VILLAGE COMMUNITIES OF THE POTTERY NEOLITHIC PERIOD IN THE MENASHE HILLS, ISRAEL

ARCHAEOLOGICAL INVESTIGATIONS AT THE SITES OF NAḤAL ZEHORA

VOLUME II
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THE LITHIC ASSEMBLAGES AT THE NAḤAL ZEHORA SITES: A SUMMARY

Avi Gopher and Ran Barkai

This chapter outlines our major results on lithic industries and their role, and particularly that of the technology and curated tools, in the study of PN cultural entities present at the Nahal Zehora sites. It shortly discusses theoretical and methodological aspects of lithic industries that are relevant to the aims of Part 4 of this book. Production, technology, typology, function, variability and change over time are discussed not only in relation to the Naḥal Zehora sites but also with respect to the broader context of the PN in the region. Finally, the lithic industries serve to portray the lithic definition of PN archaeological entities as seen in the Nahal Zehora sites. The discussion chapters in Part 11 of this volume further elaborate several conceptions presented here while also discussing additional material culture assemblages. We begin this chapter by shortly surveying the lithic finds at the Naḥal Zehora sites. This is followed by a closer look at specific technological and typological trends of change in light of the cultural meaning of change. A short discussion is then devoted to the functions for which lithic implements were used at Naḥal Zehora. This leads us to a ‘lithic’ assignment of each of the cultural entities found at Naḥal Zehora.

26.1 AN OVERVIEW OF THE PN STONE INDUSTRIES AT THE NAḤAL ZEHORA SITES

The lithic assemblages recovered at the Naḥal Zehora sites are quite vast, including four major industries – flint, flaked objects of limestone and basalt, groundstone tools, and finally, obsidians. Before presenting the chief features of each industry, a brief comment is due on methodological aspects pertaining to all our lithic studies.

A COMMENT ON METHODOLOGY

Field method and laboratory procedures applied to the lithic assemblage are identical to those applied throughout the excavation. These are described in detail in Chapters 1 and 4 and are summarized in the concluding chapter of the pottery assemblages, Chapter 17.

The lithic studies presented throughout this book emphasize typological aspects of the various assemblages. Additional aspects of the chaîne opératoire (see Schlanger 2005) are also dealt with. These begin with locating sources of flint, obsidian, and certain groundstone tools. They continue with technological reconstruction of mainly flint and, to a degree, also of groundstone tools. The life cycle of flint and some groundstone tools is investigated in terms of employment, re-sharpening, re-tooling, recycling and discard patterns. Finally, a small-scale spatial analysis involving certain flint and groundstone elements, as well as elements of other assemblages, is presented in Part 8 of this book (see Chapter 37).
Results are presented quantitatively throughout the lithic chapters, using simple measures of frequency as well as density of flint items per excavated volume unit. An attempt to define lithic cultural entities of the PN in Naḥal Zehora assumes that the rate of intrusion for flint and other lithic industries was as low as it was for pottery (see Chapter 13; for a discussion on intrusion, mixed assemblages, and definition of cultural entities see Chapter 17). This assumption is significant for some of our results and conclusions concerning the history of specific lithic technological and typological traits along the PN. It is also relevant to our view of cultural evolutionary dynamics and patterns as viewed against the cultural entities of the PN.

Our typologies of the various lithic assemblages are largely hierarchical and based on morphology (see Chapter 18). We do not normally delve into detail beyond the group and type levels of each class, except for certain curated tools such as sickle blades, and to a smaller degree, arrowheads, bifacial tools, and burins, which we detail to the subtype level. Throughout the lithic chapters we present our finds at the level of the stratum and substratum. Where possible, we delve into details of change over time within the strata. Such detail, however, is available only for the Yarmukian Stratum IV and the Wadi Rabah Stratum II at Naḥal Zehora II. Notwithstanding, as with the pottery chapters, here, too, we occasionally generalize our statements, distinguishing the combined early PN as depicted in the Yarmukian Stratum IV and the Lodian Stratum III from the late PN as depicted in the Wadi Rabah Strata II and I at Naḥal Zehora II and Strata B and A at Naḥal Zehora I.

**FLINT**

Most of the flint assemblages are made of medium-quality raw material, and many of the tools are ad hoc, expedient tools. The Naḥal Zehora flint assemblages thus generally indicate little investment in the acquisition of raw material and an ad hoc approach to blank production. In contrast, standard (formal) curated tools were meticulously shaped. The production of blades and bladelets and the shaping of certain tool types such as arrowheads, sickle blades, or bifacial tools reveal superior and professional workmanship and high manipulation capabilities.

The composition and intensity of production of the flint assemblages are particularly interesting. As in the pottery assemblage, all lithic assemblages at Naḥal Zehora generally consist of varying frequencies of similar tool type inventories. These include arrowheads, sickle blades, bifacial tools, scrapers, burins, awls and borers, notches and denticulates, truncated items, retouched flakes and blades and often also retouched bladelets, and a few miscellaneous (varia) items. No general trends can be ascertained regarding the varying frequencies of these items over time, with three exceptions concerning arrowheads, as well as sickle blades and bifacial tools types. The case of burins at Naḥal Zehora I is also exceptional.

The finds show a steady albeit moderate rise through time in the density of flint items per m², peaking at Naḥal Zehora I. Stratum IV shows a density of 328 items per m², 345 items per m² are found in Stratum III and 386 in Stratum II, while at Naḥal Zehora I the density amounts to 466 items per m². These results differ from similar analysis procedures and calculations applied to the pottery assemblages, which reveal a major rise in the density of pottery sherds from Stratum IV to Stratum II and later a decrease at Naḥal Zehora I. The two assemblages, then, clearly follow different patterns of evolution.

Certain patterns of change within the Naḥal Zehora flint assemblages are discerned (see below). The first four points concern technological issues while the rest concern typological elements in the assemblages. Both the technological aspects and typological ones concerning arrowheads, sickle
blades, and bifacial tools are further detailed in the next section, where we discuss trends over time in these specific elements.

- The typical PPN core-and-blade production technologies are absent from the Naḥal Zehora assemblages.
- While flakes were dominant, the systematic production of relatively short and wide blades continued throughout the Naḥal Zehora sequence. Relatively long and narrow blades, in contrast, were produced only in the earliest Stratum IV. The production of bladelets became a significant component in the later Wadi Rabah strata at both Naḥal Zehora sites.
- Of interest in this regard is the fact that a blade production trajectory appeared in Strata IV and III providing straight and often wide and thick blades suitable for shaping sickle blades of Types C and D with no need for pressure-flaking or for any extensive effort to be invested. This blade production trajectory increased over time and became widespread later in the Wadi Rabah flint industry.
- Pressure-flaking was prominent in the early PN of Nahal Zehora II, but it virtually disappeared in the later PN of Nahal Zehora I. The intensive use of pressure-flaking in the production of sickle blades and arrowheads in Strata IV and III seems to compensate for the absence of good blades. Extensive efforts were invested in Lodian pressure-flaked sickle blades and arrowheads, most probably because suitable blades were not systematically manufactured by Lodian flint knappers, and sickle blades were instead made mainly of flakes or wide and short blades (see Chapter 19).
- The frequency of arrowheads declined until the tool completely disappeared in the later part of the PN sequence at Naḥal Zehora. Arrowheads are usually either few or absent from Wadi Rabah sites but appear in the Lodian and Yarmukian assemblages (Gopher 1989:145), so Naḥal Zehora is no exception in this respect. Similarly, transverse arrowheads appeared in the late Yarmukian and the Lodian at Naḥal Zehora, although few of these were reported from earlier sites in the region (e.g., Dag 2001: Fig. 15:5).
- The assemblages at Naḥal Zehora II provide a unique opportunity for tracing the sequence of lithic work involved in the production of arrowheads from flakes by pressure-flaking (for details see Chapter 19).
- A change occurred in sickle blades typology and blank selection along the PN, which is manifested at Naḥal Zehora, too (see Gopher et al. 2001). Sickle blades of Types A and B were found in Strata IV and III of Naḥal Zehora II while Types C and D appeared in all strata. The fact that sickle blades of Types A and B were not found in Wadi Rabah strata at either of the Naḥal Zehora sites further supports the notion that they are characteristic Yarmukian and Lodian types. Sickle blades of Type A or similar types already appearing in the PPNC (Galili 2005; Galili et al. 1993; Rollefson and Köhler-Rollefson 1993) were made from relatively narrow blades and have rather deep and coarse denticulation. In contrast, sickle blades of Type B are shorter and wider, and were often made on flakes (for Yarmukian and Lodian sickle blades see Crowfoot-Payne 1983; Gopher 1989; Gopher and Gophna 1993:308-320; Gopher et al. 2001; Khalaily 1999). Both of these types were shaped by flat and pressure-flaking. For the most part, the geometric sickle blades of Type C made their appearance as early as Yarmukian Substratum IVC at Naḥal Zehora II as a new type of sickle blade made by what was then a different shaping technique. These usually rectangular sickle blades are backed, truncated on both ends, and their cutting edge is either finely denticulated or plain. They became dominant only in the later Wadi Rabah assemblages (e.g., Crowfoot-Payne 1983; Gopher 1989; Gopher and Gophna 1993:328-329; Gopher et al. 2001).
CHAPTER 26: THE LITHIC ASSEMBLAGES AT THE NAHAL ZEHORA SITES: A SUMMARY

The relatively rapid changes in sickle blades during the PN period highlight the dynamic nature of the period concerning the production and use of this tool type (Gopher et al. 2001). This trend is even more accentuated in light of the preceding long era of the PPNB during which sickle blades had maintained their technological and typological properties with little change.

Throughout the sequence, the bifacial toolkit at Naḥal Zehora included massive bifacial tools with a wide cutting edge, such as axes and adzes, as well as the more delicate chisels, which have a narrow working edge. A change, however, occurred in the composition of bifacial flint tools, as adzes took over the role of axes. Adzes appeared as early as the Yarmukian Stratum IV and steadily increased in frequency along the sequence. Chisels remained stable in frequency although typologically they have slightly changed. Interestingly, manufacturing standards rose for adzes, although the quality of raw materials used for all bifacial tools declined. Polish was used throughout the sequence to shape bifacial tools, which frequently underwent intensive repair, maintenance and recycling activities (for a detailed discussion and references see Barkai 2000, 2002, 2004, 2005; Yerkes and Barkai 2004).

Burins display a peculiar trait. While they are rare at Naḥal Zehora II, they are abundant, especially the transverse type, at Naḥal Zehora I.

Some tool types, such as massive borers and tabular scrapers, used to be considered characteristic of the later PN (Gopher 1988-89, 1989, 1995; Gopher and Gophna 1993). These, however, are minor or completely absent from the Wadi Rabah strata at Naḥal Zehora. Such is also the case with bifacial knives and spearheads that are rare or absent in the Naḥal Zehora sequence, while they have been recovered from other Late PPN and PN sites (e.g., Galili 2005; Khalaily 1999:39-40, Fig. 27; Olami et al. 1977; Yeivin and Olami 1979).

FLAKED LIMESTONE AND BASALT

The flaked limestone industry at Naḥal Zehora is substantial. In contrast, the flaked basalt assemblages are minor.

- Hard limestone is conspicuous, accounting for about 90% of the assemblage, throughout the strata;
- Generally, the limestone industry is an ad hoc, flake dominated industry;
- The low number of cores does not account for all the limestone debitage and tools found on-site;
- Discs and hemispheres are tool types unique to the limestone industry at Naḥal Zehora;
- No basalt cores were found in the excavations, and we assume that the flaked basalt assemblage represents manufacturing by-products and maintenance of basalt groundstone tools.

GROUNDSTONE

Active (processors) and passive groundstone tools show no clear pattern of change over time in frequencies, while density shows a clear rise in Stratum II in all groundstone tools but pestles. The trends in later strata are diverse. A few specific trends seem to be important:

- Thin delicate bowls (Type A6) increase in number over time from Substratum IVA at Naḥal Zehora II, throughout the strata and at Naḥal Zehora I. Simultaneously, the larger and less delicate bowl types decrease in quantity.
- Pedestaled bowls appear as early as the Yarmukian Substratum IVC. These include both a full pedestal and the occasional fenestrated bowl, identifiable through fragments of its legs. These bowls thus seem to have made their debut in the PN (and see Gopher and Greenberg 1987, 1996) before becoming characteristic of the later Chalcolithic Ghassulian.
Bi-plano processors of Type B1 are marked in Stratum IV.

Of the plethora of groundstone items, only six types of tools appear in Substratum IVD. This seems to supply further support for the notion that this occupation was in a pioneering stage during the settlement of Nahal Zehora II (see Chapters 4 and 6).

Strangely, the Nahal Zehora I assemblage does not include any active processors of Group B (mano).

Polished stone axes – celts, made of different minerals (green, black, grey) were found in small numbers.

Sling stones are confined to the Wadi Rabah strata, with the exception of a single item that was found in Stratum III.

**OBSIDIAN**

Obsidians are unique items because of their raw material. Only 26 obsidian items were found in all strata of Nahal Zehora II, ranging in colour from translucent, to semi-translucent grey, to opaque black.

While the number of items is generally small, Stratum II shows a higher density of obsidian items than Strata III or IV;

Only blanks, mainly bladelets with no cores or Core Trimming Elements appeared among the obsidian items, signifying that items were imported rather than produced on-site;

A provenance study of a small sample indicates diverse sources: one Nahal Zehora obsidian was ascribed to the Cappadocian Göllü Dağ volcano and four other items indicate two Eastern Anatolian sources – Bingöl and Nemrut Dağ. Two additional items are from unknown sources.

### 26.2 TECHNOLOGICAL AND TYPOLOGICAL CHANGE DURING THE PN

While PPN lithic production, especially in the PPNB, is highlighted for its sophisticated core-and-blade technology, the PN is often identified with the decline of flint and other lithic industries (*e.g.*, Rosen 1996, 1997:151-164). This, in our view, is an unjustified judgment. PN lithic industries deserve an objective, independent and careful examination, and the degree of creativity and innovation in PN flint industries should not be underrated. These express themselves in the rapid changes in major tool categories and the revival of systematic production of short and straight blades and bladelets. Certain tool categories, such as arrowheads, sickle blades, and bifacial tools are further evidence of the superior technological capabilities of PN lithic industries. In fact, this superiority continues to be evident during the Chalcolithic in items such as perforated flint discs, bifacial tools, blades, and bladelets or even during the Early Bronze Age in items such as the Canaanese blades. It is thus too early to pronounce the end of lithic technology in the PN.

It could be quite tempting to employ the model suggested by Jeske (1992:469-470) whereby a decline in the energy invested in a flint industry is related to a shift of energy towards social or political activities. PN lithic industries, in relation to PPNB, may seem to represent a decline to a rather simple, nonstandard industry (*Gopher 1994a, 1994b; Nishiaki 2000:3*). However, in our view, PN flint industries do not represent stagnation or decline, but rather exhibit extensive diversity and innovation (and see Nishiaki 2000:218-219). The intensive sociopolitical readjustment in the PN, especially in the early PN (see Garfinkel 2002; Gopher 1995; Gopher and Orrelle 1996; Orrelle and Gopher 2000), cannot thus be related to a decline in lithic production.

At Nahal Zehora, we trace the technological change in PN lithic industries in two groups of tools in particular – sickle blades and bifacial tools, while a secondary focus is set on arrowheads. Before we embark on a specific quest to delineate trends of change within the lithic industries of the Nahal Zehora sites, we first provide a short theoretical framework in which technological changes in general must be understood, and those of Nahal Zehora in particular.
TECHNOLOGICAL CHANGE: A SHORT THEORETICAL FRAMEWORK

Technology is embedded in every aspect of material culture that is the result of activities performed in either the natural or cultural environment. Being so complex, technology has various prerequisites for it to successfully serve the interests of a community. First, it requires knowledge and social networks for the procurement of raw materials. Second, the use of materials for the manufacture of different types of essential facilities, tools and objects, requires technological skill. Finally, technology calls for a network involving social status and political power to influence and gain community support for the introduction of new products and technologies. These issues have been discussed by several researchers, such as Killick (2004), Khun (2004), Roux (2003), and Schiffer (2004).

A wide range of information is attainable from the analysis of prehistoric lithic industries through various techniques, such as cognitive or social analyses (e.g., Karlin and Julien 1994; Perles 1992; Renfrew 1993, 1994; Schlanger 1994; Wynn 2002 and references therein). This type of analysis aims at inferring ancient ways of thinking from material remains. Even critics of cognitive theory (e.g., Flannery and Marcus 1993) admit that its implementation is indeed justifiable when a wide range of specific data is available pertaining to culture, social structure, and economy. Cognitive analysis combined with a meticulous analysis of flint and other lithic industries are potentially useful in reconstructing the chaîne opératoire of lithic production and illustrating past worldviews and learned behaviours. Mental constructs and cognitive abilities such as planning, decision-making, improvisation, preferences, and symbolic behaviour, may thus be revealed.

Another interpretive approach concentrates on the social outcomes of technology and the role of social interaction as a mediator in technological change. This approach defines technological change as a dynamic cultural phenomenon embedded in action, worldviews, and social relations. Technology is not seen as a mere material means to the production of artefacts but rather as a fundamental medium through which worldviews, social relationships, and power structures are expressed. The technological analysis of seemingly mundane material culture production may thus contribute to an understanding of the prehistoric way of life and cultural change (e.g., Dobres and Hoffman 1994). Technology can similarly reflect political strategies and power struggles (Pfaffenberger 1992). Controlling information about raw materials is one potential example through which economic, social, and political supremacy could have been achieved.

Innovation and change in past technology thus become particularly interesting, when prehistoric production is looked upon as a meaningful social discourse aimed to negotiate a set of practices related to material culture. Technological change therefore reflects a process consisting of several stages. First, a number of elements create the impetus for technological change. Secondly, the invention or innovation may be proposed, and thirdly, the suggested change must go through a process of acceptance and adoption. Each of these stages involves a complicated interplay of social conditions and patterns of behaviour.

Rosenberg (1990) argued that technological change results from a certain pressure, either necessity or human initiative. Innovation purporting to relieve a specific pressure or fulfil a need is accepted and assimilated more rapidly than a fortuitous invention. Similarly, Schiffer and Skibo (1987) suggested that technological change occurs because of a new functional need or a new social or symbolic structuring. Fitzhugh (2001), following evolutionary ecological models, argued that the process of innovation reveals a system sensitive to risk. Not all technological changes are ground-breaking or earth-shattering inventions. Some of these changes are merely improvements in existing media, such as a tool type, achieved in the course of their use while striving for their optimal and most effective design (Schiffer and Skibo 1987:598).
The adoption and assimilation of technological change has a major effect on conceptual and practical aspects of life. Technological innovations may clash with those sectors of society that find difficulty in adapting to the changes, as innovations occasionally entail the abandonment of and dissociation from routine, familiar, and traditional behaviour. In many cases, non-technical considerations such as status, identity or political obligations determine the acceptability of a technological change. Social relations within the group can determine the speed of the process of change, especially in cases of conflict between the proposed change and any opposing elements of society (Lemonnier 1993:21-22). Thus, the process of acceptance and assimilation of the new invention into the system may be lengthy before its transformation into a widespread technique.

Group members are likely to share a set of conceptions and thoughts regarding the acquisition and manipulation of raw material, tool shaping procedures, and patterns of use and discard. The new technological element has to fulfil specific needs and meet certain standards before its assimilation into the system would be allowed (Kim 2001). It has to be congruent with the economy in order to be supported, developed, and distributed (Spratt 1982; and see also Pfaffenberger 1992). In centralized, well-organized societies, powers from within support the inventor, whereas the mechanisms of invention and innovation are unclear in less complex societies (Spratt 1982). Spratt argued that a major change in the pace of invention occurred after the transition to permanent settlements, which was followed by an investment of effort in stationary tools. This chapter refers to processes of change through time in lithic technology and typology in light of this perspective.

TECHNOLOGY

Technologically speaking, the major change in PN lithics as a whole and at Nahal Zehora in particular is the absence of the well-known naviform cores and other opposed platform (bidirectional) cores of the PPNB. The few blades that may perhaps be attributed to this technology are sporadic, perhaps some collectors’ items. It is generally accepted that the specialized technology producing non-twisted, non-curved blades reached its peak during the PPNB, diminishing throughout the PPNC until its cessation in the PN. However, Barzilai and Garfinkel (2006), following their finds at Sha‘ar ha-Golan, recently suggested that this technology continued into the early PN.

The production of blades using other technologies indeed continued in the early PN, mainly with narrow and relatively short blades (compared to the PPNB) for Yarmukian denticulated sickle blades of Type A. The same is true at Nahal Zehora II, where sickle blades of Type A were produced on locally knapped blades. The innovation, however, lies in a certain percentage of sickle blades of Types C (and D) in the Yarmukian layer of Nahal Zehora II, which were made of different raw materials in a distinguished blade production trajectory. This is not surprising, as similar blade production continued throughout the Neolithic period and had actually never ceased. This trajectory of short, relatively wide, and in some cases thick blades, became dominant in late phases of the PN. In other words, the Yarmukian exhibits two major trajectories of blade production: narrow and relatively short blades for Type A sickle blades made of high quality homogeneous (greasy) raw material, and shorter, wider blades for Types C (and D) also made of homogenous raw material but of medium quality. Despite having two trajectories, the blade trajectory as a whole was quite marginal. It was flakes that dominated the lithic industry at this time, some of which were also used for the production of sickle blades of Type B as well as for arrowheads.

1. But see comments by Quintero on the scavenging of tools, blades and blade segments reduced from naviform cores by the Yarmukian inhabitants of‘Ain Ghazal and Jericho (Quintero and Wilke 1995).
The use of flakes for the production of sickle blades and arrowheads was intensified during the Lodian Stratum III of Nahal Zehora II. The conspicuous use of pressure-flaking for the shaping of arrowheads and sickle blades in Strata IV and III possibly compensates for the absence of high quality blades, reflecting a technological choice. Disregarding, the two trajectories of blade production continued at the same time. Sickle blades of Types A and B were still dominant in the Lodian and were still accompanied by the presence of sickle blades of Types C and D.

Stratum II portrays quite a different picture. First, flakes were no longer used for sickle blade production. The production of narrow high-quality blades for the production of Type A sickle blades also ceased, while the trajectory designated for the production of sickle blades of Type C and D soared. We suggest that blades were imported to Nahal Zehora II, since the industry does not seem to account for the number of blades uncovered at the site. At the same time, flakes and short blades were used in the diminishing industry of arrowheads, which have virtually disappeared. Pressure-flaking, previously so prominent, had also come to an end. Interesting is the innovative reappearance of bladelet production at some stage during this Wadi Rabah cultural phase.

The lithic industry of the PoWR-PG at Nahal Zehora II is too small to incorporate into a general evolutionary view. However, it does show both technological and typological continuity compared to the preceding assemblages.

Two peaks of blade production, then, are noted in the PN sequence of Nahal Zehora – one in the Yarmukian and one in the Wadi Rabah, which is particularly conspicuous at Nahal Zehora I. Blade production is less dominant between these two phases, that is, during the Lodian. In contrast, bladelets are clearly marginal in the assemblages of the PPN and early PN (if bladelets resulting from core preparation and maintenance are ignored). Bladelets as desired end products emerge anew, as a technological innovation, in the late PN and the Chalcolithic Ghassulian (Gilead 1984; Gilead et al. 1995). Bladelet production at Nahal Zehora I, for example, represents a meticulous technology practiced on selected, high-quality raw material. High-quality material and miniaturization combined may reflect a specific lithic trajectory, producing distinctive products whose function is still unknown. While a small-scale study was attempted, preliminary observations concerning use-wear on retouched and plain bladelets from Nahal Zehora II, unfortunately, provided no conclusive results on their function.

Following the Wadi Rabah and PoWR-PG phases, the production of blades similar to those used for sickle blades of Types C, D, and E continued in the Chalcolithic Ghassulian (Gilead et al. 2004). At the same time, the production of bladelets not only continued, but increased, constituting a clear component of Chalcolithic flint assemblages. Yet another technological peak in blade production was reached in the Early Bronze Age with the mass production of Canaanean blades, for which new and more efficient technology was devised (Rosen 1997; Shimelmitz et al. 2000).

**TYPOLOGY**

Typologically speaking, the three main groups of tools portraying a picture of change are arrowheads, sickle blades, and bifacial tools.

**ARROWHEADS**

The disappearance of the characteristic PPNB and PPNC arrowheads is evident. Small numbers of these arrowheads, such as Amuq and possibly Byblos points still appeared in the PN but they were shaped differently compared to earlier periods. Smaller PN types of arrowheads, such as ha-Parsa, Nizzanim, and Herzliya points recovered at Nahal Zehora II dominate the scene. These types differ from their PPN
predecessors in several respects. First, many were made from flakes rather than blades. Secondly, they are smaller and lighter than the PPN arrowheads, and finally, were shaped by intensive pressure-flaking. These differences represent a shift in invested efforts from blank production (in the PPNB) to tool-shaping starting off with an unprepared blank in the PN.

The transverse arrowhead that appeared in Substratum IVA represents an innovation in the arrowhead inventory. The frequency of this type of arrowhead increased, becoming the sole type of arrowhead found at Nahal Zehora I. In effect, this is the last new Neolithic arrowhead type produced by innovative manufacturing techniques (see Gopher 1994a: 42, 265). Perhaps it is not so surprising to find this innovation taking place in the Yarmukian or possibly in the PPNC (Dag 2001:28-31, Fig. 15:5), in light of the disappearance of typical PPNB and PPNC arrowheads. The new and unique shape of transverse arrowheads may be connected to innovative usage or new social messages conveyed by this tool. The disappearance of arrowheads, including transverse arrowheads, at the end of the PN period is highly significant, attesting to the end of a long Neolithic tradition. This tradition started with small arrowheads on bladelets and small blades in the PPNA (El Khiam, Salibiya, Jordan Valley points) and continued with large arrowheads in the PPNB (Helwan, Jericho, Byblos, and Amuq points). The next stage was small arrowheads on flakes and blades in the PN, and a new transverse arrowhead, representing a different concept. The arrowhead tradition finally disappeared in the late PN.

**Sickle Blades**

The earliest sickle blades made their first appearance during the Natufian as backed items inserted into bone hafts. Large sickle blades then appeared during the PPNA, comprising both plain tools (with sheen) and specific types such as the Beit Ta'amir knife. Standard, finely denticulated sickle blades appeared only later, during the PPNB. These large tools were typically made from large, straight blades and were used as hafted reaping knives or composite sickles (e.g., Nahal Hemar Cave, Bar-Yosef and Alon 1988). New types emerged during the PPNC made from smaller blades, with deep denticulation and intensive use of flat and pressure-flaking. Similar, possibly identical, segmented sickle blades, assigned as Type A (Crowfoot-Payne 1983; Gopher 1989; and see Chapters 19 and 20), also dominate the Yarmukian assemblages in the early PN. Further investigations are required before it can be established whether the PPNC and the early PN sickle blades are indeed identical. Additional, new, types of sickle blades emerged in the Yarmukian, possibly in its later phases. These include the wide and short sickle blades of Type B, inventively produced for the first time on flakes and shaped by intensive pressure-flaking – a conceptual change and another innovation of the later phases of the Yarmukian peaking in the Lodian. Sickle blade production in later PN assemblages and in the Chalcolithic Ghassulian was carried out on blades. The making of sickle blades on flakes was thus a unique, short-lived phenomenon that was resumed only in much later historical periods (Rosen 1997). While peaking during the Lodian, the moment of glory of these sickle blades on flakes passed by the time of Wadi Rabah. Another innovation among the (late) Yarmukian sickle blades were the geometric sickle blades, also known as Types C and D. These rectangular, backed and truncated sickle blades made on blades became dominant only in the later PN (cf., Gopher et al. 2001). The PN period, thus shows diversity and relatively rapid changes in the history of sickle blades.

Late PN sickle blades continued with little change to the Chalcolithic Ghassulian, after which they again underwent a major transformation. The most prominent change during the Early Bronze Age was
the appearance of Canaanite blades. Production and use of flint sickle blades further continued into late historical periods (Rosen 1997) where they were, in many cases made from flakes.

Naḥal Zehora II shows that sickle blades of Types C and D, traditionally considered Wadi Rabah artefacts, first appeared in the later phases of the Yarmukian and in the Lodian. It is inevitable to wonder whether the appearance of these sickle blades in the earlier PN is genuine or the result of mixed, contaminated, assemblage. In the past, we, too, endorsed the view that sickle blades of Types C, D, and E were Wadi Rabah tools (Barkai 1996; Barkai and Gopher 1999; Gopher 1995; Gopher and Gophna 1993), albeit with some reservation, as for example in the case of Munḥata (Gopher 1989:146). The appearance of these types of sickle blades in the earlier PN strata was perceived puzzling, although in retrospect it is unclear why the notion of their earlier appearance would be so persistently rejected.

It is unfeasible that the fair, or sometimes even substantial, presence of sickle blades of Type C and D in Yarmukian and Lodian strata is entirely intrusive, especially when considering the low intrusion rates for the pottery at Naḥal Zehora (see Chapter 13). Moreover, some of the innovative aspects presented above for sickle blades repeatedly appeared in large samples usually in considerably higher relative frequencies than those of the intrusive elements as a whole. In addition, the Naḥal Zehora lithic finds generally match available data from other PN sites in many respects. Interesting finds begin to emerge when seeking supporting evidence in other sites for the contention that sickle blades of Types C and D appeared in the early PN, without presupposing intrusion. A survey of the available data from the few potentially relevant PN sites indicates that sickle blades of Types C and D have indeed appeared in other assemblages dated earlier than the Wadi Rabah PN. Examples include the case of the pre-Wadi Rabah Tel Te’o Strata IX and X (Gopher and Rosen 2001); Munḥata 2B (Gopher 1989) where Type C and D sickle blades were observed and interpreted, but with some reservations, as intrusive from the later Wadi Rabah layer 2A (and thus presented both in tables and figures); Ha-Gosherim V (Khailily 1999:26), a Lodian layer laterally separated from the Wadi Rabah layer at this site; Byblos, where sickle blades similar to Types C and D were found in all PN strata (Dunand 1973: 66, Fig. 32 for Neolithique Ancien; 116-117: Figs. 70:31322, 71 for Neolithique Moyen, and 154: Fig. 96 for Neolithique Récent); Yiftahel, where a recent excavation uncovered a Lodian layer clearly distinguished stratigraphically and spatially, that included, in addition to the characteristic sickle blades, sickle blades of Types C and D (Getzov, personal communication 2008); Givʿat ha-Parsa, which yielded some sickle blades that may be considered Wadi Rabah-like (Olami et al. 199: Figs. 7:14; 12:16 and possibly Tel Dan (Gopher and Greenberg 1987, 1996). In addition, the dynamics of change in sickle blade typology throughout the Naḥal Zehora II sequence is seemingly regular and continuous, conforming to an evolutionary model such as the one suggested for pottery assemblages (see Chapter 17, Fig. 17.7). We perceive the reliability of the assemblages to be high and the Naḥal Zehora data sufficiently firm to confirm these suggestions. We thus believe that the findings of the Naḥal Zehora sites call for the refinement of the lithic definition of PN cultural entities in the region.

BIFACIAL TOOLS

Bifacial tools in the southern Levant first appear in polished stone and as small, light, flaked, varieties in flint, such as tranchet axes, in the PPNA. This group of tools became more prominent during the PPNB and PPNC with larger, mostly flaked and polished flint tools. The PN brought about two innovations in bifacial tools. One innovation was embodied in the chisel, whose early signs can be traced back to the PPN. The other, more striking innovation is that of the adze, a new tool type invented in the PN. The

2. A recently use-wear study suggested that some of these blades were used as threshing sledge blades (Anderson et al. 2004).
adze’s true moment of glory transpired during the Chalcolithic, when it became the dominant bifacial tool, before bifacial tools disappeared completely. These innovations of the PN are important as they represent a major shift in patterns of wood exploitation (Barkai 2000, 2004, 2005; Yerkes and Barkai 2004; and see also Chapters 21 and 22 herein).

A SUMMARY

The PN lithic assemblages of Naḥal Zehora display the dynamics of relatively fast evolutionary processes – both technologically and typologically. These complex processes show seemingly contradicting trends. On the one hand, the PN lithic assemblages maintain a general typological similarity in composition and character, which may be considered a conservative element. On the other hand, a highly variable and innovative attitude towards technology, tool shapes, and shaping techniques has emerged. This duality may be relevant to the spirit of PN society as a whole (for some relevant comments see Barkai 1996; Barkai and Gopher 1999; Orrelle and Gopher 2000; and Chapters 19 and 20 herein).

26.3 THE FUNCTION OF LITHIC IMPLEMENTS AT NAḤAL ZEHORA

Understanding the economy and the range of activities performed with lithic implements requires a functional reconstruction of these stone tools. A functional reconstruction is usually based on microscopic studies of either high or low magnification accompanied by experimental work and ethno-archaeological studies. Purely ethnographic records have been used for centuries as a source of information for functional reconstruction of different tool types as well as other material culture elements. However, all indirect evidence remains questionable (in the theoretical sense), unless cautiously applied to answer very specific questions. Thus, despite the wide range of ongoing investigation worldwide concerning traces of use-wear on flint tools, our present understanding of the function of lithic tools is limited.

Work on Neolithic flint tools in the Near East was, for many years, confined to formal (standard) curated types, mainly agricultural tools (e.g., Anderson 1999; Anderson et al. 1998). This is a changing trend in recent years as the study of whole assemblages gained recognition (Caneva et al. 2001; Iovino and Lemorini 2001). Since microscopic use-wear analysis is a time-consuming procedure, it is typically restricted to select items and in many cases, reveals little about the various flint items and particularly ad hoc, expedient tools. This, however, is not the case regarding groundstone tools. Functional reconstruction of groundstone tools constitutes a new field of study in the Near East and the results are promising, even if only preliminary (e.g., Dubreuil 2004; Formenti and Porcopiou 1998; Porcopiou and Formenti 2000; and see Chapter 24). Obsidians have been studied for use-wear mostly in the northern parts of the Levant and in Turkey, nearby their provenance (e.g., Anderson 1994).

At Naḥal Zehora, we conducted use-wear analysis on flint artefacts only. One study concentrated on bifacial flint tools from both Naḥal Zehora sites (see Chapter 21), while another focused on a few tool categories from Naḥal Zehora I only, including bifacial tools, sickle blades, and burins (see Chapter 22). The major results are listed below per tool type.

BURINS

The burins from Naḥal Zehora I show little, if any, traces of use-wear or any distinctive use-wear pattern. This was also the case in other sites, leading Yamada (Chapter 22) to consider the possibility that the items we call burins were in fact cores, wedges, or pièces esquille and not designated for specific work. This is no novel suggestion. A study by Barton et al. (1996) had previously suggested that stone artefacts reduced by burination hold diverse functions. The study also suggested that the burin blow is merely
a technological means for creating a working edge, similar to various types of retouch. Finally, the study suggested that burins were possibly used as cores for the production of spalls, in addition to the engraving, scraping, and cutting activities traditionally assigned to them. While Yamada (Chapter 22) rejected the core interpretation for burins based on the irregularity of burin spalls, he did not reject the pièces esquille interpretation based on the damage he observed on the proximal and/or distal ends of burin spalls. Notwithstanding, some of the Nahal Zehora I burins revealed limited polish development, potential residue, and microflakins that could suggest scraping of hard to semi-hard materials.

Interestingly, Nahal Zehora II yielded very few burins while at Nahal Zehora I, one of every three shaped tools is a burin, and most of these are transverse. Nahal Zehora I may thus be a burin site, otherwise known in the southern Levant mainly from Neolithic Jordan (e.g., Betts 1987; Rollefson 1988). The nature, function, and chronology of these sites are not yet fully understood. Rollefson (1995:516-517) suggested that the functional changes in burins at 'Ain Ghazal correspond to an ecological change and the changing nature of environmental exploitation. He contended that inter-site differences in the burin index represent, in fact, different subsistence economies. Thus, sites rich in burins are interpreted as representatives of pastoralists, while sites with low burin frequencies represent agriculturalists. In addition, he suggested that transverse burins may be related to the exploitation of wood or animals associated with woodlands.

It is our contention that Nahal Zehora I was, in some respects, a specialized site focusing on specific crafts, possibly a single social component within a larger Wadi Rabah settlement system in the Menashe hills or the Jezreel Valley in general (Gopher 1991). Although the flint assemblage of Nahal Zehora I is diverse (see Chapter 20), several characteristics portray the site as unique. One of these is the clear focus on burins. Others are the absence of active grinding tools – processors or mano – in the groundstone tools assemblage and the intensive systematic production industry of blades and bladelets. Yet another unique characteristic of the site is outside the lithic realm – the dominance of clay spindle whorls in preparation (Subtype D2, see Chapters 15 and 17). These unique traits are further discussed in the summary chapters (Part 11) of this book, where a broader socioeconomic context is examined.

BIFACIAL TOOLS

Axes, adzes, and chisels were intensively studied for function at the Nahal Zehora sites. Both our use-wear analyses show that bifacial tools at Nahal Zehora were used in woodworking. This comes as no surprise as experimental use-wear studies worldwide show that bifacial tools were used in woodworking and were especially efficient when polished (Barkai 2005 and references therein). The intensive re-sharpening of bifacial tools is reminiscent of the re-sharpening of burins at Nahal Zehora I. We suggest that both these groups of tools may have been used in different stages of woodworking. Bifacial tools were used for rough, primary shaping of wood, such as tree-felling, splitting, chopping, planning, and smoothing as well as for making wooden tools such as sickle hafts, handles for bifacial tools, and carpentry items. Burins, in contrast, were used for finer shaping and finishing of these objects, such as the creation of grooves in a sickle haft or its scraping to its final form.

Our two use-wear analyses of bifacial tools from the Nahal Zehora sites provide an exceptional opportunity to evaluate the contribution and reliability of use-wear analyses at large. With some overlap in the tool types analyzed, the double examination of a specific flint item (Item #125), and some variation in technological and typological observations – it is interesting to see that the final conclusions of the analyses are similar, determining that the tools were effectively used in woodworking activities. No signs were observed to indicate that the tools were used to work the land.
We believe the differences in the results of these analyses are technical, relating to the methodology and procedure applied during the examination of implements as well as to the scale of available databanks concerning experimental material.

**Sickle blade**
The backs and truncations of PN sickle blades generally show no use-wear signs. Sheen appears equally on both ventral and dorsal faces of the working lateral edge, unlike the case of PPNB sickle blades where sheen is less intensive and narrower on the ventral face. The PPNB case may be related to hafting methods of these implements or the way they were used (Quintero *et al.* 1997). Sheen of the PN is generally less intensive (less developed) than in the earlier (PPN) periods or in the later Early Bronze Age. Several possible reasons may explain this difference. First, a difference in raw materials would account for a different outcome. Secondly, PN blades were perhaps not used as intensively as the glossier, earlier blades. In addition, the tools may have been used in diverse ways. It is also possible that different plants were harvested during the PN compared to earlier or later times. Another factor affecting the development of gloss is hafting. Some of the PPNB sickle blades were hafted as reaping knives, thus affecting the distribution of sheen. Yamada (Chapter 22) indirectly suggests a difference between the hafting of sickle blades of Types C and the thicker sickle blades of Type D (inserted deeper into the haft), which may be of significance in the context of sheen development. Interestingly, some typologically proper sickle blades at both the Nahal Zehora sites lack sheen. Possibly, all it implies is that they were not sufficiently used to create sheen.

**Other tools**
Data is lacking on the function of other tool types at the Nahal Zehora sites, such as arrowheads, awls, borers, scrapers, truncations, and the retouched flakes and blades. We assume a wide range of processing activities related to meat, hide, leather, vegetal food, fibre, wool, basketry and other materials although we have no direct evidence for any of these assumptions.

Groundstone tools at Nahal Zehora were not studied for functionality. Notwithstanding, we are able to make some suggestions based on the shape of these tools, the visible traces of use, the (little) available experimental and use-wear studies, and the vast range of ethnographic or ethno-archaeological studies. We suggest that grinding slabs of Group GS (metate) and processors of Group B (mano) were engaged in the processing or grinding of cereals while the small bowls of Group D, small enough to be held in the palm of one’s hand, were used to process small quantities of different substances. Grooved items of Group F that bear cutting and pecking marks may have been used as cutting boards or anvils. Some groundstone tools were not related to the food industry. The perforated items of Group E include several items that may be related to spinning (see Chapter 15), while some could have been used as weights. In another realm of activities, there is no evidence that the items termed plough blades were indeed used as such.

Similarly, there is no available data regarding the function of flaked blanks and tools of limestone and basalt, or obsidian and quartzite items. Sudo (2003:225) recently suggested that clay disc-like items (scrapers?) were used to smooth wet pottery. The Nahal Zehora limestone discs are indeed similar in shape to the items studied by Sudo. Another interesting suggestion recently made by Khalaily and Kamaisky (2002) concerns the employment of flint tools in the process of pottery making. According to these researchers, flint sickle blades may have been used to incise pottery vessels.

In summary, direct evidence for activities performed with stone tools at Nahal Zehora is limited. However, we assume that stone tools were used in many activities, including construction, food processing and serving, tool making, and the shaping of objects such as imagery and jewellery items.
26.4 CULTURAL ASSIGNMENT BY LITHICS

Having reviewed the finds of each stratum at Naḥal Zehora and examining both technological and typological dynamics of change within the lithic assemblage as well as the use of different types of implements, it is now possible to portray the lithic characteristics of each cultural entity uncovered at the sites.

USING LITHICS AS CULTURAL MARKERS

Flint and other stone industries are important components in the material culture of prehistoric communities. Their important role and the detailed attention provided them with vast analytical capabilities. In effect, these industries are divided into two major trajectories: that of curated tools, such as arrowheads, sickle blades and bifacial tools, and that of ad hoc, expedient tools, such as notches, denticulates and various retouched items. Curated tools yield more readily available insights into past behaviour patterns than do expedient tools. As such, they are far more valuable and useful in the investigation of human behaviour and changing patterns. Curated tools were previously distinguished from expedient tools not only with regard to the effort invested in their production but also with regard to maintenance activities they underwent, through re-sharpening, re-tooling and reshaping for durable use. It seems that curated tools underwent greater changes through time and are therefore better indicators of technological, functional and symbolic aspects of cultural processes. In addition, curated tools are more sensitive as chronological indicators and more precise in geographical subdivisions.

In sites earlier than the PN, the lithic industries serve as the main analytical medium by which archaeological entities are defined. The PN saw the introduction of a new established industry that also has the power to serve as a major archaeological analytical medium: pottery (see Chapter 17). The two industries are not mutually exclusive in marking archaeological entities, but are rather used in tandem. Lithic analyses did not lose significance and retained their analytical potential. They are still used to define archaeological entities and the nature of sites through assemblage composition. Relative dating by seriation of lithic assemblages allows to establish chronologies within a site and between sites, while other analyses facilitate the study of geographical variability and subdivisions, dynamics of change over time, activities pertaining to economy and subsistence activities (such as food acquisition and processing or construction), and other patterns in human behaviour. Clearly, lithic studies also touch upon human behaviour as reflected in the long chaîne opératoire of the different lithic industries, histories of lithic artefacts, and spatial analyses.

Notwithstanding the power of pottery in defining archaeological entities, because curated tools exhibit particular properties, they can often be used as archaeological markers in some study fields as mentioned above. In contrast, most of the expedient tools were used for multiple purposes and do not show clear trends of change through time. They therefore cannot be beneficially used as archaeological markers. As a result, curated tools often receive attention that is disproportionate to their role in the toolkit.

The strata of Nahal Zehora II and I manifest a significant portion of the PN sequence including the presence of its three major cultural entities – the Yarmukian, the Lodian and the Wadi Rabah. Since lithic tools can serve as cultural markers, it is only logical to portray the lithic character of these three major entities of the PN based on our own finds and the available data from other PN lithic assemblages, as we did for pottery (see Chapter 17). The lithic finds at Naḥal Zehora do, indeed, bear out these three main cultural entities that have already been established by other means. This takes into account the large size of the Nahal Zehora lithic assemblages, the low rate of intrusion (confirmed by studies of pottery, see Chapter 13), and the clear and statistically viable quantitative trends of change over time among the assemblages.
The lithic assemblage of the Yarmukian can be characterized by the following chief elements, some of which place the Yarmukian Stratum IV of Naḥal Zehora II late in the Yarmukian sequence:

- The assemblage of Naḥal Zehora II lacks evidence of the production of blades from naviform or opposed platform cores of high quality flint that was so dominant in the PPNB. This tradition might have continued, to a minor degree, in the early stages of the Yarmukian for example at Sha’ar ha-Golan where blade production was suggested by Barkai (2005:189), who was referring to an on-site blade production workshop (in response to a statement by Stekelis 1972: 21-22, Pl. 37), as well as by Barzilai and Garfinkel (2006). Another workshop for Yarmukian blades that may have included some blades following the tradition of PPNB blade production was found at Khirbet ʿAin Soda (Hamadya; Kaplan 1965). The ruling whether this was an early Yarmukian site must await a detailed publication of the industry. The absence of any similar PPN lithic traditions from Naḥal Zehora constitutes yet another piece of evidence that places Naḥal Zehora’s Stratum IV late in the Yarmukian sequence, well separated from the PPN period.

- Reduction sequences include flake and blade production from cores with one, two, and sometimes more striking platforms.

- Preparation and maintenance of cores was generally not meticulous.

- Pressure-flaking was intensively used to shape tools, mainly arrowheads and sickle blades.

- Systematic blade production for sickle blades of Type A was not very common during the Yarmukian Naḥal Zehora II. An independent, albeit small, trajectory for blade production emerged in Stratum IV, designated for the production of sickle blades of Types C and D. Bladelet production was insignificant, if at all existent.

- The most characteristic sickle blades of the Yarmukian are those of Types A and B, and particularly the former. Type A sickle blades are known from the earlier PPNC, but further study is yet to be conducted to determine whether the Type A sickle blade of the two entities are identical in their characteristics.

- Rectangular sickle blades of Types C and D made their debut as early as this Yarmukian assemblage.

- The most characteristic arrowheads of the Yarmukian are the small pressure-flaked symmetrical arrowheads. These include mainly the small ha-Parsa, Herzliya and Nizzanim points with a small number of Amuq and possibly Byblos points as well. A small presence of transverse arrowheads was also found in the Yarmukian assemblage of Naḥal Zehora.

- Some arrowheads were made on flakes.

- PPNB-like finely denticulated reaping knives found in small numbers are not considered integral to the Yarmukian assemblage at Naḥal Zehora II.

- Axes are prominent among the bifacial tools, accompanied by chisels and the newly invented adze.

- Bifacial knives and tabular scrapers are rare.

- Other tool categories such as scrapers, burins, denticulates, notches, truncated elements, and retouched flakes and blades are all part of the assemblage but display no specific characteristics.

The major characteristics of the Yarmukian at Naḥal Zehora are flake production and the production of blades in two different trajectories as well as the often use of pressure-flaking. The most significant tools in this industry are small arrowheads of ha-Parsa, Herzliya and Nizzanim points, sickle blades of Types A and B but also the rectangular Type C, axes, chisels, and adzes.
CHAPTER 26: THE LITHIC ASSEMBLAGES AT THE NAHAL ZEHORA SITES: A SUMMARY

THE LODIAN (STRATUM III)
The Lodian lithic industry is similar to the Yarmukian one, while the most conspicuous difference is the growing popularity of flake blanks. Cores with one, two, or sometimes more striking platforms were used, and the preparation and maintenance of cores was not meticulous. The lithic assemblage of the Lodian can be characterized by the following chief elements:

- Flake production was the major technological trajectory underlying the lithic industry at large;
- A minor blade production persevered in this industry, including the production of blades for sickle blades of Types A and B and the trajectory designated specifically for sickle blades of Types C and D. Bladelets are rare.
- Pressure-flaking was used intensively for the shaping of arrowheads and sickle blades.
- The popular sickle blades of Types A and B, particularly the latter, were made from both flakes and blades, while sickle blades of Types C and D were made on blades and found in smaller numbers.
- Many of the arrowheads were made on flakes.
- Arrowhead types include mainly ha-Parsa, Nizzanim, and Herzliya points as well as transverse arrowheads, while Byblos and Amuq points were found only in very low numbers.
- As in the Yarmukian, bifacial tools are dominated by axes although adzes and chisels also appear in significant numbers.
- Bifacial knives and tabular scrapers are scarce.
- Other tools in the assemblage include scrapers, burins, notches, denticulates, truncations, retouched flakes, and blades.

The major characteristics of this industry are its orientation towards flake production and usage, and the intensive use of pressure-flaking. Type B and A sickle blades are the most characteristic tool types of this industry as are the small symmetrical pressure-flaked arrowheads. Axes, adzes, and chisels appear as well. This portrayal of the lithic nature of Lodian culture agrees with that established at Ha-Gosherim’s Layer V by Khalaily (1999) and at Lod (Gopher and Blockman 2004).

THE WADI RABAH (STRATA II AND I AT NAHAL ZEHORA II AND THE SITE OF NAHAL ZEHORA I)
The lithic assemblage of the Wadi Rabah culture can be characterized by the following chief elements. A further distinction is made below between the early Wadi Rabah elements at Naḥal Zehora II and the later ones at Naḥal Zehora I.

- The major blank trajectories in the lithic industry consisted of both flakes and short blades;
- Bladelet production was regular and systematic;
- Pressure-flaking was only rarely used and only to shape some arrowheads;
- Arrowheads, while still appearing at Naḥal Zehora II, in the same types as before (small symmetrical arrowheads and transverse ones), have declined to the point of almost complete disappearance;
- Most of the sickle blades are rectangular, backed, and truncated, of Types C and D;
- Bifacial tools comprised a majority of chisels and a rising number of adzes;
- Bifacial knives and tabular scrapers were only rarely found in the assemblage;
- Other tool types continued to appear as in earlier periods;
- Extraordinary is the abundance of burins, mainly transverse burins, uncovered at Naḥal Zehora I.

The major characteristics of the lithic industry during the Wadi Rabah phase at Naḥal Zehora are its orientation towards flake production, the serial production of blades from cores bearing one striking platform, the production of bladelets, and the nearly complete disappearance of pressure-flaking. The most significant point about this industry is the diminishing number of arrowheads, which are almost entirely
absent from its later phases. Among the sickle blades, the rectangular type had become most characteristic, quite unlike the flat or pressure-flaked sickle blades of Types A and B that featured in the Yarmukian and the Lodian. The emphasis increased on chisels and adzes as well as on tools made on bladelets. The adze would subsequently become very common and standardized as the dominant bifacial tool in the Chalcolithic Ghassulian.

An additional interesting finding concerning the lithic assemblages of all strata is the polished stone axe, or celt, made of various green, black, or grey minerals. Such items were found throughout the sequence and in each stratum at least one such item was associated with a burial context (see Chapters 24 and 36).

**Comparison of the Wadi Rabah Strata at Nahal Zehora I and II**

To further characterize trends of change through time in the lithic realm, we offer the following comparison between the two Wadi Rabah assemblages of the Nahal Zehora sites. The earlier assemblage comprises Strata II and I as well as Area ME at Nahal Zehora II, while the later assemblage originated in Nahal Zehora I. In addition, we make a modest attempt at examining the possible connection of the PoWR-PG at Nahal Zehora II to trends discerned in this comparison.

Raw materials used at Strata II and I of Nahal Zehora II are similar to those used at Nahal Zehora I. Medium-sized or large Eocene nodules and blocks of homogeneous chalky flint originating in the nearby Menashe plateau were used at both sites for producing bifacial tools and blades. Another type of raw material used at both sites comprised the smaller Eocene flint pebbles and blocks of higher quality. Raw material from remote sources was rare at both sites. At Nahal Zehora I there seems to have been a clear preference for a specific type of flint designated for burins, especially transverse burins, in the form of high quality, siliceous, small flint pebbles.

Cores in both Nahal Zehora sites are mainly non-standardized flake cores accompanied by a small number of CTEs, reflecting minimal planning and investment in flake production. Only a small number of blade cores bear witness to careful, well-planned, blade and bladelet production. Cores were, in many cases, extensively reduced and some exhausted bifacial tools were converted into cores, attesting to intensive exploitation of raw material.

A comparison of technological properties of Nahal Zehora II to those found at Nahal Zehora I shows numerous trends:

- The frequency of flakes, blades and debitage as a whole at Nahal Zehora I is higher and so is the density per m³ – 307 items at Nahal Zehora I compared to 177 in Stratum II and 105 in Stratum I of Nahal Zehora II.
- Cores at Nahal Zehora I comprise only 2% of the assemblage, while they comprise 4% and 5% respectively in Strata II and I of Nahal Zehora II. Their density at Nahal Zehora I is also lower than at Nahal Zehora II – ten cores per m³ at Nahal Zehora I as against seventeen and ten cores respectively at Strata II and I of Nahal Zehora II.
- The frequency of blades and bladelets at Nahal Zehora I is higher than at Nahal Zehora II.
- The frequency and density of tools at large are higher at Nahal Zehora I – 67 tools per m³ at Nahal Zehora I as compared to 52 and 32 respectively in Strata II and I at Nahal Zehora II.

These trends attest to more intensive flaking and exploitation of raw material as well as to a clearer and well-established trajectory of blade and bladelet production at Nahal Zehora I compared to Strata II and I at Nahal Zehora II.
In the Wadi Rabah strata at both Nahal Zehora sites, the number of blade cores does not account for the number of blades. Blade cores were perhaps unrecognized as they might have been used for other purposes after blade production, for example, as flake cores. If so, the blade production was only the first stage in the lifecycle of these cores that were later converted into flake cores. As for CTEs, ridge blades outnumber core tablets at a ratio of approximately 3.5:1 in the Wadi Rabah Strata at both sites. Ridge blades and core tablets together show almost a 1:1 ratio to other CTEs. In Stratum II at Nahal Zehora II this ratio is 0.08:1, amounting to 0.12:1 in Stratum I. The index of CTEs, as a whole, to cores at Nahal Zehora I is almost 1:1, while at Nahal Zehora II it amounts to 0.43:1 in Stratum II and 0.46:1 in Stratum I. These findings indicate that preparation and maintenance of blade cores were more meticulous at Nahal Zehora I and included more intensive treatment of ridges and maintenance of the production surface throughout the use-life of the cores. Core maintenance at Nahal Zehora II was devoted a much lower effort.

In summary, the ad hoc flake component of the Wadi Rabah assemblages is dominant at both Nahal Zehora sites, reflecting an economic decision to minimize the investment in acquisition of raw material and in knapping procedures. However, blade and bladelet production constitute another, different facet of the industry. This is a systematic, meticulous trajectory clearly seen at Nahal Zehora II and further intensified and enhanced at Nahal Zehora I. This investment in blade and bladelet production seems to be the inception of a trend that continued further into the PN (e.g., Golan 2006) and the subsequent Chalcolithic Ghassulian (Gilead 1984; Gilead et al. 1995). When comparing tool types among the different Wadi Rabah assemblages, a few more trends are discerned:

- The number of arrowheads found in the assemblages of the two sites represents another point supporting the notion that the assemblage at Nahal Zehora I is relatively late in the Wadi Rabah sequence. Wadi Rabah assemblages typically only contain very few or no arrowheads at all. While only a single transverse arrowhead was found at Nahal Zehora I, several arrowheads were found at Nahal Zehora II, albeit in low frequency and density. It seems, then, that the diminishing trend of Wadi Rabah arrowheads would place Strata II and I of Nahal Zehora II earlier in the Wadi Rabah sequence than Nahal Zehora I.

- Sickle blades comprise 6% of the tools at Nahal Zehora I and 10% at Nahal Zehora II Strata II and I. Sickle blades of Type C are most common at both sites. The large number of sickle blades of Type C at Nahal Zehora I and their resemblance to later Chalcolithic sickle blades (e.g., Barkai 2004 and references therein) suggest a late placement of this assemblage in the Wadi Rabah sequence. The presence of sickle blades of Type D in the Wadi Rabah assemblages raises the possibility of different hafting methods and uses of sickle blades.

- Bifacial tools – the axe, adze, and chisel – in the Wadi Rabah flint assemblages constitute 1% of the tools in Stratum II, and 2% in Stratum I at Nahal Zehora II. They also constitute 2% of the tools at Nahal Zehora I. The chisel is the most prominent bifacial tool in the Wadi Rabah assemblages, probably indicating a specific type of woodworking activity. The axe was a more prominent bifacial tool in earlier strata, but it decreased in numbers along the sequence while the adze, a new and more versatile tool, began to replace it. The form of the adze became more standardized as it increasingly assumed dominance among the bifacial tools in the Chalcolithic period. Similar to the production of bladelets and straight short blades, this is another PN trend that peaked in the Chalcolithic Ghassulian.

- Compared to Nahal Zehora II and any other known PN site in the region, Nahal Zehora I is unique in terms of assemblage tool composition as it displays an especially high frequency of burins and burin spalls. In addition, the burins at Nahal Zehora I are well-shaped and intensively maintained tools. These data suggest a focus at Nahal Zehora I on activities involving burins.
Certain differences between Naḥal Zehora II, Strata II and I and Naḥal Zehora I may be temporal, explained by Naḥal Zehora I’s subsequent chronological positioning. Environmental reasons are eliminated as the sites are in such close proximity to each other. Alternatively, the two sites may have had different designated functions within a larger settlement system, perhaps a redistributive settlement system (Gopher 1991). Naḥal Zehora I may be regarded as a specialized site in this system by virtue of its many peculiarities, the most conspicuous of which is its high emphasis on burins.

**POWR-PG PRESENCE**

The PoWR-PG sample is rather small and therefore difficult to characterize properly. flakes are clearly dominant, although this small sample also shows evidence of blade and some bladelet production. The tools relevant to the lithic definition of this assemblage are a single arrowhead fragment, possibly of Type A9, a few sickle blades of Type C, and an adze. An additional conspicuous element is a flint pick, a rare tool type in PN assemblages.

**CONCLUDING REMARKS**

In Chapter 17, summarizing our pottery studies, we highlighted the additive nature of pottery making as a technological and a conceptual innovation. Unlike the newly established industry of pottery, the PN lithic industry continues a very long, almost infinite, history of stone knapping, deeply embedded in human culture and behaviour. Lithic studies thus remain an important means of reconstructing culture and cultural change at large, including during the PN. We thus used technological and typological aspects of the lithic assemblages in the Naḥal Zehora sites as a means of defining PN cultural entities.

PN flint industries at Naḥal Zehora and in general indicate two major attitudes toward flint tool production. One reflects a rather simple approach where little effort is invested in the production process. This approach was applied mostly in the production of flakes. The other approach, applied particularly in the production of blades and bladelets points at meticulous planning and execution abilities. While the latter approach seems to have generated blades for sickle blade production and a few other blade tools, the former provided mainly flake blanks used in the production of a variety of expedient tool types as well as some major curated tool types such as arrowheads and sickle blades.

The technological analysis, particularly the analysis of technological change, as well as changes in some of the major tool types along the PN sequence of the Naḥal Zehora sites all reflect dynamic social systems, seemingly at the height of a substantial change. It is highly likely that these social systems were in the midst of a process in which status was reassessed and a new division of labour was emerging. Potters, farmers, herders, and weavers were all newly established entities replacing hunters, and to a degree, also replacing flint knappers. The actual disappearance of arrowheads is but one indication of these changes. The changes in sickle blades are another example that may be related to innovative harvesting techniques or to the adoption of new types of crops, although clear evidence for such a correlation is still unavailable (see Gopher 1994b:564). The changes in the relative frequencies of the different bifacial tool types are yet another example attesting to transformations in woodworking.

In the spirit of our previous discussion on the social role and meaning of technological innovation and change, we may perceive noted changes in PN lithic industries at the Naḥal Zehora sites as testimony to the flexibility of PN communities that were adjusting to rapid technological innovation while undergoing major socioeconomic change.
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