ABSTRACT

CULCLASURE, DAVID NEWTON. The Supply of the Roman Military in Wadi Arabah during Late Antiquity (ca. 284-636 C.E.) (Under the direction of Prof. S. Thomas Parker)

At the turn of the 3rd century C.E., the Roman Emperor Diocletian established a series of forts in Wadi Arabah, the southeast corner of the empire, to protect Roman interests from nomadic Saracen tribes. These forts were often located along significant road junctions and guarded access in and out of the Arabah. One issue that has not been examined in detail, however, is how these forts were supplied during their occupation in Late Antiquity (ca. 284-636 C.E.). Over the past several decades, these forts have been the target of archaeological excavations and in light of the newly uncovered material goods such as ceramics, glass, faunal, and botanical remains, it is now possible to begin investigating what and whom the soldiers of these forts relied upon for their sustenance.

Given the hyper-arid climate of Wadi Arabah, it would not be surprising to suspect this type of environment would prohibit the garrisoned troops from providing their own supplies. This thesis, however, attempts to combat this assumption and demonstrate that throughout the valley there is evidence of internal, local production of goods in order to supplement external supplies from the outset of the soldiers’ arrival in the Arabah. This evidence presented in this thesis suggests the existence of a complex military logistical system in Wadi Arabah during Late Antiquity and that the valley allowed some level of local supply over several centuries to support small garrisons in forts overlooking the Dead Sea, a large international port on the Red Sea, and the garrisons linking these two bodies of water.
The Supply of the Roman Military in Wadi Arabah during Late Antiquity (ca. 284-636 C.E.)

by

David Newton Culclasure

A thesis submitted to the Graduate Faculty of
North Carolina State University
in partial fulfillment of the
requirements for the degree of
Master of Arts

History

Raleigh, North Carolina

2017

APPROVED BY:

S. Thomas Parker, Ph.D
Committee Chair

Jennifer Gates-Foster, Ph.D

Julie Mell, Ph.D.
BIOGRAPHY

David Newton Culclasure was born in Greensboro, NC and attended Western Guilford High School. Following his matriculation at the University of North Carolina at Chapel Hill, he double majored in Classical Archaeology and Ancient History, eventually graduating in 2014. In the fall of 2015, he began an M.A. at North Carolina State University under the direction of S. Thomas Parker where his interest in Roman archaeology and history eventually culminated into this thesis.
ACKNOWLEDGEMENTS

It is not an easy task to adequately thank each and every person who has helped me complete this thesis. Over the past two years through different stages of planning, research, writing, and editing, I have relied on a tremendous amount of support for which I am eternally grateful. First, I would like to thank my advisor, S. Thomas Parker, who has encouraged me and provided crucial review of my research during this entire process. I also wish to extend similar thanks to my committee members, Jennifer Gates-Foster and Julie Mell, whose feedback has only strengthened the quality and content of this study. Together your evaluation and critiques of my work has allowed me to grow as a writer and researcher.

In addition to the input from my committee, I am indebted to the guidance I have received from Jodi Magness. Her constructive comments helped develop the direction of this project in its early stages, when I was still unsure how to conduct a fruitful examination of the Roman military in Wadi Arabah. Nicholas Blackwell likewise has played an instrumental role by offering advise along the way and encouraging me through each step that I have taken.

Much of my time over the past two years has been spent in the NC State Archaeology Lab, where Kako Lavendier and Jason Norris have shared many laughs with me in addition to discussions about pottery and other related research projects. I was able to stay focused in my endeavors in large part due to the pause they provided in my normal routine. Additionally, Brian Coussens and Brad Erickson have provided valuable words of wisdom over the past several years that have allowed me to prepare mentally for the rigors and challenges of graduate school. A project such as this becomes less bewildering when there are remarkable role-models to set an example for how to succeed, and CJ Rice has served as such a mentor and friend from whom I
have learned much and who has always been willing to help me through this undertaking. My only hope is that you all have gained something of value in exchange for the immense amount of help you all have given to me.

Of course, I would be remiss if I did not acknowledge my appreciation to Jocelyn Burney for all the pep talks, West Wing episodes, Maple View trips, and library runs she has provided over the past several months. Words cannot describe her impact by constantly encouraging me to set new goals for myself and inspiring me as I strive to complete them. I am forever grateful for all she has done.

Finally, there has been no more enduring and reliable source of support than from my parents, Scott and Nancy Culclasure, and my sister, Alice. When I was most stressed, memories of past summers comforted me and helped remind me why I fell in love with archaeology and history in the first place. Now that all is said and done, I look forward to enjoying more adventures together.

Truly my thesis was not completed alone, and this vast network of support has continued to motivate me through its duration. I am thankful for everyone and for all the assistance that has made this project possible.
Table of Contents

List of Figures: .................................................................................................................... vii

Chapter One: Ancient and Modern sources ................................................................. 1
  1.1: Introduction .................................................................................................................. 1
  1.2: Ancient Sources .......................................................................................................... 3
  1.3: Modern Sources ......................................................................................................... 8

Chapter Two: The Natural Environment ...................................................................... 10
  2.1: Introduction .................................................................................................................. 10
  2.2: The Natural Landscape and Environment .............................................................. 10
    2.2.1 Geography .............................................................................................................. 11
    2.2.2 Climate .................................................................................................................. 12
    2.2.3 Geology ................................................................................................................. 13
    2.2.4 Solis ....................................................................................................................... 13
    2.2.5 Hydrology ............................................................................................................. 14
    2.2.6 Vegetation .............................................................................................................. 15
    2.2.7 Fauna .................................................................................................................... 16
    2.2.8 Mineralogical Resources ...................................................................................... 16
    2.2.9 Other Natural Resources ...................................................................................... 17

Chapter Three: Historical Background of Wadi Arabah .............................................. 17
  3.1: The Historical Background ....................................................................................... 18
    3.1.1 Neolithic-Hellenistic Periods (ca. 8500-63 B.C.E.) ............................................. 19
    3.1.2 Early Roman/Nabataean Period (ca. 63 B.C.E.-106 C.E.) ................................. 20
    3.1.3 Late Roman Period (ca. 106-324 C.E.) ................................................................. 22
    3.1.4 Byzantine Period (ca. 324-630 C.E.) .................................................................. 27
  3.2: Conclusion .................................................................................................................. 29

Chapter Four: Forts of Wadi Arabah .......................................................................... 29
  4.1: Introduction .................................................................................................................. 29
  4.2: Diocletianic fortifications ......................................................................................... 30
    4.2.1 Aila ....................................................................................................................... 32
    4.2.2 Yotvata ................................................................................................................ 32
    4.2.3 Gharandal ........................................................................................................... 33
    4.2.4 Bir Madhkur ....................................................................................................... 34
    4.2.5 Mezad Hazeva ................................................................................................... 34
    4.2.6 Qasr et-Tlah ....................................................................................................... 35
    4.2.7 Mezad Tamar ..................................................................................................... 36
    4.2.8 Qasr el-Feifeh ..................................................................................................... 37
    4.2.9 Es-Safi ................................................................................................................. 38
4.3: Later Fortifications ................................................................. 38
  4.3.1 En Boqeq ........................................................................... 39
  4.3.2 Upper Zohar ...................................................................... 39
4.4: Roadways in the Arabah ....................................................... 40
4.5: Analysis and Conclusion ....................................................... 42

Chapter Five: Supplying the Frontiers ...................................... 44
5.1: Introduction ........................................................................... 44
5.2: Internal Storage and Production ........................................... 45
  5.2.1 Water Resources .............................................................. 46
  5.2.2 Evidence of Local Cultivation .......................................... 48
  5.2.3 Faunal Remains ............................................................... 51
  5.2.4 Economic Exploitation .................................................... 62
5.3: Imported Goods ..................................................................... 66
  5.3.1 Amphorae and Other Transport Containers ..................... 67
  5.3.2 Late Roman Red Wares (LRRW) ..................................... 71
  5.3.3 Other Pottery From Regional Centers ............................. 73
  5.3.4 Glass ............................................................................ 76
  5.3.5 Metal ............................................................................ 77
  5.3.6 Coins ............................................................................ 77
  5.3.7 Invisible Imports ............................................................ 79
5.4: Analysis and Conclusion ....................................................... 80

Chapter Six: Conclusion ............................................................. 83
6.1: Concluding Remarks ........................................................... 83

Bibliography ............................................................................... 88
Appendix 1: ................................................................................. 108
<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Satellite view of Wadi Arabah with military posts</td>
<td>108</td>
</tr>
<tr>
<td>2</td>
<td>Map of Wadi Arabah with roads and settlement sites during Late Antiquity</td>
<td>109</td>
</tr>
<tr>
<td>3</td>
<td>Section of the <em>Tabula Peutingeriana</em> containing Wadi Arabah</td>
<td>110</td>
</tr>
<tr>
<td>4</td>
<td>Aila: plan of site</td>
<td>111</td>
</tr>
<tr>
<td>5</td>
<td>Yotvata: plan of site</td>
<td>112</td>
</tr>
<tr>
<td>6</td>
<td>Gharandal: plan of site and bathhouse</td>
<td>112</td>
</tr>
<tr>
<td>7</td>
<td>Bir Madhkur: plan of site</td>
<td>113</td>
</tr>
<tr>
<td>8</td>
<td>Mezad Hazeva: plan of size and aqueducts</td>
<td>113</td>
</tr>
<tr>
<td>9</td>
<td>Qasr et-Tlah: plan of site</td>
<td>114</td>
</tr>
<tr>
<td>10</td>
<td>Mezad Tamar: plan of site</td>
<td>114</td>
</tr>
<tr>
<td>11</td>
<td>Qasr el-Feifeh: arial view</td>
<td>115</td>
</tr>
<tr>
<td>12</td>
<td>En Boqeq: plan of site</td>
<td>116</td>
</tr>
<tr>
<td>13</td>
<td>Upper Zohar: plan of site</td>
<td>116</td>
</tr>
</tbody>
</table>
Chapter 1. Ancient and Modern sources: an introduction to Wadi Arabah

1.1 Introduction

Wadi Arabah, the long shallow valley connecting the Dead Sea with the Red Sea and today forming the southern border between the State of Israel and the Hashemite Kingdom of Jordan, was long neglected by scholars. However, over the past several decades the Arabah has undergone much more extensive archaeological study. As this information is published scholars may begin to synthesize this new evidence to understand the history of the Arabah diachronically. To that end, this thesis aims to offer such a preliminary synthesis of published archaeological evidence from this region in the Late Roman/Early Byzantine period, from the accession of the Emperor Diocletian in 284 until the Islamic Conquest in the early 7th century (Figure 1), focusing on the supply of the Roman military garrisons posted here in this period.

The beginning of this period witnessed a major Roman military buildup in Wadi Arabah, attested by construction of forts and roads throughout the Arabah and transfer of a Roman legion, legio X Fretensis, from Jerusalem to ancient Aila (modern Aqaba) at the southern end of the Arabah.1 The chain of forts and garrisons extended along the entire length of the valley and seems to have connected the main Roman military frontier to the east in Jordan with Palestine and a secondary string of garrisons along the northern fringe of the Negev Desert to the northwest. This buildup seems to have been part of much more extensive effort to refortify the southeastern frontier and most other sectors of the imperial frontiers.

Due to the fact that Wadi Arabah is an extremely arid environment, an immediate question arises. How were the Roman forces in this bleak and seemingly inhospitable landscape

1 Parker, 2006b: 227.
supplied? Were these garrisons supplied entirely from external sources? If so, what specific goods were imported and from what sources? On the other hand, many scholars assume that the Roman frontier soldiers (Latin *limitanei*) in this period were to some degree self-sufficient, producing a portion of their food and other essential resources. But was this even possible in the hyper-arid environment of Wadi Arabah? Recent excavations of key sites in the Arabah now permit at least a preliminary response to this question. Analysis of this new evidence, plus a reconsideration of other documentary and archaeological evidence, may illuminate some regional trends and various programs of supply, production, distribution, and consumption. It may permit at least a preliminary reconstruction of the logistical infrastructure of the Roman military presence in Wadi Arabah during Late Antiquity (Figure 2).

In some ways this is the next logical step in scholarly study of the Arabah during this period. Andrew Smith’s published M.A. thesis (2010) which summarizes and synthesizes the colossal amount of survey material available and maps out the general history of Wadi Arabah, notes “Nevertheless, there is a growing body of data from Wadi Araba…[but] if we are to gain any sort of broader understanding of the historical geography of Wadi Araba, the need for such a synthesis is clear.” In this light, the following chapters offer such an analysis of archaeological reports focusing on the Late Roman/Early Byzantine period, i.e. the 4th to 7th centuries.

This introductory chapter will summarize and discuss both the relevant ancient and modern sources about the Roman military stationed in the Arabah. Chapter 2 will discuss the natural environment of the Arabah and address the various concerns facing humans living in this hyper-arid world. A brief history of the region up to the rise of Islam will be the focus of Chapter

---

2 Smith, 2010a: 1.
3. The specific forts and other infrastructure, such as the regional road system which are the cornerstone of this study, are compiled in Chapter 4. The largest chapter and apex of this thesis, a reconstruction of the supply of the garrisons, is the focus of Chapter 5. Finally, Chapter 6 is a concluding section which not only summarizes briefly the previous chapters, but will consider what future research will enhance greater understanding of this topic during Late Antiquity.

1.2 Ancient Sources

Before discussing the archaeological material, it is important to evaluate the major documentary sources to assess their relevance for this study. Literary and epigraphic evidence can supply glimpses into the imaginings of the ancient mind and even allude to how they viewed their world, but it is imperative to acknowledge their inherent biases when we read them.

Literary authors such as Diodorus Siculus, Strabo, and Pliny the Elder provide some of the earliest classical sources which describe the geography of the region as well as its inhabitants in the 1st centuries B.C.E. and C.E., but these accounts are peripheral for Late Antiquity. The ecclesiastical historian, Eusebius of Caesarea in the early 4th century, provides some contemporary insights into the Arabah in his *Onomasticon*, a biblical topography. The port of Aila (modern Aqaba) at the southern end of the Arabah had by then become the base of *legio X Fretensis*, previously stationed in Jerusalem. Eusebius also lists garrisons of soldiers stationed at Aila.

---

3 Diodorus Siculus, 3.43.4, mentions that around the coast of the Gulf of Aqaba, the Nabataeans raised livestock and raided merchant shipping; Strabo in *Geographica*, 16.2.30, 16.4.4-8 describes that the Nabataeans raided ships in the area and oversaw a trade route of incense from Gaza to Aila describing the latter as a *polis*; and Pliny the Elder in his *Natural History*, 5.12.65, mentions Aila as a town (*oppidum*) on the Red Sea; for further information about Aila and the Arabah in earlier literary traditions, see Parker and Smith, 2014: 14-16.

Zoara and Tamara.⁵ Writing almost a century later, Jerome translated Eusebius’s work from Greek into Latin, repeating the same information Eusebius provided.⁶

The Arabah is actually depicted in the Tabula Peutingeriana (Figure 3), a road map covering the entire Roman Empire. The date and purpose of this map remains in dispute among scholars. It depicts stops for travelers with intervening distances expressed in Roman miles along various roads. The extant copy map was produced in the late 12th/early 13th centuries, perhaps from a 2nd century copy revised in the 4th or 5th century. The most recent analysis suggests that it was actually produced in the reign of Diocletian (284-305).⁷ If so, it would be particularly valuable for this study as it would date to the precise period of the Roman military buildup. Whatever its actual date, the map clearly depicts Wadi Arabah along with several roads both within and around the wadi. It depicts Aila linked to roads going west, north, and east. Although it emphasizes its importance in the region, it does little for our understanding of the military garrisons in the Arabah.

The Madaba map, a mosaic laid in a church floor in this city northeast of the Dead Sea dating to the mid-6th century, also depicts Wadi Arabah; however, the portion of the map which once depicted the southern half of the Arabah has since been destroyed.⁸ This map, unlike the Tabula Peutingeriana, depicts towered forts at Zoara, Thamara, Praesidio, and Moa.⁹

---

⁵ Eusebius, Onomasticon: 6.17-21; Freeman-Grenville, 2003: 8.7-12, 42.1-7.
⁶ Freeman-Grenville, 2003: 8.30-9.4, 9.7-13, 44.7-17.
⁷ Talbert, 2010: 142-157; Talbert argues that this map should not be seen as intended for a practical use, but rather as an honorific dedication representing the restoration of peace across the region, although I wonder whether it could not be used for both purposes.
⁹ ibid.: 182-183.
Inscriptions are another important category of documentary evidence. Above all is the group of Latin milestones recently discovered and published on the western side of the Arabah. These date to the reign of Diocletian and have been interpreted as preparation for the movement of *legio X Fretensis* from Jerusalem to Aila.\(^9\)

By the early 5\(^{th}\) century the province of *Palaestina* had been partitioned into three smaller provinces named *Palaestina Prima, Secunda, and Tertia*. The Arabah fell entirely within *Tertia*.\(^1\) A monumental if fragmentary inscription (the so-called “Beersheba Edict”) lists specific amounts of money (gold *solidi*), presumably as taxes, collected from specific settlements in the region, including some from the Arabah where garrisons were stationed, including Zoara, Ariddela, Toloana, and Praesidio.\(^1\) It should be noted, however, that not all the settlements listed are known to have been garrisoned, others are strictly civilian as well as ‘mixed’ civilian and military, and, except in the case of Zoara, there is no explicit mention of soldiers paying these taxes. Mayerson and Di Segni assume that when garrisons were not mentioned, they were subsumed into general population rather than counted separately.\(^1\) This assumption, of course, does not take into consideration that there might not have been a military population at those sites and taxes were collected to support the remaining garrisons, but even with such reservations this epigraphic evidence suggests some kind of military structure in the region in the mid-6\(^{th}\) century. These taxes recorded (either as a proclamation or a receipt) the dues necessary to help cover the cost of protecting pilgrims traveling through the region and maintaining the upkeep of

\(^9\)Avner and Roll 1996, 762-764.
\(^1\) Mayerson, 1986b; Di Segni, 2004.
\(^1\) Mayerson, 1986b: 144.
\(^1\) Mayerson, 1986b: 143-144; Di Segni, 2004: 136.
travel stations, with these costs varying depending on a site’s size and importance.\textsuperscript{14} These expenses were necessary, Di Sengi argues, following the oft cited passage of Procopius describing Justinian cutting the pay of \textit{limitanei} who then found work protecting pilgrims.\textsuperscript{15}

Unquestionably the most critical document for providing detailed evidence of the Roman military in the Arabah is the \textit{Notitia Dignitatum}. This document lists most civil and military officials, their staffs, the units they commanded, and their place of garrison throughout the empire. This document is extant only in several 15\textsuperscript{th} and 16\textsuperscript{th}-century copies. Of unknown authorship, it is clearly an official document compiled by the imperial government.

Another critical question of this document is its date. The scholarly consensus is that it was originally composed at the very end of the 4\textsuperscript{th} century (ca. 395). We appear to have a copy held in the western empire, since these chapters appear to have been updated up to ca. 420, whereas the eastern chapters show no such revisions.\textsuperscript{16} Because the southeastern frontier remained relatively stable throughout the 4\textsuperscript{th} century, it has long been thought that the units in the \textit{Notita Dignitatum (Oriens 34, 37)} reflected the reorganization of the region by Diocletian and his Tetrarchy (293-305).\textsuperscript{17} These chapters then provide a complete list of the frontier armies and their place of garrison for much of Late Antiquity, including specific units and their bases.\textsuperscript{18}

One major issue with these sources, however, arises in associating specific ancient names with their modern locations. Occasionally ancient names carry over into modern times. A village in modern Israel, called in Arabic “el-Lejjun”, derives its name from the Roman legion, \textit{legio VI}

\begin{itemize}
\item \textsuperscript{14} Di Segni, 2004: 150-151.
\item \textsuperscript{15} \textit{ibid.}; Procopius, \textit{Anecdota} 24:12-14.
\item \textsuperscript{16} Mann, J.C., 1979:216; Southern & Dixon, 1996: 1.
\item \textsuperscript{17} Jones, A.H.M. 1964: 357.
\item \textsuperscript{18} Whittaker, 1997:134-135.
\end{itemize}
Ferrata, stationed there in antiquity. Likewise, an el-Lejjun in modern Jordan, likely preserves the ancient name of legio IV Martia. Place names, however, do not always survive from ancient to modern times. Occasionally Latin dedicatory building inscriptions emerge either by accident or through archaeological excavations that permit modern sites to be linked to their ancient predecessor. Two dedicatory inscriptions from forts in the Arabah have been found to confirm their ancient name: Yotvata was ancient Costia\textsuperscript{19} and an inscription found in 2013 at Gharandal proved that this fort was indeed the Ariedela of the Notitia, base of Cohors II Galatarum.\textsuperscript{20} This important discovery underscores the possibility that modern Arabic place names sometime preserve the ancient site name in some form. Despite the issues that arise when attempting to link site names from the ancient documents to forts in the Arabah, the Notitia Dignitatum is a significant source for understanding the Roman military in Late Antiquity because it provides the only comprehensive list of units and their location by the end of the 4\textsuperscript{th} century.

Further, the list of units from this same document also details the types of units so named. For example, the Notitia lists one legion (infantry) and several units of alae (cavalry), cohorts (infantry), a cohors equitata or “mixed cohort” (both infantry and cavalry), and several types of units of equites, including equites sagittarii indigenae (native horse archers, probably Arabs), equites Illyriciani (originally recruited in Illyria), and equites promote (originally the ca. 120 man cavalry unit attached to each legion during the Principate but subsequently “promoted” to the status of independent units). The presence of these varying units and their differing needs surely means that such units would have required a somewhat different mix of supplies. What the Notitia does not unfortunately provide is the strength of such units. Unit strengths are in fact

\textsuperscript{19} Meshel, 1989.
\textsuperscript{20} Darby and Darby, 2015: 461-463.
fairly well known for the early imperial period. Late Roman military units were clearly sharply reduced in strength by the 4th century but there is much debate about specific numbers within each type of unit. This is a crucial problem when reconstructing the scale of military supply to these garrisons. This thesis will accept the current scholarly consensus for such unit strengths with the proviso that these are far from certain.

Other imperial edicts indirectly reference the military in the Arabah. Notably, the *Theodosian Code* of the early 5th century includes several laws about the Roman military, including rations, diet, pay, and taxes, dated over the preceding 100 years. These laws must be evaluated critically since they usually neither reference a specific region nor necessarily reflect the extent to which they were actually enforced in any given region.

1.3 Modern Sources

Despite having attracted serious archaeological research only in recent decades, the Arabah witnessed some travel by early Western explorers. Through the 19th and 20th centuries, these explorers “rediscovered” and identified many of the forts, installations, and ancient features described below. It was not until the early 20th century, however, that the Arabah began to attract scholars especially interested in the history and archaeology of Wadi Arabah. During the first four decades of the century the likes of Alois Musil, Fritz Frank, and Nelson Glueck first set out to survey the region. Frank and Glueck collected and identified pottery from the surface of sites, and proposed dates for some sites.\(^2\)

---

21 *Codex Theodosianus*, 7.4.6, 12, 15-22.

22 For a more detailed assessment of these early scholars, see Smith, 2010a: 14-15; for the original publications themselves, see Musil, 1907-1908; Frank, 1934; Glueck, 1935, 1939.
It was not until the late 1960s and 1970s that actual excavation of some forts in or near the Arabah began, led by Rudolph Cohen at ‘En Haseva and Mordechai Gichon at Mezad Tamar and ‘En Boqeq; unfortunately, only the excavations at En Boqeq have been published in final reports.\textsuperscript{23} Important surveys took place in the 1980s, especially in the northern Arabah, which further supplemented settlement patterns in this region, as well as excavation of a Roman fort at Upper Zohar, just northwest of the Arabah.\textsuperscript{24}

But the 1990s and 2000s witnessed an explosion of archaeological interest in the region, made possible by the Israel-Jordan peace treaty signed in 1994. Projects such as the Wadi Faynan Landscape Survey and the Roman Aqaba Project began to change our understanding of the region with the former illuminating the extensive nature of Roman exploitation of copper in the region and the latter not only providing significant survey data from the southern Arabah but also revealing large scale industries in the port of Aila.\textsuperscript{25} Andrew Smith’s published M.A. thesis details settlement patterns in the classical periods throughout the entire Arabah and has been an invaluable resource for this thesis.\textsuperscript{26}

The 2010s witnessed continued interest in the Arabah. The first fort fully published from the Arabah proper was Yotvata.\textsuperscript{27} In addition to the final publications of Aila and Yotvata, there are several forts currently undergoing excavation— at Gharandal, Bir Madhkur, and Qasr at-

\textsuperscript{23} Cohen, 1988, 1992, 1993, and 1994; Gichon, 1976a, 1976b, 1993; Fischer \textit{et al.}, 1993; and Erickson-Gini, 2010. En Boqeq and Upper Zohar are situated just outside the Arabah to the north. Despite this distinction, they offer detailed final reports that shed light on two garrisons posted in the region during the 6th and 7th centuries. As such, their inclusion here provides invaluable data to enrich our understanding of Roman military in this region.


\textsuperscript{25} Barker \textit{et al.}, 2007; Parker and Smith, 2014.

\textsuperscript{26} Smith, 2010a.

\textsuperscript{27} Davies and Magness, 2015.
Tlah; forthcoming interim and final reports from these sites will add immensely to our knowledge of the lives of soldiers of Late Antiquity in the Arabah.  

Chapter 2. Wadi Arabah: The Natural Environmental

2.1 Introduction

Looking south from the Dead Sea into Wadi Arabah one cannot help but envision a landscape hostile to human activity. But closer inspection reveals that this bleak landscape is not an absolute deterrent for human activity. Although Wadi Arabah is a vast arid valley which stretches from the Dead Sea in the north to the Gulf of Aqaba in the south, during Late Antiquity it played a significant role in the protection of the Roman imperial frontier and its trade and communication routes. Before offering a more detailed analysis about the historical significance of this region, it is necessary to review its geographic setting.

This chapter lays out the natural environment of Wadi Arabah by introducing the environmental factors which framed human activity in the region. This lays the foundation for understanding how Roman troops could survive in such an arid region.

2.2 The natural landscape and environment

Because several recent publications have provided in-depth analyses of the environment of Wadi Arabah, this chapter merely summarizes the salient elements of this landscape, especially its

---

28 Darby and Darby, 2015; Smith, 2010b; Niemi, 2007.
hyperarid climate. In short, there is no conclusive evidence to suggest that the climate of the Arabah during the Roman era was significantly different than today.

### 2.2.1 Geography

Wadi Arabah is just one segment of the Dead Sea Rift, a product of a continuing shift between the African and Arabian continental plates. The entire rift stretches from Turkey in the north through the Gulf of Aqaba to the south—the body of water separating the Sinai Peninsula in the west from the Arabian peninsula to the east—and beyond through the Red Sea to east Africa. This geographic formation created the Hula Valley, Sea of Galilee, Jordan River, Dead Sea, and Gulf of Aqaba, in addition to the valley stretching from the Dead Sea to the Gulf of Aqaba—Wadi Arabah.

Stretching ca. 165 km (103 mi) north to south, Wadi Arabah ranges in width from 10 km to 30 km and ranges in elevation from -230m in the far north up to 200m in the center of the valley before descending back down to Aqaba at sea level. The wadi can be subdivided into three distinct regions: 1) the southern Arabah, or Aqaba Valley, 2) the central Arabah, and 3) the Southern Ghor of the Dead Sea in the far north.

The center of the Arabah serves as the southern sector for the modern Israeli-Jordanian border. The valley is bounded to the west by the Negev desert, to the east by the Jibal esh-Shera’a and the el-Jibal mountains which reach over 1200m above sea level, to the north by the Dead Sea, and to the south by the Gulf of Aqaba, an arm of the Red Sea.

---

29 For further analysis concerning the regional environment around Aqaba, Jordan and the surrounding Wadi, see Niemi, T, 2014: 33-80; Smith II, 2010: 1-9.

30 Smith, 2010a: 2.

31 Zohary, 1944: 204-205.
2.2.2 Climate

Although the Mediterranean Sea at its closest point lies only 70km to the west, Wadi Arabah is separated from the Mediterranean climatic influences by its western uplands and is characterized by an arid, desert climate as a part of the Arabian Desert system. During the summer (June-September), the wadi is characterized by high temperatures that can exceed 40° C (104° F), underscored by regional names such as the Wadi en Nar (Valley of Fire). In the winter months temperatures cool and daily averages can range from 20-28° C (68-82° F).\textsuperscript{32} In the upper reaches in the central Arabah, winter temperatures can fall below freezing.\textsuperscript{33}

Strong westerly winds bring rain in the winter, but during the summer these winds can carry with them fine sands which are deposited over wide areas, covering and uncovering ancient sites.\textsuperscript{34} Rain almost exclusively falls during the winter, with effectively no precipitation between June and September. Wadi Arabah averages roughly 50-150 mm of rainfall per year, with a majority of this rain occurring from October to April.\textsuperscript{35} In areas further south, such as at Aqaba, rainfall averages closer to 40mm, making any type of sustained agriculture difficult without complex hydrological systems to harvest and store rainfall.\textsuperscript{36}

These climatic characteristics of Wadi Arabah outline the difficulties facing human activity in the region. Nevertheless, human presence still is detectable across thousands of years.

\textsuperscript{32} Smith, 2010a: 5.
\textsuperscript{33} Bruins, 2006: 30.
\textsuperscript{34} Barker, et al. 2007: 25-26.
\textsuperscript{35} \textit{ibid.},: 27-28.
\textsuperscript{36} Bruins, 2006: 37.
As discussed below, human sites lie in close proximity to water or other exploitable natural resources or at nexus points for travel through the region.\textsuperscript{37}

2.2.3 Geology

Geologically speaking, Wadi Arabah is an alluvium, filled with clay, silt, and sand deposited by water from the highlands during the winter rains over the past 2.5 million years.\textsuperscript{38} The geological makeup of the surrounding region, however, is much more complex. The oldest formations in the region date to the Precambrian/Late Precambrian periods. These are visible in the southeastern cliffs of the Arabah which are composed of crystalline schists cut by grey granite. To the west this formation is only seen around Timna and Eilat; elsewhere these granite and other igneous layers serve as basement rocks which are covered by later formations.\textsuperscript{39} A majority of the surrounding features are various types of sedimentary formations, including but not limited to limestone, sandstone, marl, chert, shale, phosphorite, and dolomite, all of which range in date from the Paleozoic to the Cenozoic Eras.\textsuperscript{40}

2.2.4 Soils

Much of the soil in Wadi Arabah is a direct product of the surrounding geological formations. Desert lithosols, reg soils, and coarse desert alluvium dominate the region, deposited by erosion of the surrounding cliffs. In several areas, such as just south of the Dead Sea, just north of Aqaba,

\textsuperscript{37} Bruins, 2006: 32-33.
\textsuperscript{38} Bruins, 2006: 32-33
\textsuperscript{39} \textit{ibid.}: 35.
\textsuperscript{40} Niemi, T., 2014: 38-40.
and elsewhere such as Yotvata, there are also saline Solonchak soils created by high brackish groundwater levels.\textsuperscript{41}

The soils of Wadi Arabah are varied and often relate to surrounding hydrological, faunal, and geomorphic characteristics. There are ten general categories of landscape-vegetation soil units in the region.\textsuperscript{42} The lack of significant rainfall hinders rain-fed agriculture, but these different soil types can support enough vegetation for other uses such as grazing animals.

\textbf{2.2.5 Hydrology}

The inhabitants of Wadi Arabah relied upon its few but crucial perennial springs and cisterns to store winter rains. Recent scholarship underscores the role that hydrological sources played in the positioning of Roman military garrisons and as such it should be of no surprise that Roman forts were constructed at most of the natural springs in the wadi.\textsuperscript{43} Major springs in Wadi Arabah include Evrona, Yotvata, Gharandal, et-Tayyiba, Erga, and Rahel; and several of these sites, such as Yotvata, Gharandal, and Bir Madhkur, contain Roman forts with associated bath structures.\textsuperscript{44} Typically the springs in the eastern Arabah have higher discharge and are of better quality, but this difference does not preclude settlement in the west. It was also possible to transport water to a site via aqueducts, such as in Wadi Faynan with its aqueducts, channels, and reservoirs.\textsuperscript{45}

\textsuperscript{41} Bruins, 2006: 39-41.
\textsuperscript{42} Danin 1983; descriptions of the soil types can be found in Dan \textit{et al.}, 1975; Dan, 1981, and Bruins, 2006: 39-41.
\textsuperscript{43} Moss, 2015: 1-2; Campbell, 2012.
\textsuperscript{44} Smith, 2010a: 5-7.
\textsuperscript{45} Barker, \textit{et al.}, 2007: 124-125
2.2.6 Vegetation

The vegetation in Wadi Arabah is adapted to the arid environment; only a couple of hundred different species grow, watered by sparse winter rains and the brackish groundwater. The soils of the Arabah, even in the southern mudflats, or sabkhas, are too porous and not naturally fertile enough to promote significant growth of vegetation. The prominent vegetation in the region includes Anabasis (*Anabasis Articulata*), the Israeli babool (*Acacia tortilis*), twisted acacia (*Acacia raddiana*), glasswort (*Hammada salicornia*), bean caper plant (*Zygophyllum dumosum*), tamarisks (*Reaumuria hirtella*), amaranth (*Salsola cyclophylla, baryosma, and tetrandra*), orta (*Calligonum comosum*), white saxaul (*Haloxylon persicum*), nitre bush (*Nitraria retusa*), seepweeds (*Suaeda monoica*), camelthorn (*Alhagi maurorum*), Halfa grass (*Desmostachya bipinnata*), Nile tamarisk (*Tamarix nilotica*), the Athel tamarisk (*Tamarix aphylla*), and date palm (*Phoenix dactylifera*). The few trees in the region were used as fuel in antiquity, as their carbonized remains have been found in stratified contexts at Aila. The date palm is of particular interest as dates could be turned into date wine and either consumed locally or exported. Today, produce cultivated by irrigation includes citrus fruits, mangos, peppers, and pistachios.

---

49 Parker, 2014: 359.
50 Smith, 2010a: 7.
2.2.7 Fauna

Fauna in the region is limited due to the local aridity. Western travelers in the 19th/20th centuries described gazelles, rabbits, foxes, wolves, hyenas, hyrax, and ibexes. Recent excavations at Yotvata, a fort in the Arabah, have recovered wild deer, ibexes, and gazelle from the Roman and Byzantine period. Domesticated animals, especially camels, sheep, and goat, supplied food, hair, hides, fertilizer, and transport. Marine resources from the Gulf of Aqaba were also readily accessible.

2.2.8 Mineralogical Resources

By far the most important natural resource in Wadi Arabah is copper, exploited throughout the region’s history. During the Roman period, copper mines at Timna and Wadi Faynan were a significant industry under direct Roman oversight, pooling together labor and resources in these remote regions. The mining of copper, and possibly to a lesser extent gold, played a significant role in the Roman period in the region. Activity in these areas stretched back to the Pre-Pottery Neolithic Age and, over the millennia, its mining and smelting industry produced several thousand tons of processed copper.

The mining of gold in the region is debatable. Ze’ev Meshel points to literary sources such as Eusebius and Jerome who mention gold mines in this area and recent archaeological

51 Smith, 2010a: 7-8.
52 Davies and Magness, 2015: 228-230.
53 For domestication of camels, see Zarins, 1989: 143-48; For evidence of marine resource at Aila, see Parker and Van Neer, 2008: 1821-1827.
54 Barker, et al., 2007: 3-8.
55 In addition to the famous copper mines at Faynan, evidence has been produced to support Roman/Byzantine mining of copper mines near Timna, for more see Rothenberg, 1999b: 165.
research in Wadi Faynan also revealed elevated trace elements of gold at levels comparable to that at gold mines in eastern Egypt.\textsuperscript{57} Without further examination of these goldmines, however, it will be difficult to gauge the role of gold in the economic structure of Wadi Arabah.

2.2.9 Other Natural Resources

Other significant natural resources exploited in Wadi Arabah in the Roman period were bitumen and salt, both from the Dead Sea in the north. The salt was collected from dried up salt beds and the bitumen was retrieved when floating on the Dead Sea.\textsuperscript{58} While these two resources did not eclipse copper in overall importance, the references in literary records and art, such as the 6\textsuperscript{th} century Madaba map which depicts two boats carrying salt, suggest that they remained a significant resource, possibly secured by soldiers in the region.\textsuperscript{59}

Chapter 3. Historical background of Wadi Arabah

3.1 The historical background

Before discussing supplying the military sites of Wadi Arabah, it is important to provide a brief historical background of earlier periods in the history of the Arabah. This chapter summarizes its history from its earliest human activity through the end of the Roman/Byzantine period in order to introduce the resources and industries which remained important when the Roman army garrisoned the valley. This chapter does not intend to be a detailed examination of how Wadi

\textsuperscript{57} Meshel, 2006: 236-237; Barker \textit{et al.}, 2007: 309.

\textsuperscript{58} Diodorus Siculus: 2.48, 19.98-99.

Arabah related to other regions throughout its history, but rather provides historical context in which to discuss the supply of the military units garrisoned in the Arabah during Late Antiquity.

3.1.1 Neolithic-Hellenistic Periods (ca. 8500-63 B.C.E.)

The earliest evidence of human activity in Wadi Arabah can be traced to the Paleolithic and Neolithic periods. While this evidence is scanty, many other prehistoric sites are now likely buried under sediments deposited in later periods, especially in the southern valley.\(^{60}\) There is a general increase of settlements during the Chalcolithic (4500-3300 B.C.E.) and Bronze Age (3300-1200 B.C.E.).\(^{61}\) The first evidence of copper extraction appears in Wadi Faynan during the Chalcolithic, an activity that would continue, generally speaking, without interruption through the Roman/Byzantine period.\(^{62}\) Aside from copper extraction, it appears that some Chalcolithic and Early Bronze Age settlements were substantial in size. Sites such as Tell Maqass and Hujeirat al-Ghzulan just north of Aqaba suggest that this period in the southern Arabah witnessed irrigation-based agriculture supplementing pastoralism in the region.\(^{63}\)

In the Middle Bronze (1950-1550 B.C.E.), Late Bronze (1550-1200 B.C.E.), and Early Iron Ages (1200-539 B.C.E.), there is little archaeological evidence of occupation in the Arabah.\(^{64}\) This paucity need not necessarily be attributed to a decline in population but a shift back to pastoral nomadism which left behind minimal traces.\(^{65}\) Recent archaeological surveys

\(^{61}\) \textit{ibid.}
\(^{63}\) Parker, 2014: 362.
\(^{64}\) \textit{ibid.}: 363; Barker \textit{et al.}, 2007: 290-291.
\(^{65}\) van der Steen, 2004: 295-310.
have suggested that copper production continued from the Late Bronze Age in the late second millennium into the Early Iron Age in the early first millennium B.C.E., but its extent is difficult to ascertain due to the cursory nature of archaeological investigations in the region. Although there may have been a decline in settlement during the Early Iron Age outside the copper production centers, this period does mark the beginning of the incense trade passing through Wadi Arabah. This traffic, like the copper industry, would remain integral to the region’s broader economic significance. Some scholars connect the rise of the incense trade to the domestication of the camel and its ability to travel for extended periods in an arid environment, making it well suited to be the pack animal of choice in the region. Another recent study connected Egyptian demand for incense from southern Arabia as early as the 13th century B.C.E., in addition to the domestication of the camel, as primary reasons for establishing overland trade routes through Wadi Arabah.

By the end of the 2nd millennium/beginning of the 1st millennium B.C.E., there was an increase in the number of sites in the Arabah, suggested as a possible product of the incense trade. Less is known about the valley in the following centuries. Problematic biblical passages aside, which refer to the predecessor of Aila, Ezio-Geber or Elath, as well as copper mines, there otherwise is little evidence of human activity in the Arabah in the Iron Age, Persian (539-332 B.C.E.) or Hellenistic (332-63 B.C.E.) periods. Nelson Glueck’s early archaeological

---

69 Jasmin, 2006: 143-49.
70 Singer-Avitz, 1999: 3-5.
71 For biblical references to the Arabah, see Bartlett, 2006: 151-156; for evidence of continued copper exploitation, see Ben-Yosef, et al, 2010: 724-746.
excavations at Tell el-Kheleifeh were never fully published, but recent reappraisal of his work has confirmed the presence of a fortress and fortified settlement north of Aila dating largely from the 8th-6th century B.C.E, with some evidence (two Rhodian amphorae handles) providing a later, 3rd century date.72

In addition to the Rhodian stamps mentioned above, only a few sites in the Arabah contain archaeological remains dating to the Hellenistic period. Two sites in the northern Arabah appear to be towers which monitored traffic which cut through the region. Further south, there is Hellenistic pottery in the Faynan and only a couple of sites in the central Arabah: ‘Ain Rahel, Bir Madhkur, and Moyet ‘Awad. The fort of Moyet ‘Awad has yielded coins from Ptolemy III, Hellenistic pottery, and several Rhodian jar handles.73 The evidence may then suggest some caravan traffic between Petra and Gaza via the Negev, which transited the Arabah and was in the hands of the Nabataeans Arabs, but it is difficult to measure the extent of this trade.

3.1.2 Early Roman/Nabataean Period (ca. 63 B.C.E.- 106 C.E.)

The literary evidence of early Nabataean history is spotty. The first reference is by the 1st century B.C.E. historian Diodorus. He relied on an eyewitness account of Hieronymus of Cardia who describes how Antigonus the One-Eyed (a Macedonian general and a successor to Alexander the Great) attempted to gain control over the Nabataeans in 312 B.C.E.74 This account implies that the Nabataean Arabs were at that time completely nomadic but already growing wealthy from the caravan traffic. By the late 1st century B.C.E. an account in Strabo’s Geography suggests that the

---

74 Diodorus: 19.94.1.
Nabataeans had sedentarized, reflected in a sharp increase in sedentary occupation dating to the late 1st century B.C.E. throughout southern Jordan and the Negev, including Wadi Arabah.75 Here numerous clusters of sites, both strictly defensive structures such as towers as well as small villages and farmsteads, begin to appear.76 It is no coincidence that at the same time in the late 1st century B.C.E., the city of Aila was founded as a Nabataean port on the Red Sea, likely by Obodas III (r. 30-9 B.C.E.).77 The foundation of this port marked a concerted effort by the Nabataeans to counteract Roman attempts to seize control of the luxury traffic from southern Arabia and beyond, but specifically, of incense, by establishing or revitalizing ports on the Egyptian side of the Red Sea such as Berenike and Myos Hormos.78 The location of Aila on the northern tip of the Gulf of Aqaba provided the Nabataean kingdom a port to maximize profits via sea trade as opposed to shipping incense on the more costly overland caravan routes.

Following Pompey’s annexation of Syria in 64 B.C.E., the Nabataean kingdom became a client state of the Roman Empire. Despite occasional conflicts with both the Roman state and the neighboring Hasmonean and Herodian kingdoms over the next 160 years, the Nabataean economy flourished throughout the 1st century C.E.79 It is during this period, that Aila was first mentioned as a “polis” by ancient sources such as Strabo, Pliny the Elder, and Josephus.80 Nabataean sites along Wadi Arabah continued to grow during this period, possibly also suggesting growth in the amount of trade along these routes.81

75 Strabo: 16.4.18–23.
77 Parker, 2009a: 685.
78 Parker, 2009a: 687-688.
79 Parker, 2007: 363.
80 Strabo- Geography 16.2.30; Pliny the Elder, NH, 5.12; Josephus AJ 8.163.
81 Smith, 2010a: 110.
3.1.3 Late Roman Period (ca. 106-324 C.E.)

The Nabataean kingdom including Wadi Arabah was annexed by the Emperor Trajan and turned into the new provincia Arabia in 106 C.E. It remains unclear why the Romans annexed the kingdom.\textsuperscript{82} In fact, the very nature of this annexation has recently been cast into doubt in light of new evidence of wide-spread destruction throughout the region in the early 2\textsuperscript{nd} century C.E., possibly the result of the Roman military invasion of 106 C.E. and/or an earthquake which devastated the region just prior to annexation.\textsuperscript{83}

Throughout the next century, the Romans intensified economic exploitation of Wadi Arabah. New copper mines were opened at sites such as Beer Ora and Wadi Amran, while old mines were expanded to increase production at sites such as at Timna and Faynan.\textsuperscript{84} It is clear from the outset of Roman control of Wadi Arabah that copper production was a key attraction for Roman involvement and would remain so through the Late Roman/Early Byzantine period.

The development of trade routes during the 2\textsuperscript{nd} century helped extend Roman control throughout the region, particularly through Wadi Arabah. In addition to routes within the Arabah, the via nova Traiana was constructed from 111 to 114 C.E. with Aila serving as its southern terminus. This road ran east of Wadi Arabah following much of the old King’s Highway,

\textsuperscript{82} Bowersock viewed this annexation as the Romans filling in the final piece of the Mediterranean puzzle (1983: 82) while Parker argues that the annexation developed from Trajan’s expansionist policy (1986: 123), and still others such as Ball and Erickson-Gini emphasize the economic significance of the region which led to the Roman annexation (Ball, 2000:15-16; 63; Erickson-Gini, 2010: 48). Recently, al-Otaibi argues that Rome had long-standing ambitions to annex Nabataea for both economic and expansionist desires, and that the event in 106 C.E. was simply the first successful attempt at this takeover (2011: 62).


\textsuperscript{84} For new copper mines, see Rothenberg 1999: 162-163; Willies 1991; For expansion of copper exploitation compared to the Nabataean period, see Barker et al., 2007: 308-309.
extended north to the borders of the Roman province of Syria, and facilitated trade as well as military forces along the eastern frontier of the Roman Empire.\textsuperscript{85}

In Wadi Arabah itself several forts and caravanserais were constructed or occupied during the 2\textsuperscript{nd} century but many of these sites, such as Qasr et-Tayyiba and Khirbet es-Sa’idiyeen, appear to be associated directly with mining operations during the Roman period rather than facilitating long distance trade due to the large amounts of slag deposits at these sites.\textsuperscript{86} It is difficult to determine the role of the 2\textsuperscript{nd} century forts in the region other than those directly associated with mining industries. These forts are often loosely associated with protecting the trade routes that cut through the region. But there is little question that both the Petra-Gaza road remained in use and some north-south traffic along the Arabah continued through the 2\textsuperscript{nd} and early 3\textsuperscript{rd} centuries. Up to the mid-3\textsuperscript{rd} century, however, there is little evidence from regional surveys to suggest a decrease in settlement activity.\textsuperscript{87}

Little is known about Wadi Arabah during the course of the 3\textsuperscript{rd} century and to what extent the empire-wide “crisis” impacted the region. A number of smaller forts and caravan stations were abandoned during this period such as Qasr et-Tayyiba, Mezad Dafit, and Mezad Be’er Menuha in the Arabah.\textsuperscript{88} Without doubt, there was much turmoil throughout the empire during this period, but the impact of this crisis has often been uncritically assumed as ubiquitous for all regions. In areas as close to the Arabah as Palestine, reexamination of archaeological and literary sources suggests that during the crisis years from 235-284 C.E., the region flourished despite

\textsuperscript{85} Smith, 2010a: 111.
\textsuperscript{86} \textit{ibid.}
\textsuperscript{87} \textit{ibid.}: 111-112.
\textsuperscript{88} \textit{ibid.}
broader imperial instability. With this in mind, it is impossible to assume that the crisis of the mid-3rd century impacted all corners of the empire with equal force.

In fact, recent study of the Petra-Gaza incense road running through the Negev has indicated a sharp decline in activity after 222 C.E., possibly a product of the economic instability and temporary collapse of international trade traveling through the region. To this end, we simply lack much archaeological evidence or literary sources to illuminate the mid-3rd century in Wadi Arabah, but if there were a collapse of a major trade just to the west in the Negev, it would not be unreasonable to suspect that it would significantly impact the Arabah.

Another point of ambiguity concerning the stability of Wadi Arabah during the 3rd century regards the copper mines, particularly Wadi Faynan and its major center of Phaino. The extensive archaeological survey in the Faynan produced little evidence from this period, but this might be explained as later material largely obscuring evidence from earlier Roman phases. While the surviving remains make it impossible to determine the level to which copper was exploited during the crisis years of the 3rd century, there is some evidence, mainly loosely dated courseware ceramics, to suggest at least some degree of mining during the period.

Whatever the full extent of the mid-3rd century crisis in the Arabah, there is little question that the Palmyrene invasion and occupation of the region likely played some role in disturbing its stability. While scant remains link Queen Zenobia’s invasion in 270-271 C.E to the Arabah, the 5th/6th century historians John Malalas and Zosimus describe the governor of Arabia being killed

---

89 Bar, 2002: 43-54.
90 Erickson-Gini, 2010: 63-64.
91 Barker et al., 2007: 309-310.
by Palmyrene forces before their invasion of Egypt. Certainly this would have temporarily halted any lingering trade traveling through the Arabah on its way to the Mediterranean until the Roman reconquest in 272 C.E.

Upon his accession to the throne in 284 C.E., Diocletian took control of this unstable empire with a drastically debased monetary system and with serious external incursions from the north and east. In 293 Diocletian established the Tetrarchy by dividing the empire into two halves (east and west), each controlled by a senior Augustus and a junior Caesar. Diocletian and his partners defeated the invaders on various frontiers and then systematically refortified the frontiers, often along significant roads and geographic features, to protect and restore security.

These reforms transformed Wadi Arabah and thus expanded settlement throughout the region. First of all the entire region (Negev, Wadi Arabah, and southern Jordan) was transferred from the province of Arabia to the province of Palaestina. The newly expanded province of Palestine would itself later be subdivided ultimately into three smaller provinces, with Wadi Arabah assigned to Palaestina Salutaris, later Palaestina Tertia, by the late 4th century.

It has been suggested that Diocletian’s extensive refortification of the desert frontier was a means of protection for the region following his successful war against the Saracens in 290 C.E. to prevent further nomadic Arab tribal incursions. The old legions of Palestine were moved from Galilee (VI Ferrata) and Jerusalem (X Fretensis) to new bases on the southeastern frontier at Udhruh (just east of Petra) and Aila respectively. Another legion (IV Martia) was established in a new fortress east of the Dead Sea at el-Lejjun. A variety of auxiliary units and new bases were built on or near the via nova Traiana, along the entire length of Wadi Arabah,

93 Malalas 12.229.4-9; Zosimus, 1.44.
94 Parker, 2006a: 573.
and in the northern Negev, creating a defense-in-depth. Although the claim that Wadi Arabah functioned as part of this larger defensive system has not been universally accepted, it will nevertheless serve as the underlying motivation for the military’s presence in the region.  

This same period witnessed a transformation in the structure of the Roman army as well. The army of infantry legions and auxilia composed of both infantry cohortes and cavalry alae of the Principate was replaced by a new bipartite division—the comitatenses and limitanei. The comitatenses were elite mobile field forces held behind the frontiers which accompanied the emperor whereas the limitanei or frontier forces were deployed along the length of the limites (plural of Latin limes or “frontier”), with each frontier sector commanded by a dux. These limitanei were essentially static forces inferior to the comitatenses in status and pay. The very nature of these units has been widely debated. By 443 C.E., there is evidence that the limitanei worked land assigned to them outside their forts to reduce their cost to the imperial government and this practice was an “ancient arrangement” (prisca dispositione). The debatable issue, however, is how early this transition to soldiers as farmers took place.

While many have argued against the proposition that the Late Roman limitanei consisted of a peasant-militia before the 5th century, two treatments suffice to serve as an example of this position. Both A.H.M. Jones and B. Isaac argue that limitanei could not have been farmers prior to the early 5th century. They argue that earlier scholars, such as Mommsen and Luttwak, had misread documentary evidence to conclude that the limitanei had farmed land since the early 4th century.  

---

95 For further criticism of this proposal, see Mann (1979), Millar (1982), Isaac (2000), and Whittaker (2004).
97 Tomlin, 1987: 111.
98 N7h xxiv, 1, 4
century, if not earlier. Additionally, Isaac continues this line of argument by using the *Notitia Dignitatum* to assert frequent transfers of soldiers which would have been difficult had they been primarily farmers. While there is still debate concerning the role of farming in the daily lives of soldiers along the frontier, it cannot be denied that there is increasing evidence from the southeast frontier suggesting that farming played an important role in these frontier zones from their initial occupation under Diocletian. In addition to evidence presented below in Chapter 5, an extensive study already interprets evidence from the *Limes Arabicus* Project to support the notion of locally raised flora and fauna.

### 3.1.4 Byzantine Period (ca. 324-630 C.E.)

There is little discernible archaeological change in the region’s history through the first half of the 4th century, yet by the late 4th century, several forts in the Arabah, as discussed below, were abandoned. Some of these forts, such as Bir Madhkur and Yotvata appear to have been destroyed by earthquakes (possibly in 363 C.E.) or some other violent destruction (possibly the Saracen revolt led by Queen Mavia, ca. 375-378 C.E.) and subsequently abandoned. Several others continued into the 5th and 6th centuries, but it is uncertain when they were finally abandoned by the military. The late 4th century also saw the Arabah incorporated into a new province, *Palaestina Tertia* or *Palaestina Salutaris*, with its capital at Petra.

---

100 Isaac, 1988: 142-145.
By the early 6\textsuperscript{th} century one can discern a significant change in Roman frontier policy. Many more forts along the frontier seem to have been abandoned with their garrisons either demobilized or transferred elsewhere. Instead it had become common practice to rely on native Arab phylarchs with their \textit{foederati} to defend the southeastern frontier following Justinian’s alleged cancelling of payments to \textit{limitanei} ca. 530. Thus it appears that the Arabah was then largely void of direct Roman military control.\textsuperscript{104} Nevertheless, this abandonment of forts in the Arabah did not mark the end of all Roman military involvement in the region. During the mid-late 6\textsuperscript{th} century, several new fortlets were constructed southwest of the Dead Sea, overlooking paths that led from the Arabah into Palestine, possibly reflecting a contraction of the frontiers.\textsuperscript{105} The 6\textsuperscript{th} century Petra papyri also refer to some regular Roman soldiers remaining in that region.\textsuperscript{106} Nevertheless, the Romans had clearly shifted to primary reliance for regional security on Arab federate allies.

The early 7\textsuperscript{th} century witnessed severe turmoil including the Byzantine-Sassanian war from 602-628 C.E., which set the stage for the more permanent Islamic conquests in the 630s. It is unclear when all soldiers were removed from the region, but by 630 C.E., the port of Aila was undefended, capitulating to invading Arabs without resistance.\textsuperscript{107} This ended Byzantine presence in the region, beginning a new chapter in the history of Wadi Arabah.

\textsuperscript{104} Parker, 1986: 149-155.
\textsuperscript{105} Magness 1999: 205.
\textsuperscript{106} Fiema, Z., 2007: 313-320; For the three of four final publications, see Frösen, \textit{et al.}, 2002; Arjava, \textit{et al.}, 2007; Arjava \textit{et al.}, 2011.
\textsuperscript{107} Kaegi, 1992: 93; Parker and Smith, 2014: 19-20.
3.2 Conclusion

Leading up to the mid-3rd century, the history of Wadi Arabah often revolved around trade routes, mineral exploitation, and animal husbandry—although the extent of these activities is difficult to ascertain. In the wake of political instability and perhaps in an attempt to replace earlier protective structures in the region such as the Palmyrene presence, Diocletian established a series of forts and legionary bases throughout the southeast corner of the Roman empire manned by *limitanei* who cultivated land either upon their arrival in the region or shortly after. The garrisons of the Arabah successfully protected Roman interests in key metal resources and important trade routes, functioning effectively throughout the 4th century. However, this system was weakened through the 5th century and in the 6th century it appears that this military infrastructure disappeared. A shift in strategy witnessed removal of most regular Roman forces from the Arabah, construction further north of new fortlets, significantly smaller than those of the Arabah, and a turnover of security to Arab phylarchs and their *foederati*. By the early 7th century there were no regular Roman soldiers to protect the region from Muslim Arab invaders and the Arabah transitioned peacefully into a new era.

Chapter 4. Forts of Wadi Arabah

4.1 Introduction

Over the past thirty years, an increasing number of excavations and regional surveys along southeastern Roman frontier has expanded our knowledge of when and possibly why these fortifications were constructed. Specifically, excavations along the Arabian frontier have shown
that numerous forts at sites such as Yotvata, Da’janiya, Udruh, el-Lejjun, and other known military centers, such as Aila were constructed or heavily renovated during the reign of Diocletian. A number of important regional surveys have begun to fill in the wider picture of settlement in the frontier zone. This new evidence has led to much debate about the purpose and role of fortifications along the Roman frontier.

General syntheses of this region published in the past decade have begun the lengthy process of interpreting this data. Perhaps one of the most comprehensive of these publications is Parker’s *The Roman Frontier in Central Jordan* (2006), which has served to bolster dramatically our understanding of the Roman military presence in the region. In conjunction with additional published reports, it is becoming increasingly possible to date the fortification of the Roman frontier and map comprehensively the military network at the southeastern edge of the Roman Empire. In light of the large amount of new data, this section is primarily dedicated to examining the garrisoned fortlets in Wadi Arabah during Late Antiquity.

**4.2 Diocletianic fortifications**

**4.2.1 Aqaba (Aila)**

Work at Aila over the past 30 years has revealed a great amount of information concerning this Nabatean and Roman port. No Roman military presence has been detected in the town before the

---

108 Davies & Magness, 2015.
110 *ibid.:* 94-98.
111 Parker, 2006a: 111-246.
112 For current publications on the Roman city wall at Aila, see Parker, 1997: 19-44; The forthcoming final report on the city’s fortifications will be published in Volume 2.
113 Parker, 2006a
late 3rd century, but it appears likely from the period of the Trajanic annexation. Around the turn of the 4th century legio X Frentensis arrived and the city began to boom economically. Unlike other sites discussed below, there is no known military architecture associated with the site from the Late Roman/Early Byzantine Period besides a segment of the city wall, now dated to the turn of the 5th century. What is abundantly clear, however, is that this city held a mixed population of civilians and soldiers. Other legionary bases in the region may serve as an example of what legionary fortress looked like in Late Antiquity, housing 1,000-2,000 men at maximum as opposed to the 5,000 strong legions of earlier periods. Only the first of three projected volumes of the final publication has been published and the evidence on the Roman military presence is forthcoming. While little is known about the structure of the military base at Aila, it would nonetheless seem odd that Diocletian would have transferred the entire legion from Jerusalem to the remote southeastern corner of the empire. While the copper further north in the Arabah was significant, and the spices and other luxury items that passed through the city were in high demand, unless there was a large enough threat to this trade and industry, a legion would not otherwise need to be stationed at the port. The last mention of a military garrison at the site comes from the Notitia Dignitatum, suggesting that it was still garrisoned by legionary forces at least until the early 5th century. It is unclear when this site was abandoned by the Roman military; however, in accounts of the surrender of the port to Muhammad, no mention is made of any conflict or existing garrison in the region. Whenever the legion left, it is clear that Aila’s

---

114 Parker, 2009b. 79-80.
115 Parker and Smith, 2014.
116 Notitia Dignitatum [Or.]: 34.30
economy did not suffer, and the city continued to prosper into the Early Islamic period.\(^\text{118}\) (Figure 4)

### 4.2.2 Yotvata (Osia/Bosia/Ad Dianam?)

Located on the southwestern edge of Wadi Arabah, this is the first significant military base north of Aila, ca. 40km away. A local oasis, ‘Ain Ghadyan/Ein Ghadian, has supported human presence in the area from the Chalcolithic through Islamic periods. This fort is a *quadriburgium*, or a roughly square fort with rectangular towers protruding from each corner, measuring 39.7 x 39.4m. The walls are about 2.5 m. thick with rooms built against the interior of the curtain wall around a central internal courtyard. An adjacent bathhouse is associated with the construction of the fort. A major excavation in the early-mid 2000’s by Gywn Davies and Jodi Magness is the only fully published fort site in Wadi Arabah. An inscription found in 1985 during earlier excavations provides a Tetrarchic date for the Late Roman fort’s construction, and lists that Tetrarchs *alam costia constituerunt*.\(^\text{119}\) While this inscription likely refers to an *alam Costia*, Roll, who initially published the full inscription, favors the reconstruction *alam c(um) ostia constituerunt*.\(^\text{120}\) The discovery of 26 milestones north of the site from the late 3\(^{rd}\) to early 4\(^{th}\) centuries identify Yotvata as ancient *Osia/Bosia* and as the *caput via* for a road system, discussed below.\(^\text{121}\) In the late 4\(^{th}\) century there is evidence of a violent destruction throughout the fort

---


\(^{119}\) Roll, 1989: 239-260

\(^{120}\) *ibid*. 244; Roll presents the translation as a reference to architectural structures rather than a unit, whereas Magness and Davies argue *Costia* is some variant of either the local “Costians” or a contraction for *Constantiana* (Davies and Magness, 2014: 3). While it is impossible it to trace this unit in other periods, the argument made by Davies and Magness appears more compelling in this instance.

\(^{121}\) Roll and Avner, 2008.
possibly associated with Queen Mavia’s revolt (ca. 375-378), but the fort was immediately reoccupied. The site’s absence from the Notitia Dignitatum further complicates the attempt to pinpoint its garrison unit, but Yotvata’s absence from the list suggests that the fort was largely abandoned as a military post by the 5th century. Ephemeral occupation of the site appears in the Byzantine period and the early Islamic period (7th/8th centuries), witnessed a non-military reoccupation (Figure 5).

4.2.3 Gharandal (Ariddela/Arieldela)

A quadriburgium currently under excavation is a c. 37x37m square with projecting corner towers—two square and two rectangular—with a curtain wall ca. 2m thick and rooms around a central internal courtyard. The site lies on the southeastern side of the Arabah at a natural spring and contains its own bath complex east of the fort. A building inscription dates the fort to 293-305 C.E. and confirms the identification of this site as ancient Arieldela of the Notitia Dignitatum and its garrison, cohors II Galatarum. This is a sister fort to that of Yotvata, just 25 km to the southwest and virtually identical in form. As the excavations of the fort and bath are still ongoing no firm abandonment date has been proposed but the excavators suggest in preliminary reports an abandonment in the 5th or 6th century based on ceramic evidence (Figure 6).

---

123 ibid.: 3-7.
124 ibid: 63-64.
125 Darby, R. & Darby, E. 2014, 671-672; Notitia Dignitatum [Or]: 34.44
4.2.4 Bir Madhkur (Moa/Calamona?)

This fort, another *quadriburgium*, is being excavated by Andrew M. Smith II. The fort is 30x30 m. with rooms around a central internal courtyard and is similar in structure to the other LR/EBYZ forts of the Wadi. This site also contains a caravanserai/bath complex and a substantial *vicus* of domestic houses outside the fort. The ancient name of this site remains unknown but suggestions include *Moa* of the Madaba map or *Calamona* of the Notitia Dignitatum, base of the *cohors prima equitata*.\(^{127}\) To the east, Bir Madhkur protected a major access route to Petra and while the former Nabataean capital had lost much of its prominence by this point in Late Antiquity, it nonetheless stood as a marker along a significant road cutting further east to the *via nova Traiana*, the main N-S trunk road connecting military outposts along the Arabian frontier. Just east of Petra was the Diocletianic fortress at Udhruh, by then the base of *legio VI Ferrata*. Additionally, the rural hinterland of Petra remained vibrant throughout this period, despite the city’s decline, so the fort at Bir Madhkur would have served as protection for this hinterland.\(^{128}\) An abandonment date for the site has not yet been published.

4.2.5 Mezad Hazeva (Eiseiba/Iehibo/Tamar?)

This fort is another *quadriburgium* of Wadi Arabah located at a natural spring. The Late Roman/Early Byzantine period fort was ca. 53x43m with four projecting towers. Its ancient identification is unknown with some suggesting that the fort is *Eiseiba* of the Beersheba Edict,\(^{129}\) *Iehibo* of the Notitia Dignitatum, base of the *cohors secunda Gratiana*,\(^{130}\) or *Thamara/Tamara*.

---

\(^{127}\) Smith, 2010a: 39-42; Notitia Dignitatum [Or.]: 34.43

\(^{128}\) ibid.

\(^{129}\) Alt 1921: no. 2; Abel, 1933: vol. ii: 181; Glueck, 1935: 17; Smith, 2010a: 48-50

\(^{130}\) Alt 1921: no. 2; Abel, 1933: vol. ii: 181; Glueck, 1935: 17; Smith, 2010a: 48-50
Tamar, base of *cohors quarta Palaestinorum*.\(^{131}\) Excavations in the 1970s-1990s by Rudolph Cohen revealed several periods of occupation from the Iron Age to the Late Roman/Early Byzantine period. But these excavations destroyed much of the later Roman/Byzantine fort without adequate publication, making interpretation difficult.\(^{132}\) The abandonment of this fort was attributed by Cohen to the earthquake of 363 C.E., but no material evidence was offered to support this claim, casting doubt on the dating.\(^{133}\) Recently, Erickson-Gini accepted a destruction in 363, but also then argued for an immediate military reoccupation until abandonment in the late 5\(^{th}\) or early 6\(^{th}\) century.\(^{134}\) The possible identity of this site in the Beersheba Edict (*Eiseiba*) and/or the *Notitia Dignitatum* (*Iehibo/Tamar*) could suggest military occupation at least into the 5\(^{th}\) century and/or 6\(^{th}\) centuries (Figure 8).\(^{135}\)

### 4.2.6 Qasr et-Tlah (Toloha?)

This late Roman *quadriburgium* lies ca. 25km southeast of the Dead Sea. Limited excavations by Tina Niemi in 1999-2003 suggest occupation from the Nabataean through Byzantine periods.\(^{136}\) The Late Roman/Early Byzantine fort is 40x40m with walls ca. 2 m thick, four corner towers, and rooms around a central internal courtyard (Figure 9). Excavation in 2013-2014 focused on the fort and uncovered an earlier Nabataean structure underneath one segment of the fort’s curtain wall, yet no published report has described the findings in detail.\(^{137}\) Northeast of the forts

---


\(^{132}\) Cohen 1988, 1992, 1993b

\(^{133}\) Cohen, 1994: 206-207.


\(^{135}\) *Notitia Dignitatum* [Or.]: 34.42

\(^{136}\) Niemi, 2007: 409-416

are remains of its water reservoir, a massive 34x34m *birkeh* which could hold 6,000-8,000 cubic meters of water; this remained in use until after the 7th century.\(^{138}\) While no inscriptions survive, this fort has reasonably been associated with *Toloha*, base of the *ala Constantiana*, in the *Notitia Dignitatum*.\(^{139}\) If so, its presence in the *Notitia* suggests it was occupied at least into the 5th century.

### 4.2.7 Mezad Tamar (Tamar?)

This fort is southwest of the Dead Sea on the road which leads out of Wadi Arabah towards Gaza and the Mediterranean coast. Mordechai Gichon excavated the fort in the 1970s and published two articles on these excavations, but no final report.\(^{140}\) This is another square *quadriburgium* measuring 38 x 38m with projecting square corner towers and rooms around a central internal courtyard (Figure 10). There were no nearby water sources, so a cistern in the courtyard served as the primary location for water storage. Gichon initially dated construction to the 270s based on coins of Aurelian found in critical contexts.\(^{141}\) These coins, however, only provide a *terminus post quem* for the construction of the fort, not an exact moment of construction, and in light of the virtually identical forts in the valley constructed during the Tetrarchy and without further published ceramics, it is better to reinterpret this fort as having been erected in conjunction with the others in the Arabah at the turn of the 4th century. Gichon later adjusted his dating of the fort’s initial construction to the 1st century C.E. followed by major refurbishing of the fort in the 270s.

\(^{138}\) Niemi, 2007: 413.

\(^{139}\) *Not. Dign. [Or.]* 34.34; Smith, 2010a: 50; Alt, 1921: no.2; Alt, 1935: 7, 31; Avi-Yonah, 1976: 102.


\(^{141}\) Gichon, 1976a: 193-194; in 1976b: 92, Gichon actually attributes the initial construction of this fort to the Nabataeans in the 1st century C.E., but with heavy part of note is missing?
due to its similarity to the Nabataean fort of *Oboda*, the widespread amount of Nabataean pottery at the site, and no apparent Nabataean structure underneath the fort.¹⁴² This dating has since been refuted by Erickson-Gini, who argues that the large amount of Nabataean ceramics is evidence only of leveling filling used by the Romans taken from earlier middens, rather than signs of initial occupation.¹⁴³ Gichon argued for military occupation of the fort into the 6ᵗʰ/7ᵗʰ centuries C.E. during which times, the interior structures were transformed to include industrial or agricultural installations and possible provide room for families of the *limitanei* continuing into the early 7ᵗʰ century C.E.¹⁴⁴ Eventually, the fort was gradually abandoned, and there is no evidence of a final destruction.¹⁴⁵

### 4.2.8 Qasr el-Feifeh (Praesidium)

Little is known archaeologically about this site as it is now being heavily cultivated.¹⁴⁶ Nevertheless, it has been identified with the ancient *Praesidium* of the *Notitia Dignitatum* and home of the *ala II felix Valentiana* by Frank and Glueck.¹⁴⁷ Not much is known about the fort structure itself, or whether it was even a *quadriburgium*, but of the two structures at the site, one was c. 105 paces square, the other c. 53 x 46 m, similar in size to other *quadriburgia* of the Arabah (Figure 11).¹⁴⁸

---

¹⁴⁵ *ibid.*
4.2.9 Es-Safi (Zoara)

Since the early 20th century, several archaeological surveys have associated this site just southeast of the Dead Sea with ancient Zoara/Zoar/Segor/Zughar. This important town and adjacent tell have both been excavated over the past thirty years by Konstantinos Politis, yet no excavations have yet been undertaken on the fort overlooking the site. The fort is listed in the Notitia Dignitatum as Zoara, home of the equites sagittarii indigenae and Eusebius in the 4th century wrote about “a garrison of Roman soldiers” at Zoara, next to “a balsam and date-palm grove in the fertile land.” The continued presence of the military presence in the city is attested by the 6th century Byzantine lexicographer Stephanus in his Ethnica, who mentions a φρούριον (fort, garrison) in this “large village (κώμη μεγάλη).” Until further excavations are undertaken on the fort itself, it is difficult to say any more about the construction and occupation of the fort.

4.3 Later fortifications just outside Wadi Arabah

The next two forts, En-Boqeq and Upper Zohar are both well under half the size of quadrirubgia in the Arabah, measuring ca. 26 x 26m but still with four projecting towers and internal rooms built against the curtain wall around a central courtyard. Although these forts are not strictly in Wadi Arabah, they still guarded access between the Arabah and southern Palestine and played an integral part in the later history of the region.

150 For other published excavated areas of the site, see Politis, 2012; Maeir, 2012.
151 Not. Dign. [Or.] 34.26; Onomostikon: 40.1-3.
152 Stephanus of Byzantium, 297.3-10
4.3.1 **En Boqeq**

Located on the southwest shore of the Dead Sea, the site was excavated from 1968-1976 by Mordechai Gichon.\(^{153}\) This *quadriburgium* housed an estimated garrison of 56 men, limiting the amount of patrolling and policing these forces could conduct on a regular basis.\(^{154}\) Gichon initially dated construction of the fort to the first half of the 4\(^{th}\) century but recent reexamination of the ceramic and numismatic evidence by Magness suggests that the fort was actually constructed in the early 6\(^{th}\) century and continued into use through the 7\(^{th}\) century.\(^{155}\) Thus this fort significantly post-dates when the rest of the region was fortified and likely represents some kind of shift in regional strategy (Figure 12).

4.3.2 **Upper Zohar**

Only 10 km west of En Boqeq but at a much higher elevation in the Judaean uplands, Upper Zohar shares a similar size and *quadriburgium* plan with four towers and a central cistern as En Boqeq, yet contains a line of internal rooms against only one side of the curtain wall (Figure 13). The fort was excavated by Richard Harper in 1985-86 and overlooks the same sector of road as En Boqeq and which led into Wadi Arabah. Harper dated the fort’s construction to the early 5\(^{th}\) century, largely due to coins (Ae4 issues) dating from 350 to 450 C.E. and *nummi* dated from 450 to 550 C.E.\(^{156}\) As Magness points out, however, these earlier issues do not indicate initial settlement since they could have circulated for some time before being brought to the site. In fact, associated pottery dates almost entirely to the 6\(^{th}\) century. Thus Magness pushed the

---

\(^{153}\) Gichon, 1993: 114.

\(^{154}\) *ibid.*: 109-114.

\(^{155}\) For initial dating of the fort, see Gichon, 1993: 49-52; for redating of the fort, see Magness, 1999: 193.

\(^{156}\) Harper, 1995: 15-16.
foundation of this fort into the early 6th century with occupation continuing into the 7th century.\footnote{157}

The redating of both these fortlets just north of the Arabah to the 6th century may be significant in reconstructing changing Roman security strategy in the region, as seen below.

### 4.4 Roadways in the Arabah

A comprehensive analysis of roadways in the Arabah during Late Antiquity is addressed by Smith in recent publications, so this section serves as a brief summary of his conclusions.\footnote{158} Early suggestions of north-south roads by early 20th century scholars were often presumptive and based on “common sense” logic, trying to connect the forts identified in the Arabah as well as occasional patches of poorly preserved paths and routes, yet archaeological evidence has since proven these suppositions to be accurate.\footnote{159} What has often been overlooked by later scholars attempting to discount the presence of north-south routes, however, is the composition of these roads which were only intermittently paved depending on the surrounding environment.\footnote{160}

Beginning in Aila, several small Roman outposts north of the city likely suggest some sort of road up to Yotvata. Roads from Aila led northeast as the \textit{via nova Traiana} and west across Sinai to \textit{Clysma} (modern Suez).\footnote{161} A group of 28 Tetrarchic milestones in three mile-stations north of Yotvata refer to the site as \textit{Osia/Bosia}, also indicating that it was the local \textit{caput viae}.\footnote{162}

\footnote{157}{For Magness’ redating of the fort at Upper Zohar, see Magness, 1999: 195-199; for Reynolds’ note on the pervasive nature of 6th century pottery at the site, see Reynolds, 1995: 21, 115.}
\footnote{158}{Smith, 2010a: 92-105; 2005.}
\footnote{159}{Smith, 2010a: 92.}
\footnote{iibid.:}{101}
\footnote{ibid.:}{96.}
\footnote{160}{ibid.: 101}
\footnote{161}{ibid.: 96.}
\footnote{162}{Roll and Avner, 1996: 267.}
No evidence of the road survives, but that need not be a deterrent to recreating the road system in place.\textsuperscript{163} In addition to routes leading north, there appear to be other routes leading west into the Negev and east to Rujm Taba (Figure 2).\textsuperscript{164}

North from Yotvata the road eventually bisected, with one branch road crossing to the eastern side of the Arabah leading to Gharandal, where paved segments of roads are still preserved to the north and south. A western branch continued north along the western side of the valley. These now parallel roads on each side of the Arabah continued north, the western branch continuing to Mezad Hazeva where it was possible to exit the Arabah either going northwest towards Gaza, north to Jerusalem, or northeast onto the Karak plateau. The eastern route led through Qasr et-Tayyiba, Bir Madhkur, and eventually to Qasr et-Tlah. In the segment north of Bir Madhkur, an anepigraphic milestone has been identified. Although the road is unpaved, it follows a path which would have intersected a road to the copper mines in Wadi Faynan.\textsuperscript{165}

The milestones at Yotvata and Bir Madhkur, the presence of Roman and Byzantine outposts connecting several sites, and the remnants of paved and unpaved roads suggests that there were at least two north-south routes, more or less parallel, on both the eastern and western sides of the Arabah. Additionally, there are many east-west roads which bisect the north-south routes, providing access to the Negev and Gaza in the west, Jerusalem in the north, and several different outlets in the east, including Petra.\textsuperscript{166} These east-west roads are key to understanding the trade routes from Aila and Petra to Gaza. Recent examination by Erickson-Gini demonstrates that the original Petra-Gaza route, which ran through Oboda and Moyet ‘Awad, was largely

\textsuperscript{163} ibid.: 275.
\textsuperscript{164} Smith, 2010a: 96.
\textsuperscript{165} Smith, 2010a: 100-102.
\textsuperscript{166} ibid.: 101.
abandoned as a major trading route in the mid-3rd century C.E. and that the Negev no longer was the central path for incense. While initially this decline might be seen in the context of the economic strains across the empire during this period, it is notable that upon the trade’s return by the early 4th century, the traffic largely bypassed the Negev entirely, instead using the Egyptian port of Clysma as a primary center of this trade.¹⁶⁷

Upon the Diocletianic intervention in the region this old route was left less fortified in the Arabah than others further north which appear to have garrisons stationed with more regularity at each major entrance into the Arabah, although Bir Madhkur still guarded the path to Petra in the Arabah. In the northern Arabah, Mezad Tamar and Zoara guarded the path hugging the southern coast of the Dead Sea and Tamara guarded the road linking Mampsis to Faynan and Petra.

It is clear that an extensive road system during Late Antiquity in Wadi Arabah not only connected the forts in the region but also promoted trade and communication through the valley. These roads would prove essential in analysis of supplying the military in Wadi Arabah in the following chapter as there is clear evidence of trade and transit running the length of the valley.

4.5 Analysis and Conclusion

This analysis reveals certain recognizable patterns in these fortifications. It is clear that across the entire stretch of this southeastern frontier, from sites on the northern edge of the Negev to Aila on the Red Sea, numerous forts manned by Roman military garrisons were built within a few years around the turn of the 4th century and were connected by a complex road system running north-south and east-west. It is also important to note that most of these sites were not

found near large populated centers, with Aila and Udhruh (near Petra) being the main exceptions. In considering the purpose of these forts, the hardships faced by the soldiers forced to live in these areas, and the economic burden of supplying these far-flung garrisons should not be overlooked as exceptions to the rule, but rather as a marker of the norm.

In light of his campaign against the Saracens in 290 C.E., Diocletian could have seen this corner of the empire as unstable and under a future threat if not properly protected. This fear, whether perceived or actual, does seem to have some basis in reality. Almost one hundred years later Queen Mavia, who ruled over Arab “Saracens,” revolted against Rome, eventually reaching the Mediterranean coast around the same time that several sites in Wadi Arabah, such as Yotvata, were destroyed.\textsuperscript{168} This fear does not necessarily indicate a necessity for massive fortifications and fortresses to protect roadways— as Procopius noted that these nomadic peoples could not take walled fortifications, so even modest defensive structures could suffice, such as the \textit{quadriburgia} which line Wadi Arabah.\textsuperscript{169}

Although there is not much literary evidence to support the suggestion that Rome’s Arabian border was under constant threat of Arab nomads, there are sources that consistently refer to Diocletian refortifying the frontiers. Not only does the archaeological evidence support this claim that the Arabah was militarized during the Tetrarchy, but it also suggests that Diocletian was attempting to create an entirely new type of frontier. These small and compact yet fortified \textit{quadriburgia} were not meant to propel invasions into enemy territory, nor could they withstand a full-on attack by an enemy equipped with siege weapons. These forts were built to protect trade routes and the interior of the province by intercepting mobile nomadic bandits or

\textsuperscript{168} Davies & Magness: 63.
\textsuperscript{169} Procopius, \textit{de Aedificiis}, 2.9.4.
marauders. For this reason, several fortlets were garrisoned by equestrian units so as to patrol the landscape and meet the enemy wherever they emerged. Static garrisons in the fortlets would deny the nomads access to the limited but thus precious sources of water in the valley and protect travelers from such raids.

The later forts of En Boqeq and Upper Zohar may be indicative of this system’s abandonment by the 6th century and the withdrawal of regular Roman forces to the north. This presumably would have left responsibility for the security of the Arabah in the hands of local Arab phylarchs and their foederati. Whatever the purpose behind these later even smaller forts, their military occupation was short-lived due to the successive Sassanian and Muslim invasions in the early 7th century, thereby bringing an end to Roman control of Wadi Arabah.

Chapter 5. Supplying the frontiers: A discussion of internal production and external trade

5.1 Introduction

From the outset of the Roman army’s presence in Wadi Arabah, the problem of supplying these garrisons undoubtedly plagued imperial officials. Throughout the empire, logistics were central to the stability of the military infrastructure. To what extent did the Roman military infrastructure import supplies into Wadi Arabah rather than produce goods locally?

To that end, this chapter builds upon the discussion of limitanei in Chapter 3 by examining material evidence from the published military sites in Wadi Arabah as outlined above. While it is not possible to estimate closely how much a given unit consumed from local sources versus importation, this chapter will suggest that even in remote regions such as the Arabah soldiers likely produced some of their own supplies in addition to imports from the outset of their
arrival in the region, a notion which has been questioned by A.H.M. Jones and Benjamin Isaac.\textsuperscript{170} At the same time, \textit{contra} both Jones and Isaac, there is undeniable faunal and archaeobotanical evidence that soldiers or others closely associated with the fort practiced agriculture and animal husbandry to supplement imperial supplies that reached the forts.\textsuperscript{171} The ultimate problem is what portion of these supplies was locally raised versus imported.

It has recently been argued that late Roman military garrisons east of the Dead Sea were supplied locally from the initial establishment of these garrisons under the Tetrarchy, in sharp contrast to garrisons in more arid regions, such as the legion based at the city of Aila.\textsuperscript{172} What remains unclear is how the forts which dot Wadi Arabah, which lies between the Dead Sea and Aila, were supplied. Various kinds of potentially available local resources will shed light on how the Roman military was supplied in Wadi Arabah during Late Antiquity.

\textbf{5.2 Exploitation of Local Resources and Local Production}

The most essential component of gaging levels of local production at these military sites is clearly water. Above all, could the garrisons access water beyond the essential human and animal needs to store sufficient water for irrigation? Even during winter there is not enough rain for dry farming, particularly in the southern Arabah. Therefore agriculture in the valley would have required aqueducts to transport nearby spring water, large reservoirs/cisterns to store water, catchment systems to divert runoff into fields, or some combination of all the above. But beyond

\textsuperscript{171} Parker, 2006a: 419.
\textsuperscript{172} Parker, 2006a: 415.
water, this section considers evidence for local cultivation, local animal husbandry, and exploitation and export of local resources such as timber, copper, bitumen, salt, and fish sauce.

5.2.1 Water resources

There is little question as to the importance of water sources when planning the location of military garrisons, but this fact should not be taken for granted. Recent scholarship has explored the extent to which the Roman army accessed regions with limited water resources, with particular emphasis in Africa and along the eastern edge of the empire. In the case of Africa and Arabia, some argue that Roman expansion was halted largely due to the lack of access to drinking water, and so the examination of Wadi Arabah should be understood in the context of the Roman military having stretched its infrastructure as far as it was reasonably possible.

The ability to store and access water would have been paramount to any population in the region, military or otherwise. Aqueducts, which connected sites to nearby springs or funneled water from rare winter deluges, dot the landscape in the Arabah, suggesting that the Romans, while by no means the first to do so, quickly adapted to the extreme aridity of the desert. Some sites, such as Yotvata, Bir Madhkur, Qasr et-Tlah, and En Boqeq, are surrounded by extensive remains of agricultural installations and fields bisected by artificial water channels, suggesting that these garrisons had access to locally produced agricultural supplies. This claim should not be taken uncritically, however, since these fields do not indicate exactly by whom this land was cultivated since others may have lived in the vicinity of the forts. Additionally, without solid dating for the use of these fields, it is difficult to determine whether they were in use during the

occupation of the fort. Often these fields are dated based on ceramics from the surface of these fields.175 Regardless of their date, these field systems demonstrate that agriculture could be practiced in different locations in the Arabah, at least in some periods. It is also surely notable that three sites with such evidence extend from the northern (Qasr et-Tlah), central (Bir Madhkur), and even southern (Yotvata) sectors of the valley. Additionally, while agricultural structures have not been identified in the southern Ghor such as Qasr el-Feifeh and Es-Safi, the region contained fertile land and somewhat more rainfall than further south, perhaps permitting agricultural production without extensive irrigation systems.176

Yet even when archaeological research has not identified water management installations for field systems, remains of baths fed by channeling systems suggest significant amounts of water diversion for non-consumption. Sites such as Yotvata, Gharandal, Bir Madhkur, and Mezad Hazeva all contain bath complexes connected to nearby springs, presumably for soldiers stationed there and for passing travelers.177 This might suggest additional water surplus for at least some small scale local agriculture.

Finally, the forts at Upper Zohar, Mezad Tamar, and Qasr et-Tlah all have large cisterns within or next to the fort, emphasizing the importance of water collection even when natural

175 For Yotvata field systems, see suggestion of a Byzantine dating in Rothenburg, 1972: 218 and an Islamic dating based on the qanat technology utilized, see Evenari et al., 1982; for fields at Bir Madhkur, which are dated to the LR/Byz period, see Ramsay and Smith, 2013: 57; for Qasr et-Tlah and a Nabataean-Byzantine date of the fields see Niemi, 2007: 409-416; for an early Roman construction with renovations in the Late Roman and Byzantine periods at En Boqeq see Fischer, et al., 1993: xxii-xxvii.
176 Eusebius, Onomasticon: 40.1-3.
177 For the Yotvata bathhouse, see Davies and Magness, 2014: 48-61; For the most recent publication about the ongoing excavations at the Gharandal bathhouse, see Darby and Darby, 2015: 463-465; For the most recent publication about the ongoing excavations at the Bir Madkhur bathhouse, see Smith, 2010b: 143-152; no publications have been published for the Mezad Hazeva bathhouse, but it was excavated in the 1990’s by Rudolph Cohen (Cohen, 1994: 205).
springs were located nearby, such as the case with Qasr et-Tlah.\footnote{For Upper Zohar, see Figure 2 in Harper, 1995: 118; for Mezad Tamar, see Gichon, 1976a: 188-194; for Qasr et-Tlah, see Niemi, 2007: 409-416.} It is apparent, nonetheless, that the Roman military had become adept at water storage in this extreme environment and that water was available not only for human and animal consumption but also certainly bathing and perhaps even for agriculture.

The ability for Rome to adapt in this arid environment is not unknown to modern scholars. At the Roman fort in Humayma east of Wadi Arabah in the Hisma Desert, annual rainfall only totaled about 80 mm/year and the site contains no nearby springs in its immediate vicinity. Oleson has calculated, however, that through all the dams, cisterns, reservoirs, and runoff catchments, enough water could have been stored for both suburban and urban needs of the site, agriculture included.\footnote{Oleson, 2010: 33.} The water supply was supplemented by an spring-fed aqueduct from the well-watered highlands to the north and extending to Humayma. The aqueduct was already in use during the Nabataean period and later supported the garrison of the large Roman fort (probably a full strength auxiliary unit of ca. 500 troops).\footnote{ibid.: 490-492.} As one of the best preserved water systems in the region, Humayma displays a model of water management in Arabia from the Nabataean through early Islamic periods and many similar hydrological installations appear in Wadi Arabah.

5.2.2 Evidence of local cultivation

As mentioned above, physical traces of agricultural development during the Late Roman/Early Byzantine period are not ubiquitous across Wadi Arabah. The general trend is that the further
north one goes in the Arabah, the more common are these fields, walls, and water channels. Yet agriculture was surely practiced at Yotvata, only 40 km north of Aqaba. In the far south around Aila no agricultural installations have been dated to this period.\(^{181}\) It has also been proffered that in the hinterland of Aila cereals could have been grown in runoff fields without irrigation, possibly explaining the lack of irrigation evidence in Aila’s immediate vicinity.\(^{182}\)

Botanical remains shed light on the issue of local cultivation in Wadi Arabah. The effort that forms the basis of the present analysis has largely been spearheaded by Jennifer Ramsay at Aila, Yotvata, and Bir Madhkur.\(^{183}\) She argues that the presence of crop by-products and weed species often found in crop fields suggest local agriculture at all three sites since these by-products otherwise would have been discarded before transport during the winnowing and sieving stages of cereal processing.\(^{184}\) At Aila, for instance, weeds typically found in agricultural or fallow fields comprise 53.2\% of the 148 datable samples collected from the Roman Aqaba Project.\(^{185}\) This trend continues at Bir Madhkur where over 20 different taxa of weeds or wild species often found in crop fields have been identified among the 626 identified botanical specimens.\(^{186}\) At Yotvata are eight different weeds or wild species that often grow in agricultural and fallow fields. This evidence, when combined with the other identified cereal chaffs and peduncles, may further suggest local agriculture at these forts.\(^{187}\)

\(^{181}\) Smith, 2014: 118-121.
\(^{183}\) Ramsay and Parker, 2016; Ramsay, 2015; Ramsay and Smith, 2013.
\(^{185}\) Ramsay and Parker, 2016: 108.
\(^{186}\) Ramsay and Smith, 2013: 55.
While the evidence presented by Ramsay is compelling, it however should not be accepted uncritically as Parker has outlined in a recent article about feeding the late Roman army on this frontier.\textsuperscript{188} He notes that these carbonized seeds largely derived from animal dung used for fuel and may simply reflect the diet of animals imported from elsewhere for consumption. Additionally it is possible that, without sufficient local grazing lands, unprocessed grain stalks, which could still contain weeds, may have been imported to feed local livestock particularly in the hyper-arid summer months.\textsuperscript{189} Despite these caveats, evidence of faunal remains presented below will complicate these reservations.

These studies illustrate the types of agricultural products consumed at these sites and are likely representative of the entire Arabah. Botanical evidence from Yotvata, Bir Madhkur, and Upper Zohar suggest a diet of mostly cereals such as wheat and barley, fruit such as olives, dates, figs, grapes, peaches, and legumes such as lentils, bitter vetch, sweet pea, fava beans. There is little chance that some of these foods, particularly olives, grapes, peaches, and figs were produced locally due to the significant amount of water needed for cultivation.\textsuperscript{190} An interesting variant among these forts emerged from a domestic complex outside the fort at Bir Madhkur: 63 beet fruits were identified, possibly cultivated for culinary and/or medicinal purposes.\textsuperscript{191}

Aila, perhaps unsurprisingly as an urban center directly on the coast, reflects a more diverse archaeobotanical profile than the forts, with evidence of Christ’s thorn, species from the Cucurbitaceae family (melon or gourd), millet, rye, pistachio, chickpea, and pine nut. This diversified corpus might reflect both more direct access to international goods and consumption

\textsuperscript{188} Parker, 2015: 218.
\textsuperscript{189} ibid.
\textsuperscript{190} Ramsay, 2015: 247; Ramsay and Smith, 2013: 60-61; Boardman, 1995: 113.
\textsuperscript{191} Ramsay and Smith, 2013: 60.
of a significant non-military population as well. The city also experienced apparent changes in food stuffs from its founding in the 1st century B.C.E to the Arab conquest in the 7th century. The Late Roman period (ca. 106-324) is marked by a significant amount of crop by-products and agricultural weeds, which consisted of over half the assemblage. By the Early Byzantine period (ca. 324-500), several new species appeared, including millet, chickpea, Christ’s thorn and pine nuts. The total of weed and agricultural by-products dropped to little under half the total assemblage, possibly representing the long term effects of a large population increase at Aila following the arrival of legio X Fretensis c. 300.

Although three forts and a major port city provide a good sample of botanical remains that might be expected throughout Wadi Arabah, the absence of botanical remains from the remaining sites in the Arabah requires caution about blanket statements for the entire region. In particular, none of these botanical samples derive from the northern sector of the valley. But, given the relatively higher precipitation in the north, there is likely even greater chance of local cultivation there. Nevertheless, these sites do shed some light on the botanical diet, based on cereals, fruit, and legumes, of Roman soldiers in Wadi Arabah during Late Antiquity and suggest that some portion of their diet was grown locally and another portion likely imported.

5.2.3 Faunal remains

Botanical remains were likely the core staples of a soldier’s diet but of course did not constitute a soldier’s full ration. This was clearly supplemented with meat and perhaps eggs and dairy products. But in an environment as arid as Wadi Arabah, it is unclear to what degree these

---

192 Ramsay and Parker, 2016: 111.
193 ibid.: 112.
animals would have had enough vegetation to graze locally or were imported from elsewhere. Further north along the *Limes Arabicus* at the legionary fortress at el-Lejjun and at some smaller but contemporary forts, analysis of faunal remains suggested that such animals were raised locally rather than imported. This trend generally seems to extend further south to the forts of Wadi Arabah; however some exceptions to this pattern might be observed in the far south.

Full faunal reports have thus far been published from only two forts in or near Wadi Arabah: Upper Zohar and Yotvata. Additionally, there is some published faunal material from Aila, En Boqeq, and Humayma. Despite this dearth of published material, these reports can still be informative for meat consumption patterns at these forts. It should be noted, however, that these forts were not all occupied at the same time. Upper Zohar and En Boqeq were not constructed until the 6th century, by which point Yotvata had been abandoned, and it remains unclear whether the legion was still stationed at Aila. Nevertheless, broad trends of animal supply and consumption can still be traced through this evidence and suggest possible continuity in the sources of supply throughout the Roman occupation of Wadi Arabah.

At Yotvata, the sample size of identifiable faunal remains from the period of the fort’s military occupation (c. 300-400) is relatively small (n=1300) but still provides some interesting insights about the consumption of meat and marine resources. The largest category in this context is medium mammals such as sheep, goat, and deer (n=528, 40.6%), followed by fish

---

195 Clark, 1995; Croft, 1995; Lernau, O.; Halbmaier, 2015.
196 Parker, 2015; Lernau, 2000; Finneghan, 2013.
197 For Upper Zohar and En Boqeq dating, see Magness, 1999: 195-199; For abandonment of Yotvata, see Davies & Magness, 2014: 3-7; for ambiguity about the legion’s presence at Aila in the 6th century, see Parker and Smith, 2014: 18-19.
198 Halbmaier, 2015: 219-238.
large mammals such as camels (n=37, 2.85%), horses/donkey (n=9, 0.69%) cows (n=4, 0.31%), unidentified large mammals (n=113, 8.7%), small mammals such as pig (n=32, 3.5%), dogs and cats (n=18, 1.4%), another less diagnostic group identifiable merely as small mammals (n=17, 1.3%), birds (n=36, 2.8%), and turtles (n=4, 0.31%).\textsuperscript{199}

From the largest group of attested animals, an unusually large number of caprines were killed before their first year, when they were too young to be brought overland but also before they could be utilized for their secondary products such as wool and milk. Additionally, the entire skeletal assemblage of these animals was identified at the site, suggesting that whole animals were butchered rather than imported choice cuts. Coupled with the high costs of transporting live animals overland, these trends suggest that at a large proportion of caprines were born locally and consumed during their first year.\textsuperscript{200} The surviving breeding stock of older animals might have also supplied dairy products for the garrison. The few bovine remains from this site, however, indicate the opposite. The few such remains were limb bones, suggesting choice cuts imported on rare occasions to the fort.\textsuperscript{201} The small number of pig bones were recovered from Late Roman levels suggesting that it was not a significant portion of the military diet and possibly suggestive of a local origin for the fort’s garrison\textsuperscript{202} or perhaps representing an occasional imported delicacy. Camels, the most common identified large mammal species, likewise comprised a minor portion of the diet. Nearly all elements of camel are represented and many show evidence of butchery. This suggests that camels were consumed following their use

\textsuperscript{199} ibid.: 222-224.
\textsuperscript{200} Halbmaier, 2015: 228.
\textsuperscript{201} ibid.: 225.
\textsuperscript{202} ibid.: 228.
as a pack animal or other military purposes.\textsuperscript{203} Camel milk might also have been consumed by the garrison. Finally, there are some, albeit minimal, indications that hunting (such as ibexes) and fowling entered the diet of the garrison.\textsuperscript{204}

The second largest category of remains, fish, was not divided into species or size classes, making it impossible to say exactly their point of origin. Nevertheless, since they were found in almost all excavated contexts, they likely played an important role in the diet. Due to the fort’s proximity to Aila, just 40 km to the south, it is not difficult to imagine that they were caught in the Red Sea.\textsuperscript{205} Finally, no shellfish were described during the discussion of the faunal remains, yet it is possible this marine resource also contributed to the diet of the soldiers.

Therefore it appears that the garrison of Yotvata relied heavily on local faunal resources and imported marine foods, occasionally supplemented with imported meat. Unfortunately, it is difficult to determine the source of the other mammals. But Aila almost certainly provided the bulk of the marine resources. One final note is that no chickens were identified on site due to the unidentifiable nature of the bird bones.\textsuperscript{206} Moreover, even if these bones could be identified, it is evident that they played a minor role in the diet of the soldiers at Yotvata, a stark difference to other forts in the Arabah.

The sample from the fort of Upper Zohar is much larger (n=27,700), providing a more detailed picture of the soldiers’ diet.\textsuperscript{207} A vast majority are from mammals (n=23,015), but only

\textsuperscript{203} ibid.: 225.  
\textsuperscript{204} ibid.: 226.  
\textsuperscript{205} ibid.: 229.  
\textsuperscript{206} ibid.: 229.  
\textsuperscript{207} For mammalian remains, see Clark, 1995: 49-85; for bird and small mammalian remains, see Croft, 1995: 87-95; for shells, see Reese, 1995: 97-98; for fish remains, see Lernau, O. 1995: 99-111.
24% (n=5,318) were identifiable to a particular species.\textsuperscript{208} Caprines accounted for 86.2% of this total (n=4585), followed by pigs (12.6%, n=670) and cattle (1.2%, n=64).\textsuperscript{209} Additionally, a few equids, camels, dogs, deer and hares were identified.\textsuperscript{210} The fairly small pool of small mammal bones (n=123) included hares (n=13), black rats (n=45), Ethiopian hedgehog (n=9), lesser mole rat (n=34), fat jird (n=25), Tristram’s jird (n=2), small gerbil (n=3), and house mouse (n=1), but these remains were typically found in contexts associated with the fort’s abandonment.\textsuperscript{211}

A small but significant fraction of the faunal remains from Upper Zohar were fish (n=2325), 726 of which were assigned to 16 different species.\textsuperscript{212} The most common was mullet, consisting of 46% of identified fish (n=335), followed by parrotfish (23.5%, n=171), African catfishes (11.8%, n=86), sea bass (7.2%, n=52), porgies (5.2%, n=38), mouthbreathers (2.5%, n=18), and less than five bones each of Nile perch, snooks, jacks, Atlantic horse-mackerel, emperors, leatherjackets, scorpionfishes, Merluccid hakes, temperate basses, European seabass, drums, meagers, and a shark.\textsuperscript{213} 26 marine shells were recovered, 24 from the Mediterranean and 2 from the Red Sea.\textsuperscript{214}

Finally, the excavation also recovered 2,256 stratified bird bones, of which 90% were chicken (n=2029).\textsuperscript{215} In smaller quantities were corncrakes (n=36), ravens (n=36), doves (n=32), partridges (n=31), raptors (n=14), storks (n=5), and small passeriforms (n=4).\textsuperscript{216}

\textsuperscript{208} Clark, 1995: 50.
\textsuperscript{209} ibid: 60.
\textsuperscript{210} ibid.: 50.
\textsuperscript{211} Croft, 1995: 93-94.
\textsuperscript{212} Lernau, O., 1995: 99.
\textsuperscript{213} Lernau, O., 1995: 99-100.
\textsuperscript{214} Reese, 1995: 97.
\textsuperscript{215} Croft, 1995: 87.
\textsuperscript{216} ibid.: 87-90.
Upper Zohar, although with a much larger sample size, shares many characteristics with Yotvata. Unsurprisingly, caprines predominated in the corpus but, unlike Yotvata, represent a wide range of ages.\textsuperscript{217} This distinction might suggest that the fort was supplied in a different manner than Yotvata since the range of ages at Upper Zohar can be indicative of animals intended to be used for their secondary products such as wool or milk and only entering the meat supply once yields began to decline.\textsuperscript{218}

Little can be said about the avifaunal assemblage outside of two major points: chicken dominated the bird corpus and in conjunction with the eggs they produced would have been an important component of the overall diet, consisting about 9\% of the overall faunal assemblage. The vast range of other bird species is striking and may suggest local fowling as most could be found in the vicinity of the fort.\textsuperscript{219}

The 726 identifiable fish bones at the fort are key to this discussion since they can point to a specific origin. Most of the fish could have originated from either the Mediterranean or Red Sea (58\%) but some, such as the parrotfish which accounted for 26\% of the identified corpus, could have only originated from the Red Sea. Fish from the Jordan valley, such as the African catfish and mouthbreeders, account for about 15\% of the total corpus. Perhaps surprisingly, only 1\% of the fish remains could be positively sourced to the Mediterranean.\textsuperscript{220} While the possibilities of this evidence are striking, namely that a significant portion of the fish originated from the Red Sea, it is important to note the general uncertainty of a specific source for a majority of the identified fish. What cannot be denied, however, is the garrison imported

\textsuperscript{217} Clark, 1995: 58.
\textsuperscript{218} ibid.
\textsuperscript{219} Croft, 1995: 87-92.
\textsuperscript{220} ibid.
significant marine foods from multiple sources. Fish from the Red Sea almost certainly reached this fort by regularly traveling the entire length of Wadi Arabah.

The faunal remains at En Boqeq were only partially published due to the death of Hanan Lernau during the publication process—both fish and bird remains were published in the second volume based on his notes, but the mammalian remains are only briefly described in the first volume. For the latter, the assemblage of 459 fragments consisted largely of caprines (78%, n=358), pigs (17.4%, n=80), and cattle (4.6%, n=21). These percentages are almost identical to the identified remains at Upper Zohar, which is not surprising given their proximity to each other, but without any further analysis it is not possible to provide a more detailed discussion.

A little more certainty can be provided for the poultry and fish remains, the former totaling 1278 fragments and the latter totaling 291. Of the poultry, 99% were chicken with the remaining 1% attributed to wild poultry (n=41), dove (n=1), desert partridge (n=12), thrush (n=1), and ostrich egg (n=1). According to Lernau, the smaller size of these chickens and spurs on the ankles suggested that these birds were used for cock-fighting. If so, it would be unique among these forts. Interestingly, chickens far outnumber the caprines and despite the smaller amount of meat on a chicken, they must have been a significant part of the diet when considered alongside their eggs.

---

221 For bird and fish bones, see Lernau, H. 2000: 149-181; for the brief report on the mammalian remains, see Gichon, 1993: 444.
222 Gichon, 1993: Fig. 36.
225 ibid.: 149.
An unspecified amount of fish bones was uncovered at En Boqeq, from which 291 bones were identified.\textsuperscript{227} The most common fish was the parrot fish (n=149), followed by African catfish (n=68), mouthbreathers (n=66), emperors (n=4), meagres (n=3), and porgies (n=1).\textsuperscript{228} A majority (51%) could have originated only from the Red Sea (n=149), 46% from fresh water sources (n=134), and only 1% from the Mediterranean (n=4).\textsuperscript{229} The lack of any species from both the Mediterranean and Red Sea is odd given that they were 58% of the entire identifiable corpus at Upper Zohar. One wonders if there is additional information (including total fish bones collected) missing from this report due to the unfortunate circumstances during its publication. Nevertheless, the fish remains from En Boqeq suggest a wide range for supply of the garrison from both the Red Sea and regional freshwater sources. Once again, the Red Sea fish likely reached En-Boqeq via Wadi Arabah.

The faunal remains at Aila, however, suggest a different type of supply compared to other forts in the Arabah. Approximately 40,000 bones and thousands of shells from the excavation display a diversified array of fish, shellfish, cattle, chicken, pig, wild game and caprines. Fish played an important role in the overall corpus, and from the domestic consumables, 86.4% consisted of caprines, 10.4% from cattle, 1.7% from chicken, and 1.5% from pig. Unlike the forts, about half of the caprines were two years old when slaughtered, the age when the maximum meat-yield weight was achieved, and only a small minority reached eight years of age before consumption. Rather than wide range of ages among the caprines, the prevalence of two year old caprines suggests imports to the port, perhaps supplied in part by nomadic pastoralists in

\textsuperscript{227} Lernau, H., 2000: 169.
\textsuperscript{228} \textit{ibid.}: 170-176.
\textsuperscript{229} \textit{ibid.}: 169.
Although quite similar to the strictly military sites in terms of the predominance of caprines and the range of species and quantities of other mammalian consumables, some differences in the faunal supply may reflect both a much larger market, more direct access to marine resources, and different dietary preferences by the combined military and civilian population of Aila. It should be noted, however, when comparing the diet of civilian and military sites, pork aside, these two diets appear to be largely similar in the region.

A final contrast between Aila and Yotvata viz. En Boqeq and Upper Zohar is that pigs at the former sites played only a minor role in the faunal diet, with levels in the low single digits, comparable to the faunal profile at el-Lejjun. At the two northern forts, however, pigs were the second most common type of mammal at these sites after caprines—an animal thought to be consumed in much smaller numbers amongst the local population due to its religious stigma in the region, but otherwise consumed by the largely polytheist and later Christian soldiers of the Roman military. A similar picture emerges at Humayma when comparing the evidence from the Roman fort vs. the broader village. At this site a significant majority of pig bones were recovered (87.87%) specifically from the fort, indicating that the indigenous population at the site did not regularly eat pork. There are several plausible explanations for this difference, i.e., more direct access to pigs, more willingness on behalf of the garrison to consume them, or a more accommodating environment for pig breeding north and east of Wadi Arabah. Nonetheless,

---

230 ibid.
231 Parker, forthcoming
232 Toypln, 2006: Table 22.6
233 King, 1999: 190-191.
234 Finnegan 2013: 334, Fig. 10.11.
235 ibid.: 336-337.
even in the northern forts, caprines still dominated the corpus and were the primary meat for consumption.

While hardly exhaustive, this evidence suggests a complex system of supply that relied on largely locally produced fauna, with some external importation from both the surrounding regions better suited for grazing and marine resources from the Mediterranean and Red Sea. It is difficult to determine if local nomadic pastoralists provided some of the caprines consumed at these sites. Throughout the region, such pastoralists might have traded portions of their herds with local soldiers (perhaps for grain or manufactured goods) when passing by the forts on a seasonal basis. Early modern ethnographic parallels suggest that nomadic pastoral tribes migrated into the Arabah from the surrounding elevated plateaus during winter for the valley’s warmer temperatures and to graze its seasonal foliage. But it is also possible that the Roman authorities levied a tax in kind on these pastoralists which could conveniently be collected during this period. Another possibility is that caprines were driven into the Arabah from the surrounding regions under government supervision to supply these garrisons.

On the other hand, these limitanei, such as those stationed at forts such as Yotvata, may have tended their own herds to ensure a steady food supply. This has been argued for Yotvata on the basis of so many young caprines from this site. However two caveats must be raised about this interpretation. First, the presence of so many young animals could be explained by a tax levy in kind on the pastoral tribes while they were present during the late winter and spring, precisely the lambing season in this region. In fact, a major reason why tribes migrated into the Arabah during winter during the early modern era was reduce the danger of lambs dying from cold on

---

236 van der Steen, 2006: 249.
the plateau.\textsuperscript{237} Second, one wonders what locally managed herds could have been eaten during the summer months, particularly in the extremely arid southern Arabah around Yotvata. Fodder might have been imported but presumably the overland transport costs might have been prohibitive. In short, the evidence is rather ambiguous. Some level of importation seems likely but the evidence does not exclude the possibility of locally managed herds by the soldiers and/or their families. We must await more evidence for more definitive answers.

The remaining meat sources seemed to have played a minor role in the military diet. Most remains such as pig, cattle, and chicken, probably represent occasional imports, perhaps for officers or as sacrificial offerings for special events. One could imagine a few pigs and chickens being kept in the forts themselves or in their immediate vicinity. Camels likely served as traction animals and were consumed when their working days were over. It also appears that hunting and fowling made a minor contribution to the diet at these forts.

In contrast to the uncertainties about the source of meat and dairy supplies, there is absolutely no doubt that the garrisons in the Arabah relied on imports of marine resources from both the Mediterranean but especially the Red Sea. At sites such as Yotvata these clearly made a major contribution to the diet. But it remains uncertain whether the importation of these fish and shellfish was organized by the government as part of the regular \textit{annona militaris} or were purchased by individual soldiers from itinerant merchants on a more or less regular basis.

\textsuperscript{237} \textit{ibid.}
5.2.4 Economic exploitation

It becomes more difficult when discussing economic exploitation to link the soldiers stationed in Wadi Arabah with the different industries of the region. In previous chapters, however, it was argued that protecting the industries present in the region was a primary goal for establishing a military infrastructure in the southeast corner of the empire. As such, it is important to consider the needs of these regional industries and to what extent, if any, the military played a direct role.

The most important resource from the region was copper mined in Wadi Faynan around *Phaino* and to a lesser extent around Timna.\(^{238}\) Eusebius claimed Christians were condemned to work at *Phaino* during Diocletian’s persecution (303-311).\(^{239}\) Recent work by the Wadi Faynan landscape survey revealed the massive level of exploitation during the Roman period (defined in the study as 2\(^{nd}\)-5\(^{th}\) centuries).\(^{240}\) It is estimated that 40,000-70,000 metric tons of slag generated in this period at *Phaino* represents production of 2,500-7,000 metric tons of copper.\(^{241}\) The environmental impact of this production still plagues the region and high copper traces are still recorded in local vegetation and fauna.\(^{242}\)

To date, no forts have been positively identified in the Faynan but presumably the area contained some type of garrison as a location where criminals would be sent.\(^{243}\) Nevertheless, signs of direct military control may not be necessary since there were nearby military posts, Qasr et-Tlah to the north and Bir Madhkur to the south, that could respond if needed.\(^{244}\)

---

\(^{238}\) For evidence of Byzantine mining in the Timna region, see Rothenberg, 1999b: 165.

\(^{239}\) Eusebius, *Martyrs of Palestine*, VIII append. 7

\(^{240}\) Barker *et al.*, 2007.

\(^{241}\) Hauptmann, 2007: 52-53, 147.


\(^{244}\) *ibid.*
these nearby forts, there is no evidence to suggest the military was any more or less involved with copper production in the region. One expects detachments from the Arabah garrisons serving as guards to escort caravans that transported copper from the mines to such ports as Gaza and down the valley to Aila, where copper ore, copper slag, and hundreds of copper alloy artifacts have been recovered, suggesting the port as the a logical center for processing and transshipping Arabah metal production. An inscription of *legio III Cyrenaica* from a copper mine in southern Sinai from the early empire suggests a military presence there. One may also recall Tacitus describing legionaries tasked with mining silver in northern Germany.

Over the past twenty years, other products from the region, particularly in Aila, have begun to emerge as important economic industries. A recent analysis of the contents of a jar from Aila has concluded that fish sauce or *garum*, filled the container. Content analysis suggests that the fish which yielded this *haimation*, the highest quality *garum* known in the ancient world, originated from the Red Sea and was likely produced at the port. The high quality of the *garum* suggests that this sauce was being produced on an industrial level intended for exportation. It should be noted, however, that this product came from a late 1st century C.E. context and does not alone prove whether this industry continued into Late Antiquity. Nevertheless, a pilgrim flask from Aqaba filled with *garum* was retrieved in a 4th/5th century at Ez Zantur in Petra, which does provide further evidence for this trade in Late Antiquity. Significant examples of this

---

245 Parker, 2007: 363.
246 Rothenberg 1971: 221.
247 Tacitus, *Ann.* 11.20.3
248 Van Neer and Parker, 2008: 1821.
249 *ibid.*: 1824-1825.
250 *ibid.*: 1821.
same type vessel have also recently appeared in domestic contexts from the Petra North Ridge from 3rd and 4th century contexts.\textsuperscript{252} By the 5th century, Aila began producing its own amphorae, perhaps suggesting that some locally produced product, likely dates, date wine, or \textit{garum}, was being shipped throughout the region. Such amphorae production continued through the 7th century.\textsuperscript{253}

Cotton has also been identified in several Late Roman contexts at Aila and, despite the general aridity of the region, Ramsay and Parker suggest that the crop was locally cultivated during and after this period.\textsuperscript{254} Of course cotton textiles rarely survive in archaeological contexts, so the remains of carbonized seeds is an important first step in locating the major centers of this industry.

Given the possibility of cotton processing at Aila, it would be invaluable to compare locally produced textiles against imported textiles.\textsuperscript{255} At En Boqeq, however, an extraordinary collection of 167 items was discovered from the second quarter of the 7th century, including 80 pieces of wool, 67 of linen, 14 of cotton, and 6 of goat hair.\textsuperscript{256} Most were found in the southeast tower embedded in the earth floor.\textsuperscript{257} While all these goods can be sourced to the general region, the presence of cotton at this fort suggests some kind of cotton processing industry in the region—possibly at Aila. Additionally, fragments were identified with traces of madder (red), kermes (crimson), indigotin (often used to make green and purple), and the blue shade of red purple

\textsuperscript{252} Personal communication from S. Thomas Parker.
\textsuperscript{253} Parker, 2009b: 83.
\textsuperscript{254} Ramsay and Parker, 2016: 116.
\textsuperscript{255} Ramsay and Parker, 2016: 116.
\textsuperscript{256} Sheffer and Tidhar, 1991: 3.
\textsuperscript{257} \textit{ibid.}: 4.
(from *Murex trunculus*).\textsuperscript{258} At such a small fort, it is surprising to see such a display of wealth; unfortunately, little is known the owner(s) of these clothes besides access to a wide range of textiles with a significant range of values. Unlike some of the coarser fabrics possibly made near the fort, those with purple dyes derived from the Levantine coast.\textsuperscript{259}

Another major export industry was dates, including date wine production. Unlike grapes or olives which could not be grown in most of the Arabah, date palms thrive in the hyper-arid environment, such as at Aila and Zoara.\textsuperscript{260} Beyond general observations, it is not yet possible to determine the extent of this industry, i.e., was there sufficient surplus production for some level of exports beyond the region. Further north, the Madaba map depicts date palms at Zoara, a likely production center. Finally, as mentioned above, salt and bitumen from the Dead Sea played an important, albeit unquantifiable, part of the regional economy.\textsuperscript{261}

In terms of timber, most of the contemporary published remains from the region derive from En Boqeq. These logs were used in roofs and ceilings of the corner towers, in other buildings in the fort, and in some cases were almost undamaged.\textsuperscript{262} As for building material, 46 of 58 (80\%) logs were of local species—*Populus euphratica* (willow), *Tamarix* sp. (salt cedar), and *Phoenix dactylifera* (date palm); from these three only the first two were used in the corner towers.\textsuperscript{263} Four other botanical species also of local origin were found in smaller amounts: *Phragmites communis* (reeds), *Suaeda monoica forsk* (seepweeds), *Acacia raddiana savi*

\textsuperscript{258} ibid.: 23-24.
\textsuperscript{259} ibid.: 24.
\textsuperscript{260} Parker, 2009b: 83.
\textsuperscript{261} Bloch, 1971: 186-190.
\textsuperscript{262} Liphschitz and Waisel, 1993: 391.
\textsuperscript{263} ibid.: 394-395.
(Israeli babool), and *Nerium oleander* (oleander bush). The only two imported woods were clearly used in small amounts for “special construction purposes”: *Cupressus sempervierens* (Mediterranean cypress) and *Cedrus libani* (cedar of Lebanon). It is evident at En Boqeq that whenever possible local sources of timber were typically exploited rather than imported. There is brief mention of carbonized acacia, tamarisk, and palm wood among the botanical finds in preliminary reports from the Roman Aqaba Project. These patterns are similar to those observed at Tel Beer-Sheba and Tel Arad on the northern edge of the Negev, and St. Catherine’s Monastery in Sinai, suggesting that local timber was often used for construction material.

None of these industries required the local military for the exploitation of these resources. A 4th century Roman military presence at the copper mines has not been confirmed, but seems likely given the use of convict labor and the local security threat posed by the nomadic Arabs tribes. Additionally, it is uncertain whether the military would have been responsible for procurement of timber or if it was outsourced to communities around the forts. Nevertheless, the economic importance of some of these industries, above all copper (which was one the largest copper producing regions in the eastern Mediterranean, second only to Cyprus and owned by the state), required protection that had led to the Roman presence in the region in the first place.

### 5.3 Imported goods

While it seems apparent that either the soldiers themselves or others living in Wadi Arabah produced some goods which were consumed internally, there were many other needs that could

---

264 *ibid.*: 392-394.
265 *ibid.*: 392-393.
266 Parker, 1998: 387; Parker, 2002: 422.
not be satisfied from internal production alone. This section considers to what extent imported items may have impacted the lives of the soldiers stationed in the Arabah. As above, this discussion is limited to published reports at sites such as Yotvata, Upper Zohar, En Boqeq, and Aila, with occasional references to other sites as applicable.

5.3.1 Amphorae and other transport containers

Ceramics are by far the most numerous imported artifacts that survive in the archaeological record. From low end luxury tablewares such as Late Roman Red Wares (LRRW) to the common coarse wares used for transportation, storage, food preparation, and serving, these goods were not produced at the fort (excluding Aila and possibly Zoara) and are useful for dating as well as a range of other insights such as diet, wealth, and trade.

We will begin discussion of imported ceramics with the largest importer—Aila—and then move north to consider the ceramics assemblage at other forts. The Roman Aqaba Project recovered over 635,000 sherds from the entire site, of which almost 6000 sherds (n=5913) were identified as imported amphorae dating from the 1st to 7th centuries. A diachronic breakdown of these sherds into discrete periods reveals some interesting changes over time in the sources of these imported transport jars. For example, a sample of 660 amphora sherds from 1st-3rd century domestic contexts of Areas B, M, and O revealed that nearly three quarters derived from Gaza (47.0%, n=310) and Egypt (27.6%, n=182). None of the remainder of the imported amphorae sherds from these contexts produced more than 5% of the total, including Class 10 (“Koan”, 4.7%, n=31), Class 9 (Rhodian, 2.7%, n=18), Class 47 (Aegean? 2.1%, n=14), Class 27 (Gaul

268 Parker, 2014: 207.
269 ibid.: 213
1.4%, n=9), Class 45 (Anatolian? 0.6% (n=4), other 0.6% (n=4). Some 13.3% (n=88) of the amphorae sherds could not be sourced.\textsuperscript{270} All these sherds represent contexts dating prior to the arrival of the legion at Aila and highlight the stark change in importation patterns beginning in the early 4\textsuperscript{th} century.

Some 3328 amphora sherds (56.3% of all amphora sherds from the site) derive from an almost entirely 4\textsuperscript{th} century context from Area J and represent a pronounced shift in importation to the city. Now the overwhelming majority of amphorae sherds originated from Egypt 62.1% (n=2066), while only 9.3% (n=309) were imported from Gaza. No other sources contributed more than 5% of the total in this sample but included Class 44 (NE Med 4.2%, n=140), Class 45 (Anatolian? 4.0%, n=134), Class 46 (Palestinian 2.9%, n=95), Class 47 (Aegean? 1.9%, n=64), Class 9 Rhodian 0.2%, n=5), Class 10 (Koan 0.1%, n=4), other (5.8%, n=189). Some 9.7% (n=322) was unidentified.\textsuperscript{271} Most of these jars are thought to have carried wine. This shift in amphorae importation from Gaza to Egypt seems to coincide with a revival in the incense trade and the arrival of \textit{legio X Fretensis}, as noted by the excavator.\textsuperscript{272}

Further north at Yotvata, a different picture unfolds in regards to imported amphorae. A mere ten amphorae sherds are identified in the final report from Late Roman contexts and none originate from Egypt.\textsuperscript{273} There were three sherds of Gaza amphorae, as well as one Class 38 ‘Algerian’ amphora and one Keay Type XL amphora from Tunisia.\textsuperscript{274} Due to the small sample

\textsuperscript{270} Parker, 2014: 213, figure 16; these class types are based on designations found in Peacock and Williams, 1986 \textit{Amphorae and the Roman Economy: an Introductory Guide}. London, Longman.

\textsuperscript{271} Parker, 2014: 213, figure 2; these class types are based on Peacock and Williams, 1986. Some of these latter amphora sherds almost certainly represent residual finds in this later context.

\textsuperscript{272} Parker, 2014: 206.

\textsuperscript{273} Magness, 2015: figures 2.7-2.20, pp. 92-119. However, Tiffany Key, who has re-examined pottery from Yotvata, says that she has seen some unpublished Egyptian amphorae from the site.

\textsuperscript{274} \textit{ibid.}: Gaza amphora- figures 2.7:3, 2.7:4, 2.19:1; Class 38- figure 2.20:2; figure 2.7:5.
size it is difficult to draw many conclusions about the sources of importation for the fort of Yotvata, but there is some indication that the fort still obtained supplies, likely wine or olive oil, from Gaza and North Africa. Following the military’s abandonment of the fort and later squatter occupation in the 7th century, there also is evidence of trade with the south as evidenced by a 7th century Aila amphora.\textsuperscript{275} It should be noted of course, that a dearth of identified amphorae does not indicate a lack of trade. Goods shipped to the fort could have been shipped in wooden barrels, woven baskets, or animal skins which normally do not survive in the archaeological record.

While no final ceramic reports have been published for other forts in the southern Arabah, some additional information concerning amphorae can be extrapolated from other sources. Preliminary reports from Gharandal have reported mostly Gaza, Egyptian, and Aila amphorae with smaller amounts of Peacock and Williams Class 41, Class 44, and Class 47 amphorae.\textsuperscript{276} Likewise, evidence from Mezad Hazeva has not been published, but Tali Erickson-Gini has published some 4th century contexts which contained Gaza jars, Class 51, and Class 45.\textsuperscript{277}

The excavations at Upper Zohar retrieved all excavated sherds (n=43,692) via dry sieving through a 5 mm mesh. Nevertheless, only a few illustrated sherds were published, providing a representative sample of all wares and forms.\textsuperscript{278} While limited, these include forms from

\textsuperscript{275} \textit{ibid.}: figure 2.30.1

\textsuperscript{276} Darby, \textit{et al.}, 2012: 409.

\textsuperscript{277} Erickson-Gini, 2010: 289-304.

\textsuperscript{278} Harper, 1995: 21.
Caesarea, Rehovot, northern Africa, Palestine, and Gaza. Finally at En Boqeq, virtually no amphorae are mentioned except 35 sherds of Gaza amphorae and one example of a Class 43 amphora from North Africa. Although the size of the total ceramic corpus is unclear, Gaza amphorae are the largest single type in Gichon’s section on jars.

The lack of quantification of amphorae identified at most of these sites limits much definitive analysis. In most cases one may ascertain that some level of imports from certain sources reached these forts. But it is much more difficult to track goods transferred from amphorae into other transport containers such as baskets, barrels, or animal skins, much less determining what they contained. Therefore, what has been retrieved in the archaeological record surely then represents only a fraction of the total goods imported to any given site. Nevertheless certain trends are discernible in these forts, namely that while some amphorae reached the forts from long distances, the most common of any imported amphorae originated from Gaza. Of course Aila is the exception to this trend. As mentioned above the shift from Gaza to Egypt as its principal source of imported wine is clear and is likely related to the arrival of the legion ca. 300. It seems as yet unclear whether Egyptian amphorae traveled farther north in any quantity as only Gharandal has thus far yielded the only published evidence of dissemination in the interior of the Arabah.

---

280 Tsafrir, 1988: Form 4, 87, Ill. 131 and 89.
281 Peacock and Williams, 1986: Class 43 and 44.
282 Peacock and Williams, 1986: Class 46
283 Peacock and Williams, 1986: Class 48; for full listing of amphorae, see Harper, 1995: 30-31, fig. 16-18.
284 For the Gaza amphora, see Gichon 1993: 140 “VK 8”; for the Class 43, see Tafel 51:4.
5.3.2 LRRW

Late Roman Red Wares (LRRW) offer another category of ceramics to highlight Wadi Arabah’s connections with other regions. Fine tablewares were a type of low-end luxury product, mostly plates, bowls, and cups, but to a lesser extent jugs and jars. The earliest LRRW wares, African Red Slip (ARS) from North Africa, began reaching the eastern empire in the late 1st century but it was not until the mid- to late 3rd century that ARS became widespread across the region. In the following centuries, four major types of LRRW—ARS, Cypriot Red Slip (CRS), Phocaean Red Slip (PRS), and to a lesser extent Egyptian Red Slip (ERS)—competed against one another throughout the region.

At Aila, ARS completely dominated the LRRW corpus, comprising 76% (n=2294) of the LRRW total (n=3010). The remaining LRRW attested at Aila included ERS (18.3%, n=551 of the total, CRS (4.4%, n=131), and PRS (1.1%, n=34). Even though the production centers of ARS were by far the most distant from the port and thereby carried the highest transportation costs, it reached the city in large numbers. What this does not tell us, however, is to what extent this demand for LRRW stemmed from the legion versus the urban population. Aila’s earlier history may provide some insight here since during the 1st and 2nd centuries, the city consumed large amounts of Eastern Sigillata A from the northeast Mediterranean, indicating both demand and ability to pay for table ware well before the arrival of the Roman legion.

---

286 Recent evidence suggests that “Cypriot” Red Slip was actually produced in southwestern Anatolia. No actual production sites are in fact yet known from Cyprus itself. Its name (suggested by John Hayes in 1967) was then based on distributional evidence. This thesis will nonetheless continue to use the standard terminology but with this caveat in mind.
288 Parker, 2009b: 80. A few of the early ARS forms recovered at Aila also date prior to the arrival of the legion ca. 300.
It should also be noted that the second largest source of LRRW is Egypt. Given the predominance of Egyptian amphorae at Aila from the 4th century onwards it is possible that this ERS “piggy-backed” on the Egyptian amphorae as cargoes of opportunity.\textsuperscript{289} In sharp contrast, the general absence of North African amphorae at Aila suggests that ARS was imported to the city on its own rather than as a part of a larger amphora shipment unless it was shipped with a product that does not survive in the archaeological record.

A radically different picture seems evident at the forts farther north in Wadi Arabah. Excavations at Yotvata yielded a mere five sherds (all ARS) of LRRW from the fort,\textsuperscript{290} including single examples of Form 50B (dated. ca. 350-400/420)\textsuperscript{291} and Form 61A (dated ca. 325-400/420)\textsuperscript{292}. Apparently the soldiers at Yotvata did not consume large amounts of LRRW; almost the entire Late Roman ceramic assemblage consisted of local types.\textsuperscript{293}

Likewise at the nearby fort of Gharandal, preliminary reports suggest only a handful of ARS sherds\textsuperscript{294} and at Mezad Hazeva only three ARS sherds were published (although there is no quantified evidence available).\textsuperscript{295} These findings further support limited consumption of LRRW identified at Yotvata in other forts of the Arabah.

These patterns begin to shift, however, further north, just beyond the Arabah at Upper Zohar and En Boqeq. At Upper Zohar, LRRW consisted of 1251 sherds, or 2.87% of the total

\textsuperscript{289} Parker, 2013: 740.
\textsuperscript{290} Magness, 2015: 74.
\textsuperscript{291} Hayes, 1972: 68-73.
\textsuperscript{292} Hayes, 1972: 100-107.
\textsuperscript{293} Magness, 2015: 74.
\textsuperscript{294} Darby \textit{et al.}, 2012: 21.
\textsuperscript{295} Erickson-Gini, 2010: 289-293.
ceramic corpus (n=43,692). Of the LRRW total, no breakdown is given, but all the sherds published (ARS n=53, PRS n=50, CRS n=21) date from the mid- to late 5th through the early 7th centuries. No ERS was recovered.

Although the total ceramic corpus was not quantified at En Boqeq, the entire LRRW corpus was quantified (n=1184), similar to that of Upper Zohar. Unlike Aila, PRS was the best represented ware with 579 sherds (49.1%), followed by CRS with 408 sherds (34.6%), ARS with only 111 sherds (9.4%), ERS C with 81 sherds (9.4%), and ERS A/B with 5 sherds (0.4%). It is not possible to determine whether this is comparable to that of Upper Zohar, but this total suggests that En Boqeq was supplied differently than Aila for its LRRW and might suggest that others in the area likewise were similarly supplied. In fact, farther north in Palestine Phocaean and Cypriot Red Slip ware is much better represented than ARS, especially at sites near the Mediterranean coast.

5.3.3 Other pottery from regional centers

The vast majority of all pottery consists of utilitarian coarse wares used on a daily basis. Major production centers at Aila, Petra, and elsewhere in southern Palestine were sources for this coarse ware pottery. Quantification of utilitarian pottery from diverse sources at these forts may suggest how their garrisons were connected with regional ceramic production centers.

297 ibid.: 21-23.
298 Gichon, 1993: 175-207.
299 Hayes, 1972: 399-401, noted long ago, however, that so-called “ERS C” may not derive from Egypt at all but may in fact be of Palestinian origin.
300 ibid.
At Aila, pottery was produced from the city’s foundation in the late 1st century BCE through at least the 8th century CE. Inclusions in the local fabric were typically quartz, potassium and sodium feldspars, mica, and iron oxides. This “Aqaba Ware”, however, is surprisingly not the only coarse ware at the site. There is evidence, especially for cooking wares, of a significant minority originating from Petra (ca. 100 km distant) despite the overland travel costs.

All other garrisons in Wadi Arabah relied entirely on imported ceramics, with the possible exception of Zoara. Unsurprisingly, the Late Roman pottery from Yotvata is paralleled at sites throughout southern Jordan, the Arabah, and Negev. Many forms appear to originate from Petra including cooking pots, casseroles and their lids, jars, and juglets. Aila also produced forms such as cooking pots, casseroles, and jars. Beyond identifying types, however, without quantification it is not possible to say whether Yotvata relied more on one center over another. Needless to say, the fort seemed to import from both Petra and Aila for its coarse ware. Aila was geographically closer but Petra possessed sources of higher quality clay.

At Gharandal, preliminary data from 3634 sherds reveal one-third (n=1077, 33.2%) from Aila, 13.4% (n=390) from Petra, with the remainder either unidentified, imported amphorae, or

---

302 Parker, 2015: 209. It should be noted that this observation is based on finds from 1st-3rd century contexts at Aila, and it is unclear to what extent this is true the Byzantine period.
303 Magness, 2015: 74.
304 *ibid.*: 74-76; Figures 2.2:7 and 2.3:2.
305 *ibid.*: Figures 2.5:2 and 2.18:7-8.
306 *ibid.*: Figures 2.6:5-6 and 2.19:2.
307 *ibid.*: Figure 2.9: 3-5.
308 *ibid.*: Figure 2.4: 3 and 5; 2.4:2 cf. reg. #53494/59736; reg. #131140
309 *ibid.*: Figure 2.18:1; cf. reg. #52390/26814
310 *ibid.*: Figure 2.21:1, 2.29:4; cf. reg. #59307; reg. #91637
other imports.\textsuperscript{311} The close proximity of Gharandal to Yotvata might suggest that the latter fort likewise relied more on Aila than on Petra for its coarse ware needs.

At Mezad Hazeva, farther north in the valley, a 363 destruction layer yielded examples of Petra pottery such as late Nabataean painted bowls,\textsuperscript{312} other bowls,\textsuperscript{313} ceramics from Jerusalem such as rouletted bowls\textsuperscript{314}, mortaria\textsuperscript{315}, and storage jars\textsuperscript{316}, as well as cooking pots\textsuperscript{317} and jars\textsuperscript{318} from Aila. This mixture of different types of coarse wares from multiple sources across the region suggests that various goods were flowing through this fort along various overland trade routes, despite their transportation costs.

The coarse wares at Upper Zohar shift from the pattern of mixed assemblages as seen above. According to Harper, the cooking pots and other coarse wares likely originated from the same kiln and later work comparing this assemblage to sites in the southern Dead Sea littoral suggests this pottery was produced near or at Zoara.\textsuperscript{319} If so, then the cavalry unit based at Zoara in the 4\textsuperscript{th} century was also likely supplied with its coarse ware from the same source. The origin of coarse wares at En Boqeq is not always clear but these share many similarities, unsurprisingly, with those of Upper Zohar.\textsuperscript{320} While Gichon often could not trace the pottery from En Boqeq to a

\textsuperscript{311} Darby, et al.: 18.
\textsuperscript{312} Erickson-Gini, 2010: 134, figure 4.1
\textsuperscript{313} \textit{ibid.}: 136, figure 4.17-19.
\textsuperscript{314} \textit{ibid.}: 134, figure 4.6.
\textsuperscript{315} \textit{ibid.}: 137, figure 4.23.
\textsuperscript{316} \textit{ibid.}: 141, figure 4.40-41.
\textsuperscript{317} \textit{ibid.}: 295: 18-19, 297: 2. cf. reg. #131140/7637.
\textsuperscript{318} \textit{ibid.}: 294: 16; cf. reg. # 59307.
\textsuperscript{320} In this context, the parallels are too numerous between the sites to list them all but they include various unguentaria, hemispherical cups, cooking pots, cooking pot lids, casseroles, skillets, strainer jugs, amphoriskoi, flasks, wide-mouth jars, amphorae, and other imported fine wares; for complete comparison, see the pottery catalogue in Riley, 1995: 24-33.
specific workshop, he does source most of the course wares to central/southern Palestine and the Dead Sea where these forms are well documented.\textsuperscript{321} Given the similarities between the forts of Upper Zohar and En Boqeq, it would not be unreasonable then to suggest some of these forms were also made in the Zoara region.

While sites such as Aila, Yotvata, Gharandal, and Mezad Haseva seem to share a wide range of different coarse ware sources during the late 3\textsuperscript{rd} through 5\textsuperscript{th} centuries ranging from southern Palestine, Petra and Aila, it appears that by the 6\textsuperscript{th} and 7\textsuperscript{th} centuries, the northern forts at Upper Zohar and En Boqeq may have been more reliant on wares produced closer to the forts.

\textbf{5.3.4 Glass}

Glass represents another low-end luxury item found throughout the Arabah. At Aila glass was abundant with several thousand sherds recovered.\textsuperscript{322} The forms identified range from bowls, plates, platters, beakers to lamps.\textsuperscript{323} Unlike the pottery, however, there are no signs of local production at Aila, indicating that these mostly utilitarian items must have been imported, possibly from the Levantine coast.\textsuperscript{324} Several hundred glass fragments (n=564) were collected at Yotvata. Although there is no clear source for this glass, it possibly originated from Egypt or northern Israel.\textsuperscript{325} Glass vessels published from Mezad Tamar share markedly similar qualities to

\textsuperscript{321} Gichon, 1993: 133-246; the forms he specifically links to having strong concentrations in central/southern Palestine and the Dead Sea area include the following types: Vorratskrüge 1-14; Pilgerflaschen und Bigelkannen 2-3; Kleeblattkannen 2-3; Siebkannen 1-3; Henkelkannen, Kannchen, Fläschen und Fässchen 12, 14, 18, 19, 23; Ausgüsse 1-3; Kochtöpfe 1-16; Kasserollen 1-9; Kasserollen-Henkel 1-3; Bratpfannen 1-3.
\textsuperscript{322} Parker, 2007: 361.
\textsuperscript{323} Jones, 2000: 147.
\textsuperscript{324} Parker, 2007: 361.
\textsuperscript{325} Swan, 2015: 161-162.
those from Yotvata and Aila. Further north, at En Boqeq and Upper Zohar, larger amounts of glass fragments were identified (n=4000 and over 3000, respectively), linked to a Levantine coastal source. The glass from the last two forts share more stylistic qualities with each other than with the southern forts, but since most of these forms are sourced to the Levantine coast, this may be tentatively attributed to the different periods of occupation of the sites.

5.3.5 Metal

Beyond the metal industries mentioned above concerning copper production and coinage (mentioned below), it is difficult to source most other metals from these forts. The most common metal artifacts were the ubiquitous iron nails for construction purposes and a few militaria found at these sites. Various artifacts of iron, copper alloy, and lead are attested from most sites. Nails certainly played an important role in construction of structures such as towers and pitched roofs. Metal was simply too valuable to avoid recycling or removal when these sites were abandoned. But since there are no sources of iron in the Arabah, it must represent a key import for the garrisons.

5.3.6 Coins

Coins provide clear evidence of material imported from outside the region, although it is often difficult to identify the specific coin and its point of origin due to corrosion. At Yotvata for

---

326 ibid.: 159.
328 Swan, 2015: 159-160.
instance, 262 coins were collected during excavations, but only 111 (43.7%) could be identified.\textsuperscript{330} These coins range widely in origin. Almost one-third of legible mintmarks dated prior to 324 indicate mints from the western empire in southern France, Italy, and Croatia.\textsuperscript{331} There are two suggestions as to what led to this kind of infusion of western coins to the southeastern Roman frontier: this may reflect a large transfer of troops from Europe to this region,\textsuperscript{332} or, perhaps less likely, is that these coins may reflect the Constantinian armies moving east against Licinius, infusing the region with western coinage through various purchases.\textsuperscript{333} Whatever the case, following 324 eastern mint marks became predominant and the best represented cities are Antioch and Alexandria dating ca. 330-358, after which no other coins can be securely dated.\textsuperscript{334} Unpublished reports from En Hazeva also reflect a similar distribution for late Roman imperial coinage, showing a heavy abundance of coin profiles between ca. 330-360 but, unlike Yotvata, smaller amounts of later issues continue into the early 5\textsuperscript{th} century.\textsuperscript{335}

The forts at Upper Zohar and En Boqeq not surprisingly have a later date range for coin profiles. Of some 607 coins collected at Upper Zohar only 42 could be closely identified whereas the other 565 were placed into more generic categories.\textsuperscript{336} 12 date from 350-450, 30 to the next century (450-550), including 15 of these dated to 525-550, basically the reign of Justinian I (527-565). There were later no coins identified.\textsuperscript{337}

\textsuperscript{330} Elkins, 2015: 172.
\textsuperscript{331} \textit{ibid.}: 173.
\textsuperscript{332} Betlyon, 2006: 19. Betlyon noticed a similar influx of pre-324 western coinages at the legionary fortress at el-Lejjun and attributed this change to troop transfers.
\textsuperscript{333} Elkins, 2015: 174; this suggestion should be taken with hesitation as Constantinian armies did not reach further east than Bithynia.
\textsuperscript{334} \textit{ibid.}
\textsuperscript{335} \textit{ibid.}: 177.
\textsuperscript{336} Harper, 1995: 15.
\textsuperscript{337} \textit{ibid.}
At En Boqeq, 588 coins were retrieved, with all except three dated from the second half of the 4th to the middle of the 7th centuries. Only 30 coins could be closely dated, with 10 dating to c. 350-450 (Constantius II-Marcianus), 2 to c. 450-500 (Leo I), and 18 to c. 500-578 (Anastasius I-Justin II). The mints were identified for 11 of the 30 coins: 8 from Constantinople, 2 from Antioch, and 1 from Carthage. There is a clear increase of coins from the 6th century which corresponds with Magness’ redating construction for both this fort and En Boqeq to the 6th century.

As has been noted for the ceramics and glass, there appears to be a difference for the sources of imported items between the 6th/7th centuries forts just beyond the northern Arabah and the 4th/5th century forts in the central and southern Arabah. Unlike other goods, however, much of the difference in the coinage can be safely linked to the passage of time linked with the abandonment of some southern forts and later construction of the northern forts rather than a shift in trade routes or access to supply.

5.3.7 Invisible imports

Much of this chapter has been dedicated to the archaeological remains which have survived the past 1500 years, but some of the most important, or at least most visible items in antiquity, almost never survive— such as textiles. Besides those identified above which appear to have a

---

338 Kindler, 1993: 399. One of the earlier coins dates to a specific year in the reign of Agrippa I (42/43 CE), the second is broadly listed as Nabataean, and the third is of Constantine the Great; see catalog on pp. 400 for further details.
339 ibid.
341 Magness, 1999: 195-199
local origin, it is unclear whether any, especially at Aila, would have been purchased or obtained from elsewhere such as Egypt or the Levantine coast.

Additionally, only a small fraction of organic goods are preserved in the archaeological record. The only remains which survive are bones or carbonized plant materials, and as such may not represent the full range of accessible items or consumed goods. A similar picture emerges for vessels used to transport these goods such as animal skins, woven baskets, and wooden barrels. Only in rare cases are such items preserved, nonetheless they may have played an important role in Wadi Arabah.

5.4 Analysis and Conclusion

The supply of the Roman military in the Wadi Arabah is a complex issue that requires an analysis of both locally produced goods and external imports. Ranging from fauna to ceramics there was a regular mix of items from nearby and from afar. Throughout the Arabah, there is evidence of local food production, only to a limited degree in the case of Aila, but possibly of greater significance elsewhere in the Arabah, especially as one moves north. Beyond simply producing food, Wadi Arabah also produced other goods of economic importance, ranging from *garum* to ceramics to copper. The main problem remains quantifying this production.\(^{342}\) Were the Roman garrisons positioned to protect such agricultural activity and these industries? The most compelling case is undoubtedly the copper industry, the most important source of this metal in the entire eastern Mediterranean apart from Cyprus. But was the main *raison d’être* of these garrisons primarily to secure the traffic through the region? The military presence suggests that

\(^{342}\) Van Neer and Parker, 2008: 1821.
the copper industry (and perhaps salt and bitumen from the Dead Sea?) and the safety of traffic
moving through the valley were worth securing with establishment of forts and garrisons at key
points along the routes in the region. Aila, by far the biggest settlement in the Arabah with its
vital role for transshipping lucrative international trade and hosting several industries, was
secured with a legion that likely exceeded all the other Arabah garrisons combined in strength.

None of these garrisons could have fully supplied themselves; all relied in varying
degrees on imports to supplement whatever was produced locally. The latter likely included
some grain, perhaps other crops grown in small irrigated gardens, and possibly some
domesticated animals for both meat and secondary products such as milk and hair. Such animals
would then have provided dung to be used as fuel and fertilizer. It does not seem possible on the
basis of current evidence to estimate the level of each garrison’s local production, only that it
likely made some contribution to the soldiers posted there and probably varied to a large degree
based on locally available resources.

We are better informed about the nature of imported supplies due to surviving
archaeological evidence but again we remain at the mercy of the extant archaeological record
and a few scraps of documentary evidence. Amphorae serve as a good marker of contents such as
wine, oil, grain, or other goods shipped to these forts, but it is difficult to account for containers
such as baskets, skins and barrels which could have also transported these same or other
materials. There is limited evidence of LRRW consumption at these forts although it does not
compare to amounts at Aila—reflective of the size and makeup of the city’s population and its
direct access to the sea. An array of coarse ware pottery was traded throughout the region linking
ceramic centers in southern Palestine, Petra, and Aila during the 4th/5th centuries, but by the 6th/
7th centuries, the trading of coarse wares might have become more localized. Trade connections with the eastern Mediterranean coast and perhaps Egypt are suggested by the glass identified at these sites and the purple dye at En Boqeq, but the extent of importation of other textiles is unknown.

The port of Aila serves as an exception for many trends identified in this study. Without a doubt the city has many similarities with other 4th and 5th century forts in the region in terms of coarse ware ceramics and types of food. At the same time, however, Aila was markedly different through its access to large quantities of LRRW, amphorae (likely wine) from Egypt, and importation of caprines—likely products of the increased population, socio-economic status of its inhabitants, and direct access to the sea. But even in this city there are signs of locally grown agricultural goods and much evidence for local marine resources, especially fish and shellfish.

In this harsh environment, both trade and local production played a significant role in supplying the Roman military. Of course most of this evidence, at least in the present state of publication, is not truly quantifiable, and attempts to put percentages on the amount of imports versus exports would be futile. What is undeniable, however, is that during Late Antiquity, the Arabah was not as barren as some assume; the valley instead allowed some level of local supply over several centuries to support small garrisons in forts overlooking the Dead Sea, a large international port on the Red Sea, and the garrisons linking these two bodies of water.
Chapter 6. Conclusion

6.1 Concluding Remarks

Over the past several decades, Wadi Arabah has undergone intensive archaeological excavations and surveys. Recent publications from these projects allow us to begin synthesizing this data. This thesis offers a preliminary synthesis of published archaeological evidence and other extant evidence from this, focusing on how the Late Roman military in this region was supplied. However it must be stressed that evidence of supply is not available from several forts and is only currently published in preliminary form in several others.

Despite the arid climate of the Arabah, increasing evidence suggests some level of local agricultural cultivation as well as pastoral tending of caprine herds, utilization of chickens (including their eggs), pigs, and hunting were practiced either by the soldiers themselves and/or by those directly associated with the forts, such as their families. These supplies were supplemented by a large amount of fish from the Red Sea and other water sources and meat from traction animals such as camels once their work-life had ended. There is no doubt that some foodstuffs were imported- olives, grapes, oil, wine, and beef were all likely imported due to the water they require for growing and grazing. At the same time, however, large amounts of agricultural waste from processed gains (wheat and barley) normally discarded before transportation and weeds associated with cultivated fields suggest that these forts in the Arabah relied on locally produced flora—although it is possible these agricultural byproducts originated from imported animals or imported feed for animals. Nevertheless, such evidence of possible local agriculture are found at all periods of military occupation in these forts, suggesting that

---

343 Parker, 2015: 218.
soldiers or those in the fort’s immediate vicinity may have been responsible for farming and agriculture from their foundation at the turn of the 4th century,

Caprines dominated the faunal remains and were the most important meat in the diet for the garrisons of the Arabah. While the predominance of two year old caprines at Aila suggests they were imported when the maximum meat-bearing weight was reached, at Yotvata the high percentage of caprines butchered in their first twelve months suggests local herds were utilized since they were too young to be imported. The remains at En Boqeq and Upper Zohar reflect a wide range in ages of the caprines recovered, indicating that these animals could have been used for their secondary products in addition to their meat. The nature of the caprine herds and who tended them, however, is a little less clear. Aila aside, it is possible that some of these caprines originated from herds raised in the immediate vicinity of the fort and were managed by soldiers and/or their families, but it is also possible that these animals were collected as taxes from pastoral tribes which were present in late winter/early spring before they migrated from the valley or perhaps even imported by the government as part of the annona militaris. Without further evidence, all these possibilities should be considered when determining the supply of caprines for the forts of the Arabah.

Local sources also were exploited for timber, although fine wood was also imported, and some textiles. Many products which played an important economic role beyond the Arabah were extracted or produced and processed throughout the valley, such as copper, salt, bitumen, and garum. Otherwise, soldiers in the Arabah were supplied from a number of diverse sources for both agricultural and manufactured goods. Regional centers such as Aila, Petra, and southern Palestine provided coarse ware pottery. Wine came above all from Egypt and Gaza as well as
from other regions. The source of olive oil is more obscure. Perhaps this reached the Arabah in more perishable containers from Palestine and/or Jordan. Fine table ware pottery (LRRW) derived from North Africa, western Anatolia, Cyprus/southern Anatolia and Egypt. It is perhaps notable that North Africa (ARS) and Egypt (ERS) seem to have been the main supplier of LRRW to garrisons in the southern Arabah while northern forts drew more from other producers in Anatolia, Cyprus, and southern Palestine (PRS, CRS, and ERS C). Glass was imported from the Levantine coast and perhaps from Egypt. In terms of coinage, issues from both western and eastern mints arrived in the Arabah in the early decades of the 4th century but importation of western coins quickly ceased within a few decades. Henceforth coins are attested only from eastern mints, especially from Alexandria and Antioch. This parallels the pattern of other contemporary sites in the wider region.

A key outstanding question is the extent of local grain cultivation versus importation. Grain was likely the heart of the military diet in the Arabah as elsewhere and the evidence seems to suggest some grain production at several military sites. Although it seems doubtful that such local supplies were sufficient for the entire population throughout the year and that some level of importation was required, the balance between local versus imported grain supplies remains unclear.

This evidence does suggest a complex military logistical system in Wadi Arabah during Late Antiquity. Although it is not always possible to link soldiers directly to trade itself, they certainly maintained an important role in preserving the security of the trade routes via their presence in the valley. However, this picture is still not complete and many holes remain. One of the largest issues is the small number of sites available for study. This problem will be partly
alleviated as ongoing excavations at Gharandal and Bir Madhkur are published. This of course does not change the fact that there are other excavated forts lacking final publication.

Further evidence may also illuminate the transition in the region during the 6th century as many sites in the Arabah were abandoned and new fortlets were constructed just north of the valley. Ghor Es-Safi is of particular importance in this process as it has the best evidence for a continuous military garrison into the 6th century and its proximity to the 6th century forts of En Boqe and Upper Zohar, both of which in turn provide interesting insights into this period. Additionally, the fort at Qasr et-Tlah with its impressive agricultural fields and massive birkeh could be quite informative about the role of agriculture in Roman military supply, but additional excavation is required of the fort itself as well as closer dating of the agricultural field system for further insight.

Finally, a more comprehensive comparison needs to link the Arabah to its surroundings, both to the west and the forts along the northern edge of the Negev as well as to the east with the many forts of the Limes Palaestinae and Limes Arabicus. Wadi Arabah did not exist in a vacuum, nor did its system of supply, so it is important to compare the supply of garrisons in adjacent regions to determine whether the patterns detected from the Arabah are actually comparable to the supply of contemporary garrisons across broader areas. As mentioned above there are similar aspects of supply between the Arabah and forts to the east, but if this pattern of partial self-supply is becoming more apparent in this arid region, then it begs the question whether limitanei were also responsible for similar supplies in more temperate climates at the turn of the 4th century as clearly seems to be the case at el-Lejjun. This question, however, is well beyond the

---

344 In particular we eagerly await publication of volume 3 of the Humayma reports by John Oleson, which will focus on its Roman fort.
bounds of this thesis. Through this examination, it is evident that there is still much to learn about the Roman military, its interactions with local populations, and its ability to survive in harsh environments. Future research will certainly clarify these issues as well as raise new questions. But in the meantime it is important to continue synthesizing published information, to link different areas, and to create diachronic overviews to gain a better understanding of life in such remote and arid environments.
Bibliography
Abbreviations:

ADAJ Annual of the Department of Antiquities of Jordan
AJA American Journal of Archaeology
ANRW Aufstieg und Niedergang der römischen Welt
BAR British Archaeological Reports
BASOR Bulletin of the American Schools of Oriental Research
BiblArch Biblical Archaeologist
ESI Excavations and Surveys in Israel
JAE Journal of Arid Environments
JAS Journal of Archaeological Science
JRA Journal of Roman Archaeology
JRS Journal of Roman Science
IEJ Israel Exploration Journal
PAPS Proceedings of the American Philosophical Society
PEQ Palestine Exploration Quarterly
SHAJ Studies in the History and Archaeology of Jordan
ZDPV Zeitschrift des Deutschen Palästina-Vereins
ZPE Zeitschrift für Papyrologie und Epigraphik

Primary Literature:

Codex Theodosianus

Diodorus Siculus

Eusebius.


Jerome.

John Malalas

Josephus

Notitia Dignitatum, Oriens.

Pliny the Elder.

Procopius


Strabo

Stephanus of Byzantium

Tacitus

Zosimus
Secondary Literature:

Abel, F. M.

Aharoni, Y.

Albright, W.F., and Kyle, M.G.

Alt, A.


Arjava, A., Buchholz, M., and Gagos, T.

Arjava, A., Buchholz, M., Gagos, T., and Kaimio, M.

Avi-Yonah, M.

Avner, U. and Roll, I.

Ball, W.

Banning, E.B.

Bar, D.  

Barker, G.W.  

Barker, G., Gilbertson, D., and Mattingly, D. eds.  

Bartlett, J.  

Ben-Yosef, E., Levy, T., Higham, T., Najjar, M., Tauxe, L.  

Ben-Yosef, E., Shaar, R., Tauxe, L, and Ron, H.  

Bloch, M.R.  

Bienkowski, P.  

Bijovsky, G.  
Boardman, S.

Bonner, M.D.

Bowersock, G.W.

Breeze, D.

Bruins, H.

Campbell, B.

Clark, G.

Cohen, R.


Croft, P.


Dan, J.


Dan, J., Raz, Z, Yaalon, D.H., and Koyumdijsky, H.


Danin, A.


Darby, R. and Darby, E.


Darby, R., Erin E., T. Key, and P. Koulainos.


Davies, G. and Magness, J.


Desse-Berset, N. and Studer, J.

Di Segni, L.

Elkins, N.

Erickson-Gini T.


Evenari, M., Shanan, L, and Tadmor, N.

Fiema, Z.T.
Finkelstein, I.

Finnegan, M.

Fischer, M., Gichon, M., and Tal, O.

Frank, F.

Freeman-Grenville, G.S.P.

Frösen, J., Arjava, A., Lehtinen, M.

Gichon, M.


Glueck, N.

Graham, M.W.

Gregory, S.

Greene, K.

Grey, A. and Politis, K.

Halbmaier, R.

Hammond,

Harper, R.

Hayes, J.W.


Hauptmann, A.

Henry, D.

Isaac, B.


Jasmin, M.

Jones, A.H.M.

Jones, J.D.
Kennedy, D.L.


Kennedy, D.L. & Riley D.N.

Kindler, A.

King, A.

Lernau, H.

Lernau, O.

Liphschitz, N. and Waisel, Y.

Luttwak, W.
MacDonald, B.


Maeir, A.M. (ed.)

Magness, J.

Mann, J.C.,

Matthews, J.F.

Mattingly, D., Newson P., Creighton Ol, Tomber, R., Grattan, J., Hunt, C., Gilbertson, D., el-Rishi, and Pyatt, B.

Mattingly, D., and Salmon, J.

Mayerson, P.


Meshel, Z.


Millar, F.


Moss, G.


Musil, A.


Netzer, E. and Levine, L.


Niemi, T.


Parker, S.T. and Smith, A.M.

Pratico, G.  
*BASOR* (259): 1-32.

Atlanta: Scholars Press.

Peacock, D. and Williams, D.  

Politis, K.  
Amman: Jordan Distribution Agency.

Pyatt, F. B., et al.  

Ramsay, J.H.  


Ramsay, J.H. and Parker, S.T.  

Ramsay, J.H. and Smith, A.M.  

Ratzlaff, A.  
Reese, D.

Richardson, J.

Roll, I.

Roll, I. and Avner, U.

Rothenberg, B.


Rucker, J. and Niemi, T.

Russell, K.W.

Sartre, M.

Schmid, S.G.
1997. Nabataean Fine Ware Pottery and the Destruc- tions of Petra in the Late First and Early Second Century AD. *SHAJ* VI: 413-420.

Shehadeh, N.

Singer-Avitz, L.

Smith II, A.M.


Speidel, M. P.

Southern, P. and Dixon, K.R.

Swan, C.

Talbert, R.J.A.


Tomlin, R.S.O.
Toplyn, M.

Tsafrir, Y.

van der Steen, E.


Van Neer, W. and Parker, S.T.

Ward, W.

Whitcomb, D.

Whittaker, C.R.
1993. Land, City and Trade in the Roman Empire. Norfolk: Galliard Ltd.


Williams, S.

Willies,

Zarins,

Zohary, M.

Appendix 1: Figures

Figure 1. Satellite view of Wadi Arabah with military posts
Figure 2. Map of Wadi Arabah with roads and settlement sites during Late Antiquity. Roll and Avner, 2008: 286.
Figure 3. Section of the *Tabula Peutingeriana* containing Wadi Arabah
Image from ISAW, http://isaw.nyu.edu/exhibitions/space/tpeut.html
Figure 4. Aila: plan of the site (from Parker 2006b: Figure 17.3)
Figure 5. Yotvata: plan of site with excavated areas (from Davies and Magness 2007: Fig. 1)

Figure 6. Gharandal: plan of site and bathhouse (from Darby and Darby, 2012)
Figure 7. Bir Madhkur: plan of site (from Gregory 3: Fig. 53.1a)

Figure 8. Mezad Hazeva: plan of site and aqueducts (from Musil 1907:208)
Figure 9. Qasr et-Tlah: plan of site with fields (from Kennedy and Riley, 1990: 207, Fig. 158)

Figure 10. Mezad Tamar: plan of site (from Gregory Fig. 47.1)
Figure 11. Qasr el-Feifeh: aerial view (from Kennedy & Riley, 1990: 145, Fig. 88)
Figure 12. En Boqeq: plan of site (from Gregory 3: Fig. 45.1a)

Figure 13. Upper Zohar: plan of site (from Gregory, 1995 vol. 3: Fig. 44.1)