z2a					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
38589	34751	40308	608	Ceramic	-	Rim; IHMW or HMGPW; red slip and possible black paint; black core; some fine rocky inclusions, few fine vegetal voids
L. 266	Str. Z2(a)					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
38583	34679	40312	612	Ceramic	-	Rim; IHMW peaked-rim vessel; worn red slip on exterior; uneven black to light red core; common fine sandy temper, few fine vegetal voids
38564	34747	40312	612	Ceramic	6.7.9	Spout; HMGPW *ibrīq*
L. 268	Str. Z2(a)					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
-	32994	40347	647	Coin	7.5	Bronze *fals*, probably of al-ʻĀdil I, 1211-1214 AD(?)
-	32997	40342	642	Metal	7.12	Corroded iron blade
33004	33003	40341	641	Ceramic	6.3.2	Rim; polychrome-under-colorless glazed stonepaste; knot-back
33005	33009	40337	637	Ceramic	6.13.3	High Tongue Handle Slipper Lamp with vegetal motif

Table A2.1: Concordance of finds from Khirbat Nuqayb al-Asaymir, continued.

L. 274	Str. Z2b					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
38582	33535	40339	639	Ceramic	-	Body sherd; monochrome HMGPW; black crosshatch and diamond motif over red slip; black core; some fine vegetal and calcareous temper
L. 276	Str. Z2(a)					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
38304	33528	40363	663	Ceramic	6.5.16	Body sherd; comb-incised baggy jar
38604	33411	40371	671	Ceramic	6.13.4	High Tongue Handle Slipper Lamp with spiral motif
L. 279	Str. Z2a					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
-	33173	40380	680	Stone	7.22	Sharpening stone
L. 285	Str. Z2(a)					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
-	33368	40401	-	Bone	7.30,	Rectangular die (but lacking typical incised decoration)

Table A2.1: Concordance of finds from Khirbat Nuqayb al-Asaymir, continued.

L. 288	Str. Z2a					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
38600	33396	40405	705	Ceramic	6.1.2	Rim; polychrome-under-colorless glazed stonepaste; knot-back
L. 289	Str. Z2(a)					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
38586	34770	40452	752	Ceramic	-	High Tongue Handle Slipper Lamp with spiral motif; very small sherd
L. 290	Str. Z2b					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
-	33973	40416	716	Shell	-	Group of chicken eggshells from pit
L. 292	Str. Z2a					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
38306	34930	40424	724	Ceramic	-	Body sherd; monochrome HMGPW; sparse triangular "free-style" or linear motif in red paint applied directly to body; uneven core, black to red; many med. Rocky inclusions, some fine calcareous inclusions
38307	34930	40424	724	Ceramic	6.5.12	Rim; unglazed WM reddish bulbous-necked *ibrīq* (Petrographic sample TS2)

Table A2.1: Concordance of finds from Khirbat Nuqayb al-Asaymir, continued.

L. 293	Str. Z2b					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
38305	33644	40435	735	Ceramic	6.12.7	Body and horseshoe handle; IHMW cooking pot
L. 296	Str. Z2b					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
38590	34714	40445	745	Ceramic	-	Neck; HMGPW jug/jar; worn crosshatch design in black paint over tan slip; black core; some fine vegetal temper and fine to med. Calcareous inclusions
Building 5308						
Surface						
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
17677	-	-	-	Technical Ceramic	-	Tuyère fragment
-	-	-	-	Coin	-	Probably Ayyūbid coin (see photo in Jones, et al. 2012: 88, Fig. 20)
Building 5311						
Surface						

Table A2.1: Concordance of finds from Khirbat Nuqayb al-Asaymir, continued.

Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
38275	34783	0	0	Ceramic	6.4.4	Rim; Beirūt(?) glazed cooking pot
38276	34783	0	0	Ceramic	-	Rim; unglazed WM carinated, ridged bowl (Petrographic sample TS25)
38277	34783	0	0	Ceramic	-	Rim; unglazed WM carinated, ridged bowl
38278	34783	0	0	Ceramic	6.4.2	Body sherd; blue-under-turquoise glazed stonepaste
38279	34820	0	0	Ceramic	-	Body sherd; monochrome HMGPW; dark brown “free-style” motif over red slip; black core; thickly potted; common fine to med. Vegetal temper, some fine calcareous inclusions
38280	34820	0	0	Ceramic	6.12.4	Body sherd; monochrome HMGPW; dark brown “free-style” motif over orange-red slip
38281	34820	0	0	Ceramic	6.5.4	Rim; unglazed WM carinated, ridged bowl
Building 5312						
Surface						
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
-	-	-	-	Stone	7.24	Grinding slab
Building 5313						
Surface						

Table A2.1: Concordance of finds from Khirbat Nuqayb al-Asaymir, continued.

Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
41206	7992	0	0	Ceramic	-	Rim; HMGPW jug/jar; traces of purple-brown paint; black core; common fine sandy temper, some fine vegetal voids and calcareous inclusions
41207	7992	0	0	Ceramic	-	Rim; HMGPW everted-rim jar; painted black band and traces of red-painted design over reddish-yellow slip; black core; common fine vegetal and calcareous sand temper
41208	7992	0	0	Ceramic	-	Body sherd; black-under-colorless glazed stonepaste; arc-back
41209	7992	0	0	Ceramic	6.3.6	Body sherd; black-under-turquoise glazed stonepaste; arc-back
41211	7992	0	0	Ceramic	-	Body sherd; black-under-turquoise glazed stonepaste
41212	7992	0	0	Ceramic	-	Tongue handle; IHMW; black core; common fine to med. vegetal and fine to coarse quartz/feldspar sand temper, few argillaceous inclusions
41213	7992	0	0	Ceramic	6.4.1	Rim; black-and-blue-under-turquoise glazed stonepaste; arc-back
41214	7992	0	0	Ceramic	-	Rim; club-rim IHMW jar; red slip, lightly burnished; black core; common fine vegetal and calcareous sand temper, some med. rocky inclusions and voids, little mica
41215	7992	0	0	Ceramic	6.13.5	High Tongue Handle Slipper Lamp with simple pseudo-inscription
41217	7992	0	0	Ceramic	-	Rim; HMGPW flared-rim jug; crosshatch design in black applied directly to body; black core; common fine vegetal temper with some small calcareous and rocky inclusions

Table A2.1: Concordance of finds from Khirbat Nuqayb al-Asaymir, continued.

Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
41218	7992	0	0	Ceramic	-	Body sherd; black-under-turquoise glazed stonepaste
41219	7992	0	0	Ceramic	-	Rim; HMGPW flared-rim jug with filter; band of X's and linear design in black paint over burnished red slip; black core; common fine vegetal temper with some small calcareous and rocky inclusions
Building 5315						
Surface						
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
38282	33671	0	0	Ceramic	-	Rim; IHMW jar; uneven core, black to reddish yellow; common coarse quartz sand temper, some med. vegetal voids
38283	33671	0	0	Ceramic	6.7.3	Rim; HMGPW basin
38284	33671	0	0	Ceramic	6.12.6	Rim; IHMW jar
38290	-	0	0	Stone	7.29	*Rukh* of a *shaṭranj* (chess) set

Table A2.2: Concordance of finds from Khirbat Faynān.

Area 8						
Surface						
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
44798	31660	0	0	Ceramic	-	Tongue handle; IHMW cooking pot; surface collection from monastery; cream slip; black core; common fine to med. vegetal temper, some fine black inclusions, few fine to med. calcareous inclusions, few fine argillaceous inclusions
44799	31660	0	0	Ceramic	-	Body sherds; IHMW red burnished cooking pot; surface collection from monastery; red slip, hand-burnished; gray core; common fine to med. vegetal and calcareous temper, common fine argillaceous/iron oxide inclusions, some med. gray inclusions, some med. to large mineral voids
Area 15						
Surface						
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
39171	30031	0	0	Ceramic	6.17.8	Tongue handle; IHMW cooking pot; surface collection from slag mound
41169	41161	0	0	Ceramic	6.15.5	Rim; *qādūs*; from slope below tower, southwest of slag mound

Table A2.2: Concordance of finds from Khirbat Faynān, continued.

L. 003	Str. 15-2a					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
39172	30034	10009	0	Ceramic	6.17.1	Body sherd; HMGPW
L. 008	Str. 15-4					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
31079	30036	10057	91	Ceramic	-	Rim; carinated bowl with bead/cusp rim; Roman, residual
L. 009	Str. 15-2a					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
31067	29709	10062	96	Ceramic	6.17.12	Base; lamp, unknown type
L. 017	Str. 15-3					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
31072	31071	10110	176	Ceramic	6.15.2	Rim; jar with flaring, ridged rim; Late Byzantine-Early Islamic, residual
Area 16						
L. 102	Str. T3-1					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
29470	29466	502	0	Ceramic	6.17.9	Nozzle and base; Negev WM lamp

Table A2.2: Concordance of finds from Khirbat Faynān, continued.

L. 109	Str. T3-1					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
30842	30803	10593	0	Ceramic	6.15.3	Rim; large storage jar, LRA 5 related?
L. 110	Str. T3-2a					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
31327	31314	10595	0	Ceramic	-	Rim; ARS late Form 50a
31474	31471	10585	0	Ceramic	-	Rim; ARS Form 58b
L. 120	Str. T3-2a					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
30917	30913	10671	248	Ceramic	6.14.5	Rim; Magness Arched-Rim Basin Form 2A
L. 125	Str. T3-2					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
30592	30582	10718	295	Ceramic	-	Rim; NPFW Schmid Dekorgruppe 4
L. 127	Str. T3-2b					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
30772	30748	10741	318	Ceramic	6.16.1	Rim; ARS early Form 50a

Table A2.2: Concordance of finds from Khirbat Faynān, continued.

L. 1000	Terrace 1					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
7603	6951	90009	19	Ceramic	-	Rim; PRS Form 3f related; surface scrape
L. 1001	Terrace 1					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
8436	7255	90035	45	Ceramic	6.17.6	Rim; unpainted IHMW jar; surface scrape
L. 1003	Terrace 2					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
7847	7102	90036	46	Ceramic	-	Base; Negev WM lamp; from surface scrape
L. 1022	Str. T3-2a					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
-	7225	90117	127	Metal	7.11	Bronze strap/*polycandelon* fragment
L. 1027	Terrace 2					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
8779	7645	90104	114	Ceramic	6.17.11	Base and body sherd; Negev WM lamp
L. 1028	Terrace 2					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
8503	7465	90083	93	Ceramic	6.15.4	Rim; Magness Storage Jar Form 4C related

Table A2.2: Concordance of finds from Khirbat Faynān, continued.

L. 1033	Str. T3-2a					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
9262	8925	90364	374	Ceramic	6.16.2	Rim; ARS Form 59
L. 1037	Str. T3-2a					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
8514	7319	90147	157	Ceramic	6.16.3	Rim; ARS Form 61a
L. 1043	Terrace 2					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
8328	7752	90160	170	Ceramic	6.15.16	Rim; casserole
8810	7641	90141	151	Ceramic	6.16.7	Rim; PRS Form 3h
8811	7641	90141	151	Ceramic	6.16.8a-b	Rim and base; LRD Form 9a
8812	7641	90141	151	Ceramic	6.15.12	Rim; LRA 5 Pieri Type 3
8820	7710	90174	184	Ceramic	6.17.10	Nozzle; Negev WM lamp
8822	7710	90174	184	Ceramic	6.15.18	Rim; everted, collared-neck cooking pot/jar
L. 1045	Terrace 2					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
7910	7504	90142	152	Ceramic	6.14.8	Rim; black-slipped jug
8358	7953	90161	171	Ceramic	6.14.17	Rim; flaring ledge-neck jar
L. 1054	Str. T3-2a					

Table A2.2: Concordance of finds from Khirbat Faynān, continued.

Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
-	8212	90272	282	Ceramic	6.18	Nozzle; later South Jordan type lamp
-	8426	90288	298	Metal	7.8	Bronze bell
L. 1067	Terrace 2					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
8782	7950	90233	243	Ceramic	6.16.4	Rim; PRS Form 3e
8783	7950	90233	243	Ceramic	6.14.7	Rim; squared-rim basin
8785	7950	90233	243	Ceramic	6.15.10	Rim; T-rim jar
8786	7950	90233	243	Ceramic	6.16.5	Rim; PRS Form 3f
8788	7950	90233	243	Ceramic	-	Base and body sherd; Negev WM lamp
8790	7950	90233	243	Ceramic	-	Rim; LRD Form 9a
8791	7950	90233	243	Ceramic	6.15.19	Rim; everted, collared-neck cooking pot/jar
L. 1069	Terrace 2					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
9721	8271	90260	270	Ceramic	-	Base; Negev WM lamp
L. 1073	Str. T3-2b					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
-	8730	90321	-	Coin	-	Mid-4th century bronze *follis*, likely FEL TEMP REPARATIO
L. 1078	Str. T3-3 collapse					

Table A2.2: Concordance of finds from Khirbat Faynān, continued.

Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
-	8834	90373	-	Coin	-	Illegible bronze coin; possibly 2nd century *quadrans*
9166	8907	90365	375	Ceramic	-	Rim; NPFW Schmid Dekorgruppe 4
L. 1089	Str. T3-2b					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
-	8886	90388	398	Coin	-	Unidentifiable coin; possibly Late Roman-Early Byzantine *nummus*
-	8887	90388	398	Coin	-	4th century *nummus*, VICTORIA AVGVSTORVM?
-	8900	90388	398	Metal	-	Bronze hook
Area 18						
Surface						
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
32078	32075	0	0	Ceramic	6.15.9	Rim; small jar with ridged rim; from looters' backdirt
L. 003	Occ. 3					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
31087	31089	10040	90	Ceramic	6.15.8	Rim; reduced bag-shaped jar/cooking pot
L. 005	Occ. 3					

Table A2.2: Concordance of finds from Khirbat Faynān, continued.

Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
31685	31690	10020	20	Ceramic	6.17.7	Rim and handle; IHMW cooking pot
L. 006	Occ. 3					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
31096	31093	0	0	Ceramic	6.14.1	Rim; splash-glazed cream ware
31736	31735	10025	0	Ceramic	-	Rim; bowl with “pie-crust” rim; brown slip, very friable
31738	31735	10025	0	Ceramic	6.14.2	Rim; FBW Magness Bowl Form 2
31739	31735	10025	0	Ceramic	6.17.4	Rim; dot-painted IHMW cup/bowl; Early Islamic II?
31740	31735	10025	0	Ceramic	6.14.16	Rim; flared-rim jar
31741	31735	10025	0	Ceramic	6.17.3	Rim; IHMW cup/bowl; Early Islamic II?
31742	31735	10025	0	Ceramic	6.17.5	Rim; dot-painted IHMW cup/bowl; Early Islamic II?
31743	31735	10025	0	Ceramic	6.15.17	Rim; reduced, comb incised casserole lid
L. 008	Occ. 2 collapse					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
31091	31092	10061	61	Ceramic	6.15.14	Rim; LRA 5 Pieri Type 5
L. 009	Occ. 2 collapse					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
31077	31075	10054	54	Ceramic	6.14.11	Rim; small, flaring jug/flask
31078	31075	10054	54	Ceramic	6.14.3	Rim; FBW Magness Jug Form 1B
31593	31635	10068	68	Ceramic	6.15.13	Rim; LRA 5 Pieri Type 4 related

Table A2.2: Concordance of finds from Khirbat Faynān, continued.

Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
31636	31635	10068	68	Ceramic	6.17.2	Rim; HM basin; ‘Aqaba “Tupperware”?
31637	31635	10068	68	Ceramic	6.14.4	Rim; carinated bowl with bead/cusp rim; likely 7th century
31684	31682	10084	84	Ceramic	6.14.12	Rim; small, flaring jug/flask
31856	31854	10093	93	Ceramic	6.14.14	Rim; black-slipped jug/bottle with wavy comb incising
31857	31854	10093	93	Ceramic	-	Rim; LRD Form 9a/b
31858	31854	10093	93	Ceramic	-	Rim; NPFW Schmid Dekorgruppe 4, possibly imitating ARS or LRD forms
31859	31854	10093	93	Ceramic	6.15.20	Rim; Magness Cooking Pot Form 4B
31860	31854	10093	93	Ceramic	6.15.1	Rim; holemouth jar
L. 012	Occ. 1					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
31151	31152	10034	34	Ceramic	6.16.6	Rim; PRS Form 3f
L. 013	Occ. 3					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
31097	31098	10048	48	Ceramic	6.14.13	Rim; small jug with slightly thickened rim
L. 014	Cistern fill					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
30887	30889	10051	51	Ceramic	6.14.18	Rim; flaring ledge-neck jar with handle
30890	30889	10051	51	Ceramic	6.14.15	Rim; collared-neck jar with band combing
30891	30889	10051	51	Ceramic	6.15.6	Rim; plain-rim, white-slipped storage jar

Table A2.2: Concordance of finds from Khirbat Faynān, continued.

Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
30892	30889	10051	51	Ceramic	6.14.9	Rim; Coptic Painted Ware jug, Nile silt
30893	30889	10051	51	Ceramic	6.15.7	Rim; plain-rim, white-slipped storage jar
32216	32215	10051	51	Ceramic	6.15.11	Rim; LRA 1
L. 018	Occ. 2					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
30886	30885	10082	82	Ceramic	6.14.10	Rim; thin-walled brown jug
-	31930	10092	92	Stone	7.19.1	Rim and handle; schist bowl, 8th-9th century
L. 020	Occ. 1					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
31083	31081	10096	96	Ceramic	6.14.6	Rim; Magness Arched-Rim Basin Form 2A
39174	31668	0	0	Ceramic	-	Body sherd; LRD, unknown form; rouletted
L. 021	Occ. 2					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
-	30615	10107	-	Stone	7.20	Chancel post or colonette capital
32163	32169	10100	100	Ceramic	6.15.15	Rim; Red-Brown Ovoid Amphora, Nile silt

Table A2.3: Concordance of finds from Khirbat Ḥamrā Ifdān.

Area C						
L. 1404						
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
-	-	16015	-	Coin	7.3	Worn mid-7th century bronze *dodecanummium*, Alexandria mint
Area D						
Surface						
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
-	-	62079	-	Coin	-	Worn post-reform Umayyad epigraphic *fals*
Area L						
L. 3010	Str. L-I					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
41684	41682	45068	50040	Ceramic	6.19.2	Rim and handle; Gaza Ware jug
L. 3016	Str. L-IIA					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
19886	2142	45124	50092	Ceramic	-	Rim; HM jar, uncertain type
19888	2142	45124	50092	Ceramic	-	Rim; FBW Magness Bowl Form 1E
-	-	45140	50101	Metal	7.7	Bronze armor scale(?)

Table A2.3: Concordance of finds from Khirbat Ḥamrā Ifdān, continued.

L. 3021	Str. L-IIA					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
20006	20004	45185	50135	Ceramic	6.19.1	Rim; Mahesh Ware bowl/basin
20024	2156	45122	57539	Ceramic	6.19.3	Body sherd; comb incised
L. 3022(A)	Str. L-IIB					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
-	-	45179	50122	Ceramic	6.20	Complete upper portion; Large Candlestick Lamp
L. 3050	Str. L-IIA					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
44830	1282	45486	57603	Ceramic	-	Rim; FBW Magness Bowl Form 1E
44831	1282	45486	57603	Ceramic	-	Complete upper half; 6th-9th century cooking pot
L. 3051	Str. L-IIC					
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
20000	1267	45533	50361	Ceramic	-	Rim; Roman storage jar

Table A2.4: Concordance of finds from WFD 50a.

Area T						
Surface						
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
44823	-	-	-	Metal	-	Bronze pin; recovered from sieve, but context uncertain
L. 200						
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
44816	-	-	-	Bead	-	Toombs Type 7 bead
44824	-	-	-	Shell	-	Strip of nacre (mother of pearl)
44828	-	-	-	Metal	-	.303 caliber copper alloy bullet
L. 202						
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
44800	-	-	-	Metal	-	Bronze token with star, crescent, and rope/vine motif, probably late 19th century
44804	-	-	-	Metal	-	Silver token imitating Egyptian one *piastre* coin of ‘Abd al-‘Azīz, late 19th century
L. 204						

Table A2.4: Concordance of finds from WFD 50a, continued.

Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
41229	41223	1072	1072	Ceramic	6.19.6	Rim; reduced, white-painted bag-shaped jar
41235	41231	1020	1020	Ceramic	6.19.5	Rim; tall-necked jar with black surfaces
44819	-	-	-	Bead	-	Toombs Type 3 bead
44820	-	-	-	Bead	-	Toombs Type 10 bead
44821	-	-	-	Bead	-	Two cowrie shell beads
L. 208						
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
44801	-	-	-	Metal	-	Bronze token with star, crescent, and rope/vine motif, probably late 19th century
44802	-	-	-	Metal	7.6	Bronze token imitating gold *altun* of Maḥmūd II, later 19th century
44803	-	-	-	Coin	-	Silver 20 *para* coin of ʻAbd al-Mecīd I, mid-19th century
44805	-	-	-	Glass	7.26	Glass bracelet, probably 19th century
44808	44806	1086	184	Ceramic	-	Body sherd; Mahesh Ware vessel; comb incised
44814	-	-	-	Shell	-	Ostrich eggshell fragment
44817	-	-	-	Bead	-	Toombs Type 10 bead
44822	-	-	-	Bead	-	Cowrie shell bead
44826	-	-	-	Shell	7.28	Nacre (mother of pearl) Maltese cross pendant with inscribed Jerusalem cross
44827	-	-	-	Metal	-	Copper chain

Table A2.4: Concordance of finds from WFD 50a, continued.

L. 209						
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
44812	44810	8652	89350	Ceramic	-	Body sherd; Gaza Amphora
44813	44811	1126	0	Ceramic	-	Body sherd; reduced, white-painted bag-shaped jar
L. 211						
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
41242	41241	1042	1042	Ceramic	6.19.4	Rim; everted-rim cooking pot
44825	-	-	-	Shell	-	Seven small marine shell fragments, encrusted with mortar
L. 213						
Reg.	Bulk Reg.	Basket	EDM	Type	Fig.	Description
44809	44807	1092	191	Ceramic	-	Body sherd; unknown jar type; wavy comb incision
44818	-	-	-	Bead	-	Toombs Type 16 bead
44829	-	-	-	Metal	-	Corroded bullet, probably 9mm

Appendix 3: Sugar Production Sites in the Southern Levant

This appendix presents a list of sites in the southern Levant at which evidence of sugar production has been found or for which sugar production has been suggested in previous publications. The sites listed in Table A3.1 are sorted first by certainty, on a scale of 0-5, then by whether or not they have been excavated. Certainty values are ranked as: 5 = "certain", 4 = "likely", 3 = "plausible", 2 = "possible", 1 = "unlikely". 0 refers to sites listed in otherwise accurate sources for which I have not been able to locate survey or excavation reports referring to evidence of sugar production. Certainty is determined on the basis of associated features, density of sugar pottery, etc., as well as the source of that data. As such, an excavated site with a large quantity of sugar pottery and a clear associated sugar factory would be ranked "5," while an unexcavated site with the same features would be ranked "4." A site with a large quantity of sugar pottery found during survey but no associated architectural features would be ranked "3," a site with a low quantity of sugar pottery and no associated architectural features would be ranked "2," and so on. While all sites noted during dissertation research on sugar production are listed in Table A3.1, only excavated sites ranked "4" or "5" are discussed in Section 3.6.2.

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
al-Kābrī	Israel Antiquities Authority (IAA) Site 16-26/48/01; ASUG Site 40; Le Quiébre	Galilee	Yes	11^{th}-12^{th} centuries AD	(Frankel, et al. 2001: 14; Stern 1999a: Table 1, No. 2; Smithline 2004)	5
Khirbat al-Minya	Ḥorvat Manim, Ḥorvat Minnim	Galilee	Yes	Crusader-Mamlūk	(Cinamon 2012; Cytryn-Silverman 2009: 59, n. 59; Cytryn-Silverman 2014: 4054; Stern 1999a: Table 1, No. 15)	5

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations, continued.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
Khirbat al-Shaykh ʿĪsā	SGNAS Site 4; Zughar (?); Ṣughar (?); Zoara	Dead Sea *aghwār*	Yes	8th-15th centuries AD, but the sugar industry seems to date primarily to the 12th-14th centuries	(Albright 1924: 4; Brigitte-Porëe 1995: 409, 419-420, 425-426; Glueck 1935: 8; Jones 2017; Jones, et al. 2000; King, et al. 1987: 447-448, 456; MacDonald 1992: 232, 235, Pl. 31, 236, 237, Pl. 32, 249; Photos-Jones, et al. 2002; Politis 2013a; Politis 2013b; Politis 2015; Politis, et al. 2009; Politis, et al. 2007; Politis, et al. 2005; Stern 1999a: Table 1, No. 41; Whitcomb 1992a: 115)	5

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations, continued.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
Lower Ḥorbat Manot	Manueth	Galilee	Yes	Sugar was produced from Phase 4 (13th century) to Phase 2b (early 17th century)	(Brigitte-Porëe 1995: 413-415; Burke 2004: 116-117; Shapiro 2001; Stern 1999a: Table 1, No. 1; Stern 2001)	5
Tall Abū Ghūrdān	Often called Tall Abū Qaʻdān (see Preface)	Jordan Valley	Yes	Sugar pots first appear in Phase H (Franken and Kalsbeek 1975: 143), which Sauer (1976: 94) suggests dates to the Ayyūbid period.	(Brigitte-Porëe 1995: 401-402; Burke 2004: 113-114; Franken and Ibrahim 1978; Franken and Kalsbeek 1975; Sauer 1976; Stern 1999a: Table 1, No. 36-38)	5

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations, continued.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
Tall Abū Ṣarbūṭ		Jordan Valley	Yes	Sugar production likely began in the Middle Islamic IIa and spanned the Middle Islamic II. A radiocarbon sample from Phase 50, the first phase clearly post-dating sugar production, yielded a date of 1292-1448 AD (cal. 2σ; LaGro 2002: 10). Burke (2004: 114-115) suggests on this basis that "the factories could have been late Ayyubid or early Mamluk." During the Late Islamic Ia, the site was occupied, but sugar production does not seem to have continued.	(Brigitte-Porëe 1995: 424-425; Burke 2004: 114-115; de Haas, et al. 1989; de Haas, et al. 1992; LaGro 2002; LaGro 2010; LaGro and de Haas 1991; Steiner 1998; Steiner 2008; Stern 1999a: Table 1, No. 35)	5

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations, continued.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
Ṭawāḥīn al-Sukkar (Ghawr al-Ṣāfī)	SGNAS Site 1; Qaṣr al-Ṭūba; Qaṣr al-Bashāriyya; al-Mashnaqa; Qaṣr al-Ṣāfī	Dead Sea *aghwār*	Yes	Perhaps as early as 8th or 9th centuries AD, although it is not clear that it would have functioned as a sugar factory at this early date. The majority of material dates to the 12th-14th centuries AD.	(Brigitte-Porëe 1995: 409, 417; Glueck 1935: 7; Jones 2017; Jones, et al. 2000; King, et al. 1987: 446, 455-456; MacDonald 1992: 232, 233, Pl. 29, 249; Photos-Jones, et al. 2009; Photos-Jones, et al. 2002; Politis 2013a; Politis 2013b; Politis 2015; Politis, et al. 2009; Politis, et al. 2005; Stern 1999a; Table 1, No. 42; Whitcomb 1992a: 114-115; see also Palmer 1872: 463; Tristram 1865: 340-341)	5

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations, continued.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
Ṭawāḥīn al-Sukkar (Jericho)		Jordan Valley	Yes	The published pottery is primarily Middle Islamic IIb-c in date, but the latest coins (ostensibly, but see Section 3.6.2) date to the Middle Islamic IIa (Taha 2009: 187, Figs. 7-11, 188; Taha 2004: 76, 77, Abb. 2; Taha 2001: 70). Historical sources indicate production during the early 12^{th} century, if not earlier (Taha 2009: 181; Taha 2001: 68), and a Zangid coin (see Section 3.6.2) supports this dating.	(Brigitte-Porëe 1995: 406, 422-424; Stern 1999a: Table 1, No. 24; Taha 2015; Taha 2009; Taha 2004; Taha 2001; see also Tristram 1865: 216)	5

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations, continued.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
Umm al-Faraj	IAA Site 16-26/17/01; ASUG Site 27; Ben-Ami/Ben ‘Ami; Le Fierge	Galilee	Yes	Sugar was apparently produced from the Fāṭimid period (10^{th}-11^{th} centuries AD) into the Early Ottoman period (16^{th}-17^{th} centuries AD)	(Frankel, et al. 2001: 12; Getzov, et al. 2016; Stern 1999a: Table 1, No. 3; Damati 2011)	5
Yesud HaMa‘ala		Ḥūla Valley	Yes	13^{th}-14^{th} centuries AD	(Biran and Shoham 1987; Brigitte-Porëe 1995: 428-430; Burke 2004: 115-116; Stern 1999a: Table 1, No. 12; Shoham 1983; Shoham 1985)	5
Migdal	al-Majdal; Magdala; Taricheae	Galilee	Yes	11^{th}-13^{th} centuries AD	(Abu-‘Uqsa 2005; Abu ‘Uqsa 2001: 23*, Fig. 11.3; Avshalom-Gorni and Stern 2016; De Luca and Lena 2015: 299)	4

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations, continued.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
Nahariyya, Giv‘at Ussishkin	Kh. al-Yānūḥiyya; La Noie; Lanahiam	Galilee	Yes	12th-16th century AD (evidence for sugar production primarily in 12th); earlier Byzantine phase	(Lerer 2014; see also Stern, et al. 2015: 97-98)	4
al-Numayra 4		Dead Sea *aghwār*	Yes	Middle Islamic	(Waheeb 1996: 452-455)	4
Ṭabaqat Faḥl	Pella	Jordan Valley	Yes	14th century	(Abu Dalu 1995: 38, Fig. 1, No. 17; Glueck 1945: 254-257; McPhillips and Walmsley 2007; Schumacher 1888: 33; Stern 1999a: Table 1, No. 7א; Walmsley and Smith 1992: 188-198)	4

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations, continued.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
Tall Nimrīn	Tall al-Shūna al-Janūbiyya; EJVS Site 182	Jordan Valley	Yes	"Ayyubid-Mamluk." The published ceramics seem to indicate primarily a later 13^{th}-14^{th} century date.	(Dornemann 1990; Glueck 1945: 367-368; Flanagan, et al. 1992; Flanagan, et al. 1994; Flanagan and McCreery 1990; Kareem 2000: 80; Yassine, et al. 1988: 192, 202-205; see also Walker 2004: 123, 134-135; Walker 2007c: 190, 193-194; Walker 2008: 95; Walker 2011b: 84-85, 256, 258, 263)	4
Tel Qasīla		Coastal Plain	Yes	Crusader	(Ayalon, et al. 1987-1989; Brigitte-Porëe 1995: 425; Stern 1999a: Table 1, No. 7)	4

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations, continued.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
Tiberias	Ṭabariyya	Galilee	Yes	10th century AD, continuing into at least the 14th century	(Amir 2004: 165; Cytryn-Silverman 2009: 46, 59, n. 59; Cytryn-Silverman 2015: 206, Fig. M; Hartal 2008; Hirschfeld 2004: 125; Stern 1999a: Table 1, No. 16-17; Stern 2013: 183, 203)	4
Tall Findī al-Janūbī	EJVS Site 38; JSHS Site B. More commonly: Tell Fendī	Jordan Valley	No — Late Chalcolithic portions of Tall Findī proper have been excavated, however (see Blackham, et al. 1997)	Uncertain; 13th-14th centuries AD, based on survey data	(Abu Dalu 1995: 38, Fig. 1, No. 13; Ibrahim, et al. 1976: 47, Fig. 9, 49, 63-64; Kareem 1989; Lenzen, et al. 1987: 315; Stern 1999a: Table 1, No. 28; see also Glueck 1945: 246-247)	4
al-Rāssiya al-Janūbiyya	EJVS Site 11	Jordan Valley	No		(Abu Dalu 1995: 38, Fig. 1, No. 18; Ibrahim, et al. 1976: 48, 61, 63; Stern 1999a: Table 1, No. 6ב)	4

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations, continued.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
al-Rujūm	SGNAS Site 45; Khirbat al-Shaykh ʻAlī; Khirbat al-Ṣāfiyya; al-Maqbara, al-Ṣāfī; Zughar (?); Ṣughar (?)	Dead Sea *aghwār*	No		(King, et al. 1987: 448, 456; MacDonald 1992: 236, 238, Pl. 33, 239, Pl. 34, 240, 241, Pl. 35, 242, Pl. 36, 253; Stern 1999a: Table 1, No. 40; Whitcomb 1992a: 115-116)	4
Karayma al-Janūbiyya	EJVS Site 90	Jordan Valley	No		(Abu Dalu 1995: 38, Fig. 1, No. 27, 42-43; Ibrahim, et al. 1976: 50, 63, 65; Stern 1999a: Table 1, No. 33)	4
Khirbat al-Marqaʻa	EJVS Site 45	Jordan Valley	No		(Abu Dalu 1995: 38, Fig. 1, No. 14; Glueck 1945: 248; Ibrahim, et al. 1976: 49, 63-64; Kareem 2000: 75; Stern 1999a: Table 1, No. 7ב)	4

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations, continued.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
Khirbat al-Shaykh Ḥussayn	Maqām al-Shaykh Ḥussayn; JSHS Site O; EJVS Site 42	Jordan Valley	No		(Ibrahim, et al. 1976: 49, 63; Kareem 1989: 101; Kareem 2000: 73; Lenzen, et al. 1987: 319; Stern 1999a: Table 1, No. 29)	4
Khirbat al-Sulaykhāt	EJVS Site 80	Jordan Valley	No		(Abu Dalu 1995: 38, Fig. 1, No. 25; Glueck 1945: 280-281; Ibrahim, et al. 1976: 50, 63, 65; Kareem 2000: 79; Stern 1999a: Table 1, No. 8ב)	4
Qaṣr al-Fayfā	al-Fayfā al-Gharbiyya; SGNAS Site 91	Dead Sea *aghwār*	No		(Brigitte-Porëe 1995: 407; Glueck 1935: 9-10; King, et al. 1987: 449-450, 457; MacDonald 1992: 258; Stern 1999a: Table 1, No. 43; Whitcomb 1992a: 115)	4

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations, continued.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
Tall Abū ‘Arābiyyā al-Shamālī	JSHS Site J	Jordan Valley	No		(Abu Dalu 1995: 38, Fig. 1, No. 11; Lenzen, et al. 1987: 316-317; Stern 1999a: Table 1, No. 27)	4
Tall Abū al-Qaws	EJVS Site 102; both Ibrahim, et al. (1976) and Glueck (1945) call the site Tall al-Qaws. Ibrahim, et al. (1976) give the spelling as “Tell el-Qōṣ” — spelled like the Egyptian town, rather than “bow”	Jordan Valley	No		(Abu Dalu 1995: 38, Fig. 1, No. 28-29; Glueck 1945: 297-300; Ibrahim, et al. 1976: 50, 63-65; Stern 1999a: Table 1, No. 9ב)	4

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations, continued.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
Tall Abū Bissa	EJVS Site 18	Jordan Valley	No		(Abu Dalu 1995: 38, Fig. 1, No. 9; Ibrahim, et al. 1976: 46, Fig. 6, 47, Fig. 7, 48, 62, Fig. 24, 63-64; Stern 1999a: Table 1, No. 26)	4
Tall al-Sukkar	EJVS Site 51	Jordan Valley	No		(Abu Dalu 1995: 38, Fig. 1, No. 16; Ibrahim, et al. 1976: 49, 63-65; Stern 1999a: Table 1, No. 30)	4
Ṭawāḥīn al-Sukkar (Wādī al-Zarqā')	EJVS Site 160	Jordan Valley	No		(Abu Dalu 1995: 38, Fig. 1, No. 31; Yassine, et al. 1988: 191, 202-203)	4
Ḍirār	Dhirār; Zerar; EJVS Site 113	Jordan Valley	No		(Abu Dalu 1995: 38, Fig. 1, No. 30, 43-44; Kaptijn 2009: 282-285; Stern 1999a: Table 1, No. 34; Yassine, et al. 1988: 190, 202-203)	4

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations, continued.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
‘Ein Afeq	Doc; Da‘ūq; Kurdāna; Recordane; Tel Afek/Afeq	Galilee	No		(Abu Raya 2010; Stern, et al. 2015: 99-100)	4
Montfort		Galilee	Yes, but no evidence for sugar production (see Boas 2012)	Crusader, probably 13th century	(Brigitte-Porëe 1995: 415-416; Pringle 1986b: 68-71; Stern 1999a: Table 1, No. 1ב)	3
Ṣafad	Ẓefat	Galilee	Yes	Crusader-Ayyūbid (mid-12th-13th century)	(Barbé 2015: 66*, 67*, Fig. 17.1-4)	3
Waqqāṣ	EJVS Site 60	Jordan Valley	Yes — Classical cemetery (see Sultan and Khasawneh 2015)	Uncertain	(Abu Dalu 1995: 38, Fig. 1, No. 10; Ibrahim, et al. 1976: 49, 65; Kareem 2000: 79; Schumacher 1888: 72)	3
Tall al-Shūna al-Shamāliyya	EJVS Site 4; Khirbat al-Quṣayr (?) (Schumacher 1888: 8)	Jordan Valley	Yes — Chalcolithic-Early Bronze Age occupation and Hellenstic burials (see Baird and Philip 1992)	Uncertain	(Ibrahim, et al. 1976: 48, 61, 63, 65; Stern 1999a: Table 1, No. 25)	3

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations, continued.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
Bet She'an	Baysān; Scythopolis	Jordan Valley	Yes	12^{th}-14^{th} centuries AD	(Avissar 2014: 131, 132, Fig. 43.1-2, 137, Fig. 46.2-5, 138; Brigitte-Porëe 1995: 399-400; Burke 2004: 115; Hanna 2010; Stern 1999a: Table 1, No. 19-20; Syon 2004)	3
Dhrā' al-Khān	EJVS Site 31	Jordan Valley	Yes	The excavated coins date between 1280 and 1453 AD. A late 16^{th} century coin was surface collected (Kareem 1997: 367-368; Kareem 2000: 279-292)	(Ibrahim, et al. 1976: 49, 63-65; Kareem 1997; Kareem 2000: 28-66, 70, 83, 193-205, Fig. 53.5-10, Figs. 54-59)	3
Tall Ḥisbān		al-Balqā'	Yes	14^{th} century AD	(Jones 2003; Walker 2003: 258-259; Walker 2004: 132-133; Walker 2010: 122-123; Walker and LaBianca 2003)	3

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations, continued.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
Tel Reḥov		Jordan Valley	Yes	Uncertain	(Stern 1999a: Table 1, No. 21; Syon 1999: 45*)	3
al-Siba		Jordan Valley/Bet She'an Valley	Yes	Primarily 13th-15th century AD	(Atrash 2010)	3
al-Ḥadītha		Dead Sea *aghwār*	No		(Brigitte-Porëe 1995: 408; King 1985: 42; King, et al. 1987: 439, 442, 453; Stern 1999a: Table 1, No. 39)	3
Shūnat Ḥisbān	Heshbon Survey Site 41; Shūnat al-Ṣuqr	Balqā'	No		(Conder 1889: 217-219, 225; Ibach 1987: 17, 194, 226, 228)	3
Ṭawāḥīn al-Sukkar (Dhrā')	Ṭawāḥīn al-Sukkar II; Ṭawāḥīn al-Sukkar (Ghawr al-Mazra'a); Khirbat al-Rasīs (?)	Dead Sea *aghwār*	No		(Brigitte-Porëe 1995: 422; Glueck 1935: 5; King, et al. 1987: 443, 454-455; de Saulcy 1853: 296; Schmidt 1906: 90; Stern 1999a: Table 1, No. 10ב; Whitcomb 1992a: 114-115)	3

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations, continued.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
Wādī ‘Isal Site F3-3		Dead Sea *aghwār*	No		(Jacobs 1983: 271, Fig. 15.1, 272)	3
Settling the Steppe Project Field 81		Jordan Valley	No		(Kaptijn 2009: 277-278)	3
Tall Ṭāḥūnat al-Sukkar	‘En HaNatziv	Jordan Valley	Yes — Hellenistic settlement (Har’el 2014)		(Har’el 2014)	2
Acre	‘Akko, ‘Akkā	Coastal Plain	Yes	13th century	(Boas and Melloni 2005; Stern 1999a: Table 1, No. 4-5; Stern 1999b; Stern 2001: 303; Tatcher 2000)	2
Dār al-Gharbiyya, Kafr Yāsīf		Galilee	Yes	Crusader and Mamlūk	(Syon and Stern 2014: 247, 252)	2
Ḥorbat Ne’tar		Jordan Valley	Yes	12th-13th centuries AD, perhaps beginning earlier	(Stern 1999a: Table 1, No. 22; Syon 1999)	2

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations, continued.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
Ḥorbat Ṭafat	Khirbat al-Mazra‘a	Coastal Plain	Yes	Uncertain; the small salvage excavations produced no evidence of sugar production, but the recovered pottery was dated to the 12th-13th centuries AD	(Nudel 1999; Stern 1999a: Table 1, No. 6)	2
Jāffā	Yafo	Coastal Plain	Yes	Crusader? Ottoman?	(Stern 1999a: Table 1, No. 8; Arbel 2016)	2
Khirbat Burīn		Coastal Plain	Yes	Late 13th-14th centuries AD	(Kletter and Stern 2006: 180, 184, Fig. 15.2-3, 185)	2
Khirbat Din‘ila		Galilee	Yes	Mamlūk	(Stern 2014: 79, Fig. 5.5, 80)	2
Qiryat Ata	Kafr Atā	Coastal Plain	Yes	Uncertain; 11th-15th century AD	(Torgë and Sa‘id 2015)	2
Tel Jezreel	Zir‘īn; Le Petit Gérin; Parvum Gerinum; Esdraela; Tel Yizre’el	Jezreel Valley	Yes	Possibly pre-12th century AD (Grey 1994: 57)	(Brigitte-Porëe 1995: 412-413; Grey 1994: 57, 58, Fig. 8.7; Mitchell 1994: 70; Stern 1999a: Table 1, No. 18)	2

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations, continued.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
"Milling site on Wādī al-'Arab"		Jordan Valley	No		(Abu Dalu 1995: 38, Fig. 1, No. 1; Schumacher 1888: 8-11, 33)	2
(Qaryat?) Subayra	EJVS Site 88	Jordan Valley	No		(Abu Dalu 1995: 38, Fig. 1, No. 26; Ibrahim, et al. 1976: 50, 65)	2
Abū 'Ubayda	EJVS Site 111	Jordan Valley	No		(Kareem 2000: 80; Yassine, et al. 1988: 190, 202)	2
al-Midarāj	EJVS Site 15	Jordan Valley	No		(Ibrahim, et al. 1976: 48; Kareem 2000: 66, 68)	2
al-Ṭāḥūna		Jibāl Nāblus/Samaria	No		(Brigitte-Porëe 1995: 398; Pringle 1986b: 69)	2
Banāt Ya'qūb	EJVS Site 57	Jordan Valley	No		(Ibrahim, et al. 1976: 49, 63; Kareem 2000: 77)	2
Khibat Ma'ādh	EJVS Site 27	Jordan Valley	No		(Ibrahim, et al. 1976: 49, 63, 65; Kareem 2000: 70)	2

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations, continued.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
Khirbat al-Maḥrūqāt	WYS Site 41	Jordan Valley	No		(Abu Dalu 1995: 38, Fig. 1, No. 19; Mabry and Palumbo 1988a: 278, Table 1, 296-297, 302; Mabry and Palumbo 1988b: 427; Stern 1999a: Table 1, No. 31)	2
Khirbat al-Sāssiya	EJVS Site 17	Jordan Valley	No		(Abu Dalu 1995: 38, Fig. 1, No. 8; Glueck 1945: 240; Ibrahim, et al. 1976: 46, Fig. 5, 48, 63)	2
Khirbat al-Shaykh ‘Alayyān	EJVS Site 37	Jordan Valley	No		(Ibrahim, et al. 1976: 49, 63, 65; Kareem 2000: 73)	2
Khirbat Umm al-Kharwa‘	EJVS Site 16	Jordan Valley	No		(Ibrahim, et al. 1976: 48, 61, 65; Kareem 2000: 70)	2
Mazarat Abū ‘Īsā	EJVS Site 35	Jordan Valley	No		(Ibrahim, et al. 1976: 49, 63, 65; Kareem 2000: 73)	2

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations, continued.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
Shiqāq al-Zu‘ur	EJVS Site 141	Jordan Valley	No		(Kareem 2000: 80; Yassine, et al. 1988: 191, 202-203)	2
Tall al-‘Arba‘īn	EJVS Site 34; JSHS Sites F-I	Jordan Valley	No		(Ibrahim, et al. 1976: 49, 63-65; Kareem 2000: 70, 73; Lenzen, et al. 1987: 316)	2
Tall Abū al-Na‘īm	Settling the Steppe Project Field 329	Jordan Valley	No		(Kaptijn 2009: 274-277)	2
Tall al-Shūna al-Wusṭiyya	EJVS Site 52	Jordan Valley	No		(Ibrahim, et al. 1976: 49, 63; Kareem 2000: 75)	2
Tall al-Ṭāḥūn	EJVS Site 189	Jordan Valley	No		(Abu Dalu 1995: 38, Fig. 1, No. 33; Yassine, et al. 1988: 192, 202-203)	2
Tall Ba‘ajawiyya	EJVS Site 54	Jordan Valley	No		(Ibrahim, et al. 1976: 49, 62-64; Kareem 2000: 77)	2

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations, continued.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
Tall Sharḥabīl	EJVS Site 12; WYS Site 13	Jordan Valley	No		(Glueck 1945: 260-261; Ibrahim, et al. 1976: 48; Mabry and Palumbo 1988a: 296; Mabry and Palumbo 1988b: 427; Stern 1999a: Table 1, No. 32)	2
Wādī al-ʻArab Site 17		Jordan Valley	No		(Abu Dalu 1995: 38, Fig. 1, No. 2; Hanbury-Tenison, et al. 1984: 389; Gardiner and McQuitty 1987)	2
Wādī al-ʻArab Site 62		Jordan Valley	No		(Abu Dalu 1995: 38, Fig. 1, No. 5; Hanbury-Tenison, et al. 1984: 391; Gardiner and McQuitty 1987: 31-32)	2
ʻEn Gedi	ʻAyn Jiddī	Dead Sea *aghwār*/Judaean Desert	Yes — Several sites unrelated to mill		(Brigitte-Porëe 1995: 405; Har-El 1978: 555; Stern 1999a: Table 1, No. 3ל)	1

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations, continued.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
al-Karak		Karak Plateau	Yes	Uncertain; 13th-14th centuries AD?	(Brown 1989: 301, Fig. 6.13; Milwright 2008a: 357-359)	1
al-Ramla		Coastal Plain	Yes	10th-11th century AD; 14th century AD?	(Kletter 2009; Talmi 2010; Yehuda 2016: 65-66, Fig. 3.1.26)	1
al-Shawbak		Sharāh Plateau	Yes		(Benvenisti 1970: 253; Brigitte-Porëe 1995: 419; Brooker and Knauf 1988: 185; Milwright 2006: 15; Walker 2011b: 104; see also Boas 1999: 82; Jones, et al. 2012: 92; Rosen-Ayalon 2006: 86)	1

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations, continued.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
Tel Yoqne'am	Qīra; Cain Mons	Coastal Plain	Yes	13th-14th centuries AD?	(Avissar 1996: 154, Fig. XII.123, 155; Stern 1999a: Table 1, No. 3א)	1
Wādī Ziqlāb Site 204		Jordan Valley	Yes	Probably Ottoman	(Abu Dalu 1995: 38, Fig. 1, No. 12; Banning, et al. 1989: 56-57; Brigitte-Porëe 1995: 427-428; Schumacher 1888: 71)	1
Wādī al-'Arab Site 19		Jordan Valley	No		(Abu Dalu 1995: 38, Fig. 1, No. 3; Hanbury-Tenison, et al. 1984: 389; Gardiner and McQuitty 1987: 31-32)	1
Wādī al-'Arab Site 61		Jordan Valley	No		(Abu Dalu 1995: 38, Fig. 1, No. 4; Hanbury-Tenison, et al. 1984: 391; Gardiner and McQuitty 1987: 31-32)	1

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations, continued.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
Wādī al-ʻArab Site 63		Jordan Valley	No		(Abu Dalu 1995: 38, Fig. 1, No. 6; Hanbury-Tenison, et al. 1984: 391; Gardiner and McQuitty 1987: 31-32)	1
Wādī al-ʻArab Site 81		Jordan Valley	No		(Abu Dalu 1995: 38, Fig. 1, No. 7; Hanbury-Tenison, et al. 1984: 392; Gardiner and McQuitty 1987: 31-32)	1
Wādī al-Yābis Site 32		Jordan Valley	No		(Abu Dalu 1995: 38, Fig. 1, No. 22-23; Mabry and Palumbo 1988a: 278, Table 1, 296; Mabry and Palumbo 1988b: 427)	1

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations, continued.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
Wādī al-Yābis Site 33		Jordan Valley	No		(Abu Dalu 1995: 38, Fig. 1, No. 20; Mabry and Palumbo 1988a: 278, Table 1, 296; Mabry and Palumbo 1988b: 427)	1
Wādī al-Yābis Site 34		Jordan Valley	No		(Abu Dalu 1995: 38, Fig. 1, No. 24; Mabry and Palumbo 1988a: 278, Table 1, 296; Mabry and Palumbo 1988b: 427)	1
Wādī al-Yābis Site 44		Jordan Valley	No		(Abu Dalu 1995: 38, Fig. 1, No. 21; Mabry and Palumbo 1988a: 278, Table 1, 296; Mabry and Palumbo 1988b: 427)	1
Duqat Kafr ‘Aqab	Ḥof Kinar	Galilee	Yes — Classical burial caves		(Abu Raya 1996; Stern 1999a: Table 1, No. 14)	0

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations, continued.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
Tel Shalem		Jordan Valley	Yes	Uncertain	(Stern 1999a: Table 1, No. 23)	0
al-‘Ārḍa	EJVS Site 155; toponym given as “Shqāq Muthallath el-‘Ārda” in Yassine, et al. (1988)	Jordan Valley	No		(Abu Dalu 1995: 38, Fig. 1, No. 32; Yassine, et al. 1988: 191, 202-204)	0
al-Miṣaylaḥa	EJVS Site 203; toponym given as “el-Mesallaḥah” and “Mislaḥa” in Yassine, et al. (1988) and “Miṣaylaḥī” in Abu Dalu (1995)	Jordan Valley	No		(Abu Dalu 1995: 38, Fig. 1, No. 34; Yassine, et al. 1988: 193, 203)	0
Dafna (South)		Ḥūla Valley	No		(Stern 1999a: Table 1, No. 10)	0
Dardara	“El-Heshe”	Ḥūla Valley	No		(Stern 1999a: Table 1, No. 13)	0
Khān al-Duwayr		Ḥūla Valley	No		(Stern 1999a: Table 1, No. 9)	0
Ṭāḥūnat Mallāḥa		Ḥūla Valley	No		(Stern 1999a: Table 1, No. 11)	0

Table A3.1: List of sugar production sites in the southern Levant known from archaeological surveys and excavations, continued.

Toponym	Alternate Toponyms	Region	Excavated?	If excavated, date	Bibliography	Certainty
Zimāliyya		Jordan Valley	No		(Abu Dalu 1995: 38, Fig. 1, No. 15; Ibrahim, et al. 1976: 41)	0

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