Changing Systems:
Pre-Pottery Neolithic B Settlement Patterns in the Lower Galilee, Israel

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To Samy, Gal & Ido

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Chapter 1

Introduction

THE PRE-POTTERY NEOLITHIC B IN THE SOUTHERN LEVANT

The Pre-Pottery Neolithic period in the Levant (ca. 9,750-6,400 calBC) was a period of fundamental changes in human social and economic strategies. It involved the emergence of large sedentary village communities and was accompanied by the shift from food procurement (by means of hunting and foraging) to food production (by means of plant cultivation and animal husbandry) (Banning 1998; Bar-Yosef 2001; Sherratt 1997; Simmons 2007). Processes, the beginning of which can be traced to the preceding Natufian, reached a peak during this period; not only food resources were domesticated, but also elements of the human environment: fire (i.e. pyrotechnology, and see Goren & Goring-Morris 2008; Kingery et al. 1988), water (i.e. active water management, and see Gebel 2004a), and even space (i.e. the built environment, and see papers in Banning & Chazan 2006; Kuijt & Goodale 2009) were controlled and manipulated. Whether intentionally or not, humans began to 'engineer' the eco-systems that surround them, actively constructing their environment (Boivin et al. 2016; Zeder 2016). This process of domestication and sedentarization, termed by Gordon V. Childe (1928) 'the Neolithic Revolution' has been a central focus of prehistoric research.

Following her excavations at Jericho, Kenyon (1957) proposed a chrono-stratigraphical scheme for the Neolithic sequence, dividing the period into Pre-Pottery Neolithic A (PPNA), Pre-Pottery Neolithic B (PPNB), Pottery Neolithic A (PNA) and Pottery Neolithic B (PNB). This classification was adopted widely throughout the Levant, even though other nomenclature was suggested (e.g. Aurenche et al. 1981; Aurenche & Kozlowski 1999; Moore 1982). Over the years, Kenyon's PPNB was further divided into Early, Middle, Late and Final stages – EPPNB, MPPNB, LPPNB and FPPNB, respectively (Cauvin 1987). While some suggested modifications to this category, i.e. the PPNC instead of Final PPNB (Rollefson 1990a; Simmons 2007), others debated the validity of some sub-phases (e.g. the Early PPNB, Edwards et al. 2004; Gopher 1996; Kuijt 2003 and see discussion below).

Although Kenyon's scheme appears quite clear-cut, the assignment of individual sites or occupations within sites into the different chrono-stratigraphic sub-phases can be challenging; on the one hand, the development of new sampling and measurement techniques have led to a growth in more precise and reliable ^{14}C dates, leading to a better understanding of the period's chronology. On the other hand, limited excavations and poor organic preservation still impede the employment of radiometric methods in many sites. Thus, the chronological assignment of many PPN sites relies mainly on techno-typological markers of the lithic assemblages, particularly projectile point seriation (Gopher 1994). The lack of precise dating leads at times to a general 'PPNB' age assignment rather than to a more specific sub-phase.

In this work, I will follow Kenyon's general division and the chronological scheme proposed by Goring-Morris and Belfer-Cohen (2011, 2014a) for the Pre-Pottery Neolithic, as well as the scheme proposed by Getzov and by Gopher (Getzov et al. 2009b; Gopher 2012) for the Pottery Neolithic and Early Chalcolithic (Table 1.1). Radiocarbon dates were used whenever available (Appendix 2, Table 1).

In many respects, the PPNB (ca. 8,500-6,400 calBC) represents the climax of the Neolithisation process. Considerable cultural cohesion can be discerned during the period, expressed not only by the transition to agro-pastoral economies but also by shared material culture practices such as lithic techno-typological traditions, burial customs, and the development and intensification of exchange networks. Notwithstanding the existence of regional variability, this observed uniformity has been termed in the literature as the 'PPNB interaction sphere' or *Koine* (Figure 1.1; Bar-Yosef & Belfer-Cohen 1989, 2002; Bar-Yosef & Meadow 1995; Cauvin 2000). This cultural phenomenon encompassed the western wing of the Fertile Crescent, west of the Khabur Valley, and included parts of modern-day Turkey (to the central Anatolian plateau), Syria, Lebanon, Jordan, Israel, Egypt (Sinai) and Cyprus. Some have even described it as the first archaeologically documented occurrence of a pan-regional cultural complex. Some critiques of the 'interaction sphere' concept have emerged in recent years (e.g. Asouti 2007; Watkins 2008), while others have emphasized elements of regional differentiation and variability (Bar-Yosef 2007; papers in Kuijt 2002a; Rollefson 2004a).

Although Kenyon's chronological scheme has been applied throughout the Levant, developments were not always synchronous within it. In the northern Levant, and especially along the Middle Euphrates including the Balikh Valley, the transition from PPNA to PPNB seems to be uninterrupted (Akkermans 2004), with some sites, such as Mureybet, Göbekli Tepe and Çayönü, displaying continuity between the two phases. During the PPNB, the interaction zone expanded northwards and eastwards towards the Upper Euphrates and across the Taurus Mountains into central Anatolia (Goring-Morris et al. 2009 and references therein). Furthermore, it appears that the common, characteristic PPNB lithic technology, the 'bidirectional blade (naviform)

Table 1.1: Chronological framework (following: Getzov et al. 2009b; Gopher 2012; Goring-Morris & Belfer-Cohen 2011, 2014a)

Period	Stage/Culture	calBC	calBP
Pre-Pottery Neolithic	PPNA	~9,750-8,500	12,175-11,000
	Early PPNB	8,500-8,250	10,950-10,300
	Middle PPNB	8,250-7,500	10,150-9,725
	Late PPNB	7,500-7,000	9,400-8,900
	Final PPNB/PPNC	7,000-6,400	8,900-8,450
Pottery Neolithic	(Yarmukian; Jericho IX/Lodian)	~6,400-5,500	8,400-7,450
Early Chalcolithic	(Wadi Rabah)	~5,800-4,800	7,500-6,800

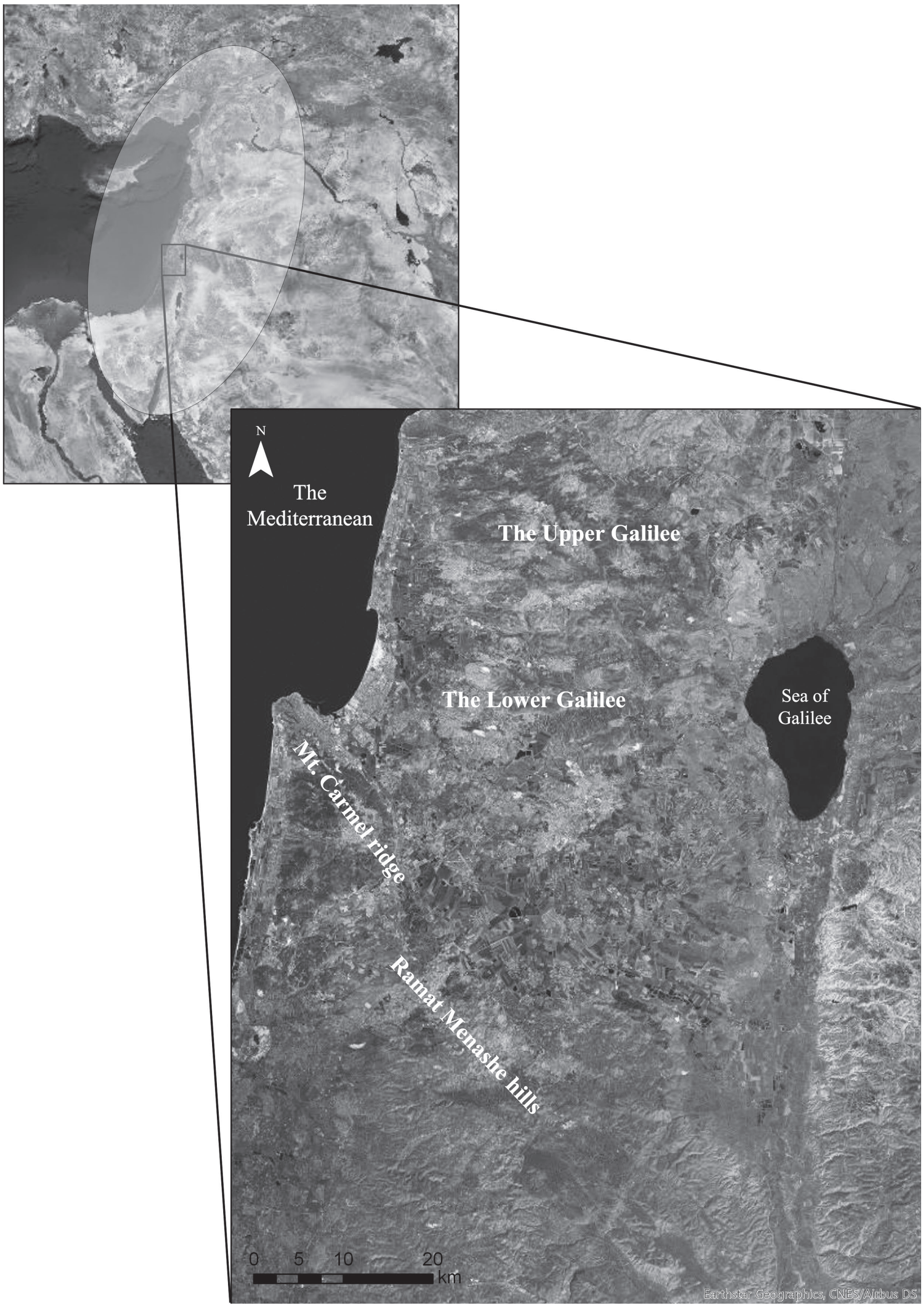

Figure 1.1: Area of research: The Lower Galilee and its natural borders. Circled: the extent of the PPNB Koine.

core technology', first emerged in the northern Levant towards the end of the PPNA (Abbès 2003, 2007; Barzilai 2010a).

In the southern Levant, on the other hand, the PPNA/PPNB transition has seemed more problematic, as almost all PPNA settlements were abandoned and new PPNB ones were founded in new locations or following a period of desertion (Goring-Morris et al. 2009). In addition, PPNA lithic traditions continued longer in this area before the appearance of the bidirectional core technology (Bar-Yosef 2007; and references therein). Until recently EPPNB in the southern Levant was poorly documented, and thus was considered somewhat obscure (and see discussion in Kuijt & Goring-Morris 2002: Table 1). Some dismissed its existence in the area entirely, opting for a prolonged PPNA instead (Kuijt 2003). Excavations of EPPNB occupations were initially limited in number and largely un-dated by radiometric dating; these included Tell Aswad in the Damascus Basin, Mujahiya in the Golan Heights, Horvat Galil in the Upper Galilee, Nahal Oren and Sefunim in the Coastal Plain and Abu Salem, Nahal Lavan 109 and Jilat 7 in the arid zones of the Negev and eastern Jordan, respectively (Burian et al. 1999; Garrard et al. 1994; Gopher 1990, 1997; Noy et al. 1973; Ronen 1984; Stordeur 2003; Stordeur et al. 2010). These excavations were augmented by the recent excavations at Motza in the Judean hills, which exposed a well-dated EPPNB sequence, showing complex stratigraphy and adding to our data concerning the economy, ritual behaviour, lithic technologies and other EPPNB material culture traits (Khalaily et al. 2007a, b). Additionally, a well-dated EPPNB phase was recently recorded at Kfar HaHoresh, shedding light on ritual aspects of the period (Goring-Morris et al. 2008; and see chapter 3). Contemporaneous occupations were also recorded at Ahihud (Caracuta et al. 2015; Paz & Vardi 2014), Tell Qarassa (Ibáñez et al. 2010) as well as several newly discovered sites in the Jordanian Badia (Fuji 2016; Lelek Tvetmarken & Bartl 2015; Rokitta-Krumnow 2016; Štefanisko & Purschwitz 2016).

The discrepancies between the northern and southern Levant have given rise to two contrasting models regarding the development and spread of the Levantine PPNB. On the one hand, the seemingly uninterrupted transition from PPNA to PPNB in the north, especially along the Middle Euphrates (Akkermans 2004), in comparison to the paucity of the southern Levantine record. This led to the creation of a ‘Core area' model, advocating the primacy of the northern Levant (specifically southeastern Turkey and northern Syria), as the focal location for the emergence of the PPNB ‘way of life' (including crop and animal domestication as well as cultural ‘PPNB traits' such as lithic traditions, burial customs, architectural traditions, etc.; Abbo et al. 2011; Barzilai 2010a; Cauvin 1990; Edwards & Sayej 2007; Edwards 2016; Gopher 1994; Gopher et al. 2013; Gopher & Abbo 2016; Kuijt 2003; Lev-Yadun et al. 2000). On the other hand, the discovery of numerous EPPNB sites east and west of the Jordan Rift Valley has raised support for a contrasting ‘Polycentric' model (or ‘Diffused protracted' model), implying a parallel, perhaps simultaneous development of PPNB traditions both in the northern and southern Levant (e.g. Finlayson et al. 2014; Khalaily et al. 2007a). Similar arguments have been made for multiple centres of origins for both cultural innovations (e.g. Gebel 2002), as well as animal and plant domestication (Asouti & Fuller 2012; Conolly et al. 2011; Fuller et al. 2012; Willcox 2005; Zeder 2011).

During the MPPNB, settlements in the southern Levant became larger and more densely populated and exchange systems intensified. Settlement and associated subsistence patterns, however, displayed considerable regional variability (Goring-Morris et al. 2009). In fact, adaptations to local conditions in different regions contributed to the formation of distinct local patterns and a mosaic of different subsistence types (Bar-Yosef 2007; Goring-Morris & Belfer-Cohen 2010a); Despite the presence of cultivated and domesticated resources, hunting and gathering of wild resources still played a major role in the subsistence of many PPNB communities (Horwitz et al. 1999; Lev-Yadun et al. 2000; Marder et al. 2011).

East of the Jordan Rift Valley, sites in the Mediterranean zone flourished from the MPPNB onwards. Sites are abundant, especially in the major wadis, and are usually small to medium in size, with the larger settlements, such as 'Ain Ghazal, probably reaching ca. 5 hectares in area. Throughout the period, subsistence was increasingly based on farming and herding (Asouti & Fuller 2012; Horwitz & Ducos 2005; Martin 1999). West of the Jordan Rift Valley, in the Mediterranean zones of the Galilee, Carmel, Judea and Samaria, smaller (1-3 hectares), though densely packed settlements emerge, which probably functioned as small villages or hamlets, whose economy was based on domesticated plants and hunted prey (Goring-Morris et al. 2009; Horwitz & Lernau 2003; Kuijt & Goring-Morris 2002; Sapir-Hen et al. 2016).

The transition to the LPPNB seems to have been accompanied by substantial changes in settlement patterning and economic strategies. In the Mediterranean zones west of the Jordan Rift Valley, most MPPNB sites seem to have been abandoned, while large villages appeared north of the Dead Sea Basin (e.g. Beisamoun) as well as the coastline opposite to and south of the Carmel (e.g. Atlit-Yam; Goring-Morris et al. 2009). At the same time, sites east of the Jordan Rift Valley reached 'mega-site' proportions, as large settlements of at least 10 hectares developed in major wadis, surrounded by smaller, 'satellite' settlements (Rollefson 2008a; Simmons 2007). It remains unclear whether the apparent 'abandonment' of the areas west of the Jordan Rift Valley indeed reflects actual processes, or whether it is the result of site visibility. It is quite possible, for example, that LPPNB sites in the Galilee and adjacent areas are covered by later period *Tells* (Kuijt & Goring-Morris 2002). In any case, the fact that the main settlements of the MPPNB in the area were no longer occupied signifies a change in site-location choices. Economy-wise, by the end of the LPPNB domesticated species such as sheep, goat, pig and cattle occupied a growing percentage in faunal assemblages, and hunting, which played a central place during the MPPNB, seems to have declined considerably. Along the Mediterranean coast, fishing emerged as an important economic activity during the FPPNB/PPNC (Galili et al. 2004).

Several explanations were suggested for the Jordanian 'mega-site' phenomenon. One explanation ties the 'mega-sites' to population growth due to pressure, especially from areas in and west of the Jordan Rift Valley (the so-called 'Jericho Stimulus', *sensu* Gebel 2004b). Some have even viewed such developments as evidence for 'proto-urbanism' (Nissen 2004; and see Rollefson 2004b *contra* Gebel 2004b). Rollefson correlates the 'mega-site' phenomenon with ecological deterioration, pushing the smaller, ecologically sensitive MPPNB settlements to larger farming villages in more 'tractable environments' (Rollefson 2008a, p.90). He links the abandonment of the MPPNB settlements in the western regions to the same environmental degradation and suggests that some of these communities joined the population east of the Jordan Rift Valley, resulting in the general population explosion of the Jordanian highlands *(ibid.)*.

The final stage of the PPNB (FPPNB/PPNC) shows a gradual demise of both scale and complexity of the former Neolithic lifeways. While the economic base of herding and agriculture remained the same, settlement systems show a divergence from former patterns, and many of the large PPNB settlements were deserted (Kuijt & Goring-Morris 2002; Goring-Morris & Belfer-Cohen 2010b). The FPPNB/PPNC demise was linked to both internal and external ecological factors; namely a brief but acute climatic deterioration, the '8,200 yr. event' (Weninger et al. 2009), on the one hand, combined with ecological degradation around the 'mega-sites' sites due to over-grazing and over-exploitation of the natural surroundings (the 'Neolithic Devolution' *sensu* Rollefson 1996b). A recent study, evaluating absolute dating and archaeological evidence together with climatic evidence, has shown, however, that the FPPNB/PPNC demise occurs too early to be caused by the '8,200 yr. event' (Flohr et al. 2016).

Goring-Morris and Belfer-Cohen (2010b) raise other issues, suggesting that environmental factors, though important, were secondary to the more immediate consequences of the actual living circumstances in the new farming villages; zoonotic diseases, brought by the proximity of domesticated animals, as well as social pressures due to overcrowding and relatively sudden increase in population size and intensity (i.e. 'scalar stress'). By the end of the FPPNB/PPNC, at the onset of the Pottery Neolithic, populations reverted to smaller, more dispersed villages, and shifted to more nomadic ways of life, as expressed also by the transition to pastoral economies in the arid zones. This transition was probably not synchronous, spreading southwards to the Jordanian plateau and desert, and westwards into the Negev and Sinai (Goring-Morris et al. 2009; Martin 1999; Rosen 2011).[1]

The tremendous economic and demographic changes in ways of life that the PPNB witnessed from its rise to its collapse necessitated new communal mechanisms to regulate and maintain the new social structures (Byrd 1994, 2005a; Goring-Morris & Horwitz 2007; Kuijt 2002b; Kuijt & Goring-Morris 2002). Aspects of these mechanisms are mirrored in the archaeological record, especially in those material culture remains pertaining to the intensification of ritual and symbolic activities; ceremonial locales became more complex, as manifested in unique structures or in defined areas within settlements, e.g. Beidha, 'Ain Ghazal and Atlit Yam (Byrd 2005b; Galili et al. 2005; Rollefson & Kafafi 1996; Verhoeven 2002); or as task-specific sites, such as Nahal Hemar, Kfar HaHoresh, Göbekli Tepe and perhaps Ba'ja (Bar-Yosef & Alon 1988; Gebel et al. 2006; Goring-Morris 2002; Schmidt 2002, 2006; Verhoeven 2002).

Mortuary practices supply further evidence for new social structures; burial customs were varied, as burials are found both within settlements, e.g. Aswad (Stordeur 2008);

[1] In general, the arid fringes of eastern Transjordan, the Negev and Sinai show distinct local developments throughout the PPNB; here as well, population increased from the EPPNB onwards, although mobile, foraging way of life was maintained throughout the period (Bar-Yosef 1984; Goring-Morris 1993; Simmons 1981). Sub-regional environmental variation within this arid zone necessitated a range of adaptations, and at least four sub-regional variants can be distinguished on the basis of techno-typological aspects of the lithic assemblages (Barzilai 2010a; Gopher 1994; Goring-Morris et al. 2009; Nishiaki 2000). There is some evidence for exchange and interactions between these hunter-gatherer communities and the settled communities of the Mediterranean zone, as expressed by various aspects of the material culture (especially marine molluscs and minerals). It is likely that exchange of organic materials, including food, also took place (Bar-Yosef & Bar-Yosef Mayer 2002; Bar-Yosef & Belfer-Cohen 1989; Goring-Morris 1993).

or, in the northern Levant, the Skull Building 'house of the dead' in Çayönü, (Özdogan 1999), and in off-site cemeteries, e.g. Kfar HaHoresh (Goring-Morris 2002, 2005). Most distinctive is the tradition of post-mortem skull removal and occasional skull modelling. This phenomenon, beginning already in the Natufian, has been widely interpreted as reflecting an 'ancestor cult' (Bonogofsky 2006; and references therein). Variations in burial customs, including the treatment of infant remains and the presence of grave goods, were also suggested to reflect developments relating to increasing inequality and the possible emergence of social ranking (Goring-Morris 2005; Kuijt 1996).

Another related phenomenon is the proliferation of cult objects, including plaster statues such as those from 'Ain Ghazal, Nahal Hemar cave and Jericho (Goren et al. 1993; Rollefson 1990b). Other symbolically charged artefacts include human and animal figurines of clay, stone and plaster. It appears that the use of figurines reached a peak in the MPPNB, perhaps reflecting a peak in social tensions (Rollefson 2008b; Schmandt-Besserat 2013).

Previous studies of the PPNB have mostly dealt with either comprehensive studies of a specific site, e.g. excavation reports (Bocquentin et al. 2007; Gopher & Goring-Morris 1998), or conversely, on a general characteristic of the period, e.g. lithic typo-technology (Barkai 2001; Barzilai 2010a; Gopher 1994). Less attention has been paid to understanding the more regional viewpoint.

Examples of such studies, concerning the paleo-subsistence and settlement organization of a particular system within a single region during the PPNB of the southern Levant, are few, but include the works of Simmons (1981) in the western Negev, that of Bar-Yosef in the Sinai Peninsula (Bar-Yosef 1981, 1984) and that of Goring-Morris (1993) who reviewed how both areas functioned within the larger PPNB world. As the Pre-Pottery Neolithic provides us with a unique opportunity to study the emergence of food production, of social differentiation and population aggregation and growth, and how they are all interrelated, a regional-scale, synthetic viewpoint becomes that much more significant.

THE LOWER GALILEE

Located in northern Israel, the Lower Galilee is a well-defined geographical unit, ca. 1700 km^2 in area. It is bordered by the Sea of Galilee and the Jordan Rift Valley to the east, the Mediterranean coast to the west, the foothills of the high Upper Galilee hills to the north, and the Mt. Carmel range and Ramat Menashe hills to the south (Figure 1.1). Since it cuts across all of northern Israel and incorporates a mosaic of different habitats and topographic features, it provides an excellent opportunity to carry out an integrated regional study.

In general, the area is characterized by wide valleys, separated by hill ranges of up to 500m asl. The interplay of several factors, including average annual precipitation of 600-800 mm, an abundance of fresh water springs, and vast areas of arable land, creates favourable conditions for agriculture, especially in the large plains and valleys (and see chapter 3). The favourable conditions that attract modern agricultural communities are probably largely responsible for the extensive exploitation of the Lower Galilee during the Neolithic.

Archaeological research in the area has been extensive; excavations of large Neolithic occupations have been conducted since the 1950s and 1960s, i.e. Tel 'Ali and Munhata (and see chapter 3). With the beginning of the 1980s research intensified, mainly following development in the area, and several large surveys and salvage excavations were conducted, including the initiation of the large-scale excavation project at Yiftah'el (Garfinkel et al. 2012b). At the beginning of the 1990s research was augmented by the discovery of Kfar HaHoresh, which to date provides us with the most comprehensive record of the PPNB stratigraphic succession in the area (Birkenfeld & Goring-Morris 2011, 2014). In the past decade, our knowledge of the PPNB in the region has been supplemented by new large-scale projects, such as Mishmar Ha'emeq, Kfar Qana, the 'Ein Zippori complex, and many other, smaller scale sites and find-spots (Barzilai & Getzov 2008; Barzilai et al. 2013a, b). These were augmented by the continued excavations at Yiftah'el (Khalaily et al. 2008; Milevski et al. 2008).

The large number of excavated, tested and surveyed sites in the Lower Galilee provides an abundance of data relating to the PPNB occupation of the area. Most importantly, a variety of occupation types were discovered, including both settlements and special activity sites, such as flint procurement sites and workshops. These provide the required conditions for conducting a regional-scale analysis of the Lower Galilee as part of a dynamic system.

AIMS OF RESEARCH

As discussed, research on the southern Levantine PPN has tended to move between two extremes: single-site studies or the study of large-scale, pan-regional phenomena, such as the origins and spread of village life, the social and cultural realms of the PPN, amongst others (e.g. Asouti & Fuller 2013; Bar-Yosef & Belfer-Cohen 1989; Bar-Yosef & Meadow 1995; Byrd 2005b; Cauvin 2000; Goring-Morris & Belfer-Cohen 2010a; Kuijt 2000a,b; Verhoven 2002). Even though there was always awareness that the 'Neolithic Interaction Sphere' comprised a wide range of regional and sub-regional variability, regional studies *per se* are almost absent from current literature.

With that in mind, the primary objectives of this research are to examine the nature and structure of the settlement system in the Lower Galilee during the course of the Pre-Pottery Neolithic B (ca. 8,500-6,400 calBC), to reconstruct its socio-economic organization, and to investigate whether diachronic changes can be identified throughout the period.

The reasoning behind these objectives stems from several theoretical approaches that address the question of human-land relationships (e.g. Site Territory Analysis *sensu* Willey 1953; and Site Catchment Analysis *sensu* Vita-Finzi & Higgs 1970, Vita-Finzi 1978; and see Chapter 2). These assert that through the study of human activities, as they are distributed across the landscape and through time, we will be able to investigate issues of social organization, interaction and change, as well as clarify issues relating to the social and economic networks that were at play in the region through the course of the period. The methodology employed incorporates Geographic Information Systems (GIS) applications, which allow us to deal with the extensive amounts of data this study entails, quantify the results and empirically test model aspects of the physical world.

The Pre-Pottery Neolithic is the connecting link between two very different ways of life, namely Palaeolithic hunter-gatherers as opposed to Proto-historic farmers. This immense development necessitated and was accompanied by significant changes in both social and cultural structures. As such, the period provides us with a unique opportunity to study major socio-cultural processes, such as the emergence of food production, of social differentiation and population aggregation and growth, and how they are all interrelated.

These developments should be mirrored not only in material culture but also in site-location choices and patterns (Binford 1992; Rossignol 1992). Thus, through the examination of both aspects of the archaeological data, this research aims to explore the ecological and behavioural systems that influenced the structure of the archaeological record of the Lower Galilee. In view of that, the study will utilize several scales of assessment. This is based on the notion that different activities and processes, be they economic, social or cultural, take place at different locales and in varying contexts. Their meaning as well as their material expression will vary with respect to these changing contexts. While the archaeological site offers a wealth of data concerning past human existence, this scale by itself is too narrow to permit a comprehensive understanding of regional-scale, complex systems; changing our scale of reference accordingly should provide a wider understanding of these processes. Consequently, the presented inquiries shift between varying scales, ranging from intra- to inter-site and to the regional level.

Lastly, I will examine how the different regional-scale patterns and processes articulate within the larger-scale social and economic developments and organization of PPNB communities in the southern Levant and the dynamics of interaction between them. In this respect, the careful interplay between different scales of investigation may provide important insights into the origins and spread of different processes and phenomena, adding to the ongoing debate between the ‘Core area’ and ’Polycentric’ models, described above.

Chapter 2

Methodology

The following chapter presents the methodology on which this research was based. First, the theoretical approaches that form the basis of analysis are presented. Second, the databases and the techniques used during analysis are discussed. A detailed description of the various technical procedures used in the data analyses is presented in Appendix 1.

THEORETICAL BACKGROUND

Spatial Archaeology and Geographic Information Systems

Since the earliest days of archaeology, archaeologists have been aware of the importance of the spatial component of the archaeological record. This is due to the fact that much of the data recovered, whether at the intra- or inter-site levels, is spatial in nature: each artefact, feature, or site not only has a location of its own, but also a series of spatial relationships, relative to other entities, such as other archaeological features or the environment. For most of the 20th century, spatial data was tabulated and plotted by hand, and the analysis of the spatial information was restricted to visual appraisal. Over the past several decades, however, the quality and volume of the spatial data we collect have increased dramatically as new techniques and equipment have become available, and as new interpretative frameworks for the study of the past were formed.

This trend began with the quantitative revolution of the 'New Archaeology' in the early 1960s, when the pursuit of more objective and verifiable methods of analysis led to an increase in techniques for spatial analysis (e.g. Hodder & Orton 1976, and references therein). These new methods and techniques were derived from different fields of research, such as mathematics, statistics, geography, and ecology. These were mainly statistical and quantitative techniques, such as the non-randomness test and Nearest Neighbour analysis, aiming at more objective and less visual methods of data appraisal (e.g. Carr 1987; Dacey 1973; Hietala & Stevens 1977; Speth & Johnson 1976; Whallon 1973, 1974, 1984). Distribution maps, a mainstay of spatial archaeology, changed noticeably, and became more composite and detailed. Furthermore, an increase in predictive and descriptive models ensued, aimed at explaining the behavioural and cultural meanings of both inter-site and intra-site spatial organization and the natural processes that influence the spatial formation of the archaeological record. These new models have relied mainly on ethno-archaeological research of modern hunter-gatherers (e.g. Binford 1978; 1980, 1987; Kent 1987; Yellen 1977).

In the mid-1980s the 'computerized revolution' entered the field of spatial archaeology; computer-aided cartography, capable of producing contour plots, generating 3D net plots and interpolating between known data points, as well as computer-aided design (CAD) and database management systems were introduced into archaeological research (for a detailed overview see Wheatley & Gillings 2002). This process has reached a new level with the development of the Geographic Information Systems (GIS).

GIS are used in a large variety of disciplinary contexts and practical applications, ranging from agriculture and city planning to hydrologic modelling and transportation. The definition of GIS has proven to be quite difficult, perhaps due to the fact that each discipline has customized GIS to its own requirements, and it seems that the precise definition of GIS is dictated by its final use (e.g. Burrough 1986; Cowen 1988; Star & Estes 1990). Following the view of Kvamme (1999, p.154), we regard GIS as an "information visualization engine, with extensive analysis, data generation, and manipulative capabilities". In short, GIS are computer systems whose main purpose is to store, manipulate, analyse and present information about geographic space.

GIS was making its first steps into the world of archaeology in the early 1980s, mainly in North America and in the UK. During those early days, GIS was used mainly for regional or national archaeological records and for constructing predictive models. By the 1990s the analysis of archaeological material entered the world of GIS, where new methods of analysis were developed (Wheatley & Gillings 2002). Since the 1990s there has been an on-going growth in the use of GIS (for summaries of the historical development of GIS see Aldenderfer 1996; Harris & Lock 1990; Kvamme 1995; McCoy & Ladefoged 2009). A cursory examination of its recent applications in archaeological projects includes a plethora of areas of research and analytical methods, such as: viewshed analysis and the study of visual space (Birkenfeld & Goring-Morris 2015; Birkenfeld & Milevski in press; Gillings 2017; Jones 2006; Llobera 2003; Paliou et al. 2011); travel-ways, population dynamics, path and terrain movement analysis (Llobera et al. 2011; Whitley & Hicks 2003), artefact scatters and activity areas analysis (Alperson-Afil & Goren-Inbar 2010; Craig et al. 2006, Moyes 2002; Spikins et al. 2002); and perhaps most dominant of all – Landscape Archaeology (Campana & Francovich 2003; Richards-Rissetto 2017).

Most of these analytical methods are not new to archaeology. Some have been part of archaeological research for over 50 years; for example, viewshed analysis, the basis of which was established as early as the 1970s by researchers such as Renfrew et al. (1979) and Fraser (1983). In fact, the main benefits that GIS applications present are twofold: first, they enable us to deal with enormous amounts of complex and diverse data in a relatively straightforward manner. Second, they allow us to quantify our results, use mathematical and statistical computations, and empirically test model aspects of the physical world. Thus, GIS not only enable new techniques of inquiry, but also advance existing, well-established archaeological methods and techniques, allowing new ways of understanding the archaeological record.

Landscape Analysis

The continuing interplay between humans and their environment has long been a main focus of archaeology. The methodology on which the current research was based utilized elements from different theoretical approaches to human-land relationships and settlement analysis. Behind these different approaches lies the understanding that, although the archaeological site itself offers a convenient scale of investigation (and see Binford 1992 *contra* Dunnell 1992), a second yet important scale is that of the landscape, i.e. the broader environment within which a site is located. The landscape perspective argues that the distribution of archaeological elements (such as artefacts, features or sites) relative to elements of the landscape (such as topography, raw material distributions, etc.) provides insights into human land-use strategies. These strategies can be explored to clarify aspects of the economic organization of past societies (Rossignol 1992).

One of the early researchers to deal with human-land relationships was Willey (1953) in his pioneering work in the Virú Valley in Peru. This work is considered by many to be the establishing work behind the Site Territorial Analysis (STA; Ashmore 2013; Sabloff & Ashmore 2001; Trigger 1967). Willey defined 'settlement patterns' as: "… the way in which man disposed himself over the landscape on which he lived. It refers to dwellings, to their arrangement, and to the nature and disposition of other buildings pertaining to community life. These settlements reflect the natural environment, the level of technology on which the builders operate, and various institutions of social interaction and control which the culture maintained." (Willey 1953, p.1).

In his definition Willey emphasized the multiple factors that affect settlement patterning, including the environmental, technological, and social aspects. Settlement archaeology studies systems of human activities, as they are distributed across the landscape and through time (Ashmore 2013, p.5). Such investigations usually use a regional scale of reference, while emphasizing socio-economic and ecological factors as the main determinants of settlement patterning *(ibid.)*.

Another method aimed at understanding the relationship between human settlements and their local environment is Site Catchment Analysis (SCA; Vita-Finzi & Higgs 1970, Vita-Finzi 1978). In their original publication of SCA, Vita-Finzi and Higgs defined it as "the study of the relationships between technology and those natural resources lying within economic range of individual sites" (Vita-Finzi & Higgs 1970, p.5). A site's *Catchment* or *Exploitation Territory* was defined as the area exploited from the site on a regular basis (*idem*, p.7).[2] They presented comparative analyses of hunter-gatherer and agricultural economies through evaluation of their catchment areas, or exploitation territories.

Bailey and Davidson (1983) emphasized that the term 'Site Catchment Analysis' in fact refers to a number of techniques focused on subsistence economy. They listed six objectives of these techniques:

[2] In later publications, Vita-Finzi made a distinction between the two concepts, and defined a *catchment* as the area from which a certain component of the site's material record (e.g. a certain raw-material, a particular animal species, etc.) is acquired. Each component might have a different catchment area, but all contribute to the definition of the site's *exploitation territory*, which was defined as the cumulative catchment area, or the habitually exploited area around the site (Vita-Finzi 1978, p.25).

"(i). to define the area habitually used by the occupants of a site for their daily subsistence;
(ii). to trace to their points of origin in the surrounding landscape materials and resources whose archaeological remains are present on-site;
(iii). to reconstruct the micro-environments around a site as a clue to variations in the environmental data present on-site;
(iv). to reconstruct the food resources potentially available to the occupants of a site and hence, by further inference, the subsistence economy actually practiced by them;
(v). to reconstruct the function of sites (as home-bases, temporary camps etc.);
(vi). to reconstruct the social and economic relationships between sites as members of regional settlement systems." (*idem*, p.88).

They stressed the distinction between Site Catchment Analysis (SCA) as the study of site catchments from on-site data and Site Territorial Analysis (STA) as the study of arbitrarily defined site exploitation territories, collating these two methods under the general term 'Off-Site Analysis' (*ibid*.). Their suggestion was partially accepted, and today all three terminologies can be found in the literature, sometimes referring to the same analytical process.

Regardless of the term used, both SCA and STA suggest that human activity is limited to a certain range: the further an area is from the site, the less likely it is to be exploited regularly. Thus, the way to delineate a site's exploitation territory is based on distance, or more accurately, on travel-time from the site. Travel-time is commonly calculated based on ethnographic research, and is considered to depend on economy type; a two-hour walking distance radius was suggested for hunter-gatherers, compared to a one-hour walking distance radius for agriculturalists (Vita-Finzi 1978, p.26; Vita-Finzi & Higgs 1970, p.7). The main problem has been how to determine the actual distance that could be covered within this time-frame, taking into account issues such as local topography. Higgs' published methodology (Higgs 1975) was based on primary data obtained from walking a number of transects from a site and interpolating their limits on a map into a boundary. This, apart from being time consuming, not only confines the use of SCA and STA to sites that are physically accessible, but also demands that their surrounding environment will be untouched by modern interference in the form of modern development, construction or even fencing that could impede one from maintaining a transect. An easier, but much more simplistic method that was often used in place of travel-time is the employment of simple, arbitrary circular buffers of ten kilometre or five kilometre radii around the site. This was of course very problematic and triggered many of the critiques raised against SCA *sensu* Vita-Finzi and Higgs (e.g. Bailey & Davidson 1983; Simmons 1981).

Another critique that was raised against the way SCA has been employed related to the oversimplification of the environmental data analysed. The sheer quantity of data has meant that the researcher most often had to reduce the physiographic variables into nominal or ordinal scales, in a way that prevents catchment analysis from reflecting the actual complexity of the area studied (Hunt 1992; Smith et al. 1983).

The use of GIS applications holds great promise for SCA, and resolves, to an extensive degree, many critiques raised against it. GIS provides us with three important abilities: the ability to manage huge quantities of data simultaneously, the ability to overlay multiple thematic layers of information and to create new ones through mathematical computation, as well as the ability to build and test model aspects of the physical world.

Firstly, overlying multiple thematic maps enables the representation of a complex environment, as different ecological parameters can be taken into account. For example, geological, hydrological and botanical maps can be analysed in tandem with topography models. Since there is hardly any limit to the number of layers that can be used, any aspect of the environment that appears relevant (either ecological or cultural) can be taken into account. On the other hand, the ability to manage large datasets facilitates the maintenance of the original, detailed categories of each variable. For many years, in order to enable the analysis of multiple datasets, each variable had to be simplified; soil types for example, were classified into general scales, such as 'good', 'medium' and 'bad', with respect to their suitability for agriculture (Hunt 1992, p.284). GIS not only enables us to maintain the original dataset of each variable, but also to add other variables to it, such as depth of soil, salinity, drainage, wind erosion, etc., thus creating a more realistic portrayal of the actual conditions, avoiding the hurdle of over-simplification and enabling a more comprehensive rendering of the landscape.

Secondly, GIS modelling capabilities enable us to deal with the issue of translating travel-time into actual distance, i.e. delineating more realistic exploitation territories. Modern GIS applications allow for the calculation not only of Euclidean distance, but also of *weighted distance*. In other words, any factor that is perceived to influence human movement through a certain terrain can be entered into the calculation of movement *cost*. This cost can be measured in terms of energy expenditure or in terms of travel-time. Influencing factors can be anything from topography, through travel method (i.e. by foot, on horseback, etc.), to group composition, weight carrying, on-path or off-path movement, etc. Even barriers, such as rivers or deep valleys, which inhibit movement in certain directions, can be considered. In this research, two factors were taken into account: the actual surface distance and the slope. This allows for the creation of a non-isotropic cost model, estimating time-travel based on topography. Recently, several studies have incorporated GIS-based models of travel costs in settlement-based analysis (e.g. Garcia 2012; Ullah 2011). All stress the contribution of GIS in creating a more realistic operationalisation of Vita-Finzi and Higgs' original methodology, but unfortunately, no standardized GIS-based methodology has been agreed upon.

Physical vs. Conceptual Environments

Both SCA and STA as well as the Settlement Patterns approach and other Landscape approaches focus on the ecological, economic aspects of human behaviour (Hunt 1992 and references therein). Nonetheless, patterns of human behaviour are not shaped exclusively by biological or economic factors. It is interesting to note that in this respect, Vita-Finzi and Higgs themselves mentioned that "…it is, of course, possible and indeed probable that some culture influence, rather than the economic, would have persuaded some human groups to exploit an area in an unsuitable and uneconomic way, particularly in periods of rapid technical change…" (Vita-Finzi & Higgs 1970, p.2). It is an important truism that ecology does not act upon an even backdrop, but rather on pre-existing human social and cultural diversity. In other words, the same physical circumstances can be seen and interpreted in many different ways by different people, as the human 'environment' encompasses both the physical and the conceptual (Layton & Ucko 2003; Tilley 2006). Thus, man-land relations are an important means for understanding not only economic, but also social, and cultural changes in human existence.

Hawkes (1954) discussed the difficulties archaeology faces when trying to decipher past behaviour from the material record. He presented a "ladder of (archaeological) accessibility", in which "techniques" are first, followed by "subsistence-economics", "social/political institutions" and lastly "religious institutions and spiritual life" (Hawkes 1954, pp.161-162). Hawkes concluded: "If material techniques are easy to infer to and spiritual life hardest of all, you have there a climax of four degrees of difficulty in reasoning. What is this climax? It is a climax leading up from the more generically animal in man to the more specifically human. So the result appears to be that the more specifically human are men's activities, the harder they are to infer by this sort of archaeology. What it seems to offer us is positively an anticlimax: the more human, the less intelligible" (*idem*, p.162).

Many scholars have addressed the issue of inferring social or cultural traits from the archaeological material record or patterning (for a comprehensive review see Ashmore 2002). Some studies have taken a philosophically-based line of thought (e.g. Thomas 1996; Tilley 2004a, b). Others advocated an archaeology based on social theory (e.g. Holl & Levy 1993; Shanks & Tilley 1982). This study suggests that comparisons between contemporaneous sites, all located within the same geo-environmental region, might provide a different approach to the problem: the discovery of features that are common to all members of a given system may call attention to the dissimilarities between them. If we isolate the more economic, subsistence-oriented processes (i.e. Hawkes' 'techniques' and 'subsistence-economics') then these differences may represent more idiosyncratic and perhaps social or cultural aspects, characteristic to each group within the larger system.

Scales of Reference

This study utilized different scales of reference. The question of the varying relevance of different spatial scales is well established in archaeological research (e.g. Binford 1964). Clarke (1977, pp.10-15) divided the continuum of archaeological spatial relationships into three main scales: the *micro level* (i.e. the personal and social space, within a structure for example), the *semi-micro* level (i.e. the communal space, within a site) and the *macro level* (i.e. the regional space, between sites). The three levels are in no way completely separated and each level has to be investigated also within the larger system of which it is a part. However, different factors, social, economic etc., might be at play on each of these levels. Thus, the transition from one scale to another during analysis may significantly impact our understating of complex systems.

Different scales might also provide different insights into social interaction, and how they change depending on the spatial (or temporal) framework. This was recognized by Irwin-Williams, who suggested the use of three 'points of view': *global*, *zonal* and *anchored*, representing the entire social network, parts of networks and the individual entities, respectively (Irwin-Williams 1977, p.142). Mills et al. (2015, p.4) suggest a different division and define three spatial scales equivalent in many respects to Clarke's micro, semi-micro and macro levels (called *micro*, *mesomicro* and *macro* scales). Whether one accepts Irwin-Williams 'points of view', which originate in a network-centred way-of-thought, or Mills' geography-based approach, it is clearly apparent that different spatial units reflect different structures of interaction. Again, it must be stressed that these units are in no way independent; together, they offer complementary views of social processes.

THE DATABASES

Three different types of databases were used in the analysis: the site database, the Kfar HaHoresh intra-site database and the environmental database. All databases were created and maintained using *Excel* software spreadsheets, which can be easily transferred and analysed using ESRI's *ArcGIS* Desktop package.

The site database comprises 24 sites, all attributed to the Pre-Pottery Neolithic B in the Lower Galilee[3]. These include 17 excavated sites and seven surveyed yet presently unexcavated sites. The sites were divided into four categories, depending on the scale of excavation and the availability of data (Table 2.1). Category I includes large-scale excavations, where large areas were exposed and large finds assemblages were collected. This category includes the sites of Kfar HaHoresh, Munhata and Yiftah'el. Category II includes smaller excavations, mainly salvage projects, where the exposed PPNB remains were less extensive, but architectural remains and large assemblages were nonetheless recorded. This category includes the sites of Ahihud, the 'Ein Zippori complex, Mishmar Ha'emeq, Nahal Zippori 3 and Tel 'Ali. The third category, Category III, includes small scale, test-excavations, or, alternately, excavations where the PPNB remains exposure was limited, but occupation during the period was ascertained. These include the sites of Ard el-Samra, 'Ein el-Jarba, 'Enot Nissanit, Hanaton, Horvat 'Uza, Kfar Qana, Khirbet 'Asafna (east), Sha'ar Hagolan and Tell Jenin. Category IV includes surveyed sites where a robust identification of PPNB occupation was made. These

[3] A possible 25th site is the site of Giv'at Kipod. Located in the southeast margins of Ramat Menashe, ca. 1km from Mishmar Ha'emeq (Figure 7.2), Giv'at Kipod is a workshop dedicated to the production of basanite axes (Rosenberg et al. 2008). Initially the workshop was considered to be PN/Chalcolithic *(ibid.)*, and as such was outside the scope of the current research. However, very recently it was published that the provenance testing of a basanite axe from PPNB Yiftah'el indicated that it derived from Giv'at Kipod, and that the workshop was active during the PPNB as well (Rosenberg & Gluhak 2016; Shimelmitz & Rosenberg 2016). Since this new information was only available after the completion of this research, the site was not included in the full analyses. It does, however, appear in the relevant discussions throughout the text.

Table 2.1: Studied sites; excavation type and extents

Site	Excavation type	Excavated area	PPNB exposure	Size estimation
Category I				
Kfar HaHoresh	Research exc.	~500 m²	~500 m²	<1 hectare
Munhata	Research exc.	~2000 m²	<500 m²	~20 hectares5
Yiftah'el	Research & salvage exc.	~4000 m²	~2000 m²	4 hectares
Category II				
Ahihud	Salvage exc.	~1800 m²	~200 m²	~3 hectares
'Ein Zippori complex	Salvage exc.	~5000 m²	<100 m²	30 hectares
Mishmar Ha'emeq	Salvage exc.	~1000 m²	~450 m²	2 hectares
Nahal Zippori 3	Salvage exc.	150 m²	<75 m²	>0.5 hectare
Tel 'Ali	Research exc.	~600 m²	~350 m²	"Confined" (Prausnitz 1966)
Category III				
Ard el-Samra	Test exc.	25 m²	2.5 m²	None
'Ein el-Jarba	Research exc.	~280 m²	~10 m²	None
'Enot Nissanit	Salvage exc.	275 m²	25 m²	None
Hanaton	Test exc.	120 m²	~10 m2	None
Horvat 'Uza	Salvage exc.	~1300 m²	~2 m²	5 hectares
Kfar Qana	Salvage exc.	125 m²	N/D	None
Kh. 'Asafna (east)	Test exc.	~500 m²	-	None
Sha'ar Hagolan	Research exc.	~3000 m²	~30 m²	20 hectares[1]
Tell Jenin	Salvage exc.	N/D	N/D	None
Category IV				
Bitaniya	N/A	< 3 hectares		
Hof Shaldag	N/A	0.5 hectares		
Judeidi-Makr #23	N/A	0.5 hectares		
Judeidi-Makr #121	N/A	0.3 hectares		
Qiryat Ata (NE)	N/A	0.2 hectares		
Trig. P. Q1	N/A	0.3 hectares		
Zefat Adi (east)	N/A	N/D		

[1] This size estimation refers to the PN occupation at the site. The earlier occupation extent is unknown, but is probably more restricted (Garfinkel & Ben-Shlomo 2009; Perrot 1993).

include the sites of Bitaniya, Hof Shaldag, Judeidi-Makr #2 and #121 (also known as Horvat Turit), Qiryat Ata (NE), Triangulation Point Q1 (also known as HaSollelim Q1) and Zefat Adi (east).

For each of the sites all accessible data was collected and documented, including (when available) the stratigraphic sequence, chronological date (radiometric and/or relative), architectural features, and the catalogues of the lithic assemblage, groundstone tool assemblage, faunal and botanical assemblages, anthropological remains and other, 'special' finds, including artefacts made on minerals or other materials such as clay or bone, artefacts with symbolic meaning such as figurines, etc. In instances of

unexcavated sites, or where the data is limited, only the physical location was recorded (i.e. xyz coordinates[4]) as well as chronological attributes, when available.
Once completed, the site database was uploaded into *ArcMAP*, and a digital shapefile was created. This location-based shapefile included the site's name, category, and chronological attributes. This shapefile then formed the base for all following GIS-based procedures (and see below).

The Kfar HaHoresh intra-site database comprises several data types, including the architectural plans of all excavated loci as well as the lithic artefact catalogues. Both were digitized and incorporated into a GIS-based database in order to facilitate their use as raw data in subsequent analyses.

Architectural plans were digitized using *AutoCAD* software[5]: The original hand drawn architectural plans were scanned to a JPG format. Each JPG drawing was imported into the *AutoCAD* program, anchored to its exact location on the excavation grid, and then traced using the *'3D polyline'* tool, which allows the recording of the Z-axis of the drawing. Thus, when transferred into *ArcMap*, each polygon retained its spatial characteristics, including its grid location and Z values. Finally, the *AutoCAD* DWG files were converted into separate loci-based shapefiles, which formed the basis for the creation of all site maps.

As a consequence of their analysis procedure, the lithic artefacts catalogues were initially organized in *Excel* spreadsheets, which formed the initial database. During excavation, the provenance of all retrieved artefacts was recorded both with regards to context (i.e. locus) as well as grid location (i.e. square, sub-square and vertical spit). For the purpose of this analysis a selection process was employed, and only lithic artefacts from loci that could be securely placed within a stratigraphic phase were included. These consist of 272,333 chipped stone items, comprising >70% of the entire assemblage. These were imported into *ArcGIS* and divided into separate databases according to stratigraphic phase. Using the *Fishnet* tool, a 1 m^2 grid was created, replicating the actual excavation grid. Using the *Join by Attribute* tool the two were joined, so that each grid square received a sum of the different artefact types that fell within it. Thus, while the selection of the material to be analysed followed the contextual loci, the actual spatial analysis was based on the metric grid location. A separate shapefile was created for each stratigraphic phase, containing a model of the excavation grid as well as the spatial summations of the lithic artefact catalogues. These formed the basis for the spatial distribution analyses (and see discussion below).

The environmental database comprises nine separate maps. It is a digital, regional database, which was used to describe and analyse each site in relation to its local environment and available resources. The database includes three topographic maps

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[4] Throughout the analysis the geographic coordinate system used was the Israel TM Grid, a Transverse Mercator projection, also known as the "New Israeli Grid".
[5] Part of the digitization of Kfar HaHoresh architectural plans was performed by N. Klein and S. Matskevich.

(altitudes, slopes, and aspects) and six environmental maps (soils, lithology, springs, rivers and streams, the Mediterranean shoreline, and agricultural potential).

The basic topographic map is a 10m cell-size Digital Elevation Model (DEM), which was obtained in digital form from the Survey of Israel, a government agency for Mapping, Geodesy, Cadastre and Geoinformatics. The Survey of Israel is responsible for basic mapping products in the country as well as for the national geographic information system. Thus, the obtained DEM was the basis for the creation of both the slope and aspect maps (see Appendix 1 for the full procedure). The Survey of Israel also supplied the water resources maps, including rivers and streams as well as springs.

The lithology map was obtained in digital form from the Geological Survey of Israel (GSI), a government institute operating under the Earth Science Research Administration within the Ministry of National Infrastructures.

Two of the environmental maps were digitized from printed, published maps; the soils map was based on 1: 250,000 map that summarized a large soil survey project conducted in Israel between the 1930s and 1960s (Ravikovitch 1969). As the original map was highly detailed, including over 20 soil sub-types, far beyond the needs of the current research, the data was lumped into nine soil-groups: chalk, limestone and marl; chert bearing chalk and limestone; igneous and metamorphic rocks; conglomerates; alluvium soils; sandstone; sand; travertine; and landslide *(ibid.)*.

Special mention should be made on the origin of the 'agricultural potential' map. This map is based on a detailed survey conducted in Israel immediately after its establishment by the Soil Conservation Service of the Ministry of Agriculture (Gil & Rosensaft 1955). The survey, encompassing over 9.5 million dunams (950,000 hectares), aimed to provide an inventory of the soils of Israel, to classify the special local characteristics, and to determine the possible land-use capabilities of each area, under both dry (non-irrigated) as well as irrigated conditions. During the survey, the following traits were documented: The colour of the soil in wet condition, soil texture (from light sand to clay and heavy clay loess), level of 'stoniness' (or, in other words, the amount of stone clearance required), soil depth, slope, wind and water erosion, and drainage (including the possibility of flooding, salinity, high water table, etc.). Based on these criteria, seven land-use classes were determined:

Classes I-III – land suitable for cultivation of all crops[6].
Class IV – land unsuitable for annual tilled crops, but suitable for plantations, pasture and perennial crops.
Class V – land suitable for pasture but not for cultivation.
Class VI – land suitable for afforestation only.

[6] For example, Class I includes prime land, deep, with loess to clayish texture, with a slope of up to 2%, with sufficient natural drainage, and no or minimal erosion or flooding. Class II includes prime land, deep, with either a slope of 2-6%, light texture, medium erosion, limited soil depth (75-100 cm), or light stone cover requiring clearance, etc.

Class VII – land not suitable for any agricultural purpose[7].

The results of the survey were published in 1:200,000 maps, which were digitized using *ArcMAP* into a digital polygonal layer. Since we are dealing with the early stages of agricultural life, when there is no direct evidence for the use of irrigation methods in the study area, only the data for dry agriculture were used in this research.

A third type of environmental dataset that needed to be created related to the Mediterranean shoreline. During the Last Glacial Maximum (LGM) sea levels were about 120m lower than present, and the shoreline around Haifa Bay, the northern part of the Israeli coastline, was about 20 km westward of the present-day coast. Since the LGM and up to the mid-Holocene, sea levels rose rapidly causing dramatic morphological changes to the shoreline (Fairbanks 1989). Based on drilled cores analysis, Zviely et al. (2006) recreated the geomorphological evolution of Haifa Bay and the Zevulon plain from the late Pleistocene and through the Holocene. Their results showed that during the PPNB sea levels rose from 50 to 25m below modern sea levels, and the shoreline moved almost ten kilometres eastwards. This of course had a critical impact on the human exploitation of the Zevulon Plain throughout the period. To account for these changing conditions four shoreline maps were digitized for this project, following Zviely et al. (2006, pp.856-857), representing the shorelines of ca. 7,500-7,000 calBC, 7,000-6,800 calBC, 6,800-6,200 calBC and 6,500-5,900 calBC.

THE ANALYSES

As mentioned above, all of the spatial analyses in this research were based on GIS applications, and particularly *ArcGIS* Desktop package, a GIS package produced by the Environmental Systems Research Institute, Inc. (ESRI). The following is a description of the methods and techniques used in the different analyses. The spatial analyses conducted via *ArcGIS* is described. For a detailed account of the procedures used see Appendix 1.

Spatial Analyses

Calculating each site's exploitation territories

Three exploitation territories were created for each site. These territories were calculated based on time-distance estimates: three radii were determined, based on walking distances of half an hour, one hour and two hours from the site. This was done using the *Path-Distance* toolset available in *ArcGIS*. The *Path-Distance* toolset calculates accumulative costs of movement while compensating for actual surface distance as well as horizontal and vertical factors. Thus, different factors influencing movement can be weighted in the time-cost calculation. In this research, two factors were taken into account: the actual surface distance and the slope. This allowed for the creation of a non-isotropic cost model, estimating time-travel based on topography.

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[7] Includes the badlands and sand dunes of the Negev.

The model was based on Naismith's 'Rule of Thumb for Hill Walking' devised by W. Naismith, a Scottish mountaineer, in 1892. The basic rule stated a cost of one hour for every five kilometers, plus one hour for every 600 meters of ascent. A correction to Naismith's rule was published by E. Langmuir, to account for time-cost of descending different slope degrees (Langmuir 1984). This correction subtracted 10 minutes for every 300m descent on a slope of 5˚-12˚, and added 10 minutes for every 300m descent on a slope steeper than 12˚. Tobler (1993) translated these into a mathematical function:

$$W = 6\ exp\{-3.5*abs(S + 0.05)\}$$

Thus travel time was calculated as distance/velocity, where *W* is the walking velocity and *S* is the slope (Tobler 1993). A table was created, summarizing Tobler's function. The table was generated in *Excel* and it uses the reciprocal of Tobler's function:

*TIME (HOURS) TO CROSS 1 METER = 0.000166666 **
(exp (3.5 (abs (tan (radians (slope_deg)) + 0.05))))*

Using the table, slope degree could be factored into the time-cost calculation performed by the *Path-Distance* toolset. First, a cost-surface was created, representing the time-cost of traversing the landscape based on distance travelled and "time-penalty" for changing slope degrees. Then, a table was used, based on the Tobler function described above, to append the cost calculation with Langmuir's correction (see Appendix 1 for the full procedures).

Extracting the environmental data

Once the three exploitation territories of each site were defined, the topographical and environmental data were extracted from the regional maps. This was done in two stages: first, the topographic data was extracted based on the point-location of the site (xy coordinated location) using the *Extract by Point* tool. Thus, each site received a set of values including height above sea level, aspect and slope degree. Second, the environmental data was extracted based on the extent of each exploitation territory. This was done using the *Clip* tool. Thus, a triple environmental dataset was created for each site (see Appendix 1 for the full procedures). The quantitative data could then be summarized into a table (Appendix 3a, Tables 2-11), which could subsequently be analysed.

Viewshed analysis

Viewshed analysis was conducted for each archaeological site, using the *Viewshed* tool, part of the *Visibility* toolset of *ArcGIS*. The analyses conducted followed the work of Higuchi (1983) and Wheatley and Gillings (2002). First, a viewshed map was created for each site, dividing the landscape into areas that can be seen and areas that cannot be seen from the site. Then, each viewshed map was further divided into three bands, representing Short-Distance, Middle-Distance and Long-Distance viewsheds. The boundaries of the short and middle-distance views were calculated following Higuchi's (1983) method, that is, 360m and 6600m, respectively. The boundary of the long-distance view was calculated based on the optimal 'distance to the horizon' from each location separately. This distance is calculated based on the absolute elevation above sea level (asl) of each site, that is, the observer's elevation, disregarding all other factors. This calculation follows the Pythagorean Theorem:

$$(R+h)^2=R^2+OG^2 \quad or \quad OG^2=(R+h)^2-R^2$$

Where *R* is the earth's radius, *h* is the observer's height and *OG* is the distance between the observer *O* and the horizon *G* (Figure 2.1). If we expand $(R+h)^2$ we find that

$$OG=\sqrt{2Rh+h^2}$$

It is important to note this distance is hypothetical, reflecting the potentially visible distance on a sphere, rather than a realistic portrayal of actual land topography. It also does not take into account the earth's refraction. It is used as a heuristic device to truncate the long-distance view.

After the Higuchi viewshed was created for each site, a cumulative viewshed map was also created, combining all of the different site-based viewsheds into a single map. This map enabled investigation of the Galilean landscape as a single entity, highlighting areas seen from several observer points. It also emphasized those areas in the landscape that are hidden from sight.

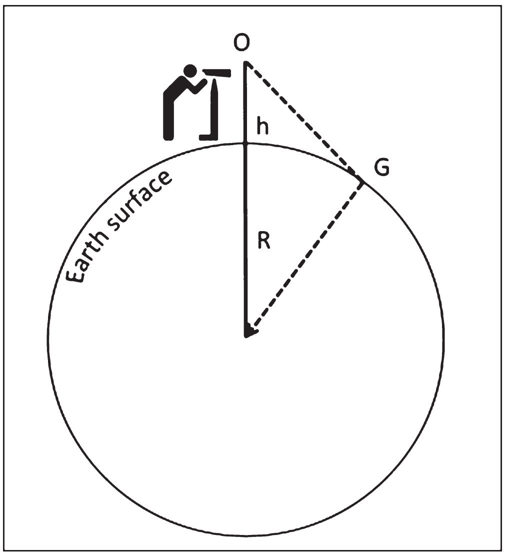

Figure 2.1: Calculating distance to horizon.

Intra-site distribution analyses at Kfar HaHoresh

As part of the intra-site analysis of the remains from Kfar HaHoresh, the spatial distribution of the site's lithic assemblage was examined. This was based on a sample of ca. 70% of the entire assemblage, as described above. Out of this sample, two groups of artefact categories were selected for further analysis, and their distribution examined separately. These include: (a) artefact categories representing different stages of the lithic production sequence, i.e. cores, core trimming elements (CTE's), flakes and blades, as well as chips; (b) five tool categories including the formal tools, i.e. projectile points, sickle blades and bifaces, as well as two non-formal, *ad hoc* tools, i.e. burins and retouched blades.

Hot-Spot analysis (Getis-Ord Gi*) was used to examine the spatial distributions of the first group of artefacts, and seek out statistically significant patterns. This was done using the *Hot Spot Analysis* tool, part of the *Spatial Statistics* toolset on *ArcGIS*. This tool calculates the Getis-Ord Gi* statistic for each feature in the dataset and identifies statistically significant spatial clusters of high and low values. This method was selected because it is a local statistic, taking into account the feature (i.e. a grid square within the excavation) and its immediate neighbors, relative to the entire dataset (Getis & Ord 1996)[8]. The tool produces a distribution map showing hot and cold spots, together with significance scores for the differences observed between them (i.e. *z* scores and *p* values for each feature in the dataset; Mitchell 2005). In this study, significance level for the *p* value was set at 0.05.

Since the results of the Getis-Ord Gi* are not reliable when analyzing samples of less than 30 neighbors (Getis & Ord 1996), a simple point-density analysis was employed in the analysis of the tools categories. This was done using the *Point Density* tool, part of the *Density* toolset on *ArcGIS*. This tool calculates the density of point features within a defined neighborhood (i.e. a grid square). Density is calculated by summarizing the number of points that fall within the square and dividing the sum by the area of the square (Silverman 1986).

[8] As described above, only lithic artefacts from loci that could be securely set within a stratigraphic phase were included in the analysis presented here. Their distribution was based on the metric grid data.

Chapter 3

The PPNB of the Lower Galilee

ENVIRONMENTAL BACKGROUND - THE LOWER GALILEE

The Lower Galilee is a well-defined geographical unit located in northern Israel: to the east, it is bordered by the Sea of Galilee and the Jordan Rift Valley. To the west, it is bordered by the Mediterranean coast and the Zevulon and Akko plains. To the north and south it is demarcated by large valleys: The Bet Ha-Qerem Valley and the foothills of the high Upper Galilee hills to the north and the plains of the Jezre'el and the Bet Shean valleys to the south (Figure 3.1). Proximity to the Mediterranean creates a winter rain climatic regime with average annual precipitation of 350-800 mm (Efrat 1996; Orni & Efrat 1971; and see below).

The Lower Galilee's present structure has been developing since the Miocene, prior to and along with the development of the Dead Sea Fault. In addition to the Jordan Rift Valley, the dominant topographic feature in the southern Levant, two subsidiary

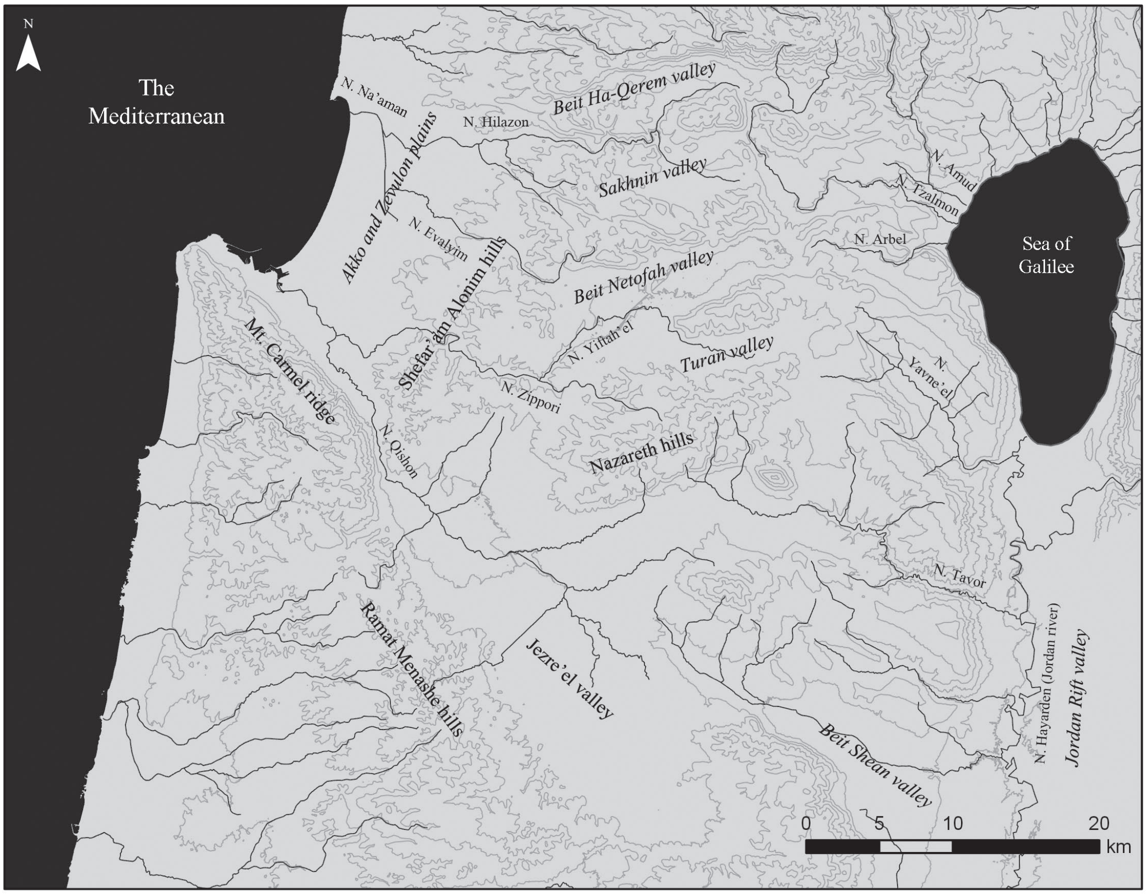

Figure 3.1: The Lower Galilee, showing major geographic units.

tectonic fault systems can be distinguished; the first, with an east/west orientation, is oriented at right angles to the Jordan Rift Valley. The second, with a south-east/north-west orientation, creates a step-like structure. These combine to create a landscape of north-south trending wide valleys and hill ranges between 200 and 600m asl (Ben-Yosef 2001; Efrat 1996).

From east to west the Lower Galilee can be divided into three sections, differing in geological structure, sedimentary regime and morphology:

1. *The eastern Lower Galilee* is represented by the Kinarot Valley (part of the northern Jordan Rift Valley). It is structured as a system of tilted plateaus with steep slopes usually facing north-east, separated by river valleys which developed along the east-west trending faults and drain eastwards to the Sea of Galilee (Ben-Yosef 2001). Four rivers drain the Lower Galilee eastwards to the Sea of Galilee or the Jordan River: Nahal Tavor, Nahal Yavne'el, Nahal Tzalmon and Nahal 'Amud. The area is extensively covered with basalt of Late Tertiary origin (Nir 1989, p.24), and basalt-derived brown soils as well as *terra rossa* (Ravikovitch 1969). An average elevation of 200m bsl and the presence of the Sea of Galilee, create year-round warm temperatures and high humidity. With average annual precipitation of 350-500 mm, this area is characterized by Savannoid Mediterranean and lacustrine vegetation associations (Danin 1992).
It is important to note that during the Last Glacial much of the Jordan Rift Valley, including both the Sea of Galilee and the Dead Sea areas, was covered by Lake Lisan. In the Early Holocene, and most probably by the end of the Younger Dryas, the lake receded to a configuration similar to the present (Hazan et al. 2005; Robinson et al. 2006)[9]. The Jordan River outlet was most probably located ca. 2km north of its modern location (Belitzky & Nadel 2002; Ben-Arieh 1965; Hazan et al. 2005).
2. *The central Lower Galilee* is comprised of a set of east-west trending, parallel hill ridges, separated by deep valleys. The hills are relatively high, reaching between 500 and 600m asl, and usually display an asymmetrical contour, as their southern slopes are often steep, while the northern slopes are mostly moderate. Valleys are usually long and deep with relatively wide, flat bases (Ben-Yosef 2001). Some of these valleys, e.g. the Beit Netofah Valley and the Jezre'el Valley, are sealed off by the surrounding hills in a way that impairs water drainage, thus creating seasonal lakes and swamps during the rainy winter season (Nir 1989; Orni & Efrat 1971). To the west of these high ridges, separating them from the Coastal Plain, are the Shefar'am-Alonim hills, a series of round, low hills about 200-300m asl.

Geologically, the area is characterized by sedimentary Eocene rocks (mainly limestones, dolomites, chalks and marls), and a wide range of karstic activity, forming numerous caves and springs. Some volcanic rocks such as tuffs and hard basalt, are

[9] Even in its present form, the Sea of Galilee underwent rises and falls through its history. In their reconstruction, Hazan et al. (2005) identify a significant drop ca. 6,000 calBC (i.e. during the Pottery Neolithic) followed by a maximum ca. 3,200 calBC (Early Bronze Age).

also present (Ben-Yosef 2001; Efrat 1996). Soils are mainly *terra rossa* and fine-grained rendzina, the result of weathering of the sedimentary rocks (Ravikovitch 1969).

Water resources are plentiful in the central Lower Galilee; numerous springs are present in the hills as a result of karstic activity, as well as along the main rivers. These include four main systems, all draining west towards the Mediterranean: Nahal Zippori, which drains both the Nazareth hills and the Shefar'am-Alonim hills, Nahal Yiftah'el, which drains the Beit Netofah Valley, Nahal Avlayim, which drains the Yotvat Mountains and Nahal Hilazon, which drains the Sakhnin Valley. Modern average annual precipitation in the area ranges between 600 and 800 mm.

The climax vegetation in the area has been largely destroyed during the Holocene by anthropogenic activities, though isolated relicts of natural vegetation remain mainly in the more hilly and mountainous areas. In general, however, the natural environment in these areas is of Mediterranean open forest, featuring mainly Tabor oak and pistachia (Baruch 1986; Ben-Yosef 2001; Efrat 1996).

3. *The western Lower Galilee*, represented by the northern Coastal Plain, is characterized by a sandy shoreline, low hills of up to 200m asl and wide valleys (the Zevulon and Akko plains), which are a continuation of the Jezre'el valley system *(ibid.)*. Lithology in the area is characterized mainly by chalk/limestone sedimentary rocks, covered by either coastal sand dunes or brown-red sandy soils, including *Hamra* (Ravikovitch 1969). Annual precipitation ranges between 500-600 mm, and modern vegetation is characterized by sandy vegetation as well as dwarf-shrub steppe vegetation.

Two rivers run through the area; Nahal Qishon, which originates in the Jenin area (Samaria) and flows at the foothills of Ramat Menashe and the Carmel ridge, and Nahal Zippori, which drains the central Lower Galilee westwards. Both rivers converge at the southern edge of the Zevulon Valley, and run westwards to the Mediterranean. The northern border of the area in delineated by the confluence of two other rivers, Nahal Na'aman and Nahal Hilazon, which drain the central Lower Galilee hills as well.

An important factor that needs to be taken into consideration is the Mediterranean sea-level changes during the Holocene and their effect on the landscape of the area. During the later Epipaleolithic, and until the mid-EPPNB, global sea level was ca. 50m below present level, thus locating the Mediterranean shoreline about 14km west of the current shore (Zviely et al. 2006). Wetlands were scattered in patches around the estuary of Nahal Qishon. During the Neolithic, and into the Late Chalcolithic, water levels rose rapidly, thus affecting both the location of the shoreline and the character of the Coastal Plain itself. In the Galilean coastal plain, during the EPPNB and MPPNB terrestrial conditions are attested, but by the LPPNB, as sea level rose to ca. 30-35m below present, the shoreline was located about 5.5km to the west. Sand from the Nile delta started accumulating for the first time along the Haifa Bay. Sea levels continued to rise, and during the FPPNB/PPNC the shoreline was ca. 4.5km to the west. The southern part of the bay became sandy, while the central and the northern parts were rocky. It is only by the end of the Pottery Neolithic, ca. 6,400-5,000 calBC that the shoreline reached its current location[10].

While the modern seasonal regime of wet winters and dry summers persisted throughout the Holocene (Orland et al. 2012), climate reconstructions indicate that conditions in the Lower Galilee during the PPNB were probably wetter and warmer than today. This is evident in both pollen records (Rossignol-Strick 1995) and the Soreq cave speleothem record (Bar-Matthews & Ayalon 2011; Bar-Matthews et al. 2003), as well as in other climatic records (Rosen 2007; Robinson et al. 2006 and references therein). A brief interruption of these conditions might be represented by the '~8.2 ky calBP event' (ca. 6.3k calBC), which represents a climatic deterioration associated with 2-3° cooling and/or increased aridity (Bar-Matthews & Ayalon 2011; Bar-Matthews et al. 2003; Langgut et al. 2011; Weninger et al. 2009). It seems, however, that the absolute effects of this event in terms of vegetation changes and yields, were not sufficient to drastically impact local populations (Flohr et al. 2016). The Early Holocene also witnessed the maximum development of the Mediterranean maquis, as indicated by marine pollen records from the southern coast of Israel. This was probably due to amelioration in climatic conditions, as corroborated by the continental pollen records from the Hula Valley (Baruch & Bottema 1999) and the northern coast of Israel (Kadosh et al. 2004, 2015).

THE STUDIED SITES

The study area includes 24 sites[11], organized in four categories based on the scale of investigations conducted and the availability of data (Figure 3.2; Tables 2.1, 3.1-3.2). The following is a description of each site, including its location, history of research and a short account of the nature of the archaeological remains uncovered. Sites are arranged by category, and presented alphabetically.

Category I

Kfar HaHoresh

The site of Kfar HaHoresh (KHH) is located on the western flanks of the Nazareth hills, on the left (north-facing) bank of Nahal Zvi, a tributary of Nahal Qishon, emanating from the Nazareth hills into the Jezre'el Valley (Figure 3.2). The wadi in which the site is located is narrow, rising sharply on all sides save downstream to the west, and the site is positioned in its uppermost reaches at an elevation of ca. 375m asl. Bedrock in the area is Senonian chalk, overlain by outcrops of Eocene limestone, providing sources of flint. Surrounding soils are heavy brown and pale rendzinas and grumosols (Table 3.2). Modern vegetation is completely man-made, as the area of the site was used as agricultural fields and other facilities for the nearby kibbutz for over 40 years,

[10] It is interesting to note that during the Chalcolithic this process continued as the shoreline moved eastwards, until, by the end of the Early Bronze Age, the entire Zevulon Valley was flooded, and small saline wetlands were created along the coast.

[11] And see note 3 regarding the site of Giv'at Kipod.

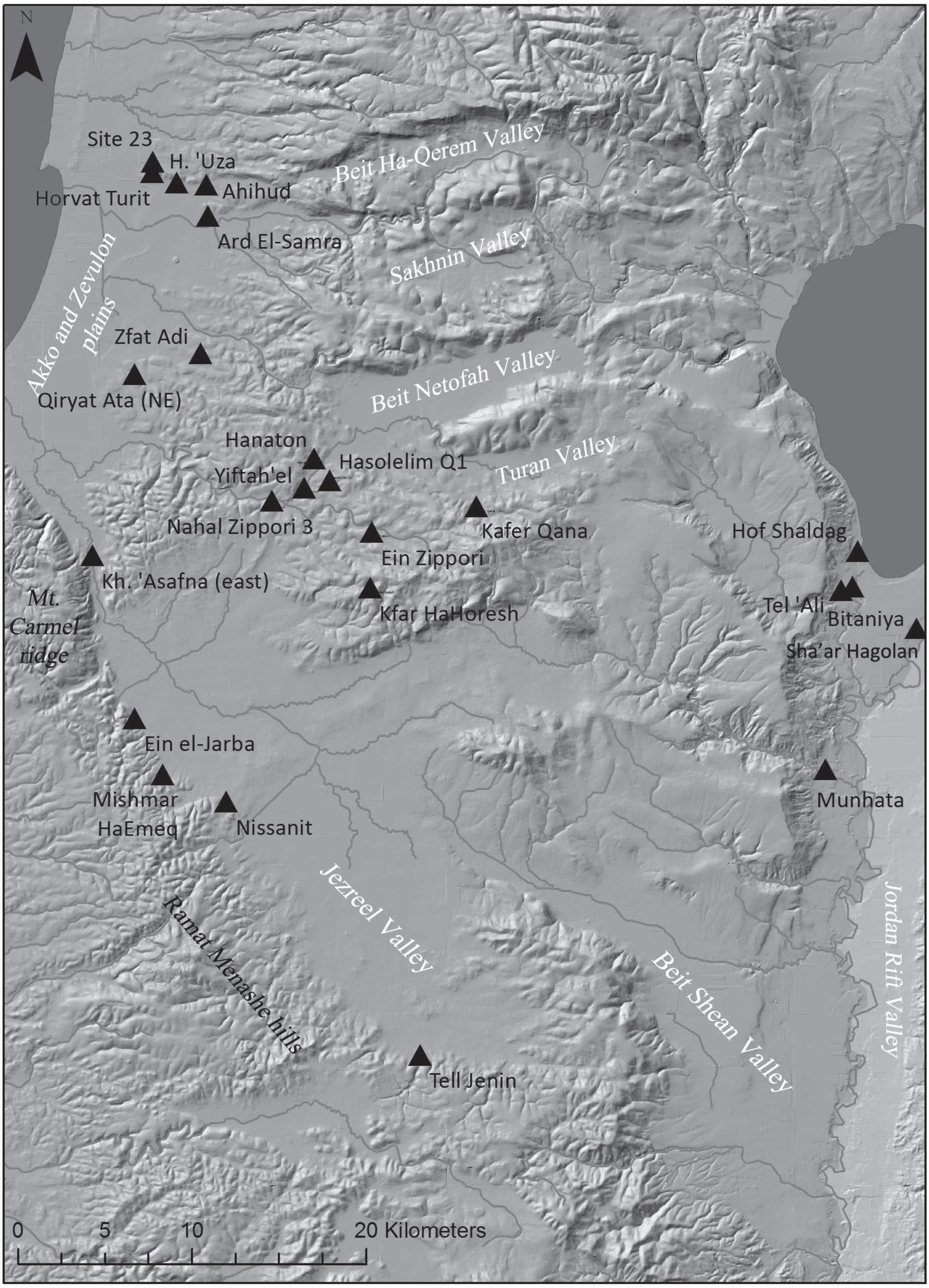

Figure 3.2: Studied sites.

Table 3.1: relative site chronology and periodization

Site	PPN						PN	Early Chalcolithic (Wadi Rabba)
	PPNA	PPNB				FPPNB/ PPNC		
		PPNB - General	EPPNB	MPPNB	LPPNB			
Category I								
Kfar HaHoresh	-	+	+	+	+	-	-	-
Munhata	-	+	-	+	-	?	Yarmukian	+
Yiftah'el	-	+	?	+	?	?	(Jericho IX/Lodian)	+
Category II								
Ahihud	-	+	+	?	?	-	-	+
'Ein Zippori complex	-	+	+	+	+	+	-	+
Mishmar Ha'emeq	-	+	-	+	?	-	Yarmukian	+
Nahal Zippori 3	-	+	-	+	-	-	Yarmukian	+
Tel 'Ali	?	+	+	+	-	+	Beth Shean XVIII	+
Category III								
Ard el-Samra	-	+	-	-	?	?	Yarmukian	+
'Ein el-Jarba	-	+	-	-	-	?	Yarmukian	+
'Enot Nissanit	-	+	-	-	-	+	-	-
Hanaton	-	+	-	-	?	-	-	+
Horvat 'Uza	-	+	-	-	-	+	Yarmukian	+
Kfar Qana	-	+	-	?	-	-	?	+
Kh. 'Asafna (east)	-	+	+	-	-	-	Yarmukian	-
Sha'ar Hagolan	-	+	-	-	-	+	Yarmukian	?
Tell Jenin	-	+	-	?	?	+	-	-
Category IV								
Bitaniya	-	+	?	-	-	-	-	-
Hof Shaldag	-	+	-	?	?	?	-	-
Horvat Turit	?	+	+	-	-	-	-	-
Judeidi-Makr #23	-	+	-	-	?	?	-	-
Qiryat Ata (NE)	-	+	-	-	-	-	-	-
Trig. P.Q1	-	+	-	-	-	-	-	-
Zefat Adi (east)	-	+	-	-	-	-	-	-

Table 3.2: Site topographic and environmental location.

Site	Elevation masl	Slope (degrees)	Aspect	Lithology[1]	Soils[2]	Plant Association[3]
Ahihud	35	1	South	Chalk, limestone and marl	Mediterranean brown forest soils	*Quercus ithaburensis*
Ard El-Samra	14	1	NW	Chalk and marl	Alluvial soils	*Ceratonia silliqua – Pistacia lenticus*
Bitaniya	-204	2	SE	Sandstone, gravel & limestone conglomerates	Alluvial soils	*Ziziphus lotus*
'Ein el-Jarba	63	4	NE	Chalk	Mediterranean brown forest soils	Alluvial valley, unknown climax
'Ein Zippori complex	227	5	NE	Chert bearing limestone and marl	Mediterranean brown forest soils; Alluvial soils	*Quercus ithaburensis*
'Enot Nissanit	130	3	NE	Chert bearing chalk & limestone	Mediterranean brown forest soils	*Quercus ithaburensis*
Hanaton	155	2	West	Chert bearing chalk & limestone	Mediterranean brown forest soils	*Quercus ithaburensis*
Hof Shaldag	-210	3	East	Igneous and metamorphic rocks	Alluvial soils	*Ziziphus lotus*
Horvat Turit	75	7	NW	Chert bearing chalk & limestone	Mediterranean brown forest soils	*Quercus ithaburensis/ Quercus calliprinos*
Horvat 'Uza	22	3	South	Chalk, limestone and marl	Alluvial soils; Mediterranean brown forest soils	*Quercus ithaburensis*
Judeidi-Makr #23	34	1	North	Chert bearing chalk & limestone	Alluvial soils	*Quercus ithaburensis/ Quercus calliprinos*
Kfar HaHoresh	366	11	North	Chalk, limestone and marl	Mediterranean brown forest soils	*Quercus ithaburensis*
Kfar Qana	225	3	NE	Chalk, limestone and marl	Mediterranean brown forest soils	Steppe-forest
Kh. 'Asafna (east)	15	0	West	Chalk, limestone and marl	Alluvial soils	*Quercus ithaburensis/ Quercus calliprinos*
Mishmar Ha'emeq	119	4	North	Chalk, limestone and marl	Mediterranean brown forest soils	*Quercus ithaburensis*
Munhata	-216	4	South	Limestones and basalts	Alluvial clays, marl and very soft chalk	*Ziziphus lotus*
Nahal Zippori 3	122	6	North	Chalk, limestone and marl	Alluvial soils; Mediterranean brown forest soils	*Quercus ithaburensis*
Qiryat Ata (NE)	40	4	NE	Chalk, limestone and marl	Mediterranean brown forest soils	*Quercus ithaburensis*
Sha'ar Hagolan	-210	2	SE	Marl and very soft chalk	Alluvial soils; Peat soils	*Ziziphus lotus*
Tel 'Ali	-196	2	East	Sandstone, gravel & limestone conglomerates	Alluvial soils	*Ziziphus lotus*

[1] Geological Survey of Israel (GSI)
[2] Ravikovitch 1969
[3] Baruch 1986

Table 3.2 (cont.).

Site	Elevation masl	Slope (degrees)	Aspect	Lithology[1]	Soils[2]	Plant Association[3]
Tell Jenin	144	2	NE	Chalk, limestone and marl	Alluvial soils	*Quercus ithaburensis*[4]
Trig. P. Q1	194	4	West	Chert bearing chalk & limestone	*Terra Rossa*	*Quercus ithaburensis*
Yiftah'el	139	3	NE	Chert bearing chalk & limestone	Alluvial soils; *Terra Rossa*	*Quercus ithaburensis*
Zefat Adi (east)	74	4	West	Chert bearing chalk & limestone	Mediterranean brown forest soils	*Quercus ithaburensis*

[4] The area of Tel Jenin is not part of the original analysis by Baruch (1986), but based on the similarity in environmental conditions to nearby 'Enot Nissanit, a *Quercus ithaburensis* association can be suggested here as well.

but the original vegetation was probably a dense Tabor oak park-forest (Goring-Morris 2005 and references therein).

Following discovery in 1991, two trenches and three test pits were mechanically excavated to ascertain that it was *in situ* (Goring-Morris et al. 1994, 1995). Subsequently, excavations were initiated in two areas along Trench I (Figure 3.3): The Upper area, and the Main area, the latter further partitioned into two sub-areas: West and East. Between 1991 and 2012 16 excavation seasons of excavation were conducted, and the extent of the site was estimated to be ca. 0.75 hectare, of which ca. 500m² have been exposed[12].

To date KHH provides the longest and most coherent PPNB chronological sequence in the region. This complex stratigraphic sequence was divided into three main phases, broadly corresponding to the Early, Middle and Late PPNB (Birkenfeld 2008; Birkenfeld & Goring-Morris 2014; Goring-Morris et al. 2001). This division, based on field observations as well as on techno-typological markers (especially the projectile points) was further strengthened by a series of ^{14}C dates (mostly unpublished) that indicate the occupation lasted from ca. 8,500 to somewhat later than ca.7,500 calBC (Tuross & Goring-Morris 2011).

Excavations at the site revealed a variety of architectural remains and installations as well as large assemblages of both mundane and symbolically charged artefacts (Appendix 2, tables 2-3). The main architectural features at the site are lime-plastered surfaces, either seemingly 'free-standing' or associated with low surrounding stone-built walls. Structures vary in size from small cists or chambers to larger, more intricate complexes and change significantly in nature through the occupation sequence. Worth noting is the monumental platform/podium (L1604 complex), which represents monumental communal architecture. Clear examples of domestic architecture on the other hand, have not been reported (and see Chapter 4).

[12] A survey conducted during 2013 in the vicinity of the site indicated that its extent may have been slightly larger than previously suggested, reaching an estimated area of 10 dunams - 1 hectare (Barzilai & Vered pers. comms.).

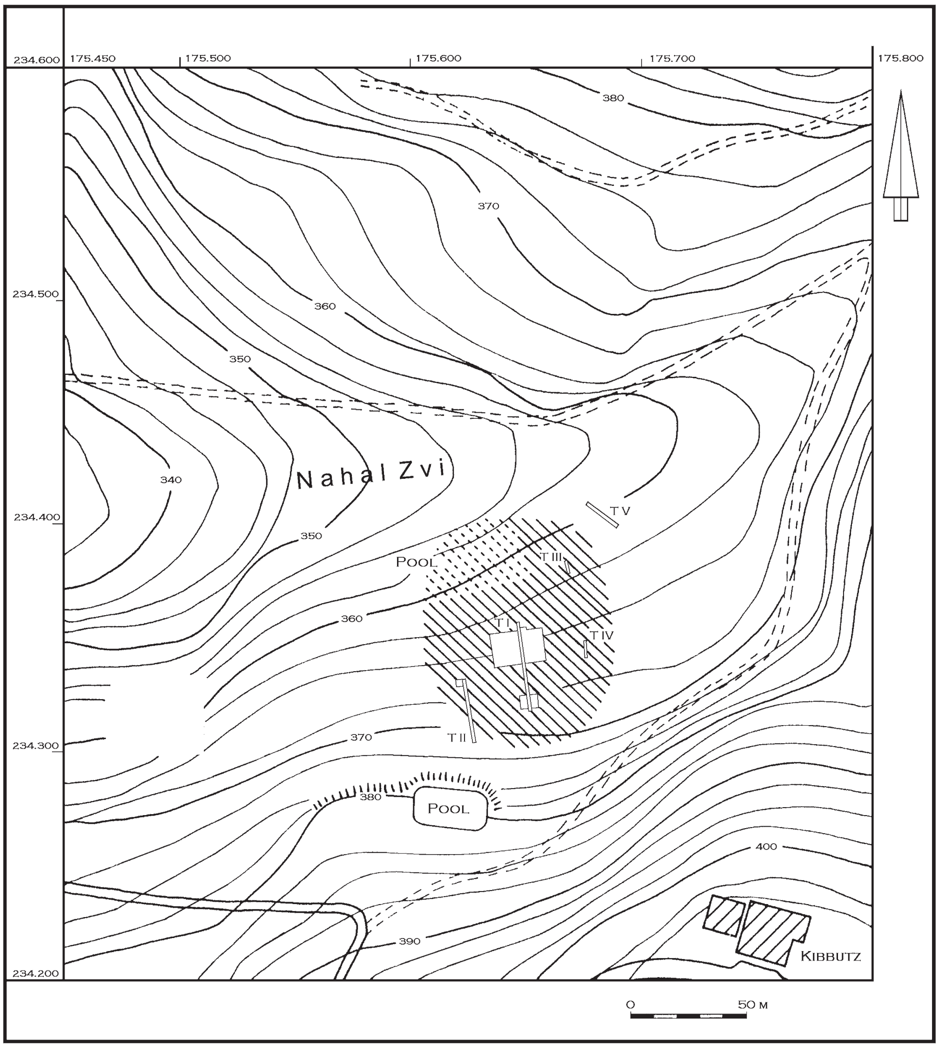

Figure 3.3: Excavation areas at Kfar HaHoresh (after Goring-Morris 1991, fig.2).

One of the most notable features of the site is the extensive evidence for mortuary and ritual activities; more than 70 burials were recorded, as well as at least three plastered skulls, and a variety of grave markers, *stelae* and other ritual-related installations (Eshed et al. 2008; Goren et al. 2001; Goring-Morris 2005; Goring-Morris et al. 1998, 2008; Hershkovitz et al. 1995; Simmons et al. 2007). Ritual activity was also evidenced in the rich faunal assemblages, suggested to reflect feasting events (Goring-Morris & Horwitz 2007; Meier et al. 2017a). Based on its location, together with the wide range of unusual mortuary installations and practices documented as well as the varied nature of the material culture remains, the site has been interpreted as a cult and mortuary locality, serving the populations of nearby settlements in the lowlands (Goring-Morris 2002, 2005).

Munhata

The site of Munhata is located in the Jordan Rift Valley, ca.15 km south of the Sea of Galilee. It sits on a wide alluvial fan at the outlet of the perennial Nahal Tabor, less than 1km from the Jordan River, at an elevation of -215 m bsl (Figure 3.4). The dominant sediments in the area are alluvial clays as well as marl and very soft chalk of the Lisan formation, while the adjacent hills to the west and east provide access to both Neogene limestones and basalts as well as to Eocene formations (Table 3.2). The site sits in the Mediterranean savanoid zone, dominated mainly by the *Ziziphion loti* community, associated with dwarf shrubs of the *Ballotalia* order (Baruch 1986).

The site was excavated by J. Perrot between 1962 and 1967 (Perrot 1964, 1965, 1966a, 1966b, 1969, 1993; Tzori 1958)[13]. Two excavation areas were opened (north and south) and six layers were identified, representing two main occupation phases, separated by a hiatus: a PPNB occupation phase (layers 6-4), a Pottery Neolithic occupation (Yarmukian; Layer 2b) and Early Chalcolithic (Wadi Rabah; Layer 2a). While ca. 2000 m^2 of the upper, PN occupation were exposed, the lower, PPNB layers were uncovered on the order of a few hundreds of square meters (Gopher 1989, p.7). Perrot estimated that the PN village extended over ca. 20 hectares (Perrot 1993, p.1046).

PPNB remains at Munhata comprise both domestic and communal architecture, as well as rich and varied assemblages (Appendix 2, Tables 2-3), and the site was interpreted by its excavators as a sedentary village, with an economy based mainly on hunting. Techno-typological markers of the lithic industry indicate the site was

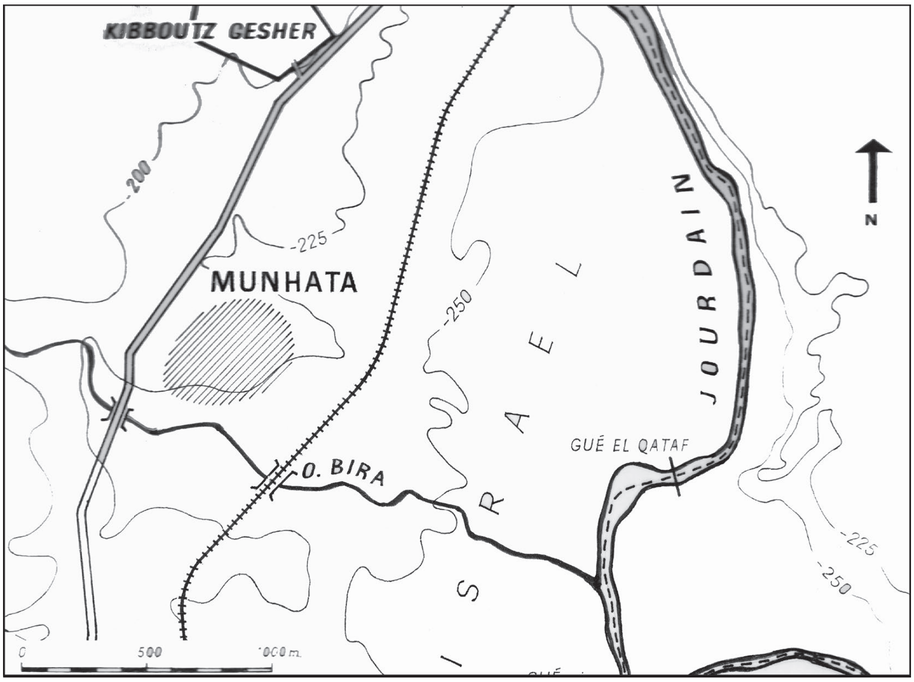

Figure 3.4: Location and estimated extent (in dashed) of Munhata (figure courtesy of J. Perrot).

[13] During the 1990s further excavations were conducted (Commenge 1996). Although a small PPNB assemblage was reported, these excavations focused on the later phases (layers 2-3) and remain unpublished, and thus beyond the scope of this research.

occupied relatively early within the MPPNB (Barzilai 2010a; Gopher 1989). A single radiometric date of the PPNB layers gave a date of 8463 ± 678 calBC (Perrot 1993, and see Appendix 2, Table 1).

Yiftah'el

The site of Yiftah'el is located on the western edge of the Beit Netofah Valley, west of the Nazareth hills, at an elevation of 140m asl. It is situated on a gentle slope on the eastern bank of Nahal Yiftah'el, which drains the valley and flows westwards to the Mediterranean. Bedrock in the area is mainly chalk and limestone, accompanied by alluvial and *terra rossa* soils (Table 3.2; Garfinkel et al. 2012d). The dominant vegetation in the area today is Tabor oak open-park, consisting mainly of the *Quercus ithaburensis – Styrax officinalis* associations, while wood remains recovered at the site suggest that during the PPNB the dominant native association was *Quercus calliprinos – Pistacia palaestia* (Baruch 1986; Garfinkel et al. 2012b, p.6; Liphschitz 2012).

The site was initially tested in 1982 (Area D; Table 3.3, Figure 3.5), exposing PPNB architectural features, faunal and botanical remains, and an abundant flint tool assemblage (Lamdan 1983; Lamdan & Davis 1983; Ronen et al. 1991). Subsequently, three seasons of salvage excavations were conducted between 1983 and 1985 (Area C), revealing more PPNB remains (Garfinkel 1985a, b, c; 1987). During the same years, a second, large-scale salvage excavation (Areas A & B) revealed later occupations, including a possible FPPNB/PPNC occupation (and see discussion in Chapter 5), as well as a Pottery Neolithic and Early Bronze Age occupations (Braun 1984, 1985, 1986, 1997). Further investigations were carried out in 1997 (Area E), exposing a continuation of the PPNB occupation layers identified in Areas C and D. Finally, two extensive seasons of excavations were held in 2007 and 2008, when four new areas were opened (Areas F, G, H, I; Khalaily et al. 2008, 2010). The total area of the PPNB occupation is estimated as at least 40 dunams (4 hectares), of which ca. 2,000 m^2 were

Table 3.3: Excavated areas of Yiftah'el ([1]Braun 1997; [2,3]Garfinkel et al. 2012d; Khalaily et al. 2012)

Area	Years	Excavator	Area excavated	Phases represented
A[1]	1983-1985	Braun, E.	2400 m^2	EB I; PPNC?; LPPNB
B[1]				MB IIa; EB IV; PN (Jericho IX)?
C[2]	1983-1985	Garfinkel, Y.	185 m^2	EB Ia; MPPNB; EPPNB?; Sterile fill
D[2]	1982-1983	Ronen, A.; Lamdan, M. & Davies, M.	80 m^2	Modern; EB Ia?; MPPNB; Sterile fill
E[2]	1997	Khalaily, H., Marder, O., Milevski, I.	72 m^2	Modern; EB Ia?; LPN/Early Chalc. (Wadi Rabah); MPPNB; EPPNB?; Sterile fill
F[3]	2007-2008	Khalaily, H., Getzov, N. and Milevski, I.	1400 m^2	Post EB Ia; EB Ia; PN (Jericho IX); MPPNB
G[3]				Modern; EB IV; EB Ia; PN (Jericho IX); MPPNB
H[3]				Modern; MPPNB
I[3]				Modern; LPN/Early Chalc. (Wadi Rabah); MPPNB

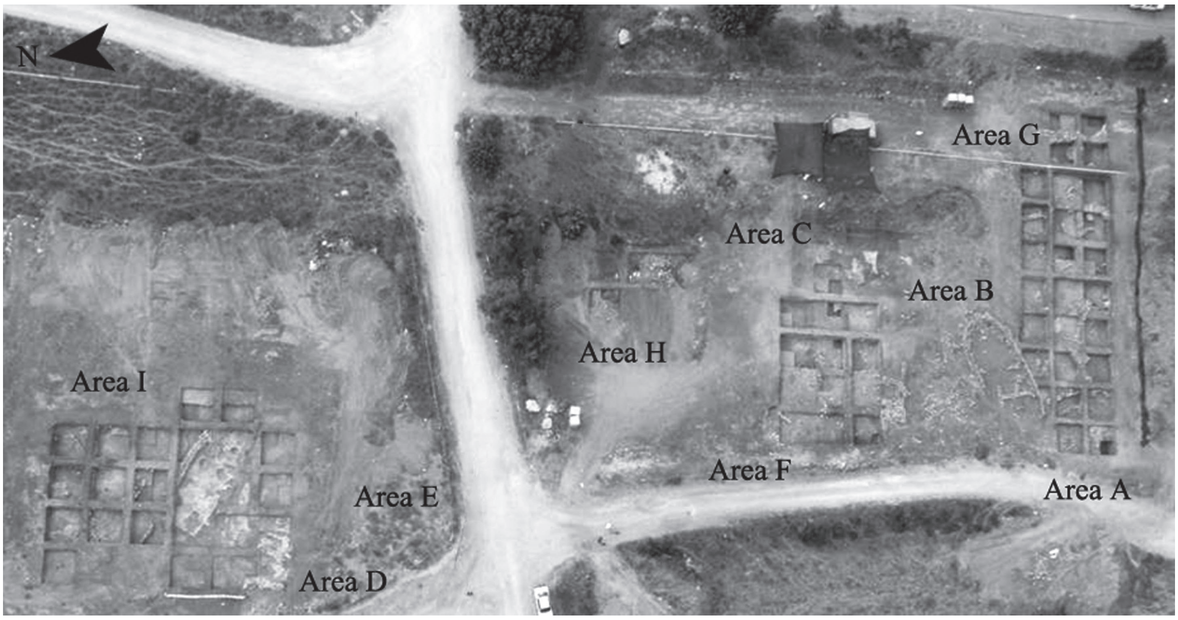

Figure 3.5: Yiftah'el – location of the site and excavated areas (after Khalaily et al. 2008).

exposed by the various expeditions (Khalaily et al. 2010). The main occupation is dated by a series of ^{14}C dates from areas C, E and I to the MPPNB (ca. 8250-7500 BC; Garfinkel et al. 1987, 2012d; Poduska et al. 2012; Appendix 2, Table 1). The presence of EPPNB and LPPNB occupations were also suggested by some of the excavators, based on isolated finds, but no clear strata have been identified to date (Table 3.3).

PPNB remains at Yiftah'el include domestic and communal architecture, as well as various installations. Industrial activities are also indicated, including a large-scale naviform blade production industry. Numerous human burials were recorded at the site, representing over 30 individuals (Garfinkel et al. 2012b and references therein; Khalaily et al. 2008).

Yiftah'el is interpreted by its excavators as a medium-sized village, with a population estimated at 600 individuals (Garfinkel et al. 2012a, pp.297-298). While medium-sized in comparison to the large-scale villages east of the Jordan Rift Valley, these estimations place Yiftah'el as one of the largest sites in the region. Based on the variety of architectural remains as well as the evidence for extensive caching, they suggest a certain degree of social complexity within the population of the site, which is portrayed as being central in the local, regional scheme *(ibid.)*.

Category II

Ahihud

The site of Ahihud is located on the northern slope of Giv'at Ahihud, a small hill at the northeastern edge of the wide Akko plain, at an elevation of 35m asl. Bedrock in the area comprises mainly chalk, limestone and marl accompanied by Mediterranean brown forest soils (Table 3.2). The dominant vegetation in the area is Tabor oak open-park *Quercus ithaburensis* association (Baruch 1986).

A salvage excavation conducted in 2013 revealed PPNB and Early Chalcolithic (Wadi Rabah) occupations (Paz & Vardi 2014). About 200 m^2 of PPNB occupation were exposed, but a survey revealed that PPNB material is present over the entire area of the hill, indicating a fairly large occupation, ca. 30 dunams (3 hectares) in size.
Although the architectural remains at Ahihud are few, finds are abundant and diverse, indicating a well-established occupation with long-distance interactions (Appendix 2, Tables 2-3). Worth mentioning is a remarkable botanical assemblage as well as an extensive obsidian tool assemblage. Human burials were also recorded (Paz & Vardi pers. comm.).

The earliest occupation at the site can be dated based on typo-technological markers of the lithic assemblage to the EPPNB. This is supported by ^{14}C dates, which place the site at the end of this chronological stage (Appendix 2, Table 1; Caracuta et al. 2015). A second phase, post-dating the EPPNB occupation and pre-dating (and cut by) the Chalcolithic strata, can perhaps be dated to later in the sequence, possibly Middle/Late PPNB (Vardi pers. comm.).

The ʻEin Zippori complex

The site complex of ʻEin Zippori is located in a small valley on the southern bank of Nahal Zippori, immediately adjacent to the northwestern flanks of the Nazareth hills (Figure 3.2). Bedrock in the area comprises chert-bearing limestone and marl and accompanying soils are Mediterranean brown forest soils at the foothills and alluvial soils along the valley (Table 3.2). Past plant association was identified as Tabor oak park-forest (*Quercus ithaburensis* association; Baruch 1986).

Until recently, this complex was thought to represent separate sites, i.e. Ilut, ʻEin Zippori and Giv'at Rabi East (Figure 3.6). However, recent surveying and large-scale excavations have shown that these separate locales are most probably all part of a single large site, spread along the valley, from the upper reaches of the hill (Giv'at Rabi East at ca. 240m asl) to the valley lowlands (between 227-235m asl), extending over some 300 dunams (30 hectares).

Several test excavations and large-scale salvage projects were conducted at the site between 1995 and 2016, and exposed a long stratigraphic sequence ranging from the PPNB to the Crusader era (Figure 3.6; Abu Zidan et al. 2013; Barzilai et al. 2013a; Getzov, pers. comm; Milevski & Getzov 2014; Yaroshevich, pers. comm; Zidan 2014). While over 5000 m^2 were excavated, the exposure of the PPNB occupation was very limited, reaching less than 100 m^2. While very partial architectural remains were exposed (comprising a single plaster floor from area N; Milevski & Getzov 2014) and finds were scant, the flint assemblages recovered indicate that the PPNB occupation probably extended from the EPPNB through the MPPNB and perhaps LPPNB as well as the FPPNB/PPNC (pers. obs.; Barzilai et al. 2013a; Milevski, Getzov & Yaroshevich pers. comm.).

Another facet of the PPNB occupation at the ʻEin Zippori complex was revealed at Giv'at Rabi East, where a flint workshop was excavated (Barzilai & Milevski 2010, 2015). Based on the quality of the knapping and the techno-typology identified, it

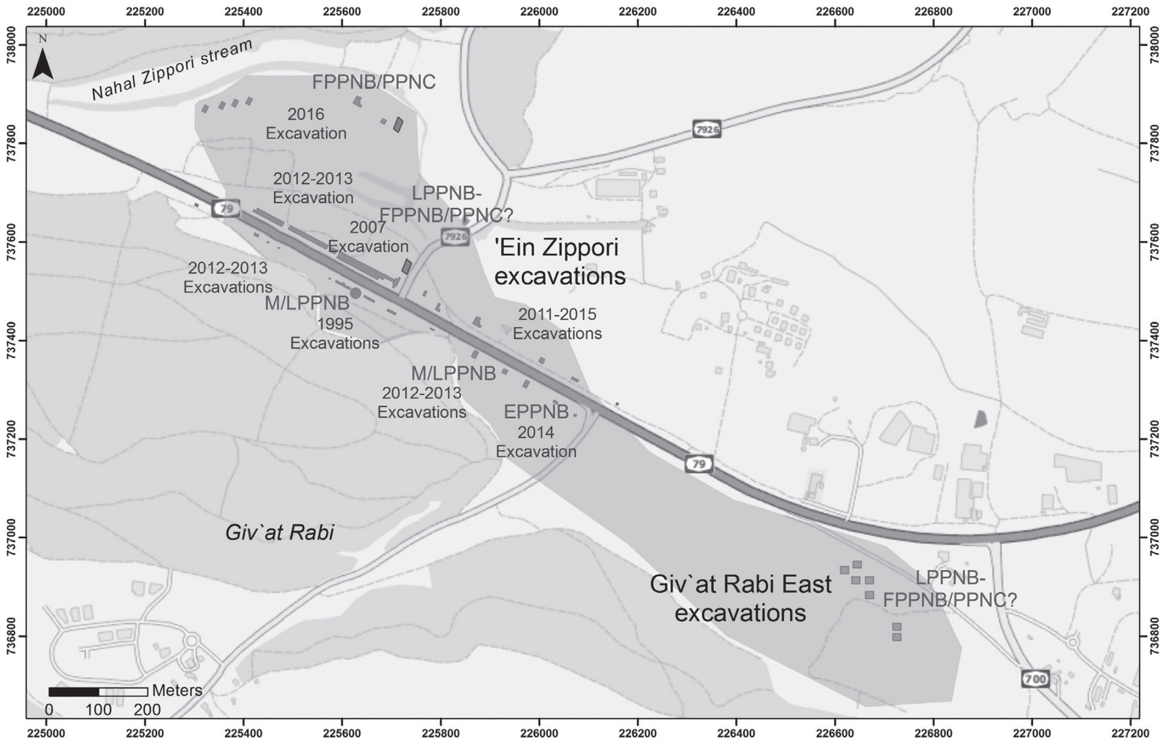

Figure 3.6: The Ein Zippori complex, showing location of the different excavations.

was suggested that the lithic production was performed by experienced flint knappers during the FPPNB/PPNC to Early PN *(ibid.)*. Thus, it seems that the 'Ein Zippori complex represents a series of PPNB occupations that were both residential and industrial in nature. It is likely that the settlement changed in size and in extent through time, and the centre of occupation most probably shifted, resulting in the extensive distribution of the site (Figure 3.6).

Mishmar Ha'emeq

Mishmar Ha'emeq is located at the western edge of the Jezre'el Valley, at the foot of the Ramat Menashe hills at an elevation of ca. 120m asl (Figure 3.2). Bedrock in the area comprises mainly chalk, limestone and marl, and soils are mainly Mediterranean brown forest soils (Table 3.2). Vegetation in the area was identified as Tabor oak open park-forest (*Quercus ithaburensis* association; Baruch 1986). Following preliminary testing, several seasons of extensive salvage excavations were conducted exposing PPNB remains in an area of ca. 450 m^2 (Figure 3.7) (Cinamon 2010; Barzilai & Getzov 2008, 2011; Lavi 2013, pers. comm).

Mishmar Ha'emeq was interpreted by the excavators as a sedentary village, estimated as ca. 10 dunams (1 hectare) in area. The excavations revealed both domestic and ritual activities, the latter represented by a large flagstone building and an immediately adjacent burial ground at the northwestern edge of the site (Barzilai & Getzov 2008; Barzilai et al. 2011). Based on techno-typological markers of the lithic assemblages, the

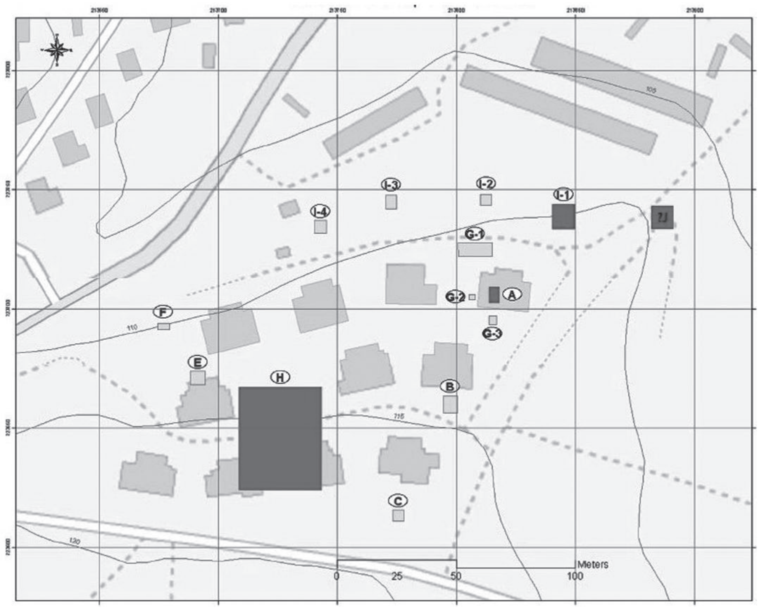

Figure 3.7: Excavation areas at Mishmar Ha'emeq (after Barzilai & Getzov 2011). Areas where PPNB remains were exposed are marked in dark grey.

main occupation at the site was dated to the earlier phase of the MPPNB, although a possible continuation into the M/LPPNB was suggested in area G (Barzilai et al. 2011).

Nahal Zippori 3

The site of Nahal Zippori 3 is located on the southern bank of Nahal Zippori, at the foot of Tel Mizpe Zevulun, at an elevation of ca. 120m asl (Figure 3.2). Bedrock in the area is dominated by chalk, limestone and marl and soils comprise mainly alluvial soils and Mediterranean brown forest soils (Table 3.2). Wood remains identified during excavation indicate the presence of a maquis-forest on the surrounding hills (*Quercus cf. calliprinosis* association), while the remains of fig (*Ficus* sp.) reflect the water-rich environment immediately adjacent to the site (Caracuta et al. 2014).

Salvage excavations extending over ca. 150 m^2 were conducted in 2011, exposing occupations dating to the PPNB, Pottery Neolithic, Chalcolithic, and Early Bronze Age (Barzilai et al. 2013b). PPNB remains comprise complex architecture as well as rich artefact assemblages (Appendix 2, Tables 2-3; Barzilai et al. 2013b; Barzilai & Vardi, pers. comm.). Special note should be made of the botanical remains, which include both charred wood as well as seeds (Caracuta et al. 2014). Human burials were also reported from within the structures (Barzilai et al. 2013b).

Although PPNB remains were only exposed in a limited area during excavation (Figure 3.8), extensive remains were documented over a large extent, ca. 300 m^2 long, during post-excavation construction (Liran 2012). The documented sections show that the site sits in a relatively low area, between two limestone spurs, confining it from the north and south. Since the excavation followed a long but narrow strip (less than 10m wide), it is hard to estimate the original extent of the site, but a minimal extent of ca. 5 dunam (0.5 hectare) can be established.

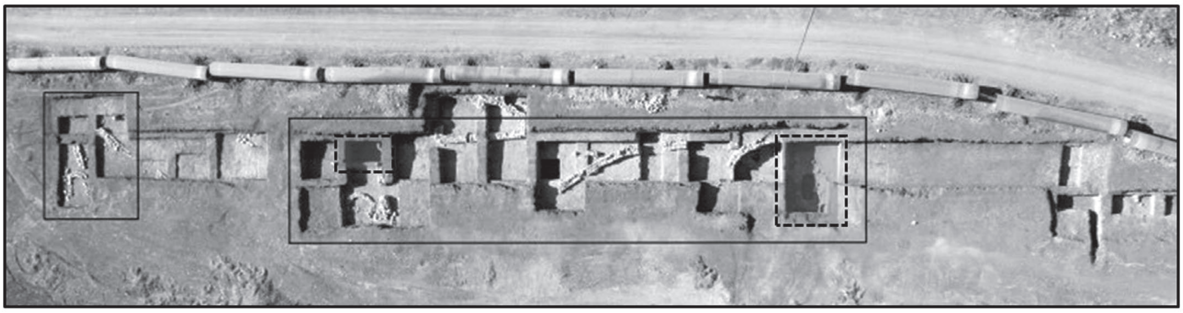

Figure 3.8: Excavation areas at Nahal Zippori 3. In dashed: areas where PPNB remains were exposed (after Caracuta et al. 2015).

Tel ʻAli

The site of Tel ʻAli is located in the central Jordan Rift Valley, about 1.5 km south of the Sea of Galilee, on a wide fluvial terrace ca. 196m bsl, at the confluence of the Jordan River and Nahal Yavne'el (Figures 3.2 & 3.9). Bedrock in the area comprises mainly sandstone, gravel and limestone conglomerates, as well as marl, gypsum and soft chalk. Basalt is also present. Local soils are comprised of alluvial soils, Mediterranean brown forest soils, brown basaltic soils and peat soils (Table 3.2). The site is situated in the Mediterranean savanoid zone, dominated by the *Ziziphion loti* community (Baruch 1986).

The site was excavated between 1955-1959 and three excavation areas were opened, exposing a stratigraphic sequence ranging from the PPNB to Chalcolithic (Prausnitz 1955, 1957a,b, 1960, 1961). PPNB remains were identified in Area B (strata IV-III), lying directly on top of sterile clay. A total of ca. 325 m^2 were exposed (Prausnitz 1966, 1970; Garfinkel 1994). Another locale was identified in an olive grove, situated on a slightly lower terrace, adjacent to and north of the *tel* (Figure 3.9). Here a cluster of round huts, apparently correlating chronologically with stratum IV, was surveyed, but not excavated (Prausnitz 1966, p.144).

Two more seasons were held in 1989-1990. These excavations focused mainly on Prausnitz's Pottery Neolithic and Chalcolithic layers, strata I-II (Garfinkel 1992, 1994). Two excavation areas were opened (areas D and E, 300 m^2 in total). In Area D two occupational strata were identified: stratum D1, assigned to the Pottery Neolithic (equivalent to Beth Shean Layer XVIII; Garfinkel 1994), and stratum D2, assigned to the FPPNB/PPNC.[14] According to Garfinkel, stratum D2 is stratigraphically equivalent to Prausnitz's layer II, thus challenging its original assignment to the Pottery Neolithic, and suggesting that any pottery recorded by Prausnitz from that layer was intrusive.
Prausnitz described the PPN occupation at Tel ʻAli as a sedentary village, economically based on fishing and hunting. Although no estimate of the size of the settlement was provided by either Prausnitz or Garfinkel, the former noted that it was relatively

[14] Sporadic lithic finds (mainly Helwan points) indicate the possible presence of an otherwise unidentified EPPNB occupation phase (Garfinkel 1992, 1994).

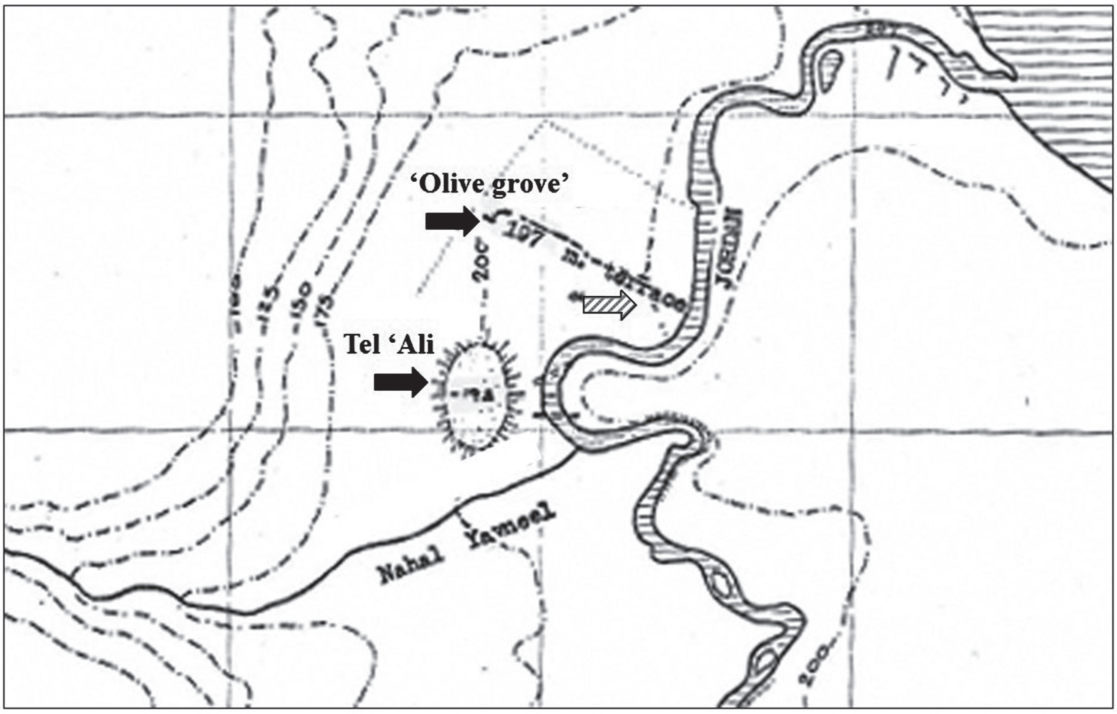

Figure 3.9: Location of Tel 'Ali and adjoining terrace, marked in black arrows. Dashed arrow shows location of Bitaniya survey site (after Prausnitz 1966).

confined by its ecological environment, mainly the rise of the Jordan River, to the uppermost areas of the terraces (Prausnitz 1970, p.142).

Category III

Ard el-Samra

Ard el-Samra is located on the eastern edge of the Akko plain, on the alluvial plains of Nahal Hilazon, near the foothills of Giv'at Yavor, at an elevation of 14m asl (Figure 3.2). Bedrock in the area comprises mainly chalk and marl (Table 3.2). Vegetation in the area is open park-forest of the *Ceratonia silliqua – Pistacia lenticus* association, typical of the Shephela lowlands (Baruch 1986).

Salvage excavations conducted in 2003 revealed several occupation layers, including Neolithic, Early Chalcolithic, Early and Intermediate Bronze age occurrences. A subsequent test excavation, comprising a single 5x5m test pit ca. 200m from the previous excavation areas, revealed a three meter deep occupation dated to the PPNB, early Pottery Neolithic (Yarmukian) and Early Chalcolithic (Wadi Rabah) periods (Barzilai 2010b; Getzov et al. 2009a). The PPNB layer (layer 4) was only exposed over 1x2.5m. No architectural features were revealed, but mud-brick remains were identified, indicating the possible presence of structures. Finds were limited to lithic and faunal assemblages. The limited nature of the PPNB exposure prohibits a discussion of the size of the settlement or the duration and nature of the occupation. As for chronology, elements in the lithic assemblage led the excavators to suggest that the site should be dated to the LPPNB and/or the FPPNB/PPNC (Barzilai, pers. comm.; Getzov et al. 2009a, p.147).

'Ein el-Jarba

The site of 'Ein el-Jarba is located at the foot of the Ramat Menashe hills, at the western edge of the Jezre'el Valley (Figure 3.2). It sits at an elevation of ca. 65m asl, on Mediterranean brown forest soils. Lithology in the area is mainly comprised of chalk (Table 3.2). While it is difficult to reconstruct the PPNB vegetation in the alluvial valley, Tabor oak open park-forest was probably the dominant association in the hills above the site (Baruch 1986).

Past excavations at the site revealed a large Early Chalcolithic (Wadi Rabah) village (Kaplan 1969; Meyerhof 1982). Renewed excavations in 2013 exposed PPNB as well as Pottery Neolithic, Early Chalcolithic and Early Bronze Age occupations. The limited PPNB exposure included a poorly preserved plaster surface and a small but diagnostic PPNB lithic assemblage (Streit, pers. comm.).

'Enot Nissanit

The site of 'Enot Nissanit is located at the western edge of the Jezre'el Valley, at the foot of the Ramat Menashe hills, at an elevation of 130m asl (Figure 3.2). Bedrock in the area is mainly chert bearing limestone and chalk, and soils are Mediterranean brown forest soils (Table 3.2). Tabor oak open park-forest was identified as the dominant association in the hills above the site (Baruch 1986).

Test excavations exposed Neolithic, Late Chalcolithic, and later occupations (Tepper 2013, 2014). PPNB remains were uncovered in a single 5x5m excavation square (Area A) at a depth of ca. 1m, and comprised mainly flint tools. In the centre of the excavation area, an 8.5m deep well was exposed, cut into the soft limestone bedrock. The fill within the well contained animal bones, charcoal and organic matter, as well as flint and groundstone tools. A human burial was also recovered from this fill (Tepper 2014). Based on the lithic material and on the absence of pottery, the exposed remains were dated to the FPPNB/PPNC. It is plausible that the well served a coeval settlement, yet to be excavated.

Hanaton

The site of Hanaton is located at an elevation of 155m asl, on the eastern flanks of a low hill overlooking a narrow alluvial valley at the western end of Beit Netofah valley, ca. 1.5 km north of Yiftah'el (Figure 3.2). Bedrock in the area comprises mainly chert-bearing chalk and limestone, and soils are Mediterranean brown forest soils (Table 3.2). Vegetation in the area is Tabor oak park-forest (*Quercus ithaburensis* association; Baruch 1986).

A small test excavation exposed PPNB (stratum III) and Early Chalcolithic (Wadi Rabba; strata II-III) occupations (Nativ et al. 2014). The PPNB stratum was exposed in two small areas, ca. 10 m^2 in total and included mainly occupation deposits and several built and rock-cut installations.

Hurvat 'Uza

The site is located on the south-facing slope of a low hill, about 15m above the Akko plain (ca. 20m asl; Figure 3.2). Bedrock in the area comprises mainly chalk, limestone and marl, and the dominant soils are alluvial soils along the valley bed accompanied by Mediterranean brown forest soils in the hills. Local vegetation is Tabor oak park-forest (*Quercus ithaburensis* association; Baruch 1986).

The site covers ca. 50 dunam (5 hectares), and a small *tell* rises in its eastern part. A salvage excavation exposed PPNB as well as Pottery Neolithic and Early Chalcolithic layers (Getzov et al. 2009b). The excavation of the PPNB layer (stratum 21) was very limited (ca. 2 m^2) and finds included only flint artefacts. Although the limited nature of the remains prevents a discussion of site size or function, some elements in the lithic assemblage indicate that it should perhaps be dated to the FPPNB/PPNC (idem, p. 19).

Kfar Qana

The site is located in the modern town of Kfar Qana. It is situated on a northeast-facing slope, in the northern part of the Nazareth hills, rising above the Turan valley. Bedrock in the area is comprised mainly of chalk, limestone and marl, and local soils are Mediterranean brown forest soils (Table 3.2). While modern development has completely transformed the local environment, local vegetation during the Neolithic most likely comprised steppe-forest vegetation (Baruch 1986).

In 2001, a salvage excavation exposed a stratified PPNB occupation layer, reaching a depth of up to one meter (Smithline, pers. comm.; IAA archives). PPNB remains were exposed in two areas (Areas III and IV), and included architectural remains as well as relatively large assemblages, which remain to be systematically analysed. While the limited data available prevents a discussion of site size or function, the architectural remains imply that it probably served as a sedentary settlement. Several elements of the lithic assemblage suggest it should be dated to the MPPNB (pers. obs.).

Khirbet 'Asafna (east)

The site of Khirbet 'Asafna is located in a narrow valley, connecting the Zevulon coastal plain to the west and the large Jezre'el Valley to the east (Figure 3.2). Although this area was included in previous archaeological surveys (Olami et al. 2004), the site went unrecognized, as it was sealed by a 0.4-2 m thick layer of alluvial clay sediments, deposited by the Qishon River, currently located about 300m west of the site. Bedrock in the area comprises mainly limestone, chalk and marl (Table 3.2). The site is located at the midpoint between two different plant associations: The Kermes (Palestine) oak (*Quercus calliprinos*) association in the Carmel ridge, and the Tabor oak (*Quercus ithaburensis*) association in the Shefar'am-Alonim ridge (Baruch 1986).

Two excavation seasons were conducted in 2013-2014 (van den Brink 2013; pers. comm.). Ca. 500 m^2 were excavated, exposing PPNB, Pottery Neolithic, Early Chalcolithic and Middle Bronze age occupation layers. Older architecture-bearing strata, pre-dating the Pottery Neolithic layer, were recognized during both excavation seasons, but were not probed (van den Brink pers. comm). PPNB remains thus comprise a large flint assemblage, which shows clear techno-typological markers of the EPPNB. Discussions of site size or function during the period are impeded by the restricted nature of the remains, but at least during the Yarmukian, the site seems to have functioned as a permanent village (van den Brink 2013; van den Brink & Yaroshevich pers. comm.; pers. obs.).

Sha'ar Hagolan

Sha'ar Hagolan is located in the central Jordan Rift Valley, ca. 1.5 km south of the Sea of Galilee (Figure 3.2). It lies on the northwestern bank of the Yarmuk River, at an elevation of ca. 210m bsl. Bedrock in the area comprises mainly marl and very soft chalk. Local soils are comprised of alluvial soils and peat soils (Table 3.2). The site is situated in the Mediterranean savanoid zone, dominated by the *Ziziphion loti* association (Baruch 1986).

The site was discovered and first excavated in the 1940-1950s (Stekelis 1950, 1952). Large-scale excavations conducted between 1989 and 2004 exposed a large Pottery Neolithic (Yarmukian) village, extending over ca. 200 dunams (20 hectares), of which ca. 3000 m^2 were excavated (Garfinkel & Ben-Shlomo 2009; Garfinkel & Miller 2002; Rosenberg & Garfinkel 2014). At the base of the chronological sequence at the site, sitting directly on top of a natural layer of river wash, a FPPNB/PPNC cultural phase was discerned. This phase was exposed in areas E and G (Figure 3.10), to an extent of

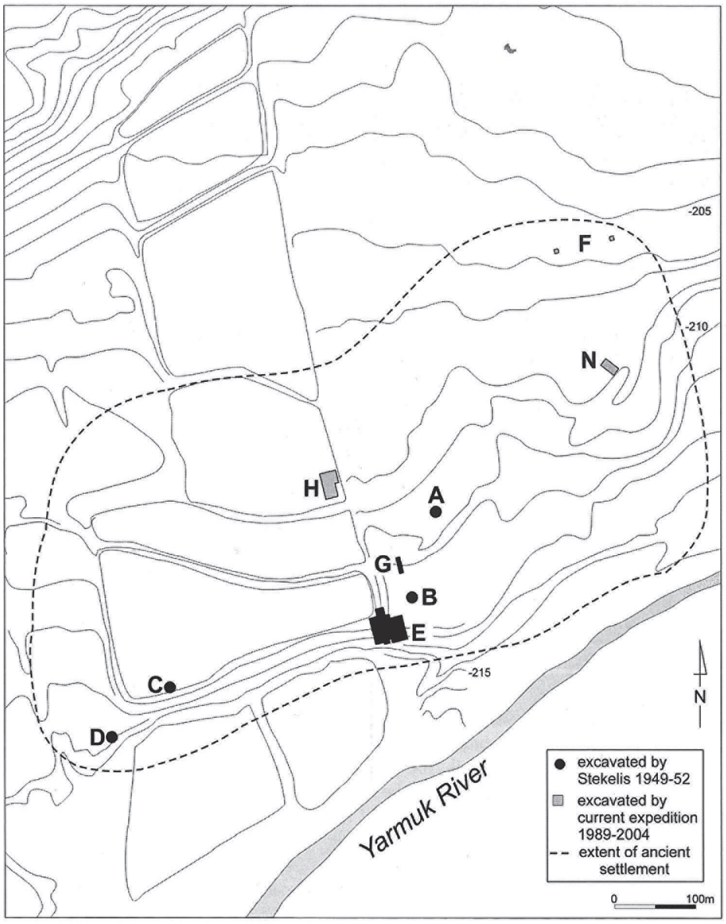

Figure 3.10: Excavation areas at Sha'ar Hagolan. Areas where FPPNB/PPNC was exposed marked in black (after Garfinkel & Ben-Shlomo 2009).

ca. 50 m^2. Remains comprise a thick debris layer, but no architectural remains were identified, save a single, large pit dug into river wash and the Lisan formation (Area G). Finds include mainly flint and animal bones. Elements of the lithic assemblage, together with ^{14}C dates place the site securely within the FPPNB/PPNC. However, the limited exposure of this layer prevents a discussion of site size and function during the period.

Tell Jenin

Tell Jenin is located in the southeastern area of the Jezre'el Valley, at the centre of the mouth of Wadi Belameh, as it opens to the valley from the south, at an elevation of 145m asl (Figure 3.2). Bedrock in the area consists of limestone, chalk and marl, and soils vary between alluvial and Mediterranean brown forest soils (Table 3.2).

Ten archaeological strata were identified at the site, from PPNB to modern times (Glock 1992; Sayej 1997a,b). PPNB architectural remains are mentioned in the initial reports, suggesting this site was a permanent settlement (Glock 1992). Techno-typological markers of the lithic material indicate the presence of both M/LPPNB as well as FPPNB/PPNC occupations. The limited nature of the available data prevents a discussion of site size.

Category IV

Bitaniya

The site is located on the west bank of the Jordan River, on a moderately sloping hill (Figure 3.2). Bedrock in the area comprises mainly sandstone, gravel and limestone conglomerates, as well as marl, gypsum and soft chalk. Local soils are comprised of alluvial soils, Mediterranean brown forest soils, brown basaltic soils and peat soils (Table 3.2). The site is situated in the Mediterranean savanoid zone, dominated by the *Ziziphion loti* association (Baruch 1986).

A survey revealed concentrations of flint artefacts indicative of the EPPNB (Getzov 2010). Based on the spread of artefacts as well as several test probes the size of the site is estimated as less than 30 dunams (3 hectares). It seems that the centre of the site is located at the top of the hill, where the Bitaniya mandatory period police station is located.[15] Bitaniya is located ca. 600m northeast of the site of Tel 'Ali, and in even greater proximity (ca. 200m) to the 'olive grove' locale, where a cluster of round huts was surveyed (Figure 3.9; Prausnitz 1966). It should be taken into account that if indeed coeval, these separate locales could in fact represent a single site.

Hof Shaldag (Ohalo I complex)

An archaeological survey was conducted along the shores of the Sea of Galilee between 1989-1991 and later during 1991-2001, when the lake level dropped significantly

[15] In the IAA archives there is a description of PPNB architectural remains as well as flint artefacts identified during construction in the area (Marder pers. comm.).

due to drought (Nadel 1993, Nadel et al. 2006). A large (ca. 10 hectares) flint scatter displaying a clear Neolithic component was recorded at Hof Shaldag, at an elevation of 210m bsl. Bedrock in the area is dominated by igneous and metamorphic rocks (mainly basalt) as well as conglomerates comprised of limestone and sandstone gravel, marl and gypsum (Table 3.2). The site sits at the northern edge of the Mediterranean savanoid zone, dominated by the *Ziziphion loti* association (Baruch 1986).

Several areas were sampled and collected (Figure 3.11); all artefacts originate from the lake deposit surface, and although several test pits were excavated, no signs of an *in situ* archaeological layer were identified. Nadel et al. (2006, p.83) describe the site as reflecting local recurrent flint knapping activities, focusing on the exploitation of cobbles and pebbles for tool manufacture. These repetitive visits, albeit small scale individually, are possibly the reason for the large extent of the lithic scatter. PPNB

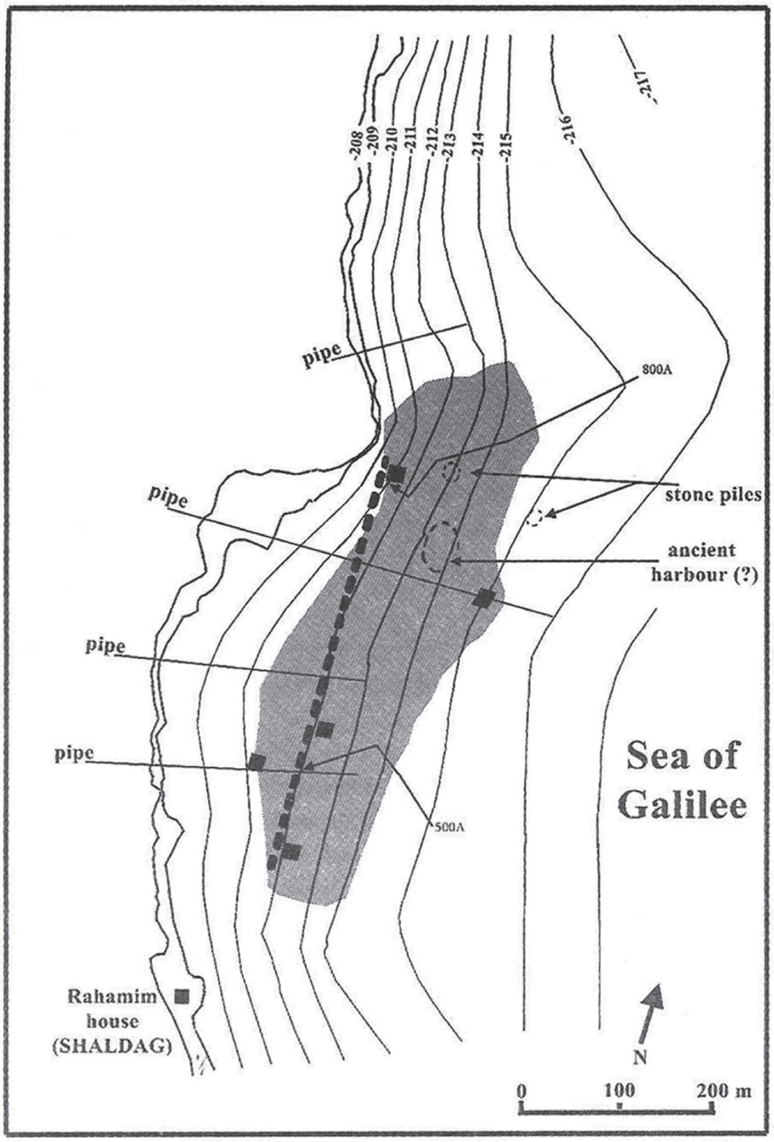

Figure 3.11: Hof Shaldag lithic scatter, showing distribution of finds (in grey) as well as location of test pits and trenches (Nadel et al. 2006).

activity in this locale can be dated to the M/LPPNB and FPPNB/PPNC, based on lithic techno-typology (mainly projectile point typology).

Judeidi-Makr #23

This survey site is situated at the margin between the Turit hill range and the Akko plain (Figure 3.2). It is located within an olive grove at an elevation ca. 35m asl, at the foot of a Cenomanian-Turonian limestone hill, rich in flint exposures (Getzov et al. 2009a). Soils in the area are comprised of Mediterranean brown forest soils (Table 3.2), and vegetation is open park-forest, dominated by Tabor and Kermes oak (Baruch 1986).

PPNB remains documented comprise lithic artefacts, which were dispersed over an area of ca. five dunams (0.5 hectares). Based on core typology, the site, suggested to have served as a blade manufacturing workshop, was dated to the PPNB, possibly LPPNB and/or FPPNB/PPNC (Barzilai, pers. comm.; Getzov & Marder 2007).

Horvat Turit (Judeidi-Makr #121)

The site of Horvat Turit is located ca. 600m south of Judeidi-Makr #23. It is situated at an elevation of ca. 75m asl, on a high terrace on the western flanks of the same Cenomanian-Turonian limestone hill, rich in flint exposures. As site #23, soils are comprised of Mediterranean brown forest soils (Table 3.2), and vegetation is open park-forest, dominated by Tabor and Kermes oak (Baruch 1986).

A large artefact scatter was recorded over an area of ca. 50 dunams (5 hectares), but the centre of the site, about three dunams (0.3 hectare) in area, is located at the highest point of the hill (Lerer in prep.). Finds include flint artefacts, basalt groundstone tools and burnt limestone. Several rock surfaces bearing cupmarks were recorded in the vicinity. Two components can be discerned in the flint assemblage: a PPNA/EPPNB component and a Pottery Neolithic or Early Chalcolithic component (Barzilai & Getzov pers. comm.; Lerer in prep.). It seems that during the Neolithic the site functioned, at least in part, as a quarry and flint procurement site.

Qiryat Ata (NE)

The site is located on the flanks of the Zevulon plain on top of a hill at an elevation of 40 m asl (Figure 3.2). Bedrock in the area is dominated by chalk, limestone and marl, and soils are mainly Mediterranean brown forest soils (Table 3.2). Vegetation in the area is Tabor and Kermes oak open park-forest (Baruch 1986).

Surveyed PPNB remains comprise of a flint scatter, distributed over an area of ca. 2 dunams (0.2 hectares). Several fragments of basalt grinding stones were recorded as well (Olami & Gal 2003, site 48).

Triangulation Point Q1

Triangulation Point Q1 is a low hill within the Nazareth hill range (Figure 3.2). Bedrock comprises mainly chert-bearing chalk and limestone and the hill itself is rich in flint exposures. Soils comprise mainly *terra rossa* and Mediterranean brown forest soils, and the dominant vegetation is Tabor oak open park-forest (Table 3.2; Baruch 1986).

A large scatter of flint artefacts, ca. 20 dunams (2 hectares) in area, was recorded during a survey of the hill (Oshri et al. 1999). The main distribution is centered in an area of ca. 3 dunams (0.3 hectares), where three large concentrations of flint artefacts were identified. Each concentration, ca. 10m in diameter, contained numerous preforms, cores (including naviform cores), debitage, debris and many tools (mainly bifacials), indicating that during the PPNB both quarrying and knapping were conducted on-site. Based on its proximity to Yiftah'el (located ca. 1km south-west) it was suggested that this was the main source of bidirectional preforms and 'HaSollelim' raw material blocks brought there (Garfinkel 2007).

Zefat Adi (east)

The site of Zefat Adi is located at the eastern fringes of the Akko Valley, at an elevation of ca. 75m asl (Figure 3.2). Bedrock in the area is mainly chert-bearing chalk and limestone, and the dominant soil type is Mediterranean brown forest soils (Table 3.2). Local vegetation is mainly comprised of open park-forest dominated by Tabor oak (*Quercus ithaburensis* association; Baruch 1986). A PPNB occupation was suggested by surveys conducted in the area, based on lithic attributes (Getzov et al. 2009a; Getzov & Marder pers. comm.).

Chapter 4

Aspects of Intra-Site Variability: The Example of Kfar HaHoresh

One of the basic hypotheses of this research is that different scales of investigations reflect different mechanisms of interaction and that once combined, these differing scales offer complementary views of social processes. Thus, an investigation of the intra-site spatial organization and activity structuring within each of the Category I sites (i.e. Kfar HaHoresh, Yiftah'el and Munhata) was to be conducted. However, during analysis it became clear that only at Kfar HaHoresh the available data were sufficient for such detailed investigation. Consequently, the following chapter discusses intra-site variability solely at that site.

First, the site and its stratigraphy are presented, followed by a discussion of the PPNB occupation at the site; the built environment, the human burials and the lithic assemblage are presented and analysed according to the stratigraphic phases. Since the long occupation sequence at the site provides important insights into chronological aspects of change and continuity throughout the period, special emphasis is given to chronology and chrono-stratigraphic variability. Although the full scope of the intended analysis could not be achieved, the preliminary results presented offer an interesting example of the potential of detailed intra-site analyses.

THE SITE AND ITS STRATIGRAPHY

Excavations at Kfar HaHoresh (KHH) unearthed a long and intricate occupation sequence spanning most of the PPNB, and is currently the longest, most coherent one exposed in the study area (Table 3.2). Together with a relatively extensive exposure (ca. 500 m^2) and large databases (and see Appendix 2, Tables 2-3) KHH provides a unique opportunity to examine issues of intra-site function and structure, and how these changed through the sequence.

The stratigraphic sequence initially relied upon the trenches and test pits excavated in 1991 and in particular Trench I, which followed a north-south orientation in the upper part of the site (Figure 3.3; ; Goring-Morris 1991). The trench was approximately 40m long and 0.6m wide, and reached a maximal depth of ca. 3m, revealing the following sequence, from base up (Figure 4.1):

1. A bedrock escarpment ca. 2.5m high at the southern (upslope) end of the trench. This "cliff" protected the main area of the site from the erosion processes that have clearly damaged its northern parts.
2. A layer of dark reddish-brown heavy *terra rossa*, containing sporadic, rolled Mousterian artefacts.

3. A PPNB occupation layer of varying thickness (ca. 50-150 cm). At the northern (downslope) end of the trench the top of the sediments was damaged and truncated by current-day topography and recent agricultural activities. To the south, the layer abuts the bedrock cliff face. The original PPNB topography of the site was clearly more gently inclined from south to north than the present configuration.
4. A colluvial layer, mostly sterile, of varying thickness: towards the upper, southern end of the trench this layer was approximately 1.5m thick, diminishing as the trench progressed towards its lower northern end. In the southern half of the trench, this layer also contained a paleosol, about 0.5m below the present-day surface, which ran parallel to the Neolithic occupation layer. A 12th century AD coin was recovered from the base of the colluvial layer immediately overlying the uppermost PPNB sediments providing a *terminus postquem* for this colluvium.

Excavations were initiated in three areas along Trench I (Figure 3.3): the Upper area, the Main area and the *'Bos pit'*, the latter two subsequently being joined. After one season the investigations of the Upper area ceased due to the heavy nature of the overlying sediments (Goring-Morris pers. comm.). Work thereafter focused on the Main area, which was expanded to the east and west of Trench I. Although sterile sediments were exposed in Trench I under the occupation levels in the Upper Area, it appears that the excavation there exposed the top of the Late phase, the Middle (and possible Early) phases being exposed only in the trench sections (and see below).

In general, the excavations revealed a variety of architectural remains and installations, as well as large assemblages of both mundane and symbolically charged artefacts (Appendix 2, Tables 2-3). The main architectural features are lime-plastered surfaces, usually accompanied by long low stone walls delineating the plastered surface on two or three sides. Rectangular constructions were also identified as well as a wide variety of built installations, such as hearths, built ovens, kilns and built cists. The lime-plastered surfaces themselves are of varying dimensions and thicknesses. Several surfaces were exposed to date, many of which are associated with different types of burials.

Burials at the site are varied and range from primary to secondary and from single to multiple. The primary burials also vary in position, from supine through flexed to contracted. Several graves show clear signs of re-opening for the addition of extra burials and differential taphonomic processes (Simmons et al. 2007). Both adults and children were buried at the site, and there is an unusual distribution of ages as well as a bias in the sex ratio in favour of males (Eshed et al. 2008). Grave goods are quite common, and some inhumations show clear associations with animal remains, including gazelle (*Gazella gazella*), aurochs *(Bos primigenius*), and fox (*Vulpes vulpes*), which apparently served as grave goods as well (Goring-Morris & Horwitz 2007). A variety of monoliths, either flat slabs or rounded blocks of stone, originally standing to heights of up to 1.2m, as well as different types of grave markers were also associated with the funerary remains (Goring-Morris 2005). Special mention should be made of the plastered skulls: although only one complete modelled skull was discovered at KHH, fragments of at least two other plastered skulls were recovered and some grave

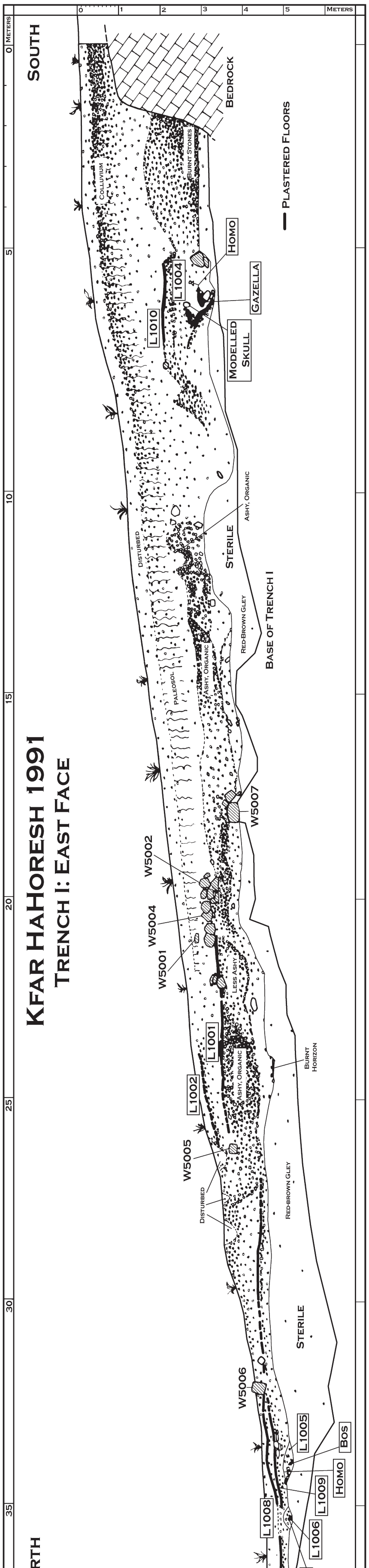

Figure 4.1: KHH section of Trench I, facing east (after Goring-Morris 1991, fig.3).

locales comprise isolated skulls or skull caches (Goring-Morris 2005, Goring-Morris et al. 1995).

The material culture at KHH is rich and varied. In addition to large chipped stone, ground stone and faunal assemblages, 'exotic' materials, originating from distant areas in the Near East, indicate well-developed exchange systems. These include: obsidian from Central Anatolia (Delerue 2007); asphalt, malachite and other minerals originating in Iraq, Transjordan, the Dead Sea area; and large quantities of a variety of marine molluscs, from both the Mediterranean and the Red seas (Goring-Morris 2002). Also recovered at the site are anthropomorphic and zoomorphic stone and clay figurines (Biton 2010). It appears that clay was widely used at the site, especially for the manufacture of beads, tokens and figurines, but also for the production of ceramic vessels (Biton et al. 2014).

The detailed stratigraphy of the PPNB occupation layer is complicated. As stated, the upper part of the sequence in the northern part of the main area was eroded and truncated by current-day topography and recent agricultural activities. Nevertheless, given that the site is situated on a slope, the degree of disturbance was not consistent throughout its entire area: from the south, the occupation layer abuts the bedrock cliff face, which protected the sediments against erosion. The thickness of the occupation layer in this southern area reaches about 1.5m. The northern area, on the other hand, suffered much more disturbance both recent and during the course of the PPNB, and the occupation layer is only ca. 0.5-0.8m thick in total.

The slope poses a clear obstacle when addressing the issue of stratigraphy. Although it was established that at the time of the PPNB occupation the slope did exist, the exact inclination of the original surface initially remained uncertain (Goring-Morris et al. 1994). Moreover, given the relatively horizontal surfaces of some of the plaster floors, it is possible that some degree of terracing was in use during the occupation (*ibid.*). This further complicates the stratigraphic analysis, since there is evidence that occupation during different periods was more intense and sediments accumulated at a faster rate in certain areas, while other areas were cleaned and/or levelled, thus creating elements of 'horizontal' or 'spiral' stratigraphy (Goring-Morris 2005).

In general, the stratigraphic analysis, based primarily on field observations, has enabled a basic division of the PPNB occupation sequence into three main phases: Early, Middle and Late. Within each phase, several sub-phases were identified, evident particularly in the architectural features: several walls and other features were in use during more than one stage of the sequence, and the repair and re-building of several walls and complexes can be observed over time (and see discussion below). These aspects of stratigraphic sequencing and diachronic differentiation were the focus of a previous pilot study (Birkenfeld 2008). Although limited by the preliminary status of the stratigraphic analysis at the time and by the restricted area it related to, the results indicated certain patterns of continuity and change between the three PPNB phases; while most aspects of the material culture displayed clear signs of continuity, a significant shift was apparent between the initial Early phase occupation and the subsequent Middle and Late phases. This shift was most evident in the restructuring and realignment of the architectural environment. A second, major change related to the burial customs, which seemed to become more elaborate, as the single, mostly primary (and perhaps less complex) burials of the Early phase were replaced by multiple, secondary and more intricate burials of the Middle and Late phases (*ibid.;* Goring-Morris 2005).

These two apparent shifts could indicate a significant change in the structure and perhaps nature of activities at the site during the course of the PPNB. One of the aims of the current research was to evaluate whether the identified patterns were indeed valid throughout the site. Thus, the analysis of the built environment and the human remains catalogues was repeated, this time taking into account the entire excavation database. The stratigraphic analysis was refined as well, based on the more recent excavation seasons (2009-2012).

This chapter presents the results of this intra-site analysis at KHH. The three main phases are presented from base up. The main architectural units and burials[16] of each phase are first described, and the main trends identified are then summarized and discussed. The spatial analyses of the lithic assemblage are then presented, again by phase, from the base up. Lastly, the KHH sequence is discussed within the chronological framework of the PPNB.

KFAR HAHORESH PPNB OCCUPATION

The Early Phase

The architectural features

The early phase of occupation was revealed in the Main excavation area. Most of the area exposed to date (ca. 350 m^2) is dominated by a monumental structure or podium, the L1604 complex (Figure 4.2). This quadrilateral structure, measuring at least 21x10 m, comprises three preserved walls enclosing a series of associated large interior lime-plastered surfaces[17] (Figure 4.3). Several distinct phases have been identified within the structure, reflected in the rebuilding of walls as well as re-plastering; the walls were built of different combinations of undressed limestone, nari and dolomite stones, and are between one and three courses high. They are usually made of two rows of stones, ca. 60-100 cm wide. At least three plaster surfaces have been identified, differing in consistency as well as in thickness; while the two lower surfaces are rather consistent, single surfaces, the upper plaster is comprised of numerous, partially overlapping patches. In some areas the plaster curved up against the walls, indicating the podium had a parapet. No interior postholes or sub-divisions were noted within the structure, raising a question as to whether it had been roofed. A semi-circular hearth, ca. 1m wide, was modelled in the lowermost plaster surface (L2124). Holes, depressions

[16] This chapter refers only to clearly intentional burials (isolated human remains were excluded).
[17] A probable fourth, northwestern wall has yet to be uncovered, but there are indications it was subsequently largely, if not completely destroyed during the later phases of the PPNB occupation.

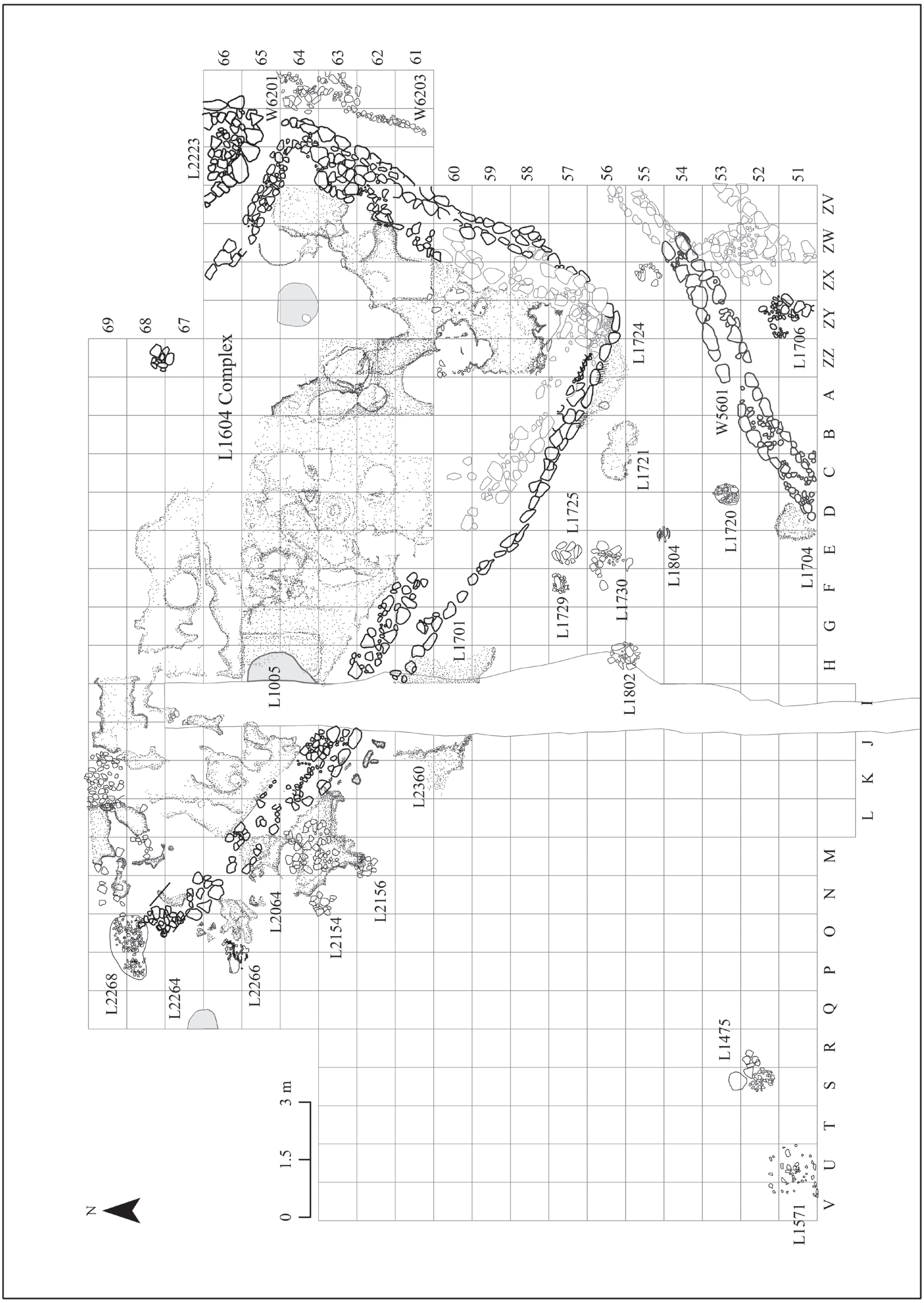

Figure 4.2: KHH - The Early phase.

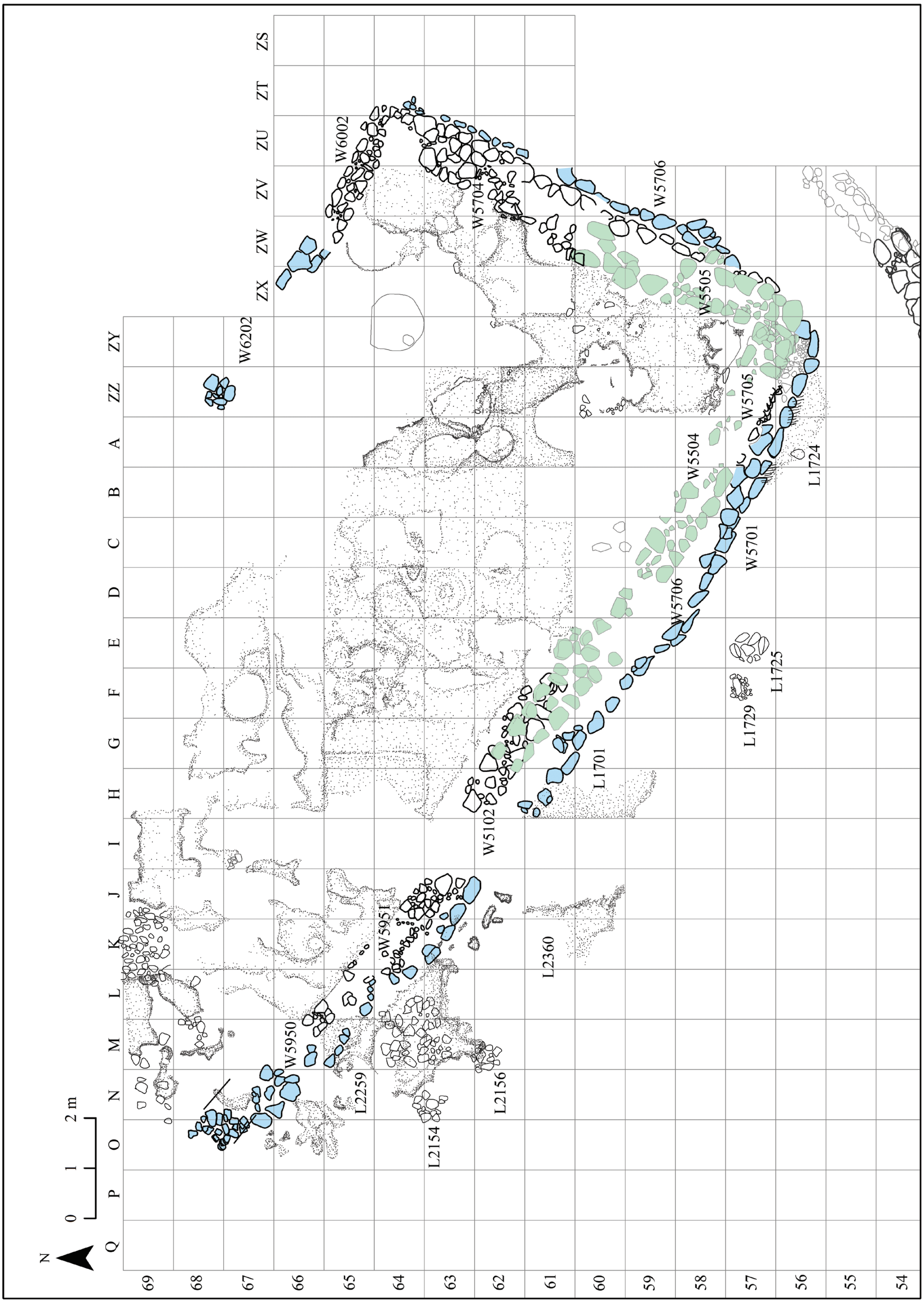

Figure 4.3: KHH - The L1604 complex, showing all phases: Early (light blue), Middle (white) and Late (light green).

and subsidence in the plaster indicate the presence of underlying pits, most yet to be excavated.

Both the walls and the plaster surfaces exhibit several stages of re-building and repair, and at least two architectural sub-phases were identified as belonging to this stage (i.e., the early and middle phases of the complex; Figure 4.3). Differences in construction techniques and materials were evident between the different sub-phases and at times even between walls of the same sub-phase. In fact, it seems that, much like the plaster surface, the surrounding walls were also constructed as different segments. For example, some walls were built of limestone blocks (e.g. W5950), while others were made of either *nari* or dolomite or a combination of both (e.g. W5703).

Furthermore, while the walls of the lowest sub-phase were usually made of vertically placed flat slabs (i.e. W5701, W5703 and W5706), the overlying walls (i.e. W5951, W5705 and W5602) were built of larger limestone and *nari* blocks, lain flat. A certain offset of between ca. 25-40 cm was noted between the walls of the different sub-phases.

Several plaster patches (L2064, L2259, L1701 and L1721) were exposed alongside and abutting the outer (southern) face of the southwestern wall of the structure (W5950 and W5701, i.e. earliest phase of the L1604 complex). These rather thin, fragile patches seem to create a strip, ca. 1-1.5m wide, alongside the length of the structure. Four postholes also accompany this plaster strip (L1725, L1729, L2154 and L2156). It is unclear whether these postholes are coeval with or somewhat later than the outer plaster surface, but they could imply the existence of partially roofed (?) activity areas alongside the structure. Alternately, these could be related to the positioning of *totems* (Goring-Morris, pers. comm.).

Directly underlying the earliest phase of the L1604 complex, a burial pit was recorded (L1005, and see discussion below). This pit, located near the centre of the L1604 complex, was dug into sterile soil. Other features, predating the L1604 complex, have been exposed in recent excavation seasons. These include W6201, which runs alongside and under W5704. Built of large lime and dolomite rocks, it is uncertain if this wall predates the L1604 complex, or whether it represents an even earlier stage of it. Immediately to the north of W6201 and the L1604 complex, the remains of a second, possibly round, large structure were exposed (L2223). This structure comprises two walls, built of very large, vertically laid stones. The interior seems to be paved with medium and small stones. This feature continues into the northern section of the excavation, preventing its full exposure.

The other basal loci are all relatively small pits, dug into sterile soil. These include a small knapping pit, L2264, comprising mainly debitage but also a Helwan point and a *tranchet* axe, two stone-filled pits with aurochs (*Bos primigenius*) bones (L1571 and L2268; Meier et al. 2017a), and a burial pit (L2266, and see discussion below). While the relation between these basal loci and the L1604 complex remains unclear, they are of significance as they demonstrate that the initial occupation at KHH was established on sterile soil during the EPPNB (and see discussion of chronological timescale below).

Other features belonging to the early phase include a long retaining wall/slope breaker (W5601), located to the south of and apparently coeval with the L1604 complex (Figure

4.2). A segment of this wall was exposed in the section of Trench I (W5007; Figure 4.1), indicating it was at least 15m in length. The open area between this wall and the L1604 complex as well as the area east of the L1604 complex comprise a succession of stony midden deposits. Several hearths (e.g. L1705, L1720 and L1802), stone-filled pits (e.g. L1457 and L1704) and other installations (e.g. L1730) were identified within these middens, indicating that these open areas served as production areas. A third burial (L1804) was also recovered from the open area south of the L1604 complex (and see discussion below).

The burials

Three burials were recorded from the early phase of occupation (L1005, L1804 and L2266; Table 4.1). All three are single burials of adults and two of the three are primary, articulated burials (i.e. L1005 and L2226).

L1005 (Figure 4.4) is a relatively large pit, ca. 1m in diameter and 40cm deep (Goring-Morris 1991; Horwitz & Goring-Morris 2004; Goring-Morris & Horwitz 2007). Sealed by L1604 complex plastered surfaces, this pit was located near the centre of and underlying the L1604 complex. Excavation revealed the flexed grave of a young adult male in partial articulation, the skull and mandible having been removed after burial. The skeleton lay on a limestone slab immediately above 360 bones of aurochs (*Bos primigenius*), representing a small herd, including a male, six adult females and a calf. While some of the aurochs remains were found in partial articulation, virtually no cranial elements were recovered (Goring-Morris 2005, 2008). It was suggested that these represent the remains of a funerary feast.

L2266 is also located near the L1604 complex, immediately outside the structure's southwestern corner. This is a primary burial of a male adult, in full articulation and in a tightly flexed position (Eshed, pers. comm.). The head, including both skull and mandible, was removed. The burial was laid in a shallow pit dug into sterile sediments and a fallen large limestone block (ca. 90x45cm), which probably served as a grave marker, was placed above the location where the head should have been.

Table 4.1: KHH - Burials assigned to the Early phase

Locus	Association	Primary/secondary	Single/ multiple	Composition
L1005	L1604 complex	Primary	Single	Contracted, articulated remains of a young male, with skull removed, deposited above 246 bones of aurochs, some in partial articulation (all postcranial remains). Possible grave goods include: fox & gazelle bones, a large core and a groundstone tool.
L1804	Open area	Secondary	Single	Secondary burial of an adult male (30-40 years old), including long bones (a single femur, tibia, ulna and radius), ribs, pelvis, and a segment of the lower jaw.
L2266	Open area	Primary	Single	Adult male in full articulation, in a tightly flexed (contracted) position. Head (skull and mandible) removed. Grave marker placed above the burial.

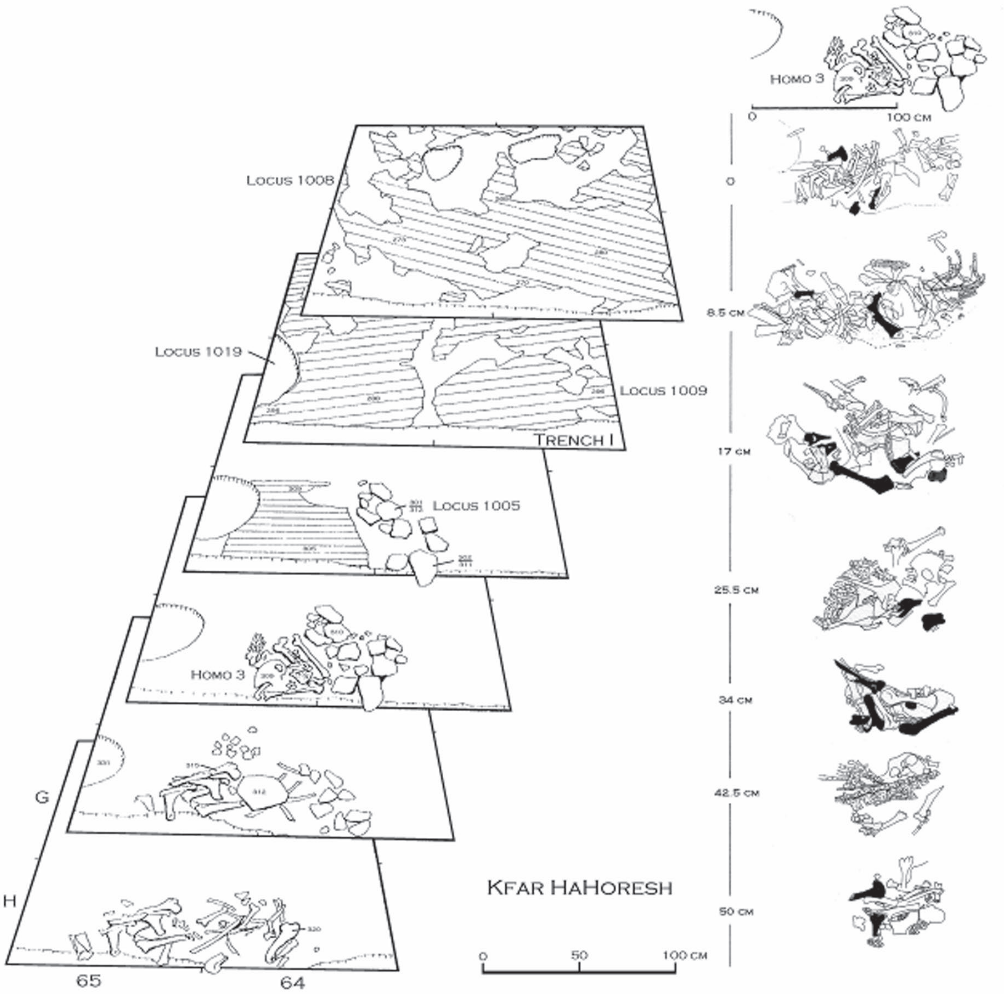

Figure 4.4: KHH - Isometric drawing of L1005 'Bos Pit' (after Goring-Morris & Horwitz 2007, fig. 3).

The third human burial, L1804 (Figure 4.5), is located in the open area between the L1604 complex and W5601. This burial is quite exceptional; it is a secondary burial of an adult male, comprised of a single example of each of the long bones, together with several ribs, pelvis, and half the mandible (Eshed pers. comm.). The cranium, hand and feet bones were absent. It seems that the bones were intentionally placed so that the long bones are laid in the centre, while the other bones are set on both sides, symmetrically, and the ribs frame the burial.

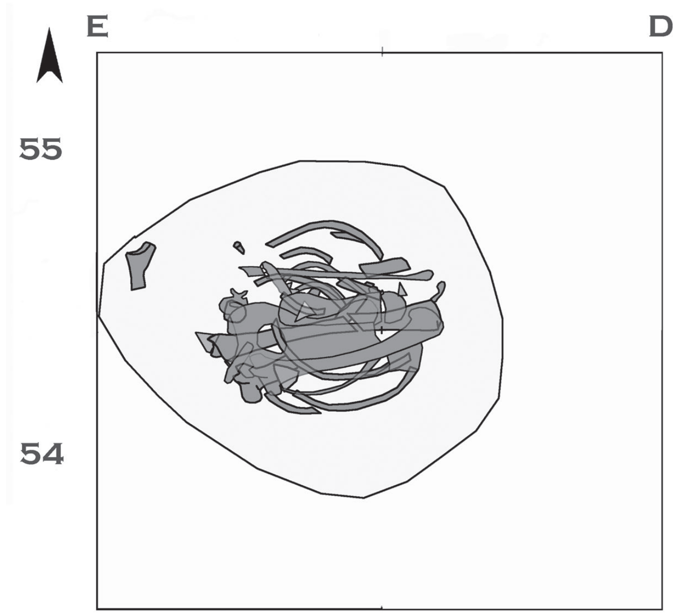

Figure 4.5: KHH - L1804 'Half-a-Man' burial (figure courtesy of N. Goring-Morris).

The Middle Phase

The Middle phase of occupation was originally defined during the initial stratigraphic analysis (Birkenfeld 2008). However, as analysis progressed, it became clear that it should be further divided into at least two sub-phases, named hereafter Upper-Middle (above) and Lower-Middle (below). This was especially apparent in the architectural environment, which changes dramatically between the two sub-phases. However, not all excavated loci could easily be assigned to one of the sub-phases. This is particularly true for some of the more ephemeral installations located in the open areas between the main architectural complexes, and in the case of the upper excavation area. The latter is thus described separately.

The architectural features

The lower sub-phase, Lower-Middle, shows clear continuation from the early phase of occupation (Figure 4.6). This is most evident in the continued use of the L1604 complex; new walls, made of *nari*, were built on top of the existing structure, following the same orientation (W5504, W5505; Figure 4.3). This phase of the structure could only be traced to a more limited extent (ca. 10x13m), and it is unclear whether the size of the structure was actually reduced, or whether this is the result of erosion and post-depositional disturbance especially on the northwestern side of L1604.

South of the L1604 complex, a new structure (the L1508 complex) was constructed on top of and utilizing the eastern extremity of W5601. This structure was only partially exposed, as it continues into the eastern section. However, it seems to be a semi-subterranean, rectangular structure. The three exposed walls were made of both nari and dolomitic stones. A large rectangular platform or cist (L1408) adjoined the structure from the west. Embedded in the platform was a rectangular hearth with burnt white,

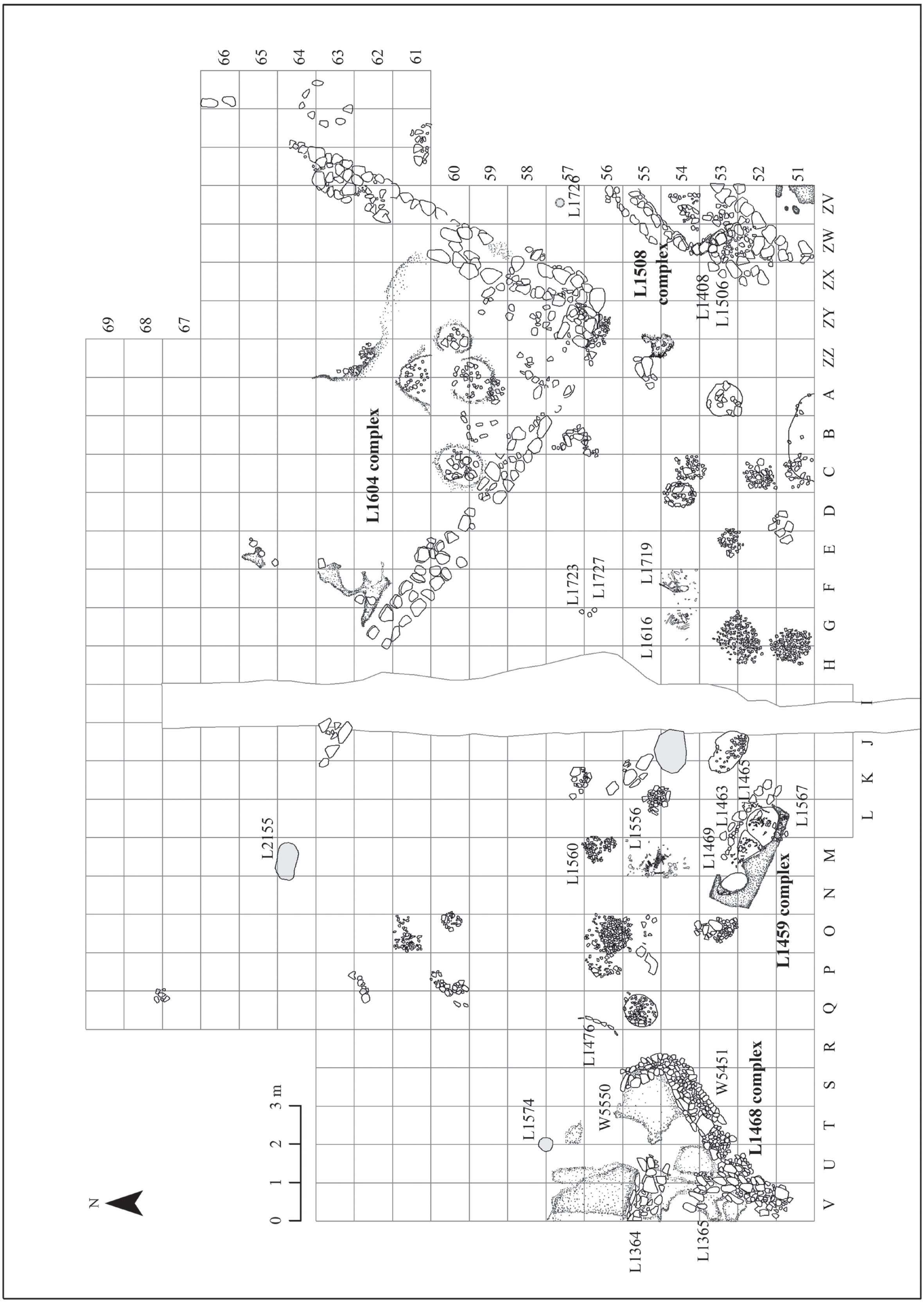

Figure 4.6: KHH - Middle II sub-phase.

fist-sized stones (L1506). Within the structure sediment was heavy and compacted, but no actual floor was identified.

To the west, the L1468 complex was erected. This complex comprises an L-shaped wall built of small and medium sized stones, with a general southwest-northeast orientation (W5451) and adjoining plaster patches. A probable stele (L1365) made of stones piled up as an upright pillar was erected south of W5451 and was found fallen, resting on the plaster surface. Several stages were identified in the construction of this complex; these include the addition of a small, perhaps supporting wall (W5550) built adjacent to W5451, as well as the repair and re-plastering of some of the plaster surfaces. It is interesting to note that an upturned fox head (including the cranium, mandible and cervical vertebra) was embedded in the plaster of L1461. This is particularly interesting since four other fox burials were recovered from this phase (L1560, L1726, L1476 and L1465).

Later on during the sequence, a second structure (L1364) with an opposite northwest-southeast orientation, was built, cutting and postdating the L1468 structure. Only a small part of this structure was exposed, and it comprises a wall, built of large stones, some in an upright position, and a plaster surface constructed on top of the existing surface, abutting wall L1364.

Another new feature constructed during this phase is the L1459 plaster surface: a rectangular, freestanding plaster surface, ca 1x3m in size, seemingly unaccompanied by any stone-built walls. Several inhumations are associated with this plaster surface, including three secondary inhumations (L1463, L1465 and L1469) dug into the plaster surface (and see below).

The open area delineated by the three main architectural features (i.e. the L1604 complex, the L1508 complex and the L1468 complex) continued to serve as a production/industrial area, comprising mainly midden deposits, hearths, kilns, stone-filled pits as well as burials (and see below). In the next sub-phase, Middle I, a major reorganization of the built environment compared to the earlier sub-phase occurred (Figure 4.7). The structures belonging to the earlier phases no longer continued in use; a new, large plaster-surfaced structure, ca. 5x7m in area (the L1252/L1017 complex), was built on top of the open midden area, while a freestanding oval plastered surface (L1151) replaced the earlier L1468 complex to the west. A large platform or burial cist (L1109 complex) was constructed where the L1604 complex once stood.

The L1252/L1017 complex comprises four walls, all made of two rows of large and medium-sized stones. The southern wall (W5150) and the eastern wall (W5010) are better preserved than the northern (W5012) and western (W5011) ones, where only about a meter-long segment of the walls remained intact. Within these four walls a plaster surface was laid (L1252). The plaster surface covers only the northeastern part of the structure but this could be a result of poor preservation. In the centre of the structure a rectangular sunken, lime-plastered brick oven or hearth was inserted (L1254). Several burials were recovered from the area between the plaster surface and the southern wall (L1152 and L1250). Later, a new plaster surface was laid down (L1017), covering the whole area of the chamber.

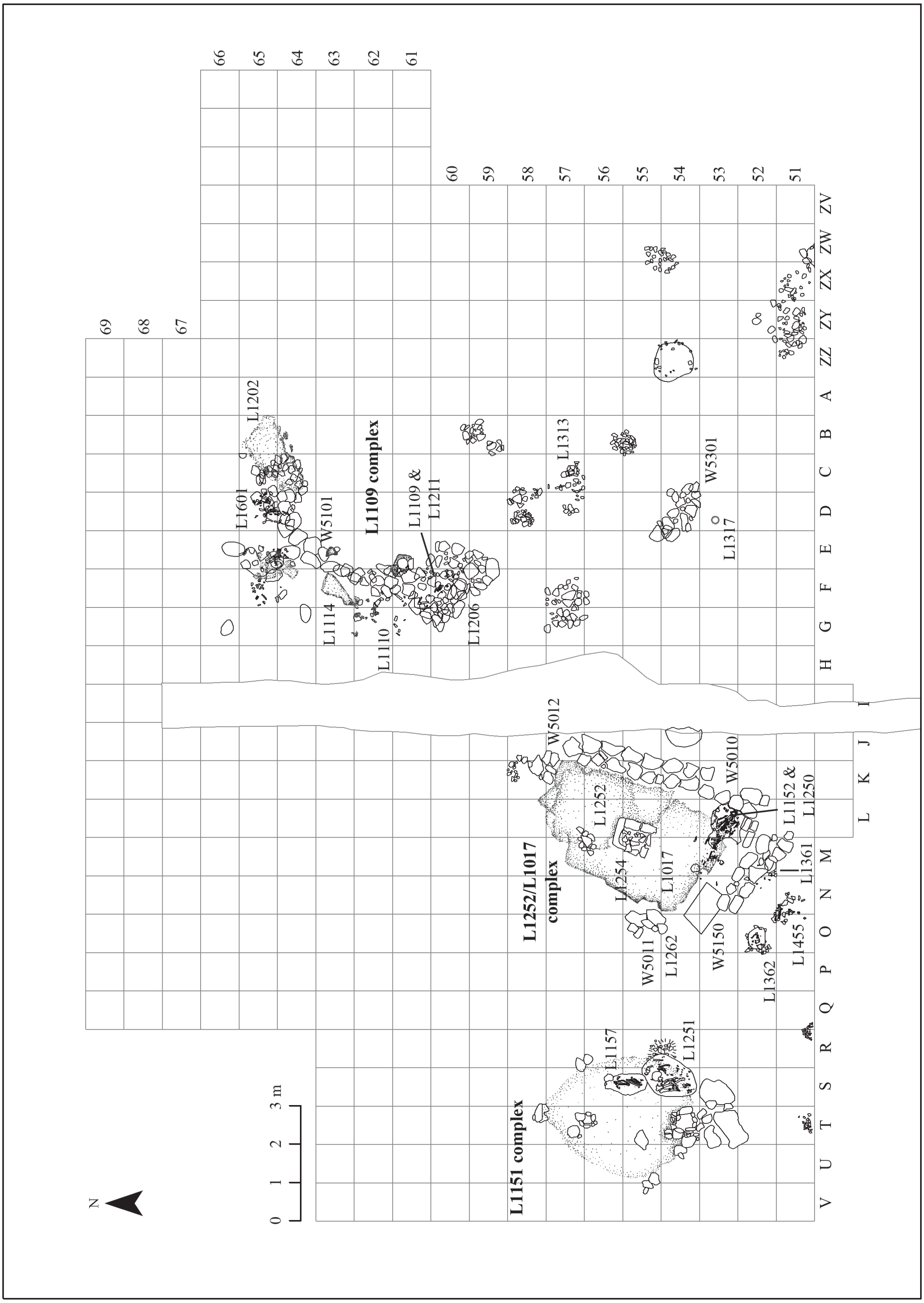

Figure 4.7: KHH - Middle I sub-phase.

West of the L1252/L1017 complex, L1151 is a freestanding oval plastered surface, ca. 3x4m in area, associated with several installations, including several hearths, postholes and a large stele (L1165). The plaster edges curl up at several places, indicating the existence of a low parapet or wall made of mud brick or daub. Two burials are associated with this plaster surface (L1157 and L1251), interred in pits dug through the plaster and then re-plastered (and see discussion below).

The L1109 complex comprises a platform (L1206) built of large stones abutting a south-north trending wall (W5101) and several small plaster patches (L1114 and L1202). At least three burials are associated with this complex; these comprise two skulls interred within the platform itself, together with fragments of a possible third skull and a pile of long bones (L1109 and L1211), and two primary, single burials associated with the plaster patches (L1110 and L1601).

Another built feature in the eastern area comprises a roughly rectangular large cist or platform (W5301) made of two rows of large, smooth dolomite blocks, ca. 1.75 x 75 cm. It is surrounded by an oval surface made of a dense array of broken fist-sized stones. The function of this construction is unclear. Worth noting in that respect is a naviform blade cache (L1317), which was recorded in its vicinity, and interpreted by the excavator as a cache associated with symbolic behaviour (Barzilai & Goring-Morris 2010).

The burials

Nine burials were identified in the Lower-Middle sub-phase: three in association with the L1459 complex and six within the open area between the three main architectural features (Figure 4.6; Table 4.2). Three of the nine are primary, articulated burials of a single individual (L1567, L1616 and L1719). A possible fourth example of a primary burial includes the burial of an adult together with a child (L1556). The other burials are secondary in nature; three of the secondary burials are associated with the L1459 complex and were dug into the plaster surface (L1463, L1465 and L1469). An intentional interment of three skull fragments in a shallow pit was recorded within the midden deposit of the open area (L1723 and L1727).

Several of the burials contained possible grave goods, including animal remains (mainly fox), polished pebbles, shells, clay and plaster lumps as well as flint tools. At least one clear example of skull removal was recorded (L1616).

Twelve burials were assigned to the following Middle I sub-phase. These divide evenly between burials found in association with architectural features and burials found in the open areas between them (Figure 4.7). The burials also divide evenly between primary and secondary, and five out of the twelve are multiple burials (Table 4.2). The phenomenon of skull caching, recorded in the previous sub-phase was identified here as well: three skulls were interred within the L1109 platform, and two infant skulls (L1361 and L1362) were found in adjacent pits in the open area to the south.

Four burials contained possible grave goods, including polished pebbles, marine shells, flint tools and animal bones. Two multiple burials exhibit the widest variety of grave goods, including a basalt axe and mother of pearl pendant (L1251 burial) as

Table 4.2: KHH - Burials assigned to the Middle phase

Locus	Sub-phase	Association	Primary/ secondary	Single/ multiple	Composition
L1463	Middle II	L1459 complex	Secondary	Single	Fragmented remains of a child. Grave goods include a polished pebble and fox bone fragments.
L1465	Middle II	L1459 complex	Secondary	?	Human bone fragments interred with an articulated fox skeleton, missing head and mandible.
L1469	Middle II	L1459 complex	Secondary	?	Several human rib bones.
L1556	Middle II	Open area	Disturbed primary?	Multiple	Poorly preserved burial of an adult and a child. Human leg in articulation.
L1567	Middle II	Open area	Primary	Single	Child burial in articulation.
L1574	Middle II	Open area	?	Single	Fragmentary remains of a child. Possible grave goods include a fox tooth, molded plaster fragment, red/orange burnt clay lump and two polished pebbles.
L1616	Middle II	Open area	Primary	Single	Adult burial. Primary, lying flexed on right side. Skull and mandible missing. Possible grave goods include red polished pebble, freshwater shell, fox remains, a sickle blade, a Helwan point and a reaping knife.
L1719	Middle II	Open area	Primary	Single	Articulated burial of an adolescent, in supine position.
L1723 & L1727	Middle II	Open area	Secondary	?	Interment of three skull fragments within the midden deposit.
L1152 & L1250	Middle I	L1252/ L1017 complex	Primary	Multiple	Three individuals, including an adult male, a young adult and a child. Also includes an infant skull and adult mandible. Possible grave goods comprise shells, polished pebbles, a polished axe, a clay/ochre lump and an obsidian artefact.
L1157	Middle I	L1151 Plaster surface	Primary	Single	An articulated burial of an adult female in a tightly flexed position. Skull removed before burial. Possible grave goods include a flint flake and a canine mandible.
L1251	Middle I	L1151 Plaster surface	Secondary	Multiple	At least two individuals interred in a small pit. Possible grave goods include a polished stone, a basalt axe and a mother of pearl pendant.
L1109 & L1211	Middle I	L1109 complex	Secondary	Multiple	Skulls interred within platform, together with a pile of long bones. Skulls represent an adult male and a female/juvenile.
L1110	Middle I	L1109 complex	Primary	Single	Partially articulated burial of an adult male on top of W5102 and in association to floor L1114.
L1601	Middle I	L1109 complex	Primary	Single	Disturbed primary burial, with mostly long bones, skull removed.
L1361	Middle I	Open area	Secondary	Single	Very fragmentary infant skull, associated with an ashy area with bird and fox bones. Soil impressions of organic materials possibly represent an unpreserved basket or leaf bedding.
L1362	Middle I	Open area	Secondary	Single	Infant skull found on top of rocky bedding. Possible grave goods include animal bones and flint artefacts. Soil impressions of organic materials possibly represent an unpreserved basket or leaf bedding.
L1259	Middle I	Open area	Secondary	Multiple	Secondary burial of three individuals, including an adult male, a young adult and a newborn.
L1262	Middle I	Open area	Primary	Single	Almost complete infant skeleton.
L1313	Middle I	Open area	Secondary	Multiple	Fragmentary adult skull interred with child's pelvis.
L1455	Middle I	Open area	Primary	Single	Primary burial of an adult female, reconstructed as lying face down with lower leg bent backwards and outwards. Possible grave goods include a malachite bead.

well as an obsidian artefact (L1152 and L1250 burial). At least two instances of skull removal were recorded (L1157 and L1601).

The Upper area

The lower part of the Upper excavation area immediately overlying sterile sediments appears to relate primarily to the (Early?) and/or Middle phases; however, the excavation only exposed the uppermost, Late level, the lower levels only being exposed in the Trench I sections (Figure 4.1).

The Middle phase is represented in the Upper area by a shallow lime-plastered pit, ca. 1m in diameter (L1004), exposed near the base of the trench. It contained an excellently preserved red painted plaster modelled human skull of an adult male, ca. 25 years old, facing east (Goring-Morris 2002; Goren et al. 2001; Hershkovitz et al. 1994, 1995, 1996). The modelled facial features included the nose, mouth, chin, eyes and cheeks (Goren et al. 2001). A few tools appeared to be associated with the burial, including a Byblos point, and several burins (Goring-Morris et al. 1994). Immediately beneath this skull in L1004 a fully articulated but headless skeleton of a mountain gazelle (*Gazella gazella*) was also found in the section (Horwitz & Goring-Morris 2004), as were the partially articulated remains of a human (H-2; Goring-Morris et al. 1994, 1995). It seems that the plastered skull, the human and gazelle interments were intentionally placed on a lime-plaster surface, perhaps lining a pit, then covered and sealed during the Late phase by the L1010/L1014 complex (Goring-Morris et al. 1994; and see below).

The Late Phase

The architectural features

The late phase of occupation signifies the culmination of the shift in the spatial organization of the built environment that began during the Middle I sub-phase. The weight of the occupation shifted to the south. The L1252/L1017 complex was expanded and other, large constructed complexes adjoined it from the east (the L1024 complex) and west (L1016 complex and the L1027 plaster surface) (Figure 4.8). The north area, previously dominated by the large L1604 complex, was now a large open area dedicated to industrial, pyro-technological activities, as indicated by a succession of midden deposits, kilns, hearths and pits. These activities do not seem to relate in any way to the previous L1604 complex, but in effect cut into and disturb the earlier strata.

Built on top of and following the exact same orientation of the previous L1252/L1017 complex, the new L1001 complex represents a direct continuation of it. The structure, ca. 7x7m in area, was built of two well-preserved walls and two probably extensively eroded walls on the north and west, ca. 60 cm thick and built of undressed limestones. The walls preserved to a maximum height of 25 cm, the eastern (W5004) and southern (W5002) walls being the best-preserved ones. Only a short segment of the fourth, northern wall (W5005) was exposed, and it is possible that this wall is a later addition as it somewhat overlies the northeastern edge of the plaster floor (L1001). This rectangular plaster surface, ca. 10 m^2 of which were preserved, seems to have originally covered the entire interior of the structure. It comprises two layers, at least in its eastern part;

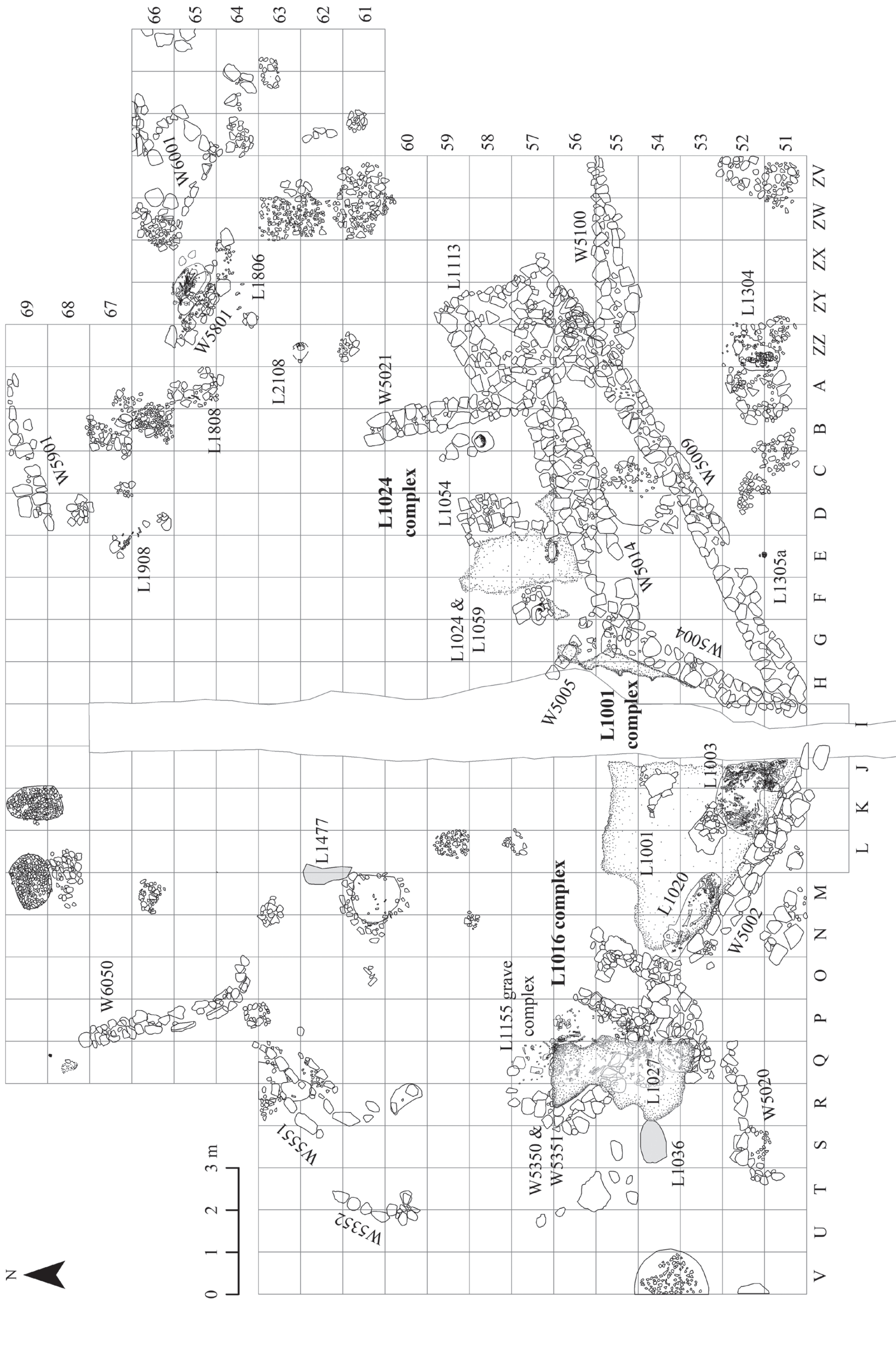

Figure 4.8: KHH – The Late phase.

these layers differ in thickness, as the upper one is ca. 2 cm thick and the lower is ca. 10 cm thick. Two graves are associated with the southern edge of the structure, adjacent to W5002: a large, oval grave (the L1003 grave complex) immediately underlying the plastered surface in the southern corner of L1001, containing at least 17 individuals; and further west a primary, single burial (L1020, and see below).

Northeast of the L1001 complex and adjoining it, another large built complex was constructed (L1024 complex). This is an 'L' shaped structure, ca. 5x7m in area, comprised of two perpendicular walls (W5014 and W5021). The eastern part of the structure was plastered (L1024 and L1059). At least the central panel of plaster was painted red and a stone-built hearth was constructed on it, adjacent to the southern wall. Two querns and a grinding bowl were found within the structure, as was a stone-built installation, most probably a fallen pillar (L1054). To the north of and upslope from the L1024 complex, two large terrace walls or slope breaker walls were constructed (W5009 & W5100). To the east, in the meeting point of the two walls with the L1024 complex, a large square platform, ca. 3x3m in area, was constructed (L1113).

A series of adjoining walls were exposed west of the L1001 complex. Within this cluster several features were discerned. The main feature is a multi-phased 'cubicle', ca. 2x2m in area (L1016 complex). The upper phase of the complex is roughly paved, and approximately oval in plan. The lower phase has more of a right-angled corner. Together with W5351 and W5350 it underlies the L1027 complex. The latter comprises a large freestanding plaster surface (L1027), ca. 2x4m in area, covering a succession of associated burials, which seemingly create an animal depiction (L1155 grave complex; and see discussion below).

Other walls were also recorded within the late phase, apparently detached from any structures. Some of these walls (W6050 and W5020) are positioned in opposite direction to the local slope, and were interpreted as terrace walls. Other short wall segments were suggested to have had a more symbolic meaning. These walls are often associated with burials (e.g. W5801 and burial L1926), with monoliths and hearths or ashy material, perhaps part of related ritual or ceremonial activities (W5352 and W5551).

Another example of late phase architecture was exposed in the upper area (Figure 4.9). Here, a quadrilateral lime-plastered surface (L1010), measuring at least 6x3.5m was excavated. A rectangular stone-built basin, ca. 1x1.5m in size, was moulded in the plaster surface (L1014), and a post-hole was set in its centre. Since this structure directly overlies the plastered pit containing the plastered skull (L1004), it was suggested that this posthole might have served as a grave marker (perhaps holding a totem pole) rather than a roofing post (Goring-Morris 2002, p.109).

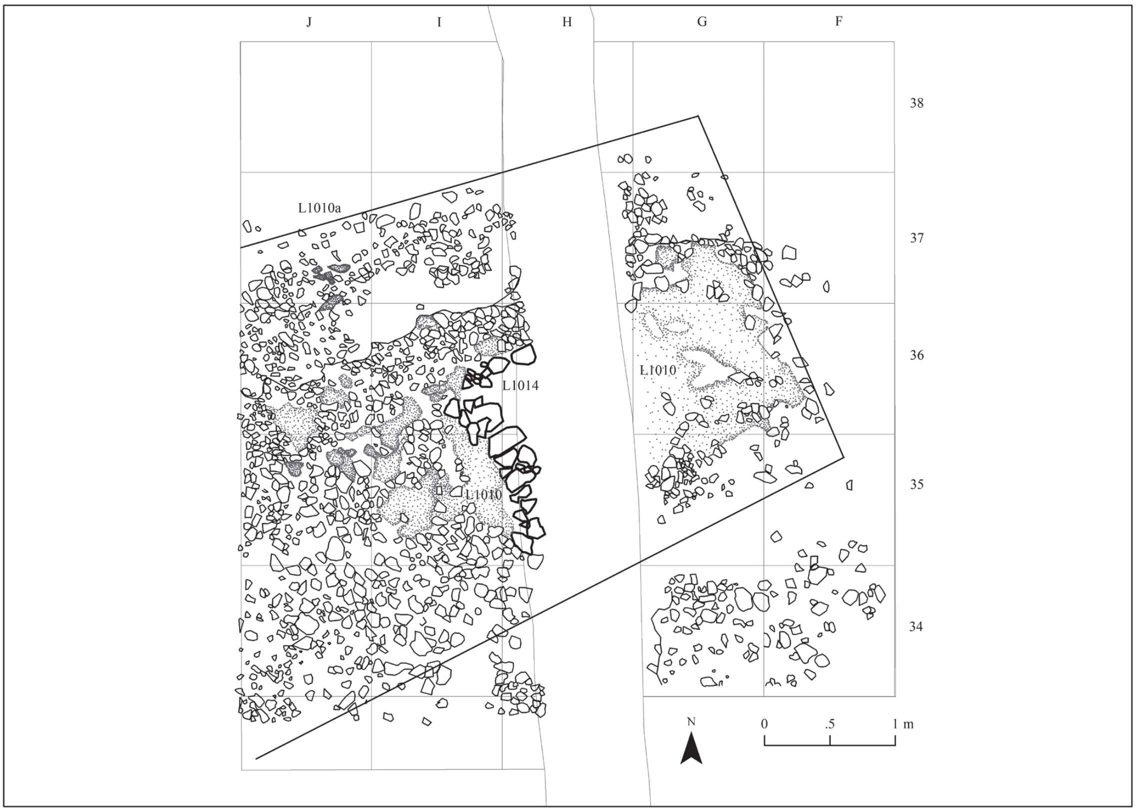

Figure 4.9: KHH - Plan of the Late phase architectural features in the upper area.

The burials

Eighteen graves were assigned to the Late phase of occupation; most contain secondary, multiple burials and only a few examples of single, articulated burials were recorded (Table 4.3). Burials were located both in association with the constructed environment (in particular the L1001 and the L1027 complexes) as well as in the open areas between them (Figure 4.8). A phenomenon unique to this phase is the large grave complexes of L1155 and L1003.

The L1003 grave complex comprises a large, kidney-shaped pit, ca. 1.5m in diameter and ca. 0.6m deep, immediately underlying the plastered corner of L1001 (Goring-Morris 2005, 2008). It contained the remains of at least 17 individuals (*ibid.;* Eshed, nd; Simmons et al. 2007; and see Figure 4.10). At the base of the grave, two primary adult burials, with their heads removed, were exposed; one of the two individuals, possibly a female, had a headless, articulated infant skeleton nestled in her left arm, and foetal bones in the area of her stomach. Numerous postcranial bones, some in partial articulation, as well as mandibles, were arranged around the periphery of the pit, around and above the two primary burials.

The L1155 grave complex comprises several inter-connected ash-filled pits, containing both secondary, disarticulated remains, a skull cache, as well as separate articulated burials (L1155, L1156, L1162, L1352, L1353, L1355 and L1373), immediately underlying the L1027 lime-plaster surface. Extending over ca. 3 m^2 and ca. 45 cm deep,

Table 4.3: KHH - Burials assigned to the Late phase

Locus	Association	Primary/ secondary	Single/ multiple	Composition
L1003	L1001 complex	Primary & secondary	Multiple	Oval shaped grave under L1001 plaster surface. Contains remains of at least 17 individuals. Most are secondary, although occasional articulated limbs were retrieved. Remains are arranged in a ring around the edges of the pit with mandibles mostly placed on top. The only cranial elements recovered from the grave belong to an articulated infant, with head nestling in pelvis of a bovid. At the base of the pit two adult, articulated skeletons (but missing skull and mandibles), were interred. One (possibly female) with headless, articulated infant in left arm, and foetal bones in area of stomach. Possible grave goods include: a *tranchet* axe, knife, cowrie pendant, limestone polisher, and partially articulated gazelle remains.
L1020	L1001 complex	Primary	Single	Supine burial of an adult, without the skull. Cuts through lime-plaster surface of L1017 and overlain by L1001 plaster surface.
L1027a	L1155 grave	Secondary	Single	Intentional burial of half mandible beneath a lime-plaster "patch" on floor of L1027 complex.
L1155	L1155 grave	Primary & secondary	Multiple	Multiple grave. Includes both secondary and primary burials of at least nine individuals. Possible grave goods include polished pebbles, a malachite bead, and cranial fragments of a bovid.
L1156	L1155 grave	Secondary	Multiple	Circular pit containing human remains. Possible grave goods include minute polished pebbles.
L1162	L1155 grave	Secondary	Multiple	Multiple grave including the partial remains of at least two individuals (mainly mandibles) as well as articulated vertebrae. Possible grave goods include a nest of 3 sickles and a polished pebble.
L1352	L1155 grave	Primary & secondary	Multiple	Multiple grave including disarticulated and partially articulated remains of several adults as well as an articulated infant with skull removed. Possible grave goods include stone and shell beads, groundstone tools and flint artefacts.
L1353	L1155 grave	Primary & secondary	Multiple	Multiple grave including both disarticulated and articulated remains, as well as a cache of three skulls (one of them plastered). Possible grave goods include stone and shell beads, groundstone tools and flint artefacts.
L1355	L1155 grave	Secondary	Multiple	Multiple grave - continuation of L1162.
L1373	L1155 grave	Secondary	Multiple?	Grave with mandible and humerus.
L1036	Open area	Secondary	Single	Oval pit (Favissa?) with cinnabar modelled skull
L1304	Open area	Secondary	Multiple	Skull cache with four adult skulls in oval shallow pit. Dark clay imprints of organic material lining pit or wrapping the skulls. A horse-shoe shaped arrangement of stones and an upright stone on the north side of the pit may have served as a grave marker. Possible grave goods include: two goat horns, a projectile point, a burin on a blade, and a chunk of red-patinated flint.
L1305a	Open area	Secondary	Single	Partial remains of a human skull seemingly associated with a stone arrangement (post-hole). Possible grave goods include a nearby flint toolkit cache (L1319), a seashell and a chunk of ochre.
L1477	Open area	Primary	Single	Articulated burial of an adult, only partially excavated.
L1806	Open area	Secondary	Multiple?	Disturbed grave, containing long-bone shafts & fragments, mandible and teeth. Also contains a gazelle mandible.
L1808	Open area	Secondary	Multiple?	Disturbed grave, containing skull fragments, mastoid and long-bones. Possible grave goods include a marine mollusc, a shell, a complete naviform blade and core, an Amuq point and a pestle fragment.

Table 4.3 (cont.).

Locus	Association	Primary/ secondary	Single/ multiple	Composition
L1926	Open area	Primary	Single	Burial of a 40+ year-old male in complete articulation, placed in an extra-flexed position in a small pit adjacent to and associated with W5902. Possible grave goods include shells, sickle blade, an ochre lump and an obsidian item. Also possibly associated with a shell cache (L1933).
L2108	Open area	Primary	Single	Infant (neonate) burial in full articulation within a small pit (ca. 20cm in diameter) lined with yellow ochre mud-plaster. A circle of small stones was placed above the pit, perhaps as a grave-marker.

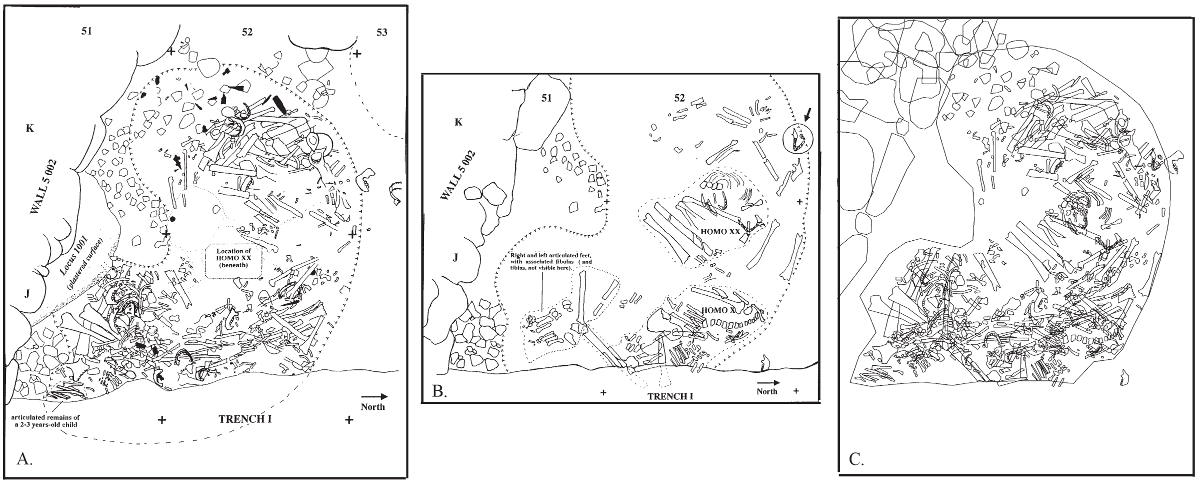

Figure 4.10: KHH - L1155 grave complex; (A) Upper layer showing animal depiction (after Goring-Morris 2005, fig. 12.4); (B) Plan showing entire succession of burials.

the grave complex comprised the remains of at least nine individuals and possibly as many as 17 altogether, including at least five adults and four juveniles (Goring-Morris et al., 1998; Goring-Morris 2002, 2005; Horwitz & Goring-Morris 2004; Simmons et al. 2007). In the upper part of the grave complex, disarticulated long bones of several individuals (Horwitz & Goring-Morris 2004, p.169) were intentionally arranged, speculatively appearing to represent a depiction of an animal in profile (Figure 4.11). The head, foreleg, back and tail all seem to be indicated, while the northeastern end of the depiction, presumably showing the belly and hind leg, had been disturbed by a later burial, causing some dislocation to the arrangement. South of the depiction a skull cache was recovered (L1353), containing three skulls, one of which was plastered; these were marked by a posthole. Interestingly, a half human mandible had been placed under a small circular plaster patch (L1027a) on the L1027 plastered surface immediately overlying the L1155 complex.

Taphonomic analysis of the human remains at the site has shown that the two large grave complexes differ from other burial loci at the site, and show clear markers of secondary burials (Simmons et al. 2007). The two grave complexes also differ one from the other, indicating different types and intensities of mortuary practices. L1155 exhibits

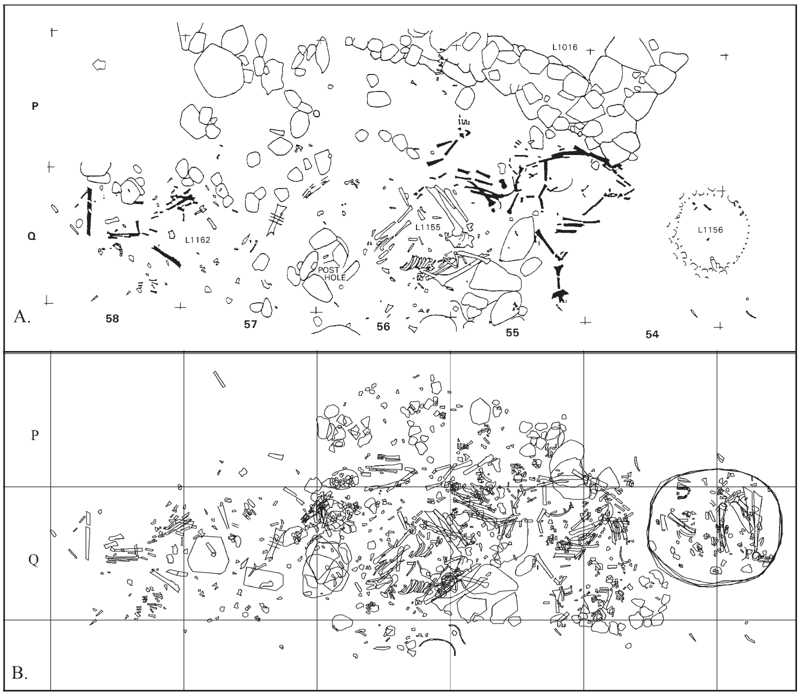

Figure 4.11: KHH - The L1003 grave complex; (A) Upper phase and (B) lower phase. (C) Entire succession of burials. Original figures courtesy of N. Goring-Morris.

high frequencies of various types of modifications (including cut marks, hack marks and drilled holes as well as animal modifications), as well as the highest degree of bone weathering and abrasion. These appear in L1003 as well, but in lesser intensity. Still, in both cases, this implies that the remains were exposed prior to their final deposition and burial. Interestingly, the bones used to create the 'animal depiction' of L1155 seem to have been subject to lengthier exposure than the other remains in the grave complex (Simmons et al. 2007, p.122).

Skull caching appears several times in the Late phase; besides the L1353 skull cache described above, an interment of four adult skulls (L1304) was recovered from a shallow oval pit dug in the open area south of W5009 (Figure 4.8). Fragments of a modelled skull with traces of cinnabar (L1036) were located in a poorly preserved clay lined 'bin' or installation (Goring-Morris 2005).

For the first time, grave goods were identified in most (i.e. 11 of 18) burials. These include flint and obsidian tools, groundstone tools, polished pebbles, beads and pendants, modified and unmodified shells, ochre lumps as well as animal remains.

Discussion

The built environment at Kfar HaHoresh

A long and intricate succession of architectural remains has been uncovered at Kfar HaHoresh (KHH). Features comprise a wide range of constructions:

1. *Lime-plastered surfaces:* numerous lime-plastered surfaces appear throughout the sequence at KHH, exhibiting a large degree of heterogeneity; they vary in size, from a

2 m^2 (e.g. L1459 plaster surface) to ca. 200 m^2 (the L1604 complex), as well as in the techniques employed in their construction. This is evident in their composition as well as in their varying thickness (from 2 to 12 cm) (Goring-Morris et al. 1994, 1995). The use of red colouring was noted in several instances (e.g. L1024). Different installations, including hearths, basins and ovens (e.g. L1254 and L2124) were at times moulded into the plaster floors, and pits, including burial pits, were repeatedly cut through them. Most surfaces show evidence of re-plastering episodes and it seems that at times, and especially in the case of the later phase of the L1604 complex, floors were constructed as patches rather than integral surfaces. Furthermore, some of these patches are so thin (1-2 cm thick) and frail, that it is hard to imagine that they constituted actual, functional flooring. Furthermore, many of the surfaces were associated with graves, and it has been suggested that they represent funerary and cultic installations rather than residential constructions (Goren & Goring-Morris 2008; Goring-Morris 2002).

2. *Stone built walls:* walls at KHH were usually built of two rows of undressed limestone blocks of varying sizes. In some cases (e.g. the L1604 and the L1508 complexes), both *nari* and dolomite blocks were used interchangeably. Walls range in width, between ca. 50-100 cm, and were usually preserved to a height of two or three courses. Several types of stone-built walls include low bounding walls associated with plastered surfaces, as well as isolated slope breaking or terrace walls. In fact, it seems that substantial effort was put into levelling and terracing the occupation surfaces throughout the sequence (Birkenfeld 2008; Goring-Morris et al. 1994). A third type of stone-built wall recorded is short wall segments, usually ca. 1-1.5m in length (e.g. W5301). These were possibly related to ceremonial-related activities as they appear together with large monoliths or groups of orthostats, hearths or ash deposits, and sometimes are associated with burials (e.g. W5801).

3. *Mud-brick or daub 'parapets':* although no actual remains of mud-brick were identified during excavation, their use was indicated by micro-morphological evidence (Arpin 2004) as well as the 'lipping' of some of the seemingly 'free-standing' plaster surfaces (e.g. L1151).

4. *Stone-built platforms:* Several platforms/cists were identified throughout the KHH sequence (e.g. L1109, L1113 and L1508); these are usually rectangular in shape and range between ca. 4-9 m^2 in area. As with the wall segments, these constructions may have had a ceremonial function, as they are often associated with hearths or ash deposits as well as burials.

5. *Various installations:* Numerous installations were identified, including many pits, hearths, ovens and kilns. These were found within structures, sometimes incorporated within the plaster floors, as well as in the open areas between structures, assimilated in the midden deposits. Post-sockets are also quite numerous in the open areas. These do not appear to provide coherent patterns in terms of post supports for roofing, and thus it has been suggested they were used for grave markers or *totems* (Goring-Morris 2002, p.109; 2005a).

At least ten discrete structures could be identified; most are quadrilateral, comprising a lime-plastered surface accompanied by two or three low, surrounding walls (e.g. the L1001 complex). Several examples of oval architecture have been recorded as well (e.g. L1151), as were small chambers or cists (e.g. L1016). Structures vary greatly in size, ranging from few square meters (e.g. L1508 complex) to over 200m in area (i.e. the L1604 complex).

The detailed stratigraphic analysis of the PPNB remains at KHH has resulted in a division of the occupational sequence into several distinct phases. While previous studies suggested a tripartite division into Early, Middle and Late phases (Birkenfeld 2008; Birkenfeld & Goring-Morris 2011, 2014), the current research further divided the Middle phase into two sub-phases: Middle I and II. Several chronological trends could be discerned with regards to the built environment. For example, the interplay between *nari* and dolomite seems to appear mainly in the Early and Lower-Middle phases, but has not been recorded later in the sequence. Furthermore, structures in the later phases are much smaller, and significantly differ in scale than the impressive L1604 complex. At the same time, a significant shift in the built environment was identified, marking the transition from the Lower-Middle sub-phase to the Upper-Middle sub-phase; during the Lower-Middle sub-phase a clear continuation of the previous, early phase architecture was identified. The large L1604 complex continued to function, and although new structures are constructed, they seem to follow the same general orientation of the existing structures, clearly relating to them (e.g. the L1508 complex which sits directly on top of W5601, utilizing it). The organization of activities within the site, as reflected in the built environment, apparently remained consistent, as the open area between the main architectural units continued to be dedicated to production and/or industrial, pyrotechnic activities, as indicated by the numerous hearths, kilns and pits recorded within the extensive midden deposits.

The onset of the Upper-Middle sub-phase on the other hand showed a significant break from the previous phases. None of the earlier structures continued to function, and new structures were erected. The spatial organization of activities shifted as well, as new structures (mainly the L1252/L1017 complex) were built on top of the previously open area. The same trend continued into the late phase of occupation; the L1252/L1017 was rebuilt and expanded and large, massively built complexes were erected adjoining it from the east and west. The area previously occupied by the large L1604 complex was now transformed into a production and midden area; a large, open area with numerous installations including kilns and hearths, pits, post-sockets as well as graves. In the northwestern area, W5352 and W5551 and associated hearths and monoliths (L1367 and L1354) may represent a focal point of ceremonial or cult activity. The built environment of the Upper-Middle and Late phases shows no regard whatsoever to the constructions of the Early and Lower-Middle phases. On the contrary, the intense activity in the now-open area clearly cut into and disturbed earlier strata.

This shift between the Lower-Middle and Upper-Middle sub-phases is expressed mainly in the re-organization and re-structuring of the built environment. The focus of the occupation moved towards the south and there was a changeover between the open, industrial/production area and the built locales. Structures became smaller in size, and there seems to be an increase in the intensity and density of their spatial arrangement[18]. This shift was deemed significant enough to justify separating the Middle phase into two distinct, independent phases. Thus, a new, quadripartite division of the KHH sequence is suggested: Phase I (i.e. the former Late phase), Phase II (the former Upper-Middle sub-phase), Phase III (the former Lower-Middle sub-phase) and Phase IV (the former Early phase). The extent of the changes and the apparent break between Phase III and II, stand in contrast to the continuity observed before and after the shift (i.e. between Phase IV and III and between Phase II and I). This contrast seems significant enough to justify the designation of two main stages: An *Early Stage*, including phases III and IV, and a *Late Stage*, including phases II and I.

Human burials at Kfar HaHoresh

Kfar HaHoresh (KHH), to date, represents the largest sample of human remains in the study area. Almost 70 loci containing human remains have been excavated, comprising at least 90 individuals (and see Table 5.1). Forty-two clearly defined, intentional burials, all of which could be securely assigned to a stratigraphic stage, form the base of the following discussion.

Mortuary customs at the site display a wide variety; burials range from primary to secondary and from single to multiple. Locations vary as well, as burials were found within and immediately beneath structures and in open areas, in different associations with plaster surfaces, midden deposits and various installations such as platforms/cists, wall segments, post-sockets, etc. Individuals represented include males and females of all age groups, including neonates, infants, children, juveniles and adults, though with an unusual emphasis on young male adults (Eshed et al. 2008).

Several general characteristics of the KHH burial repertoire could be discerned; grave-goods were recorded in several burials and include animal remains, flint tools, shells, pendants and beads, clay lumps, polished pebbles as well as green minerals and obsidian. Skull removal is known from at least 12 clear instances of primary burials at the site, but is not ubiquitous. Several skull caches were also recorded, including the well-preserved modelled skull (L1004) as well as the remains of at least two other plastered skulls (L1036 and L1353). A wide use of grave markers in the form of *stelae*, post-sockets and large stone slabs was also noted.

Another interesting phenomenon is the association of burials with animal remains, and especially aurochs, fox and gazelle (and see discussions in Goring-Morris 2002, 2005; Horwitz & Goring-Morris 2004); of note are the primary burial of an adult with several aurochs in L1005 (the *'Bos Pit'*), and the burial of the complete but headless gazelle skeleton in association with the plastered skull (L1004). At least two instances were

[18] The apparent intensity could however be a result of the partial exposure of the Early stage. Further excavations are needed to corroborate this deduction.

recorded where almost complete fox skeletons were found in association with human remains. Other phenomena relating to burial customs include intricate intentional arrangements of human remains, such as the L1155 and L1003 grave complexes.
Once assigned to the different stratigraphic phases and discussed within their chronological framework, several temporal trends could be identified within the KHH assemblage[19].

Firstly, the number of burials increases significantly from the initial Phase IV (n = 3) to Phase III (n = 9), Phase II (n = 12), and Phase I (n = 18)[20]. Secondly, it seems that the frequency of multiple burials rises with time as well. This is apparent in the single to multiple burial ratios (Figure 4.12), as well as in the minimum number of individuals represented (Figure 4.13). Secondary burials seem to become more frequent as well (Figure 4.14).

Another phenomenon that showed clear intensification through time was the appearance of grave goods. At least 19 instances of clear grave goods were identified during excavation. While no such instances were recorded in the Phase IV burials, a third of the burials in Phase III and nearly half of the burials in Phase II contained grave goods. In Phase I, grave goods were recorded in almost two-thirds of the burials.

The association of burials with animals is a phenomenon that appears throughout the PPNB sequence at KHH. Several different patterns of association have been identified, including a possible 'animal depiction' (L1155 grave complex), the *'Bos pit'* (L1005), the gazelle skeleton and plastered skull (L1004) and isolated finds within burials (Horwitz & Goring-Morris 2004). The latter includes the remains of mountain gazelle, wild goat, wild boar, red fox, hare, spur-thighed tortoise, rodent and snake.

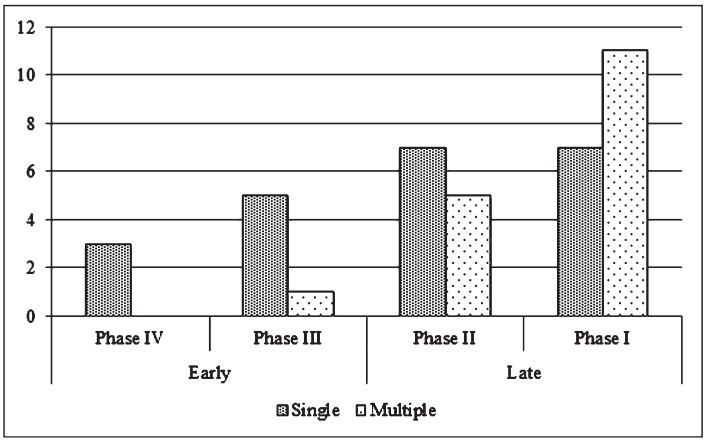

Figure 4.12: Ratio between single and multiple burials at KHH, by phase.

[19] This discussion follows the new quadripartite stratigraphic division.
[20] However, this disproportion in finds could very well be a result of the state of excavation, as the main Early phase features at the site, including the large L1604 complex, are yet to be fully excavated. Further fieldwork is needed to corroborate this assertion.

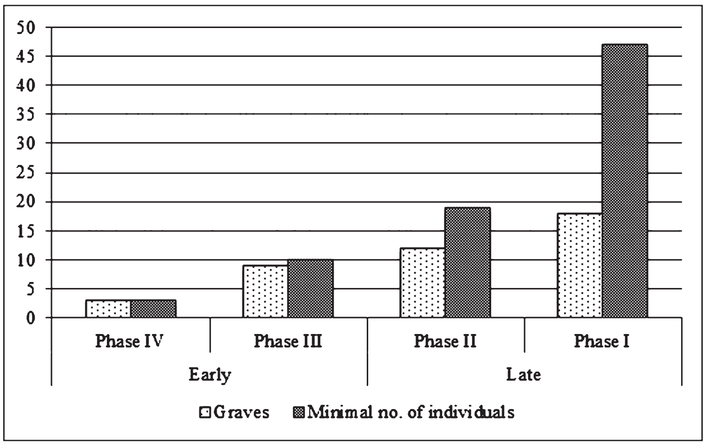

Figure 4.13: Ratio between number of graves and minimal number of individuals identified at KHH, by phase.

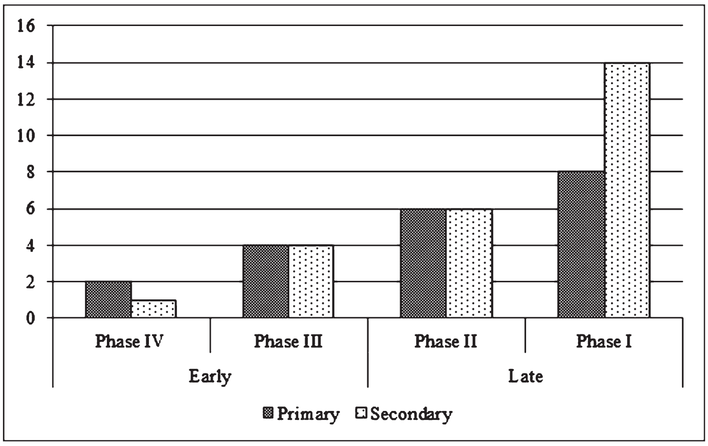

Figure 4.14: Ratio between primary and secondary burials at KHH, by phase.

The majority of these isolated faunal remains recovered from grave contexts could represent part of the general site fill rather than intentional grave goods. The fox, on the other hand was noted as an exception, due to its particular abundance within grave contexts in comparison to the general faunal assemblage, and an apparent selection of body parts (mainly mandibles). It was suggested that the fox played a symbolic role in the belief system expressed at the site (*ibid,* p.176). This is further demonstrated by the intentional burial of fox skeletons, sometimes in full articulation (e.g. L1465 and L1476), similar to the pattern for aurochs and gazelle remains.

While these human-animal burial associations are frequent throughout the sequence, some chronological differentiation was recorded; for example, the vast majority of fox remains, including the complete fox interments, derive from Phase III burials. A single fox bone, possibly unrelated to the burial itself, was recorded within the *'Bos Pit'* (L1005) in Phase IV; another isolated fox bone was recorded in a Phase II burial; and a fox mandible was recorded in association with L1352 in Phase I. A similar pattern is suggested regarding the *Bos* pits; while bovids in general appear in burials throughout the sequence, *Bos pits* in particular are common in Phase IV, and particularly the basal loci (L1005 burial and L1006, L1571 and L2268 pits (Horwitz & Goring-Morris 2004; Meier et al. 2017a, b).

In summary, similar to the shift expressed in the structure and the organization of the architectural remains, burial customs at KHH also seem to have changed through time. Here the transition seems to develop more gradually from phase to phase and the shift seems less abrupt. Still, burial customs during the late stage, and more specifically during Phase I, changed dramatically and it seems that ritual practices became more complex; burial activity became more intense and more intricate. Multi-stage interments, such as the L1003 and L1155 grave complexes, may imply that the ritual system also became more pre-planned. On the other hand, the increase in multiple, secondary burials could indicate a growing complexity of the process leading to the final interment of the dead at the site.

PLACING THE KFAR HAHORESH SEQUENCE WITHIN PPNB CHRONOLOGY

Two main stages, divided into four phases, were discerned in the PPNB occupational sequence at KHH. A clear shift in the structure and possibly the function of the site was identified between the two stages. The following discussion attempts to place the different stages (and subsequently the apparent shift) within the absolute chronology of the PPNB.

Twenty-one ^{14}C dates are currently available from the KHH excavations, only one of which is clearly aberrant (Goring-Morris, pers. Comm; Goring-Morris et al. 2001; Goring-Morris & Tuross, in prep; Tuross & Goring-Morris 2011). Sixteen of these were derived from loci that could be securely set within the stratigraphic sequence. These dates place the initial occupation at the site, represented by the *'Bos pit'* burial L1005, between ca. 8,900 and 8,600 calBC. This is in agreement with the original assignment of the initial occupation at the site to the very beginning of the EPPNB. It seems that the 'pull' towards 8,900 calBC is a result of the long range given to the Phase IV samples due to the nature of the calibration curve. Still, even if we accept the later end of this range as the beginning of the EPPNB occupation, it seems that Kfar HaHoresh somewhat pre-dates some of the other EPPNB sites in the region (and see discussion in Edwards 2016). Still, similar dates, ranging between 8,700 and 8,600 calBC have been published from other EPPNB sites in the southern Levant, e.g. Tell Qarassa, Motza and Horvat Galil (Carmi & Segal 1992; Ibáñez et al. 2014; Yizhaq et al. 2005).

The late stage of occupation, represented by the L1003 grave complex, is dated to the end of the MPPNB, ca. 7,600-7,500 calBC. Since L1003 does not denote the very end of the occupation, it has been suggested by the excavator that the end of the occupation itself should be dated to ~7,250 calBC, i.e. the beginning of the LPPNB, even though no clear LPPNB dates were obtained (Goring-Morris, pers. comm.).

It has been previously suggested that the three occupational phases at KHH broadly corresponded to the EPPNB, MPPNB and LPPNB (Birkenfeld & Goring-Morris 2011, 2014). Even with the new quadripartite division of the KHH sequence, this scheme remains generally valid. Accordingly, Phase IV corresponds to the EPPNB; Phases III and II represent two stages within the MPPNB; Phase I corresponds to the end of the MPPNB and the transition to the LPPNB[21]. Following the above chronology, the transition from the early to the late stages of occupation, i.e. the point in the sequence where the apparent shift in the organization of the built environment was detected, should be dated to ca. 7,900-7,800 calBC.

Examining the ^{14}C dates deriving from the different loci raised two other issues: the stratigraphic and chronological assignment of burial L1804 and of the plastered skull L1004. L1804 is a secondary burial of an adult male, retrieved from the open area between the L1604 complex and W5601. It was originally assigned to Phase IV. However, ^{14}C dates obtained from that loci raise the possibility that the L1804 burial should be re-assigned to Phase III (Goring-Morris & Tuross, in prep.). L1804 was the only example of a secondary burial from Phase IV. This is of interest, since once reassigned to Phase III it better fits the pattern observed in the burial customs at the site (and see discussion above). Similarly, the plastered skull (L1004) and associated gazelle burial were previously assigned to the Middle phase of occupation. However, it has been difficult to correlate stratigraphically between the upper and main areas of excavation. Thus, it was unclear if these finds should be assigned to Phase II or phase III. The ^{14}C dates obtained adjacent to the L1004 skull (*ibid.*) fit comfortably within the phase II loci, thus implying that it should perhaps be assigned to the late stage of occupation.

THE LITHIC ASSEMBLAGE

The following section presents the results of selected spatial analyses of portions of the lithic assemblages from KHH (and see description bellow, in Chapter 4). Together with the analysis of the built environment and the burial practices at the site, it aims at shedding light on aspects of intra-site spatial organization and activity structuring through the chrono-stratigraphical sequence. It is intended to serve as a preliminary case study, demonstrating the potential of intra-site spatial analysis of small finds. A short description of the general characteristics of the KHH lithic assemblages is presented first. The compositions of the assemblages are then described in detail according to the four stratigraphic phases. Finally, the results of the spatial analyses are presented, followed by a discussion of the results.

General Characteristics of the Assemblage

The lithic assemblages at the site display typical PPNB characteristics. In all phases there are three distinct technological components: first, an *ad hoc* component, used for

[21] It has recently been suggested that, based on the ^{14}C dates from Ahihud (Caracuta et al. 2015) and at Tell Qarassa (Ibáñez et al. 2010), the EPPNB/MPPNB transition should be dated to ca. 8,100 calBC (Goring-Morris, pers. comm.). If correct, then Phases IV and III at KHH correspond to the EPPNB, while Phase II corresponds to the MPPNB.

the manufacture of common, non-standardized tool forms such as some perforators, awls and becs, scrapers and various retouched flakes and blades. This component utilizes rather irregular, amorphous flake and irregular blade cores that dominate the core assemblage. Second, a bidirectional naviform blade component, used mainly for the production of more standardized tool forms, such as sickle blades and reaping knives, projectile points, burins and some borers (Barzilai 2010a; Brailovsky-Rokser 2015; Goring-Morris 1994). A small assemblage of bifacial tools represents a third distinctive reduction sequence (Barkai 2005).

The main raw material used at the site is a light brown (beige), fine-grained material, named 'HaSollelim' flint that originates locally in the Shefa'am-Alonim hills and the Tur'an–Nazareth ranges, respectively west and north of the site. During a survey in the vicinity of the site several flint outcrops were recorded showing signs of exploitation and flint procurement (Barzilai 2013). At one of these locations a naviform-type preform was recorded, indicating these sources were exploited during the PPNB, thus possibly connecting them to the site. Most raw material appears to derive from within a couple of hours walk from KHH, though some appears to derive from more distant sources, whether in the Carmel, Judean desert or Transjordan (Ekshtain, pers. comm.). Some of the more standardized tool categories, such as projectile points and sickle blades were made on apparently non-local, finer textured flint, ranging from dark brown to purple and pink. Chronological changes in the emphasis on different raw materials occur between the different occupation phases; in the early phase of occupation more colourful, non-local flints are more common, while 'HaSollelim' flint becomes more and more predominant during the later phases (Barzilai & Goring-Morris 2010; Goring-Morris 1994; and see discussion below).

Since cores are relatively few within the assemblage (Table 4.4; Goring-Morris 1994), some of the lithic material could have been brought to the site from elsewhere. There is, however, clear evidence for on-site lithic production, including a bidirectional workshop dump (L1007), located ca. 14 m from the main excavation area at the very southwestern margins of the site (Barzilai & Goring-Morris 2007, 2010), as well as other caches (e.g. L1307 and L1309) and possible workshop areas documented within the main excavation area (Davidzon & Goring-Morris 2007; and see discussion in Chapter 5).

The tool repertoire is typical of local PPNB traditions, and includes mainly retouched blades and flakes, notches and denticulates, burins, sickle blades, perforators and projectile points. Among the projectiles, most common are the Amuq, Byblos, Jericho and Helwan types with the relative proportions changing through the sequence. Worth noting is a variant of the Jericho point made by bifacial pressure flaking that creates a splayed ('fishtail') tang. KHH is the first documentation of this tang type, although a few examples also occur at Mishmar Ha'emeq (Barzilai et al. 2011, fig. 7:4-5). A small number of Jericho points fashioned by 'Abu Gosh' retouch exist as well. In general, however, 'Abu Gosh' retouch (i.e. invasive pressure flaking, creating narrow oblique parallel scars across the dorsal ridge of the blank) is associated with the Byblos and Amuq points, where it appears on ca. 1/3 and 1/2 of the points, respectively. The

Table 4.4: KHH Flint distribution by type and stratigraphic phase, from Early (Phase IV) to Late (Phase I)

	Phase IV		Phase III		Phase II		Phase I	
	N	%	N	%	N	%	N	%
PE	1024	5.3	1043	4.4	1069	5.3	9143	5.9
Flakes	2080	10.8	2609	11.1	2435	12.1	19,416	12.5
Blade\lets	722	3.7	936	4.0	1143	5.7	8224	5.3
CTE	267	1.4	408	1.7	391	1.9	2909	1.9
CT	8	< 0.1	15	0.1	15	0.1	154	0.1
RB	25	0.1	51	0.2	70	0.3	468	0.3
Burin sp.	150	0.8	226	1.0	235	1.2	1511	1.0
Biface sp.	1	< 0.1	0	0.0	1	< 0.1	24	0.0
Chamfered[1] sp.	43	0.2	70	0.3	30	0.1	375	0.2
DBT[2] sp.	18	0.1	41	0.2	25	0.1	197	0.1
Debitage	4338	22.5	5399	23.0	5414	26.8	42,421	27.2
Tools	1075	5.6	1697	7.2	853	4.2	9366	6.0
Cores	174	0.9	319	1.4	126	0.6	1390	0.9
Hammer-stones	27	0.1	42	0.2	23	0.1	265	0.2
Intrusive[3]	231	1.2	326	1.4	236	1.2	1008	0.6
Chunks	1999	10.4	2061	8.8	2082	10.3	12,426	8.0
Chips	11,438	59.3	13,643	58.1	11,444	56.7	88,860	57.1
Debris	13,437	69.7	15,704	66.9	13,526	67.0	101,286	65.0
TOTAL	19,282	100.0	23,487	100.0	20,178	100.0	155,736	100.0

[1] Transversal burin spall, produced by the *chanfrein* technique, a method of truncating blades, which leaves a bevel or chamfered surface on the break (Crowfoot-Payne 1937).
[2] Dorsal Blow Technique (DBT), a snapping technique employing a direct blow to the dorsal face of the blank.
[3] Mostly rolled Middle Palaeolithic material.

sickle blades are usually made on naviform or bi-directional targeted blades, and are usually finely denticulated with inverse retouch (Brailovsky-Rokser 2015). Bifacials are relatively few, comprising mainly axes, picks and massive awls.

Assemblage Composition

The total lithic assemblages comprise 384,176 items (Appendix 2, Tables 7-8). The analyses presented here were based on the material that could be securely set within the stratigraphic sequence at the time of writing, i.e. 272,333 items, mostly deriving from well-defined loci such as built features and installations. This sample comprises >70% of the combined assemblages, including all of the different categories: debitage, debris, tools and cores[22]. Table 4.4 summarizes the sample counts by type as well as by archaeological phase.

Composition-wise, all four sub-assemblages show very similar characteristics. The debitage comprises ca. 1/3 of the assemblages and most frequent within this category

[22] It is important to note that all of the sediments excavated were sieved using a 5mm mesh.

are the flakes (10.8-12.5%), followed by the primary elements (4.4%-5.9%) and blades (3.7-5.7%). Tools comprise between 4.2- 7.2% of each assemblage. Cores are relatively scarce, comprising between 0.6-1.4%. No clear chronological trends could be discerned, although a slight increase in the frequencies of flakes and blades as well as a decrease in debris were noted through the sequence.

A comparison of the frequencies of the different tool categories revealed a similar pattern (Table 4.5); although slight differences were noted between the sub-assemblages, no clear chronological patterns could be discerned. In all four assemblages, the most frequent tool types are the retouched blades and flakes, followed by burins, notches and denticulates and multiple tools. The formal tools, including projectile points, sickle blades and bifaces, comprise ca. 15% of each tool assemblage.

Within the formal tools category, most frequent are the sickle blades (n = 952), comprising between 52-62% of each assemblage (Figure 4.15). They are usually made on bidirectional blades of high-quality flint: mostly on 'HaSollelim' beige flint, but also on non-local flint (pink/purple, grey, brown, etc.). Over 40% of the sickle blades recovered were intentionally fragmented (Brailovsky-Rokser 2015). Of the identifiable items, most (ca. 40%) are finely denticulated. They are followed by truncated sickle blades (ranging between 8-12% of each assemblage) and tanged sickle blades (3-6%; Goring-Morris 1994, fig.8). Study of the sickle blade assemblage from the site revealed that the different sickle blade types likely represent different reaping implements, i.e. the reaping knife, represented by tanged blades, usually with a finely denticulated

Table 4.5: KHH tool frequencies by type and stratigraphic phase, from Early (Phase IV) to Late (Phase I).

	Phase IV		Phase III		Phase II		Phase I	
	N	%	N	%	N	%	N	%
Projectile points	41	5.9	106	5.7	84	4.3	439	5.8
Perforators	63	9.0	97	5.2	150	7.7	611	8.0
Sickle blades	65	9.3	150	8.1	164	8.4	573	7.5
Retouched blades	96	13.8	364	19.7	380	19.4	1291	16.9
Microliths	10	1.4	18	1.0	12	0.6	46	0.6
Scrapers	6	0.9	9	0.5	34	1.7	103	1.4
Burins	75	10.7	219	11.8	256	13.1	996	13.1
Notches & Denticulates	74	10.6	214	11.6	187	9.6	900	11.8
Multiple tools	75	10.7	165	8.9	79	4.0	609	8.0
Bifacials	10	1.4	20	1.1	14	0.7	87	1.1
Retouched flakes	78	11.2	211	11.4	313	16.0	966	12.7
Varia	105	15.0	277	15.0	283	14.5	1002	13.1
Total	698	100.0	1850	100.0	1956	100.0	7623	100.0

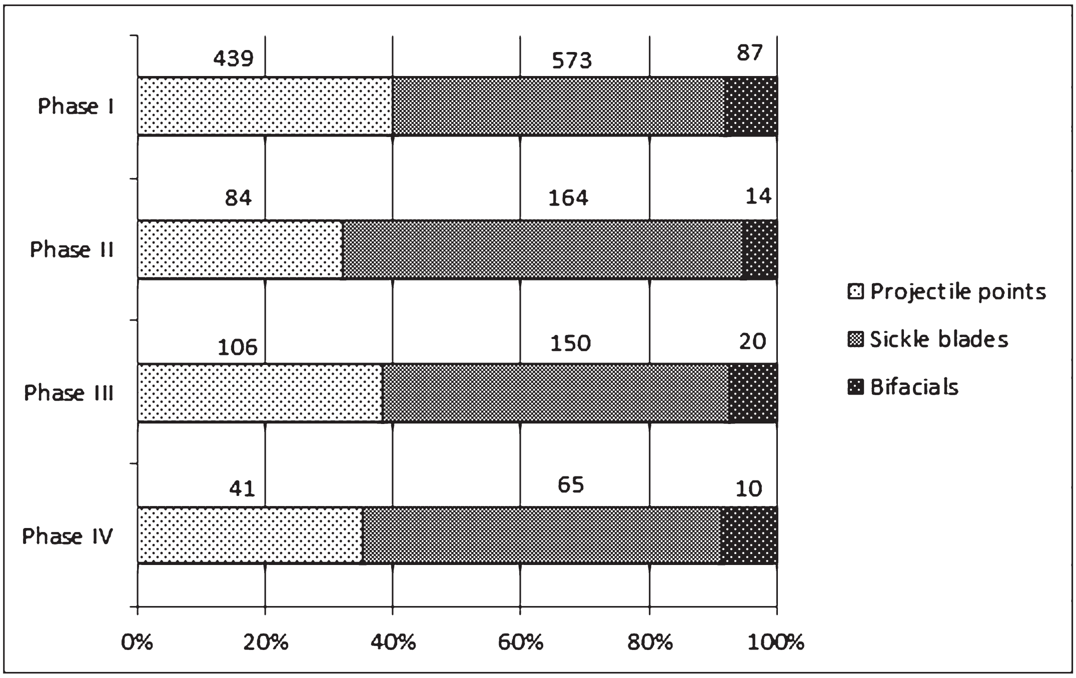

Figure 4.15: Formal tool frequencies at KHH by stratigraphic phase, from Early (Phase IV) to Late (Phase I).

working edge, and the composite sickle, represented by the segmented sickles, usually truncated using the Dorsal Blow Technique (DBT; Brailovsky-Rokser 2015, p.125). At least two types of composite sickles were indicated based on differentiation between long and short segments.

When phasing is taken into account, sickle blade frequencies show a very slight decrease in their percentage within the entire tool assemblage (Table 4.5). These changes, however, are minor, and may not be significant. Another chronological pattern relates to raw material use: a slight decrease was noticed in the use of the non-local flint, and particularly the pink/purple flint, between the early and late stages (Figure 4.16). No other clear chronological trends were identified; typologically, all sub-assemblages show similar compositions. The only exceptions are the sickles with coarse denticulation, which only appear during the late stage of occupation (i.e. phases II and I), and become more frequent with time (comprising 1% during phase II and 7% during phase I).

Projectile points are the second most frequent formal tool category, comprising ca. 36% (n = 670) of all formal tools. The assemblage is dominated by Amuq points, followed by Byblos and Jericho points (Goring-Morris 1994, figs. 6-7). Small numbers of Helwan points occur in the earlier levels, comprising almost 40% of the relatively small assemblage. Isolated examples of el-Khiam points were recorded as well. When examining the projectile point sub-types according to their stratigraphic location, they follow the seriation suggested by Gopher (1994), as Helwan and Jericho points are dominant in phase IV, and are gradually replaced by the Byblos and Amuq points during the later phases (Figure 4.17). Several of the Helwan points that were found

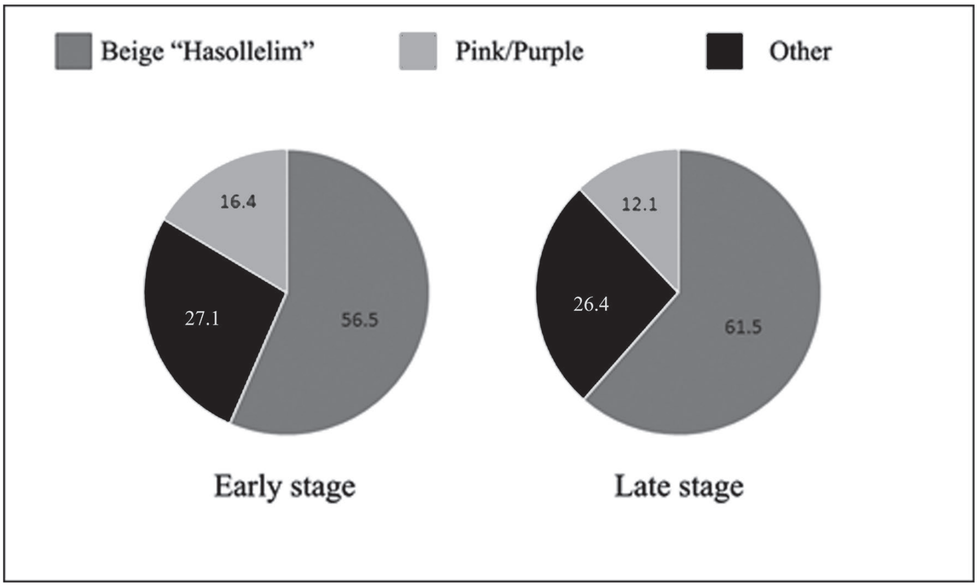

Figure 4.16: KHH sickle blade raw materials: 'Early stage' includes Phases IV and III (n = 215), 'Late stage' includes Phases II and I (n = 737).

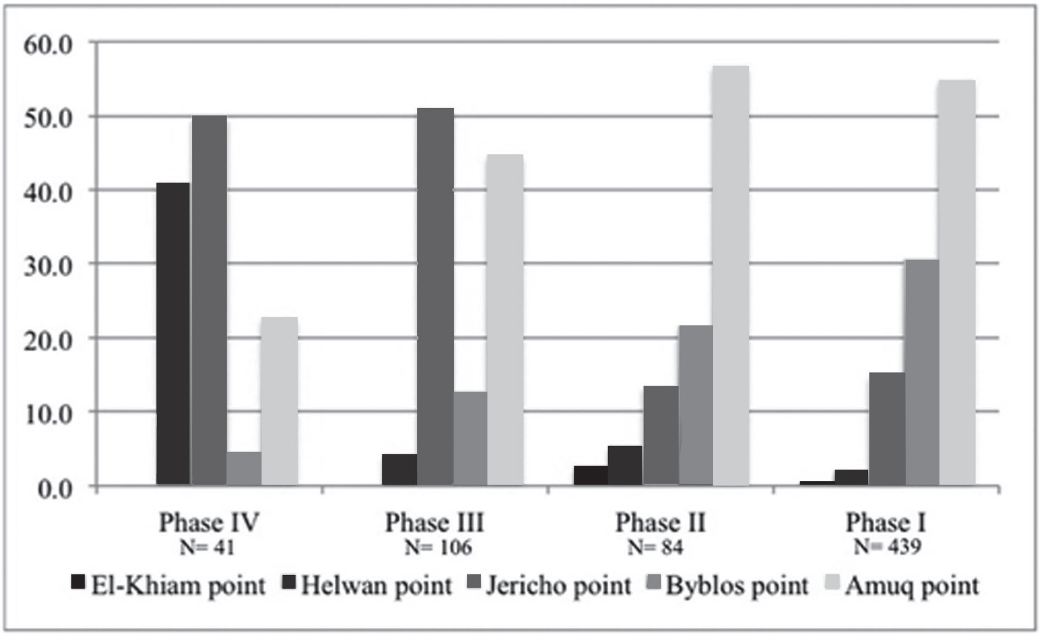

Figure 4.17: KHH projectile point sub-types by stratigraphic phase.

in the younger strata derive from burial contexts (Goring-Morris, pers. comm.). As for raw materials, the chronologically earlier types, including the Helwan, Jericho and Byblos points display a wider range of raw material types, including high quality purple/pink and brown raw materials, than the Amuq points, which are mostly made on 'HaSollelim' beige flint.

Lastly, more than 130 bifacials were collected at KHH, accounting for ca. 1% of each sub-assemblage (Table 4.5). Most were made on high quality tabular flint and included axes and chisels, adzes, knives, massive borers and daggers. Axes and chisels dominate throughout the sequence, while adzes appear mainly during the late stage of occupation. Transversal *tranchet* blows as well as polish were occasionally used in the shaping of the working edge (pers. obs.). Here, again, chronological changes occur, as the typical *tranchet* diminishes with the transition from early to late stages, while polishing appears later in the sequence. Of interest is a single *tranchet* axe that was retrieved from the L1003 burial complex (Phase I), apparently representing a grave-good.

Spatial Distributions

The lithic assemblages from each stratigraphic phase were plotted and their spatial distributions analysed. Since the main aim of the analysis was to recognize spatial patterns related to the way different activities were organized throughout the site, specific lithic categories were analysed separately as well; these include categories representing different stages of the lithic production sequence, i.e. cores, core trimming elements (CTE's), flakes and blades, and chips. Hot-Spot analysis (Getis-Ord Gi*) was used to examine spatial distributions and seek out statistically significant patterns. Five tool categories were also analysed separately: projectile points, sickle blades, bifaces, burins and retouched blades. Since the number of items in each sub-assemblage was too low to allow for the application of the Hot-Spot method, a simple point-density analysis was employed (and see Chapter 2).

Figure 4.18 shows the results of the Hot-Spot analysis for each stratigraphic phase. All phases, except Phase II, show very similar patterns: most artefacts derive from the large open, midden deposit areas surrounding the architectural complexes. In the two earliest phases, Phase IV and III, artefacts were clustered east and south of the L1604 complex. Within the complex itself, a significant "cold spot" was identified. While in Phase IV it could be argued that this might be a result of partial excavation, this area in Phase III was fully excavated. Furthermore, it was noted during excavation that most of the fill between the lower plaster floors of the complex indeed lacked finds, as if purposefully sieved prior to deposition. Thus, it seems that the pattern identified is probably not a result of differential excavation.

When the different artefact categories are analysed separately, several variations emerge: in Phase IV, while CTE's and chips can be found in both large midden areas (Figure 4.19b, c), the flakes and blades were concentrated east of the L1604 complex (Figure 4.19d). Cores on the other hand were significantly clustered in the midden area south of the complex (Figure 4.19a). In Phase III, a different pattern emerges, as a cluster comprising cores and CTE's was identified in the open area immediately east of the L1468 complex (southwestern corner of the excavation area; 'Cluster 1' Figure 4.20a, c). In contrast, the same location exhibited a significant lack of tools (Figure 4.21b).

Tool distributions in both phases follow the general artefact distribution, as most tools also seem to concentrate in the large midden areas, south and east of the L1604 complex (Figure 4.21a, b). However, several specific patterns, deviating from the general trend

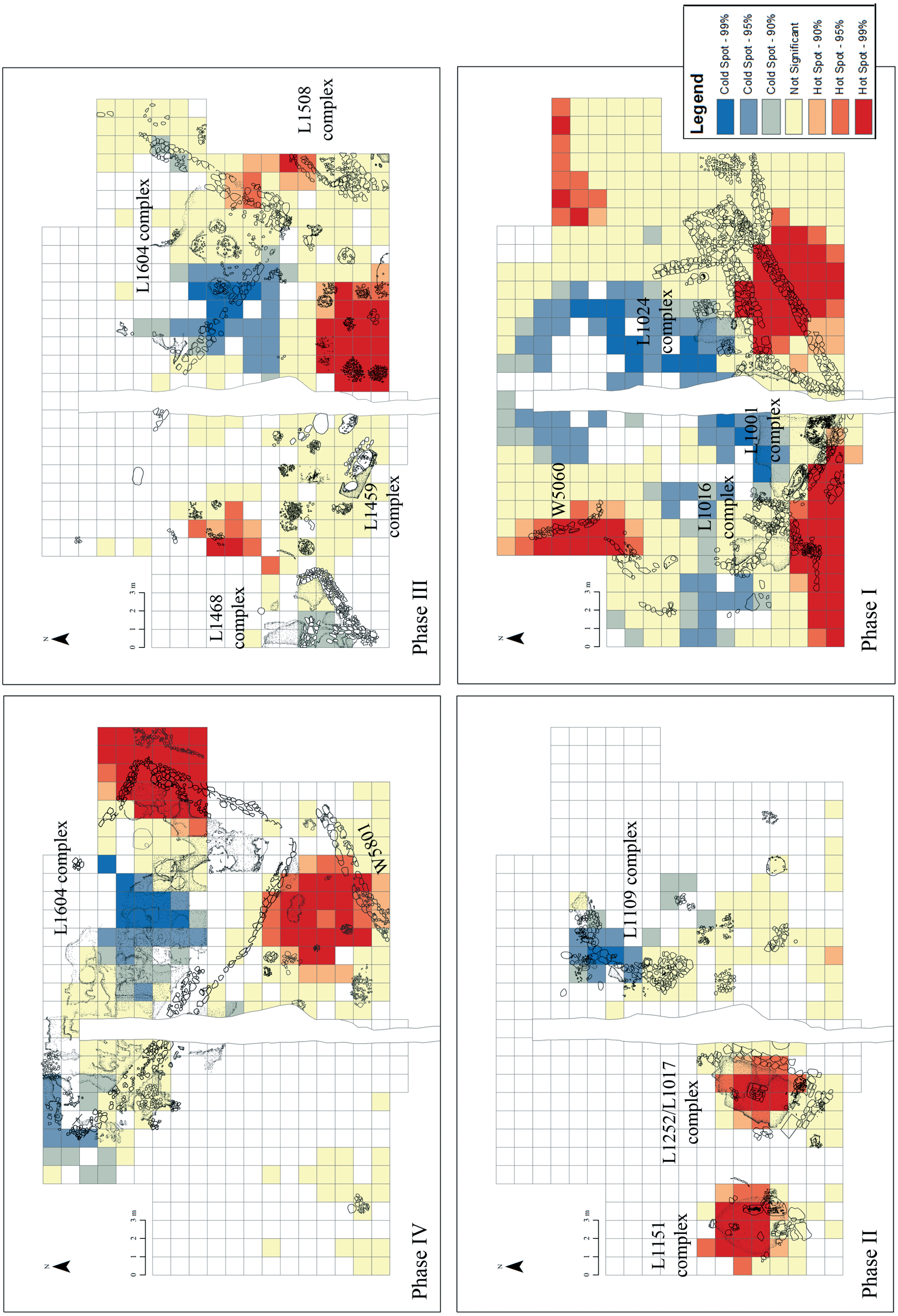

Figure 4.18: KHH – "Hot Spot" mapping of general artefact distributions according to stratigraphic phase.

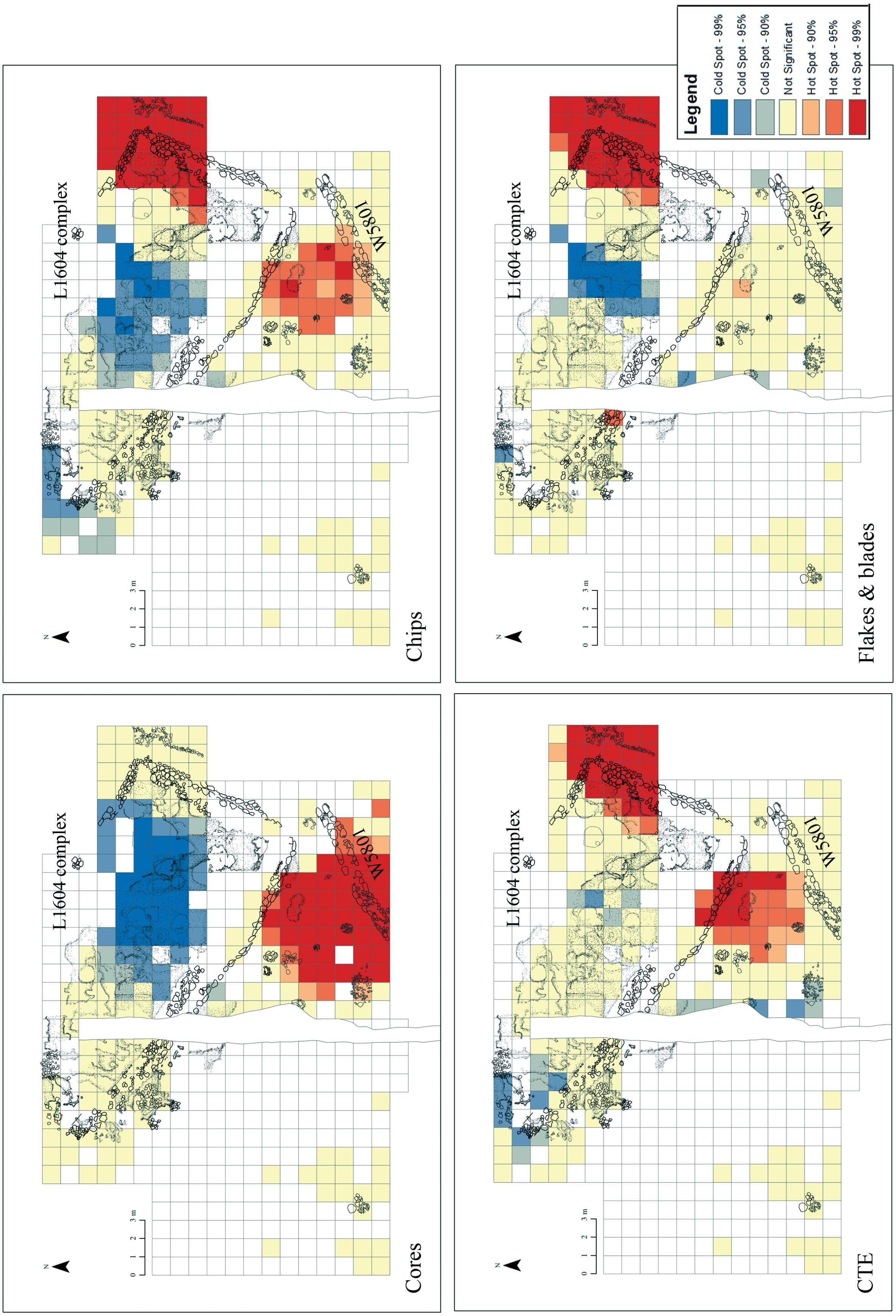

Figure 4.19: KHH - "Hot Spot" mapping of artefact distributions in Phase IV.

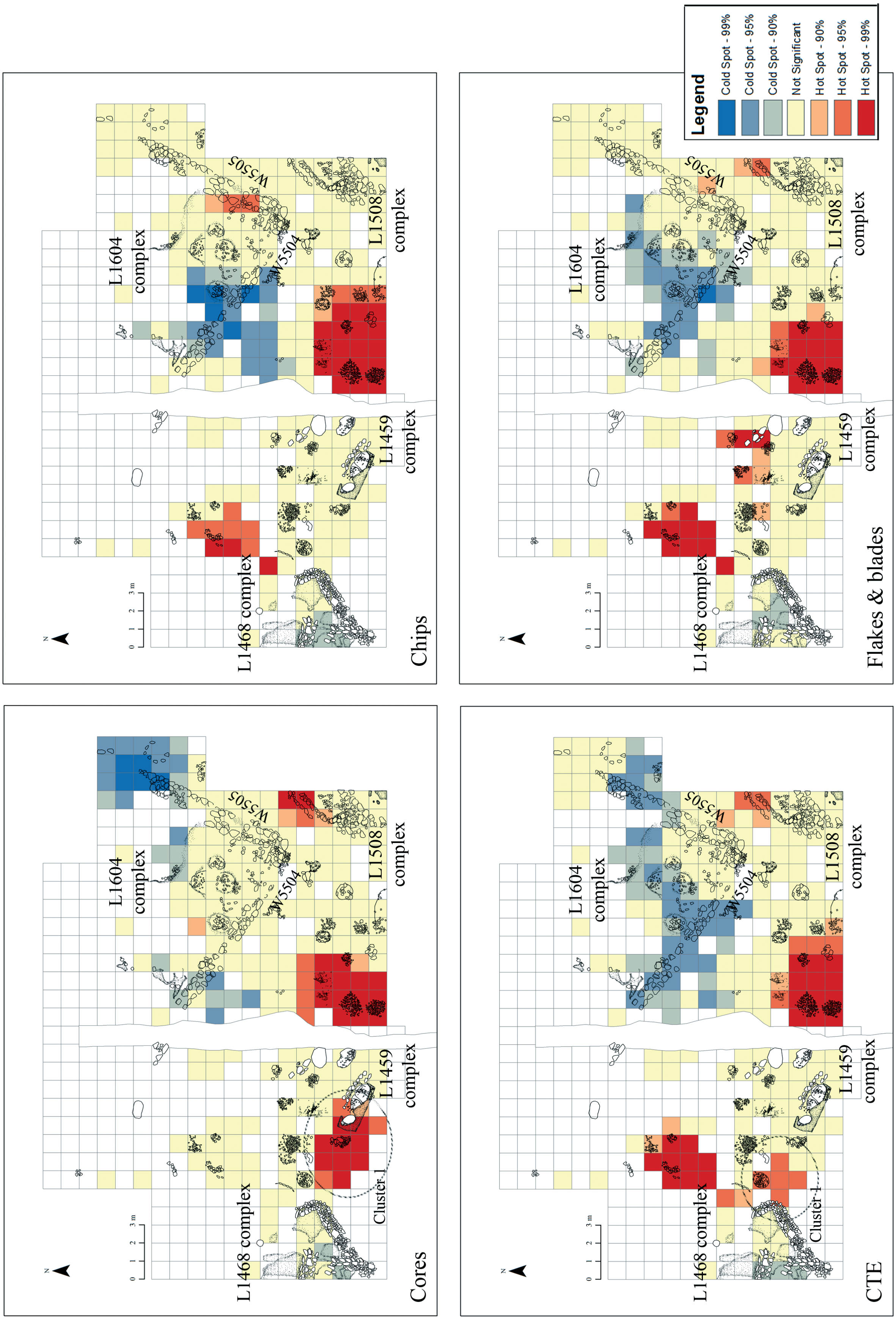

Figure 4.20: KHH - "Hot-Spot" mapping of artefact distributions in Phase III.

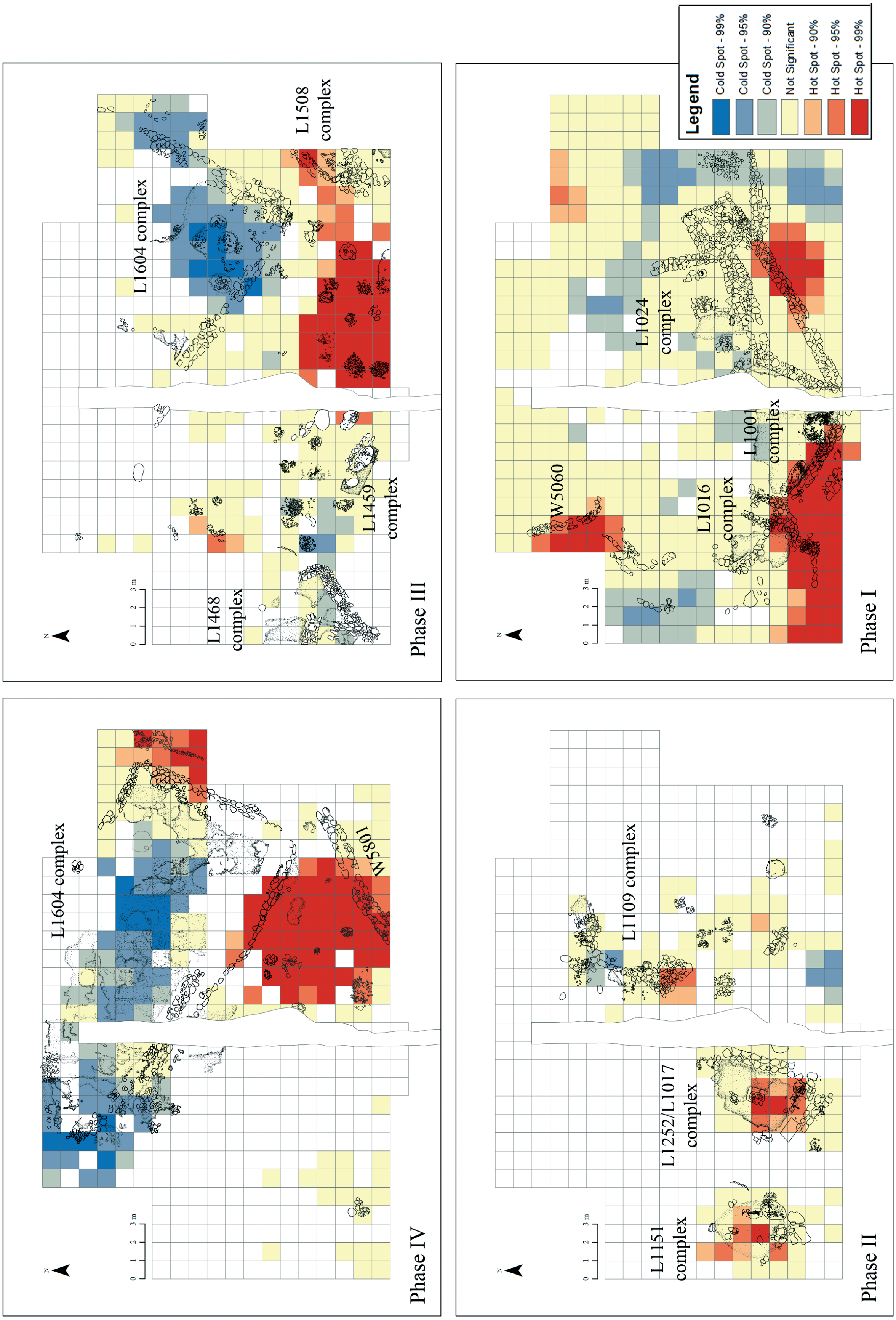

Figure 4.21: KHH – "Hot-Spot" mapping of general tool distributions according to stratigraphic phase.

were identified; in Phase IV, a concentration of projectile points was identified within the L1604 complex. It comprises five points, including two Abu Gosh tang fragments, a Jericho point and an Amuq point, all deriving from the fill beneath the second plaster floor (L1930 and L2203 plasters). Interestingly, five out of the 10 bifaces in this phase also derive from the same context. These, together with other items from within the complex all come from general loci from the fill above the second plaster floor of the L1604 complex, thus, perhaps, post-dating the actual structure. Similarly, Phase III tools that derive from within the complex all derive from L1515 – the fill between W5504 and W5505 - above the uppermost plaster surface, perhaps postdating the complex itself.

The following phase, Phase II, exhibits a distinctive pattern (Figure 4.18c); unlike the preceding and the following phases, here the lithic artefacts are clearly clustered within the perimeters of the architectural complexes, namely the L1151 and L1252/L1017 complexes. In contrast, the area of the third built complex, the L1109 complex, is significantly devoid of finds. When distributions are examined by category, three other, secondary concentrations appear; the first, containing only tools and CTE's, is located adjacent to the L1109 platform ('Cluster 1', Figure 4.22c). The second, comprising mainly chips, cores and tools is located east of and immediately adjacent to L1314 ('Cluster 2', Figure 4.22a, b). A third distinct cluster, comprising cores, flakes and blades, was recorded in the open midden area east of the L1252/L1017 complex, adjacent to the southern excavation section ('Cluster 3', Figure 4.22a, d). Tool distributions in Phase II largely follow the same trend as the other artefact categories, and no unusual patterns or clustering were observed (Figure 21c).

The latest phase, Phase I, showed the least variability with regards to artefact distribution; all artefact types followed the same general trend, as most artefacts were concentrated in the midden deposits bounded by the large walls – west of and abutting W6050, south of and abutting W5009 and W5014, and south of and abutting the northern walls of the L1001 and L1016 complexes (Figure 4.23). This may indicate some sort of deliberate deposition/dumping in those specific areas, perhaps in an attempt to level the slope; this supports the identification of these long walls as slope breakers/terracing walls, and the suggestion made by the excavator that the walls were meant to protect the plaster surfaces from the debris coming from upslope.

While following the same general trend as the rest of the assemblage, cores show another significant concentration related to the L1024 complex ('Cluster 1', Figure 4.23a). It should be noted that neither the CTE's nor the chips exhibit similar clustering. A second interesting cluster was identified within the L1003 grave complex, including flakes and blades ('Cluster 2', Figure 4.23d), as well as several tool types. These include more than 20 projectile points (both complete and fragments; see Figure 4.24a), retouched blades (Figure 4.24c), burins (Figure 4.24d) as well as two bifacials (a *tranchet* axe and an adze; see Figure 4.25). This seems to reflect intentional deposition, probably as grave goods, since none of the other tool types or other artefact categories such as cores, CTE's or even chips were concentrated there.

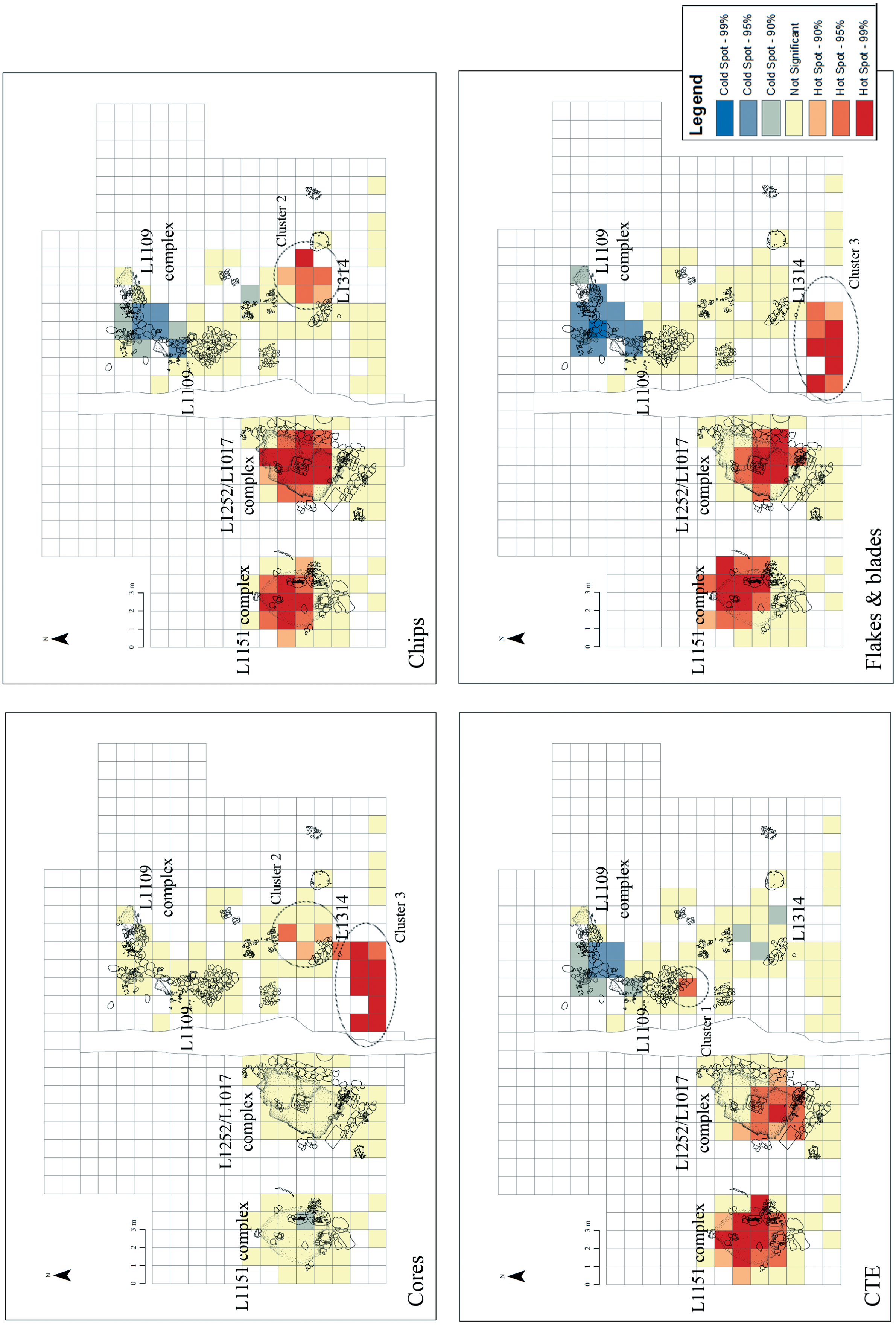

Figure 4.22: KHH – "Hot-Spot" mapping of artefact distributions in Phase II.

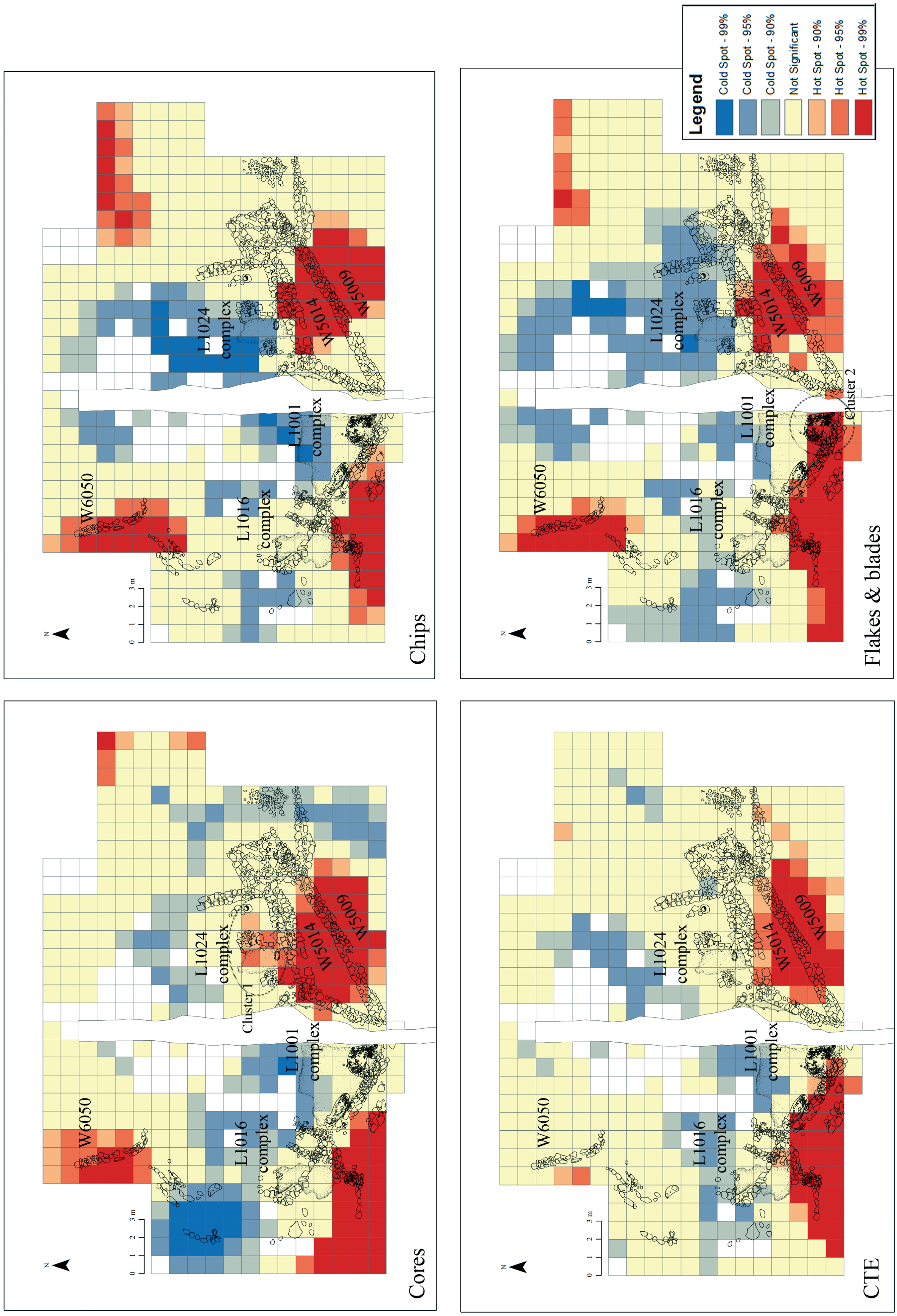

Figure 4.23: KHH – "Hot-Spot" mapping of artefact distributions in Phase I.

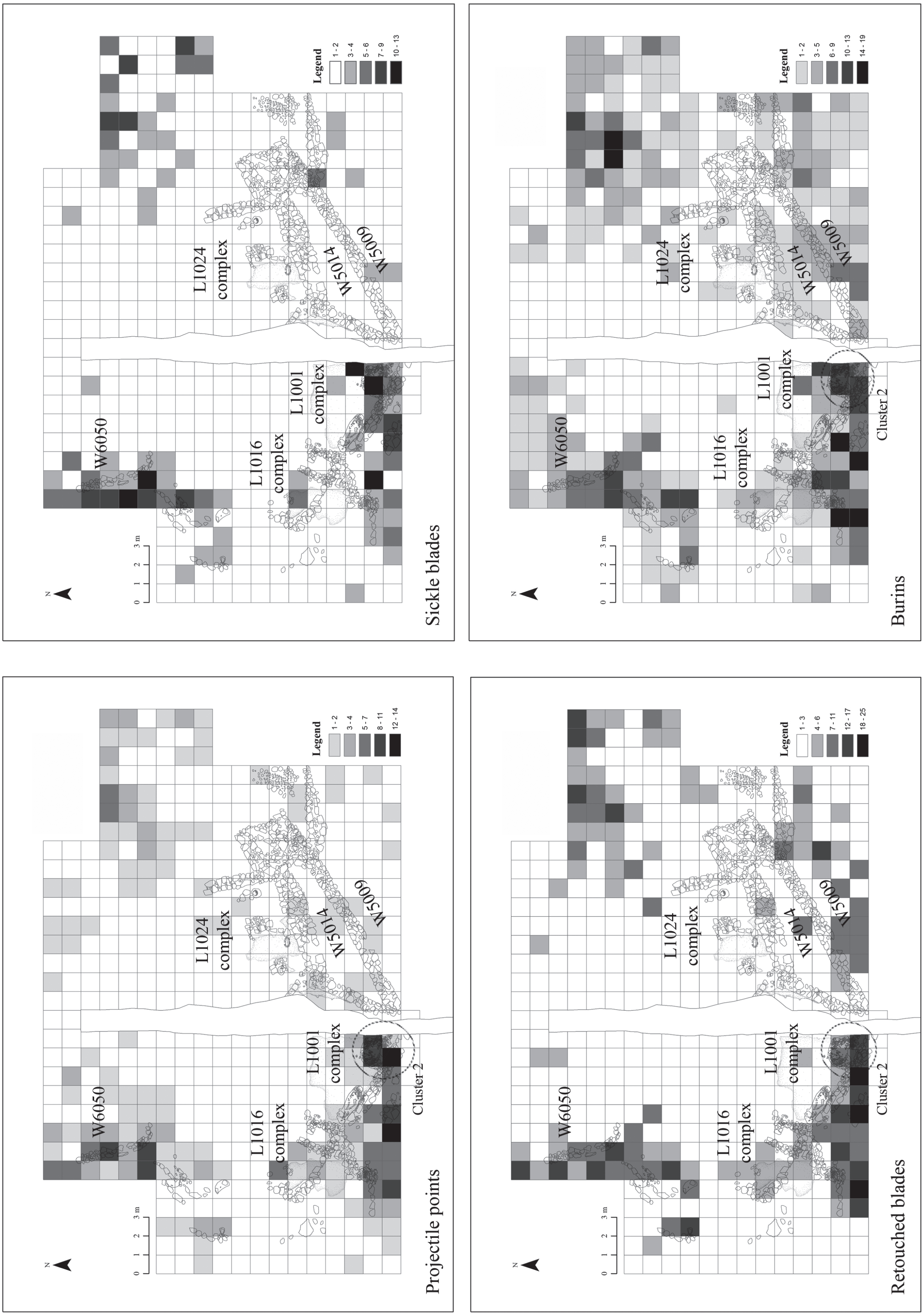

Figure 4.24: KHH - Tool distributions in Phase I, according to tool type.

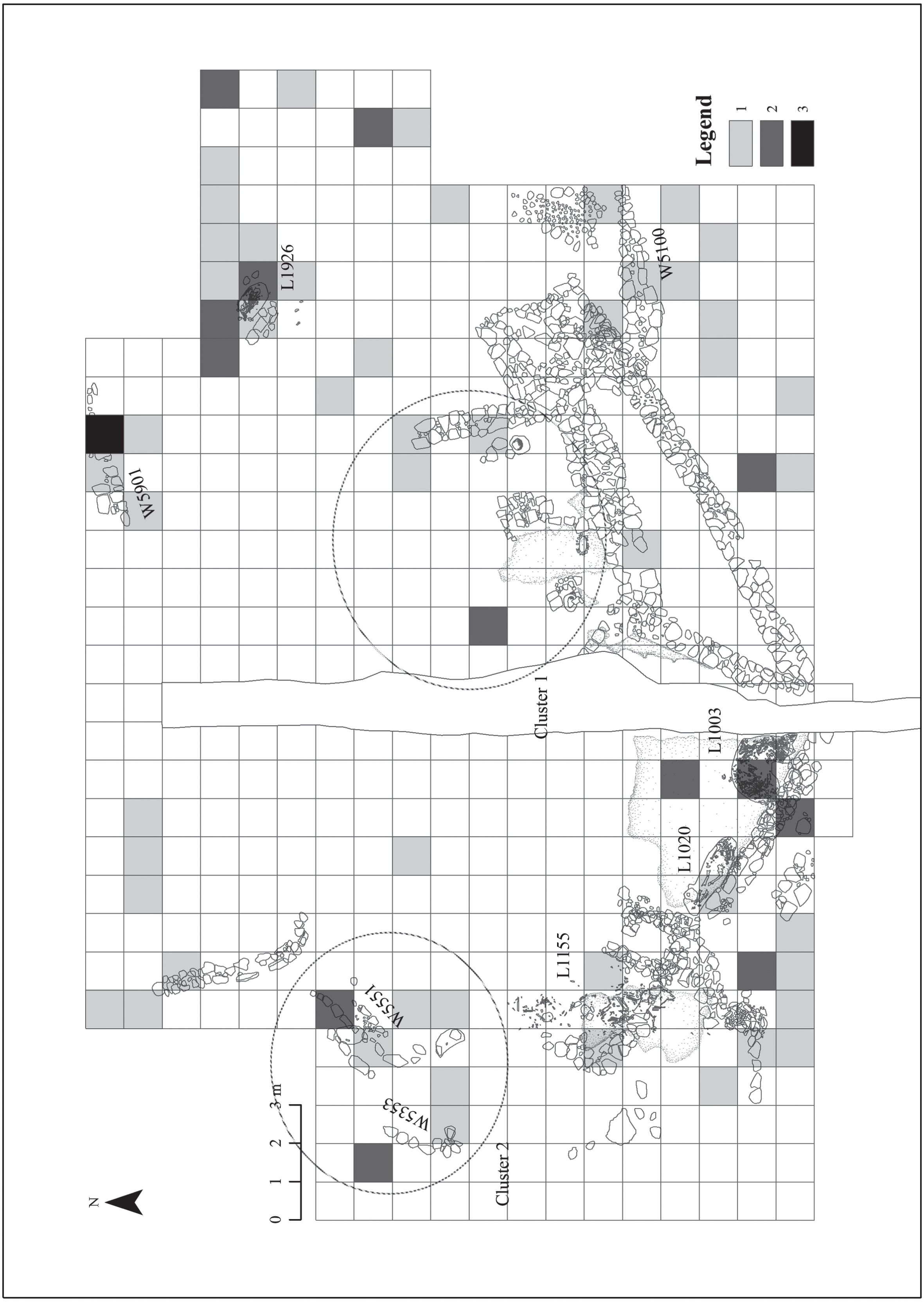

Figure 4.25: KHH - Biface distribution in Phase I.

In general, most tool categories, including burins, retouched blades, sickle blades and projectile points, do not diverge from the trends observed by the general lithic distributions. Bifaces on the other hand show somewhat different concentrations (Figure 4.25): While most derive from open areas and midden deposits, two other distinct concentrations were identified; the first, within the L1024 complex (Phase I), comprised a chisel, two axes and several biface fragments ('cluster 1', Figure 4.25). A second cluster was identified in the vicinity of the 'ceremonial' locales of W5352 and W5551 ('Cluster 2', Figure 4.25).

Examination of the provenance of the bifacial tools of Phase I raised an interesting association between bifaces and burials: besides the two bifaces recorded in the L1003 grave (a *tranchet* axe and an adze), a biface fragment was recorded in the other burial (L1020) associated with the L1001 complex. Two axes were also recorded in association with the L1155 grave complex, while a pick and a polished chisel were found in open area burials (L1926 and L1806, respectively). A few bifacial tools were also recorded in association with walls – these are mostly fragments, but worth noting are a complete pick found within W5100, and a chisel, an axe and an adze found in association with W5901, all possibly reflecting intentional wall interments, perhaps wall offerings (Figure 4.25). These associations of bifacial tools, including distinctly early types (such as the *tranchet* axe in the L1003 complex), both as grave goods and possible wall offerings, may reflect symbolic meaning given to these items. It is interesting that bifaces were also recorded within burials in phase III (the L1459 grave complex and the L1574 secondary burial) and phase II (L1250 and L1455 burials as well as within the L1109 platform)[23].

Discussion

The spatial analysis of the lithic assemblage distributions showed certain similarities between three of the four phases: in Phases IV, III and I, results showed clear artefact clustering in the open areas and midden deposits located outside the built complexes. Structure floors, on the other hand, seem to remain relatively clear of finds. An opposite pattern was identified in Phase II: here, the most significant clustering was apparent within the built complexes. It is unclear whether this inconsistency reflects actual patterns of deposition, or whether it is a result of a certain bias in the analysis, since Phase II was defined mainly on the basis of architectural stratigraphy. Future analysis, refining the stratigraphic division so as to include all open areas, should result in larger samples of the lithic assemblage assigned to this phase, and assist in clarifying this matter.

The general pattern observed, in which most artefacts were recovered from open areas and midden deposits, reflects issues of site-maintenance and refuse disposal strategies. The discovery of the workshop dump of L1007 has already clarified that lithic refuse disposal strategies were being employed at KHH (Barzilai & Goring-Morris 2010). The

[23] Grave goods were absent from Phase IV burials.

results of the current analysis indicate that lithic refuse was habitually collected and disposed of, both within and at the edge of the site's perimeter, and indicates the likelihood of regular cleaning of the plastered surfaces (Barzilai & Goring-Morris 2010).

On the other hand, comparative analyses of the different lithic categories indicate that deposition was rather differentiated; several artefact categories, most specifically cores, but at times also CTE's, flakes and blades, seem to have been separated from the general refuse and deliberately deposited in separate locations, perhaps as caching for future use. A similar pattern was indicated by the analysis of specialized lithic workshop dumps both at KHH and Yiftah'el (Barzilai 2010a; Barzilai & Goring-Morris 2010; Marder et al. 2012; and see disposed of in Chapter 5). Such a pattern of selective deposition, in which cores were separated from the main assemblage and deposited elsewhere, could also explain why cores appear in such low frequencies at KHH.

The fact that tool distributions follow to a large degree the same pattern as the other artefact categories indicates that tools in general were disposed in a similar fashion to the debitage and debris. No clear patterns of disposal were identified between the different tool categories. However, an interesting association was observed between bifacial tools and burials, raising the possibility that these items were at times charged with a symbolic, perhaps cult-related meaning.

Another interesting phenomenon is the intentional depositing of lithic artefacts in specific concentrations. Four types of such depositions can be discerned, displaying variability in both their size (i.e. the number of items stored) as well as in their composition:

1. Deposition of isolated items, usually as foundation deposits, offerings and/or grave goods; these include, among others, a complete, high quality naviform blade deposited within W5505 (Barzilai & Goring-Morris 2007, p.291). Other examples include deposition of three sickle blades lying parallel to one another within the L1162 burial (part of the L1155 grave complex) and a similar deposition of three distinctively asymmetrical arrowheads in grid square N57 (*ibid.*).
2. Caches comprising mainly blade blanks (usually naviform) and tools; at least three examples have been identified: L1317 comprises 27 naviform blades, likely struck off a single core, as well as tools, a flake and a *chanfrein* spall (Barzilai & Goring-Morris 2007, p.286); L1319 comprises 10 unretouched blades and six tools, including a single Byblos point, a sickle blade, a borer, a retouched blade, a notch, and a *bec*, and may be considered to represent an archetypical "PPNB toolkit" (*ibid.*); L2267 comprises 13 thin, narrow naviform blades, all probably struck from same core.
3. Depositions of knapping products; these include the refitted naviform concentration in the open area L1599 (grid square P59; Davidzon & Goring-Morris 2007), as well as the ones in L1580 and L2264. All three are comprised of a variety of artefact types (i.e. primary elements, flakes, blades as well as core trimming elements, ridge blades, etc.), representing the entire reduction sequence of a knapping session.
4. Depositions from extensive knapping sessions, i.e. workshop dump L1007 (Barzilai & Goring-Morris 2010; and see discussion in Chapter 5).

The vast majority of these concentrations were recovered from open areas. At times, imprints of organic wrapping material were identified, indicating these concentrations were originally wrapped together in bundles (e.g. L1317 and L1319; Barzilai & Goring-Morris 2007). Other times, they were deposited within designated pits (e.g. L1007, L2264).

Barzilai and Goring-Morris (2007) have distinguished between *stocks*, which represent storage for utilitarian purposes, and *caches*, which are associated with symbolic purposes. Certain associations with burial activity were suggested for some of the KHH concentrations (e.g. L1317 and L1319; Barzilai & Goring-Morris 2007, p.285; L1599; Davidzon & Goring-Morris 2007), implying that they should be seen as caches, linked with symbolic purposes. Others, such as the knapping products depositions of L1580 and L2264, might be considered to represent storage for future utilization, i.e. stocks. However, their appearance within the general context of KHH, a special activity, ritual locale, raises questions as to the possible symbolic meaning of these otherwise seemingly utilitarian occurrences.

SUMMARY AND CONCLUSIONS

Results of the current analysis have demonstrated that the PPNB occupation at KHH was initiated at the beginning of the Early PPNB and lasted for ca. 1,500 years, at least until the Middle PPNB/Late PPNB transition. This long occupational sequence was divided into four phases, which were grouped into Early and Late stages. The transition between the two stages, dated to ca. 8,000 calBC, was signified by a distinct shift in the organization of the built environment and of the activities preformed on site. Burial customs also change, and although this change appears to be more gradual than that apparent in the architectural features, it is still significant. This validates the preliminary results indicated by the pilot study conducted.

Examination of the lithic assemblage distributions, both chronologically and spatially, was aimed at enhancing the analysis of the built environment, and showing the potential of full intra-site analyses. Composition-wise, all four sub-assemblages proved to be quite similar, as no clear differences were noted between them. However, artefact distributions showed very clear patterns, which resonated the shifts observed in the built environment. It seems that the results obtained demonstrate aspects of site-maintenance and of how lithic reserves and waste were organised at the site. On the other hand, the identification of actual *in situ* activity locales proved to be problematic. This probably has much to do with the maintenance and constant cleaning of floors and work areas (*sensu* Hardy-Smith & Edwards 2004). Clearly further study, including not only the complete flint catalogues, but also other find types such as faunal remains, groundstone tools, etc. is needed.

Chapter 5

The Material Culture of the Lower Galilee: Intra-Site Data and Inter-Site Comparisons

The aim of the analyses of the material culture remains from the Lower Galilee was twofold; first, to assist in defining the nature of occupations of the different sites (e.g. settlement, special purpose site, or combinations, etc.) and thus their suggested role within the larger, regional system; and second, through inter-site comparisons, to examine whether relationships between sites can be suggested and discussed.

A main concern that emerged during the analysis relates to excavation methods, and sample and assemblage sizes. As described above, the sites were divided into four categories, based on the scale of excavation and the availability of published and unpublished data to minimize bias (Table 2.1; Appendix 2, Tables 2-3; and see chapter 3). Still, the quality of data available varied significantly, even between sites within a single category. The following description is thus arranged thematically, and only sites where sufficient data were available are discussed (see Appendix 2, Tables 2-10). In each section, the data available are first described by site, followed by a discussion of inter-site variability.

ARCHITECTURAL REMAINS

Of the 24 sites studied, 13 contained some architectural remains (Appendix 2, Table 10), ranging from completely exposed structures (i.e. Kfar HaHoresh, Munhata, Yiftah'el, Mishmar Ha'emeq, Tel 'Ali), partial remains such as plaster floors and/or wall segments (i.e. Ahihud, 'Ein Zippori complex, Nahal Zippori 3, 'Ein el-Jarba, Hanaton, Kfar Qana) to isolated installations (i.e. 'Enot Nissanit). At Tell Jenin, the existence of architectural remains, including complete structures, was mentioned but no description was provided (Glock 1992, p. 679).

Architectural remains from Kfar HaHoresh were detailed in Chapter 4. In summary, the built environment at the site comprises numerous lime-plastered surfaces, low bounding and slope-breaking walls, cists, platforms and a variety of associated features and installations. At least ten distinct structures were identified, accompanied by numerous seemingly freestanding plaster surfaces and wall segments. These structures were mostly quadrilinear, although several examples of oval architecture were recorded as well, as were small chambers and cists. Walls range in width, averaging ca. 0.8 m, and were usually built of two rows of medium to large-sized undressed limestone blocks, two or three courses high. In some cases (e.g. in the L1604 and the L1508 complexes) a combination of *nari* and dolomite blocks was used in the construction of the walls. The use of mud brick has been suggested, based on micro-morphological evidence (Arpin 2004) as well as the 'lipping' of some of the seemingly 'free-standing' plaster surfaces (e.g. L1151, L1016). Structures vary greatly in size, ranging from a few square meters (e.g. L1508 complex) to over 200m in area (i.e. the L1604 complex). Floors were usually plastered, but there are extensive variations in construction methods as well as in the thickness and the matrix of these floors. Numerous installations were also identified, including many hearths, ovens and kilns. Post-sockets are also quite numerous and it has been suggested many were used to support grave markers or totems (Goring-Morris 2002, p.109; 2005a).

At Yiftah'el, the remains of at least 15 structures of domestic nature were identified, all displaying rectilinear plans, mudbrick walls, sometimes with fieldstone foundations, together with thick lime-plastered floors. Post-sockets were reported from many of the structures, and numerous lumps of mud with branch and plant impressions were reported, indicating that wooden pillars were utilized to support roofs of branches and mud. These were usually randomly distributed, indicating, according to the excavators, their occasional rearrangement (Khalaily et al. 2008). Features within structures include constructed hearths, pits, installations and sub-floor burials.

One of the more complete examples of domestic architecture in Yiftah'el was Structure 700 in area C (Figure 5.1; Garfinkel 1987; Garfinkel et al. 2012d); this was a large structure (17x7.5 m), of which extensive plaster surfaces and the remains of several stone-built walls with a mud-brick superstructure were exposed. Garfinkel reconstructs a tripartite plan, comprised of a roofed central room and two courtyards, all with plastered floors (*ibid.*). Installations within the structure include a square post socket, and several storage installations. These consist of a silo built of clay and small stones containing

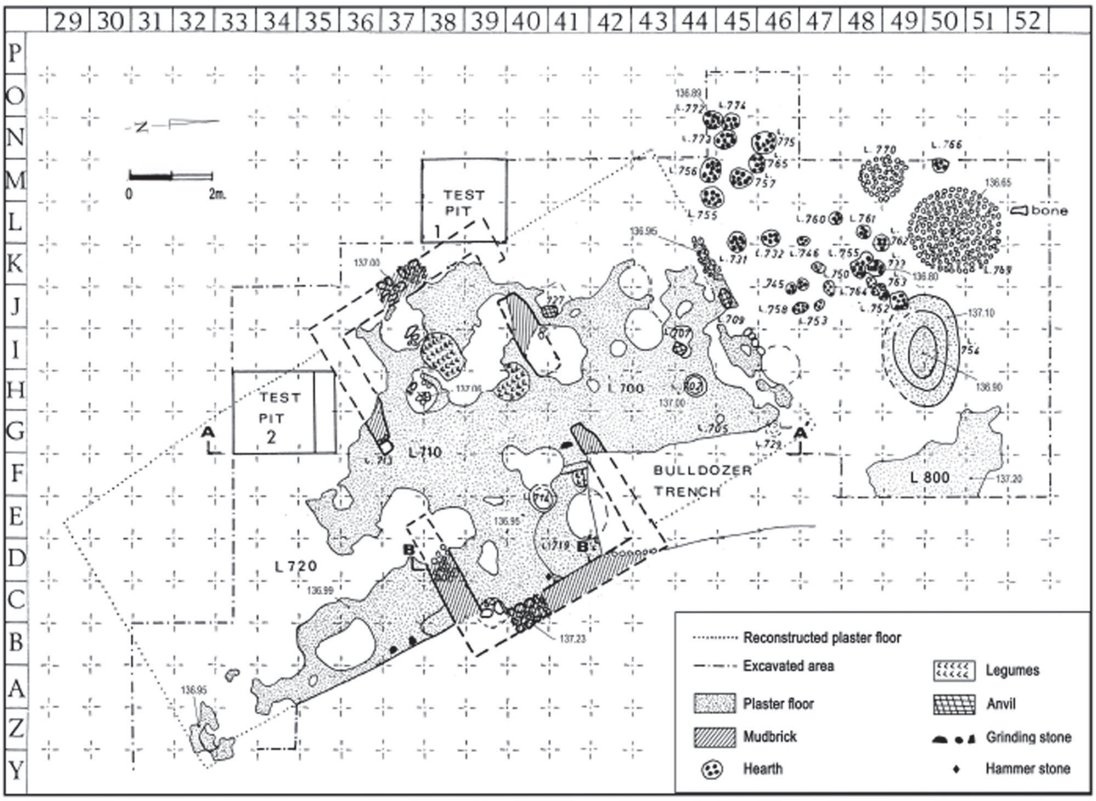

Figure 5.1: Yiftah'el area C, Structure 700 (after Garfinkel et al. 2012b, fig.2.2).

ca. 2600 horsebean seeds[24], as well as perishable storage facilities, evident in a circular installation, moulded in the plaster next to the silo, where fragments of clay and lime plaster with plant imprints were found. Several concentrations of seeds recovered from the floor surface were also identified by the excavator as originating from perishable containers such as baskets (Garfinkel et al. 2012d, p.22). In the courtyards, several grinding stones were recorded, as well as anvils and other installations moulded in the plaster. A burial was also reported from the southern courtyard. In the open area north of the structure a concentration of 25 hearths was recorded as well as large amounts of animal bones, a possible lime kiln and a related basin-like installation (*ibid.*).

Several possible examples of communal buildings were also reported at Yiftah'el. Worth mentioning is an unusual structure (Building 200) exposed in area G (Figure 5.2; Getzov, pers. comm.). This relatively large structure (>9 x 8 m) had 150 cm thick stone-built walls, at least partially accompanied by inner mudbrick walls. A thick plaster floor was laid on top of a 15-30 cm thick foundation of small stones and cobbles. This is quite unusual, as other plaster surfaces at the site were laid upon a fine soil fill (*ibid.*). Four pits dug in the plaster floor each contained a post socket made of flat stones bounded by smaller ones, at a depth of about 20-40 cm below the surface.

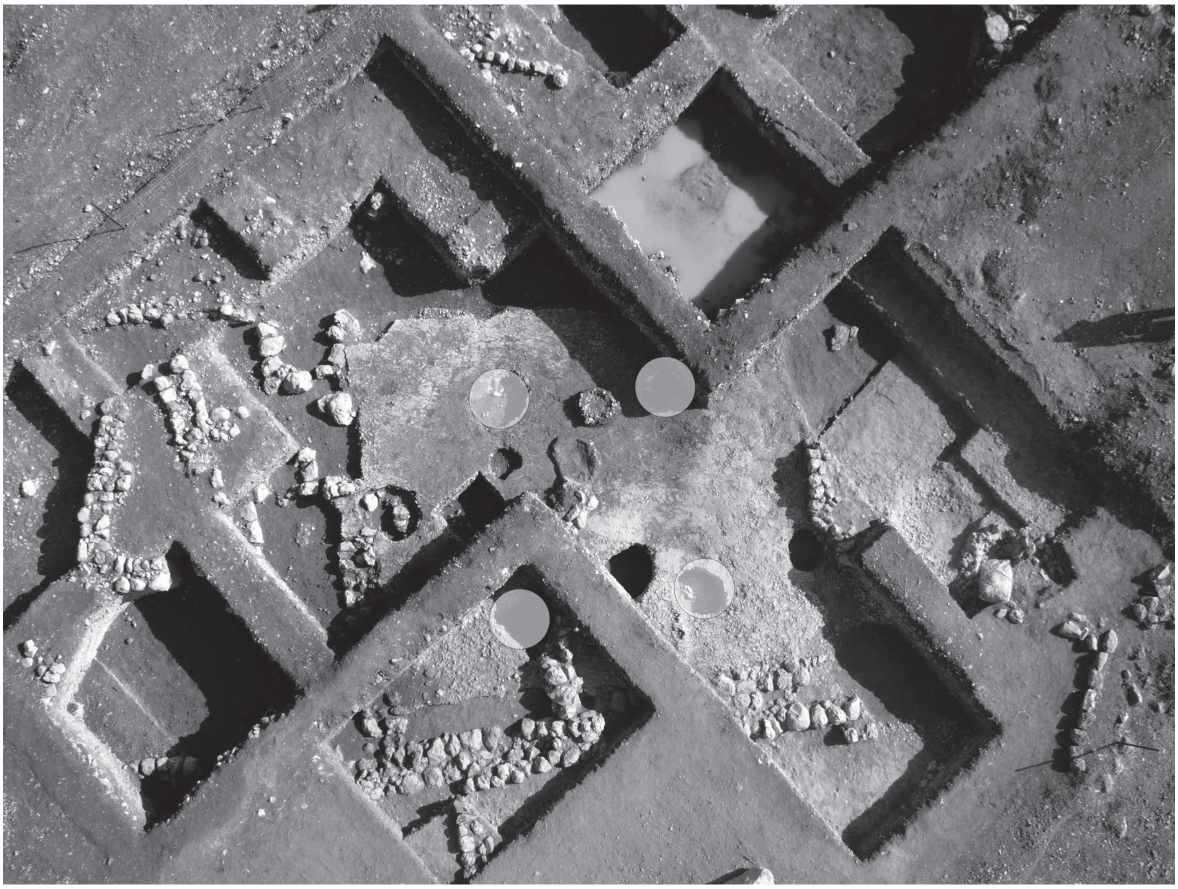

Figure 5.2: Yiftah'el Building 200, area G. Post sockets marked by white circles (after Khalaily et al. 2008, fig.2).

[24] On the floor of the same room ca. 7.5 kg of carbonized lentil seeds were also found (Kislev et al. 2012, p.284).

A hearth was located near the centre of the structure, constructed of plaster patches covered with layers of burnt material. Other than the pits containing the post sockets, four other stone-filled pits were dug into the plaster surface. A courtyard was located adjacent to the structure to the north, at least partially paved with crushed lime. A small corridor separated the courtyard from the entrance to the structure. South of the structure, a standing stone, ca. 140 cm high and 60 cm wide and carefully shaped by knapping was erected, surrounded by smaller stones. On abandonment, building 200 was intentionally buried: the plaster floor was covered with a layer of brown soil, and the opening was closed using large stones. On top of the soil fill a large stone (100x160x70 cm) was laid, next to a small, round hearth made of small stones. A broken stone bowl was found within the hearth, together with grey ashes. Lastly, the entire structure was covered with a midden deposit layer of small, angular stones. From the east, this layer was delineated by a wall (Getzov, pers. comm.). This structure was interpreted by the excavators as a communal building, used and abandoned during the course of the Middle PPNB (Khalaily et al. 2008, p.4).

Other possible communal buildings were recorded in area I (Figure 5.3; Khalaily et al. 2008). These include two large structures: Building 552, which was cut by

Figure 5.3: Yiftah'el, plan of Area I, (courtesy of I. Milevski and H. Khalaily).

modern disturbance, and Building 501, ca. 14x6 m in size, which was well preserved. Building 501 was built of mudbrick or daub, and had two thick layers of plaster floors. Two narrow entrances were located in the western wall, both plastered. Inside the structure there were several installations, including randomly distributed post sockets, as well as pits and hearths. Several burials were also interred within the structure (and see discussion below). A cache of three plastered skulls were buried in a pit in the open area north of Building 501 (L4187, Figure 5.3; Milevski et al. 2008; Slon et al. 2014; and see below). Later in the sequence, Building 500 was built over the remains of Building 501. The walls of this later building were constructed of stone; several modifications occurred, including the construction of a small room in the southeastern part of Building 500 (Khalaily et al. 2008).

A note should be made of the 'Aceramic Neolithic' occupation suggested by Braun following his excavations in Areas A and B (Figure 5.4); the two lowermost strata exposed in these excavations (strata III and IV) were assigned by Braun to the FPPNB/PPNC. Although relatively restricted in area, they exposed architectural remains, as well as ground and chipped stone assemblages, a faunal assemblage and several human

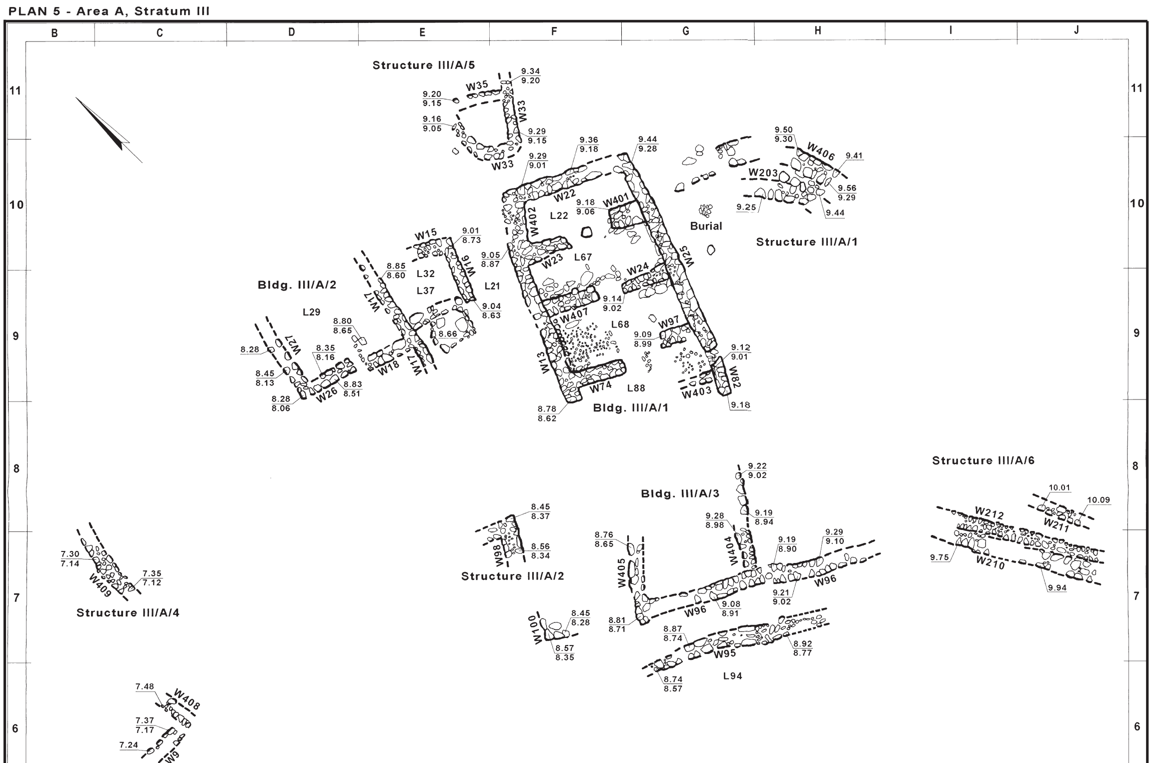

Figure 5.4: Yiftah'el, area A, 'Megaron' structure in Stratum III (after Braun 1997, Plan 5).

burials. Architectural remains include a series of unconnected long walls, perhaps open-air enclosures (stratum III), directly underlying several rectilinear, well-built structures (stratum IV). The latter are multi-roomed, rectangular structures, sharing a common orientation (Braun 1997, p.108). Most interesting is Building IIIA/1, described as a 'Megaron' or 'Pier house' (Figure 5.4; *sensu* Banning & Byrd 1988). This structure comprised an elongated room, divided into three rooms or chambers with 1-2m long buttresses protruding from each side (Braun 1997, fig. 14.1). Braun emphasized similarities between the architecture of stratum III and the PPNC of 'Ain Ghazal. This, together with a single ^{14}C date (6323 ± 205 calBC; Appendix 2, Table 1) deriving from stratum IV and the lack of pottery in direct association with the architecture of Strata IV and III form the base of his assertion for a FPPNB/PPNC date to these strata.

This assertion was questioned following the large excavation seasons in 2007-8; although an extensive area was excavated immediately adjacent to the area excavated by Braun, no sign of a FPPNB/PPNC occupation was found. In the renewed excavations, the occupation following the PPNB is Pottery Neolithic, i.e. Jericho IX or Lodian culture (Khalaily, Getzov & Milevski pers. comms.). Furthermore, Braun's excavation report clearly described the problems encountered during excavation deciphering the stratigraphic sequence and associations of the Neolithic strata; He stated that "...with respect to the Neolithic strata (III and IV), there are significant problems in establishing the relationship between the architecture, artefacts, and the matrix/sediments of the site... it is distinctly possible that much of the material culture recovered from strata III and IV was washed into fills or can be attributed to other post-depositional processes... compounded by the mixture of Pre-Pottery Neolithic and Pottery Neolithic elements..." and "The mixture of the PPNB and PN components is virtually impossible to sort out." (Braun 1997, p.133 & p.142). Consequently, the attribution of these remains to the PPNB is called into question.

At Munhata, architectural remains of the earliest stratum (layer 6) include simple, round huts with beaten earth floors laid over a cobble base[25] (Perrot 1964, 1993). These are replaced in layers 5-4 by rectangular structures built of undressed stone foundations and mud-brick (Figure 5.5); the walls are built of two faces, the outer having a single row of stones, usually up to three courses high, supporting an inner face of mud-brick. Floors were usually plastered and some show signs of polish and even yellow ochre colouring.

In the southern area, an unusual construction was exposed, identified as a ceremonial/ritual locale; associated with layer 5, it is comprised of a large delineated area of ca. 250 m^2. In its centre, five large basalt slabs were laid flat on the ground, featuring large flat artificial grooves, perhaps to drain liquids (Perrot 1993). Surrounding these slabs on the east and north was a pavement of large river cobbles connected to a beaten-earth

[25] These 'huts' do not appear in any of the published architectural plans and drawings and are only briefly described in the excavation report as *"...Elles consistent en aires empierrées (fonds de huttes?) avec débris organiques carbonisés, os fragmentaires et éclats de silex atypiques"* (Perrot 1964, p.325).

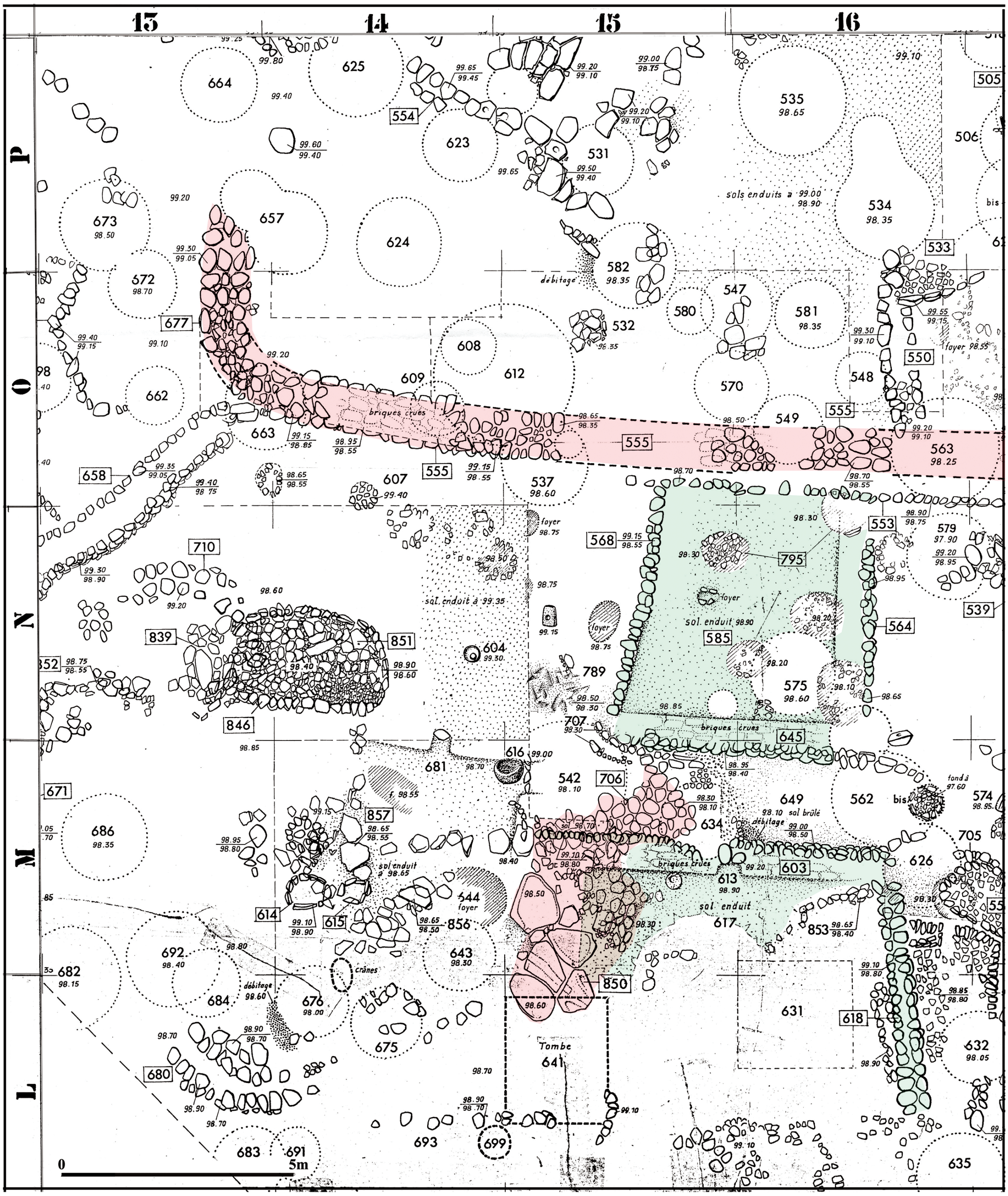

Figure 5.5: Munhata - domestic structures in layer 4 (highlighted in green); and the ceremonial locale of layer 5 (highlighted in red); courtesy of J. Perrot.

floor with hearths. A >20m wall running east-west and curving northwards enclosed this area from the north (Figure 5.5).

Another large ritual activity complex was revealed at Mishmar Ha'emeq; this complex, discovered at the northwestern edge of the site, comprises a large flagstone building and an immediately adjacent burial ground to the east (Figure 5.6; Barzilai & Getzov 2008; Barzilai et al. 2011). The flagstone structure is rectangular (ca. 10x13 m) and is constructed of long low walls or benches made of flat dark basalt stones and light limestone slabs. These delineate an extensive paved area with flat stones (again, both

Figure 5.6: Mishmar Ha'emeq: the 'Flagstone structure' (after Barzilai & Getzov 2008, fig. 4).

basalt and limestone slabs) on top of a plaster/crushed chalk matrix. The paving seems to be made of separate segments, representing either different activity areas or perhaps construction stages. A group of vertically positioned limestone slabs seem to represent the latest phase of this structure (*idem*, p.3). Remains of domestic architecture were also recorded at the site. These include several lime-plastered floors exposed in areas I and J. It is interesting to note that differences in construction techniques were recorded between the two areas; while in area I floors were set on a foundation of small stones covered with mud-brick remains, in area J they were laid on a fill of fine-grained, perhaps sieved sediments (Barzilai & Getzov 2011; Lavi 2013)

At Tel 'Ali, several stratigraphic phases were discerned, each demonstrating different types of architectural remains (Figure 5.7). Stratum IV is divided into two sub-phases, IVa and IVb. The former includes a round hut of mud-brick or daub with three occupation floors, the lowest of which rests on a pebble foundation. The remains of a second hut, with a similar pebble bedding were identified in stratum IVb; it was interpreted as coeval with the huts documented in the adjacent terrace (i.e. 'the olive grove'), representing the earliest occupation of the site. Both huts were recorded in the sections, but do not appear in the plans (Prausnitz 1966). When examining the plans from Tel 'Ali there appears to be a second, rectangular structure of medium-sized fieldstones, also belonging to stratum IVa (Figure 5.7; *idem*, p.168), but there is no reference to this feature in the final report. A short note states the presence of "… round pebble floors

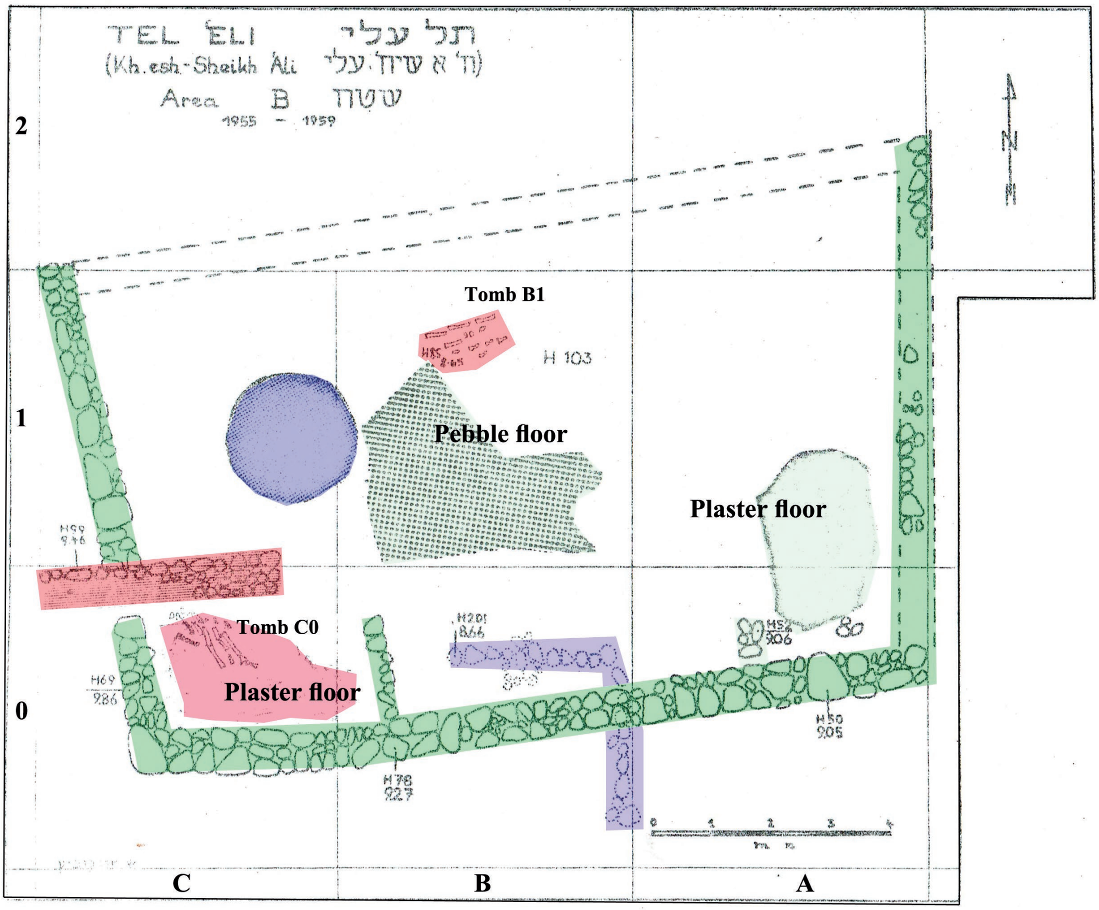

Figure 5.7: Tel 'Ali IV-II architectural remains; Stratum IV (Blue), III (red) and II (green); (after Prausnitz 1966, fig.56).

of huts, as well as rectangular rows of stone, alongside occupation floors." (Prausnitz 1960, p.119).

The overlying stratum III is represented by two burials (C_0 and B_1, and see below), as well as a partial wall and a lime-plaster floor (Figure 5.7). The burial of C_0 was laid beneath the plaster floor, which was built on top of a "... washed down layer intermediate between strata III and IV" (Prausnitz 1970, p.104). Prausnitz interpreted this washed layer as evidence for discontinuity between stratum IV and stratum III.

The main architectural features of stratum D2 are two perpendicular walls (two and three meters long) adjoining a cobble surface, probably representing the partial remains of a rectangular structure (Figure 5.8). Other features include six round pits, ranging from 1-5m in diameter. Two of these pits were filled with small, angular limestone, while a third was filled with thin grey sediment, rich in organic material (Garfinkel 1994, p.546). The entire area was enclosed by a long wall, of which 12 meters were exposed (*ibid.*). If, indeed, Prausnitz's stratum II should also be assigned to this occupation stage, then it provides another example of a rectangular structure, ca. 15x20m in size. This structure (Figure 5.7), built of medium and large-sized fieldstones, comprises three elongated rooms, each ca.2x4m, aligned along the southern facet of the structure, and facing a large courtyard. While the rooms were paved with white plaster floors, the courtyard had pebble flooring (Prausnitz 1966, 166-167).

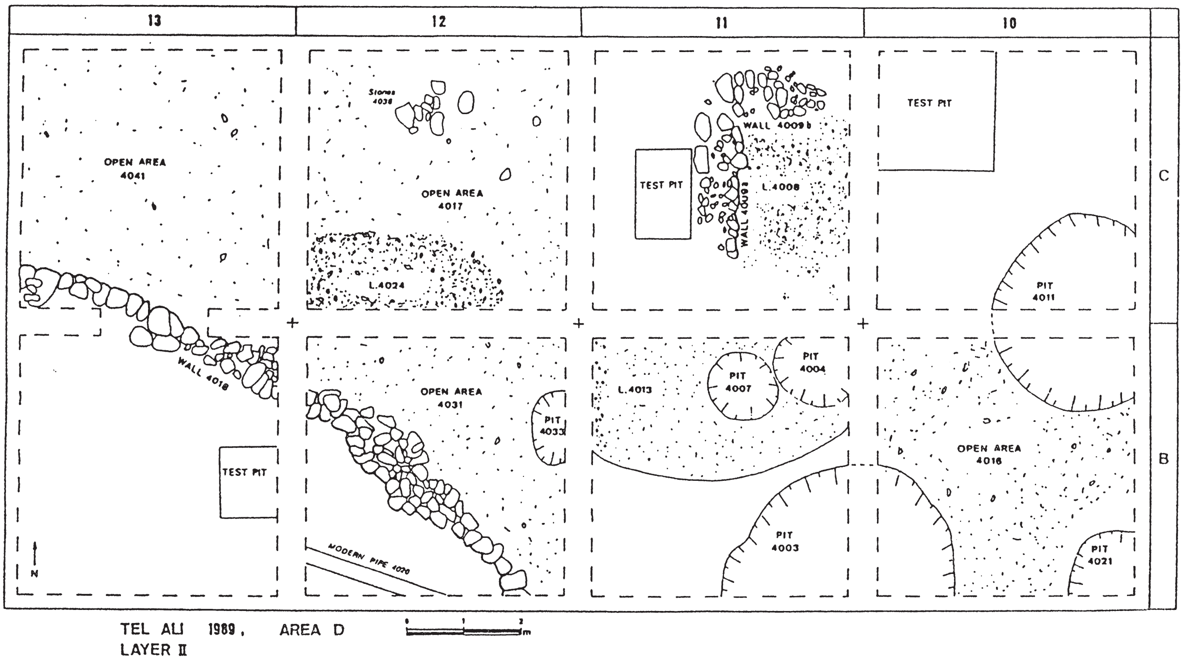

Figure 5.8: Tel 'Ali D2 (after Garfinkel 1994, fig.1).

At Nahal Zippori 3 PPNB remains include three superimposed plaster floors, extending over an area of ca. 50 m^2 (Figure 5.9; Barzilai & Vardi, pers. comm.). The floors were separated by a relatively clean, fine-grained fill devoid of artefacts. A test pit dug beneath the floors demonstrated that this structure was built on sterile soil. Neither the full extent of the floors nor any constructed walls were exposed, thus hindering any discussion of construction methods. Several pits dug into the plaster floors were reported, one of which showed signs of plaster lining. One of these pits (L271), a stone-lined silo, contained large amounts of charred seeds (Caracuta et al. 2014 and see below). No artefacts were recovered from the other pits. A lime-plaster kiln was also reported (Barzilai et al. 2013b).

During construction in the area after the salvage excavations, extensive PPNB remains were documented, adjacent to the originally excavated area (Liran 2012). These included the remains of at least seven plaster floors, some exposed for more than 10m in length. Two architectural phases were clearly discerned. It is interesting to note that these floors were made of thick (ca. 10 cm) plaster, lying on top of a foundation of small stones and cobbles, similar to Building 200 at Yiftah'el area G.

At Ahihud, the initial PPNB occupation is quite ephemeral. It was founded directly on the bedrock, which was also used for rock-cut installations, and as foundations for structure floors, usually constructed of beaten hearth and rich in finds (Figure 5.10). Also ascribed to this phase is a 'habitation level' comprised of a surface made of small stones and a basalt grinding stone. Another possible living floor was constructed of crushed lime and perhaps plaster fragments (Paz & Vardi 2014; Vardi, pers. comm.).

A second phase of occupation, apparently later than and cutting the EPPNB occupation phase, but seemingly cut by the Early Chalcolithic phase, was also documented. This

Figure 5.9: Nahal Zippori 3 PPNB floors (after Barzilai et al. 2013b, fig.5).

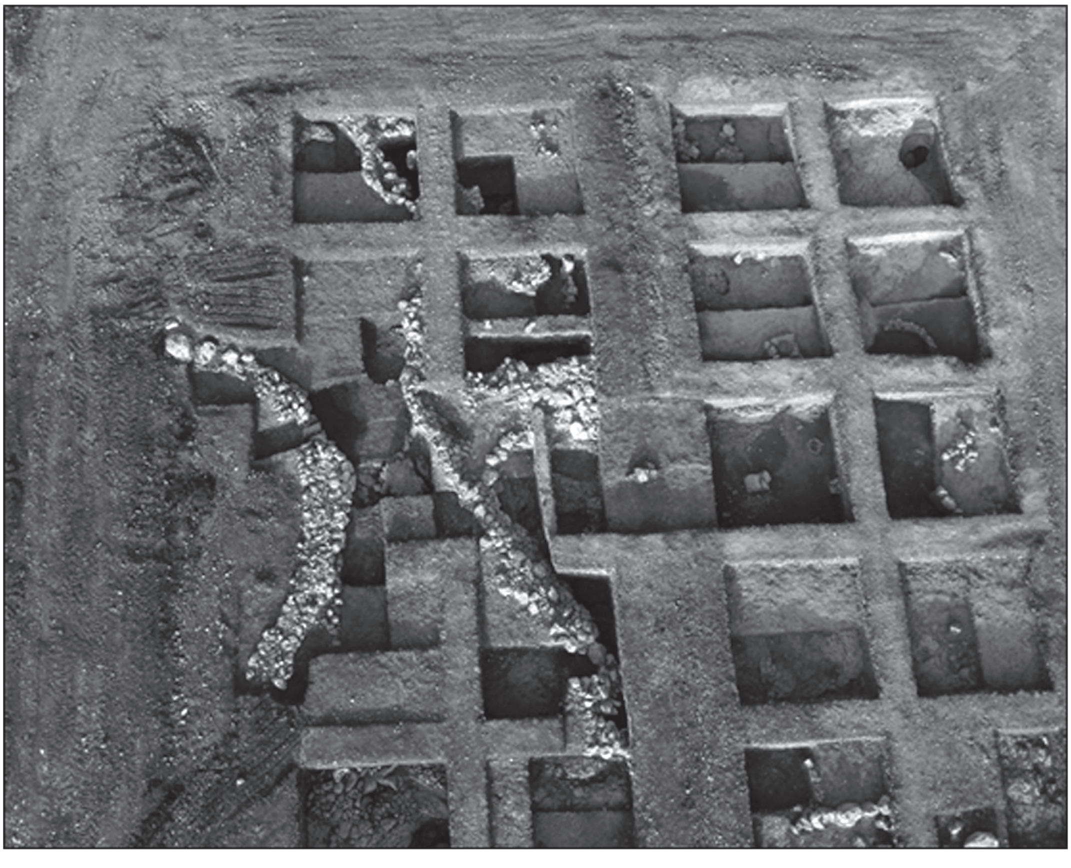

Figure 5.10: Ahihud PPNB remains, view to north. Main EPPNB remains showing at upper right; Possibly MPPNB(?) terrace walls on left (after Caracura et al. 2017, fig.2).

phase is characterized by several walls, built of medium to large-sized stones, some reaching a meter in length, as well as a poorly preserved, round wall that formed a large circle, ca. 15m in diameter. Two semi-circular walls were built perpendicular the northern slope, perhaps serving as terrace walls (Figure 5.10). The walls abutted a thick level of crushed orange limestone (max. thickness 50cm), which was perhaps laid as a stabilizing foundation level. Very few finds were recovered from this later phase, inhibiting a clear chronological placement. However, several projectile points recovered from the two semi-circular, possible terrace walls, may indicate that this phase may perhaps be assigned to a later phase within the PPNB (Paz & Vardi 2014).

The PPNB stratum at Hanaton was exposed in two small areas, ca. 10 m^2 in total and included mainly occupation deposits and several built and rock-cut installations (Figure 5.11). The former include a semi-circular paved surface, of which ca. 1 m^2 was exposed, and a stone-lined hearth, surrounded by medium-sized field stones, which

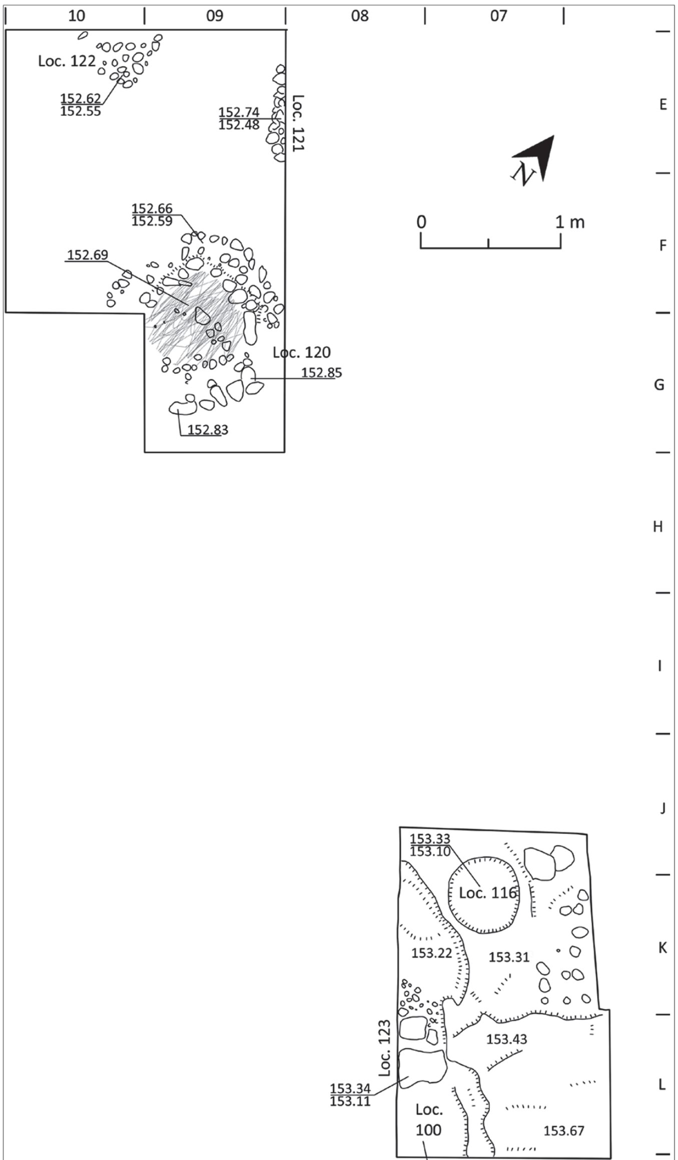

Figure 5.11: PPNB remains at Hanaton (after Nativ et al. 2014, fig.6).

together with what was identified by the excavators as a stone built 'shelf', could represent a cell-like structure (Nativ et al. 2014).

At the other sites, only very partial architectural remains were exposed; these include plaster surfaces (i.e. at the 'Ein Zippori complex and 'Ein el-Jarba) and short wall segments (Kfar Qana).

Discussion

The nature and form of architecture depends on and reflects many variables, including not only the available technology and raw materials, but also a wide range of social and economic factors such as group ideology, structure and organization. Previous studies have shown that differences in house plans reflect broad regional customs as well as sub-regional differences, echoing local group traditions (Goring-Morris & Belfer-Cohen 2013: 276). Indeed, when the data available are reviewed, several regional trends can be discerned, encompassing construction methods and materials as well as plans.

In general, most structures were quadrilateral in plan (Figure 5.12). This is true for all sites where complete or almost complete structures were exposed, i.e. Kfar HaHoresh, Munhata layers 4-5, Yiftah'el, Mishmar Ha'emeq, Tel 'Ali FPPNB/PPNC layers and Tel Jenin. At two other sites, i.e. Kfar Qana and Tel 'Ali MPPNB layer, only wall segments were reported, but even though a complete structure was not exposed, the fact that the wall segments are straight, likely indicates a quadrilateral plan. A few exceptions occurred in the form of oval, round or semi-circular structures; round structures were reported at Tel 'Ali layer IV, as well as at Munhata layer 6, and possibly from Kfar

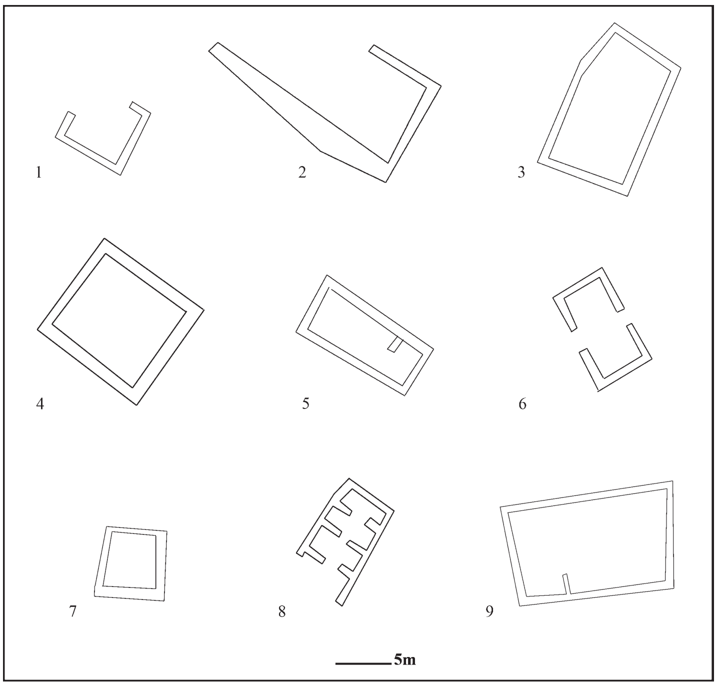

Figure 5.12: Schematic representations of PPNB structure plans from the Lower Galilee; 1) the L1001 complex, KHH; 2) the L1604 complex, KHH; 3) 'Flagstone building, Mishmar Ha'emeq; 4) Building 200, Yiftah'el Area G; 5) Building 501, Yiftah'el Area I; 6) Building 700, Yiftah'el Area C; 7) domestic structure, Munhata level 4; 8) (PPNC?) domestic structure, Yiftah'el Area A; 9) (PPNC?) domestic structure, Tel 'Ali layer II.

HaHoresh (L2223). In both Tel 'Ali and Munhata these are described as small, round huts with beaten earth floors laid on top of a cobble foundation (Perrot 1964; Prausnitz 1966) while at Kfar HaHoresh it was built of stone. Other examples include an oval 'free standing' plaster surface from Kfar HaHoresh phase I (L1151) and a round plaster surface from Tel 'Ali layer III. In both cases the plaster surfaces were directly associated with human burials (Birkenfeld & Goring-Morris 2011; Prausnitz 1970). Other examples included the ceremonial/communal structures at Munhata southern area, layer 4-5 (Perrot 1993). A fifth example comes from Hanaton, where a semi-circular paved surface and a hearth surrounded by medium-sized fieldstones was identified as a 'shelf' rather than a structure (Nativ et al. 2014).

Structures were usually built of a combination of medium-sized undressed limestone blocks and mudbrick or daub. This is apparent in all sites where sufficient architectural remains were exposed, with the exception of Ahihud and Tel 'Ali. At Ahihud, the use of mud for construction does not appear in any of the strata (Paz & Vardi 2014), while at Tel 'Ali layer IV a structure built solely of mudbrick or daub was reported (Prausnitz 1966). The presence or absence of mudbrick could, however, be a result of post-depositional processes, as was suggested at Kfar HaHoresh (Arpin 2004; Goring-Morris et al. 1998, p.3). Thus, the apparent absence at Ahihud could perhaps be related to post-depositional processes.

Differences occur in the interrelation between limestone and mudbrick; at times walls were constructed with a fieldstone foundation, one stone or two stones in width and one to two courses high, together with a mudbrick superstructure. This seems to be the case at Yiftah'el area C (Structure 700) and probably with some structures at Kfar HaHoresh (e.g. L1001 complex). Other examples display two-faced walls, comprised of an outer face built of stone supporting an inner face built of mudbrick, as in the case of Building 200 in Yiftah'el area G and Munhata layers 4-5. A small number of structures, built solely of mudbrick or daub, were also reported, e.g. Building 501 in Yiftah'el area I and the round hut at Tel 'Ali IVa. This might also be the case for at least some of the 'free standing' plaster surfaces at Kfar HaHoresh, e.g. L1151 complex.

Basalt stones and slabs were also used as construction material at several sites, when such material was locally available, including Munhata, Mishmar Ha'emeq and 'Enot Nissanit. At 'Enot Nissanit no actual structures were exposed, and the evidence for the use of basalt derives from the fill within the well, thus inhibiting discussion of its wider context. At Mishmar Ha'emeq, basalt was used in the construction of the benches (as large slabs comprising the 'seats', and as orthostats) as well as in the flooring of the 'flagstone structure' (Barzilai & Getzov 2011, p.306, figs. 3 & 5). At Munhata, basalt was used in the construction of the large 'ceremonial locale' in layer 5 (L850): five large basalt slabs flat with artificial grooves in its centre large (Perrot 1993, p.1047).

Another variation in construction materials is evident at Kfar HaHoresh. Here, the interplay between friable *nari* limestone and hard, rounded dolomite stones is evident in the L1604 complex walls (Goring-Morris, pers. comm.). The use of wood for construction is also noted, mainly as posts/pillars for roof supports. This is most clearly evident at Yiftah'el, where carbonized wood remains were recovered; e.g. in the central room of structure 700 (Area C) where carbonized oak was retrieved from within a post-socket, probably the remains of a doorpost incorporated into a mudbrick wall (Garfinkel et al. 2012d, p.22). In other instances, the proliferation and location of post-sockets within structures also suggests the use of wooden pillars or posts, e.g. Building 200 at Yiftah'el area G (Khalaily et al. 2008). At Kfar HaHoresh, some of the post-sockets were suggested to have been used as bases for ceremonial wooden posts or *totems* (Goring-Morris 2002; 2005).

Variation is also noted in the methods and materials used in the construction of structure floors. Several types of flooring exist; most frequent are lime-plastered surfaces. These appear at nine of the 13 sites where architectural remains were recorded, including Kfar HaHoresh, Munhata layers 5-4, Yiftah'el, 'Ein Zippori complex, Mishmar Ha'emeq, Nahal Zippori 3, Tel 'Ali layers III-II, 'Ein el-Jarba, Kfar Qana and Tell Jenin. In other instances, structures had beaten earth and/or cobble paving, i.e. Munhata layer 6, Ahihud early phase, Kfar HaHoresh L2223, Tel 'Ali PPNC layer and Hanaton. Variation also occurs in the way plaster surfaces were constructed: at times, plaster was laid over a fill comprised of fine-grained, seemingly well-sifted soil, free of finds, i.e. Kfar HaHoresh L1604 complex, Yiftah'el area C, Nahal Zippori 3, Kfar Qana. Other times plaster was laid on top of a cobble/crushed chalk foundation, i.e. Kfar HaHoresh L1001 complex, Munhata, Yiftah'el Building 200, Mishmar Ha'emeq area H. Some surfaces had been re-plastered on more than one occasion, i.e. Kfar HaHoresh L1604 complex and well as later structures and Yiftah'el Building 501. Other times pits dug in the plaster were also re-plastered, e.g. L1604 complex and L1151 at Kfar HaHoresh. Variation also occurs in the thickness and matrix of the plaster itself, and in the quality of its construction. This is manifest not only between different sites, but also within the same sites, as evident at both Yiftah'el (Poduska et al. 2012) and Kfar HaHoresh (Goring-Morris et al. 1994). Here, plaster surfaces were at times built of patches, and are at times too thin and fragile to indicate that they constituted functional flooring (e.g. L1604 upper) Other variations exist in plaster decoration: at Kfar HaHoresh Phase I, for example, plaster surface L1024 was painted in red ochre (Goring-Morris et al. 1998, p.3), while at Munhata layers 5-4 plaster was sometimes polished or coloured using yellow ochre (Perrot 1964).

A general chronological development can be traced in the complexity of the architectural form and structure size, which increased through the PPNB sequence: from the small round huts of Tel 'Ali IV and Munhata layer 6 (ca. 2.5 m in diameter and ca. 5 m^2 in area; Perrot 1993; Prausnitz 1966), to simple, quadrilateral structures in the Middle/ Late PPNB and finally to the large, complex 'pier houses' at Yiftah'el (area E)[26] and 'courtyard house' at Tel 'Ali II, which reached 200 and 300 m^2 in area respectively (Figures 5.12-5.13). During the Middle/Late PPNB, structures exhibit a wide range of sizes: At Yiftah'el, structure 700 (Area C) is approximately 7.5x17 m (130 m^2) in size,

[26] if indeed these layers should be assigned to the PPNC, as suggested by Braun (1997) and Garfinkel (1994, p.546; Prausnitz 1966, p.166-167).

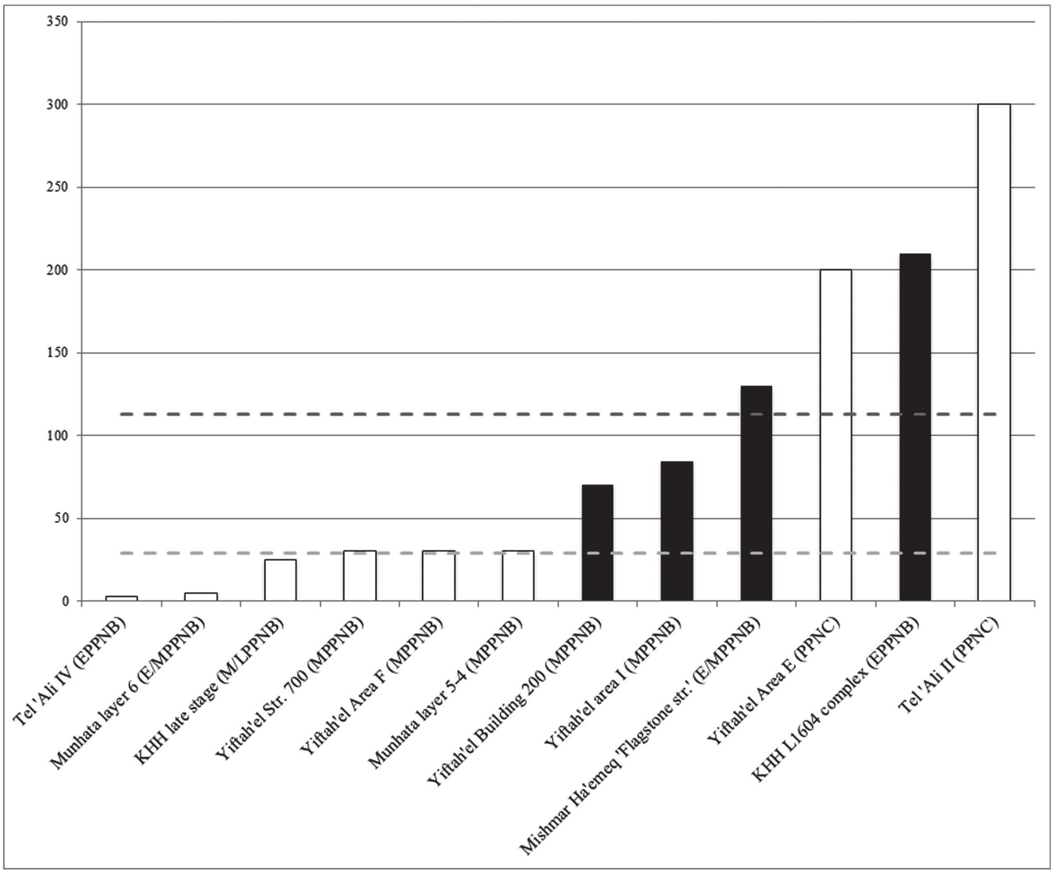

Figure 5.13: PPNB structure sizes in m²: domestic (in white) and communal (in black). Dark grey dashed line shows overall average; Light grey dashed line shows average of domestic PPNB structures, not including communal architecture.

including a main structure of ca. 30 m^2, adjoined by two courtyards (Garfinkel et al. 2012d). In area F, rectangular rooms are similar in size. Other examples are larger, i.e. Building 200 (Area G), which is ca. 70 m^2 in area and Building 501 (Area I), reaching ca. 85 m^2 (Getzov, pers. comm.; Khalaily et al. 2008). At Munhata, the quadrilateral structures of layers 4 and 5 were ca. 25-30 m^2. The ceremonial locale of layer 5 was even larger, reaching ca. 250 m^2 (Perrot 1993), but this is an open area rather than a closed construction. At Mishmar Ha'emeq, the flagstone structure was ca. 10x13 m (ca. 130 m^2 in area; Barzilai & Getzov 2008). Kfar HaHoresh stands out, exhibiting a very different example of EPPNB architecture, comprised of the large, quadrilateral plastered podium (the L1604 complex), measuring at least 21x10 m (>210 m^2 in area). Later in the sequence structures were much smaller, ranging between 5-25 m^2 in area (Goring-Morris 2002). The architectural plan of these structures was also unique, as they usually comprised a plaster surface accompanied by only two walls, rather than four (Goring-Morris 2005, p.94, fig. 12.3). These were usually positioned at the topographically higher, southern side of the structures, perhaps as a means to protect the plaster surfaces from sediments washing in from upslope.

Elements within structures included constructed hearths, pits and other installations such as benches, post sockets, etc. Some installations were built of small to medium sized stones, lying on top of or cutting the plaster surfaces, while other were moulded in plaster or clay and built as an integral part of the plaster floors, e.g. a *tabun* - hearth - (L1254) at Kfar HaHoresh, and a silo (L719) at Yiftah'el. Courtyards were occasionally attached to structures, as suggested by Garfinkel in his reconstruction of Structure 700 in Yiftah'el area C (Garfinkel et al. 2012d, p.22).

Other activities were manifest in different industrial installations found in open areas outside the structures themselves; combustion installations, such as hearths, lined ovens, kilns and fire pits were reported at Kfar HaHoresh, Yiftah'el, Munhata and Mishmar Ha'emeq. Several lithic workshop dumps, evidence of extensive flint production, were recovered at Yiftah'el (Barzilai 2010a) and at Kfar HaHoresh (Barzilai & Goring-Morris 2010; and see discussion below).

Most of the architectural remains described above were interpreted as domestic in nature. However, not every structure is necessarily residential, and several sites displayed less regular architecture, interpreted by the excavators to have served as communal or ceremonial locales: the plastered podium (L1604 complex) as well as later funerary architecture at E/MPPNB Kfar HaHoresh (Goring-Morris & Belfer-Cohen 2014b); the 'ceremonial precinct' at MPPNB Mishmar Ha'emeq, including the 'flagstone structure' and adjoining burial ground (Barzilai & Getzov 2011); and the large delineated 'ceremonial locale' at Munhata layer 5 (Perrot 1993). Other examples of communal buildings were suggested at MPPNB Yiftah'el; these include Building 200 in area G and building 552 and 501 in area I (Khalaily et al. 2008).

The appearance of special purpose, communal and/or ceremonial structures are considered a hallmark of the PPN and is usually connected to a rise in social complexity (e.g. Banning 2003; Goring-Morris & Belfer-Cohen 2008, 2013; Love 2013; Watkins 1990). But how do we define the function of a structure? It seems that the 'communal/ceremonial' structures described above do not share any unique attribute or characteristic; instead, some were differentiated from domestic architecture on the basis of size, construction method or architectural plan. Others, due to the material culture recovered from them or to an association with burials.

Several points seem pertinent from the previous discussion: first, the interplay between two different kinds of locally available construction materials - basalt and limestone at Mishmar Ha'emeq and Munhata, and *nari* and dolomite at Kfar HaHoresh - seems to indicate particular attention to special-purpose structures within sites. This could serve either symbolic or ornamental purposes. In either case there is no doubt that special effort was invested in the construction of these structures.

A second issue has to do with form; generally, as stated earlier, there is a chronological development from round to quadrilateral form during the PPNB. However, it seems that circular constructions continued to appear in special contexts: both at Kfar HaHoresh (L2223 and L1151) and Tel 'Ali III the continued use of the 'archaic' round form is evident in burial-related contexts. In this respect, it is also interesting to note Building 200 at Yiftah'el (Area G). This structure was built in a similar manner to the domestic structures of Munhata layers 4 and 5, i.e. two-faced walls (an outer face built of stone supporting an inner face of mudbrick), as well as a plaster floor constructed on top of a foundation made of small cobbles. This combination is unique to Munhata, and was not reported from other structures at Yiftah'el, even though Munhata layers 4-5 seem to be earlier chronologically than Yiftah'el area G (Crane & Griffin 1970; Milevski, pers. comm.) Here, again, a communal or ceremonial function was suggested for the building.

Finally, a third issue regarding non-domestic architecture relates to size and scale; suggested communal/ceremonial structures seem to have been larger than domestic architecture (Figures 5.12-5.13). This is especially marked during the EPPNB (i.e. the L1604 complex at Kfar HaHoresh in comparison to the round huts of Munhata layer 6 and Tel 'Ali IV), but could also be the case later in the sequence, as the comparison between communal and domestic architecture at Yiftah'el and Munhata indicates.

It must be considered that the clear-cut separation between the mundane and the ritualistic is very much a contemporary notion. It is likely that domestic structures were also symbolically charged and *vice versa*, so-called 'everyday' domestic activities could have taken place in symbolically-charged contexts or centralised in communal areas or structures (and see discussion in Banning 2011; Finlayson et al. 2011). While certain points were brought to light regarding the 'special purpose' locales identified in the Lower Galilee, the small number of fully exposed PPNB structures inhibits a more comprehensive discussion of the issue.

In conclusion, architectural remains across the Galilee show general similarities in both construction methods as well as forms. Some variability is expressed in the use of several construction techniques. This variability does not seem to correspond to any regional or chronological parameters: different methods appear at times in adjacent, seemingly coeval structures within a single site, and *vice versa*, distinct similarities do occur between geographically distant sites.

INHUMATIONS

Human remains were reported from nine sites, including Kfar HaHoresh, Yiftah'el, Ahihud, Mishmar Ha'emeq, Nahal Zippori 3, Tel 'Ali, 'Enot Nissanit, Kfar Qana and Munhata (Table 5.1). The largest number of burials was recorded at Kfar HaHoresh, where 70 graves have been excavated to date, containing over 100 individuals. A wide variety of burial customs have been recorded at the site (see Chapter 4). In summary,

Table 5.1: Summary of studied human remains.

Site	Graves	Individuals	Single	Multiple	Primary	Secondary
Kfar HaHoresh	70	108	35	15	17	34
Yiftah'el	34	43	26	8	24	8
Mishmar Ha'emeq	8	8	8	0	1	7
Nahal Zippori 3	2	2	2	0	1	1
Tel 'Ali	2	5	0	2	5	0
Kfar Qana	1	2	0	1	0	2
Ahihud	2	2	2	0	1	1
Nissanit	1	3	0	1	0	3
Total	120	173	73	27	49	56

burials at Kfar HaHoresh include both primary and secondary, single and multiple inhumations. Several general characteristics were observed, including the interment of grave goods with the deceased, post-mortem skull removal, skull caching and a strong association between the human burials and the remains of specific faunal species, such as the aurochs, the gazelle and the fox (Eshed et al. 2008; Goring-Morris 2005, 2008; Horwitz & Goring-Morris 2004). Several temporal trends were identified within the Kfar HaHoresh sequence; the relative number of burials rises with time, as well as the frequency of multiple and secondary burials. The use of grave goods intensifies as well, and in general, ritual practices seem to become more complex.

The second largest record of human burials derives from Yiftah'el. Here, 34 clear cases of intentional burials were recorded during the various excavations, representing 43 individuals (Tables 5.1-5.2). In general, burials follow 'conventional' PPNB traditions; most of the burials are primary, single inhumations found in either flexed or semi-flexed positions, underneath house floors. They include both males and females, and all age groups are represented (Getzov, pers. comm.; Hershkovitz et al. 2012; Lamdan & Davis 1983; Milevski & Khalaily pers. comm.; Smith & Horwitz 1997).

Most of the secondary, multiple burials in this assemblage originate in questionable contexts; For example, the secondary burial of two young male adults found in area E (T15) originated in layer B, which was damaged by intrusions and disturbances. Mixed flint and pottery assemblages suggest Late Neolithic as well as EBI and Wadi Rabah intrusions into the PPNB layer, thus raising doubts regarding the stratigraphic context of this burial (Braun 1997, p.36). Four other quite fragmentary, secondary and multiple burials were reported from areas A and B. Braun (1997, p. 122) originally suggested a FPPNB/PPNC date for these burials; however, it is quite possible that these should actually be dated to the Pottery Neolithic (and see discussion in Chapter 3).

Skull removal was recorded in at least five instances but is clearly not ubiquitous throughout the site. Both male and female adults as well as children were treated in this manner. No grave goods were reported from any of the burials (Getzov, pers. comm.; Hershkovitz et al. 2012; Lamdan & Davis 1983; Milevski & Khalaily pers. comm. Smith & Horwitz 1997).

Nearly all of the burials (31 out of 34) were found in association with plaster floors; Five burials were associated with Structure 700 in area C, and at least 10 burials were located in pits under the plaster floors of Buildings 501, 502 and 552 in area I. It is interesting to note that in two of the buildings (Building 501 and 552) aurochs remains were also buried underneath the plaster floors; the former comprised a horn interred in proximity to a multiple, primary burial of two adult individuals. The latter comprised a burial of an almost complete aurochs skeleton in articulation, near a primary burial (Milevski & Khalaily, pers. comm.). Two instances of skull caching were also recorded in area I; the first included three plastered skulls interred in the open area immediately north of Building 501 (Milevski et al. 2008). The second, a single fragmented skull, was recorded lying directly on top of a low wall delineating Building 501 to the east (Milevski & Khalaily pers. comm.).

Human remains are less frequent at the remaining seven sites; at Mishmar Ha'emeq, eight burials were recovered adjacent to the flagstone structure, in a small open 'burial

Table 5.2: Burials from Yiftah'el

Area	Layer	Locus	Association	Primary/ secondary	Single/ multiple	Composition
A/B[1]	III(*)	L22	Building IIIA/I	?	Multiple	Partial remains of a child found under house floor; Burial also contained adult phalanges and tarsals and child phalanges.
	III(*)	L68	Building IIIA/I	Secondary	Multiple	Cranial fragments and teeth of an adult and child recovered from under pebble floor.
	III(*)	L69	Building IIIA/I	Secondary	Multiple	Incomplete remains of adult male and female.
	III/IV(*)	L315	Building IIIB/I	Secondary	Multiple	Secondary burial containing the remains of an adult male, adult female and a child, under house floor.
C[2]	1	H1	Pit dug in brick debris above structure 700	Secondary	Single	Partial remains of a male adult; No long bones recovered.
	1	H2	Pit dug in brick debris above structure 700	Primary	Single	Articulated burial of adult female in flexed position. Skull removed.
	2a	H3	Structure 700	Primary	Single	Damaged remains of a primary burial of an adult female, in a pit beneath the plastered floor of the southern courtyard. Skull removed.
	2a	H4	Structure 800	Primary	Single	Poorly preserved remains of a newborn uncovered at the edge of the floor. Reconstructed as originally buried under plaster floor.
	2a	H5	Structure 700	?	Single	Newborn skeleton found beneath floor level.
	2a	H6	Structure 700	Primary	Single	An infant buried in a flexed position under plaster floor of Structure 700.
	2b	H7	Structure 730	Primary	Single	Damaged articulated burial of an adult male beneath plaster floor of structure 730. Skull removed.
D[3]	?	?	Structure	Primary	Single	Highly damaged burial of an adult female.
E[5]	B(*)	T15	Open area	Secondary	Multiple	Partial remains of two adult males; mainly skull fragments and few post-cranial bones.
	C3	T30	Structure	Primary	Single	Articulated burial of an adult female, in a semi-flexed position, beneath plaster floor. Skull and mandible removed.
F[4]	5d	H26	Unknown	Primary	Single	Burial of a child (6-8 years old).
G[7]	B5	L2231 (H20)	Open area	Secondary	Single	Secondary burial of an adult in a pit dug into sterile soil; about 15 m south west of building 200.
H[7]	-	L3057 (H19)	-	Primary	Single	Articulated burial of an adult female (40-50 years old) in a flexed position, in a pit under plaster floor.

[1] Smith & Horwitz 1997
[2] Hershkovitz et al. 2012
[3] Lamdan & Davis 1983
[4] The anthropological remains from the 2007-2008 seasons of excavation at Yiftah'el have not yet been published in full. They are studied by Julia Abramov as part of her MA thesis, to be submitted to the Tel Aviv University.

Table 5.2 (cont.).

Area	Layer	Locus	Association	Primary/ secondary	Single/ multiple	Composition
I[*]	3b	L5190	Building 550	Primary	Single	Burial of an adult male
		L5196	Building 550	Primary	Single	Burial of an adult female (20-40 years old) under house floor.
		L5562	Building 550	Primary	Single	Burial of an adult, unknown sex.
		L5224 (H6, H7 & H8)	Building 502	Primary	Multiple	Triple burial of two males and a female in flexed and semi-flexed positions, in an embrace-like arrangement.
		L5304 (H16)	Building 551	Primary	Single	Articulated burial of an adult between two plaster floors.
	3c	L5302 (H7)	Building 551	Primary	Single	Articulated burial of a young adult male
		L5303 (H15)	Building 551	Primary	Single	Articulated burial of an adult in semi-flexed position, in a pit cut through the wall and floor of Structure 551.
	3c/d?	L5024	Building 500	Primary	Single	Pit burial of an adult male in flexed position.
	3d	L5228 (H4 & H5)	Building 501	Primary	Multiple	Burial of an adult male (age 40-60) and child, in flexed and semi-flexed positions, respectively. The skull of the child removed.
		L5300/ L5282 (H13)	Building 501	Primary	Single	Neonate burial in a pit within the structure.
		L5309 & L5583 (H12 & H18)	Open area	Primary	Multiple?	Intermingled graves of an adult, possibly female, and a neonate.
		L5580 (H9)	Building 501	Primary	Single	Articulated burial of an adult male in flexed position under the floor of Building 501.
		L5581 (H10)	Building 501	Primary	Single	Articulated burial of an adult male in semi-flexed position under the floor of Building 501.
		L5582 (H11)	Building 501	Primary	Single	Articulated burial of a child in flexed position under the floor of Building 501.
	3e	L4168	Open area	Primary	Single	Pit burial of an adult male
		L5543	Building 554	Secondary	Single	Secondary burial of an adult.

(*) PPNB dating of these finds is questionable (see discussion above).

ground' delineated to the south by a long wall (Barzilai et al. 2011). All graves were single burials of adults, representing seven males and a single female. Of the eight, one was a primary burial, while the other seven were secondary. Grave goods were recovered from two of the burials, including a Byblos point from a male burial and a cowrie shell and aurochs remains from the female burial (*ibid.*).

At Nahal Zippori 3 two burials were documented in pits cut into sterile soil and covered by a plaster floor. Both burials are of adults; only post-cranial remains were reported, but while one seems to have been articulated, the other was secondary (Barzilai et al. 2013b). No grave goods were recorded (Vardi, pers. comm.).

At Tel 'Ali, two multiple primary burials were recorded in layer III beneath a plaster surface (Figure 5.7). Tomb B_1 contained an adult male, a juvenile and a child, while Tomb C_0 contained two poorly preserved individuals, probably adult females (Haas 1974, p.39). Beneath the burial of C_0 large quantities of animal bones were recovered, including the bones of aurochs, gazelle, fox and a canine. It is unclear whether these were grave goods (*idem*, p.37-38). Prausnitz (1957b, p.263) noted that the burials lacked the skulls.

At Ahihud, human remains included two burials. One was a primary burial in flexed position, with the skull removed. The other comprised several human bones interred in a natural depression in the rock surface that was further extended by rock cutting. Other remains include isolated finds of bones, some found in contexts with flint and stone artefacts, and interpreted as grave goods (Paz & Vardi 2014).

At Kfar Qana, a burial was recovered in a pit in area III, comprised of the non-articulated remains of two individuals, represented by two mandibles and two long bones (IAA archives). It was unclear during excavation whether these remains should indeed be ascribed to the PPNB; however, a large naviform blade on high quality purple flint was recovered from the burial, suggesting a PPNB date (pers. obs.).

Human bones including a mandible, a skull with mandible and other skull fragments were recovered from the fill of the well at 'Enot Nissanit. These represent three individuals: an adult female and male and a third individual of indeterminate sex and age. Two large stones located at the top of the layer were interpreted as grave stones, causing the excavator to suggest that this was an intentional burial (Tepper 2014).

Human remains at Munhata included a few isolated bones from fills in and around structures, but no clear, intentional burials were discerned. Two fragmentary skulls were apparently found on the floor of a hut in level 6, possibly in association with caprinae horn cores (Perrot 1993, p.1048).

Discussion

In summary, 120 graves comprise the human remains assemblage in the current study, representing 176 individuals. Most burials contain single inhumations, and secondary burials are more frequent than primary ones (Table 5.1, Figures 5.14-5.16). This is especially apparent at Kfar HaHoresh, which by itself accounts for more than half of the secondary burials recorded in the Galilee. Mishmar Ha'emeq also stands out in that respect, as seven out of the eight burials were secondary. It is important to note that when secondary burials were noted at other sites (i.e. Ahihud and Kfar Qana), they included very few bones, and the question is raised as to whether these should in fact be defined as intact, intentional burials, or rather as isolated remains or disturbed contexts (not necessarily post-Neolithic disturbance).

At most sites burials were found in direct association with structures (mostly under plaster surfaces), in pits dug in open areas, or in association with installations (such as the well at 'Enot Nissanit). The situation at Mishmar Ha'emeq, where the burials

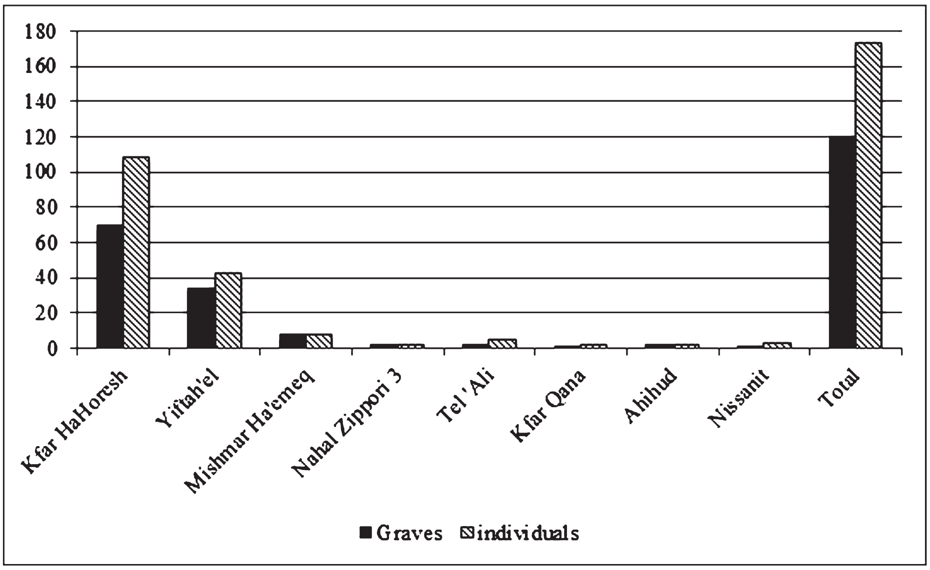

Figure 5.14: Ratio between number of graves and minimum number of individuals, by site.

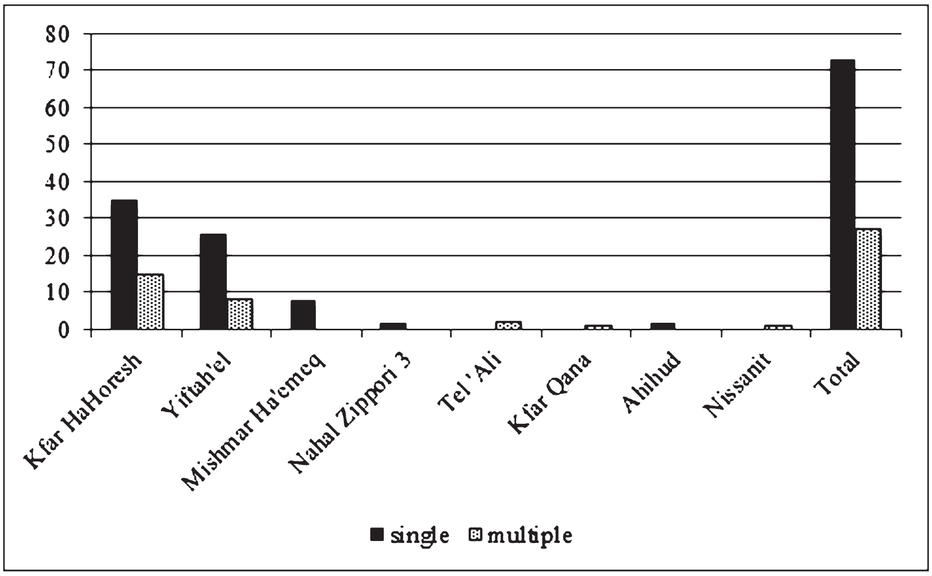

Figure 5.15: Ratio between single and multiple burials, by site.

were found in an open delimited area, albeit in proximity to the flagstone building (i.e. the 'burial ground'), is unique. So is Kfar HaHoresh, which was interpreted by the excavator as a mortuary centre (and see discussion in Chapter 7).

Grave goods are almost absent. Only at Kfar HaHoresh and at Mishmar Ha'emeq clear instances of grave goods were reported. These include mainly flint tools, shells and 'exotic' artefacts such as ornaments, minerals, etc. Another aspect of the ritual world is manifest in the association of burials and animal remains. At Kfar HaHoresh

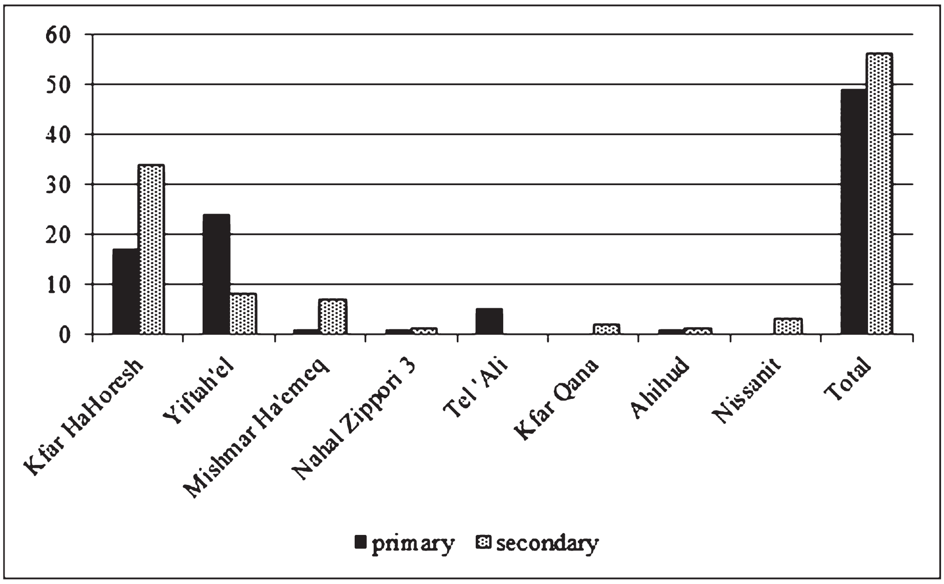

Figure 5.16: Ratio between primary and secondary burials, by site.

a clear association between burials and animals such as the aurochs, the gazelle and the fox was demonstrated (Horwitz & Goring-Morris 2004). The same species appear in association with Tomb C_0 at Tel 'Ali, together with canine remains. The aurochs appears again at Yiftah'el, as well as at Mishmar Ha'emeq. Caprinae remains were reported from Munhata associated with human cranial remains, somewhat reminiscent of the gazelle skeleton found with the plastered skull at Kfar HaHoresh (*idem,* p.173)

It is difficult, given the limited nature of the available data, to discern any clear chronological trends between the different sites. However, it is interesting to note that at the early occupations at Ahihud and Mishmar Ha'emeq all burials are of single individuals. Multiple burials were observed at the later sites, e.g. Kfar Qana and Nissanit. This possibly echoes the identified pattern at Kfar HaHoresh, where multiple burials become more common during the later phases of the period.

FAUNAL REMAINS

Faunal remains were reported from 13 sites, but data available regarding these assemblages is limited, with detailed reports only available for seven of these assemblages: Kfar HaHoresh, Munhata, Yiftah'el, Mishmar Ha'emeq, Sha'ar Hagolan, Tel 'Ali and Ard el-Samra (Appendix 2, Tables 4-5)[27]. Even when detailed reports are available, data are still partial as at Kfar HaHoresh and Mishmar Ha'emeq (Goring-

[27] Other preliminary reports are available: at Ahihud and Nahal Zippori 3 faunal reports have not been published, with only preliminary descriptions of species present in the assemblages (Paz & Vardi 2014; Vardi, pers. comm.). At the 'Ein Zippori complex, data are available only for the 2007 season, which comprises only two identifiable bones from PPNB contexts, impeding further discussion (Barzilai et al. 2013a). At 'Enot Nissanit, Hanaton and Kfar Qana the existence of faunal assemblages is mentioned in preliminary reports, with analysis being on-going (Nativ et al. 2014; Smithline pers. comm.; Tepper 2014).

Morris et al. 1994, 1995; Horwitz 2009; Horwitz & Goring-Morris 2004; Meier & Munro 2012; Meier et al. 2016, 2017a, b; Sapir-Hen et al. 2016). At Tel 'Ali, on the other hand, the entire assemblage was analysed but suffers from other problems, such as missing items and small number of specimens (Jarman 1974, p.50; Lev-Tov 2000, p.208). Sample size is also an issue at several other sites, e.g. Ard el-Samra (n = 94) (Marom 2014).

The six PPNB assemblages for which detailed reports are available are dominated by ungulates, mainly the mountain gazelle (*Gazella gazella*), wild goat (*Capra aegragus*), aurochs (*Bos primigemius*) and wild boar (*Sus scrofa;* Figure 5.17). Other ungulates also include the red (*Cervus elaphus*), roe (*Capreolus capreolus*) and fallow deer (*Dama dama*) in lower frequencies. Also present, in much lower proportions, are small game species, primarily the spur-thighed tortoise (*Testudo graece*), hare (*Lepus capensis*) and carnivores, specifically the fox (*Vulpes vulpes*).

The assemblages can be divided into two groups, displaying two main trends (Figure 5.18); the first, including the sites of Kfar HaHoresh and Yiftah'el, are assemblages dominated by gazelle, which comprise 30-50% of the assemblages (Appendix 2, Table 5). At Yiftah'el, the gazelle is followed by wild goat (ca. 15-20%), aurochs (6-17%) and wild boar (7-17%). At Kfar HaHoresh, on the other hand, smaller species, such as the fox and tortoise are more numerous than the aurochs or the pig, but this could reflect differences in retrieval techniques.

A second trend is exhibited by the assemblages from Mishmar Ha'emeq, Ard el-Samra and Tel 'Ali III-IV (Figures 5.17-5.18). Here aurochs and wild boar were the two dominant species. At Mishmar Ha'emeq wild goat and wild boar (both ca. 17%), and gazelle (ca. 14%) occurred in similar frequencies. At Tel 'Ali III-IV gazelle is also the third most frequent species, comprising ca. 11% of the assemblage, while at Ard el-Samra it comprises only 6%, while a substantial caprovine group comprises 28% of the assemblage. Other variability between sites may reflect sample size, retrieval methods and local ecological conditions.

Munhata shows an interesting, somewhat intermediate pattern (Figures 5.17-5.18): wild sheep (together with the caprovine group) and the gazelle are the two dominant species, comprising ca. 25% each in both published assemblages, and aurochs and wild boar follow closely with ca. 15% of the assemblage. Surprisingly, the assemblage originating from Perrot's excavations includes ca. 13% of domestic cattle, but no aurochs, while the assemblage from Commenge's excavations shows the exact opposite trend (Horwitz & Commenge-Pellerin in press). Distinction between the two was made based on metric rather than morphometric measurements (Ducos 1968, p.84). This difference might reflect the relatively small sample size, or alternately, problematic stratigraphy given the presence of overlying PN levels. The presence of wild sheep is also of interest, as the natural habitat of this species during the Holocene was restricted to the Taurus and Zagros ranges, thus suggesting at least some level of animal control (Said-Agha 2011 and references therein). Other hunted game includes roe deer (in Munhata and Yiftah'el), fallow deer (in Kfar HaHoresh, Munhata, Ard el-Samra and Tel 'Ali), as well as red deer (in Yiftah'el and Mishmar Ha'emeq). Several unique finds

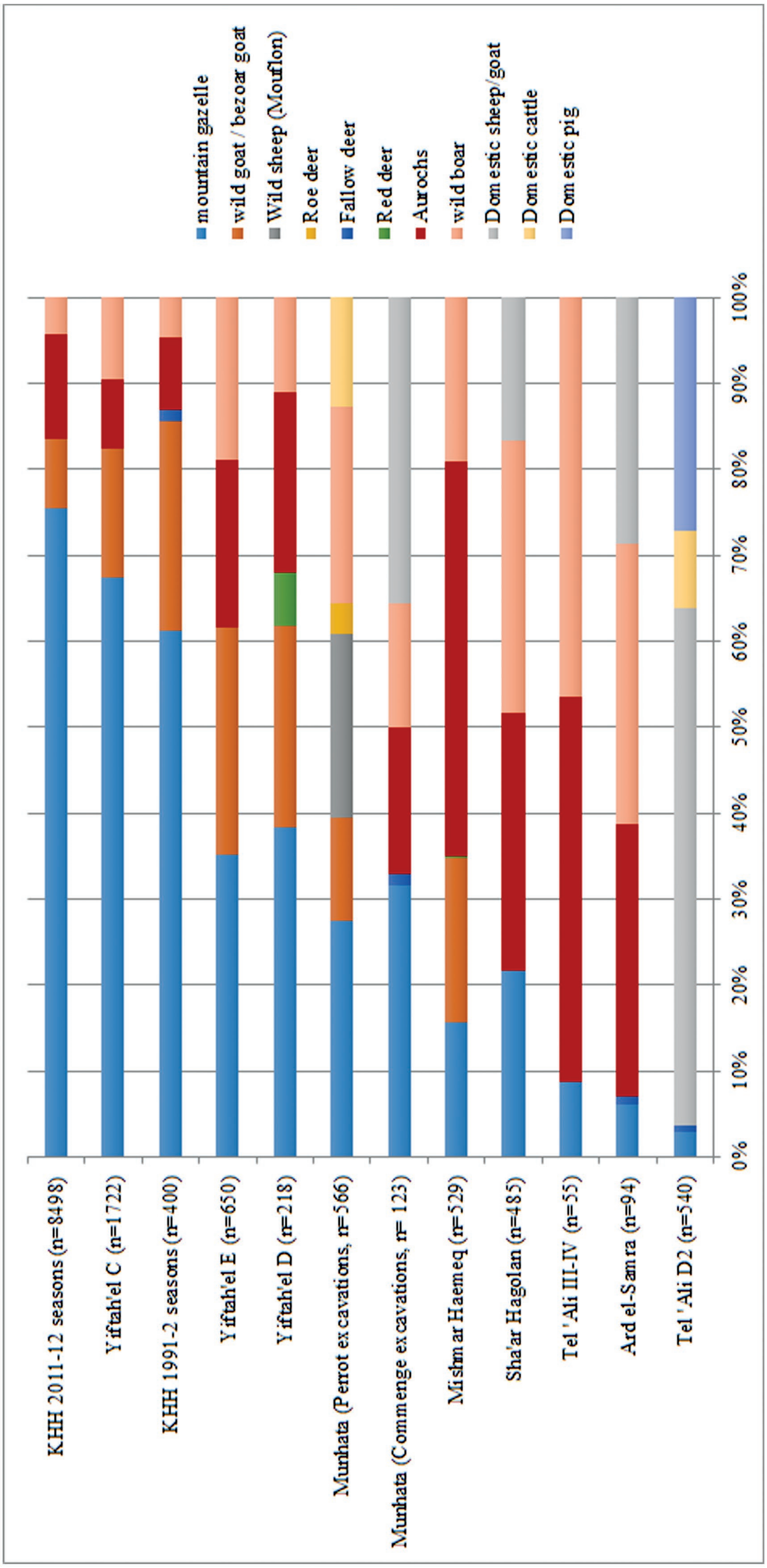

Figure 5.17: Frequencies of main ungulate species, by assemblage.

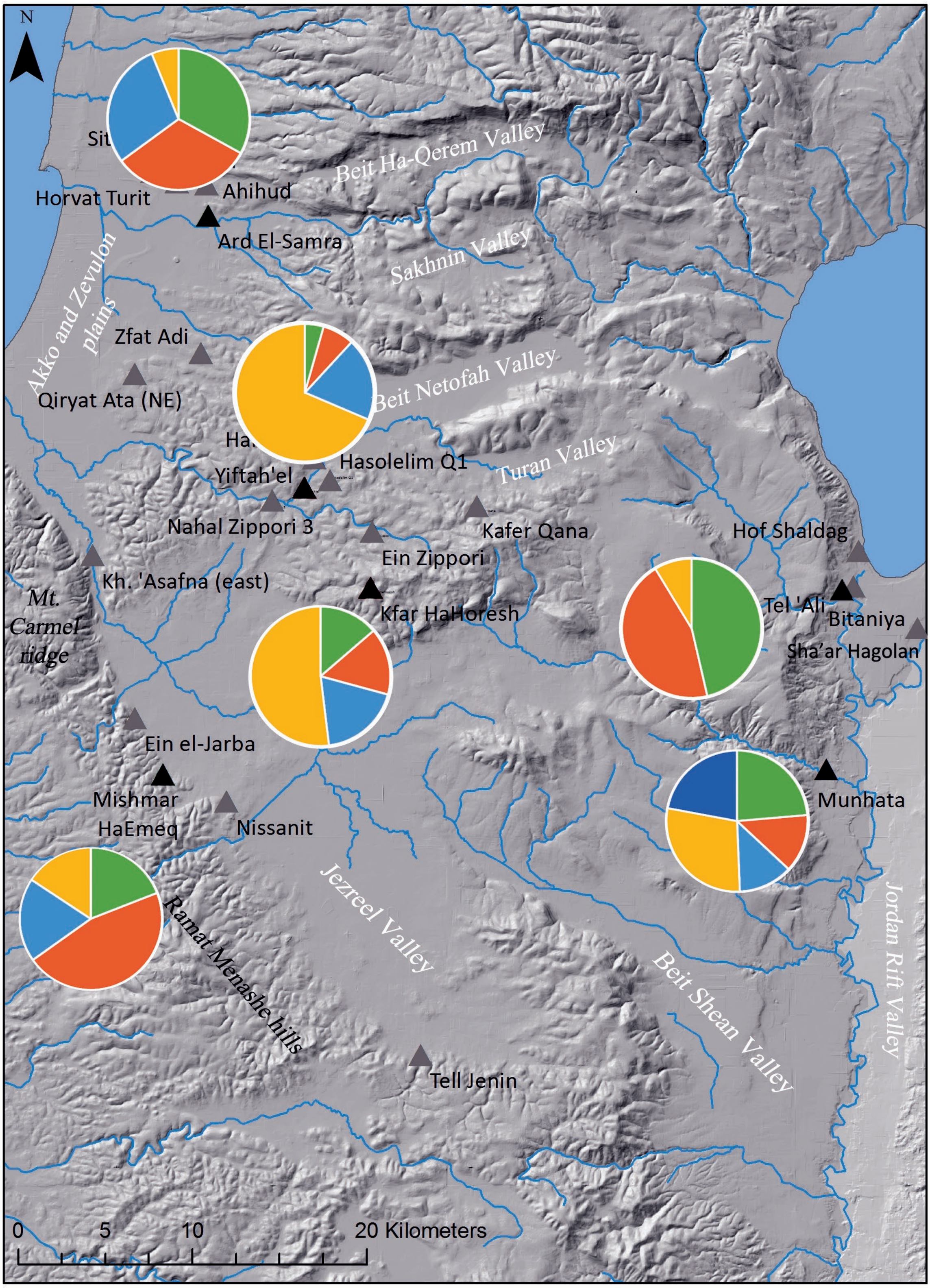

Figure 5.18: Site locations and main PPNB ungulate species frequencies: gazelle (yellow), wild goat (light blue), aurochs (orange), wild boar (green) and wild sheep (dark blue).

include a leopard (*Panthera pardus*) bone bearing butchery marks in the Mishmar Ha'emeq 'burial ground' (Marom 2012a), and a hippopotamus (*Hippopotamos amphibious*) tooth at Ard el-Samra (Marom 2014). Other, smaller species that appear in low frequencies are fox, hare, birds, fish and reptiles, as well as felines and canines.

It seems that during the PPNB hunting expeditions were not necessarily long-distance, as the faunal assemblages reflect the local environments and habitats around sites. Gazelles' favoured habitats are open, stony land, like the foothills of the Lower Galilee and the edges of the large valleys (including the basaltic high plains of the eastern Lower Galilee and the Beit Shean Valley). Fallow deer prefer park-forests and Mediterranean forests and scrubs, which can be found within a day's walk of most sites. Roe deer and red deer, on the other hand, prefer denser woodland suggesting that areas further away, such as the Carmel Mountains, may have been exploited on occasion.

The only assemblages to undoubtedly exhibit the exploitation of domestic animals are the FPPNB/PPNC assemblages of Tel 'Ali layer D2, Sha'ar Hagolan and Yiftah'el Areas A and B[28] (Figure 5.17; Appendix 2, Tables 4-5), and it seems that the exploitation of domestic animals was more developed during this period, as evidenced throughout the southern Levant (Horwitz & Lernau 2003). However, while these assemblages differ significantly from the other five assemblages discussed, they also differ from one another; the assemblage from Tel 'Ali D2 is dominated by domestic animals, including mainly the domestic pig, cattle, sheep and goat. Wild animals, such as gazelle and fallow deer also appear, but in very low percentages (ca. 1%). At Yiftah'el, the domestic sheep/goat dominates the assemblage, comprising nearly 50% (Horwitz 1997). However, unlike the evidence from Tel 'Ali, the assemblage from Yiftah'el indicates the continued importance of hunting: gazelle, fallow deer, aurochs and wild boar are still represented. Nevertheless, there seems to be a change in hunting techniques: while gazelle hunting was much reduced during the FPPNB/PPNC (from ca. 40% during the PPNB to ca. 6% during the FPPNB/PPNC), aurochs percentages do not decrease, and wild boar hunting even increases to 21% of the assemblage. Indeed, Marom and Bar Oz (2009) propose that, with the transition to farming economies, less attention was given to long-range hunting expeditions; rather, attention focused on hunting boar and aurochs, which were likely foraging in the vicinity of agriculturally-modified habitats, especially in places where these species were naturally abundant. A similar situation was recorded at Sha'ar Hagolan, where the assemblage is dominated by domestic goat and sheep. They are followed by wild boar and cattle. However, at Sha'ar Hagolan it has been suggested that both species were husbanded (Marom 2012b, p.62). The gazelle is also represented (13%) there, together with other hunted species such as the roe and red deer.

Modern populations of wild boar inhabit a variety of habitats, but their preferred environs are well-watered oak forests and thicketed areas along water streams (Horwitz

[28] It should be taken into account however, that the chronology of these Yiftah'el assemblages is under debate; thus, the validity of the faunal assemblage is questionable (and see discussion above).

& Lernau 2003). Aurochs prefer relatively open environments such as alluvial valleys and hill slopes, which provided ideal pasture (*ibid.*). Thus, the large Galilean valleys such as the Jezre'el valley and the Beit Netofah valley, as well as the large river systems such as Nahal Zippori, were probably prime locations. The Jordan Rift Valley, which at that time held rich riparian and alluvial habitats, also provided favourable conditions for aurochs and wild boar (Marom & Bar-Oz 2013, p.2). This proximity to natural habitats could also explain the dominance of these species at Mishmar Ha'emeq, Ard el-Samra, Sha'ar Hagolan and Tel 'Ali (and to lesser extent – Yiftah'el) in comparison to the Kfar HaHoresh assemblage.

A change in hunting practices was also suggested by Horwitz and Lernau (2003, p.27), based on an observed shift in the size of hunted gazelles in the Yiftah'el assemblages, signifying an altered sex ratio and the hunting of more male gazelles during the FPPNB/PPNC relative to preceding periods. Recent study of the MPPNB faunal assemblage there deriving from the 2007-2008 excavations supports this conclusion, indicating that the increase in abundance of the three progenitor species (goat, aurochs and wild boar), together with the decline in their body size and the de-intensification of wild prey hunting, indicate some sort of human control that began with the onset of the EPPNB and preceded more obvious evidence for managed culling (Sapir-Hen et al. 2016).

Molluscs

A different faunal resource exploited during the PPNB is molluscs. Molluscs were reported from several sites, including Kfar HaHoresh, Yiftah'el, Ard el-Samra and Kfar Qana. They include both marine and lacustrine shells as well as land-snails[29]. Unlike other species discussed above, molluscs do not seem to have been a part of the Neolithic diet in the region. They were treated as ornaments, and many were perforated and fashioned into pendants and beads.

At Kfar HaHoresh, marine molluscs are abundant, comprising more than 2000 items (not including the 2011-2012 seasons of excavation; Goring-Morris 2010, pers. comm. and see Bar-Yosef Mayer 2018). These include mainly Mediterranean species, but Red Sea and fresh water species are present as well. The assemblage is comprised mainly of the Mediterranean bivalves, *Cerastoderma glaucum* and *Glycymeris insubrica* (Figure 5.19: 1-2; 59% and 29% respectively) as well as a wide variety of other species, such as *Nassarius*, *Cypraea* and *Donax* sp. Red Sea species are represented by *Cypraea erosa nebritas* (Cowry shells; Figure 5.19: 4) and *Pinctada margaritifera* (Black-Lip Pearl Oyster). Also common are freshwater *Melanopsis praemorsa*. A possible cache of hundreds of these shells was found adjacent to a late stage burial of an adult male (L1926, see Chapter 4). Although it has been frequently suggested that *Melanopsis* shells were brought to PPNB sites unintentionally within mud-brick material (e.g.

[29] As land-snails could have found their way into the sites unintentionally, either within mud-brick material or vegetation (or even after occupation of the site ceased), they will not be dealt with in the following discussion.

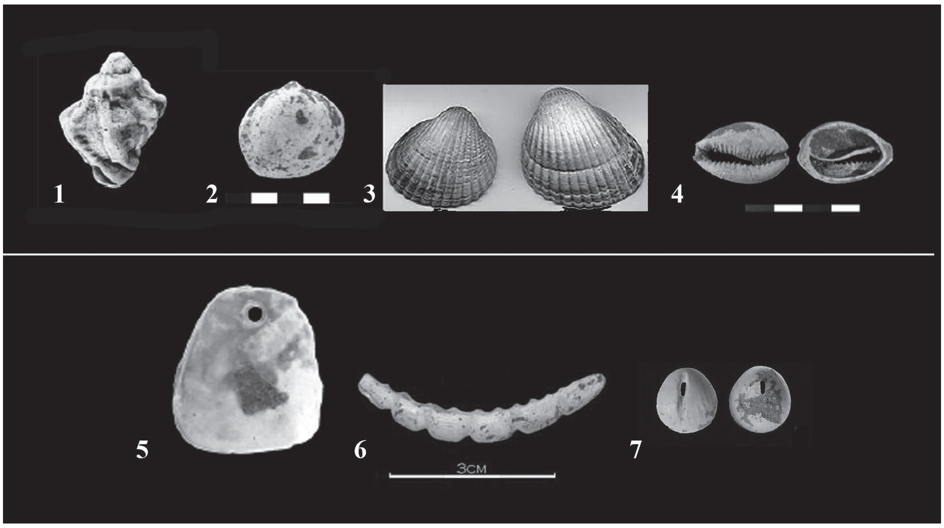

Figure 5.19: Modified and unmodified molluscs from Kfar HaHoresh; 1) Murex; 2-3) Glycymeris violacescens and cardium; 4) modified Cypraea; 5) Mother-of-pearl pendant; 6) Spacer pendant from Phalium granulatum; 7) Unidentified, modified & pierced marine mollusk (after Goring-Morris 2010, figs. 32-33).

Garfinkel et al. 2012a, p.280), this find could indicate intentional use of this freshwater shell. Signs of modification are apparent on many items, and many of the molluscs recovered at Kfar HaHoresh are holed, either naturally or intentionally (Figure 5.19: 4-7). Worth noting are a few spacer pendants made of Phalium granulatum (Figure 5.19: 6; Goring-Morris 2010, p.63). Molluscs are known from several burial contexts, and probably served as grave goods (*idem,* p.82).

The second largest assemblage is the assemblage from areas C and D at Yiftah'el (N = 440; Bar-Yosef Mayer & Heller 2012). Its composition is quite similar to the Kfar HaHoresh assemblage, with over 98% of the marine species originating in the Mediterranean and 1.3% originating in the Red Sea. Most common are the *Cerastoderma glaucum* and *Glycymeris insubrica* (comprising ca. 11% each) as well as *Melanopsis* (*idem,* p.281, table 14.1). Red Sea species include a single *Cypraea turdus* (Cowry shell) and a single *Nerita polita*. It seems that the shells at Yiftah'el were brought there for ornamental purposes (*idem,* p.281), as many bear signs of modification and perforation. Although no grave goods were recorded, shells were also recorded in ritual contexts in the modelling of the three plastered skulls recovered during the renewed excavations: a single white shell (*Donax* sp.), fractured into two equal segments, was used to portray the human eyes (Milevski et al. 2008).

At Ard el-Samra the mollusc assemblage comprises only eight items. These follow the trend seen at Kfar HaHoresh and Yiftah'el: five items are of *Glycymeris insubrica* and another is a broken, holed *Cerastoderma glaucum* (Getzov et al. 2009a). Worth noting are two *Acanthocardia tuberculate* pendants, a species that appears also at Yiftah'el, in both modified and natural stages (Bar-Yosef Mayer & Heller 2012, p. 280).

BOTANICAL REMAINS

Botanical assemblages were reported from very few sites in the Galilee. This is due, in part, to poor preservation, but another factor may be the lack of sieving. At some sites, botanical remains are reported, but no further information is given (Appendix 2, Table 6). For example, at Munhata, charred organic debris is mentioned in association with the round huts of the earliest stratum (layer 6), but no further information is given (Perrot 1964, 1993). Three sites currently provide the largest, best-preserved assemblages available: Yiftah'el, Nahal Zippori 3 and Ahihud.

Due to exceptional preservation, Yiftah'el offers the largest database available regarding plant exploitation in the Galilee. Botanical remains at the site include both seeds and wood remains. Microbotanical remains such as phytholiths were also recorded and analysed (Kislev et al. 2012; Liphschitz 2012; Miller-Rosen 2012).

Large quantities of seeds were recovered during the 1983 excavation season in area C. These indicate an economy based on legumes, mainly lentils (*Lens culinaris*) and horsebean (*Vicia faba*). The 2007-2008 excavations strengthen this observation, as hundreds of thousands of lentil seeds as well as beans (most probably horsebean) were found in Building 502 in Area I (Khalaily et al. 2008; Marder et al. 2011). Emmer wheat (*Triticum dicoccoides*) was also identified, though in small quantities, as seeds from the 2007-2008 excavations and in phytoliths from area C 1983 excavations (Miller-Rosen 2012; Marder et al. 2011).

While horsebean has been identified as cultivated (Caracuta et al. 2015; Kislev 1985; Kislev et al. 2012), the situation regarding the lentils is unclear, since domestication is identified in lentils on the basis of size increase, a gradual process. However, the quantities of seeds recovered (>7.4 kg on the floor of Structure 700 alone) indicate they were indeed cultivated. The presence of *Galium triconutum Dandy* within the lentil assemblages of both area C and area I is also suggestive of cultivation, as this weed is known to infest modern lentil fields (Garfinkel et al. 2012b; Marder et al. 2011). As for the emmer wheat, the small quantities as well as the botanical evidence indicate that it was probably wild (*ibid.*).

Wood remains include three main species, which were used as building materials: *Pistacia palaestina* (Terebinth), *Quercus calliprinos* (Kermes oak) and *Quercus ithaburensis* (Tabor oak). All are local species present during the Neolithic (see discussion in Chapter 3). Other weeds and wild grasses, such as the common reed (*Phragmites* sp.), were also identified within the phytoliths, and probably used for baskets, mats and thatch (Miller-Rosen 2012).

Wood charcoals and seeds were also recovered from Nahal Zippori 3 (Caracuta et al. 2014). The species identified are very much the same as at Yiftah'el, and include horsebean (*Vicia faba*) and lentils (*Lens culinaris*) within the seeds, as well as *Pistacia palaestina* (Terebinth) and *Quercus calliprinos* (Kermes oak) within the charcoals. An exceptional find are the remains of *Ficus carica*, the fig, a species rare in archaeological sites in the southern Levant[30]. The modern distribution of the fig tree is limited to areas where water is available, thus representing the immediate environment of the

[30] Figs are known from Lower Jordan Rift Valley sites such as PPNA Gilgal and Netiv Hagdud and PPNA and PPNB Jericho (Kislev et al. 1986, 2010; Liphschitz 2007). Fig was also recorded as early as ca. 800,000 BP (at the site of Gesher Benot Ya'akov; Goren-Inbar et al. 2002)

site, which is located near the bank of Nahal Zippori (Caracuta et al. 2014). Unlike at Yiftah'el, where the wood remains analysed originate in relatively well-preserved building materials, those at Nahal Zippori 3 are restricted to scattered charcoals, thus inhibiting a discussion of related activities. They do provide, however, some information on the local environment of the site, and suggest the presence of a maquis-forest on the hills in the area (*ibid.*).

At Ahihud, thousands of charred seeds where retrieved from two silos securely dated to the Early PPNB stratum. These include horsebean (*Vicia Faba*), lentil (*Lens culinaris Moench*), and pea (species yet to be identified; Paz & Vardi 2014). A recent comparative study of the *Vicia faba* remains from the three sites has shown that the seeds from Ahihud, which are older chronologically, are longer than those from Nahal Zippori 3 and Yiftah'el (Caracuta et al. 2015). The study suggested that this indicates that size cannot be used as a 'domestication-trait' at this early stage. However, the sheer volume of seeds found is evidence of domestication, since harvesting wild pulses is too inefficient to account for such large quantities (*ibid.;* Caracuta et al. 2016).

To summarize, all three assemblages show similar characteristics, suggesting an economy based on legumes (mainly lentils and horsebean). These were most probably cultivated, as evidenced by the large assemblages and the presence of the weed *Galium triconutum Dandy*. The scarcity of cereals within the assemblages is of note; although emmer wheat was found in small amounts at Yiftah'el, cereals were clearly less exploited, and remains likely indicate the exploitation of wild stands rather than cultivated crops. Wood remains are relatively few, and reflect the immediate environments surrounding the sites: the open park/maquis-forest in the hills, i.e. the different oak species and the terebinth; and the riverine environment along waterways, i.e. the fig.

STONE TOOLS

Flint Assemblages

The chipped stone assemblages provide the most frequently available data of all the different small-finds categories and partial or complete data are available for many sites (Appendix 2, Tables 2, 7-8). Aspects of the lithic industry have also been researched recently relating to the more formal, bidirectional lithic technology and its regional organization (e.g. Barzilai 2010a; Barzilai & Goring-Morris 2007; Barzilai & Milevski 2015). In the next section, a short description of the main assemblages is presented first, followed by a discussion of the inter-assemblage comparisons. The analysis and discussion focus on issues of raw material and technology, evidence for on-site production and tool techno-typology. The latter focuses on three tool types: projectile points, sickle blades and bifaces, which are largely considered to be the main *fossiles directeurs* of the PPNB. Furthermore, all three tool-types, and especially the projectile points, are considered to be both geographically and chronologically sensitive (Barkai 2005; Brailovsky-Rokser 2015; Burian & Friedman 1979; Gopher 1994).

The largest assemblage (N = 384,176) was recorded at Kfar HaHoresh[31]. In general, the assemblage follows 'traditional' PPNB characteristics. It was divided into four different chronological phases (chapter 4 and Table 4.3). Although cores are relatively few (Appendix 2, Table 7), both bidirectional naviform blade and flake-based *ad hoc* components were identified. The main raw material is 'HaSollelim' flint, although some of the more standardized tool categories, such as projectile points and sickle blades were at times made on non-local, finer textured flint, ranging from dark brown to purple and pink (Goring-Morris 1991, 1994).

On-site production was demonstrated by a large workshop dump (L1007) exposed at the edge of the site. It contained over 100,000 artefacts including debitage, debris, but few cores and tools, representing all stages of the knapping process. A minimum number of 117 sequences were indicated, the vast majority being fabricated on 'HaSollelim' flint. A small number of artefacts, perhaps representing a single reduction sequence, were fabricated on pink/purple flint (Barzilai & Goring-Morris 2010).

The tool repertoire at Kfar HaHoresh (n = 16,458) includes mainly retouched blades and flakes, notches and denticulates, burins, sickle blades, perforators and projectile points. The latter include mainly Amuq points, followed by Byblos and Jericho points, as well as Helwan points and several el-Khiam points (Figures 5.20-5.21, 5.23; Goring-Morris 1994, figs. 6-7). Jericho points are usually fashioned by pressure flaking. A variant of the Jericho point made by bifacial pressure flaking that creates a splayed tang (the 'fishtail' tang) was documented at the site (Figure 5.21: 13). 'Abu Gosh' retouch is usually associated with the Byblos and Amuq points, but appears also on several Jericho points (Figure 5.22: 7-8). As discussed in Chapter 4, Helwan and Jericho

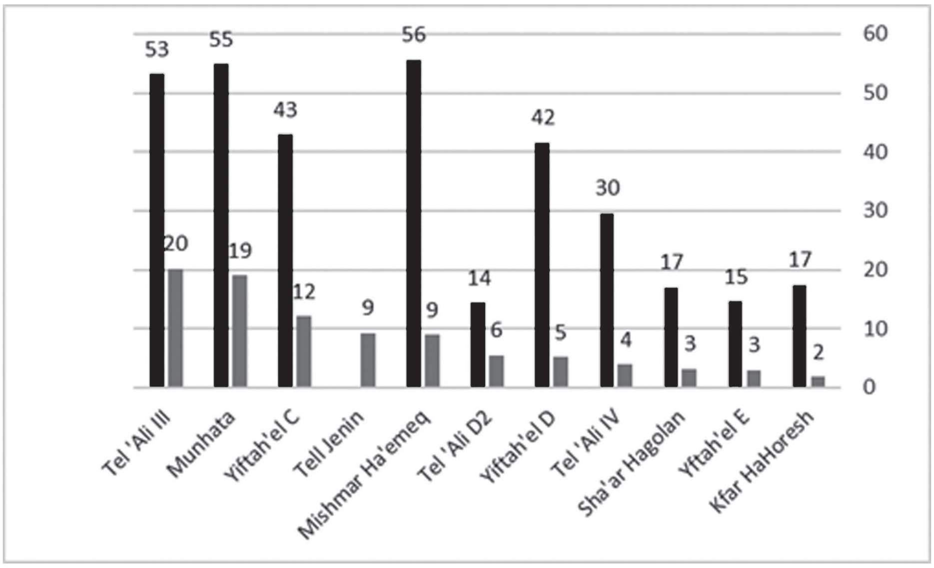

Figure 5.20: Projectile points - percentages of entire tool assemblage (grey) and of the formal tools (black).

[31] This discussion relates to the entire lithic assemblage recovered from Kfar HaHoresh.

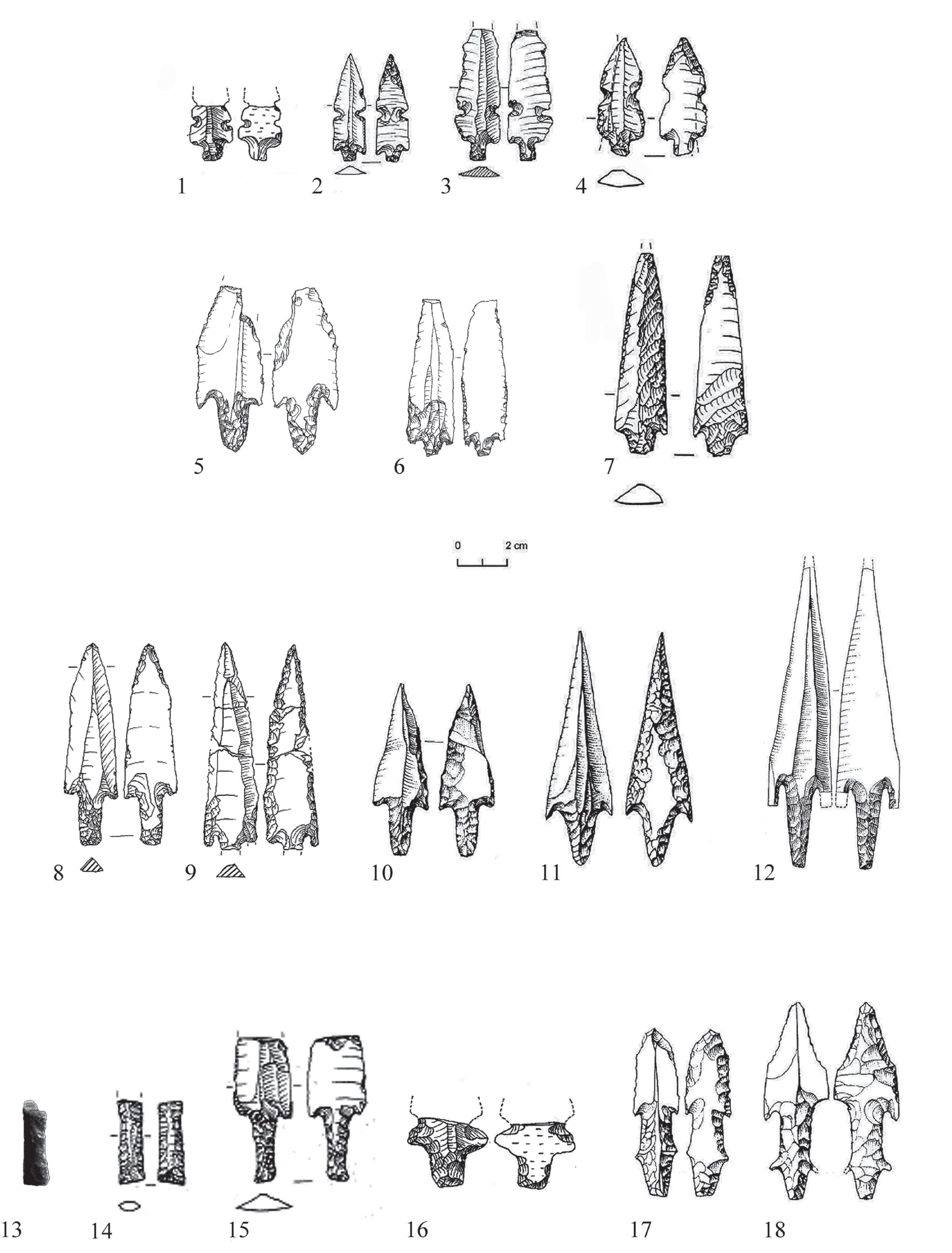

Figure 5.21: Helwan and Jericho points from the Lower Galilee: 1-4) Helwan points (Tel 'Ali, KHH, Yiftah'el, Mishmar Ha'emeq); 5-12) Jericho points (KHH, Mishmar Ha'emeq, Yiftah'el, Munhata); 13-15) Jericho (?) 'fishtail tangs' (KHH, Mishmar Ha'emeq); 16-18) 'Munhata points' (Tel 'Ali, Munhata); (after Barzilai et al. 2011, fig.7; Garfinkel 2012a, fig.3.19; Goring-Morris 1991, fig.8; Perrot 1966a, figs. 2 & 4; Prausnitz 1970 fig.45).

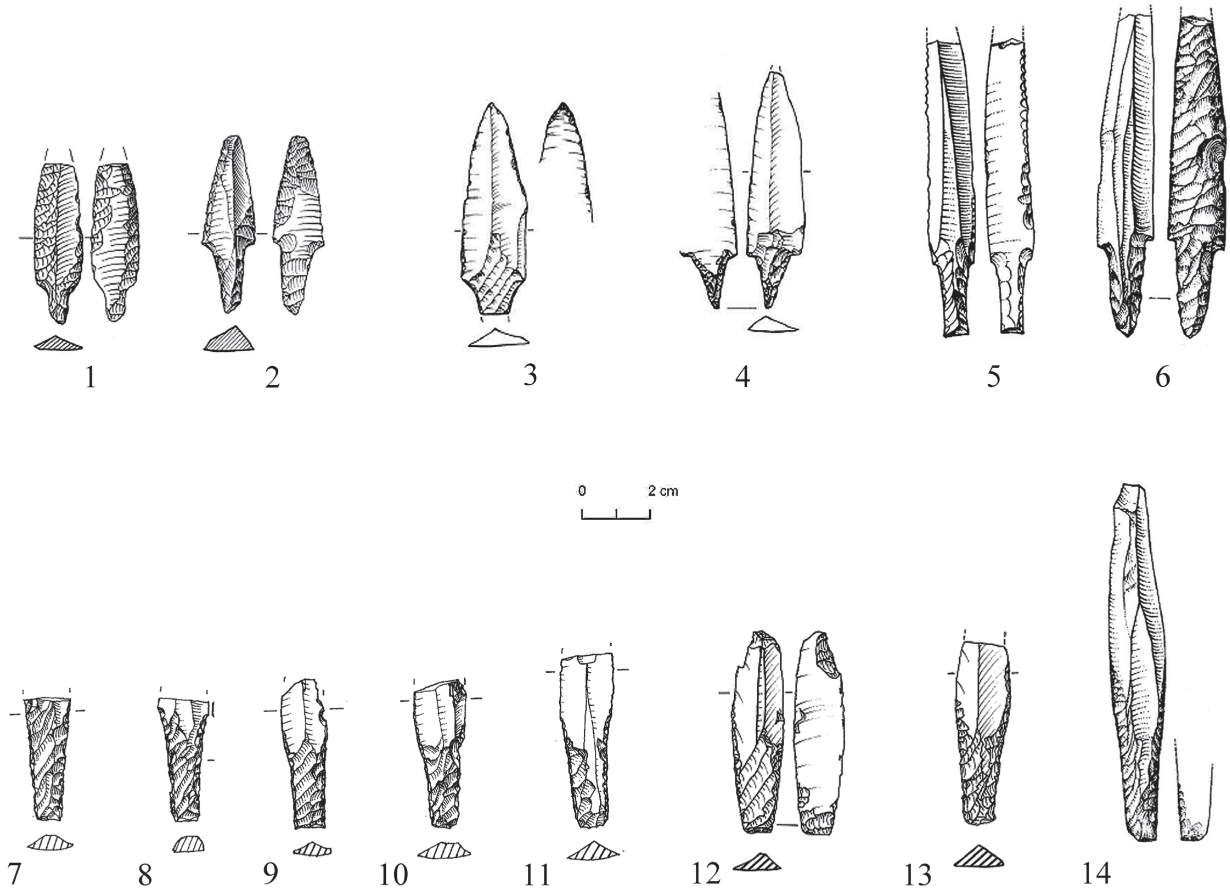

Figure 5.22: Byblos and Amuq points from the Lower Galilee: 1-6) Byblos points ('Ein Zippori, KHH, Munhata); 7-14) Amuq points (KHH, Tel 'Ali, Yiftah'el, Munhata);(after Barzilai et al. 2013a, fig.18; Garfinkel 2012a, fig.3.24; Goring-Morris 1991, fig.9; Perrot 1966a, figs.2-3; Prausnitz 1970, fig.45).

points are dominant in the earliest phase of occupation, to be gradually replaced by Byblos and Amuq points during the later phases of occupation (Figure 4.18). Another chronological trend identified was the use of a wider range of raw material types for the chronologically earlier projectile point types than the Amuq points, which are mostly made on 'HaSollelim' beige flint.

Sickle blades comprise ca. 8% of the tool assemblage (ranging between 9.3% in the earliest Phase IV and 7.5 in the latest Phase I) and more than 50% of the formal tool types (Figure 5.24). They are made on bidirectional blades of high-quality flint, and most (ca. 70%) are finely denticulated (Figure 5.25: 9-10). The bifacial tools assemblage comprises more than 130 items (ca. 1% of the tool assemblage; Figure 5.26). Axes and chisels dominate throughout the sequence, while adzes appear mainly during the late phase. Massive awls and borers exhibit an opposite trend, appearing mainly in the early Phase IV. Transversal *tranchet* blows as well as polish were occasionally used in the shaping of the working edge (e.g. Figure 5.27: 6).

Another large assemblage was collected at Yiftah'el. More than 10 tons of lithic artefacts were retrieved during the 2007-2008 excavations and await analysis, but appear to display similar trends (Khalaily et al. 2008). Full counts are only available

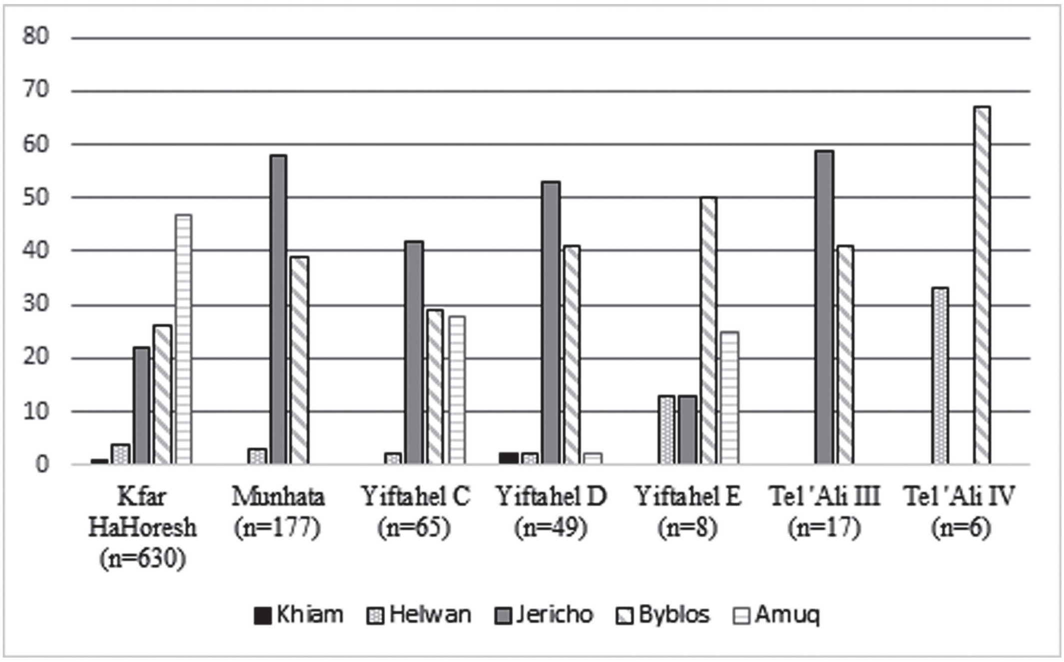

Figure 5.23: Projectile point sub-type frequencies.

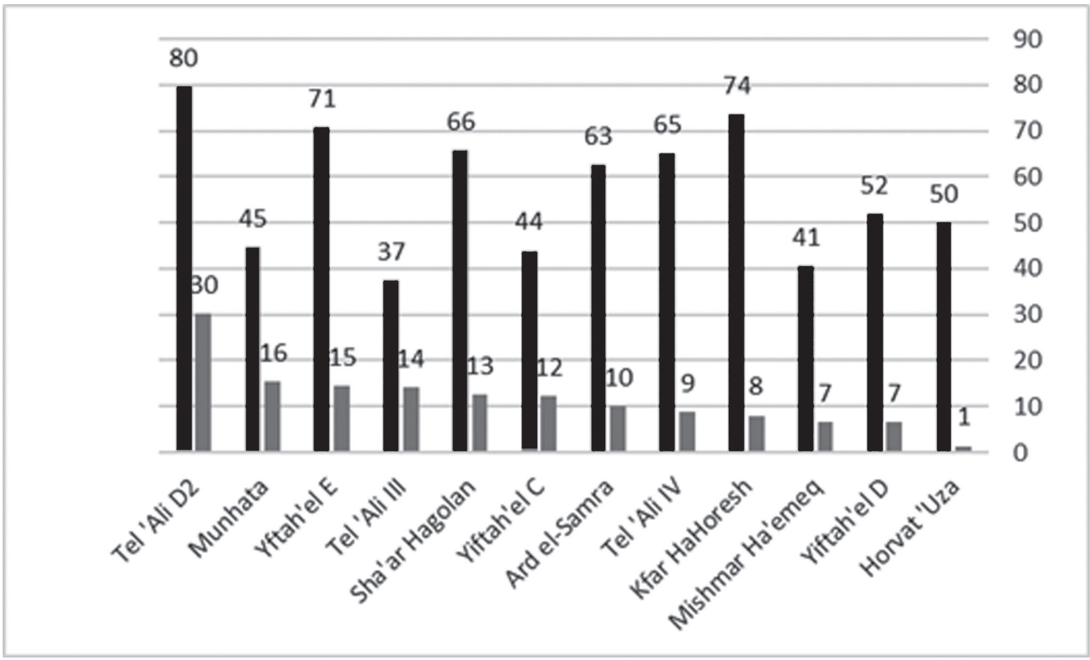

Figure 5.24: Sickle blades - percentages of entire tool assemblage (grey) and of the formal tools (black).

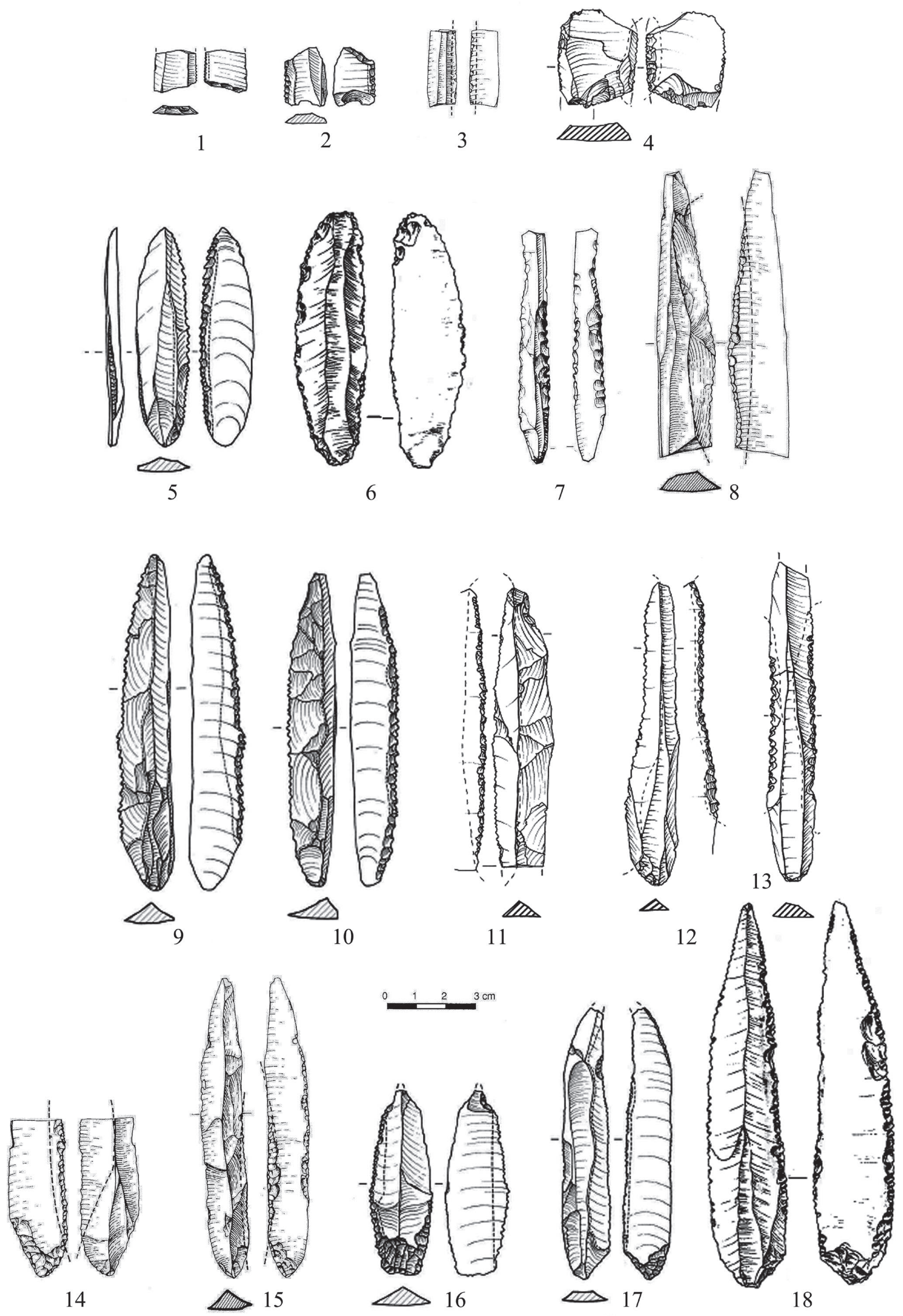

Figure 5.25: PPNB Sickle blades from the Lower Galilee: 1-4) sickle blade segments (KHH, Munhata, Yiftah'el); 5) Sickle blade with abrupt retouch backing (KHH); 6-13) Finely denticulated sickle blades (Tel 'Ali, Munhata, KHH, Yiftah'el); 14-18) Tanged sickle blades (Munhata, KHH, Tel 'Ali);(after Brailovsky-Rokser 2014, figs. 3.1-3.2 & 3.6; Garfinkel 2012a figs. 3.28-3.29; Gopher 1989, figs.14-17; Prausnitz 1970, fig. 47).

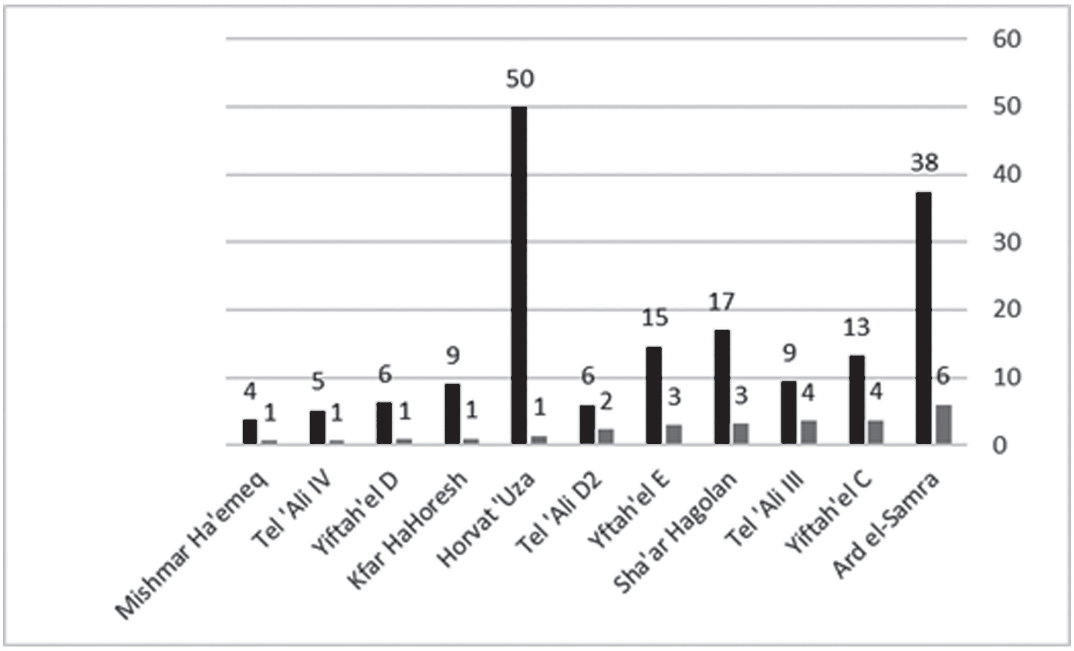

Figure 5.26: Bifacials - percentages of entire tool assemblage (grey) and of the formal tools (black).

for the assemblages of areas C, D and E (N = 143,225) (Appendix 2, Table 7; Garfinkel 2012a; Marder et al. 2012; Ronen 2012).

The major source of raw material (95% of items) is HaSollelim flint[32]. Other raw material types are dark brown to brown, fine-grained, translucent flint originating from the Nahal Zippori area (Tur'an–Nazareth ranges) used for mainly *ad hoc* tools, and light brown material with pinkish-purple colouring, perhaps heat-treated (Garfinkel 2012a, p.79-83), as well as pink/purple lustrous flint (Barzilai 2010a, p.25). Cores display very high frequencies of the bidirectional naviform technology, ranging from 60-80% of the core assemblages in the different areas. This is distinct when compared to other PPNB sites in the Mediterranean and desert zones, where naviform cores rarely reach more than 10% of assemblages (Garfinkel et al. 2012a, p.295).

Several of the numerous bidirectional workshop dumps at Yiftah'el were analysed (Barzilai 2010a); in Pit L11 (area E) artefacts represent all stages of production except for tool blanks and cores, which were apparently removed. Pit L24, on the other hand, included mainly blades and bladelets, while cores were missing (Marder et al. 2012, p.169). The opposite situation was reported from area I, where a waste dump located within a structure comprised a cache of 21 bidirectional cores in early production stages, in association with a stock of flint and bone tools (Khalaily et al. 2010, p.392). Two other workshop dumps were reported from area I (Khalaily et al. 2013): Cache L4196, in an open area outside Building 501, and Cache L5068 in a pit next to a wall within Building

[32] Two exposures are known in the immediate vicinity of the site; the Triangulation point Q1 production site (Oshri et al. 1999; and see below), and another locality ca. 150 m from the site (see Garfinkel 2012a, p.95 for discussion).

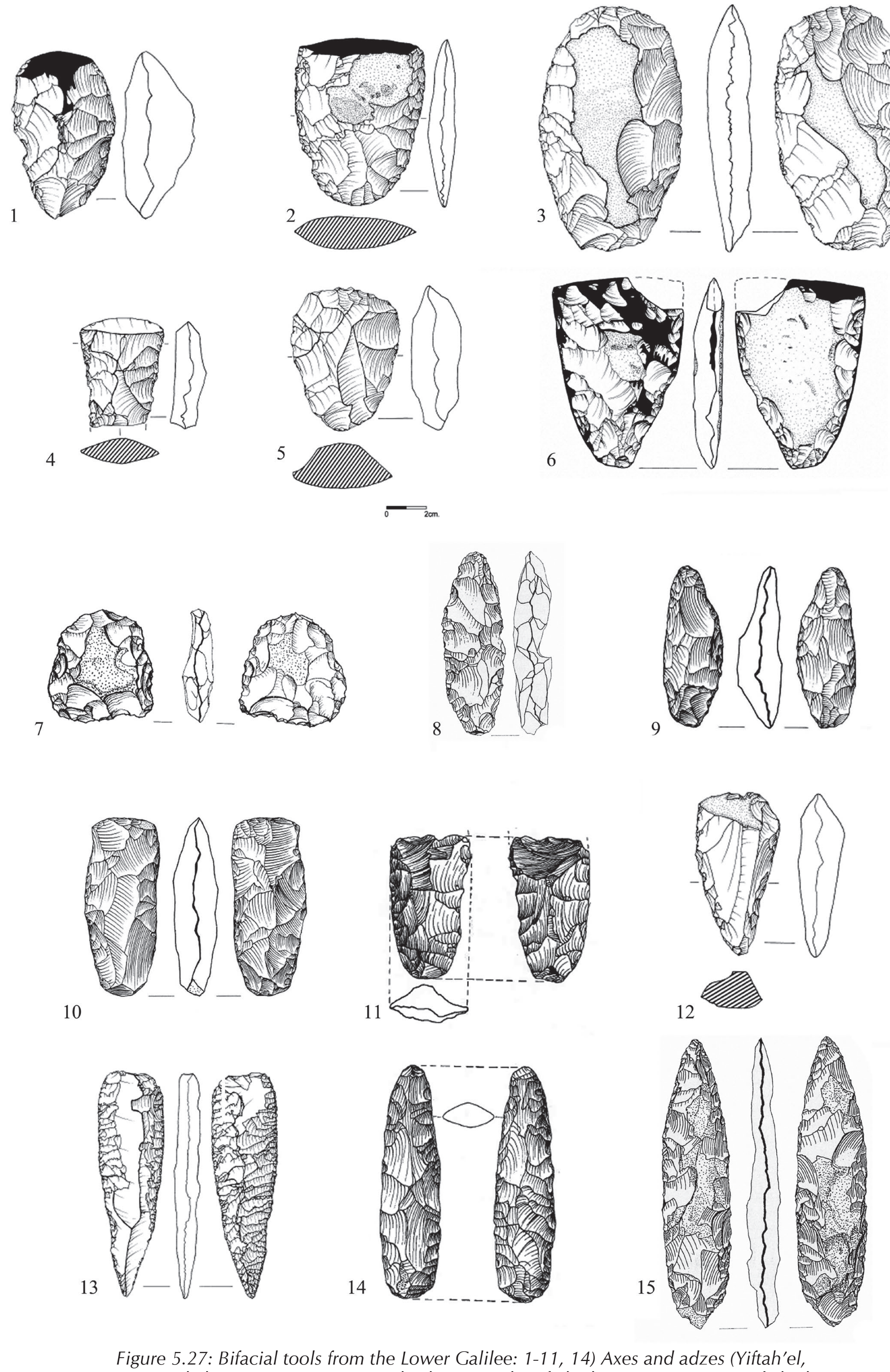

Figure 5.27: Bifacial tools from the Lower Galilee: 1-11, 14) Axes and adzes (Yiftah'el, KHH, Ard el-Samra, 'Ein Zippori, Tel 'Ali); 12) Pick (Yiftah'el); 13,15) Daggers (Yiftah'el, Tel 'Ali, KHH); (after Garfinkel 2012a, figs.3.32-3.37; Getzov et al. 2009a fig. 18;Goring-Morris 1994, fig. 12; Goring-Morris et al. 1991, fig.13;Prausnitz 1970, figs.42-43).

500. Both caches are quite similar, containing ca. 100 flint items and comprising mainly bidirectional blades and blade tools (mainly unused projectile points, sickle blades and retouched blades). Cache L5068 also included four bidirectional cores, two bone tools and a limestone anvil (*idem,* p.224-226). Another dump, from area F, comprised debris, debitage, tools and cores, representing several stages in the reduction sequence: core preformation, blade production and core abandonment (Barzilai 2010a, p.46). Some of these stages are clearly under- or over-represented, as the minimum number of reduction sequences represented by the different artefact types differ: while initial platform spalls indicate a minimum of 56 reduction sequences, the cores are twice as common, representing at least 112 sequences (*ibid.*). This extensive evidence for on-site manufacture and caching, together with the high *core:tool* ratio (Appendix 2, Table 7, and see discussion below) led the excavators to suggest that naviform production at the site went beyond the domestic level of production, and represents production specialization, perhaps for exchange on a regional level (Garfinkel et al. 2012a, p.295). Other than the naviform bidirectional reduction sequence, a secondary reduction sequence, also performed on-site, comprises amorphous cores for *ad hoc* tools.

The tool repertoire at the site is typical of the PPNB, and includes mainly sickle blades, projectile points, burins, perforators, notches and denticulates, scrapers, bifacial tools and retouched blades and flakes. Variability occurs between the different excavation areas in the tool frequencies, suggesting differential arrangement of activities within the site. Projectile point types include mainly Jericho, Amuq and Byblos points, with very few Helwan points and a single el-Khiam point from area D (Figure 5.20:3, 8, 9; Figure 5.22: 13; Garfinkel 2012a, p.86, figs. 3.18-3.25; Marder et al. 2012, p.162, fig.4.10; Ronen 2012, p.189). Variability occurs between the different excavation areas, not only in the percentage projectiles occupy within the tool assemblage (Figure 5.20), but also in sub-type frequencies (Figure 5.28). This intra-site variability indicates both differential arrangements of activities within the site as well as possible chronological differentiation, and the existence of two occupation phases within the Middle PPNB within the different excavation areas (Khalaily et al. 2008, p.7). In general, Jericho points are reported to be very well made. Tangs were usually retouched on both sides and fashioned by pressure flaking. Some items exhibit down-turned wings similar to those from Munhata (Figure 5.21:9). Byblos points are not as carefully made, and some were fashioned using 'Abu Gosh' retouch, as in Kfar HaHoresh (Garfinkel 2012a, p.87). It is interesting to note that while the single Helwan point was made on the local 'HaSollelim' flint, a large proportion of the other points were made on high quality purple/pink flint. This is especially true for the Jericho and Byblos points (59% and 42% respectively), but also for the Amuq points (17%).

Sickle blades range between 6.5-14.5% (Figure 5.24). They were made on high-quality flint, including 'HaSollelim' beige as well as purple/pink raw materials, and usually have no retouch or very fine denticulation, varied in location and character (Figure 5.25: 11-13). They exhibit a low degree of standardization in blank dimensions, retouch and sheen location, and almost all items recovered were segmented (Figure 5.25: 4; Garfinkel 2012a, p.88, figs. 3.26-3.30; Marder et al. 2012, p.162, fig. 4.11;

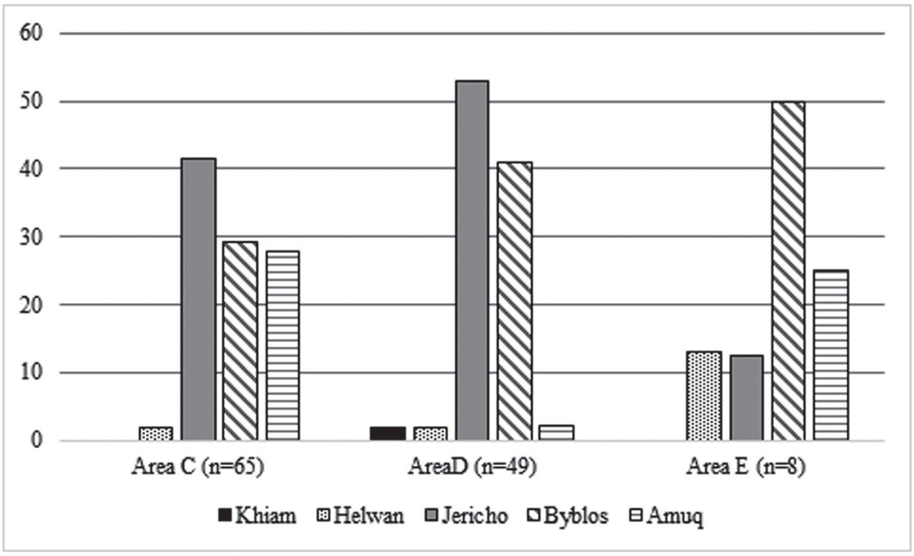

Figure 5.28: Sub-types of projectile points at Yiftah'el, by excavation area (Garfinkel 2012a; Marder et al. 2012; Ronen 2012).

Ronen 2012, p.189). In all areas there were items that are similar to the sickle blades in form, but lack sickle sheen, or at least visible sheen, interpreted as 'sickle blades in preparation' (Marder et al. 2012, p.162-163). The remains of a hafted sickle were recovered in area E: the haft was made of a curved, polished (perhaps heat-treated) *Bos primigenius* rib and a sickle blade with an unmodified working edge was stuck into a groove cut in its narrow side; faint remains of sickle sheen were visible under a microscope (Khalaily et al. 2008; Marder et al. 2012, figs 4.17-4.18).

The bifacial tools include 60 items from area C and eight from area E, accounting for ca. 3% of the assemblages (Figure 5.26; Garfinkel 2012a, figs.3.31-3.37; Marder et al. 2012, figs. 4.15-4.16). The assemblage is diverse, including chisels, axes, adzes, picks and spearheads/daggers, some with polished edges (Figure 5.27:1-5, 12-13). The Area C assemblage is dominated by chisels (ca. 33% of the bifacials), followed by axes and adzes (Garfinkel 2012a, p.88). Almost all were made on 'HaSollelim' beige flint, although a few examples on purple/pink flint were also reported (Garfinkel 2012a, p.88; Marder et al. 2012, p.168). There are sporadic items with a *tranchet* blow (Garfinkel 2012a, fig.3.33:6; Marder et al. 2012 fig.4.15:2), and others were polished (Figure 5.27: 1 & 4; Garfinkel 2012a, fig. 3.32:1-2). Several axes, some with *tranchet* blows, were reported also from the later excavations (Khalaily et al. 2008, fig. 5:k-l). *This, together with the rare Helwan points recovered may hint at the presence of an earlier (EPPNB) occupation at the site*.

The lithic assemblage from Munhata is significantly smaller, comprising 10,308 items (Appendix 2, Table 7).[33] It shows a predominance of flakes in the debitage, while blades are more frequent amongst the blanks used for tools (Gopher 1989). Cores are

[33] It must be noted that some material was discarded during excavation thus possibly affecting presented ratios, as did the lack of sieving during excavation.

relatively scarce, and naviform cores are nearly absent (only one item recorded). The high tool ratios (ca. 14% of the assemblage), on the other hand, raise the possibility that, although some lithic manufacture was conducted on-site, much of the assemblage originated off-site and finished tools or blanks for tool production were introduced from elsewhere. This is especially true for the naviform or bidirectional component (Barzilai 2010a, p.28).

Raw materials are varied, and range from light brown (beige) through a variety of browns to pink, light and deep purple. There is also a small quantity of items made on dark-brown and black flints (Gopher 1989). In an analysis of the lithic procurement strategies at Munhata, Delage (2007) identified 15 PPNB raw materials types that were exploited. He defined two methods of production; the first, utilizing cherts from secondary contexts such as fluvial terraces in the immediate vicinity of the site or from Nahal Tabor, was used mainly to produce a flake-dominated reduction sequence. The second, utilizing cherts from primary contexts, was used mainly to produce blades, on which projectile points and sickle blades were prepared and brought to the site as finished products (Gopher 1989, p.137). These include the pink-purple flints, which may originate in northwestern Jordan (Rollefson et al. 2007), and red-coloured Eocene cherts from eastern Upper Galilee, about 50km away from the site (Delage 2007, p.268).

The tool repertoire includes projectile points, sickle blades, burins, perforators, scrapers and retouched blades and flakes, while bifacials are nearly absent from the assemblage (Gopher 1989). The projectile points are dominated by Jericho and Byblos points (Figure 5.23). Helwan points appear too (n = 5) in layers 5 and 5/4 (Figure 5.29). Their absence from the earliest layers is surprising, but could result from the small sample size (Gopher 1989, p.32). A gradual increase in the frequency of Byblos points to Jericho points is evident, although the latter remains dominant throughout the sequence. The absence of Amuq points in the assemblage is also of interest. Even

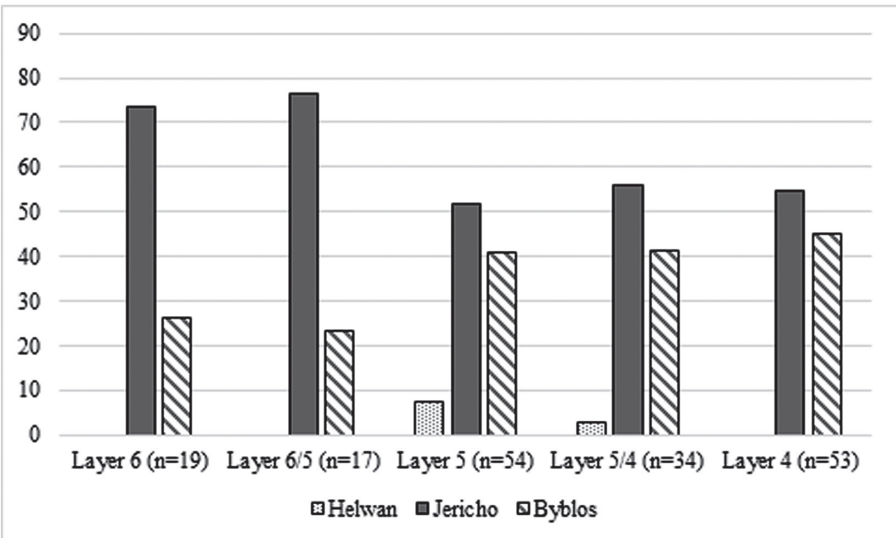

Figure 5.29: Projectile point sub-types at Munhata by layer (Gopher 1989).

though a small number of Amuq points were originally ascribed by Gopher to the PPNB (Gopher 1989, p.42), these belong to layers 4/3 and 3/2 (i.e. Pottery Neolithic). All projectiles at Munhata were fashioned on non-curved, non-twisted, bidirectional blades of high quality purple/pink raw material (*idem,* p.82).

Munhata's Jericho points are usually fashioned by pressure flaking, sometimes covering the body of the artefact as well, sometimes including 'Abu Gosh' retouch (Figure 5.21: 10-12, 17-18; Gopher 1994, p.84, figs. 8-9). Byblos points are usually less worked than the Jericho points, and exhibit a wider variety of retouch types, including semi-abrupt and abrupt retouch as well as pressure flaking (Figure 5.22: 5-6; Gopher 1989, p.37, fig. 12:4,5,7-8). A unique variant of the Jericho point appearing in low numbers is the 'Munhata point', which displays a rectangular or triangular lateral thickening or protrusion in middle of the tang (Figure 5.21: 17-18; Gopher 1989, fig. 8:6,11).

Sickle blades comprise more than 15% of the tool assemblage (Figure 5.24). The vast majority (>80%) are finely denticulated (Figure 5.25:7-8), while the rest were mainly plain sickles blades, with only ca. 2-3% being backed blades. All were shaped on high-quality brown, purple or pink bidirectional blades (Gopher 1989, p.44-45, figs. 14-16). It seems that blades were hafted as reaping knives, based on the presence of tanged sickle blades (Figure 5.25: 14-15) and the fact that in most complete items the sickle-sheen stops ca.1-3 cm before the proximal end. Complete sickle blades are "virtually non-existent". There were no signs of sickle blades being hafted as composite tools, even though "... this reconstruction is not easily accepted and causes problems concerning the efficiency of a reaping knife with an active edge of usually less than 10 cm... ...and a question as to why many of the sickles show sheen only on one edge" (*ibid.* p.45).

The 2007 season lithic assemblage from Mishmar Ha'emeq is quite small (n = 3,968; Appendix 2, Table 7; Barzilai et al. 2011). Two main reduction sequences were identified. The first, a bidirectional technology, aimed at producing long, thin blades on which the more formal tools such as sickle blades and projectile points were manufactured. This aspect of the assemblage, which utilized mainly high-quality purple flint, most likely originates off-site, as very few cores or core-reduction by-products were recovered. The second reduction sequence is a flake/flakelet technology, made on locally available raw material. Tools comprise ca. 15% of the assemblage, including mainly retouched blades and flakes. Projectiles include mainly Jericho points, as well as a few Byblos and one Helwan point (Barzilai & Getzov 2008, fig.8:1-7). They note that "... some of the Jericho points have extremely pronounced bifacially flaked tangs" (*idem,* p.14), comparing these items to the 'fishtail' tangs at Kfar HaHoresh (Figure 5.21: 14-15; Barzilai et al. 2011). Sickle blades are mainly inversely retouched (*idem,* fig.8:8-9). Bifacial tools are virtually absent, and only a few fragments were reported.

From the large 'Ein Zippori complex, only two assemblages have been published in detail: the 2007 test excavation (n = 1,398; Barzilai et al. 2013a) and the Giv'at Rabi East flint workshop (n = 1,426; Barzilai & Milevski 2015; Appendix 2, Table 7). The former is a flake-dominated assemblage, with a tool repertoire comprising mainly perforators, retouched blades and flakes, scrapers, burins, notches and denticulates, as well as projectile points (including pressure retouched Byblos points and an atypical Amuq point), bifaces and sickle blades. The latter represents a flint tool production workshop, utilizing the Timrat formation bedrock, which is rich in large nodular and tabular flint blocks of "HaSollelim" beige flint. Two workshops were identified, for both blade and bifacial tool production (and see details and further discussion below). The former includes mainly bidirectional but also unidirectional technologies, representing all knapping stages. The bifacial workshop dump included large primary and secondary flakes, *tranchet* spalls and large numbers of unfinished bifaces, mainly axes and adzes. Based on the quality of the knapping it was suggested that blade production was performed by experienced flint knappers during the FPPNB/PPNC to Early PN (Barzilai & Milevski 2015).

At Ard el Samra, the lithic assemblage (n = 536) items displays a dominance of flakes within the debitage (Appendix 2, Table 7). Bidirectional blade technology is evident in an exhausted core and a few blade tools. The most frequent tools are retouched flakes, burins and notches. Sickle blades comprise three broken items made on bidirectional blades, and include one on highly lustrous violet flint. No projectile points were recovered. The high percentage of bifacials likely reflects the small sample size, comprising only a small polished axe (Figure 5.27: 9) and a trihedral pick; the latter, with longitudinal flaking, possibly originated from the PN layer (Getzov et al. 2009a).

Although the lithic assemblage at Tel 'Ali originally comprised 22,500 artefacts, only ca. 5% (ca. 1,140 items including cores, tools and debitage) were listed in the final summary, and less than 300 were assigned to the PPNB strata (Appendix 2, Table 7; Prausnitz 1966, p.169). Raw materials are mostly grey and brown flints, while high quality pink-purple or deep brown material was used to manufacture the more formal tool-types. Tools comprise between 80-90% of the PPNB assemblages, most probably a result of selective retrieval methods, and include bifacials, perforators, burins, sickle blades (with fine denticulation), scrapers, retouched blades and retouched flakes.

Projectile points include Helwan (Figure 5.21: 1), Jericho and Byblos points (Prausnitz 1966, p.190, fig.63). The absence of Jericho points from Layer IV can probably be attributed to sample size; two of the Jericho points in Layer III are apparently of the 'Munhata point' type (Figure 21: 16; *ibid.*). Projectiles at the site were usually made on high-quality pink, black or chocolate-brown flint and all types exhibit the use of pressure retouch, including several examples of 'Abu Gosh' type retouch (Figure 5.22: 12).

At Tel 'Ali, sickle blade frequencies increase between the different strata, ranging from 8.8% in stratum IV to 14.2% in stratum III to 30.3% in stratum D2 (Figure 5.24). Prausnitz (1966) described two types of sickle-sheen bearing blade tools; the first type is the knife - long blades with trapezoidal or triangular cross-sections red, rose, black or chocolate-brown flint. These are most numerous in stratum IV, but appear throughout the sequence (Figure 5.25: 18; *ibid.*). The sheen usually stops ca. 4 cm from the proximal end, similar to Munhata, and a straight or nearly straight reaping knife was reconstructed in which the blades were hafted (*idem,* p.210). The second type is the wide and deeply denticulated sickle blade usually truncated on both ends (Figure

5.30: 1). This type appears in all strata as well (*idem,* p.209, fig.67:1,6,7). It does seem, however, that the appearance of this tool type in the PPNB strata may result from later intrusions and/or stratigraphic ambiguity.

Bifacials include mainly axes, adzes and picks (Figure 5.27: 11 & 14). While three complete polished axes were found at Tel 'Ali III-IV, numerous *tranchet* axes were collected from the surface (Prausnitz 1966, p.179, fig.59). The presence of axes with a *tranchet* blow, as well as a relatively high percentage of microlithic blades and a single lunate led Prausnitz to suggest that stratum IV should be dated to the very end of the PPNA or the beginning of the Early PPNB (Prausnitz 1966, p.222-223).

The PPNC assemblage from layer D2 at Tel 'Ali includes 8,622 items (Appendix 2, Table 7; Garfinkel 1994). The main raw materials in the assemblage are locally available grey, medium-sized river pebbles. Some flakes and blades were made on finer-quality, brown and purple (perhaps heat-treated) raw materials, of non-local origin. Cores are mainly of the single platform or two platform types, including naviform cores. It is interesting to note that all of the cores are made on local river pebbles/cobbles raw material. Tools comprise ca. 5% of the assemblage and include all characteristic FPPNB/PPNC types, including retouched blades and flakes, notches and denticulates, burins, scrapers, awls and borers and bifacials.

Most common are the sickle blades. Wide denticulation is the most frequent type (63%) and is considered characteristic of the PPNC assemblage (Figure 5.30: 1). It is accompanied by 'PPNB type' sickle blades (31%) made on bidirectional blades on high quality purple flint, either plain or with fine denticulation (Garfinkel 1994, p.555, fig.3). Worth noting is a wide sickle blade with pressure retouch (*idem,* fig.3:16). Four similar items were reported by Prausnitz from stratum Ic. Comparable items were reported from the southern Pottery Neolithic sites of Nitzanim and Giv'at Haparsa (*idem,* p.556; Prausnitz 1966, p.204).

Projectile points include four Helwan points (reported as intrusive), and a single Jericho point on purple flint, the remainder being described as Byblos/Amuq. Differentiation between medium-sized and large-sized Byblos/Amuq points was suggested to indicate that the former are an intermediate type, typical of PPNC assemblages (Garfinkel 1994,

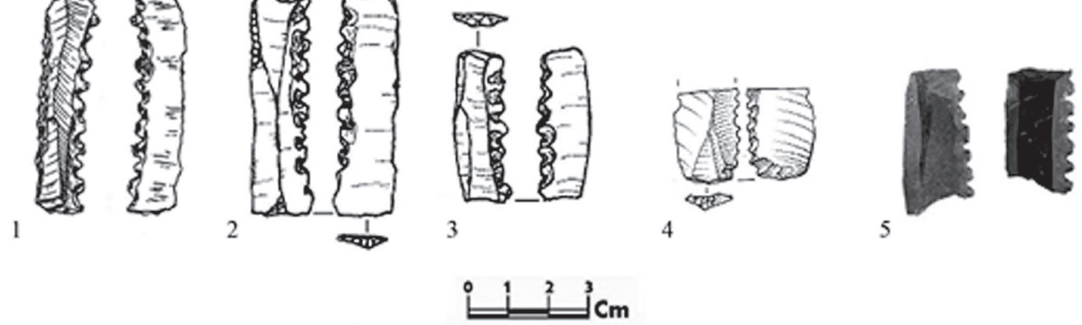

Figure 5.30: FPPNB/PPNC sickle blades from the Lower Galilee: 1) Tel 'Ali; 2-3) Sha'ar Hagolan; 4) Horvat 'Uza; 5) 'Enot Nissanit (after Getzov 2009b, fig.2.16; Prausnitz 1970, fig. 48; Shatil 2007, pl.8; Tepper 2014, fig. 13).

p.555). No other data is given regarding the projectiles, but the use of pressure flaking as well as 'Abu Gosh' retouch is present (Garfinkel 1994, fig. 2:11). Ten bifacial tools were reported from Tel 'Ali D2, including two chisels, two bifacial knives and three axes, one completely polished and another with a transversal blow, and two broken items (Garfinkel 1994, p.556, fig.4:6).

Another PPNC assemblage was excavated at Sha'ar Hagolan. This is a relatively large assemblage (n = 15,579), dominated by the production of small flakes. Blades and bladelets were also produced, but to a lesser degree. The main raw material derives from small river pebbles from the Yarmuk riverbed, in various colors and qualities. Most frequent are the grey and dark-grey varieties. Cores are mostly unidirectional, although bidirectional technology was also used, especially for the production of blade blanks for arrowheads and sickle blades. The tool assemblage is characterized by a high frequency of sickle blades, notches and denticulates. Other tools include projectile points, as well as scrapers and a few bifacials (Shatil 2007). The projectiles are dominated by medium-sized Byblos points (ca. 85% of the identifiable items) with few Amuq points (ca. 15%). They vary in size as well as level of craftsmanship, and are usually fashioned using pressure retouch (Shatil 2007, p.20-21, pl. 7).

Two other possible FPPNB/PPNC assemblages were reported from Horvat 'Uza and Tell Jenin; The Horvat 'Uza assemblage is relatively small (n = 368; Getzov et al. 2009b). Raw materials include high-quality blackish brown or grey-beige flint, apparently originating in Eocene flint exposures in the hills to the north of the site. Cores are irregular in shape, and include both single, double and multiple striking platforms. The tool repertoire includes bifacial tools, burins, scrapers, notches and retouched blades and flakes. A single sickle blade with deep, regular ventral denticulation was recorded as well (Figure 5.30: 4; Getzov et al. 2009b). The noticeable absence of projectile points and of bidirectional or naviform cores could be the result of the limited size of the assemblage. Still, these, together with the denticulated sickle blade were interpreted as an indication that this assemblage could be dated to FPPNB/PPNC (*idem,* p.19).

A larger assemblage was collected at Tell Jenin (n = 1,797; Sayej 1997a, b). It was made on good quality raw material, ranging in colour between brown, yellow, grey, red and white, of local origin. Tools are comprised of retouched flakes and blades, as well as scrapers, perforators, notches and denticulates, and denticulated sickle blades. Very few projectile points were reported, made on both flakes and blades, using pressure retouch. A FPPNB/PPNC date was suggested by Sayej based on sickle blades and projectile point morphologies (Sayej 1997a, fig.1).

Discussion

Several types of flint raw materials were used in the assemblages studied; most frequent is 'HaSollelim' light brown (beige) flint, a fine-grained material that originates in the Shefa'am-Alonim hills and the Tur'an–Nazareth ranges in the central Galilee. This raw material is especially abundant in the sites surrounding the outcrops (i.e. the Zippori/ Nazareth cluster sites), but also appears at other sites, such as Mishmar Ha'emeq (Barzilai 2010a, p.25) and Horvat Turit (pers. obs.). "HaSollelim" flint does not appear to have reached the Jordan Rift Valley cluster sites (i.e. Munhata, Tel 'Ali and Sha'ar Hagolan). Here, the most common raw materials derive from secondary contexts such as river cobbles. Most common is a grey coloured flint, but flints of different colours and qualities were also used. In general, it seems that at most sites utilized flint is mainly of local origin. Indeed, the exploitation of small-scale outcrops in the vicinity of the site was noted in several instances, including Kfar HaHoresh, Nahal Zippori 3 and Horvat 'Uza (Barzilai 2013; Barzilai et al. 2013b; Getzov et al. 2009b). Several sites, proposed to have served as designated production sites, indicate a more organized method of lithic procurement and production. These include Triangulation point Q1 (Oshri 1999), Giv'at Rabi East (Barzilai & Milevski 2015), and possibly Judeidi-Makr #23 (Getzov & Marder 2007) and #121 (Horvat Turit; Barzilai & Getzov pers. comm.; Lerer in prep), as well as Hof Shaldag (Nadel et al. 2006; and see discussion below).

The utilization of high quality flint of non-local origins was also noted in all lower Galilean sites. The most common is a high quality, lustrous purple/pink flint. It appears in many sites, in all of the different site clusters, including Kfar HaHoresh, Yiftah'el, Munhata, Mishmar Ha'emeq, Nahal Zippori 3 and Tel 'Ali. It is important to note that the use of these flint types are more common during the early phases of the PPNB; it is almost ubiquitous at Early PPNB sites such as Ahihud and Bitaniya (Getzov 2010; Vardi et al. 2013), and appears more frequently in the early phases at Kfar HaHoresh. It also seems to be more frequent at the Jordan Rift Valley cluster sites, where it continues to appear in larger quantities in Middle PPNB layers. Although it was suggested that this flint was the result of heat-treatment (Garfinkel 2012a, p.79; Nadel 1989), natural outcrops discovered east of the Jordan Rift Valley could in fact be its source (Barzilai 2010a, p.25; Quintero 1996; Rollefson et al. 2007). The higher frequency of this raw material in the easternmost sites probably supports the latter interpretation.

Other types of flint include different brown and grey varieties, as well as blackish raw material (the latter appears mainly in the Jordan Rift Valley cluster sites). Some of these raw materials, specifically the ones identified in the Jordan Rift Valley cluster sites, derive from eastern Upper Galilee (Delage 2007), while the origins of some remain currently unknown. It seems that they were imported to the sites as targeted blanks or as finished tools.

Three main knapping technologies were identified in the studied assemblages: a flake/blade-producing technology used mainly for the fabrication of *ad hoc* tools such as retouched flakes and blades; a second technology aimed at producing bifacial tools such as bifacial tools; and a bidirectional (naviform) blade production technology, mainly used for the making of formal blade tools such as projectile points and sickle blades (Barkai 2005; Barzilai 2010a; Goring-Morris 1994). While the *ad hoc* flake technology could have been practiced by non-specialists at any location, it seems that bifacial tool and bidirectional blade production were carried out in specialized workshops in designated locations, either within settlements or at the original flint procurement locations (Barzilai & Milevski 2015, p.64).

At Triangulation point Q1 and Giv'at Rabi East large-scale flint procurement and production is evident, including blade preform and core production as well as bifacial tool production (Barzilai & Milevski 2015; Oshri 1999). Both of these flint workshops are located near to, or at the fringes of a settlement: Q1 and the site of Yiftah'el; and Giv'at Rabi East and the 'Ein Zippori complex. Serving as 'industrial areas', these production sites supplied the settlement with specialized products such as bidirectional core preforms to be further exploited at the on-site workshops (Barzilai 2010a; Barzilai & Milevski 2015; Garfinkel 2007, 2012a). Another such pairing of a settlement and a lithic production site can possibly be suggested for the sites of Judeidi-Makr #121 and #23, based on the surface finds (Getzov & Marder 2007).

The second stage of production was sometimes carried out on-site. Clear evidence for on-site lithic production is the existence of workshop refuse dumps. Such dumps were recovered at Yiftah'el, Kfar HaHoresh and Nahal Zippori 3[34]. Differential deposition of waste types and the differences in composition between the various dumps indicate that discarding of waste at Yiftah'el was done according to stages of production rather than at the end of a production sequence or sequences (Barzilai 2010a, p.48). A similar pattern was recorded at the large workshop dump (L1007) at Kfar HaHoresh, as some knapping stages were under-represented, especially regarding core abandonment, as cores were significantly rare (Barzilai & Goring-Morris 2010). This follows well the results of the spatial analysis described in Chapter 4, indicating differential deposition of cores in comparison to other lithic artefact types.

Barzilai (2010a) defined two types of on-site lithic workshop dumps in the Lower Galilee: the first, represented by the Yiftah'el dumps, are long-term workshops, characterised by multiple dumps, each containing different waste types. These "... indicate intensified production, probably of large centralized workshops that produced hundreds of thousands (perhaps even millions) of bidirectional by-products" (*idem,* p.50). The second workshop type is characterised by single dumps containing waste from all stages of production, as at L1007 at Kfar HaHoresh. These workshops were shorter-term in nature. The large quantities of chips indicate that the knapping waste was carefully collected at the end of the process and dumped together (*ibid.*). Such careful collection may imply that knapping was conducted in a multi-purpose locale rather than at a specialized workshop. Nonetheless, analyses of both types of dumps indicate that they are the products of specialized knappers (Barzilai & Goring-Morris 2010, p.32), albeit in different contexts.

On-site production can also be deduced from the composition of the lithic assemblages themselves; certain artefact types, such as cores, primary elements and core trimming elements (CTE's) can indicate the degree to which knapping was conducted on-site. When examining core/debitage ratios (Figure 5.31), the Yiftah'el area E assemblage stands out with an especially large number of cores (core/debitage ratio of 1/15). Tel Jenin and Kfar HaHoresh also display high core frequencies (ratios of 1/21 and 1/26 respectively). This correlates well with the high percentages of primary elements and

[34] Reported but unexcavated, no details are currently available regarding the Nahal Zippori 3 workshop dump.

CTE's in both assemblages (Figures 5.32-5.33), indicating that different stages of core shaping and maintenance were conducted on-site.

While the low frequencies of cores at Ard-el Samra, Tel 'Ali III and Horvat 'Uza likely reflect small sample sizes (and see Appendix 2, Table 7), the extremely low frequency at Yiftah'el area C (core/debitage ratio of 1/122) is of particular interest; as primary elements are quite frequent in the assemblage, it could indicate that cores were deliberately removed and deposited elsewhere, similar to the pattern indicated by the

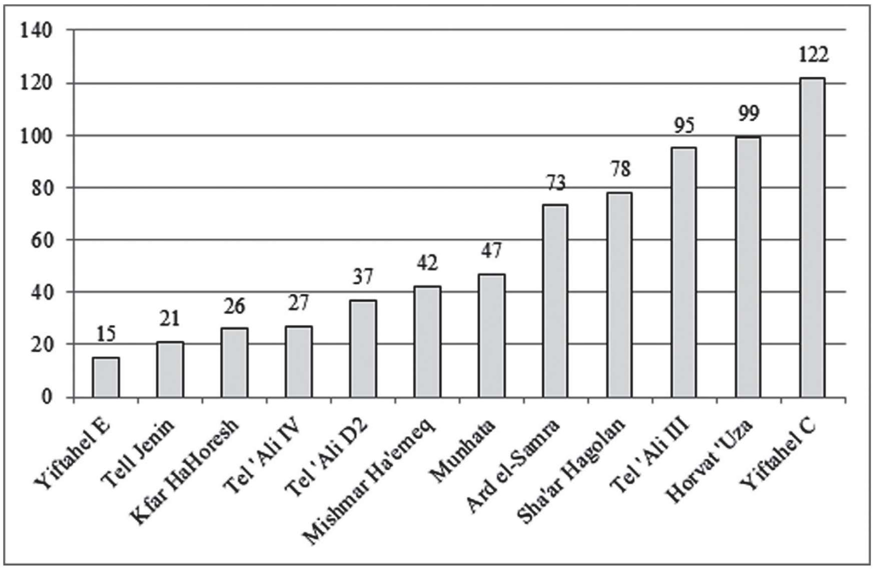

Figure 5.31: Debitage/Core ratios.

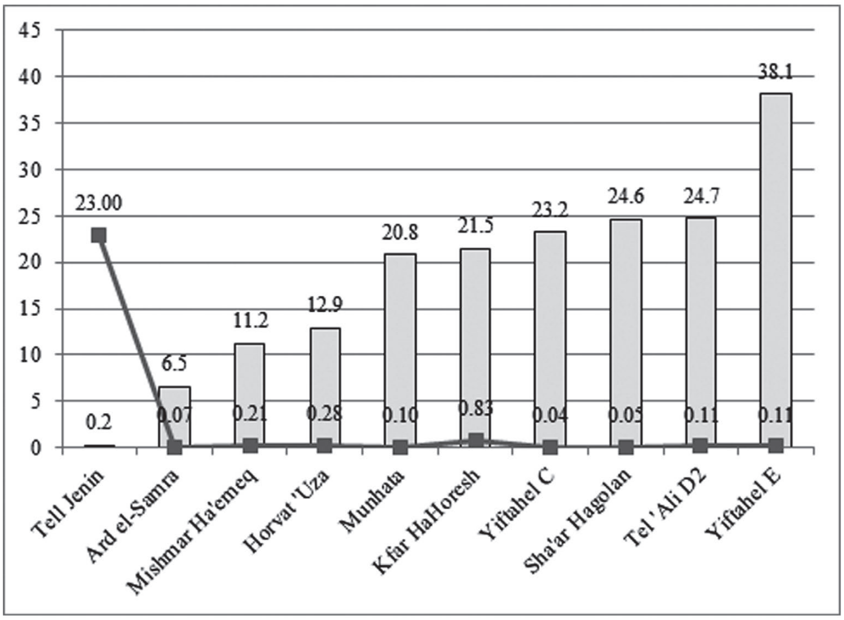

Figure 5.32: PE percentages of total debitage (light grey) and PE/Core ratios (black).

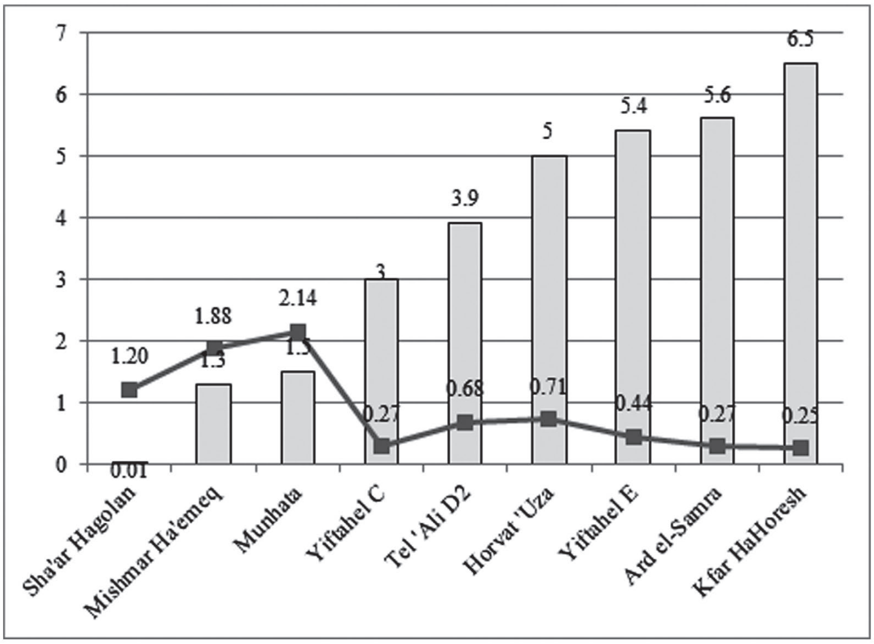

Figure 5.33: CTE percentages of total debitage (light grey) and CTE/Core ratios (black).

workshop dumps and the spatial analysis at Kfar HaHoresh. Relatively high core/debitage ratios also occur at Mishmar Ha'emeq and Munhata. Here the low frequencies of cores are accompanied by especially low CTE frequencies, indicative of off-site lithic production. The relatively high ratios of primary elements at Munhata could result from the exploitation of raw material from secondary contexts such as river cobbles (Delage 2007). A similar pattern of relatively high percentages of primary elements within the debitage appears at Tel 'Ali and at Sha'ar Hagolan where river cobbles were also a main source of raw material (Garfinkel 1992; Shatil 2007).

The relative tool frequencies seem to follow generally similar patterns, as sites with little evidence for lithic production showed high tool frequencies, and *vice versa* (Figure 5.34); the particularly high tool frequencies at Tel 'Ali III and IV should be attributed to selective collection and registration, as is likely also the case at Munhata. Exceptionally low tool frequencies at Yiftah'el area C could imply some sort of spatially patterned behaviour, where finished tools were taken elsewhere, as with the cores.

Based on the presence of workshop dumps as well as assemblage composition, it can be established that on-site production was practiced at several sites. The type of production and its intensity, however, differs from site to site. Although both Kfar HaHoresh and Yiftah'el contain workshop dumps as well as high debitage/core ratios, they seem to represent two different roles within the regional system; the excess of dumps, their arrangement and constitution indicate that production was conducted on a much larger-scale at Yiftah'el than at Kfar HaHoresh, both in quantity and in intensity. Additionally, it seems that the aims of production differed between the sites: while at Yiftah'el bidirectional cores dominate the core assemblage, reaching 60-80% in the different areas (Garfinkel et al. 2012a, p.295), at Kfar HaHoresh, >50% of the

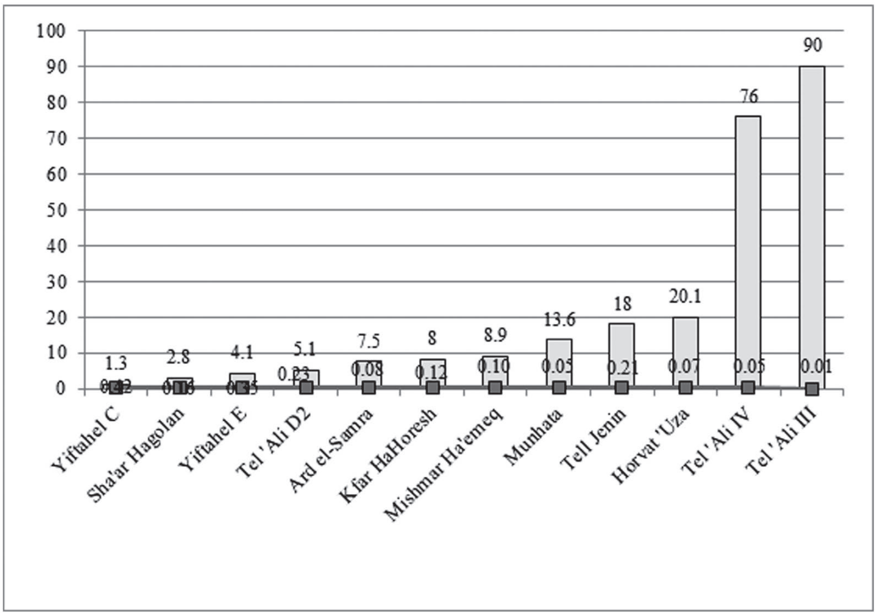

Figure 5.34: Tool percentages of entire assemblage (light grey) and Tool/Core ratios (dark grey).

identified cores are flake cores, and bidirectional cores comprise only 20% of the core assemblage. This corresponds well with Yiftah'el functioning as a large-scale centre of production, serving not only on-site demand, but also the needs of other communities within the larger, regional system (Barzliai 2010a, p.55; Garfinkel et al. 2012a, p.295; Khalaily et al. 2013, p.228). The 'Ein Zippori complex could perhaps represent a second centre of production, similar in magnitude to Yiftah'el, as indicated by the large 'industrial' centre at Giv'at Rabi East (Barzilai & Milevski 2015, p.17), though excavated areas there are limited. However, based on the typo-technological characteristics of the Giv'at Rabi East workshops, it seems that the two production centres were not contemporary (*ibid.*).

Kfar HaHoresh (and possibly Nahal Zippori 3) represents a second level of on-site production. Albeit the product of specialized craftsmen, the workshop at Kfar HaHoresh seems to represent a more localized form of production and clearly a shorter-term event. It is unclear whether lithic production at the site was intended for local use, and it is quite possible that some products were taken away from the site. Still, it is significantly different to the large-scale, 'industrial' production at Yiftah'el.

Some sites, such as Mishmar Ha'emeq and Munhata, show very few signs of on-site lithic manufacture, corresponding well with the scarcity of nearby flint resources (and see discussion in Chapter 7). It seems that artefacts were brought into these sites as finished tools and tool blanks. Thus, a regional system of transmission can be suggested, in which blanks and tools moved from the larger centres of acquisition and production near raw material concentrations (i.e. Yiftah'el and the 'Ein Zippori complex) to the settlements lacking raw material sources (i.e. Mishmar Ha'emeq) at the end of this 'chain of production'. This system did not encompass the Jordan Rift Valley cluster sites to the east, which seem to have received their raw material from elsewhere, most probably Transjordan to the east and/or the eastern Upper Galilee to the north.

The main tool categories of the PPNB in the area include more formal tools, such as projectile points, sickle blades, burins and perforators, usually fashioned on bidirectional blade blanks, as well as bifaces and *ad hoc* tools such as retouched flakes, scrapers, etc. This study focused on projectile points, sickle blades and bifacials.

In a study of projectile points Gopher (1994) showed that in the southern Levant the Early PPNB was characterized by the Helwan and Jericho points, which were gradually replaced during the Middle and Late PPNB by the Byblos and Amuq points. Barzilai (2010a), in discussing his 'Northern Province' (including Kfar HaHoresh, Yiftah'el, Mishmar Ha'emeq and Munhata), demonstrated that projectile points of the Lower Galilee were usually fashioned on predetermined bidirectional blades, and display a high degree of symmetry. Two formal retouch types were used for shaping the tangs of points. The first retouch technique, commonly used to fashion the chronologically earlier Jericho points, was bifacial pressure flaking, creating a pronounced tang with delicate, angular wings (e.g. Figure 5.21: 7, 11-12). The second, 'Abu Gosh' retouch, is an invasive pressure flaking technique typical of the chronologically later Amuq points, creating narrow oblique parallel scars crossing the dorsal ridge of the tang (Figure 5.22: 9-12; *ibid*.). Another chronological trend was for the points to be more elongated towards the Middle and Late PPNB (Barzilai 2010a, p.41).

An overview of the projectile point assemblages from the different sites shows that, with the exception of Tel 'Ali III and Munhata, where projectile points reach ca. 20%, they comprise a relatively small portion of entire tool assemblages (Figure 5.20). It is interesting to note variations between the different excavation areas at Yiftah'el as well as between the different strata at Tel 'Ali. The different assemblages display similarities in assemblage composition, in the morphology of the points themselves as well as the techniques used for their manufacture. A more critiqued comparison, however, is difficult, as many variations between sites can be attributed to differences in sample size (e.g. comparing the Kfar HaHoresh assemblage, containing over 600 identifiable points with the Tel 'Ali IV assemblage, which contains a mere six). Another problem arises from the use of different typologies during analysis, e.g. the use of 'lanceheads' and 'spearheads' for items larger than 6.5 cm, which in other assemblages would be classified as Byblos or Amuq points (Prausnitz 1966, p.194; Ronen 2012, p.189). Still, differences in the typological composition of the different assemblages, such as the appearance of Helwan points, could reflect chronological differences between sites and sometimes between different areas (e.g. Yiftah'el) or strata within a single site (e.g. Kfar HaHoresh). However, one must take into account the possibility of artefact curation and the use of early types in later contexts, e.g. the presence of Helwan points within burial contexts at Kfar HaHoresh.

An interesting phenomenon is the occurrence of local variants of Jericho points, namely of the presence of 'fishtail' tangs and 'Munhata points'. The 'fishtail' tang was originally identified at Kfar HaHoresh, where it is typical of the earlier strata, and at Mishmar Ha'emeq (Figure 5.20: 13-15; Barzilai et al. 2011). As both sites display relatively early occupations and are relatively near one another, the 'fishtail' tang could represent a unique regional phenomenon, with both geographic and chronological implications. A single item from Munhata might also represent a similar example (Gopher 1989, fig. 10:5).

The 'Munhata point' is a more widespread phenomenon, as it appears at the more eastern sites of Munhata and Tel 'Ali III (Figure 5.21: 16-18; as well as Jericho, Beidha and 'Ain Ghazal; Rollefson 2008a, p.86), as well as at sites nearer the Mediterranean coastal plain, e.g. Nahal Oren, Michmoret 26 and 26-A, and in southern Sinai, e.g. Abu Maadi III, Ujrat el-Mehed (Gopher 1994, p.204). Although generally absent from the Lower Galilee assemblages, two 'Munhata points' were recovered at Kfar HaHoresh (pers. obs). Gopher (1994, p.204) suggested that the 'Munhata point' appears during the Early PPNB and spreads southwards towards Sinai during the Middle and Late PPNB. The presence of the 'Munhata point' at Kfar HaHoresh and *vice versa*, the presence of a "fishtail" tang at Munhata, may signify connections between the two sites relatively early within the sequence.

Sickle blades, which first appear during the Natufian, are the only tool category defined not only by morphology, but also (and sometimes solely) by the sickle-sheen or lustre, associated with cutting herbaceous vegetation. During the PPNB sickles were usually fashioned on bidirectional blades, and although some lack retouch (i.e. plain sickle blades), they were most commonly retouched with fine denticulation. In some instances, a tang was fashioned as well (Brailovsky-Rokser 2015; and references therein). Sickle-sheen usually appeared as a strip parallel to the cutting edge, but other variations occur, suggesting two main hafting methods: the reaping knife and the composite sickle (*idem,* p.34-38). During the FPPNB/PPNC, a significant change is observed as sickle blades were usually fashioned on short, unidirectional blades, with a wide denticulated cutting edge and usually truncated on both ends and backed. The frequency of sickle blades within assemblages rises throughout the period, and by the PN they become the most frequent tool type (*ibid.*).

A recent comparative study of the sickle blade assemblages from Kfar HaHoresh, Yiftah'el and Mishmar Ha'emeq, focused on technology, style and chronological issues indicating several common trends (Brailovsky-Rokser 2015). Firstly, undifferentiated sickle blades (i.e. lustred blades without signs of hafting, such as tang, truncation or back) were the most common sickle type in all three assemblages. Reaping knives were rare in all sites, although higher values were noted at early phase Kfar HaHoresh (*idem,* fig. 4.1). Secondly, raw material choice seems to have chronological implications; at all three sites, 'HaSollelim' beige flint was the most common raw material, while purple/pink flint never exceeds 10%. It was most frequent however in the early phase of Kfar HaHoresh (10%) and at Mishmar Ha'emeq (9%). A third trend with possible chronological implications may relate to retouch: while sickle blades with plain (unmodified) cutting edges were always rare, they appear slightly more frequently in the earlier occupations, i.e. early phase Kfar HaHoresh and Mishmar Ha'emeq (Brailovsky-Rokser 2015, p.134).

Several aspects of the three assemblages seem to convey stylistic preferences; for example, different types of fine denticulation (i.e. ultra-fine, middle-fine and fine-coarse) were favoured in different assemblages. A similar phenomenon was noted regarding the location of the cutting edge and the truncation technique. This indicates that at least some of the sickle blades were fashioned on-site (*idem,* p.150-151). Other observations also relate to sickle blade production and recycling; 'blades in preparation' were most common at Yiftah'el. Recycled sickle blades, on the other hand, were most frequent at Mishmar Ha'emeq and least frequent at Yiftah'el (*idem,* p.129). Cutting edge attrition seemed to follow the same pattern, as minimal wear was very rare at Mishmar Ha'emeq (*idem,* p.151). This may indicate that sickle blades were in limited access and thus more intensively used at Mishmar Ha'emeq in comparison to Yiftah'el, and correlates with the hypothesis that the two sites were situated at the opposite ends of a lithic transmission system.

In the current study it was noted that many sickle blades were broken or fragmented in all the assemblages (e.g. Figure 5.25: 1-4). Experimental studies indicate that unintentional breakage via post-depositional processes could not explain the high fragmentation rate, but that at least some of the 'broken' items were intentionally snapped to create standardized segments (Brailovsky-Rokser 2015, p.154). Since fragmentation in many cases was done using a simple dorsal snap, differentiating intentionally fragmented from unintentionally broken items can be quite difficult. It could be suggested, however, that at least some of the 'broken' items should be interpreted as intentionally fragmented blades to be used in composite sickles. This would explain the extremely high percentages of broken sickle blades at Munhata (>90%) and why most of the fragments there do not have sickle-sheen on both edges.

To summarise, sickle blade assemblages show relatively high level of consistency in typology as well as in other characteristics (Figure 5.25); all sickle blade assemblages were made on similar blanks, i.e. long, straight, bidirectional blades of high-quality flint. The working edge was usually finely denticulated ventrally, although a small percentage of plain, unmodified blades exist as well. All assemblages show very high percentages of broken and fragmented items, which may imply their use in composite tools alongside the reaping knives. The latter seem to be more frequent during the early stages of the PPNB, as are sickle blades with plain (unmodified) cutting edges.

In general, sickles comprise ca. 10% of each assemblage. The two outliers, Tel 'Ali D2 and Horvat 'Uza, can be explained by chronology and sample size, respectively. Notwithstanding, sickle blade frequencies vary from 6.5% (Yiftah'el D and Mishmar Ha'emeq) to 15.5% (Munhata). This could be explained partially by chronological differences, as sites with earlier occupations (i.e. Mishmar Ha'emeq, Tel'Ali IV and Kfar HaHoresh) exhibit relatively low frequencies of sickle blades. This follows well the premise that sickle blade frequencies increase from their first appearance during the Natufian, through the PPN until finally becoming the most frequent tool type during the PN (Brailovsky-Rokser 2015, p.54-55). Still, it does not account for all variability. The differences between the excavation areas at Yiftah'el may reflect intra-site spatial distributions of activities, similar to the projectile point frequencies.

The high frequencies of sickle blades at Munhata and Tel 'Ali could reflect more functional differences. Traditionally, sickle blades were associated with the exploitation of herbaceous vegetation, and especially cereal harvesting. Botanical records indicate however, that PPNB economy in the area relied mainly on legumes (and see above), thus raising questions as to the functions of sickle blades. During the PPNA within the Jordan Rift Valley, morphologically wild cereals were collected in large quantities, raising the possibility of systematic cultivation (Kislev et al. 1986; 2010; Weiss et al. 2006; Zohary et al. 2012). During the PPNB domesticated cereals were exploited east of the Jordan Rift Valley, e.g. 'Ain Ghazal, Basta, Beidha, and Wadi Jilat 7 (Asouti & Fuller 2013, Colledge 2001, Rollefson et al. 1985). The high frequencies of sickle blades in the PPNB Jordan Rift Valley sites may imply that cereals were more commonly exploited there than in the lower, central and western Galilee. This is further corroborated by the presence of grinding slabs at Tel 'Ali (and see discussion below).

Another plausible explanation for the use of sickle blades is that they may have been used to harvest vegetation for animal fodder (Brailovsky-Rokser 2015, p.155). Recent studies have indicated that foddering of goats was practiced in the southern Levant as early as the Middle PPNB, e.g. Abu Gosh (Makarewicz & Tuross 2012). While in the Lower Galilee a similar pattern was only identified somewhat later towards the beginning of the Late PPNB (Makarewicz et al. 2016), it could explain some of the rise in sickle blade frequencies towards the FPPNB/PPNC. The presence of wild sheep in the faunal assemblage at Munhata could indicate at least some level of animal control earlier in the period, as the natural habitat of this species during the Holocene was restricted to the Taurus and Zagros ranges (Agha 2011 and references therein). Therefore, it is possible that the high frequencies of sickle blades at the site could also imply a greater exploitation of foddered animals.

Another variation between the Jordan Rift Valley sites and sites to the west can be seen in the raw materials used for the production of the sickle blades. Even though in all sites high quality flint was used, the assemblages from Kfar HaHoresh, Yiftah'el and Mishmar Ha'emeq were made mainly on 'HaSollelim' beige flint, irrespective of chronology. At Tel 'Ali and Munhata, on the other hand, sickle blades were mostly made on red, rose, black or chocolate-brown flint (Tel 'Ali) or on brown and purple/pink flint (Munhata). As noted above, the high quality and standardization of the blanks, the stylistic preferences apparent in retouch type and the composition of the different assemblages all indicate that sickle blades were part of a lithic transmission system in which items were distributed from production centres (e.g. Yiftah'el) to other sites located more distant from raw material sources (e.g. Mishmar Ha'emeq). The differences observed between the Galilee sites and the Jordan Rift Valley sites likely indicate that the latter did not partake in this specific distribution network, at least with regards to sickle blade production.

The last standardised tool type to be discussed here are the bifacials. Bifacial tools, including axes, adzes, chisels and picks, are one of the more distinctive markers of the PPN. Unlike other formal tools, bifacials are the product of a separate knapping technology, conducted perhaps by specialized craftsman in designated workshops

(Barzilai 2010a; Barzilai & Milevski 2015). Such a workshop for axe and adze production was recently excavated at Giv'at Rabi East (Barzilai & Milevski 2015). This small *in situ* workshop dump contained large primary and secondary flakes, *tranchet* spalls, unfinished bifaces and a broken bifacial tool, all made on 'HaSollelim' beige flint. All tools in the excavated assemblage are bifacials, of which 90% are unfinished, probably unsuccessful preforms, on tabular cortical blocks, or on large primary flakes.

Bifacials usually comprise a small percentage within assemblages. In the studied sites bifacials average ca. 2% of the tool assemblage, though variability between assemblages is quiet distinct (Figure 5.26). While at most sites bifacial tools are almost absent, probably due to sample size, two large assemblages were recovered at Kfar HaHoresh and Yiftah'el. In general, both assemblages show general similarities, even though specific tool frequencies may differ. Both *tranchet* removals and polish were occasionally used to fashion the working edge (Figure 5.27), although *tranchet* removals are more abundant at Kfar HaHoresh than at Yiftah'el. It is interesting to note, however, that while at Kfar HaHoresh some *tranchet* axes were cruder and not as finely made, *tranchet* axes at Yiftah'el were smaller and thinner and recall those of the PPNA (Barkai 2005, p.154). This could indicate that some of the Kfar HaHoresh *tranchet* axes were perhaps imitations, trying to mimic the 'archaic' forms. This may relate to the prolonged use of such forms at the site, as was suggested by the curation of early types of projectile points and the use of round architecture in some burial contexts. It also follows well the hypothesis that bifacial tools in general might have had a place in the ritual activities at Kfar HaHoresh, as indicated by their association with some burial contexts (see Chapter 4).

In comparison to other contemporary assemblages the bifacial assemblage from Kfar HaHoresh is also unique in the numbers (>65%) of complete items recovered (Barkai 2005): At Yiftah'el an opposite pattern was detected with relatively few complete items (*idem,* p.310). This, again, may imply that at Kfar HaHoresh bifacial tools were used in the context of social/symbolic activity, as opposed to actual labour as at Yiftah'el.

Groundstone Tool Assemblage

Groundstone tools are common in most Neolithic sites, and are often regarded as indicative of plant processing, whether wild or domesticated. As such, they may clarify aspects of the economic activities on-site, as well as issues relating to inter-site networks of production, exchange and use. However, most groundstone assemblages in the study area were either too small or under-published to enable meaningful discussion (Appendix 2, Tables 2 & 8). Accordingly, the following discussion focuses on only four assemblages: Kfar HaHoresh, Yiftah'el, Munhata, Sha'ar Hagolan and Tel 'Ali.

The assemblage from Kfar HaHoresh is the largest assemblage, comprising > 2500 items (including tools, tool fragments and debitage). Typological analysis was conducted on a total of 721 items, recovered up to and including the 2003 season of excavation (Goring-Morris 2010; pers. comm.). The assemblage from Yiftah'el areas C and E and the assemblage from Munhata were published, but they are substantially smaller, comprising 69 and 119 items, respectively (Dag et al. 2012; Gopher & Orelle 1995).

Another relatively large assemblage was reported from Tel 'Ali, but only the material from the 'Olive grove survey' (chronologically coeval with layer IVb, i.e. PPNA/EPPNB; and see Chapter 3) was published[35]. No quantitative details are presented in the report (Prausnitz 1966). Ninety-eight items were reported from the FPPNB/PPNC layer D2 but without details (Garfinkel 1994, p.552, table 2). A small but well-published FPPNB/PPNC assemblage was however recorded at Sha'ar Hagolan (n = 57; Rosenberg & Garfinkel 2014).

Groundstone tools in the Galilee were made on two main raw materials: basalt and limestone. There seems to be a high degree of correlation between raw material choice and specific typological classes, which is comparable throughout the region, regardless of geographic location; thus, the abundance of basalt in the Jordan Rift Valley area, or, alternatively, its relative scarcity in the central Galilee, do not seem to influence the choice of raw material for handstones, which were primarily made on basalt at Munhata, Kfar HaHoresh and Yiftah'el. Other materials are present within the assemblages, such as limestone, sandstone and beach rock (*Kurkar*), quartz, pumice, tuff and scoria. The largest variety of raw materials was recorded at Kfar HaHoresh, which may reflect the large assemblage size. Nevertheless, the range of raw materials, including both locally available and extraneous resources, indicates the transportation of these materials, whether as natural resources or as finished items.

There are very few instances where on-site manufacture is evident. At Kfar HaHoresh, ca. 150 basalt and limestone flakes and other debitage items may indicate some small-scale *in situ* manufacture (Goring-Morris, pers. comm.). The same was implied at Yiftah'el area C, where 24 waste items, including basalt and limestone chunks and flakes were collected (Dag et al. 2012). It seems that at both sites, however, the vast majority of tool production was conducted off-site. At Sha'ar Hagolan, both debris and debitage items were recorded, including flakes, blades and CTE's. While no clear concentrations were identified, these could reflect a higher degree of on-site manufacture (Rosenberg & Garfinkel 2014).

Typologically, there seems to be substantial uniformity among the assemblages (Figure 5.35). At Kfar HaHoresh, Munhata, Yiftah'el and Sha'ar Hagolan the two most frequent tool types are the processors and the vessels. Processors are mainly bi-plano (flat; e.g. Figure 5.35: 11) or plano-convex (e.g. Figure 5.35: 12) handstones, almost exclusively made on basalt. Vessels include mainly limestone platters and bowls[36] (Figure 5.35: 1-6) as well as "bowlets" with a rounded, small, u-shaped depression (Figure 5.35: 7-10), the latter apparently missing from the Kfar HaHoresh repertoire (Dag et al. 2012, figs. 6.2 & 6.4:1-5; Gopher & Orelle 1995, Dubreuil & Goring-Morris, pers. comm.). Pounders and pestles, although present, were far less frequent and include isolated items (*ibid.*). In general, pounding does not seem to have been a major activity in any of the sites. This is also manifest in the passive tools repertoire, as mortars were rare

[35] There is no description of the stone tools from the excavation itself, although photos in the report clearly show *in situ* mortars during excavation (Prausnitz 1966, Fig. 51, p.155).
[36] Including querns, *sensu* Wright 1992.

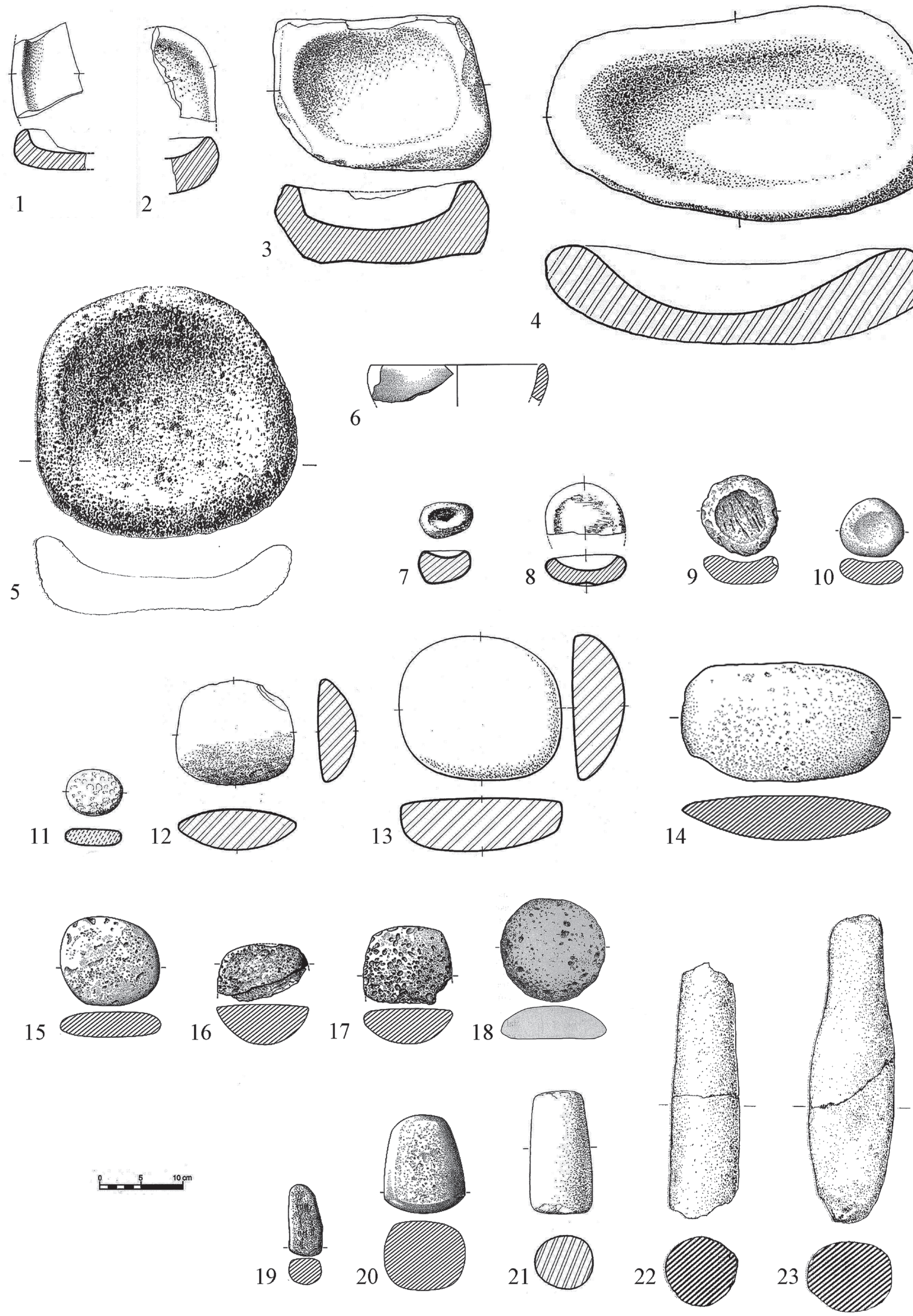

Figure 5.35: Groundstone tools from the Lower Galilee: 1) Platter (Munhata); 2-4) Bowls (Munhata); 5) Bowl/quern (KHH); 6) Bowl (Yiftah'el); 7-8) Bowlets (Munhata); 9-10) Bowlets (Yiftah'el); 11-13) processors (Munhata); 14-17) processors (Yiftah'el); 18) Processor (KHH); 19-20) Pestles (Yiftah'el); 21) pestle (Munhata); 22-23) Pestles (KHH); (after Dag et al. 2012, figs. 6.1-6.4; Gopher & Orelle 1995, figs.13, 15, 17, 20, 22-23, 25, 28; Goring-Morris 1991, fig. 14; 1995, fig.10).

in all sites. At Kfar HaHoresh grinding slabs and querns (on both limestone and basalt) were the dominant passive tools. Although considered typical of the PPNB (Gopher & Orelle 1995, p.83), grinding slabs were absent at Munhata and only two possible fragments of thick basalt slabs were reported from Yiftah'el (Dag et al. 2102; fig. 6.1:1-2). Two fragments of basalt grinding slabs were recovered at Sha'ar Hagolan (Rosenberg & Garfinkel 2014, p.241).

It was suggested that the dominance of grinding over pounding activities might indicate that cereal processing was of lesser importance at Yiftah'el, as attested also by the botanical remains (Dag et al. 2012, p.205). A similar pattern occurs at Kfar HaHoresh, where the groundstone tools, especially those on basalt, indicate a similar emphasis on grinding activities (Dubreuil pers. comm.; Goring-Morris 2010, pp. 44-46). Use-wear analysis on a sample from Kfar HaHoresh indicated that 58 tools and tool fragments showed signs of processing non-oily vegetable matter, mostly legumes. Only a few showed clear signs of cereal processing. Non-greasy vegetable matter processing was also evident on one of the mortar fragments, while another indicated possible meat processing (*idem,* p.43). A single pestle, a handstone and two grinding slabs displayed signs related to skin processing (*idem,* p.46). Other residues were reported on several items, including the presence of plaster on some vesicular basalt plano-convex handstones, indicating they were used to prepare, apply, smooth and/or burnish plaster surfaces; some of the scoria applicators had traces of a black substance, perhaps asphalt or manganese. It is interesting to note that most examined tools did not show clear use-wear, perhaps denoting that they had not been used long enough for such use-wear to develop (Goring-Morris 2010, p.37).

Another artefact category, the grooved stones, was reported from Yiftah'el, Kfar HaHoresh and Munhata (Figure 5.36). These usually comprise a few items within each assemblage, made on pebbles of either limestone or basalt, with either a V- or U-shaped grooves. Some of these items were decorated with parallel or netted incisions (Dag et al. 2012, p. 198, fig.6.4-6.5; Gopher & Orelle 1995, figs. 34:2-3, 43:6, 44:7; Goring-Morris 2010, p.37). Grooved stones were often regarded as symbolically charged artefacts (e.g. Cauvin 2000, p.48; Gopher & Orelle 1995; Hermansen 1997).

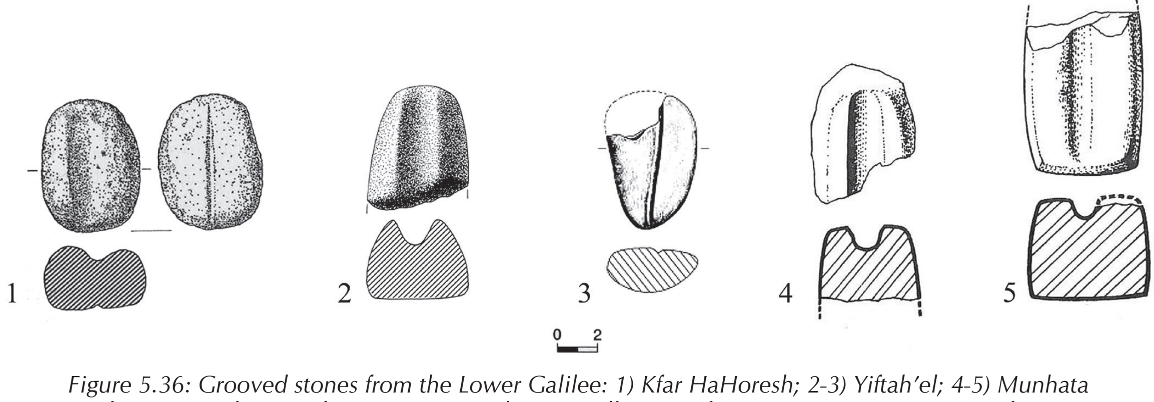

Figure 5.36: Grooved stones from the Lower Galilee: 1) Kfar HaHoresh; 2-3) Yiftah'el; 4-5) Munhata (after Dag et al. 2012, figs. 6.4, 6.9; Gopher & Orelle 1995, fig.141; Goring-Morris 1995, fig.11)

However, use-wear and functional analyses have shown that many of these items, and specifically the types of grooved stones at Kfar HaHoresh, Munhata and Yiftah'el, should be regarded as tools used for different functions such as sharpening flint axes, shaping and sharpening bone tools, shaft-straighteners, etc. (Savage 2014; Vered 2013; and references therein).

Another tool type which may have had a symbolic meaning are the so-called "game-boards" reported from Kfar HaHoresh; these are limestone blocks or slabs of various sizes with a series of regularly spaced holes, some linked by incised lines (Figure 5.37; Goring-Morris 2005b). It was suggested that these items were used as fireboards, associated with the production of fire using clay drills (Goren-Inbar et al. 2012).

Chopping tools, polishing pebbles and polished stone axes or celts (Figure 5.38:1-3) also appear in the studied assemblages, though in isolated instances. Worth noting are several perforated items ('mace heads') recovered at Kfar HaHoresh and Munhata (Figure 5.38: 4-6), as well as applicators made on scoria and sandstone and granite plaques, all apparently unique to Kfar HaHoresh (Goring-Morris 2010). Whorls as well as various types of weights and sinkers were recovered at Sha'ar Hagolan, Munhata and Tel 'Ali (e.g. Figure 5.38: 7-8; Gopher & Orelle 1995; Prausnitz 1970; Rosenberg & Garfinkel 2014, p.246).

A somewhat different assemblage derived from the Tel 'Ali 'Olive grove' survey, where ca. 80 cm long basalt pestles with a spherical section were reported. These might have functioned differently than the smaller pestles (Prausnitz 1966, p.146).

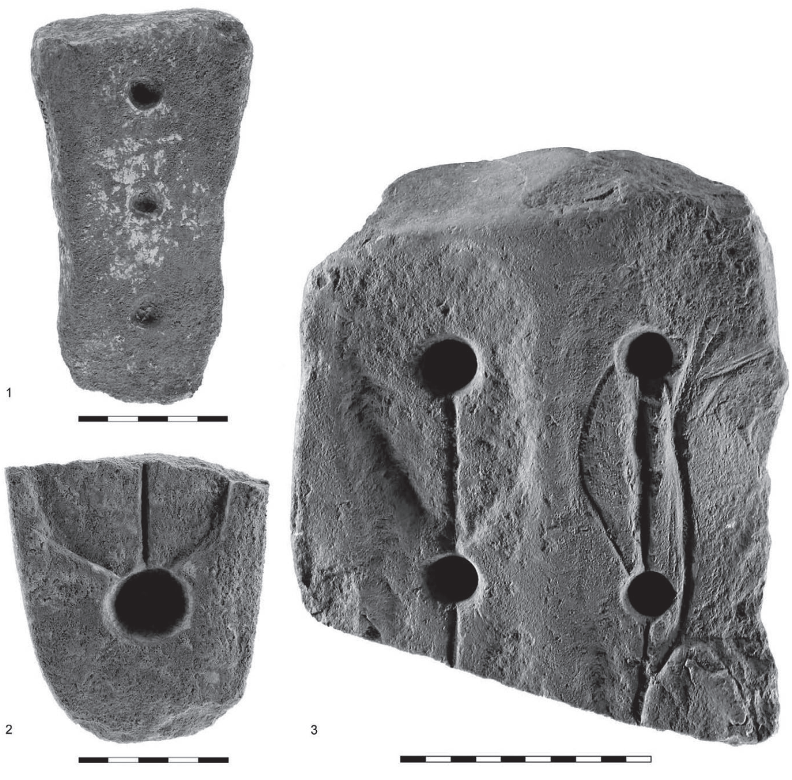

Figure 5.37: Kfar HaHoresh 'gameboards' (after Goren-Inbar et al. 2012, fig. 6).

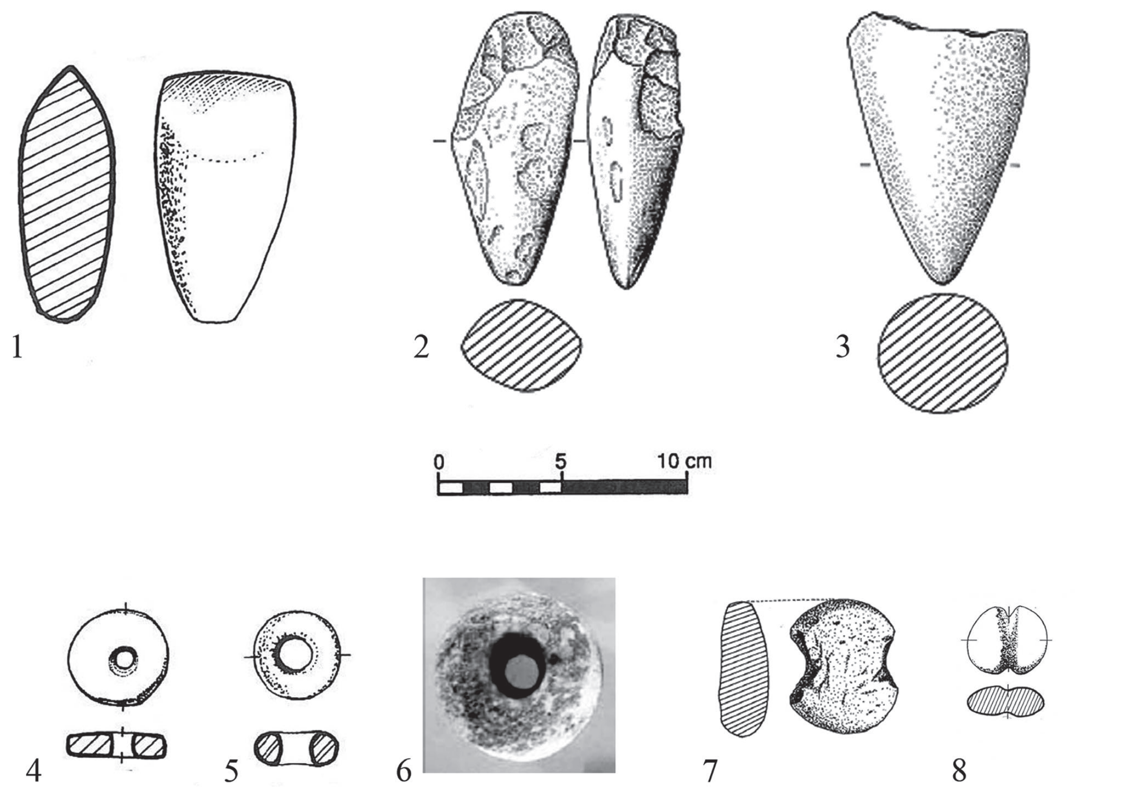

Figure 5.38: Various groundstone tools from the Lower Galilee: 1-3) polished limestone axes/celts (Munhata, Yiftah'el); 4-5) Perforated items (Munhata, KHH); 7-8) Weights (Tel 'Ali, Munhata); (after Dag et al. 2012, fig.32; Gopher & Orelle 1995, figs 30, 36, 46;Goring-Morris 2010, fig.13; Prausnitz 1970, fig.32).

Large grinding slabs were also recorded, perhaps set in the floors of the round huts, as well as several fragments of high basalt mortars with a stumped base (*idem,* fig. 51b). Other tools mentioned include handstones of both the plano-convex and bi-plano (flat) types on a variety of porous materials, from basalt to sandstone, a shaft-straightener and a perforated stone, perhaps a mace-head. Worth noting are small weights or sinkers made on relatively small pebbles, fashioned by two lateral notches (Figure 5.38: 7). Similar notched pebbles were recorded at Sha'ar Hagolan (Rosenberg & Garfinkel 2014, p.246, fig. 246) as well as in Munhata (Gopher & Orelle 1995, fig. 46). They are known from various sites in the area as early as late Upper Palaeolithic Ohalo (Nadel & Zaidner 2002), through the PPNA of 'Ein Dishna (Birkenfeld et al. in press) and as late as the Early Bronze Age (e.g. Beit Yerach; Rosenberg & Greenberg 2014) and seem to represent a local variant of weights for fishing gear (Rosenberg et al. 2016).

Since the occupation at the 'Olive grove' was dated earlier in the PPN sequence, the differences observed in comparison to the other studies assemblages could represent chronological issues. They may also reflect different economic practices, favouring pounding activities. However, since the assemblage originates from a survey with no quantitative data, it is hard to draw meaningful conclusions.

In conclusion, all of the studied assemblages showed a high level of uniformity both typologically as well as with regards to raw material selection. Variations observed could be a result of differences in assemblage sizes, or in the case of Tel 'Ali, possibly chronological. In general, it seems that groundstone tools were used for a diverse set of activities, not all necessarily related to food production, as indicated by the use-wear analysis at Kfar HaHoresh. The minor evidence for on-site production indicates that the majority of these tools were produced off-site, possibly at the raw material sources. This, and the observed uniformity in tool morphology and production techniques, likely indicate they were the products of larger-scale production and distribution mechanisms. A similar scenario was recently suggested for the production and distribution of basanite bifacial tools in the Galilee area, following the discovery of a unique production site at Giv'at Kipod; indeed, a PPNB basanite axe from Yiftah'el was one of the sampled items traced back to the Giv'at Kipod workshop (Rosenberg & Gluhak 2016; Rosenberg et al. 2008; Shimelmitz & Rosenberg 2016).

OTHER TECHNOLOGIES

Pottery

Although clay was commonly used as raw material during the PPNB, it was mainly employed for the construction of installations and structures and the fabrication of small objects (see Chapter 5). Clay vessels, on the other hand, were considered, until recently, to be introduced in the succeeding Pottery Neolithic. Nonetheless, a small pottery assemblage was recovered from Kfar HaHoresh, comprising 23 potsherds securely dated to the PPNB (Biton 2010; Biton et al. 2014)[37]. Deriving from all occupation phases, most sherds have a distinctive fabric and were termed 'KHH Ware' (*idem,* p.742; ; Figure 5.39: 5-6). Analysis has shown that these vessels were probably medium/large open vessels with thick walls (12-20 mm) and loop handles, fired at low temperatures.

Petrographic analysis distinguished at least five groups; all 'KHH ware' sherds were made of a marl matrix tempered with vegetal material originating from herbivore manure. Several different outcrops of marl were identified, two of which, including Senonian marl and Eocene marl, could be sourced, being present within 5 km of the site (*idem,* p.744). Two other petrographic groups were identified, each represented by a single sherd not classified as KHH ware. While one of the two was made on local *terra rossa*, the other was made using matrix found in the Lower Cretaceous formations of Mt. Hermon or of southern Lebanon, i.e. minimally 30-70 km away from the site (*idem,* p.745).

Several conjoinable sherds of a large clay vessel were also reported from Yiftah'el area C (Dag 2012, p.215) and it is reasonable to assume that clay vessels were present also at other sites. However, even taking into account their relatively low preservation chances (especially when fired at low temperatures), it seems that their scarcity suggests sporadic rather than large-scale production and use. Clay vessels were probably

[37] This includes all finds from the 1991-2010 seasons.

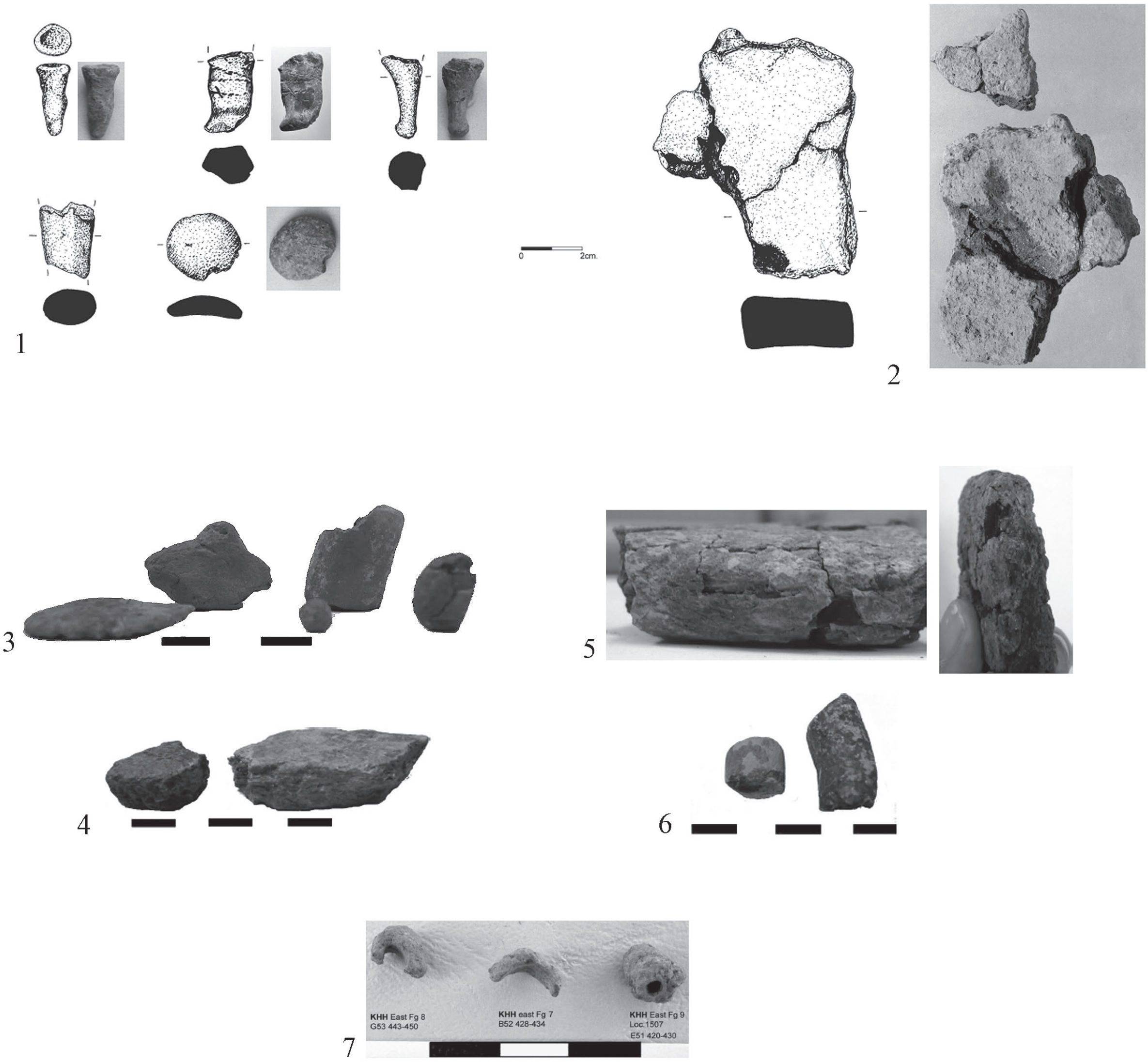

Figure 5.39: Clay items from the Lower Galilee: 1) geometric clay items (Yiftah'el, Munhata); 2) Pottery sherd (Yiftah'el); 3) Geometric clay items (KHH); 4) Pottery sherd (KHH); 5) 'KHH ware' sherd with rim (KHH); 6) 'KHH ware' handles (KHH); 7) Clay beads (KHH);(after Biton 2010, figs. 2.2-2.3; Dag 2012b, fig.8.1; Garfinkel 1995, fig. 83).

produced for short-term use, or within specific contexts (and see discussion in Biton et al. 2014). The finds from Kfar HaHoresh and Yiftah'el, together with several vessel fragments from other, contemporary sites such as Motza (Khalaily et al. 2007a) and Jericho may indicate a local, southern Levantine invention that evolved out of the clay technology (Ben-Michael 2013).

Bone Tools

Bone was widely used during the PPNB for the manufacture of tools and ornaments. However, very few assemblages were published, and publications available tend to be of small assemblages, lack typological uniformity, and are schematic (and see Horwitz & Garfinkel 1988; Le Dosseur 2008 and references therein). Here, data are currently available from only Yiftah'el areas C and E (Garfinkel et al. 2012c), and Kfar HaHoresh (Belfer-Cohen & Goring-Morris, pers. comm.).

At Kfar HaHoresh, the large assemblage of 465 items includes beads and pendants, tools and tool fragments, generally poorly preserved. Of the tools, most frequent are the spatulas, comprising about half of the clearly identified artefacts (Figure 5.40: 12-13). Also common are awls and points (ca. 20% each; Figure 5.40: 1-2). Other tools include applicators and needles (Belfer-Cohen & Goring-Morris, pers. comm.).

At Yiftah'el, the bone tools from areas C and E include 104 and 30 worked bones items, respectively (Garfinkel et al. 2012b). The composition of both assemblages is similar, including mainly spatulas, followed by points (Figure 5.40: 3-5, 9-11). Other items include ornamental artefacts (e.g. beads; Figure 5.40: 6-7) as well as polished items. Worth noting is a single haft, made from a *Bos primigenius* rib bone, found in area E (Marder et al. 2012, p.168). A single spatula and a pendant were also reported from area D (Gubenko & Ronen 2014).

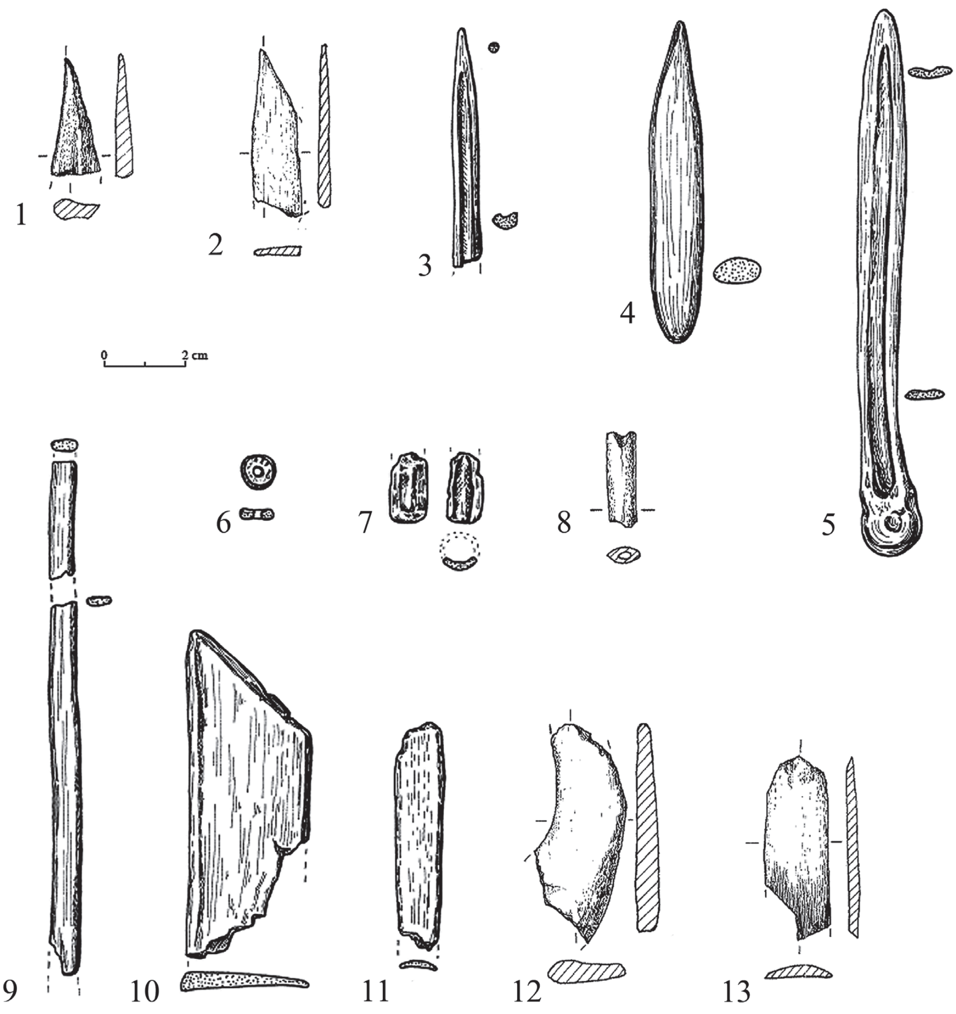

Figure 5.40: Bone tools from the Lower Galilee: 1-5) points (KHH, Yiftah'el); 6-8 beads (Yiftah'el, KHH); 9-13) Spatulas (Yiftah'el, KHH); (after Garfinkel et al. 2012c, figs. 9.2, 9.5; Goring-Morris 1991, fig.15).

Of interest from Hof Shaldag were two bone Byblos points, fashioned using delicate retouch, and dated to the LPPNB or early Pottery Neolithic (Nadel 1994). While points in general are a known tool type in PPNB (as well as earlier) bone tool assemblages, the items from Shaldag, showing a flint-like retouch and tang, are unique.

Disregarding differences in sample sizes, the assemblages from Yiftah'el and Kfar HaHoresh are quite similar, both in tool types as well as in tool frequencies. In that respect both assemblages differ from other PPNB assemblages, such as 'Ain Ghazal, Jericho, Motza and Abu-Gosh, where points and awls were more abundant than spatulas (Garfinkel et al. 2012c; Khalaily et al. 2007a; Le Dosseur 2008; Lechevallier 1978; Marshall 1982; Rollefson et al. 1992). This could reflect geographic, or alternatively, functional factors.

SPECIAL FINDS

Rich assemblages of "exotic" materials from varied sources are a hallmark of the PPNB. The presence of materials from distant locations such as Anatolia, Iraq, Cyprus, the northern Levant, the Dead Sea region, the Red Sea, Sinai, Transjordan and Saudi Arabia within the small finds inventories of Neolithic sites of the southern Levant has long been noted (Bar-Yosef & Belfer-Cohen 1989; Bar-Yosef Mayer 2005; Bar-Yosef Mayer & Porat 2008; Goring-Morris & Belfer-Cohen 2014a). Some of these have contributed to a long-standing discussion of Neolithic symbolism (e.g. Cauvin 2000; Goring-Morris & Belfer-Cohen 2002; Hodder & Meskell 2011; Kuijt 2008; Verhoeven 2002). Yet, excavation reports and analyses of these unique assemblages remain sparse, limiting discussion to a small number of sites. The following is thus organized by find-type, and only sites where data were available are discussed.

Obsidian

The presence of obsidian artefacts was reported at several sites, but rarely systematically. The largest assemblage was reported from Ahihud, where >100 obsidian items were recorded (Paz & Vardi 2014; Vardi pers. comm.). Preliminary reports indicate that it includes a core, two projectile points (including an el-Khiam point) and many bladelets (Figure 5.41: 5-9). Provenience studies indicated the origin of the PPNB obsidian at Ahihud to be from Göllü Dağ, in central Anatolia, ca. 700 km away (Vardi pers. comm.).

Another significant assemblage (n = 61) was recovered from Kfar HaHoresh. Artefacts range from small chips and chunks to debitage and tools, including two Helwan projectile points (Figure 5.41: 4). Some of the blade/lets were bilaterally notched, and might have served as pendants (Goring-Morris 2010). Provenience testing conducted on eight items also located the source of obsidian at Göllü Dağ, in particular Göllü Dağ East (Delerue 2007).

A smaller assemblage was reported from Yiftah'el; eight items were recovered during the 1983 excavation in area C, all chips. No cores, tools or debitage were identified (Yellin & Garfinkel 1986, p.102). The source of the obsidian from area C is currently undetermined, but similarities in composition suggest that it, too, originated in central Anatolia, perhaps in a subgroup of Göllü Dağ (Yellin 2012, p.245). Seventeen other

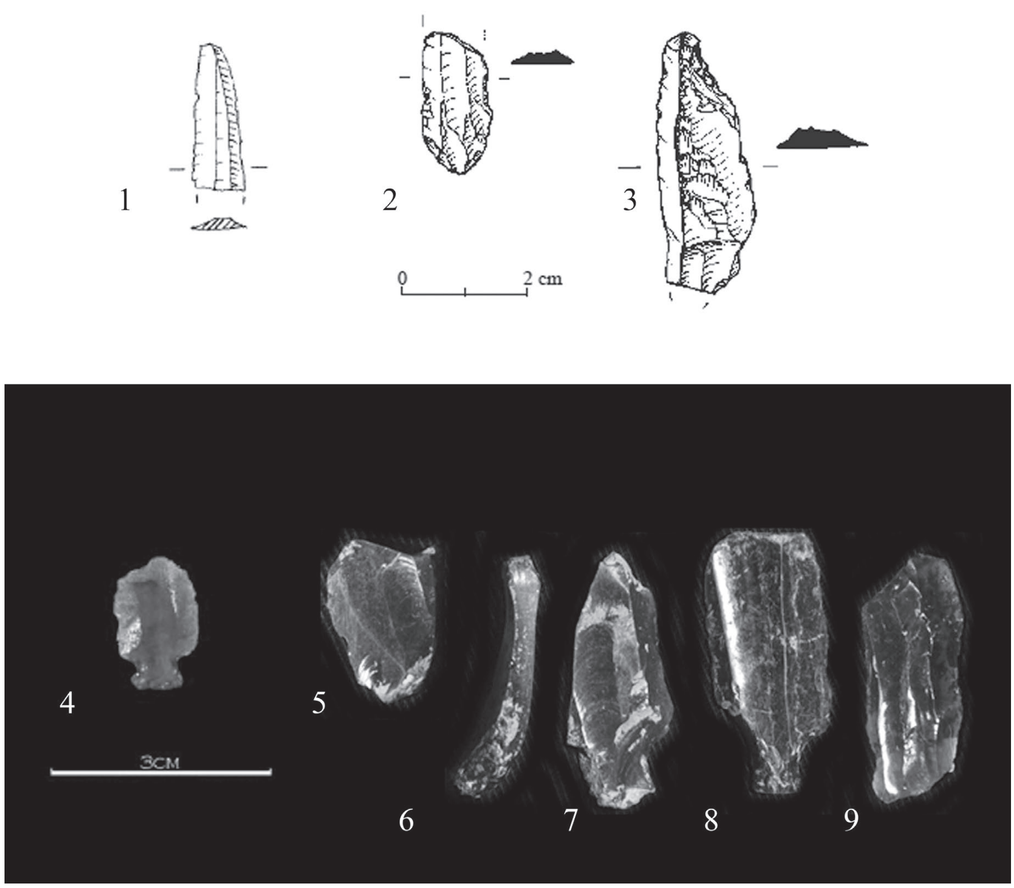

Figure 5.41: Obsidian items from the Lower Galilee: 1-3) Obsidian blades & bladelets (KHH, Yiftah'el); 4) Obsidian Helwan point (KHH); 5-9) Obsidian items from Ahihud; (after Goring-Morris 2010, fig. 31; Goring-Morris 1991, fig15; Yellin 2012 fig.11.1; Vardi et al. 2013).

obsidian items, mainly bladelets as well as a few tools, including a Jericho point and a retouched blade were recorded during the 2007-2008 seasons (Khalaily pers. comm.). Some displayed slight to moderate use-wear, perhaps indicating both utilitarian use, as well as the possibility that some were used as pendants. Here, as well, provenience testing indicated they derived from Göllü Dağ (Rice pers. comm.).

Seventeen obsidian items, mostly bladelets and chips, but also a single CTE from a bladelet core, were reported from FPPNB/PPNC contexts at Tel 'Ali, although no provenience testing is available (Garfinkel 1994, p.557). Obsidian artefacts were also reported from 'Ein Zippori, Mishmar Ha'emeq and Kfar Qana (Barzilai pers. comm.; Milevski pers. comm.; pers. obs.).

In summary, although limited by the paucity of the data, several generalisations can be made; firstly, all of the material analysed originates in central Anatolia, specifically in Göllü Dağ. Secondly, the artefacts reached the sites as ready-made objects, or at least blanks, and that little to no production was conducted on-site. Third, all of the projectile points identified were chronologically early types: el-Khiam at Ahihud, Helwan at Kfar HaHoresh and Jericho at Yiftah'el. This, and the relatively large quantities of items recorded at Early PPNB Ahihud, compared to other, later sites, could indicate that these long-distance networks were stronger earlier during the PPNB sequence, perhaps weakening with time. Lastly, the fact that almost all obsidian tools recovered are projectile points, combined with the notched items suggested to serve as pendants from Kfar HaHoresh might imply that they were indeed used as personal/ symbolic ornaments, rather than for purely practical use. As was suggested earlier, the abundance of early point types, in this context, could reflect the curation of archaic forms within the realms of the symbolic or ritual activities.

Figurines, Ornaments and other Symbolic Items

Several types of seemingly symbolically charged items were reported. Some, such as figurines and tokens are quite rare, being found only at Kfar HaHoresh, Munhata and Yiftah'el (Figure 5.42). Others, such as beads, pendants and items made on 'exotic' minerals, are more common, and were reported from almost all category I and II sites. However, in most cases further details are rarely available, e.g. the 'art objects' mentioned at Tel 'Ali stratum D2, or the polished pebbles at Nahal Zippori 3 (Barzilai et al. 2013b, Garfinkel 1994, p.546).

Figurines were fabricated using stone and clay, and include both zoomorphic and anthropomorphic items. Stone figurines are quite rare and were only reported at Munhata and Kfar HaHoresh[38]. At Munhata, nine stone figurines were found in PPNB contexts, including three zoomorphic and six anthropomorphic figurines (Gopher & Orelle 1995, p.61-63). Zoomorphic figurines include a naturalistic depiction of a quadruped (a pig?) and an animal head with a groove around the neck (Figure 5.42: 15). Anthropomorphic figurines include two small 'votive axes' made on greenstone (see discussion of the 'votive axes' below) with incised eyes (Figure 5.42:14) and a small carved limestone female bust and head (Figure 5.42: 17). A third type of anthropomorphic representation is the phallus, including three elongated limestone cobbles with horizontal incisions (Figure 5.42: 18). Similar phallic figurines were reported from Kfar HaHoresh (Figure 5.42: 19). Six such figurines were found, usually fabricated on limestone, in a range of sizes (Goring-Morris, pers. comm.; Goring-Morris et al. 2008). A unique anthropomorphic stone figurine is an elongated, shaved limestone pebble with incised eyes (Goring-Morris, pers. comm.).

Figurines and other symbolic items were also fabricated using baked clay, and although much more prone to deterioration and post-depositional damage than stone artefacts, these were recovered in larger numbers. The largest assemblage was recovered at Munhata, with 19 anthropomorphic and 36 zoomorphic clay figurines. The anthropomorphic figurines all belong to the "pillar figurine" type, displaying a schematic, cylinder-like body and an emphasis on the head, face and upper body parts (Figure 5.42: 8-12). Gender was sometimes conveyed either by the presence of breasts or schematic genitalia; nine were female, while only one was male (Garfinkel 1995, p. 17-20). The zoomorphic figurines were also quite schematic, making identification of

[38] Anthropomorphic and zoomorphic figurines on clay and stone were cursorily reported from the 2007-2008 seasons at Yiftah'el (Khalaily et al. 2013)

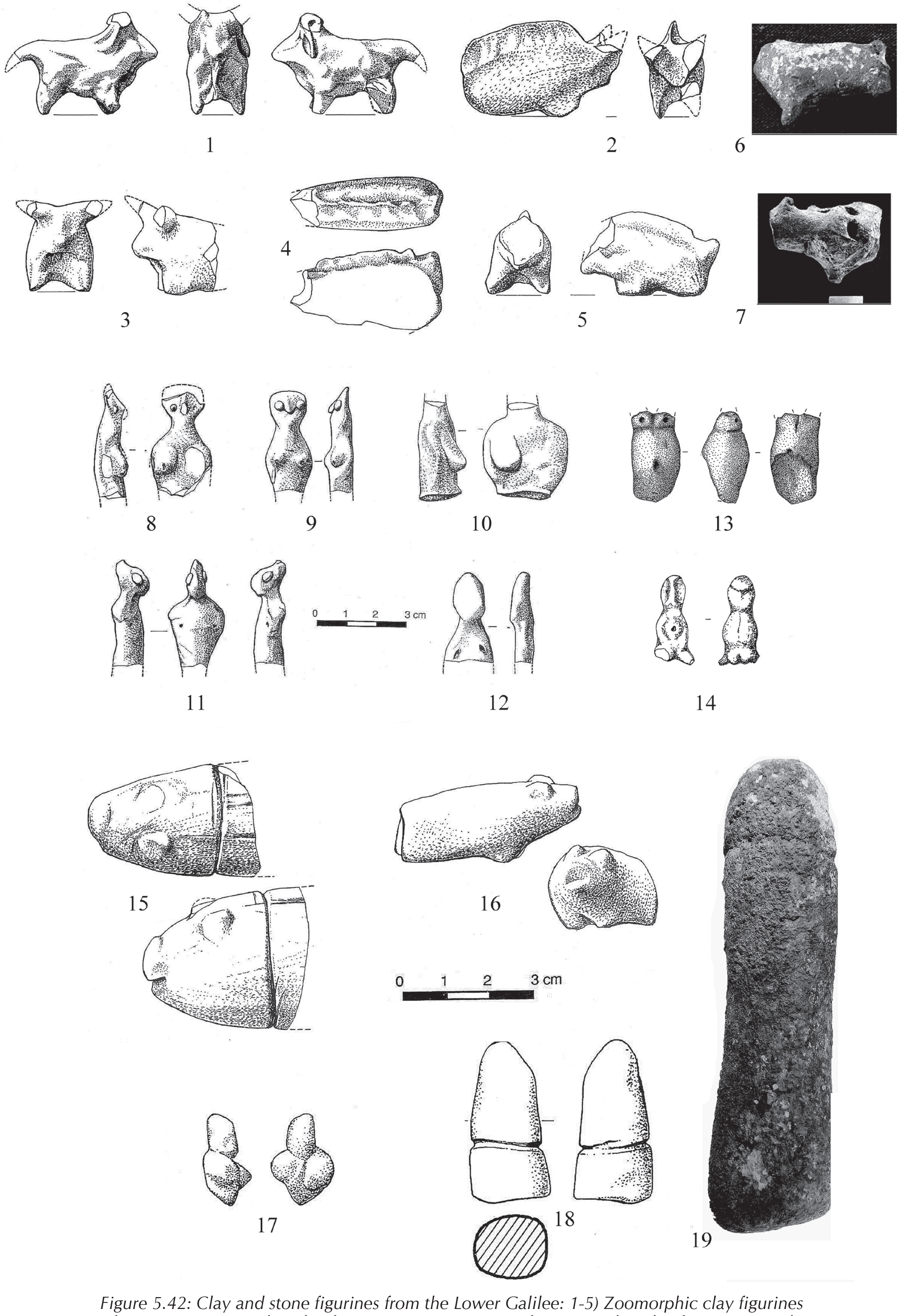

Figure 5.42: Clay and stone figurines from the Lower Galilee: 1-5) Zoomorphic clay figurines (Munhata); 6-7) Zoomorphic clay figurines (KHH); 8-12) Anthropomorphic clay figurines (Munhata); 13-14) Anthropomorphic clay figurines (Yiftah'el); 15-16) Zoomorphic stone figurines (Munhata); 17) Anthropomorphic stone figurine (female bust) (Munhata); 18) Stone phallus (Munhata); 19) Stone phallus (KHH);(after Biton 2010, figs. 2.5-2.6; Garfinkel 1995, figs. 13, 15-16; Gopher & Orelle 1995, figs. 39-40; Goring-Morris et al. 2008, fig.6; Gubenko & Ronen 2014, fig. 2).

the animals portrayed problematic, although most seem to represent horned bovines (Figure 5.42: 1 & 3). Several items with a pinched ridge on their supposed backs were suggested to represent maned animals (Figure 5.41: 2, 4-5), while others were thought to represent sheep, goats or pigs (*idem,* p.22).

At Kfar HaHoresh, both zoomorphic and anthropomorphic baked-clay figurines were reported, with most zoomorphic figurines being fragmentary, modelled schematically and lacking distinguishing features (Biton 2010, p.28). Nonetheless, several figurines, including items representing single horns, may depict aurochs (Figure 5.42: 6). One of the figurines is of interest as it displays multiple round perforations penetrating the trunk of the animal (Figure 5.42:7). These perforations, made before the firing of the figurine, are reminiscent of the perforated bull figurines found at 'Ain Ghazal (Rollefson 1986). Several schematic anthropomorphic figurines were also reported, including at least three "pillar figurines", similar to those recorded at Munhata, of indeterminate gender (Biton 2010, p.29).

Two anthropomorphic clay figurines at Yiftah'el area D (Gubenko & Ronen 2014), include a possible headless female torso that seems to fit the general characteristics of the "pillar figurines" recorded at Munhata and Kfar HaHoresh (Figure 5.42: 13). The other, a seated figure with a distinct pinched nose, resembling a bird's beak (Figure 5.42: 14); it has no known local parallels, although similar figurines were reported from Mureybet, Jericho, Tell Aswad and Tell Ramad, where they were interpreted as representing female images (Cauvin 2000; Contenson 1995, 2000; Holland 1983). A single anthropomorphic clay figurine was also reported from Ahihud (Paz & Vardi 2014).

Another type of baked-clay items with possibly symbolic meaning are small geometric clay objects, ca. 1-2 cm in size, often referred to as 'tokens' (*sensu* Schmandt-Besserat 1992; and see Garfinkel 1995; Mahasneh & Gebel 1998). Such geometric items were reported from Yiftah'el, Munhata and Kfar HaHoresh (Figure 5.39: 1 & 3). At Yiftah'el six items were reported, including a few conical items as well a single concave disk (Dag 2012, p.215). At Kfar HaHoresh they are much more frequent, comprising 48 items, divided into five major morphotypes: cones, spheres, disks, cylinders and ovoids (Biton 2010, p.22). The Munhata assemblage, comprising 28 items, was also divided into five morphotypes: cylindrical and conical, spheres, disks, rings and tablets (Garfinkel 1995, p.23). Technological analysis conducted at Kfar HaHoresh indicate both the baked-clay geometric items and the figurines were all *ad hoc* objects, made from local soil and fired at relatively low temperatures, ca. 600-800˚C (Biton et al. 2014).

Beads and pendants were reported from many Neolithic sites and are made of a wide variety of materials, ranging from bone and teeth to stone, minerals, shells and clay (e.g. Bar-Yosef 1985; Bar-Yosef & Gopher 1997; Bar-Yosef Mayer 2005; Bar-Yosef Mayer & Porat 2008; Edwards et al. 2004; Horwitz & Garfinkel 1988; Rollefson 1984;

Stordeur 2000). Within the studied area, these were reported from Kfar HaHoresh, Yiftah'el, and Munhata[39].

At Kfar HaHoresh, numerous beads and pendants were recovered, with a relatively high proportion made on various types of green minerals (Figure 5.43: 11). These include apatite, chrysocolla, malachite, amazonite and serpentinite (Bar-Yosef Mayer & Porat 2008; Goren, pers. comm.). Twelve different types of stone bead were defined based on morphological traits. Many beads and pendants were found within or in close proximity to graves, usually as single items. The largest concentration was in L1352 (Squares Q54/55) where several beads and pendants were found in association with a child (Goring-Morris 2005, fig. 12.6.).

In addition to the complete items, ca. 130 lumps and fragments of raw material were also collected at Kfar HaHoresh, including chlorite, malachite and serpentinite, as well as other minerals. These raise the possibility that some bead manufacture was conducted on-site, although not as part of a mass production process (Goring-Morris 2010, p.60). However, the differences in shape, size, perforation size, drilling methods, manufacturing techniques and stylistic aspects indicate that these items were often manufactured off-site (Goring-Morris, pers. comm.). Similar green mineral lumps were recorded at Mishmar Ha'emeq (Barzilai, pers. comm.) and at Kfar Qana (pers. obs.). On-site bead manufacture was also suggested at Yiftah'el area C, where 18 items on green minerals, including two finished beads (Figure 5.43: 3-4), as well as a lump of raw material and 15 splinters of various sizes were recovered in the open area north of structure 700 in association with a group of flint drills (Garfinkel 1987, 2012a,b). Minerals identified include rosasite, malachite, apatite and chrysocolla (Garfinkel 2012b, p.210). Two other stone beads were fabricated on grey agate, and on a black-coloured, unidentified mineral (Figure 5.43: 1-2; *idem,* p.207). Eleven complete beads and four fragments were reported from the 1982 excavation in area D (Gubenko & Ronen 2014). Of these, 10 are disk-shaped on greenstone (Figure 5.43: 5-8). The other bead, a surface find, is made on grey stone, but is similar to the other beads in both typology and production technology, which led the authors to suggest that it, too, should be assigned to the PPNB assemblage (*idem,* p.152).

Only two beads were recovered at Munhata. These are similar to the Kfar HaHoresh beads, but were made on limestone rather than greenstone or other minerals (Figure 5.43: 9-10). A polished limestone palette with two perforations, unknown from other sites in the Galilee, probably a pendant, was also reported (Figure 5.43: 21; Gopher & Orelle 1995, p.61).

Beads were also produced using baked clay; at Kfar HaHoresh, three types of clay beads were identified, including cylindrical, ellipsoid and circular beads (Figure 5.39: 7). Almost all items were fragmentary, red or orange in colour, with large perforations (Biton 2010, p.24). The perforation was achieved by moulding the beads around a

[39] Shell beads were also reported from Ard el-Samra. For a discussion of shell made ornaments see Ch. Ch.5.

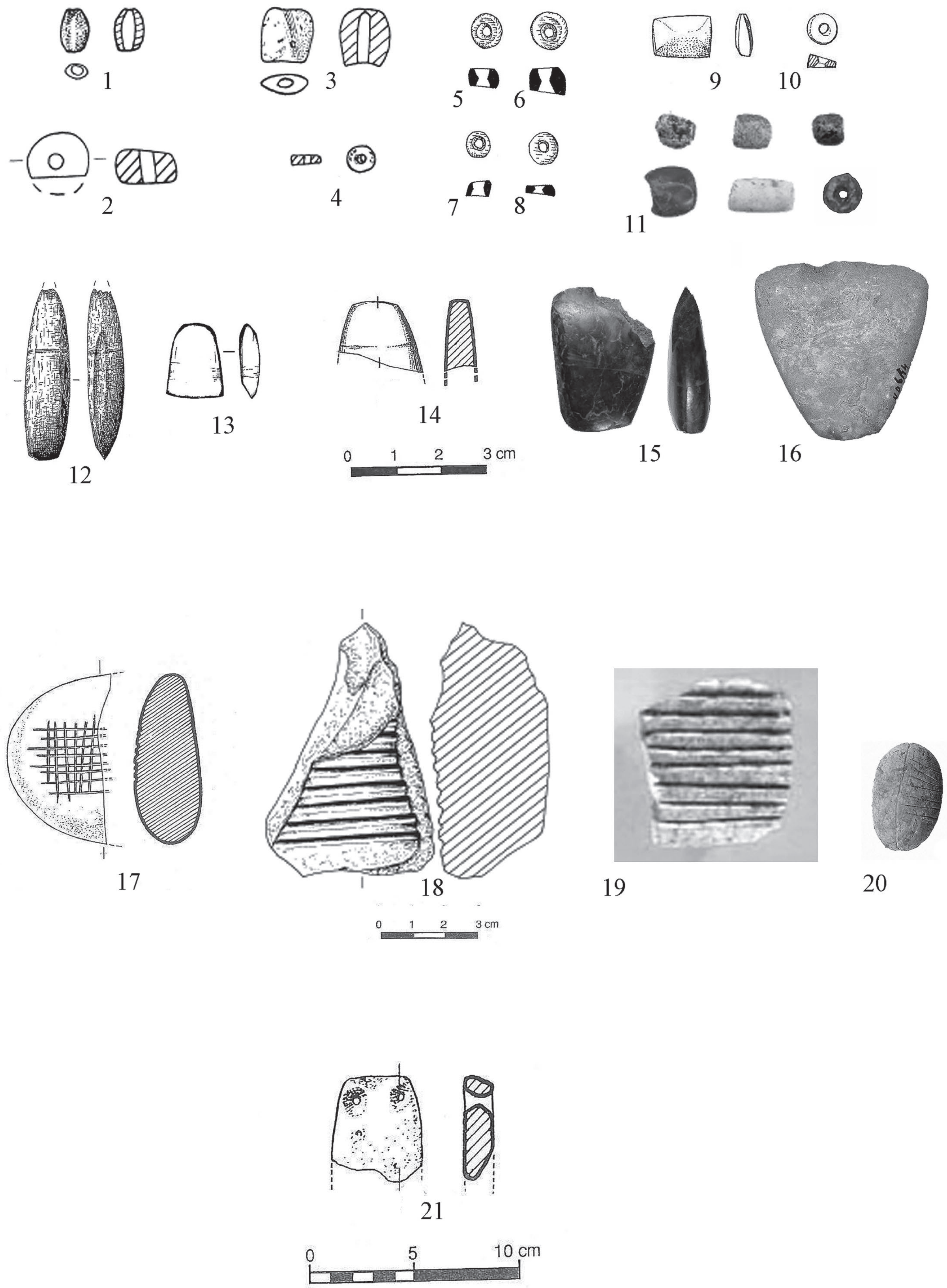

Figure 5.43: 'Special finds' from the Lower Galilee: 1) grey Agate bead (Yiftah'el); 2) black bead (Yiftah'el); 3-8) greenstone beads (Yiftah'el); 9-10) Limestone beads (Munhata); 11) Beads from various minerals KHH); 12-13) Greenstone Miniature "votive" axes (Yiftahe'l); 14) Greenstone miniature "votive" axe (Munhata); 15-16) miniature "votive" axes (KHH); 17) limestone incised pebble (Munhata); 18) Limestone incised block (Yiftah'el); 19-20) Limestone incised block and pebble (KHH); 21) limestone pendant (Munhata); (after Garfinkel et al. 2012b, fig. 7.2; Gopher & Orelle 1995, figs. 38 & 40; Goring-Morris 2010, figs. 13 & 30; Goring-Morris et al. 2008, fig.6; Gubenko & Ronen 2014, fig. 2).

cord, as indicated by imprints (*idem,* p.26). While no clay beads were reported at Yiftah'el, several bone beads were recovered from areas C and D; these include a single disc-shaped, flat bead, two tubular, elongated beads (Figure 5.40: 6-7; Garfinkel et al. 2012c, p.224) as well as a possible bone pendant (Gubenko & Ronen 2014, p.155).

In summary, beads and pendants of various materials were recorded, including locally available (limestone, bone and clay) as well as 'exotic' materials, e.g. the greenstone minerals. Unlike the locally made clay beads, it seems that local production of greenstone beads, if at all, was limited in scope. Notwithstanding the small number of items recovered, there are considerable typological similarities between sites.

Greenstone and other 'exotic' minerals were also used to manufacture miniature polished axes, recorded from Kfar HaHoresh, Yiftah'el, Munhata and Ahihud (Figure 5.43: 12-16). These are quite small, 1-5cm in length, and were polished to create a symmetrical cross-section and an elongated trapeze shape.

A relatively wide variety of 'exotic' raw materials, such as serpentine, chrysocolla, malachite, and chlorite were used in the manufacture of these items (Meir 2015), and they appear in various shades and colours, ranging from light grey, through lighter and darker shades of green to almost black. The widest array of colours, including grey, green, blue, yellow, reddish and brown items was reported at Kfar HaHoresh (Goring-Morris, pers. comm.). The possible origins of most raw materials, and particularly the different greenstones, are quite remote; the nearest possible source of malachite and chrysocolla are in Faynan or Timna in the Arava region, while serpentinite and chlorite sources derive from either northern Syria or Cyprus (Bar-Yosef Mayer & Porat 2008; Rosenberg et al. 2010). At Ahihud specimens are quite unique in their raw material, as they were identified as made on amphibole, a metamorphic rock originating from northern Italy or Greece, and was previously unknown in the PPNB (Vardi, pers. comm.; Vardi et al. 2013).

The polished axes were found in various contexts, including burial contexts at Kfar HaHoresh. At Yiftah'el, a cache of eight miniature axes was found on the floor of Building 501 (Area I; Khalaily et al. 2013). Their miniature nature and the 'exotic' nature of the raw materials have led to suggestions they had a votive, ceremonial use (e.g. Barkai 2005, p.42; Cauvin 2000, Khalaily et al. 2013, p.228). Some items from Yiftah'el had deep incisions on both sides, perhaps the result of tying, and it was suggested that they served as pendants (Figure 5.43: 13; Gubenko & Ronen, p.153). Two items with similar incisions were reported at Munhata, where they were interpreted as representing eyes, and thus classified the items as anthropomorphic figurines (Figure 5.43: 14; Gopher & Orelle 1995, p.63). Similar axes had signs of use-wear, suggesting a possible utilitarian function, perhaps wood working (e.g. Yerkes et al. 2012).

Elsewhere in the southern Levant, polished, miniature axes are quite rare in PPNB contexts. Similar items were reported from Horvat Galil (Gopher 1989), Atlit Yam (Galili et al. 2005), Beisamoun (Lechevallier 1978), Motza (Khalaily et al. 2007a, Yerkes et al. 2012), and Jericho (Wheeler 1983). Outside of Cisjordan, they were only reported from sites in the northern Levant, such as Byblos, Bouqras and Abu Hureyra (Moore 1978, p.171, 179), and in Cyprus (i.e. Klimonas and Shillourokambus; Guilaine et al.

2002; Vigne et al. 2012). Thus, their concentration within the Galilee is of interest, and indicates connections to the northern Levant and perhaps beyond (i.e. Greece).

A third artefact type on different minerals and stones are the 'polished pebbles'. These are small, round, token-like items, shaped by polishing. They do not usually exceed two centimetres in diameter, and should be distinguished from 'polishing pebbles' (*sensu* Wright 1992; sometimes referred to as 'polishing stones'), which are larger, less symmetrical and were probably used for polishing lime-plaster floors and other surfaces (and see Shea 2013, p.266; Wright 1992, p.70). There also seems to be some ambiguity in the literature when addressing these items, as the terms 'polished pebbles' and 'polishing pebbles' are sometimes used interchangeably (e.g. Dag et al. 2012, p.205). Unlike the 'polished pebbles' that are made on colourful, sometimes 'exotic' materials, 'polishing pebbles' are made on locally available limestone or basalt. While 'polishing pebbles' were identified in several Galilean sites (and see above), miniature 'polished pebbles' on various minerals were only identified at Kfar HaHoresh (Goring-Morris, pers. comm.), Munhata (Gopher & Orelle 1995), Nahal Zippori 3 and Mishmar Ha'emeq (Barzilai & Vardi, pers. comm.; Appendix 2, Table 3).

The Kfar HaHoresh assemblage comprises 497 items and is the only fully recorded and analysed assemblage to date. Raw materials include gabbro, basalt, limestone, marble, chalk, flint, calcite, sandstone and quartz, ranging in colour from grey (often mottled), black, white, and beige, to yellow, orange, pink and red (Goring-Morris 2010). There are preliminary indications for some correlation between specific polished pebble types and burial contexts (Birkenfeld 2008). Two similar items on gabbro were reported from Munhata (Gopher & Orelle 1995, p.75), and from Mishmar Ha'emeq (Barzilai, pers. comm.). The apparent absence of polished pebbles in other sites is intriguing. While this could signify an actual pattern, it may reflect retrieval methods.

To summarise, the relative abundance of items (personal ornaments, polished pebbles and polished axes) made on 'exotic' minerals and other unique materials is interesting, especially when considering the possible origins of these raw materials. Identified minerals include apatite, originating in the Dabba marbles of Jordan or in the Hatrurim formation of Israel[40], chrysocolla and malachite, which originate in the Faynan and/or Timna areas, amazonite, found in Wadi Tbeik in Saudi Arabia and serpentinite, which appears in northern Syria and in Cyprus. (Bar-Yosef Mayer & Porat 2008, p.8548-8549). Especially intriguing are the chlorite, rosasite and amphibole; the closest sources of chlorite, which was identified at Kfar HaHoresh, can be found in northern Syria, Anatolia, and Cyprus (Rosenberg et al. 2010). Rosasite, identified at Yiftah'el, could originate from either Greece or Iran (Burg pers. comm.), and amphibole, identified at Ahihud, could originate in either Greece or northern Italy (Vardi, pers. comm.). Thus, the appearance of these minerals in the Galilean sites indicates well-developed, long-distance trade or exchange networks, similar to the one indicated by obsidian.

[40] Exposures of the Hatrurim formation are located on the edges of the Jordan Rift Valley, in the Judean Desert, and the Negev (Bar-Yosef Mayer & Porat 2008 and references therein).

In conclusion, the 'special finds' recorded in the studied sites are quite varied, including artefacts of diverse types, from figurines and other items with symbolic insignia, to personal ornaments. A wide array of raw materials was used, from locally available clay, bone and stone, to 'exotic' materials such as greenstone minerals and obsidian, sometimes originating hundreds and thousands of kilometres away. Most items, such as the miniature axes and the obsidian tools were most probably brought to the sites as ready-made goods, while others, for example the clay objects, could have easily been manufactured locally. Similarities between the different sites can be drawn in both technology and typology of these items, but in the absence of detailed publications it is difficult to draw any decisive conclusions. The fact that most items discussed above originate either in Kfar HaHoresh, Yiftah'el or Munhata could reflect the centrality of these sites within the PPNB of the Galilee, but could also be the result of data availability and excavation size.

SUMMARY AND CONCLUSIONS

In this chapter, various aspects of the material culture recovered from the studied sites were comparatively analysed. These include the built environment, human burials, faunal and botanical assemblages, various tool assemblages and special finds categories. The aim of the analysis was twofold; first, to clarify the nature of the various occupations; and second, to examine whether associations between different sites within the region could be recognized.

In general, several lines of similarity were discerned between the different sites; these include, for example, architectural construction methods and techniques, stone tool techno-typologies, as well as other aspects of the small finds recovered. Nonetheless, several dissimilarities were also discerned between the different assemblages, and at times even between different assemblages deriving from a single site.

Some of these dissimilarities seem to reflect chronological differences; for example, a general chronological development was traced in the complexity of the architectural form and structure size, which increased through the PPNB sequence. Other diachronic patterns recorded involve the lithic assemblages (e.g. changes in tool type frequencies) or the faunal assemblages, indicating changes and developments in the economy of the sites. However, it must be taken into account that only a few sites in the Galilee were radiometrically dated (Appendix 2, Table 1). Other sites were dated by typological seriation of the flint tool assemblages. While at times greater resolution was possible, and a sub-chronology of Early, Middle, Late and Final PPNB/PPNC was suggested, most sites were assigned a general PPNB date (Table 3.1), and it was not always clear whether sites were indeed contemporaneous. Thus, it was difficult at times to clearly characterize the observed patterns, and separate diachronic trends from other patterns, be they functional, economic, geographic, or otherwise.

Other patterns recorded seemed to reflect geographic variations; in particular, a distinction between the central Galilee sites and the Jordan Rift Valley cluster sites was recognised. The latter seem to differ in several aspects, including certain characteristics of their faunal assemblages, stone tool categories, etc. Some of these discrepancies imply that the Jordan Rift Valley cluster sites may have differed in their economic base. For example, it is possible that they relied more on cereals and perhaps on foddered animals. Other variations recorded, for example in the lithic raw materials used, raise issues of inter-site interactions, and indicate that the Jordan Rift Valley cluster sites may have had stronger connections with entities to the east and north, rather than westwards (and see discussion in Chapter 7).

A major impediment that emerged during analysis is the issue of data quality and sample size. Although sites were ranked and set into categories in order to minimize the obvious bias, it became clear that the significant differences between the various assemblages in terms of size and of data availability (i.e. extent of publication, access to quantitative details, etc.) made inter-site comparisons very problematic. This was not only the case when comparing sites from different categories; even within Category I, comprised of Kfar HaHoresh, Munhata and Yiftah'el, three large-scale excavations, where large areas were exposed and large finds assemblages were collected and published, imbalances were noted.

Chapter 6

Results of site locational analyses

The following chapter summarizes the results of the sites' locational analyses. It deals with the sites' geographic and topographic locations, the size of their exploitation territories and their composition. Results of the viewshed analyses are presented as well. Full quantitative results are given in Appendix 3.

GEOGRAPHIC AND TOPOGRAPHIC LOCATION

PPNB sites in the area under study were grouped in five separate clusters, based on their geographical location (Figure 6.1); the easternmost cluster, situated at the southern edge of the Sea of Galilee and adjacent northern Jordan Rift Valley (henceforth 'The

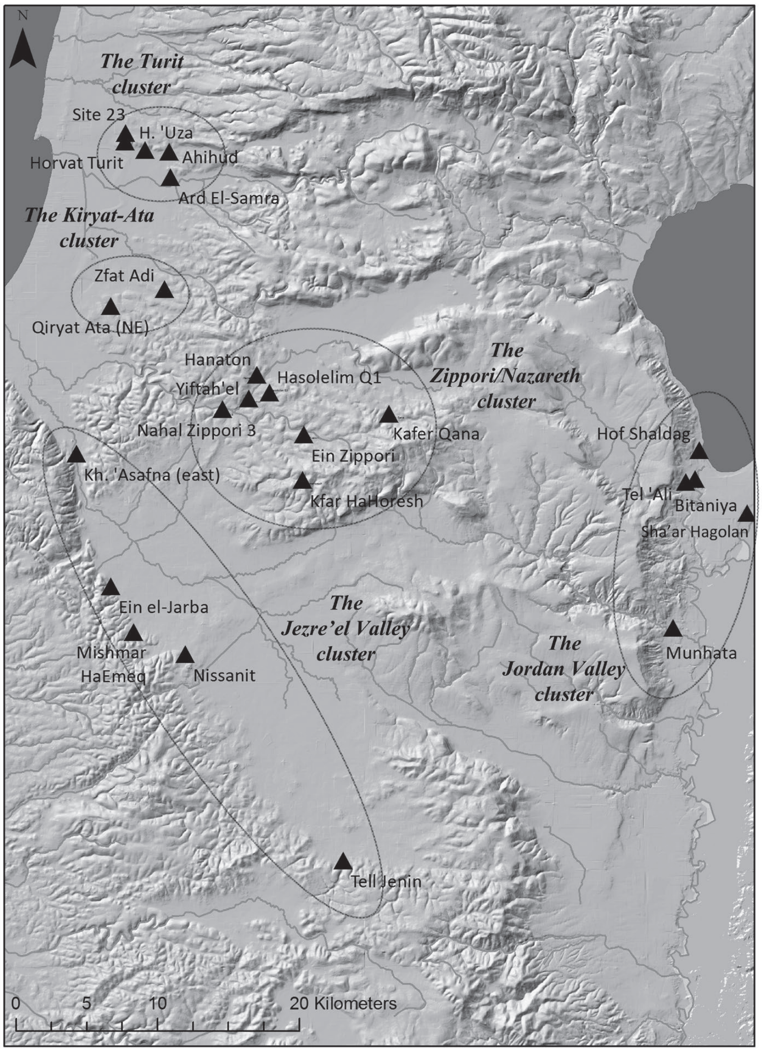

Figure 6.1: Main site clusters in the Lower Galilee.

Jordan Valley cluster'), comprises five sites: Munhata, Tel 'Ali, Bitaniya, Hof Shaldag and Sha'ar Hagolan. Further to the west, along the southern edge of the Jezre'el Valley and at the foothills of the Mt. Carmel ridge and Ramat Menashe hills, a second cluster comprises five sites, including Khirbet 'Asafna (east), Mishmar Ha'emeq, 'Ein el-Jarba, 'Enot Nissanit and Tell Jenin (henceforth 'The Jezre'el Valley cluster'). A third cluster, located in the Nazareth hills and along the Nahal Zippori stream that transects them (henceforth 'The Zippori/Nazareth cluster'), comprises seven sites: Nahal Zippori 3, Yiftah'el, Hanaton, the 'Ein Zippori complex, Kfar Qana, Triangulation Point Q1 and Kfar HaHoresh. Two clusters were located at the westernmost area of the central Lower Galilee, at the border of the coastal Shephelah; the one to the north comprises five sites situated along the Turit hill extension. These include Horvat Turit (Judeidi-Makr #121) and Judeidi-Makr #23, Horvat 'Uza, Ahihud and Ard el-Samra (henceforth 'The Turit cluster'). The cluster to the south, towards the central Shephelah, includes only two sites: Qiryat Ata (NE) and Zefat Adi (east) (henceforth 'the Qiryat Ata cluster').

Topographically, most sites showed similar patterns: they are usually located at the seam between the valleys and the foothills, on very gentle slopes rarely exceeding six degrees (Figure 6.2; Table 3.1). This location is beneficial in allowing for the exploitation of two different but complementary environments: the hill ranges and the valley plains. Most sites sit on slopes with a northern aspect (Figure 6.3). Some however differ from this trend, including the Jordan Valley cluster sites, which slope to the east and to the south, Horvat 'Uza and Ahihud, which incline to the south, as well as Khirbet 'Asafna (east), Hanaton, Triangulation Point Q1 and Zefat Adi, which face westwards. All of these sites (with the exception of Triangulation Point Q1) face their immediately adjacent lowlands and potential arable land.

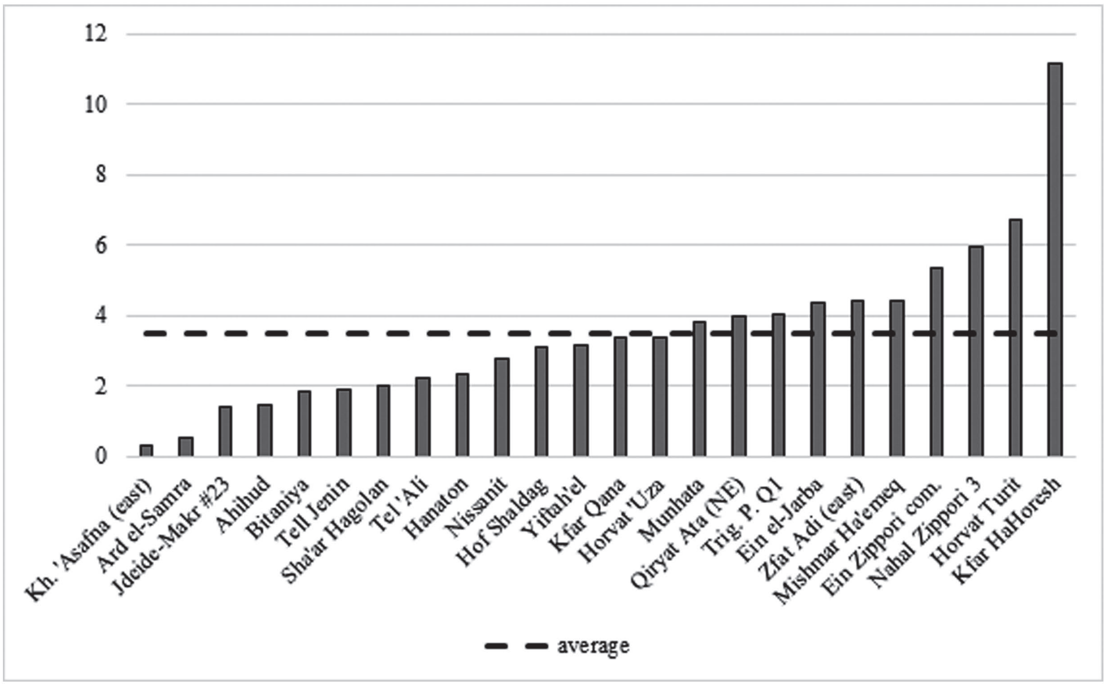

Figure 6.2: Slope (in degrees) at site location.

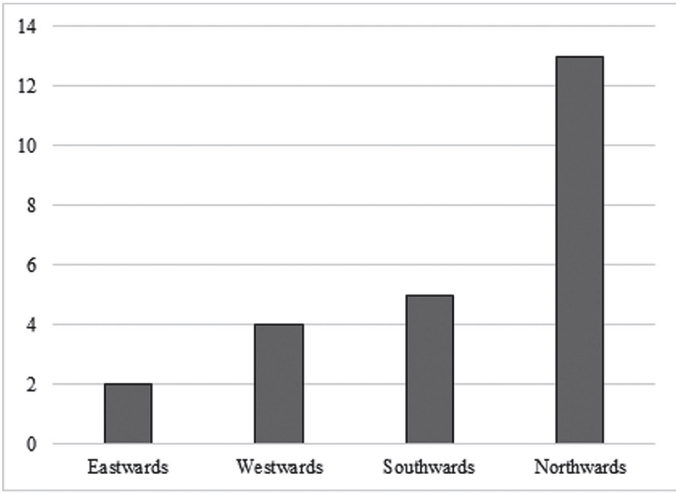

Figure 6.3: Aspect of slope at site location.

Other variations were noted, influenced in part by geographic location; the Zippori/ Nazareth cluster sites, for example, are located higher than the other sites, all sitting well above 100m asl (Figure 6.4). There seems to be a division between the lower sites including Hanaton, Yiftah'el, Nahal Zippori 3, the 'Ein Zippori complex and to some degree Kfar Qana, which follow the general trend of ecotonal locations, and the sites of Triangulation Point Q1 and Kfar HaHoresh, situated higher up in the hills with much less access to the valley plains. The Jordan Valley cluster sites also seem to differ from the general trend. While maintaining the concept of sitting slightly higher than the valley plains, their preferred location seems to be on river terraces. Hof Shaldag is the only exception, located on the shore of the Sea of Galilee. Out of the five sites in this cluster, Munhata is the only one retaining in full the ecotonal location trend, remaining close to the hilly areas to its east.

Some variability was also apparent within other clusters; the site of Horvat Turit, for example, is situated on the upper reaches of a hill, on a relatively steep slope measuring seven degrees. This is an atypical location in comparison with the other sites in the Turit cluster, which sit at the very edge of the foothills, if not right down on the valley floors (e.g. Ard el-Samra), on slopes ranging between one and three degrees. Within the Jezre'el Valley cluster, Khirbet 'Asafna (east) also showed some variation, as it sits much lower than the other sites, towards the valley itself, adjacent to the stream of the Qishon, on almost flat terrain.[41]

Another characteristic in the location of the sites is proximity to running water, as most sites are located less than 500m from perennial streams or rivers[42] (Figure 6.5),

[41] However, it should be noted that Khirbet 'Asafna (east) was covered by a thick layer of fluvial deposition, such that post-depositional activity may mask the original topographic setting, and that it was originally more similar to the other sites.

[42] This distance refers to walking distance, e.g. weighted distance, taking into account local topography rather than the Euclidean, straight-line distance between the site and the nearest water stream.

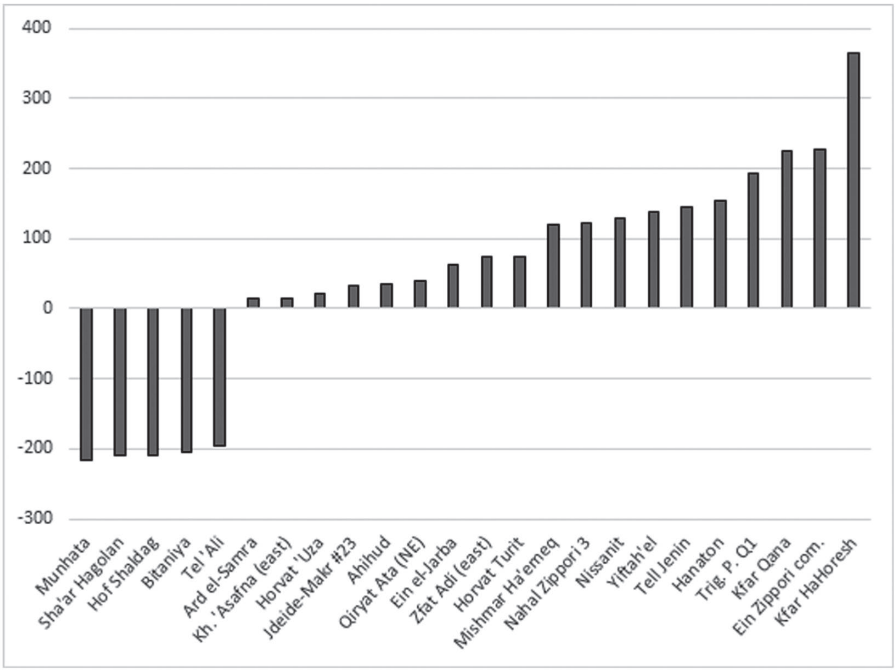

Figure 6.4: Elevation (in meters above sea level) of site locations.

and many sites are located immediately adjacent to, and somewhat elevated from the watercourse itself.[43] This was especially obvious in the Jordan Valley sites, which are not only located near the Jordan River, but also at the confluence of it with other west to east draining tributary streams: Munhata at the confluence with Nahal Tavor, Tel ‘Ali and Bitaniya at the confluence with Nahal Yavne’el. Sha’ar Hagolan was the only exception within this cluster, as it is somewhat distant from the Jordan River itself. It still, however, sits on the bank of the Yarmuk River. Only three sites diverge from this pattern altogether: Kfar HaHoresh, Horvat Turit and Horvat ‘Uza.

When summarized, it seemed that several sites diverge repeatedly from the general trends; the sites of Kfar HaHoresh and Triangulation point Q1, for example, are both located on relatively steep slopes, not following the ecotonal location pattern, and neither faces any arable land. Kfar HaHoresh is also located relatively far from any watercourse. A somewhat similar pattern is observed at Horvat Turit. In the Jordan Valley cluster, Hof Shaldag also stands out, located on the shore of the Sea of Galilee. It is interesting to note that all of these sites were suggested to function as special-purpose sites (and see discussion in Chapter 7).

THE EXPLOITATION TERRITORIES

Three exploitation territories were calculated for each of the sites, based on walking distances of half an hour, one hour and two hours from the site (and see Chapter

[43] Modern development and over-extraction have dried many of the sources of the Lower Galilee streams, and left them seasonal. However, until recently, these streams were affluent, perennial watercourses, supplying millions of cubic meters per year (Perelmuter 2008).

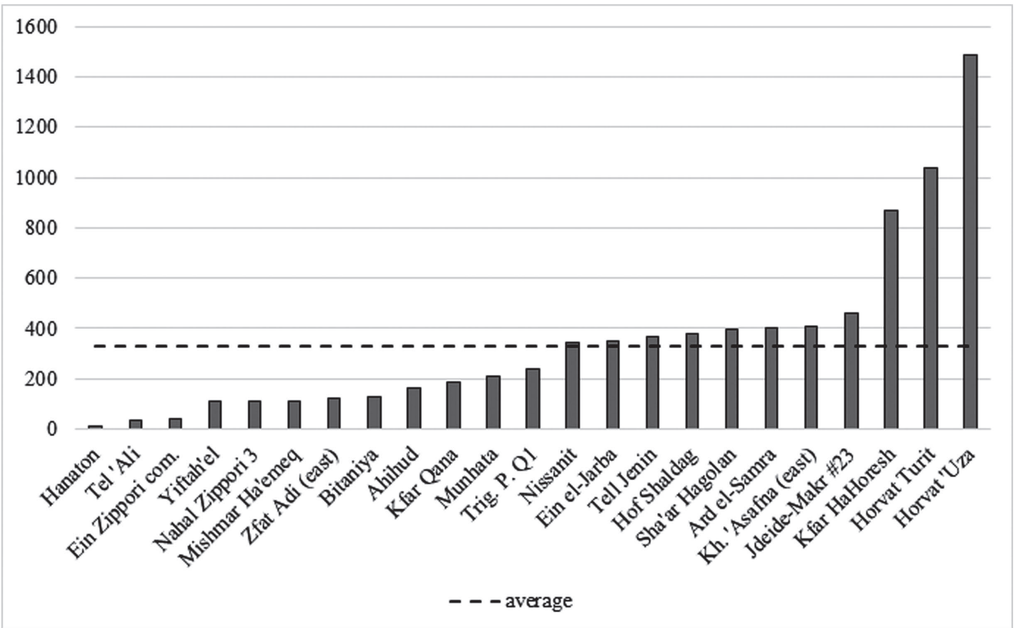

Figure 6.5: Walking distance (in meters) to nearest stream.

2; Appendices 3a,b: Table 1, Figures 1.1-1.24). An important note should be made regarding the Jordan Valley cluster sites (e.g. Hof Shaldag, Bitaniya, Tel 'Ali, Munhata and Sha'ar Hagolan); because of their proximity to the modern political border between the state of Israel and the Hashemite Kingdom of Jordan, the three territories of these sites could not be calculated in full. This is due to the insufficiency of topographic and environmental information east of the border. As a result, only half-hour and one-hour territories could be calculated in full for the sites of Hof Shaldag, Bitaniya and Tel 'Ali, and a half-hour territory for Munhata. At Sha'ar Hagolan, which is located immediately adjacent to the border, all three territories were affected (Figure 6.6). However, in order to fully exploit the available data, calculations of the environmental variables were made for the other territory sizes as well, and the results were treated as percentages of the available area, in order to minimize possible bias. It must be taken into account, however, that this bias of the environmental data might have affected the results presented below, as some parts of the actual exploitable territories remain unknown. On the other hand, the modern political border follows the course of the Jordan and Yarmuk rivers, which may have formed a real physical obstacle affecting the actual exploitation potential of the areas to their east and southeast.

Exploitation Territories: Size and Location

Figures 6.7-6.9 display the area (in km^2) covered by the different territories of each site. Since topography was the main variable taken into account in the calculation of the territories, it is no surprise that the resulting exploitation areas followed to a large degree the geographic clustering of the sites; The Turit and Qiryat Ata site clusters all exhibited above average territory sizes, as may be expected due to their proximity to the large coastal plain to the west. The Zippori/Nazareth cluster sites, on the other hand,

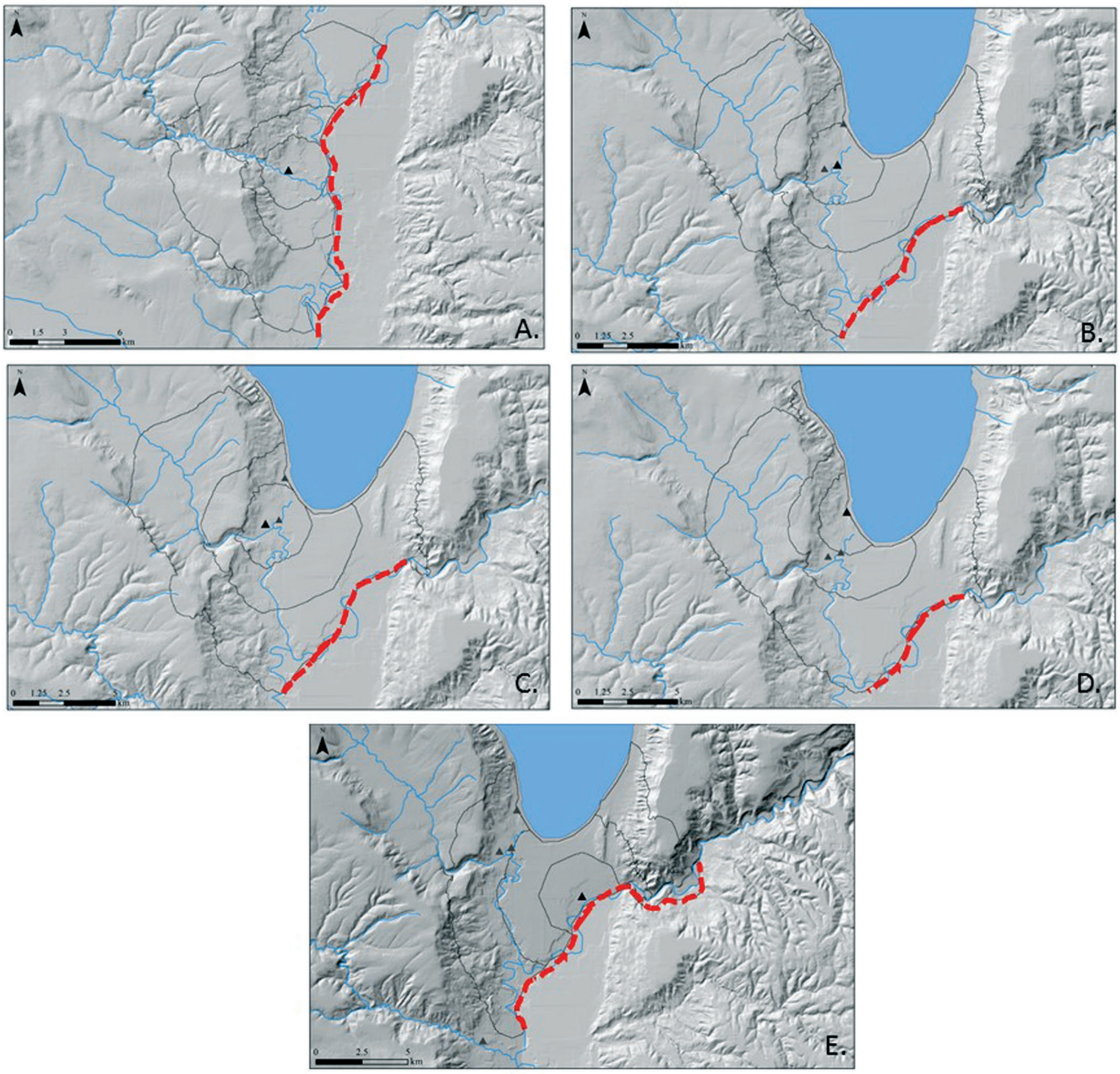

Figure 6.6: Jordan River cluster sites, showing territories cut by proximity to the modern border; Munhata (A), Bitaniya (B), Tel 'Ali (C), Hof Shaldag (D) and Sha'ar Hagolan (E).

are surrounded by the central Galilee hills that impede movement. Consequently, they displayed smaller territory sizes in all three distance-categories. The Jezre'el valley cluster sites exhibited a range of values, as some sites such as Khirbet 'Asafna (east) and 'Ein el-Jarba showed below average territory sizes, while 'Enot Nissanit displayed relatively high values, much more similar to the Turit cluster sites. In the Jordan Valley cluster, the territories available exhibited average values as well. It is interesting to note that in all of the time-distance categories, the average area of the actual territories is ~ 60% of the "optimal" travel distance, i.e. if the terrain was completely flat (Figure 6.10).

Some sites showed interesting patterns. Kfar HaHoresh, for example, has considerably smaller territories than all of the studied sites, in all three distance-categories. Khirbet 'Asafna (east) and Ahihud also follow a similar tendency: located in hillier locations than their immediate neighbours, both showed repeatedly smaller exploitation territories. Since all three sites demonstrate EPPNB occupations, this may reflect a chronological trend.

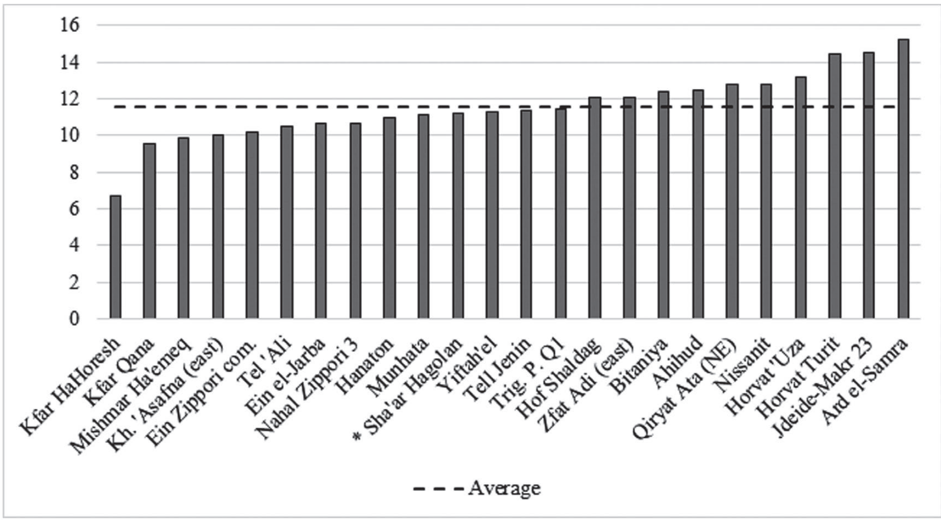

Figure 6.7: Areas of half-hour territories in km². (*) marks Jordan Valley cluster sites affected by the proximity to the modern border.

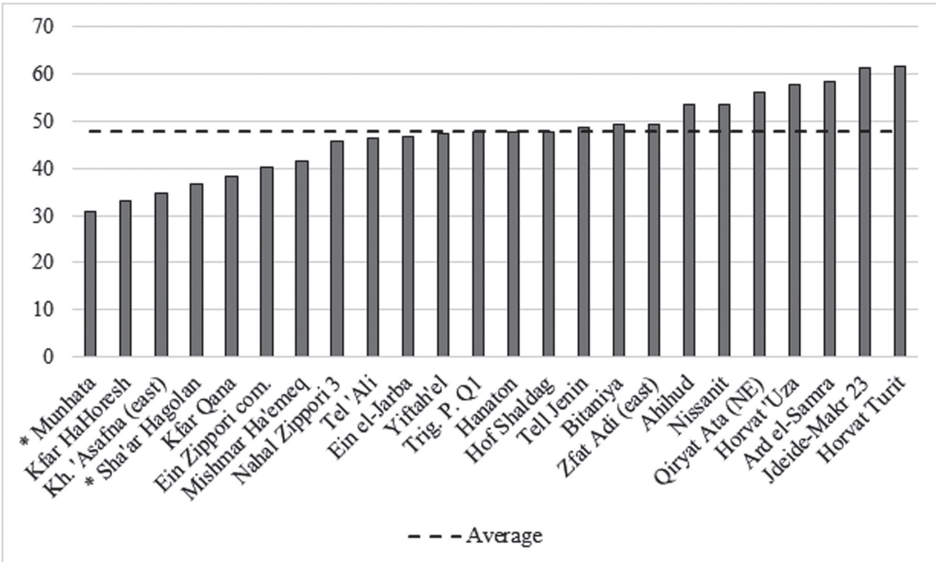

Figure 6.8: Areas of one-hour territories in km². (*) marks Jordan Valley cluster sites affected by the proximity to the modern border.

In some of the clusters there is a great degree of overlap between the exploitation territories of the different sites. This was especially noticeable in the one- and two-hour territories. However, when examining the sites' relative locations, a significant pattern emerged and it seems that sites were deliberately situated within constant walking-distances from one another. This was clearly evident in the respective locations of Qiryat Ata (NE) and Zefat Adi (east), which were located approximately one-hour walking-distance from each other (Figure 6.11). In the Jezre'el Valley cluster, a similar pattern was observed in the respective locations of 'Ein el-Jarba, Mishmar Ha'emeq and 'Enot Nissanit (Figure 6.12).

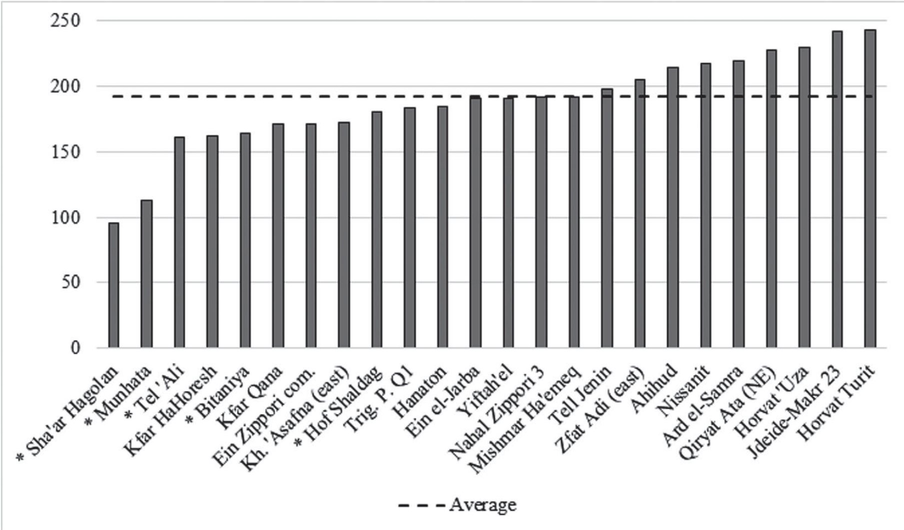

Figure 6.9: Areas of two-hour territories in km^2. (*) marks Jordan Valley cluster sites affected by the proximity to the modern border.

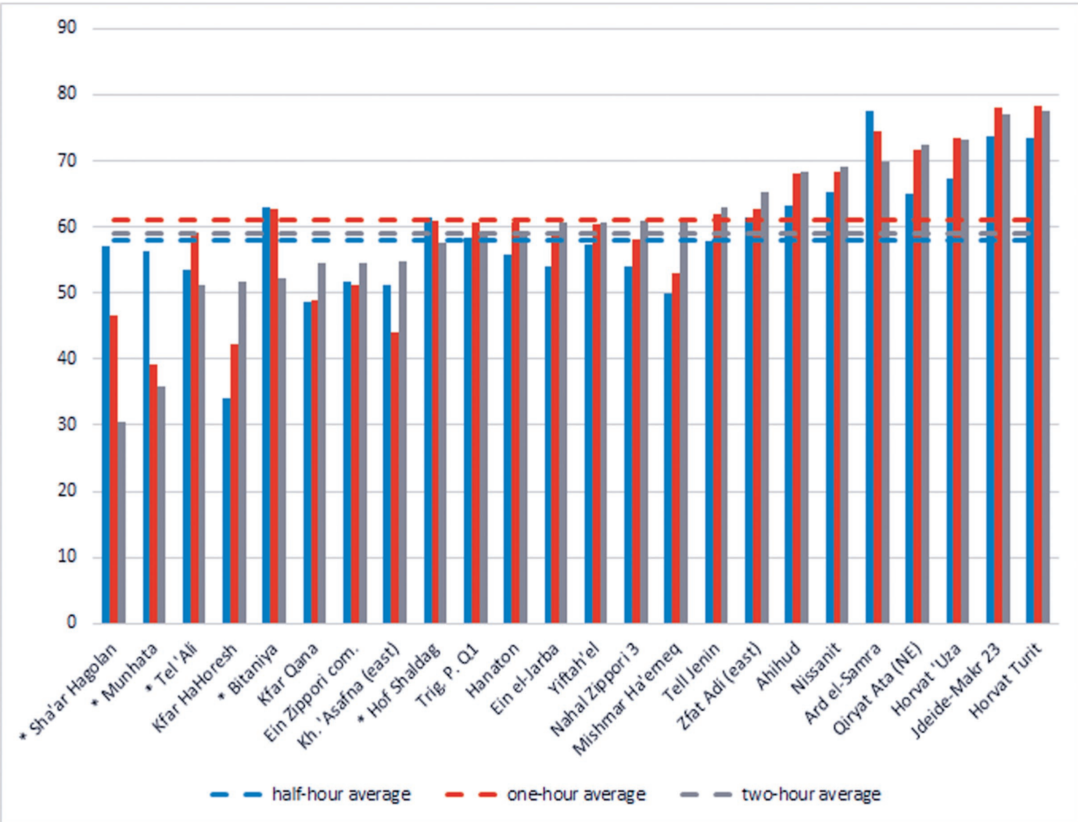

Figure 6.10: Actual available territory as percentage of optimal territory. (*) marks Jordan Valley cluster sites affected by the proximity to the modern border.

In the Turit cluster, it seemed that the half-hour territories overlap significantly (Figure 6.13a). However, when the sites were separated according to chronology and only contemporaneous sites were examined in tandem, a similar pattern appeared; Horvat Turit and Ahihud, both dated to the Early PPNB, were located approximately one-

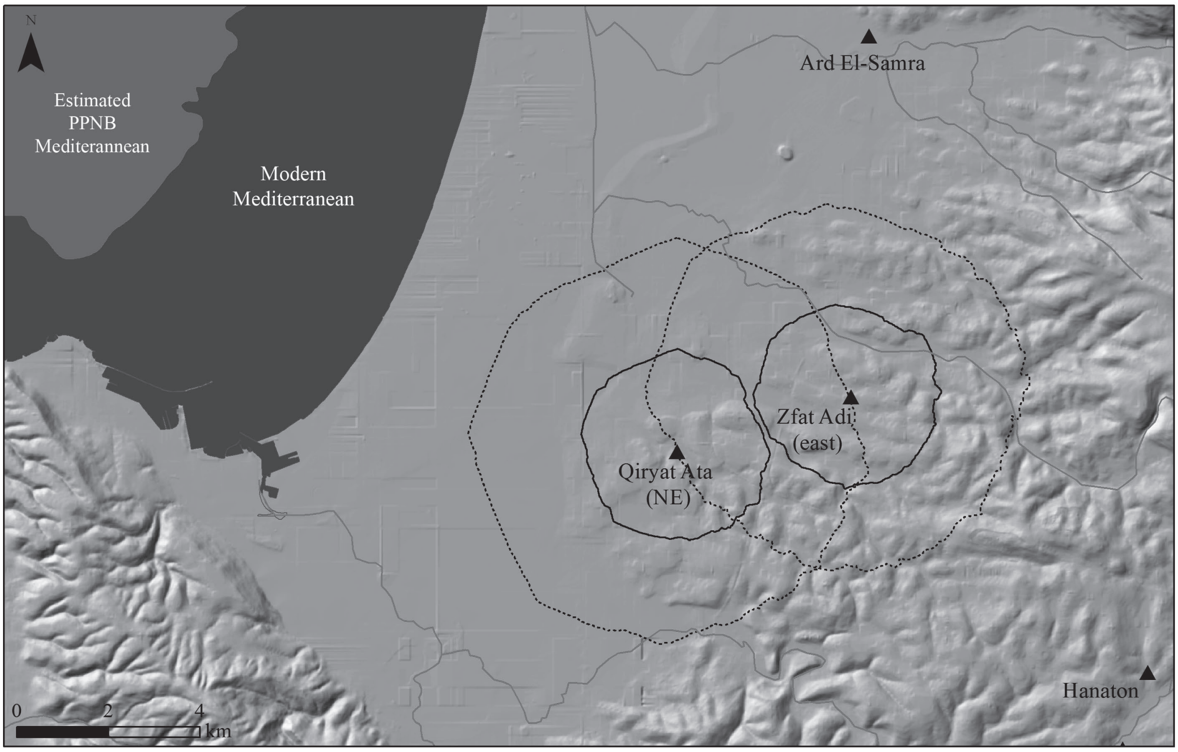

Figure 6.11: Half- (in black) and one-hour (in dashed) territories of Qiryat Ata (NE) and Zefat Adi (east).

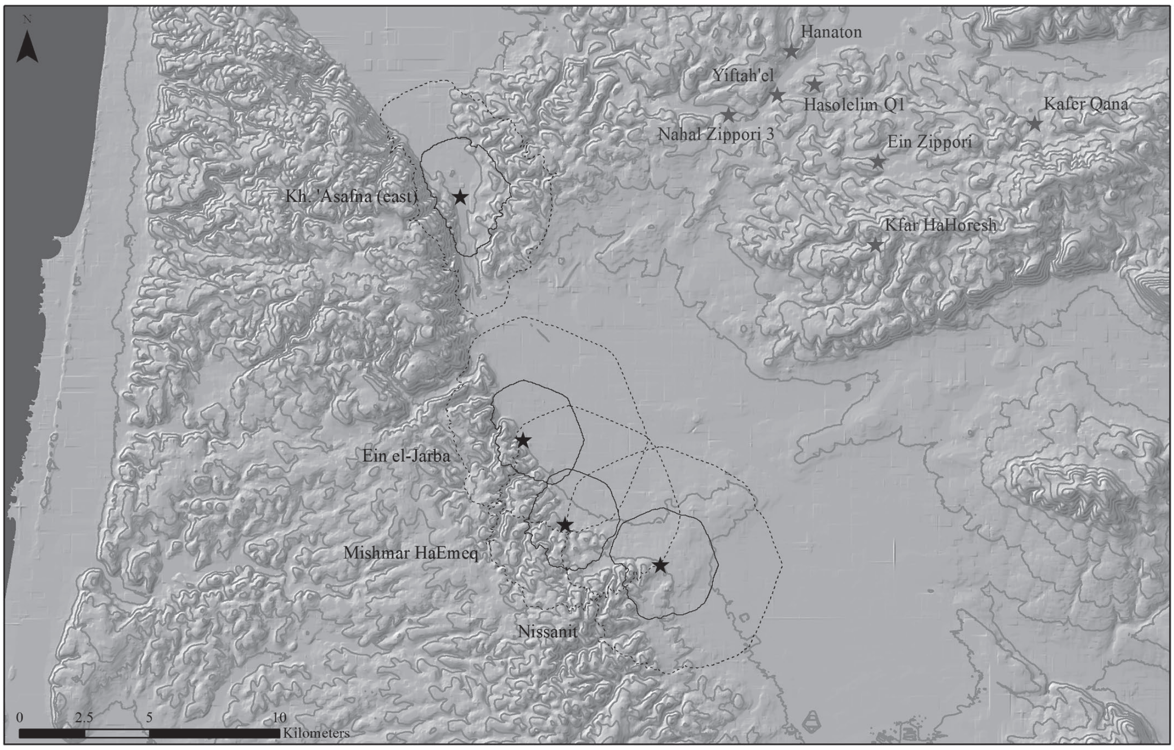

Figure 6.12: Half- (in black) and one-hour (in dashed) territories of 'Ein el Jarba, Mishmar Ha'emeq and 'Enot Nissanit.

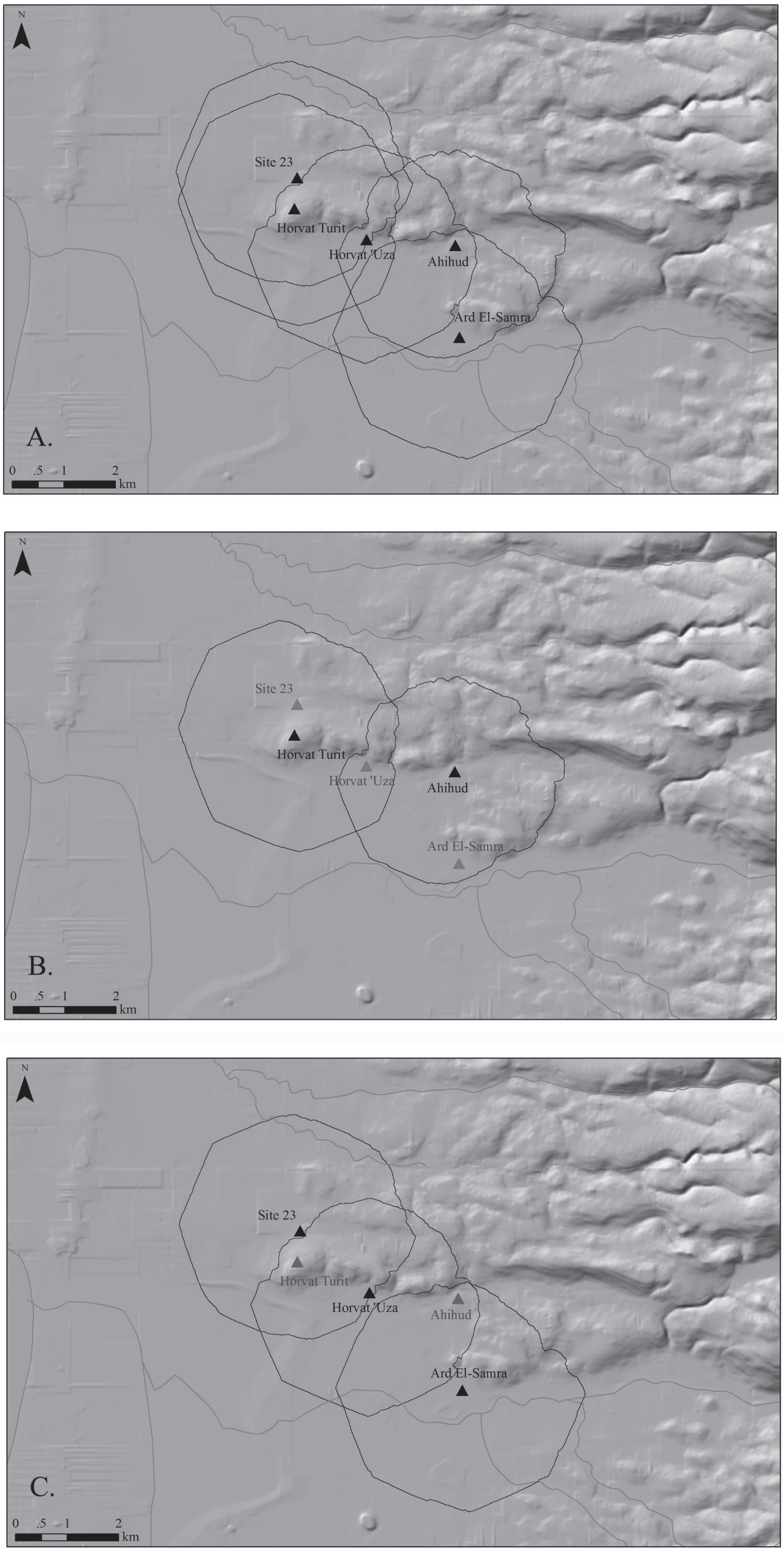

Figure 6.13: Half-hour territories of Turit cluster sites (A), and of contemporaneous sites: EPPNB Horvat Turit and Ahihud (B); LPPNB-FPPNB/PPNC Judeidi-Makr #23, Horvat 'Uza and Ard el-Samra (C).

hour walking distance from each other (Figure 6.13b). Judeidi-Makr #23, Horvat 'Uza and Ard el-Samra, all probable Late PPNB – FPPNB/PPNC sites, were located closer together, approximately a half-hour walking distance one from the other (Figure 6.13c). A similar pattern was observed with the Zippori/Nazareth cluster, where the sites of Hanaton, Nahal Zippori 3 and Yiftah'el were all located at half-hour walking-distances (Figure 6.14). As in the Turit cluster, all three sites are apparently contemporaneous M/LPPNB sites. It was also interesting to note that Triangulation Point Q1, the flint procurement site suggested to have served Yiftah'el, is located at the fringes of the half-hour territories of both Yiftah'el and Hanaton.

In the Jordan Valley cluster, there is a significant degree of overlap between the territories of Bitaniya, Tel 'Ali and Hof Shaldag (Figure 6.15). However, as discussed earlier (and see Chapter 3), Tel 'Ali and Bitaniya could in fact represent a single site. If so, then the pattern that emerges is in compliance with the other site clusters, as Sha'ar Hagolan and Tel 'Ali/Bitaniya, both with FPPNB/PPNC occupations, are located within one-hour walking distance from one another.

The location of Hof Shaldag at the edge of the Tel 'Ali/Bitaniya half-hour territory is reminiscent of the pattern observed in the Zippori/Nazareth cluster, between Triangulation Point Q1, Hanaton and Yiftah'el. This seems to represent a meaningful pattern, as in both cases one of the sites functioned as a habitation site (i.e. Yiftah'el and Tel 'Ali/Bitaniya), while the other (i.e. Triangulation Point Q1 and Hof Shaldag) functioned as a special-activity site related to lithic procurement. A possible third example of a similar pairing can perhaps be proposed in the Turit cluster, where

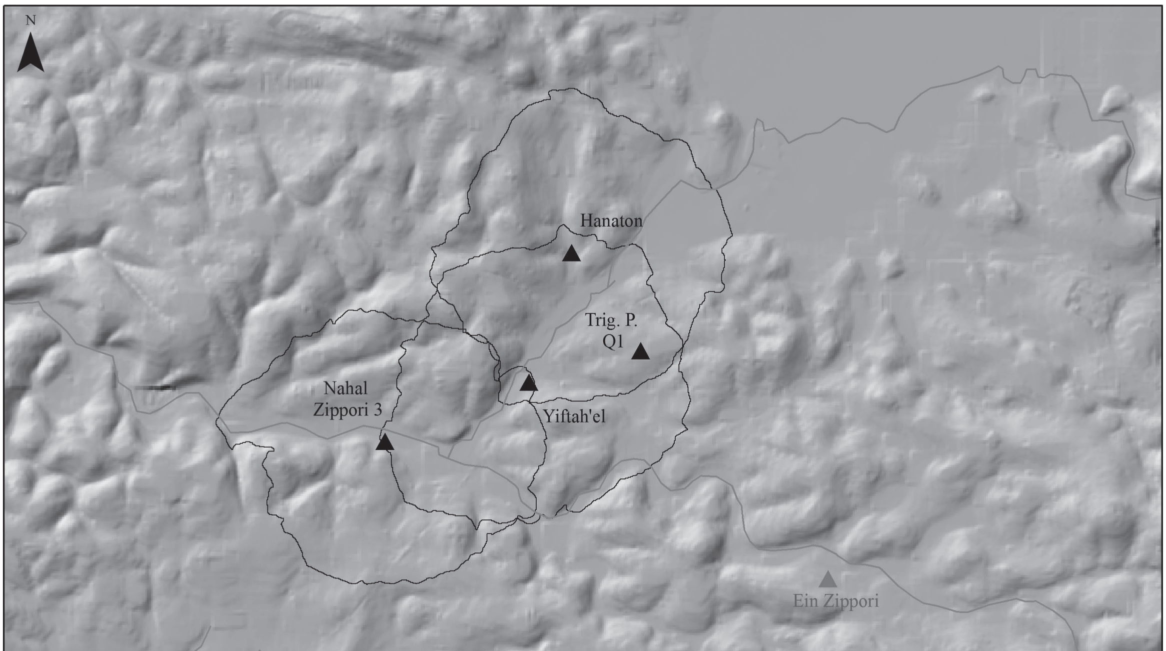

Figure 6.14: Half-hour territories of Hanaton, Yiftah'el and Nahal Zippori 3.

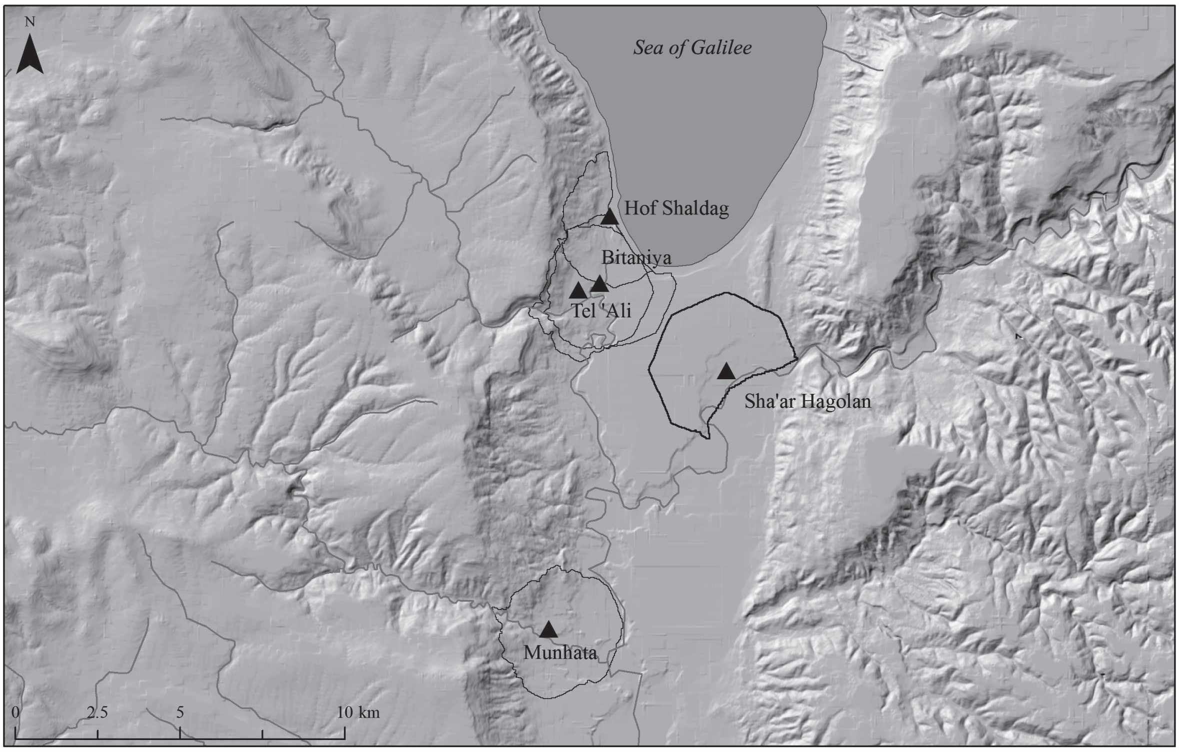

Figure 6.15: Half-hour territories of the Jordan Valley cluster sites.

Judeidi-Makr #23, supposedly a blade-manufacturing site, is located at the edge of the Horvat 'Uza half-hour territory (Figure 6.13c). A fourth example could be represented by the basanite workshop at Giv'at Kipod, located ca.1km west of Mishmar Ha'emeq. In summary, the results showed repetitive patterns, indicating that sites were habitually located at set distances one from the other. Three complementary arrangements were identified: clusters where sites were placed at half-hour intervals (the M/LPPNB Zippori/Nazareth cluster and the LPPNB-FPPNB/PPNC Turit cluster), one-hour intervals (the Qiriyat Ata cluster, the Jezre'el Valley cluster, the EPPNB Turit cluster and the FPPNB/PPNC Jordan Valley cluster) and a third arrangement, where special-activity sites where located at the fringes of the half-hour territory of habitation sites.

Exploitation Territories: Composition and Resources

Several environmental factors were reviewed within the parameters of the three exploitation territories, including soil composition, lithology, agricultural potential and water resources. It can be assumed that when dealing with these parameters, and especially with soil composition and lithology, each site's characteristics would be primarily influenced by its geographic location. Accordingly, one can expect higher levels of variability to exist between the different site clusters, and lower levels of variability within them. Results are thus presented according to site-clusters.

The databases on which the following analyses were conducted are based on information regarding the modern-day environment of the Lower Galilee (and see Chapter 2). Clearly, these do not portray the exact environmental conditions in the area during the PPN. Human land use, together with climatic variability, tend to induce environmental change and degradation (Barker et al. 1999; Barton et al. 2010a,b; Casana 2008); ca. ten millennia of settlement, agricultural and pastural activities probably accelerated erosion processes as well as consequent alluvial valley fill, and must have influenced both soil composition and depth, as well as other environmental aspects explored. The causes and effects of this process of Holocene erosion and alluviation has long been a major interest in archaeological and ecological studies of the Eastern Mediterranean (and see discussion in Bintliff 2002). It is clear, however, that resolving this issue requires a multidisciplinary, integrative approach (Butzer 2005). In the absence of a detailed micro-environmental history of the region, modern day data is taken to serve as a proxy.

Lithology

Generally speaking, the lithological makeup of all exploitation territories displayed a predominance of chalk and limestone with some conglomerates. However, there were differences in the frequencies in which they occurred, as well as in the accompanying lithological types (see Appendices 3a, b, Tables 2-4, Figures 2.1-2.3). As could be expected, the four site clusters located in the central Lower Galilee (i.e. the Jezre'el valley cluster, the Zippori/Nazareth cluster, the Turit cluster and the Qiryat Ata cluster) were more similar to each other than to the Jordan Valley cluster.

All of the Zippori/Nazareth cluster sites exhibited high percentages of chert-bearing layers, and a range of values for chalk and limestone. This was especially apparent within the half-hour territories. It is important to note that within these territories both Triangulation Point Q1 and Yiftah'el exhibited low values for chalk and limestone, but very high values for chert bearing layers. Even within the one and two-hour territories chert bearing layers appeared in this cluster in much higher frequencies than in the other clusters. Nahal Zippori 3 was the only site to have basalt within its half-hour territory. Within the one-hour territory however, the Kfar HaHoresh territory contained the largest expanses of basalt, followed by Nahal Zippori 3 and Yiftah'el, in minute percentages. This corresponds to some evidence, albeit scanty, of possible *in situ* manufacture of tools at Kfar HaHoresh (Goring-Morris, pers. comm.) and perhaps at Yiftah'el (Dag et al. 2012, p.197). Still, within the two-hour territories this evens out, since most sites have some available basalt in their territory.

Some variability was identified within the Jezre'el Valley sites; in general, no conglomerates were found in the immediate vicinity of any of the sites, with the exception of Khirbet 'Asafna (east), where they appeared in very low percentages, due to the proximity to the Qishon river. This trend continued in the one-hour territories but evened out within the two-hour territories, as conglomerates appeared near all sites except Tell Jenin. The latter, on the other hand, has significantly low percentages of limestone and chalk, but very high percentages of chert-bearing layers (40-45%). In contrast, Mishmar Ha'emeq was the only site outside of the Jordan Valley cluster to have no chert-bearing layers in its immediate vicinity. Even within its two-hour radius chert appeared in very low percentages. This trend is manifested well in the lithic assemblage from the site, which exhibited almost no indications for *in situ* lithic manufacture (and see discussion in Chapter 5).

All sites in this cluster except for Khirbet 'Asafna (east) and Tell Jenin contain basalt in their vicinity. Especially high percentages appeared at Mishmar Ha'emeq [44] and 'Enot Nissanit. Within the one-hour territories, only Tell Jenin had no basalt, although Khirbet 'Asafna (east) showed very low values. Very high values appeared in the vicinity of 'Enot Nissanit.

Sites in the Qiryat Ata cluster showed relatively high percentages of chert-bearing layers in their immediate vicinity accompanied by low percentages of conglomerates. Most differences between this cluster and the other clusters seemed to weaken when examining the one- and two-hour territories. The Turit cluster sites showed a similar pattern relating to the presence of conglomerates and the absence of basalt, although chert appeared in lower percentages. This was especially apparent at Ard el-Samra, which has no chert within its half-hour territory. Within the two-hour territories, this is the only cluster in which sandstone appears.

The Jordan Valley sites were, as expected, quite different in the lithological make-up of their exploitation territories; they exhibited very low percentages of chalk and limestone and almost no chert-bearing layers, especially in the half- and one-hour territories. Once in the two-hour territory, all sites but Munhata showed very low percentages of chert-bearing layers available, though in significantly lower frequencies than all the other studied sites. Basalt on the other hand appeared in low percentages within the half-hour territories of all sites, and frequencies increased significantly in the one- and two-hour territories. Conglomerates were also quite frequent, especially within Munhata's one-hour territory.

Sha'ar Hagolan was the only site in this cluster to have low quantities of chert bearing layers in all of its three territories, and in higher percentages in total than any of its neighbours. Munhata, on the other hand, was the only site in the Galilee not to have any chert available in its vicinity, not even within its two-hour territory. Like at Mishmar Ha'emeq, this is echoed in the lithic assemblage from the site; the variety of raw materials recorded at the site includes either material from far-away sources, or from local secondary-deposition sources like cobbles and small nodules from riverbeds and conglomerates (Delage 2007; and see discussion in Chapter 7).

Soil composition

In general, soil composition in all exploitation territories was comprised of an interplay between three dominant soil types: alluvial soils, Mediterranean brown forest soils and *terra rossa* soils. Similar to the lithological makeup, there were clear differences in the frequencies in which these soil types occurred as well as in the other soil types that accompanied them (see Appendices 3a, b, Tables 5-7, Figures 3.1-3.3). As could

[44] The basanite axe workshop at Giv'at Kipod, located ca. 1km from Mishmar Ha'emeq reflects the exploitation of these resources during the PPNB (Rosenberg & Gluhak 2016; Shimelmitz & Rosenberg 2016).

be expected, the four site clusters located in the central Lower Galilee (i.e. the Jezre'el Valley cluster, the Zippori/Nazareth cluster, the Turit cluster and the Qiryat Ata cluster) were more similar to each other than the Jordan Valley cluster.

In the Zippori/Nazareth cluster there were relatively low percentages of alluvial soils, while Mediterranean brown forest soils appeared in high percentages, regardless of territory size. *terra rossa* soils also appeared in all site territories, although they were especially high within the one-hour catchment from the 'Ein Zippori site complex. Kfar HaHoresh stood out within the cluster, as the *terra rossa* soils were replaced here by Rendzinas. Nevertheless, when examining the two-hour territories, the variability subsided, as all sites shared all four main soil categories in similar proportions. Nevertheless, Kfar HaHoresh was the only site in the Nazareth/Zippori cluster to have basaltic soils within its two-hour territory.

In the Jezre'el valley cluster, soil composition was typified by an interplay between the alluvial soils within the Jezre'el valley and the Mediterranean brown forest soils of the Ramat Menashe hills. 'Enot Nissanit and Mishmar Ha'emeq displayed low percentages of brown basaltic soils, while Khirbet 'Asafna (east) and Tell Jenin included some *terra rossa* soils within their territories. Although strongest within the half-hour territories, this trend continued in the one-hour territories, accompanied by the appearance of Rendzina soils in very low percentages in both Khirbet 'Asafna (east) and Tell Jenin. Except for the Jordan Valley sites (see below) and Kfar HaHoresh, the Jezre'el valley sites were the only ones with brown basaltic soils within their exploitation territories, although in much lower percentages. This is especially true for the half-hour and one-hour territories. Within the two-hour territories there were relatively high percentages of alluvial soils (due the large expanse of the Jezre'el valley that they cover) and basaltic soils appeared in low percentages in all sites but Khirbet 'Asafna (east).

Within the Qiryat Ata cluster, Mediterranean brown forest soils and alluvial soils were most dominant, especially within the half-hour territories. In the one-hour territories this persisted, although at Qiryat Ata (NE) there appeared a more diverse composition, with coastal sand dunes, as well as low percentages of hydromorphic and Rendzina soils. This again evened out within the two-hour territories, as both sites exhibited similar soil compositions including Mediterranean brown forest soils, alluvial soils, coastal sand dunes, hydromorphic soils, *terra rossa* and Rendzina soils.

Within the Turit cluster alluvial soils were more dominant, followed by Mediterranean brown forest soils. Ahihud was somewhat different, since the relative frequencies of the two soil types were opposite to the other sites. Horvat Turit and adjacent Judeidi-Makr #23 displayed low percentages of hydromorphic soils as well. In the one-hour territories ratios seemed to even out: hydromorphic soils appeared in low percentages around all sites, while coastal sand dunes appeared within the territories of the two westernmost sites, Horvat Turit and Judeidi-Makr #23, and Rendzina appeared around the other sites. Within the two-hour territories soil compositions became more similar, as Rendzina and *terra rossa* soils now appeared around all sites. The western location of Horvat Turit and Judeidi-Makr #23 is apparent again, as they were the only sites to have brown-red sandy soils (*Hamra*) within their two-hour territories.

Although alluvial soils and Mediterranean brown forest soils were ubiquitous here as well, the Jordan Valley sites differed in soil composition from the other clusters; first, there was no *terra rossa* present in any of the sites' territories, and Mediterranean brown forest soils appeared in very low frequencies. Second, they were the only sites (except for Mishmar Ha'emeq and 'Enot Nissanit) to have any brown basaltic soils within their half-hour or one-hour territories. They were also the only sites with peat soils, which appeared in high percentages (32-40% for the half-hour territory, except for Hof Shaldag, which has 11%). These were also the only sites (except for Kfar HaHoresh) where Rendzina soils appeared within the half-hour and one-hour territories. It is interesting to note that Munhata differed from the other Jordan Valley cluster sites in this respect. Generally speaking, it is more similar to the central and western Galilee sites, especially when comparing the half-hour and one-hour territories.

Agricultural potential

The agriculture potential index was calculated using multiple variables, based on a survey conducted in Israel in the early 1950s (Gil & Rosensaft 1955; and see Chapter 2).[45] It comprises seven classes, identifying the agricultural potential of a certain area, under non-irrigated conditions, and according to activity type; Classes I-III and Class IV indicate land suitable for cultivation. The former types are suitable for cultivation of all crops, while the latter is suitable for plantations, pasture and perennial crops, but is unsuitable for annual tilled crops. Class V indicates land suitable for pasture but not for cultivation, while Class VI indicates land only suitable for afforestation. Since afforestation was not practiced during the Neolithic, this class is regarded together with Class VII, which indicates land unsuitable for any agricultural purpose.

In general, the results of this analysis exhibited less inter-cluster variability than the other variables tested, such as soil composition or lithology (see Appendices 3a,b, Tables 8-10, Figures 4.1-4.3). Of the five clusters, the sites of the Zippori/Nazareth cluster and the Turit cluster appeared to exhibit the most intra-cluster homogeneity, although variations occur, especially when examining the half-hour territories. Subsequently, the results of this analysis are presented not according to site cluster, but rather according to the index classes and territory size.

Land suitable for cultivation, i.e. Classes I-III and IV. comprised relatively large percentages of all three exploitation territories, for all sites (ca. 30-90% with variations between territories of different sizes, and see Figures 6.16-6.18). The only exception was the site of Kfar HaHoresh, which exhibited extremely low values of 6% and 17% in the half and one-hour territories, respectively. In general, sites of the Zippori/Nazareth cluster exhibited relatively low values compared to other sites, in all territory size categories. The sites of the Turit cluster, on the other hand, exhibited relatively high

[45] The area of Tell Jenin, which was outside the Israeli international border at the time, was not covered by this survey and is subsequently omitted from this part of the analysis.

values. The other sites did not seem to follow their geographic location, and clusters were quite heterogeneous.

The half-hour territories displayed the most variability between the different sites, which can be arranged into three groups (Figure 6.16); the first, exhibiting values ranging ca. 30-35% includes most of the Zippori/Nazareth sites (i.e. Nahal Zippori 3, Yiftah'el,

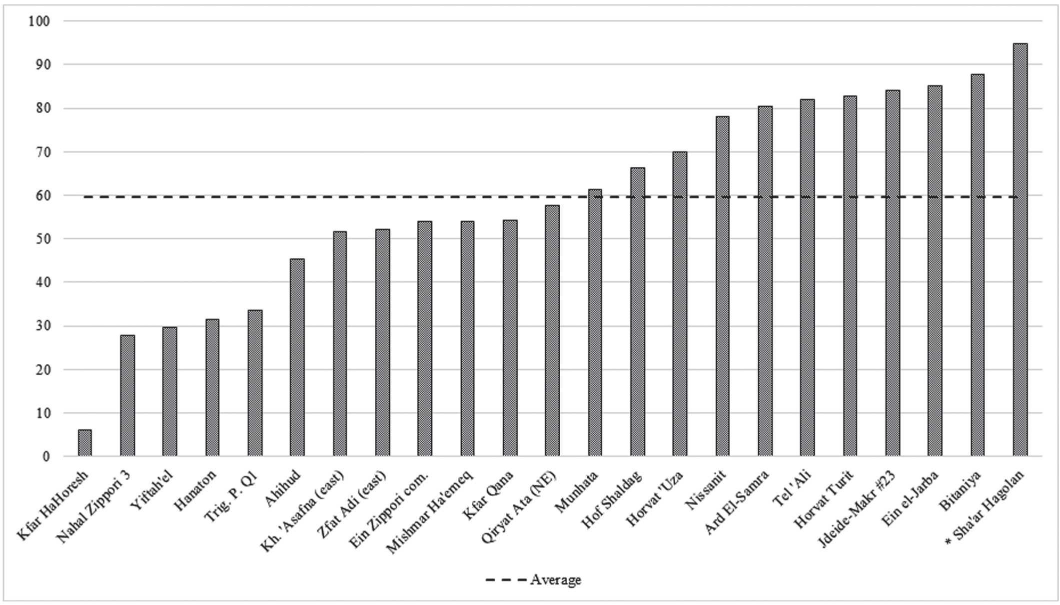

Figure 6.16: Area suitable for cultivation within half-hour territories, as a percentage of the total exploitation area. (*) marks Jordan Valley cluster sites affected by the proximity to the modern border.

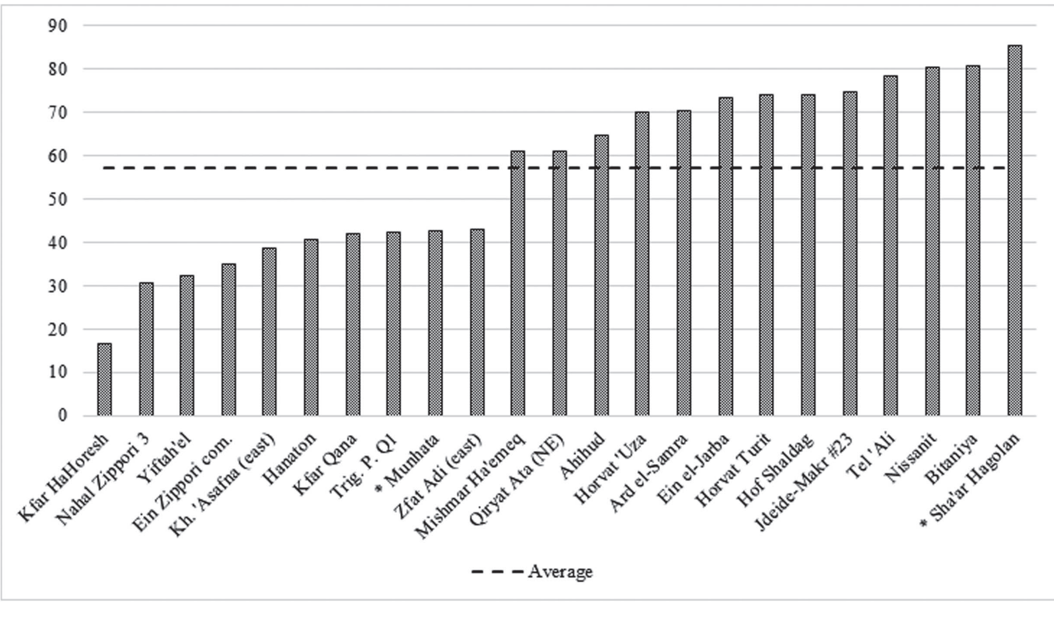

Figure 6.17: Area suitable for cultivation within one-hour territories, as percentage of total exploitation area. (*) marks Jordan Valley cluster sites affected by the proximity to the modern border.

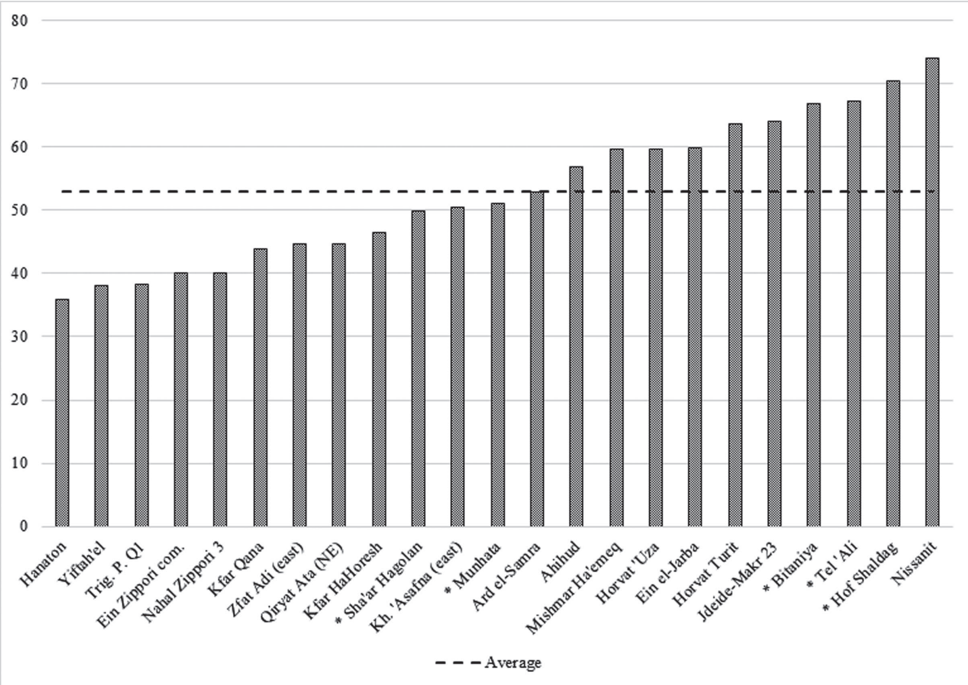

Figure 6.18: Area suitable for cultivation within two-hour territories, as percentage of total exploitation area. (*) marks Jordan Valley cluster sites affected by the proximity to the modern border.

Hanaton and Triangulation Point Q1). The second, intermediate group exhibits values ranging between 45-70% and includes Ahihud, Khirbet ‘Asafna (east), Zefat Adi (east), the ‘Ein Zippori complex, Mishmar Ha’emeq, Kfar Qana, Qiryat Ata (NE), Munhata, Hof Shaldag and Horvat ‘Uza. The third group, with values ranging between 78-95% includes ‘Enot Nissanit, Ard el-Samra, Tel ‘Ali, Horvat Turit, Judeidi-Makr #23, ‘Ein el-Jarba, Bitaniya and Sha’ar Hagolan, which demonstrated higher values than any other site in the Galilee. As catchment sizes increase, the dichotomy between site-groups diminished and disappeared, but the general trends were maintained.

As stated above, Classes I-III represent areas suitable for cultivation of all crops, including annual tilled crops, while Class IV is suitable for perennial crops and pasture. It is interesting to examine the interplay between the two types of crop-suitability within the different site-territories (Figures 6.19-6.21). The Zippori/Nazareth cluster sites, for example, while showing low values for Classes I-III, displayed relatively high values for Class IV. This was valid for both the half- and one-hour territories, but seemed to even out in the two-hour territories. None of the other sites, except for the Jordan Valley cluster, exhibited any exploitation of Class IV lands. Here again, Munhata and Sha’ar Hagolan exhibited patterns more in tune with the central Galilee sites than with their geographic neighbours.

Opposite patterns were apparent regarding the land suitable for pasture, but unsuitable for cultivation (Class V); the Zippori/Nazareth cluster and the Qiryat Ata cluster sites exhibited high values, while sites from the Jezre’el valley, Turit and Jordan Valley clusters exhibited relatively low values (Figures 6.22-6.24). This pattern is valid throughout all territory sizes, but a subdivision of the sites into discrete groups was

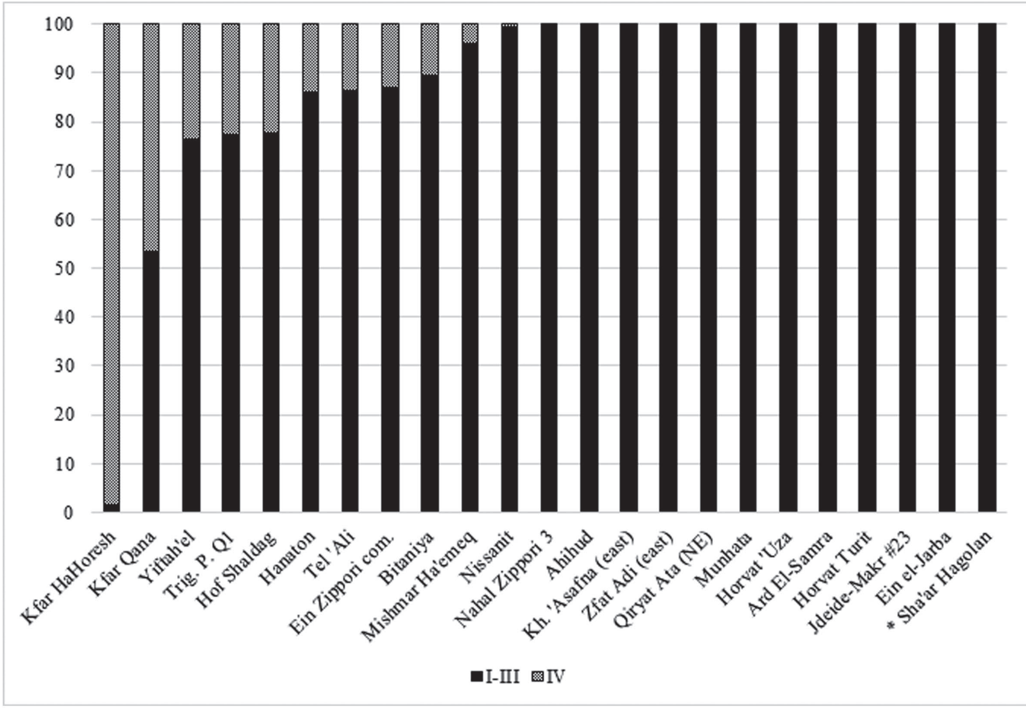

Figure 6.19: Suitability for different crops within half-hour territories as a percentage of the total area suitable for cultivation. (*) marks Jordan Valley cluster sites affected by the proximity to the modern border.

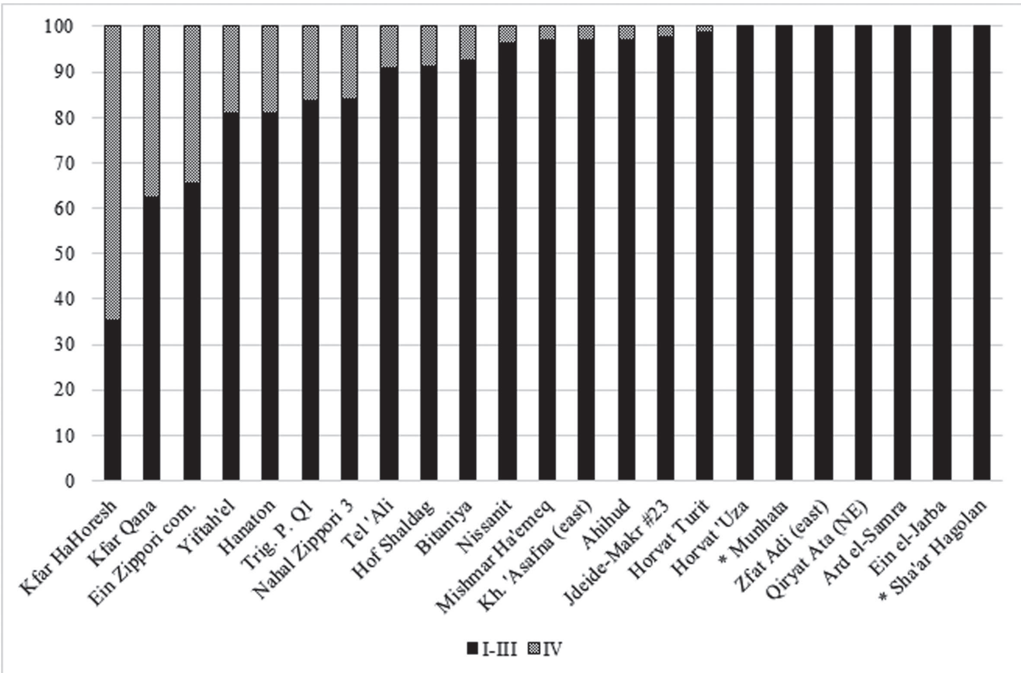

Figure 6.20: Suitability for different crops within one-hour territories as a percentage of the total area suitable for cultivation. (*) marks Jordan Valley cluster sites affected by the proximity to the modern border.

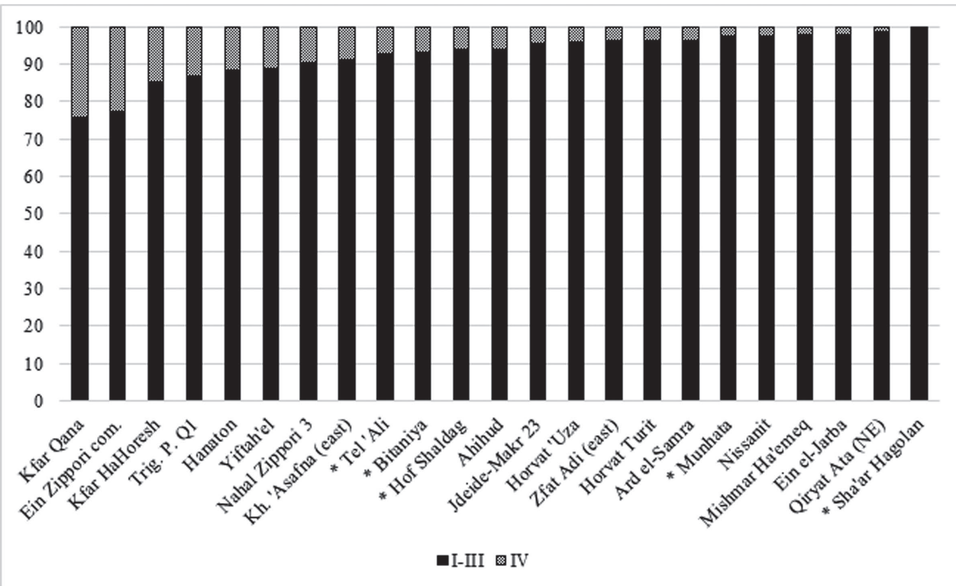

Figure 6.21: Suitability for different crops within two-hour territories as a percentage of the total area suitable for cultivation. (*) marks Jordan Valley cluster sites affected by the proximity to the modern border.

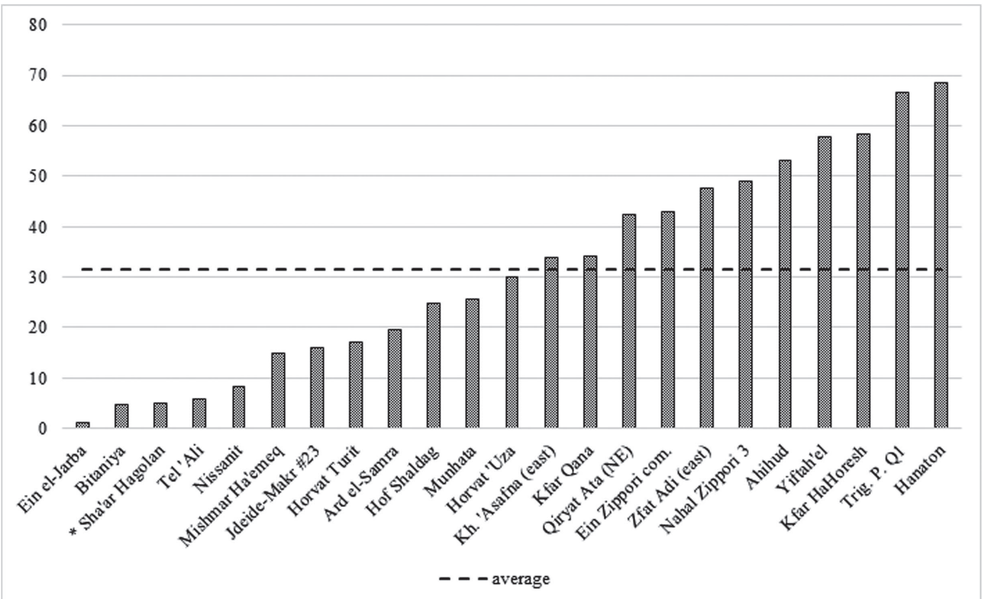

Figure 6.22: Area suitable for pasture only within half-hour territories, as a percentage of total exploitation area. (*) marks Jordan Valley cluster sites affected by the proximity to the modern border.

especially apparent in the one-hour territory size. There were, of course, several sites that differed significantly from their neighbours; the site of Ahihud, for example, with over 50% of its half-hour territory suitable for pasture only. Another example is the site of Kh. ‘Aafna (east), which displays much higher values than the other sites in the Jezre’el cluster (>30%). Since both sites were dated to the EPPNB, this could represent a chronological marker. It is also interesting to note that when examining

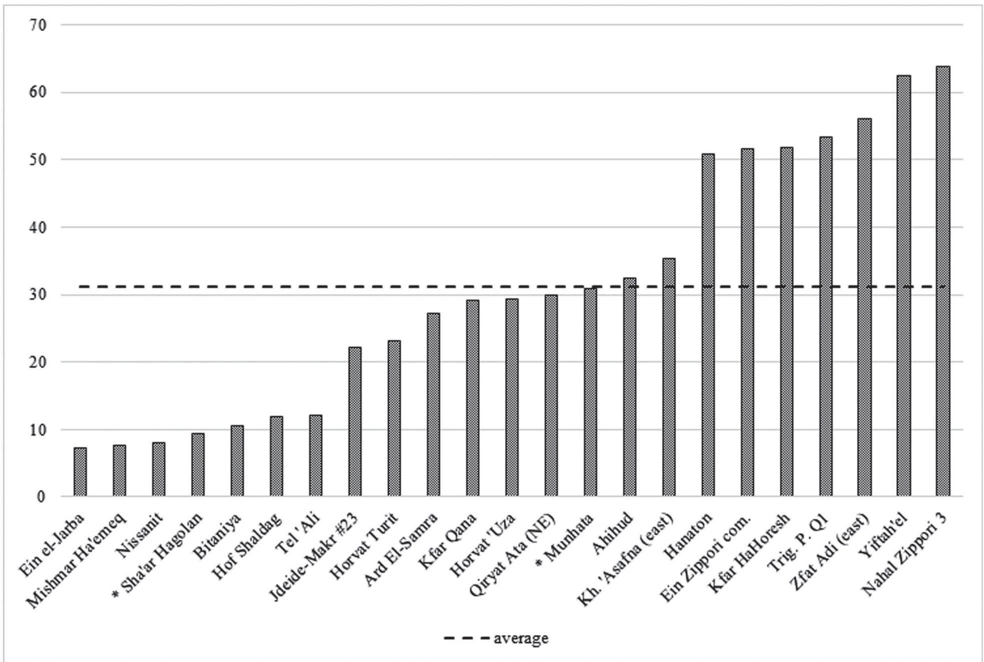

Figure 6.23: Area suitable for pasture only within one-hour territories, as a percentage of total exploitation area. (*) marks Jordan Valley cluster sites affected by the proximity to the modern border.

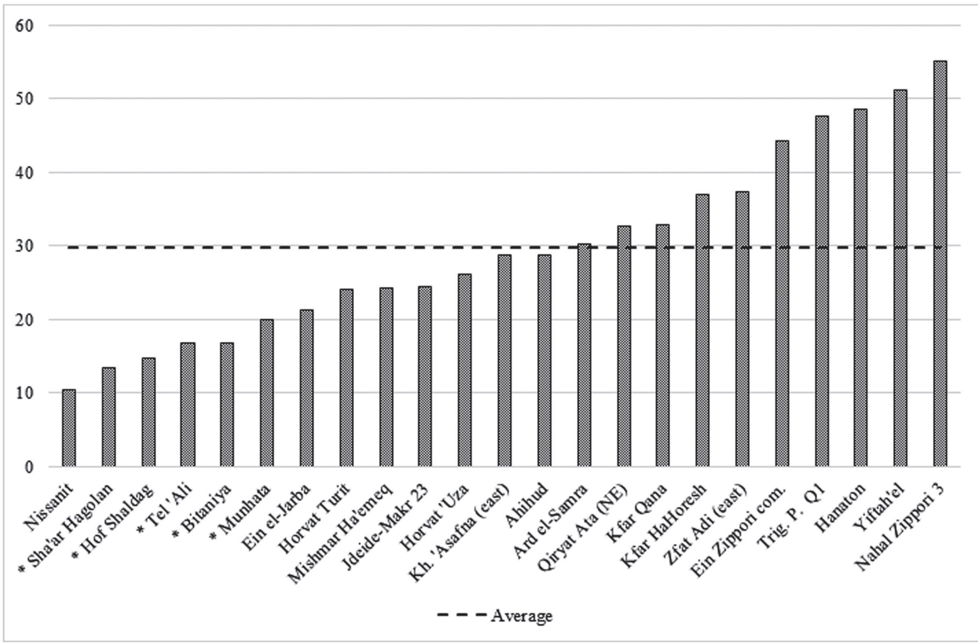

Figure 6.24: Area suitable for pasture only within two-hour territories, as a percentage of total exploitation area. (*) marks Jordan Valley cluster sites affected by the proximity to the modern border.

the percentages of land unsuitable for any kind of agricultural use (e.g. Classes VI-VII), the sites of Kfar HaHoresh and Mishmar Ha'emeq display significantly higher values, ranging ca. 30% of the exploitation territories of both half- and one-hour territories. This pattern disappears in the two-hour territory.

Water resources

As stated above, one of the main characteristics of site location in the study area was vicinity to running water; most sites are located less than 500m from streams or rivers (Figure 6.5), frequently immediately adjacent, and somewhat raised above the water course itself. A second water resource undoubtedly exploited during the Neolithic are the fresh water springs, which the Galilee offers in plenty. The available information regarding the location of springs in the area portrays the modern-day situation, influenced by changing climate as well as human intervention (not only by water extraction, which causes the drying up of local aquifers, but also through past and present development, especially in the upper parts of the drainage basins). This information can, however, be used as a minimal estimate if we take into account that climate during the Neolithic was probably somewhat wetter than today, and human intervention minimal to non-existent.

Figure 6.25 displays the minimal walking distance [46] between each site and the nearest spring. Most sites are located less than four kilometres walking distance from at least one spring, with an average of little under three kilometres distance. Several sites exceed this average; these include the sites of Tel 'Ali, Bitaniya, Hof Shaldag, Sha'ar Hagolan, Qiryat Ata (NE), Triangulation Point Q1, and the Turit cluster sites. As for the first three, it must be remembered that these sites are located adjacent to (or in the case of Hof Shaldag, on the coast of) the fresh water lake of the Sea of Galilee, an abundant water source. In the case of Sha'ar Hagolan and Qiryat Ata (NE), the sites are located on the banks of a flowing stream, which most probably supplied sufficient quantities of fresh water. This also seemed to be the reason that the adjacent site of Zefat Adi (east) also displayed a relatively long distance from the nearest spring. Since Horvat 'Uza and Horvat Turit are also the two sites furthest from a stream or river (Figure 6.5), it seemed that the Turit cluster sites demand a different explanation. A possible explanation can be sought in ancient man-made development in the area: The modern-day landscape of the Turit area, although devoid of natural springs, is full of man-made wells and water-holes, some dating back at least to the Roman and Byzantine periods (Lehmann and Peilstöcker 2012; Figure 6.26). These indicate the presence of an aquifer relatively close to the surface. Moreover, ancient water holes were frequently constructed on top of and taking advantage of existing springs. Thus, they may conceal the existence of such springs during the Neolithic. Also, since wells are also known from Neolithic contexts, e.g. at FPPNB/PPNC Nissanit, Atlit Yam and PN Sha'ar Hagolan and even

[46] This distance refers to walking distance, e.g. weighted distance, taking into account local topography rather than the Euclidean, straight-line distance between the site and the nearest water stream.

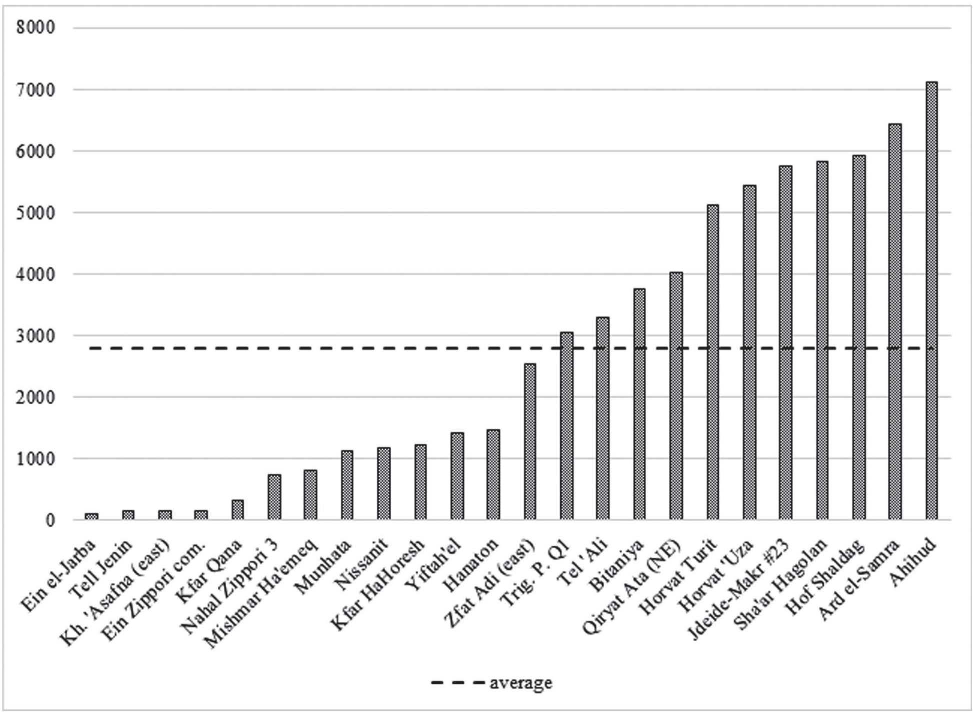

Figure 6.25: Walking distance (in meters) to nearest spring.

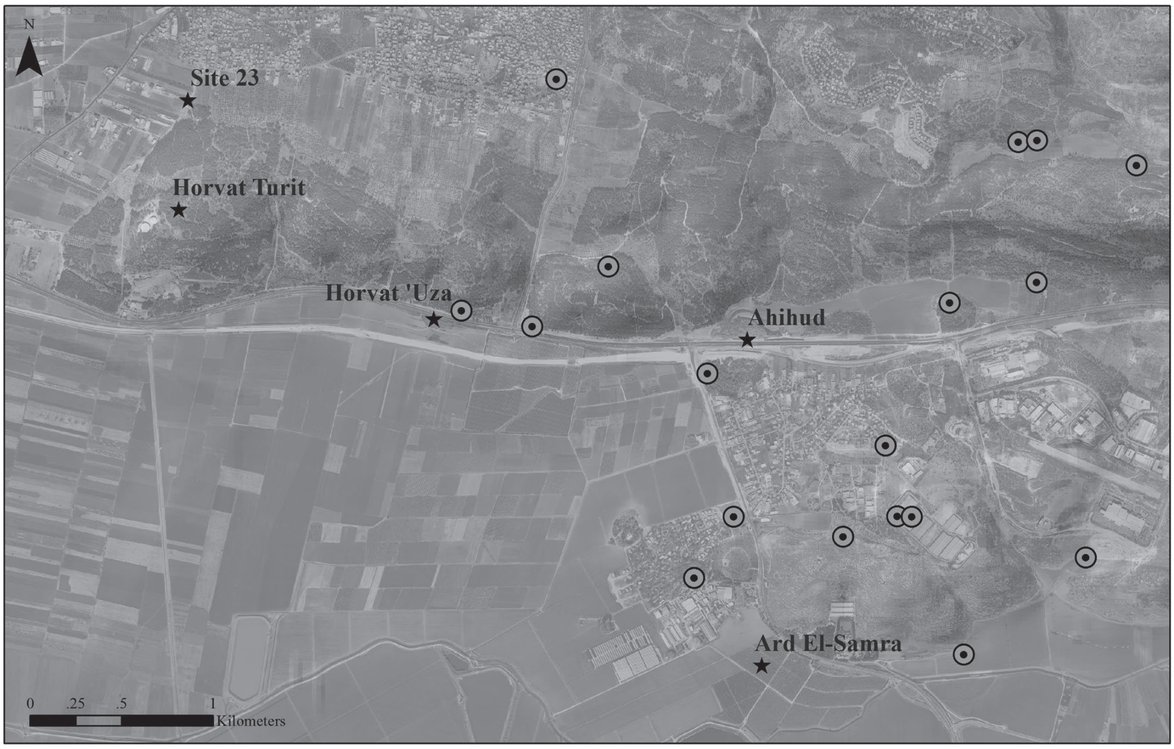

Figure 6.26: Water holes and wells in the Turit cluster area.

earlier on Cyprus (Galili & Nir 1993; Galili & Sharvit 1998; Garfinkel et al. 2006; Peltenburg 2003) it is not unreasonable to suppose that similar technology may have been used in the region.

Another aspect analysed was the number of springs within the different territories of each site (Figure 6.27). There are four springs on average within the sites' one-hour territories (six, if the Turit cluster sites are excluded). In general, the same trends apparent in the minimal distance to the nearest spring existed here; the sites with the highest number of springs within their one-hour territory are the Jezre'el valley cluster sites (with the exception of Tell Jenin) and the Zippori/Nazareth cluster sites (with the exception of Kfar HaHoresh and Kfar Qana). The Jordan Valley cluster sites showed relatively low values, but as stated above, this may reflect their proximity to the Sea of Galilee. In the case of Munhata and Sha'ar Hagolan, although it must be taken into account that additional springs might be present east of the modern-day border, these would have required crossing the flowing streams of the Jordan and Yarmuk rivers, respectively.

It is interesting to note that one of the two sites with the largest number of springs (n = 12) in their immediate vicinity, the site of 'Enot Nissanit, is also the only site where a water well was recorded (Tepper 2013, 2014).

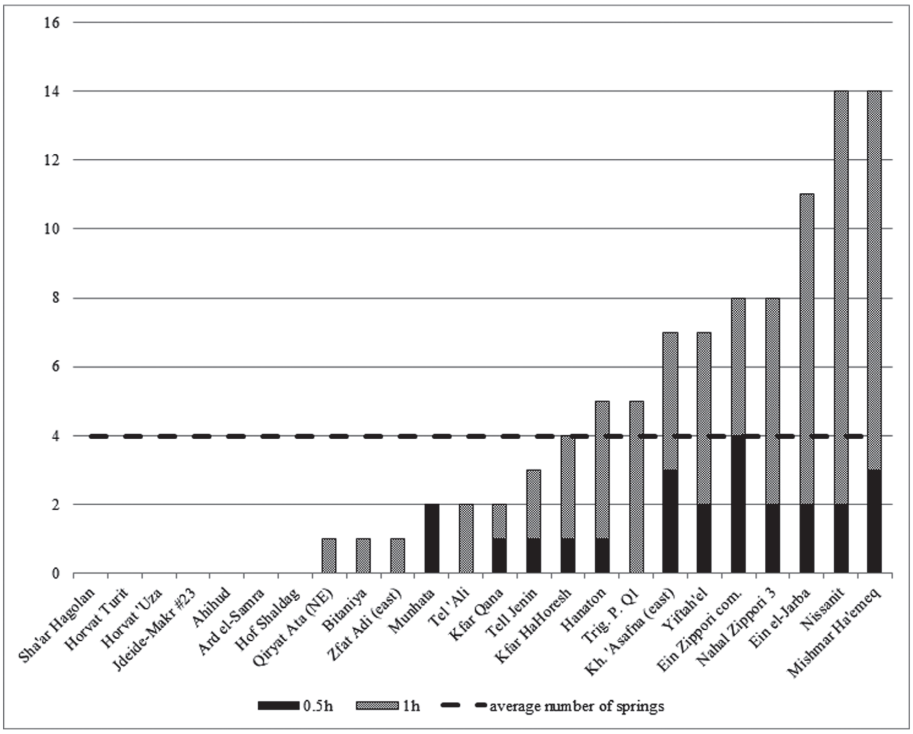

Figure 6.27: Number of springs in each site's territory.

VIEWSHED ANALYSIS

Viewshed maps were created for each of the sites separately, and cumulative viewshed maps were created for each of the site clusters, as well as for the entire site database (see Appendices 3a, b, Table 11, Figures 5.1-5.24). In general, sites varied greatly in the area visible from them (Figure 6.28); Several sites, not necessarily those located at the highest elevations, showed extensive viewsheds while others displayed much more constricted views.

The Nazareth/Zippori sites, albeit occupying higher elevations topographically than all other sites, showed relatively restricted viewshed ranges, with visible areas ranging between 2-12 km^2. Triangulation Point Q1 is different within this group, with higher values of almost 25 km^2. The Jezre'el sites represent the opposite end of the scale. While from both Tell Jenin and 'Ein el-Jarba an area of ca. 110 km^2 is visible, Mishmar Ha'emeq and 'Enot Nissanit displayed even higher values of ca. 170 km^2 for the former and a very high value of ca. 300 km^2 for the latter. Khirbet 'Asafna (east) is very unusual within this group, with less than 8 km^2 visible from the site, well within the ranges of the Nazareth/Zippori group. At the Turit cluster all sites except Ahihud showed average or above average viewsheds. Within the Jordan Valley sites, Hof Shaldag was quite unusual with the second highest value among the tested sites (ca. 210 km^2).

Out of all the other aspects of the local environment presented so far, it seemed that the aspect least affected by the attribution of the site to a geographic cluster is how much of the potentially viewable area was actually available from the location of each site. Here the variability between sites belonging to the same cluster was the highest. Relatively

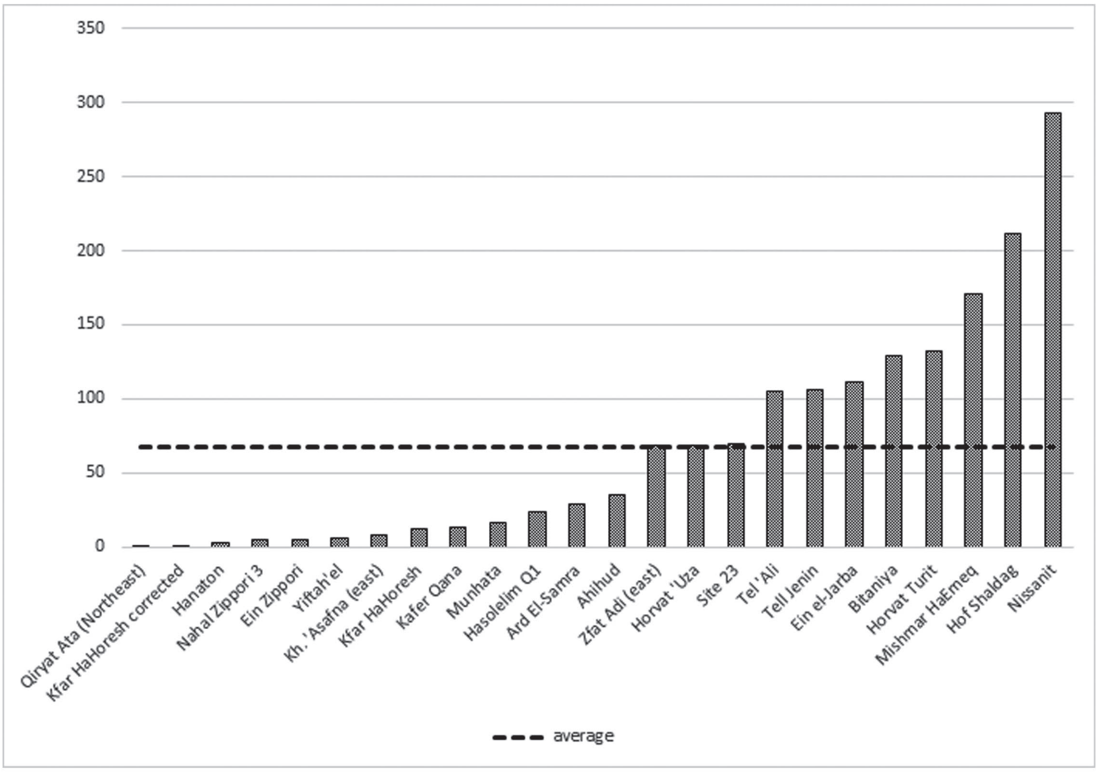

Figure 6.28: Viewshed area (in km²).

speaking, the short distance view was the area in which the highest percentage of the potentially viewable area was actually available (Figure 6.29), followed by the middle distance view and the long distance view. This is of course a direct result of the exponential growth in the potentially visible area. However, there is marked variability between sites, and values range between 10-80% in the short distance view, 0.3-30% in the middle distance view and 0-5% in the long distance view (Figure 6.29).

Out of all of the sites it seemed that Horvat Turit was the most focused on the middle and long distance views, while only 10% of its short distance view was actually available. Other sites that stood out in utilizing relatively high percentages of their middle and long distance views were Horvat 'Uza and Judeidi-Makr #23 in the Turit cluster, 'Ein el-Jarba, Mishmar Ha'emeq and 'Enot Nissanit in the Jezre'el valley cluster and Hof Shaldag in the Jordan Valley cluster. Horvat 'Uza and 'Ein el-Jarba were unique within this group in that, while utilizing high percentages of their middle and long distance views, their short distance view utilization was also high, with over 70% of the area visible from site. This was also reflected when examining the different Higuchi viewsheds as percentages of the total viewshed of the site (Figure 6.30).

A special note should be made regarding the viewshed of Kfar HaHoresh; the results presented above provide a somewhat skewed result, as it seems that the site utilizes a large viewshed area within the long-distance category. This influences both the total area visible from the site, and it appears that attention is focused westwards to the Mt. Carmel ridge (Figure 6.31a). However, personal observations conclusively demonstrated that it is simply impossible to view Mt. Carmel from any given point within Kfar HaHoresh (Birkenfeld & Goring-Morris 2015); in fact, none of the areas

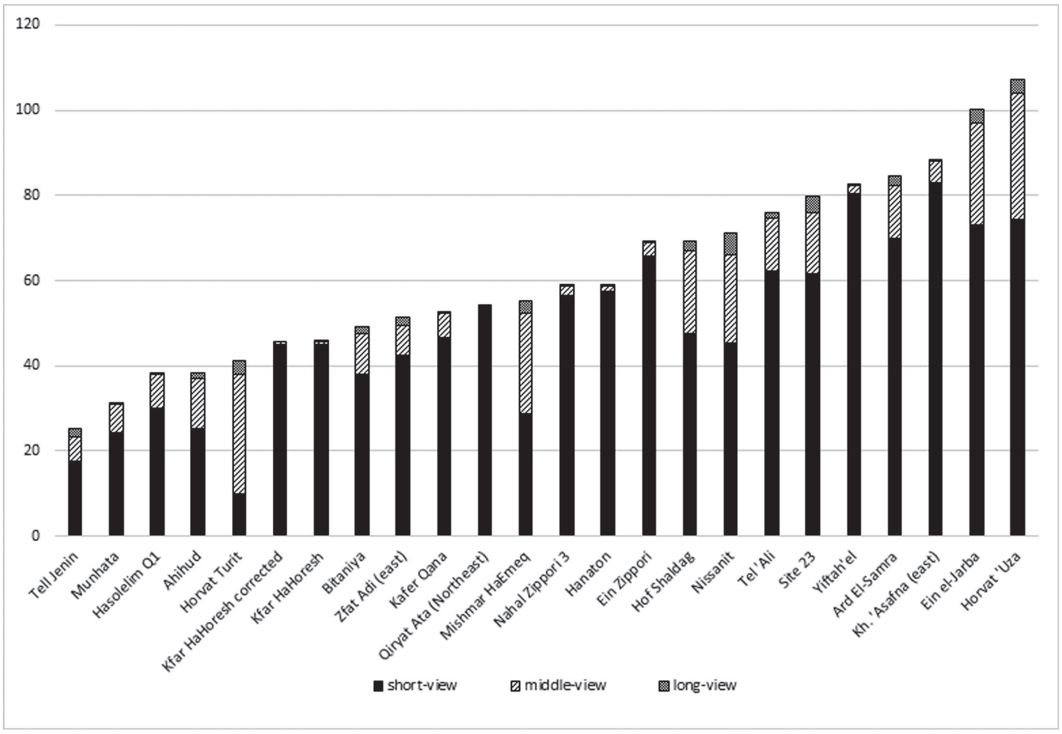

Figure 6.29: Higuchi viewsheds as a percentage of each distance's potential.

in the long-distance category can be seen from the site. This likely reflects problems concerning the local characteristics of the DEM, probably arising from the limitations of the DEM resolution available (Fisher 1994, 1995). It is especially relevant where topography is variable over short distances, as is the case around Kfar HaHoresh; a slight rise immediately west of the site obscures views down the length of the wadi. As Wheatley and Gillings (2000, p.10) observe: "small variations in topography near to the viewer are far more likely to have large effects than similar variations further away". Thus, a suggested correction to the Kfar HaHoresh results was added in addition to that provided by the DEM model.

Another issue examined regarding visibility was the question of site inter-visibility. Results showed that most sites had no visual connection to other sites in their vicinity, and very few sites had direct line-of-sight with contemporaries; these include several pairs: in the Zippori/Nazareth cluster Triangulation Point Q1 seems to have had direct line-of-site with both Yiftah'el and Hanaton. It is possible that it could also view the site

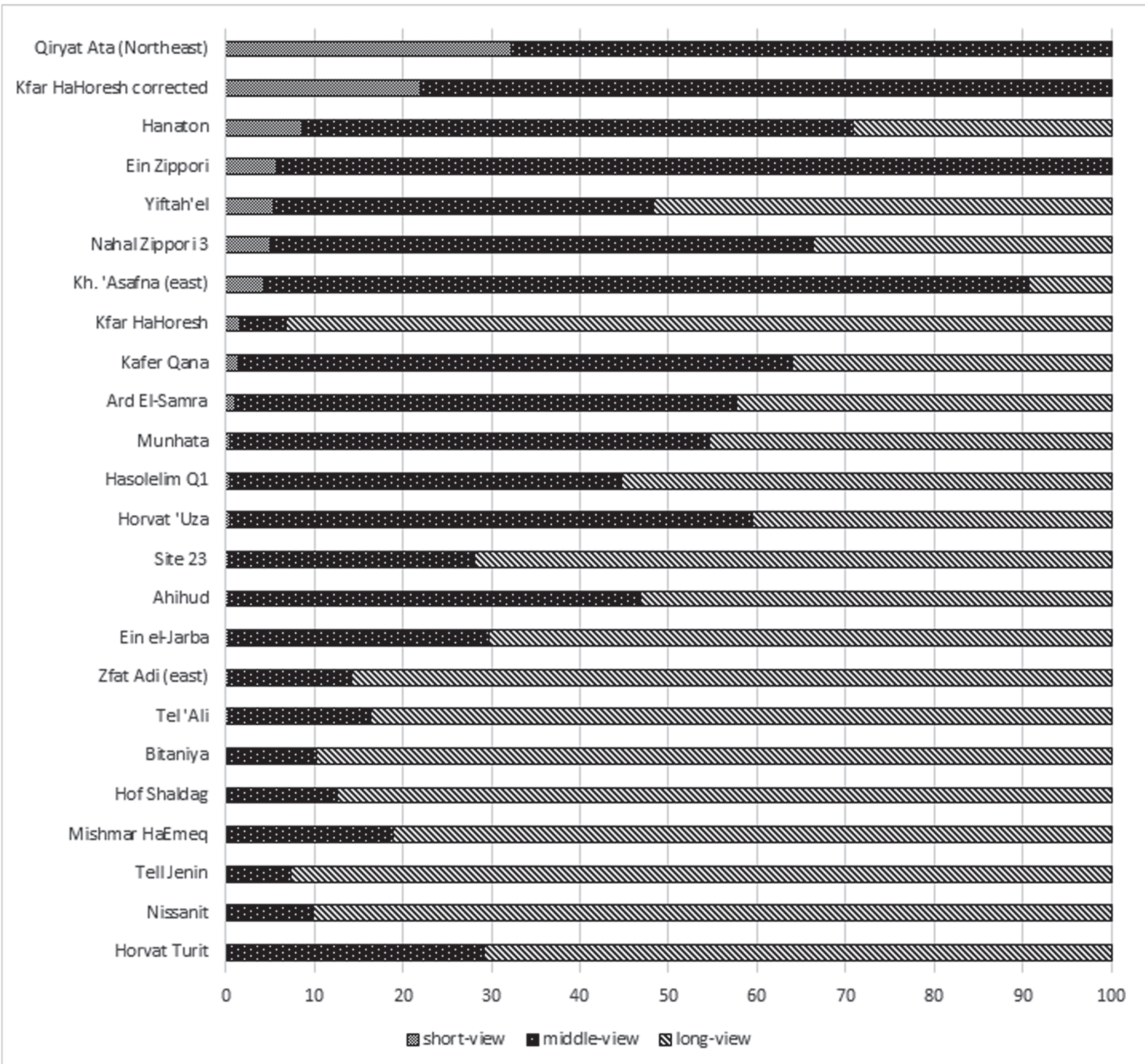

Figure 6.30: Higuchi viewsheds as a percentage of total viewshed area.

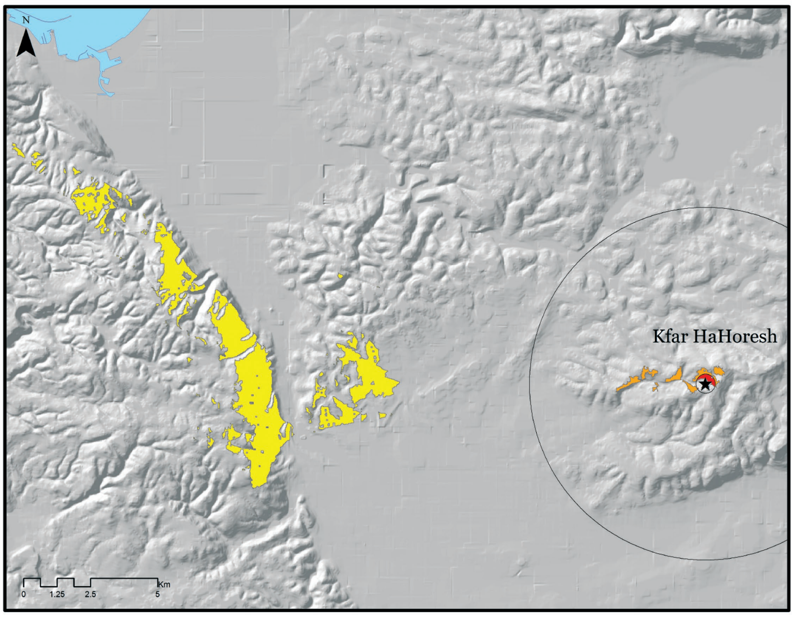

Figure 6.31: Viewshed of Kfar HaHoresh, showing short-, medium- and long-distance views (in red, orange and yellow, respectively).

of Nahal Zippori 3, or at least the hill directly above it. Yiftah'el, on the other hand, is the only other site to have reciprocal line-of-sight to Triangulation Point Q1. A similar situation was recorded in the Turit cluster, where the sites of Horvat Turit and Judeidi-Makr #23 had direct visual contact with each other. Another possible pairing within the Turit cluster are the sites of Ahihud and Horvat 'Uza. However, unlike Horvat Turit and Judeidi-Makr #23, which might have coexisted at some point during the PPNB, Ahihud and Horvat 'Uza are dated to EPPNB and FPPNB/PPNC, respectively. Within the Jezre'el valley cluster, the sites of Tell Jenin and 'Enot Nissanit, both dated to the FPPNB/PPNC, were visually connected, as were the sites of Bitaniya and Tel Ali in the Jordan Valley cluster. None of the other studied sites seemed to have had any direct visual contact with any of the other sites. It should be noted, however, that in some cases although the actual sites were not visible, the hill ranges directly above them were visible. This is the case for Ard el-Samra, which had direct views of the Turit hill extension, immediately above the sites of Horvat Turit and Horvat 'Uza, as well as in the sites of Khirbet 'Asafna (east), Tell Jenin, Mishmar Ha'emeq and 'Enot Nissanit, which had direct views to the hills immediately above 'Ein el-Jarba.

Cumulative viewshed maps, representing areas visible from several sites simultaneously, were produced for each of the site clusters, as well as an inclusive map showing all studied sites. In general, there was little overlap between the cumulative viewsheds of the different site clusters. The Jezre'el valley cluster and the Jordan Valley cluster seem to have had the most extensive viewsheds. However, the Jordan Valley cluster viewshed seems to have concentrated towards the east, overlooking the arable lands directly adjacent to the sites, and focused on the highlands further away (Figure 6.32b). The only site to diverge from this pattern was Sha'ar Hagolan, which in comparison to its neighbours, seemed to focus more to the west (Appendix 3b, Figure 6.19). The

Jezre'el Valley cluster viewshed concentrated to the north and northeast, covering the expanses of the Jezre'el Valley. Here, as well, the joint viewshed seemed not to concentrate on the immediately adjacent lands, but slightly further away to the north (Figure 6.32d). The Zippori/Nazareth cluster viewshed was much more contracted, focusing mainly on the immediate area between the different sites. A certain degree of emphasis seems to have concentrated on the hill ridges bordering the area, i.e. the Mt. Tzameret/Mt. Baharan range to the south, the Mt. Yiftah'el/Giv'at Hazir range to the west and Mt. Atzmon to the north (Figure 6.32e). The Turit cluster viewshed was more dispersed than the others, with focal points to the west (the northern part of the Akko plain), the east (Mt. Gamal and the Majd al-Krum range), and the southeast (the Mt. Carmel ridge; Figure 6.32a). It is interesting to note that in the Qiryat Ata cluster, there was no overlap between the viewsheds of the two sites. Moreover, there was a clear dichotomy between the extremely contracted viewshed of Qiryat Ata (NE) and the more extensive viewshed of Zefat Adi (east). The latter seemed to correspond much more with the Turit cluster viewshed than with its neighbour to the west.

As mentioned, there was little overlap between the viewsheds of the different clusters. However, when a cumulative viewshed was assembled for the entire study area, combining the individual viewsheds into a single map, two focal points could be identified within the Lower Galilee landscape. These include the Keren-Hakarmel peak (474m asl) atop the Mt. Carmel range and the Mt. Baharan/Mt. Tzameret ridge (438-476m asl) on the western summit of the Nazareth hills (Figure 6.33). While at Mt. Carmel large swathes of the north-facing slope of the range were visible, the other locale is extremely limited, encompassing but a few square kilometres of visibility. These two locales could be seen from all clusters, with the exception of the Jordan Valley cluster, which had no views westwards due to their locations within the Rift Valley, and the Qiryat Ata cluster. Here, while Keren-Hakarmel can be viewed from the site of Zefat Adi (east), neither locale can be seen from the site of Qiryat Ata (NE).

Views from both locales are vast; views from atop the Har Baharan-Har Tzameret and Nabi Sa'in ridge are expansive in all directions save the east, and an almost complete panoramic view can be seen from Keren Ha-Karmel. No prehistoric sites are currently known from either of these locales, which have undergone erosion and modern development. However, it should be noted that Kfar HaHoresh, which cannot be seen directly from any other PPNB site in the area, is located directly below the Har Baharan ridge, a mere 600m away (and see discussion in Chapter 7).

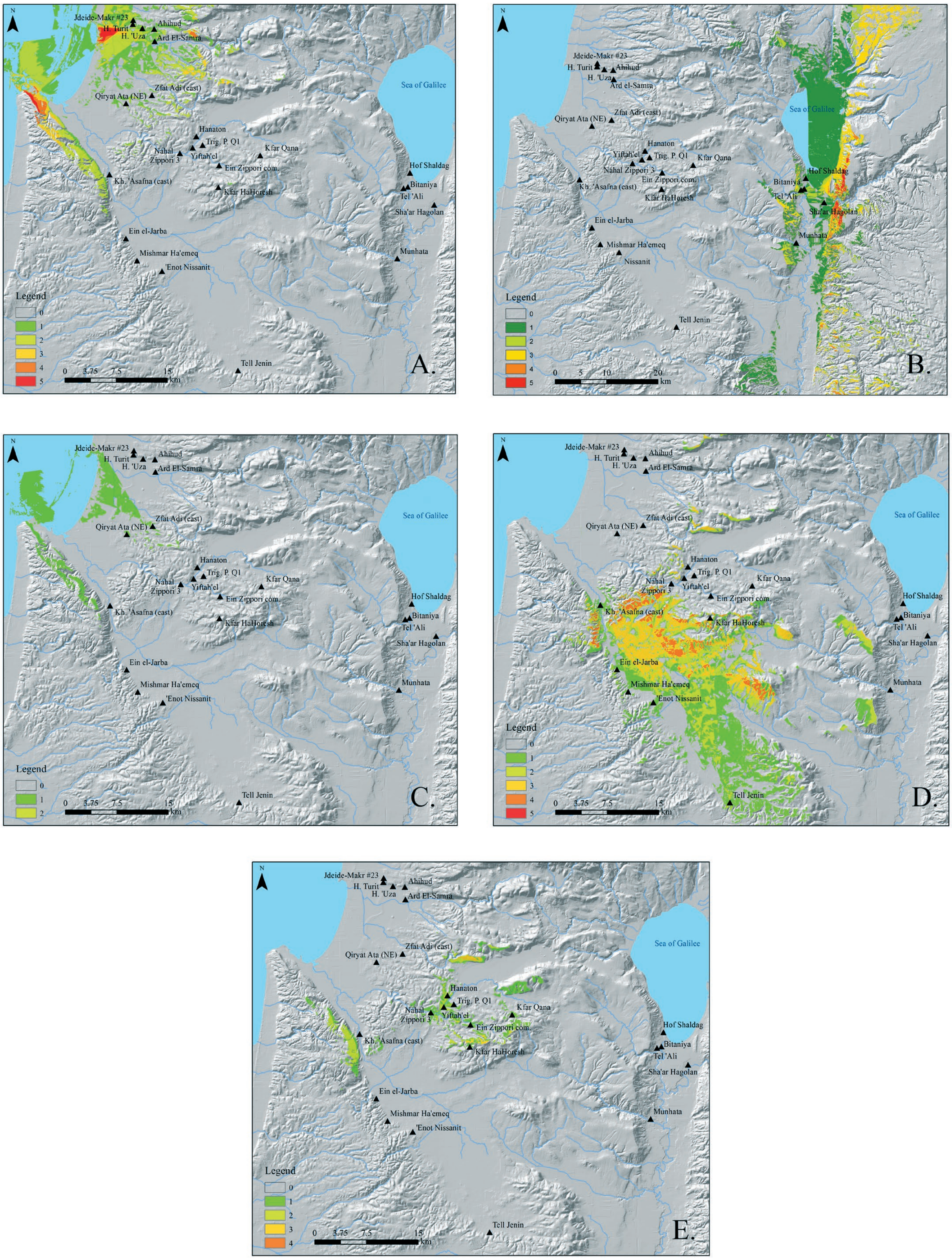

Figure 6.32: Cumulative viewsheds for the different site clusters; (A) the Turit cluster; (B) the Jordan Valley cluster; (C) the Qiryat Ata cluster; (D) the Jezre'el valley cluster; (E) The Zippori/Nazareth cluster. Colour scheme represents the number of sites from which each location is visible.

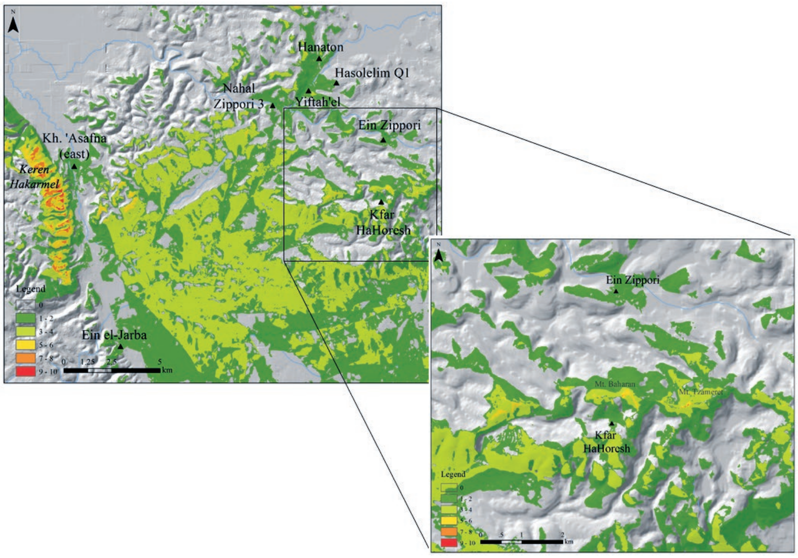

Figure 6.33: Cumulative viewshed, showing areas most visible from studied sites. Colour scheme represents the number of sites from which each location is visible.

Chapter 7

Discussion and Conclusions

"Beyond the overly theoretical controversies between "processual archaeologists" and "contextual archaeologists," we are striving to combine clearly the various methods with regard to the Neolithic in the Near East. The first step in this process is to construct a classic synthesis on the basis of our own excavations and those of our colleagues, using available architectural, technological, environmental, and subsistence data, then situating these chronologically in relation to other more specifically cultural information... This multidimensional analysis reveals anomalies that are counter to current interpretive models and allows us to enter into a "palaeopsychological" interpretation of the past..."
Cauvin 2002, p.237

SITES OF THE LOWER GALILEE

Based on the results of this research, PPNB sites in the Lower Galilee exhibit general similarities in both their selected locations within the landscape and the techno-typological aspects of their material culture. The synthetic analysis of both these aspects of the archaeological record allows us to identify overall trends, and most importantly, to single out those sites which do not conform. As stated above, the observed differences between the rule and its exceptions enable discussion of inter-site variability, site function and site hierarchy, and present us with the building blocks with which we can begin to reconstruct the larger socio-economic organization of the regional system.

The first aspect to be dealt with here is *site function*. Sites in the Lower Galilee were typically situated in ecotonal locations, on the lower foothills, above the valley floors, on gentle, north facing slopes, rarely exceeding 6°, and in close proximity to fresh water resources. They usually faced their arable land, which was located within the sites' immediate surroundings, dominating a large part of it. However, during analysis it became clear that several sites diverge from this pattern. Once these variations were weighed against the material culture remains from those sites, several types of special-activity sites could be discerned, including lithic procurement sites, e.g. Triangulation point Q1, as well as different subsistence-related activity sites, e.g. Hof Shaldag.

Kfar HaHoresh (KHH) represents a third type of special-activity site; as stated earlier, the site was interpreted by the excavator as a cult and mortuary centre, serving the populations of nearby settlements (Goring-Morris 2002, 2005). Indeed, the results of the analyses indicate that KHH differed from its counterparts in its locational attributes as well as in the material culture remains recovered. When it comes to its location, results show that when compared to contemporary neighbouring sites KHH was situated higher up in the hills, on a significantly steeper slope, with much less access to the valley plains. It was located far from any watercourse, and had fewer fresh water springs in its vicinity than any other site in the area. With respect to resource availability, Kfar HaHoresh stood out again, exhibiting extremely low values of land suitable for cultivation. This is amplified by the fact that the site's exploitation territories were considerably smaller than those of other sites. This, combined with the lesser availability of water, means that the carrying capacity of the exploitation territories of KHH was significantly lower than that of other sites. On the other hand, high values of land suitable for pasture/hunting were indicated in both the immediate and intermediate exploitation territories. This implies a stronger reliance on hunting, which was also reflected in the faunal record from the site (Meier et al. 2016).

While Kfar HaHoresh is by no means the only site in the region where human burials were recorded, the nature of the interments at the site is unique. The number of burials (ca. 70 graves, representing >100 individuals) is significantly larger than any other site, especially if we take the extent of the excavated area into account. Indeed, the population buried at the site significantly differs from that of the general PPNB southern Levantine population, as it is characterized by an unusual emphasis on young males, between the ages of 20 to 29 years (Eshed et al. 2008). Another characteristic is the presence of grave goods, which are otherwise almost absent from the lower Galilean record. Additionally, the prevalence of secondary burials at KHH is notable, accounting for more than half of those burials recorded in the region. Moreover, when secondary burials reported from other sites were examined, they usually comprised but a few isolated bones. This accords well with the scenario of initial burial of the dead at the habitation sites and the later, perhaps seasonal transportation of the remains to the funerary centre at Kfar HaHoresh (Goring-Morris 2002).

Architecture at KHH, while similar in general construction methods and techniques to that recorded in other sites, differed in size (particularly during the EPPNB) and in the continued use of archaic forms, as apparent in the construction of round and oval structures throughout the sequence. Another important feature was the effort invested in the construction, as reflected in the interplay between dolomite and *nari* blocks. This type of construction, using two visibly different materials, perhaps as a way of decoration, has only been documented in the region in the context of communal architecture. Also unique to the site are the built installations that are associated with the graves, i.e. standing stones, grave markers etc.

When the small finds recovered at Kfar HaHoresh were compared to other, contemporary sites, there was a large degree of similarity, mainly in the types of artefacts and the technology in which they were made. Yet the KHH record displays the widest variety of raw material types, both local and non-local, and in the typological composition of different tool classes; this is true for almost all of the different assemblages studied, including both the utilitarian tool assemblages and the 'special' finds. This could correspond to the site being a place of gathering for populations from different areas.[47] Additionally, the extensive use of burnt clay is notable; more than 10,000 clay items were recovered (Biton 2010; Biton et al. 2014). While no clear association of these items and burial contexts was identified, it was suggested that these clay items might have been created during ritual ceremonies. If so, then the modelling of the objects from the site's soil was probably an important part of the clay objects' "life cycle" (Biton 2010, p.78). The firing of the objects, and their subsequent transformation from one state to another, could have also been of significance. The production of pottery at KHH was sporadic, but their recurrent presence in all phases is a unique phenomenon in the region (Biton et al. 2014).

To summarize, the results presented seem to strengthen the excavator's conclusions that Kfar HaHoresh represents a thus-far unique locale within the region, reflecting a facet of social practices, particularly those related to death. The intra-site analysis of the site indicated diachronic developments during the course of the PPNB. The intensification of the mortuary practices and their rising complexity, together with the significant shift in the organization of these activities within the site, undoubtedly reflect the changing dynamics in the region as a whole (and see discussion below).

A note should be made regarding the funerary area at Mishmar Ha'emeq. While significantly smaller in scale, this was the only locale of all the studied PPNB sites to exhibit similarities to the burial practices at Kfar HaHoresh, specifically relating the dominance of secondary burials and the appearance of grave goods. However, Mishmar Ha'emeq clearly functioned primarily as a habitation site. Interaction between KHH and Mishmar Ha'emeq is evident, particularly in the co-appearance of the 'fishtail' tang Jericho points. However, the relationship between them and their respective roles within the regional systems remain unclear. It should be considered that chronologically, Mishmar Ha'emeq is dated to the Early phase of the MPPNB, i.e. possibly coeval with Kfar HaHoresh Phase III. The parallel occurrence of two mortuary locales, differing in magnitude and in their contexts (i.e. internal and external to the mundane world of the habitation) should be further explored in the future, within the diachronic framework of the social changes and transformations that took place with the beginning of the MPPNB.

Variation in site function could also be discerned within habitation sites. This was especially evident with regards to the Zippori/Nazareth cluster sites. These sites, located in the midst of the rich chert sources of the Nazareth hills, were clearly more targeted towards lithic production. This was not only reflected by the flint procurement sites at Triangulation Point Q1 and Giv'at Rabi East, but also in the settlement at Yiftah'el. The extensive evidence for large-scale lithic production, far exceeding the needs of the local population, indicates that the site may represent lithic production specialization, perhaps for exchange on a regional level (and see discussion below). On the other hand, the Zippori/Nazareth cluster sites are much poorer in arable land in comparison to sites

[47] It could also be a result of sample size, as most of the assemblages from Kfar HaHoresh are much larger than those available from other sites, including the large-scale excavations of Munhata and Yiftah'el.

in other clusters (ca. 2.5 and 3 km^2 of potentially cultivable land, representing ca. 22% and 28% of the immediate exploitation territories of Yiftah'el and Nahal Zippori 3, respectively). This is compounded by the fact that the Zippori/Nazareth cluster sites are located much closer together, exhibiting a large degree of territorial overlap.

A contrasting pattern was identified by sites in the Jezre'el and Jordan Valley clusters; although the two clusters are located in very different geographic settings, they show significant similarities when it comes to available resources. This is especially apparent when comparing Mishmar Ha'emeq and Munhata; both sites 'control' large areas of arable land (ca. 5 and 7 km^2 of land suitable for cultivation, representing ca. 50% and 60% of their immediate exploitation territories, respectively). On the other hand, the exploitation territories of both sites are extremely poor in flint raw material, and their lithic assemblages reflect very low rates of on-site production.

Thus, the results of the analyses allow us to shed light on how different sites functioned, and on the differential arrangements of activities between them. These differences are also reflected in the way sites were distributed in relation to one another. One of the more striking results of the analyses is that sites in the Lower Galilee were deliberately situated within constant walking distances one from the other. Three complementary arrangements were identified: most sites were located at one-hour walking-distance intervals. This can be observed in both the Jezre'el Valley cluster and the Jordan Valley cluster sites. The Zippori/Nazareth cluster sites, on the other hand, exemplify a different pattern, as they are located much closer together, at intervals of only half-hour walking-distances. This reinforces the observed differentiation between the three clusters and the reconstruction of their economic foci. A third pattern observed relates to the special-activity sites; these were at times located just under a half-an-hours' walk from a habitation site. This arrangement, exhibited at both Triangulation Point Q1 and Hof Shaldag, may indicate the importance of the resources they exploited, and that they were probably utilized quite often, perhaps on a daily basis. It is interesting that, while the Viewshed analysis demonstrated that most sites within the region had no visual connection to other sites in their vicinity, some of these special-activity sites (e.g. Triangulation Point Q1 and Judeidi-Makr #23) had direct lines of sight with their respective habitation sites.

Another aspect to be dealt with concerns *site size*. The studied sites can be divided into three groups according to their estimated size (Table 2.1). The first group comprises three very large sites, with estimated areas of over 20 hectares, i.e. the 'Ein Zippori complex, Sha'ar Hagolan and Munhata. The second group comprises four sites with areas ranging between two and five hectares, i.e. Mishmar Ha'emeq, Ahihud, Yiftah'el and Horvat 'Uza. Tel 'Ali also is probably part of this group, especially if the identification of Tel 'Ali and Bitaniya as representing a single site is correct. Still, the majority of sites are small, with size estimations of less than one hectare, and most measuring ca. 0.5 hectares or less, i.e. Kfar HaHoresh, Nahal Zippori 3, Hof Shaldag, Judeidi-Makr #23, Horvat Turit, Qiryat Ata and Triangulation Point Q1. While the first two groups consist of habitation sites, the third group includes mainly special activity sites, but also at least one small habitation site. But what is the meaning of size variations between settlements? Could size infer a certain *centrality* (*sensu* Rollefson 1987)?

Firstly, it cannot be assumed that estimated size reflects the actual extent of the occupation at any certain point in time. It is plausible that some of the observed distribution of remains is a result of 'horizontal stratigraphy', i.e. movement of the occupations during different stages. This is especially true for the sites of Munhata and Sha'ar Hagolan, where the PPNB layers are superimposed by extensive PN occupations, and the former's actual extent is uncertain. Secondly, there was no appreciable association between the size of a site and the richness of its material culture; Kfar HaHoresh, less than one hectare in area, has one of the most diverse and rich material culture records in the region. Thirdly, results show that size does not reflect differences in the carrying capacity of the area in which a site is located. This is exemplified by the Zippori/Nazareth cluster sites, which are poorer in arable land and water resources than the Jezre'el Valley cluster sites, but are larger, and were apparently much more densely populated. So, it seems that despite the differences observed in site sizes, these cannot be taken as a direct implication of site centrality.

It seems that the only aspect that might convey a certain centrality of a locale within the regional site hierarchy is the presence of communal architecture. Possible communal structures were recovered at several sites, and include: the large L1604 complex as well as later funerary architecture at Kfar HaHoresh (Goring-Morris & Belfer-Cohen 2014b); the 'ceremonial precinct' at Mishmar Ha'emeq (Barzilai & Getzov 2011); and Buildings 200, 552 and 501 at Yiftah'el (Khalaily et al. 2008). Analysis shows that all of these structures were larger than their domestic counterparts, and special efforts were invested in their construction.

Non-domestic architecture appears in the literature as evidence for the emergence of mechanisms aimed at mitigating the stress and social friction caused by growing populations, i.e. scalar stress (Goring-Morris & Belfer-Cohen 2008, 2013; Watkins 2004). Whether this is true or not, there is no doubt that these structures supply evidence for communal labour; whether in the sheer investment required for their construction (and see for example Goren & Goring-Morris 2008) or the magnitude of the activities performed within them, e.g. the large scale lithic production at Yiftah'el Building 200. Either way, these structures indicate that relatively large groups of people were or could be gathered. It must be considered however, that most excavations have not been extensive enough to rule out the possible existence of similar, communal architecture elsewhere.

A possible distinction can be made between *ceremonial* locales, where activities apparently related to ritual, as at Kfar HaHoresh (and possibly Mishmar Ha'emeq), and *communal* locales within habitation sites, such as Building 501 at Yiftah'el, where activities seem to have focused more on production and the concentration of commodities, including both lithic artefacts and cultivated produce. This distinction is, of course, somewhat artificial, as a connection between the mundane and the sacred aspects of communal life is clearly implied by the evidence for intricate burials of both human and bovine remains within Building 501 at Yiftah'el, on the one hand, and the evidence for more 'mundane' activities such as lithic production at Kfar HaHoresh. Clearly a dichotomy between these two aspects of human existence is very much a contemporary perception. On the other hand, the very existence of the ceremonial site at Kfar HaHoresh implies that some rituals were indeed separated from everyday existence.

The results discussed above show that in the Lower Galilee, PPNB settlement patterns result from a subtle interplay of several factors; some environmental, e.g. proximity to fresh water, raw materials and other resources; others relating to topographical location, e.g. on moderate slope and north facing aspects. Nevertheless, the regularity observed in site distributions throughout the landscape indicates a strong socio-economic influence on site location choices. In order to pursue this further, we need to first understand the economies on which these sites were based.

PPNB SUBSISTENCE AND ECONOMY

In the Southern Levant the PPNB is associated with the advent of plant cultivation and animal domestication, i.e. the development and intensification of an agro-pastoralist economy (Asouti & Fuller 2012; Banning 1998; Bar-Yosef 2001; Goring-Morris & Belfer-Cohen 2010a, b, 2011; Kuijt & Goring-Morris 2002). In the Lower Galilee PPNB subsistence was based mainly on the cultivation of domesticated crops, while hunting continued to play a vital role (Caracuta et al. 2015; Gopher & Abbo 2016; Horwitz & Lernau 2003; Horwitz et al. 1999; Zohary et al. 2012).

Botanical remains in Galilee indicate an economy based on domesticated legumes, mainly lentils (*Lens culinaris*) and horse bean (*Vicia faba;* Caracuta et al. 2014, 2015; Kislev 1985; Kislev et al. 2012; Paz & Vardi 2014). Cereals were exploited as well, but to a much lesser degree, and were probably collected from wild stands rather than cultivated (Kislev et al. 2012).

Faunal assemblages in the study area indicate the exploitation of gazelle, wild goat, aurochs and wild boar (Alhaique & Horwitz 2012; Ducos 1968; Horwitz & Lernau 2003; Horwitz & Commenge-Pellerin in press; Lev-Tov 2000; Marom 2012a,b, 2014; Sapir-Hen et al. 2016). While gazelles were clearly hunted, there has been a debate as to the exploitation strategies of other species, mainly the goat. While these animals were morphometrically wild, it has been suggested that intentional human control was applied to wild herds (Horwitz 1989, 1993; Horwitz & Lernau 2003; Sapir-Hen et al. 2016; Meier et al. 2016). It has also been recently shown that goats in the Lower Galilee may have been managed through fodder provisioning by the end of the MPPNB and the transition to the LPPNB (Makarewicz & Tuross 2012; Makarewicz et al. 2016; Meier et al. 2016). It was only with the onset of the FPPNB/PPNC that morphometrically domesticated goats appear in the studied assemblages.[48]

[48] It is interesting to note, in that context, the appearance of water wells during the same sub-phase. Such wells were recorded at Atlit-Yam as well as at Nissanit (Galili & Nir 1993; Galili et al. 2002; Tepper 2013, 2014). The latter is especially interesting since Nissanit has more fresh water springs in its vicinity than any other site in the Lower Galilee. The fact that a well was dug, even though fresh water was not in shortage indicates that other factors were perhaps taken into consideration. It is possible that the co-appearance of wells and domesticated animals are connected; the water in the well is controlled, preventing possible pollution, which can be caused by the proximity of domestic animals (see also Goring-Morris & Belfer-Cohen 2010b, p.74).

The results presented above raise issues regarding the reconstruction of how subsistence-related activities were spatially organized around the sites. Three exploitation territory sizes were used in the analyses: the *immediate* exploitation territory, which can be reached within half-an-hour's walk from the sites; the *intermediate* exploitation territory, which can be reached within one-hour's walk from the sites; and the *outer* exploitation territory, which can be reached within a two-hour walk from the sites. When the different exploitation territories were analysed with respect to their composition and the distribution of resources within them, the immediate exploitation territory stood out significantly, exhibiting the greatest inter-site variability and differentiation. On the other hand, the analysis of the agricultural potential showed a clear dichotomy between areas suitable for cultivation, which concentrated within the immediate, half-hour exploitation territories and areas suitable for pasture (and see discussion below), which were mostly located within the intermediate, one-hour exploitation territories. This dichotomy reflects a division of the landscape into several exploitation spheres, dedicated to different tasks. The different traits of the exploitation spheres (proximity to the habitation, differential composition and resource distribution, etc.) have implications as to the type of tasks and activities performed in them, and may assist in their interpretation.

Several crop husbandry models have been previously applied to Neolithic agriculture; these include both *intensive* and *extensive* husbandry regimes, which are distinguished by the level of labour input per unit area and subsequent area yields (Bogaard 2004). One of the regimes suggested was *floodplain cultivation*, i.e. intensive hand cultivation of lower valleys, where the deep alluvial soils are cyclically enriched by floods and colluvium (*ibid,* pp.34-38; and see White & Wolff 2012). Such a cultivation method could have theoretically been practiced in the flooded, marshy areas of the large Jezre'el and Beit Netofah Valleys. However, floodplain cultivation is an intensive method, necessitating regular tending of the plots, which in turn requires them to be located in close proximity to the habitation site. The results presented show that lands suitable for such cultivation were located outside the daily exploitation territories of the vast majority of the studied sites.

It is my suggestion that the location of the land suitable for cultivation within half-an-hour reach from the sites, together with the regular placement of settlements so that those immediate territories adjoin but do not overlap, point towards a different regime: *intensive garden cultivation* (Bogaard 2004, p.159; Halstead 1987). Garden cultivation is characterized by high inputs of human labour through practices such as dibbling, sowing, hand weeding, hoeing, and at times also watering and manuring. These improve yields per unit area and reduce the amount of land a household needs to cultivate. Under a garden cultivation regime, the intensity of cultivation dictates that plots are located close to the settlement.

In her work on the Greek island of Evvia, Jones (2005) gave a detailed ethnographic example of pulse cultivation under a garden regime and explored the relationship between cultivated plot sizes, distance from the village and agricultural practice. She showed a direct correlation between the distance of the plot from the habitation site, its size, and diminishing intensity of cultivation. Garden plots included a mixture of pulses and vegetables for human consumption. They were small (<100 m^2), and were usually located within a few minutes' walk from the settlement.

While there is no direct evidence for intensive cultivation methods in the archaeological record of the Lower Galilee, it has been reported in adjacent regions. Tilling and weeding were reported in MPPNB Beidha and LPPNB el-Hemmeh east of the Jordan Rift Valley, as well as MPPNB Halula in northern Syria, based on osteological markers, use-ware analysis and other archaeological evidence (Ibáñez et al. 1998, 2007; White & Wolff 2012). Active water management practices were demonstrated by the construction of wells, both in EPPNB Cyprus, i.e. Kissonerga-Mylouthkia (Peltenburg 2003) and in FPPNB/PPNC Atlit-Yam and 'Enot Nissanit (Galili & Nir 1993; Tepper 2013, 2014). The use of selective irrigation and water control have also been suggested for LPPNB Ba'ja (Gebel 2004a) and 'Ain Ghazal (Styring et al. 2016; Wallace et al. 2015); the latter also showing indications of manuring during the LPPNB, which can help maintain higher yields over many years (Styring et al. 2016). Abbo et al. (2003) have proposed small-scale, intensive garden-type cultivation of the chickpea recovered from both MPPNB Jericho (Garrard 1999) and LPPNB 'Ain Ghazal (Rollefson 1985). Intensive plant cultivation was also suggested to have been practiced at LPPNB el-Hemmeh, where plots were located just below the site, well within half-an-hour's walk. Recurrent use of the same plots over very long periods was noted (White & Wolff 2012). Indeed, the delayed returns inherent in such intensive garden cultivation provide a strong incentive for remaining in the same place and cultivating the same patch of land. The application of intensive methods, including manuring and tilling, over a period of years creates a good fertile tilth and lends these garden soils high value (Bogaard 2004; Jones 2005). This could explain the prolonged occupation of the same locales from the Early to the MPPNB, and would also explain why the same locales were at times re-occupied during the FPPNB/PPNC (and see discussion below).

Garden agriculture creates a mosaic of different habitats in close proximity to the settlement; these habitats attract a variety of wild species and can support relatively high densities of small mammals and fowl, which become easily available to the local community for exploitation, i.e. 'Garden hunting' *sensu* Linares (1976; and see discussion in Arbuckle 2015; Speth & Scott 1989). The increasing abundance of small game animals (e.g. hare), small predators (e.g. fox) and birds in the faunal assemblages of the studied sites may very well indicate that 'garden hunting' was indeed practiced in and around settlement. Gardens also attract larger species of game; the intensification of wild boar and aurochs during the PPNB may also reflect the influence human agricultural activities had on the environment surrounding the site as well as animal exploitation patterns (Marom & Bar-Oz 2009).

The intermediate exploitation territory represents a second exploitation sphere. It seems that this secondary sphere, covering areas that could be reached within one hour's walk, encompassed several activities relating to animal exploitation. The results of the agricultural potential analysis showed that the environments present within this sphere, while unsuited for cultivation, provide ideal habitats for the animals exploited, and indeed, this is reflected well in the composition of the studied faunal assemblages, which imply that hunting took place in relatively close proximity to the settlements. The same environs are of course suitable for pasture. It is largely accepted that wild goats were being managed prior to the appearance of domesticated species (Horwitz & Lernau 2003; Horwitz et al. 1999; Meier et al. 2016; Sapir-Hen et al. 2016). This probably involved keeping incipient domesticated animals close to sites, their movement, as well as access to food and water, restricted (Zohary et al. 1998). Marom (2012b) has shown that by at least the FPPNB/PPNC, caprine herding was perennially village-bound, and supplemented by intensive hunting of wild boar, wild cattle and gazelles. Thus, the secondary exploitation sphere was well suited for the different stages in herd management throughout the period. The ecotonal location selected for the habitation sites, utilizing both the upper foothills and the lower valleys, and the differential distribution of habitats and resources in the various exploitation spheres suit very well the prototypical Mediterranean village model (*sensu* Butzer 1996).

The third exploitation sphere represents areas that could be reached within a two-hours walk from the settlements. These encompass the Mediterranean park-forests and scrubs as well as more densely wooded areas, and could have been occasionally exploited for hunting other species, such as the roe, red and fallow deer, which appear in low frequencies in the studied faunal assemblages.

To conclude thus far, the analyses performed enabled a discussion of the economic basis and land-use practices during the PPNB in the region. A division of the landscape into different exploitation spheres is suggested, each encompassing different aspects of everyday subsistence. This is not to say that these spheres were in any way separate from each other, but rather complementary, similar to Ingold's *'taskscapes'* (Ingold 1993); corresponding and interconnected ranges of related activities transpired within them. From a social point of view, these shared contexts of human activity create a network of interrelationships between human beings and their environment. Thus, land-use most likely defined a set of meaningful categories within the landscape, represented by the different exploitation spheres. In that respect, it is interesting that, in contrast to the immediate exploitation sphere, where cultivation took place, the two larger spheres, the centres of animal exploitation activities, were shared by neighbouring villages. It must be assumed that social and communal affinities, and perhaps kinship, existed between these adjacent sites. Otherwise, social tensions would have risen in response to competition over resources (and see discussion below).

INTRA-REGIONAL INTERACTIONS

As stated earlier, differences between the various sites and assemblages in terms of quantitative scale and data availability made inter-site comparisons problematic. Still, various lines of evidence provide insights as to the nature and extent of inter-site interactions at varying levels and scales, from the inter-site to the inter-regional. Tracking the spread of specific aspects of the archaeological record (e.g. local and non-local raw materials) enable the reconstruction of certain networks of interaction, transmission and exchange, both within the Lower Galilee region and beyond it.

Several examples of intra-regional networks can be discussed. One of the clearest examples is that of the "HaSollelim" lithic transmission system, centred in the Zippori/Nazareth cluster. This network was previously characterized based on the bidirectional blade production and the evidence for specialized manufacture at Yiftah'el (Barzilai 2010a). Initial procurement and the first stages of manufacture were conducted at the procurement sites, e.g. Triangulation Point Q1. The production of the blanks, on the other hand, was conducted in large production centres such as Yiftah'el, as evidenced by the extensive workshop dumps there. Blade blanks were then transported to consumption sites, where final shaping of the tools was performed, at least with regards to sickle blades (Brailovsky-Rokser 2015).

While the centre of this transmission system was clearly identified, its geographical extent remains unclear. Within the Lower Galilee, "HaSollelim" lithic products were clearly transported southwards to the Jezre'el Valley cluster sites, e.g. Mishmar Ha'emeq, and possibly towards the northwest, e.g. the Turit cluster sites. Munhata and the other Jordan Valley sites, on the other hand, were not part of this lithic system, as no evidence for the use of this raw material was recorded there. Still, a significant part of the lithic assemblages from the Jordan Valley were made on non-local flint, brought to the site as blanks and finished items. This indicates that these sites were part of a different, external transmission system.

This was not the only distinction between the Jordan Valley cluster sites and the central Galilee sites. In fact, they differ in several aspects, including certain characteristics of their economic base. The analyses indicate that the Jordan Valley cluster sites may have had stronger connections with entities to the east and northeast, rather than westwards. Still, the existence of connections with the sites to the west cannot be overlooked, and are apparent in other aspects of the material culture such as the presence of the miniature votive axes, which are currently unknown east of the Jordan Rift Valley. One of the instances where specific inter-site interaction could be inferred is reflected in the co-occurrence of local variants of Jericho points, namely the presence of 'fishtail' tangs and 'Munhata points' at Munhata, Kfar HaHoresh and Mishmar Ha'emeq; these imply the existence of connections between the three sites; however, the absence of the Munhata point at Mishmar Ha'emeq implies that perhaps Kfar HaHoresh was a central link connecting the Jezre'el Valley and the Jordan Valley sites.

A second example for the distribution of commodities within the region can be seen in the production and distribution of groundstone tools. While the mechanisms of such a system have not yet been identified, the negligible evidence for on-site production and the observed uniformity in raw material selection, production techniques and tool morphology imply its existence. Evidence for an aspect of such a system was recently recorded at the Giv'at Kipod basanite workshop located in the southeast margins of Ramat Menashe (Rosenberg et al. 2008; Shimelmitz & Rosenberg 2016). Initially Giv'at Kipod was considered to be a PN/Chalcolithic workshop. But testing has shown that a PPNB basanite axe from Yiftah'el, located ca. 20km to the northeast, derives from Giv'at Kipod, and that the workshop was an important production centre over several millennia including the PPNB, operating primarily on a local, regional level (Rosenberg

& Gluhak 2016). We can only assume that several other groundstone transmission systems operated in parallel within the region (and see discussion below regarding biface production in Mt. Carmel).

An issue that has seldom been raised regarding these transmission systems is the issue of reciprocity. What were the incentives of the production centres? Which commodities were exchanged in return to lithic products? Based on the analyses presented above, a certain option comes to mind; as was noted earlier, the abundance of lithic raw material in the Nazareth hills probably served as a catalyst for PPNB settlement in the area. On the other hand, the lower carrying capacity of the area combined with the fact that much of the sites' immediate exploitation spheres were overlapping mean that each of the Zippori/Nazareth sites had much less available land to cultivate.

Based on ethnographic data (Davis 1991; Halstead 1981), it was suggested that under an intensive cultivation regime, 250 hectares of cultivated land should suffice to sustain a settlement of 200-400 inhabitants (Perlés 2001, p.165). This is based on mixed cultivation of both cereals and pulses, with yields of 600-1000 kg/hectare, and assuming an annual consumption of ca. 200 kg per person, while allowing for storage of seeds for sowing (*ibid.*). The area suitable for cultivation within the immediate exploitation sphere at Yiftah'el is ca. 2.5 km^2, i.e. 250 hectares. However, ca. 2/3rd of this area is shared between Yiftah'el and its neighbours: Nahal Zippori 3 to the west and Hanaton to the north (Figure 6.14). Even if the entire area was cultivated, it seems insufficient for its' estimated population of ca. 600 individuals during the MPPNB [49] (Garfinkel et al. 2012a, p.297). And still, botanic remains from Yiftah'el comprise the largest assemblage of seed remains recovered in the Galilee, including hundreds of thousands of lentil and bean seeds, kept in silos and containers in various areas of the site. Similar finds were reported from the neighbouring Nahal Zippori 3. Is it possible that the large-scale storage of agricultural produce at these sites reflect some sort of reciprocal exchange between the Zippori/Nazareth sites and adjacent, more agriculturally oriented sites such as Mishmar Ha'emeq, the consumers of "HaSollelim" lithic production? The paucity of the botanical record from the Lower Galilee is an obstacle in further pursuing these questions. Recent discoveries of large quantities of seeds, such as those recovered from Yiftah'el, Nahal Zippori 3 and Ahihud, and their current analyses (Caracuta et al. 2014, 2015) will hopefully set the stage for such research. The recent findings from Giv'at Kipod, located ca. 1 km from Mishmar Ha'emeq, indicate that basanite axes might have also been part of this reciprocal network. Future analysis of the groundstone tool assemblage from the site should shed light on possible connections between it and Giv'at Kipod.

PPNB SETTLEMENT PATTERNS IN THE LOWER GALILEE AND DIACHRONIC CHANGE

Until recently, the chronological framework of the PPNB in the Lower Galilee was based mainly on techno-typological markers of the lithic assemblages, i.e. projectile

[49] Although this might be an over-optimistic assessment.

point seriation (Gopher 1994) and aspects of the bidirectional blade technology (Barzilai 2010a). Few radiometric ^{14}C dates were available, from a small number of sites, i.e. Yiftah'el, Kfar HaHoresh, Munhata and Tel 'Ali (Crane & Griffin 1970; Garfinkel 1987, 1999; Goring-Morris et al. 2001). Moreover, several of the dates available were deemed "problematic" due to disturbed contexts or aberrant results (e.g. Garfinkel 1999, p.5). In the past few years however, dozens of new dates have been obtained, enabling a more informed discussion of regional PPNB chronology and diachronic processes (Appendix 2, Table 1 and references therein). The following discussion utilizes these new chronological data to review diachronic changes in the lower Galilean settlement patterns through the PPNB sequence.

The first occupation of the interior valleys of the Lower Galilee was thought, until recently, to have occurred during the MPPNB (e.g. Goring-Morris et al. 2009; Kuijt & Goring-Morris 2002). Recent discoveries of PPNA sites such as Bir el-Maksur and 'Ein Dishna, though ephemeral in nature, indicate that the area was settled much earlier (Birkenfeld et al. in press; Malinsky-Buller et al. 2013). Evidence for EPPNB occupation of the Lower Galilee is also quite limited (Figure 7.1): a clearly defined stratum of this sub-phase has only been recorded at four excavated sites: Kfar HaHoresh, Tel 'Ali, Ahihud and Kh. 'Asafna.[50] As far as could be ascertained, all four EPPNB sites were established on either bedrock or sterile soil and the EPPNB occupations were not preceded by a PPNA one. Tel 'Ali might represent a relatively early occupation within this phase, as suggested by Prausnitz (1966), but no ^{14}C dates are available to support this suggestion. ^{14}C dates were obtained from both Kfar HaHoresh and Ahihud (Appendix 2, Table 1). While at Kfar HaHoresh the dates span the entire sub-phase, and even somewhat earlier, at Ahihud the dates cluster towards the transition from Early to MPPNB, ca. 8300-8200 calBC. All sites except for Kh. 'Asafna show continuous occupation from the EPPNB to the MPPNB.

With the exception of Kfar HaHoresh, all other EPPNB sites in the study area were interpreted by their excavators as settlements. The existence of architectural remains, burials as well as a rich and varied material culture at Tel 'Ali and Ahihud seem to support this interpretation. The exposure of the EPPNB occupation at Kh. 'Asafna, on the other hand, is too limited to determine the site's function. Results however show that all of these sites are located further up the hills than their MPPNB neighbours. Subsequently, they 'controlled' larger areas suitable for animal exploitation. This could reflect a greater reliance on hunting in comparison to later sites.

Even though most excavations of EPPNB have been limited in size, it seems that architectural remains are quite ephemeral. The rich material culture, however, especially at Ahihud and Kfar HaHoresh, reflects well-developed and far-reaching transmission systems, specifically regarding obsidian, greenstone and lithic raw materials. It is interesting to note, in that respect, a group of sites located on Mt. Carmel (Figure 7.1),

[50] Other possible EPPNB occurrences include Horvat Turit, Bitaniya and 'Ein Zippori, but these were never systematically investigated.

where surveys during the 1950-1960s noted the presence of 'Tahunian' (i.e. *tranchet*) axes, indicating an early age within the PPN (i.e. PPNA and/or EPPNB; Olami 1984). Two of these sites (i.e. Karmeliyya and Nahal Ornit) seem to represent flint procurement and knapping sites, possibly the origin of some of the lithic raw material recovered in the lower Galilean EPPNB sites.

Within the excavated sites, Kfar HaHoresh stands out significantly, supplying evidence for large-scale, communal EPPNB architecture (the early phase of the large L1604 complex). The magnitude of construction is striking in contrast to the paucity of architectural remains at the other sites, strengthening the suggestion that the site served as a special-activity, ceremonial locale since its establishment. This is true even in comparison to other, well-established EPPNB settlements in adjacent regions, such as Mujahiya in the Golan Heights (Gopher 1990) or Horvat Galil, in the Upper Galilee (Gopher 1997; Figure 7.1).

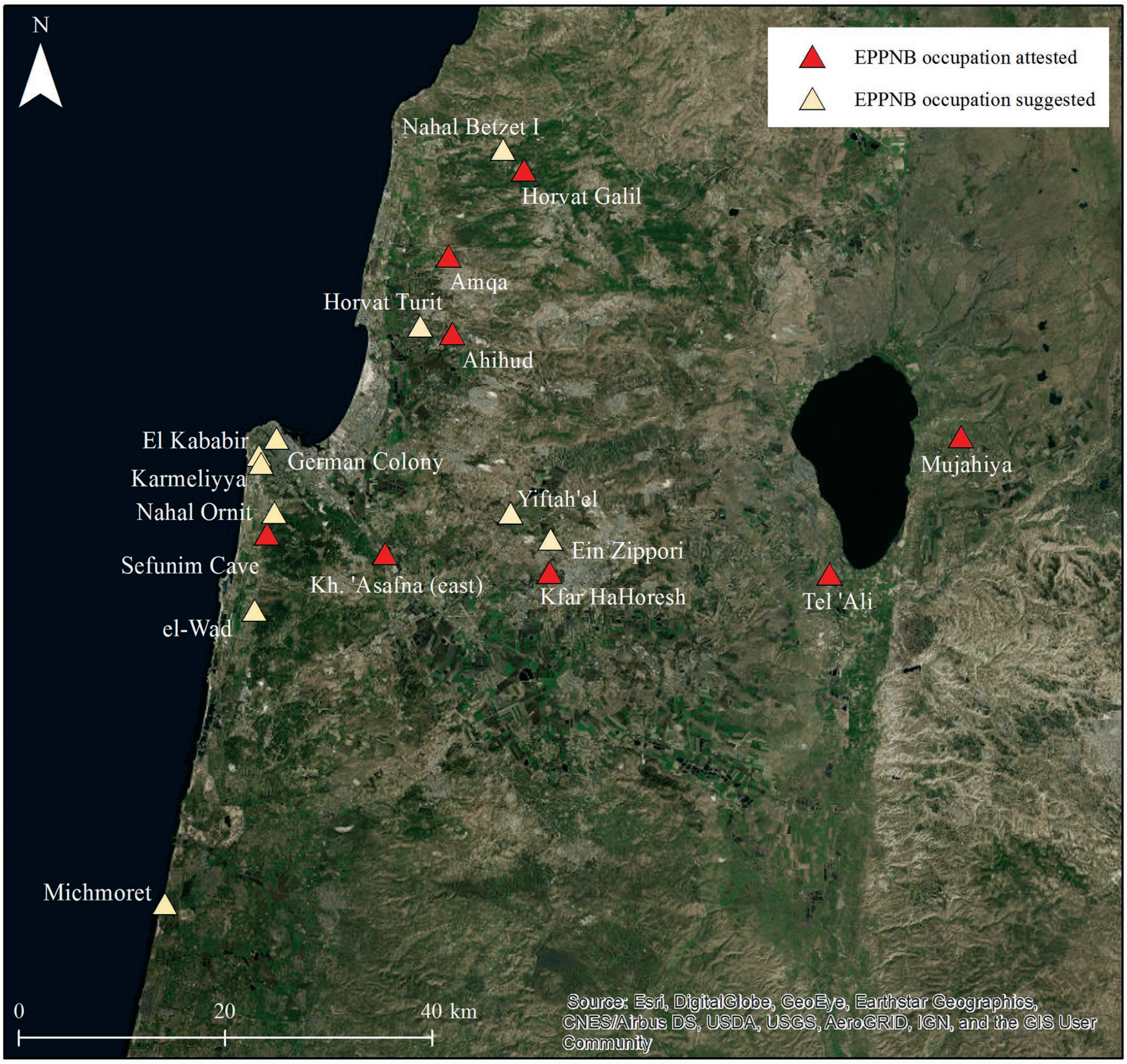

Figure 7.1: EPPNB sites in the Lower Galilee and adjacent regions.

The establishment of several new sites marks the onset of the MPPNB (Figure 7.2); these include the beginning of the large-scale occupation of the Zippori/Nazareth area (i.e. Yiftah'el, Nahal Zippori 3, Hanaton and Kfar Qana) as well as the large settlements of Munhata in the Jordan Valley and Mishmar Ha'emeq in the Jezre'el Valley cluster. These sites join the already existing occupations at Ahihud and Tel 'Ali, and are linked to several smaller-scale, task-specific sites. Chronologically, MPPNB ^{14}C dates were obtained from Kfar HaHoresh, Yiftah'el and Nahal Zippori 3 (Appendix 2, Table 1) and span the entire sub-phase, from ca. 8,250 calBC to 7,500 calBC. [51]

The MPPNB sites are not only more numerous, but are larger as well, suggesting some degree of population increase. Both domestic and communal architecture became much

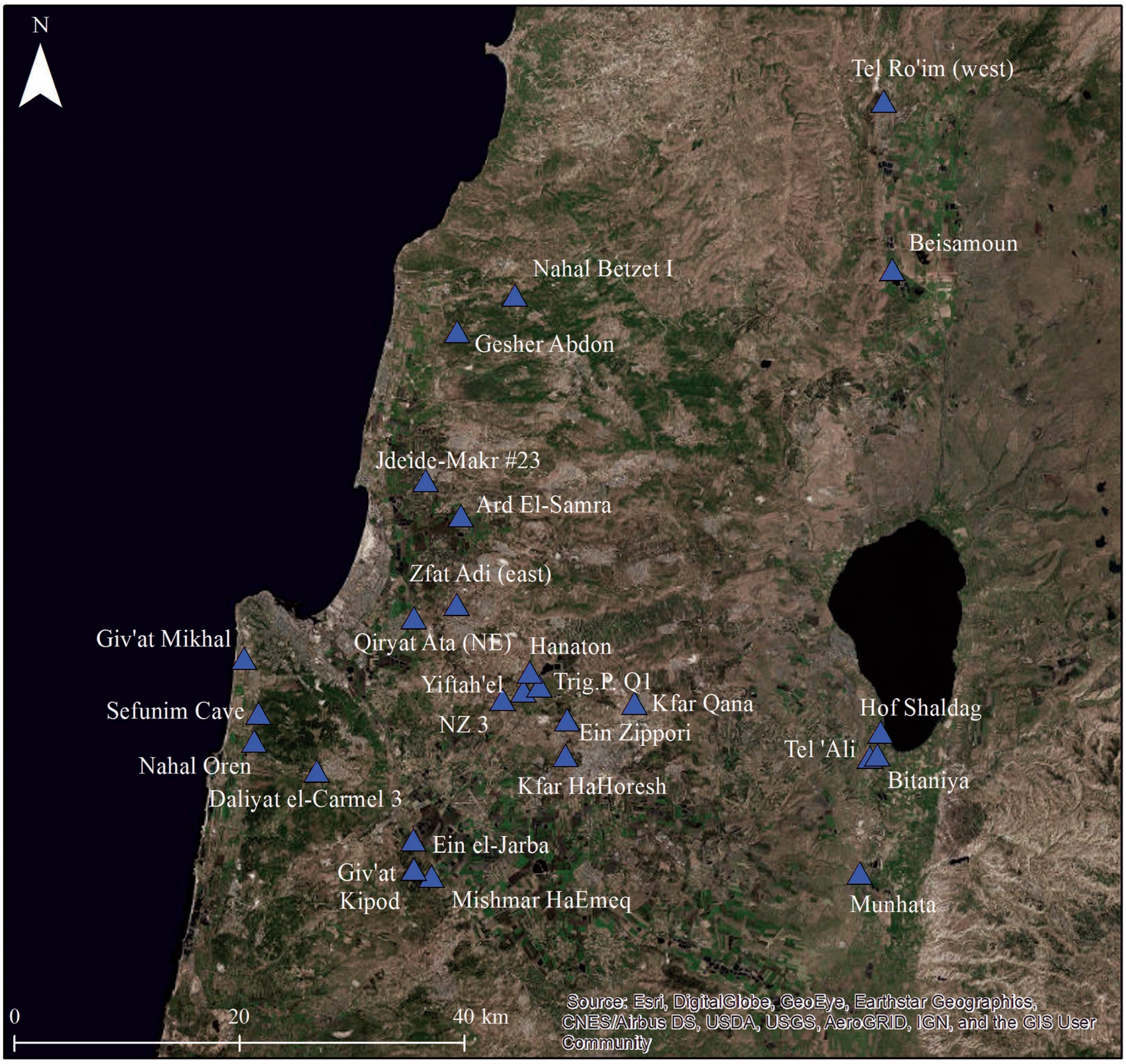

Figure 7.2: MPPNB sites in the Lower Galilee and adjacent regions.

[51] ^{14}C dates were also obtained from Munhata, but their error margins are too large to enable any meaningful discussion (Appendix 2, Table 1).

more substantial, and were accompanied by the establishment of distinct communal centres within the larger settlements. Kfar HaHoresh also continued to play a unique role within the region, as attested by the prolonged use of the large L1604 complex and related ritual activity. Moreover, this activity, as reflected in burial and associated behaviours, significantly intensified during this phase and became more intricate, clearly reflecting the dynamic developments seen throughout the region. The intensification of the settlement system can also be observed in the lithic assemblages, specifically in raw materials selection and procurement strategies. With the transition to the MPPNB, the frequency of the non-local lustrous pink/purple flints began to decline, while the local "HaSollelim" beige flint increased dramatically and became the mainstay. This clearly correlates with the extensive exploitation of the Nahal Zippori hills and the establishment of the Zippori/Nazareth cluster sites.

The increase in population during the MPPNB could be the cause for the observed regularity in site distributions; an increase of population over a certain threshold would create both social and environmental stresses, possibly causing villages to split and a portion of the population to move nearby and settle in a new locale. The new settlement would have its own independent exploitation territories, which would enlarge the areas that could be cultivated and exploited without turning to less-intensive methods, and limiting distance to plots and hunting grounds. The establishment of new villages close to the parent settlement, presumably keeping in close contact with it, would explain the observed overlap of the hunting/pasture territories. This scenario seems to be reflected especially vividly in the Jezre'el Valley cluster and the Zippori/Nazareth cluster, with the central sites (Mishmar Ha'emeq and Yiftah'el), which still retain the communal locales, and the nearby, smaller settlements (Nahal Zippori 3 and Hanaton to Yiftah'el, 'Ein el-Jarba and Nissanit to Mishmar Ha'emeq). The fact that both Mishmar Ha'emeq and Yiftah'el were settled during the early phase of the MPPNB while their neighbours, as demonstrated by Nahal Zippori 3, were likely settled slightly later during the period supports the suggested scenario.

With the transition to the LPPNB, the vast majority of sites were abandoned (Figure 7.3). The only sites where occupation might have persisted through to the early phase of the LPPNB are Kfar HaHoresh and Yiftah'el. However, despite the numerous available ^{14}C dates from both these sites, none of the samples postdates ca. 7,450 calBC (Appendix 2, Table 1). The possibility of a LPPNB occupation was raised at Ard el-Samra and the 'Ein Zippori complex, but at both these sites this was based on indirect lithic criteria, such as the presence of relatively wide bidirectional blade cores (Barzilai & Milevski, pers. comm.). In fact, not a single ^{14}C date of LPPNB age exists in the lower Galilean record. It is possible that the absence of LPPNB sites is due to visibility; perhaps these sites were located lower in the valleys, and later covered by alluvial activity. This is unlikely, however, when one takes into account the seasonal flooding of the large valleys, which probably prohibited year-round habitation. Nonetheless, even if visibility or the extent of archaeological research are the reasons for the apparent paucity in LPPNB activity in the region, the abandonment of the MPPNB sites reflects a dramatic shift in settlement patterns.

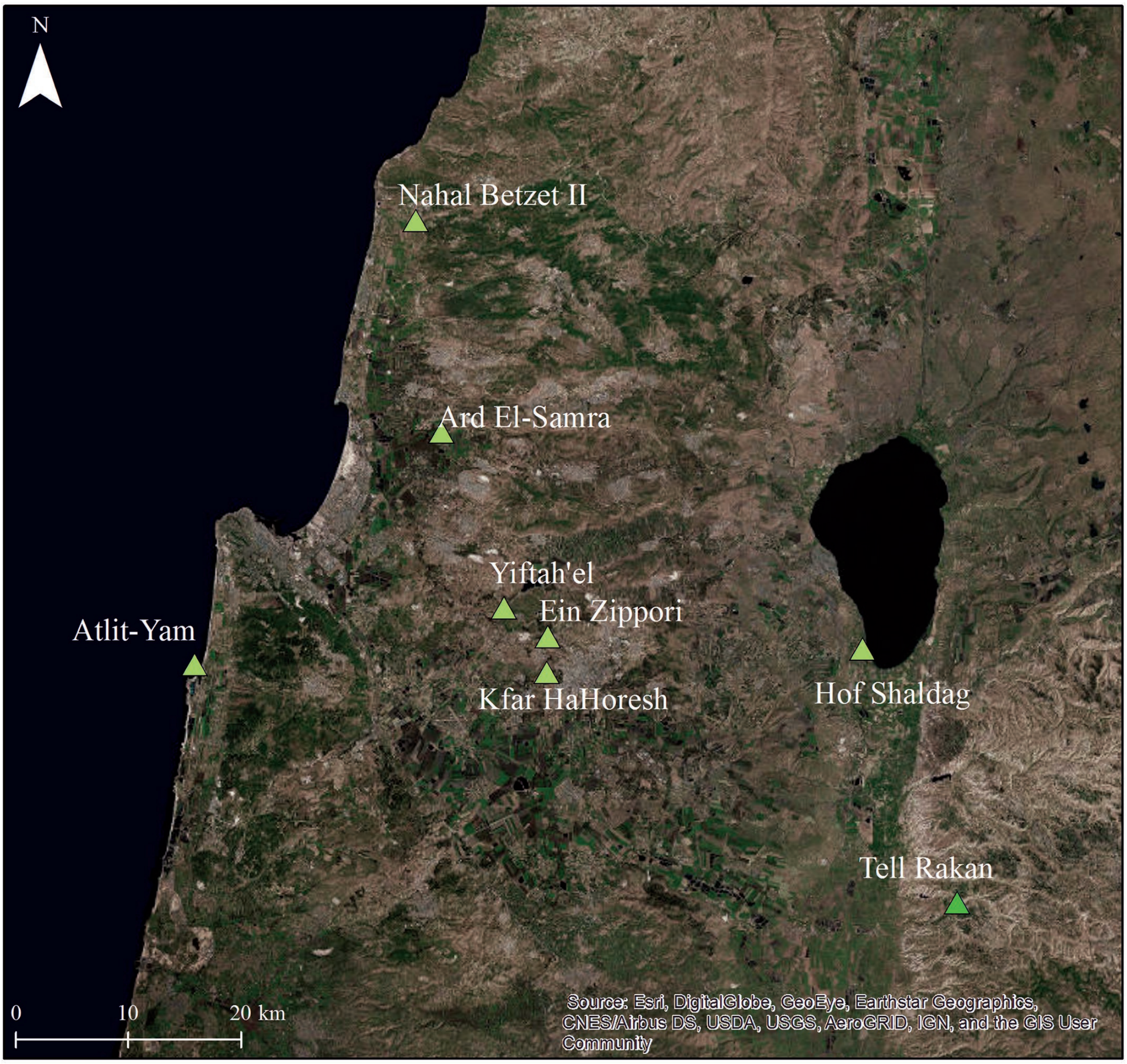

Figure 7.3: LPPNB sites in the Lower Galilee and adjacent regions.

The decline in settlement numbers during the LPPNB is not unique to the Lower Galilee, and was also recorded in adjacent areas west of the Jordan Rift Valley. This phenomenon was discussed widely in the context of the supra-regional systems of the southern Levant in relation to the appearance of LPPNB "Mega-sites" east of the Jordan Rift Valley (Gebel 2004b; Rollefson 1989, 2008a; and see discussion below). Still, LPPNB attributions of sites have occasionally been suggested, based on techno-typological markers of the lithic assemblages, especially projectile point seriation (e.g. Braun 1997; Getzov et al. 2009a). This dissonance between LPPNB attributions and the ^{14}C evidence raises issues regarding notions of LPPNB lithic techno-typological markers, especially the anchoring of certain aspects of projectile point seriation in absolute chronology.

Gopher (1994) distinguished two main subgroups of projectile point compositions within PPNB assemblages (his Group III): an early one (sub-group IIIa), in which Jericho and Byblos points (and their intermediate variants) are dominant, and a later one (sub-group IIIb), in which Byblos and Amuq points (and their intermediate variants) are dominant. When we examine the projectile point assemblage from Kfar HaHoresh for example, we can see that according to the seriation scheme, both Phase II and Phase I should be dated to the sub-group IIIb. Absolute dating, however, securely places these two phases in the MPPNB (Phase III) or the transition between Middle to LPPNB at the latest (Phase II). A similar situation was recorded at Yiftah'el; the assemblages from areas C and I, for example, are dominated by Jericho points (Garfinkel 2012a; Khalaily et al. 2008). The assemblage from area G, on the other hand, has a significant presence of Byblos points (and see discussion in Chapter 5). All three areas, however, are dated to the MPPNB (Garfinkel 2012a; Khalaily et al. 2008; Khalaily, Getzov & Milevski, pers. comm.). Thus, with respect to the lithic assemblages, there are two 'phases' within a single chronological 'sub-phase': early-MPPNB and late-MPPNB. The earlier phase is characterized by higher frequencies of Jericho points (including, at Kfar HaHoresh and Mishmar Ha'emeq, the 'fishtail' variant) and extensive use of high-quality brown flint. The later 'sub-phase' is characterised by the dominance of Amuq and Byblos points, many with 'Abu Gosh' retouch, and high frequencies of "HaSollelim" beige flint. The characteristics of the LPPNB in the area, on the other hand, remain unknown.

The FPPNB/PPNC is characterized by a renewal of settlement in the Lower Galilee (Figure 7.4). Some occupations were re-established, i.e. Tel 'Ali and the 'Ein Zippori complex, while others were founded in new locations, i.e. 'Enot Nissanit, Tell Jenin, Horvat 'Uza and Sha'ar Hagolan. However, except for the continued occupation of the Nazareth hills area, mainly due to exploitation of "HaSollelim" raw materials, the central areas of the Lower Galilee seem to have remained mostly unpopulated. Instead, large settlements were concentrated towards the margins of the area: along the foothills of Ramat Menashe, e.g. the Jezre'el valley cluster sites of 'Enot Nissanit and Tell Jenin (Tepper 2014; Sayej 1997a,b), along the coastal plain, e.g. Horvat 'Uza and Atlit-Yam (Galili & Nir 1993; Galili et al. 2002; Getzov et al. 2009b), and along the Jordan Rift Valley, e.g. Sha'ar Hagolan and Tel 'Ali (Garfinkel 1994; Garfinkel & Ben Shlomo 2009). Large permanent villages also clustered around the edges of the Hula Basin, i.e. Hagoshrim, Tel Ro'im West, Tel Teo and Beisamoun (Eisenberg et al. 2001; Nadler-Uziel 2007; Getzov 2008; Bocquentin et al. 2014).

The locations of the FPPNB/PPNC sites do not seem to differ from those of the MPPNB sites. Even the observed regularity of half-hour and one-hour intervals was maintained. This may indicate that similar socio-economic factors were at play. It seems that the introduction of domesticated animals did not change the organization of activities between the different exploitation spheres, and that the intermediate, one-hour exploitation sphere was now utilized for both hunting and more intense pasturing. It is interesting to note that the focal point of the Zippori/Nazareth cluster sites shifted eastwards during the FPPNB/PPNC to more favourable areas in terms of potential arable land, and lithic production moved from Triangulation Point Q1 to Giv'at Rabi East.

By the end of the period, settlement patterns display some continuity with respect to the areas being settled, including mainly the central Galilee, the Mediterranean coast

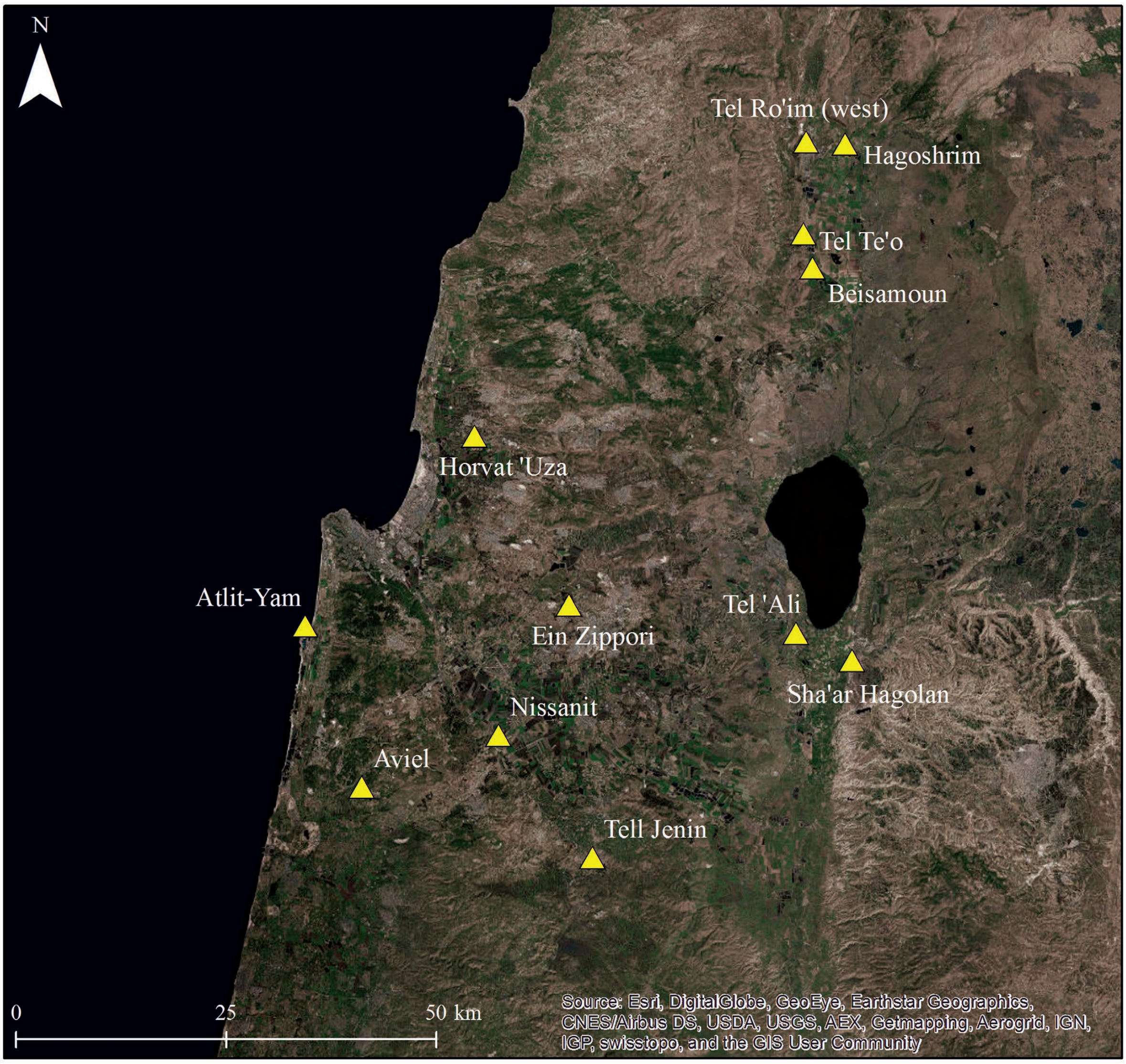

Figure 7.4: FPPNB/PPNC sites in the Lower Galilee and adjacent regions.

and the Jordan Rift Valley. At sites such as Tel ʻAli, Horvat ʻUza and Sha'ar Hagolan Early PN occupations follow the FPPNB/PPNC ones, although it is not clear whether this transition was indeed uninterrupted. Many settlements were re-established following a certain occupational gap, i.e. Mishmar Ha'emeq, Kh. ʻAsafna, Nahal Zippori 3, ʻEin el Jarba, the ʻEin Zippori complex and perhaps ʻEnot Nissanit, as well as Ard el-Samra and Munhata. Other sites were founded in new locations, e.g. Nahal Zehora II and Tel Abu Zureiq in Ramat Menashe, Tel Qishon in the central Galilee, and Hamadiya in the Jordan Rift Valley (Gopher 2012; and references therein). Sites vary in size, duration and intensity of their occupation, but significant similarities in material culture attest to a high level of regional and sub-regional interaction (*idem*, p.1553). The PN represents the final stages of the Neolithic revolution, and the full establishment of the prototypic Mediterranean village, i.e. farming, herding and fishing (Galili et al. 2002; Gopher 2012). While the reoccupation of many sites indicates the suitability of the PPNB site locations to the new economic regime, changes in the way sites were located in relation to one another reflect the different socioeconomic organization. But these are outside the scope of the current research.

THE LOWER GALILEE WITHIN THE LARGER CONTEXT OF THE SOUTHERN LEVANTINE PPNB

Tracking the use of local and non-local raw materials can shed light on inter-regional connections and may assist in deciphering the possible systems of interaction and transmission between the Lower Galilee and adjacent regions; one example of such a system is the transmission of the high-quality, lustrous purple/pink flint. This non-local material dominated the bidirectional blade flint tool assemblages in the Lower Galilee during the EPPNB and continued to appear, in diminishing quantities, during the MPPNB, mainly as blade blanks and finished tools. Although it was suggested that this flint was the result of heat-treatment (Garfinkel 2012a, p.79; Nadel 1989), natural outcrops discovered east of the Jordan Rift Valley could in fact be its source (Barzilai 2010a, p.25; Quintero 1996; Rollefson et al. 2007). The higher frequency of this raw material in the easternmost sites supports this hypothesis. This transmission system was characterised by Barzilai (2010) as a one-way network that consisted of production centres east of the Jordan Rift Valley, possibly in the Gilead region, and consumption sites in the west. Natural sources of this flint were identified near Tell es-Sawwan (Figure 7.5; Delage 2007; Rollefson et al. 2007), where on-site bidirectional blade production was indicated, making it a possible centre of production, perhaps one of many (Barzilai 2010a; and references therein). This transmission system, operating between the two banks of the Jordan River Valley predated and was probably to a large degree replaced during the MPPNB by the "HaSollelim" transmission system.

Other, long-distance transmission systems can be deduced from the presence of other raw materials, foreign to the Lower Galilee. Thus, the presence of asphalt, malachite and other minerals indicates exchange systems with the Dead Sea area. Amazonite was brought from southern Jordan, turquoise and carnelian from the Sinai Peninsula (Alarashi 2016). The marine molluscs indicate connections to both the Mediterranean and the Red seas. Other materials indicate connections with more remote regions, including the northern Levant. Serpentinite and chlorite for example would have had to be brought from either northern Syria or Cyprus (Bar-Yosef Mayer & Porat 2008; Rosenberg et al. 2010), while the amphibole votive axes from Ahihud originated in either northern Italy or Greece (Vardi, pers. comm.; Vardi et al. 2013). The numerous obsidian items traced to central Anatolia, specifically Göllü Dağ, indicate a well-developed, long-distance transmission system, spanning a distance of >650 km (Delerue 2007; Yellin 2012).

Certain diachronic changes seem to be implied by the results of the analysis: lithic assemblages show a growing reliance on local resources, with less and less material coming from east of the Jordan Valley. The lower frequencies of obsidian indicate a similar pattern regarding connections with the obsidian sources at Göllü Dağ. Could these reflect a weakening of the supra-regional connections through the course of, and especially towards the end of, the MPPNB? This 'withdrawal' into the region and the weakening of inter-regional connections precedes the drastic decline in the settlement

Figure 7.5. Main PPNB sites in the southern Levant.

of the Lower Galilee with the onset of the LPPNB. This phenomenon deserves further discussion within the larger framework of the southern Levant and the settlement dynamics recorded within it during the PPNB.

While the particularities of the socioeconomic organization and diachronic changes in settlement patterns described above were quite homogeneous within the Lower Galilee, they differed from parallel processes in neighbouring regions. Even though the general paucity of information regarding some of these regions makes a comparative discussion difficult, several trends and diachronic changes can still be addressed. In the following section, settlement and subsistence patterns of different regions of the southern Levant are presented, followed by a discussion of possible inter-regional relations and processes.

The Damascus basin, albeit geographically part of the central Levant, is considered to represent the northernmost expression of southern Levantine PPNB: faunal remains seem to reflect southern Levantine trends, as do architecture, funerary practices and symbolism (Stordeur et al. 2010). The earliest PPN habitation of the region was recorded at Tell Aswad and Tell Qarassa, during the EPPNB (Figure 7.5; Akkermans & Schwarz 2003; Ibáñez et al. 2010; Stordeur 2003; Stordeur et al. 2010). Although Tell Aswad was previously dated to the PPNA (Contenson 1995), recent excavations and a series of ^{14}C dates have shown that both Aswad and Qarassa were settled in the second half of the 9th millennium BC, i.e. EPPNB (Ibáñez et al. 2010; Stordeur 2003, Stordeur et al. 2010). During the MPPNB, while both sites continue to be occupied, the settlement of the area expanded with the establishment of Ghoraifé (contemporaneously with Tell Aswad II; Cauvin 1975; Contenson 1995; Stordeur et al. 2010). During the LPPNB a new occupation was established at Tell Ramad, and probably also at Tell Aante, signifying further expansion of the population in the region.

While the cultivation of domesticated cereals and legumes (as well as flax) were documented in the Damascus basin as early as the EPPNB (Stordeur et al. 2010), animal exploitation shows significant development throughout the period; Initially, morphometrically wild goats dominate the EPPNB faunal assemblages of Tell Aswad and Qarassa (Helmer & Gourichon 2008; Ibáñez et al. 2010). They continue to be the most abundant species at these sites during the MPPNB, as well as at Ghoraifé (Arbuckle 2014; Ducos 1993; Helmer & Gourichon 2008; Ibáñez et al. 2010). Sheep, largely absent in the early assemblages, as well as domesticated pigs, appear in small but consistent numbers during the MPPNB and LPPNB of Tell Aswad (Ducos 1993). Both represent the earliest occurrence of these domesticated species in the southern Levantine PPNB (Arbuckle 2014).

By the end of the LPPNB and the beginning of the FPPNB/PPNC, both Qarassa and Ghoraifé were abandoned, as was Tel Aswad. Tell Ramad, on the other hand expanded, and was now a large village, exhibiting organized architecture of rectilinear structures (Contenson 2000, p.291). Not much is known of the latest occupation at the site, which is probably dated to the PN, as much of it has been eroded (*ibid*.).

Further to the south, east of the Jordan Rift Valley, evidence for EPPNB settlement was until recently scant, as EPPNB settlements were only known from Wadi Jilat 7 in the eastern steppe (Garrard et al. 1994) and Abu Hudhud in Wadi Hasa, south-central Jordan (Figure 7.5; Rollefson 1996a; Sayej 2005). Recent excavations at EPPNB sites in various regions of the eastern Jordan, e.g. Mushash 163 (Lelek Tvetmarken & Bartl 2015; Rokitta-Krumnow 2016), ‘Ainan 1A (Štefanisko & Purschwitz 2016) and Harrat Juhayra 202 (Fuji 2016), not only add to our knowledge of the period in the area, but also indicate the possibility of local development from the PPNA to the MPPNB. A similar scenario of indigenous developments was also suggested by Finlayson et al. (2014) for southern Jordan, based on an identification of a distinct Late PPNA phase at Wadi Faynan 16, el-Hemmeh and Zahrat adh-Dhra’ 2 (ZAD2). EPPNB economy in these areas seems to have been based on hunting and the cultivation of domesticated wheat and barley (Rollefson 2008a, p.74). Management of morphometrically-wild goats has recently been suggested during the earliest phases at Beidha (Finlayson et al. 2014).

During the MPPNB sites are more abundant, especially in the major valleys draining into the Jordan Rift Valley, and are usually small to medium in size, with the larger settlements, such as ‘Ain Ghazal, probably reaching ca. five hectares in area. Communities in less favourable environments, such as Ghwair I and Beidha, also appear to have been organized in smaller agricultural villages, often under one hectare in area (Kuijt & Goring-Morris 2002).

During the LPPNB several sites in eastern Transjordan reach ‘mega-site’ proportions; these include a series of sites located along the Jordanian Highlands, from Abu Sawwan and ‘Ain Ghazal in the north to ‘Ain Jammam in the south, including Kharaysin, es-Sayyeh, el-Hemmeh, Basta, Ba’ja and possibly Khirbet Hammam (Figure 7.5; al-Nahar 2010; Bienert et al. 2004; Fino 2004; Gebel 2004b; Ibáñez et al. 2015; Makarewicz & Austin 2006; Peterson 2004; Rollefson 2008a). Other than their sheer size, usually reaching 10 hectares in area, the ‘mega-sites’ also exhibit complex, seemingly pre-planned, domestic and communal architecture and an economy based on farming and herding (al-Nahar 2010; Asouti & Fuller 2013; Gebel 2004b; Horwitz & Ducos 2005; Martin 1999), while hunting remained important in certain regions, e.g. the Azraq basin (Martin et al. 2016). The ‘mega-sites’ were interconnected with a variety of smaller, specialized sites such as production sites, seasonal herding camps, hunting stations, etc. The seasonal sites discovered at Biqat Uvda in the southern Negev (e.g. Nahal Issaron, and see below) seem to be associated with this system (Goring-Morris 1993; Kuijt & Goring-Morris 2002). The population explosion of the Jordanian steppe stands in stark contrast to the patterns of abandonment and reduced population observed west of the Jordan Rift Valley.

FPPNB/PPNC occupations were documented at several sites in Jordan, including ‘Ain Ghazal, Wadi Shu’eib, el-Hemmeh and es-Sayyeh, and (Figure 7.5; Bartl & Kafafi 2015; Makarewicz & Goodale 2004; Kafafi et al. 1999). Possible FPPNB/PPNC occurrences might also be suggested at Basta, Beidha, Ghuwayr I and ‘Ain Jammam (Rollefson 2008a). Subsistence was based on farming and herding, and it was suggested that pastoral nomadism/transhumance was practiced (Rollefson et al. 2014). A consistent transition from the FPPNB/PPNC and into the PN was also suggested, based mainly on the evidence from 'Ain Ghazal (Rollefson 1993, 2008a; Rollefson & Köhler-Rollefson 1993). This continuity is taken as evidence for the local development of PN traditions, including the introduction of pottery (Simmons 2002).

West of the Jordan Rift Valley, in the Judean hills, PPNB settlement largely follows the same general trends observed in the Lower Galilee (Figure 7.5). Excavations at Motza exposed a large, well-dated, EPPNB settlement, comprising both rectangular and curvilinear architecture with lime-plastered floors, human burials and rich and varied material culture remains (Khalaily et al. 2007a). Similar to the EPPNB of the Lower Galilee, the remains recovered at Motza reflect considerable long distance exchange networks extending the Southern as well as the northern Levant. Faunal remains indicate a subsistence economy based on hunting, mainly of gazelle (*ibid.*).

During the MPPNB, an increase in the number of sites and their sizes is apparent, and occupations were recorded at Motza, Abu Gosh, Hurvat Rabud and Jericho (Gubenko et al. 2009). Differences in the economic organization between the Lower Galilee and the Judean hills were suggested, based on the evidence from Abu Gosh for a preference of goats over gazelles and the probable cultivation of domesticated cereals (Marder et al. 2011). Another possible MPPNB site in the region is Nahal Hemar cave (Bar-Yosef & Alon 1988). The site, located east of the Dead Sea, at the southern edge of the Judean desert, seems to have served as a ritual locale. Remains recovered include a variety of cultic objects, including a modelled skull, stone masks, anthropomorphic plaster statue and figurines, as well as a unique lithic assemblage and diverse artefacts made from organic materials (Bar-Yosef & Alon 1988; Goren et al. 1993; Schick 1989).

During the LPPNB, in a similar fashion to the pattern reported from the Lower Galilee, a distinct decrease in settlement is observed, and possible occupations were only recorded in deep soundings at Motza (Eisenberg & Sklar 2005).

In the arid and semi-arid environments of the Negev and northern Sinai, a very different socioeconomic organization was discerned, characterized by settlement patterns and economic strategies similar to those practiced in the late Epipaleolithic (Goring-Morris 1993; Simmons 1981). These comprise small sites, reflecting a clear hierarchy, from base camps to more ephemeral task-specific sites such as hunting camps and knapping stations, and seasonal movement between them, as well as an economy based on hunting and gathering of wild resources. Architecture is comprised of small, round structures, either as isolated dwellings (in smaller-scale, family-based camp-sites such as Abu Maadi I) or in a beehive-like formation in larger scale settlements such as Nahal Issaron (Goring-Morris 1993). Here again we see an increase in the number and size of sites from the EPPNB to the MPPNB, followed by an almost complete abandonment of the area during the LPPNB. Seasonal sites in the southern Negev seem to be connected to settlement systems to the east (Kuijt & Goring-Morris 2002).

In summary, it seems that the different regions of the southern Levantine PPNB went through different processes, at different tempos. Once compared, several issues of inter-regional dynamics are raised. These issues are dealt with in the following section, and are presented chronologically, from the first appearance of the PPNB in the southern Levant to its final stages.

The first issue to be discussed is the origins and the spread of the southern Levantine PPNB. Two contrasting models have been previously suggested; The 'Core area' model advocates a primacy of the Northern Levant (specifically southeastern Turkey and northern Syria), as the focal location for the emergence of village life (including crop and animal domestication as well as cultural 'PPNB traits' such as lithic traditions, burial customs, architectural traditions, etc. (Abbo et al. 2011; Barzilai 2010a; Cauvin 1990; Edwards & Sayej 2007; Gopher 1994; Gopher et al. 2013; Gopher & Abbo 2016; Kuijt 2003; Lev-Yadun et al. 2000). This is based on the seemingly uninterrupted transition from PPNA to PPNB in the north, especially along the Middle Euphrates including the Balikh Valley (Akkermans 2004), in comparison to the southern Levantine record, which exhibits a significant shift in settlement patterning between the PPNA and PPNB (and see discussion in Goring-Morris & Belfer-Cohen 2014a).

The 'Polycentric' model (or 'diffused protracted' model), on the other hand, argues for multiple centres of origins for both cultural innovations (e.g. Gebel 2002) as well as animal and plant domestication (Asouti & Fuller 2012; Conolly et al. 2011; Fuller et al. 2012; Willcox 2005; Zeder 2011). The discovery of numerous EPPNB sites east and west of the Jordan Rift Valley has raised support for this model, taken by some to imply a parallel, perhaps simultaneous development of PPNB traditions both in the northern and southern Levant (e.g. Finlayson et al. 2014; Khalaily et al. 2007a).

In the Lower Galilee, the EPPNB remains recorded indicate both internal and external processes. While some aspects of the material culture were clearly transmitted from the north, e.g. the appearance of the bidirectional blade technology (Barzilai 2010a), other aspects, specifically those related to subsistence, seem to reflect a continuation of local traditions, as well as local adaptations and innovations (Caracuta et al. 2016; Horwitz 1989, 1993; Horwitz & Lernau 2003; Sapir-Hen et al. 2016). Similar scenarios were suggested for other sub-regions of the southern Levant, portraying a combination of indigenous, local developments, interwoven with external influences (Horwitz et al. 1999; Martin & Edwards 2013).

The recent discoveries regarding the Cypriot Early Neolithic provide a remarkable viewpoint on PPN dispersals. On the one hand, the colonization of Cyprus represents decisive evidence for the physical dispersal and diffusion of PPNB populations. Domesticated as well as wild species were intentionally brought into the island, implying advanced capabilities of not only seafaring, but also of plant cultivation and animal management, as early as the PPNA. On the other hand, the local innovations and adaptations reflect a similar mixture of both external and internal processes, as do other sub-regions (Briois 2016; Simmons 2016a, b; Vigne et al. 2011, 2012).

The advent of the EPPNB throughout the Levant was not always synchronous, and it was suggested that the EPPNB of the northern Levant preceded that of the Southern Levant (e.g. Edwards 2016). The relatively early ^{14}C dates of the EPPNB occupation at Kfar HaHoresh, as well as those from other sites such as Tell Qarassa and Motza, shorten the gap between north and south to ca. 100 calendric years. As discussed above, southern Levant EPPNB material culture and subsistence practices reflect both northern influences as well as autochthonous traits. Thus, the southern Levantine EPPNB record indicates dual processes, of both internal and external influence.

During the following MPPNB population densities rose throughout the southern Levant, and the 'PPNB life ways' seem to expand throughout the region. At the same time, in the Lower Galilee, a certain 'withdrawal' into the region and a weakening of the supra-regional connections was noted (and see above). A similar process, at least with regards to lithic raw material exploitation, was suggested to occur in the greater Petra region (Purschwitz 2016). On the other hand, other cultural aspects, specifically those related to symbolic expression, seem to be shared at the larger, inter-regional scale. This is evident in mortuary practices, for example in the appearance of plastered skulls. This tradition, often related to ancestral cult, was interpreted as part of a wider array of mortuary practices aimed at encouraging the creation of social cohesion, transecting the individual household and restricting social differentiation (Bonogofsky 2006; Croucher 2006; Goring-Morris 2002; Kuijt 2002a). The practice of post-mortem skull removal, which traces back to the preceding Natufian, is known from throughout the Levantine PPNB (Bocquentin et al. 2016; Cauvin 2000; Goring-Morris & Belfer-Cohen 2014b). However, modelled and plastered skulls, were only recorded in the southern Levant and the Damascus basin at Kfar HaHoresh, Yiftah'el, Jericho, Nahal Hemar, Beisamoun, 'Ain Ghazal, Tell Ramad and Tell Aswad. Furthermore, at the same time, during the MPPNB, differences in the frequency, as well as related techniques and *chaînes opératoires* of skull removal reflect a significant break in burial customs between the northern and southern Levant (Bocquentin et al. 2016). Somewhat later, beginning with the last quarter of the 8th millennium BC, a similar 'disconnection' between north and south is reflected the evolution of the bidirectional blade technology (Borrell & Khalaily 2016).

Thus, it seems that following the initial spread of the EPPNB, evolution during the MPPNB was more regionalized. This is reflected in subsistence and settlement patterns, but also in other aspects of everyday existence. In fact, the main aspects that seem to convey a wider, supra-regional 'interaction sphere' are those related to ritual activity (mainly burial customs, figurines and other symbolically-charged items). These, however, seem to be, to a certain extent, restricted to the Southern Levant, as connections between the southern and northern Levant seem to have weakened.

During the LPPNB, two opposed processes can be observed: while regions west of the Jordan Rift Valley exhibit the same type of LPPNB abandonment observed in the Lower Galilee, settlements east of the Jordan Rift Valley (and to some extent also north, in the Damascus basin) exhibit major growth. Gebel (2004b) ties these opposed processes together, and attributes the stimulus for the 'mega-site' phenomenon observed in the east in population pressure originating in the 'disturbed habitats" of the Mediterranean zones to the west and movement into the semi-arid fringes of the Arabian Plateau, i.e. the 'Jericho stimulus'. He states, settlements "…expanded on an almost 'unlimited' scale in terms of food resources, due to the presence of various ungulates… and the availability of arable land" (Gebel 2004b, p.4). In a similar fashion, Rollefson (2008a) associates the population explosion of the Jordanian highlands with the abandonment of the MPPNB settlements, including those in the western regions. He suggests that culturally induced environmental degradation was the main incentive for this process.

The results presented in this study raise several questions regarding these scenarios. Firstly, there is no doubt that the beginning of the LPPNB witnessed a large-scale shift in settlement patterns and an apparent abandonment of the Lower Galilee. But there is no concrete data pointing to a movement eastward. In fact, the data available seem to indicate that connections to the east were weakening already during the MPPNB. Secondly, there is no data pointing towards environmental degradation, cultural or otherwise, in the Mediterranean zone; climate reconstructions indicate that conditions in the area during the PPNB were in general wetter and warmer than today (Bar-Matthews & Ayalon 2011; Bar-Matthews et al. 2003; Miller-Rosen 2007; Robinson et al. 2006; Rossignol-Strick 1995). However, despite this long-term trend, climate during the Holocene was unstable, punctuated by brief but extremely cold events of Rapid Climate Change (RCC). It has been suggested that these events, and specifically the '~8.2 ky calBP event' (ca. 6.3k calBC) had a direct effect on PPNB settlement dynamics, i.e. the demise of the FPPNB/PPNC (Weninger et al. 2009). Recently it was suggested that earlier RCC events, dated to ca. 10,200 calBP and 9,200 calBP (ca. 8,200 and 7,100 calBC), were linked to a significant decrease in population density in the middle Euphrates Valley during the MPPNB (Borrell et al. 2015). None of these events, however, correlates chronologically with the LPPNB abandonment of the Galilee. In fact, it corresponds to the onset of Sapropel S1 period, ca. 9,500 calBP, representing warmer climatic conditions and enhanced rainfall (Flohr et al. 2016; Weninger et al. 2009). Indeed, faunal assemblages do not display signs of stress on hunted species, and as it was shown, the economy was moving towards more intensive animal husbandry. Moreover, if, as Gebel suggested, the move to the semi-arid regions was due to the presence of various hunted ungulate species, we would expect to see their exploitation in LPPNB contexts. However, LPPNB faunal remains from Jordan exhibit an obvious decreased emphasis on hunting, as more than 70% of the assemblages comprise domesticated ovicaprids (Rollefson 2008a, p.85). Finally, it seems that the socioeconomic organization suggested for the MPPNB in the Lower Galilee could have dealt with rising population pressure by expanding into adjacent environments. Why relocate to semi-arid regions, which were inherently more fragile ecologically, and were already experiencing population increase and aggregation of their own? Why the large-scale abandonment of the region? Were the environments of the Lower Galilee and adjacent regions indeed stressed to a point that the entire area had to be abandoned wholesale? The archaeological record from the Lower Galilee does not indicate the same intense impact of human exploitation on the environment as was suggested for the much larger settlements to the east, such as 'Ain Ghazal (Rollefson & Köhler-Rollefson 1989, 1992). Perhaps the reasons for the apparent collapse of the MPPNB organization of the region should be sought in the realms of social and cultural processes and mechanisms, rather than deterministic, environmental stresses.

Whatever were the reasons for the LPPNB abandonment, the FPPNB/PPNC witnessed the reestablishment of settlement in the Lower Galilee, setting the stage for continued occupation of the region for several millennia to come. Nonetheless, the FPPNB/PPNC reflects demise of both scale and complexity of the former PPNB ways of life, and many of the large PPNB settlements were deserted (Kuijt & Goring-Morris 2002; Goring-Morris & Belfer-Cohen 2010b). This was probably the result of both ecological factors, e.g. the '8,200 yr. event' combined with anthropogenic ecological degradation (Rollefson 1996b; Weninger et al. 2009), as well as the more immediate consequences of the actual living circumstances in the new farming villages, e.g. zoonotic diseases, 'scalar stress', etc. (Goring-Morris & Belfer-Cohen 2010b).

FPPNB/PPNC at the large Jordanian sites such as 'Ain Ghazal and Wadi Shu'eib, as well as at several of the sites west, e.g. 'Ein Zippori, Munhata and Sha'ar Hagolan, exhibit a direct local development into the PN. On the other hand, whether the FPPNB/PPNC in the Lower Galilee constitutes a break from former PPNB traditions and the extent of its cultural homogeneity within the region, remain open questions in our understanding of Early Neolithic processes in the region (and see Khalaily 2009).

SUMMARY AND CONCLUSIONS

Archaeology has long been interested in the ways in which sites are ordered within the landscape, and how settlement and related patterns reflect socio-economic organization. Most such analyses, especially those focusing on the PPNB in the southern Levant, usually conclude by pointing to several, mostly environmental factors, which would have influenced site location choices. The results of the current research clearly show that in the Lower Galilee settlement patterns were regulated by an interplay of several factors, both environmental as well as socio-economic. While the favourable conditions, such as fertile soils and plentiful fresh water sources, were probably responsible for attracting early Neolithic populations to the region, there is no doubt that socio-economic factors impacted the regulation and organization of their activities within this plentiful landscape. This was evident in site location decision-making, as well as in the way different activities were patterned both within and beyond the site itself. While diachronic changes were noted, the fact that these patterns were largely continuous through almost an entire millennium (from the EPPNB to the end of the MPPNB) is evidence of their success, until their final collapse with the transition to the LPPNB.

The results presented above are the direct outcome of the synthetic stand taken by the research's methodology. While the nature of the archaeological record imposes clear limits, the importance of using multiple data sources, including the entire available material culture records, ^{14}C dates and varied environmental data, is evident. The use of several scales of reference, building from the site-based data and into the landscape has proven to be just as paramount, allowing for the identification of different factors and different processes, operating on parallel yet complementary levels.

The integration of GIS technologies enabled the relatively straightforward and uniform organization of the complex and diverse data sets that formed the base of this research, as well as their later analyses. The ability of GIS to build and test model aspects of the physical world facilitated the enhancement of long-standing, well-known archaeological methods such as Site Catchment Analysis and Viewshed Analysis. These in turn enabled a more detailed understanding of human-land relationships throughout the region.

Finally, a few words should be said about the regional-scale focus of this work. The large-scale cultural cohesion and observed uniformity across the PPNB "Interaction Sphere" has long been acknowledged in the prehistoric research of the Levant (Bar-Yosef & Belfer-Cohen 1989, 2002; Bar-Yosef & Meadow 1995; Cauvin 2000). On the other hand, considerable regional variability has also been widely noted, especially with regards to everyday subsistence. Furthermore, developments and processes, such as the onset and the disappearance of certain PPNB traditions, as well as evidence for continuity and discontinuity, differ remarkably between regions, separating not only the north from the south, but also east from west. It seems that only through the articulation of particularistic, regional-scale patterns, based on an understanding of micro-regional environments, resource management, material culture and chronologies, could we begin to understand the large, complex, supra-regional developments of the PPNB in the Levant.

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Appendix 1

GIS Working Methodology

The following describes in detail the actual procedures involved in the spatial analyses, based on ESRI *ArcGIS Desktop*. Technical ArcGIS terminology and functions appear in *italics*. The coordinate system employed throughout the entire analysis is the Israel Transverse Mercator (ITM) coordinate system. All rasters have a 10m cell-size.

1.1. Preparing the Sites data layer

In *Excel*:
A table was prepared containing all analyzed sites, including the following data:
Site name; X coordinate (ITM); Y coordinate (ITM); Category (I-IV); Dating (EPPNB/MPPNB/LPPNB)
In *ArcMAP*:
The *Excel* table was uploaded into the map using the *add data* application.
Tool: *Data Management Tools – Layers and Table Views – make XY Event Layer*
Aim: Creates a new point feature layer based on x- and y-coordinates defined in the source table.
Procedure: *XY table:* Sites.xls
X Field: X coordinate
Y Field: Y coordinate
Spatial Reference: ITM
Output: Sites.shp - point shapefile representing location of all sites in table. This file can be divided when needed into site specific files by selecting a specific site and exporting the data to a new layer, via the Table of Contents menu.

2.2. Creating Slope and Aspect maps

In *ArcMAP*:
Tool: *Spatial Analyst Tools – Surface – Slope*
Aim: Identifies the slope (gradient, or rate of maximum change in z-value) from each cell of a raster surface.
Procedure: *Input raster*: Topo_gal (DEM raster layer representing topography, i.e. height in meters above sea level. DEM cell size = 10m)
Output measurement: Degree
Z factor: 1
Output: Slope raster
Tool: *Spatial Analyst Tools – Surface – Aspect*
Aim: Derives aspect from a raster surface. The aspect identifies the downslope direction of the maximum rate of change in value from each cell to its neighbors.

Procedure: *Input raster:* Topo_gal (DEM raster layer representing topography, i.e. height in meters above sea level. DEM cell size = 10m)
Output: Aspect raster

1.3. Calculating exploitation territories

In *ArcMAP*:
Tool: *Reclass – Reclassify*
Aim: Reclassifying the values in the Slope raster from singular degree values to intervals of 10 degrees.
Procedure: *Input raster:* Slope
Reclass field: Value
Reclassification:

Old values	New values
0-10	1
10-20	2
20-30	3
30-40	4
40-50	5
50-60	6
60-70	7
70-80	8
No Data	No Data

Output: Slope_rec raster
Tool: *Spatial Analyst Tools – Map Algebra – Raster Calculator*
Aim: Creating a cost-surface raster. Values represents the time cost in seconds to cross each raster cell, based on Naismith's rule with Langmuir's correction as described in Chapter 2. In a 10m cell this calculates as 7.2 seconds + 24 seconds for each 10% slope.
Procedure: In the *Raster Calculator* tool window enter the formula:
Con("Slope10_reclas"==1,7.2, con("Slope10_reclas"==2, 31.2, con("Slope10_reclas"==3, 55.2, con("Slope10_reclas"==4, 79.2, con("Slope10_reclas"==5, 103.2, con("Slope10_reclas"==6, 127.2, con("Slope10_reclas"==7, 151.2, con("Slope10_reclas"==8, 175.2, con("Slope10_reclas"==9, 199.2)))))))))
Output: Cost_gal raster
Tool: *Spatial Analyst Tools – Map Algebra – Raster Calculator*
Aim: Results of the cost surface calculation must be divided by cell size.
Procedure: In the *Raster Calculator* tool window enter the formula:
Cost_gal/10.001
Output: Cost_gal raster
Tool: *Spatial Analyst Tools – Distance – Path Distance*

Procedure: *Input feature source:* Site.shp (point shapefile representing location of site)
Input Surface Raster: Topo_gal (DEM raster layer representing topography, i.e. height in meters above sea level. DEM cell size = 10 m)
Maximum Distance: 1800/3600/7200*
Vertical factor parameters:
Input Vertical Raster: Topo_gal
Vertical Factor: table / VF.txt (Vertical Factor table, representing Langmuir's correction, created in *excel*, saved as an ASCII file.

* Maximum distance is measured in time units. Here it is calculated in seconds, representing half an hour, one hour and two hour distances.
Output: 0.5h/1h/2h rasters

1.4. Extracting the environmental data
In *ArcMAP*:
Tool: *Spatial Analyst Tools – Extraction – Extract Values to Points*
Aim: Extracts the topographic data from the different rasters based on site location, and records the values in the attribute table of an output feature class.
Procedure: *Input point features:* Site.shp (point shapefile representing location of site)
Input raster: Topo_gal / Slope / Aspect
Output: Site.shp (with appended attribute table)
Tool: *3D Analyst Tools – Conversions – From raster – Raster Domain*
Aim: Converts the raster site territory into a polygon, to facilitate data extraction.
Procedure: *Input raster:* 0.5h/1h/2h rasters
Output Feature Class: polygon
Output: 0.5h.shp / 1h.shp / 2h.shp polygon shapefiles
Tool: *Analysis Tools – Extract - Clip*
Aim: Extracts data from the environmental maps and creates a new feature class according to each territory size, or study area, which contains a geographic subset of the features in the environmental maps.
Procedure: *Input features*: soils.shp / lithology.shp / springs.shp / rivers.shp / agri_map.shp
Clip features: 0.5h.shp / 1h.shp / 2h.shp
Output: Subset of each of the environmental maps in the extent of each site's territories. Name of file is coded by Site name _ Type of map _ territory size. For example: KHH_soil_2h.shp
Tool: *Analysis Tools – Statistics – Summary Statistics*
Aim: Summarizing the quantitative data retrieved in previous procedures into a summarizing table to allow further statistical analyses in *JMP* software.
Procedure: *Input table:* KHH_Soil_2h.shp (see former procedure)
Statistics field: Shape_area

Statistics type: SUM
Case field: Code

Output: a standalone table summarizing the required data, which can be exported to excel, ASCII or dbf formats.

1.5. Viewshed analysis

In *ArcMAP*:

Tool: *3D Analyst Tools – Visibility – Viewshed*

Aim: Determines the raster surface locations visible from each observer point, i.e. site.

Procedure: *Input raster*: Topo_gal (DEM raster layer representing topography, i.e. height in meters above sea level. DEM cell size = 10m).
Input point of polyline observer feature: Site.shp (point shapefile representing location of site)
Z factor: 1
Use earth curvature correction: checked
Refractivity coefficient: 0.13 (default value)

Output: Site_view raster

Tool: *Spatial Analyst Tools – Map Algebra – Raster Calculator*

Aim: Creating a cumulative viewshed map by adding the site-specific viewshed maps into a single raster map.

Procedure: In the *Raster Calculator* tool window enter the formula:
Site_view_1 + Site_view_2 + Site_view_3.... + Site_view_n

Output: Cum_view raster, where Value represents number of sites from which each raster cell is visible.

1.6. Intra-site distribution analyses

In *ArcMAP:*

Tool: *Data Management Tools – Sampling – Create Fishnet*

Aim: Creating a fishnet of rectangular cells representing the excavation grid, and a central point for each cell.

Procedure: *Output Feature Class*: Grid_sq.shp
Fishnet origin coordinate: 1000, 5000
Y-axis coordinate: 1000, 5100
Cell-size width: 1
Cell-size height: 1
Number of rows: 20
Number of columns: 30
Geometry type: Polygon
Create label point: selected

Output: Grid_sq.shp; Grid_sq_p.shp

The *Excel* tables with lithic counts were uploaded into the map using the *add data* application.

In *ArcMAP*:

Tool: *Data Management Tools – Join – Add join*
Aim: Allowing a spatial representation of the lithic data, by joining it with the central point created for each excavation square.
Procedure: *Layer Name or Table View:* Grid_sq_p.shp
Input join field: Sq
Join Table: KHH_lithics.xls
Output join field: Sq
Output: lithics_p.shp
Tool: Spatial Analyst – Density – Point Density
Aim: Calculating magnitude-per-unit area from the point features
Procedure: *Input point features*: lithics_p.shp
Population Field: *the procedure is run multiple times, each time on a different field, according to the artefact type that is examined*
Output raster: *artefact_type*_density.grid
Output cell size: 1m
Neighborhood: rectangle
Output: *artefact_type*_density.grid
Tool: *Analysis tools – Overlay – Spatial Join*
Aim: Summing the lithic data per excavation square, by artefact type
Procedure: *Target features*: Grid_sq.shp
Join features: lithics_p.shp
Output feature class: Lithics_sq.shp
Join operation: Join one to many (SUM)
Match options: within
Output: Lithics_sq.shp
Tool: *Spatial Statistics – Mapping Clusters – Hot Spot Analysis (Getis-Ord Gi*)*
Aim: Identifying significant hot and cold spots using the Getis-Ord Gi* statistic
Procedure: *Input feature class*: Lithics_sq.shp
Input field: *the procedure is run multiple times, each time on a different field, according to the artefact type that is examined*
Output feature class: *Getis_*artefact_type*.shp*
Conceptualization of spatial relationship: Fixed Distance Band
Distance Method: Euclidean Distance
Output: *Getis_*artefact_type*.shp*

Appendix 2

Site-Based Data Tables

Table 1: C14 dates from PPNB sites in Galilee. Calibration was made using the OxCal v4.2.4 program (Bronk Ramsey 2013); r5IntCal 13 atmospheric curve (Relmer et al. 2013) with a probability of 95.4%

Site	Exc. Area	Layer	Sq\Locus	Height	Date UncalBP	CalBC			Lab ref. No.	Material tested	Reference
						From	To	%			
Ahihud	-	-	L450	-	9030 ± 60	-8417	-7971	95.4	RTK-6866	Seeds	Caracuta et al. 2015
Ahihud	-	-	L398	-	8950 ± 65	-8291	-7876	95.4	RTK-6875	Seeds	Caracuta et al. 2015
Ahihud	-	-	L433	-	8975 ± 65	-8293	-7961	95.4	RTK-6868	Seeds	Caracuta et al. 2015
Ahihud	-	-	L348	-	9010 ± 40	-8298	-8040	95.4	RTD-8246	Seeds	Caracuta et al. 2017
Ahihud	-	-	L398	-	9060 ± 45	-8341	-8219	95.4	RTD-8258	Seeds	Caracuta et al. 2017
Ahihud	-	-	L398	-	9090 ± 45	-8352	-8236	95.4	RTD-8251	Seeds	Caracuta et al. 2017
Ahihud	-	-	L398	-	9060 ± 45	-8341	-8219	95.4	RTD-8252	Seeds	Caracuta et al. 2017
Ahihud	-	-	L398	-	9050 ± 45	-8326	-8211	95.4	RTD-8254	Seeds	Caracuta et al. 2017
Ahihud	-	-	L398	-	9065 ± 40	-8320	-8231	95.4	RTD-8253	Seeds	Caracuta et al. 2017
Ahihud	-	-	L398	-	8880 ± 70	-8247	-7786	95.4	RTK-6873	Seeds	Caracuta et al. 2017
Ahihud	-	-	L442	-	9070 ± 45	-8345	-8224	95.4	RTD-8250	Seeds	Caracuta et al. 2017
Ahihud	-	-	L450	-	9100 ± 45	-8444	-8243	95.4	RTD-8257	Seeds	Caracuta et al. 2017
Ahihud	-	-	L476	-	9045 ± 45	-8324	-8208	95.4	RTD-8247	Seeds	Caracuta et al. 2017
Ahihud	-	-	L476	-	9040 ± 40	-8301	-8223	95.4	RTD-8256	Seeds	Caracuta et al. 2017
Kfar HaHoresh	East	-	ZY51	414	8,65 ± 50	-7787	-7581	95.4	RTT-3733.1	Charcoal	Goring-Morris et al. 2001
Munhata	-	IVa	Fireplace 644	'5m deep'	7370 ± 400	-7290	-5536	95.4	M-1792	Soil sample [1]	Crane and Griffin 1970
Munhata	Trench 631	IVb/V	L16	-	9160 ± 500	-10044	-7187	95.4	M-1793	Soil sample	Crane and Griffin 1970
Nahal Zippori 3	-	-	L273	-	8905 ± 65	-8260	-7823	95.4	RTK-6864	Seeds	Caracuta et al. 2015

[1] Considered younger than expected and aberrant by the excavator (Perrot 1993).

Table 1 (cont.)

Site	Exc. Area	Layer	Sq\Locus	Height	Date UncalBP	CalBC			Lab ref. No.	Material tested	Reference
						From	To	%			
Nahal Zippori 3	-	-	L174	-	8870 ± 70	-8241	-7756	95.4	RTK-6865	Seeds	Caracuta et al. 2015
Sha'ar Hagolan	Area G	G12	Pit G103	-215.36	7726 ± 37	-6635	-6478	95.4	OxA 13294	Charcoal	Garfinkel & Ben-Shlomo 2009
Sha'ar Hagolan	Area G	G12	Pit G103	-215.48	7479 ± 36	-6428	-6251	95.4	OxA 13295	Charcoal	Garfinkel & Ben-Shlomo 2009
Sha'ar Hagolan	Area G	G12	Pit G1674	-215.03	7900 ± 40	-7027	-6646	95.3	OxA 13274	Charcoal	Garfinkel & Ben-Shlomo 2009
Sha'ar Hagolan	Area G	G12	Pit G174 lower [2]	-215.13	7815 ± 40	-6766	-6528	95.4	OxA 13276	Charcoal	Garfinkel & Ben-Shlomo 2009
Sha'ar Hagolan	Area G	G12	Pit G174 lower [4]	-215.00	7896 ± 38	-7025	-6644	95.4	OxA 13296	Charcoal	Garfinkel & Ben-Shlomo 2009
Sha'ar Hagolan	Area E	E7	E768 (debris)	-215.75	7620 ± 45	-6588	-6414	95.4	RTT 5480	Charcoal	Garfinkel & Ben-Shlomo 2009
Sha'ar Hagolan	Area E	E7	E769 (debris)	-216.31	7735 ± 50	-6646	-6470	95.4	RTT 5481	Charcoal	Garfinkel & Ben-Shlomo 2009
Sha'ar Hagolan	Area E	E7	E818 (debris)	-216.30	7535 ± 50	-6470	-6255	95.4	RTT 5482	Charcoal	Garfinkel & Ben-Shlomo 2009
Sha'ar Hagolan	Area E	E7	E819 (debris)	-216.37	7455 ± 50	-6422	-6236	95.4	RTT 5483	Charcoal	Garfinkel & Ben-Shlomo 2009
Tel 'Ali	-	2	Pit 4003	-	7940 ± 50	-7040	-6684	95.4	OxA 7921	Charcoal	Garfinkel 1999
Tel 'Ali	-	2	Pit 4003	-	7975 ± 70	-7062	-6681	95.4	OxA 7886	Charcoal	Garfinkel 1999
Tel 'Ali	-	2	Open area 4024	-	135 ± 35[3]	1681	1933	95.6	OxA 7922	Charcoal	Garfinkel 1999
Tel 'Ali	-	2	Open area 4042	-	6030 ± 453	-5846	-3979	95.4	OxA 7923	Charcoal	Garfinkel 1999
Yiftah'el	Area C	2a	Silo 719	-	8570 ± 130	-8176	-7326	95.4	RT 736A	Seeds	Garfinkel et al. 2012
Yiftah'el	Area C	2a	Silo 719	-	8870 ± 90	-8271	-7725	95.4	Pta 4242	Seeds	Garfinkel et al. 2012
Yiftah'el	Area C	2a	Silo 719	-	8780 ± 140	-8241	-7591	95.4	LY 3938	Seeds	Garfinkel et al. 2012
Yiftah'el	Area C	2a	Silo 719	-	9200 ± 80	-8617	-8281	95.4	KN 3541	Seeds	Garfinkel et al. 2012
Yiftah'el	Area C	2a	Floor 710	-	8890 ± 120	-8290	-7655	95.4	RT 736B	Seeds	Garfinkel et al. 2012

[2] These are PN pits cutting PPN stratum (Garfinkel & Ben-Shlomo 2009).
[3] According to Garfinkel (1999, p.5), this sample came from a problematic context.

Table 1 (cont.)

Site	Exc. Area	Layer	Sq\Locus	Height	Date UncalBP	CalBC			Lab ref. No.	Material tested	Reference
						From	To	%			
Yiftah'el	Area C	2a	Floor 710	-	8720 ± 70	-8167	-7589	95.4	Pta 4245	Seeds	Garfinkel et al. 2012
Yiftah'el	Area C	2a	Floor 710	-	8940 ± 140	-8437	-7615	95.4	LY 3939	Seeds	Garfinkel et al. 2012
Yiftah'el	Area C	2a	Floor 710	-	9060 ± 80	-8536	-7971	95.4	KN 3570	Seeds	Garfinkel et al. 2012
Yiftah'el	Area C	2a	Posthole 713	-	9060 ± 80	-8536	-7971	95.4	KN 3540	Charcoal	Garfinkel et al. 2012
Yiftah'el	Area C	2a	Floor 800	-	9100 ± 80	-8564	-8011	95.4	KN 3571	Seeds	Garfinkel et al. 2012
Yiftah'el	Area E	C4	L39	-	8885 ±35	-8233	-7883	95.4	RT 2970	Seeds	Garfinkel et al. 2012
Yiftah'el	Area E	C4	L41	-	8665 ± 35	-7741	-7594	95.4	RT 2972	Seeds	Garfinkel et al. 2012
Yiftah'el	Area E	C4	L42	-	8735 ± 50	-7946	-7606	95.4	RT 2973	Seeds	Garfinkel et al. 2012
Yiftah'el	Area E	C3?	K34	-	8685 ± 55	-7937	-7589	95.4	Rt 2971	Seeds	Garfinkel et al. 2012
Yiftah'el	Area I	3b	L5512 (Unit 550)	-	8405 ± 70	7587	-7313	95.4	RTS 6229	Plaster	Poduska et al. 2012
Yiftah'el	Area I	3b	L5512 (Unit 550)	-	10670 ± 80	-10783	-10479	95.4	RTS 6230	Plaster	Poduska et al. 2012
Yiftah'el	Area I	3d	L5118 (Unit 501)	-	9080 ± 75	-8545	-7996	95.4	RTS 6231	Plaster	Poduska et al. 2012
Yiftah'el	Area I	3d	L5118 (Unit 501)	-	11870 ± 95	-12004	-11527	95.4	RTS 6232	Plaster	Poduska et al. 2012
Yiftah'el	Area I	3d	L5118 (Unit 501)	-	11380 ± 85	-11449	-11128	95.4	RTS 6233	Plaster	Poduska et al. 2012
Yiftah'el	Area I	3d	YIF142 (Unit 501)	-	10380 ± 250	-10769	-9398	95.4	RTT 6082	Plaster	Poduska et al. 2012
Yiftah'el	Area I	3d	YIF142 (Unit 501)	-	8580 ± 240	-8272	-7083	95.4	RTT 6083	Plaster	Poduska et al. 2012
Yiftah'el	Area I	3d	YIF142 (Unit 501)	-	8960 ± 75	-8297	-7842	95.3	RTS 6234-1	Plaster	Poduska et al. 2012
Yiftah'el	Area I	3d	YIF142 (Unit 501)	-	7730 ± 70	-6686	-6445	95.4	RTS 6234-2	Plaster	Poduska et al. 2012
Yiftah'el	Area I	3d	L5073	-	8895 ± 65	-8252	-7799	95.4	RTK-6892	Seeds	Caracuta et al. 2015
Yiftah'el	Area C	-	L715	-	8815 ± 40	-8199	-7741	95.4	RTK-6991	Seeds	Caracuta et al. 2015

Table 2: PPNB small finds inventories in Galilee (and sources).

Site	Flint tools		Groundstone tools		Bone tools	
	Assemblage	Report	Assemblage	Report	Assemblage	Report
Category I						
KHH	+	Preliminary; Goring-Morris 1994; Barzilai & Goring-Morris 2007, 2010	+	In prep.	+	In prep.
Munhata	+	Gopher 1989	+	Gopher and Orrelle 1995	-	-
Yiftah'el Areas C, D, E	+	Garfinkel 2012a; Marder et al. 2012; Ronen 2012	+	Dag et al. 2012	+	Garfinkel et al. 2012c
Yiftah'el Areas F, G, H, I	+	Preliminary; Khalaily et al. 2008[1]	+	-	+	-
Category II						
Ahihud	+	-	+	-	-	-
'Ein Zippori complex (2007 season)	+	Barzilai et al. 2013a	-	-	-	-
'Ein Zippori complex (Givat Ravi east)	+	Barzilai & Milevski 2015	-	-	-	-
'Ein Zippori complex (2012-2013 seasons)	+	-	+	-	-	-
Mishmar Ha'emeq	+	Barzilai & Getzov 2008, 2011; Barzilai et al. 2011	+	-	+	-
Nahal Zippori 3	+	In prep.	-	-	+	-
Tel 'Ali III-IV	+	Prausnitz 1966	+	Prausnitz 1970	-	-
Tel 'Ali D2	+	Garfinkel 1994	+	-	-	-
Category III						
Ard el-Samra	+	Getzov et al. 2009a	+	Getzov et al. 2009a	-	-
Ein el-Jarba	+	-	-	-	-	-
'Enot Nissanit	+	Preliminary: Tepper 2014	+	Preliminary: Tepper 2014	-	-
Hanaton	+	Preliminary; Nativ et al. 2014	+	Preliminary; Nativ et al. 2014	-	-
Horvat 'Uza	+	Getzov et al. 2009b	-	-	-	-
Kfar Qana	+	-	-	-	+	-
Kh. 'Asafna (east)	+	-	-	-	-	-
Sha'ar Hagolan	+	Barzilai & Garfinkel 2006; Matskevich 2011; Shatil 2007	+	Rosenberg and Garfinkel 2014	+[2]	-
Tell Jenin	+	Sayej 1997	-	-	-	-
Category IV	N/A					

[1] More than 10 tons of lithic material was recovered during the 2007-2008 seasons. Although studies were conducted on samples of these assemblages, most awaits analysis and publication. Thus, the existing lithic analysis is preliminary.
[2] Bone artefacts mentioned in Garfinkel & Ben-Shlomo 2009, p.102.

Table 3: PPNB special finds inventories in Galilee and sources.

Site	Polished pebbles		Beads & pendants		Figurines		Pottery		obsidian		Other
	Assemblage	Report	Assemblage	Report	Assemblage	Report	Assemblage	report	Assemblage	report	
Category I											
KHH	+	In prep.	+	Bar Yosef-Mayer & Porat 2008	+	Biton 2010; In prep.	+	Biton 2010; Biton et al. 2014	+	Delerue 2007; In prep.	Votive axes
Munhata	-	-	+	Gopher & Orelle 1995	+	Garfinkel 1995	-	-	-	-	Votive axes
Yiftah'el Areas C, D, E	+	Garfinkel et al. 2012, ch.6	+	Garfinkel et al. 2012, ch.7 (Area C), Gubenko & Ronen 2014	-	-	+	Garfinkel et al. 2012, ch.8 (Area C)	+	Garfinkel et al. 2012, ch. 11	Votive axes
Yiftah'el Areas F, G, H, I	-	-	-	-	+	-	-	-	+	-	Votive axes
Category II											
Ahihud	-	-	-	-	+	-	-	-	+	-	Votive axes
'Ein Zippori complex (2007 season)	-	-	-	-	-	-	-	-	+	-	-
'Ein Zippori complex (Givat Rabi east)	-	-	-	-	-	-	-	-	-	-	-
'Ein Zippori complex (2012-2013 seasons)	-	-	-	-	-	-	-	-	+	-	-
Mishmar Ha'emeq	+	-	+	Barzilai & Getzov 2011	-	-	-	-	+	-	-
Nahal Zippori 3	+	-	+	-	-	-	-	-	-	-	-
Tel 'Ali III-IV	-	-	-	-	-	-	-	-	-	-	-
Tel 'Ali D2	-	-	-	-	-	-	"white ware"	-	-	-	'art objects'

Table 3 (cont.)

Site	Polished pebbles		Beads & pendants		Figurines		Pottery		obsidian		Other
	Assemblage	Report	Assemblage	Report	Assemblage	Report	Assemblage	report	Assemblage	report	
Category III											
Ard el-Samra	-	-	-	-	-	-	-	-	-	-	-
Ein el-Jarba	-	-	-	-	-	-	-	-	-	-	-
‘Enot Nissanit	-	-	-	-	-	-	-	-	-	-	-
Hanaton	-	-	-	-	-	-	-	-	-	-	-
Horvat ‘Uza	-	-	-	-	-	-	-	-	-	-	-
Kfar Qana	-	-	+	-	-	-	-	-	-	-	-
Kh. ‘Asafna (east)	-	-	-	-	-	-	-	-	-	-	-
Sha’ar Hagolan	-	-	-	-	-	-	-	-	-	-	-
Tell Jenin	-	-	-	-	-	-	-	-	-	-	-
Category IV	N/A										

Table 4: Faunal remains in PPNB sites in Galilee.

Site	Mountain gazelle (*Gazella gazelle*)	Wild goat (*Capra aegagrus*)	Fallow deer (*Dama mesopotamica*)	Wild boar (*Sus scrofa*)	Aurochs (*Bos primigenius*)	Red fox (*Vulpes vulpes*)	Hare (*Lepus capensis*)	Equus	Testudo	Aves	Rodentia	Fish	Mollusca	Other
Category I														
Kfar HaHoresh[1]	+	+	+	+	+	+	+	-	+	+	+	+	+	Roe deer; *Felis silvestris; Marmota marmota; Martes foina; Vormela peregrusna*
Munhata[2]	+	+	+	+	+	+	+	-	-	-	-	+	-	Roe deer; Wild sheep
Yiftah'el[3]	+	+	-	+	+	+	+	+	+	+	-	-	+	*Canis* sp.; *Felis* sp.; *Mustelidae*; Red deer
Category II														
Ahihud[4]	+	-	-	+	+	-	-	-	-	-	-	-	-	-
'Ein Zippori com.[5]	Faunal assemblage reported, unpublished.													
Mishmar Ha'emeq[6]	+	+	+	+	+	-	+	-	-	+	-	-	-	*Canis* sp.; *Felis* sp.; Red deer

[1] Goring-Morris et al. 1994-5; Horwitz 2009; Meier 2012; Meier et al. 2016, 2017a, b.
[2] Ducos 1968; Horowitz & Commenge-Pellerin in press.
[3] Alhaique & Horwitz 2012; Horwitz 2003; Sapir-Hen et al. 2016.
[4] Paz & Vardi 2014.
[5] Barzilai et al. 2013a; Milevski & Getzov 2014.
[6] Barzilai & Getzov 2008, 2011.

Table 4 (cont.)

Site	Mountain gazelle *(Gazella gazelle)*	Wild goat *(Capra aegagrus)*	Fallow deer *(Dama mesopotamica)*	Wild boar *(Sus scrofa)*	Aurochs *(Bos primigenius)*	Red fox *(Vulpes vulpes)*	Hare *(Lepus capensis)*	Equus	Testudo	Aves	Rodentia	Fish	Mollusca	Other
Nahal Zippori 3[7]	+	N/D	N/D	N/D	+	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D
Tel 'Ali[8]	+	+	-	+	+	-	-	-	-	-	-	-	-	-
Category III														
Ard el-Samra[9]	Species include bovidae, suidae and caprovines. Species and state of domestications unclear.													
Ein el-Jarba[10]	No faunal remains reported													
'Enot Nisanit[11]	Faunal assemblage reported, unpublished.													
Hanaton[12]	Faunal assemblage reported, unpublished.													
Horvat 'Uza[13]	No faunal remains reported													
Kh. 'Asafna (east)[14]	No faunal remains reported													
Kfar Qana[15]	Faunal assemblage reported, unpublished.													
Sha'ar Hagolan[16]	+	-	-	+	+	+	-	+	+	+	-	+	-	*Felis* sp.; *Cervus elaphus*; Red deer; Roe deer
Tel Jenin	Faunal assemblage reported, unpublished.													
Category IV – N/A														

[7] Barzilai & Vardi pers. comm.
[8] Lev-Tov 2000; Prausnitz 1966.
[9] Marom 2014.
[10] Streit pers. comm.
[11] Tepper 2014.
[12] Nativ et al. 2014.
[13] Getzov et al. 2009b.
[14] van den Brink 2013.
[15] IAA archives.
[16] Marom 2012.

Table 5: Faunal species frequencies in PPNB sites in Galilee.

		KHH 2011-12[17]	KHH 1991-2[18]	Yiftah'el E[19]	Yiftah'el D19[19]	Yiftah'el C[20]	Yftah'el A, B[21]	Yiftah'el G, I[22]	Munhata (Commenge exc.)[23]	Munhata (Perrot exc.)[24]	Mishmar Haemeq[25]	Ard el-Samra[26]	Tel 'Ali III-IV[27]	Sha'ar Hagolan[28]	Tel 'Ali D2[29]
No. of identified bones		8498	400	650	218	1722	444	4230	123	566	529	94	55	485	540
Mountain gazelle	*(Gazella gazella)*	46.9	40	31.2	31	50	4.6	46.7	24	27.3	14	6	10.9	13	1
Wild goat / bezoar goat	*(Capra aegagrus)*	5	15.9	23.5	19	11	-	4.3	-	11.9	17	-	-	-	-
Wild sheep (Mouflon)	*(Ovis orientalis)*	-	-	-	-	-	-	-	-	21.1	-	-	-	-	-
Roe deer	*(Capreolus capreolus)*	0.04	-	-	-	-	-	-	-	3.5	-	-	-	-	-
Fallow deer	*(Dama mesopotamica)*	0.02	0.8	-	-	-	1.8	-	1	-	-	1	-	-	0.2
Red deer	*(Cervus elaphus)*	-	-	-	5	0.1	-	<0.1	-	-	0.2	-	-	-	-
Aurochs	*(Bos primigenius)*	7.5	5.6	17.4	17	6	20	7.2	13	-	41	31	56.4	18	-
Wild boar	*(Sus scrofa)*	2.7	3	16.8	9	7	19	9.1	11	22.6	17	32	58.2	19	-
Fox	*(Vulpes vulpes)*	5.4	5.8	4.6	2.5	5	-	7.5	2	1	0.6	-	-	2	0.2
Hare	*(Lepus capensis)*	6.5	4.2	0.6	2.5	2	-	5.7	4	-	-	-	-	-	0.2

[17] Meier 2012, Meier et al. 2016
[18] Goring-Morris et al. 1994; Horwitz 2009
[19] Alhaique & Horwitz 2012
[20] Horwitz 2003
[21] Horwitz 1997
[22] Sapir-Hen et al. 2016
[23] Horowitz & Commenge-Pellerin in press
[24] Ducos 1968
[25] Marom 2012
[26] Marom 2014
[27] Prausnitz 1966
[28] Marom 2012
[29] Lev-Tov 2000

Table 5 (cont.)

		KHH 2011-12[17]	KHH 1991-2[18]	Yiftah'el E[19]	Yiftah'el D19[19]	Yiftah'el C[20]	Yftah'el A, B[21]	Yiftah'el G, I[22]	Munhata (Commenge exc.)[23]	Munhata (Perrot exc.)[24]	Mishmar Haemeq[25]	Ard el-Samra[26]	Tel 'Ali III-IV[27]	Sha'ar Hagolan[28]	Tel 'Ali D2[29]
Med. tortoise	*(Testudo graeca)*	9.6	-	0.8	1	13	-	0.1	-	-	-	-	-	-	0.2
Sheep/goat	*(Ovis/Capra)*	-	-	-	-	-	45	-	27	-	-	28	-	-	16
Domestic sheep	*(Ovis aries)*	-	-	-	-	-	-	-	-	-	-	-	-	4	2
Domestic goat	*(Capra hircus)*	-	-	-	-	-	-	-	-	-	-	-	-	6	2
Domestic cattle	*(Bos taurus)*	-	-	-	-	-	-	-	-	12.7	-	-	-	-	3
Domestic pig	*(Sus scrofa domesticus)*	-	-	-	-	-	-	-	-	-	-	-	-	-	9
	N	8498	400	650	218	1722	444	4230	123	566	529	94	55	485	540

Table 6: Botanical remains from PPNB sites in Galilee.

Site	Reference	Botanical remains				
		Lentils *(Lens culinaris)*	Horsebean *(Vicia faba)*	Wheat *(Triticum)*	Wood remains	Other
Category I						
Kfar HaHoresh	Goring-Morris, pers. comm.	+	-	-	-	-
Munhata	No Data					
Yiftah'el	Kislev et al. 2012; Miller-Rosen 2012	+	+	+	*Pistacia palaestina; Quercus calliprinos; Quercus ithaburensis*	Cleavers *(Galium tricornutum Dandy* or *G. aparine L)*
Category II						
Ahihud	Paz & Vardi 2014; Caracuta et al. 2015, 2016	+	+	+[1]	-	-
'Ein Zippori complex	No botanical remains reported					
Mishmar Ha'emeq	No botanical remains reported					
Nahal Zippori 3	Caracuta et al. 2014	+	+	_	*Quercus calliprinos; Ficus* sp.	-
Tel 'Ali	No botanical remains reported					
Category III						
Ard el-Samra	No botanical remains reported					
Ein el-Jarba	No botanical remains reported					
'Enot Nissanit	No botanical remains reported					
Hanaton	No botanical remains reported					
Horvat 'Uza	No botanical remains reported					
Kh. 'Asafna (east)	No botanical remains reported					
Kfar Qana	No Data					
Sha'ar Hagolan	No botanical remains reported					
Tel Jenin	No Data					
Category IV	N/A					

[1] Cereals, species unknown.

Table 7: PPNB flint tool assemblages in Galilee – general characteristics

Site	Assemblage size		Tools	Cores		Debitage		Naviform technology	Raw materials
	Total N	Analyzed	% of total assemblage	Type	Core/ debitage ratios	PE % of debitage	CTE % of debitage		
Category I									
Kfar HaHoresh all	394,951	Fully	8%	Opposed platform (incl. naviform); amorphous flake cores; tested nodules; discoidal	1/26	21.5%	6.5%	+	"HaSollelim" beige flint; Pink/ purple; dark-brown
Kfar HaHoresh Phase I	155,736	Fully	6%	Opposed platform (incl. naviform); amorphous flake cores; tested nodules	1/30	21.5%	6.8%	+	"HaSollelim" beige flint; Pink/ purple; dark-brown
Kfar HaHoresh Phase II	20,178	Fully	4.2%	Opposed platform (incl. naviform); amorphous flake cores; tested nodules	1/43	19.7%	7.2%	+	"HaSollelim" beige flint; Pink/ purple; dark-brown
Kfar HaHoresh Phase III	23,487	Fully	7.2%	Opposed platform (incl. naviform); amorphous flake cores; tested nodules	1/17	19.3%	7.5%	+	"HaSollelim" beige flint; Pink/ purple; dark-brown
Kfar HaHoresh Phase IV	19,282	Fully	5.6%	Opposed platform (incl. naviform); amorphous flake cores; tested nodules	1/25	23.6%	6.15%	+	"HaSollelim" beige flint; Pink/ purple; dark-brown
Munhata[1]	10,308	Final	13.6%	Two-striking and one-striking platform cores	1/47	20.8%	1.5	+	Purple/pink/brown fine grained flint; light brown-beige; dark brown; black
Yiftah'el, Area C[2]	126,925	Final	1.3%	Naviform; amorphous flake cores	1/122	23.2%	3.0%	+	"HaSollelim" beige flint 95%; brown dark-brown flint; pink flint
Yiftah'el D[3]	5472	Final	4.2%	Naviform; other	1/9	N/D	N/D	+	"HaSollelim" Grey-brown high quality flint; dark & light brown; pink; violet
Yifath'el, Area E[4]	10,828	Final	4.10%	Bidirectional; naviform; amorphous flake cores	1/15	38.10%	5.40%	+	"Hasollelim" beige flint 95%; brown dark-brown flint; pink flint

[1] Gopher 1989
[2] Garfinkel 2012a
[3] Ronen 2012
[4] Marder et al. 2012

Table 7 (cont.)

Site	Assemblage size		Tools	Cores		Debitage		Naviform technology	Raw materials
	Total N	Analyzed	% of total assemblage	Type	Core/ debitage ratios	PE % of debitage	CTE % of debitage		
Category II									
'Ein Zippori complex (2007 season)[5]	1398	Fully	7.40%	Flakes, tested nodules, blade and bladelet cores	1/19	22.80%	5.20%	+	N/D
'Ein Zippori complex (Giv'at Rabi)[6]	1426	Fully	4%	Bidirectional and unidirectional blade cores, tested nodules, flake cores	1/23	29%	4%	+	"Hasollelim" beige
Mishmar Ha'emeq[7]	3,968	Fully	%	Flake/flakelets; bidirectional and unidirectional blade cores	1/42	11.20%	1.30%	N/D	Local small nodules of grey flint, purple flint, "Hasollelim" beige flint
Nahal Zippori 3[8]	N/D	Preliminary	N/D	Naviform	N/D	N/D	N/D	+	Beige Hasollelim; Purple/pink
Tel 'Ali D2[9]	8622	Final	5.10%	One and two striking platforms, incl. naviform	1/36	25.4%	4%	+	Local grey flint river cobbles; brown; pink
Tel 'Ali III[10]	95	Final	90%**	Bidirectional	1/95	N/D	N/D	N/D	Local grey flint river cobbles; brown; black; purple/pink
Tel 'Ali IV[11]	194	Final	76%**	Bidirectional	1/27	N/D	N/D	N/D	Local grey flint river cobbles; brown; black; purple/pink
Category III									
Ard el-Samra[11]	536	Final	7.5%	Blake cores; bladelet core; bidirectional core	1/73	6.50%	5.60%	+	N/D

[5] Barzilai et al. 2013a
[6] Barzilai & Milevski 2015
[7] Barzilai & Getzov 2008, 2011; Barzilai et al. 2011
[8] Vardi, pers. comm.
[9] Garfinkel 1994
[10] Prausnitz 1966
[11] Getzov et al. 2009a

Table 7 (cont.)

Site	Assemblage size		Tools	Cores		Debitage		Naviform technology	Raw materials
	Total N	Analyzed	% of total assemblage	Type	Core/ debitage ratios	PE % of debitage	CTE % of debitage		
‘Hurvat ‘Uza[12]	368	20.10%	-	Irregular; multi-platform, two platform and single platform cores	1/99	12.90%	5%	-	High quality Eocene blackish-brown or grayish-grey of local origin
Sha’ar Hagolan[13]	15,579	Fully	2.81%	Single striking platform flake & blade cores; amorphous flake cores; Bidirectional	1/78	24.6%	1.65%	+	Local grey and dark-grey flint river cobbles; brown flint; black dense flint
Tell Jenin[14]	1797	Final	18%	N/D	1/21	0.20%	N/D	N/D	“local flint”
Category IV	N/A								

[12] Getzov et al. 2009b
[13] Barzilai & Garfinkel 2006; Matskevich 2011; Shatil 2007.
[14] Sayej 2007a,b

Table 8: PPNB formal tool frequencies from Galilee[1]

Site	Projectile points					Sickle blades	Bifacials			
	% of tool assemblage	Type				% of tool assemblage	% of tool assemblage	Type	Polish	*Tranchet*
		Helwan	Jericho	Byblos	Amuq					
Category I										
Kfar HaHoresh all	5.5%	6%	19%	21%	53%	7.9%	1.1%	Chisels; axes; adzes; picks	+	+
Kfar HaHoresh Phase I	5.8%	2%	13%	26%	59%	7.5%	1.1%	Chisels; axes; adzes; picks	+	+
Kfar HaHoresh Phase II	4.3%	6%	14%	22%	58%	8.4%	0.7%	Chisels; axes	+	+
Kfar HaHoresh Phase III	5.7%	4%	39%	11%	56%	8.1%	1.1%	Chisels; axes; picks	+	-
Kfar HaHoresh Phase IV	5.9%	43%	33%	-	24%	9.3%	1.4%	Chisels; adzes	?	?
Munhata	19%	2.5%	50.7%	34%	-	15.5%	0.14%	N/D	-	-
Yiftah'el, Area C	12.1%	1.2%	40%	30.5%	28.3%	12.37%	3.73%	Chisels; axes; adzes; picks; daggers	+	+
Yiftah'el D	5.2%	-	53%	40%	-	6.5%	0.8%	Axes		
Yifath'el, Area E	2-3%	10% (1 item)	10% (1 item)	40%(4 items)	20% (2 items)	10-14.5%	1.5-3%	Axes; chisel; adze; bifacial knife	+	+[2]
Category II										
'Ein Zippori complex (2007 season)	7.8%	-	-	+	+	4.9%	5.8%	Axes; pick	-	-
'Ein Zippori complex (Giv'at Rabi)	-	-	-	-	-	-	11.5%	Axes	-	-
Mishmar Ha'emeq	8.9%	+[3]	+	+	-	6.5%	0.6%	N/D	N/D	N/D
Nahal Zippori 3	N/D	-	+	+	-	10%	N/D	Axes	+	N/D
Tel 'Ali D2	5.5%	+ *	+	+	+	30.3%	2.3%	Chisels, bifacial knives, axes	+	+
Tel 'Ali III	20.2%	-	+	-	-	14.20%	3.6%	Axes; adze	+	-
Tel 'Ali IV	4.0%	+	-	-	-	8.8%	0.7%	Axes	+	+[4]
Category III										
Ard el-Samra	-	-	-	-	-	10%	6%	N/D	N/D	-
Hanaton	N/D	-	-	+	N/D	+	N/D	Bifacial knife	-	N/D
'Hurvat 'Uza	-	-	-	-	-	1.4%	1.4%	Axe	-	-
Sha'ar Hagolan	3.19%	-	-	71.4%	14.3%	12.55%	3.19%	Axes; adze; pick		
Tell Jenin	9.3%	N/D								

[1] For references see Table 7.
[2] From unclear context, probably intrusive.
[3] One item
[4] The single *tranchet* axe from layer IV was apparently collected from the 'olive grove'.

Table 9: PPNB groundstone tool assemblages in Galilee.

Site	N	Analyzed	Raw materials[1]	Tool types												
				Handstones/ processors/ mullers	Pestles	Choppers/ chopping tools	Querns/ Grinding slabs	Mortars	Vessels	Polished stone axes	Polishing pebbles	Grooved items/ shaft straighteners	Perforated items	Weights	Decorated items	Other
Kfar HaHoresh[2]	>2500	Fully	Ba, Sc, Tuff, Pum, Lim, Ch, Fl, Gr, Sand	+	+	+	+	+	+	+	+	+	+	-	+	Applicators; plaques
Munhata[3]	119	Fully	Ba, Lim, San	+	+	+	-	-	+	+	-	+	+	-	-	Sporadically flaked items
Yifath'el areas C, E[4]	45	Fully	Ba, Lim, Sc, BR, Qu	+	+	+	+	+	+	+	+	+	-	-	+	Rod
Sha'ar Hagolan[5]	57	Fully	Ba, Lim, Sand, Dol,	+	-	-	+	+	+	-	-	-	+	+	-	Whorls; notched pebbles
Tel 'Ali (olive grove)[6]	N/D	N/D	Ba, Sc, San, Lim, Fl	+	+	-	+	+	-	-	-	-	-	+	-	Hammerstones; notched pebbles
Ard el-Samra[7]	2	Fully	Ba, Lim	+	-	-	-	-	-	-	-	-	+	-	-	-
Hanaton[8]	2	Preliminary	Ba, Lim	-	-	-	-	-	+	-	-	-	+	-	-	-

[1] Raw materials: Basalt (Ba); Scoria (Sc); Tuff; Pumice (Pum; Limestone (Lim); Chalk (Ch); Granite (Gr); Flint (Fl), Sandstone (Sand) and Dolomite (Dol).
[2] Goring-Morris 2010; pers. comm.
[3] Gopher and Orelle 1995; Data presented refers only to material assigned to levels 6-4.
[4] Dag et al. 2012.
[5] Rosenberg& Garfinkel 2014.
[6] Prausnitz 1966
[7] Barzilai 2010b
[8] Nativ et al. 2014.

Table 10: Architectural features in Galilee.

Site	Architectural remains	Shape	Materials	Plaster floors/ surfaces	Function			Installations
					Domestic	Cult/public	Production	
Category I								
Kfar HaHoresh Phase IV	+	Quadrilinear & oval (?)	Nari & dolomite limestone fieldstones[1]	+	-	+	+	+
Kfar HaHoresh Phase III	+	Quadrilinear	Nari & dolomite limestone fieldstones[1]	+	-	+	+	+
Kfar HaHoresh Phase II	+	Quadrilinear & oval	Nari & dolomite limestone fieldstones[1]	+	-	+	+	+
Kfar HaHoresh Phase I	+	Quadrilinear & oval	Nari & dolomite limestone fieldstones[1]	+	-	+	+	+
Munhata Layer 6	+	Round (layer 6)	Limestone fieldstones; mudbrick; clay	-	+	+	+	+
Munhata Layers 4-5	+	Round (layer 6) Quadrilinear (layers 4-5)	Limestone fieldstones; basalt slabs; mudbrick; clay	+	+	+	+	+
Yiftah'el	+	Quadrilinear	Limestone fieldstones; mudbrick	+	+	+	+	+
Category II								
Ahihud Early Phase	+	?	Small limestones and cobbles	?	+	-	-	+
Ahihud Late Phase	+	Semi-circular	Large limestone fieldstones	-	?	-	?	-
'Ein Zippori complex	+	Quadrilinear?	?	+	+	-	+	+
Mishmar Ha'emeq	+	Quadrilinear	Limestone fieldstones and slabs; basalt slabs; mudbrick	+	+	+	_	+
Nahal Zippori 3	+	?	?	+	+	-	+	+
Tel 'Ali IV & Olive grove (PPNA/EPPNB)	+	Round (+Quadrilinear?)	Limestone fieldstones; cobbles	-	+	-	-	-
Tel 'Ali III (MPPNB)	+	Quadrilinear?	Limestone fieldstones; cobbles	+	+	-	-	-
Tel 'Ali D2 FPPNB/ PPNC	+	Quadrilinear	Limestone fieldstones; cobbles	+	+	-	?	+
Category III								
Ard el-Samra	-	-	-[2]	-	-	-	-	-
Ein el-Jarba	+	?	?	+	?	?	?	?
'Enot Nissanit	+	?	Limestone fieldstones; basalt and limestone slabs	-	-	-	-	+
Hanaton	+	Round	Limestone fieldstones	-	?	-	?	+
Kfar Qana	+	Quadrilinear	Limestone fieldstones	?	?	?	?	?
Tell Jenin	+	Quadrilinear	?	+	+	-	-	?

[1] No mudbrick recovered, although micromorphological testing indicates their existence (Arpin 2004)
[2] Mud-brick remains attested in fill.

Appendix 3

Site Locational Analysis, Data-Tables

Table 1: Exploitation territories. Areas presented in km². (*) Jordan Valley cluster sites affected by the proximity to the modern border.

site	Half-hour territory	% of optimal	One-hour territory	% of optimal	Two-hour territory	% of optimal	Total exploitation area
Ahihud	12.46	63%	53.44	68%	214.81	68%	280.71
Ard el-Samra	15.24	77%	58.50	74%	219.22	70%	292.96
Bitaniya	12.38	63%	49.28	63%	*163.80	*52%	*225.46
Ein el-Jarba	10.63	54%	46.70	59%	190.37	61%	247.70
Ein Zippori com.	10.16	52%	40.16	51%	171.67	55%	221.99
Horvat Turit	14.44	73%	61.59	78%	243.49	77%	319.51
Horvat ‘Uza	13.22	67%	57.67	73%	230.28	73%	301.17
Hanaton	10.96	56%	47.72	61%	184.94	59%	243.62
Trig. P. Q1	11.46	58%	47.71	61%	183.89	59%	243.07
Hof Shaldag	12.07	61%	47.80	61%	*180.77	*58%	*240.64
Kfar Qana	9.56	49%	38.42	49%	171.25	54%	219.23
Kfar HaHoresh	6.70	34%	33.09	42%	162.37	52%	202.17
Kh. ‘Asafna (east)	10.06	51%	34.66	44%	172.37	55%	217.09
Mishmar Ha’emeq	9.83	50%	41.67	53%	191.69	61%	243.19
Munhata	11.10	56%	*30.82	*39%	*113.03	*36%	*154.96
Nahal Zippori 3	10.64	54%	45.70	58%	191.63	61%	247.97
Nissanit	12.82	65%	53.59	68%	216.98	70%	283.39
Qiryat Ata (NE)	12.81	65%	56.20	71%	227.72	72%	296.74
Jdeide-Makr #23	14.51	74%	61.37	78%	242.31	77%	318.19
Sha’ar Hagolan	*11.24	*57%	*30.82	*47%	*113.03	*30%	*154.96
Tel ‘Ali	10.53	53%	46.54	59%	*160.93	*51%	*218.01
Tell Jenin	11.41	58%	48.67	62%	198.14	63%	258.22
Yiftah’el	11.31	57%	47.48	60%	190.58	61%	249.37
Zfat Adi (east)	12.10	61%	49.33	63%	204.70	65%	266.13

Table 2: Lithology; half-hour territories. Areas presented in km² (GSI - Geological Survey of Israel). (*) Jordan Valley cluster sites affected by the proximity to the modern border.

Site	Alluvium	Chalk, limestone and marl	Chert bearing chalk and limestone	Conglomerates	Igneous and metamorphic rocks (Basalt)	Sea	Total
Ahihud	5.20	6.40	0.86	-	-	-	12.46
Ard el-Samra	12.62	2.62	-	-	-	-	15.24
Bitaniya	8.83	0.72	-	1.35	0.07	1.41	12.38
Ein el-Jarba	8.24	2.36	-	-	0.02	-	10.63
Ein Zippori com.	1.30	3.56	5.30	-	-	-	10.16
Hanaton	2.61	1.15	7.21	-	-	-	10.96
Trig. P. Q1	2.07	0.92	8.47	-	-	-	11.46
Hof Shaldag	4.86	0.10	-	0.77	0.21	6.13	12.07
Horvat Turit	9.45	2.99	1.72	0.28	-	-	14.44
Horvat ‘Uza	7.97	2.98	2.20	0.07	-	-	13.22
Kfar Qana	1.07	5.56	2.93	-	-	-	9.56
Kfar HaHoresh	-	1.90	4.77	0.03	-	-	6.70
Kh. ‘Asafna (east)	4.97	1.75	3.31	0.03	-	-	10.06
Mishmar Ha’emeq	4.39	4.85	-	-	0.59	-	9.83
Munhata	7.63	1.06	-	1.16	1.25	-	11.10
Nahal Zippori 3	2.44	2.16	3.86	2.17	0.01	-	10.64
Nissanit	8.77	2.12	0.71	-	1.22	-	12.82
Qiryat Ata (NE)	5.03	4.12	3.55	0.11	-	-	12.81
Jdeide-Makr #23	9.13	3.30	1.80	0.28	-	-	14.51
* Sha’ar Hagolan	10.89	0.28	-	-	0.06	-	11.24
Tel ‘Ali	7.57	0.78	-	1.85	0.24	0.08	10.53
Tell Jenin	6.61	0.55	4.25	-	-	-	11.41
Yiftah’el	2.14	0.87	8.06	0.24	-	-	11.31
Zfat Adi (east)	3.00	2.83	6.26	-	-	-	12.10

Table 3: Lithology; one-hour territories. Areas presented in km² (GSI - Geological Survey of Israel). (*) Jordan Valley cluster sites affected by the proximity to the modern border.

Site	Alluvium	Chalk, limestone and marl	Chert bearing chalk and limestone	Conglomerates	Igneous and metamorphic rocks (Basalt)	Sandstone (incl. *Hamra*)	Sea	Grand Total
Ahihud	29.66	21.29	2.22	0.28	-	-	-	53.44
Ard el-Samra	39.47	16.77	2.23	0.03	-	-	-	58.50
Bitaniya	26.58	1.55	-	4.59	5.89	-	10.67	49.28
Ein el-Jarba	32.14	10.65	3.65	-	0.25	-	-	46.70
Ein Zippori com.	1.58	12.04	26.53	-	-	-	-	40.16
Nissanit	34.49	7.78	2.71	1.28	7.33	-	-	53.59
Hanaton	11.99	11.51	23.04	1.19	-	-	-	47.72
Hof Shaldag	16.48	0.97	-	3.51	5.54	-	21.31	47.80
Horvat Turit	48.01	10.64	2.22	0.28	-	0.44	-	61.59
Horvat ‘Uza	40.52	14.66	2.22	0.28	-	-	-	57.67
Jdeide-Makr #23	45.87	12.17	2.22	0.28	-	0.84	-	61.37
Kfar HaHoresh	0.30	8.85	20.27	3.00	0.67	-	-	33.09
Kfar Qana	7.40	15.26	15.73	0.03	-	-	-	38.42
Kh. ‘Asafna (east)	12.84	13.04	8.46	0.32	0.02	-	-	34.66
Mishmar Ha’emeq	23.08	17.27	0.28	-	1.03	-	-	41.67
* Munhata	15.56	2.45	-	6.96	5.85	-	-	30.82
Nahal Zippori 3	7.42	5.09	26.22	6.92	0.05	-	-	45.70
Qiryat Ata (NE)	32.50	10.89	11.18	1.63	-	-	-	56.20
* Sha’ar Hagolan	29.44	3.84	0.66	0.68	1.49	-	-	36.28
Tel ‘Ali	24.95	1.52	-	4.73	7.45	-	7.88	46.54
Tell Jenin	25.81	0.55	22.32	-	-	-	-	48.67
Trig. P. Q1	10.81	11.84	23.54	1.53	-	-	-	47.71
Yiftah’el	7.89	8.47	27.76	3.34	0.01	-	-	47.48
Zfat Adi (east)	15.72	23.77	9.61	0.22	-	-	-	49.33

Table 4: Lithology; two-hour territories. Areas presented in km² (GSI - Geological Survey of Israel). (*) Jordan Valley cluster sites affected by the proximity to the modern border.

Site	Alluvium	Chalk, limestone and marl	Chert bearing chalk and limestone	Conglomerates	Igneous and metamorphic rocks (Basalt)	Landslide	N/A	Sand	Sandstone (incl. *Hamra*)	Sea	Grand Total
Ahihud	117.82	77.40	9.14	0.77	0.28	-	-	3.25	2.81	3.34	214.81
Ard el-Samra	117.64	79.08	10.45	1.43	0.38	-	-	4.90	1.28	4.06	219.22
* Bitaniya	59.74	6.99	0.95	17.61	33.96	1.10	0.15	-	-	43.31	163.80
Ein el-Jarba	99.19	51.49	27.79	5.37	6.53	-	-	-	-	-	190.37
Ein Zippori com.	37.02	49.19	73.89	10.69	0.88	-	-	-	-	-	171.67
Nissanit	140.92	40.28	19.29	7.09	9.40	-	-	-	-	-	216.98
Hanaton	43.90	59.18	70.77	10.85	0.24	-	-	-	-	-	184.94
* Hof Shaldag	60.28	6.91	0.53	16.05	31.70	0.93	0.14	-	-	64.22	180.77
Horvat Turit	134.44	54.30	5.17	1.42	-	-	-	7.77	5.70	33.93	242.73
Horvat ʻUza	129.60	64.41	7.24	1.37	0.20	-	-	6.67	4.98	15.81	230.28
Jdeide-Makr #23	131.47	54.97	5.94	1.02	-	-	-	6.97	6.03	34.63	241.03
Kfar HaHoresh	46.91	33.59	56.24	22.22	3.41	-	-	-	-	-	162.37
Kfar Qana	44.71	60.87	60.77	3.19	1.71	-	-	-	-	-	171.25
Kh. ʻAsafna (east)	82.90	57.49	26.57	4.93	0.49	-	-	-	-	-	172.37
Mishmar Ha'emeq	100.26	42.20	38.51	2.72	8.01	-	-	-	-	-	191.69
* Munhata	43.81	6.31	-	26.54	35.97	0.39	-	-	-	-	113.03
Nahal Zippori 3	52.38	50.14	71.89	16.55	0.67	-	-	-	-	-	191.63
Qiryat Ata (NE)	123.23	39.98	36.43	2.57	-	-	-	12.33	-	13.18	227.72
* Sha'ar Hagolan	48.79	8.16	2.71	16.89	15.00	33.92	-	-	-	-	95.38
* Tel ʻAli	59.73	5.99	0.54	17.88	36.50	0.83	0.14	-	-	39.32	160.93
Tell Jenin	102.01	8.95	85.97	-	1.21	-	-	-	-	-	198.14
Trig. P. Q1	46.25	50.56	75.88	10.94	0.26	-	-	-	-	-	183.89
Yiftah'el	47.97	51.75	75.89	14.69	0.28	-	-	-	-	-	190.58
Zfat Adi (east)	95.34	66.80	37.55	2.62	0.31	-	-	2.08	-	-	204.70

Table 5: Soil composition; half-hour territories. Areas presented in km² (Ravikovitch 1969). (*) Jordan Valley cluster sites affected by the proximity to the modern border.

Site	Alluvial soils	Brown basaltic soils	Hydromorphic soils	Mediterranean brown forest soils	Peat soils	Reddish-yellow desert soils	Rendzina soils of mountains	Rendzina soils of valleys	*Terra Rossa* soils	Total
Ahihud	5.28	-	-	7.18	-	-	-	-	-	12.46
Ard el-Samra	13.09	-	-	2.14	-	-	-	-	0.01	15.24
Bitaniya	2.65	0.79	-	2.52	4.93	-	-	1.49	-	12.38
Ein el-Jarba	7.00	-	-	3.63	-	-	-	-	-	10.63
Ein Zippori com.	0.01	-	-	7.01	-	-	-	-	3.14	10.16
Nissanit	3.68	0.12	-	9.03	-	-	-	-	-	12.82
Hanaton	2.05	-	-	7.46	-	-	-	-	1.45	10.96
Hof Shaldag	1.90	1.55	-	1.10	1.30	-	-	6.21	-	12.07
Horvat Turit	9.32	-	0.62	4.50	-	-	-	-	-	14.44
Horvat 'Uza	8.03	-	-	5.19	-	-	-	-	-	13.22
Jdeide-Makr #23	9.29	-	0.24	4.98	-	-	-	-	-	14.51
Kfar HaHoresh	-	-	-	4.52	-	-	0.31	-	1.87	6.70
Kfar Qana	0.63	-	-	5.13	-	-	-	-	3.80	9.56
Kh. 'Asafna (east)	5.01	-	-	3.71	-	-	-	-	1.34	10.06
Mishmar Ha'emeq	2.14	0.29	-	7.41	-	-	-	-	-	9.83
Munhata	1.95	2.01	-	3.50	3.41	-	-	-	-	10.87
Nahal Zippori 3	2.09	-	-	7.68	-	-	-	-	0.86	10.64
Qiryat Ata (NE)	4.72	-	-	8.09	-	-	-	-	-	12.81
* Sha'ar Hagolan	1.74	0.02	-	-	8.48	0.69	-	-	-	10.93
Tel 'Ali	2.80	1.30	-	2.70	3.61	-	-	0.13	-	10.53
Tell Jenin	7.48	-	-	2.47	-	-	-	-	1.46	11.41
Trig. P. Q1	2.26	-	-	4.96	-	-	-	-	4.23	11.46
Yiftah'el	2.29	-	-	5.48	-	-	-	-	3.54	11.31
Zefat Adi (east)	2.03	-	-	10.06	-	-	-	-	-	12.10

Table 6: Soil composition; one-hour territories. Areas presented in km² (Ravikovitch 1969). (*) Jordan Valley cluster sites affected by the proximity to the modern border.

Site	Alluvial soils	Brown basaltic soils	Desert sand dunes	Hydromorphic soils	Mediterranean brown forest soils	Peat soils	Reddish-yellow desert soils	Rendzina soils of mountains	Rendzina soils of valleys	*Terra Rossa* soils	Grand Total
Ahihud	28.76	-	-	0.23	19.96	-	-	0.06	-	4.43	53.44
Ard el-Samra	35.66	-	-	0.39	20.35	-	-	0.35	-	1.75	58.50
Bitaniya	9.27	6.26	-	-	4.10	18.42	0.42	-	10.80	-	49.28
Ein el-Jarba	29.40	-	-	-	17.17	-	-	-	-	0.13	46.70
Ein Zippori com.	0.96	-	-	-	18.78	-	-	0.76	-	19.66	40.16
Nissanit	30.16	0.60	-	-	22.75	-	-	-	-	0.08	53.59
Hanaton	11.39	-	-	-	29.42	-	-	-	-	6.92	47.72
Hof Shaldag	6.49	6.31	-	-	2.97	10.54	-	-	21.48	-	47.80
Horvat Turit	39.52	-	1.70	7.62	12.75	-	-	-	-	-	61.59
Horvat 'Uza	35.06	-	-	5.60	16.50	-	-	0.34	-	0.17	57.67
Jdeide-Makr #23	39.35	-	1.08	6.24	14.66	-	-	-	-	0.04	61.37
Kfar HaHoresh	0.04	-	-	-	13.67	-	-	1.05	-	18.33	33.09
Kfar Qana	6.88	-	-	-	16.25	-	-	1.36	-	13.93	38.42
Kh. 'Asafna (east)	12.21	-	-	-	17.45	-	-	0.01	-	5.00	34.66
Mishmar Ha'emeq	16.88	0.29	-	-	24.50	-	-	-	-	-	41.67
* Munhata	3.97	7.18	-	-	9.77	6.13	0.54	1.30	-	-	28.89
Nahal Zippori 3	4.84	-	-	-	31.48	-	-	-	-	9.38	45.70
Qiryat Ata (NE)	30.21	-	1.92	0.54	23.39	-	-	0.15	-	-	56.20
* Sha'ar Hagolan	5.42	1.39	-	-	2.28	24.03	1.72	-	0.29	-	35.13
Tel 'Ali	10.57	7.34	-	-	4.26	16.20	0.17	-	8.00	-	46.54
Tell Jenin	29.61	-	-	-	9.05	-	-	0.19	-	9.80	48.67
Trig. P. Q1	10.18	-	-	-	28.94	-	-	-	-	8.59	47.71
Yiftah'el	6.70	-	-	-	30.86	-	-	-	-	9.91	47.48
Zfat Adi (east)	10.46	-	-	-	38.86	-	-	-	-	0.02	49.33

Table 7: Soil composition; two-hour territories. Areas presented in km² (Ravikovitch 1969). (*) Jordan Valley cluster sites affected by the proximity to the modern border.

Site	Alluvial soils	Brown basaltic soils	Brown-red sandy soils	Desert sand dunes	Hydromorphic soils	Mediterranean brown forest soils	Peat soils	Reddish-yellow desert soils	Rendzina soils of mountains	Rendzina soils of valleys	*Terra Rossa* soils	Grand Total
Ahihud	88.47	-	2.91	12.05	11.96	60.97	-	-	0.62	-	34.53	211.50
Ard el-Samra	87.26	-	0.94	15.29	11.98	68.89	-	-	0.77	-	30.07	215.20
* Bitaniya	47.18	23.33	-	-	-	14.61	24.94	3.25	2.43	43.40	-	159.15
Ein el-Jarba	94.82	0.55	-	-	-	82.01	-	-	-	-	12.99	190.37
Ein Zippori com.	31.03	-	-	-	-	78.71	-	-	3.19	-	58.74	171.67
Nissanit	136.93	0.74	-	-	-	68.79	-	-	-	-	10.52	216.98
Hanaton	37.90	-	-	-	-	100.28	-	-	0.43	-	46.33	184.94
* Hof Shaldag	50.19	19.56	-	-	-	12.18	24.60	2.80	4.00	64.38	-	177.69
Horvat Turit	104.73	-	5.51	18.84	11.98	48.39	-	-	0.50	-	19.10	209.05
Horvat 'Uza	98.24	-	4.18	18.05	11.98	57.20	-	-	0.50	-	24.45	214.61
Jdeide-Makr #23	104.94	-	6.10	17.07	11.90	43.88	-	-	0.43	-	22.34	206.67
Kfar HaHoresh	46.42	2.04	-	-	-	58.03	-	-	2.32	-	53.56	162.37
Kfar Qana	41.02	-	-	-	-	52.60	-	-	3.83	-	73.80	171.25
Kh. 'Asafna (east)	78.72	-	-	-	-	54.17	-	-	4.74	-	34.73	172.37
Mishmar Ha'emeq	95.35	0.74	-	-	-	94.62	-	-	-	-	0.99	191.69
* Munhata	31.61	27.87	-	-	-	16.44	20.75	4.78	6.28	-	-	107.73
Nahal Zippori 3	45.12	-	-	-	-	113.04	-	-	0.54	-	32.93	191.63
Qiryat Ata (NE)	90.35	-	-	32.44	6.36	83.77	-	-	0.50	-	1.09	214.51
* Sha'ar Hagolan	20.05	19.15	-	-	-	16.42	26.38	3.25	-	0.52	-	85.77
* Tel 'Ali	48.91	23.81	-	-	-	14.85	24.95	3.25	1.28	39.41	-	156.47
Tell Jenin	109.97	0.18	-	-	-	32.02	-	-	1.14	-	54.83	198.14
Trig. P. Q1	39.54	-	-	-	-	93.51	-	-	1.21	-	49.63	183.89
Yiftah'el	43.07	-	-	-	-	103.27	-	-	0.79	-	43.45	190.58

Table 8: Agriculture potential; half-hour territories. Areas presented in km². Classes I-II: Suitable for cultivation of all crops; Class IV: Suitable for perennial crops; Class V: Suitable for pasture; Class V(I-II): Suitable for pasture due to heavy basaltic stone cover; Class V(w): Suitable for pasture due to swamps, high aquifer and Peat soils; Class V(wa): Suitable for pasture due to saline swamps; Class VI: Suitable for afforestation (Gil and Rosensaft 1955). (*) Jordan Valley cluster sites affected by the proximity to the modern border.

Row Labels	I-III	IV	V	V(II-IV)	V(w)	V(wa)	VI	Total
Ahihud	5.64	-	6.63	-	-	-	0.19	12.46
Ard el-Samra	12.26	-	2.98	-	-	-	-	15.24
Bitaniya	8.18	0.96	0.48	-	-	-	0.80	10.41
Ein el-Jarba	9.03	-	0.12	-	-	-	1.48	10.63
Ein Zippori com.	4.75	0.72	4.37	-	-	-	0.32	10.16
Nissanit	9.97	0.06	1.06	-	-	-	1.74	12.82
Hanaton	2.96	0.48	7.52	-	-	-	-	10.96
Hof Shaldag	2.48	0.72	1.20	-	-	-	0.43	4.82
Horvat Turit	11.96	-	1.92	-	-	0.57	-	14.44
Horvat 'Uza	9.26	-	3.97	-	-	-	-	13.22
Jdeide-Makr #23	12.21	-	2.15	-	-	0.16	-	14.51
Kfar HaHoresh	0.01	0.40	3.91	-	-	-	2.38	6.70
Kfar Qana	2.78	2.42	3.27	-	-	-	1.09	9.56
Kh. 'Asafna (east)	5.20	-	2.93	-	0.48	-	1.44	10.06
Mishmar Ha'emeq	5.11	0.21	1.47	-	-	-	3.04	9.83
Munhata	6.74	-	1.91	0.90	-	-	1.42	10.98
Nahal Zippori 3	2.95	-	5.21	-	-	-	2.46	10.63
Qiryat Ata (NE)	7.38	-	5.43	-	-	-	-	12.81
* Sha'ar Hagolan	10.67	-	0.57	-	-	-	-	11.24
Tel 'Ali	7.09	1.12	0.57	-	-	-	1.23	10.01
Trig. P. Q1	2.97	0.87	7.62	-	-	-	-	11.46
Yiftah'el	2.56	0.79	6.54	-	-	-	1.42	11.31
Zfat Adi (east)	6.32	-	5.77	-	-	-	-	12.10

Table 9: Agriculture potential; one-hour territories. Areas presented in km². Classes I-II: Suitable for cultivation of all crops; Class IV: Suitable for perennial crops; Class V: Suitable for pasture; Class V(I-II): Suitable for pasture due to heavy basaltic stone cover; Class V(w): Suitable for pasture due to swamps, high aquifer and Peat soils; Class V(wa): Suitable for pasture due to saline swamps; Class VI: Suitable for afforestation; Class VII: Unsuitable for any type of cultivation, due to badlands and Negev and coastal sand dunes (Gil and Rosensaft 1955). (*) Jordan Valley cluster sites affected by the proximity to the modern border.

Row Labels	I-III	IV	V	V(II-IV)	V(w)	V(wa)	VI	N/A	Total
Ahihud	33.66	0.97	16.96	-	-	0.35	1.50	-	53.44
Ard el-Samra	41.17	-	15.26	-	-	0.60	1.47	-	58.50
Bitaniya	28.51	2.27	4.04	-	-	-	3.31	-	38.12
Ein el-Jarba	34.33	-	3.37	-	-	-	9.00	-	46.70
Ein Zippori com.	9.21	4.86	20.72	-	-	-	5.36	-	40.16
Nissanit	41.48	1.59	4.26	-	-	-	6.26	-	53.59
Hanaton	15.63	3.71	24.23	-	-	-	4.15	-	47.71
Hof Shaldag	17.57	1.69	3.12	-	-	-	3.64	-	26.02
Horvat Turit	45.03	0.53	7.24	-	-	7.05	-	1.73	61.59
Horvat ‘Uza	40.34	0.13	11.57	-	-	5.31	0.32	-	57.67
Jdeide-Makr #23	44.95	0.96	7.80	-	-	5.75	-	1.91	61.37
Kfar HaHoresh	1.95	3.56	17.17	-	-	-	8.36	2.06	33.09
Kfar Qana	10.07	6.06	11.21	-	-	-	11.08	-	38.42
Kh. ‘Asafna (east)	12.98	0.40	11.74	-	0.48	-	9.06	-	34.66
Mishmar Ha’emeq	24.61	0.79	3.18	-	-	-	13.09	-	41.67
* Munhata	12.52	-	6.10	2.96	-	-	7.84	-	29.42
Nahal Zippori 3	11.79	2.25	29.18	-	-	-	2.47	-	45.69
Qiryat Ata (NE)	34.33	-	15.67	-	-	1.18	-	5.02	56.20
* Sha’ar Hagolan	31.32	-	3.45	-	-	-	0.51	-	35.28
Tel ‘Ali	27.05	2.75	4.62	-	-	-	3.50	-	37.92
Trig. P. Q1	16.81	3.31	25.49	-	-	-	2.09	-	47.70
Yiftah’el	12.37	2.94	29.68	-	-	-	2.48	-	47.47
Zfat Adi (east)	21.14	-	27.65	-	-	-	0.54	-	49.33

Table 10: Agriculture potential; two-hour territories. Areas presented in km². Classes I-II: Suitable for cultivation of all crops; Class IV: Suitable for perennial crops; Class V: Suitable for pasture; Class V(I-II): Suitable for pasture due to heavy basaltic stone cover; Class V(w): Suitable for pasture due to swamps, high aquifer and Peat soils; Class V(wa): Suitable for pasture due to saline swamps; Class VI: Suitable for afforestation; Class VII: Unsuitable for any type of cultivation, due to badlands and Negev and coastal sand dunes (Gil and Rosensaft 1955). (*) Jordan Valley cluster sites affected by the proximity to the modern border.

Site	I-III	IV	V	V(II-IV)	V(w)	V(wa)	VI	VII	N/A	Total
Ahihud	113.60	7.17	49.40	-	-	11.90	18.62	2.49	9.41	212.59
Ard el-Samra	110.24	4.11	52.73	-	-	12.56	21.84	4.10	10.54	216.13
* Bitaniya	73.06	5.40	16.57	3.26	-	-	19.10	-	-	117.39
Ein el-Jarba	111.56	2.31	40.47	-	0.03	-	36.01	-	-	190.37
Ein Zippori com.	53.18	15.54	76.09	-	-	-	23.58	-	3.28	171.66
Nissanit	151.51	3.58	21.75	-	-	-	32.87	-	0.00	209.72
Hanaton	58.76	7.75	89.83	-	-	-	28.59	-	-	184.93
* Hof Shaldag	76.56	5.04	16.07	1.04	-	-	16.56	-	0.58	115.84
Horvat Turit	129.93	5.00	38.44	-	-	12.52	6.45	5.17	14.37	211.87
Horvat ‘Uza	124.06	5.28	43.95	-	-	12.56	11.72	5.12	14.00	216.69
Jdeide-Makr #23	128.48	5.81	39.59	-	-	11.73	6.16	5.17	12.71	209.65
Kfar HaHoresh	64.59	10.98	60.14	-	-	-	23.37	-	3.28	162.36
Kfar Qana	56.95	18.17	56.32	-	-	-	37.04	-	2.77	171.25
Kh. ‘Asafna (east)	79.19	7.69	49.20	-	0.48	-	25.32	-	10.48	172.37
Mishmar Ha’emeq	112.01	2.35	46.47	-	-	-	30.86	-	-	191.69
* Munhata	55.03	1.31	11.28	10.06	0.68	-	31.82	-	-	110.19
Nahal Zippori 3	69.42	7.44	105.51	-	-	-	9.25	-	-	191.62
Qiryat Ata (NE)	94.45	1.40	61.70	-	-	8.42	2.00	5.17	41.27	214.42
* Sha’ar Hagolan	47.59	-	12.89	3.56	-	-	13.80	3.47	-	81.31
* Tel ‘Ali	74.22	5.79	16.29	3.76	-	-	19.07	-	-	119.14
Trig. P. Q1	61.16	9.13	87.74	-	-	-	25.85	-	-	183.88
Yiftah’el	64.46	8.22	97.53	-	-	-	20.36	-	-	190.57
Zfat Adi (east)	87.98	3.50	69.09	-	-	7.51	20.85	1.92	13.86	204.70

Table 11: Viewshed areas (in km²).

Site	Total_ viewshed area	Higuchi distances						Potential viewshed area			Utilization of potential		
		Short	%	Middle	%	Long	%	Short	Middle	Long	Short	Middle	Long
Ahihud	35.14	0.10	0.3%	16.38	47%	18.66	53%	0.41	136.85	1407.77	25%	12%	1%
Ard el-Samra	29.47	0.29	1%	16.72	57%	12.47	42%	0.41	136.85	553.26	70%	12%	2%
Bitaniya	129.12	0.15	0.1%	13.14	10%	115.83	90%	0.41	136.85	7853.98	38%	10%	1%
Ein el-Jarba	111.24	0.30	0.3%	32.85	30%	78.10	70%	0.41	136.85	2515.65	73%	24%	3%
Ein Zippori com.	4.61	0.27	6%	4.34	94%	0.00	0.04%	0.41	136.85	9071.43	65%	3%	0%
Nissanit	292.99	0.18	0.06%	28.56	10%	264.24	90%	0.41	136.85	5191.09	45%	21%	5%
Hanaton	2.72	0.23	9%	1.69	62%	0.80	29%	0.41	136.85	6186.18	57%	1%	0%
Hof Shaldag	211.95	0.19	0.09%	26.56	12%	185.20	87%	0.41	136.85	7853.98	47%	19%	2%
Horvat Turit	132.17	0.04	0.03%	38.43	29%	93.69	71%	0.41	136.85	2991.07	10%	28%	3%
Horvat ‘Uza	68.88	0.30	0.4%	40.64	59%	27.93	40%	0.41	136.85	876.57	74%	30%	3%
Jdeide-Makr #23	70.14	0.25	0.4%	19.45	28%	50.44	72%	0.41	136.85	1347.97	62%	14%	4%
Kfar HaHoresh	12.21	0.18	1.5%	0.65	5%	11.38	93%	0.41	136.85	14638.24	45%	0.5%	0.1%
Kfar HaHoresh corrected	0.84	0.18	22%	0.65	78%	0.00	0%	0.41	136.85	14638.24	45%	0.5%	0%
Kfar Qana	12.83	0.19	1.5%	8.02	62%	4.62	36%	0.41	136.85	8988.67	46%	6%	0%
Kh. ‘Asafna (east)	7.84	0.34	4%	6.77	86%	0.72	9%	0.41	136.85	607.60	83%	5%	0.1%
Mishmar Ha’emeq	171.29	0.12	0.07%	32.27	19%	138.90	81%	0.41	136.85	4772.40	29%	24%	3%
Munhata	16.93	0.10	0.6%	9.14	54%	7.69	45%	0.41	136.85	7853.98	24%	67%	0.1%
Nahal Zippori 3	4.53	0.23	5%	2.77	61%	1.53	34%	0.41	136.85	4874.61	57%	2%	0%
Qiryat Ata (NE)	0.68	0.22	32%	0.46	68%	0.00	0%	0.41	136.85	1581.89	54%	0.3%	0%
Sha’ar Hagolan	85.60	0.27	0.3%	26.42	31%	58.91	69%	0.41	136.85	7853.98	65%	19%	0.7%
Tel ‘Ali	105.48	0.25	0.2%	17.07	16%	88.16	84%	0.41	136.85	7853.98	62%	12%	1%
Tell Jenin	106.53	0.07	0.1%	7.84	7%	98.62	93%	0.41	136.85	5779.91	18%	6%	2%
Trig. P. Q1	24.07	0.12	0.5%	10.63	44%	13.31	55%	0.41	136.85	7748.75	30%	8%	0%
Yiftah’el	6.02	0.33	5%	2.58	43%	3.12	52%	0.41	136.85	5575.69	80%	2%	0%
Zfat Adi (east)	68.24	0.17	0.2%	9.55	14%	58.51	86%	0.41	136.85	2966.47	43%	7%	2%

Appendix 3B

Site Locational Analyses, Figures

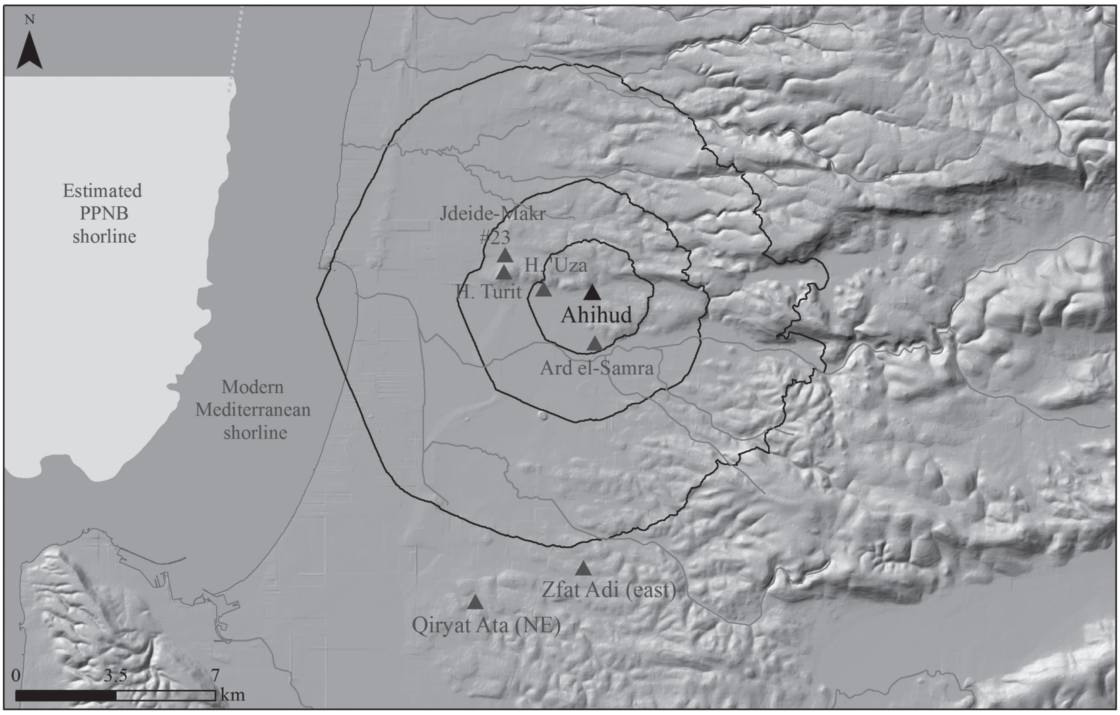

Figure 1.1: Ahihud.

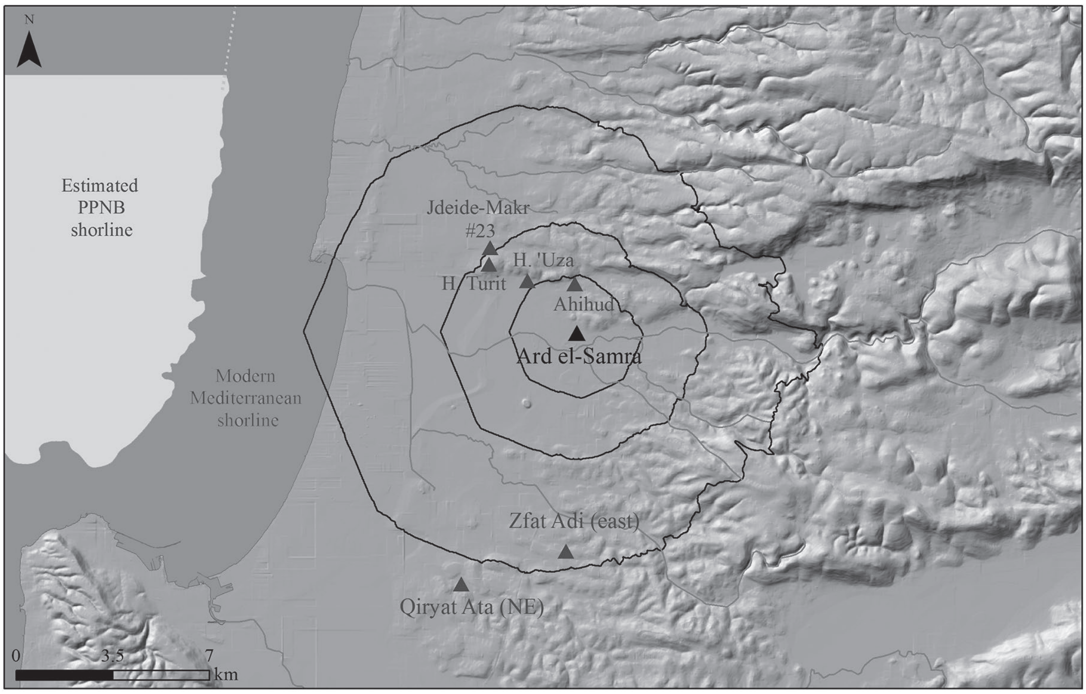

Figure 1.2: Ard el-Samra.

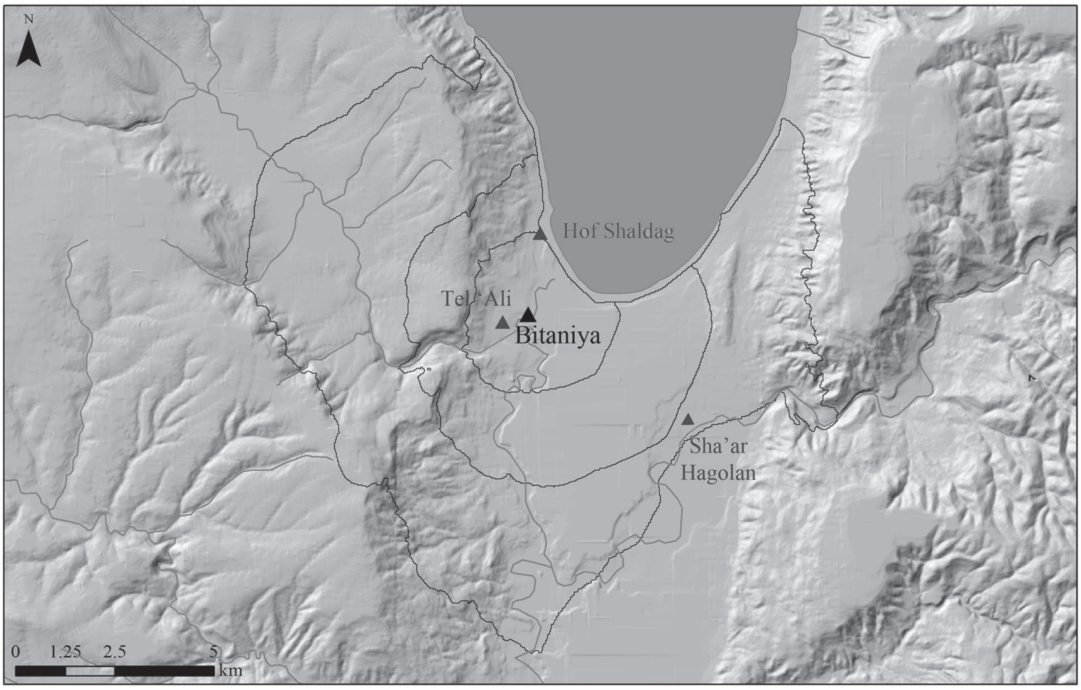

Figure 1.3: Bitaniya.

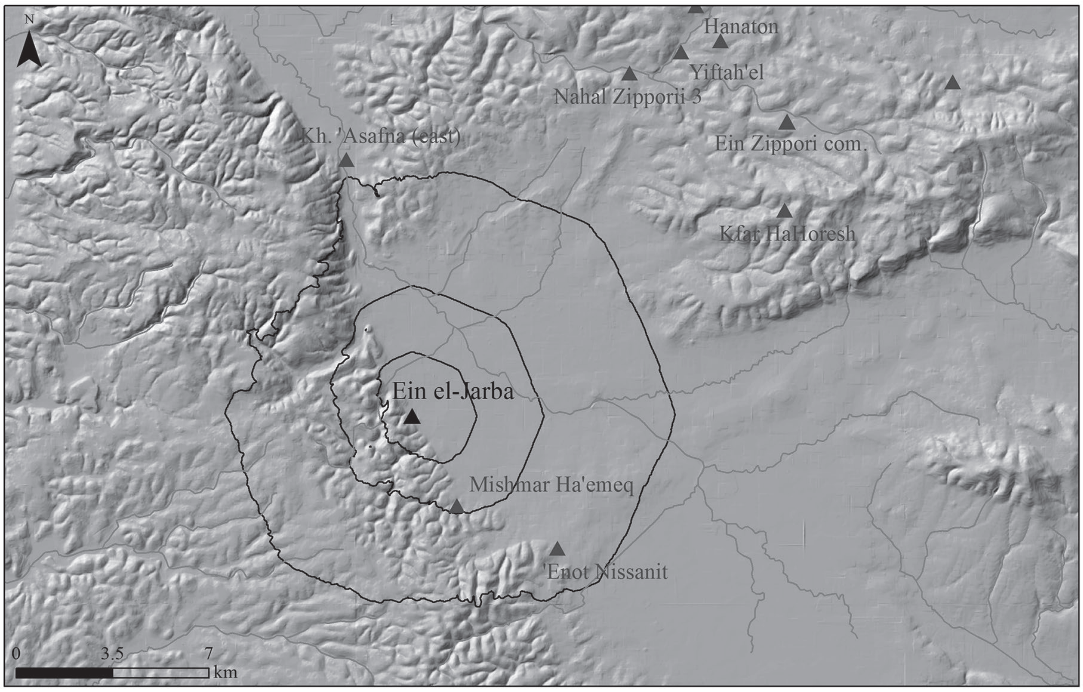

Figure 1.4: 'Ein el-Jarba.

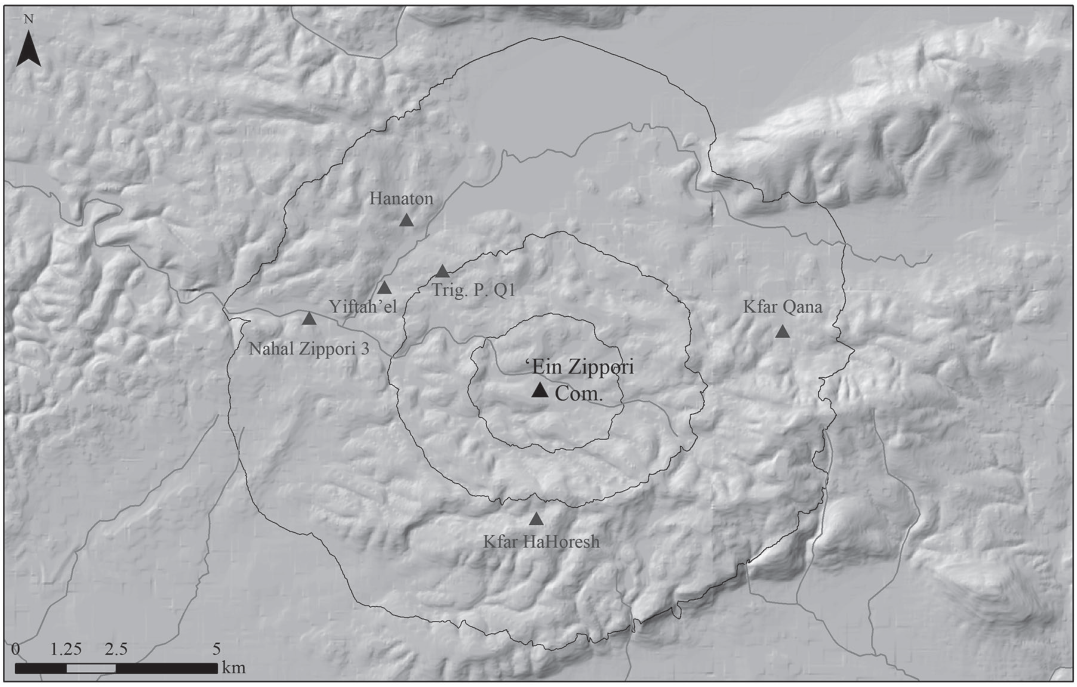

Figure 1.5: 'Ein Zippori complex.

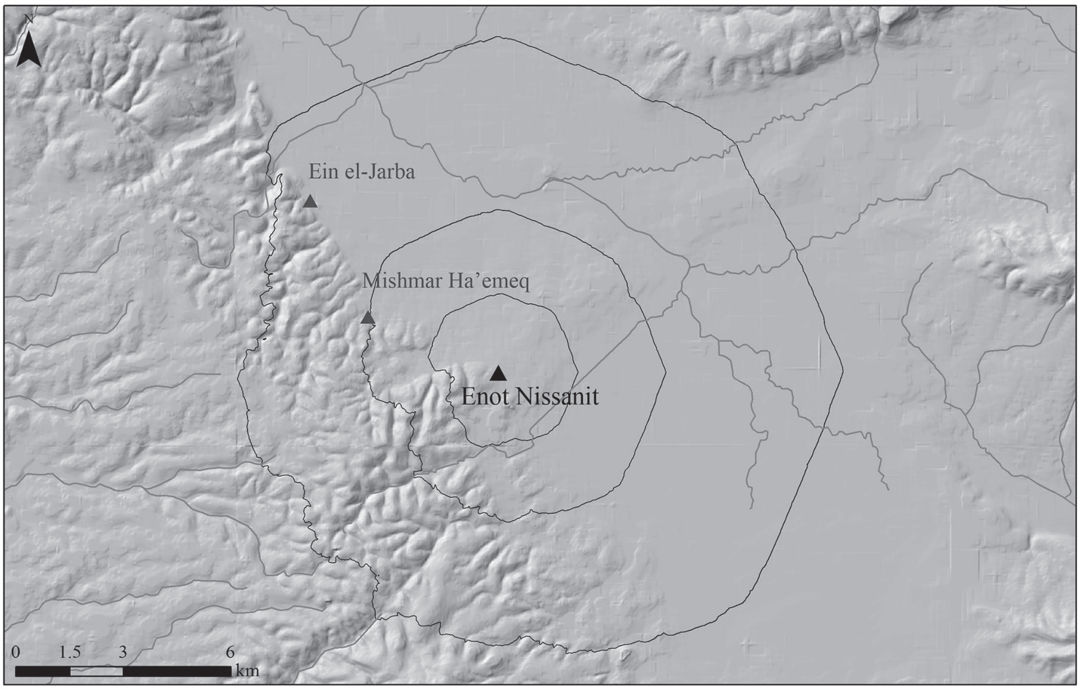

Figure 1.6: 'Enot Nissanit.

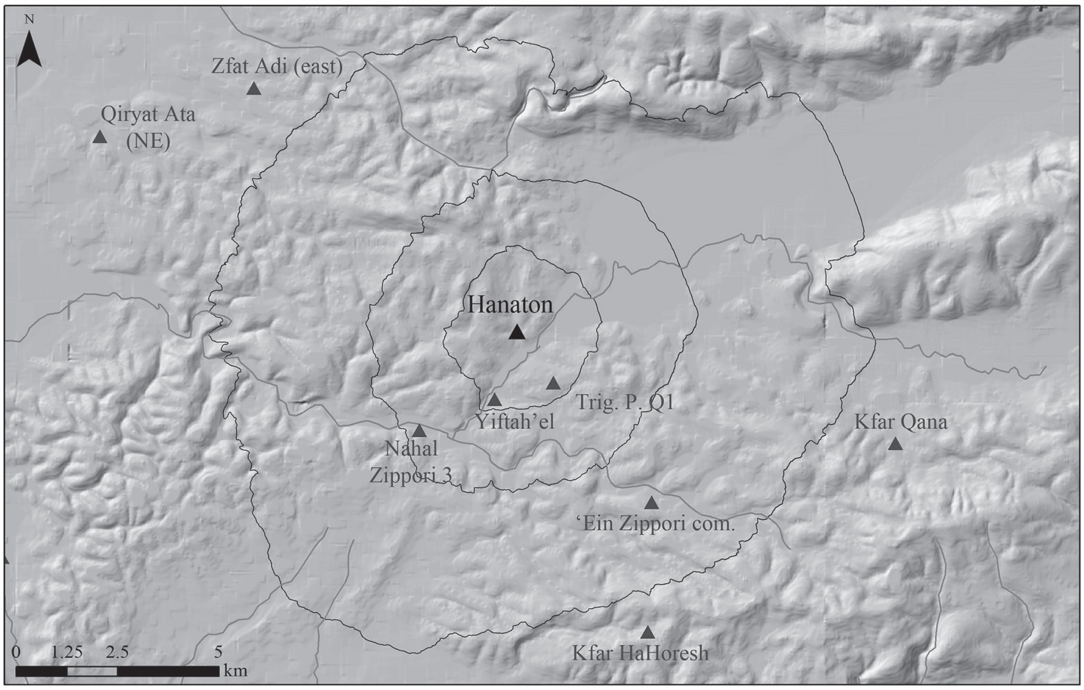

Figure 1.7: Hanaton.

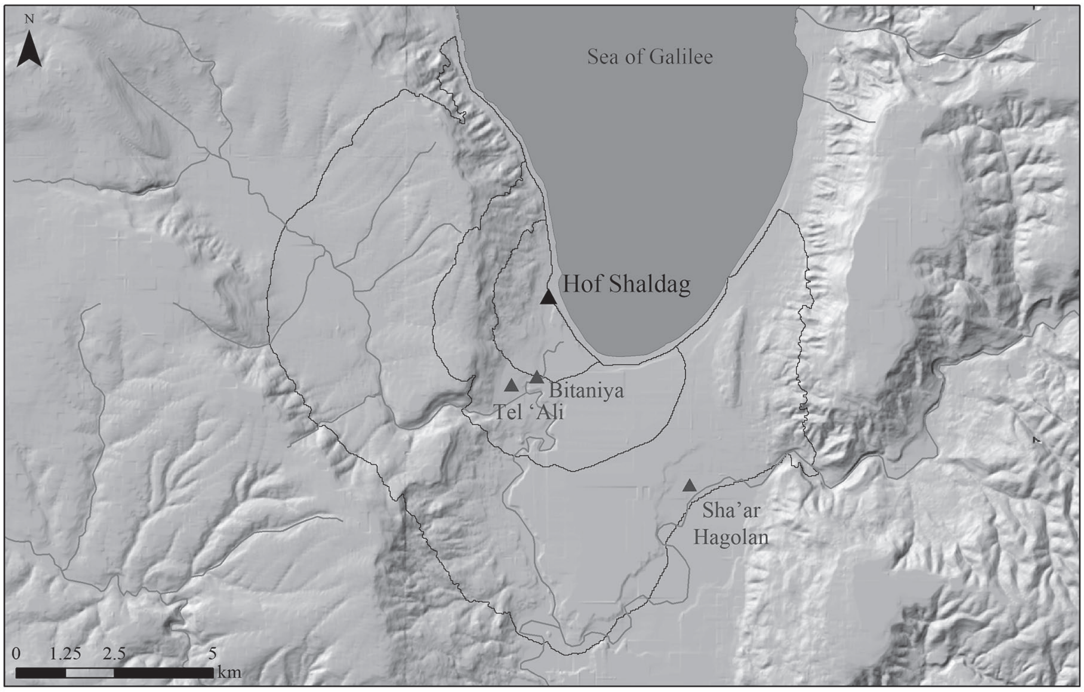

Figure 1.8: Hof Shaldag.

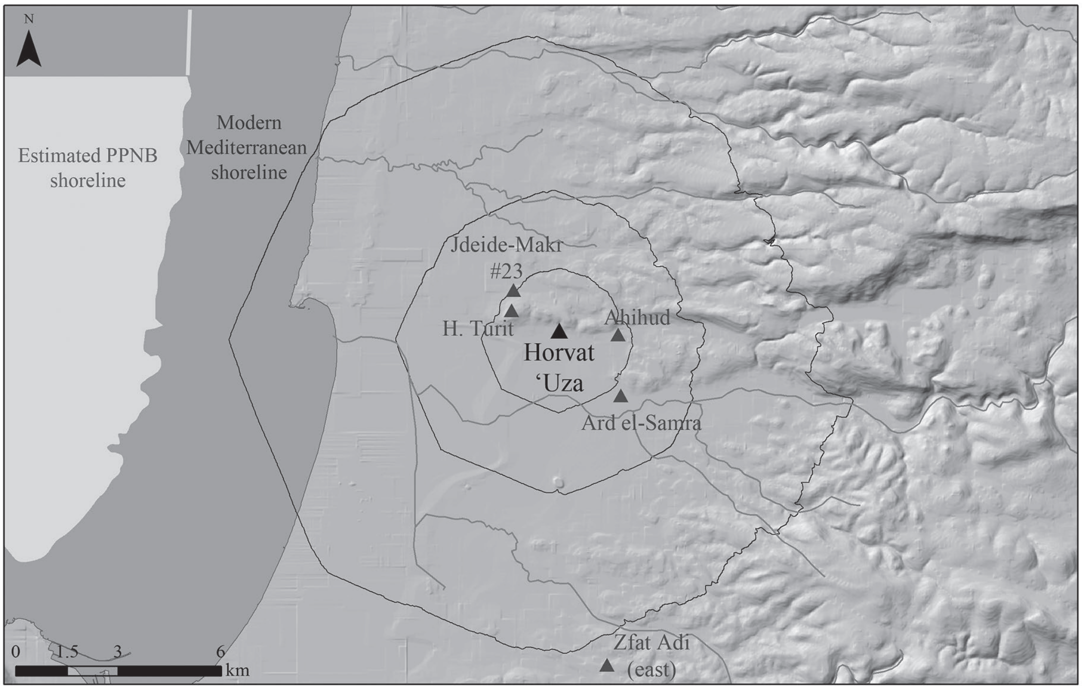

Figure 1.9: Horvat Turit.

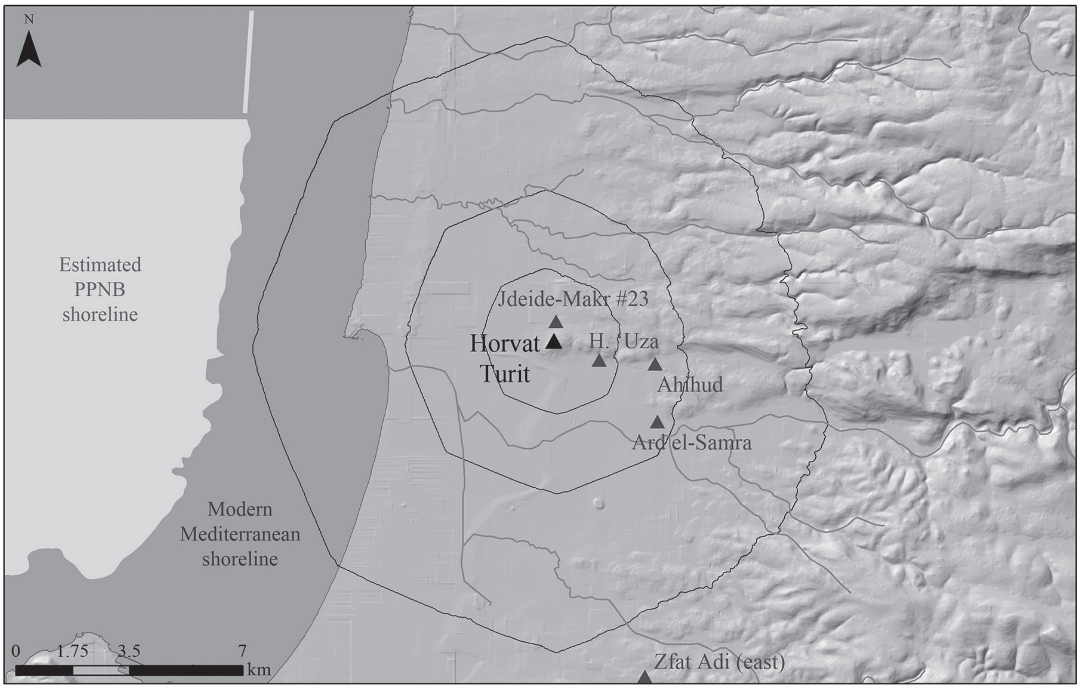

Figure 1.10: Horvat 'Uza.

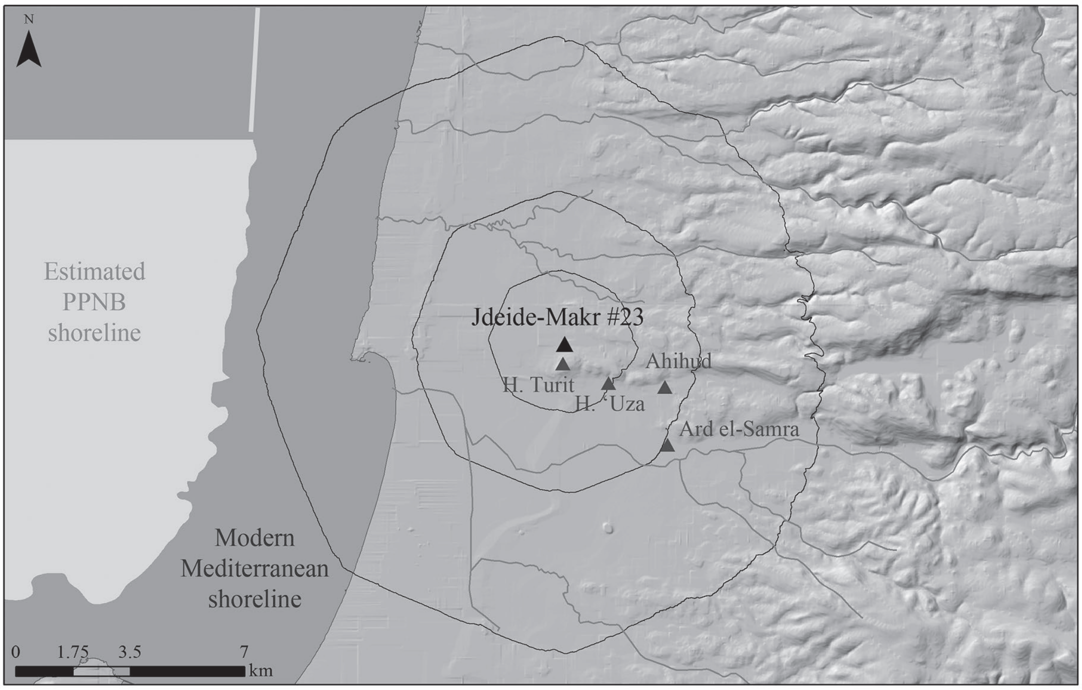

Figure 1.11: Judeidi-Makr #23.

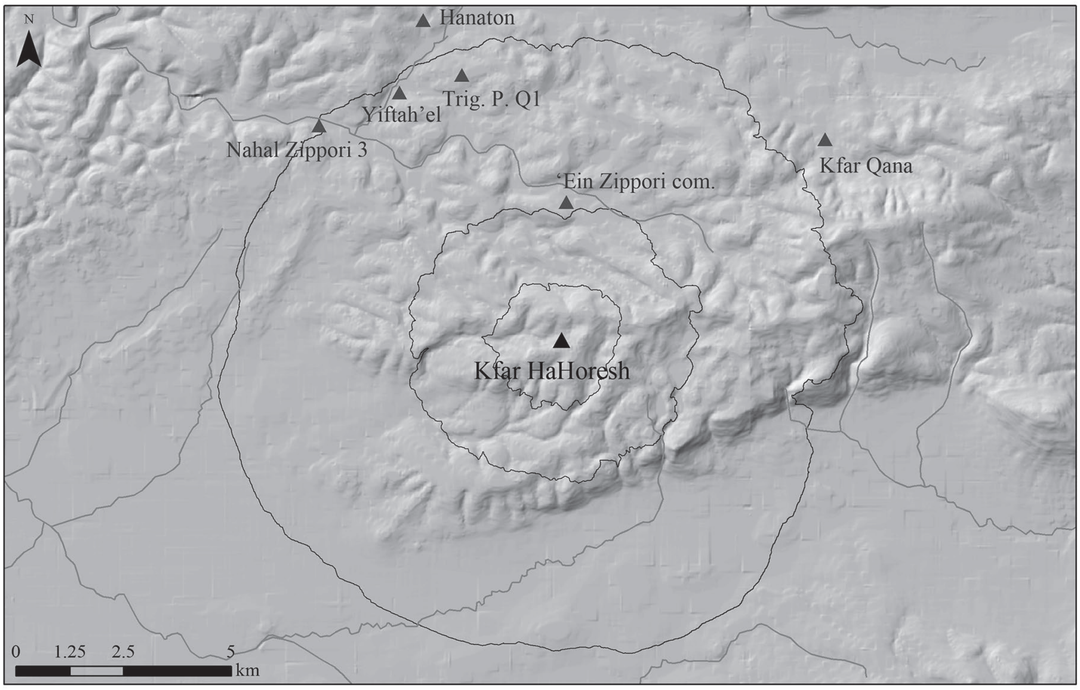

Figure 1.12: Kfar HaHoresh.

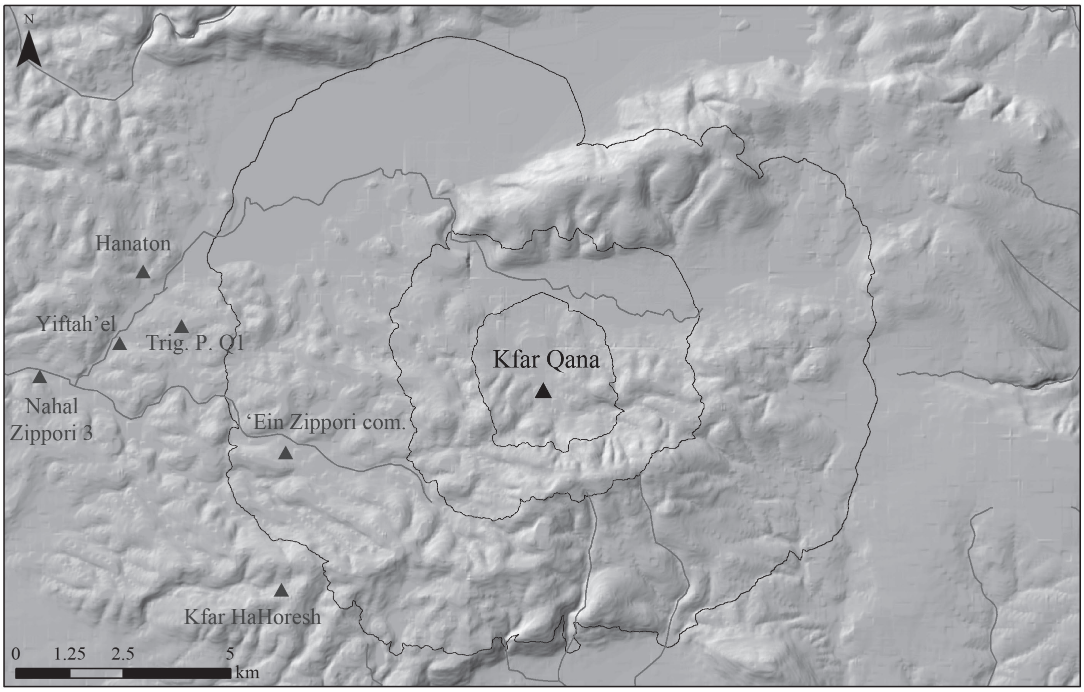

Figure 1.13: Kfar Qana.

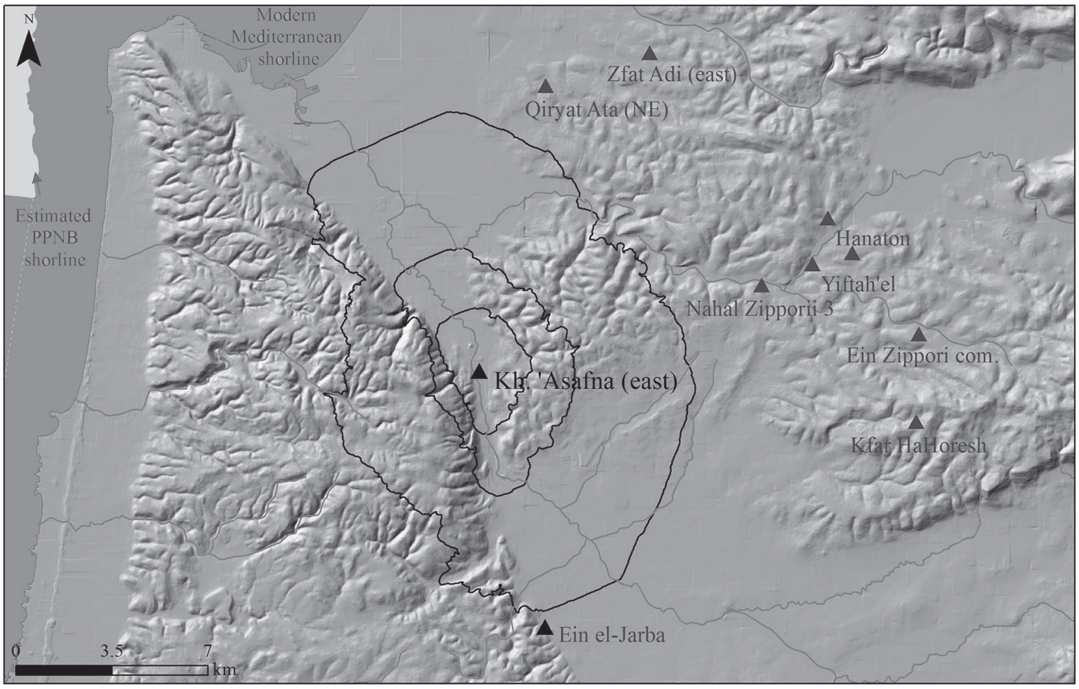

Figure 1.14: Kh. 'Asafna (east).

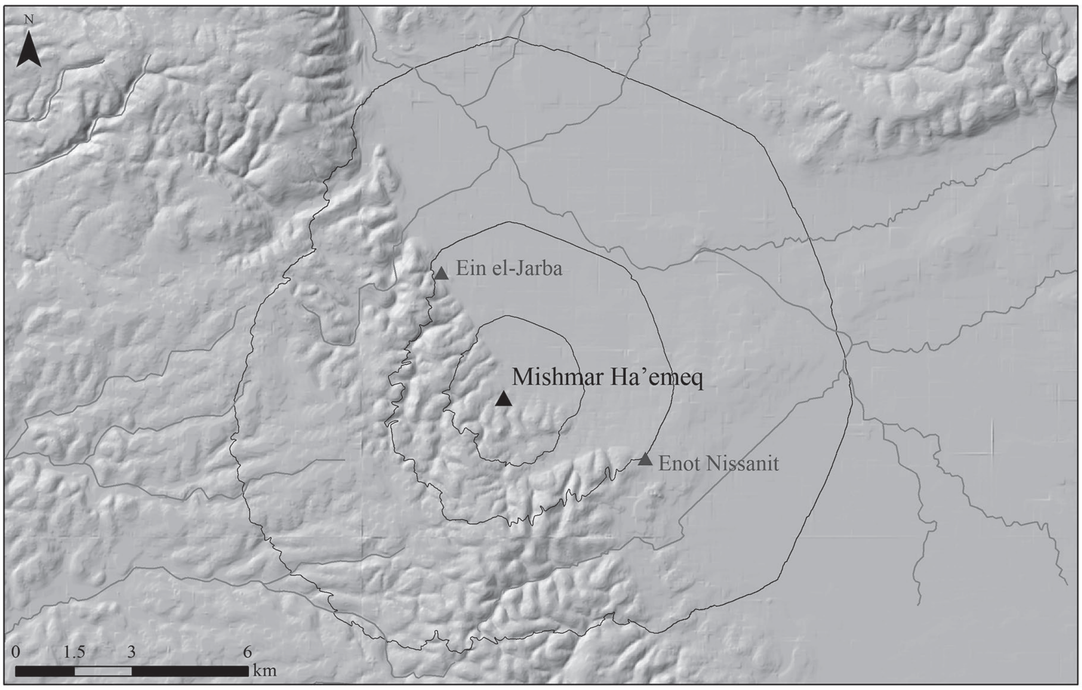

Figure 1.15: Mishmar Ha'emeq.

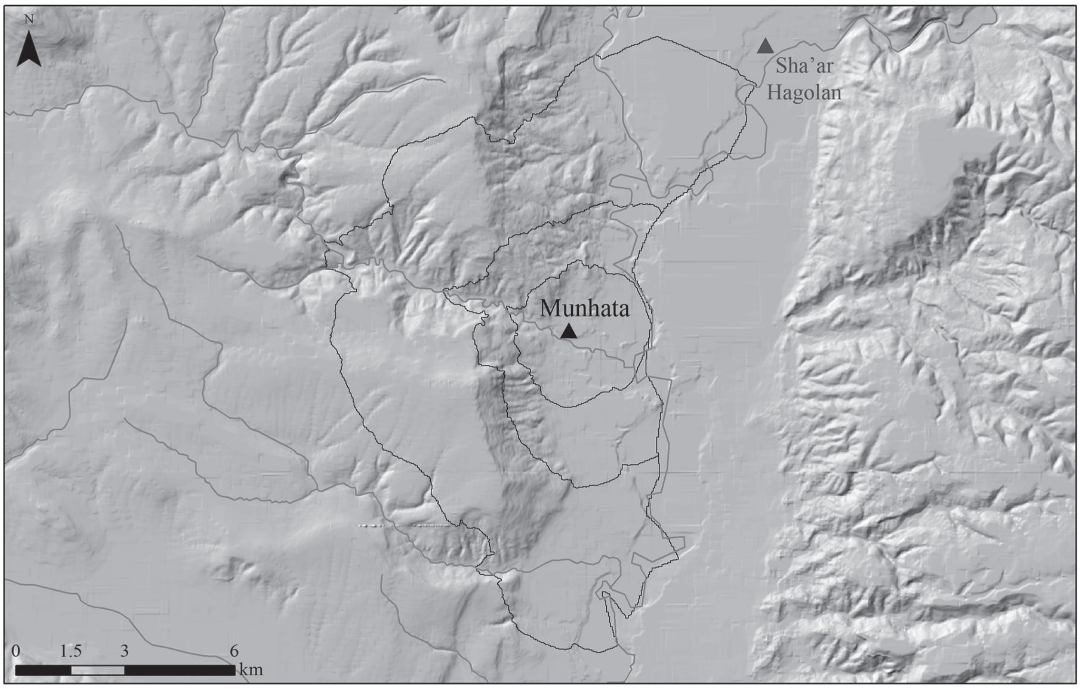

Figure 1.16: Munhata.

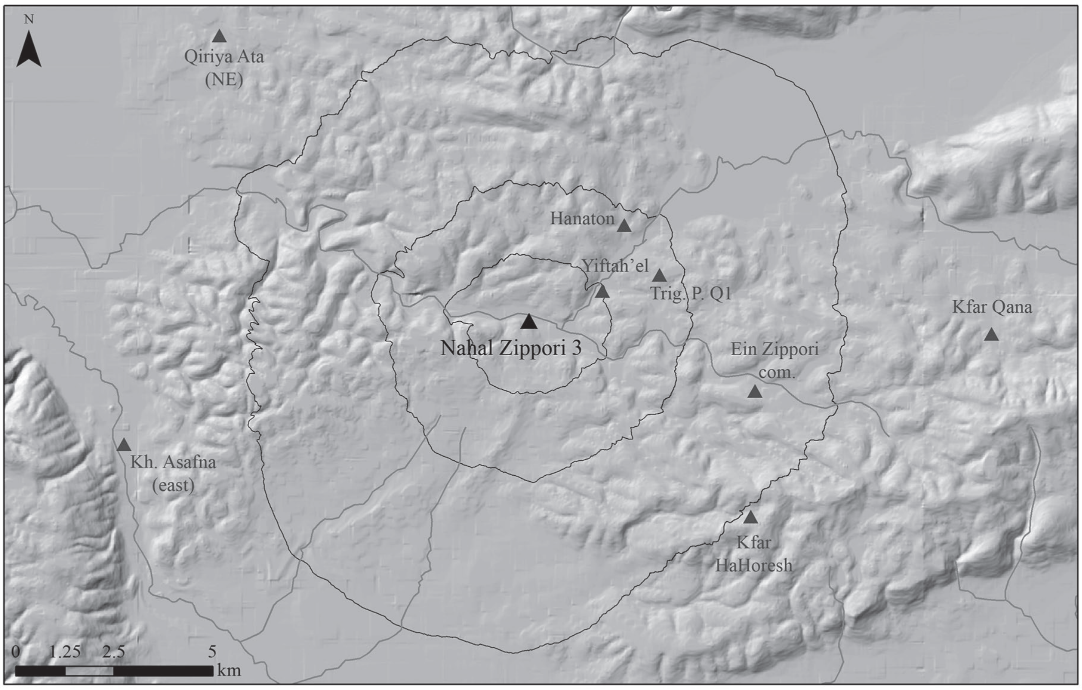

Figure 1.17: Nahal Zippori 3.

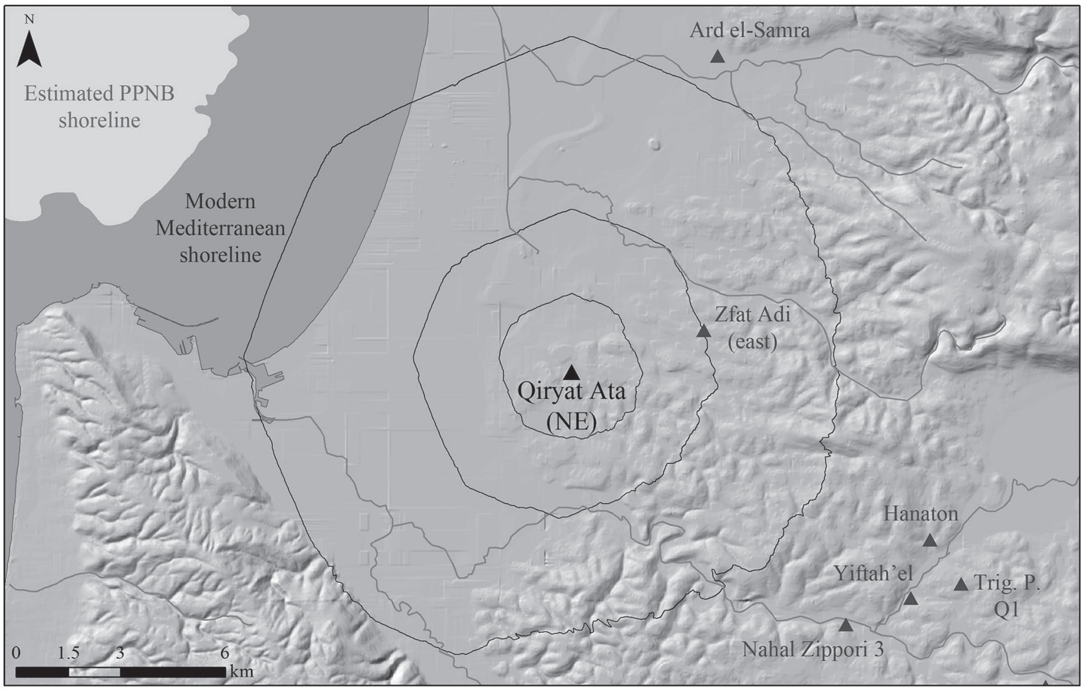

Figure 1.18: Qiryat Ata (NE).

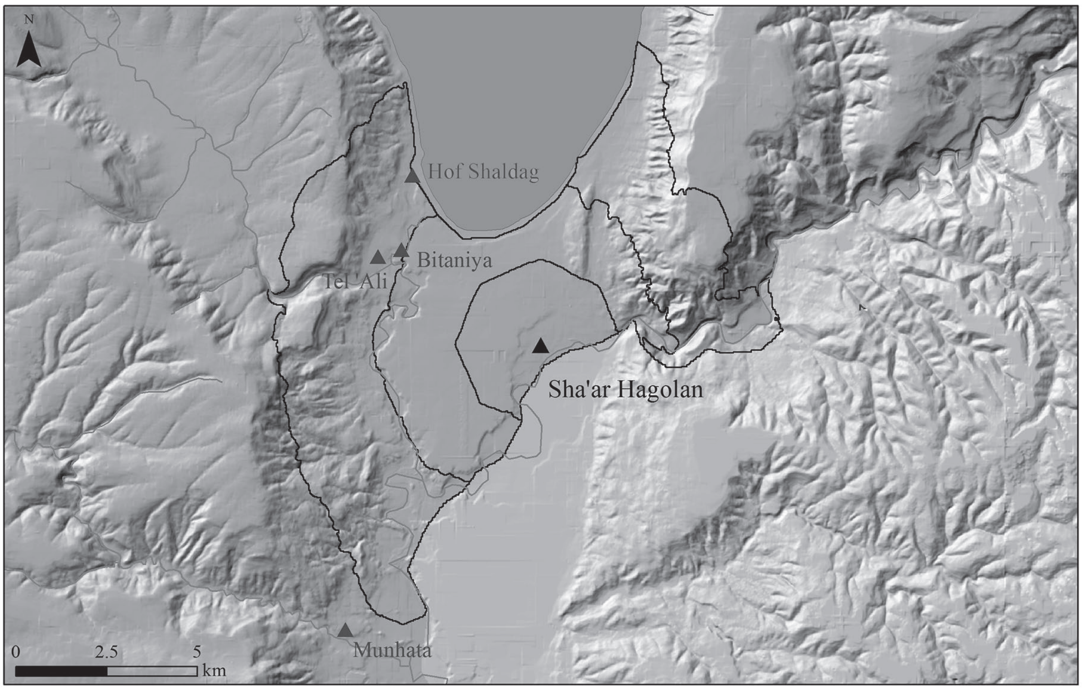

Figure 1.19: Sha'ar Hagolan

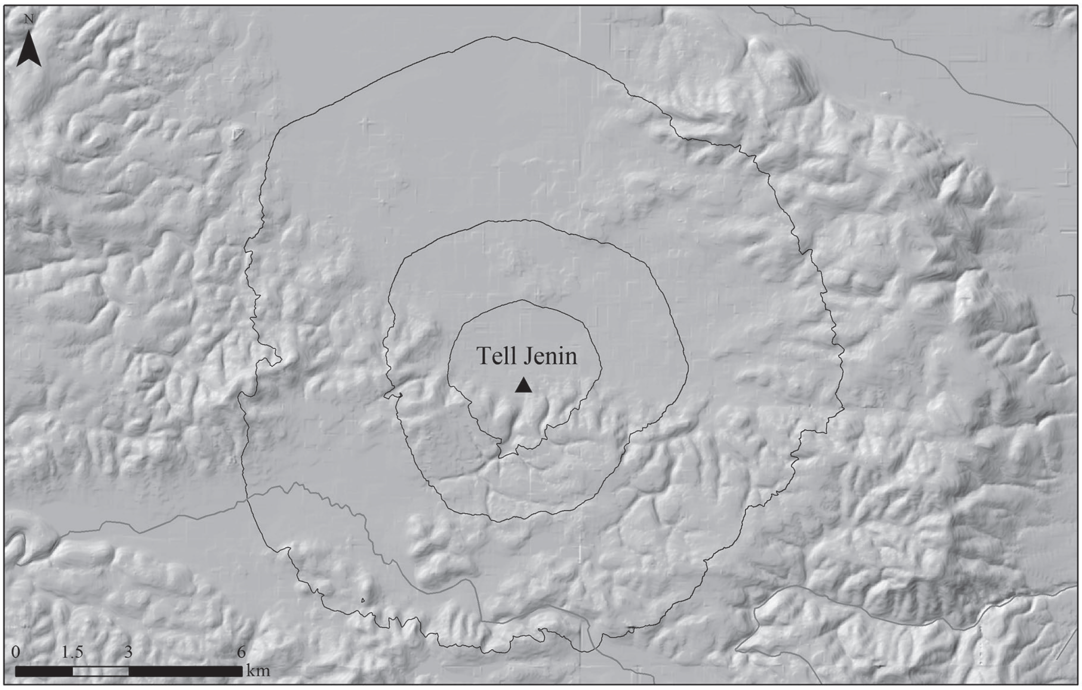

Figure 1.20: Tell Jenin.

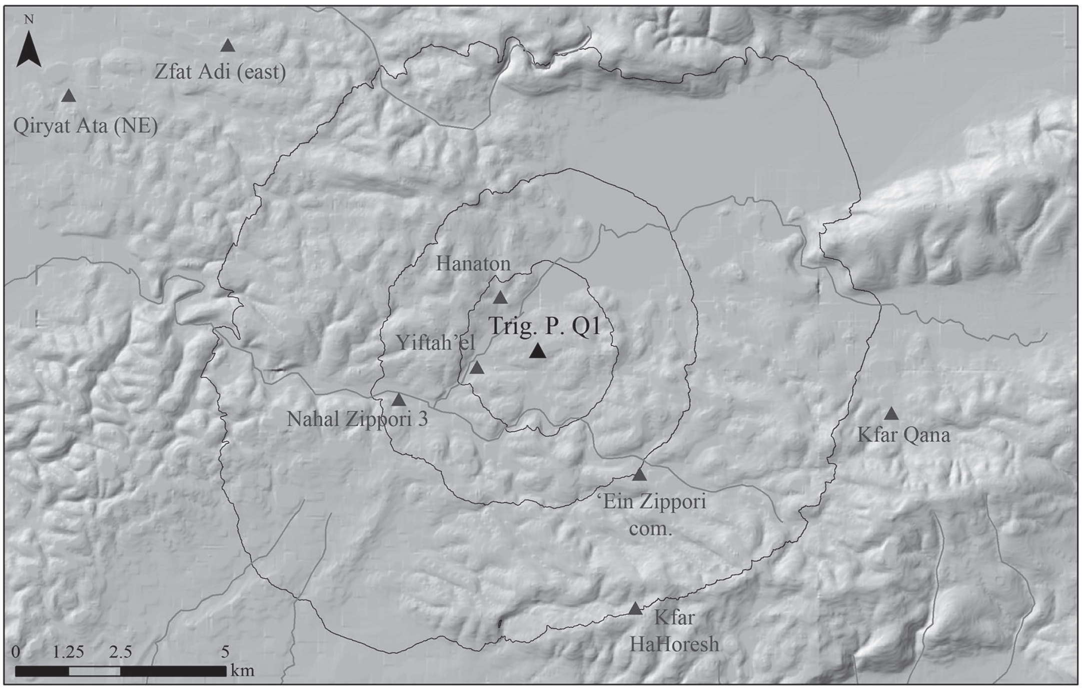

Figure 1.21: Triangulation Point Q1.

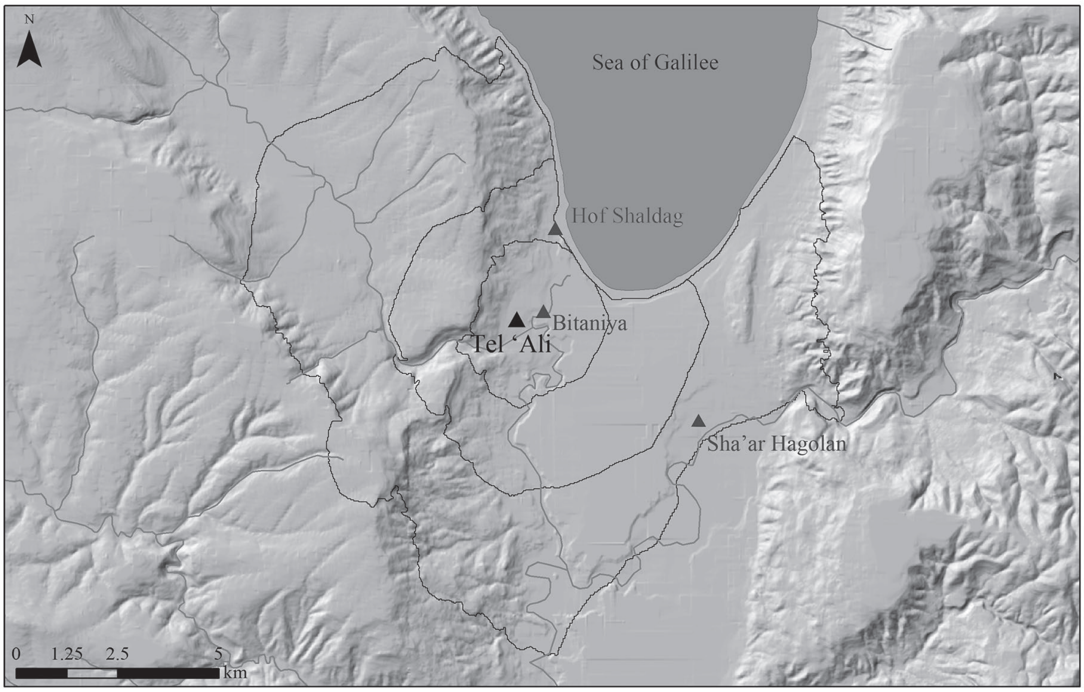

Figure 1.22: Tel 'Ali.

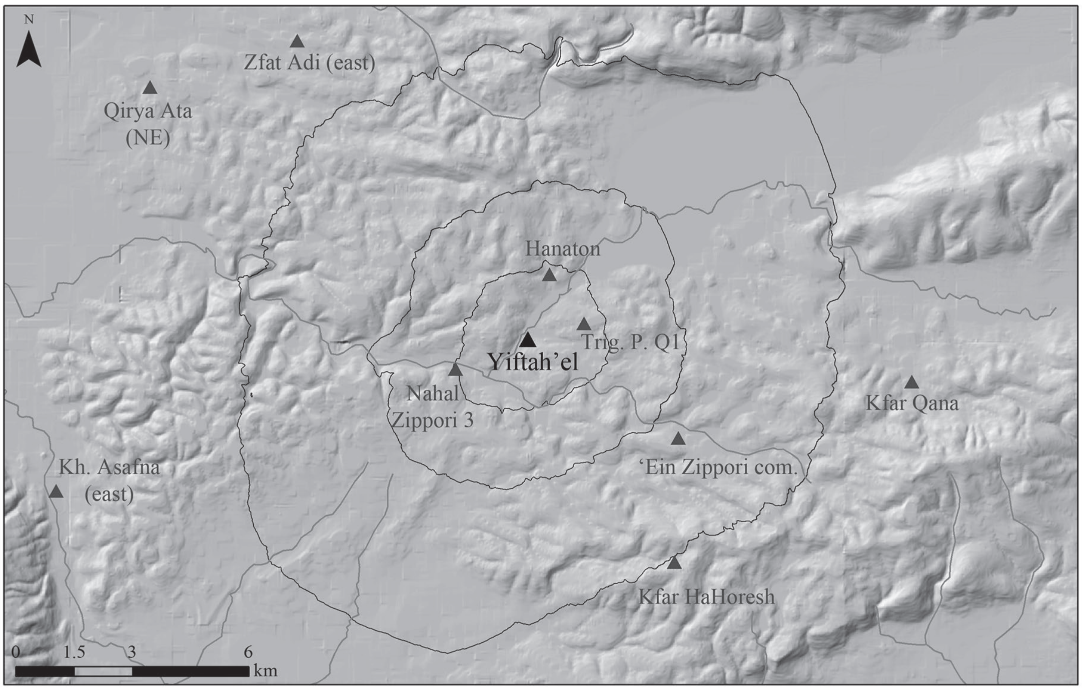

Figure 1.23: Yiftah'el.

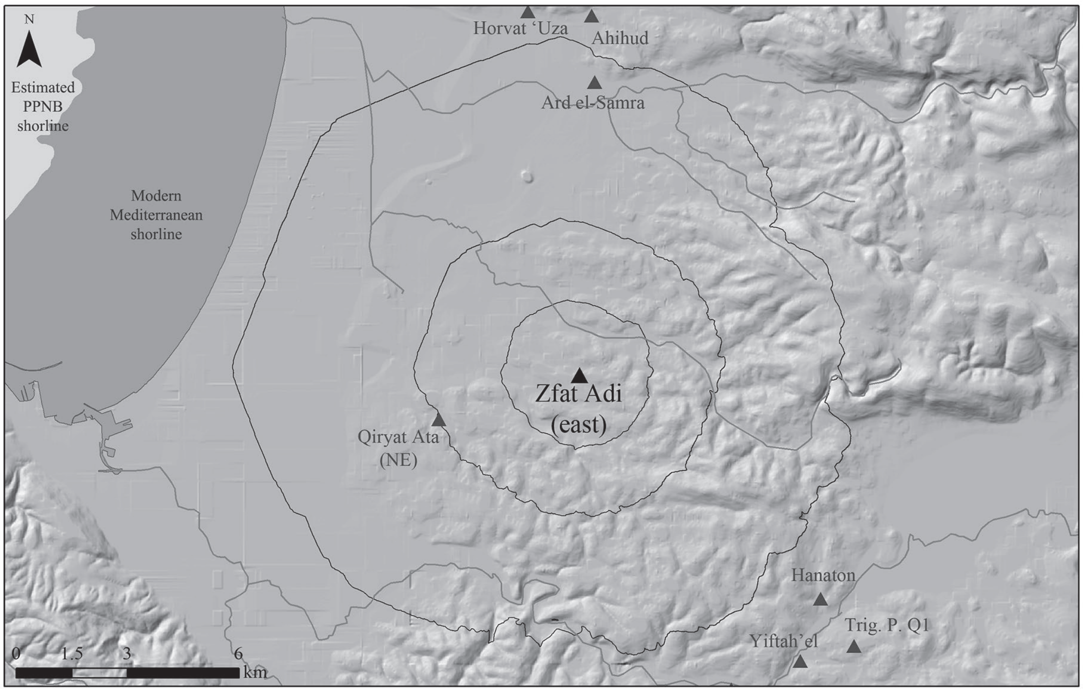

Figure 1.24: Zefat Adi (east).

The Exploitation Territories: Composition and Resources

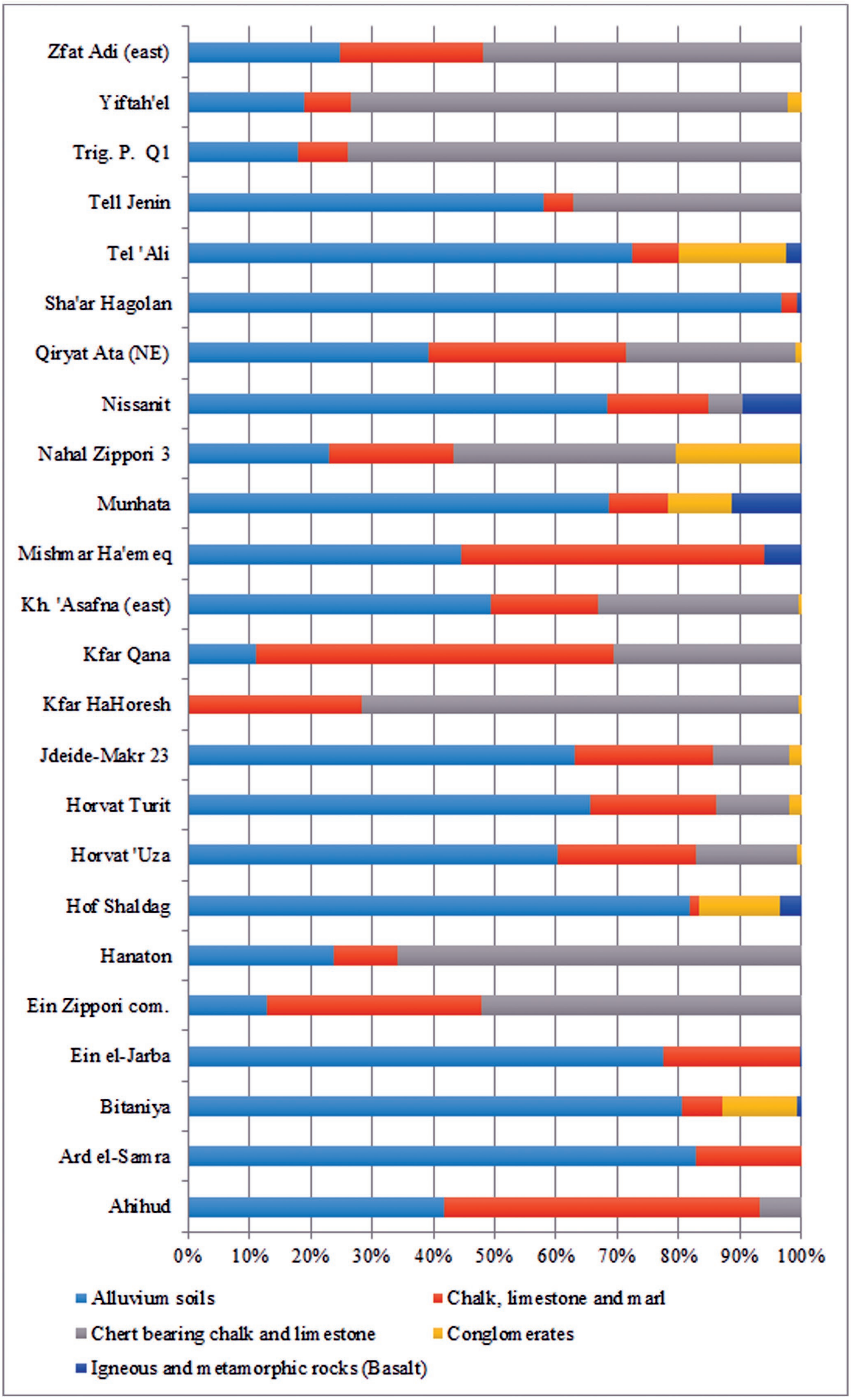

Figure 2.1: Lithological makeup, half-hour territories.

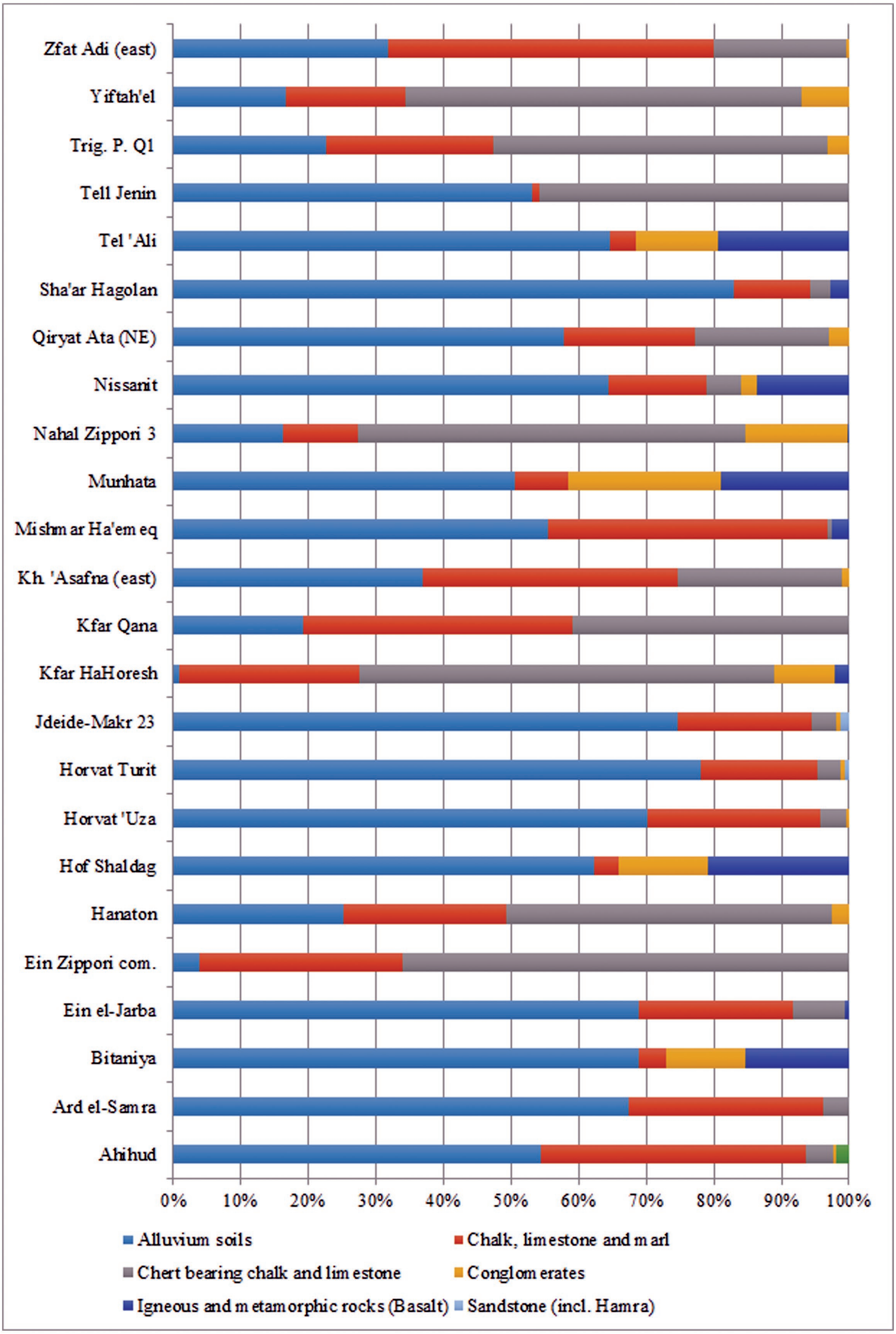

Figure 2.2: Lithological makeup, one-hour territories.

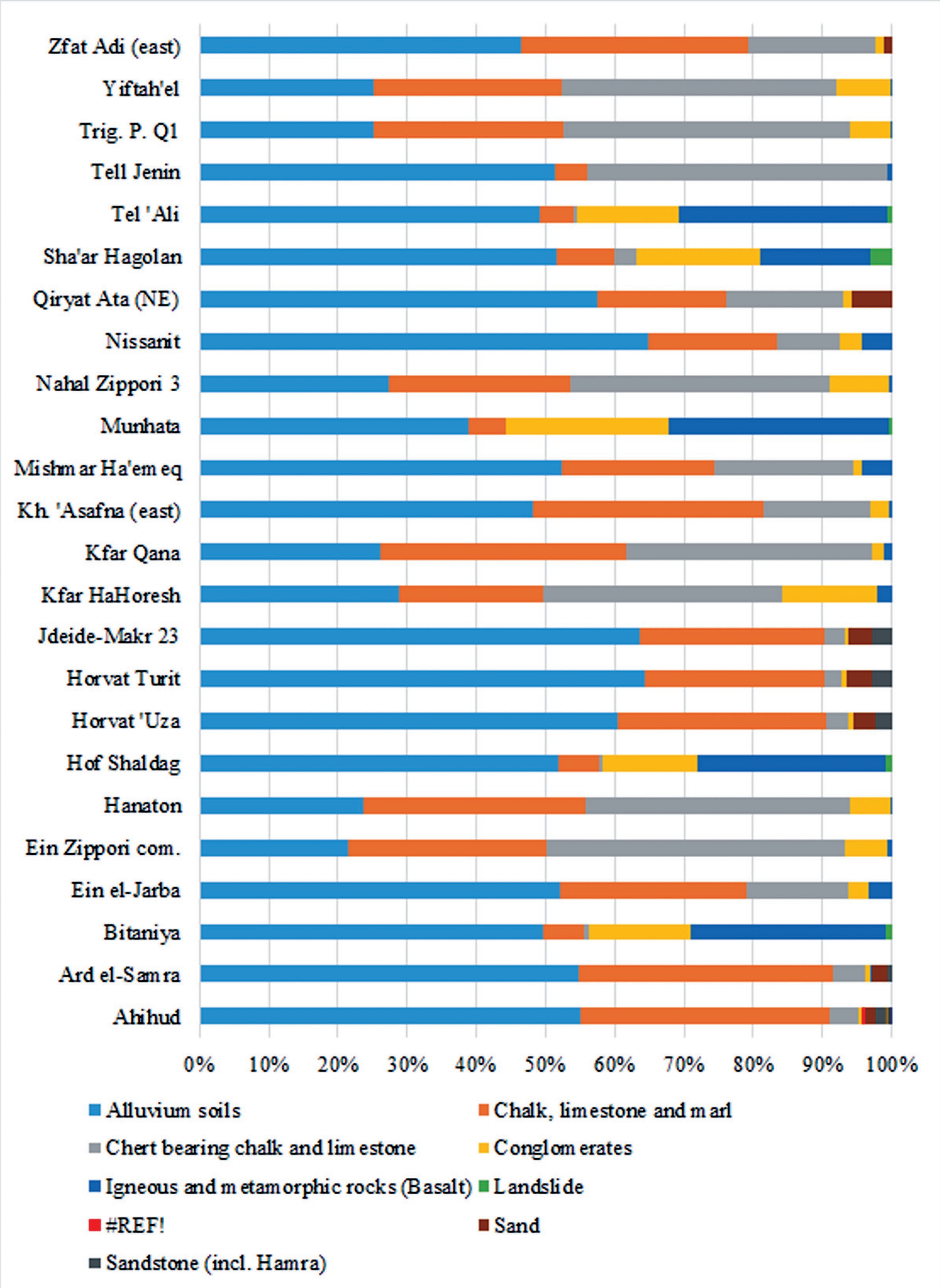

Figure 2.3: Lithological makeup, two-hour territories

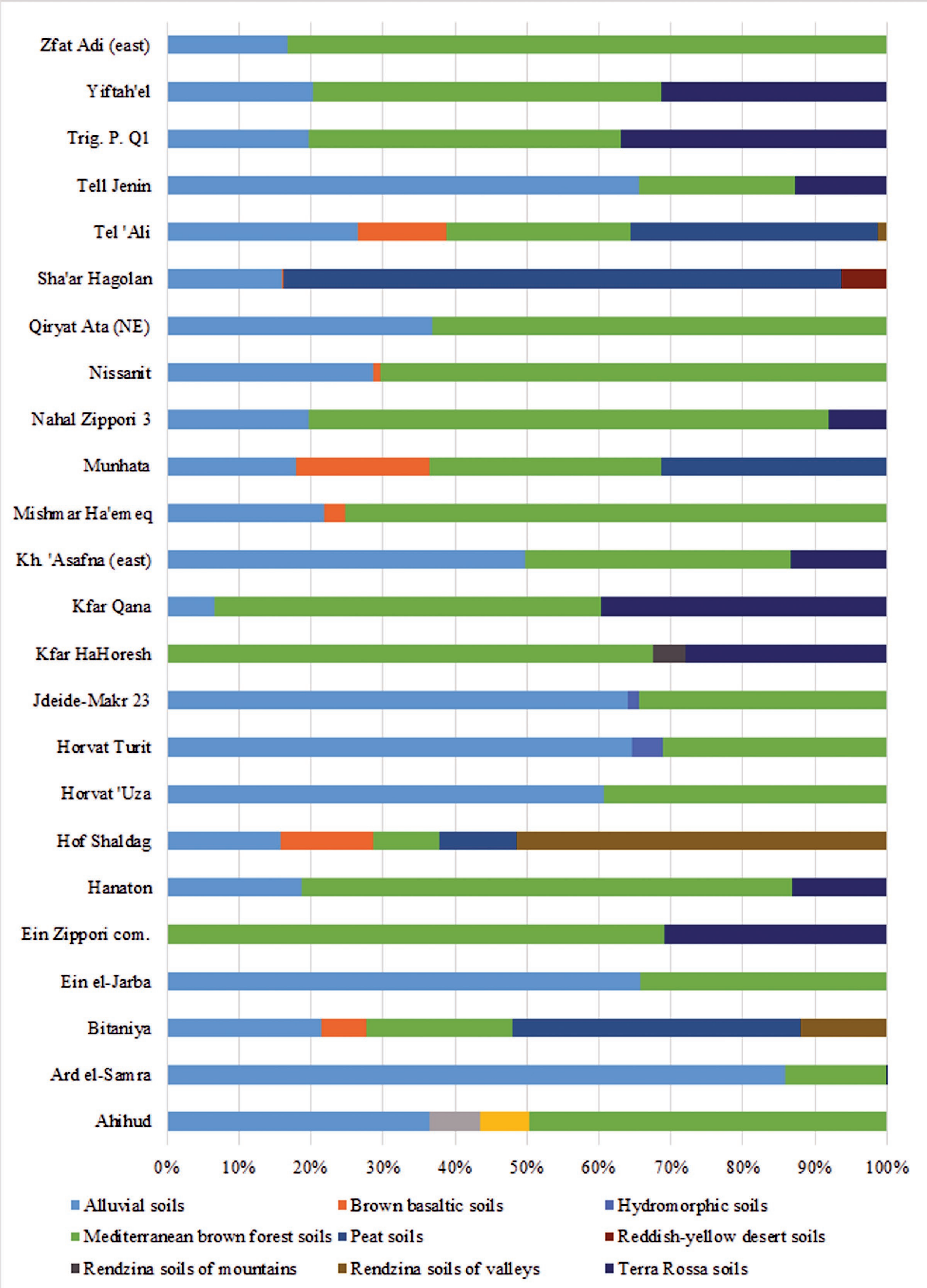

Figure 3.1: Soil composition, half-hour teritorries

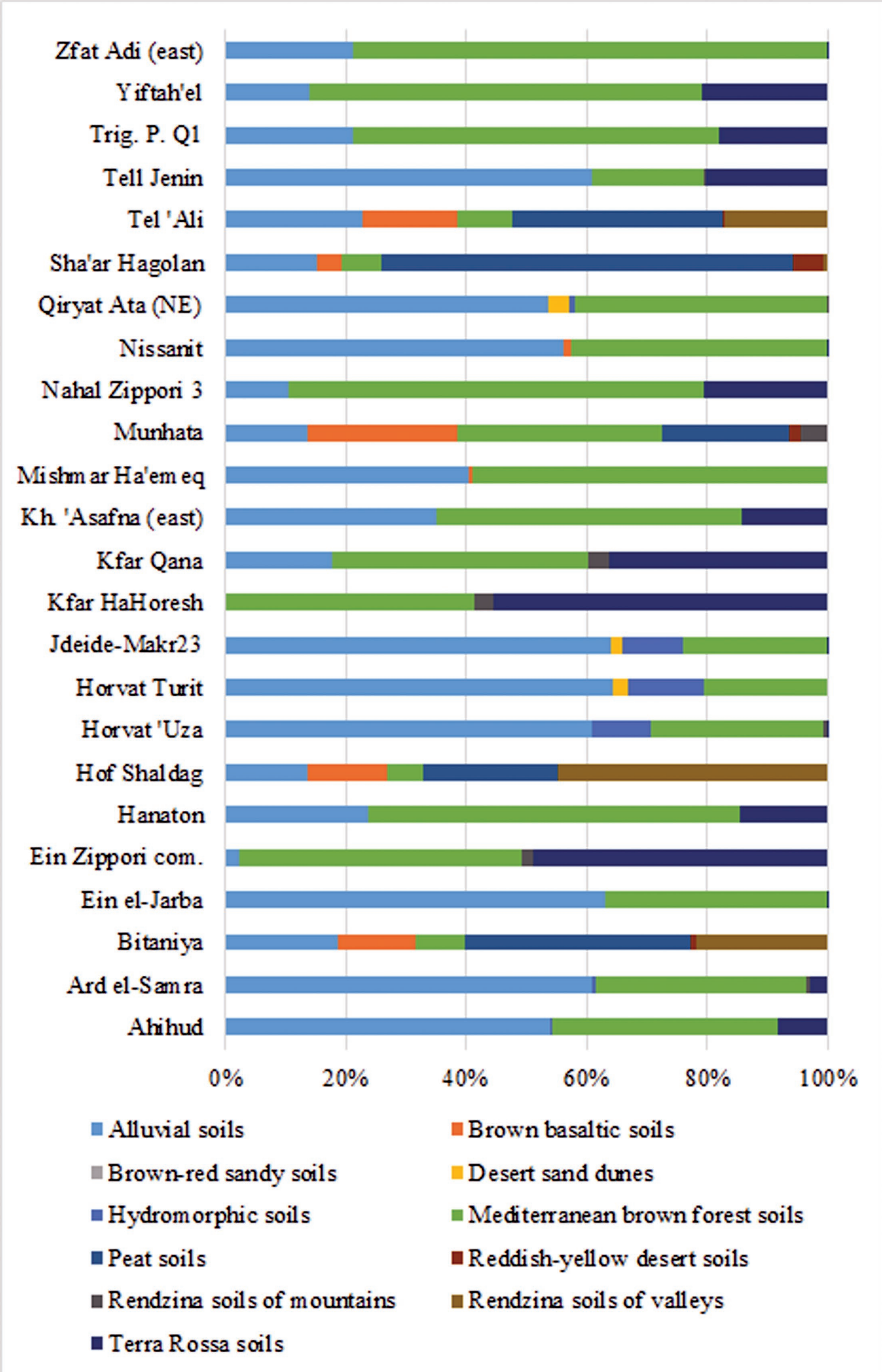

Figure 3.2: Soil composition, one-hour territories

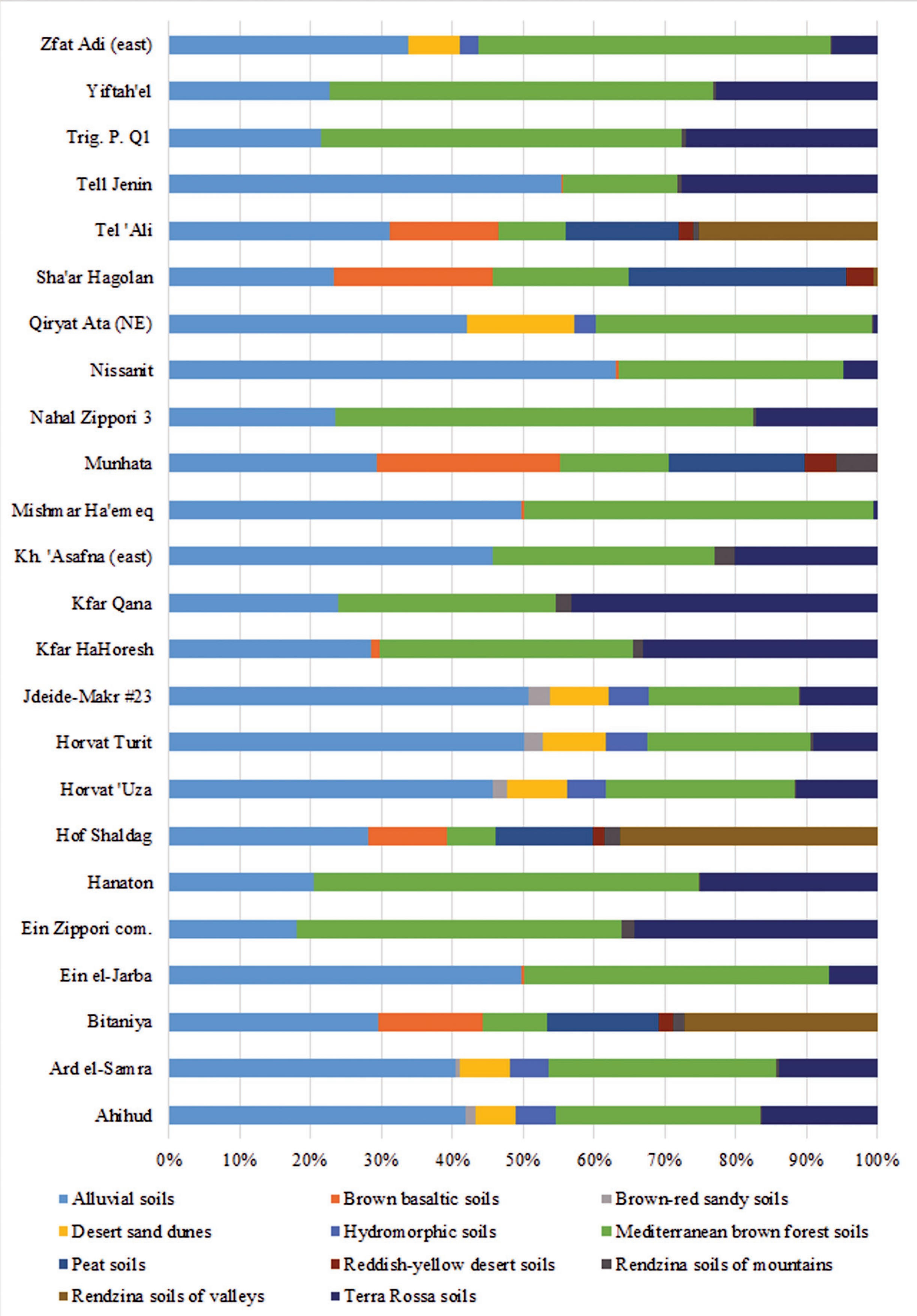

Figure 3.3: Soil composition, two-hour territories

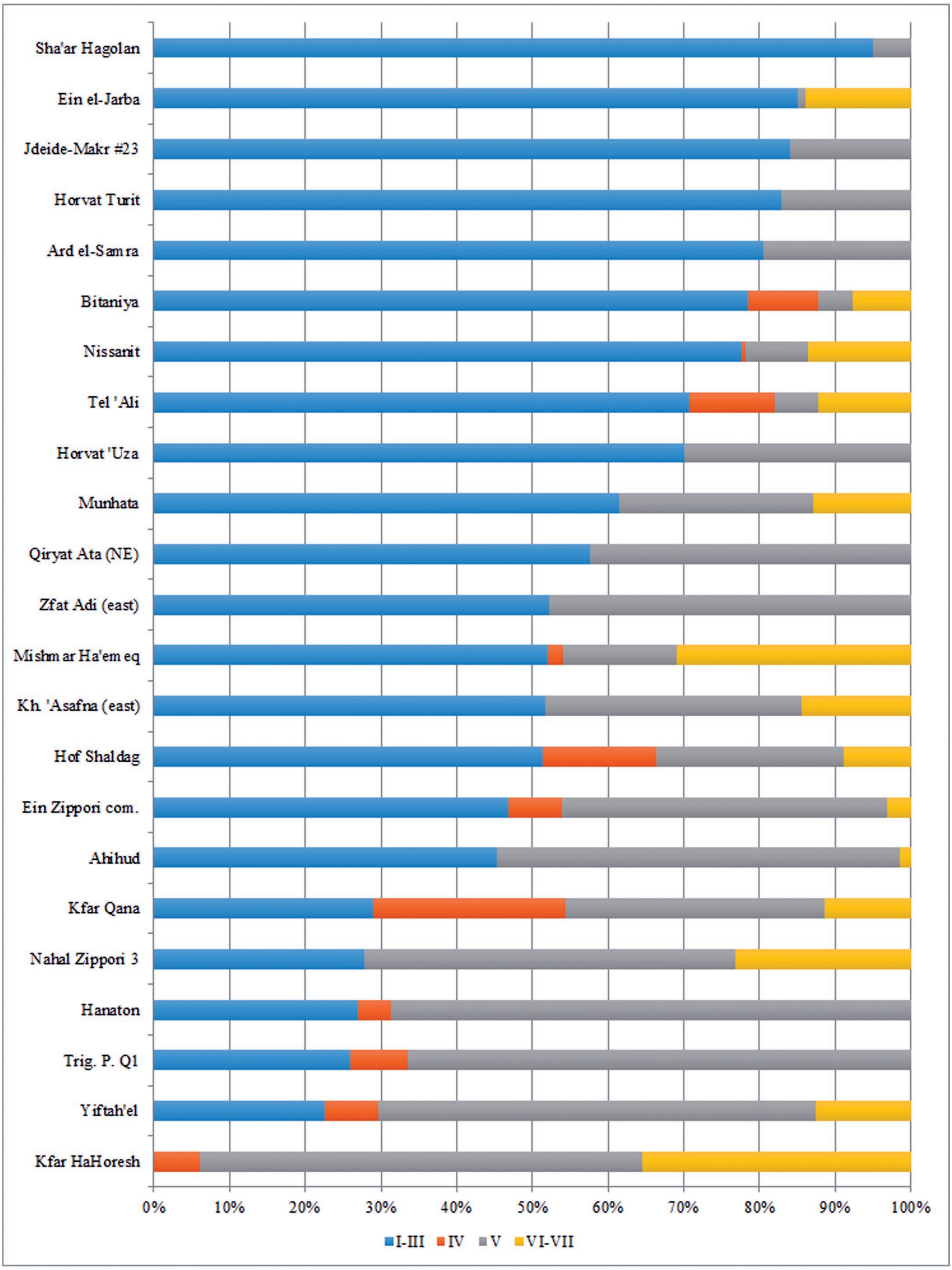

Figure 4.1: Agricultural potential, half-hour territories.
Classes I-II: Suitable for cultivation of all crops; Class IV: Suitable for perennial crops; Class V: Suitable for pasture; Class VI: Suitable for afforestation; Class VII: Unsuitable for any type of cultivation, due to badlands and Negev and coastal sand dunes (Gil and Rosensaft 1955).

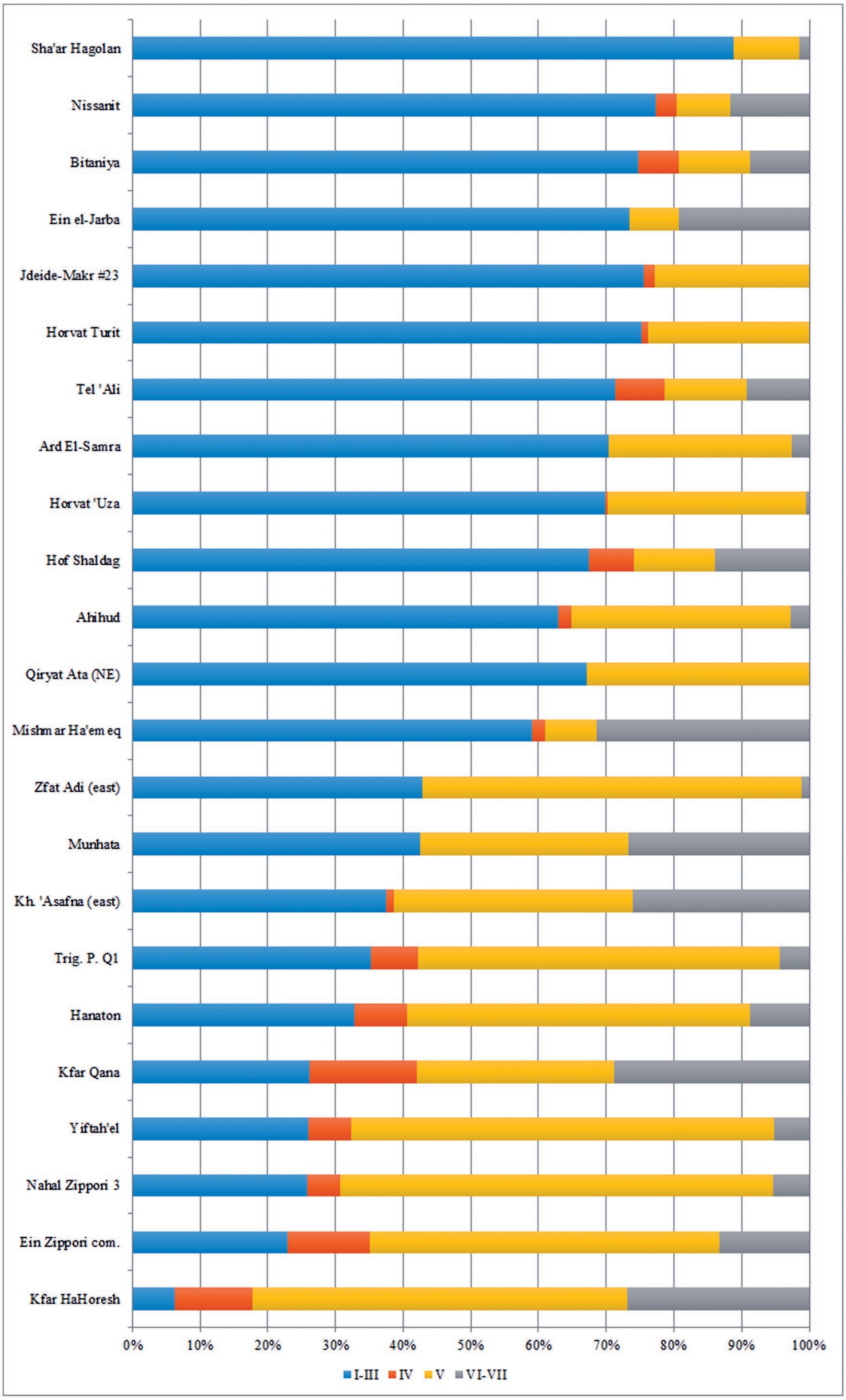

Figure 4.2: Agricultural potential, one-hour territories.
Classes I-II: Suitable for cultivation of all crops; Class IV: Suitable for perennial crops; Class V: Suitable for pasture; Class VI: Suitable for afforestation; Class VII: Unsuitable for any type of cultivation, due to badlands and Negev and coastal sand dunes (Gil and Rosensaft 1955)

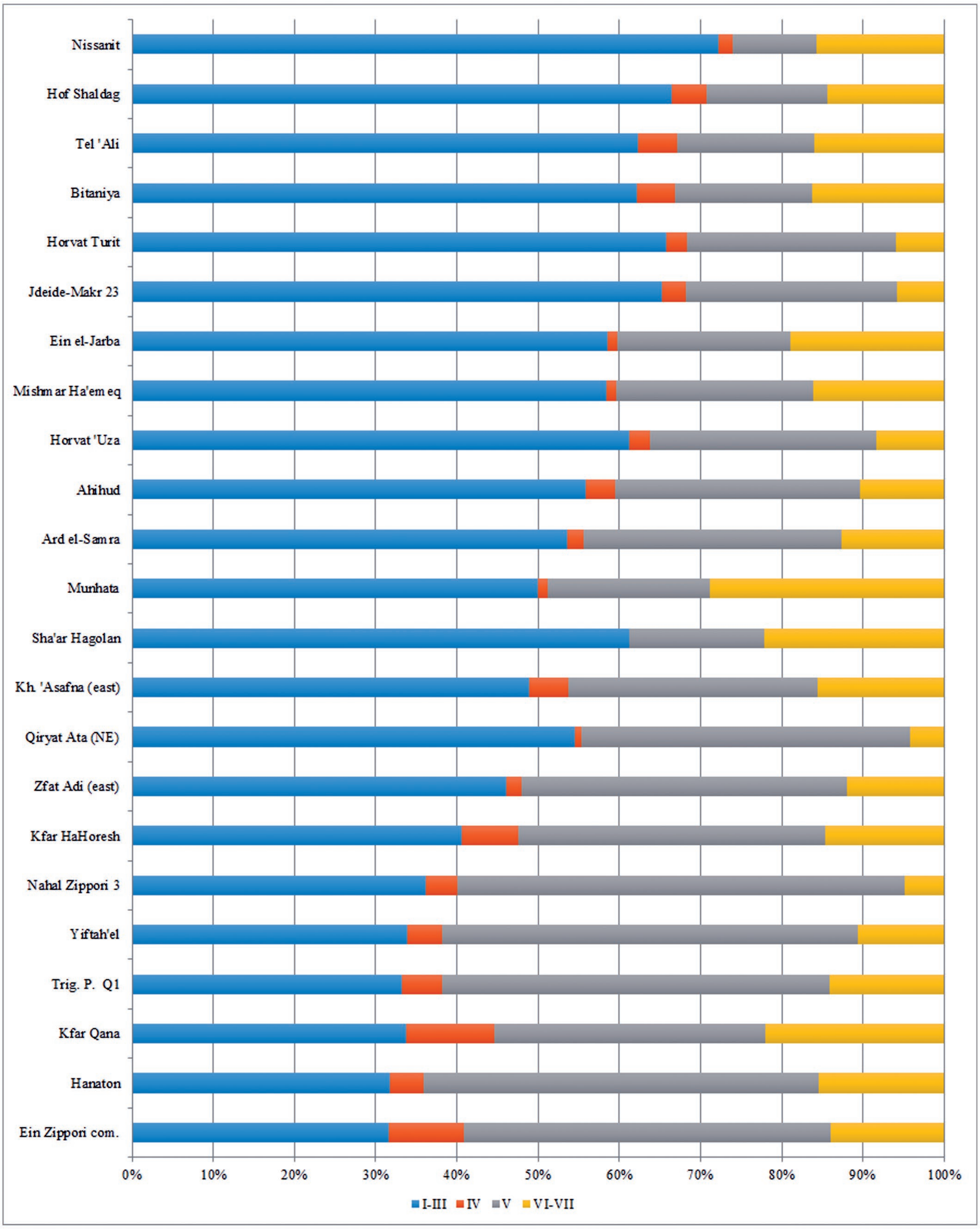

Figure 4.3: Agricultural potential, two-hour territories.
Classes I-II: Suitable for cultivation of all crops; Class IV: Suitable for perennial crops; Class V: Suitable for pasture; Class VI: Suitable for afforestation; Class VII: Unsuitable for any type of cultivation, due to badlands and Negev and coastal sand dunes (Gil and Rosensaft 1955).

Viewshed Analysis

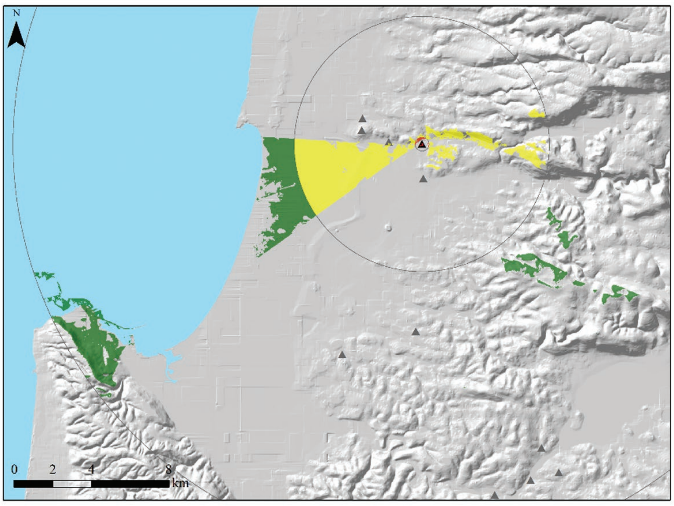

Figure 5.1: Ahihud.

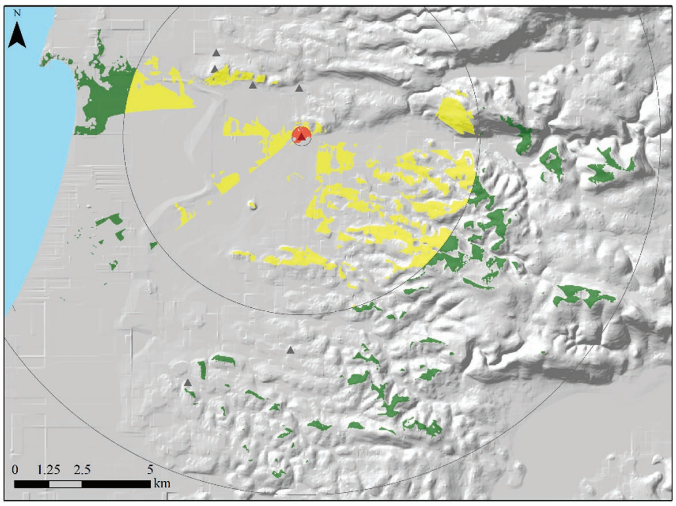

Figure 5.2: Ard el-Samra.

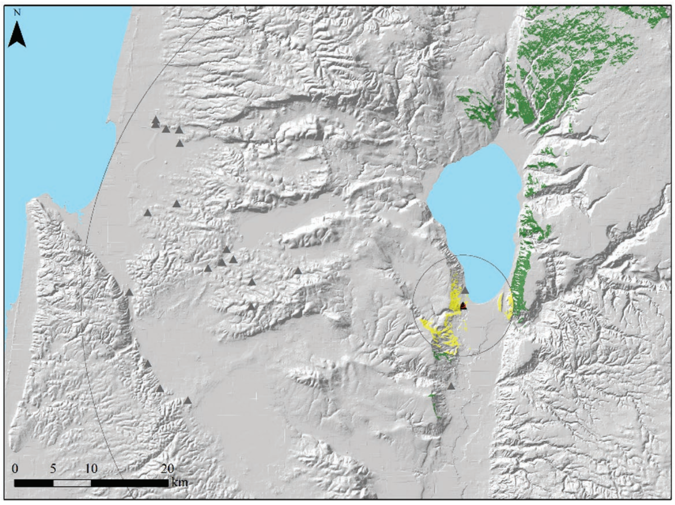

Figure 5.3: Bitaniya.

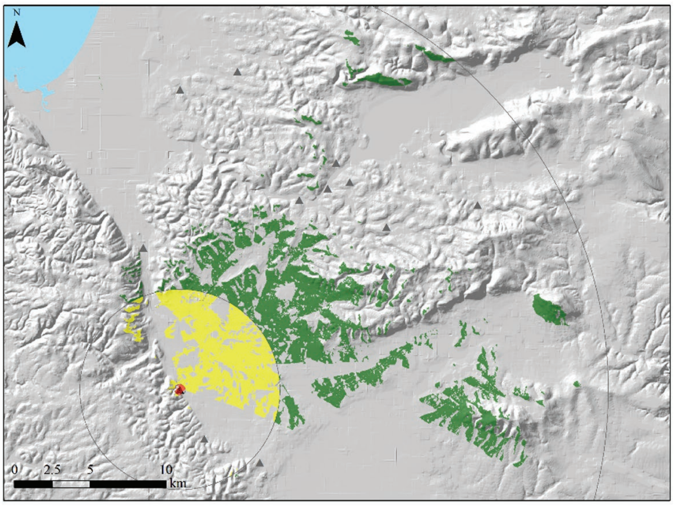

Figure 5.4: 'Ein el-Jarba.

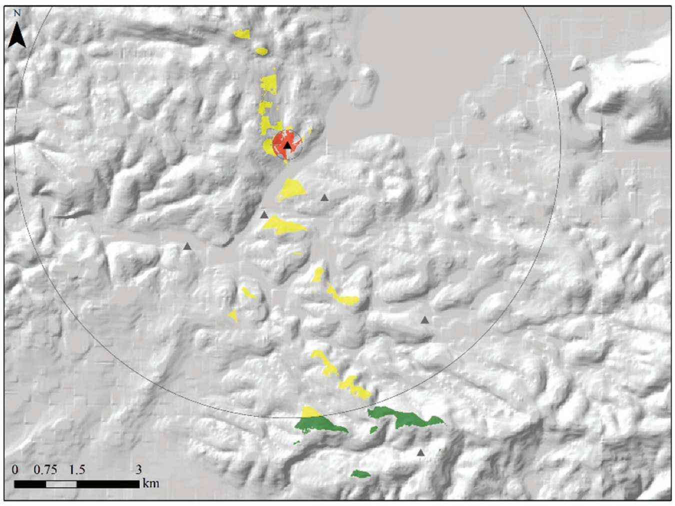

Figure 5.5: 'Ein Zippori.

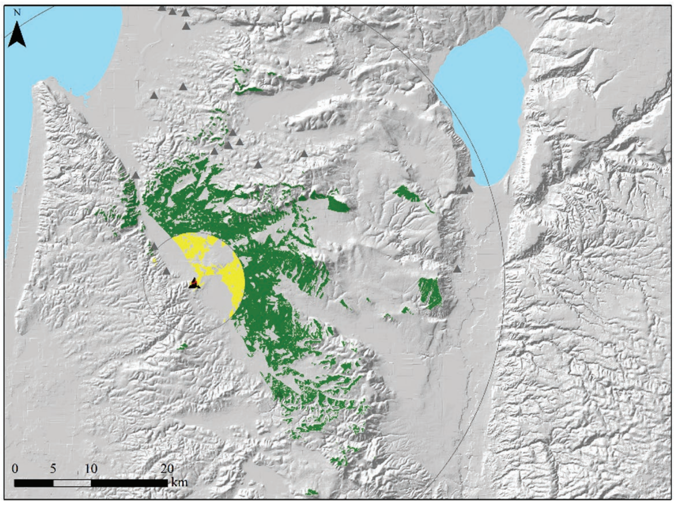

Figure 5.6: 'Enot Nissanit.

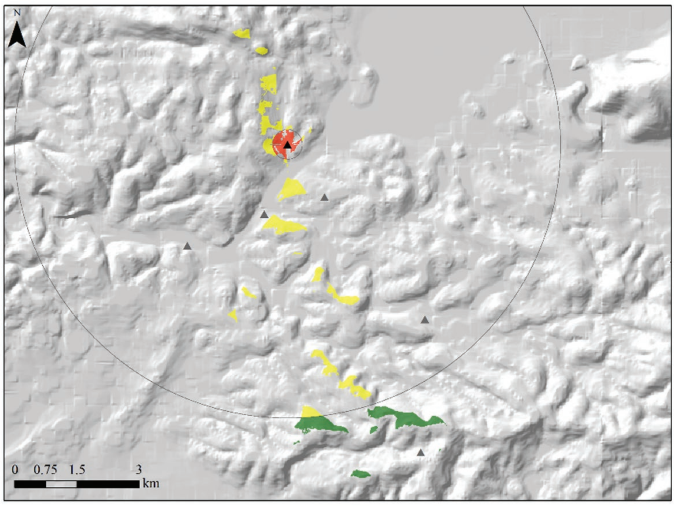

Figure 5.7: Hanaton.

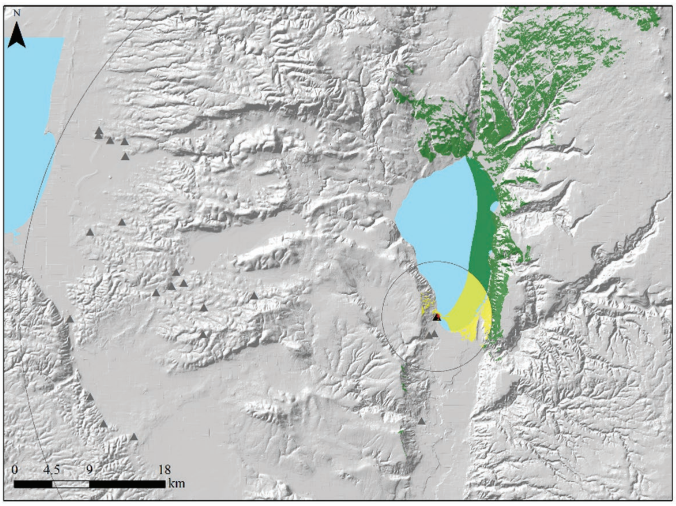

Figure 5.8: Hof Shaldag.

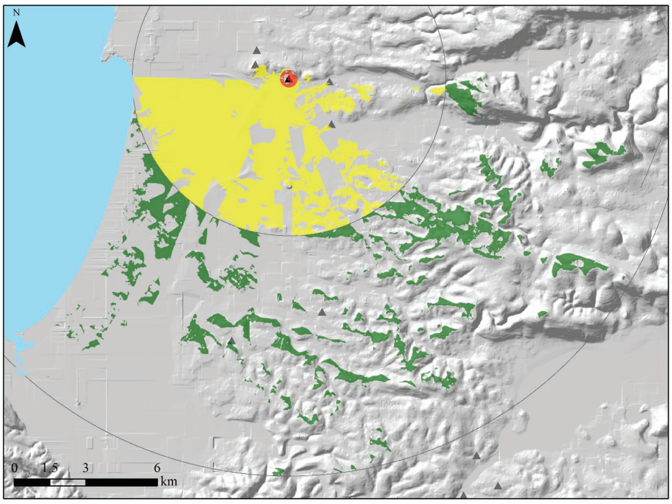

Figure 5.9: Horvat Turit.

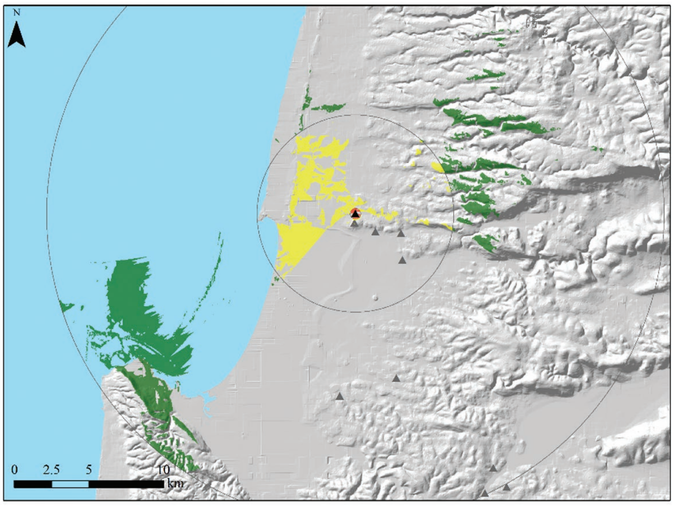

Figure 5.10: Horvat 'Uza.

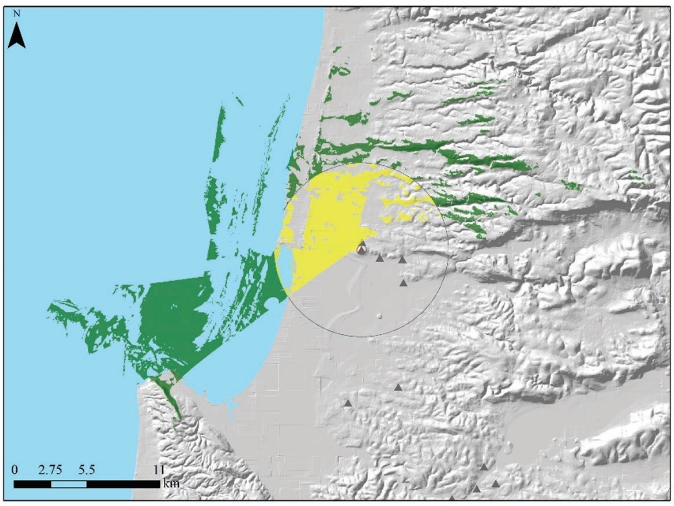

Figure 5.11: Judeidi-Makr #23.

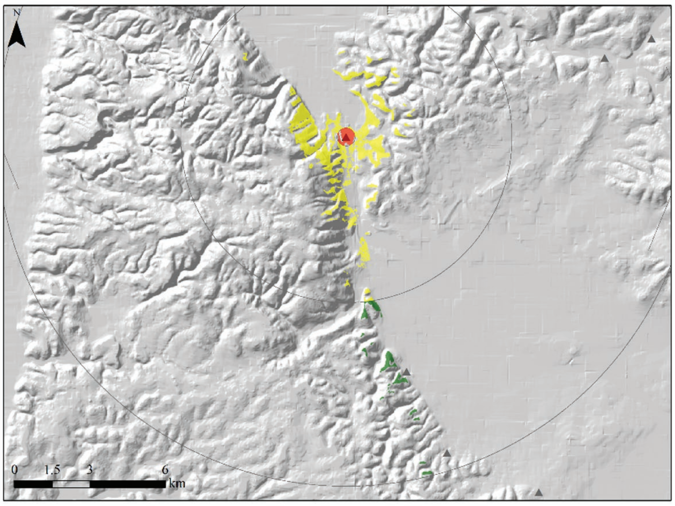

Figure 5.12: Kh. 'Asafna (east).

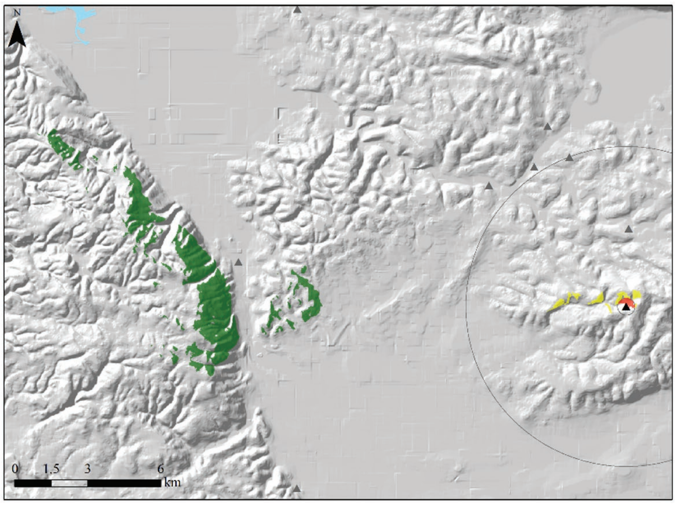

Figure 5.13: Kfar HaHoresh.

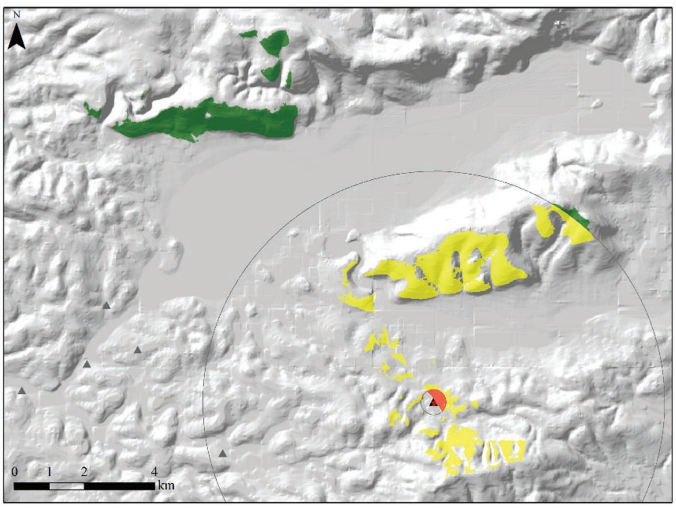

Figure 5.14: Kfar Qana.

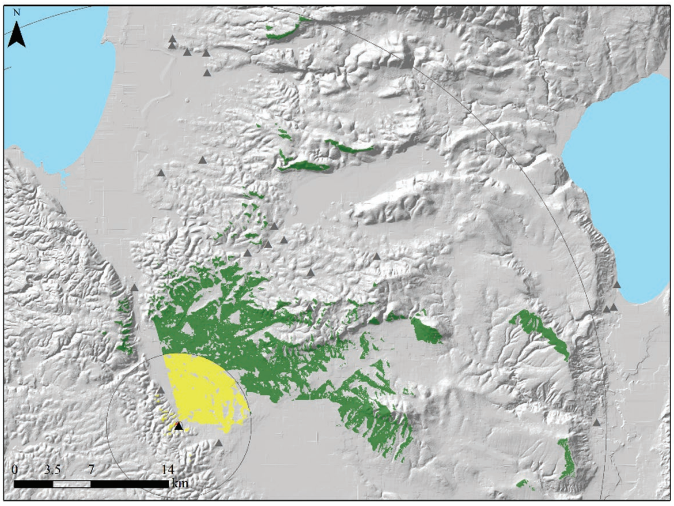

Figure 5.15: Mishmar Ha'emeq.

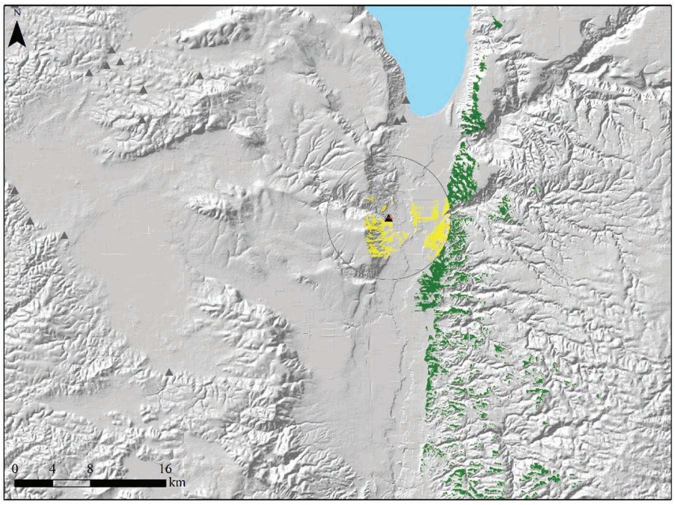

Figure 5.16: Munhata.

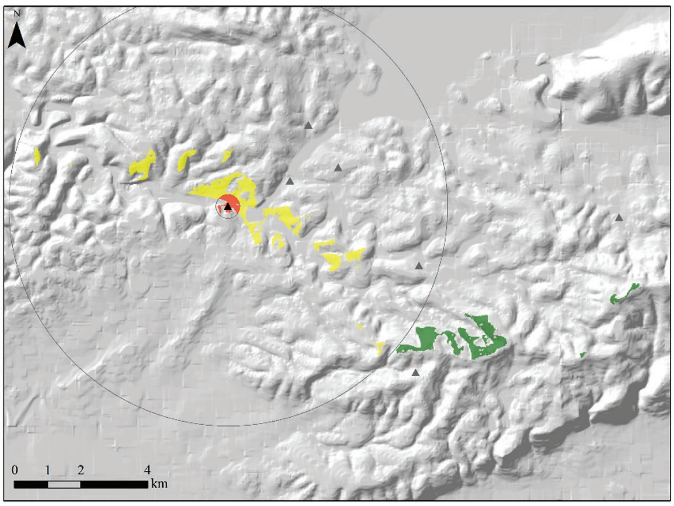

Figure 5.17: Nahal Zippori 3.

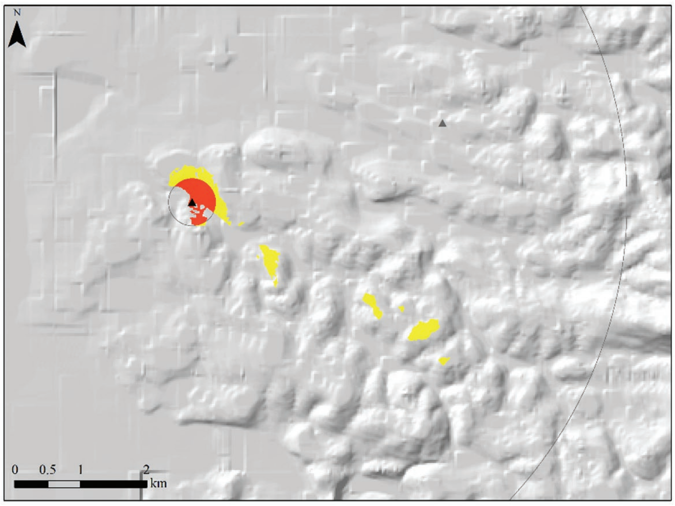

Figure 5.18: Qiryat Ata (NE).

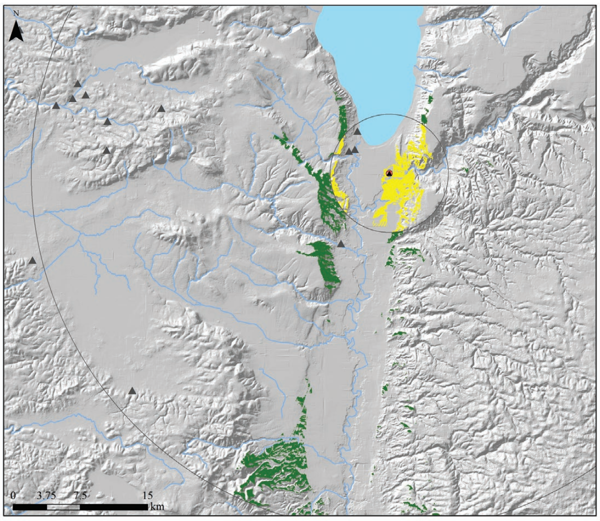

Figure 5.19: Sha'ar Hagolan.

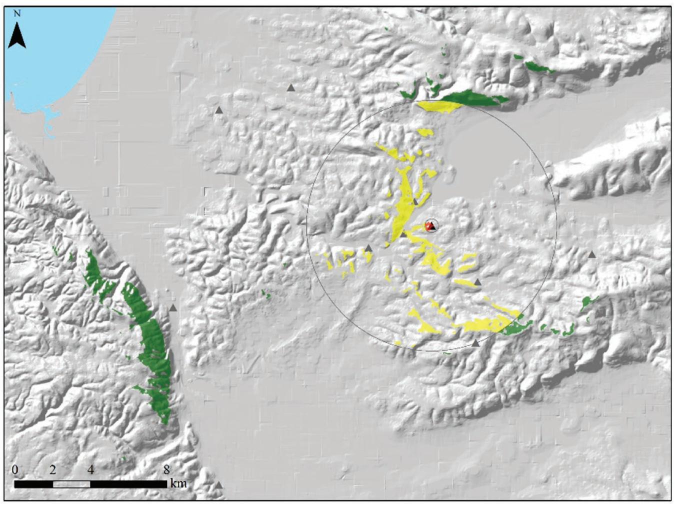

Figure 5.20: Triangulation Point Q1.

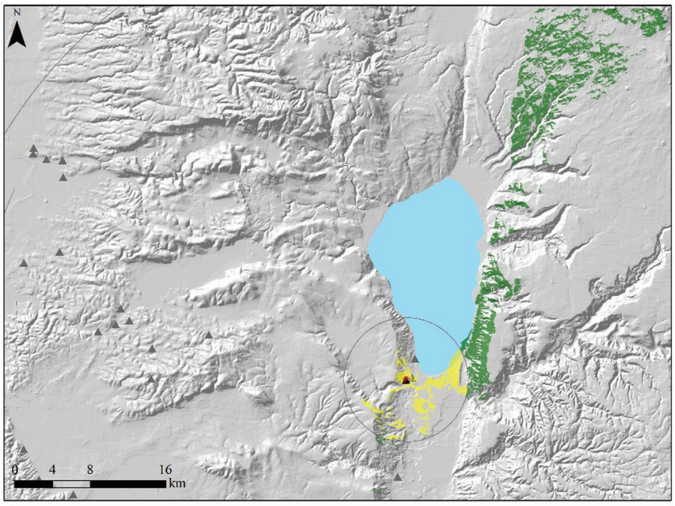

Figure 5.21: Tel 'Ali.

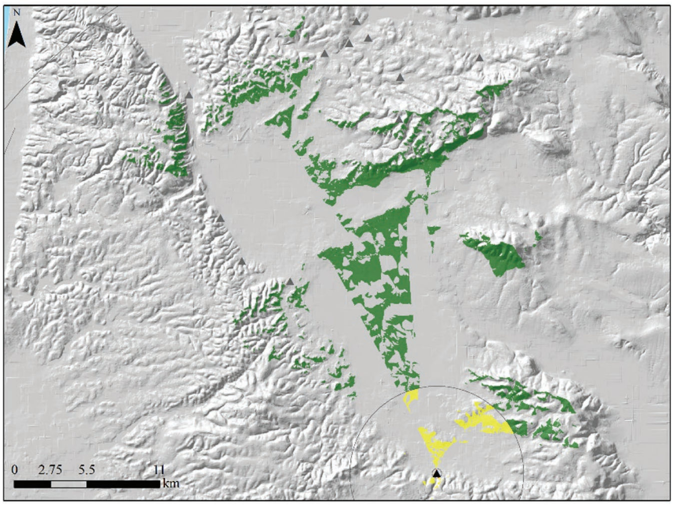

Figure 5.22: Tell Jenin.

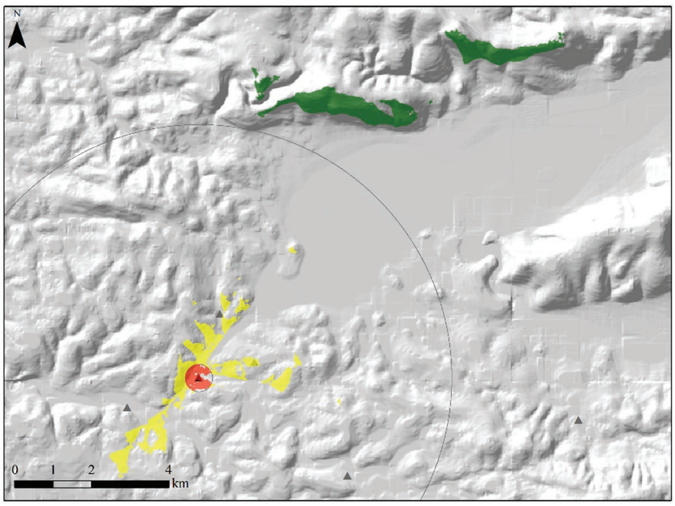

Figure 5.23: Yiftah'el.

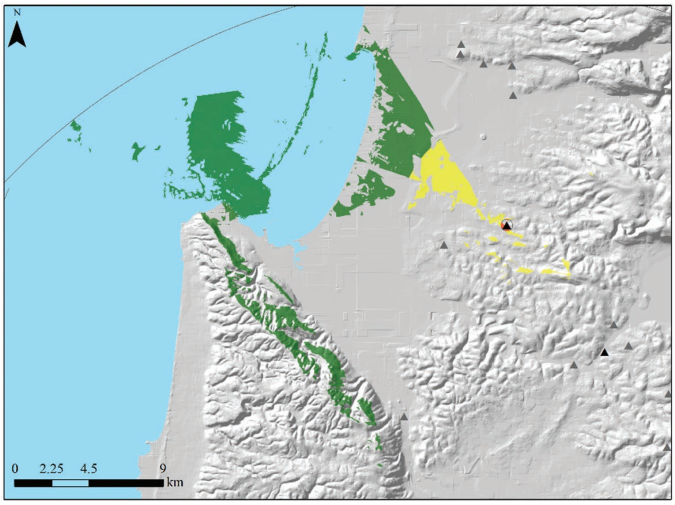

Figure 5.24: Zefat Adi (east).

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