

THE NATUFIAN IN THE LEVANT

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INTRODUCTION

The Natufian entity was first identified and described in the early 1930s by D. Garrod (39) following her excavations at the Shukba Cave in the Samaria (Figure 1). Other assemblages identified as Natufian were subsequently uncovered within the boundaries of what was to become identified as the Natufian core area, encompassing the Galilee, Mt. Carmel, and the Judean Hills and Desert (41, 64, 83). Though the original definition of the Natufian complex was based on the characteristics of its chipped stone industry, both Garrod and Neuville (63, 64), who explored the Judean desert Natufian sites, were impressed by the nonlithic finds. This is the first Levantine prehistoric entity with durable architectural remains bearing evidence of intensive building activities. Some of the sites exceed in size anything known before, heralding the appearance of the villages and compounds of the Neolithic cultures to come. Besides an unprecedented abundance (in quantity and variety) of bone implements, there is a wealth of limestone and basalt artifacts. Also, for the first time there appear numerous art objects and ornaments made of a variety of raw materials, both common and exotic. All these components place the Natufian apart from preceding archaeological cultures.

Since the early discoveries, sites identified as Natufian have been reported both from the core area (12, 49, 65, 67, 78, 88) and from regions further away, some within different phytogeographic zones: northern Syria (26, 27, 60), north and south Lebanon (19), the Jordan Rift Valley (9, 33, 38), southern Jordan (46, 55, 56), the Syrian-Arabian Desert (20), and the Negev (43, 58, 61) (Figure 1). The abundant data accumulated over the years

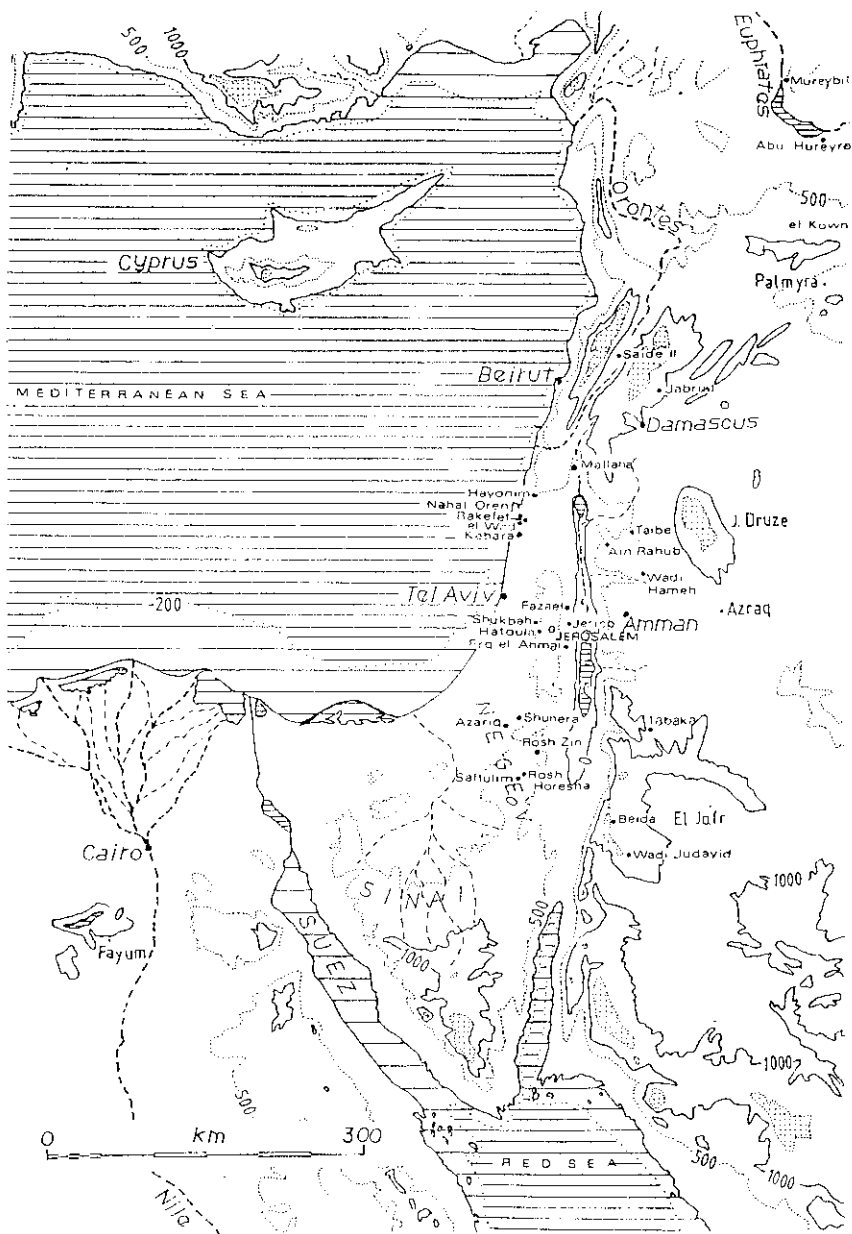


Figure 1 Map of the southern Levant showing the major sites of the Natufian and of other contemporaneous entities.

necessitate a reexamination of several assumptions concerning the Natufian that until recently were taken for granted. Topics to be reevaluated range from the functions of various artifacts, to the possible existence of social stratification within Natufian populations.

In the following sections I address several problems pertaining to the definition of the Natufian, the question of sedentism, and the origin and evolution of the Natufian sociocultural complex. All these issues have some bearing on the unique position of the Natufian, diachronically and culturally in the sequence of Levantine prehistoric cultures.

GENERAL DESCRIPTION

Natufian flint assemblages are characterized by the dominance of lunate-shaped microliths, the use of bifacial, Helwan retouch, and the use of the microburin technique. In addition, new tool types appear—sickle blades, picks, and axes—frequent in the flint assemblages of the succeeding agricultural entities (6, 40, 48, 64; Figure 2:1–7, 13–14, 18–19). The flint industries exhibit inter- and intrasite typological variability, and the frequencies of various tool groups are highly correlated with environmental settings, site types, and specific activity areas within sites. Yet the technological patterns are quite homogeneous. A time-dependent variability in the lithic assemblages was employed to define the various chronological sub-stages of the Natufian sequence, together with stratigraphic evidence and ^{14}C dates.

The groundstone assemblages, earlier occurring sporadically, are here varied and numerous. Most are made of limestone, but basalt and sandstone artifacts have also been transported over considerable distances (30 km and more), either as complete items or as raw material, probably traded by the locals from other groups. The core area assemblages are dominated by mortars (Figure 2:15–17) and pestles, but other utensils are present as well—mullers, plates, shaft straighteners, and whetstones. Quite a few instances of stone beads and other decorative and decorated elements also occur (12, 17, 32, 33, 67). The assemblages from the core area are substantially different from assemblages found further away (see below).

Most of the Natufian core area sites have yielded rich bone assemblages, of both functional and decorative items. Microscopic studies of use-wear traces reveal that a significant proportion of the functional items had been used mostly for weaving and hide-working (24, 25). A change in the production technique of worked bone items is noticeable: While most of the functional artifacts had been shaped by scraping and shaving, a technique used for woodworking, the beads and pendants were shaped by grinding. Grinding was the common technique for working bone in the succeeding Neolithic cultures, but it is practically unknown from earlier bone industries. Several

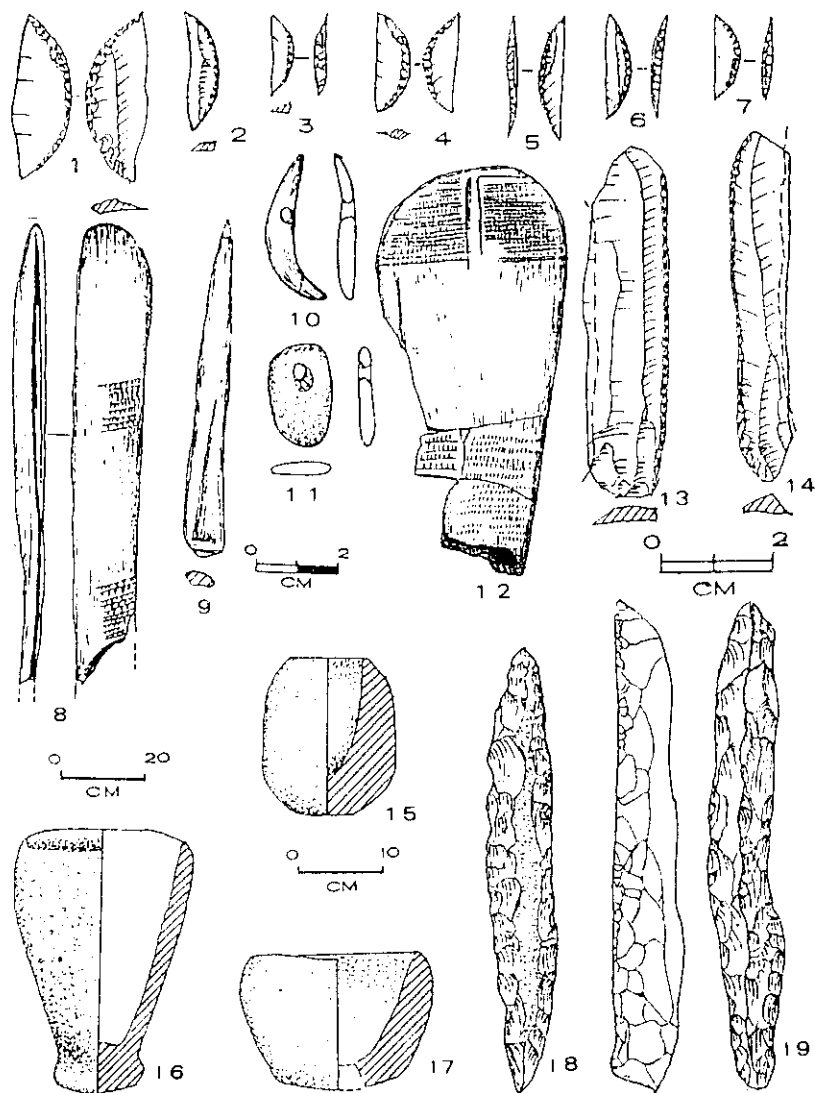


Figure 2 Natufian artifacts: flint—1, 4 Helwan lunates; 2-3,5-7 backed lunates; 13-14 sickle blades; 18-19 picks; bone—8 haft; 9 point; 11 pendant; 12 decorated item; tooth—10 pendant; groundstone 15-17 mortars (basalt and limestone)

unique items have been recovered: bone hafts (presumably for sickle blades), and some decorated items of unknown function (12, 17, 33, 40, 64, 79-81) (Figure 2:8, 9, 12).

Natufian ornaments are varied and numerous. Beads and pendants are made

of limestone, basalt, greenstone, and malachite, as well as of bone, teeth, and a great variety of marine shells. Exotic materials, though rare, testify to connections with neighboring regions. Thus obsidian found at Eynan (Mallaha) had been brought from Anatolia, greenstone from Syria, Jordan, or Sinai, and marine shells from the Red Sea and the Nile. A number of stone and bone figurines have been found, mostly of animals but some human representations as well. There are also incised limestone slabs with geometric and figurative patterns, used as decorative elements in architectural contexts. While many of the beads and pendants—i.e. personal ornaments—have been recovered from adorned burials, the other artistic items were found only in the living areas (6, 12, 17, 26, 33, 40, 48, 64) (Figure 2:10–12).

More than 400 burials have been recovered so far from Natufian cemeteries (18, 18a). Most of them are multiple, orderly arranged burials, though occasionally solitary burials have also been encountered. Burial positions are varied (flexed, extended, on the side, head facing to the north or to the south, etc), as is the number of burials per grave (single burials or group burials in mixed compositions of women, men, and children). Decorated burials—of children, women, or men—are rare (see 92 for a suggestion of implied social stratification; see 14 and 18a for its negation). Burials are of every possible variety: primary and secondary, interned in pits—sometimes stone lined or lime washed or in built graves, occasionally with stone pavements or stone coverings. Some graves had been re-opened to enable new burials, while others remained sealed (14, 18, 41, 69). Certain mortuary customs underwent changes or disappeared altogether during the Natufian sequence. Thus the decoration of burials seems to have ceased in the later Natufian, apparently at about the same time as the novel custom appeared, of skull removal and separate burial apart from the skeleton. This custom, first reported from the agricultural Neolithic societies, has been considered to be an element of an ancestors cult, denoting ownership and emotional ties to a locality, and implying the existence of defined territories. Whether the same is true for the Natufian is hard to tell, but undoubtedly there are indications of a certain continuity between Natufian mortuary practices and those of the Neolithic cultures to come—including, for example, the strict separation between living quarters and burial grounds (12, 86)!

The intensity of Natufian building activities is manifested by dwelling structures (some with stone pavements), hearths, built graves, and various other installations such as the paved or lime-washed pits interpreted elsewhere as storage bins (69, 88). Most of the building material consists of uncut limestone slabs, and there is evidence for the use of lime, as well as a lime kiln uncovered in Hayonim Cave in the Western Galilee (12).

Natufian subsistence strategies, though varying in accordance with particular environmental characteristics, focused mainly on hunting and gathering, with a heavy emphasis on plant processing, especially in the Mediterranean

core area. In the absence of primary paleobotanical evidence, the notion of intensive plant processing is supported mainly by the number and variety of the groundstone tools and the presence of sickle-blades, as well as by patterns of tooth attrition in human skeletons, which exhibit considerable inter-site diversity (76; for detailed review see 23, 35). Garrod originally regarded the Natufians as incipient agriculturalists (40), a notion later rejected by others (26, 68; see also 73, 74, 91) for lack of supportive evidence, but recently reintroduced (51, 84). Opinions are also divided both about whether cultivation and agriculture had been practiced all through the Natufian or only through part of the sequence, and about the possible beginning of domestication during its later stages. Domestication of the dog seems to have been started by the Natufians, as evidenced by joint dog-man burials from at least two Natufian sites, Eynan and the Hayonim Terrace (31, 88). Hunting-prey patterns exhibit variations dependant on macro-environmental factors and to a lesser degree on localized topographic and phytogeographical variables (23). The faunal assemblages of forest and coastal settlements are dominated by gazelle, with fallow deer and cattle occurring in moderate frequencies and caprine and equid remains uncommon or absent. In steppe and desert sites, gazelles are not as predominant, while caprines and equids occur much more frequently. St/Ca analyses, presently under reevaluation, do not as yet supply answers to the issue of meat/plant proportion in the Natufian diet (75). Variations in diet composition were not paralleled by observable changes in Natufian health status (but see 18 for possible changes in stature).

At first, the Natufian was chronologically positioned, according to stratigraphic considerations, in post-Pleistocene times (40, 64), and defined as a Mesolithic culture predating the Neolithic cultures to come. Later, Perrot (68) proposed that it should be regarded as an Epipalaeolithic culture. This assignment to the Late Pleistocene was eventually fully validated by numerous ^{14}C dates (89), which firmly placed it in the range between 12,500 and 10,200 years before the present (BP).

A chronological subdivision of the Natufian was proposed on the basis of consistent variations through time in several components of the material repertoire. Accordingly, Early Natufian was regarded as characterized by an abundance of Helwan (bifacial) retouch (Figure 2:1,4) and an absence of the microburin technique (although later the latter was found to have been employed in both Early and Late Natufian, though not in every site; 11), as well as by multiple burials and rich artistic assemblages. The Late Natufian was regarded as characterized by a scarcity of Helwan retouch, largely replaced by backing (Figure 2:2-3, 5-7), and by extensive use of the microburin technique, as well as by single burials and by a decline in artistic expression. The time ranges for the Early and Late Natufian are 12,500-11,000 BP and 11,000-10,200 BP, respectively. Recently, a tripartite divi-

sion was suggested (89) in which the Late Natufian is further subdivided into Late and Final stages on the basis of a decline in lunate size, a relative decrease in Helwan retouch, and an absence of structures in the Final Natufian. The proposed duration of the Final Natufian is from 10,500 to 10,200 BP.

Though many of the phenomena observed in the Natufian, such as the ordered burial-grounds and the wealth of artistic manifestation, appear for the first time in the local prehistoric record, the Natufian is unique mainly because it constitutes the first deviation from the traditional way of prehistoric living. Instead of nomadic hunter-gatherers, living in small groups (nuclear or extended families) and practicing a well-established mode of resource exploitation, we have in the Natufian indications of sedentism, of larger groups functioning at a higher level of social organization and exhibiting different patterns of resource exploitation—namely, intensive and specialized collection, and possibly incipient agriculture (51, 84). This basic change occurred about 12,000 years ago, though previous more subtle changes may have occurred that are unobservable in the available archaeological evidence.

Archaeologists have become aware of this change only in the past 30 years. Previously, the turning point was considered to have occurred at what was commonly known as the “Neolithic Revolution”. Since the mid-19th century it had been well established that about 10,000 years ago agriculture became the main subsistence strategy in Southwestern Asia. Several models were advanced to explain the emergence of farming communities in the “Fertile Crescent,” starting with Childe’s “propinquity theory,” through various ecological-demographic models and different versions of the “climatic trigger” approach (7, 16, 37, 48, 61, 72, 73, 74, 91), and still the debate goes on.

Though only a few claim that the Natufian was an agricultural society in the full sense of the word, certain prerequisites essential for the appearance and establishment of farming societies had undoubtedly been met during the Natufian. As these are recognizable through the archaeological record, the study of the Natufian culture is crucial for a better understanding of the “Agricultural Revolution.”

DEFINITION, VARIABILITY, AND DISTRIBUTION

Most Natufian occurrences, located in the Mediterranean phytogeographic zone where the entity was first identified and described, possess most of the material components detailed above. In contrast, a growing number of sites reported from the semi-arid Irano-Turanian vegetational zone as well as from regions as far away from the original core area as the banks of the Euphrates in northern Syria, were relegated to the Natufian cultural complex on the basis of lithic criteria, because most of the other Natufian hallmarks were absent

altogether. Indeed, this absence of cultural components has called into question the applicability of the term "Natufian" to all these occurrences (6, 27, 70): Should the term "Natufian" be restricted to sites in the Mediterranean forest zone of northern Israel and northwestern Jordan, or should the assemblages comprising lunates, in the more arid portions of Jordan, Syria, and the Negev, also be termed Natufian (15, 22)? Of course it all depends on what is meant by this term. Thus, for example, Byrd uses the term Natufian "essentially as a temporal label for Levantine occupation between 12,500 and 10,200 BP" (23, p. 160). In general, a terminological problem seems to prevail with researchers using the term Natufian as an equivalent to the term Pre-Pottery Neolithic A (PPNA)—namely, as a time-stratigraphic unit encompassing various cultural entities with loose affinities including some lithic attributes (2, 15).

On closer inspection it became apparent that there were differences also in the lithic component. A multifactoral approach was urged for the analysis of lithics (5, 44), and it was suggested, by Henry (44) and subsequently by others (23, 43, 66) that the typological variability between several Natufian site-complexes is related to the location of sites in particular macroenvironmental zones. [A technological variability suggested by Olszewski (66) was not validated by further study of larger samples (15, 22).]

Henry suggested a clustering system based on similarities in site-type (base camp or transitory camp) and in macro- and micro-environments, as reflected in the assemblages to be clustered (44, 45). Thus he defined three clusters: (a) sites located in dry hilly areas near the coast; (b) sites located in forest/steppe and steppe vegetation; and (c) sites located up an inland mountain, in the Mediterranean zone.

Olszewski, elaborating on this scheme, suggested taking into consideration also the fact whether the site is an open-air or a cave site. Yet another subclustering, suggested by Byrd (23), distinguishes between forest and beach sites, steppe and desert sites, and specialized steppe and desert sites. Clearly, all three clustering systems are generally similar.

Evidently the various clusters are broadly correlated with the corresponding macro-environments, because there are associations of tool classes with site locations, which suggest general situational patterns of tool use during the late Epipaleolithic in the Levant (66).

These clustering systems are affected by serious drawbacks stemming from the very nature of the available data. Impressive as the statistical methods employed may be, their application to data that is either very fragmentary or derived from old excavations, provides a shaky foundation for further speculations, as illustrated by the case of the Hayonim Cave site. All clustering analyses pertaining to this site were done on the basis of samples [as opposed to the whole assemblage (12)]. Thus while in Olszewski's analysis (68) the

percentages of notches in the two samples from Hayonim Cave available to her are 20.6 and 14.5 ($n = 49$ and 24 , respectively), in the whole assemblage the notches comprise between 3.9% and 8.6% in the various levels of the Natufian Layer ($n = 88-94$). Because both Byrd and Olszewski based their clusterings on the relative frequencies of particular tool-types, such as the notches, they assigned Hayonim Cave to the cluster correlated with steppe and desert environments, thus separating it from the adjacent Terrace site which was assigned to a different cluster! It should be noted that both scholars were nevertheless aware that the Hayonim Cave and Hayonim Terrace may comprise a single site (23, 68). Indeed, the combined samples from El-Wad Cave and from the adjacent Terrace are treated as one in both their analyses.

There are also differences in the quality between the samples. Microlith frequencies serve as a criterion for subclustering, yet many of the compared assemblages originate from excavations where wet sieving was not practiced (for example, the El Wad Cave and Terrace, the Kebara and the Shukba Caves). Thus the percentages of the microlithic component, although certainly reflecting specific modes of subsistence, also reflect to a certain degree the progress in excavation methods over the last 50 years.

Though a quantitative approach entails focusing on the large tool-groups, disregard of certain tool-types present in small numbers inevitably distorts the overall picture and weakens the validity of the correlation between assemblage-profiles and particular subsistence patterns (66). This is well illustrated by the omission of the massive tools—the forerunners of Neolithic axes and adzes—and especially by the omission of sickle blades, because there are indications that they were used for harvesting wild cereals (51, 84).

Moreover, the various assemblages were clustered disregarding their chronological position in the Natufian sequence. Yet it is time-dependent variations in the lithic components on which the chronological subdivision into Early and Late phases was initially based.

Site clustering, based on lithic comparisons, obscures the main issue, which is a definition of the Natufian entity and an evaluation of the extent to which it could be modified in order to accommodate additional occurrences. While viewing lithic variability as stemming from differences in subsistence patterns, it disregards the presence or absence of other cultural components. Subclustering does not account for the observed variability in nonlithic components—i.e. their presence or absence at particular sites as well as their variety and numbers.

It is well established by ethnographic research (57) that changes in lithics reflect large-scale cultural changes only to a very limited extent. This implies that similarities in lithics between two entities do not necessarily indicate a close resemblance in social structure.

While one must be cautious in using flint assemblages as a cultural de-

nominator, there seems to be no doubt about the cultural significance of cemeteries, artistic manifestations, etc. An absence of cemeteries from sites exhibiting adequate faunal preservation, whose surface area is similar to that of sites in which there are cemeteries, should overrule the lithic similarities and lead to the conclusion that they represent different cultural entities.

The different entities most probably came into contact with one another, influenced, borrowed, and adopted technological and stylistic features from one another; but it is those characteristics retained only by some of the entities which should be assigned a different weight. When dealing with a cluster of interrelating sites, such as the "Desert Natufian" sites in the Negev (43) or those from northern Syria (66), it is not enough to report that no burials were recovered or that artistic and decorative elements are missing. The absence of these features is meaningful.

Byrd rightly assumes (23) that the archaeological record is biased in favor of the large, highly visible Natufian sites, but the large sites outside the core area lack many of the components present at the large core-area sites.

He is also right that the range of activities carried out, the types of resources exploited, and the intensity of activity and permanence of settlement vary between environmental regions and particular clusters of Natufian sites. But there is more to it than varying adaptations to different macro-environments. What about the ornaments, the artistic activities, and the cemeteries? How are these to be understood in relation to the statement above?

Large settlements (such as those found in the Natufian core area), at least partially sedentary (see below), undoubtedly imply social interaction different from that found in smaller, mobile bands of hunter-gatherers. Sedentism and larger community sizes call for a specific social organization, as is well established by ethnographic data (53).

Such differences between various local groups may have existed in preceding periods, too, and went unnoticed by researchers, for lack of data. In the Natufian, however, we do have at least some means of differentiation between observed phenomena, and we should use them.

The importance of nonlithic cultural components such as architectural remains, bone tools, grinding utensils, ornaments, and ordered burials to a better understanding of the cultural processes that accompanied the changes in the Natufian way of living—the transition from the Paleolithic existence of nomadic hunting and gathering to sedentism and perhaps even farming—is self-evident.

SEDENTISM

It is possible to differentiate between Natufian base camps and seasonal camps (4). The base camps are much larger, reaching a size of 1000 m² and

even more (67). Nothing like this is known from the previous local cultures. Moreover, the temporary, task-specific sites lack most of the unique Natufian cultural characteristics. While in the temporary camps we find mostly flint artifacts, base camps exhibit the whole range of the material culture. Some of the utensils and manuports found in base camps are very heavy, such as large basalt vessels, weighing up to 100 kg and more, known from the sites of Hayonim Cave and Eynan, or the engraved siltstone slabs from Wadi-Hemmeh 27, weighing several hundred kg—a new and unique phenomenon when compared with the previous Epi- and Palaeolithic cultures (6, 33, 48).

The issue of Natufian sedentism has been under debate for some time. Edwards (34) raises the issue of the different and sometimes conflicting definitions of sedentism, as well as the difficulties in defining solid criteria for its recognition. He also presents an alternative view “that sedentism is a nonfossilizing human organizational feature, for which exclusive archaeological correlates may not exist” (34, p. 16).

Edwards claims that the material characteristics of the largest Natufian sites (including extensive and intensive building activities) show considerable overlap with those of the settlements of recent mobile people and that at present the precise residence strategies that gave rise to these sites cannot be elucidated. We also have great difficulty distinguishing large sites made up of multiple short occupation events from sites of similar size resulting from continuous occupation.

Yet there is a growing body of circumstantial evidence that Natufian base camps were indeed at least partially sedentary. Analysis of the content of owl pellets suggests that various sites had been occupied for at least half of each year (between November and April), while the remains of certain migratory birds indicate an occupation of at least 10 months (September through July) every year (70). Moreover, the remains of a great number of young gazelles indicate a year-round hunting activity (29). For example, it is likely that occupation at Abu Hureyra was a year-round one (23). Even if occupation had not been quite year-round, it would still be considered a sedentary life-style, especially when compared with preceding and contemporary local cultures. Though there is indeed an overlap between Natufian base camps and the settlements of recent mobile people, no sites of similar magnitude were found in the southern Levant prior to the sedentary, farming Neolithic occupations. Thus the evidence of intensive building activity, the ordered cemeteries and storage facilities as well as settlement sizes and degree of complexity, may be taken under local circumstances to indicate incipient sedentism.

Another line of evidence for sedentism derives from data pertaining to the density of flint artifacts (6) and to the observed changes in flint exploitation patterns. While the preceding, highly nomadic Geometric Kebarans were extravagant in their mode of exploitation of flint cores—as though an unlim-

ited supply of flint was ever available—in the Natufian, flint cores were much more thoroughly exploited—as if raw material was not as available as before (12). Byrd (23), too, observes various differences in flint density and exploitation patterns between the clusters. The increase in density of cores per cubic meter from cluster 1 sites through cluster 2 to cluster 3 sites suggests that core reduction was most intensive at the forest and coastal (i.e. core-area) sites, less so at the steppe and desert sites of cluster 2, and least intensive at the specialized steppe and desert sites of cluster 3. The same is indicated by the higher ratio of tools-per-core in the core-area sites. As sites that were occupied for longer periods would be expected to yield evidence of more intensive utilization of on-site raw material than sites where occupation was only short-term, the above ratios suggest that cluster 3 sites were least intensively occupied and the least permanent, while the cluster 1 sites were probably more intensively occupied than the cluster 2 sites.

Edwards (34) offers what he considers evidence for sedentism: the rebuilding of structures in the position of earlier-phase ones of similar types, implying long-term knowledge of the position and function of previously occupied structures.

Ornaments, decorative elements, and other manifestations of artistic activity may be considered indicators of intensive social interaction. According to recently defined models (13, 57), a rise in the extent of communal artistic activities testifies to increasing social tensions among various groups forced into social encounters. This explanation was suggested for the intensive social activities (art being just one of them) known to occur in aggregation sites. These activities are actually devices to relieve tensions created during social interactions within large groups of people (53). While nomadic societies conduct just one (yearly) or a few (seasonal) gatherings of this kind, sedentary people inevitably face a situation that forces them to share territories or even living quarters with other, not immediately related people, with no option of splitting into smaller groups. In such situations, a need arises for mechanisms that would create a sense of (smaller) group identity and (smaller) group loyalty (for instance personal ornamentation; 90), while still retaining a sense of participation in the greater cultural entity. Thus artistic activity may be viewed as indirect evidence for extended habitation of given locations by large groups.

A most significant evidence for Natufian sedentism stems from various faunal remains, which include for the first time commensals such as the house rat, the house mouse, and the sparrow. These are new species or subspecies. For example, the house mouse, *Mus spicilegus*, was replaced by the domestic variety, *Mus musculus domesticus* (1, 82).

Why indeed did the hunter-gatherers in this region give up mobility? It is possible that a sedentary trend was reinforced by "residential constraints

imposed on returning social units by emergent attitudes of ownership or land tenure in the Natufian period" (34, p. 17). Taking into consideration the ecological peculiarities of the Mediterranean Levant, which dictated certain preadaptations within Late Pleistocene groups, it seems that the establishment of sedentary communities may be considered a point of no return, because it seems that farming communities emerged among these sedentary groups.

ORIGINS AND EVOLUTION

The circumstances of the emergence of the Natufian are pertinent to the emergence of the succeeding Neolithic agricultural societies. If indeed we accept that much of what is considered Natufian on the basis of a common techno-typological lithic tradition actually represents more than one cultural complex, then it is possible to explain (at least regarding the Levant) the appearance of sedentism and farming and that of the complex Neolithic societies. It seems that such explanation would postulate that in the arid zones of the southern Levant, nomadic people were pursuing the traditional way of living, while other groups, living further away in the northern Levant, were practicing other subsistence strategies dictated by different climatic-geographical circumstances. In both these instances, the material cultures lack the unique cultural components found in the assemblages of a third contemporaneous entity, the Natufian of the Mediterranean southern Levant. The boundaries between these entities are not clearly outlined. Thus it is quite possible that following a budding-off process, which occurred in the core area during the Late Natufian, an originally northern group established itself in the Negev, reconciling its traditional way of life with the different, local circumstances and applying different logistics to the exploitation of the new macro-environment (43). Undoubtedly, the study of the issue of incipient agriculture and the appearance of agricultural societies will profit if we adhere to this tripartite division and reserve the term Natufian to the Mediterranean southern occurrences and their offshoots.

Opinions vary about the origin and cultural evolution of the Natufian. The notion, originally advocated by Garrod (39, 40), of an intrusion from North Africa of an entity fully grown with no traceable roots in the past (40, p.212) was subsequently replaced by a general agreement that the Natufian was continuous with the local Levantine tradition (63) and evolved from the local Geometric Kebaran (6, 48). Recently it was suggested (43) that at least some of its material components were derived from entities located outside the boundaries of the Natufian core area. Thus, the Hamran, an entity defined in southern Jordan, was proposed (46) to have been the progenitor of the early Natufian. These claims are at the least problematic as (a) the Early Natufian at the suggested region lacks a considerable number of attributes, mainly

nonlithic ones, characteristic of the Natufian in the core area; and (b) no continuity is detectable between Early and Late Natufian in Transjordan.

Climatic fluctuations were often suggested as the main triggering force for various changes observed in the Natufian (47, 48), yet the whole issue of climatic changes and their possible impact on the evolution of the Natufian and on its nature—particularly on its patterns of subsistence and expansion—is yet to be resolved.

Several general trends can be observed regarding the climate at the end of the Pleistocene in the Levant: Temperatures were rising, and with the retreat of the glacial ice sheets, air circulation patterns changed worldwide, storm tracks began shifting northward until they reached their present day patterns, and sea level rose, inundating the coastal plain.

While the northern Levant seems to have been less sensitive to changes in temperature and amount of rainfall, in the southern Levant small-scale climatic changes seem to have had significant effects. There is, however, considerable disagreement regarding the exact timing of these changes, their duration, and their possible effect on the distribution of plant communities. The main reason for this disagreement is the poor dating of most of the pollen columns comprising the main source for climatic interpretations in the Levant, which makes correlations between various local sequences difficult (23). A climatic reconstruction based on a pollen diagram from Hayonim Terrace (50), postulates a humid phase about 14,000 years ago followed by cold and dry conditions; these gave way at the beginning of the Natufian to mild and humid ones, which continued till the onset of drier conditions in the Late Natufian. Another climatic reconstruction (21) maintains that the climatic amelioration that began prior to 14,500 BP reached an optimum at about 10,000 BP and persisted throughout the Natufian into the period of the early Neolithic cultures. Yet a third opinion (89) conceives of the Geometric Kebaran (at least towards its end) and the Early Natufian as periods of wet conditions replaced in the Late Natufian by dry conditions that persisted until the emergence of the Neolithic cultures. This notion is supported by recent pollen data (3), which confirm that about 17,000 years ago the cold period of the Late Glacial maximum was followed in the southern Levant by a period of more humid conditions whose peak occurred about 11,500 years ago. In the northern Levant the cold period lasted until about 10,000 BP, and the peak of wet conditions occurred about 8,000 years ago (21).

In accordance with all these climatic pictures, while most of the Kebaran sites were located in the Mediterranean zone of the southern Levant, the succeeding Geometric Kebarans were able, owing to the climatic amelioration (42), to spread out into the neighboring desert areas and adapt to the local conditions. The desert sites are generally smaller and had most probably been occupied by smaller groups exercising a limited range of activities (mainly hunting). They were mobile, because limitations upon resources precluded

prolonged exploitation of the sites' immediate surroundings (43). Sites located north of the Negev are much larger and display evidence of complex activities (including elaborate burials; 54), richer material remains, and some indications of longer occupancy and larger nuclear groups. Though the desert sites are small, the total population of the Geometric Kebaran grew in comparison with its predecessors, as their Mediterranean sites were of the same size as the previous, Kebaran ones. All in all the existence of the desert sites can indeed be interpreted as reflecting an increase in population size, related to additional or more easily available food resources. The same lithic material is recovered from both the north and the south, and sea-shells from the Mediterranean are recovered from the southernmost of Geometric Kebaran sites in Sinai (10). This can be taken as evidence that the desert groups retained their connections with their contemporaries in the north. An appropriate analogue to the above scenario is a tribe, spread over a large region, with all its clans or bands reconfirming their adherence to the tribal entity through seasonal or annual aggregations. These are held in locations with optimal conditions for ceremonial activities, matchmaking, and exchange of goods and information.

The climatic amelioration in the semi-desert and desert regions of the southern Levant drew other nomadic groups—the Mushabians, of north African or eastern affinities—to the Negev and Sinai, and even to regions further north on the southern slopes of the Judean Hills (7, 8). Eventually, both cultural traditions influenced each other (thus the Mushabians were using the microburin technique to produce microliths similar to those of the Geometric Kebarans). According to ^{14}C dates, the coexistence of these two cultural traditions lasted for 1000–1500 years. After this period the Geometric Kebarans disappeared from the Negev and Sinai while Mushabian habitation of the semiarid regions went on (43). The Geometric Kebarans may have been pushed back into the Mediterranean zone following intensive competition with Mushabian groups that had arrived in the arid areas of the Negev from regions with similar phytogeographical conditions and were therefore better adapted to life in the desert. The southern Geometric Kebaran populations joined their macro-bands in the Mediterranean belt, and this inflated population put heavier pressure on available resources. The need to cope, facing this increased population, generated various transformations that eventually gave rise to a new cultural entity—the Natufian.

This may have been a continuous process, involving desert groups moving north during the dry seasons, reentering the Mediterranean zone (just like the Beduins in the last century). Each year additional groups, having come to the north for the yearly aggregation events, may have decided to remain there because conditions in the south were not tempting enough to draw them back.

The northern Geometric Kebarans assimilated their Negev counterparts while exploiting new food resources, improving exploitation of familiar ones,

and reorganizing their society. They seem to have made use of passive knowledge, which may have been acquired accidentally and effortlessly in the past, through sheer curiosity—a primary motivational force in all primates (8). Application of this knowledge was a necessity rather than a choice, because it certainly required investment of energy and changes of familiar habits. Apparently, some adaptive mechanisms developed by the Mediterranean-zone Geometric Kebarans played an important role in the establishment of the new socioeconomic system. Thus a subsistence behavior based on small territories and on the existence of base camps in specific locations was necessarily adjusted to the spatial concept of this enlarged population. The use of pounding and grinding stones, the exploitation of legumes and cereals, the existence of bone tools testifying to the knowledge of basketry (possibly an improved means for carrying and storing food), and the employment of broad spectrum subsistence tactics (35, 52, 62) contributed towards adjustment to the new social patterns.

Most probably population increase within small territories led to a corresponding increase in the size of Natufian base camps and to a decrease in mobility. Evidence for this is diverse. Changes appear in patterns of raw material exploitation (see above); an observed techno-typological variability may be interpreted as reflecting merging of flint knapping traditions (this, for example explains the presence of the microburin technique in certain sites and its absence from others). It is noteworthy that this diversity decreases with time, and the Late Natufian exhibits a higher level of technological uniformity. For the first time in the Levantine record, artistic manifestations appear on a large scale, thus reflecting intensified pressures resulting from the tight interaction within various social groups (13). For example, an abundance in personal decorations, displaying great intergroup variability, is similarly significant with respect to these complex social dynamics (79). Ordered graveyards, similar to those encountered later on in the sedentary, farming Neolithic societies, may also testify to sedentism and territoriality. Permanent storage facilities and increasing quantities of food refuse would attract rodents, birds, and scavengers. This may explain the appearance of domesticated wolves (dogs) in base camps, buried together with their masters (31, 88). Continuous broad-spectrum exploitation, which became essential for feeding large and relatively stable groups, exerted pressure on game populations, leading to depletion and extinction of the scarcer species. This intensive exploitation pattern is reflected also through morphological changes in the gazelle, as the depletion of its gene pool caused dwarfism (28, 30). The consumption of cereals and pulses is indicated by attrition and caries found in Natufian teeth from most sites (76). Recent work carried out by Unger-Hamilton (84, 85) supports earlier contentions that the particular sheen on sickle blades resulted from cereals harvesting. Although harvesting by beating

gives the highest yield per unit of time and demands much less effort, harvesting by sickles apparently maximizes the yield per unit of area (51). This calculation is in accord with Natufian territoriality and its patterns of intensive exploitation. The need to exploit to the utmost their limited-size "fields" drove the Natufians to maximize energy returns per unit area, instead of maximizing returns per unit of time spent in harvesting and travel. Moreover, according to Hillman & Davies (51), harvesting by sickles led to domestication of wild-type crops. It is important to note that in the "Natufian" assemblages from the northern Levant sickle blades are rare or nonexistent (23, 66). Apparently, the domestication process could occur rather rapidly—within no more than two centuries—which implies that the "Agricultural Revolution" may have taken place during the Natufian period and that the Natufians may have been the first farmers in the Levant (A. Belfer-Cohen, in preparation).

The Natufian economic infrastructure reflects the need to confront certain stress conditions. However, data derived from Natufian skeletons indicate good health and balanced physical conditions within the population (16, 77). This is additional indirect evidence that it was not famine which drove the Natufians to take the drastic measures entailed in vast economic change, since a society cannot afford experimentation in times of stress. Rather it was the need to accommodate more people.

CONCLUSIONS

The success of the Natufian led to its demise. The short duration of the Natufian phenomenon and its replacement by the Neolithic cultures suggest that the unique characteristics of the Natufian created an uncontrolled momentum. Thus, Natufian populations not only did not starve, but flourished and kept growing. This population growth presumably led (at least in the Mediterranean zone) to a growing sense of proprietorship of land, especially so with the growing dependence on cultivated plants. Sedentism brought about many changes in settlement patterns, including greater investment of energy and resources in habitation structures and storage facilities. Under such conditions of population pressure, when each group defends its territory and strives to differentiate itself from its neighbors, the need for group identity increases and encourages the appearance of unique characteristics in each social group. As more and more people are forced to live in close proximity to one another, the establishment of strong institutional mechanisms becomes inevitable in order to prevent anarchy and to control emotional behavior and information exchange within the group. The strengthening of all these trends culminated in the appearance of a new cultural entity—the Neolithic Complex.

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