LATE PLEISTOCENE AND EARLY HOLOCENE FINDS FROM THE 2020 TRIAL EXCAVATION AT GIRMELER, SOUTHWESTERN TURKEY

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Abstract

This paper represents a preliminary report of the results obtained from a sounding at the mouth of the Girmeler Cave in 2020. In addition, it also re-evaluates the data derived from the trail trenches previously opened in the same area. Girmeler is the only site in Western Anatolia that elucidates the transition from the late Pleistocene to the early Holocene. In Girmeler, radical changes were determined in the chipped stone industry between the late Pleistocene and the early Holocene, which reveals differences from the Antalya region and Central Anatolian. The late Pleistocene layers, characterized by geometric microliths, were replaced by a flake and bladelet based industry without geometric microliths and bears general similarities with the chipped stone industries from the Aegean islands sites of the early Holocene. The cave was likely inhabited by semi-sedentary hunter groups engaged in selective gathering and some agriculture, which lived in wattle-and-daub huts with lime plastered floor.

INTRODUCTION

The transition to a Neolithic way of life represented a major technological, social, cognitive, economic, and cultural transformation for the past societies. In Aegean prehistory, debates are often focussed on two polarized perspectives as cultural diffusion via native hunter-gatherer societies versus demic diffusion by population migrations from the Near East, where many of the domestic plant and animal species originate from (see Özdoğan 2014; Sampson 2014; Çilingiroğlu 2017; Erdoğu 2017; Reingruber 2018; Horejs 2019; Carter 2019; Atakuman *et al.* 2020). Until recently there was no evidence for the existence of pre-Neolithic hunter-gatherer communities in the Aegean coast of Anatolia, thus there was no supporting data for the interaction and acculturation hypotheses. Early Neolithic

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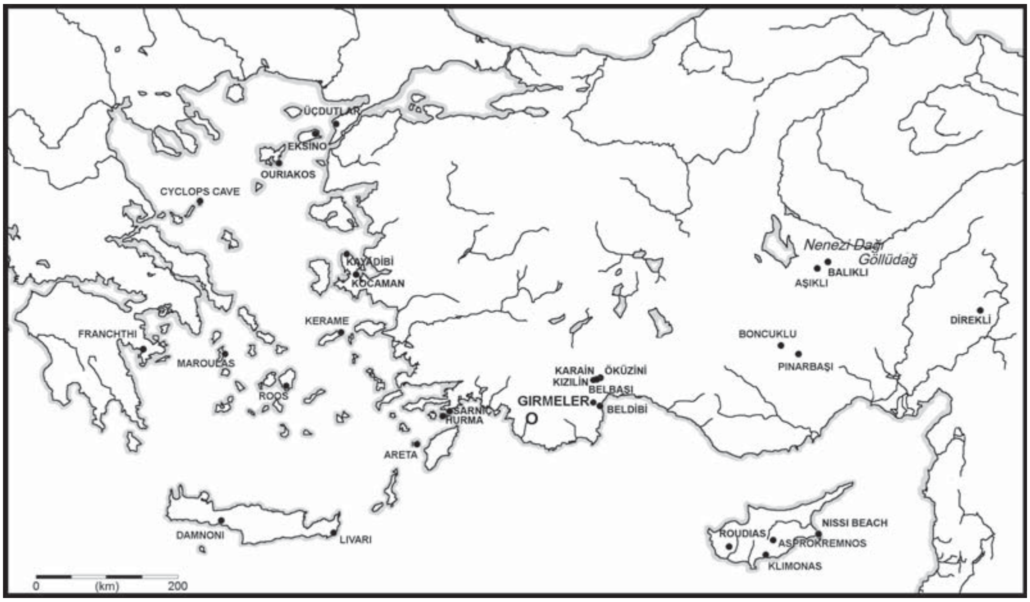

Fig. 1. Location map of Girmeler and some of the early Holocene and Late Pleistocene sites.

sites such as Ulucak in the coastal region of central Western Anatolia have already been shown that the Neolithic communities with features of agricultural activity based on domestication of animals and plant, and sedentism emerged abruptly during the first quarter of the seventh millennium BC (Çevik and Erdoğu 2020). A significant challenge to this notion was encountered during previous trial excavations in Girmeler, where traces of an early settled community was found (Takaoğlu *et al.* 2014). In addition, the most recent surveys in the Karaburun and Bozburun Peninsulas points to the presence of a dense hunter-gatherer population before the Neolithic (Çilingiroğlu *et al.* 2020; Atakuman *et al.* 2020).

Girmeler has so far been the only known excavated early settlement in the Aegean coastal region of Anatolia, where we can best understand the pre-Neolithic process and transition to the Neolithic way of life. Girmeler is located at a small limestone hill of the Eşen Valley, southwest Anatolia, about 5 km northwest of the ancient Lycian city of Tlos (Korkut 2015) (Fig. 1). There is a natural hot thermal spring nearby the site. The site of Girmeler consists of two long cave galleries (I & II) (Fig. 2). A 7 m high mound once stood in front of the caves but was bulldozed away for the construction of a thermal car park in the 1980s (Köktürk 2000). The previous excavations conducted at the basal layers, that remained from the removal of top layers of the mound demonstrated that the earliest occupation was dated to the late 9th millennium BC, although virgin soil has not yet been reached (Takaoğlu *et al.* 2014; Takaoğlu and Korkut 2019). This paper presents the results of the recent excavations undertaken in the course of 2020 field season as part of the Tlos Excavations program to determine the stratification of the site together with re-evaluated previous excavated data from the site.

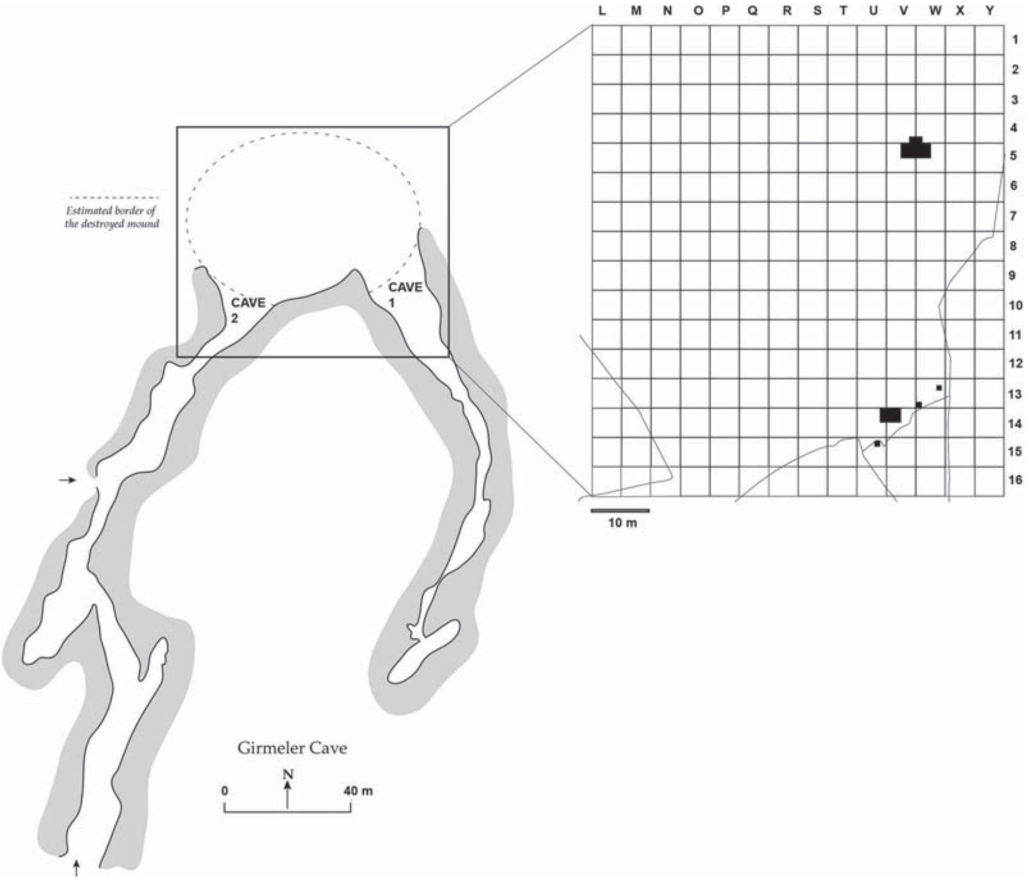

Fig. 2. Map of Girmeler Cave showing trial excavation trenches in 2020.

THE 2020 TRIAL EXCAVATION AT GIRMELER

A 3,5 × 2,5 m trial trench was opened in front of Cave I in order to understand the overall stratigraphy of the site (Fig. 3). The topsoil was cleared by scraping the surface until the first traces of archaeological remains appeared. Beneath the surface in the eastern part of the trench disturbed structural remains were revealed (Layer 1). They consist of patches of lime floors, less than 1 cm in thickness, which yielded few pottery sherds of Neolithic date. Some large rocks were also observed due to cave roof collapse.

Leaving the structural remains and large rocks, the trench was deepened in the 1,5 × 2,5 m section in the western part. Layers without any pottery began to appear 5 cm below, and a change in the soil was recognized. An oval sunken basin with oval and circular lime platforms were discovered in Layer 2. The largest lime platform is about 80 cm in diameter and 30 cm thickness and lies on an ashy lime floor. The chipped stone industry in this layer is characterized by a small microlithic component of flake and bladelet based industries with the absence of geometric microliths. Soil colour and archaeological finds change just below

Fig. 3. The 2020 trial excavation trench in front of Cave 1.

this layer. The deposit consists of distinctive dark loose soil of a Pleistocene deposit. Layer 3 consists of two successive compact floors that ended in a fire (Fig. 4). They include numerous shell ornaments, hackberry seeds and chipped stones artefacts. The chipped stone industry is now characterized by microliths, especially geometric microliths. Geometric microliths slightly increased in lower layers 4 and 5 where a thick floor and associated circular platform of white plaster ca. 50 cm in diameter were found. A 30 × 30 cm trial trench was opened to layer 5 and another floor (layer 6) was found at the bottom. The sounding had been taken down to a depth of 1,63 m, but without yet reaching virgin soil (Fig. 5). The trial excavation was stopped due to the presence of possibility of architectural structures, as seen in the Near East (i.e. Natufian Culture), and for further wider excavations.

Radiocarbon Dates

AMS radiocarbon dating on charred animal bone samples, directly associated with the archaeological sounding described above, which was carried out in the TÜBİTAK-MAM Dating laboratory in Turkey and provided secure absolute age estimates to the early 11th millennium cal. BC. A date from sounding layer 6 (TÜBİTAK-1527; 10928±32 BP) calibrate respectively to 10956-10806 cal. BC (2σ; 95.4% confidence)[1]. Two extra samples

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[1] Preliminary elemental analysis results show that the charred bone contains 3.98% Carbon, 0.27% Nitrogen and C/N ratio 14.74. These values imply that collagen is not preserved in the bone sample (Longin 1971). This is expected situation for fully charred bone samples. Since the collagen of the bone is fully charred, the

Fig. 4. The 2020 trial excavation trench with the remains of a possibly structure floor.

were also analysed to verify the date of the early layers. These two dates fall within a relatively well-defined period between ca. 10700-9600 cal. BC. Thus, the result suggests that the earliest layers of the 2020 sounding are dated to the Younger Dryas cold oscillation. The date from the Late Pleistocene layers at Girmeler matches with that of Phase III (Layers IV-Ia) sequence at the Öküzini Cave, Antalya region (Kartal 2009: 150) as well as of Ouriakos on the island of Lemnos (Efstratiou *et al.* 2014). In the wider geography, it is also contemporary with the Natufian Culture in the Near East (Bar-Yosef 1998).

Three dates from the Early Holocene layers were published earlier and dated between 8200 and 7900 cal. BC (Takaoğlu *et al.* 2014). The new AMS date taken from a burial found during the 2013 excavation (Beta-539762; 8670 ± 30 BP) calibrate respectively to 7739-7594 cal. BC (2σ; 95.4% confidence). The result suggests that the early Holocene layers of Girmeler could be dated ca. 8200-7600 cal. BC.

Chipped Stones

Although several dozens of chipped stone artefacts were discovered, only the chipped stones from well-preserved and unmixed contexts have been studied. The majority of the assemblage includes waste products.

carbon in the bone is usually very stable, resistant to contamination. Pre-treated purely charred material resulted in 55.5% Carbon that is in the range of a typical elemental charcoal composition. This refers to the degree of charred bone fully occurred.

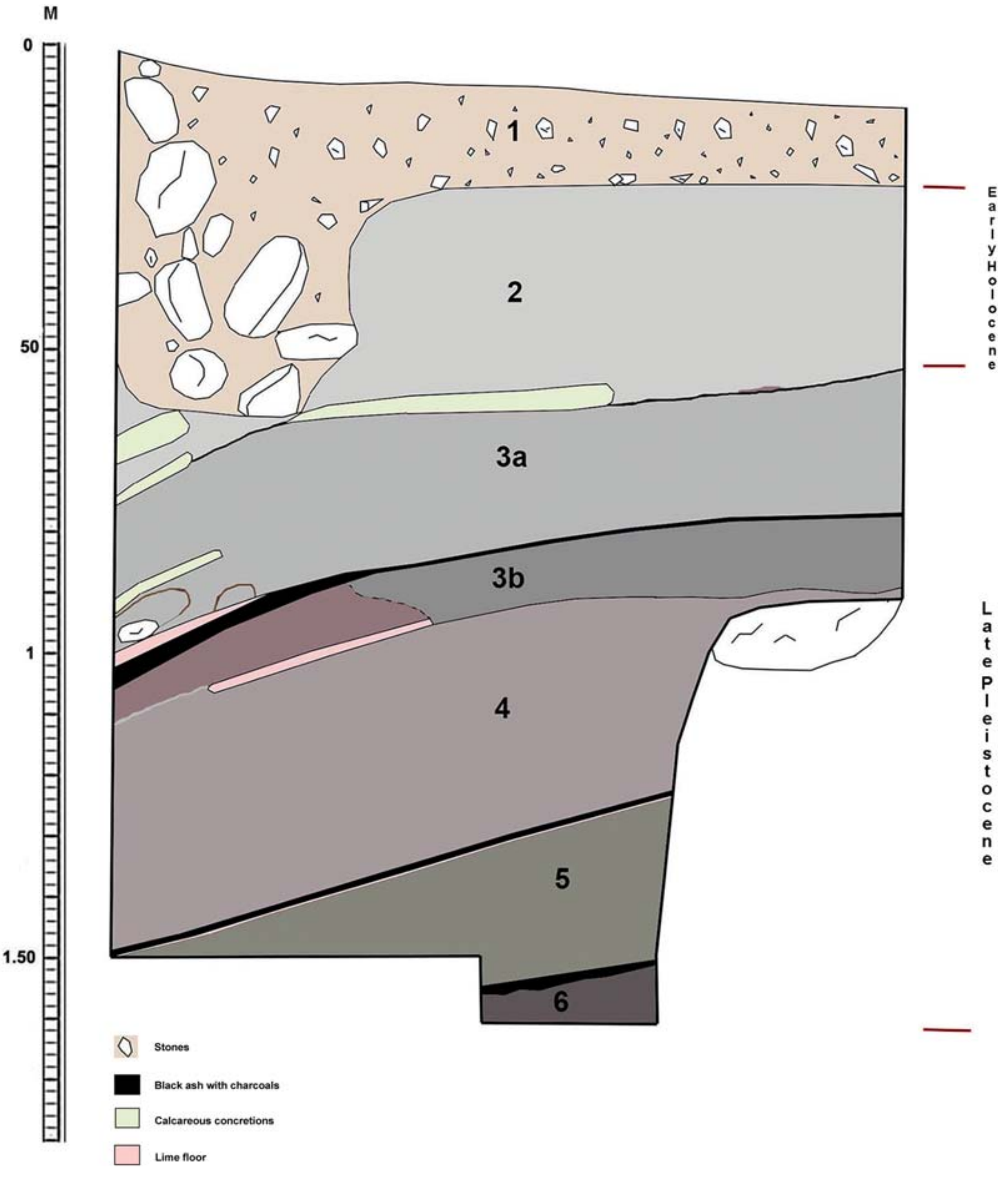

Fig. 5. South profile of the 2020 trial excavation trench.

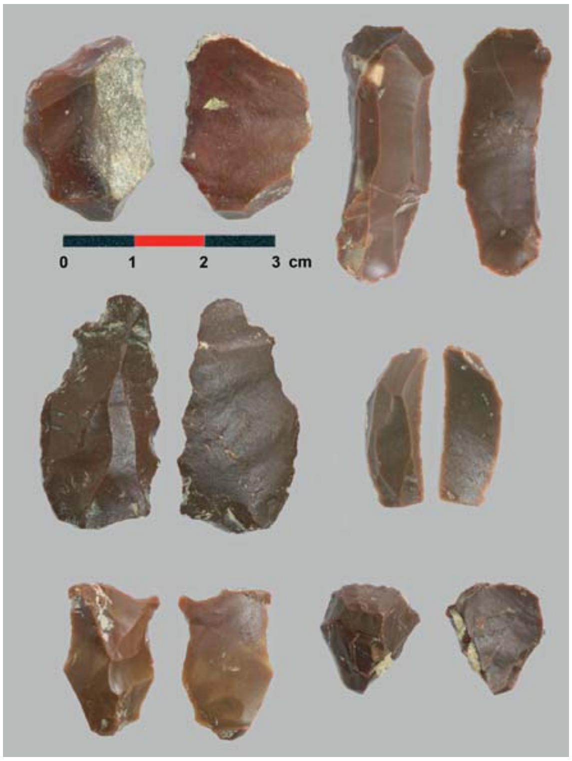

Fig. 6. A representative sample of the early Holocene chipped stones from Girmeler.

Chipped Stone from the Early Holocene Layers

All chipped stone artefacts found in the early Holocene layers of the 2020 sounding, as well as the 2014 excavation, were evaluated together as they were fairly homogeneous in terms of raw material and techno-morphological features (Fig. 6). Radiolarite appears to be the main raw material (80%) and probably comes from stream beds near the cave. Its quality varies. Most of the blocks are almost impossible to knap because of natural cracks. A few are very fine grained and homogeneous. 6% of the chipped stones are made on flint. There are of various colours and quality. 14% of the chipped stones were significantly altered by fire exposure and their raw material cannot be recognised. The artefacts are always quite small. The *chaînes opératoires* were dependent on the quality of the raw materials. The aim of knapping on radiolarite was first to produce blades when it was possible. There are only two blade cores (Fig. 7, n° 7) and 41 blades (Fig. 7, n° 1-4). The blade cores present bipolar blade removals. The debitage was probably performed on site. The shaping of the cores and the management of the blade knapping were first dependent on the bad quality of the blocks exploited. Most blades were detached by direct percussion, probably with a soft stone. A few examples may have been produced with the indirect percussion technique. Flakes were also produced on site. There are four flake cores, and numerous flakes and waste.

Flint was also knapped for flake production. There is only one blade (Fig. 7, n° 5). There are 54 tools (Table 1). The majority corresponds to blanks used directly without any retouch or retouched to re-sharpen the edges after use (23 "used" blanks, 10 splintered pieces, 6 artefacts with lateral retouch). Blanks modified before use are rarer: there are 6 scrapers, 6 borers, one beak, one burin (Fig. 7, n° 6, 9-13). The use of the microburin technique is possible on one blank (Fig. 7, n° 8). Geometrics are completely absent.

Used	*Splintered piece*	*Lateral retouch*	*Scraper*	*Borer*	*Beak*	*Microburin?*	*Burin*	*Total*
23	10	6	6	6	1	1	1	54

Table 1. Toolkit from the Early Holocene layers at Girmeler.

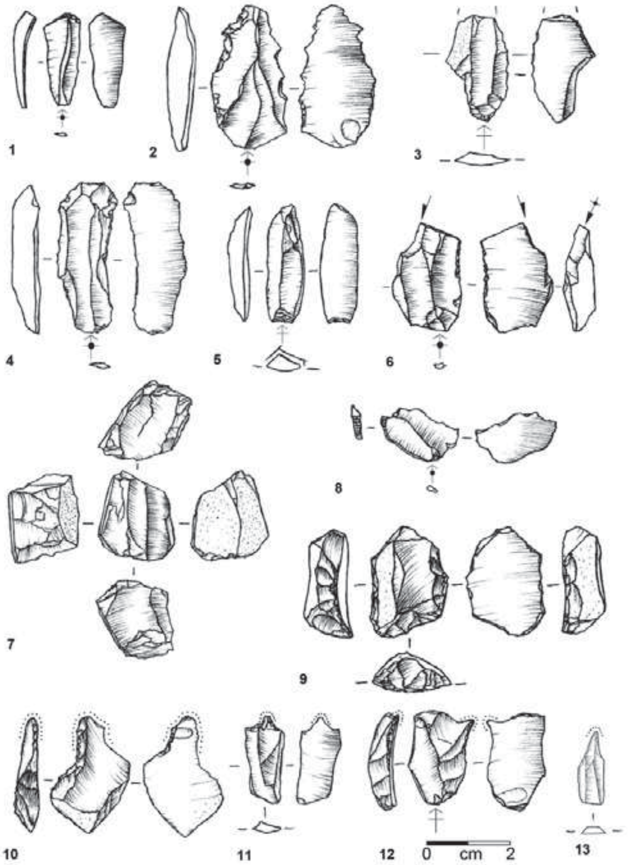

Fig. 7. Chipped stones from the early Holocene contexts at Girmeler. 1-5 blades; 6 burin on blade; 8 flake with truncation or microburin; 9 scraper on flake; 10-11 borers; 12 borer on a flake from a blade core.

Chipped stones from the Late Pleistocene layers

Preliminary evaluation of the selected chipped stones from the Late Pleistocene layers shows that radiolarite was the main raw material. Several varieties of flint with different colours and quality were also recognized. Cores, flakes and debris show that all stages of knapping activity took place at the site.

The aim of knapping on radiolarite and flint was first to produce bladelets. Most of them were used directly without any retouch. There are also flakes which could not be clearly associated with bladelet production. Bladelets are produced in a unipolar system using the direct percussion technique. The opposite direction of removal is rarely seen. The unipolar cores are generally pyramidal and prismatic (Fig. 9, n° 15-16). The sizes of these exhausted cores are less than 30 mm.

The late Pleistocene chipped stone assemblages of Girmeler is characterised by geometric and none-geometric microliths (Fig. 8; Table 2). A total of 7 geometric microliths (13%) consists of 6 lunates and 1 isosceles triangle (Fig. 9, n° 1-4). Lunate lengths are between 24,05 mm and 9,30 mm. The isosceles triangle is 20,08 mm. Current data indicates that geometric microliths are less than 25 mm. One of the lunates has a semi-abrupt shaping retouch, the others have abrupt retouch. One of the geometrics has an alternating abrupt retouch.

Backed bladelets (38%) are the most common non-geometric microliths (Fig. 9, n° 5-7). They vary depending on size, retouch and form. Straight and curved-shaped backed blades are attested and have usually abrupt retouch and rarely semi-abrupt retouch. These retouches were applied as uni-directional or bi-directional. Obliquely truncated bladelets and pointed bladelets are rare. End scrapers are also characteristic, the largest is 35,40 × 17,06 × 5,49 mm and the smallest 11,97 × 9,39 × 3,33 mm (Fig. 9, n° 12-14).

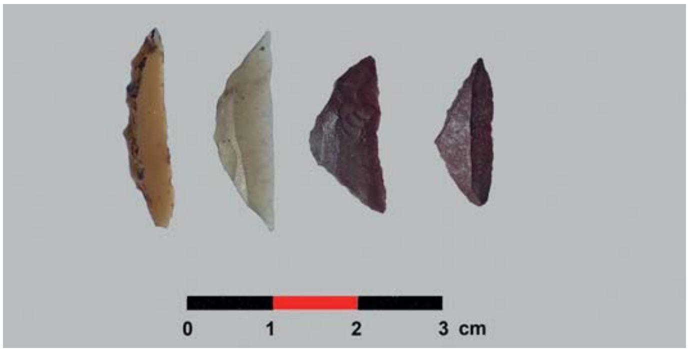

Fig. 8. A representative sample of the late Pleistocene microlithics from Girmeler.

Geometric microliths	*Backed bladelet*	*Truncated bladelet*	*Pointed bladelets*	*Retouched bladelet*	*Scraper*	*Retouched pieces (broken)*	*Total*
7	21	4	2	7	10	4	55

Table 2. Toolkit from the Late Pleistocene layers at Girmeler.

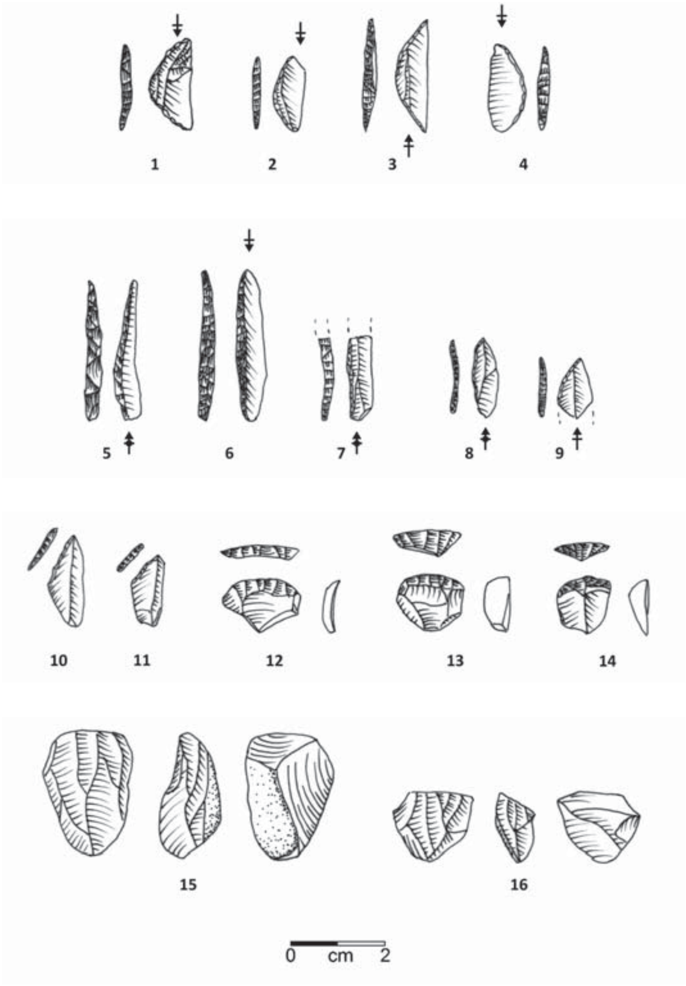

Fig. 9. Chipped stones from the late Pleistocene contexts at Girmeler. 1 isosceles triangle; 2-4 lunates; 5-7 backed blades; 8-9 pointed bladelets; 10-11 truncated bladelets; 12-14 scrapers; 15-16 cores.

Shell ornaments and other finds

All shell ornaments are made from marine molluscs, and were brought to the site from the shores of the Mediterranean Sea, which is at present today about 40 km away. The ornaments consist of shells of *Tritia gibbosula* (known as *Nassarius* or *Arcularia gibbosula*), *Columbella rustica* and *Dentalium*. 18 complete *Columbella rustica* and 11 complete *Tritia gibbosula* were found in sounding layers 3-6 (Fig. 10). All shells are perforated. 10 *Dentalium* were also found in sounding layers 3-6. Some of them are small ring shaped beads, cut from larger specimen.

The same shell ornaments have also been attested in the Epi-Palaeolithic Öküzini Cave in Antalya and Direkli Cave in Maraş. (Albrecht *et al.* 1992; Yalçınkaya *et al.* 2002; Baysal 2016). The same species were also discovered in Antalya Karain B where the earliest

Fig. 10. Late Pleistocene shell ornaments from Girmeler.

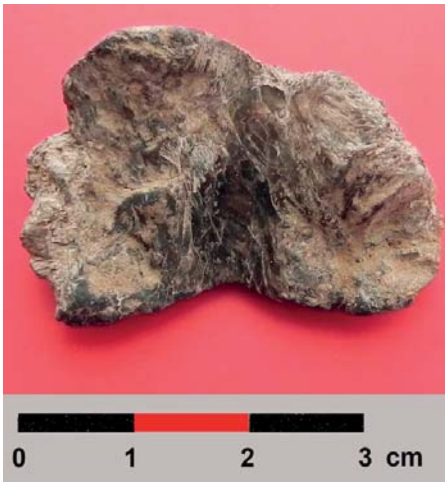

Fig. 11. A late Pleistocene shaft straightener from Girmeler.

specimens are dated to the Upper Palaeolithic period (Özçelik 2015). Again, the same shell ornaments were found in the early Epi-Palaeolithic layers of Pınarbaşı in Central Anatolia (Baysal 2013).

Finds other than shell ornaments are scarce. A shaft straightener and four bone awls were discovered in the late Pleistocene layers (Fig. 11).

ZOOARCHAEOLOGY AT GIRMELER: PRELIMINARY RESULTS

This section presents the preliminary results of the ongoing zooarchaeological research at Girmeler Cave. Although the analysed context dates to the well-defined deposits of the late 9th and the early 8th millennium BC wattle-and-daub structure, a new and rigorous excavation and dating program is currently under way to examine the stratigraphy and reveal its exact nature. This will eventually lead to a better understanding of the sub-strata and enable us to establish clearer relationships between features, tool assemblages, and archaeofaunal assemblages. From the onset, it is important to note that this analysis excludes a small fish assemblage to be dealt with separately in due course.

In order to characterize the assemblage and to identify taphonomic agents responsible for bone accumulation, modification, and destruction, a total of 1651 specimens including every skeletal element and nonidentified bone splinters were recorded and examined first by naked eye and then with a 15× hand lens under strong light, if necessary, for bone surface modifications.

As far as the macrofaunal assemblage is concerned (N=918), traces of carnivore ravaging, rodent marks, weathering, and root etching are very sporadic and extremely rare in the Girmeler assemblage. Origins of break data show that 99.8 percent of the 496 recorded specimens were fragmented during the pre-depositional stage with 57 percent of the fracture surfaces retaining sharp edges and 43 percent showing a mixed pattern with both sharp and eroded surfaces. The degree of fragmentation is high with non-identified limb bone fragments (27.3%), nonidentified long bone shaft fragments (23.7%), nonidentified skeletal fragments (12.1%), and nonidentified bone splinters (12.1%) accounting for 75.2 percent of the entire assemblage. As a result, the degree of identifiability to specific skeletal element and taxon is remarkably low.

This evidence would suggest rapid burial events and intensive site occupation and maintenance with foot traffic or trampling. Combined with a high ratio of burnt or carbonized (26% of the entire assemblage) and cut-marked specimens, it is plausible to rule out a role for carnivores and other biotic and abiotic taphonomic filters. The taphonomic analysis suggests that the Girmeler macrofaunal assemblage was accumulated, modified, and destroyed largely by cultural processes. The present fragmentation pattern partly reflects exhaustive processing of carcasses by humans when bones were in a fresh state before they were buried and deposited rapidly.

As to the microfaunal assemblage (N=720), it is important to note that all of the 720 specimens came from Trench A and the presence of loose maxillar or mandibular teeth (N=112; 15%), mandibles with teeth (N=157; 22%), and limb bones (N=451; 63%) indicate that this assemblage was most likely introduced into the sediments in owl pellets. Caves are often occupied by other animal species including raptors and their presence and nature of their prey may offer implications about the site formation processes, site function, and duration and seasonality of occupation. Site setting, size of cave, position of exits, potential conflict between the flight paths of raptors and human use of caves are important factors in better understanding of alternating seasonal use of caves by humans and owl (Pokins 2001).

Taxonomic Composition

Table 3 details taxa identified in the Girmeler assemblages with their relative abundance based on NF (Number of Fragments), MNE (Minimum Number of Elements), and BW (Bone Weight in Grams). The identified taxa include caprines (sheep/goat), fallow deer, roe deer, wild boar or pigs, and European hare in varying proportions. The remains of caracal, red fox, marten, and hedgehog are also present in marginal numbers, but their status as food animal is not certain. It is clear that remains of large game are predominant in the assemblage as a general pattern. If we turn to principal taxa in general and ungulates in particular, and extrapolate from the available data after proportionally allocating the remains of medium mammal and medium artiodactyl, we identify a clear pattern in which fallow deer, wild goats, and wild boar/pigs are predominant in the assemblage. The caprine assemblage was likely made up entirely of goats as no specimen could be specifically identified to sheep. Based on the lack of robust biometric data (i.e., age, sex, and size) that

Taxonomic ID	**NF**	**MNE**	**BW (GR)**
Mammalian Macrofauna			
Ovis/Capra (sheep/goat)	18	18	50
Capra aegagrus (wild goat)	1	1	5
Capreolus capreolus (roe deer)	2	2	4
Dama dama (fallow deer)	14	10	70
Sus scrofa (wild boar)	6	6	18
Lepus europaeus (European hare)	8	8	15
Erinaceus concolor (white-breasted hedgehog)	1	1	2
Martes martes (European pine marten)	1	1	2
Vulpes vulpes (red fox)	5	5	6
Caracal/Lynx sp. (caracal)	5	5	14
Small carnivore	1	1	1
Small mammal (rabbit to medium dog)	19	0	9
Medium artiodactyl	390	7	619
Medium carnivore	1	1	3
Medium mammal (medium dog to medium sheep)	446	0	285
Mammalian Macrofauna total	**918**	**66**	**1103**
Mammalian Microfauna			
Rodentia	720	720	147
Mammalian Microfauna Total	**720**	**720**	**147**
Other			
Testudo graeca (spur-thighed tortoise)	12	0	17
Decapoda (e.g., crab)	1	1	1
Other Total	**13**	**1**	**18**
Grand Total	***1651***	***787***	***1268***

Table 3. Animal taxa identified in the early Holocene Girmeler Assemblage.
NF: Number of Fragments; MNE: Minimum Number of Elements; BW: Bone Weight in grams.

could serve to distinguish between wild and domestic ungulates, goat and pig specimens were assigned wild status. The complete lack of or underrepresentation of wild sheep at Girmeler has to do with the local paleoecology and topography, reflecting mountainous wild goat habitats with uneven terrain, steep slopes and rocky escarpments. The presence of both fallow deer and roe deer suggests exploitation of more open country and gallery forests and dense, insular forests and high-elevation meadows.

To summarize and conclude, based on the evaluation of the currently available preliminary data, the Girmeler assemblage represents a generalized foraging strategy with increased duration of occupation and increased multi-seasonal site use in an ecotonal zone with a diverse resource base. The inhabitants had the technology and knowledge to exploit a wide array of animal taxa including large game, slow and small game (tortoise), and quick and slow game (hare).

There are still wide temporal and spatial gaps in our understanding of the nature of the Pleistocene-Holocene transition and its temporality and directionality in eastern, southern, central, and western regions of Anatolia. In the southern and southwestern (i.e., the Mediterranean) regions of Anatolia, most of what we know about the Late Pleistocene-Early Holocene transition come from the Karain B and Öküzini caves (Atici 2011a, b). But these fillings are quite mixed. There are no similar sites, however, with sequences encompassing Pre-Pottery Neolithic and Pottery Neolithic in this region, preventing us from developing a diachronic picture of animal exploitation strategies. In the central and western regions of Anatolia, we face an opposite trajectory missing sequences dating to the earlier part of Epipaleolithic, but yielding Pottery Neolithic and Pottery Neolithic sequences. Thus, although direct comparison and meaningful articulation and synthesis of data through time and across geographical regions of Anatolia are not possible at the moment, we can still draw parallels.

In the Epipaleolithic of southern and southwestern Anatolia, a trend from a specialized caprine hunting to a dietary expansion is evident by 12,500 cal BC and onwards with increased fallow deer hunting and the addition of high-yield tertiary taxa such as roe deer and wild boar, small and fast-moving taxa such as hare and partridge, and small and slow-moving taxa such as tortoise (Atici 2011). This dietary breadth expansion then may have led to changes in patterns of site use and seasonality of hunting, with a shift from restricted seasonal to multiseasonal site use, i.e., increased sedentism. Zooarchaeological data from central Anatolian sites like Boncuklu, Aşıklı Höyük, and Pınarbaşı, too, fit well into the broad-spectrum foraging (a.k.a. Broad-Spectrum Revolution), with differential emphases on diverse wild ungulate and small animal species such as the fox and hare, aquatic and terrestrial birds, and tortoises (Baird *et al.* 2018; Carruthers 2004; Stiner *et al.* 2014). At Aşıklı, Mary Stiner and colleagues (2014) report a broad meat diet featuring wild ungulate and small animal species in Level 4 and document how this pattern evolved into the management of sheep in just a few centuries. Similarly, Carruthers (2004) identifies the same dietary expansion at Pınarbaşı A with a dual emphasis on aurochs and caprine hunting, followed by a secondary reliance on wild equid and boar hunting, and a tertiary exploitation of the fox, hare, and aquatic birds. At the nearby 10th/9th millennia site Boncuklu, Baird and colleagues (2018) describe a contrasting subsistence strategy relying on aurochs and boar hunting, supplemented by fishing and wild fowling.

In light of the foregoing discussion, the broad-spectrum animal resource exploitation or niche expansion strategy as documented at Girmeler entails a primary reliance on wild ungulates including fallow deer and wild goats, a secondary exploitation of wild boar and roe deer, and a supplementary small game hunting with the fox, hare, and tortoise. This pattern aligns well with observed changes in the Western Taurus animal exploitation at the end of the Pleistocene, as documented for Öküzini Cave Phase VI, reflecting multi-resource scheduling toward resource intensification, diversification, and sedentarization (Atici 2011; Çakırlar and Atici 2017).

Benjamin Arbuckle and colleagues (2014) integrated zooarchaeological data from 17 sites in Turkey, spanning the Epipaleolithic through Chalcolithic periods, to document the initial westward spread of domestic ungulates across Neolithic central and western Turkey. According to the authors, one of the routes delivering domesticates from Anatolia into Europe followed a coastal route along the Mediterranean and the Aegean. With its key geographical position and its proximity to key Anatolian regions including the Western Taurus, the Lakes District, and the Aegean, future excavations and new and comprehensive bioarchaeological (i.e., archaeobotanical and zooarchaeological) datasets from Girmeler will significantly enhance our understanding of the development of farming in the westernmost region of Anatolia and western movement of farming and domesticated animals during the Neolithization process.

ARCHAEOBOTANICAL REMAINS: PRELIMINARY OBSERVATIONS

Preliminary observations concerning macrobotanical plant remains at Girmeler provides some important insights for the vegetation around the site and aspects of plant use by the inhabitants. The samples derive from two different excavation areas: the well-defined deposits of the late 9th/early 8th millennium BC wattle and daub structure (Takaoğlu *et al.* 2014), and the deposits of the 2020 trial excavation trench.

Archaeobotanical analyses of these samples are ongoing. Initial observations to date reveal that plant remains are moderately well-preserved, especially in the Early Holocene layers. Most of the plant remains are carbonized; however, there are also mineralized remains such as fruit stones of hackberry (*Celtis* sp.), and nutlets of borage family (Boraginaceae) (Table 4). Each component is counted as one when preserved whole. Fragmentation, however, is very common in the assemblage (see below). The counting of the macrobotanical remains, therefore, is based on estimating the "minimum number of items" (MNI), except for fruits and nuts, and awn fragments. At this stage of the research, these remains are counted only as fragments. The diagnostic features of grains, the apical and embryo ends, are counted separately, and the most frequent among them is recorded. For pulses and wild plant taxa, the embryos, or similar diagnostic parts, and for chaff remains, glume bases and upper nodal parts of rachis segments are counted. Hackberry fruit stones are fragmented in some samples. These fragments were estimated through the attachment points of the fruit stones.

Plant remains identified, so far, from the structure consist of grains and chaff remains of grass family (Poaceae), seeds of legume family (Fabaceae), wild mustard family (Brassicaceae),

Plant Taxa	**Components**	**2013 Structure Samples (n=7)**	**2020 Trial Trench Samples (n=3)**	**Total**
Poaceae				
Hordeum sp.	Grain MNI	1	0	1
cf. *Hordeum* sp.	Grain MNI	4	0	4
Hordeum sp.	Rachis internode	16	0	16
Taeniatherum caput-medusae	Seed MNI	1	0	1
Triticum sp.	Glume base	10	1	11
cf. *Triticum* indeterminate	Grain MNI	0	0	0
cf. *Stipa* sp.	Seed MNI	1	0	1
cf. *Stipa* sp.	Awn fragments**	268	0	268
Poaceae small-seeded	Seed MNI	1	0	1
Poaceae-Cereal type	Grain MNI	3	0	3
Poaceae-Indeterminate	Seed MNI	8	3	11
Poaceae-Indeterminate	Rachis internode	8	0	8
Brassicaceae				
Brassicaceae-Indeterminate	Seed MNI	4	0	4
Fabaceae				
Fabaceae small-seeded	Seed MNI	4	0	4
cf. Fabaceae small-seeded	Seed MNI	1	0	1
Fabaceae large-seeded	Seed MNI	1	0	1
Cistaceae				
Helianthemum sp.	Seed MNI	8	0	8
cf. *Helianthemum* sp.	Seed MNI	4	0	4
Scrophulariaceae				
Verbascum sp.	Seed MNI	4	1	5
Characeae				
Chara sp.	Seed MNI	2	0	2
Boraginaceae				
Alkanna sp. (mineralized)	Fruit MNI	1	0	1
Chenopodiaceae				
Salsola sp.	Seed MNI	1	0	1
Chenopodiaceae-Indeterminate	Seed MNI	0	1	1
Polygonaceae				
cf. *Rumex* sp.	Seed MNI	1	0	1
Wild plants-Indeterminate				
Wild plant seed	Seed MNI	29	0	29
Wild plant seed (mineralized)	Seed MNI	1	1	2
Fruits/Nuts				
Celtis sp.	Whole	2	30	32
Celtis sp.	Fragments MNI*	2	1	3
Prunus type- whole fruit stone	Whole	0	1	1
Fruit stone/nut shell-Pistacia type	Fragments**	11	8	19
Fruit stone/nut shell-Indeterminate	Fragments**	10	16	26
Fruit/nut kernel type	Fragments**	0	7	7
Amorphous remains (ml)	Fragments (ml)	0,05	0,07	0

Table 4. Plant taxa identified in the Girmeler Assemblage. MNI: minimum number of items; (ml): millilitres. * Fragments converted to MNI. ** Counts of fragments.

rock-rose family (Cistaceae), and nutlets of figwort family (Boraginaceae). Few whole and some fragmented hackberry fruit stones (elm family-Ulmaceae) are also present in the building contexts. Some fragments of carbonized fruit stones might belong to wild pistachio (*Pistacia* sp.); however, no whole fruit of this taxon has yet been identified.

Among Poaceae chaff the rachis segments of barley (*Hordeum* sp.), possibly wild, appears to be a common plant component in the assemblage. Awn fragments identified as Stipa type are also common, occurring almost in each sample. Their widespread presence raises the question whether they originate from plant-related activities that the inhabitants might have conducted, such as the processing of grains for consumption and throwing the chaff/cleaning residue into the fireplace. However, such interpretations need support with further evidence. Glume bases of glume wheats (*Triticum* sp.) are also present in the samples, but they rarely occur. The glume bases found so far are in fragmented conditions. This prevents further taxonomic examination. Poaceae grains are generally very fragmented with corroded surfaces. Some of the grains possibly belong to barley (cf. *Hordeum* sp.), wheat (cf. *Triticum* sp.) and feather grass (cf. *Stipa* sp.).

Samples from the 2020 trial excavation trench mainly contain wood charcoal. Other identifiable plant remains are rare. In the Early Holocene deposits, one sample (Sounding Layer 2) contains hackberry fruit stone fragments, several wild plant seeds consisting of fragmented and badly preserved Poaceae grains and *Verbascum* (Scrophulariaceae) seeds, and one goose foot family (Chenopodiaceae) seed. A glume base from this sample could be identified as a tetraploid type (*Triticum turgidum*/*timophevii* type).

A sample from the Late Pleistocene deposit (Sounding layer 3) yields hackberry fruit stones, almost all preserved whole (n=30), together with pistachio-type fruit fragments. Few amorphous remains found in this sample might belong to the fragments of a certain fruit or nut flesh. Another sample (Sounding layer 5) contained few plant remains, consisting of wood charcoal and a small whole Prunus type fruit stone.

Further research involving more samples and contextual analyses is required to make elaborate interpretations about the inhabitants' diet, daily activities, and to raise the discussions regarding the importance of gathering or cultivation practices, and the inhabitants' relationship with their environment. These preliminary observations indicate that different plants from the surrounding were available to the inhabitants, and at least some were likely to be part of the diet such as hackberries, and glume wheats, and possibly also others such as different Poaceae grains.

Discussion and Concluding Remarks

Girmeler presents a long sequence of human occupation that allows for the evaluation of the environmental conditions and the periods of human occupation during the Late Pleistocene and much of the Holocene in Western Anatolia.

In Anatolian archaeology the Neolithic period starts immediately after the end of the Younger Dryas, when the Holocene climatic regime began. The Aegean Early Holocene sites are called Mesolithic while the emergence of agricultural communities in the 7th millennium BC is considered the beginning of the Neolithic period in the Aegean. On one hand the early Holocene communities in the Aegean, Cyprus and Central Anatolia show the same general trend. On the other hand, they have their own regional idiosyncratic features. All are characterized by a sedentary community engaged in intensive hunting. Comparisons between Aegean, Central Anatolian and Cyprus PPNA communities show that people lived in oval structures. Intramural/subfloor burial customs were practiced in both the Aegean and Central Anatolia. The term sedentism is used in many different ways and encompasses a range of settlement forms. For example, Higss and Vita-Finzi (1972) defined sedentary-cum-mobile societies as "a mobile element associated with sedentary occupation". The sedentism in Central Anatolia, Cyprus and the Aegean refers to semi-sedentary or quasi-sedentary mobility patterns wherein macro bands at base camp settlements are annually inhabited by at least some members of the group, for example, the aged. It seems that each environment developed its own pattern of sedentism. Archeozoological and archaeobotanical data suggest that the quest for food becomes quite diversified. Subsistence at Central Anatolian sites was mostly dependent on the gathering of wild food resources and the hunting of wild animals (Baird *et al.* 2018; Özbaşaran 2012; Stiner *et al.* 2014; Ergun *et al.* 2018). Pre-pottery Neolithic Aşıklı Höyük and Boncuklu communities also practised agriculture, but Pre-pottery Neolithic Pınarbaşı did not. Agriculture was also practised at Cyprus PPNA sites (Vigne *et al.* 2012). Domestic animals were not present in all regions, but in Aşıklı Höyük and Boncuklu ovicaprids, in Maroulas pigs and in the Cyclops Cave goats, were managed (Baird *et al.* 2018; Sampson 2014; Stiner *et al.* 2018; Buitenhuis *et al.* 2018). The subsistence strategy of Girmeler is similar to Pre-pottery Neolithic Central Anatolia as well as Cyprus PPNA, which was mostly dependent on the gathering of wild food resources and the hunting of animals. Glume wheats were also a real component of the subsistence strategy.

Some researchers have emphasized that there was a migration from the east, especially from the Levant to the Western Anatolian coasts in the early Holocene (Horejs 2019). Although DNA studies on early Holocene human skeletons of Girmeler[2] are still in their infancy, initial results show that they are related to Boncuklu people, who lived between 10,300 and 9500 years ago in Central Anatolia[3]. This would suggest that early Holocene Girmeler people belonged to the same population, the earliest Neolithic central Anatolians.

Radical changes in the chipped stone industry between the late Pleistocene and the early Holocene at Girmeler have been determined. The early Holocene assemblage at Girmeler is characterized not only by a small microlithic component and the almost total absence of geometric microliths but also manufacturing techniques that relied on the use of direct percussion and poor quality raw material. The Aegean Early Holocene lithic traditions are often described by the intensive presence of "flake based micro-industries" (Kaczanowska

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[2] Three burials were found in the early Holocene layers of Girmeler during previous excavations. Two of them were probably intentionally burned. Another burial of a middle-aged female has been buried in the hocker position and a large stone has been placed in his skull.

[3] DNA research on skeletons found in Girmeler was performed by the ERC-funded project NEOGENE: Archaeogenomic Analysis of Genetic and Cultural Interactions in Neolithic Anatolian Societies. Although the results have not been published yet, we thank Mehmet Somel and his team for their information.

and Kozłowski 2014), which are deemed to be different from the Anatolian and Near Eastern traditions, that are typically based on blade/bladelet production. The Girmeler community living at the site during this period did not get good raw materials from distant regions, but rather used poor quality local raw materials. They tried to produce blades when it was possible. They used these blanks directly or with a minimal retouch, with a few exceptions. Such a strategy is quite similar to that observed in contemporary Aegean Early Holocene lithic traditions (i.e. Kerame I and Maroulas). Although the current excavations are early to make definitive comparisons, our first observations show that the Girmeler chipped stone assemblages are different from the Antalya settlements (i.e. Öküzini) characterized by the frequency of geometrics. It also differs from Cappadocia, Cyprus and Levant where specialized productions of bipolar blades were related to the use of arrowheads and spearheads.

Girmeler late Pleistocene strata can be compared with contemporary Phase 3 (layers IV through la) sequence at Öküzini Cave in Antalya Geometric microliths, mostly lunates, triangles and trapezes are very common at this sequence of Öküzini Cave. Although geometric microliths are characteristic in Girmeler, their numbers are few. Microliths in Girmeler mostly consist of backed blades. In addition, macroliths have a large proportion (54%) in Öküzini Cave (Kartal 2009: 123), but there are almost none in Girmeler and end scrapers as well as unretouched bladelets are abundant. The late Pleistocene site of Ouriakos, similar to Girmeler is characterized by microlithic lunates and backed bladelets with some end scrapers and burins. Like Öküzini Cave, microlithic lunates are abundant in Ouriakos (Efstratiou *et al.* 2014).

In the Late Pleistocene Girmeler, the collection of nuts and fruits, as well as hunting, appear to have played an important role in diet. As thought in Öküzini Cave (Martinoli 2004), Girmeler may have also been inhabited periodically in every season, but especially in spring and autumn.

Girmeler seems to be one of the important sites where we can best understand the transition period from the Late Pleistocene to the early Holocene according to our current knowledge in the Aegean. Future work at the site can hopefully contribute to longstanding debates surrounding the origin of the Neolithic way of life in the Aegean.

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