An analysis of ground stone artifacts from Ghwair I, a Pre-Pottery Neolithic B site in southern Jordan

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AN ANALYSIS OF GROUND STONE ARTIFACTS FROM GHWAIR I,
A PRE-POTTERY NEOLITHIC B SITE IN SOUTHERN JORDAN

by

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A thesis submitted in partial fulfillment
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ABSTRACT

An Analysis of Ground Stone Artifacts from Ghwair I, A Pre-pottery Neolithic B Site in Southern Jordan

by

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Ground stone artifacts indicating food preparation and other activities are well-represented among the assemblage resulting from three seasons of excavation at Ghwair I, a Pre-Pottery Neolithic B site in southern Jordan. Placement of Ghwair I in context of roughly contemporaneous Levantine sites indicates that its ground stone assemblage is typical of the period and that Ghwair I was a self-reliant community. The ground stone assemblage indicates that mobility of the site’s occupants was relatively low. Spatial analysis of distribution of ground stone across the site suggests specialized activity loci and, possibly, early social stratification.
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CHAPTER 1

INTRODUCTION AND RESEARCH DESIGN

Purpose of the Study

The transition from hunting and gathering economies to those based on food production, or the domestication of plants and animals, represents one of the most important milestones in human history. This "Neolithic Revolution" (cf. Childe 1936) occurred independently in a few parts of the world, but based on current data seems to have first taken place in the Near East around 10,000 years ago. This thesis examines one specific material aspect of the Neolithic, that of ground stone artifacts. Such implements were used to process plants both before and after they were domesticated, and large diverse ground stone assemblages are a defining characteristic of the Near Eastern Neolithic. In addition, ground stone was likely used for non-subsistence activities, and many scholars believe that the people who used such artifacts were female. Thus a thorough study of ground stone can provide a potential source of information about many aspects of Neolithic society. The focus of this study is one specific Neolithic site, but some of the conclusions that will be drawn have broader implications to how scholars interpret one major material component of the Neolithic. The first set of research questions to be addressed include subsistence, non-subsistence activities, and mobility
and are specific to the site, time period, and technology. The second set of research questions, the development of hierarchical social systems, regional interaction, and longer-term technological change throughout the Levant is broader in terms of location, chronological placement, and potential evidence.

Ghwair I is a Middle Pre-Pottery Neolithic B (MPPNB) village dating to ca. 10,000-9300 B.P. (calibrated). It is located in the Levantine Near East, southeast of the Dead Sea in the modern country of Jordan, and was the scene of interdisciplinary excavations from 1996 through 2000 (Simmons and Najjar 2003). Ghwair I is a compact yet architecturally complex settlement that yielded a large, diverse ground stone assemblage. Likely year-round occupation of this site and other PPNB villages by people practicing agriculture and animal husbandry while continuing to hunt and gather likely contributed to the diversity of the ground stone that is typical of these early villages (e.g., Wright 1992a; 2000). The data for this thesis consists of 2,489 ground stone artifacts from Ghwair I that were accumulated during the three major seasons of excavation at the site. The remainder of this chapter discusses ground stone technology and early agriculture, limitations and definitions, and contemporary approaches. Finally, it presents the research design for the thesis.

Ground Stone Technology and Early Agriculture

In order to understand why people shifted to domesticated plants of lower nutritional value requiring a great deal of labor to process as they did during the Neolithic in the Levant, it is illuminating to investigate what they were processing before this transition occurred. The existence of ground stone technology prior to this shift in subsistence may represent a technological preadaptation to processing cultigens. The increase in diversity
of ground stone forms strongly suggests that there are unanswered questions about Neolithic developments; for if the diet is becoming less diverse, why is the ground stone toolkit becoming more diverse?

Schneider (1993:7) notes that near the Pleistocene/Holocene transition there was an increased frequency of milling implements in the archaeological record, correlated with a shift in reliance on certain kinds of plants by prehistoric people. In the Near East, high frequencies of certain types of milling implements, termed handstones and querns, occur during the transition to agriculture. Ehrenberg (1989:87) places the initiative for invention of new types of ground stone technology in women’s sphere.

In the Levant, significant increases in the amount of ground stone in the archaeological record are linked with the earliest evidence for semi-sedentism around 12,800 to 11,500 B.P. (K. Wright 1993). These dates fall inside the parameters of the terminal Epipaleolithic time period referred to as the “Natufian” in the Levant, which ends around 10,300 B.P., 12,000 years cal. B.P. (Kuijt and Goring-Morris 2002:366). According to Henry (1981:427), settlement patterns during the Natufian have more in common with those of the Pre-Pottery Neolithic A than those of the preceding time periods.

The Natufian is characterized by an increase in sedentism, heavy representation of microliths within lithic assemblages, and base camps occupied at least for most of the year comprised of oval stone structures. Subsistence entailed a complex foraging pattern with an emphasis on wild cereals such as emmer wheat and barley (Henry 1989:217). Bar-Yosef and Valla (1991:1) characterize the Natufian as “a threshold phase which led to the emergence of farming communities.”
Bar-Yosef (1983:11) defines the period as characterized by intensified hunting and gathering alongside the development of agricultural preadaptations. Solecki and Solecki (1983:125) note that the Natufian is characterized by an abundance of art, “personal adornments,” and graves with grave goods. Though querns and handstones are present, mortars and pestles are more common during the Natufian. Henry (1989:195) attributes the increase in quantity and diversity of ground stone artifacts during the Natufian to greater sedentism in addition to a greater emphasis on nuts and wild cereals.

Ground stone becomes even more prevalent and diverse during the transition to farming between 11,700 and 10,500 B.P. (calibrated) (Kuijt and Goring-Morris 2002:369), or the PPNA. In the southern Levant, the PPNA has been subdivided into two periods, the Khiamian and the Sultanian (Crowfoot-Payne 1976:134). During the PPNA, substantial circular structures occur, and some sites also hint at a shift to rectangular architecture, which is characteristic of later time periods. In the Near East, sedentism precedes the shift to rectangular architecture. Habitation sites are larger, more numerous, and occupied for a longer portion of the year, if not year-round, than during the Natufian. Interregional trade is indicated by shells from the Mediterranean and Red Seas as well as greenstone and malachite from the southern Rift Valley (Kuijt and Goring-Morris 2002:380). The distribution of El-Khiam points, according to Bar-Yosef (1989:59), demarcates a PPNA interaction sphere.

PPNA sites provide evidence that wheat and barley were cultivated. Reliance on cultivated cereals has also been indicated by strontium/calcium ratios (Sillen 1984). In addition, small and medium sized fish, mammals, birds, and reptiles (Kuijt and Goring-Morris 2002:378) as well as other seeds and fruit (Kuijt and Goring-Morris 2002:379)
contributed to the PPNA diet. Pistachio, acorns, legumes, and fig are represented among PPNA botanical remains (Wright 2000:98).

Grinding slabs and handstones are more common than during the preceding Natufian, suggesting "a new emphasis on more finely ground foods" (Wright 2000:98). Sickles, blades, perforators, and burins are well-represented among PPNA lithic assemblages (Kuijt and Goring-Morris 2002:380). Mortuary practices including primary burial and the removal of skulls continue from the Natufian (Kuijt and Goring-Morris 2002:376).

The succeeding PPNB dates between 10,500 B.P. and 8700 B.P. (calibrated) (Kuijt and Goring-Morris 2002:366). This time period has also been referred to as the "Tahunian" (Bar-Yosef 1981a:391; Crowfoot-Payne 1976:131) and is contemporaneous with what Moore (1981:446) refers to as "Neolithic 2" in Syria. From the PPNA to the PPNB, rectangular architecture becomes dominant and room size increases (Peterson 2002:132). True plant and animal domestication is evident during the PPNB, although wild resources continue to be used. Domestication of cereals and legumes as well as herding of goats and sheep define the PPNB economy. Reliance on migratory birds and waterfowl decreases (Goring-Morris and Belfer-Cohen 1998:85). Grinding slabs and handstones increase in frequency, which would have enabled intensified food processing (Wright 2000:103). Changes in ground stone assemblages from the Natufian onwards, besides reflecting changes in subsistence, likely reflect changes in other activities and social organization.

**Ground Stone Analysis: Definitions and Limitations**

Milling implements such as those identified at Ghwair I have been called by many
names, including manos, metates, mortars, pestles, querns, netherstones, handstones, grinding slabs, grinding stones, grinding basins, anvils, mills, mullers, pounders, and grinders (Schneider 1993:9). This set of terms will be subsumed under the general label of “milling implements,” to be distinguished from ground stone items that were probably not used as part of presumably subsistence-related processing activity. Querns, grinding slabs, handstones, mortars, and pestles are milling implements identified by analysis of artifacts from Ghwair I using Wright’s (1992b) typology for Levantine ground stone artifacts. Querns and grinding slabs were used for grinding with handstones on a plane more or less parallel to that on which the querns and grinding slabs rested. Mortars were used with pestles for pounding and grinding on a plane more or less perpendicular to that on which the mortars sat. Artifacts not classified as milling implements include axes, celts, weights, gaming boards, shaft straighteners, vessels, and mace heads.

According to Schneider (1993:5), the distinction between chipped stone and ground stone is “inaccurate and misleading.” She indicates that “both flaking and grinding probably played some part in the production or use of both types of tools.” Tools were made by “removing flakes from a larger piece of stone and any grinding occurred as the result of use, not by design.” Other ground stone artifacts, such as figurines, were ground by design. Schneider (1996b: 69) mentions palettes, beads, stone pipes, and pendants among other objects as examples of objects that are ground during manufacture. These, however, do not represent milling implements as defined here.

McGowan (1990:30) distinguishes between utilitarian and non-utilitarian ground stone. Utilitarian items include milling implements and non-utilitarian items include pendants, figurines, and other decorated or decorative objects. This distinction may be
problematic since there is overlap between the categories. “Utilitarian” items such as querns, pestles, and shaft straighteners are sometimes decorated.

Davis (1982:73) excluded “non-utilitarian” ground stone from his discussion of the site of Çayonü. While defensible in the sense that the site was occupied during the transition to agriculture in the Near East, and therefore only “food-processing” items were of interest, it is problematic in that it has yet to be conclusively proven that these items were only used for plant processing and the others were not. Assuming the artifacts in question were only used in plant processing, and were the only ground stone artifacts used in plant processing, focusing only on this type of information to the exclusion of the “non-utilitarian” items perpetuates a Neolithic behavioral reconstruction that is not at all holistic. It is problematic to assign many items from Ghwair I a “utilitarian” or “non-utilitarian” value; therefore, the distinction will not be used here.

Some plants require processing in order to be rendered edible, such as wild cereals, chenopods, acacia seeds, and other fibrous or toxic plants (Wright 1994:242). Cereals and acorns are items this may be pertinent to in the Near East. According to Stahl (1989:185), “increased extraction of nutrients becomes more critical with increased specialization on... high-fibre resources.” Stahl (1989) notes that fibrous plants impede absorption of carbohydrates, protein and minerals; smaller particle size allows for easier absorption of nutrients; and grinding materials can facilitate the leaching of toxins. Tannin-rich foods, such as acorns, sometimes require processing on order to be rendered edible (Moore 1978:71). Stahl (1994:174) notes, however, that grinding can also remove nutrients.
Since ground stone analysis has become more commonplace, archaeologists have more frequently viewed it as a source of subsistence information. Although this is a positive step it has led to widespread assumptions in need of testing. A processualist emphasis on subsistence in the Near East, cereal processing in particular, has led to neglect of other activities represented by ground stone assemblages.

Aside from its generally accepted function in processing foodstuffs, ground stone technology had a variety of other uses in prehistory. According to Adams (1997:36), "Many kinds of ground stone artifacts can be used to understand the role of grinding technology in aspects of prehistoric life other than food production." The correlation between the presence of large milling equipment and the task of processing cereals is regularly assumed by archaeologists working with the remains of early agriculturalists. Wright (2000:92) cautions against assuming certain types of ground stone toolkits are linked with dominance of particular types of foods in prehistoric diets.

Ethnographic data from Africa and Australia indicate that ground stone tools have been used for processing a diverse array of things, only some of them subsistence items. Medicinal herbs, clay, temper, bone, tobacco, green vegetables, beans, seeds, roots, bulbs, nuts, rhizomes, and fruit are among these items (Schneider 1993:13). Ritual life, woodworking, fishing, migratory bird hunting, shaft straightening, hideworking, and weaving are represented in ground stone assemblages in different time periods throughout the world and many of the associated forms appear in Neolithic assemblages (Wright 1992b).

Ground spherical pebbles may have been used in the hunting of migratory birds. Shaft straighteners and hideworking tools also indicate the role of ground stone technology in
exploiting animal components of the environment. Fishing weights, pebbles with notches on opposing sides, were identified at Natufian ‘Ein Mallaha (Henry 1973:92; Perrot 1960:20) and Natufian Abu Hureyra (Olszewski 1986:71). The use of milling implements to grind pigments as well as the existence of ground stone figurines attests to the potential importance of ground stone technology in ritual life. During the Natufian, milling implements were sometimes recycled to be used as grave markers. During the Neolithic, ochred pebbles are common.

In the Levant and elsewhere (Mackie 1995), ground stone axes, adzes, and celts have been associated with woodworking activities. The presence of ground stone loom weights indicates yet another non-subsistence function for ground stone technology. Schneider (1996b:77) mentions pottery anvils, indicating another function for ground stone technology during later time periods.

Ground stone tools are made from both locally available and non-local raw materials. Limestone, basalt, granite, serpentine, steatite, crypto-crystalline silicates, sandstone, gypsum, quartzite, alabaster, dolerite, marble, chlorite, and steatite are among the materials commonly represented worldwide. At Tell Sabi Abyad in northern Syria, basalt from Turkey or the Euphrates valley was a common raw material for the production of ground stone tools (Akkermans and Verhoeven 1995:27). Locally available limestone, gypsum, sandstone, and quartzite were also used (Akkermans and Verhoeven 1995:26). Certain materials may have been preferred for particular types of artifacts, rendering procuring materials from great distances worthwhile.

In the past, ground stone technology has not received the amount or quality of attention that other types of artifacts have. According to Adams (1993a:61), “The
category of ground stone artifacts is large and varied. But as large and varied as this
category is, there has been relatively little in-depth analysis as compared to ceramic or
flaked lithic artifacts.” According to Schneider (1993:12), ground stone items present at
sites were not always reported in the past. Peterson notes, regarding the Near East, that
“these implements tend to be unevenly reported, loosely classified, and under-analyzed”
(1999:1). In addition, measurements, descriptions, and illustrations are rare (Schneider
1993:12).

Ground stone tools, by nature, are almost always larger artifacts than chipped stone
tools or pot sherds, which has been a source of physical limitation on how thoroughly
they are studied. Larger items which may be difficult to remove from the site area may
not be subject to rigorous analysis in a laboratory. The size of some items also causes
curation problems, if they are curated at all. Since many Near Eastern scholars reside in
Europe or the United States, their access to curation facilities in the Near East is limited.

Wright (1992b:53) identifies inconsistent terminology, small sample size, a neglect to
define types of artifacts said to be present in assemblages, narrow focus with regard to the
numerous artifact classes the category of ground stone encompasses, and neglect of
ground stone debitage as problems related to ground stone in the Near East. Terminology
to describe Near Eastern ground stone artifact types has been inconsistently applied. A
variety of names have been attached to, we can only assume, morphologically similar
artifacts. The multiplicity of forms in which ground stone is manifest renders more
problematic the fact that the terminology used to describe these items has not been
consistent, rendering interassemblage comparisons difficult even within small regions. In
the past, there was no uniform typology to cover the ground stone artifacts of the region.
Schneider (1996a:299) notes that pre-agricultural milling tool quarries and ground stone tool production in the Old World have not been well examined.

According to McGowan (1990:29), “In the past, the realization of ground stone’s full information potential was hampered by a lack of standardization with regard to attribute selection and analysis. In many cases, ground stone categories included materials that did not fit into other, more easily defined artifact classes.” All too often, ground stone artifacts have been lumped in the “other artifacts” section of reports. They were not viewed as informative enough in their own right, in contrast to chipped stone.

Items associated with the animal portion of the diet have received more archaeological attention than those associated with plant food processing. This may reflect the legacy of gender bias in archaeology (Sørensen 2000:35) since hunting is generally understood to be a “male” activity (Ehrenberg 1989:42; Gero 1991:167; Hughes and Hughes 1995:10; Watson and Kennedy 1991:256; Zihlman 1998:94). Processing plant materials with ground stone technology is seen to be a “female” activity (Hastorf 1991:134). The lack of attention to ground stone is not as severe in some ways in the Near East. Since the “origin” of agriculture was the focus of many projects and ground stone technology was assumed to have been used in processing agricultural products, the presence of large milling implements was usually noted. Most reports, however, discussed this artifact class with more brevity than was reserved for chipped stone.

Recent Innovations in Ground Stone Research

Given that ground stone technology is now being studied more frequently it should be easier to generalize about it in the future. Analysis of large assemblages like that of Ghwair I is becoming commonplace. Detailed typologies for ground stone artifacts now
exist in many regions of the world. Experiments, ethnographic data, and residue analysis are likely to contribute to a better understanding of the use of this technology.

New techniques of residue analysis as well as ethnographic data and results of experiments with ground stone tools have indicated that conclusions about the functions of ground stone technology must be drawn carefully. Wright (1992a:313) characterizes linking tool morphology to specific resources as "risky." Adams (1993a:61) indicates that "tools once assumed to have been used to process grain are now being examined for residues and damage patterns that might imply other uses, or even multiple uses."

Anderson (1992:193) has conducted experiments in dehusking cereal, indicating not only that wooden tools are appropriate for this activity, but also that cereal harvesting and processing can be "invisible" in the archaeological record (1992:206). The work of Meurers-Balke and Lüning (1992:352) corroborates Anderson's conclusions regarding wooden tools.

Anderson (1991:527) notes the appropriateness of residue analysis of milling implements since they are known ethnographically to have been used in processing a wide variety of materials. Schneider (1993:9) mentions immunoprotein residue analysis and investigation of pollen and phytoliths as techniques that might illuminate what ground stone tools were used for. Wright (1994:242) indicated that a study of chemical residues from prehistoric Levantine ground stone tools was in progress, though it has not yet been published.

Research questions about ground stone manufacture and use are moving closer to resolution. Recently, scholars have focused on ground stone quarrying locales (Huckell 1986, Schneider 1996a). Hayden (1987) conducted a study of metate manufacturing in

Ground Stone: Key to Prehistoric Mobility?

Since ground stone tools like those identified at Ghwair I are often large and heavy, it is often assumed that they are related to a low degree of mobility of the people that used them. Sites with large ground stone tools are frequently interpreted as reflecting a relatively long duration of occupation. These assumptions may not be valid.

To begin with, the portability of the artifacts themselves should be distinguished from the mobility of the people who used them. Among highly mobile hunter-gatherer groups smaller, more portable implements were used or ground stone technology was cached (Wright 1994:247). There is, therefore, no reason to assume that since artifacts are not easily portable, the people who used them were not mobile. Adams (1993b:341) views basin and trough metates, large, heavy artifacts, as portable “at least within the household if not between households or even between villages,” indicating a reevaluation of conventionally understood artifact mobility may be in order. Calamia (1983:3) makes the point that small, portable artifacts have less of a relationship with the context in which they are found than larger, less portable artifacts do.

Mobility of raw material blanks to be turned into ground stone tools is worth investigating in order to obtain data relevant to questions of human mobility. Locations of quarries or at least identification of the closest possible source for certain kinds of raw materials is worthwhile in order to obtain insight into human mobility as well as how
portable ground stone artifacts really are. Sourcing studies could contribute parameters for human mobility.

It is probable that the relationship between formality/expedience and mobility is more complicated for ground stone technology than it is generally understood to be for chipped stone technology. Formal tools in which considerable labor was invested in manufacture may have been carried from site to site. Formally designed smaller items, such as shaped handstones, were probably often curated by mobile groups. Expedient tools, in a setting of lithic abundance, may indicate a degree of sedentism on the part of the people who used the tools. Adams (1997:36), however, associates strategically designed tools with relative sedentism and expedient tools with settlement mobility. Peterson (1999:6) links expedient tools with high mobility, but discusses the complexity of the relationship between tool types, mobility, and reuse of sites or lack thereof. Aside from noting the size and formality/expedience of tools present at a site, it is also worthwhile to evaluate how intensively the tools were used. Expedience of use, rather than design, may have a relationship with high mobility for users of large, heavy artifacts. Repeated use of sites by mobile groups, however, could give rise to patterns similar to those at sites with long occupations.

The source of the tool stone (local vs. nonlocal), the amount of effort in obtaining the raw materials for tool manufacture (distance of the stone source from the site, whether quarrying was necessary or appropriate blanks were available), the effort expended in manufacturing the tool (whether it was necessary to remove large flakes, whether shaping occurred), the effort expended in maintaining the tool (repecking), and the intensity of use of the tool (including whether frequent repecking resulted in breakage) should be assessed
alongside intensity of tool use, curation, and formality/expedience before mobility is evaluated. Other techniques for inferring mobility, such as strontium isotope analysis of human bone (Price et al. 1998; 2001) would be useful in testing parameters of mobility provided by artifact assemblages.

The Division of Labor

The nature of the division of labor during the Neolithic is hotly contested. It is a widespread assumption that ground stone implements are women's tools. As projectile points are commonly assumed to have been used in hunting, "men's work" (Gailey 1987:39), ground stone is seen to be involved with gathering and food processing, or "women's work." This assumption is based on ethnographic analogy, both worldwide and from Mesopotamia, though in the latter region at least males also took part in milling activities (Wright 1992a:328). We simply do not know for sure if grinding was only women's work during prehistory (Peterson 2002:33). Nelson (1997:102), however, notes that in horticultural societies women conduct the majority of food processing.

Peterson (2002:3) recommends investigating skeletal evidence to see if different musculoskeletal stress markers suggesting different activity patterns are expressed by gender, rather than jumping to conclusions about sex-specific activities. Skeletal evidence from other parts of the world has linked adoption of agriculture with an increase in arthritis among women suggesting at least an increased workload for women in early agricultural economies (Cohen and Bennett 1998:302). Molleson interpreted skeletal evidence among women and girls from Neolithic Tell Abu Hureyra as reflecting prolonged grinding activities (Evans 1998:17). Wright (1992a:329) suggests
investigation of patterns of distribution of ground stone grave goods as a means to shed light on the degree to which milling was women’s work.

During the preceding Natufian period, burials were believed to have provided no evidence of division of labor along gender lines (Crabtree 1991:386). Analysis of patterns of grave good distribution by Wright (1992a:332) did not link ground stone grave goods with age or gender. More male Natufian burials have been identified than female Natufian burials, however, suggesting that there may be gender-based status differentiation represented by burial (Crabtree 1991:389). A Zarzian (Epipaleolithic) (Braidwood 1952) burial of a woman from Zawi Chemi Shanindar, interestingly away from the main cemetery, had an ochre-covered handstone associated with it (Solecki and Solecki 1983:129; Solecki and Solecki 2004:60). The work of Peterson, analyzing musculoskeletal stress markers on Natufian skeletons, now suggests a “weakly developed sexual division of labor” (2002:106).

A problem with reconstructing lifeways by means of skeletal materials during the Neolithic is small sample size (Hershkovitz and Gopher 1988:11). During the Neolithic, Peterson (2002:107) found within her admittedly small sample a greater shift in typical male activities from the Natufian to the Neolithic, while female activities did not change. Skeletal evidence indicates that both men and women worked harder during the Neolithic (2002:110). Peterson (2002:111) indicates that pronounced teres major and latissimus dorsi in Neolithic men may indicate that they played a role in grinding plant food.

The Utility of Ground Stone in Reconstructing Subsistence

It has been widely assumed in the Near East that slab-shaped milling implements reflect the importance of seeds and mortars and pestles reflect the importance of nuts and
acorns (Wright 1994:241). Wright (1994:241) notes that, ethnographically, morphological types of ground stone tools are often not correlated with the processing of particular foods. Evidence from ancient Mesopotamia, for instance, indicates that slabs were not just used to process cereals, but also pistachio, caraway, cumin, herbs, temper, pigments, cress seeds, and sesame as well, while mortars and pestles were used for chicory, onions, grapes, dates, spices, and sesame, among other things (Wright 1994:241). In the absence of residue analysis, it is unlikely that ground stone artifacts tell us much more about subsistence than that subsistence materials may have been processed where these tools are found. Ground stone artifacts retain the potential to provide subsistence information, albeit more indirectly than has been previously assumed.

Research Design for Analysis of the Ground Stone Assemblage from Ghwair I

Ground stone implements, then, represent a defining technology for the Neolithic. Analysis of these implements has the potential to contribute both to spatially and temporally narrow and broad research questions, despite having been relatively neglected as a fruitful line of inquiry for many years. Due to the spatial and temporal affiliation of Ghwair I, it is possible to apply these two kinds of research questions to its ground stone assemblage. Thus, the first set is site, time, and technology specific and addresses subsistence and non-subsistence activities and mobility. The second set of research questions is broader, and allows us to address issues related to the development of hierarchical social systems (including stratification and gender distinctions), regional interaction, and longer-term technological change throughout the Levant.
A principal objective of this thesis is to provide a descriptive analysis of the ground stone from Ghwair I. This baseline is necessary before more interpretive issues can be addressed. The main hypothesis of this thesis is as follows:

The ground stone assemblage from Ghwair I exhibits a high degree of variation characteristic of similar contemporary sites. This variation is due to the wide range of subsistence and non-subsistence activities that occurred at the site and that can be tied into the ground stone. Further, the variation may reflect social distinctions and degrees of mobility. A condition of this hypothesis is that comparable comparisons can be made to other PPNB sites.

To test this hypothesis, several research questions can be asked. These are summarized in Table 1. In order to address these questions, a number of issues will be examined in the following chapters. First of all, I provide a thorough description of the ground stone assemblage from Ghwair I in order to establish a baseline data set. After this is done, several aspects of the assemblage will be examined in relation to the questions posed in Table 1.

Regarding both subsistence and non-subsistence pursuits at Ghwair I, artifact types and functions have the potential to provide much information. Contexts of items at other PPNB sites have previously provided some clues regarding artifact function; therefore, in order to address functional questions, ground stone from Ghwair I will be discussed in relation to similar items from roughly contemporaneous sites. In addition, information gleaned from other artifacts and contexts at Ghwair I will be reviewed.

The issue of the nature and degree of mobility at Ghwair I is a difficult one to document. It can, however, be assessed by the expedience of ground stone artifacts'
Table 1. Research Questions Applied to the Ghwair I Ground Stone Assemblage.

<table>
<thead>
<tr>
<th>Research Questions—Site Specific:</th>
<th>Some Hypothesis Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What are the characteristics of Ghwair I’s ground stone?</td>
<td>-provides comparative data to test distinctness of Ghwair I -provides baseline data to characterize site</td>
</tr>
<tr>
<td>2. What does the ground stone tell us of subsistence activities at Ghwair I?</td>
<td>-if most ground stone appears to be used for agricultural subsistence activities, negates hypothesis</td>
</tr>
<tr>
<td>3. What does the ground stone tell us of non-subsistence activities at Ghwair I?</td>
<td>-if a significant amount of ground stone appears not to relate to subsistence, supports hypothesis</td>
</tr>
<tr>
<td>4. What does the ground stone tell us of mobility at Ghwair I?</td>
<td>-if mobility is suggested, sedentism may be questioned, since most PPNB villages are assumed to be year round occupations.</td>
</tr>
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<tr>
<th>Research Questions—Regional:</th>
<th>Some Hypothesis Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Does the ground stone from Ghwair I inform us of the site’s role within a wider PPNB interaction sphere?</td>
<td>-if Ghwair I fits within a consistent regional pattern, hypothesis is supported</td>
</tr>
<tr>
<td>6. Is there evidence for social or gender stratification at Ghwair I as reflected in the ground stone? How does this relate to contemporary sites?</td>
<td>-if social stratification is suggested by the ground stone, hypothesis is supported since most researchers believe that the PPNB was essentially egalitarian</td>
</tr>
<tr>
<td>7. How do patterns in the ground stone from Ghwair I fit into a broader regional and chronological framework?</td>
<td>-if ground stone from Ghwair I is similar to that from contemporary sites, supports hypothesis</td>
</tr>
</tbody>
</table>

...manufacture, the degree to which raw materials are predominantly local, the presence of caches, and the sheer quantity of ground stone artifacts at the site.

The concept of a PPNB interaction sphere is well-developed (e.g., Bar-Yosef and Belfer-Cohen 1989; Rollefson 1987). For Ghwair I, this can be addressed in several...
ways. Regional interaction is represented in some assemblages by exotic raw materials, so their presence or lack thereof in the Ghwair I assemblage may provide clues regarding the nature and scale of regional interaction, as may certain oceanographic items. Regional interaction may be identified by stylistic characteristics or certain iconographic artifacts.

Whether craft specialization occurred at the site ties into this research question as well. If Ghwair I functioned as an outpost supplying larger centers with goods, there may be evidence of craft specialization at the site. Workshops provide evidence for craft specialization, having been identified at other PPNB sites (Costin 1991; Tosi 1984). Van Pool and Leonard (2002) conducted an analysis of specialized ground stone tool production using a standardization statistic, the standard deviation divided by the sample mean multiplied by 100. This is referred to as the coefficient of variation (CV). Application of this statistic to elements of the ground stone from Ghwair I will be used to suggest specialization.

The issue of whether or not PPNB villages were egalitarian or hierarchically structured has been the subject of considerable recent discussion, and a related issue is the status of women in Neolithic society. Many early views proposed egalitarian social organization, but some current scholars are questioning this (Bar-Yosef and Meadow 1995; Cauvin 2000b). Questions about the development of hierarchical social systems and related longer-term technological change can be addressed with ground stone and other data. Whether there is evidence at Ghwair I for the emergence of social stratification will be addressed by assessing if burials appear to reflect differential or ascribed status. If so, are these associated with specific ground stone artifacts? In addition, issues of craft
specialization (see previous paragraph) are frequently interpreted as indicating an early stage of economic and social complexity. Specialized and potentially ritual ground stone artifacts may suggest stratification as well. Spatial variation and concentrations of ground stone may hint at degrees of stratification, or at least at distinctions in gender.

Finally, the degree to which the ground stone assemblage at Ghwair I fits into the ground stone chronological and regional context has the potential to clarify questions about the site's inhabitants shifts in subsistence, mobility, and social organization over time. The assemblage will be compared with others in the region as well as those from different time periods in order to gauge if there was formal or ideological continuity within the area and between time periods. The potential ramifications of such continuity will be explored.

By addressing these questions with the data from Ghwair I, the hypothesis that Ghwair I's diverse ground stone assemblage has significant informational potential regarding the wide range of subsistence and non-subsistence activities that occurred at the site will be addressed. Whether or not the hypothesis is verified, several of these questions might enable progress toward the goal of contributing towards a more holistic, less subsistence-centered perspective of Neolithic lifeways.
CHAPTER 2

RESEARCH BACKGROUND

Approaches to the Origins of Agriculture in the Near East

Horticulture, animal husbandry, and settled village life such as that evident at Ghwair I have been regarded in the past as a “higher” stage of cultural evolution than hunting and gathering because the transition to settled village life ultimately enabled the emergence of state level society. The importance of the shift toward humans becoming the “driving force” (Naveh 1990:48) of change in their ecosystem that the transition entailed should not be underestimated; however, the ethnocentric assumption that civilization is a morally and rationally superior form of social organization is no longer tenable. While resulting in a more complex material culture, including a diverse ground stone industry, assumptions that the agricultural paradigm entails a better way of life than hunting and gathering are no longer universally accepted. Anthropologists following in the tradition of Durkheim (1893), discarding 19th century notions of progress and the superiority of civilizations, refer to “simple societies” and “cultural complexity” instead of “cultural evolution,” but this terminology has the potential to be misleading. Durkheim and Mauss (1903) made an influential case for the cognitive complexity of the “uncivilized.”
Following Engels (1884), complexity of material culture, degree of economic specialization, and degree of political and economic inequality may be better criteria for characterizing the effects of the adoption of an agricultural way of life. These criteria imply no value judgments on the cognitive “complexity” of hunters and gatherers or farmers and herdsmen but, rather, provide terminology for describing aspects of their culture. Furthermore, these criteria are frequently reflected in the archaeological record by architecture, burial practices, skeletal remains, and workshops.

If a culture is described as being “more complex” what is really signified is that the culture is simply more specialized to the extent that different subgroups within the culture are interdependent. Whether interdependence leads to an enriched, more “complex” existence is dubious. Interdependence leads to a decrease in knowledge about one’s environment while increasing the complexity of one’s relationships with fellow human beings. According to Leacock (1982), the degree to which hunter-gatherers in the past led an impoverished existence has been exaggerated by anthropologists studying living groups, who did not take the effects of colonialism into account. Kabo (1985:603) documents that some 19th century anthropologists were aware hunter-gatherers were not engaged in a “cruel struggle for survival.”

Early theories on the Neolithic (Childe 1928) rest on a tacit assumption that the hunting and gathering way of life is inferior to that of horticulturalists. Later processualist theories, spearheaded by Binford (1968) and Flannery (1969) attribute little human agency to hunting and gathering groups who made the transition. Processualist theories view the transition as caused by factors external to the groups, such as the environment, or incidental to their existence and likely unintentional, such as population
growth. Post-processual theories such as those espoused by Bender (1978), Hodder (1990), Tilley (1996), and Cauvin (2000a, 2000b) emphasize the roles that culture and human agency may have had in the transition.

**Domestication as Inevitable**

Early theories about the origins of agriculture projected that people would be naturally inclined toward farming and herding because of its assumed inherent superiority to hunting and gathering. V. Gordon Childe (1928) put forth the “oasis propinquity” theory to explain the emergence of agriculture in the Near East. On the premise of late Pleistocene/early Holocene environmental “desiccation” he suggested that people and animals clustered around lowland water sources (Childe 1928:46). Since people and animals were close together in a circumscribed area, according to Childe, it occurred to humans to domesticate animals. Plant domestication, he believed, preceded “oasis propinquity.” Childe does not mention prior relationships between humans and the environment as being a contributing factor in the ease of the transition, making it appear as though the change happened in a vacuum simply because domestication of animals was inherently a good idea that would naturally occur to people who spent enough time in close proximity to them. Smith (1995:17) points out that hunter-gatherers are familiar with manipulation of plants, which indicates other variables might have been important in the transition.

Braidwood (1960) modified Childe’s theory to apply to well-watered uplands on the “hilly flanks” of the Zagros/Taurus mountains where he thought ancestors of domesticates would be found, noting that radical climate change did not occur there (1960:134). Braidwood (1960:134) assumes domestication was inevitable as a result of
specialized subsistence regimes in which people were particularly familiar with the environment of the "hilly flanks" area. A key problem with both Childe's and Braidwood's theories is that they were based on a climatic model entailing late Pleistocene/early Holocene environmental desiccation that later research demonstrated to be erroneous (Henry 1989). Another weakness of these theories is the assumption that domestication, as a superior subsistence system, was inevitable.

Another problem with Childe's and Braidwood's theories is that they assume sedentism would occur at the few resource-rich areas in a generally sparse environment. Hunter-gatherers in marginal environments, however, tend to be mobile. Only in situations of general resource abundance are they relatively sedentary. This situation characterized what we now know of conditions during the Natufian, but a generally sparse environment is a cornerstone of Childe's and Braidwood's theories. The assumption of sedentism coupled with localized abundant resources in a generally sparse environment does not stand up. As Binford (1968:326) pointed out, there is no explanation for why hunters and gatherers in marginal environments would start living "beyond their means."

Later "pull" theories of the emergence of agriculture (e.g., Henry 1989) assume that once it was practiced, population grew to the degree that agriculture had to be relied on, at which point there was no turning back. Like the previous theories, it assumes domestication as inherently an attractive proposition. A major problem with theories entailing the assumption that people would choose agriculture as an inherently superior subsistence system is nutrition, if nutrition can be taken as an objective measure of the efficiency of a subsistence system. Flannery (1969:75) did not make this assumption,
noting that hunters and gatherers did not have to work very hard to fulfill their caloric needs. There is evidence that it was not the most nutritious foods that were first domesticated (Ehrenberg 1989); Wright (1994:253) calls into question the assumed inherent superiority of cereals.

In terms of reliability of a subsistence system, ethnographic studies of hunters and gatherers have painted a picture of this system as possessing many advantages (Ehrenberg 1989:84). Among these is that hunting and gathering is a more reliable means to provide better nutrition than agriculture, even in times of resource scarcity such as drought. Second-choice foods are frequently relied on by hunters and gatherers, while horticulturalists are more heavily invested in a small quantity of resources.

Domestication Caused by Environment and/or Population Pressure

With the advent of processualist archaeology came a new set of theories about the origins of agriculture that do not rely on the appeal of agriculture having “pulled” people into the horticultural way of life. Binford (1968) and Flannery (1969) came up with bodies of theory referred to as “edge” or “marginality” hypotheses (Watson 1995:27). These can be characterized as “push” theories since they assume people would not have started practicing agriculture without demographic stress motivating them to do so. Unlike Malthus, who emphasized population growth as the result of an abundance of food (Evans 1998:3), agriculture is viewed as the result of population growth.

Binford (1968:332) posited population growth resulting from abundance of marine resources as having resulted in fissioning of groups. Fissioned subgroups moved to less desirable areas, resulting in demographic pressure over resource access to the degree that agriculture had to be adopted to supplement the subsistence base. Binford acknowledges
that farming is more labor-intensive than hunting and gathering, providing a rationale for
why people would have to be “pushed” into practicing agriculture.

Binford’s theory assumes that societies adopt changes in order to reestablish
equilibrium, and that equilibrium is the natural state for societies to be in. One problem
with Binford’s theory is that there is a lack of evidence for dependence on marine
resources. Binford’s assumption that hunter gatherers in optimal environments would not
remain within the environment’s carrying capacity is problematic. If the carrying
capacity was not reached, population would not grow to the degree that people were
“fissioned off,” pushed to the edges of the optimal area. This aspect of Binford’s model
seems to contradict his assertions regarding hunter-gatherer equilibrium. Despite these
problems, Binford’s theory was adopted and qualified by Flannery (1969). Flannery
views “broad spectrum” economies as a preadaptive condition for agriculture.

Boserup (1965) views population growth as the cause of the transition. Cohen (1977,
1985) espouses a similar theory, invoking population pressure. Cohen eschews the
concept of population stability at carrying capacity (1977:280) and hypothesizes, “human
population as an aggregate has grown continuously, requiring more or less continuous
redefinition of the ecology of the species as a whole.” Like Childe’s hypothesis, both
share the assumption that the size of the population in relation to the carrying capacity of
the environment would or could not be held in check.

Hunter-gatherers, however, are capable of limiting population size by a variety of
methods, including herbal contraceptives or abortifacients and infanticide (Ehrenberg
1989:61) as well as prolonged breastfeeding (Ehrenberg 1989:89). There is little
evidence that population pressure was widespread before agriculture was practiced (Evans 1998:21). During the Neolithic, population growth is inferred by an increase in numbers of structures at early villages.

Inclusion of variables such as technology and culture has distinguished later theories, though many tend to retain the underlying premises of environmental change and population growth (Watson 1995:29). Moore (1982:227) characterizes agriculture as the culmination of the "systematic practice of exploitation techniques" used by Epipaleolithic groups. The initiation of these intensive exploitation techniques coincided with sedentism (Moore 1982:232). He invokes the Late Pleistocene environment as a causal factor (1982:229) and notes that changes in social organization were linked to sedentism (1982:233) and may have contributed to its persistence (1985:47). Bar-Yosef and Kislev (1989:634) view environmental change as the main factor behind the transition, which was also enabled by the sizes of Natufian communities.

Henry (1989:27) proposes a model in which climate change is the ultimate cause of the emergence of agriculture, leading first to complex foraging. He does not deny the importance of a broad-spectrum subsistence pattern, increase in population, or resource stress; however, he sees climate change as having pulled populations into complex foraging, followed by another climate change that led to agriculture. Culture, as such, is not invoked as a determinant.

McCorriston and Hole (1991) couple environmental factors with subsistence, technology, and sedentism. Their matrix of variables includes climate change, the existence of harvesting and processing technology, storage, the existence of cultural means to oversee and distribute stored goods, and sedentism. They also consider the
availability, malleability, and storability of potential domesticates as components comprising the necessary preconditions for the emergence of agriculture in the Near East. During the Late Natufian, McCorriston and Hole (1991:49) invoke longer dry seasons as having caused seasonal stress on subsistence items, resulting in planting of cereals.

Richerson et al. (2001) assume population growth is inevitable, but is accelerated by changes in subsistence and subsistence technology. As the population increases it requires agriculture to sustain it. The circular reasoning of this argument is evident - it relies on the effects to explain the cause of the development of agriculture.

The problem with population pressure as a determining factor for either relatively sedentary or mobile hunter-gatherers is the underlying assumption that people could not, or would not, control population growth themselves. Hunter-gatherers are known to keep their population sizes under control. This is acknowledged by Binford (1968) and Bar-Yosef and Valla (1995:50) who, however, assume that population pressure would occur among sedentary hunter-gatherers. Agriculturalists, on the other hand, are not known for keeping population size small - having more children means maximizing field labor - children are an economic asset, not a liability.

In his overview of protoagricultural practices among hunter-gatherers, Keeley (1995:244) notes that theories invoking demographic pressure "are rather vague about how much population increase or pressure is enough" and neglect the question of "why such pressure arose in only a few places in the early postglacial period." According to Keeley (1995:257), "increasing population pressure alone leads only to socioeconomic complexity, not to protoagriculture." Such an increase in population pressure is likely to have happened during, rather than before, the Neolithic.
Bar-Yosef and Meadow (1995:49) postulate that the Natufian broad-spectrum subsistence pattern and sedentism led to population growth. They state a premise that stands in opposition to this tenet, however: “Hunter-gatherer macrobands maintain their populations below the size supportable by the mean carrying capacity of their home region as monitored by the living memory of the band” (1995:50). They indicate a connection between site size and the number of people living there; however, population growth needs to be demonstrated to have resulted in demographic pressure. That population grew does not, by itself, demonstrate that resources were depleted or population pressure resulted. Goring-Morris and Belfer-Cohen (1998), merging a common processualist theme with post-processualist insights, interpret changes from the Natufian through the Neolithic as adaptations to environmental conditions. The adaptations are enabled by extant technology and social mechanisms that function to buffer change.

Human Agency and “Social” Theories

As a reaction to the processualist preoccupation with all matters environmental or demographic, theories emphasizing culture’s role in the transition to agriculture appeared. These theories tend not to be holistic—certain elements of culture are emphasized as the major factors behind the transition and other aspects of culture are not discussed. Even so, these theories represent progress since they entail an acknowledgment of the humanity of their subject matter. By default, with processualist theories, people are viewed primarily as creatures with fewer concerns other than the gastronomical or puppets at the whim of environmental change, secondarily as having a rather small subset of additional motivations. Animals can be studied in terms of environment and demographics;
allowing culture theoretical room may lead to a better understanding of the causes of the transition. Human agency is a common post-processualist theme. It lends human decision-making causal weight in theories of culture change. Instead of being passively acted upon by forces such as climate change, cultures are viewed to have the potential to generate cultural developments. This originates in specific decisions consciously made by human beings.

Bender’s (1978) theory posits culture, not environment or population pressure, as the prime impetus for the transition. She explicitly reacts against the processualist tradition of seeing culture change as originating outside the culture itself (1978:207). Bender gives the adaptability of culture when subjected to stresses causative force. She interprets archaeological evidence from the Natufian as suggesting emergence of centralized authority (1978:215). Farming depends on “prior and ongoing social relations” (Bender 1990:248), and technological and environmental factors are “socially mediated.”

Hillman and Davies (1992) allow for human agency, but differentiate between cultivation methods that result in domesticates (without this being the result of human agency) and planting and harvesting methods (which probably were conscious). In stark contrast, Rindos (1984:86) denies that human agency had any relevance in the transition to agriculture, viewing it as the result of unconscious selection. Due to the unpredictability of plant breeding, he views it as impossible that agriculture could have resulted from human intent. Since agriculture is unknown in the animal kingdom, however, Rindos may have attributed too much agency to plants.

Rindos (1989) views the consequences of agriculture as the result of an evolutionary process (that culture itself he views is subject to), the outcome of selective pressures.
Unlike theories of cultural evolution espoused by anthropologists in the past, Rindos' model is not unidirectional. It entails "that no inherent direction underlies cultural evolution and that, instead, all change is the result of selection" involving preexisting conditions (Rindos 1989:28). Rindos follows the processualist tradition of theorizing that sedentism and agriculture caused population pressure.

Hayden's (1990, 1992) theory of competitive feasting is in harmony with the premise that hunter-gatherers keep population within levels dictated by available resources. Hayden postulates that in a situation of abundant r-selected, difficult to deplete resources, where sharing is no longer the norm and concepts of ownership are relevant, competitive feasting by elite members of the group could occur in order to gain loyalty of members of the group. This would effectively put most of the group in the position of indebtedness, without depleting the resource base or otherwise causing population pressure (1990, 1992).

Hayden (1990) hypothesizes production of surpluses during the late Pleistocene, particularly the Natufian, enabled by new technologies and the consequent emergence of socioeconomic inequality. He suggests that the first domesticates were not staple foods (1990:46, 1992:13), but rather, prestige foods that were either difficult to obtain or labor-intensive to produce, and puts wheat and barley in this category, noting that they are carbohydrate-rich and that beer can be made out of them (1990, 1992). Hayden (1990:39, 1995:288) notes that "complex" hunter-gatherers, except for the elites among them, have fewer alliances with neighboring groups and would, therefore, adapt to situations of resource stress in the Levant by exploring alternative means of subsistence, such as agriculture, and limiting the population.
Competitive feasting and warfare are known among groups commonly characterized as chiefdoms, rather than hunter-gatherer groups. It is possible, though hotly contested, that a similar degree of centralization of authority characterized the Neolithic; whether this can be said of the Natufian is more controversial. Hayden’s and Bender’s arguments require a chiefdom-level degree of political centralization. Both arguments also require production of surpluses. According to Carneiro (1981:60), production of surpluses is coerced from the populace in chiefdoms—surpluses do not spontaneously occur.

Hayden’s (1990, 1992) ideas about competitive feasting rely on the existence of “big men” as causal elements. The problem with the “big man” hypotheses is that it is unclear whether centralized authority preceded agriculture. Its central assumptions are the presence of competitive, self-interested individuals within hunter-gatherer societies prior to the Neolithic and the willingness of the rest of the society to allow these individuals to dominate them. As Hayden (1990:35) puts it, “the advent of competition between individuals using food resources to wage their competitive battles provides the motive and the means for the development of food production.”

Hayden does not discuss that the people who would have been investing labor into processing such materials were likely women, nor what the social implications of such a setup might be. The abundance of ground stone tools at Neolithic sites and their use by women cross-culturally indicates this as a highly probable scenario so it should have a place in the discussion of the dynamics of power. Most of the ethnographic examples Hayden (1990) uses to bolster his argument are already engaged in food production; his model dictates that competitive feasting preceded it. Many elements of his model have a
high degree of probability for explaining social dynamics of Neolithic developments, but not the origins of agriculture.

Lee (1990:239) provides the mechanism by which resource redistributors might arise, and unlike Hayden, he asserts that they arise in a cooperative setting where sharing is encouraged. Unlike Bender, he invokes determinants other than culture as being partially responsible for their presence—specifically, they arise under conditions of population growth. There is nothing inherently competitive about their genesis. He invokes an ideological shift to account for the shift of redistributors to self-aggrandizement, and notes that the factors giving rise to inequality do not result in identical levels of inequality cross-culturally, either as objectively determined or subjectively perceived.

Cauvin (2000a, 2000b) views symbolic developments as the driving factor behind the transition, which he refers to as "manifestly cultural" in origin (2000a:63). He describes post-Ice Age climate change as less "traumatic" in the Near East than elsewhere (2000a:12), suggesting its importance in the transition has been overemphasized. Cauvin (2000a:64) views "sociological" influences on population growth as more significant than the productivity of the environment. His theory is that cultural changes, represented by a "revolution of symbols" (2000b:238), led to the transition. These changes are represented by women and bulls present during the Khiamian, between the Natufian and the PPNA (2000b:236). At this point it is worthwhile to note that fertility iconography and metaphors are common in agricultural groups around the world. Whether this is a cause or an effect of domestication, however, is still open to debate.

Generally, theories that explain the transition in terms of culture have not been holistic in that they isolate certain elements of culture, such as the existence of "big men" as the
major cause of the transition. Some of the theories employ circular reasoning, using social changes evident after the emergence of agriculture, such as centralized authority, to explain the emergence of agriculture. Even so, theories incorporating culture as a variable have considerable explanatory potential. Decisions of human beings, filtered through culture, likely played a role in the transition in the context of environmental and demographic conditions conducive to the emergence of agriculture.

The Current State of the Evidence

At this point the verdict is still out on the ultimate causes of the transition. The evidence currently indicates agriculture in the Near East arises among “complex” relatively sedentary hunter-gatherers with a broad-spectrum subsistence base (Price and Gebauer 1995:8). Bar-Yosef and Meadow (1995) concur with van Zeist and Zohary (1989) that cultivation initially occurred within the Levantine Corridor. Late Pleistocene/Early Holocene climatic conditions appear to have been favorable. Zohary (1989:358) indicates that the first domesticated crops in the Near East were emmer wheat, barley, einkorn wheat, pea, lentil, chickpea, bitter vetch, and flax. Moore (1989:625) suggests that population grew during the Epipaleolithic since site sizes and densities increased. He suggests that certain wild foods were intensively exploited before domestication occurred (Moore 1982).

It is likely that no single factor determined the emergence of agriculture, but the convergence of several enabling factors, including human agency, put it within the realm of the probable. Human agency should be taken into account, as should culture in general, since biological concepts are insufficient in the study of human beings. The matrix of coinciding enabling factors—technology, environment, culture, sedentism,
human agency, and perhaps population growth—may exhibit a sort of probabilistic
determinism as the factors act in concert that none of the factors in isolation would
exhibit. Keeley’s (1995:266-267) cross-cultural study of protoagricultural hunter-
gatherers identified a causal matrix, consisting of the cultivation of staple foods that were
generally not associated with social gatherings, in “high-risk environments with low,
variable rainfall in low to mid-latitudes, where moderate to high population pressure
exists.” He notes that it is the combination of these factors that is significant, not each
factor in isolation from the others.

Effects of Domestication

There are two major themes in characterizations of the effects of agriculture, animal
husbandry, and settlement in permanent villages. One theme is the emphasis of the
positive effects of the transition. Farming has been placed in an evolutionary stage
leading to civilization and therefore represents “progress.” The perspective that has been
given of Near Eastern agricultural developments provided by Western archaeologists
should perhaps be interpreted in light of the fact that it is the archaeologists’ own cultural
history being described. Viewing domestication as a positive development— as a step in
becoming “civilized”— has been the norm in the Western intellectual tradition.

Developments in the Near East eventually gave rise to Western civilization, so it is
unsurprising that intellectual traditions of Western civilization have colored its study.

The other theme coloring the interpretation of neolithization stands in opposition to
this—the transition led to loss of liberty, centralized control, malnutrition, environmental
degradation, and a host of other developments interpreted as negative. Viewing
domestication as a negative development is also rooted in the Western intellectual tradition, going back at least as far as the Enlightenment (Smith 1976:1).

Rousseau is frequently quoted regarding his views on the origins of private property and the corresponding loss of freedom, which he links to early agriculture. His point of view is echoed by more recent Marxist viewpoints, and corroborated by numerous studies of hunter-gatherers. Rather than viewing the Enlightenment tradition as reactionary, it might be better to incorporate the knowledge about the nature of state-level societies such inquiry has led to into our understanding of what may have been developing during the Neolithic. At the very least, such inquiries have colored inquiries into the effects of agriculture and decreased residential mobility.

Whether environmental degradation following the transition is the result of agriculture, pastoralism, and deforestation or the effect of climate change is a subject of current debate. Simmons et al. (1988:38), Rollefson and Köhler-Rollefson (1989:85), and Köhler-Rollefson and Rollefson (1990) hypothesize abandonment of some late PPNB settlements as having been triggered by environmental degradation as a result of pastoralism and deforestation. Fall (1990:275) suggests that deforestation may have begun during the PPNB, based on evidence from fossil hyrax middens. Bar-Yosef and Meadow (1995:45), however, think mid-Holocene increasing aridity and temperature increase was also significant.

Larsen (1995) enumerates several negative consequences of agriculture- a decrease in dental health, diminished nutrition, reduced stature, a growth in infectious diseases, and a general increase of "physiological stress" (1995:204). Cohen and Armelagos (1984), in their synthesis of findings of paleopathologists studying the effects of the transition,
discuss increased infection, higher rates of malnutrition, and probable decreased life expectancy. Contrary to these findings, however, Smith et al. (1984:120) identify an increase in life expectancy during the Levantine Neolithic. Incidents of periodontal disease and dental caries, however, have since been shown to increase during post-Neolithic time periods (Smith 1991:427).

Although Smith et al. (1984) assert that early stages of domestication, including the PPNB, did not result in deteriorating health, they note that after the Pre-Pottery Neolithic health declined, likely due to disease (Smith et al. 1984:129). More recent research has shown a decline in health from the Natufian to the Neolithic (Smith 1991:428). Rathbun’s (1984:146) data from Iran and Iraq shows a decrease in sexual dimorphism during the Neolithic. Skeletal data indicative of anemia (cribra orbitalia and porotic hyperostosis) during the Neolithic are identified by Rathbun (1984:149), who characterizes infection as “relatively common” during this time period (1984:158).

Schepartz (1989) proposes a paradigm for understanding the effects of domestication which notably lacks any mention of social or ideological adjustments. Shepartz’ (1989) key variables are mobility, population density, human waste and pollution, infectious disease, nutritional stress, and physical stress. While this set of variables is rather comprehensive, people appear to have a limited role in this paradigm.

The social implications of the Neolithic transition remain largely unexplored (Peterson 2002:135). Little has been done to date regarding the cultural effects of the transition in the Levant, with the notable exception of the work of Kuijt (1995, 1996a, 2000), and Cauvin (2000a, 2000b). Kuijt examines issues of egalitarianism and social stratification. Cauvin focuses on symbolism. There is little debate whether the seeds were sown for
emergence of state-level society during the Neolithic and much debate regarding whether there is tangible evidence of inequality during this time period; the questions remain: when did these changes start to take place, and which changes were the first manifestations of stratified society?

An Argument for Technology as a Focal Point

Bender (1978:204) states, “Technology and demography have been given too much importance in the explanation of agricultural origins; social structure too little.” As detailed in the preceding section, at this point demography, environmental determinism, and social theories have enjoyed precedence in terms of causation at the expense of customarily serious examination of the quintessential Neolithic technology, ground stone. The technology of cultigen production has enjoyed primacy over the technology of cultigen processing, although processing technology preceded cultivation.

Price and Gebauer (1995:6) identify several factors as important in the emergence of agriculture, and rank them in order of importance as follows: “available protodomesticates, human sedentism, higher population density, resource abundance, geographic and/or social constraints, processing and harvesting technology, storage, and wealth accumulation.” Although all of these factors likely are significant, milling implements should carry as much weight as available protodomesticates. It has been demonstrated that processing early domesticates enhanced their frequently negligible nutritional value, and it is known that grinding technology preceded the transition. Whether the other factors are a cause or effect of the transition to agriculture remains nebulous since they are difficult to quantify.
Milling technology was present in the Near East prior to incipient cultivation and the later emergence of agriculture (Wright 1991). An increase in frequency of the occurrence of ground stone artifacts, including mortars and pestles, occurs during the Natufian. Another rapid expansion in terms of frequency and diversity of forms occurs during the Pre-Pottery Neolithic A. Ground stone technology persists throughout the Neolithic, even with the development of pottery. Kabo (1985:602), while noting the importance of grinding technology as a precondition of agriculture, views human beings as the primary agents of the transition. Wright (1992a:330) cautions against ground stone technology being regarded as the only preadaptive mechanism in place leading to the emergence of agriculture.

Domestication should probably be characterized as a technology with a similar pattern of development as other technologies. Like the florescence of ground stone during the Neolithic, it probably arose from some ancestral form. Technologies should not be conceptualized in isolation from each other in this case- the florescence of ground stone technology and the emergence of agriculture were most likely related.

All new technology comes from older technology, which functioned as a preadaptive springboard for the new technology. Computers, for instance, would be difficult to invent without the prior existence of circuit boards and many other items. Change does not occur in a vacuum, neither culture change nor technological change. The material items present among any group of people as well as their ideas about such items place parameters on what kinds of change might occur. As items are invented, people come to depend on them. This was likely true for ground stone technology, which enabled people to rely on domesticates requiring processing.
The diversity of tasks ground stone was likely used for and its diversity of forms has important implications for current models of the "Neolithic Revolution," which tend to be subsistence-focused. Many models suggest a subsistence-centered model of Neolithic life, focusing on cereal production and consumption, at the expense of contributing to a holistic understanding of Neolithic life. Non-subsistence functions and contexts of ground stone technology have the potential to add detail to the picture of Neolithic lifeways.

*Ground Stone Technology in the Near East From the Natufian to the Pottery Neolithic*

The existence of ground stone technology during the Upper Paleolithic (Bar-Yosef 1981a:395; Wright 1992a:285) posits its presence as a preadaptive condition for the emergence of agriculture. Specific ground stone artifact types emerged during the Kebaran (Wright 1992a:291), including bowls, mortars, and pestles (Bar-Yosef 1981a:395). Moore (1978:54) notes pestles, mortars, and querns during what he terms the Mesolithic I, or Kebaran.

Goring-Morris and Belfer-Cohen (1998:79) note an increase in ground stone artifacts during the Middle Epipaleolithic Geometric Kebaran in the southern Levant (Bar-Yosef 1981a:391). Wright identifies the emergence of regional variability in ground stone technology during the Geometric Kebaran (Wright 1992a:296). Peterson (1999:13) notes a distinction between early Epipaleolithic lowland sites with formal, portable predominantly basalt tools and other sites with expedient tools and permanent grinding features entailing a variety of raw material types. Processing technology was, then, well-developed before the onset of the Natufian during the Late Epipaleolithic.
With the onset of the Natufian there was a notable increase in the number of sites with ground stone (K. Wright 1993) as well as an increase in typical numbers of ground stone tools present per site (Fellner 1995:75) and an increase in tool diversity (Goring-Morris and Belfer-Cohen 1998:80; Wright 1994:252). Ground stone assemblages at base camps include boulder mortars, bedrock mortars, vessel-mortars, pestles, bowls and miniature vessels (Wright 2000:92). Wright (1994:254) suggests these developments as an effect of increasing sedentism. Mobility, however, likely remained rather high, as attested to by heavy use of basalt from 80 km away at Late Epipaleolithic Abu Hureyra (Moore 1991:282) and representation of nonlocal basalt in the eastern Galilee region (Solecki and Solecki 1983:125). That food processing activities frequently took place inside shelters during the Natufian is attested to by the distribution of *in situ* bowls, mortars, and pestles (Wright 2000:96).

Within the Natufian tradition, Henry (1973:149) differentiates between base camps with burials, architecture, and ground stone and transitory sites that lack these elements. Byrd and Colledge (1991:274) categorize the Natufian site of Tabaqa, with its rich ground stone industry, as “one component of a seasonal round.” There are sites such as Hatula (Ronen and Lechevallier 1991) and Salibiya I (Crabtree et al. 1991), however, that have very little ground stone, without entirely lacking it. Byrd (1991:260) does not see Natufian Beidha as fitting the distinction between base and transitory camps well since elements of both extremes are present at the site. He proposes a three tiered distinction between Natufian sites based on their apparent permanence of occupation (1989:83).

Natufian ground stone technology appears to have been more dependent on the mortar and pestle than later Neolithic ground stone technology based on their proportions within.
assemblages. These items dominate Early Natufian assemblages (K. Wright 1993) though they continue to appear at later sites, such as Ghwair I. Deep mortars referred to as “stone pipes” are present at numerous Natufian sites (Bar-Yosef 1981a:400). There is no consensus on what deep mortars were typically used to process; they may have been used to dehusk cereals or, as Moore (1983:96) hypothesizes and Olszewski (1986:148) concurs, process acorns during the Epipaleolithic. Kirkbride (1985:120) notes the presence of acorns near Beidha, and that the local Bedouin consume them. Moore notes that a villager from Jebel Barisha in northwest Syria identified them as a food source when harvests failed (Moore 1978:71).

Alongside the changes in assemblage patterns is a rise in dental caries (Smith 1991:426) and attrition (Smith 1991:428), which strongly suggests that the changes in ground stone assemblages are related to changes in diet- specifically, heavier reliance on cereals ground with milling techology (Smith 1991:431). Wright (1992a:336), in noting that seeds tend to be a food relied on in response to stress, notes that the stress may be social, ideological, environmental, or nutritional. Wright (1994:257) notes, “The addition of grinding to an earlier, simpler repertoire of food processing would require social acceptance of additional labor.”

The Natufian ground stone industry has been interpreted as more elaborate than that of the Neolithic due to the frequencies of decorated forms that are nicely finished, particularly pestles, such as artifacts from ‘Eynan (‘Ein Mallaha) (Henry 1973; Moore 1978, 1983; Olszewski 1986; Perrot 1960:19), Nahal Oren (Noy 1991; Stekelis and Yizraely 1963:12), Erq El-Ahmar (Henry 1973:114), Wadi Hammeh 27 (Edwards et al. 1988:543; Edwards 1991:129; Potts et al. 1985:186), Wadi al-Himnah 27 (Edwards et al.
1998:27) and Hayonim Cave (Bar-Yosef and Goren 1973:54; Belfer-Cohen 1991). This pattern is echoed among Zarzian (Epipaleolithic) decorated assemblages in the Zagros-Taurus region (Solecki and Solecki 1983:133). Wright (1992a:299) notes the emergence of finishing techniques during the early Natufian time period as well as stylistic variation (Wright 1992a:300). Goring-Morris and Belfer-Cohen (1998:80) note a general “proliferation of artistic and decorative endeavors” during the Natufian. Fellner (1995:78) notes the prevalence of decorated “utilitarian” items as well as items that appear to function as decorative objects. Wright (2000:97) interprets curation, labor-intensive production, and decoration of ground stone tools during the Natufian as suggesting “formality in food-sharing and an element of social ritual surrounding it.” Between the Early and Late Natufian, frequencies of elaborately decorated artifacts decreases- a pattern which continues into later time periods (K. Wright 1993).

During the Late Natufian there is a shift toward use of grinding slabs and handstones as opposed to mortars and pestles (Wright 1992a:305, 1994:255). Grinding slabs and handstones are frequently interpreted as having functioned to process seeds. There seems to be a dichotomy between sites utilizing mortar/pestle versus handstone/grinding slab technology (K. Wright 1993), though mortar/pestle technology remains dominant. Wright interprets these different toolkits as reflecting relative mobility versus relative sedentism, respectively, which culminates in the development of the mobile-foraging Harifian tradition (Solecki and Solecki 1983:125) coinciding with the relatively sedentary PPNA (Bar-Yosef 1981a:402). The Harifian ground stone industry is characterized by bedrock mortars, pestles, and bell-shaped handstones (Wright 1992a:311).
During the PPNA, the percentage of sites with ground stone increases, as does ground stone assemblage size (Wright 1992a:314). Decorated forms do occur but in lower frequencies. PPNA ground stone technology sees the addition of new types (like pebble mortars) and a reduction of decoration of pestles (K. Wright 1993) as well as a shift to heavier reliance on handstones and querns (Wright 1992a:314, 1994:255). Polished axes become more common (Moore 1978:86; Olszweski 1986:21; Wright 1992a:314), particularly during the Sultanian (Bar-Yosef 1981b:562), suggesting an increased need for wood. Decorative artifacts have been recovered from some PPNA sites, such as Jerf el-Ahmar near the Euphrates (Stordeur et al. 1996:1) and Netiv Hagdud (Gopher 1997). There is, however, a marked decline in their frequency from the Natufian (Wright 1992a:315; Wright 2000:98). Food preparation appears to have occurred primarily inside houses (Wright 2000:101).

Quantities of ground stone tools at sites increase from the PPNA to the PPNB (Moore 1978:258). Greater diversification in types of ground stone artifacts occurs during the PPNB (K. Wright 1992a:318, 1993)- polishing pebbles, axes, and pounders are numerous and there is diversity in morphological types of querns (Wright 1992a:321), which are common. Wright (1992a:341) emphasizes that high frequencies of grinding slabs are linked to the necessity to maximize nutritional value from limited agricultural yields.

During the PPNB, mortars and pestles become less frequent (Wright 1992a:321). Locally available raw materials dominate village assemblages, which are distinguished from those of other sites by having larger grinding tools (Wright 1992a:318). Given PPNB developments such as craft production (Wright 1992a:318; 1993:16) and the
widespread use of plaster at villages, the expansion of the ground stone toolkit is not surprising.

Ground stone technology continues to be present at a majority of PPN sites (Wright 1992a:317). During the Early and Middle PPNB, regional variability is evident in assemblages between woodland and desertic sites (Wright 1992a:317), the former of which have architecture. Desertic sites are linked with higher mobility. The presence of trough querns distinguishes southern Levantine sites (Wright 1992a:319), perhaps representing an innovation in processing efficiency. Bar-Yosef (1981a:564) notes a shift in axe morphology from tranchet-shaped during the Early PPNB to amygdaloid and oval tools during the Middle PPNB. Mazurowski (1997:189) interprets the rise of single-purpose tools, strategically designed for specific tasks, as indicating the importance and regularity of those tasks.

Vessels diversify in morphology during the PPNB, implying an expansion in their typical function (Wright 2000:110). Platters are well-represented among vessels and first arose during the PPNB (Wright 2000:103). Food processing appears to have typically taken place near entrances to houses or just outside them, which would have enabled food processing as an opportunity for social interaction with other households (Wright 2000:111).

During the Late PPNB in the northern Levant, well-made elaborate alabaster and marble bowls appear; these are not characteristic of the southern Levant (K. Wright 1993). Villages in the southern Levant that expanded significantly in size during this time period are notable for large household milling toolkits, which appear to have been used indoors more frequently than during the MPPNB (Wright 2000:112). This would
have functioned to limit interactions of people conducting food-processing with the larger community.

At the end of the 7th millennium many southern Levantine villages were no longer occupied, possibly because resources in their surrounding environments had been depleted (Rollefson and Köhler-Rollefson 1989). According to K. Wright (1993) sites that continued to be occupied after the PPNB show less frequency of ground stone in general and fewer types of ground stone tools into the Pottery Neolithic, dating between 8250 and 7800 B.P. (calibrated) (Kuijt and Goring-Morris 2002:366). Rollefson and Köhler-Rollefson (1989:81) also note the paucity of ground stone artifacts at sites occupied during the PPNC. Wright (1992a:341) attributes this pattern to increased mobility during this time period.

PPNB and Pottery Neolithic ground stone technology played a role in the development of other crafts and technologies, including pottery (K. Wright 1992a:320, 1993). Grinding technology becomes larger in size during later time periods, which Wright (1992a:341) indicates may indicate that full-time craft specialists were not grinding their own subsistence materials. In other words, perhaps an elite was being fed. Ground stone stamp seals are known from some Pottery Neolithic sites, such as Sabi Abyad (Akkermans 1993:17) and Ras Shamra (de Contenson 1983:62), suggesting that this technology played a role in the development of writing. Stamp seals were also identified in Neolithic 2 Bouqras (Moore 1978:179).

As discussed previously, the Natufian ground stone industry stands in contrast to that of the Neolithic, particularly the southern Levantine PPNB, due to the frequencies of decorated forms. With the advent of the Pottery Neolithic, or Yarmoukian in the Central...
Jordan Valley (Stekelis 1972:41), came an apparent decline in diversity of ground stone artifact types and overall ground stone artifact frequencies at sites (K. Wright 1992a:324, 1993). Muheisen et al. (1998:497) note the standardized morphology of tools at Yarmoukian ‘Ain Rahub. Rollefson and Simmons (1985:46) note the paucity of ground stone artifacts in Yarmoukian layers at ‘Ain Ghazal; ground stone was abundant in PPNB levels (Rollefson and Simmons 1985:13). During the Pottery Neolithic ground stone artifacts become less numerous, possibly due to the emergence and dispersal of ceramic technology (Wright 1992a:325). Moore (1978:382) notes that, at many sites, milling implements become more common during the Pottery Neolithic while ground stone vessels decrease in number. Ground stone bowls that are manufactured are sometimes nicely finished (Moore 1978:405). During the Pottery Neolithic and later, craftsmanship again appears in the form of exquisitely made marble and alabaster bowls. Stamp seals increase in quantity (Moore 1978:383).

Models invoking the stresses of the social change that relative sedentism and the practice of agriculture during the Neolithic entailed suggest themselves, with a resolution of such stresses occurring some time after the introduction of pottery. These stresses could have taken the form of less time for craftsmanship for the average Levantine person during the Neolithic due to an increased workload. The emergence of craft specialization could have resulted in the relative re-emergence of decorative forms.

Another possibility is that women, as manufacturers of ground stone technology, did not regard milling with enthusiasm since, already a labor-intensive activity (Wright 1992a:334, 1994), it became extremely labor-intensive after the emergence of agriculture. Further data from physical anthropology has the potential to lend resolution to whether
this was the case. The later fluorescence of ground stone technology may have simply been the next stage of its development which would have probably occurred if it continued to be used, which it had to be.

The patterns in differences in ground stone assemblages from the Natufian through the Pottery Neolithic may indicate shifts in the status of the people making and using these tools besides echoing shifts in changes in the subsistence system, settlement patterns, and other types of technology. Regardless, ground stone technology has the potential to provide information relevant to unanswered questions about the Neolithic while shedding light on later developments.
GHWAIR I IN TEMPORAL AND REGIONAL CONTEXT

The PPNB

According to Kuijt and Goring-Morris (2002:362), “reorganization of the processes and structures by which human social interactions occurred” helps define the PPNB. According to Bar-Yosef and Meadow (1995:77), shifts in social organization are reflected by architectural changes during the PPNB. Villages increase in size from the PPNA to the PPNB. A settlement size hierarchy is pronounced during the PPNB. Small hunting camps such as Nahal Divshon (Servello 1976) continued to exist, as did other more ephemeral sites, as villages expanded. The PPNB is defined by the earliest occurrence of pastoralism, identified archaeologically by high percentages of young goats and sheep which tend to be smaller than their wild counterparts. Along with the practice of animal husbandry and the dominance of rectangular architecture, other characteristics of the PPNB include the use of naviform cores and heat treatment of flints (Bar-Yosef 1981b:562).

The northern and southern Levant share plastered floors, rectilinear buildings, and burial practices during this time period (Moore 1978:226). Red-painted floors and walls are characteristic of the PPNB (Kuijt and Goring-Morris 2002:392). Aside from
domestication of animals, other developments during the PPNB include rectangular architecture, plastered skulls recovered from both large and small sites, craft specialization, and White Ware, or *vaisselles blanches*, in the northern Levant (Bar-Yosef and Meadow 1995). In the northern part of the southern Levant, whiteware appears at Wadi Shu‘eib, Munhatta, and ‘Ain Ghazal (Rollefson 1987:31). According to Henry (1995:19) past research emphasized the northern Levant, but more recent research has included the southern Levant to a greater degree. Larger Jordanian PPNB sites include ‘Ain Ghazal, Wadi Shu‘eib, and Basta as well as Es-Sifiya (Mahusneh 1997:203) and ‘Ain el-Jammam (Simmons et al. 2001:2) (Figure 1). Bar-Yosef and Belfer-Cohen (1989) indicate Abu Hureyra and Beisamoun as large sites within the Levantine Corridor, and note that along the Levantine Corridor is where the largest sites tend to be clustered.

The Early PPNB (EPPNB) dates between 10,500 and 10,100 B.P. (calibrated) (Kuijt and Goring-Morris 2002:366). The EPPNB is characterized by the presence of Helwan points and both prismatic and naviform core technology (Kuijt and Goring-Morris 2002:386), and rectangular architecture makes its appearance at some sites (Bar Yosef 1981b:564). Rollefson (1989:168) notes the presence of Byblos points in the Northern Levant during the EPPNB. Larger sites occur in the northern portion of the southern Levant (Kuijt and Goring-Morris 2002:382).

The Middle PPNB (MPPNB) dates between 10,100 and 9250 B.P. (calibrated) (Kuijt and Goring-Morris 2002:366). During the MPPNB, long sickle blades showing inverse retouch dominate lithic assemblages and Byblos and Jericho points are common. Treatment of the dead is elaborate (Kuijt and Goring-Morris 2002:387). Plastered skulls are common, as are secondary collective burials and subfloor interments. Iconographic
artifacts, frequently interpreted as evidence for ritual, is more common than during the EPPNB, during which figurines were present. During the MPPNB iconography takes the form of figurines, statues, and masks (Kuijt and Goring-Morris 2002:396). Cultic and ritual practices appear widespread and pronounced during this time period (Kuijt and Goring-Morris 2002:418). According to Kuijt and Goring-Morris (2002:419), the variation in MPPNB mortuary practices “indicates some sort of differential status within communities.”

According to Rollefson (1989:169) permanent agricultural villages first appeared in the southern Levant during the MPPNB. Evidence of goat and sheep herding is present at many sites and rectangular buildings are common, though oval or round buildings persisted in desertic areas (Kuijt and Goring-Morris 2002:389). Settlements increased in number from the PPNA to the PPNB (Kuijt and Goring-Morris 2002:389).

The Late PPNB (LPPNB) dates between 9250 and 8700 B.P. (calibrated) (Kuijt and Goring-Morris 2002:366). During the LPPNB high frequencies of Byblos and Amuq points have been identified (Kuijt and Goring-Morris 2002:412). Domesticated goats and sheep are widely represented (Kuijt and Goring-Morris 2002:412). The northern Levant was characterized by an increase in site size (Bar-Yosef 1981b:565).

Many sites in the southern Levant were abandoned during the LPPNB, possibly due to environmental degradation (Rollefson 1989:169) including Jericho and Beidha (Moore 1978:260). Deforestation, farming, and grazing of goats and sheep may have rendered areas around sites unproductive. Basta and Baja continued to be occupied, and Basta grew considerably. Basta, however, was abandoned before the end of this time period (Gebel et al. 1988:130). Sites that continued to be occupied include mega-sites like ‘Ain
Ghazal. LPPNB settlements are found primarily east of the Jordan Valley, in the ecotone between Mediterranean and desertic zones, potentially due to stress on resources in the Mediterranean zone or developments in pastoralism (Kuijt and Goring-Morris 2002:406). Floors were no longer plastered as frequently as they were during the MPPNB (Kuijt and Goring-Morris 2002:413). During the LPPNB there is a higher frequency of burials with grave goods and interment of humans with animals (Kuijt and Goring-Morris 2002:410).

Kuijt and Goring-Morris (2002:366) place the Final PPNB/PPNC between 8600 and 8250 B.P. (calibrated). For purposes of this discussion, PPNC will be used, rather than Final PPNB. During the PPNC there was a general population contraction in the Mediterranean zone (Kuijt and Goring-Morris 2002:414), possibly due to resource stress. Some of the larger sites, however, continued to be occupied during this time period.

At ‘Ain Ghazal the floors are not plastered as frequently as they were during the LPPNB, and lime plaster was less frequently used than crushed marl (Kuijt and Goring-Morris 2002:415). Evidence from ‘Ain Ghazal suggests a shift in burial practices to group interments (Kuijt and Goring-Morris 2002:416). Little is known about this time period due to its having been recognized rather recently, and only limited excavation has been undertaken. During the subsequent Pottery Neolithic, many large sites were abandoned, perhaps due to the “ecological havoc” wrought by changing relationships between people and the environment during the PPNB and PPNC (Simmons et al. 2001:2).

Southern Levantine PPNB Sites

Numerous PPNB sites have been identified in the Levant. ‘Ain Ghazal, a large village site near Amman, is particularly notable for its plaster statuary (Rollefson and Simmons...
Rollefson identifies a center for public ritual at the site during the LPPNB (1997:292). Ground stone tools, still awaiting detailed analysis, are well-represented within its PPNB components. Querns, handstones, weights, palettes, pounders, mortars, pestles, bowl mortars, and polishing pebbles are among the artifacts represented (Rollefson and Simmons 1983; 1984;1986; Wright 1992a:453-456). Most of the tools are made of limestone, though basalt obtained from at least 35 km distant is present among the assemblage (Rollefson 1987:30; Rollefson and Simmons 1988:399).

Wadi Shu’eib, west of ‘Ain Ghazal, was occupied from the MPPNB through the Pottery Neolithic (Simmons et al. 2001:7). Although the numerous ground stone artifacts at the site were not analyzed in detail (Simmons et al. 2001:19), the presence of stone bracelets was noted (Simmons et al. 2001:21). The architecture at the site featured red-painted plaster floors (Simmons et al. 2001:6).

Wadi Jilat 7, Wadi Jilat 32, and Azraq 31 are PPNB sites identified east of ‘Ain Ghazal. Early evidence for use of cultivated grain, whether or not it was grown locally, was recovered from EPPNB/MPPNB Wadi Jilat 7 (Garrard et al. 1987:24). Numerous ground stone artifacts were found at this site, including a palette and pounding and grinding tools (Garrard et al. 1988:322; Wright 1992a:438-439). Evidence for early steppe/desert domestication of goats and sheep was recovered from LPPNB Azraq 31 (Garrard et al. 1987:24) as well as a palette (Wright 1992a:447). In the Azraq region floors and walls were not plastered (Kuijt and Goring-Morris 2002:389). Wadi Jilat 32 is another LPPNB site that contains potentially earlier PPNB components (Baird et al. 1992:17).
Dhuweila, east of Azraq, is a hunting camp with a LPPNB component (Betts 1987:225, 1988a, 1988b). Ground stone, including figurines, was identified as part of its Late Neolithic component (Betts 1988b). Also in eastern Jordan, in the Black Desert, is the PPNB site of Ibn el-Ghazi at which circular grinding stones with central hollows and worked basalt and limestone were found (Betts 1987; 1988b). Numerous PPNB knapping stations, lithic scatters, animal traps and occupation sites have been identified in the Black Desert, northeast of Azraq (Betts 1987:225).

An artifact concentration at Wadi El Yabis in the Jordan Valley, originally published by Kirkbride (1956), has been interpreted as having a PPNB component. South of Amman but north of Ghwair I is Al-Jafr 17, a LPPNB encampment in the Al-Jafr Basin, which features a rock corral and a lithic scatter but no ground stone at all (Quintero and Wilke 1998:120), suggesting its association with hunting. Also south of Amman, east of the Dead Sea, Es-Sifiya is a large PPNB site with red-painted floors and numerous ground stone artifacts. Querns, grinders, bowls, rubbing stones, mortars, hammerstones, polishing stones, pestles, basalt axes, weights, perforated discs, a shaft straightener, and a sandstone bracelet fragment were identified at Es-Sifiya (Mahusneh 1997).

Ba’ja, a LPPNB village site in the area of Petra, has a large ground stone assemblage (Gebel 1998:85), including a sandstone bracelet workshop (Bienert and Gebel 1998). Ground stone artifacts include grinding slabs and manos, stone discs, vessels, variously shaped handstones, cuphole stones, pounders, weights, perforated pieces, polishers, adzes, celts, chisels, and picks (Bienert and Gebel 1998; Gebel and Bienert 1997; Gebel and Starck 1984; Gebel 1988).
Ad-Daman, a MPPNB village site near Petra, joins ‘Ain Ghazal, in Amman, in showing continued occupation into the Yarmoukian (Moore 1978). The presence of numerous milling implements, including grinding slabs and handstones, was noted (Gebel 1988:81; Moore 1978). Ghwair I and Ad-Daman I (Gebel 1988:81) share retaining walls as architectural features. In the Wadi Musa area is LPPNB Al-Basit, a site with very little in the way of ground stone artifacts though bowls and a limestone handstone were identified (Fino 1998). Ghwair I is south of Al-Basit and north of Ba’ja.

Also in the area of Petra are Beidha and Basta, south of Wadi Musa. Beidha is southwest of Ba’ja, and Basta is southeast of Beidha. LPPNB Basta, like Ba’ja, is a village site with numerous ground stone artifacts (Gebel 1988:92). Among these are sandstone palettes, slabs, handstones, weights, spheroid pounders, bowl fragments, and perforated and grooved stones (Gebel and Starck 1984; Gebel 1988; Gebel et. al. 1988; Hermansen 1997; Nissen et. al. 1987). Also in the Petra area is Shaqarat Musai’id, which yielded milling implements (Moore 1978).

South of Basta, Between Petra and the Wadi Rumm, is the LPPNB site ‘Ayn el-Jammam, which continued to be occupied into the Pottery Neolithic and has a large ground stone assemblage of hundreds of artifacts, including handstones, querns, and spheroid pounders (Waheeb and Fino 1997:215). ‘Ain Abu Nekheileh, a site with a PPNB component in the Wadi Rumm area of southern Jordan, south of ‘Ain el-Jammam, yielded an incised shaft straightener, querns, a grinder with V-shaped groove, other grinders, a weight fragment, pounders, querns, grinders, and pestles (Kirkbride 1978; Moore 1978).
In terms of the size distribution of PPNB sites plotted by Bar-Yosef and Meadow (1995:76), Ghwair I is among the smaller of the Mediterranean sites, covering only about 3 acres. The largest sites, such as Jericho and ‘Ain Ghazal, may have exceeded 5 ha in size (Rollefson 1992). A good analogue for Ghwair I is Beidha, though Beidha is smaller, about 0.4 ha (Bar-Yosef and Belfer-Cohen 1989:61), the same size as Nahal Oren. Large PPNB sites tend to continue to be occupied through later time periods (Bar-Yosef and Belfer-Cohen 1989:62).

Beidha merits discussion since, like Ghwair I, it is a small southern village site and its PPNB component is perhaps Ghwair I’s closest analogue. The variety and quantity of ground stone artifacts recovered from Beidha is comparable to Ghwair I, including shaft straighteners, pestles, handstones, celts, spheroid pounders, querns, mortars, bowls, polished axes, and weights (Byrd 1991; Moore 1978; Wright 1992a:426-430). Ghwair I is contemporaneous with Levels IV and V at Beidha (Najjar 1994:81). Kirkbride (1966; 1968a) interpreted Beidha’s artifact distribution as suggestive of craft specialization. Unlike Ghwair I, Beidha has a Natufian component, albeit transitory (Byrd 1989:80), and continued to be occupied longer (Bar-Yosef and Belfer-Cohen 1989:62).

Ghwair I and Beidha share wall niches as structural features (Kirkbride 1968a:269; Simmons and Najjar 1996:6). Kuijt and Goring-Morris (2002:394) hypothesize that these niches may have had a ritual function. Other elements of the architecture of the two sites are similar—buildings are constructed of stone, stairs are present in some of them, both sites have stone-lined pits, and the interior walls are lined with red-painted plaster (Kirkbride 1966; Najjar 1994; Simmons and Najjar 1998b). At both sites little space was left between structures (Kuijt and Goring-Morris 2002:390). Massive steps serving the
village were found at both sites (Kirkbride 1968b:93). Beidha has subfloor child burials (Kirkbride 1966:23), of which one has been found at Ghwair I.

PPNB Ground Stone Technology

During the PPNB, types of probably subsistence-related artifacts shift in frequency while, in general, there is an increase in diversity of artifact types. K. Wright (1993) notes that frequencies of sites with ground stone artifacts do not change between the PPNA and EPPNB, and the frequencies of sites with ground stone artifacts remain stable through the Pre-Pottery Neolithic time periods. Artifacts that emerge or increase in frequency during the PPNB include weights, polishing pebbles, pounders, axes, and celts.

There is a sharp decline in frequencies of mortars within PPNB assemblages and a sharp increase in ground stone tool diversity (K. Wright 1993). Wright hypothesizes a shift to wooden mortars, considerably less likely to be preserved, during the PPNB, which would have been more effective technology for dehusking ripe cereals (1994:243). Smaller mortars than those of previous time periods are common during the PPNB; specifically, bowl-sized mortars and smaller pebble mortars, possibly used for non-subsistence purposes, have been identified at PPNB sites.

Querns are more heavily represented than during the PPNA (Kuijt and Goring-Morris 2002:387), representing the shift from mortar and pestle toolkits to quern and handstone toolkits associated with cultigen processing. Differences in quern morphology distinguish the southern Levant from the northern Levant during the EPPNB and MPPNB (Wright 1992a:319). During the LPPNB there is increased regional variation in ground stone assemblages between the northern and southern Levant (K. Wright 1993).
Sandstone and limestone bracelets appear at many sites in the southern Levant (Kuijt and Goring-Morris 2002:412).

Though lacking in high frequencies of decorated objects such as exhibited by Natufian assemblages, PPNB assemblages frequently contain red-pigmented or ochred artifacts, as will be discussed in the subsequent chapter. Enigmatic PPNB artifacts such as ground spheres and gaming boards are nicely finished. The earliest stamp seals date to the PPNB (Moore 1978:290), though they are rare.

**Chronology and Cultural History of the Study Area**

Work conducted near Ghwair I has resulted in the identification of numerous sites from a variety of time periods. The study area is concentrated in the Wadi Feinan drainage, located between the Dead Sea and the Red Sea. Other PPNB sites have been identified in the area (Adams 1991), and recent survey has added to the tally. The area is currently sparsely inhabited; this stands in stark contrast to its heavy use during earlier time periods.

The British Insititute at Amman for Archaeology and History (BIAAH) has conducted detailed mapping of sites in Wadi Faynan, including Khirbet Faynan, the South Cemetery, and a Roman aqueduct at Wadi Ghwair (Ruben et al. 1997:434). Khirbet Faynan is at the junction of Wadi Dana and Wadi Ghwair roughly 1 km west of Ghwair I. Materials and structures at Khirbet Faynan encompass many time periods. A church at Khirbet Faynan was partially reconstructed during Islamic times. Graves at the site date to the Roman/Byzantine time period. During the Byzantine time period, the Khirbet functioned as a town. The site was in use during the Bronze Age (Ruben et al. 1997:439) and was originally occupied during the Chalcolithic (Najjar 1994:75).
Work conducted at Wadi Feinan 100 (Wright et al. 1998) primarily documented its Early Bronze I component; however, some evidence of Neolithic use of the area was documented as well. A smelting site east of Khirbet Faynan was identified as Iron Age during the course of the German Mining Museum at Bochum's Archaeometallurgical Investigation Project (Hauptmann et al. 1992).

Lagrange identified copper mines in the area as being those enslaved early Christians were forced to mine (Schick 1995). Also in the vicinity of Khirbet Faynan, two sites (WF8 and WF15) were identified during survey with cairn tombs likely dating to the Chalcolithic/Early Bronze Age (Ruben et al. 1997:440). A rectangular structure (WF9) likely dates between Nabataean and Byzantine time periods (Ruben et al. 1997:440). A building complex (WF12) probably dates to Nabataean/Roman time periods (Ruben et al. 1997:440). One field system (WF9) has associated Early Bronze Age and Byzantine pottery; another field system (WF13) has associated Roman and Byzantine sherds (Ruben et al. 1997:442). The largest field system (WF4) sherds of Nabataean, Roman, Byzantine, Early Bronze Age, and Chalcolithic sherds were identified (Ruben et al. 1997:444).

Najjar (1990) worked in association with the Archaeometallurgical Investigation Project to excavate a Pottery Neolithic/Chalcolithic site, Tell Wadi Feinan. A Neolithic site, Site B identified by Raikes (1980), shows evidence of architecture, including a stone tower. Numerous chipped stone artifacts, several ground stone tools, pottery, and bone tools were identified at the site. Raikes' Site A, a Pre-Pottery Neolithic B site, is on an island in Wadi Fidan and has a similar assemblage (Raikes 1980). Site C, another PPNB site inside a gorge on Wadi Fidan, has remains of walls (Raikes 1980:51). Site D consists
of Pottery Neolithic house foundations, lithic artifacts, and potsherds. Raikes identified numerous later sites as well- Chalcolithic/Bronze Age and Roman (1980).

Adams (1991) has recorded parts of a potentially Chalcolithic/Early Bronze Age cemetery near Wadi Fidan. Later components were identified at the cemetery. A nearby mound yielded LPPNB architecture (Adams 1991:183). A PPNA site, Wadi Feinan 16, has been investigated by the Dana-Faynan-Ghuwayr Early Prehistory Project (Mithen et al. 2000).

At a greater distance from Ghwair I, Raikes mentions a potential Pottery Neolithic structure near the Chalcolithic settlement at Dhra' (1980:57). Dhra' has a PPNA component and is 75 km north of Ghwair I (Finlayson et al. 2003; Simmons and Najjar 1996:6). A ground stone axe is among the artifacts recovered from the site (Kuijt 1996b:7).

Ghwair I, like other sites in the region, was subject to limited reuse during later time periods. It is interesting that no evidence of use of the site during the Chalcolithic, following the Neolithic, is evident; nearby sites seem to have been preferred during the Chalcolithic. Roman burials and pottery were identified at Ghwair I, suggesting its use in a peripheral, opportunistic manner.

_Ghwair I_

Ghwair I is situated on the slope of a hill near the confluence of Wadis Feinan and Ghwair. The architecture of the site consists of stone buildings with frequently intact plaster floors. Some buildings depart from the rectilinear PPNB norm by exhibiting curving walls (Simmons and Najjar 1996:6). The first investigation undertaken at the site was by Najjar of the Jordanian Department of Antiquities in 1993 (Najjar1994) in
association with the Archaeometallurgical Investigation Project. Several radiocarbon
dates for the site were determined as a result of these investigations (Table 2). Ground
stone artifacts identified during this excavation include mortars, trough querns, grinding
slabs, and bowls (Najjar 1994:80). Some bowls had traces of plaster and one had traces
of red pigment. Blades and naviform cores were identified among the lithics (Najjar
1994:80). Figurines and beads were also recovered.

Previous research conducted at the site has been published, in part (Gervasoni 2000;
Ghwair I’s chipped stone assemblage have been conducted (Gervasoni 2000; Powell
2001). Analyses of botanical, faunal, and geomorphological data are currently underway.

The site is on a steep, north-facing hill at an elevation of 300 m above sea level. The
area of the site today is very dry and sparsely vegetated. Conditions were likely lusher
and wetter when the site was occupied, though to what degree this was the case is
difficult to determine. Today the area is inhabited by semi-nomadic pastoralists, the
Bedouin, who graze goats. Ruben et al. (1997:440) note that the Bedouin have reused
parts of the ancient field system associated with Khirbet Faynan. From Neolithic through
Byzantine times, the copper ore occurring in the area was exploited (Ruben et. al.
1997:433). Water is another resource that had significance to the ancient inhabitants of
the area; Romans channeled runoff from the ash-Shara mountains (Ruben et al.
1997:444). The area is also prone to flash floods; during the 1997/1998 field season, a
flash flood rendered Ghwair I temporarily inaccessible from camp.

The Wadi Ghwair runs along the eastern and northern edges of the site. On the west
side of the site is a steep gorge, which feeds the Wadi Ghwair. Wadis Ghwair and Dana
Table 2. Radiocarbon Dates for Ghwair I.

<table>
<thead>
<tr>
<th>Uncalibrated B.P. (13C/12C Corrected)</th>
<th>Cal B.C. (2 sigmas)</th>
<th>Area of the Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>8390+50</td>
<td>7560-7335</td>
<td>I</td>
</tr>
<tr>
<td>8620+50</td>
<td>7740-7570</td>
<td>I</td>
</tr>
<tr>
<td>8610+50</td>
<td>7730-7570</td>
<td>I</td>
</tr>
<tr>
<td>8754+52</td>
<td>7929-7592</td>
<td>II</td>
</tr>
<tr>
<td>8755+311</td>
<td>8484-7033</td>
<td>III</td>
</tr>
<tr>
<td>9027+116</td>
<td>8345-8297</td>
<td>II</td>
</tr>
<tr>
<td></td>
<td>8273-7881</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7810-7711</td>
<td></td>
</tr>
<tr>
<td>8806+52</td>
<td>8007-7693</td>
<td>I</td>
</tr>
<tr>
<td></td>
<td>7661-7636</td>
<td></td>
</tr>
<tr>
<td>8880+117</td>
<td>8083-7592</td>
<td>I</td>
</tr>
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<td>8035-7411</td>
<td>I</td>
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<td>I</td>
</tr>
<tr>
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<td>7670-7620</td>
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</tr>
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<td>7865-7815</td>
<td>I</td>
</tr>
<tr>
<td></td>
<td>7705-7530</td>
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</tr>
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<td>7840-7825</td>
<td>IV</td>
</tr>
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<td></td>
<td>7700-7420</td>
<td></td>
</tr>
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<td>8590+70</td>
<td>7750-7540</td>
<td>II</td>
</tr>
<tr>
<td>8870+70</td>
<td>8250-7750</td>
<td>I</td>
</tr>
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<td>7610-7480</td>
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<td>7730-7530</td>
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<td>9710+150</td>
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<tr>
<td></td>
<td>9390-8690</td>
<td></td>
</tr>
<tr>
<td>1590+70</td>
<td>330-620</td>
<td>Geological test pit</td>
</tr>
</tbody>
</table>

Note: Data from Simmons and Najjar (2003).

feed Wadi Feinan, which is renamed Wadi Fidan past ‘Ain el-Fidan (Najjar 1994:75).

The Neolithic village is concentrated on east side of the higher of two terraces. The lower terrace shows evidence of Byzantine and Roman use (Najjar 1994). Roman materials are present in parts of the upper terrace but have not shown to have significantly
disturbed the earlier materials. Early Bronze II copper smelting occurred on the eastern part of the upper terrace (Najjar 1994:75).

Excavation has been conducted on six areas of the site encompassing 518 square meters under the direction of Simmons and Najjar. Excavation units measure 5 m by 5 m. Three areas have received the most attention. Generally, 20% of excavated materials were screened. The sampling for ground stone artifacts was higher than this—due to their frequently large size they were frequently spotted during excavation. Remote sensing indicated an anomaly on the west side of the site. Excavation of this area revealed a dense midden and ambiguous architectural remains.

The site continues as deep as 5 m below the present ground surface in places. Three architectural phases have been identified. The walls of the buildings were covered with red-painted plaster which is no longer intact. Two small staircases were revealed during the last season of excavation, as well as a large staircase on the northwest side of the site. The large staircase may possibly indicate an “amphitheater” or other public gathering place.

One burial of a child had associated grave goods. Some of the grave goods are ground stone artifacts and will be discussed at length in Chapter 5. Ceremonial behavior is suggested by the child burial, a curious room on the west side of the site, and an unusual artifact assemblage in a room on the south side of the site. Several other burials were exposed during excavation, but none of the burials were comparable to the child burial—most are group burials in rubble (Simmons and Najjar 2000:7).

Analyses of the chipped stone assemblage indicates that it is typical of the PPNB (Gervasoni 2000; Powell 2001; Simmons and Najjar 2000). Byblos points are common.
High percentages of blades, bladelets, and microliths occur in the assemblage. Analyses of faunal and botanical materials recovered from the site continue. Paleoenvironmental and geomorphic reconstruction is still in progress.

Figurine fragments and figurines, including two female figurines, were discovered at the site. Also worth mentioning are several caches. Ground stone, chipped stone, and animal skulls comprise their contents. Although some caches may have served a utilitarian function, Kuijt (1996a) notes that caching of ritual objects and faunal remains is a PPNB development.

Research (Simmons and Najjar 2003) has indicated that Ghwair I, despite its small size, does not fit neatly into a “regional outpost” category in the context of Wallerstein’s (1974) World Systems theory. The site does not appear to have functioned as a provider of materials to a larger regional center. Iconographic data, such as fertility figurines, indicates that Ghwair I was not isolated from other MPPNB settlements, however. The nature of Ghwair I’s relationship to other MPPNB sites remains a challenge to characterize. LPPNB Ba’ja, with evidence of craft specialization, similarly does not appear to have served as a supplier of surplus goods but was rather, like Ghwair I, a self-sufficient village (Bienert and Gebel 1998:84).
CHAPTER 4

METHODOLOGY OF THE ANALYSIS

Wright's (1992b) ground stone typology was applied to the Ghwair I assemblage as the primary tool of analysis with the goal of addressing several research questions. The degree to which non-subsistence pursuits are documented at Ghwair I by the ground stone assemblage was of interest, and it was expected that artifact morphology might shed light on this question. Proportions of subsistence-related artifacts were compared to proportions of artifacts that were probably not related directly to food processing. Querns, grinding slabs, handstones, mortars, and pestles are milling implements are classified as prototypically subsistence-related, whereas axes, celts, weights, gaming boards, shaft straighteners, vessels, and mace heads probably had functions unrelated to food processing.

The research question, "What does the ground stone assemblage from Ghwair I suggest about the site's placement in the MPPNB regional interaction sphere?" is related to the presence or absence of specific types of artifacts as well as the presence of exotic raw materials, or lack thereof. In addition, it was expected that how the ground stone assemblage at Ghwair I fits into the ground stone chronology for the region could be assessed by presence or absence of typical MPPNB artifact types. Another question to be
addressed, "What does the ground stone assemblage from Ghwair I indicate about the nature and degree of mobility of the occupants of the site?" was expected to be related to artifact types, sizes, contexts, and expedience or formality as well as the source of the tool stone, the effort expended in tool manufacture and maintenance, and the intensity of use of the tools.

Variables other than artifact type and metrics recorded during the analysis include completeness, raw material, plan view, transverse view, and number of faces utilized. In addition, modifications to each artifact such as shaping, striations, burning, pecking, incision, battering, and the presence of ochre or other materials were recorded. When use wear was visible in the form of striations, the presence of striations and their direction were noted.

Many artifacts, due to their size, were analyzed in the field and left at the site. Select artifacts were curated at the Department of Antiquities facility in Amman. Some artifacts notable for their nature or completeness were illustrated or photographed. Results from pollen washes performed on some of the items are not yet available.

Wright's (1992b) detailed typology, based on artifacts from a variety of sites dating to different time periods, was modified to better fit the Ghwair I assemblage. The majority of Wright's artifact types were retained; however, artifacts were analyzed that are not covered by Wright's typology. In some instances, particularly regarding handstones, Wright's typology is extremely detailed. For purposes of clarity, such distinctions are omitted from this discussion. In other cases, artifacts did not meet the strict criteria for inclusion in a particular type, so a case will be made for expansion of the typology.
Ground Stone Artifact Types

Grinding slabs and querns are classified based on morphological attributes and the types of blanks they were made from. Grinding slabs and querns classified by blank type are categorized as having tabular blanks or boulders as blanks. Grinding slabs and querns classified on the basis of morphology have been intentionally shaped to become basin, trough, or saddle-shaped. Exhausted grinding slabs and querns are classified as “hollowed,” having been used to the degree that the base is penetrated. “Miscellaneous” and “fragmentary” slabs and querns do not fit into any of these categories.

Grinding slabs are stationary milling implements made from boulders or tabular blanks. Grinding slabs on tabular boulders are “block” grinding slabs. Their use surfaces are flat or slightly concave.

Querns are more substantial lower, stationary milling implements than grinding slabs. They frequently show evidence of shaping, and their use surfaces are deeply concave. Some of these tools are light enough to be considered somewhat portable; others are extremely heavy and should perhaps be considered features. Querns, grinding slabs, and handstones are ubiquitous throughout the PPNB. The presence of trough querns distinguishes the southern Levant from the northern Levant during the EPPNB and MPPNB; trough querns have been identified at Beidha, Jericho, and Basta (Wright 1992a:319).

Handstones are small, easily portable tools used to grind materials with grinding slabs or querns. They are characterized here primarily by the number of faces that show use and their morphology. Handstones frequently are shaped; however, many are expedient tools, handstones a priori, that show little use and no shaping. Although handstones are
considered primarily to be subsistence-related milling implements, it is likely that they were used to process other materials as well.

Mortars are frequently identified at Neolithic sites, though they are associated more with Natufian sites. A prototypical mortar is a cylindrical stone with a cylindrical area hollowed out showing evidence of pounding in the center and grinding around the edges. These are “pillar mortars.” If they become exhausted, they are “hollowed mortars.” Mortars on unshaped boulders are classified accordingly. Many Neolithic mortars are, however, small bowl-shaped artifacts that show evidence of heavy pounding. They do not, however, show evidence of having a shaped rim or base (Wright 1992b:66), unlike bowls classified as vessels. Mini mortars, or “pebble mortars,” are small bowl mortars made from pebbles and “can be held easily in one hand” (Wright 1992b:66).

Pestles are elongated stones that show evidence of pounding on one or both ends and, frequently, grinding along their sides. With the exception of miniature pestles, they are classified on the basis of whether one or both ends show evidence of pounding as well as morphology. Miniature pestles may have been used with bowl mortars or pebble mortars. Generally, these items show no shaping and little grinding but are small, elongated pebbles with evidence of pounding on one or both ends.

Palettes are small tabular pieces of stone, frequently showing shaping along the edges and evidence of grinding on one or both sides. Palettes are frequently identified at Neolithic sites with large ground stone assemblages. Small slab abraders differ from palettes in having a smaller use surface and being made of grittier rock, such as sandstone (Wright 1992b:71). These tools are made on tabular blanks.
Vessels, ubiquitous at Neolithic villages, include bowls and platters. Pedestaled vessels appear to be characteristic of later time periods, such as specimens from Late Neolithic Abu Hamid (Dollfus et al. 1988:594) and Chalcolithic Tall Fendi (Blackham et al. 1998:174). Miniature vessels would be ideal containers for medicine, cosmetics, or pigment. Platters are large, slightly concave dishes with a low rim.

Counterpoise weights are round or rectangular items, nearly flat in cross-section, with a single large off-center but symmetrically-placed hole near one edge of the artifact. These items show evidence of shaping. The actual function of these artifacts is a subject of debate.

Axes, celts, chisels, and ebauchoirs are ground on all sides and feature a ground and polished wedgelike blade, which was removed from the preform by flaking. Grinding to a high polish is evident on all sides of these artifacts, and the bit is ground as well. Whether an artifact was characterized as an axe or a celt at Ghwair I depended on size and whether its bit length was greater or smaller than the total artifact width. Some ground stone axes/celts were analyzed as part of the chipped stone assemblage and have not to date been added to this tally, since they were not subject to ground stone analysis.

Spheroid pounders, ubiquitous at Ghwair I, and the far less common ground spheres may have been used in hunting and capturing wild animals (Mazurowski 1997:24). Pounders are predominantly heavily flaked and battered nodules typically of flint, showing battering on all sides. Wright (1992a:318) suggests that these tools may have been used in ground stone tool manufacture. Because these artifacts are made primarily of flint they have occasionally been analyzed as part of chipped stone assemblages.
Shaft straighteners (Wright 1992b:73) are elongated pebbles with U-shaped grooves lengthwise along one face. The U-shaped grooves frequently show striations, indicating that they were used in the processing of a rounded, cylindrical object like an arrow shaft. These items occur from the early Natufian onwards (Fellner 1995:75).

Polishing pebbles are small, smooth, waterworn pebbles with polished-looking utilized faces. They are classified on the basis of whether they are unifacial or bifacial (Wright 1992b:71). Identified at Beidha by Kirkbride (1968a:268), they are referred to as “pebble polishers.” Wright (1992a:318, 1993) hypothesizes that polishing pebbles may have been used in smoothing plaster floors.

In terms of the function of mace heads, different interpretations exist. At Nemrik 9, they are found among burial goods (Mazurowski 1997:85). Mazurowski (1997) discusses their potential functions as digging weights, drill weights, doorsockets, and weapons. Their interpretation as weapons is strengthened by the apparent need for defense manifest in a burial at Nemrik, and a case is made that rather than being attached to sticks, they may have been swung in leather thongs (1997:86).

Gaming boards are called such for want of a better term. They are not common but have been identified elsewhere during the PPNB. They are tabular stones with two series of regularly-spaced cupules. Narrow grooves run between the cupules. Moore hypothesizes that these could have functioned as bases for bow drills (1978:250).

Ground cobbles/pebbles (Wright 1992b:70) with irregularly ground surfaces offer few clues regarding their function. Ochred cobbles/pebbles (Wright 1992b:71) do not appear to be modified in any matter aside from having ochre adhering to them. During the Early Upper Paleolithic, most ground stone tools had ochre adhering to them (Wright
Upper Paleolithic ochred items were used to process ochre, frequently around a campfire (Wright 1992a:290). According to Peterson (1999:8), ochred ground stone tools and burial goods can be assumed to be related to ritual behavior.

**Spatial Analysis**

*In situ* artifacts, particularly those associated with features, were examined in relation to other associated artifacts and features. It was expected that this analysis might answer questions about mobility of the inhabitants of the site. Spatial analysis might clarify whether there is evidence at Ghwair I for emergence of social stratification and/or craft specialization. Whether there was spatial patterning of large milling implements was examined.

**Quantitative Methods**

Chi square analysis was selected as an appropriate tool by which to compare the Ghwair I assemblage composition with that of PPNB Beidha in order to determine how the assemblage from Ghwair I fits the regional pattern. VanPool and Leonard (2002) conducted a rare analysis of specialized ground stone tool production using a standardization statistic, the standard deviation divided by the sample mean multiplied by 100, referred to as the coefficient of variation (CV). Lower coefficients of variation imply a higher likelihood of specialized manufacture. Only artifacts at least 50% complete, of sufficient quantity to yield at least ten measurements for length, width, and thickness for each artifact type were subject to this analysis from Ghwair I in order to determine whether craft specialization is evident at the site.
CHAPTER 5

RESULTS

The ground stone assemblage from Ghwair I includes numerous milling implements as well as a variety of items that were probably not typically used as part of a food-processing activity (Table 3). Over 40% consists of milling implements, generously defined as including miniature mortars, miniature pestles, and palettes as well as larger mortars, pestles, querns, and handstones (Figure 2). Due to their nature and size, the smaller items were probably not used as part of a subsistence-related milling activity. Excluding artifacts that could not be positively identified, 47% of the assemblage consists of artifacts that can not be classified as subsistence-related milling implements. Several of these items were not included among types identified by Wright (1992b).

Artifact Types

A variety of milling implements were identified at Ghwair I (Tables 3 and 4). Forty-two grinding slabs, 14 basin querns, 3 trough querns, 4 saddle-shaped querns, 15 other querns, a hollowed mortar, seven boulder mortars, and a pillar mortar comprise the typologically distinct large milling implements recorded. Most of the grinding slabs are made of granite (Table 4), though limestone is also well-represented and other materials were used as well. One block grinding slab shows traces of ochre and the use surface of
Table 3. Types of Ground Stone Artifacts Analyzed from 1997-2000 at Ghwair I.

<table>
<thead>
<tr>
<th>Type</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axe or celt fragment</td>
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<td>0.04</td>
</tr>
<tr>
<td>Axe, trapezoidal</td>
<td>3</td>
<td>0.12</td>
</tr>
<tr>
<td>Axe, waisted</td>
<td>1</td>
<td>0.04</td>
</tr>
<tr>
<td>Axe/celt preform</td>
<td>4</td>
<td>0.16</td>
</tr>
<tr>
<td>Boulder with cupholes</td>
<td>1</td>
<td>0.04</td>
</tr>
<tr>
<td>Bowl, globular</td>
<td>290</td>
<td>11.65</td>
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<tr>
<td>Celt, ovate</td>
<td>290</td>
<td>11.65</td>
</tr>
<tr>
<td>Chisel</td>
<td>6</td>
<td>0.24</td>
</tr>
<tr>
<td>Counterpoise weight</td>
<td>16</td>
<td>0.64</td>
</tr>
<tr>
<td>Drillmarked green spheroid</td>
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</tr>
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<td>Flake core</td>
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<tr>
<td>Flake</td>
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<td>0.04</td>
</tr>
<tr>
<td>Gaming board</td>
<td>3</td>
<td>0.12</td>
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<tr>
<td>Grinding slab, block</td>
<td>36</td>
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<tr>
<td>Grinding slab, boulder</td>
<td>6</td>
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<tr>
<td>Grooved stone</td>
<td>9</td>
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<tr>
<td>Ground half disk</td>
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</tr>
<tr>
<td>Ground sphere</td>
<td>8</td>
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</tr>
<tr>
<td>Ground cobble/pebble</td>
<td>137</td>
<td>5.50</td>
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<tr>
<td>Ground ochre source</td>
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<td>17</td>
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</tr>
<tr>
<td>Handstone, bifacial ovate/oval</td>
<td>53</td>
<td>2.13</td>
</tr>
<tr>
<td>Handstone, bifacial ovate/wedged</td>
<td>3</td>
<td>0.12</td>
</tr>
<tr>
<td>Handstone, bifacial discoidal/wedged</td>
<td>2</td>
<td>0.08</td>
</tr>
<tr>
<td>Handstone, bifacial discoidal/oval</td>
<td>14</td>
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</tr>
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<td>Handstone, bifacial discoidal/lens</td>
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<td>0.04</td>
</tr>
<tr>
<td>Handstone, bifacial discoidal/planoconvex</td>
<td>8</td>
<td>0.32</td>
</tr>
<tr>
<td>Handstone, bifacial ovate/tapered</td>
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<td>0.04</td>
</tr>
<tr>
<td>Handstone, bifacial loaf/flat</td>
<td>4</td>
<td>0.16</td>
</tr>
<tr>
<td>Handstone, bifacial loaf/oval</td>
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<td>0.20</td>
</tr>
<tr>
<td>Handstone, bifacial loaf/wedged</td>
<td>1</td>
<td>0.04</td>
</tr>
<tr>
<td>Handstone, bifacial rectilinear/flat</td>
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<td>0.20</td>
</tr>
<tr>
<td>Handstone, bifacial rectilinear/wedged</td>
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<td>0.04</td>
</tr>
<tr>
<td>Handstone, bifacial discoidal/planoconvex</td>
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<td>0.08</td>
</tr>
<tr>
<td>Handstone, bifacial discoidal/flat</td>
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<td>0.32</td>
</tr>
<tr>
<td>Handstone, irregular a posteriori</td>
<td>44</td>
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<tr>
<td>Handstone, unifacial discoidal</td>
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</tr>
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<td>Handstone, unifacial ovate</td>
<td>132</td>
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<td>Handstone, unifacial rectilinear</td>
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<td>0.04</td>
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</tr>
<tr>
<td>Type</td>
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<td>%</td>
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<td>-------------------------------------------</td>
<td>-----</td>
<td>------</td>
</tr>
<tr>
<td>Maul</td>
<td>2</td>
<td>0.08</td>
</tr>
<tr>
<td>Maul, miniature</td>
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<td>0.04</td>
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<td>Mortar, hollowed</td>
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<td>Mortar, pebble</td>
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<td>Mortar, bowl</td>
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<td>Mortar fragment</td>
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<tr>
<td>Notched cobble</td>
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<td>0.04</td>
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<tr>
<td>Ochred cobble/pebble</td>
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<td>0.32</td>
</tr>
<tr>
<td>Palette</td>
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<tr>
<td>Pecked preform</td>
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<td>Perforation on disk</td>
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<tr>
<td>Pestle fragment</td>
<td>41</td>
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</tr>
<tr>
<td>Pestle, miniature</td>
<td>8</td>
<td>0.32</td>
</tr>
<tr>
<td>Pestle, unipolar conical</td>
<td>4</td>
<td>0.16</td>
</tr>
<tr>
<td>Pestle, unipolar cylindrical</td>
<td>2</td>
<td>0.08</td>
</tr>
<tr>
<td>Pestle/handstone, other</td>
<td>33</td>
<td>1.33</td>
</tr>
<tr>
<td>Pestle, bipolar cylindrical</td>
<td>18</td>
<td>0.72</td>
</tr>
<tr>
<td>Pestle, bipolar conical</td>
<td>7</td>
<td>0.28</td>
</tr>
<tr>
<td>Pestle, miscellaneous</td>
<td>15</td>
<td>0.60</td>
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<tr>
<td>Platter</td>
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<tr>
<td>Polishing pebble/possible celt preform</td>
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<td>0.04</td>
</tr>
<tr>
<td>Polishing pebble/pounder</td>
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<td>0.04</td>
</tr>
<tr>
<td>Polishing pebble fragment</td>
<td>1</td>
<td>0.04</td>
</tr>
<tr>
<td>Polishing pebble, bifacial</td>
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</tr>
<tr>
<td>Polishing pebble, number of faces utilized indeterminate</td>
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<td>0.20</td>
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<tr>
<td>Polishing pebble, unifacial</td>
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<td>Possible handstone/quern</td>
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<td>Pounder fragment</td>
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<td>0.68</td>
</tr>
<tr>
<td>Pounder, ovate/ovoid</td>
<td>17</td>
<td>0.68</td>
</tr>
<tr>
<td>Pounder, irregular core</td>
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<td>0.12</td>
</tr>
<tr>
<td>Pounder</td>
<td>2</td>
<td>0.08</td>
</tr>
<tr>
<td>Pounder, spheroid</td>
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<td>4.58</td>
</tr>
<tr>
<td>Quern or slab fragment</td>
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<td>3.13</td>
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<tr>
<td>Quern, basin</td>
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<td>0.56</td>
</tr>
<tr>
<td>Quern, trough</td>
<td>3</td>
<td>0.12</td>
</tr>
<tr>
<td>Quern, saddle-shaped</td>
<td>4</td>
<td>0.16</td>
</tr>
<tr>
<td>Quern, block</td>
<td>3</td>
<td>0.12</td>
</tr>
<tr>
<td>Quern, boulder</td>
<td>12</td>
<td>0.48</td>
</tr>
<tr>
<td>Quern or slab, miscellaneous</td>
<td>10</td>
<td>0.40</td>
</tr>
<tr>
<td>Shaft straightener</td>
<td>6</td>
<td>0.24</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Type</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slab with cupule</td>
<td>2</td>
<td>0.08</td>
</tr>
<tr>
<td>Slab abrader</td>
<td>9</td>
<td>0.36</td>
</tr>
<tr>
<td>Unknown</td>
<td>322</td>
<td>12.94</td>
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<tr>
<td>Vessel, miscellaneous</td>
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<td>4.66</td>
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<tr>
<td>Vessel rim fragment</td>
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<tr>
<td>Vessel body fragment</td>
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<tr>
<td>Vessel base fragment</td>
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<tr>
<td>Vessel, miniature</td>
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<td>2.69</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2489</td>
<td>100</td>
</tr>
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</table>

Figure 2. Comparison of frequencies between milling implements and other ground stone artifacts.
Table 4. Summary of Ghwair I Artifact Types.

<table>
<thead>
<tr>
<th>Type</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grinding slab</td>
<td>42</td>
</tr>
<tr>
<td>Quern</td>
<td>36</td>
</tr>
<tr>
<td>Handstone</td>
<td>521</td>
</tr>
<tr>
<td>Mortar</td>
<td>108</td>
</tr>
<tr>
<td>Miniature mortar</td>
<td>108</td>
</tr>
<tr>
<td>Palette</td>
<td>7</td>
</tr>
<tr>
<td>Pestle</td>
<td>87</td>
</tr>
<tr>
<td>Miniature pestle</td>
<td>8</td>
</tr>
<tr>
<td>Vessel</td>
<td>638</td>
</tr>
<tr>
<td>Weight</td>
<td>16</td>
</tr>
<tr>
<td>Axe/celt</td>
<td>14</td>
</tr>
<tr>
<td>Pounder</td>
<td>153</td>
</tr>
<tr>
<td>Shaft straightener</td>
<td>6</td>
</tr>
<tr>
<td>Polishing pebble</td>
<td>86</td>
</tr>
<tr>
<td>Gaming board</td>
<td>3</td>
</tr>
<tr>
<td>Other artifact</td>
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</tr>
<tr>
<td>Ambiguous fragment</td>
<td>121</td>
</tr>
<tr>
<td>Unidentified</td>
<td>320</td>
</tr>
<tr>
<td>Boulder with cupholes</td>
<td>1</td>
</tr>
<tr>
<td>Chisel</td>
<td>1</td>
</tr>
<tr>
<td>Drillmarked green spheroid</td>
<td>1</td>
</tr>
<tr>
<td>Ground sphere</td>
<td>8</td>
</tr>
<tr>
<td>Ground half disk</td>
<td>2</td>
</tr>
<tr>
<td>Macehead</td>
<td>1</td>
</tr>
<tr>
<td>Maul</td>
<td>2</td>
</tr>
<tr>
<td>Miniature maul</td>
<td>1</td>
</tr>
<tr>
<td>Notched cobble</td>
<td>1</td>
</tr>
<tr>
<td>Perforation on disk</td>
<td>2</td>
</tr>
<tr>
<td>Slab with cupule</td>
<td>2</td>
</tr>
<tr>
<td>Small slab abrader</td>
<td>9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2489</strong></td>
</tr>
</tbody>
</table>

another is stained with black residue. Some smaller grinding slabs identified at Ghwair I, light enough to be considered portable, bear a strong resemblance to some specimens from LPPNB Basta (Nissen et al. 1987:108), being oval in plan view and frequently
difficult to distinguish from handstones. Most of the querns are made of either granite or limestone, which comprise equal portions of the querns.

Almost all of the mortars are limestone. Eleven of the pebble mortars are incised. Three appear to have been burned. Three bowl mortars are incised. One appears to have been burned. Thirty-six bowl mortars were identified at the site, as well as 108 pebble mortars. All of the pebble mortars are made of limestone. These artifacts were identified at PPNB Beidha (Kirkbride 1966:32), where they are numerous (Wright 1992a:426). There is probably considerable overlap between bowl mortars and bowls as well as pebble mortars and miniature bowls. Artifacts such as these were classified as mortars, rather than vessels, on the basis of whether there was evidence of heavy pounding and little evidence of shaping; however, light use of such artifacts might leave little or no trace.

Two hundred eighty-two artifacts consisting of nineteen types of formal handstones were identified at Ghwair I (Table 3). Two hundred thirty-nine other handstones exhibited no evidence of shaping. Limestone is the most common raw material for handstones, although basalt is also well-represented and other materials were used. Three handstones had ochre adhering to them and one was coated with malachite. Sixteen of the handstones appear to have been burned. Striations visible on some of the handstones indicate that they were used with a back-and-forth motion. At Beidha, Kirkbride identified a bone tool production area with numerous handstones (1968a:271), indicating yet another function for these tools. Handstones were also used to process ochre at PPNB Beidha (Moore 1978:249).

Four formal pestle types comprising 31 artifacts were recorded at Ghwair I in addition
to 15 pestles that were not apparently shaped. In addition, 8 miniature pestles were identified. These were probably used with bowl mortars, pebble mortars, or miniature bowls. Most of the pestles are made of basalt, though granite and limestone are well-represented. Most of the miniature pestles are made of limestone; however, two are made of basalt. One of the miniature pestles appears to have been burned.

Vessels are numerous, comprising one fourth of the ground stone artifacts. At Ghwair I vessels are made almost exclusively of limestone, frequently a soft, chalky limestone. 290 globular bowls dominate the assemblage. Sixteen platters, 67 miniature vessels, and 116 miscellaneous vessels were also recorded. One of the platters has ochre adhering to it, as does one of the globular bowls. Platters as well have been identified at PPNB Beidha (Wright 1992a:429). Sixty of the globular bowls have incised decorations on the inside and/or outside, as do 35 of the miniature vessels. The decorations do not form a clear pattern, but consist of long, slightly curved lines around the plane on which the vessel would sit. The complete bowls lend themselves to be classified by size into three distinct categories. The smallest, miniature bowls, were also identified at Beidha (Kirkbride 1966:32). Besides the miniature bowls, globular bowls with diameters of approximately 15-20 cm occur as well as large bowls with diameters exceeding 30 cm. It is clear that many of the bowls at Ghwair I also (or primarily) served as mortars, and the possibility that they were used to process non-subsistence-related materials can not be ruled out, particularly in the case of the miniature vessels.

It is interesting that none of the miniature vessels shows traces of ochre, perhaps arguing against their use in pigment processing. One unidentifiable vessel fragment is
ochred and three fragments appear to have been burned. Kirkbride (1966:16) asserts that some bowls at Beidha functioned as lamps.

Seventeen weights were recovered; 16 of these are what Wright terms “counterpoise weights” (Figure 3). It is unclear whether they typically played a role in grinding or were, in fact, primarily weights. Most of these artifacts are made of limestone. Basalt, granite, and sandstone are also represented, however. The remaining weight at Ghwair I is classified as a loomweight. There is little variation in the dimensions of these artifacts. Counterpoise weights were also identified at PPNB Beidha (Kirkbride 1966:35; Moore 1978:250; Wright 1992a:428). Several loomweights were identified at LPPNB Beidha (Wright 1992a:428).

Wright (1992b:72) does not include ground flint axes and celts; however, some are included among ground stone artifacts analyzed at Ghwair I. Axes and celts during the PPN are included among ground stone tools and are common at villages, including Beidha (Kirkbride 1968a:268; Wright 1992a:428). Axes, celts, chisels, and ebauchois were identified at PPNB Beidha (Wright 1992a:428). Most of the Ghwair I axes and celts are made of basalt, though flint and limestone are well-represented. The actual proportion of flint axes and celts is likely higher since many of these were analyzed as part of the chipped stone assemblage and were not included with the ground stone. Most of the tools covered by this analysis are basalt. Flint, limestone, and granite comprise the rest of the identifiable raw materials. Axes are distinguished from celts (Figure 4) at Ghwair I in having their widest point at the bit. According to Mazurowski (1997:66), this distinction has less to do with function than with morphology, since functions of axes and celts overlap. Three trapezoidal axes and a waisted axe, with a groove through its center
where it was hafted, were recorded at Ghwair I. The category of “waisted axe” is not in Wright’s typology. Six ovate celts were recorded. Chisels are common at sites with axes and celts and Ghwair I, where a flint chisel was identified, is no exception. In addition, several axe/celt preforms were identified at Ghwair I. Axes have been positively identified with woodworking at other sites.

Six items classified as “shaft straighteners” were recorded (Figure 5). These are roughly oval in plan view, bisected by a U-shaped groove with the exception of one specimen with a V-shaped groove. Most are made of limestone, though one is made of
Figure 4. Celts from Ghwair I.
sandstone and another of basalt. Four shaft straighteners were identified at PPNB Beidha (Wright 1992a:428)

Nine slab abraders were recorded, all made of sandstone. Six are unifacial and the other three are bifacial. One of the bifacial slab abraders has traces of ochre.

Several items, including three “gaming boards” (Figure 6), fell outside Wright's typology. Two of the artifacts are sandstone. The remaining gaming board is limestone. The cupmarks on each gaming board are roughly the same size, though the cupmarks on one of the sandstone gaming boards are larger than those on the limestone gaming board. The gaming boards are similar to artifacts identified at Beidha (Kirkbride 1966:34), ‘Ain...
Figure 6. "Gaming board" from Ghwair I.
Ghazal (Rollefson 1992), and the PPNB mortuary installation of Kfar HaHoresh in Israel (Goring-Morris 1998:4).

Also identified at Ghwair I and not covered by Wright’s typology were two mauls (Figure 7), one made of sandstone and the other of limestone, a sandstone miniature maul, and probable phallic representations. The mauls are grooved around their centers, probably for hafting, and both ends exhibit evidence of battering.

Besides the gaming boards, a sandstone slab with a cupule was identified, as was a sandstone boulder with cupules. The specimens from Ghwair I do not fit into Wright’s (1992b:74) “perforated post-socket” category, which is not assumed to indicate function in any case; therefore, the function of the cupuled artifacts from Ghwair I remain unknown. At Beidha as well, candidates for post-sockets are rare (Kirkbride 1966:16).

Other artifacts include pounders and polishing pebbles, palettes, ground spheres, a mace head, ground half discs, and perforated discs. Ovoid specimens and pounders made of other materials were identified, but are rare. Ovoid pounders are not covered by Wright (1992b) but were classified based on their morphology. Most (n=114) of the pounders are spheroid, but 17 ovate/ovoid pounders were also recorded as well as three irregular core pounders. Almost all of the pounders are made of flint. Numerous spherical and spherical/irregular pounders were identified at PPNB Beidha (Moore 1978:249; Wright 1992a:427).

Eighty-three polishing pebbles were recorded at Ghwair I. Flint is the best-represented raw material for these artifacts, though limestone and quartz are also common and comprise equal proportions of the polishing pebbles. Quartzite is also present. It was possible to determine that 54 of the polishing pebbles were unifacial and 24 were bifacial.
Traces of red pigment on many of the polishing pebbles from Ghwair I suggests that they may have been used to paint the floors and walls. Polishing pebbles are common at PPNB Beidha (Wright 1992a:427). At Beidha, a quantity of polishing pebbles were identified in a work area with a lump of pigment (Kirkbride 1968a:268). During the Paleolithic, “water-worn pebbles” were used in processing of ochre (Wright 1992a:287).

Seven palettes were identified. Most are made of limestone, but two are made of sandstone and one is basalt. Two are ochred. Palettes identified at Beidha are notable for having holes drilled through one end (Kirkbride 1966:35).
Eight ground spheres were recorded. Most are limestone, but two are made of sandstone and one is flint. These artifacts vary in diameter from 1.4 cm to 8.6 cm. PPNB Beidha (Wright 1992a:428) yielded several of these artifacts.

One Ghwair I item fit well into Wright's "mace head" type (1992b:75). Another item, made of an unidentified green stone, could not be placed in that category by virtue of the fact that it had not been drilled all the way through. Drillmarks are present on opposite sides of the green sphere, indicating that it may be a mace head preform. The raw material of the green mace head or spindle whorl could not be identified and the other is made of vesicular basalt. Two mace heads were identified at PPNB Beidha (Wright 1992a:428).

Two limestone ground half disks were identified. These are nicely finished items that may have had a purely ornamental function. Two limestone perforated disks were recorded. These have holes drilled through their centers.

Ground cobbles/pebbles were identified at Ghwair I in a variety of sizes and shapes. Ambiguous or unidentifiable fragments could not be attributed to any particular artifact type mentioned above. Occasionally fragments showed potential for membership in several of the artifact types. Sometimes fragments were obviously members of one of two artifact types. When a fragment could not be identified as belonging to a single artifact type, it was considered "unidentified."

Unidentified artifacts could not be placed in any typological category. Many of these could not be attributed to groups of types of artifacts (for example, grinding slabs or querns). Frequently a small fragment with one ground surface is all that is represented. Other artifacts in the "unidentified" category include possible phallic representations.
Miscellaneous perforated stones (Wright 1992b:75) have the distinction of lacking modifications other than having been drilled.

_A Statistical Comparison of Ghwair I and Beidha_

Wright (1992a) published data on milling implements from Beidha that is rare in terms of its completeness and appropriateness for use in comparative analysis. Select milling implements that were identified at both Ghwair I and Beidha (Table 6) were subjected to a chi square analysis in order to determine whether there were substantial differences between the two assemblages. It was expected that proportions of different milling implements might be similar, much like proportions of milling implements to artifacts that were probably not used as part of a food processing activity.

Statistically significant (p<.001) differences in frequencies of milling implements between the two sites were identified, which may indicate differences in subsistence patterns due to marginal environmental differences between the two sites. Another possibility is that availability of different raw materials determined artifact morphology. The vicinity of Beidha is characterized by a large quantity of readily available sandstone.

_Raw Materials_

The raw materials of the ground stone artifacts at Ghwair I, with the possible exception of fine-grained basalt, are all available in the vicinity of the site. Most of the artifacts are made of limestone (Table 5, Figure 8). Basalt is also well-represented. Very little reduction debris was identified, with the exception of several preforms, several flakes, and a flake core. This may be due more to the difficulty of recognizing such artifacts than the rarity of ground stone tool production on the site. It is unusual for
Table 5. Raw Materials of Ghwair I Artifacts

<table>
<thead>
<tr>
<th>Type</th>
<th>Basalt</th>
<th>Flint</th>
<th>Granite</th>
<th>Limestone</th>
<th>Sandstone</th>
<th>Quartz</th>
<th>Quartzite</th>
<th>Indeterminate</th>
<th>Other</th>
<th>Total</th>
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<td>0</td>
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<td>36</td>
</tr>
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<td>0</td>
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<td>0</td>
<td>0</td>
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<td>0</td>
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<td>0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
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<td>0</td>
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<td>0</td>
<td>0</td>
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<td>0</td>
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<td>162</td>
<td>1525</td>
<td>130</td>
<td>17</td>
<td>14</td>
<td>18</td>
<td>11</td>
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</table>
Table 6. Artifacts from Ghwair I and Beidha Subjected to Chi-Square Analysis.

<table>
<thead>
<tr>
<th>Type</th>
<th>Beidha</th>
<th>Ghwair I</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block Quern</td>
<td>9</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>Boulder Quern</td>
<td>15</td>
<td>12</td>
<td>27</td>
</tr>
<tr>
<td>Trough quern</td>
<td>14</td>
<td>3</td>
<td>17</td>
</tr>
<tr>
<td>Boulder grinding slab</td>
<td>8</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td>Basin quern</td>
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<td>14</td>
<td>18</td>
</tr>
<tr>
<td>Bowl mortar</td>
<td>4</td>
<td>36</td>
<td>40</td>
</tr>
<tr>
<td>Boulder mortar</td>
<td>3</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Handstone, bifacial discoidal/oval</td>
<td>3</td>
<td>14</td>
<td>17</td>
</tr>
<tr>
<td>Handstone, bifacial discoidal/lens</td>
<td>42</td>
<td>1</td>
<td>43</td>
</tr>
<tr>
<td>Handstone, bifacial discoidal/flat</td>
<td>11</td>
<td>8</td>
<td>19</td>
</tr>
<tr>
<td>Handstone, bifacial discoidal/wedged</td>
<td>7</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Handstone, bifacial ovate/tapered</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Handstone, bifacial ovate/planoconvex</td>
<td>11</td>
<td>8</td>
<td>19</td>
</tr>
<tr>
<td>Handstone, bifacial loaf/oval</td>
<td>1</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Handstone, bifacial loaf/wedged</td>
<td>10</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>Handstone, bifacial rectilinear/flat</td>
<td>2</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Handstone, bifacial rectilinear/wedged</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Handstone a posteriori</td>
<td>13</td>
<td>44</td>
<td>57</td>
</tr>
<tr>
<td>Handstone, unifacial discoidal</td>
<td>8</td>
<td>17</td>
<td>25</td>
</tr>
<tr>
<td>Handstone, unifacial ovate</td>
<td>21</td>
<td>132</td>
<td>153</td>
</tr>
<tr>
<td>Handstone, unifacial rectilinear</td>
<td>4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Handstone, unifacial loaf</td>
<td>5</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>Miscellaneous, handstone</td>
<td>43</td>
<td>195</td>
<td>238</td>
</tr>
<tr>
<td>Pestle, bipolar cylindrical</td>
<td>17</td>
<td>18</td>
<td>35</td>
</tr>
<tr>
<td>Pestle, bipolar conical</td>
<td>8</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td>Pestle, unipolar conical</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Miscellaneous, pestle</td>
<td>3</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>Total</td>
<td>273</td>
<td>566</td>
<td>839</td>
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</tbody>
</table>

Note: Data from Wright (1992a:426-429).

ground stone debitage to be mentioned in reports, perhaps to the difficulty of recognizing it; however, Gopher (1997:167) notes the presence of flakes at PPNA Netiv Hagdud.

Although there is little evidence that ground stone manufacture took place on site, as Schmidt (1997) notes in the case of stone bowl manufacture, it is extremely unusual for tools used in the manufacture of ground stone artifacts to be identified as such at PPN/PN.
Figure 8. Raw Materials of Ground Stone Artifacts from Ghwair I.
sites. Small amounts of debitage and a few preforms comprise the evidence of ground stone reduction at Ghwair I. Investment in manufacture of ground stone tools, however, can be indicated by the degree to which artifacts tend to be strategically designed.

Without the benefit of replicative studies, it is suggested here that the soft limestone that comprises many of the artifacts was probably the easiest material to work. Many of the formal artifacts are made of this material. This indicates expedient manufacture, though not expedient design. There is a strong relationship between certain artifact types and certain raw materials (Table 5) but it may be difficult to determine whether this pattern is due to certain materials being preferred for certain artifacts rather than the local availability of the dominant raw materials.

*Ambiguous Evidence for Craft Specialization*

Given the results of Van Pool and Leonard’s (2002) standardization statistic, specialized design, rather than manufacture, is a possibility for spheroid pounders at Ghwair I, which manifest a low coefficient of variation (Table 7). Low coefficients of variation imply standardized manufacture characteristic of craft specialization. Whatever the function of these artifacts, however, a particular size range may have been appropriate even if the artifacts were not manufactured by specialists.

Low coefficients of variation for other artifact classes, such as counterpoise weights, may indicate craft specialization or simply be the function of small sample size. A perhaps more likely alternative is that these items were strategically designed and therefore exhibit a high degree of standardization in their manufacture without having been manufactured by specialists. If counterpoise weights indeed functioned as weights, strategic design of these artifacts would seem appropriate.
Use of this technique on ground stone assemblages from other Levantine Neolithic sites has the potential to yield interesting results. It is possible that craft specialization occurred at Ghwair I; however, the coefficient of variation alone does not provide compelling enough evidence for unqualified acceptance that it did. The coefficient of variation might be more appropriately used during the PPNB on assemblages from sites where workshops are identified.

Recovery Contexts

_In situ_ ground stone artifacts were identified on the floors of ten rooms. Milling implements were identified in each of these rooms, suggesting the ubiquity of milling activities across the site (Figure 9). The assemblage from Feature 17 in Area IV suggests it as a locus for food production and consumption. Ground stone artifacts from hearths, caches, and work surfaces provide evidence for other activities. Five hearths had ground stone artifacts associated with them. Milling implements and vessel fragments were each associated with four hearths. This, unsurprisingly, suggests the hearths as settings for food preparation and consumption. Four of the hearths also had other types of artifacts associated with them, which suggests them as a focal point for non-subsistence-related activities as well. One hearth, Feature 23 in Area II, had a high proportion of artifacts unrelated to milling or food consumption. The area adjacent to this feature was interpreted as a work surface. Aside from the vessels and milling implements, an axe, the mace head preform, a spheroid pounder, a perforated stone, and a polishing pebble that also functioned as a pounder were identified. Other ground stone artifacts probably not related to subsistence recovered from the floor of the room.
Table 7. Summary Statistics for Selected Ghwair I Artifacts.

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>Mean</th>
<th>Median</th>
<th>Standard deviation</th>
<th>Coefficient of Variation</th>
</tr>
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<tbody>
<tr>
<td>Pebble Mortar</td>
<td>31</td>
<td>7.58</td>
<td>7.10</td>
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<td>Bowl Mortar</td>
<td>25</td>
<td>14.96</td>
<td>13.50</td>
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<th>Median</th>
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<td>4.22</td>
<td>3.70</td>
<td>1.65</td>
<td>39.09</td>
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<td>15.13</td>
<td>14.88</td>
<td>2.88</td>
<td>19.03</td>
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<td>6.20</td>
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<td>5.24</td>
<td>5.15</td>
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<td>0.96</td>
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<td>Counterpoise Weight</td>
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<td>2.80</td>
<td>1.17</td>
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</tr>
</tbody>
</table>

containing the feature include an ochred handstone, two polishing pebbles, and a ground spheroid.

Three caches consisting solely of ground stone artifacts were identified at Ghwair I.

Ground stone artifacts were cached with chipped stone artifacts in three other instances.

The nature of some of the caches suggests utilitarian or logistical reasons for caching the tools; however, the setting of some of the other caches appears ritual.
Unlike Netiv Hagdud, where ground stone grave goods associated with burials were rare (Gopher 1997:172), at Ghwair 1, above the child burial in Area IV of the site two caches with associated ground stone artifacts were identified. Two bowl fragments and a pestle fragment were associated with a cache of blades. Artifacts associated with the cache of animal skulls include two palettes with pigment adhering to them, a handstone covered with malachite, a vessel fragment, and a celt preform.

According to Peterson (2002:132), PPNB “communal grinding areas” have not yet been described. The irony of this situation is that communal grinding was likely a prototypical MPPNB activity. A potential communal grinding area was identified at Ghwair I. A feature identified as a ground stone scatter in Area IV of the site (Table 8) included floor-contact bowls, a pounder, a grinding slab, and a handstone. Numerous ground stone artifacts associated with hearths may indicate communal work areas as well.

Over 20 ground stone artifacts were identified in 10 rooms at Ghwair I (Table 9). Large, relatively complete milling implements at Ghwair I are concentrated in several locations (Table 10) which may represent communal grinding areas. The largest concentration of large milling implements at least 50% complete consists of nine artifacts in Area I of the site. This group of artifacts 00N30W shares a level with Feature 31, a ground stone cache in Room C. One artifact was identified in Room A, and the locations of the other 8 artifacts regarding room designation is not specified. Artifacts in 20N00E were identified on the same level in the same room as Feature 35, a ground stone scatter, but were not recorded by the excavator as being part of the scatter. 20N05E is unusual in having large milling implement concentrations in three rooms of the unit as well as lacking features. Two milling implements found in a doorway in 00S40W were found on
the same level and next to a cache, not given a feature number, of two spheroid pounders and two ground spheres. A handstone was found in association with the trough quern.

Level 11 in 15S05W was interpreted as a work surface. The basin quern found in Level 13 of 15S05W shares the level with Feature 23, a hearth in the southwest corner of the North Room.

Discussion

The ground stone assemblage from Ghwair I appears to be typical of the MPPNB. Its closest analogue is Beidha, though, as noted, similar artifacts have been identified at numerous Levantine Neolithic sites. Less than 40% of Beidha's assemblage consists of probably subsistence-related milling implements (Table 11). PPNB ground stone industries show a decrease in percentage of nicely decorated forms and an increase in general of artifacts. The numerous and diverse milling implements are typical of the time period, during which Wright (1992a:321) hypothesizes grinding functioned to maximize the nutritional value of food harvested from limited areas near sedentary villages in the woodland. The numerous axes identified at the site, typical for the time period (Wright 1992a:322) may have enabled deforestation, leading to degradation of the area surrounding the site and its abandonment, following Rollefson and Kohler-Rollefson (1989).

Patterns of local raw material use, abundance of ground stone artifacts, and use of large tools evident at Ghwair I are typical of PPNB woodland sites such as Beidha and Jericho (Baird et al. 1992: 20). Use of primarily local raw materials is a strong argument for sedentism of the inhabitants of Ghwair I- a higher proportion of exotic raw materials
Figure 9. Map of Ghwair I.
would be expected for a highly mobile group. A highly mobile group would also be expected either to use smaller, easily portable artifacts unless caching or strategic or opportunistic reuse of large artifacts encountered at an encampment occurred.

If it is possible to undertake sourcing studies of the assemblage in the future, the basalt axes are good candidates for such a study since it is highly probable they are made of nonlocal raw material. Use of nonlocal raw materials for axes and celts appears to be a regional pattern, though Moore (1978:381) notes that this is more the case during the Pottery Neolithic than during the Pre-Pottery Neolithic. Jadeite from the Taurus region 300 km to the north was used for these artifacts at Neolithic 2 Abu Hureyra (Moore 1981), and jadeite axes at LPPNB sites in Israel provide evidence for long-distance contacts (Bar-Yosef 1981b:565). The basalt used for some of these artifacts at Ghwair I bears little resemblance to the basalt used for other artifacts which was likely obtained locally- it is much finer-grained. The use of nonlocal raw materials for Neolithic stone axes corroborates Renfrew’s (1972:371) interpretation of these tools as “desirable” artifacts.

Finally, the sheer quantity of ground stone artifacts at Ghwair I provides evidence of limited mobility and a long-term occupation of the site. What the majority of the artifacts lack in terms of formal design and decoration is belied by the investment in manufacture of a great quantity of artifacts. Perhaps the need to quickly mass-produce artifacts led to the preferred use of soft limestone at Ghwair I for certain artifacts. The raw material in question would have required less labor to reduce to its finished form. Items decorated by deep incisions at Ghwair I seem to be preferentially made of this material. Nissen et al. (1987:109) note the use of this material at LPPNB Basta.
<table>
<thead>
<tr>
<th>Area</th>
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<th>Feature Type</th>
<th>Artifact Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>29</td>
<td>Lithics cache</td>
<td>Spheroid pounder&lt;br&gt;Unifacial ovate handstone</td>
</tr>
<tr>
<td>I</td>
<td>31</td>
<td>Ground stone cache</td>
<td>Miscellaneous handstone&lt;br&gt;Other pestle/handstone&lt;br&gt;Pebble mortar</td>
</tr>
<tr>
<td>II</td>
<td>23</td>
<td>Hearth</td>
<td>Globular bowl, incised&lt;br&gt;Mace head&lt;br&gt;Three miniature vessels&lt;br&gt;Spheroid pounder&lt;br&gt;Unifacial ovate handstone&lt;br&gt;Two unifacial polishing pebbles&lt;br&gt;Unipolar conical pestle&lt;br&gt;Two unidentified artifacts&lt;br&gt;Vessel rim fragment</td>
</tr>
<tr>
<td>IV</td>
<td>11</td>
<td>Ash pit</td>
<td>Slab or quern fragment&lt;br&gt;Vessel rim fragment</td>
</tr>
<tr>
<td>IV</td>
<td>17</td>
<td>Hearth/pit</td>
<td>Spheroid pounder&lt;br&gt;Unidentified artifact</td>
</tr>
<tr>
<td>IV</td>
<td>19</td>
<td>Cache</td>
<td>Globular bowl&lt;br&gt;Miscellaneous vessel&lt;br&gt;Pestle fragment&lt;br&gt;Unidentified artifact</td>
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<tr>
<td>IV</td>
<td>21</td>
<td>Animal skulls</td>
<td>Axe/celt preform&lt;br&gt;Bifacial discoidal/oval handstone with malachite&lt;br&gt;Miscellaneous vessel&lt;br&gt;Two palettes with ochre&lt;br&gt;Unidentified artifact</td>
</tr>
<tr>
<td>IV</td>
<td>22</td>
<td>Hearth</td>
<td>Bifacial ovate/oval handstone&lt;br&gt;Globular bowl, incised&lt;br&gt;Ground half disk&lt;br&gt;Three miscellaneous handstones&lt;br&gt;Small slab abrader with ochre&lt;br&gt;Spheroid pounder&lt;br&gt;Seven unidentified artifacts</td>
</tr>
<tr>
<td>IV</td>
<td>27</td>
<td>Burial</td>
<td>Miscellaneous vessel</td>
</tr>
<tr>
<td>IV</td>
<td>35</td>
<td>Ground stone scatter</td>
<td>Block grinding slab&lt;br&gt;Two globular bowls&lt;br&gt;Two miscellaneous vessels&lt;br&gt;Spheroid pounder&lt;br&gt;Unifacial discoidal handstone</td>
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<tr>
<td>VI</td>
<td>28</td>
<td>Plastered floors</td>
<td>Pebble mortar</td>
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Table 9. Rooms at Ghwair I With High Ground Stone Artifact Densities.

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<thead>
<tr>
<th>Artifact Type</th>
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<th>AREA IV</th>
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<th>AREA VI</th>
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<td>25N05E</td>
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<td>Room C</td>
<td>Room B</td>
<td>Room C</td>
<td>Room D</td>
<td>Room 3a</td>
</tr>
<tr>
<td></td>
<td>Room 3</td>
<td>Room 3b</td>
<td>Room 1</td>
<td>Room 2</td>
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<td></td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>2</td>
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<td>1</td>
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<td>0</td>
<td>0</td>
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<td>0</td>
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<td>0</td>
<td>6</td>
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<td>1</td>
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<table>
<thead>
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<th>Type</th>
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<th>AREA VI</th>
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<tr>
<td></td>
<td>00S35W Room 1</td>
<td>20N00E Room C</td>
<td>20N05E Room B</td>
</tr>
<tr>
<td>Ground cobble/pebble</td>
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<td>5</td>
<td>0</td>
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<tr>
<td>Small slab abrader</td>
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<tr>
<td>Trapezoidal axe</td>
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<tr>
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<tr>
<td>Vessel rim fragment</td>
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<td>6</td>
<td>0</td>
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<td>Vessel base fragment</td>
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<tr>
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<tr>
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<td>Total</td>
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<td>23</td>
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Table 10. Concentrations of Large Milling Implements at Ghwair I.

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<th>Level</th>
<th>Details</th>
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<tr>
<td>I</td>
<td>00N30W</td>
<td>4</td>
<td>Room A, floor</td>
<td>Basin Quern</td>
</tr>
<tr>
<td>I</td>
<td>00N30W</td>
<td>4</td>
<td>Basin Quern</td>
<td>Block Grinding Slab</td>
</tr>
<tr>
<td>I</td>
<td>00N30W</td>
<td>4</td>
<td>Basin Quern</td>
<td>Block Grinding Slab</td>
</tr>
<tr>
<td>I</td>
<td>00N30W</td>
<td>4</td>
<td>Block Grinding Slab</td>
<td>Block Grinding Slab</td>
</tr>
<tr>
<td>I</td>
<td>00N30W</td>
<td>4</td>
<td>Block Grinding Slab</td>
<td>Boulder Grinding Slab</td>
</tr>
<tr>
<td>I</td>
<td>00N30W</td>
<td>4</td>
<td>Boulder Quern</td>
<td>Boulder Quern</td>
</tr>
<tr>
<td>I</td>
<td>00N30W</td>
<td>4</td>
<td>Boulder Quern</td>
<td>Boulder Quern</td>
</tr>
<tr>
<td>I</td>
<td>00N30W</td>
<td>4</td>
<td>Boulder Quern</td>
<td>Boulder Quern</td>
</tr>
<tr>
<td>I</td>
<td>00S40W</td>
<td>3</td>
<td>Floor, in S. entry</td>
<td>Trough Quern</td>
</tr>
<tr>
<td>I</td>
<td>00S40W</td>
<td>3</td>
<td>Entryway</td>
<td>Basin Quern</td>
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<tr>
<td>I</td>
<td>05S30W</td>
<td>3</td>
<td>Basin Quern</td>
<td>Block Grinding Slab</td>
</tr>
<tr>
<td>I</td>
<td>05S30W</td>
<td>3</td>
<td>Basin Quern</td>
<td>Saddle-shaped Quern</td>
</tr>
<tr>
<td>I</td>
<td>05S30W</td>
<td>3</td>
<td>Boulder Quern</td>
<td>Boulder Quern</td>
</tr>
<tr>
<td>II</td>
<td>15S05W</td>
<td>11</td>
<td>North room</td>
<td>Boulder Quern</td>
</tr>
<tr>
<td>II</td>
<td>15S05W</td>
<td>11</td>
<td>North room</td>
<td>Boulder Quern</td>
</tr>
<tr>
<td>II</td>
<td>15S05W</td>
<td>11</td>
<td>North room</td>
<td>Basin Quern</td>
</tr>
<tr>
<td>II</td>
<td>15S05W</td>
<td>13</td>
<td>North room, floor</td>
<td>Basin Quern</td>
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<td>Room C</td>
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<td>IV</td>
<td>20N00E</td>
<td>5</td>
<td>Room C</td>
<td>Block Grinding Slab</td>
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<tr>
<td>IV</td>
<td>20N05E</td>
<td>4</td>
<td>Room B</td>
<td>Basin Quern</td>
</tr>
<tr>
<td>IV</td>
<td>20N05E</td>
<td>4</td>
<td>Room B</td>
<td>Basin Quern</td>
</tr>
<tr>
<td>IV</td>
<td>20N05E</td>
<td>4</td>
<td>Room B</td>
<td>Block Grinding Slab</td>
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<tr>
<td>IV</td>
<td>20N05E</td>
<td>5</td>
<td>Room B</td>
<td>Block Quern</td>
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<tr>
<td>IV</td>
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<tr>
<td>IV</td>
<td>20N05E</td>
<td>4</td>
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<tr>
<td>IV</td>
<td>20N05E</td>
<td>5</td>
<td>Room D</td>
<td>Block Grinding Slab</td>
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</tbody>
</table>

Phallic representations are consistent with the site's temporal affiliation. Though identified at earlier sites, such early Natufian El-Wad Cave (Garrod and Bate 1937:41; Henry 1973:96; Marshack 1997; Weinstein-Evron and Belfer-Cohen 1993:102) and Mugharet El-Kebara (Henry 1973:102), Cauvin (2000b:244) refers to "the beginning of
Table 11. Percentage of Total Identifiable Artifacts from Beidha Constituting Milling Implements.

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<tr>
<th>Type</th>
<th>n</th>
<th>%</th>
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</thead>
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<tr>
<td>Boulder quem</td>
<td>15</td>
<td>1.1</td>
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<tr>
<td>Saddle-shaped grinding slab</td>
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<td>0.2</td>
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<tr>
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</tr>
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</tr>
<tr>
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</tr>
<tr>
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</tr>
<tr>
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</tr>
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</tr>
<tr>
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</tr>
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</tr>
<tr>
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<tr>
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</tr>
<tr>
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<td>0.1</td>
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</tr>
<tr>
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<tr>
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<td>0.4</td>
</tr>
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</tr>
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</tr>
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<td>Fragment, pestle</td>
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</tr>
<tr>
<td>Miscellaneous, pestle</td>
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</tr>
<tr>
<td>Boulder grinding slab/mortar</td>
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</tr>
<tr>
<td>Basin quern/mortar</td>
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<td>0.1</td>
</tr>
<tr>
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</tr>
<tr>
<td>Baguette pestle/handstone</td>
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</tr>
<tr>
<td>Other pestle/handstone</td>
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</tr>
<tr>
<td>Total</td>
<td>543</td>
<td>39.0</td>
</tr>
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</table>

Note: Data from Wright (1992a:426-429).

an ascendancy of male artistic representations..." during the PPNB. Although phallic representations have been identified in the Near East during earlier time periods, they became noticeably frequent during the PPNB and continued to appear in later assemblages elsewhere.

Conkey and Gero (1997:415) indicate that to “identify or assert the presence and activities of women on prehistoric sites” is an important initial theoretical step for archeological studies. The fact that the ground stone artifacts at Ghwair I appear to be mass-produced indicate that the people producing such tools, probably women, had to
allocate more time to other tasks, such as grinding. At PPNB Nemrik 9, grinding activities took place in courtyards (Mazurowski 1997:161), which would have allowed for more social interaction between women. The movement of grinding activities outdoors is likely due to an intensification in agricultural production (Mazurowski 1997:188). A possible courtyard at LPPNB Ba’ja contained milling equipment and may represent a communal grinding area (Bienert and Gebel 1998:82). Grinding activities at Ghwair I appear to have taken place primarily indoors; most of the concentrations of large milling implements occur within rooms. It is interesting that storage space specific to each house was not uncovered during the excavation. Storage bins were only identified in Area I of the site. Hastorf (1991:135) identifies women’s control over food storage as an index of their relative power within a culture.

At PPNA Netiv Hagdud an area with an unusually high density of ground stone artifacts was identified. The 54 artifacts include bowl fragments, polished and striated artifacts, pestles, and an axe (Gopher 1997:171). This area might have been a work area. What is particularly notable about the locus, however, is the presence of three adult human skulls within the same house (Gopher 1997:172). Kirkbride (1968a:268) suggests craft specialization is evident several rooms at PPNB Beidha characterized by large quantities of ground stone tools which at least must be characterized as work areas.

A Natufian cache with both ground stone and lithics is known from the site of Rosh Zin, and according to Henry, “can only be assumed” to represent “some sort of offering” (1973:208). The cache was located at the base of a column made of limestone (Henry 1976:342). Its contents consisted of four shaft straighteners, a shaped disk, and five blade cores.
A cache of pestles was identified at Natufian Hayonim Cave (Bar-Yosef 1991a:89). A cache of four pestles and two mortars was found at Natufian Wadi Hammeh 27 (Edwards et al. 1988:558). At Çayönü in a building complex (Redman 1983:192) a cache of blades was identified in association with a burial, near a cache of polished limestone artifacts (Redman 1983:193).

A cache of ground stone tools identified in a house floor at Netiv Hagdud is notable for being comprised of unusual artifacts in terms of frequency of decoration and raw materials (Gopher 1997:172). Caching was not the norm during the Upper Paleolithic (Wright 1992a:290).

In summary, the large artifact assemblage from Ghwair I is diverse in terms of artifact morphology as well as potential artifact function. While fitting the regional pattern well, rare artifacts were identified at the site. Though proportions of milling implements to other artifacts are similar to Beidha’s, there is statistically significant variation between artifact types between Ghwair I and Beidha, perhaps reflecting differences in locally available raw materials. Almost all of the raw materials for ground stone tools may have been obtained from the immediate vicinity of Ghwair I, though little evidence of ground stone tool manufacture on-site was obtained. Milling activities occurred throughout the site, primarily indoors. These may represent women’s work areas. Ground stone artifacts are included among the contents of caches and burial goods as well.
CHAPTER 6

CONCLUSIONS

Assemblage Composition, Artifact Contexts, and Implications of the Analysis

Introduction

As shown in previous chapters, the diversity of the ground stone assemblage from Ghwair I suggests that a variety of activities occurred at the site. This chapter addresses the research questions stated earlier in this thesis. The first of these questions is related to documenting and describing the ground stone from Ghwair I. This has already been addressed in the previous chapter, where the assemblage was thoroughly characterized.

Six additional questions relating to subsistence, activities other than subsistence, mobility, the site's role within a wider interaction sphere, gender and social stratification, and Ghwair I's role in a regional and chronological context are discussed below. Finally, this chapter evaluates the validity of the thesis' central hypothesis that the varied ground stone assemblage from Ghwair I has significant informational potential regarding the wide range of subsistence and non-subistence activities that occurred at the site. The following discussion addresses the research questions posed earlier in this thesis.

Subsistence Activities

The ubiquity of milling implements throughout the site indicates high intensity of food
processing activities, which fits conventional interpretations of the Neolithic lifeway. The concentration of large milling implements indoors represents a shift from earlier time periods. The size of the milling implements and the degree to which many of the handstones are expedient suggests a high workload for food-processors. As is typical during the MPPNB, mortar/pestle technology is dominated by handstone/quern technology, likely echoing a shift in emphasis from gathered foods such as acorns and tubers to early cultigens. Residue analysis should provide greater resolution to what specific tools were used for.

Non-Subsistence Activities

The morphology and contexts of ground stone artifacts from Ghwair I suggest that a variety of non-subsistence pursuits took place at the site along with food processing activities, supporting the hypothesis that these implements have the potential to provide substantial information about a range of activities during the PPNB. Along with milling implements, other artifacts including axes, celts, weights, gaming boards, shaft straighteners, vessels, and mace heads are represented at the site. The significant percentage of ground stone artifacts that likely had nothing to do with food production, echoed at other MPPNB sites, suggest something culturally significant outside of subsistence pursuits was occurring at this time.

Curation of ground stone tools at Ghwair I is suggested by the caches (Table 9), though it is likely some of these served a ritual function. Caches of unusual items and caches in proximity to burials and animal skulls are likely related to ritual. Artifacts from the room with the infant burial have interesting implications. The nature and context of these artifacts suggests a ritual placement of the items. Almost all of the artifacts...
recovered from nearby or contiguous rooms that were not associated with features were ordinary milling implements or vessels.

Ground stone tools as grave goods are known from as far back as the Middle Epipaleolithic (Peterson 1999:8). At Natufian El-Wad Cave, pestle fragments were associated with a child burial and a broken mortar with an adult burial (Garrod and Bate 1937:15). Ochred pestles served as grave goods at Natufian Hayonim Cave (Belfer-Cohen 1991:579).

A PPNB site in Israel, Kfar HaHoresh, serving primarily as a mortuary center, contained an infant burial with probable grave goods including a polishing pebble and pieces of ochre (Goring-Morris et al. 1988:3). The use of ochre likely had ritual significance. At PPNB Nahal Oren, two adult burials had polishing pebbles among the grave goods (Moore 1978:217; Noy et al.1973:79). At Nemrik 9, mace heads, a quern, a mortar, a handstone, and other ground stone artifacts comprise goods associated with a tomb burial of an adult that died in a fight (Mazurowski 1997:151). A multiple subfloor burial of four people at LPPNB Wadi Shu’eib yielded a plaster female figurine on the ribcage of an adult (Cooper 1997:54; Simmons et al. 2001:28).

Goring-Morris and Belfer-Cohen (1998:87) interpret human burials with wild animals as reflecting “psychological stresses” manifest by animal domestication; burials with domestic animals might have had a similar function. Kfar HaHoresh yielded an arrangement of human and animal bones placed to show the profile of an animal (Goring-Morris et al. 1998:2). Kuijt and Goring-Morris note that most infant burials during the MPPNB are in courtyard fill or otherwise outside buildings (2002:395). Adult burials during this time period usually are without grave goods (Kuijt and Goring-Morris...
Caching of sometimes plastered human skulls is an element of the typical MPPNB mortuary pattern (Kuijt and Goring-Morris 2002:395). For the time being, the infant burial at Ghwair I appears unusual but additional data from other MPPNB sites are needed to provide greater resolution to MPPNBN burial practices. In summary, evidence from the analysis implies that a greater emphasis on activities other than food processing, and possibly a greater emphasis on ritual, is warranted when interpreting MPPNB ground stone assemblages. Wright (1992a:337), in discussing Early Natufian iconography evident within ground stone industries, suggests that the activity of plant processing “may have been laden with ideological or ritual associations” and may have reflected social adjustments to additional labor (Wright 1992a:338). Bar-Yosef and Belfer-Cohen (1989:65) characterize adjustment to settled village life as “probably a painful process” requiring ritual to justify.

Patterns of Mobility at Ghwair I

Local availability of materials dominating the ground stone tool assemblage suggests generally low mobility for inhabitants of Ghwair I, as do high frequencies of expedient tools. As discussed in Chapter 1, even large ground stone tools have been demonstrated to be more portable than previously assumed. It may not be appropriate to construe the entire ground stone assemblage of Ghwair I as “site furniture,” especially given the lack of built-in tools. The sheer quantity of ground stone artifacts at the site, however, argues for low mobility for most of the inhabitants of Ghwair I.

Caching of subsistence-related ground stone tools, however, is evocative of the hunting-gathering way of life, and may have continued to occur at desert foraging sites during this time period (Wright 1992a:322). It is possible that many inhabitants stayed at
Ghwair I year-round and task forces frequently left the site for resource procurement or trading purposes. According to Bar-Yosef and Belfer-Cohen (1989:64), “Logistically organized long-distance hunting by groups of males probably began during the PPNA and continued to the PPNB.”

Caching of artifacts generally assumed to be used by men (chipped stone) with artifacts generally assumed to be used by women (ground stone) raises interesting questions. The presence of other women in the village, particularly relatives, with whom to share child care duties would have enabled women to join men in long-distance forays during the PPNB. Bar-Yosef and Meadow (1995:93) state that during the PPNB, “Logistically organized, long-distance forays carried out by men became a necessity, clearly demarcating male and female activities.” Ghwair I provides evidence to the contrary, suggesting the possibility that women took part in these journeys, assuming that the cached ground stone tools belonged to these women. Wylie (1997:82) discusses the bias regarding hunters and gatherers that women “are presumed to be tied to ‘home bases’” in conflict with ethnographic evidence for high female mobility, so it is likely that similar biases affect interpretation of Neolithic female mobility. Further investigations of the mobility of the inhabitants of Ghwair I, beyond the scope of this thesis, would require incorporation of botanical, faunal, and archaeological data.

Placement of Ghwair I Within the PPNB Interaction Sphere

To address stratification of settlement size, Wallerstein's (1974) core/periphery model (World Systems Theory) was one of the research domains of the work conducted by Simmons and Najjar (2003) at Ghwair I. Data from the ground stone assemblage at Ghwair I corroborates work done with the chipped stone assemblage in terms of placing it
in a context in which World Systems Theory is irrelevant. The local origin of the raw materials for the ground stone tools suggests a high degree of self-sufficiency of the inhabitants of Ghwair I, indicating that the model may need revision if applied since it requires a codependent relationship between settlements. This conclusion is consonant with that of Gervasoni’s chipped stone analysis (2000).

The morphological similarity of many of the ground stone artifacts to those from other PPNB sites, in particular, the gaming boards and figurines that were recovered from the site, provide evidence against Ghwair I, self-sufficient or not, being isolated. The presence of unusual artifacts such as gaming boards suggests a degree of interaction with other settlements such as ‘Ain Ghazal and Beidha, where they were also found. In spite of the site being smaller than ‘Ain Ghazal, Basta, and Wadi Shu’eib, its architectural complexity argues against its status as merely an outpost (Simmons and Najjar 1998b:7; Simmons and Najjar 2003). No workshops were identified that would indicate items were produced at Ghwair I for larger settlements.

Evidence Supporting MPPNB Social and Gender Stratification

Grinding activities at Ghwair I, appearing to have primarily taken place indoors unlike at Nemrik 9 (Mazurowski 1997:161), imply a change in women’s social interactions and may indicate a shift in women’s status. It is probable that at Ghwair I, women’s economic role and ritual status were in a state of flux. Movement of grinding activities back indoors during the Late PPNB would have isolated presumably adult women from the greater community (Wright 2000:117).

Wright notes, "The addition of grinding to an earlier, simpler repertoire of food processing would require social acceptance of additional labor" (1994:257). Bar-Yosef
and Belfer-Cohen theorize that farming “created extra responsibilities for women” (1989:64). If women were not yet experiencing a heavier workload, they at least were experiencing a change in economic activities they participated in (Bentley et al. 2001: 212, Ehrenberg 1989:77) and probably a decrease in equality with males as well (Ehrenberg 1989:38). From the Late Natufian onward, milling implements were strategically designed to produce larger quantities of smaller particles of food, which would have required social acceptance of the additional labor prior to the MPPNB (Wright 1992a:338).

Bar-Yosef (1991b:392) asks whether art objects might reflect a change in the status of women. Wright (2000:116) suggests that special-purpose buildings at PPNB sites lacking ground stone artifacts might indicate men’s corporate ritual activities. PPNB iconographic evidence suggests that gender was a highly salient concept, so it merits discussion and further investigation.

Women have higher status in hunter gatherer societies than in other types of societies (Ehrenberg 1989:65; Gailey 1987). The Neolithic transition may initially have benefitted all members of the group. As this way of life developed, however, it is highly probable that it benefitted some members of the group more than other members of the group. Gender issues have only recently begun to be addressed regarding the Near Eastern Neolithic. Further research beyond the scope of this thesis is likely to provide greater resolution to the nature and chronology of shifts in status and women’s responses to changes in subsistence and social organization that characterize the Neolithic.

The subfloor infant burial at Ghwair I and the unusual artifacts and features associated with it may imply the beginnings of social inequality and ascribed, rather than
achieved, status. Ascribed status is a hallmark of social inequality. More evidence is needed from elsewhere during this time period, however, to strengthen this hypothesis. The lack of evidence for craft specialization in the ground stone industry of Ghwair I manifest by an apparent lack of workshops and ambiguous coefficients of standardization provides an argument against inferring that economic complexity characteristic of hierarchical societies was in place at the site, though craft specialization has been identified in ground stone industries at other MPPNB sites (Bienert and Gebel 1998; Kirkbride 1968a; Mazurowski 1997).

According to Hodder (1990:292), "a major concern of social groups would... be to 'domesticate' people within settlements. This human control was achieved by using the conceptual, social, and economic structures." Economic control may have been manifest at Beidha, where there is evidence of craft specialization in the form of workshops that evidence of localized cereal preparation precedes (Kirkbride 1966). Ground stone production workshops, including one for phallic figurines, were identified at PPNB Nemrik 9 (Mazurowski 1997:163). A stone bracelet workshop was identified at LPPNB Ba’ja (Bienert and Gebel 1998:82). Some of the bracelets from Ba’ja and Basta show traces of ochre (Starck 1988:139).

Bar-Yosef and Meadow (1995) discuss stratification of settlement size as implicating "social complexity" during the PPNB, and burial patterns as indicating the emergence of hierarchy. Goring-Morris and Belfer-Cohen (1998:85) note that PPNB burial practices might indicate "both ascribed and attained status." Rollefson and Köhler-Rollefson (1989:80) interpret the distinction between subfloor and trash midden burials as reflecting
status differences. Lee (1990:226) lists "differential burials, presence of imported and/or luxury goods, house types," and "settlement hierarchies" as "indices of social inequality."

Evidence for social inequality has been identified earlier than the MPPNB. A tomb at Nemrik 9 contained one burial with grave goods and another with nothing, manifesting evidence of social inequality during the late PPNA (Mazurowski 1997:151). Kuijt (1996a) interprets Levantine PPNA secondary mortuary practices which did not involve grave goods as functioning to assuage social discord arising as a result of economic shifts.

Hayden (1990) asserts that socioeconomic inequality emerged during the Natufian. His evidence is that "shells from the Mediterranean and Red Seas, Anatolian obsidian, decorated mortars, polished stone dishes and cups, stone figures, decorated bone tools, paved structures and at least one structure with plastered and painted walls, slab covered and paved burials, and personal jewelry in the form of chaplets, diadems, frontlets, bonnets, bracelets, necklaces, and anklets all speak of considerable socioeconomic inequalities and quite powerful accumulators." This evidence indicates considerable investment of labor in non-subsistence pursuits, but by itself, it does not indicate socioeconomic inequality. That these items were common during the Natufian actually argues against Hayden's conclusion. For these items to be indicators of socioeconomic inequality, it would be expected that they would be associated with a small, elite segment of the population, which needs to be demonstrated. The ground stone assemblage from Ghwair I indicates such a pattern- it is dominated by items whose ordinariness is striking; however, unusual potential prestige goods are present in certain contexts.

Currently there is not a consensus on whether social differentiation arose during the Natufian; Kuijt (1996a) uses burial data to support social differentiation and Grindell
(1998) uses burial data to refute it. Belfer-Cohen(1995) notes the complexity of Natufian burial patterns but does not interpret this evidence as reflecting social stratification. Bar-Yosef and Goren (1973:54) interpreted burial data from Hayonim Cave as potentially reflecting social hierarchy. Further research is likely to clarify this issue.

During the Neolithic, given the rapid shifts in material culture and subsistence patterns, it is probable that there were rapid shifts in social organization as well, and it does not seem unreasonable to posit that individuals or groups might have opportunistically taken advantage of these shifts to obtain differential status and power over other human beings. Increased sedentism and proximity to other people might have served as a catalyst to centralized authority, and religion might have served as a means to arrive at consent to be governed. Trends toward sedentism evident from the Natufian onward enabled population growth, which may have been ideologically encouraged during the Neolithic. Higher population densities and higher levels of production can be inferred during the Neolithic, which indicates that social inequality was likely in its formative stages. According to Lee (1990:235), “social and sexual inequality have their beginnings as untoward consequences of changes in societal scale and in the levels and forms of production.” In his view, population growth leads to social inequality. As this transition takes place, higher population densities lead to fewer resources per member of the group, resulting in higher levels of production and creation of social tensions (1990:237). Ehrenberg (1989:88) states that social inequality may have arisen during the Neolithic. Goring-Morris and Belfer-Cohen (1998:87) view the “introduction of new social mechanisms” as a means to grapple with the increased size of settlements during the PPNB.
Kuijt and Goring-Morris (2002:421) argue against emergence of centralized authority assumed by force during the Pre-Pottery Neolithic due to lack of evidence for “extensive food storage,” “profound social differentiation,” conflict, and ritual evidence against social cohesion and collective identity. At Nemrik 9, however, there is evidence for social conflict in the form of victims of weaponry (Mazurowski 1997:86). Ideological control during the Pre-Pottery Neolithic may have made exerting control by force unnecessary. One might not expect social differentiation to be stark in the early stages of its formation. The infant burial with grave goods from Ghwair I may represent an example of a privileged individual. Kuijt and Goring-Morris note that “interrelated, coexisting hierarchical units” may have been present, and that egalitarian and hierarchical spheres were likely to have coexisted during the Pre-Pottery Neolithic, as they have been shown to coexist in many agrarian societies (2002:422).

In summary, the ground stone assemblage from Ghwair I, while supporting that milling activities are ubiquitous across the site, suggests that a variety of other activities were significant to the users of the technology such as woodworking and ritual pursuits. The size and nature of the assemblage argues for low mobility for most of the inhabitants of Ghwair I, though the caches argue for higher mobility for some segments of the population. The lack of craft specialization within the ground stone industry echoes conclusions of earlier research (Gervasoni 2000; Simmons and Najjar 2003) that Ghwair I does not appear to function as an outpost in the context of World Systems theory but is instead a small, independent center without being isolated from other PPNB developments. Although craft specialization is not evident within the ground stone industry, the association of the infant with unusual features and ground stone grave goods
suggests emerging social complexity. The movement of grinding activities indoors suggests that women’s social lives were becoming circumscribed and may indicate shifts in their status.

Evaluation of Ghwair I in Regional and Temporal Context

The assemblage from Ghwair I fits well into chronological and regional sequences for ground stone development in the Levant. In general, in terms of artifact morphology the ground stone industry at Ghwair I is typical of the PPNB- many morphological types found at Ghwair I were recovered from Basta and Beidha, in particular (Kirkbride 1966 and 1968). Trough querns, grinding slabs, and limestone platters, characteristic of the Southern Levantine sites, were identified at Ghwair I.

Upon cursory comparison of the ground stone industries of Nemrik 9 and Ghwair I, there appear to be more similarities than differences between Levantine and northern Iraqi technology and iconography. Rosenberg et al. (1998:26) put forth a convincing argument that neolithization along the Taurus-Zagros are occurred in relative isolation from Levantine developments, and use sites such as Nemrik 9 to bolster their argument. Similarities in artifact morphology between the two regions, however, are striking. Further research should clarify the degree to which neolithization along the Taurus-Zagros are occurred independently of Levantine developments.

Hypothesis Evaluation

The ground stone assemblage from Ghwair I exhibits a high degree of variation characteristic of similar contemporary sites due to the wide range of subsistence and non-subsistence activities that occurred at the site, some of which could be tied into the ground stone. The variation has been demonstrated to imply social distinctions and
degrees of mobility. The condition of the hypothesis that comparable comparisons could be made to other PPNB sites has been fulfilled.

Since most of the ground stone tools were not food-processing tools, the hypothesis that the assemblage has the potential to provide information about a variety of activities at the site is supported. Since mobility of some inhabitants of the site appears to be higher than what is typically assumed for the MPPNB, it is possible that not all inhabitants occupied the site year-round. The assemblage, while exhibiting unique characteristics, fits well into the MPPNB regional pattern. Elements of the assemblage and its context suggest the emergence of hierarchy and a shift in women's status, which is echoed by evidence from other sites but in need of reevaluation once more data is available.

Directions for Future Research

Wright's typology (1992b) endeavors to cover the entire prehistory of the Levant. While useful, data from Ghwair I suggests that it should possibly be supplemented by more in-depth typologies covering specific periods in Levantine prehistory. In the instance of Ghwair I, it was necessary to add the types of "maul" and "gaming board" among others, since these are formal tools that have analogues elsewhere. The occurrence of forms common to specific time periods in the Near East argues for use of typologies that are more specific to particular subsistence regimes and degrees of sociopolitical centralization, rather than regionally based typologies covering a long period of time.

Later time periods provide more clarity in resolving questions of production, exploitation, and subjugation of women. Analysis of imagery on stamp seals from Fourth Millennium B.C.E. Mesopotamia by Pollock and Bernbeck (2000) indicates ideological
reinforcement of women by elites as “menial laborers,” whether their typical status as such was borne out in fact. They suggest that worship of the goddess Inanna functioned to “legitimate the interests of elite men by suggesting that in fact both men and women had a share in power” and made women’s inferior status as exploited workers appear “natural” (Pollock and Bernbeck 2000:163). As they put it (2000:164), “Powerful men created the image of a world, which had very little place for women at all.”

The obvious question is, when did these social changes begin to foment? Gailey (1987) describes an evolutionary progression from egalitarian to hierarchical gender relations emerging in states. The means by which the gap between the two was bridged is not clear, though Gailey identifies the transformation between kin-based roles and those dictated by civil society as being central (1987:56), culminating in society revolving around gender, ethnic, and class stereotypes emerging “alongside a division of labor that privileges uselessness and the institutions of state that enforce the class relations” (1987:57). Cauvin (2000a; 2000b) places the shift toward inequality driven by iconography during the Neolithic.

With the emergence of "civilization" came a class of elites with power to make decisions affecting the rest of the group, wealth, and divine sanction. This was undoubtedly a positive development for people at the top of the hierarchy, but what about everybody else? As Nelson (1997:174) states, “the consequences of change are likely to be different for different groups within the culture.” It is known that many women had a limited role by this time (Wright 1996). The question is, how did they get in such a position? The nature of changes in ground stone assemblages from the Natufian through
the Pottery Neolithic may provide indirect evidence for such a change, since these are presumably primarily women's tools.

According to K. Wright (1993), sites that continued to be occupied after the PPNB show less frequency of ground stone in general and fewer types of ground stone tools into the Pottery Neolithic. The Natufian ground stone industry stands in contrast to that of the Neolithic due to the frequencies of decorated forms. Rather than these decorated forms being objects belonging to "those with pretensions" as Hayden (1990:45) put it, they were likely equitably distributed during the Natufian. It is during the Neolithic that it is obvious that they are rare.

The PPNB ground stone industry, though massive, looks mundane compared to the Natufian in terms of craftsmanship and aesthetics. The milling implements, if not other tools, appear to be mass-produced. Models invoking the stresses of the social change that relative sedentism and the shift to agriculture and pastoralism during the Neolithic entailed suggest themselves.

There is evidence that during the Neolithic, grinding became a communal activity. According to Zagarell (1986:416), collective activities of women, including grinding, "played a key role" in Mesopotamian state formation. Temple workers performing these duties were "isolated in cloisters" (1986:417). This labor situation, according to Zagarell, facilitated usurpment of power by state officials from kin groups, resulting in lower status for women (1986:420), the majority of whom were laborers. Wright (1992a:333) is divided about whether the association of milling implements with women is a result of neolithization or urbanization, but notes that ethnographic examples support the former.
Phallic figurines are known from the Natufian and have been recovered from PPNA sites (Kuijt and Goring-Morris 2002:377). Bar-Yosef and Belfer-Cohen (1989:64) and Bar-Yosef and Meadow (1995:79) posit that the shift from predominantly animal figurines of the Natufian to human, specifically female, figurines during the Neolithic “reflects a change in the hierarchy of values within Neolithic society.” According to Simmons (2000:225) the shift to male iconography during the PPNB "may suggest some rather dramatic social changes that could be linked to traditionally male activities such as animal husbandry. One could, albeit tentatively, posit a reduction in the role of females during the Pottery Neolithic, when pastoralism assumed more importance...". Hermansen (1997:323) acknowledges the association of phallic iconography with animal domestication- “The association between representations of rams and phalluses represents a dual symbolism well known in the Near East.”

The persistence of iconography evoking themes of fertility from earlier time periods suggests the salience of fertility in general. A mating couple figurine from Natufian ‘Ain Sahkri (Bar-Yosef 1983; Garrod 1958; Henry 1973) suggests ideological preadaptation to the Neolithic emphasis on fertility. Particularly detailed figurines were present at ‘Ain Ghazal during the PPNB (Rollefson 1987:30).

Gopher and Orelle (1996: 274) suggest that fertility figurines might have functioned to help encourage reproduction and Hodder sees female fertility symbolism as having been appropriated (1990:294). Worth noting are phallic figurines that appear to be circumcised, like those from Jarmo (Braidwood and Howe 1960:46; Moholy-Nagy 1983:300). Gopher and Orelle (1996:273) interpret Yarmukian iconography as reflecting different reproductive stages of women which appear to have been co-opted by men. In
addition, they (1996: 275) interpret phallic figurines as suggesting "a form of blood ritual for men was being practiced " during the Yarmukian. Numerous figurines representing both people and genitalia were identified at the Yarmoukian type site (Stekelis 1972:26).

Later time periods, during which human modification of the natural environment intensified, could be expected to be characterized by potent ideological developments. During the Halaf period in Mesopotamia corresponding to Moore’s (1978:406) “Neolithic 4” or the beginning of the Chalcolithic (Moore 1978:411), lasting roughly from the middle of the 5th to the middle of the 4th millennium B.C., female figurines and phallic amulets are common (Goff 1963). Large ground stone pillar figures with hollowed heads during the Chalcolithic in the Golan region are interpreted by Epstein as serving in fertility offerings (1978). Whether represented as figurines or erotic illustrations on stamp seals, fertility iconography persists in Mesopotamia through the 1st millennium B.C. (Goff 1963:153).

Physical anthropology has the potential to shed light on questions of gender inequality between during the Neolithic. To date, scarcity of skeletal materials has hampered such inquiry, but further research may result in a larger data set. Differential nutrition, performance of different tasks, and the existence of craft specialization can be obtained from skeletal evidence (Cohen and Bennett 1989; Ehrenberg 1989:26; Peterson 2002).

Although this line of inquiry was inspired by elements of the Ghwair I assemblage and contexts of some of the artifacts, and my literature review fed my fascination with this aspect of the Neolithic, resolution to these issues is far from having been achieved. Physical anthropology has enormous potential to shed light on questions of gender inequality and other types of social hierarchy that has, to date, been hampered by a
relative scarcity of human remains at PPNB sites. Ground stone analysis is a fuzzier lens through which to view these developments but, in conjunction with other lines of research, can provide useful information while raising even more research questions.
REFERENCES CITED

Adams, J. L.

Adams, R. B.

Akkermans, P. M. M. G.

Akkermans, P. M. M. G. and M. Verhoeven

Anderson, P. A.

Baird, D., A. Garrard, L. Martin, and K. Wright
Bar-Yosef, O.


Bar-Yosef, O. and A. Belfer-Cohen


Bar-Yosef, O. and N. Goren


Bar-Yosef, O. and M. E. Kislev


Bar-Yosef, O. and R. H. Meadow


Bar-Yosef, O. and F. Valla


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Braidwood, R. J.

Braidwood, R. J. and B. Howe

Byrd, B. F.

Byrd, B. F. and S. M. Colledge

Calamia, M. A.
1983 *Interpreting Human Mobility through the Analysis of Ground Stone Implements.* M.A. Thesis, University of Illinois at Urbana-Champaign.

Carneiro, R.L.

Cauvin, J.
Childe, V. G

Cohen, M. N. and G. Armelagos

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Crabtree, P. J., D. V. Campana, A. Belfer-Cohen, and D. E. Bar-Yosef
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de Contenson, H.

Dollfus, G., Z. Kafafi, J. Rewerski, N. Vaillant, E. Coqueugniot, J. Desse, and R. Neef

Durkheim, E.

Durkheim, E. and M. Mauss
1903 *De quelques formes primitives de classification*. Année Sociologique 1901-2.

Edwards, P. C.

Edwards, P. C., S. J. Bourke, S. M. Colledge, J. Head, and P. G. Macumber

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Edwards, P. C., P. G. Macumber, and M. K. Green

Ehrenberg, M.

Engels, F.
1884 Der Ursprung der Familie, des Privateigenthums und des Staats. Schweizerische Genossenschaftsbuchdruckerei, Hottingen-Zürich, Switzerland.

Epstein, C.

Evans, L. T.

Fall, P. A.

Fellner, R. O.


Fino, N.

Flannery, K.V.

Gailey, C. W.
1987 Evolutionary Perspectives on Gender Hierarchy. In Analyzing Gender: A


Garrod, D. A.

Garrod, D. A. and D. M. A. Bate

Gebel, H. G.

Gebel, H. G. K. and H. Bienert


Gebel, H. G. and J. M. Starck

Gero, J. M.
Gervasoni, J.

Grindell, B.

Goff, B. L.

Gopher, A.

Gopher, A. and E. Orelle

Goring-Morris, N.

Goring-Morris, N. and A. Belfer-Cohen


Hastorf, C.A.
Hauptmann, A., F. Begemann, E. Heitkemper, E. Pernika, and S. Schmitt-Streker
1992 The Early Copper Produced at Feinan, Wadi Araba, Jordan: The Composition of

Hayden, B.
1987 *Traditional Metate Manufacturing in Guatemala Using Chipped Stone Tools.* In
Lithic Studies Among the Contemporary Highland Maya, edited by B.
1990 Nimrods, Piscariots, Pluckers and Planters: The Emergence of Food Production.
1992 Contrasting Expectations in Theories of Domestication. In *Transitions to
Prehistory Press, Madison, Wisconsin.
Perspectives on the Prehistoric Transition to Agriculture*, edited by T. D. Price
and A. B. Gebauer, pp. 273-299. School of American Research Press, Santa Fe,
New Mexico.

Henry, D. O.
Dissertation, Southern Methodist University, Dallas.
1976 Rosh Zin: A Natufian Settlement Near Ein Avdat. In *Prehistory and
Paleoenvironments in the Central Negev, Israel Volume I*, edited by A. A. Marks,
1981 An Analysis of Settlement Patterns and Adaptive Strategies of the Natufian. In
*Prehistoire du Levant: Chronologie et Organisation de L’espace Depuis Les
Origines Jusqu’au Vie*, pp. 421-432. Millénaire Colloques Internationaux du
Centre National de la Recherche Scientifique no. 598.
1989 *From Foraging to Agriculture: The Levant at the End of the Ice Age.* University
of Pennsylvania Press, Philadelphia.

Hermansen, B. D.
1997 Art and Ritual Behaviour in Neolithic Basta. In *The Prehistory of Jordan II:
Perspectives from 1997*, edited by H. G. Gebel, Z. Kafafi, and G. O. Rollefson,
pp.333-343. Studies in Early Near Eastern Production, Subsistence, and

Hershkovitz, I. and A. Gopher
1988 Paleodemography, Burial Customs, and Food-Producing Economy at the
Beginning of the Holocene: A Perspective from the Southern Levant. *Mitekufat
Haeven* 23:9-47.

Hillman, G. C. and M.S. Davies
1992 Domestication Rate in Wild Wheats and Barley Under Primitive Cultivation:

Hodder, I.

Huckell, B. B.

Hughes, S. S. and B. Hughes

Kabo, V.

Kapches, M.

Keeley, L. H.

Kirkbride, D.
Köhler-Rollefson, I. and G. O. Rollefson

Kuijt, I.

Kuijt, I. and N. Goring-Morris

Larsen, C. S.

Leacock, E.

Lee, R.B.

Mackie, Q.

Mahusneh, H. M.

**Marshack, A.**

**Mazurowski, R. F.**

**McCorriston, J. and F. Hole**

**McGowan, D.**
1990 *CA-SAC-225: A Ground Stone Manufacturing Site in the Central Sierra Nevada Foothills*. M.A. Thesis, Department of Anthropology, California State University, Sacramento.

**Meurers-Balke, J. and J. Lüning**

**Mithen, S.J., B. Finlayson, A. Pirie, D. Carruthers, and A. Kennedy**

**Moholy-Nagy, H.**

**Moore, A.M.T.**
1981 *North Syria in Neolithic 2*. In *Préhistoire du Levant: Chronologie et
Millénaire Colloques Internationaux du Centre National de la Recherche Scientifique no. 598.

Muheisen, M., H. G. Gebel, C. Hannss, and R. Neef

Najjar, M.

Naveh, Z.

Nelson, S.M.
1997 Gender in Archaeology. Alta Mira, Walnut Creek, California.

Nissen, H., M. Muheisen, and H.G. Gebel

Noy, T.
Noy, T., A.J. Legge, and E. S. Higgs

Olszewski, D.

Perrot, J.

Peterson, J.

Pollock, S. and R. Bernbeck

Potts T. F., S. M. Colledge, and P. C. Edwards

Powell, D.
2001 Alternative Perspectives of Projectile Point Variability During the Levantine Neolithic. M.A. Thesis, Department of Anthropology, University of Nevada, Las Vegas.

Price, T. D. and A. B. Gebauer

Quintero, L. A. and P. J. Wilke

Raikes, T.D.
1980 Notes on Some Neolithic and Later Sites in Wadi Araba and the Dead Sea Valley. Levant XII:40-60.
Rathbun, T. A.  

Redman, C. L.  

Renfrew, C.  

Richerson, P. J., R. Boyd, and R. L. Bettinger  

Rindos, D.  

Rollefson, G. O.  

Rollefson, G. O. and A. H. Simmons  
Rollfson, G. O. and I. Köhler-Rollfson

Ronen, A. and M. Lechevallier

Rosenberg, M., P. Nesbitt, R. W. Redding, and B. L. Peasnall

Ruben, I., R. H. Barnes and R. Kana'an

Schepartz, L. A.

Schick, R.

Schmidt, Klaus

Schneider, J. S.
Dubuque, Iowa.

Servello, A. F.

Sillen, A.

Simmons, A.

Simmons, A. H., I. Köhler-Rollefson, G. O. Rollefson, R. Mandel, and Z. Kafafi

Simmons, A. and M. Najjar

Singh, P.
1974 *Neolithic Cultures of Western Asia*. Seminar, New York.

Smith, P.

Smith, B.D.

Smith, P. E.

Smith, P., O. Bar-Yosef, and A. Sillen

Solecki, R. L. and R. S. Solecki


Sørensen, M. L. S.

Stahl, A. B.

Starck, J. M.

Stekelis, M.
Stekelis, M. and T. Yizraely

Stordeur, D., B. Jammous, D. Helmer, and G. Willcox

Tilley, C.

Tosi, M.

VanPool, T. L. and R. D. Leonard

van Zeist, W. and J. A. H. Bakker-Heeres

Waheeb, M. and N. Fino

Wallerstein, E.

Watson, P. J.

Watson, P. J. and M. C. Kennedy
Weinstein-Evron, M. and A. Belfer-Cohen  

Wright, K. I.  


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