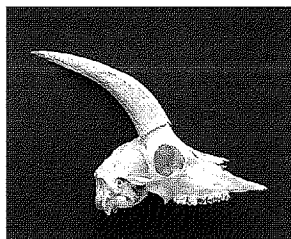

EPIPALEOLITHIC SUBSISTENCE STRATEGIES IN THE LEVANT



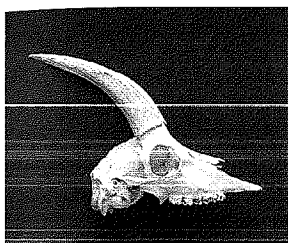
A Zooarchaeological Perspective

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1 Introduction



The end of the last glacial in the Levant encompasses the Epipaleolithic cultural sequence (*ca.* 21,000–11,500 cal. BP), a period of marked changes in global climatic conditions and human cultural evolution. The major Epipaleolithic evolutionary trajectory is the transition from small-scale highly dispersed and mobile hunting and gathering lifeways to complex communities with large-scale permanent settlements on the threshold of agriculture. It is commonly suggested that decreased mobility, increased human population density, and continuous intensive exploitation of the environment led to increasing hunting pressure on local prey populations. Changes within the Epipaleolithic are regarded by many scholars as socioeconomic responses to environmental changes, either due to rising population densities and increased pressure on available resources (Cohen 1977; Hassan 1981; Henry 1985), or the shift to sedentism and the overexploitation of prey resources in the vicinity of sites (Bar-Yosef and Belfer-Cohen 1992; Belfer-Cohen and Bar-Yosef 2000; Henry 1989; Tchernov 1991a, 1992, 1997). Increased interest in the Epipaleolithic has accelerated the study of a growing body of archaeological evidence with the goal of understanding the driving forces underlying this major socioeconomic and cultural shift (e.g., Bar-Yosef 1996; Bar-Yosef and Belfer-Cohen 1992, 2002; Bar-Yosef and Meadow 1995; Cauvin 2000; Goring-Morris 1988; Goring-Morris and Belfer-Cohen 1997; Henry 1989, 1991, 1995; Sanlaville 1996; Tchernov 1997).

This study aims to gain insight into Epipaleolithic subsistence strategies on the basis of a number of recent zooarchaeological and taphonomic studies from the northern coastal plain and Mount Carmel region of Israel.

Reconstructing the foraging behaviors of Epipaleolithic people from a zooarchaeological perspective is one of the keys for examining the impact of subsistence strategies on the evolution and development of their cultures. New taphonomic studies, refined methods of age and sex determination, and morphological data for the main ungulate species, coupled with reconstruction of the faunal spectrum and variability in dietary breadth, provide comprehensive chronological comparisons for the Epipaleolithic cultural and ecological succession. Multivariate inter-site taphonomic comparisons serve to detect potential differences between sites (Bar-Oz and Dayan 2003; Behrensmeyer 1991; Lyman 1994; Stiner 1991a) and provide insights into both meat processing and consumption patterns of key prey resources (Behrensmeyer 1986; Miracle and Milner 2002; Stiner 1994). The diversity of exploited fauna highlights foraging behaviors and hunting preferences (Stiner 2002a). Morphometric analyses of Epipaleolithic prey populations allows us to assess body size changes through time and to correlate these changes with the prevailing paleoclimatic fluctuations (e.g., Garrod and Bate 1937; Davis 1981; Kurten 1965; Speth and Tchernov 2002; Tchernov 1968) and increased hunting pressure (Dayan and Simberloff 1995; Stiner et al. 1999). Moreover, the manner in which Epipaleolithic hunters manipulated and managed animal resources is fundamental for understanding the advent of animal domestication (e.g., Davis 1982; Dayan 1994; Tchernov 1991a). It is commonly asserted that the development of ungulate domestication is the result of a long history of human–animal interactions marked by increasingly productive and sophisticated hunting practices and resource management (Clutton-Brock 1999). Therefore, the demographic composition of the main ungulate species will enable us to discern whether Epipaleolithic hunters selected particular age or sex groups.

This study provides full documentation of the faunal remains from five Epipaleolithic assemblages. These assemblages are: Nahal Hadera V, Hefzibah 1-6, Hefzibah 7-18, Neve-David, and el-Wad Terrace. Detailed taphonomic and zooarchaeological comparisons serve to differentiate forces affecting the accumulation of fossil remains and to identify human exploitation patterns during this critical period of change in human culture and economy.

The main objectives of this study are: a) to reconstruct the postdepositional history of each of the discussed Epipaleolithic bone assemblages; b) to identify culturally-determined behavioral differences in Epipaleolithic food consumption practices; c) to explore variability in dietary breadth; d) to learn how the main ungulate species were exploited and to explore variation in Epipaleolithic hunting strategies; and e) to study the prevailing ecological conditions of the late Glacial period in Israel. The goal of this study is to employ the collected data from these five zooarchaeological assemblages to explore the relationships between prehistoric human hunters and their prey in order to formulate a clear picture of the Epipaleolithic subsistence economy. The introduction provides a brief description of the Epipaleolithic cultural, economic, and climatic succession, and the geographical setting of the northern coastal plain and the Mount Carmel region of Israel. The next chapter presents the procedures and methods of faunal analysis used in this study. This is followed by a detailed description of the five assemblages and culminates with inter-assemblage comparisons. The closing discussion considers the disclosed temporal trajectories and discusses the factors that may have contributed to changes of Epipaleolithic subsistence strategies.

Cultural Changes During the Epipaleolithic

The main archaeological complexes of the Epipaleolithic (or late Upper Paleolithic in European terminology) in the Mediterranean region of the southern Levant include the following (all dates are calendar years BP): the Kebaran complex (21,000–17,000); the Geometric Kebaran complex (17,000–14,500 BP); and the Natufian complex (14,500–11,500 BP). Ages of the archaeological entities follow calibrated chronologies (Bar-Yosef 2000, 2001). Considerable heterogeneity has been recognized among the numerous Kebaran and Geometric Kebaran assemblages, each of which exhibits varying degrees of regional and diachronic variability. The Natufian culture is divided into an early phase that lasted until *ca.* 13,000 BP, and a late phase that lasted until *ca.* 11,500 BP. Each of these cultural complexes is defined principally on the basis of stratigraphic evidence, radiocarbon chronology and quantitative and qualitative stylistic differences of microlithic tool types and shapes (e.g., Bar-Yosef 1981,

1990; Bar-Yosef and Vogel 1987; Bar-Yosef and Belfer-Cohen 1989; Fellner 1995; Goring-Morris 1987, 1995; Henry 1989, 1995; Kaufman 1992; Valla 1984; Valla et al. 1986). Most of these studies suggest a developmental continuum, with the Natufian representing a major cultural change. The Kebaran and Geometric Kebaran are generally considered mobile and semi-mobile foragers. The Natufian culture had both ephemeral sites as well as relatively large scale permanent settlements (e.g., Bar-Yosef 1998, 2001, 2002; Bar-Yosef and Belfer-Cohen 1989, 1991; Henry 1989; Valla 1995).

Cultural features, such as site size, site distribution, intensity of site occupation, and patterns of seasonal mobility provide evidence for the archaeological complexity of the Epipaleolithic period. During the Kebaran period sites were limited to the Mediterranean vegetation zone due to the environmental constraints of the Late Glacial Maximum. Large Kebaran sites are located near wadi courses on the coastal plain and along the two flanks of the Jordan Valley and are also known from eastern Jordan near permanent water sources (see Bar-Yosef and Belfer-Cohen 1989: Figures 3–4). Climatic amelioration in the following period led the Geometric Kebaran to expand into former desert areas that had become typical Mediterranean steppe. The distribution of Geometric Kebaran sites indicates the exploitation of an entire array of ecological zones. Large sites are located in favorable ecotonal settings, where resources from several habitats can be gathered or hunted (Bar-Yosef and Belfer-Cohen 1989). Both Kebaran and Geometric Kebaran sites varied in size from *ca.* 1,000 m² in the lowland Mediterranean core areas to less than 100 m² camps in the semi-arid belt and the highlands. High densities of artifacts and deep cultural deposits in the lowland Kebaran and Geometric Kebaran sites of the coastal plain (e.g., Bar-Yosef 1990: Table 3.1; Kaufman 1992) indicate occupational intensity either in the form of larger populations, repeated occupations over long periods or relatively long stays. Smaller sites, which are much more ephemeral, are either short-term seasonal or specialized activity camps (Henry 1989). The distribution of sites and the differences in site sizes can be interpreted as reflecting different degrees of mobility. These data suggest that both Kebaran and Geometric Kebaran peoples lived in seasonal aggregation camps of larger bands,

exploited small territories and intensively occupied lowland base camp sites (Bar-Yosef 1990; Bar-Yosef and Belfer-Cohen 1989, 1991; Goring-Morris 1987, 1995; Goring-Morris and Belfer-Cohen 1997; Henry 1989; Kaufman 1992). Aggregation sites from the Kebaran and Geometric Kebaran complexes were located at the ecotone between woodland and steppe (Kaufman 1992) and represent the precursors to the permanent settlements of the Natufian.

Hunter-gatherer mobility strategies are closely linked to seasonality. Seasonal variations in temperature and rainfall force foragers, who depend on daily foraging strategies, to adapt to shifts in the spatial and temporal availability of resources (Kelly 1995). Henry (1989) suggests that Kebaran and Geometric Kebaran foragers dispersed to the uplands during the spring and summer and aggregated in the lowlands in autumn and winter. Similarly, other researchers (Bar-Yosef 1987, 1990; Bar-Yosef and Belfer-Cohen 1989; Bar-Yosef and Vogel 1987) propose that winter and spring were the times of aggregation in the lowlands. All agree that cold temperatures in the wooded highlands prevented winter occupation of those regions.

The large number of excavations from the Natufian cultural complex demonstrate changes in settlement pattern, demography and social organization (for detailed description of archaeological evidence see Bar-Yosef 1983, 1998, 2001, 2002; Bar-Yosef and Belfer-Cohen 1989, 1991, 1992, 1999; Bar-Yosef and Valla 1990, 1991; Belfer-Cohen 1991a; Belfer-Cohen and Bar-Yosef 2000; Byrd 1989, 1994; Garrod 1957; Henry 1989; Valla 1995, 1998). Aside from dwelling structures and burials (mostly organized in defined graveyards), the Natufian record is characterized by the establishment of long-distance exchange networks (e.g., D. Bar-Yosef 1991; Weinstein-Evron et al. 1995, 1999, 2001), increased artistic manifestations (e.g., Bar-Yosef and Belfer-Cohen 1991, 1998, 1999; Belfer-Cohen 1991b; Weinstein-Evron and Belfer-Cohen 1993), and a varied bone tool industry (Campana 1989). Use-wear analysis indicates that bone tools were used for hide-working and basketry (Campana 1989). Ornaments, such as pendants made from bone, tooth and seashells, and variability in mortuary practices, demonstrate growing inter- and intra-site variability, possibly pointing to higher levels of competition within

those communities (Bar-Yosef and Belfer-Cohen 1991). It has been suggested that some of the art objects mark emerging territoriality among the Natufian (Bar-Yosef and Belfer-Cohen 1999) and that symbolic expressions of decorated and incised objects may indicate ties between different communities (Bar-Yosef and Belfer-Cohen 1998).

The Natufian archaeological record is further characterized by increased harvesting and processing of wild cereals, possibly including intentional small scale cultivation, as evidenced by the remains of cereals in several sites in the core area (Edwards 1991a; Valla et al. 1989), the abundance of sickle blades with the typical gloss (Anderson 1991; Unger-Hamilton 1989, 1991; Yamada 2000), and numerous ground stone implements (Wright 1991). Increased exploitation of cereals is supported by evidence of a high percentage of dental disease in the Natufian, typical of populations that eat large amounts of starches and sugars (Smith 1991). The first domesticated dog remains (*Canis familiaris*) in Natufian sites mark the initial process of animal domestication (Davis and Valla 1978; Dayan 1994; Tchernov and Valla 1997; Valla 1990).

Evidence of the emergence of sedentary communities during the Natufian is supported by the presence of high frequencies of human commensal species such as the house mouse (*Mus musculus*), rat (*Rattus rattus*), and house sparrow (*Passer domesticus*), indicating that these species evolved to take advantage of the new niche created by partially or fully sedentary human occupations (i.e., constant sources of food and reduced risk of predation; Tchernov 1984, 1991a, 1991b). Natufian sedentism is also suggested by the evidence of storage facilities as seen at Eynan (Mallaha) (Perrot 1966; Valla et al. 1989, 1991) and systematic rebuilding of houses (Valla 1991). Reduced mobility of Natufian societies is also inferred from seasonal bands in the cementum of teeth of hunted gazelle (Lieberman 1991, 1993, 1998; but see Stutz 2002) and by the presence of seasonally migratory birds that indicate both summer and winter hunting events (Pichon 1987, 1991). The remains of young gazelles from all juvenile stages (based on dental eruption patterns and deciduous molar crown heights) in Natufian sites also support year-round occupation (Davis 1982, 1983, 1987).

Some researchers have argued that Natufian sedentism was enhanced by the need to intensify cereal exploitation (Bar-Yosef and Belfer-Cohen 1992; Bar-Yosef and Meadow 1995; Henry 1989) and others have proposed that sedentism enhanced the spread of cereals (McCorriston and Hole 1991). Other explanations suggest that economic and social circumstances and/or abrupt climatic change enforced sedentism (the "push" model) or that sedentism resulted from the attraction of humans to spatially rich, stable and restricted resources (the "pull" model; Rosenberg 1998 and references therein). A relative increase in population density is often cited as a central factor in population aggregation (Bar-Yosef 2002).

Natufian sites range in size from small ephemeral camps ($\leq 100 \text{ m}^2$) to large base camps ($\geq 1,000 \text{ m}^2$) in the core of the Mediterranean zone (Bar-Yosef and Belfer-Cohen 1989). The large Early Natufian sites show relationships between increased cultural complexity and sedentism when compared to their predecessors and to the following Late Natufian (Lieberman 1998). It was suggested that the Late Natufian peoples were more mobile due to the harsh and unstable environmental conditions created by the Younger Dryas (Bar-Yosef 2002; Bar-Yosef and Belfer-Cohen 2002; Goring-Morris and Belfer-Cohen 1997). The greater mobility of Late Natufian people marks a return to a presumably more egalitarian society, which is indicated by the disappearance of individual decorated burials and the larger number of group burials (Bar-Yosef 2001, 2002).

Ground stone implements (grinding stones, mortars and pestles) are found throughout the Epipaleolithic archaeological sequence. These implements and, in particular, deep mortars first appear during the Upper Paleolithic. They are found in Kebaran and Geometric Kebaran sites and are numerous in Natufian sites (Bar-Yosef 1980; Wright 1994). The presence of such implements likely suggests an increasing reliance on vegetal resources, in particular wild seeds, which required extensive pounding or grinding prior to their consumption (Bar-Yosef 1998; Wright 1991). Archaeobotanical remains have been recovered from the late Upper Paleolithic (pre-Kebaran) site of Ohalo II (Kislev et al. 1992, 2002) and late Epipaleolithic (late Natufian) in Mureybet and Abu Hureyra (Hillman in Moore et al. 2000; Hillman et al. 1989).

The cultural transformation of the Natufian is striking, and has led some researchers to view the shift as "revolutionary" (e.g., Gilead 1988; Henry et al. 1981). According to Tchernov (1992, 1997) the emergence of the Natufian can be viewed as a quantum event that took place rapidly. This view is similar to, and influenced by, Gould and Eldredge's (1977) punctuated equilibrium model. Henry (1983:99) describes the onset of the Natufian as "one of the more important transitions in the history of modern development". Other researchers, such as Kaufman (1992), emphasize gradual change within the Epipaleolithic and interpret the Geometric Kebaran as an intermediate between the Kebaran and the Natufian. Most researchers, however, regard Geometric Kebaran adaptations to be similar to Kebaran adaptations (Bar-Yosef and Belfer-Cohen 1989; Gilead 1988; Henry 1989).

Whether defined as steady, directional evolution or as a revolution, the causes of the shift are poorly known, and much remains to be discovered about the development of Natufian economies. Our knowledge of Kebaran and Geometric Kebaran subsistence economies is scarce and comparisons within the Epipaleolithic sequence are unwarranted. Zooarchaeology is the primary tool for the reconstruction of Epipaleolithic subsistence as limited to animal tissues. A well-defined indication of food stress as reflected in the Natufian zooarchaeological records may support the hypothesis that the transition to agriculture was in part triggered by economic considerations (Dayan 1999).

The aim of this study is to document and explore variability in animal exploitation strategies during the Epipaleolithic. Through detailed taphonomic and zooarchaeological analyses of Kebaran, Geometric Kebaran and Late Natufian assemblages, the following questions are addressed: Do the Kebaran and Geometric Kebaran foreshadow Natufian hunting practices? Can a directional trend of increasing hunting pressure and intensity during the pre-Natufian millennia be seen to culminate in the Natufian? Was the Natufian culling and foraging behavior innovative? Understanding these and other Kebaran and Geometric Kebaran foraging behaviors is crucial for gaining insights into Terminal Pleistocene cultural development (see also Bar-Yosef and Belfer-Cohen 1992). Addressing these questions may be fundamental

for recognizing ancient human resource management and subsistence behaviors, leading up to the adoption of animal husbandry in the Near East.

Economic Changes During the Epipaleolithic

Faunal remains from the Levantine Epipaleolithic period have been studied using classic zooarchaeological methods (e.g., Bar-Yosef and Tchernov 1966; Davis 1974; Dayan et al. 1986; Legge in Noy et al. 1973; Saxon 1974; Saxon et al. 1978; Tchernov in Valla et al. 1986). These zooarchaeological reports are limited to species identifications based on teeth and epiphyses without identification of less identifiable body parts (such as shaft fragments). Unfortunately, taphonomic research in the Levant is still limited and few recent studies have employed taphonomic techniques (e.g., Gaudzinski 2004; Munro 2001; Rabinovich 1990, 1998a; Rabinovich and Tchernov 1995; Speth in Bar-Yosef et al. 1992; Speth and Tchernov 1998, 2001; Stiner n.d.; Stiner and Tchernov 1997; Stiner et al. 2001; Zohar et al. 2001). Taphonomic techniques include: identifying an array of skeletal elements; searching for various bone modifications to detect potential biases in the zooarchaeological record; and refining our understanding of ancient human economies (food transport and food processing). Moreover, only a few taphonomic studies have been conducted for the Levantine Epipaleolithic (e.g., Bar-Oz et al. 1998; Bar-Oz and Dayan 2002b; Martin 1994; Munro 2001; Rabinovich 1998a, 1998b). Additionally, only a very limited number of pre-Natufian Epipaleolithic excavations from the Mediterranean region have yielded good faunal collections (e.g., Bar-Yosef and Tchernov 1966; Davis 1974; Heller 1978; Hovers et al. 1988; Noy et al. 1973; Saxon 1974; Saxon et al. 1978) and many of these have been published only as faunal lists. Natufian remains are more abundant and have been more thoroughly analyzed (e.g., Garrod and Bate 1937; Bouchud 1987; Churcher 1994; Cope 1991; Crabtree et al. 1991; Davis 1982, 1983; Davis et al. 1994; Ducos 1978; Edwards 1991a; Garrard 1982; Garrard et al. 1996; Helmer 1991; Henry et al. 1981; Horwitz and Goring-Morris 2000; Legge and Rowley-Conwy 2000; Munro 2001; Stiner and Munro 2002; Tchernov 1993a, 1993b, 1993c; Valla et al. 1986, 1998, 2001).

Two patterns of Natufian faunal exploitation have been suggested in recent years:

1. A shift to a broad spectrum economy featuring an increased number of small game species (Davis 1989, 1991; Henry et al. 1981; Tchernov 1991a, 1993a), and in particular consumption of proportionally large numbers of fast-moving species (Munro 1999, 2001, 2004; Stiner 2001; Stiner et al. 1999, 2000; Stiner and Munro 2002).

2. Specialized gazelle hunting (*Gazella gazella*) populations, suggested by an increase in the percentage of gazelle remains in archaeofaunal assemblages (e.g., Legge 1972; Davis 1982; Henry 1985; Tchernov 1991a, 1993a, 1993d), an increase in the proportion of young gazelle (Davis 1983), a high proportion of male gazelles (Cope 1991; Tchernov 1991a, 1993a, 1993d), and a diminution in gazelle body size (Cope 1991; Davis 1981).

The adoption of broad-spectrum foraging strategies as a solution for rising human population pressure and increased environmental intensification was first proposed by Binford (1968) as the main factor instigating the origins of agriculture. The broad-spectrum revolution hypothesis was later proposed by Flannery (1969) to explain the advent of plant and animal domestication. The model of a broad-spectrum revolution supposes a shift from the hunting of large ungulates to dietary diversification including the increased exploitation of small-animal and plant resources. A continuous and increasingly intensive exploitation of the environment led to a decline in the quantity of available resources as well as a change in the distribution of available resources. As a result, the relationship between resource yield (caloric value of the game) and the effort invested per foraging episode decreased. In order to maintain adequate nutrition, the nutritional base was broadened to include new species, especially small low-ranked resources that were seasonally predictable and available (birds, reptiles, fish, invertebrates, and plants). If heavy pressure on resources is continued, this process may deplete populations and even drive some animal and plant species to extinction. If resources are not replenished, consumers are forced to find new sources of subsistence. Under such circumstances there may be pressure to find alternative sources of food that humans can control (i.e., the domestication process; see also Flannery 1973, 2000).

The broad spectrum economy of the Epipaleolithic Levant has been widely discussed and accepted for many years but, until recently, it remained essentially untested. The intensification and diversification of plant use remains to be analyzed quantitatively. The number and diversity of plant remains identified from the water-logged site of Ohalo II in the Sea of Galilee, dated to *ca.* 19 kya BP, are impressive (133 taxa; Weiss 2002; Weiss et al. 2004), and they certainly indicate broad spectrum foraging for plants, even if many of those taxa were not brought to the site as food.

A growing number of studies using faunal remains have been conducted to test the broad spectrum revolution hypothesis. Henry et al. (1981) compared the Geometric Kebaran and Early Natufian strata from Hayonim Terrace and found an increase in the proportion of small game. Similar increases were also found in the PPNA layer at Hatoula in comparison to the Late Natufian layer (Davis et al. 1994; see also Davis 1991). Bar-El and Tchernov (2001) emphasized the role of mobility patterns in the Natufian, and argued that the shift from ephemeral to more sedentary occupations at Levantine sites resulted in the exploitation of a wider array of animals, particularly small game such as hares, birds and reptiles. They also noted the possible role of new technologies, such as traps and snares, which would have increased the effectiveness of capturing hares.

Recently, Horwitz and Tchernov (2000) used measures of taxonomic diversity to infer changes in Epipaleolithic and Neolithic subsistence practices and found an increase in the diversity of game species across the transition to the Natufian period. While their study offers a useful synthesis of the Epipaleolithic faunal sequence in the Jordan Valley, the results of their diversity analyses are problematical. They compare zooarchaeological assemblages of different sizes, it is unclear which species were used in the analysis, and the taphonomic histories of the different assemblages were not investigated (for a demonstration of the importance of taphonomic analyses for measures of taxonomic diversity see Bar-Oz and Dayan 2003a; Schmitt and Lupo 1995).

Edwards (1989) conducted a broad chronological comparison of 24 sites from the Middle Paleolithic to the Bronze Age, and found no support for the broad spectrum revolution. However, his study included

species of no economic value (Neeley and Clark 1993), pooled a large number of sites from across the entire Levant, combined published reports using different means of quantification (MNI and NISP), and used both open-air and cave sites without considering possible taphonomic disturbances (see also Blumenshine 1998). Moreover, Edwards (1989) used diversity indices, which obscure the actual number of species (richness) and their relative abundance (evenness; Pielou 1975). Neeley and Clark (1993) reanalyzed most of the same database, making an *a priori* distinction between economic and non-economic faunas (by excluding raptors, songbirds, rodents, insectivores, some carnivore species, and reptiles except for tortoises). They also excluded all molluscs because of inconsistent reporting from numerous sites and because of their possible use as ornaments. Their comparison provided tentative support for a broad spectrum pattern of exploitation, since the results indicated greater richness and evenness in the Epipaleolithic, and Neolithic periods, followed by a predictable decline in the Bronze Age (Neeley and Clark 1993). However this study did not identify differences between the pre-Natufian and Natufian Epipaleolithic. As a whole, these studies suffer from the use of a scale that is too coarse to adequately distinguish between alternative models of subsistence change (see also Miracle 1996).

A preliminary survey of the published Epipaleolithic literature revealed that a detailed analysis of subsistence patterns from Israel is not possible (Bar-Oz et al. 1999). Various problems prevented the use of many published Epipaleolithic datasets even after excluding sites which were not excavated using modern recovery techniques. Differences in the state of bone preservation, techniques of bone recovery, and site type limited the potential for inter-site comparisons. Moreover, the published reports differ in the types of analysis undertaken. Some of the published reports only mention the various species encountered, and provide no quantitative data. In some instances only the artiodactyls were published (see details in Bar-Oz et al. 1999). These reports contribute unevenly to discussions of subsistence patterns.

A previous comparison of Epipaleolithic assemblages from the Mediterranean region with complete datasets (Bar-Oz et al. 1999), which include the Natufian sites of Eynan (Bouchud 1987; Desse 1987;

Pichon 1987) and Hatoula (Davis et al. 1994) and the pre-Natufian sites of Neve-David and Nahal Hadera V, showed that Eynan has the most diverse assemblage and Hatoula the least diverse (see Bar-Oz et al. 1999:Table 7). Therefore no temporal pattern in species diversity could be discerned within the Epipaleolithic. These results suggest that the real difference lies not between the Natufian and the Kebaran, but between Eynan and the other sites. Although all four sites are in the Mediterranean region, they represent different sub-regions and habitats. Of the 62 species of economic value at Eynan, ca. 66% are waterfowl. Eynan's location in the Hula Basin may account for this large diversity of waterfowl. For example, at Ohalo II, over 60 species of waterfowl were identified (Simmons and Nadel 1997; Simmons 2002). Ohalo II and Eynan are located in the same general region and share a similar type of habitat. Therefore habitat type may be the determining factor for species diversity. Pichon (1991) found that waterfowl formed part of the Natufian diet, in particular at sites along the Jordan Valley. Fishing, which was significant at Eynan (Desse 1987) and Ohalo II (Zohar 2002; see also Nadel et al. 1994), may have been less important along the Mediterranean coastal plain. The bottom line of Bar-Oz et al. (1999) was that owing to the great geographic diversity of the Levant, care must be taken when comparing different zooarchaeological assemblages from different chronological periods and it is necessary to distinguish between spatial and temporal variability.

Recently, Stiner and colleagues (Stiner 2001; Stiner et al. 1999, 2000; Stiner and Munro 2002) presented a new approach to understanding changes in dietary choice based on the zooarchaeological analysis of small game exploitation. Their study indicates how the abundance of specific prey types, rather than the overall diversity of prey, shifted over the last 200 kya. While slow-growing and slow-moving animals (tortoises and marine molluscs) dominate the Mediterranean Middle Paleolithic small game record in Israel and Italy, agile and fast-maturing animals (hares and partridges) became increasingly important in human diets only during the Late Upper Paleolithic (Stiner et al. 2000). In addition, climate-independent size diminution is evident in the mean body size of the Levantine tortoises near the end of the Middle Paleolithic (Stiner et al. 1999; but see also

Speth and Tchernov 2002). These trends in small game use and in body size change are supported by predator-prey simulations that provide evidence for pulses in human population growth that increased the level of harvest pressure (Stiner et al. 2000). Relative proportions of small game in the Natufian period indicate another demographic pulse in the opposite direction (Munro 2001, 2004; Stiner and Munro 2002). High proportions of fast-moving small game in the Early Natufian are replaced by a heavy dependence on slow-moving tortoises in the Late Natufian. This return to pre-Natufian exploitation patterns suggests a decrease in occupation intensity during the Late Natufian in association with the Younger Dryas climatic event (Munro 2001, 2004). Thus, it has been suggested that Late Pleistocene Levantine societies did not diversify their diet in comparison to earlier periods, but shifted from the primary consumption of slow-moving to fast-moving taxa. Indeed, these studies are the first to clearly point to a temporal pattern of change in human dietary breadth, which began to expand much earlier than at the Pleistocene-Holocene transition as suggested by Flannery's (1969) broad spectrum revolution hypothesis (see Richards et al. 2001 for isotope evidence of increasing dietary breadth in the Middle Upper Paleolithic).

The heavy exploitation of gazelle particularly during the Natufian has generated extensive research on gazelle hunting patterns and their implications. Since the origins of animal domestication and the transition to farming communities was first described in prehistoric sites from the Near East, the nature of human relationships with gazelle populations before livestock husbandry has stimulated great interest (e.g., Campana and Crabtree 1990; Cope 1991; Davis 1982, 1983, 1991; Garrard 1982; Legge 1972; Horwitz et al. 1990; Martin 1994, 2000; Simmons and Ilany 1975-1977). Increased gazelle hunting has been attributed to cultural change (Henry 1975; Hooijer 1961) or to climatic changes that made gazelle herds more abundant, in comparison to those of fallow deer (*Dama mesopotamica*) towards the end of the Epipaleolithic (Garrod and Bate 1937; see also Davis 1982; Higgs 1967). Bate's (Garrod and Bate 1937) environmental explanation for this change was later supported by the analysis of Upper Pleistocene rodent faunas (Tchernov 1968, 1979a). Ducos (1968) also accepted

Bate's (Garrod and Bate 1937) environmental reconstruction, but suggested that the climatic shifts reflected in the ratios of gazelle and fallow deer were far less severe. Garrard (1982) presented another theory that suggested that Natufian populations may have begun to clear woodland to expand the range of wild cereals and/or to increase the density of gazelles. Thus, patterns of the Natufian economy have been ascribed variously to climatic and cultural processes. However, as shown recently by Grayson et al. (2001) for the Early Upper Paleolithic hunters of southwestern France, the dominance of a faunal assemblage by a single species may result from species availability rather than from specialized hunting (see also Grayson and Delpech 2002).

Comparisons of the relative proportion of gazelles in assemblages from a series of published Epipaleolithic sites from Israel (see list in Bar-Oz et al. 1999) showed no difference between the Natufian and pre-Natufian cultures. This observation does not support Henry's (1975) suggestion that Natufian sites have higher proportions of gazelle relative to previous periods. However, comparison of Epipaleolithic gazelle and fallow deer representation in sites from the northern coastal plain and the Mount Carmel region reveals a difference in gazelle ratios between pre-Natufian and Natufian assemblages, with gazelles being more common and fallow deer less common in the Natufian (see also Davis 1982).

Davis (1983) noted an increase in the cull of juvenile gazelles beginning in the Early Natufian and suggested several explanations for this pattern. Most importantly he suggested that the increase reflected year around hunting of gazelle, including numerous juveniles that are abundant in the natural population during the spring (see discussion in Hovers et al. 1988). Other studies have suggested that high rates of juveniles reflect new hunting methods such as communal net hunting, or the use of animal drives or kites (Campana and Crabtree 1990, 1991; Legge and Rowley-Conwy 1987, 2000; Rosen and Pervolotsky 1998). However, as pointed out by Edwards (1991b), mortality profiles are ambiguous, and the time resolution of Natufian deposits is too coarse to distinguish discrete events or mass kills. In addition, catastrophic mortality profiles are just as likely to have resulted from the culling of different age groups through time (Davis 1983).

The increase in the hunting of male gazelles during the Natufian has been interpreted as a result of conscious herd management techniques (Cope 1991; Legge 1972; Saxon 1974). Cope (1991:353) suggested that intensive sex culling practiced by the Natufians represents "an intermediate area between management of wild animals and true domestication" and proposed the term "proto-domestication" for this stage of cultural intervention. Cope also argued that the Natufian interference in the gazelle mating systems resulted in pronounced dwarfism and measurable phenotypic aberrations of body proportions and sizes in a high percentage of individuals. Natufian gazelle diminution was previously noted by Davis (1981) and interpreted as a climatically induced phenomenon (see also Ducos and Horwitz 1998). Cope (1991) suggested that although all limb bone elements showed some degree of diminution, proximal limb bones were less affected than distal ones, indicating disproportional allometric size diminution. Later studies, however, questioned these "patterns". Dayan and Simberloff (1995) analyzed Cope's published data (all sample statistics) and found no statistically significant evidence for dwarfing or increased variation in Natufian gazelles, and thus no support for the hypothesis of "proto-domestication". Ducos and Horwitz (1998) recently studied morphological change in Late Pleistocene–Early Holocene gazelles, using size indices as a measure of morphological change. Their results show that Kebaran populations were the largest, followed by a marked size reduction during the Geometric Kebaran and Early Natufian. Finally, gazelle body size increased slightly during the Late Natufian. Bar-Oz et al. (2003) also showed an increase of gazelle body size during the Natufian in comparison to previous Epipaleolithic periods. Similar evidence for a size increase in the Natufian was found for the Hatoula gazelles (Davis et al. 1994). Thus, as pointed out by Dayan and Simberloff (1995), statistical analysis of raw morphometric data from the entire Epipaleolithic sequence would be a major step towards resolving this intriguing issue.

Climatic Changes During the Epipaleolithic

Climate at the end of the last glacial played a major role in shaping past environments, landscapes, and available resources. Paleoclimatic sequences and paleoenvironmental

conditions have been reconstructed from oxygen isotope fluctuations registered in ice cores and deep sea cores, detailed isotope analysis of stalagmites that reflect rainfall fluctuations, pollen cores from lakes, geomorphological data, faunal analyses, sea level changes, and site distributions (see Weinstein-Evron 1998 for recent review of the literature and a comprehensive paleoecological reconstruction for the Mediterranean Epipaleolithic). A palynological sequence from the Hula Basin covering the Epipaleolithic sequence was recently published by Baruch and Bottema (1991, 1999). The resulting pollen curve is dated with ^{14}C dates and can be divided into lower, middle, and later phases. The lower phase corresponds to the end of the European Late Glacial Maximum (OIS 2) and coincides with the Levantine Kebaran culture. This phase contains the driest spectra of the sequence, as evidenced by low values of arboreal pollen. This result, coupled with correlations with deep sea cores (see references in Weinstein-Evron 1998), and detailed isotopic analysis of Israeli speleothems (Bar-Matthews et al. 1997; Frumkin et al. 1999) indicate that the Kebaran climate was dry and cold. The middle phase, which coincides with the Geometric-Kebaran, is characterized by a marked increase in arboreal pollen and a clear withdrawal of desert vegetation. This suggests climatic amelioration with an increase in humidity and temperature. A change to colder and drier conditions is evident during the later phase, at the end of the Early Natufian and the transition to the Late Natufian. The peak of this phase is correlated with the cold Younger Dryas climatic event (Baruch and Bottema 1991, 1999). More humid fluctuations follow the Younger Dryas, but the high humidity levels reached by the Early Natufian, were never reached again. Very similar trends were observed in other cores from the Hula and Ghab basins (see correlations in Weinstein-Evron 1990, 1998).

Northern Coastal Plain and Mount Carmel Epipaleolithic Sites

The Mediterranean coastal plain of the Levant is restricted to narrow beaches and coves along the coasts of Syria, Lebanon, and northern Israel, but opens to a wide plain south of the Mount Carmel promontory. In this southern section the coastal plain is a flat strip of land composed of a series of parallel south-north Quaternary

sandstone ridges ("kurkar") which follow the contour of the present-day sea shore. During the Last Glacial Maximum the coastal plain was some 12–14 km wider than today as the sea level was more than 100 m lower (Farrand and Ronen 1977; Horowitz 1979; Ronen 1983; Weinstein-Evron 1998). The rise in sea level that followed the Last Glacial Maximum was gradual and continued until the mid-Holocene (Bar-Yosef 1996).

As a result of the low sea level, the wider Epipaleolithic Mount Carmel coastal plain may have resembled the present-day Sharon plain, south of the Carmel coastal plain. Two of the studied sites, Nahal Hadera V and Hefzibah, are located atop the first sandstone ridge, a few hundred m east of the current outlet of Hadera River at the present shoreline (Figures 1.1–1.2). The Hadera River, which flows westward from the mountainous zone, is obstructed by the sandstone ridges and, until recently, formed swamps and ponds in the vicinity of the sites.

Mount Carmel is a structurally elevated, triangularly shaped area, up to 300 m high with gentle topography, a total length of *ca.* 30 km, and a maximum width of *ca.* 25 km (Weinstein-Evron 1998 and references therein). Two of the studied sites, Neve-David and el-Wad, are located in western Mount Carmel, where the slopes of Mount Carmel meet the open expanses of the coastal plain (Figures 1.3–1.4). Both sites are located on the boundaries between two geographical settings—the western slopes of Mount Carmel and the broad coastal plain, which probably constituted the main area of resource acquisition (Weinstein-Evron 1998; see also Vita-Finzi and Higgs 1978 for site catchment analysis for the Carmel sites, and Saxon 1974, 1978 for catchment analysis of the coastal plain).

The vegetation of the northern coastal plain and Mount Carmel is primarily eastern Mediterranean. The botanical landscape is characterized by a mosaic of forest park and open woodland (oak–pistachio association) with wide grassland areas and marshlands (e.g., Hadera and Kebara marshes) that developed along the river valleys that cut the sandstone ridges. The distribution of the main plant formations is determined by the lithology and derived soils of the region, and is also influenced by altitude on Mount Carmel. The northern coastal plain supports vegetation types confined to Holocene sand dunes, sandstone hills, marshes and saline environments.



Figure 1.1 View of the local environment of Nahal Hadera V. Photograph by G. Bar-Oz.



Figure 1.2 View of the local environment of Hefzibah. Photograph by G. Bar-Oz.

The association of carob (*Ceratonia siliqua*) and pistachio (*Pistacia lentiscus*) is widespread in western Mount Carmel (see Weinstein-Evron 1998 for details and vegetation map). The botanical data, charcoal remains (Levyadun and Weinstein-Evron 1993, 1994), and pollen assemblage (Weinstein-Evron 1994), gathered at el-Wad Cave suggest a local, typical Mediterranean environment with abundant oak and pistachio, and wooded areas, grasslands, chaparral and marshes in the vicinity of the site.

Today's Mediterranean climate is characterized by distinct seasonality: wet, cool winters and dry, hot summers.

Climatic conditions in the Mount Carmel/northern coastal plain region are temperate—influenced by topography and proximity to the coast. Annual rainfall averages are 600–800 mm and the rainy season extends from October to April. The mean annual temperature is 18.8°C, with a daytime average of *ca.* 11.9°C in January and 28°C in August (see Weinstein-Evron 1998 and references therein).

The northern coastal plain and the slopes of Mount Carmel contain a large number of prehistoric sites and numerous sites from the Epipaleolithic sequence (Ronen 1983), and thus provide an opportunity to study a continuous



Figure 1.3 View of the local environment of el-Wad. Photograph courtesy of M. Weinstein-Evron.



Figure 1.4 View of the local environment of Neve-David. Photograph courtesy of D. Kaufman.

archaeological record of the Epipaleolithic cultural transition. Three of these sites (Figure 1.5), Nahal Hadera V (Early Kebaran), Hefzibah (Geometric Kebaran), and el-Wad Terrace (Late Natufian), were recently excavated. Data collected from these sites were added to the Neve-David assemblage (Late Geometric Kebaran), which was previously analyzed by the author.

The sites share many characteristics including: location within the Mediterranean vegetation belt at a relatively low elevation; large size; layers composed of deep cultural deposits; high densities of artifacts with the presence of ground stone implements; and water was

available from the wadis—and possibly from springs—within close proximity. Abundant flint sources, and other raw materials were available in the limestone bedrock of Mount Carmel (e.g., Weinstein-Evron and Ilani 1994; Weinstein-Evron 1998 and references therein). The five archaeofaunal assemblages from the four sites were subjected to identical detailed taphonomic and zooarchaeological procedures.

Nahal Hadera V

Nahal Hadera V is situated on the northern coastal plain of Israel, on top of the first sandstone (“Kurkar”) ridge overlooking the Hadera River, *ca.* one km southeast of its present outlet to the sea.

The site was discovered by R. Gophna in the 1960s (Gophna personal communication 2001). In 1973, E. Saxon conducted a 3-x-2 m trial excavation on the highest part of the hilltop. All excavated sediments were dry-sieved through two mm mesh and then wet-sieved, sorted, and stored at the Institute of Archaeology, Hebrew University, Jerusalem. Faunal remains were identified to element and species and were published in a site report that included studies of pedology, and the lithic assemblage (Saxon et al. 1978). A taphonomic re-evaluation of the faunal remains recovered in 1973 (Bar-Oz and Dayan 2002a, 2002b) shed light on the significance of taphonomic research for reconstructing the depositional history and the economic structure of the site.

New excavations at the site, directed by A. Gopher and R. Barkai between 1997 and 1999, focused on enlarging the excavated area to *ca.* 80 m², on the southern slope of the hilltop, adjacent to the previous test excavation (Figures 1.6–1.8; Gopher and Barkai n.d.). By creating a large sample from which statistically and behaviorally meaningful inferences can be drawn, the new excavation provides the opportunity to enhance our understanding of the site’s rich faunal assemblage (Bar-Oz and Dayan 2003b). The Nahal Hadera V faunal collections (both recent and old) are now stored at the Tel Aviv University Zoological Museum.

Faunal remains from the new excavation were originally divided into two distinct living floors: Locus 100 (squares H9a, F-G9, G8b levels 200–10; F-H10 levels 200–10) and Locus 175 (squares G13–15, H13–15, I13–15, levels 175–85). Typological analysis of the lithic

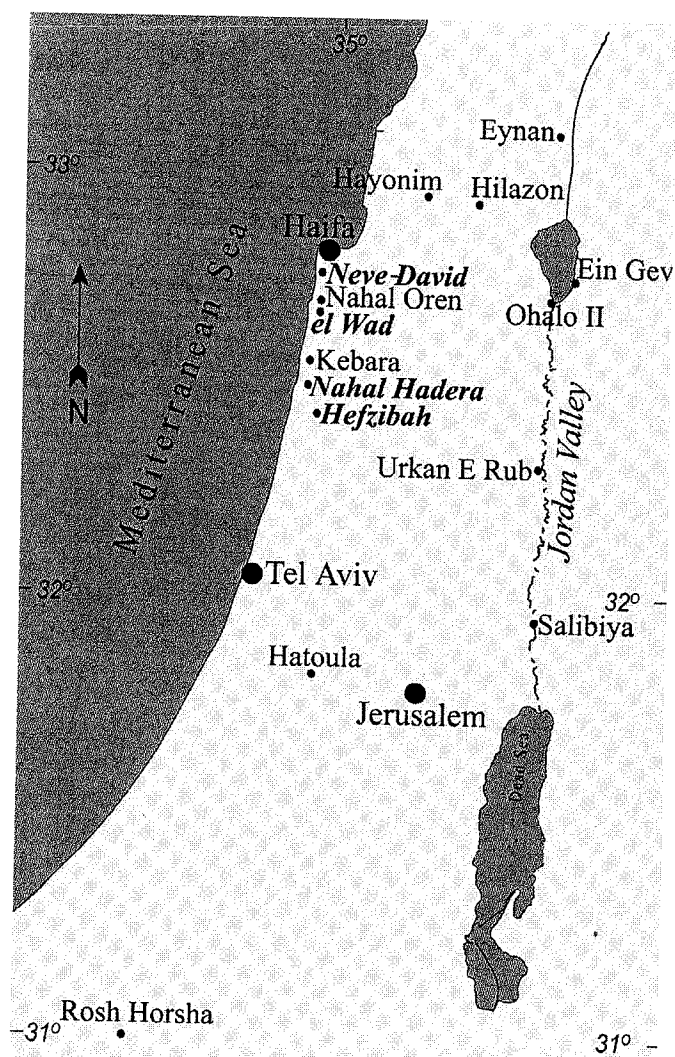


Figure 1.5 Map showing the location of the four Epipaleolithic sites analyzed and other sites mentioned in the text. Study sites appear in bold.

assemblage suggests that different activities occurred in association with each living floor (Gopher and Barkai n.d.). The absence of differences between the two living floors in species abundance and body part frequencies of the primary hunted species, and the absence of differences between the two living floors and the rest of the assemblage (see comparisons in Bar-Oz and Dayan 2003b), permits us to clump the entire zooarchaeological assemblage into a single Kebaran unit. Study of the lithic artifacts from the site also shows that the entire assemblage can be treated as a single Kebaran archaeological unit.

The majority of the Kebaran finds was recovered from stratified contexts and was restricted to a layer of very dark brown loam (Hamra) located 0.2–0.8 m below the surface. The Kebaran horizon is marked by well-preserved densely packed faunal remains. There are no ^{14}C radiometric dates from Nahal Hadera V. Direct Luminescence dating of sand from the site suggests that human occupation of the site occurred between 21,300 and 14,000 cal. years BP (Godfrey-Smith et al. 2003). Chronologically, these dates place the site within the Middle to Late Kebaran and the lithic analysis supports this conclusion (Bar-Yosef 1981; Gopher and Barkai n.d.).

Hefzibah

Hefzibah is situated in the northern coastal plain of Israel, on top of the first of three sandstone ridges, less than 1,500 m east of the present shoreline, and ca. 200 m east of the site of Nahal Hadera V.

Hefzibah was discovered by R. Gophna (Gophna et al. 1973). In the early 1970s A. Ronen conducted three seasons of extensive excavation at Hefzibah, uncovering a total of 47 m² on the southern and the western slopes of the site, of which 23 were completely excavated (Ronen et al. 1975). The faunal remains from the 1972–1974 excavation seasons (Ronen et al. 1975) were only sampled during excavation and never fully published (i.e., Hecker 1974; Saxon et al. 1978). Eventually they were misplaced and are, unfortunately, no longer available for study. The site covers an area of ca. 2,000 m², and it is possible that it represents a number of seasonal camps (Ronen et al. 1975).

A new excavation at Hefzibah was directed by O. Zackheim and G. Bar-Oz between 1996–1998, and was conducted in eight m² within area G5 of Ronen et al.'s 1975 grid (Figures 1.9–1.10). The aims of the excavation were to re-sample the site's rich faunal assemblage



Figure 1.6 View of Nahal Hadera V during excavation. Photograph courtesy of A. Gopher and R. Barkai.



Figure 1.7 Close up on Locus 175. Photograph courtesy of A. Gopher and R. Barkai.



Figure 1.8 Close up of bone fragments from Square H14. Note that bones are well-represented in fresh condition. Photograph by G. Bar-Oz.

and to re-examine the stratigraphic relationships between the faunal sequence and the lithic assemblage. The excavated sediments were wet-sieved through two mm mesh, sorted, and stored at the Zinman Institute of Archaeology, University of Haifa. All of the finds were recovered from stratified contexts within two major sedimentological units: layers 1–6, and layers 7–18. Layers 1–6 consist of a reddish sandy loam at a depth of 0.1–0.5 m below the surface. Layers 7–18, consist of dark brownish red sandy loam at a depth of 0.5–1.4 m below the surface.

The Hefzibah 7-18 horizons are marked by densely packed (9,700 bones per m³) and well-preserved faunal remains. Conversely, a low concentration of poorly preserved bones (1,383 bones per m³) marks the HEF 1–6 horizon. Lithic analysis places both assemblages (Hefzibah 1–6 and Hefzibah 7–18) within the Geometric Kebaran cultural complex, *ca.* 17,500–14,900 cal. years BP (Ronen et al. 1975; Kaufman 1992; Zackheim and Bar-Oz 1999), although final study of the lithic assemblage from the new excavation is still ongoing. Thus, the cultural affiliations tentatively assigned to the various stratigraphic units are subject to future modification.

Typological analysis of the lithics from the 1972–1974 excavations (Kaufman and Ronen 1976; Ronen et al. 1975) suggests the presence of a special activity camp represented by a highly specialized tool kit within a small area in the lower level. Within the upper layers a residential base camp associated with a more generalized and diverse tool kit and covering a larger area was identified (Kaufman 1986, 1992). There are no radiometric dates from Hefzibah, but the microlithic assemblages contain high frequencies of trapeze-rectangles, indicating that Hefzibah post-dates Nahal Hadera V and is contemporary with Neve-David.

Neve-David

Neve-David is situated at the foot of the western slope of Mount Carmel, on the northern bank of wadi Siah, at its outlet to the coastal plain (Figures 1.11–1.13). The site is located 60 m above sea level and *ca.* 1,000 m from the present shoreline. This is an ecotonal setting, permitting easy access to two primary environmental zones: the slopes of Mount Carmel and the broad coastal plain.



Figure 1.9 View of Hefzibah during excavation. Photograph by G. Bar-Oz.



Figure 1.10 View of Hefzibah during excavation. Photograph by G. Bar-Oz.

Neve-David was excavated during the 1980s by D. Kaufman. Stratigraphically, the Geometric Kebaran layer is overlain by deposits *ca.* 1.5 m thick that contain Chalcolithic/Early Bronze Age to twentieth century finds. Some features from the later occupations, such as pits and structures, intrude into the underlying layers and impact some loci in the Geometric Kebaran layer.

The Geometric Kebaran layer is composed of a dark reddish brown colluvium, which at its maximum thickness is *ca.* 1.4 m. No sedimentological changes were observed in the deposits that would suggest postdepositional disturbances or deflation. The contact between the Geometric Kebaran layer and the overlying sediments, however, is quite sharp, indicating an erosional episode. The archaeological horizon within this sediment is *ca.* 0.6 m thick. The number of artifacts decreases rapidly with depth and the sediment eventually becomes sterile. The areal extent of the Geometric Kebaran



Figure 1.11 View of Neve-David during excavation. Photograph courtesy of D. Kaufman.



Figure 1.12 View of Neve-David during excavation. Photograph courtesy of D. Kaufman.

occupation is somewhat difficult to determine. However, reddish brown colluvium containing artifacts is observable for a distance of at least 30 m within a north-south section created by a road cut that destroyed much of the site. Assuming that the east-west dimension was similar, the occupation area was roughly 1,000 m².

The Geometric Kebaran horizon at Neve-David is marked by a high density of artifacts and faunal remains. This can be explained, in part, by the rapid burial of the site by colluvium. In addition, the high artifact densities suggest a relatively prolonged period of site occupation, and it has been proposed that the site represents a period of group aggregation (Kaufman 1986, 1989, 1992). This is supported by the overall size of the site. The two documented burials (Kaufman 1987, 1989; Kaufman and Ronen 1988) further suggests an extended temporal connection to this particular setting.

Two radiocarbon samples from charred bone yielded dates of cal. 16,100 ± 350 (OxA 859) and 14,700 ± 450 (OxA 892; Kaufman 1988). Both of these dates fall within the accepted range for the Geometric Kebaran, but are problematic due to an 800 year gap and the fact that there is no overlap between the dates, even at two standard deviations. However in combination with the characteristics of the lithics, the dates suggest that Neve-David can be attributed to the later stages of the Geometric Kebaran (Kaufman 1988), just prior to the appearance of the Natufian culture.

The sample analyzed for this study comes from an area of 55 m² and includes only those materials that originated from undisturbed areas of the Geometric Kebaran horizon. The excavated sediments were dry-sieved through three mm mesh, sorted, and are currently stored at the Zinman Institute of Archaeology, University of Haifa.

El-Wad

El-Wad Cave and its adjacent terrace, along with three other caves (Tabun Cave, Skhul Cave, and Jamal Cave) are located at the foot of the western slope of Mount Carmel, on the southern cliff of Nahal Me'arot (wadi el-Mughara). The cave faces northwest and is situated 44 m above sea level at the point at which the wadi opens out to the coastal plain (Figures 1.14–1.15). Nahal Me'arot drains into the Mediterranean Sea ca. 3.5 km west of the cave.

This large and elongated cave consists of an outer chamber and an inner chamber (Chambers I and II), as well as a 71 m long corridor (Chambers III–VI; Garrod and Bate 1937). The el-Wad site is situated in a similar ecological setting to that of Neve-David.

The site was originally excavated by C. Lambert, who found two burials on the terrace, later identified as Natufian, and a decorated sickle haft in the cave (Garrod and Bate 1937; Weinstein-Evron 1998 n.d.). D. Garrod excavated at el-Wad for over five seasons from 1929 to 1933. Chambers I and II were excavated to bedrock. Chamber III was partially excavated, and the terrace was dug to bedrock over an area of *ca.* 270 m². The stratigraphic sequence yielded Middle and Upper Paleolithic (layers G–C), Natufian (layers B2–B1), and Holocene (layer A) deposits. The Natufian layer is the best-represented layer at the site, and stretches across Chambers I–II of the cave and the entire terrace. The Natufian deposits on the terrace yielded the most notable finds including a few architectural remains, *ca.* 100 burials (Belfer-Cohen et al. 1991), a rich lithic assemblage, decorative items, bone tools, ground stone implements, and a large faunal assemblage (Garrod and Bate 1937). The latter provided the basis for the first paleoenvironmental sequence of the Levant. Many of the features, decorated burials, and most of the rich material culture on the terrace were assigned to the lower Early Natufian (layer B2). In contrast, bone implements and art objects were rare in the Late Natufian phase (layer B1; Garrod and Bate 1937; see also Garrod 1957).

In 1980 and 1981, limited excavations were conducted by F. Valla and O. Bar-Yosef to the northeast of Garrod's terrace excavations. Based on techno-typological criteria, the excavation revealed that layer B1 could be further subdivided into Late and Final Natufian phases (Valla et al. 1986). Excavations in Chamber III were renewed in 1988 and 1989 by M. Weinstein-Evron and enabled the collection of vital data regarding the site's Natufian habitation (Weinstein-Evron 1998), such as large and small game exploitation (Rabinovich 1998b; Munro 2001, 2004; Stiner and Munro 2002).

Three radiocarbon dates from charcoal from the Early Natufian layer of Chamber III, yielded calibrated dates of 15,750–15,050 yrs BP (RT-1368) for the lower part, 15,100–14,650 yrs BP (PTA-5435) for the middle part, and an average of 12,900–12,450 yrs BP (two counts of sample RT-1367) for the upper part (Weinstein-Evron 1991). The available data indicates that the earlier el-Wad dates may be the oldest occurrence of the Early Natufian in northern Israel (Weinstein-Evron 1991, 1998).



Figure 1.13 Close-up of bone fragments from Neve-David. Photograph courtesy of D. Kaufman.



Figure 1.14 View of el-Wad Terrace in the first season of excavation (1995). Photograph courtesy of M. Weinstein-Evron.



Figure 1.15 View of the southern section of El-Wad Terrace during the 2000 excavation season. Photograph courtesy of M. Weinstein-Evron.

Based on recent excavations within the cave and the re-evaluation of archival materials it has been suggested that the Natufian of el-Wad extended over the entire terrace and that it was considerably more varied and complex than the original excavations suggest (Weinstein-Evron 1997, 1998, n.d.). On the basis of these observations new excavations were initiated on the terrace by M. Weinstein-Evron and D. Kaufman starting in 1995. The new excavations are located to the northeast of Garrod's trench and cover an area of 60 m². This area seems to be less disturbed than that at the front of the cave. To date, only the upper parts of the Natufian layers have been excavated. The rich material culture belongs to the Late Natufian (Weinstein-Evron et al. n.d.) and includes characteristic flint tools, ground stone implements, bone tools, decorative items (shells and beads) and art objects. Zooarchaeological remains, including macro-fauna (Bar-Oz et al. 2003), rodents and insectivores (Weissbrod 2002; Weissbrod et al. 2004), fish (I. Zohar, in preparation) and molluscs (Bar-Yosef-Mayer in Weinstein-Evron et al. n.d), are abundant and well-preserved. In addition, individual and group burials of some 11 Natufian graves (I. Hershkovitz and N. Bachrach in preparation) were uncovered on the terrace.

The bone samples analyzed here are from the new terrace excavations (1995–2000), and include only faunal remains originating from undisturbed Late Natufian contexts (excluding fish, mammals smaller than *ca.* 200 gr, and molluscs). The excavated sediments were wet-sieved using three mm and one mm mesh, sorted, and stored at the Zinman Institute of Archaeology, University of Haifa.