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A Multiproxy Approach to Identify Occupation and Mobility Patterns of a Pastoral Community of the Late Fourth Millennium at Arslantepe (Period VI B1) Eastern Turkey

Giulio Palumbi, Marcella Frangipane, Francesca Balossi Restelli, Susanna Cereda, Paola Iacumin, Rana Özbal, Burhan Ulaş

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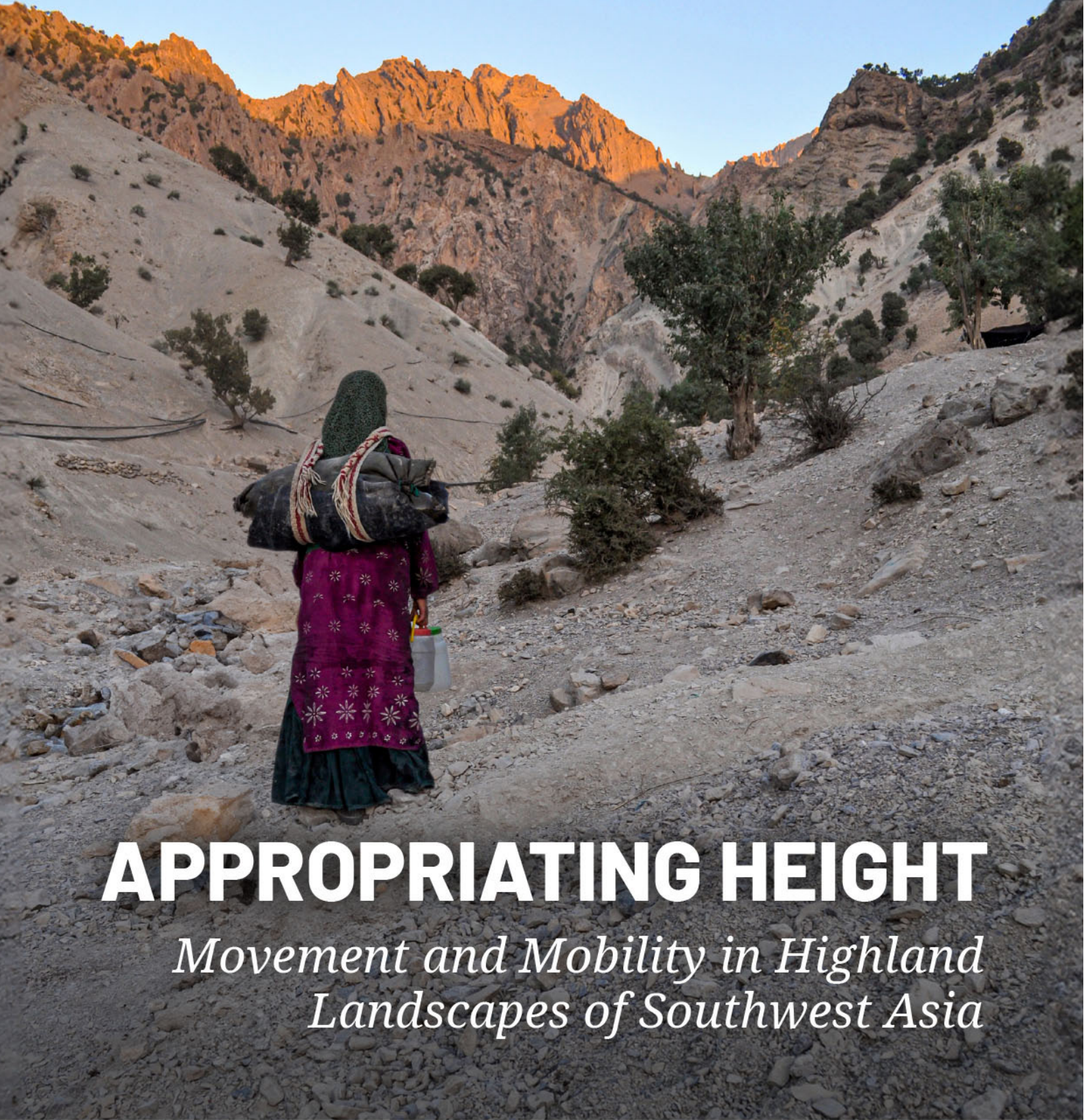
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APPROPRIATING HEIGHT

*Movement and Mobility in Highland
Landscapes of Southwest Asia*

SEPIDEH MAZIAR & BARBARA HELWING (EDS)

THE IRANIAN HIGHLANDS EARLY SOCIETIES BETWEEN RESILIENCE AND INTEGRATION

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Series Editors: Reinhard Bernbeck, Wouter F.M. Henkelman, Susan Pollock, Thomas Stöllner, Judith Thomalsky



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A Multiproxy Approach to Identify Occupation and Mobility Patterns of a Pastoral Community of the Late Fourth Millennium at Arslantepe (Period VI B1) Eastern Turkey

Giulio Palumbi, Marcella Frangipane,
Francesca Balossi Restelli, Susanna Cereda,
Paola Iacumin, Rana Özbal, Burhan Ulaş

Abstract

The paper discusses pastoralism within the context of a case study at Arslantepe (Malatya) in Eastern Turkey during Period VI B1, which dates to the end of the fourth millennium BCE. This period saw significant changes in the settlement's architecture and occupation patterns following the destruction of the Uruk period's monumental palatial complex. The paper employs a multiproxy as well as a multiscalar approach, integrating material culture, geoarchaeological, and bioarchaeological evidence. The results reveal that the community in VI B1 practiced both transhumant pastoralism reaching as far as the highlands of East and Central Anatolia and small-scale farming. This suggests that the community had a mobile lifestyle while maintaining a connection to the settlement.

Keywords: Mobility, pastoralism, transhumance, East Anatolia, Arslantepe, Early Bronze Age

چکیده

این مقاله به بررسی چراگردی در شرق ترکیه با تمرکز بر مرحله VI B1 ارسلان تپه (ملطیه) در پایان هزاره چهارم پیش از میلاد می‌پردازد. به دنبال ویرانی مجموعه کاخ‌های عظیم دوره اروک، در دوره مورد مطالعه شاهد تغییرات بنیادین بسیاری در معماری این محوطه و الگوهای سکونت در آن هستیم. در این جستار رهیافت‌های چندمقیاسی و چندمتغیره شامل بررسی داده‌های به دست آمده از فرهنگ مادی، شواهد زمین‌باستان‌شناسی، و زیست‌باستان‌شناسی را به کار برده‌ایم. نتایج این پژوهش نشان می‌دهد که جوامع ساکن در ارسلان تپه در دوره VI B1 هر دو شیوه چراگردی رمه‌گردانی که تا ارتفاعات شرقی و مرکزی آناتولی گسترده بوده، و نیز کشاورزی در مقیاس کوچک را به کار می‌بسته‌اند. این امر حاکی از آن است که این جوامع در عین حفظ ارتباط با محل استقرار خود، سبک زندگی سیاری داشته‌اند.

کلمات کلیدی: جابه‌جایی، چراگردی، رمه‌گردانی، شرق آناتولی، ارسلان تپه، مفرغ قدیم

Introduction

by Giulio Palumbi and Marcella Frangipane

A recent overview of the archaeology of mobility (Beaudry and Parno 2013) highlights how questions related to human movement are themes that constantly characterized the history of the archaeological discipline since the writings of O. Montelius, and G. Kossinna. Since then, tracing the movement of raw-materials, artefacts, languages, genes, and ideas has been, and still is, one of the main challenges of the archaeological research aimed at detecting patterns of mobility of human communities and their products.

In spite of the already existent immense literature on these topics, human mobility continues to represent a source of endless interest for both social and 'natural' sciences. On the one hand, this is due to the fact, as T. Cresswell pointed out (2006, 1) "the nature of mobility remains often slippery and intangible thus making it an elusive object of study" in constant need of conceptual redefinitions. On the other hand, this is also because new scientific methods are continuously developed to produce new proxies for tracing movement with increasing resolution in both temporal and spatial terms, as will also be illustrated in this paper (cf. section 4).

In any case, as pointed out by T. Cresswell (2006, 2), human movement cannot be simply reduced to the abstract concept of displacement from location "A" to location "B", since it is a complicated process involving "contents and practices as well as innumerable factors shifting at different rates" (Beaudry and Parno 2013). Environmental and human factors transform the abstract process of movement into practices of mobility that need to be contextualized and defined according to multiple dimensions: adaptive choices, economic strategies, political negotiations, as well as social and cultural dynamics embedded in mobility.

Among the fundamental activities that shaped human subsistence and socio-political systems at once, animal herding is inextricably linked to mobility. As Dyson-Hudson and Dyson-Hudson pointed out (1980, 17),

"[...]livestock husbandry and mobility are frequently associated because the livestock must be fed regularly throughout the year, and especially in those regions with marked seasonality, where the production, harvest, and storage of fodder is not an available option, migration to exploit seasonal pastures represents the best strategy for maintaining a regular supply of food for livestock."

Strong relations between animal herding and mobility are attested since the early stages of the domestication in Late PPNB Syria (Gourichon 2004, 350; Arbuckle and Hammer 2019, 403–4), Levant (Honeychurch and

Makarewicz 2016, 343–44; Makarewicz 2013, 161; Rollefson, Rowan, and Wasse 2013) and Anatolia (Pearson *et al.* 2007), where early forms of 'pastoralism' could be identified as early as the late eight millennium BCE.

Pastoralism (from Latin *pastor*, derived from Latin *pascere* 'to pasture') is a generic term indicating the practice of exploitation of pastures in the frame of which animals play a significant (but not necessarily an exclusive) role in shaping the lives of the people who depend on them for their subsistence and economic strategies (Krader 1959, 499; Spooner 1973; Makarewicz 2013, 160; Arnold and Greenfield 2004). Basically, the essence of pastoralism is that people move with their animals (Harris and Fuller 2014, 109). However, as mentioned earlier, the multiple dimensions that pastoral mobility can take (Arbuckle and Hammer 2019, 393–94) may develop in a fluid continuum of forms, from village-based to fully nomadic (Khazanov 1994; Abdi 2003), that make it very hard to classify pastoral mobility in pre-conceived categories. From short daily movements to and from pastures near the settlements, to longer seasonal movements to distant and higher pastures (what is also called transhumance), to fully mobile practices from pasture to pasture throughout the year, all these different practices can be considered as forms of pastoral mobility (Harris and Fuller 2014, 109). Though we are aware of the fluidity of forms and practices that pastoral mobility can take, we think it is important, in order to approach the case study that will be presented in this paper and to contextualise it also in cultural and historical terms, to differentiate between what has been defined as "nomadic pastoralism" from "semi-nomadic or transhumant pastoralism" (Arnold and Greenfield 2004, 98; Chang and Tourtelotte 1993, 249–50). While nomadic pastoralism features a greater residential flexibility and higher degree of territorial mobility across space and time and can imply the mobility of entire households and communities, transhumant pastoralism is practiced by specific (and sometimes specialized) segments of the same household or community, who seasonally leave their settlements to move to fixed locations, according to a rather precise seasonal schedule (Arnold and Greenfield 2004). Moreover, "nomadic pastoralism" and "semi-nomadic or transhumant pastoralism" can be different in terms of their degree of investment in farming activities (Khazanov 1994, 15–25), and this may not only affect the role played by agricultural produces in the subsistence of these groups/communities, but may also shape the role played by pastoral communities in the regional economies as well as the dynamics of economic and social integration of these communities with other non-pastoral (farming-based and more sedentary) communities (Arnold and Greenfield 2004; Makarewicz 2013, 160).

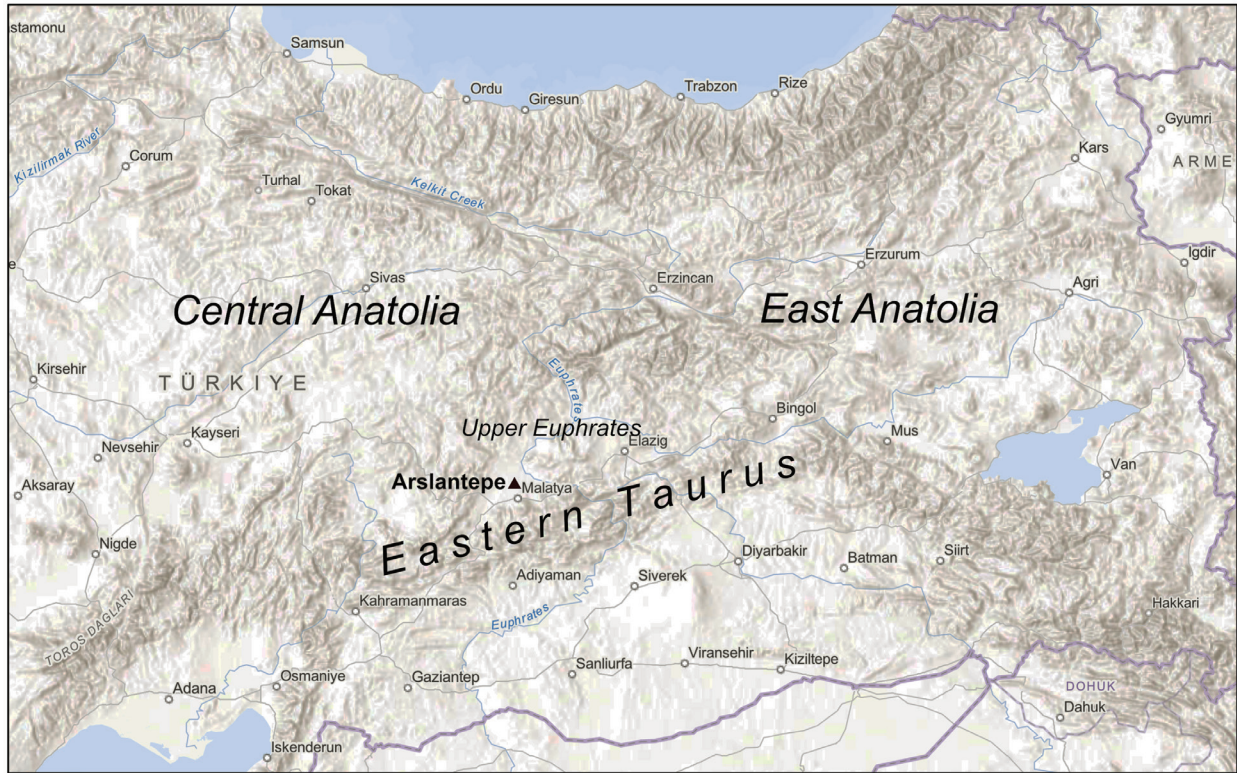


Fig. 1: Map of Central and Eastern Turkey with localization of Arslantepe. Background map: <https://www.arcgis.com/home/webmap/viewer.html>.

The geographical setting

by Giulio Palumbi

The highlands of East Anatolia (Fig. 1) are an ideal location to investigate pastoralism in its multiple forms and dimensions. In geographical terms, East Anatolia develops in direct continuity with the plateaus of Central Anatolia and gradually rises from west to east to reach 1800 m of altitude in the Erzurum basin (Kuzucuoğlu, Çiner, and Kazancı 2019). The East Anatolia plateaus are inset in a system of mountain ranges running along a SE–NW and E–W axis reaching up more than 3500 m above sea level. East Anatolia is characterized by a continental climate featuring long-lasting winters (Kuzucuoğlu 2019), with cold peaks of temperature down to -30 °C and winter snow cover remaining on the ground between November and April, contrasting with very hot summers. Phenomena of contrasted precipitations between dry plains and higher humidity zones in the highlands characterize the region (Kuzucuoğlu, Çiner, and Kazancı 2019). This allows for an abundance of grass in the well-watered mountainous areas, which is a resource that has historically encouraged the exploitation of the vast highland pastures in the frame of practices of “vertical” pastoral mobility (Kuzucuoğlu,

Çiner, and Kazancı 2019). These practices, well documented by the ethnohistorical record (Frödin 1944; Cribb 1991; Hammer 2012; Thevenin 2011), consist of seasonal transhumance between complementary seasonal pastures (Geddes 1983; Arnold and Greenfield 2002) originating from the piedmont regions and the lower plateaus of East Anatolia, as well as from the plains of Upper Mesopotamia, all very warm and dry in summertime, and reaching as far as the greener and wetter East Anatolian highlands in summertime.

The broad Malatya plain, in the region of the Upper Euphrates, is one of these ‘high’ plains (900 m above sea level) inset in the East Taurus Mountain ranges reaching up to 2,000 metres in altitude. In the hearth of the Anatolian highlands, the Malatya plain develops to the west in continuity with the Central Anatolian plateau and is connected to the more eastern (and altitudinally higher) regions through the Karasu and Murat River valleys as well as through the Bingöl Dağları and the Munzur range. In the frame of this geographical setting, the Malatya plain and its mountainous surroundings offer spaces and natural resources (water and pastures) to sustain forms of vertical pastoral mobility which is still practiced nowadays.

In the frame of this ideal geographical setting to study both ancient and contemporary pastoralism several works have focused on the material remains left by the pastoral communities that frequented or are still frequenting East Anatolia, in order to trace the spatial and temporal dimensions of their mobility as well as to reconstruct their land use and resources' exploitation strategies (Cribb 1991; Ur and Hammer 2009; Hammer 2012; Arbuckle and Hammer 2019). These works highlighted how the material remains left by these communities, though often flimsy, fragmentary, and apparently "invisible" (Hammer and Arbuckle 2023), can be detected with appropriate fieldwork and research methods.

Moving now from present or recent material evidence to that of the more distant past, how much of the remains of the prehistoric pastoral communities can actually be retrieved from the archaeological record, and to which extent is it possible to reconstruct different scenarios and practices of mobility of the prehistoric 'pastoral' communities in this same region?

In spite of the traditional skepticism considering mobile communities as often archaeologically invisible, Arbuckle and Hammer (2019) suggested that, as it will also be discussed in this paper, direct material evidence, combined with bioarcheological data and with a series of related proxies can altogether offer significant insights to identify not only the existence of these communities in the distant past, but also to reconstruct the geographical and temporal scales, the economic strategies, and finally also the social and cultural dimensions connected to their practices of mobility.

The case-study: Arslantepe Period VI B1

by Marcella Frangipane and Giulio Palumbi

Arslantepe, located 10 km west of the right bank of the Euphrates, is one of the largest settlements in the Malatya plain (Fig. 1), covering approximately 5 ha and recording a long occupation sequence stretching from the fifth millennium BCE¹ to the fourth-fifth centuries CE (Frangipane 2019a). In this paper we will focus on Period VI B1 (3200–3100 BCE), which represents an ideal case study to analyse the conduct of a prehistoric pastoral community, and to also investigate practices of mobility in the highlands of Eastern Turkey at the end of the fourth millennium BCE.

In stratigraphical terms, Period VI B1 follows Period VI A, which is marked by the construction of a monumental palatial complex with mud-brick architecture. The monumental complex of Period VI A was made up of functionally diversified and interconnected buildings, each

intended for specific political, representative, economic, and ritual functions (Frangipane 2019b). Hundreds of clay-sealings found in this complex speak at once for the intensity of economic transactions related to accumulation and distribution of staple products administered through a complex bureaucratic system controlled by numerous officials belonging to a local élite (Frangipane *et al.* 2007). All the evidence points to the existence of a strong political power based on a centralised economic system accumulating and controlling staple products and labour similar to the Mesopotamian one (Frangipane 2018).

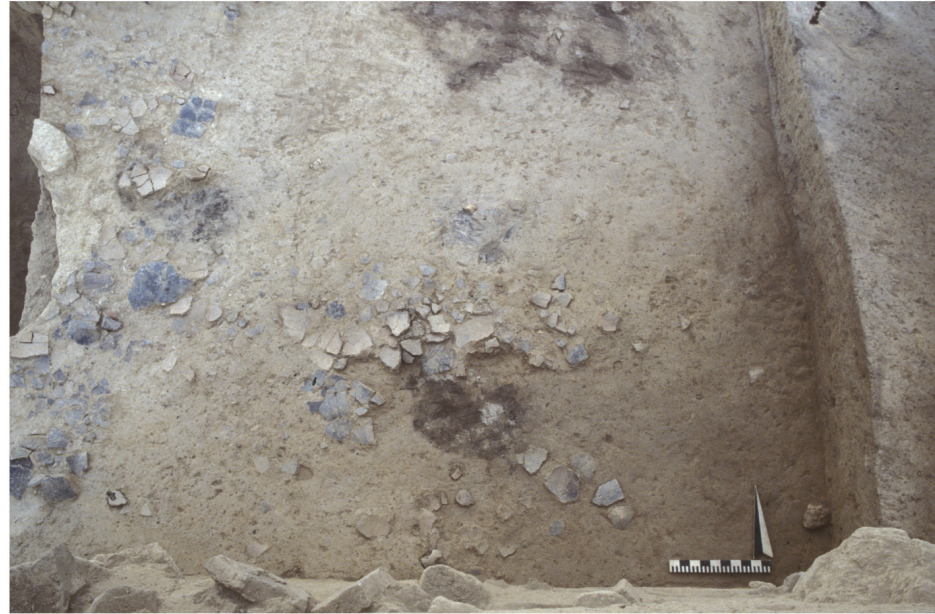
A process of production specialisation can be recorded in both primary and craft sectors, as best exemplified by animal husbandry strategies neatly focused on caprines, as well as by the wheel-made ceramics and metallurgy, though forms of centralised intervention or control are only clearly evidenced as for primary production (Frangipane 2022).

Though the centralised and administrative system and the display of monumental public architecture as seat of power in Period VI A, as well as several traits of the material culture (such as the general features and taste of the ceramic production and the use of a few glyptic images) are strongly inspired by the wider Uruk 'world' of Greater Mesopotamia, the material culture from this phase mainly shows hybrid features. Peculiar cultural traits are moreover expressed by the significant amounts of hand-made Red-Black Burnished Ware found in all contexts of the palatial complex². It has been highlighted (Frangipane and Palumbi 2007) that this ceramic production recalls analogous manufacturing techniques, colour patterns, as well as morphological repertoires of the contemporary Central Anatolian communities, thus emphasising that the external interactions of Arslantepe and its élites in this period were not exclusively channelled towards Mesopotamia. They were also directed towards the northern Anatolian areas and, in particular, towards the social and cultural world of the Central Anatolian plateau as is also suggested by the metallurgical evidence (Frangipane 2017; Hauptmann *et al.* 2002).

The earliest occupation levels of Period VI B1 follows the violent destruction by a fire of the monumental complex of Period VI A. Both stratigraphical data and a series of ¹⁴C datings, spanning between 3200 and 3000 BCE (Vignola *et al.* 2019), show that not much time passed between these two phases. Since their very first discovery in the early seventies, these levels caught the attention of the archaeologists due to the presence of a series of superimposed large surfaces (extending up to 200 sqm) covered by black or dark-brown sediment (so-called 'black lines'; Fig. 2) that were interpreted as

1 The occupation of the mound started at least in the 6th millennium BCE.

2 Significant quantities of Red-Black Burnished Ware were also found in the residential buildings north of the public complex.



a

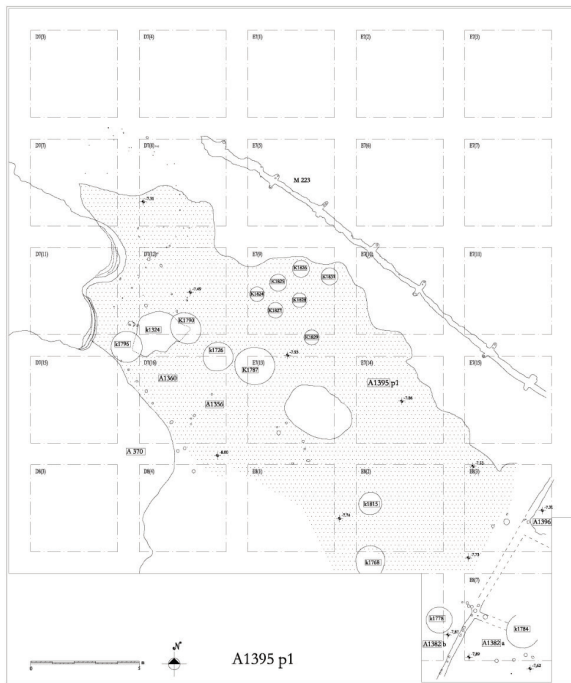


b

Fig. 2: a) Surface of anthropic occupation of the early levels of Period VI B1; b) Rows of post-holes connected to a 'black line'. © Archive *Missione archeologica italiana nell'Anatolia orientale* (MAIAO).

the remains of decayed organic material (Frangipane and Palmieri 1983; Palmieri and Cellai 1983). The flimsy nature of these occupations that stood in sharp contrasts with the monumental architecture of the previous Phases VII and VI A, together with the exclusive presence of Red-Black burnished ceramics recalling the contemporary Kura-Araxes ceramics of North-East Anatolia and South Caucasus, clearly pointed to radical changes in the occupation patterns of the settlement that were accompanied by a kind of intrusiveness of new cultural traditions.

The abrupt appearance of new 'intrusive' Kura-Araxes cultural traditions was immediately acknowledged by the archaeologists at Arslantepe (Frangipane and Palmieri 1983) and has led some authors to interpret this piece of evidence as the material 'sign' of the arrival of migrant Kura-Araxes communities in Arslantepe during the Period VI B1 (Rothman 2003; Abay 2005; Batiuk and Rothman 2007; Rothman 2015). This arrival occurred in the frame of a broader phenomenon also known as the Kura-Araxes "expansion" towards the Taurus and the Levant (Kohl 2009; Palumbi and Chataigner 2014). This interpretation certainly opens up the perspective of



a



b

Fig. 3: a) Plan of one of the ‘black lines’ (A1395) dating to early Period VI B1; b) Bulk profile showing three superimposing ‘black lines’. © Archive *Missione archeologica italiana nell’Anatolia orientale* (MAIAO).

regional interactions between the South Caucasus/East Anatolia and the Malatya plain. Within these interactions, Kura-Araxes communities ‘on the move’ played the role of ‘main actors’ in the diffusion of the Kura-Araxes culture. However, recent works also highlighted that the dynamics at work beyond these interactions may have been more complex than migratory waves of Kura-Araxes communities originating from East Anatolia and the South Caucasus (Palumbi and Chataigner 2014; Palumbi and Frangipane 2022). Instead, indigenous local communities also played a key role in the Kura-Araxes ‘expansion’. This paper brings new data in this direction and also makes it possible to better define the socio-economic identity of the communities that played the role of ‘vectors’ of the Kura-Araxes culture in the Malatya region.

This is also thanks to the fact that over the past 30 years the extension of the excavations on the southern slopes of the mound brought to light a surface larger than 1350 sqm, covering a significant sector of the mound of the Bronze Age period. This made it possible not only to acquire new data on the settlement arrangement, but also to better highlight the stratigraphic sequence and reconstruct a more complex succession of occupations relating to Period VI B1 which consist, at present, of at least four different occupation levels. The earliest one, which followed the destruction of the monumental complex, consists of the remains of some wattle and daub huts interspersed with wide open spaces

bordered by rows of post-holes (Fig. 3a), which settled on the ruins of the Palace. In these open spaces, at least two black or dark brown layers of organic material (the above-mentioned ‘black lines’) overlapped (Fig. 3b). The nature and dynamics of the formation of these layers will be more thoroughly analysed in the following sections of the paper.

The scanty remains of the early levels of Period VI B1 were followed by an occupation featuring a more organized spatial layout. A thick wattle and daub palisade, buttressed on both internal and external sides (Fig. 4a), seems to have defined an enclosure separating an upper residential area (Fig. 4b). The lower area along the slopes of the mound continued to be occupied by some huts and wooden fences, while further north it was occupied by a mud-brick building (Building 36), which in its first construction phase consisted of one single large rectangular room (A1000) hosting a circular fireplace at the centre. The upper area north of the palisade was occupied by a single and large wattle and daub building with a tripartite plan (Fig. 4c), later rebuilt as a large quadrangular room, which was interpreted as the residence of a chief (Fig. 4d) (Frangipane 2014). A later phase consisted of the enlargement of Building 36 through the juxtaposition of another room (A1369), west of A1000, exactly where the large pits of the former phase used to be (Fig. 5a). The violent fire that destroyed Building 36 in this second construction phase left large amounts of materials



Fig. 4: a) The butressed palisade M223; b) The palisade (right) separating the lower from the upper residential area of the settlement (left); c) – d) The wattle and daub hut interpreted as the ‘residence of a chief’ showing the earlier tripartite and later quadrangular plan. © Archive *Missione archeologica italiana nell’Anatolia orientale* (MAIAO).

in situ, which allowed us to define its functions (Palumbi *et al.* 2017). In Room A1369 (Fig. 5b), the large number of storage jars (at least 40) with a total potential capacity of about 2.000 litres attest to the storage of large quantities of foodstuff. The large quantities of fruits (sorbs) found in this room could indicate that fermented beverages were stored here. However, the intrinsic value and peculiarity of other materials found, not only in A1369, but also in the larger main room equipped with fireplace (A1000), as well as around Building 36, point to the fact that the functions of the building were not only related to storage. Among these special materials, worth mentioning are two leaf-shaped metal spear-heads, the unusual presence of few

wheel-made ceramics in the Uruk tradition, and some decorated vessels, among which were special drinking vessels, as well as anthropomorphic rytha (Fig. 6). Finally, just north of Building 36, between it and the ‘chief hut’, several thousands of caprine bones (the largest part of which were identified as high-quality meat cuts) were left in the open air (Siracusano and Palumbi 2014) scattered over a large area. Altogether, this evidence strongly points to the fact that Building 36 hosted activities of feasting, during which conspicuous consumption of special kinds of liquids and foodstuff took place, possibly in the frame of collective ceremonial events. Connected with this special function of the building was also the display of metals,



a



b

Fig. 5: a) Building 36 in its second construction phase; b) The storage room A1369 with in situ ceramics © Archive *Missione archeologica italiana nell'Anatolia orientale* (MAIAO).



a



b

Fig. 6: a) Drinking vessel from Building 36; b) Rytha found in proximity of Building 36. © Archive *Missione archeologica italiana nell'Anatolia orientale* (MAIAO).

possibly as prestige objects characterising the symbolic representation of the new 'élites' of the very end of the fourth millennium, perhaps referring to some aspects of the palace elites' symbolism, as also clearly shown by the slightly later "Royal Tomb" (Frangipane 2001; Frangipane *et al.* 2001; Palumbi 2019). The finding of special artefacts (such as two seals and a few wheel-made ceramics of a Mesopotamian type) in connection with the 'chief's hut' moreover confirms that this might have been the residential building of one of these leaders who still had the memory of the powerful elites of the past and probably continued interacting with the local sedentary population of the plain still bearing some Uruk world traditions (Frangipane 2014).

Finally, the last architectural level consists of a reconstruction of Building 36 that was subdivided in three different rooms of possibly more domestic functions, thus eventually losing its ceremonial characterization. It is unclear if these functions were transferred to another large buttressed mud-brick building on the southern slopes of the mound that was connected to a series of horse-shoe shaped fire installations and to a large circular oven (Palmieri 1981).

Overall, it is possible to observe an evolution in the dynamics of the occupation of the settlement that are also characterised by the re-introduction of mud-brick materials for special buildings. The scanty remains of light architecture of what were probably wooden huts characterising most of Period VI B1 phases do not define any clear agglomeration of dwellings and could hint at little investment in terms of long-lasting buildings, thus suggesting some type of transient or temporary occupations. The numerous overlapping 'black lines' featuring the fenced open areas in the early stages of Period VI B1 could have also been the result of repeated occupations by small groups with large animal flocks (sheep and goat) that may have succeeded at a short temporal distance from each other, thus revealing frequent probably seasonal abandonments and reoccupations.

On the other hand, the later phases of occupation, evidencing the construction of the palisade and Building 36, seem to mirror a more 'structured' and spatially organised settlement in terms of functional spaces. While small wattle and daub huts and fences continue to occupy the lower sector of the settlement, the construction of the mud-brick Building 36 could hint at a new effort in creating a more permanent architectural venue for communal events, perhaps also serving surrounding groups. Building 36 indeed seems to mediate in spatial (and possibly also symbolic) terms, between a lower sector and an upper residential, possibly élite-related sector of the settlement and perhaps between communities living in the plain, as the rare wheel-made

vessels of Uruk tradition exclusively found in it seem to suggest. While this evidence does not necessarily imply a more stable installation of the community, this more structured/formalised organisation in the use of the different sectors of the settlement and the appearance of special buildings could also speak for more consolidated occupations/frequentations and for a newly acquired leading function of the site in the region.

New geoarchaeological data

by Susanna Cereda and Rana Özbal

Geoarchaeological methods can provide crucial insights into the nature of the sedimentary matrix of a site. Both composition and structure of a deposit are indeed the result of specific human actions/activities, or of natural events. Micromorphological analyses, for instance, allow us to not only to identify particles and debris that would otherwise remain unseen (e.g., dung spherulites, phytoliths etc.) but also to reconstruct the type of deposit in which they are embedded (e.g., dumped fuel, penning area, floor/construction material, etc.). Sediment geochemistry, on the other hand, identifies elemental compositions of residues across use-surfaces through their spatial distributions and the comparison of the intensities of various chemical elements across archaeological floors. Certain elements such as P (phosphorus) are among the best indicators of anthropogenic activities and are surprisingly good indicators of animal penning. When measured against elements that are typically more representative of background geology, such as Ti (titanium), geochemical analyses are able to identify locations that may have been high in organic residues resulting from dung, animal pens or feces. Thus, both techniques are particularly well-suited to investigate the proximity of animals to humans, and consequently to tackle questions related to settlement dynamics, spatial organization of human occupations as well as to subsistence and mobility.

Micromorphology

by Susanna Cereda

New micromorphological analyses carried out on the black surfaces of the earliest occupations of Period VI B1 provide new data as concerns the use of these areas, the activities carried out on them, and more in general the organization of the space in the settlement.

The first geoarchaeological studies, carried out by Palmieri and Cellai (1983), focused on the sedimentological and chemical properties of the early VI B1 dark-coloured layers, in order to identify their nature. Tests included grain size analysis of fine particles, XRF spectrometry, chromatography, and pH measurements, and the results

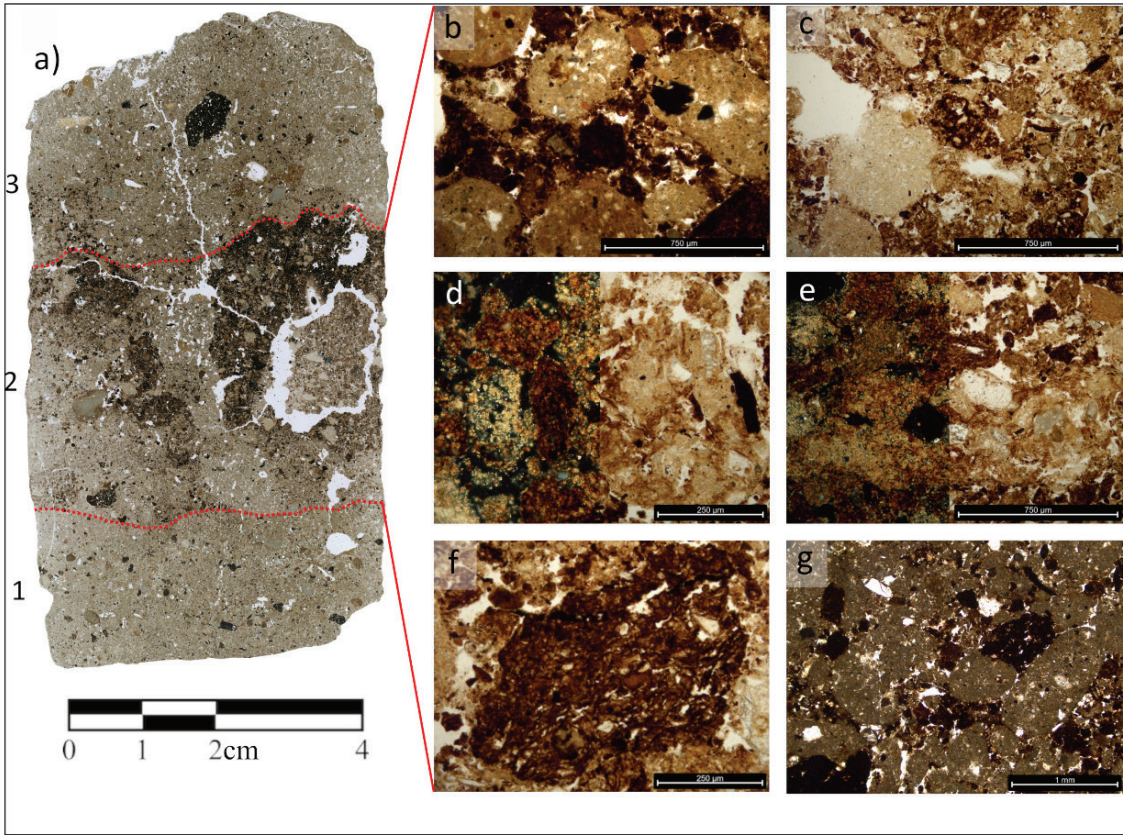


Fig. 7: Top: Three sediment blocks sampled along the eastern profile, corresponding to the excavation limit. Bottom: Scan of the thin section from sample 82/16. Three layers, separated in the image by a dotted red line, were distinguished on the basis of their composition and of the general spatial organization of their constituents. Layer number 2 represents a (partially bioturbated) deposit of trampled dung pellets. The photomicrographs to the side of the scan illustrate the main features observed under the microscope in this layer: b)-c) rounded and pellety nature of the dung remains. The same pictures show that the deposit is composed of a combination of organic-rich (dark brown) and organic-poor (yellowish brown) degraded dung. Both images are in PPL (plane polarized light); d)-e) details of the dung pellets. The left side of each picture was taken in XPL (cross-polarized light) and reveals high quantities of dung spherulites in the groundmass, with the characteristic high interference colors of calcite and a central extinction cross; f) further detail of the pellets' shape. Fragments of ingested plant matter (phytoliths) may occasionally be recognized and indicate that the dung was probably produced by sheep/goats. Image in PPL; g) overview of the boundary towards with layer 1. where rounded dung aggregates can be seen mixed and interlocked with sediment aggregates. Image in PPL.

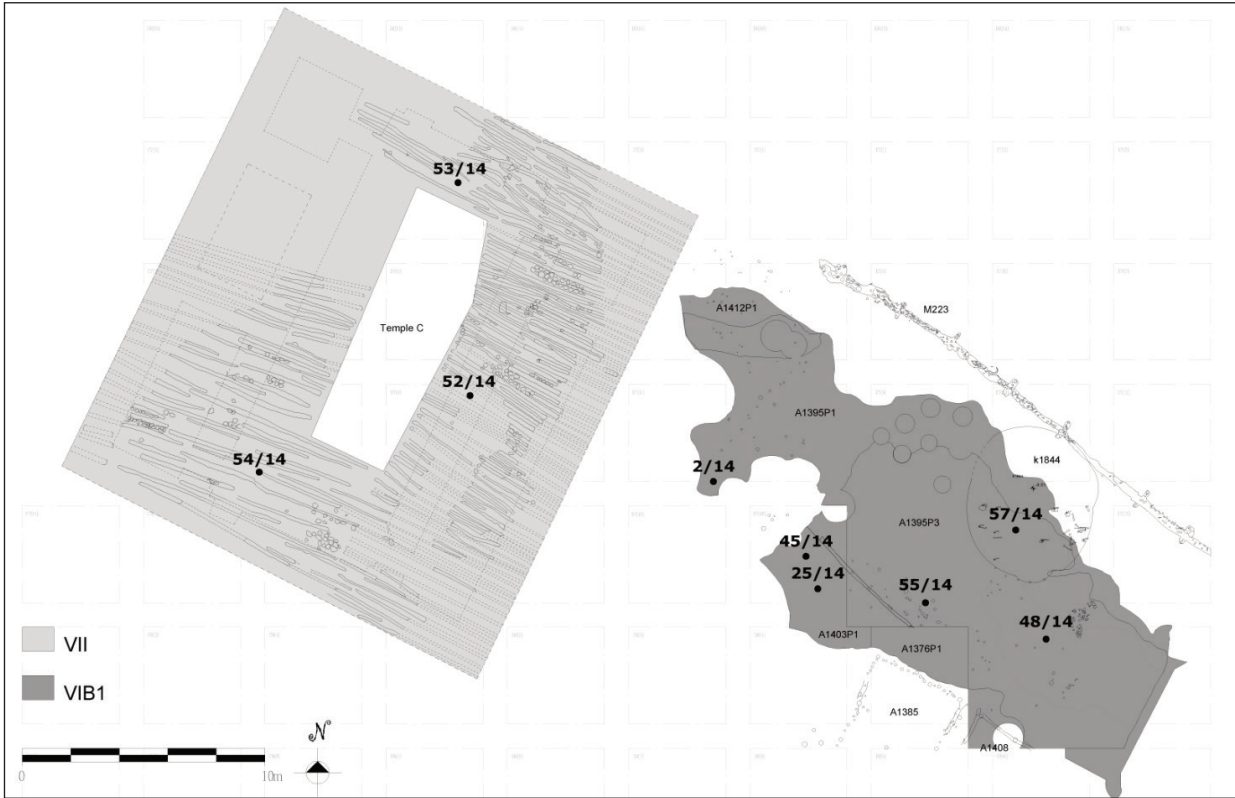
evidenced a concentration of organic material tentatively associating this dark matter with abandoned and decayed pieces of timber, presumably the wooden posts characterizing the architecture of this period. To verify this initial interpretation and to further describe the aforementioned dark layers, micromorphological analyses of these early VI B1 occupation layers were conducted for the very first time on three samples collected during the 2016 excavation campaign.

The three undisturbed and oriented sediment blocks—82/16, 217/16 and 218/16—were sampled along the eastern profile, corresponding to the excavation limit (Fig. 7 top), with the aid of bandages soaked in plaster of Paris, which facilitated their extraction and transport. Once in the laboratory, samples were air-dried, impregnated with acetone-diluted polyester resin, and ground to a thickness of 30 micrometres (μm). The resulting thin sections were studied with a Leica DM2700 P polarising microscope, at magnifications ranging from 12,5x to 400x, under plane polarised (PPL), cross polarised (XPL), and oblique incident light (OIL). The standard micromorphological analytical guidelines were followed (Bullock *et al.* 1985; Stoops 2021; Stoops 2003) and the most recent comprehensive micromorphological manuals (Karkanas and Goldberg 2018; Nicosia and Stoops 2017; Verrecchia and Trombino 2021) were used to analyse the nature, characteristics and spatial arrangement of the sediment components. Based on these features, discrete bodies of sediment were identified and interpreted as the result of distinct depositional processes and agents (Karkanas and Goldberg, 2018).

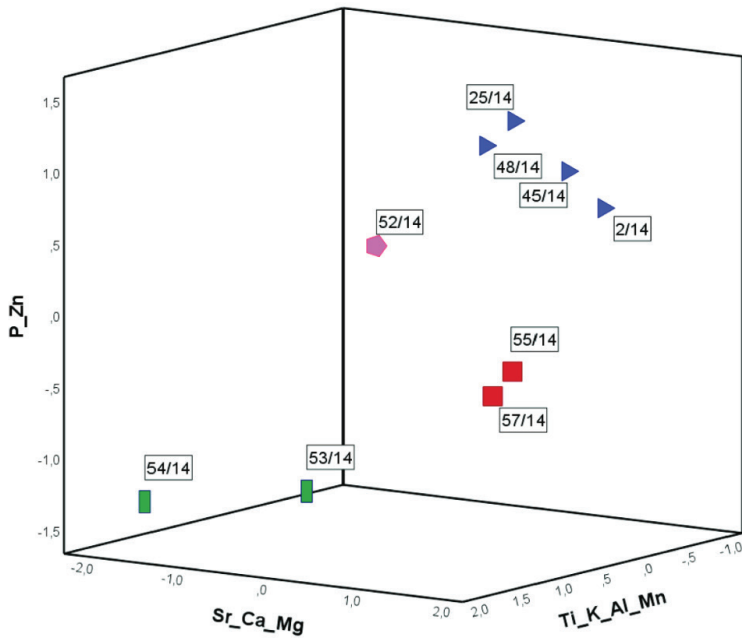
Sample 82/16 shows the best preserved and most complete sequence and it will be used here to illustrate the main results of the micromorphological analysis. Three different depositional episodes could be observed in this section (Fig. 7 bottom: a). Layer 1 and 3 appear very similar, with the exception of layer 1 being slightly coarser and presenting different concentrations of anthropogenic particles in the groundmass (i.e., more ashes and less spherulites). The coarse minerogenic component is represented in both cases by mostly calcite,

quartz, feldspar, fragments of igneous rocks, limestone, and micritic aggregates. In general, these deposits are rich in anthropogenic debris, such as spherulites, ashes, bones, pottery, charcoals, maybe a charred seed, rubified and burnt clay aggregates. Both layers are unsorted and they present a sandy loam texture. The orientation of the coarse components is moderately horizontal or unexpressed, while their distribution is generally random, with occasional clustered/banded lenses where no clear-cut layer is recognisable.

The central part of the slide is occupied by a ca. 3 cm thick dark brown deposit (layer 2), whose boundaries with layer 1 are diffuse, while with layer 3 they are clear and slightly digitated. Small fragments of the same brownish matter are scattered in both layers 1 and 3 (especially in the latter), but only towards the boundary with layer 2 (Fig. 7 bottom: g). This central layer is composed almost exclusively of herbivore dung, clearly recognisable from the calcitic spherulites densely distributed in the groundmass of the faecal material (Fig. 7 bottom: d-e). Some mineral sand is also present (the same composition observed in the other two layers) as well as pedofeatures, such as phosphatic nodules and especially biological disturbances. The packed structure of the deposit (Fig. 7 bottom: b-c), showing a limited porosity, indicates that it has been compressed, probably through trampling. Organic-rich fragments are found together with organic-poor ones (Shahack-Gross 2017, 271), and the form of the pellets as well as the fragmentation of the embedded plant matter (phytoliths) suggests that they may have been produced by ovicaprids (Fig. 7 bottom: f). While trimmed plant remains are sometimes identified within the pellets, charcoals are almost absent in the whole deposit and the organic matter does not seem to derive from decaying plants. In general, no feature associated with wood could be observed and it seems, thus, that the organic matter conferring to the deposit its distinctive coloration is composed exclusively of dung. Overall, both nature and structure of this dark organic layer suggests that this was an area where animals were kept within the settlement.



a



b

Fig. 8: a) Plan indicating the locations of the sediment geochemistry samples taken in 2014 for both phases VII and VI B1 (MAIAO Archive); b) 3D scatterplot showing the relationship between sediment geochemistry data points elemental results (excluding the offsite sample) based on the three factor analysis variables. Blue triangles represent samples taken from the black organic levels, red squares represent the typical clay samples for the anthropogenic layers of the site, green rectangles represent clean clastic sediments used as a fill layer to prepare a platform for the building of Temple C and the pink pentagon comes from this same matrix but has clearly received an organic admixture.

Tab. 1: Table representing the results for the sediment geochemistry samples in logarithmic format and the factor analysis results for the cluster groups.

Sample ID	Ba - Log	Ti - Log	Sr - Log	Zn - Log	Mn - Log	K - Log	Na - Log	Al - Log	Fe - Log	Ca - Log	P - Log	Mg - Log	Ba - Log	Factor 1: Ti_K_Al_Mn	Factor 2: Sr_Ca_Mg	Factor 3: P_Zn
ARSLAN 2/14	0.27	-0.33	0.34	-0.35	0.52	1.80	1.14	1.57	1.75	2.72	1.41	2.00	0.27	-0.20	1.59	0.70
ARSLAN 25/14	0.09	-0.32	0.33	-0.21	0.57	1.67	0.74	1.64	1.81	2.72	1.71	1.91	0.09	-0.14	0.64	1.24
ARSLAN 45/14	0.07	-0.32	0.34	-0.31	0.50	1.74	1.01	1.58	1.73	2.72	1.56	1.90	0.07	-0.33	1.05	0.90
ARSLAN 48/14	0.50	-0.33	0.34	-0.30	0.56	1.65	0.76	1.55	1.75	2.71	1.64	1.87	0.50	-0.48	0.00	0.97
ARSLAN 52/14	-0.10	-0.36	0.32	-0.53	0.44	1.67	0.66	1.72	1.86	2.71	1.26	1.88	-0.10	-0.54	-1.28	0.17
ARSLAN 53/14	0.14	-0.21	0.32	-0.74	0.56	1.94	1.06	1.81	1.85	2.72	0.09	1.85	0.14	1.40	-0.23	-1.19
ARSLAN 54/14	0.20	-0.18	0.32	-0.75	0.62	2.03	1.42	1.85	1.90	2.70	-0.01	1.96	0.20	1.98	-1.49	-1.27
ARSLAN 55/14	-0.10	-0.34	0.32	-0.69	0.37	1.58	0.72	1.70	1.88	2.72	0.62	1.96	-0.10	-0.87	-0.05	-0.67
ARSLAN 57/14	-0.19	-0.34	0.32	-0.69	0.37	1.61	0.71	1.70	1.86	2.72	0.41	1.95	-0.19	-0.81	-0.22	-0.84
OFFSITE	-0.70	-0.57	-1.11	-0.91	0.13	0.45	0.39	1.49	1.54	1.67	-0.30	1.25	1.25	-	-	-

Sediment Geochemistry Results

by Rana Özbal

During the 2014 season ten sediment samples, nine of which were from the site itself and the tenth from an offsite location, were selected for geochemical analyses and sent to the Archaeology Laboratory at Koç University (Fig. 8a). They were collected with the primary purpose of sampling the black humic soils of level VI B1 and to compare these with the surrounding matrixes. All samples were subjected to the weak acid extraction protocols developed by Burton and Simon (1993) and adapted by Middleton and Price (1996). This analysis is typically used for sediments from living floors and spaces. A weak acid is preferred, in order to gently extract residues that may have accumulated within the floor surfaces and to avoid acid digesting floor matrixes. Sediments brought to the lab were dried in an oven at 105°C for 48 hours and then ground into powder in a porcelain mortar. 0.2 grams of each ground sample was placed in glass bottles. 1M HCl, a weak hydrochloric acid solution, was used in the extraction process. 20 ml of the solution was added to each sample and agitated to ensure homogeneity. The samples were kept at room temperature for 2 weeks and were thereafter filtered. The filtered samples were measured for 12 elements namely Al, Ba, Ca, Fe, K, Mg, Mn, Na, P, Sr, Ti, and Zn, using an ICP-OES, inductively coupled plasma – optical emission spectrometer. The single comparative offsite sample yielded very little evidence for anthropogenic residues showing that all Arslantepe samples were anthropogenically meaningful. Explained here are the results of these nine samples analyzed using IBM SPSS 28.

After being converted into a logarithmic value, all variables were subjected to a Pearson correlation test to measure their normalized covariance. Variables with highly significant correlations at the 0.01 level were then reduced to a general z-score measure through factor analysis. This natural clustering unique for each dataset led to the creation of three distinct categories for the Arslantepe samples analyzed; Factor 1 refers to Ti, K, Al, Mn which when viewed in combination must be considered representative of non-anthropogenic activities and are likely a result of intentional fill deposits and floor preparation surfaces (Bintliff and Degryse 2022). Factor 2 refers to Sr, Ca and Mg, all alkali earth metals which behave very similar chemically. These elements are typically found occurring together frequently in areas where intense anthropogenic activities take place, such as on indoor living floors and/or outdoor courtyard areas. They have been known to be found in ethnographic studies near kitchen areas, or are often believed to be remnants of food residues (Kalkan and Özbal 2018; Middleton *et al.*

2010. 202; Wells 2004, 75). Finally, Factor 3 refers to the correlation of Zn and P, both of which are representative of high organic remains and/or humic rich waste or latrine deposits (Middleton *et al.* 2010; Wilson *et al.* 2008, 416). These three measurements provided a three-pronged baseline to interpret the Arslantepe data (Fig. 8b; Tab. 1). For this dataset, the remaining three elements, namely Ba, Fe, and Na yielded unclear signals and were not considered in the analyses.

The nine samples from the site all come from the same area but represent different phases. The six dating to phase VI B1 were selected from the area southwest of palisade M223, while the remaining three are from phase VII and represent the intentional leveling fill into which the Temple C wooden post foundations were embedded to the north. The latter must thus be considered comparative samples, as they represent little in the form of anthropogenic activities. Indeed, especially samples 53/14 and 54/14 (represented by green rectangles in Fig. 8b) yielded an extremely high combination of Ti, K, Al, Mn, which are typical of clastic sediments. Their high correlation may be a result of their sedimentation processes typical of the Malatya area (Bal Akkoca *et al.* 2017). These clays were brought here from a clean exogenous source prior to the building of Temple C. Although from the same deposit, sample 52/14 (represented by a pink pentagon in Fig. 8b) yielded a lower concentration of Ti, K, Al, Mn indicative of clastic minerals. This value was still higher than all other samples, but the sediments had a slightly elevated admixture of Factor 3, the concentration of Zn and P, suggesting a small addition of organic remains within the sedimentological matrix. Overall, these three samples show little in the form of anthropogenic residues and are representative of natural sediments. However, their chemical analysis provides an excellent background that allows the other organically rich samples to be interpreted.

The remaining six samples all come from VI B1 levels and have a greater variability of element combinations. Four of these, samples 2/14, 25/14, 45/14, 48/14 (represented by blue triangles in Fig. 8b), collected from black organic layers between the wattle-and-daub huts (A1385, A1408), are highly distinctive and indicative of anthropogenic residues.

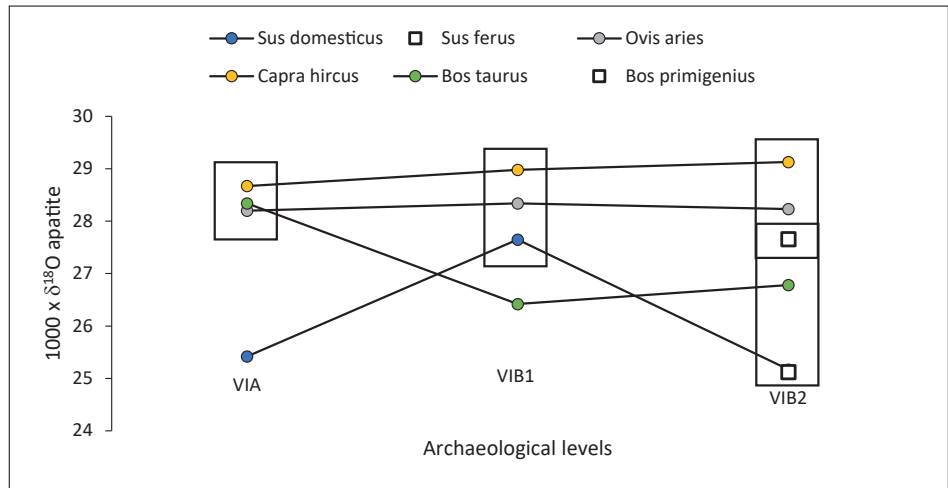
Three of these samples, namely samples 25/14, 45/14 and 48/14, coming from between the wattle and daub huts of layer VI B1. were extremely high in Factor 3, represented by P and Zn. This enrichment in these elements, especially P, indicate high degrees of organic debris and could be indicative of animal penning like a byre or sheepfold or even a midden context full of organic refuse (Wilson *et al.* 2008, 421). This data is in line with the micromorphology results (see above). Zn, likewise, has been linked in some studies to latrine activities and could likewise be an indication of high humic activities including animal penning (Middleton *et al.* 2010. 205). The concentrations recorded here are several orders of

magnitude above that of other deposits, suggesting intense and long-term use. On the other hand, sample 2/14, from the same area, is slightly lower than these three with regards to P and Zn, but yielded much higher concentrations of Mg. Magnesium is an element that has consistently been associated with hearths and habitation areas and has been considered by several studies as the most distinctive element representative of a settlement (Griffith 1981; Konrad *et al.* 1983; Wilson *et al.* 2008, 422). Evidence for such data may reaffirm the black lines identified in the micromorphology samples from this area (see above).

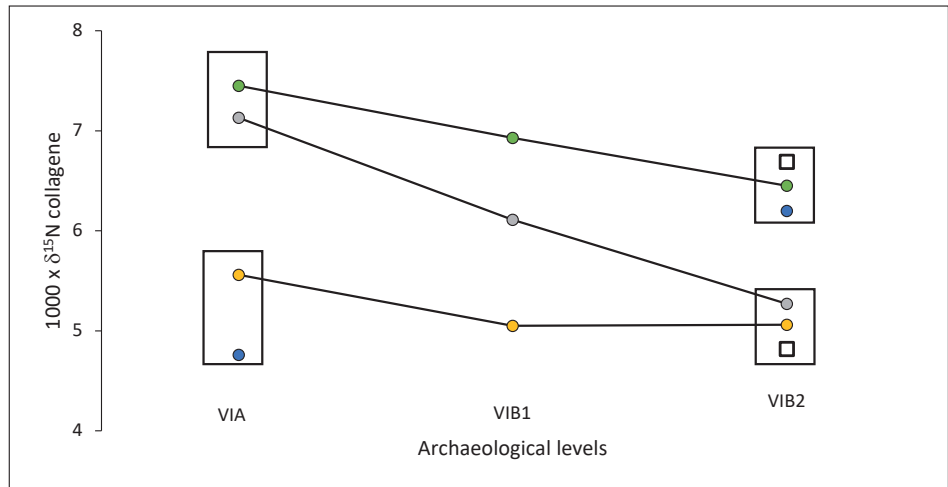
Finally, two samples with surprisingly similar compositions but coming from different fill layers are samples 55/14 and 57/14 (represented by red squares in Fig. 8b). This sediment in both situations may represent what could be considered a typical background sediment for the site. The value of these samples is that they provide a backdrop to be able to interpret the organically rich samples which were likely enriched by animal manure. Sample 57/14 represents the clayey light brown fill deposit of K1844, an anomalous pit containing human bones, while sample 55/14 refers to the clay beneath the dark organic layers. Both samples yielded low levels of elements comprising Factor 3, like P and Zn, but relatively high Mg, though notably lower than sample 2/14 described above. If this clay is considered representative of a typical background element level for Arslantepe, then its anthropogenic nature, especially when compared with the offsite sample, is noteworthy. At the same time, when compared with the high organic levels likely representative for animal penning, the values appear to be notably lower, overall demonstrating the tremendous variability represented in the samples sent to Koç University for sediment geochemical analysis.

Interpretation of geo-archaeological analyses

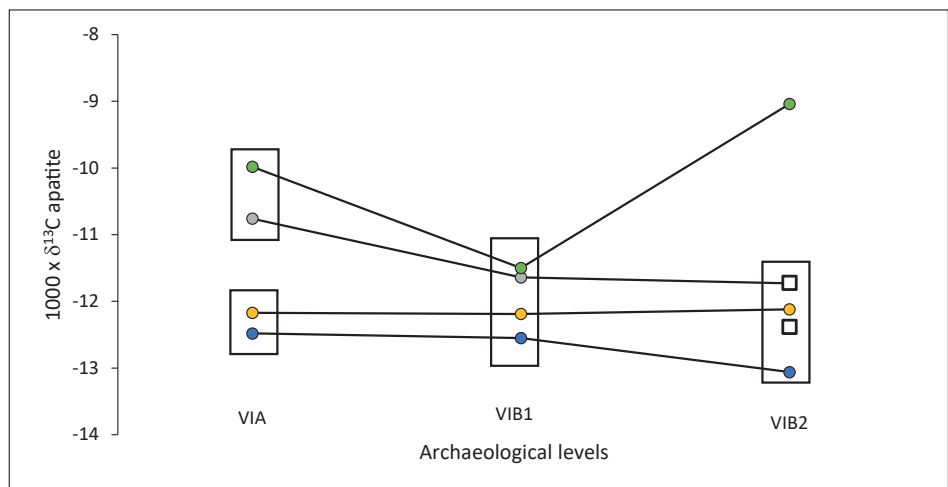
Geoarchaeological and geochemical data appear to be consistent; whilst the geochemical data confirms that animal penning must have taken place in this area, micromorphology reaffirms these results in a clear and explicit way, and demonstrates the presence of animal trampling, faecal material, herbivore dung and abundant organic material in samples coming from external surfaces. The Zn and P correlation, recorded by the sediment geochemical data, which is typical of latrines or byres reaffirms this claim. It seems likely that this was the result of practices of animal penning at the site, which can be confirmed by the fact that these black lines are often delimited by rows of post-holes, the negative traces of wooden fences. These new data allow us to make two observations. The first is a close cohabitation between the inhabitants of Arslantepe and their flocks during the early stages of Period VI B1, a behaviour that might have been repeated in the later occupation phases, where large



a



b



c

Fig. 9: Plot of the apatite $103 \times \delta^{18}O$, $103 \times \delta^{13}C$ and collagen $103 \times \delta^{15}N$ values for the different archaeological periods and the different animal species. The point represents the mean value for the period. The lines join the mean values of the same species. The red squares contain the mean values of the same period that are statistically the same.

open spaces limited by fences were also found, but is unique to the settlements of this period. The second is that in the frame of this cohabitation, the overlapping of two, sometimes even three, of these dung deposits covering large surfaces of the settlement confirms the hypothesis of cyclical occupations by shepherds with their flocks.

Faunal data from Period VI B1: economy, isotopes and mobility

Identification of the reared species

by Giulio Palumbi

As to the composition of the herds that were kept in the settlement of Period VI B1, faunal data offer a very clear picture. According to the different contexts of retrieval throughout the sequence of occupation, caprines represent between 70 and 90% of the reared species (Siracusano and Bartosiewicz 2012). This data clearly highlights the fact that herding strategies carried out at Arslantepe in period VI B1 were highly oriented towards caprovines. Actually, these herding strategies seem to develop in strong continuity with those already practiced in the previous Period VIA, when caprine already reach well over 70% of the reared species (Siracusano and Bartosiewicz 2012). This continuity in the herding strategies has encouraged to suggest that, by taking into account the short interval between the two phases, as well as some common traits related to the Red-Black ceramics of both periods, the pastoral community that settled at Arslantepe in Period VI B1 could have been the direct descendant of those shepherds that frequented the Palace and were integrated in the centralised economy of Period VI A (Frangipane and Palumbi 2007; Palumbi and Frangipane 2022). Though some changes were noticed between the caprine-focused strategies of Period VIA and those of Period VI B1 – namely a decrease of the sheep-goat ratio and possibly a slight change in favour of the exploitation of milk in Period VI B1 (Siracusano and Bartosiewicz 2012) –, the kill-off patterns of both periods show that herding strategies were on the whole mainly focused on meat consumption. However, while in Period VI A the production of caprine meat was aimed to feed the system of food distribution controlled by officials and elite members operating in the monumental complex, in Period VI B1 data from the large dump north of Building 36 highlight that caprine meat (especially that of young individuals) was consumed in the frame of collective feasting ceremonies. On this note, the culling patterns reconstructed from the bones found in this dump (and more in general from Period VI B1), which show the high incidence of old (more than 6 years) and very young individuals (less than two months), reflect a choice related to the fact that animals of these ages would have not afforded treks to distant pastures and were

therefore consumed before departure from the settlement (Siracusano and Bartosiewicz 2012). This indirectly confirms the strategies of mobility of the shepherds. Furthermore, the significant presence of very young individuals consumed at the settlement could indicate that these departures took place in early-spring or early-summer (Siracusano and Bartosiewicz 2012).

Isotopic data

by Francesca Balossi Restelli and Paola Iacumin

Recent results of isotopic analyses (C, N, and O of collagen and C of apatite) on the fauna from Arslantepe Period VI B1 are also in line with the above described faunal and archaeobotanical data. Isotopic analyses of 279 animal (domestic and wild) skeletal remains have been carried out from different phases of occupation at Arslantepe (5th to 1st millennium BCE) (Iacumin *et al.* 2021). Of these 279 samples, 23 are from Period VIA (cattle, pig, sheep and goat, dog), 17 from Period VI B1 (sheep, goat, cattle, dog), and 34 from Period VI B2 (sheep, wild and domestic cattle, goat, dog, wild and domestic pig, red deer). As to the analytical methods, tooth and bone samples were drilled with a low-speed dental-style drill. The resulting powders were pre-treated with 2%w hydrogen peroxide for 24 h, and 1M acetic-acid buffer solution (pH ~ 2) for 18 h, to remove organics and secondary carbonates, respectively. Sample preparation included the rinsing of samples with ultra-pure water and subsequently centrifuging them between all treatment steps. Each sample was then analysed on a Finnigan Delta Plus mass spectrometer with an in-line Gas Bench automatic sampler.

Collagen was extracted from crushed bone and tooth samples, dissolving at 4°C for three days with 0.5 M HCl, treated with 0.125 M NaOH for 20h to remove humic acids, and gelatinized overnight in ultrapure water at 100°C. The gelatine solution was frozen, lyophilized for 48h, and then analysed. Each sample was weighed into tin capsules and combusted to CO₂ and N₂ in an elemental analyser EA/NA-1100 CHN, coupled in continuous flow mode with a mass spectrometer Finnigan Delta plus. Stable isotope data are reported in conventional delta (δ) notation, the analytical precision for δ¹³C and δ¹⁸O from carbonate apatite and for δ¹³C and δ¹⁵N from collagen are ±0.2‰, based on replicate analyses of samples and standards.

Isotopic data from bones of various phases of occupation of Arslantepe show that caprines had a diet made of essentially C3 plants, which are those mostly found at the site as well (Galli 2016). What appears interesting when comparisons between isotopic values of animal species and periods are made is that animal bones from VI B1 appear to be very different from those of the preceding period VI A, where a clear distinction was evident between some species: in period VI A sheep

Tab. 2: List of archaeobotanical taxa from Period VI B1. The number of contexts analysed is 50.

Total Liters	79	<i>Amygdalus</i> sp.	6
<i>Avena fatua</i>	2	<i>Celtis australis</i> (mineralized)	1
<i>Avena sativa</i>	1	<i>Ficus carica</i>	1
<i>Avena</i> sp.	5	<i>Pistacia atlantica/terebinthus</i>	13
<i>Hordeum vulgare</i>	82	<i>Pistacia</i> sp. (mineralized)	2
<i>Hordeum</i> sp.	67	<i>Prunus</i> sp. (mineralized)	2
<i>Triticum</i> sp.	7	<i>Sorbus</i> sp. (seed)	41
<i>Hordeum spontaneum</i>	1	<i>Sorbus</i> sp. (berry)	25
<i>Hordeum vulgare</i> (glume base)	12	<i>Sorbus</i> sp. (fragment)	47
<i>Hordeum vulgare</i> (rachis internode)	4	<i>Vitis vinifera</i>	4
<i>Secale cereale</i>	6	Indet. Fruit fragment	5
<i>Secale cereale</i> (glume base)	1	<i>Adonis</i>	1
<i>Aegilops</i> sp. (glume base)	1	Asteraceae	7
<i>Triticum aestivum/durum</i>	141	<i>Bellevalia</i>	3
<i>T.aestivum subsp. compactum</i> (Host)	3	cfr. <i>Bellevalia</i>	4
<i>Triticum dicoccum</i>	9	<i>Bolboschoenus maritimus</i>	1
<i>Triticum monococcum</i>	4	<i>Bromus</i> sp.	3
<i>Triticum/Hordeum</i>	146	<i>Bromus arvensis</i>	4
<i>Triticum dicoccum</i> (glume base)	115	<i>Centaurea</i> sp.	3
<i>Triticum monococcum</i> (glume base)	43	<i>Chenopodium</i> cfr. <i>album</i> (mineralized)	1
NGW= <i>Triticum timopheevii</i> (glume base)	1	<i>Chenopodium</i> cfr. <i>album</i>	4
<i>Triticum</i> cfr. <i>spelta</i> /NGW	2	<i>Coronilla</i> sp.	2
<i>Triticum spelta</i> (glume base)	3	<i>Colutea arborescens</i>	1
<i>Triticum terminal</i> (glume base)	7	Cyperaceae	3
<i>Triticum</i> sp. (glume base)	165	<i>Digitariassp.</i>	1
Naked wheat (rachis remains - tetraploid)	9	<i>Euphorbia</i> sp.	1
Naked wheat (rachis remains - hexaploid)	15	<i>Festuca</i> sp.	8
Tetraploid/hexaploid (rachis remains)	10	<i>Galium aparine</i>	5
Cereal / Dough pieces	284	<i>Galium</i> sp.	4
Poaceaea indet. (fragment)	3557	<i>Glaucium</i>	1
Poaceaea small wild type	5	<i>Poa annua</i>	1
Culm	36	<i>Leontodon saxatilis</i>	1
Straw remains	220	<i>Malva</i> sp.	5
Fabaceae	5	Ranunculaceae	1
Fabaceae small	2	<i>Phalaris</i> sp.	1
<i>Lens culinaris</i>	13	Cfr. <i>Polycnemum</i>	1
<i>Cicer arietinum</i>	6	<i>Stipa</i> sp.	1
<i>Lathyrus sativus</i>	1	<i>Taeniatherum caput-medusae</i>	4
<i>Medicago arabica</i> sp. mineralized	1	<i>Taeniatherum caput-medusae</i> (glume base)	3
<i>Medicago minima</i>	1	<i>Triglochin maritima</i>	2
<i>Pisum sativum</i>	6	<i>Valerianella</i> sp.	4
<i>Vicia ervilia</i>	1	Indet Seeds	79

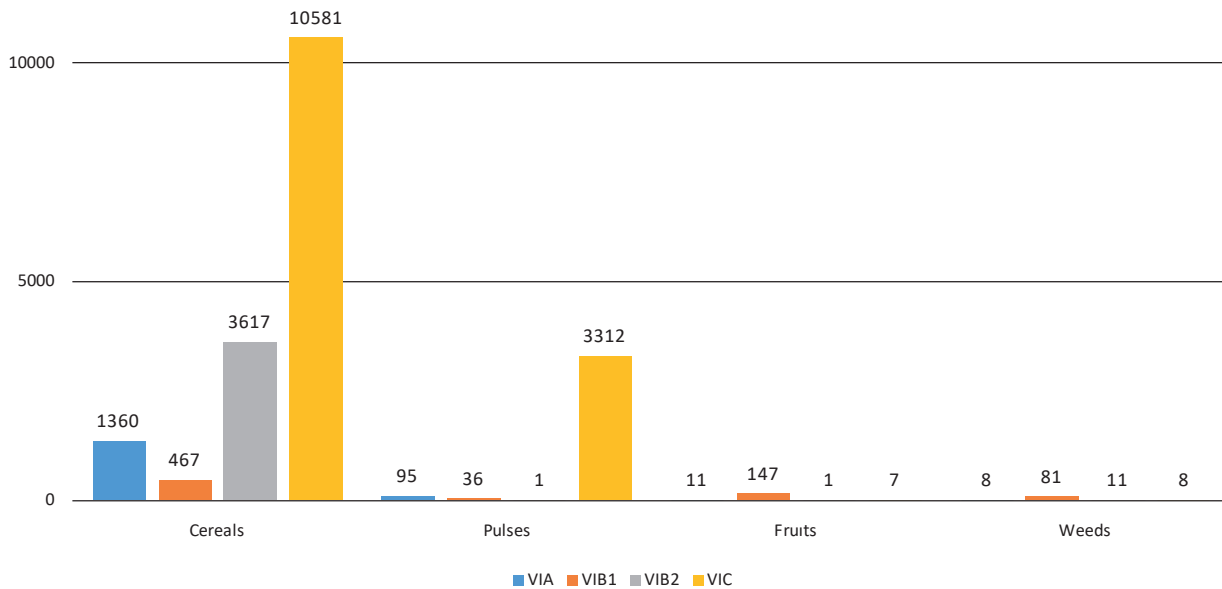


Fig. 10: Cereal, pulses, fruit and weed taxa ratios in VI A, VI B1, VI B2 VI C periods. Chaff and fragmented seed remains are not included in these taxa ratios. Data for Period VI A are taken from Balossi *et al.* 2010. Period VI C data are the sum of the Sadori *et al.* 2006 publication and the data presented in this study.

and cattle have a more similar diet, as well as the same N and O isotopic signals (Fig. 9a–b). This brings to assume that sheep and cattle grazed in the same fields, fertilized by the animals themselves (high values of nitrogen in the bones), and drank strongly evaporated water, as that present in puddles (high value of O in cattle). Goat and pig instead had different isotopic values and were probably left to browse freely (Galli *et al.* 2021; Iacumin *et al.* 2020). In VI B1, in contrast, all domestic species had very similar diets (statistically similar isotopic values). This suggests that all the animals were left in a semi-wild state and that fertilization of fields was no longer practiced, or animals did not pasture on the agricultural fields. A comparison with isotopic data of later VI B2 further gives some interesting insight: cattle are again grazed on manured fields with cereals (higher $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ values) (Fig. 9b–c), but partly also on areas with C_4 plants ($\delta^{13}\text{C}_{\text{diet}}$ mean value -20.9%), whilst caprines have a less varied diet than in Period VI B1 (Fig. 9c) and also drink less varied water (Galli *et al.* 2021).

On the whole, the isotopic signals fit well with the settlement characters indicating, during the palatial centrally managed phase of VI A, a herding system mostly specialised on sheep and cattle kept under control close to the fields, whereas a change is recorded during the VI B1 period, when animals appear to be left to graze in the semi-wild and caprines show a greater mobility, evidenced through their diet (vaster grazing areas). In the VI B2 cattle are reared again closer to the site, even though not as intensely as in VIA, and caprines have a less varied diet than

in VI B1, thus probably move across more restricted areas. Interesting is also the fact that the isotopic analyses seem to suggest that pig might have been in the wild during VI B1, whilst it was cared for near the site in later VI B2, as it probably drank the same water as humans (statistically same $\delta^{18}\text{O}$ values).

Archaeobotanical evidence

by Burhan Ulaş

Diachronic comparison between new and old data

This paper also presents new archaeobotanical data, aiming to better characterise subsistence strategies and agricultural practices of Period VI B1.

In the framework of this research, 50 contexts (79 litres of soil samples) dating to the VI B1 period were analysed (Tab. 2).

In addition to VI B1, new data from VI B2 (8.1 litre soil sample) and VI C (3.1 litre soil sample) are also presented (Appendix 1). These new data are statistically compared with previously published archaeobotanical data from the VI A (Late Chalcolithic 5), VI B2 (Early Bronze I) and VI C (Early Bronze II) periods in terms of taxa ratios of plant group remains (cereals, weeds, chaff and straw etc). On the basis of these data, it is possible to state that the archaeobotanical data from period VI B1 strongly contrast with those from previous Period VI A and later Periods VI B2 and VI C, for the reasons explained below.

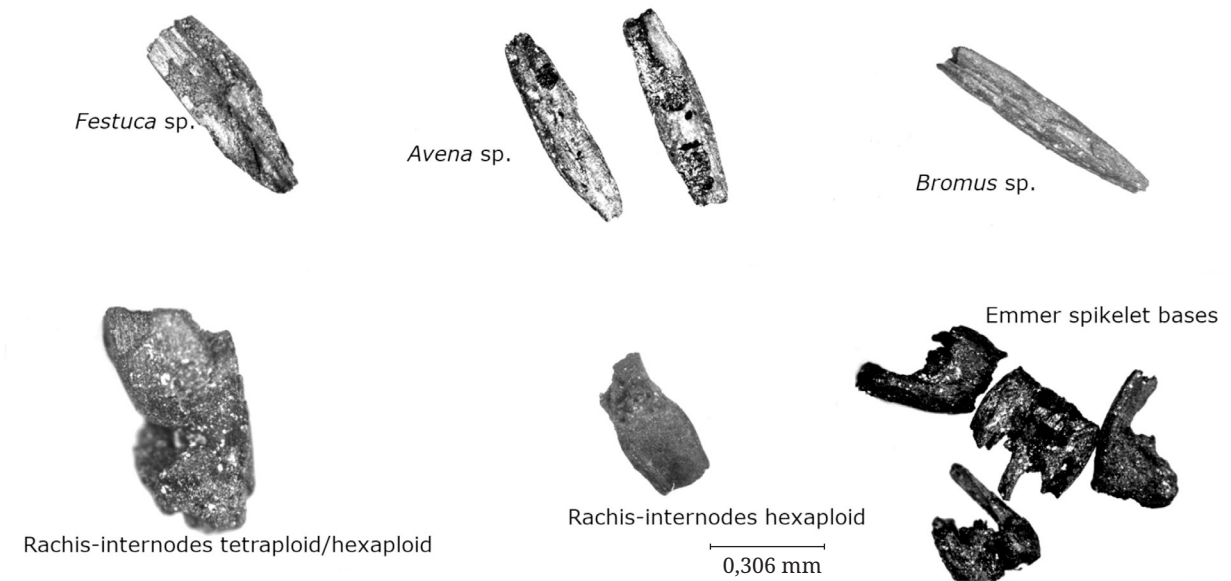


Fig. 11: Macrobotanical remains from Period VI B1. © Burhan Ulaş and Archive *Missione archeologica italiana nell'Anatolia orientale* (MAIAO).

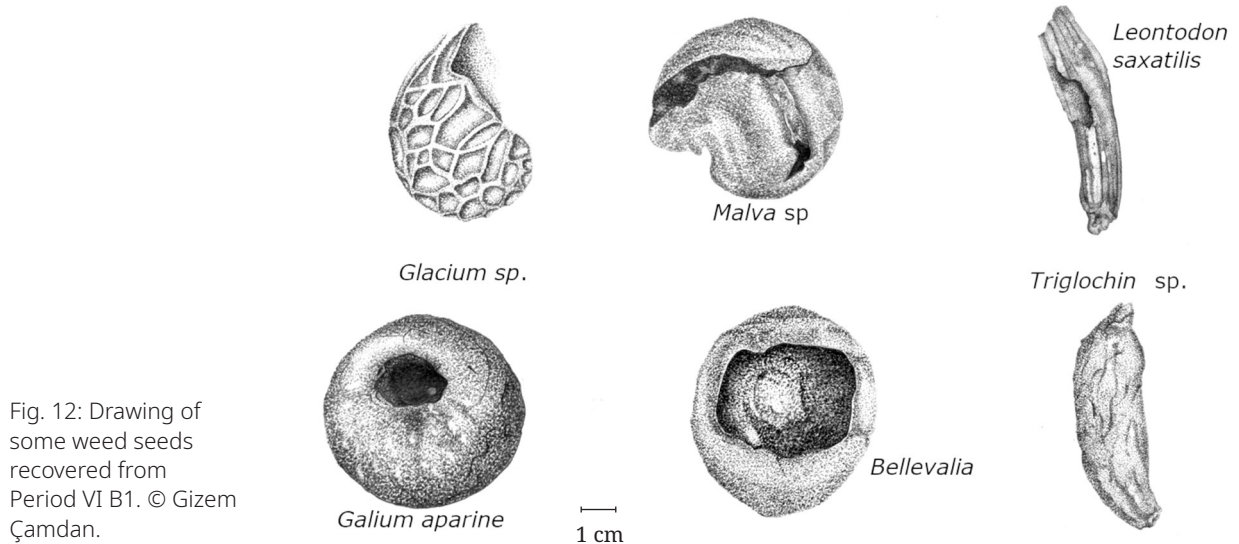


Fig. 12: Drawing of some weed seeds recovered from Period VI B1. © Gizem Çamdan.

– Quantitative species and *genus* ratios of plant remains. One of the most important features that distinguishes Period VI B1 from both previous and later periods is the plant species diversity (see Tab. 1). While 22 different species and 43 *genus* have been identified in Period VI B1, these are limited to 10 species and *genus* in VI A (Follieri and Coccolini 1983; Balossi *et al.* 2010, tab. V.1), 9 species and *genus* in VI B2 (Tab. 2 in the present study) and 13 species and 14 *genus* in VI C (Appendix 1; Sadori *et al.* 2006, tab. 2).

– Quantitative ratios of cereal remains. Although the analysed soil sample of phase VI B1 (79 litres) is large, very small quantities of cereal remains were identified

(N. 476, taxa ratio 65%³) compared to the abundant remains of cereals found in Periods VI A, VIB2 and VI C (Fig. 10).

³ In all archaeobotanical statistical data used here, the numbers and ratios only apply to seed remains. Since fragments, spikelet bases and rachis etc. were not included in previous publications, these data were not included in this study either. There are no records of fragmented cereal or dough in the published taxa of VI A, VIB2 and VI C. In the cereal data obtained in this study related to Period VI B1, 3557 fragments of cereal and 284 fragments of dough are recorded. Similarly, in the present study 3739 dough fragments are recorded in Period VI C, and 56 fragmented cereal remains are recorded in Period VI B2 (see Tab.1 and 2).

Tab. 3: Archaeobotanical taxa of rooms A1000, 1369, 1325 and 1346 in Period VI B1.

TAXA - VI B1 Period	E7(9-13) A1369 Q1 Camp. No. 406/2013	A1000 E 1d / Camp. No. 664/2012	E7 (9-10) (9) A1369 3dx / Camp. No. 688/12	E7 (9) A1369 3a	E7 (9) A1369 3dx / Camp. No. 706/12-2	A1000 A Δ t x	A1000 F 2ax / Camp. No. 712/2012	A1000 1b / Camp. No. 426/12	A1000 B 2ax / Camp. No. 708/12	A1000 B 2ax / Camp. No. 294/12	E7 (9-10) A1369 d1 b1 / Camp. No. 723/12	E7 (11-15) A1325 1a / Camp. No. 278/12	E7 (11-15) A1325 1c / Camp. No. 291/12	E7(11-15) A1325 1b / Camp. No. 281/12	A1346 Px / Camp. No. 183/13
Liters	5	1	6,5	0,75	8,5	0,1	0,5	0,75	0,2	1,25	0,25	0,6	0,2	0,75	6,75
<i>Avena fatua</i>	2														
<i>Hordeum vulgare</i>	1		3												
<i>Hordeum spontaneum</i>	1														
<i>Secale cereale</i>												1			
<i>Triticum aestivum/durum</i>	2				1								1		28
<i>Triticum dicoccum</i> (glume base)			1									2	4	1	
<i>Triticum monococcum</i> (glume base)															1
<i>Triticum terminal</i> (glume base)			1												
Tetraploid/hexaploid (rachis remains)															1
Cereal / Dough pieces												192			72
<i>Poaceaea</i> indet. (fragment)			4										21	14	1132
Culm				1											2
<i>Cicer arietinum</i>													1		
<i>Medicago arabica</i> sp. mineralized															1
<i>Medicago minima</i>					1										
<i>Pistacia atlantica/terebinthus</i>												1			
<i>Sorbus</i> sp. (seed)					39										
<i>Sorbus</i> sp. (berry)					25										
<i>Sorbus</i> sp. (fragment)					47										
<i>Vitis vinifera</i>			1		1										
Indet. Fruit fragment															5
<i>Bellevalia</i>	2														
<i>Coronilla</i> sp.	1														
<i>Galium aparine</i>	1														2
<i>Glaucium</i>	1														
<i>Leontodon saxatilis</i>	1														
<i>Malva</i> ssp.	1														
<i>Triglochin maritima</i>	2														

As to the earlier Period VIA, the proportion of cereal taxa is around 92% (seeds N. 1360) (Balossi *et al.* 2010)⁴, as well as that of following Period VIB2 (Sadori personal communication). The high ratio of cereal taxa is confirmed by a new sample (8.4 litres of soil) from Period VI B2 recording N. 5030 cereal residues and corresponding to 99% of the archaeobotanical remains (Appendix 1 and Fig. 10). Finally, as to the later Period VIC, the incidence of cereal taxa is around 80% (= N. 10267) (Sadori *et al.* 2006, tab. 2)⁵ and even higher is the incidence of cereal remains in a new sample from this same period consisting of 3.1 litres of soil where cereal remains account for N. 314 and correspond to 97% of the assemblage (Appendix 1 and Fig. 10).

– Comparison of cereal species diversity ratios. In Period VI B1 there is a remarkable diversity of cereal species (N. 12 cereal species) consisting of 5 different genus (*Aegilops*, *Avena*, *Hordeum*, *Secale*, *Triticum*; Tab. 2). Amongst them, *Triticum* is the most frequent and consists of 6 different species (*Triticum aestivum/durum*, *T. aestivum* subsp. *compactum* (Host), *Triticum dicoccum*, *Triticum monococcum*, *Triticum timopheevii*=NGW and *Triticum* cfr. *spelta*). Tetraploid/Hexaploid wheat (144 grains in total) and barley *Hordeum vulgare* (150 grains) are the most common cereal groups. In Period VI A it consists of 5 cereal species and 2 different genus (*Hordeum* and *Triticum*) (Balossi *et al.* 2010, tab. VI.1). Among these, *Hordeum vulgare* is the most common (800 grains in total), followed by *Triticum dicoccum* (382 grains). In the new samples from Period VI B2, 5 cereal species were recorded (*H. vulgare*, *T. aestivum/durum*, *T. monococcum*, *T. dicoccum* and *T.cfr. spelta*/NGW) belonging to 2 genus. Here, the highest number of grains that is recorded (grains: 2661; fragments: 1413) belongs to *H. vulgare*. Among the other cereal species are one grain of *T. cfr. Spelta*/NGW, *T. monococcum*, *T. dicoccum* and two grains *T. aestivum durum*. As to those from Period VIC, 6 cereal species belonging to 4 genus (*Avena*, *S. cereale*, *H. vulgare*, *T. aestivum/ durum*, *T. monococcum*, *T. dicoccum*) are recorded. The highest number of grains recorded are *H. vulgare* (N. 149), *T. dicoccum* (N. 80); *T. monococcum* (N. 35), *T. aestivum/durum* (N. 23), *S. cereale* (N. 16) and *Avena* sp. (N. 11) (Appendix 1). L. Sadori states that in Period VI B2 *Hordeum vulgare* is the most common cereal (60%), followed by *Triticum dicoccum* (about 20 %) (Balossi *et al.* 2010, tab. V.4), as well as in Period VI C, where cereal species appear to be only two (*Hordeum vulgare* and

Triticum aestivum/durum) and 2 the genus (*Hordeum* and *Triticum*) (Balossi *et al.* 2010, tab. V.4).⁶ In Period VI C, *Hordeum vulgare* constitutes 77% of the sample, followed by *Triticum aestivum/durum* (about 4%).

– Comparison of barley taxa ratios. In Period VI B1 the share of barley in the overall taxa appears to be lower (around 20%; Tab. 2; Appendix 1) than in other periods (Sadori *et al.* 2006; Balossi *et al.* 2010). For instance, barley increased in its importance since Period VI A, with a 54.3% share, reaching a proportional value of approximately 60% in Period VI B2 and up to 70% in Period VIC.

Comparison of taxa ratios of chaff and straw remains. Another taxa group that distinguishes VI B1 period from the others are the remains of chaff and straw linked to *crop processing*, such as spikelet bases, rachis, culm, etc. (Fig. 11). These remains are not recorded in previous publications on Periods VI A, VI B2 and VI C (Sadori *et al.* 2006; Sadori and Masi 2012; Balossi *et al.* 2010). In this study a total of 336 spikelet bases, 34 naked tetraploid/hexaploid rachis fragments, and 36 culm and 220 chaff and straw remains belonging to the seven cereal species from Period VI B1 have been recorded (Tab. 2). Data from Periods VI B2 and VI C record a limited number of spikelet bases, rachis and culm compared to period VI B1. In Period VI B2, 3 spikelets, 1 culm, and 94 chaff and straw remains have been recorded, and in Period VI C, 4 culms, 6 rachis internodes, and 50 spikelet bases. It should be noted that 31 of the spikelet bases belong to *H. vulgare* (Tab. 2).

Comparison of taxa ratios of weed remains. Period VI B1 features a large assemblage of plants (54 different plants with respect to family, genus, species, and subspecies), 26 of which consist of seeds of weed species. More in detail, a large number of weed seeds from steppe vegetation (like *Asteraceae*, *Bellevalia*, *Bromus* sp., *Centaurea* sp., *Coronilla* sp., *Festuca* sp., *Galium* sp., *Glaucium*, *Leontodon saxatilis*, *Malva* sp., *Poa annua*, *Stipa* sp., and *Taeniatherum caput-mechindusae*) have been identified (Tab. 2; Fig. 12). This data sharply contrasts with the very limited variety of plants identified in periods VI A (*Bromus* sp. and *Lithospermum* sp.). In periods VI B2 and VI C as well, weed numbers appear to be much smaller than those of VI B1. In the VI B2 samples *Cornell* sp., *Galium aparine* and *Vaccaria* sp. have been recorded, whilst *Chenopodium album* and *Leonton triglochis* were found in VI C, as well as *Polygonum* sp. (Sadori *et al.* 2006; Appendix 1).

4 Even though Balossi *et al.* 2010 do not provide the volume of the analysed soil sample, more than half of these samples were already published by Follieri and Coccolini 1983 and sum up 123 liters of soil.

5 Note the number of excessive chickpea grains in Period VI C. A total of 2308 seeds and 994 cotyledons were recorded. Cotyledons were not included in the taxa ratio.

6 Samples from period VI C all come from a single room, A607. This might be a bias to the limited species diversity.

Spatial distribution of the archaeobotanical remains in Period VI B1

The distribution of the archaeobotanical remains in Period VI B1 is uneven throughout the different occupation levels. For instance, a very limited archaeobotanical taxa record features the earliest levels, exclusively recording scattered remains of wooden and wattle and daub architecture associated to those 'black lines' that we know now to be the result of stratified animal dung. As to the other levels of occupation, altogether with bread or dough fragments, a large number of fragmented/flaked cereal remains (the overall taxa of bread and cereal fragments is about 80%) were concentrated in areas A1325 and A1346. These were the same open areas/dumps where the large quantities of leftovers of animal bones were recovered (Siracusano and Palumbi 2014), presumably in connection with special feasting events that took place in the adjacent Building 36. As for the latter building, 3.7 litres of soil samples have been analysed so far from A 1000, but no archaeobotanical remains were found. However, in the adjacent room A1369, both previous (Palumbi *et al.* 2017) and new archaeobotanical analyses have recorded a large number of *Sorbus* sp. (in total 25 berry, 39 seeds, and 47 fragments (Tab. 3) and two *Vitis vinifera* seeds (in a total of 21.45 litres of soil samples). As suggested in previous studies, it is possible that both *Sorbus* and *Vitis* fruits were used to produce alcoholic beverages consumed during ceremonial events (Palumbi *et al.* 2017). Additionally, according to our data, very little cereal remains are found in A1369 (Tab. 3). The limited number of cereal grains found in this room, together with 6 pestles and 1 quern, could suggest that cereals were processed possibly to produce flour, which might then have been kept in some of the many storage jars found in the room. Finally, worth remarking is also that in the latest levels of occupation, the dominant taxa are represented by cereal remains with a proportion of approximately 80%.

Remarks on the archaeobotanical data

The first important result of the archaeobotanical analyses of Period VI B1 is that, notwithstanding the marked pastoral characterisation of the settlement and of the caprine-focused animal economy practiced by the community, we can now say that agriculture was probably also practiced, even though direct evidence of storage of agricultural produces is lacking so far.

However, these new data also allow us to say that the practices of farming of Period VI B1 were different in both quantitative and qualitative terms from those of previous and later periods.

First of all, the considerably lower incidence of cereal remains identified in Period VI B1 could support the hypothesis that storage of cereals did not actually take place at the site and that farming practices among the pastoralists of Period VI B1 may have also been less intensive than those of other periods. On this note, the total absence of cereals in

the earliest levels of Period VI B1, when the settlement was first occupied by small groups of shepherds and their herds, emphasizes either their animal-focused preferences in terms of their economic and subsistence strategies or the transient seasonal presence of these groups at the site.

The most important effect of this decrease in farming activities seems to have been the significant drop in barley that, conversely, represents a clear crop marker of both previous and later periods, in particular of Period VI B2, when large amounts of barley have been interpreted as evidence of food for livestock (Masi *et al.* 2014, 256).

Quite interestingly, this drop in barley is counterbalanced by (and possibly was the cause of) two different phenomena presumably reflecting the adoption of new subsistence strategies.

The first piece of evidence is the increase in the variety of species of *Triticum* in Period VI B1 and may indicate the existence of farming traditions that were different (or independent) from those practices, probably more specialised, implemented in the context of the centralised economy of the previous Period VI A.

The second specific feature consists in the quantitative and qualitative increase of weeds that could be linked to both farming and herding practices. On the one hand, the large number of weed seeds and chaff and straw remains found in Period VI B1 points to the fact that *crop processing* activities took place at the settlement, differently from what occurred in Periods VI A, VI B2, and VI C, when the restricted number of these remains suggest that these activities were carried out elsewhere from the inhabited areas, possibly in specific spaces designated to them, according to procedures that suggest a more systematic spatial organization of farming-related activities. The reduced weed presence in Periods VIA, VIB2, and VIC might have also derived from techniques of removal/clearing of weeds directly from the crop field (Sadori, Susanna, and Persiani 2006), which may have not been practiced in Period VI B1.

On the other hand, if we hypothesise a general decrease of farming in Period VI B1, the large number and varieties of weed seeds may also be explained in a different way. The very limited amount of barley in Period VI B1 could have encouraged, or obliged, the herders of Period VI B1 to feed their animals from other sources: summer pastures (*yaylak*), winter pastures (*kishlaks*), and autumn pastures (*güzlek*⁷), but also from the same weed gathering.

7 Emiroğlu (1977) states that *Güzlek* (Güz = autumn, in Turkish) is lower than the plateau and closer to the centre of permanent settlement. X. de Planhol (1959) states that the word "güzleme", which describes the autumn ascent, is also used for the spring ascent and that "güzlek" constitutes the first level of the plateau. Therefore, "güzlekler", which is milder than the plateau, was used by pastoralist communities both in the spring and autumn seasons, i.e. during both the ascent to the plateau and the return from the plateau to the village.



a



b

Fig. 13: a) Jars in Kura-Araxes style from Building 36; b) *Black Topped Bowls* from Period VI B. © *Archive Missione archeologica italiana nell'Anatolia orientale (MAIAO)*.

Previous research (Atalay and Mortan 2006, 329) showed that in East Anatolia the grass harvested and dried from the meadows was used as animal forage in the winter period. In a similar way, the numerous weed taxa featuring the archaeobotanical record of Period VI B1 could mirror the fact that weeds were intentionally collected and brought to the settlement to feed the animals in winter time. Actually, Arslantepe and its surroundings are located in the Irano-Turanian Floristic Region (Zohary 1973; Atalay and Mortan 2006),

consisting of oak forests, pastures, and grazing areas that can be used in all four seasons (summer, spring, autumn, and winter) and are an ideal ecological environment to meet the feed requirements of caprines without any additional agricultural activities (such as barley cultivation).

Reconstructing the geographical and cultural dimensions of mobility through ceramics and obsidian

by Giulio Palumbi

To which extent is it possible to reconstruct, on the basis of the remaining archaeological evidence, the geographical, social, and cultural dimensions of the mobility practiced by the community or by the groups that occupied Arslantepe in Period VI B1?

Pottery

Pottery may offer significant insights on these matters, as the hand-made Red-Black, Monochrome and Black burnished ceramics feature systematically morphologies (such as double-handled jars, cylindrical well distinct necks, and circular lids) clearly recalling the contemporary Kura-Araxes pottery from East Anatolia and South Caucasus (Fig. 13a; Palumbi 2008;). These analogies could speak for intensive contacts and, possibly, systematic coexistence with the East Anatolian/South Caucasian communities in the same areas. However, the picture might not be that simple and it does not suggest an origin of these groups from the Caucasus, nor their full belonging to that cultural environment: the red-black ceramics from Period VI B1 indeed also show some features that are not exclusively Kura-Araxes related and are rather linked to the earlier local red-black pottery tradition in turn related to Central Anatolian cultural environments. This is for instance the case of the abundant and ubiquitous red-black hemispherical bowls (Fig. 13b). This type of bowls is actually absent in the contemporary Kura-Araxes repertoires but recalls the contemporary *black-topped bowls* from Central Anatolia, also in terms of the use of red and black colour pattern (black colour inside and red colour outside; Palumbi 2012). Meaningful is the fact that this pattern, usually applying black to the most visible surface of the vessel (the outside for closed pots and the inside for open ones) and red to the less visible one, also characterised the pottery shapes of the previous Period VI A, whereas it is different from the 'fixed' Kura-Araxes use of the two colours (black always on the exterior surfaces). Overall, the red-black ceramics of Period VI B1 mingle shapes and colour effects (and therefore firing techniques) deriving from different regional traditions (Upper Euphrates, Central Anatolia, and East Anatolia/South Caucasus) thus expressing a profound sense of hybridity. It was suggested (Palumbi 2012) that this hybrid repertoire recalling traditions that developed in and between the plateaus, mountains and highlands of the Upper Euphrates, Central and East Anatolia/ South Caucasus could have been the result of the interactions that the herders of Period VI B1 undertook with the communities located east and west of the Malatya plain

in the frame of long-distance regional movements (Fagnoli 2018).

In the frame of this interregional network of cultural contacts, new data also shows that the ceramic production of Arslantepe VI B1 was actually connected to a more local or shorter-distance type of mobility. Petrographic and geochemical analyses have recorded the use of clay sources located in two different geological areas at a different distance from the settlement: the volcanic Orduzu suite, at less than 1 km from Arslantepe, and the outcrops of metamorphic rocks between 10 and 30 km southwest from Arslantepe (Fagnoli 2018, 323). There is a vast ethnographic literature providing information on the distance occurring between sources of raw materials and pottery making communities showing a wide spatial variability stretching from in loco sources to about 30 km that can differ between sedentary and non-sedentary communities (Arnold 1985, 32–44). P. Fagnoli remarked (2018) that the composition of the clays exploited in the two different areas mirror the above-mentioned morphological bipartition between open and closed shapes. Accordingly, the black-topped bowls in Central Anatolian 'style' were made with raw materials available in proximity to the settlement and corresponding to the catchment area of the Malatya plain, while the jars in Kura-Araxes style were made with raw materials available further away and already located in the mountainous zone bordering the Malatya plain. These preferences for different raw materials could be embedded in different practices of mobility carried out in adjacent but ecologically complementary zones (i.e. plains and mountains) of the Malatya region. While in the case of the bowls, the proximity of the clay sources to the settlement allowed for a daily type of movement, the distance of the clays used for jars may have required longer journeys in the direction of the mountains. However, it still remains very difficult to understand the aims and practices behind this twofold pattern of clay supply and these data raise more questions than give answers. Does the variability of the distance from the sources mirror different patterns of residential mobility of the potters? Were bowls and jars made in proximity of the clay sources or, conversely, clays were brought back to Arslantepe to be processed and fashioned at the settlement? Did these preferences mirror technical choices linked to different technical qualities of the clays? As long as these questions remain unanswered, it will not be possible to put pottery production in the context of more specific types of mobility.

Obsidian

The geochemical signature of the obsidian allows at once to locate the primary sources of this volcanic glass as well as to trace its dispersal. Several works have now localised with precision the geographical location of the obsidian sources from Central and East Anatolia as well as from

South Caucasus (Chataigner *et al.* 2014; Chataigner and Gratuze 2014). Furthermore, obsidian sourcing studies, once coupled with technological analysis of the debitage highlighted the role of social and cultural dynamics in the interregional circulation of the obsidian as a raw material, as well as semi-finished or finished products (Ibáñez *et al.* 2016). Obsidian sourcing from Arslantepe Period VI B1 confirms the transregional connections of the settlement (Mouralis *et al.* 2018) already highlighted in the frame of the pottery styles. These data show that the majority of the obsidian sources exploited in Period VI B1 are those in East Anatolia (Bingöl, Nemrut, Pasinler and Sarıkamış) and that obsidian from Cappadocia (Göllü Dag) was used in much lower quantities than the East Anatolian one. This confirms the frequentation of both East and Central Anatolia regions, though the higher incidence of East Anatolian obsidian hints at some type of preference towards this latter region. However, the technological analysis on the obsidian also shows that raw material was not processed at Arslantepe and that it reached the settlement under the form of blanks or preformed tools. Taking into account that sources are located at a distance between 230 and 460 km, which can be covered between 50 and 100 walking hours, we cannot exclude that the inhabitants of Arslantepe directly reached the sources and brought back 'home' blanks and semifinished tools. However, the possibility that the obsidian that arrived to Arslantepe was the result of broader networks of exchange and interaction with both Kura-Araxes and Central Anatolian communities, possibly framed into and activated by the mobility of the Arslantepe herders, seems to us a hypothesis even more plausible than the former, also in the light of the ceramics data discussed above.

Final remarks

by Giulio Palumbi, Marcella Frangipane,
Francesca Balossi Restelli, Susanna Cereda, Paola
Iacumin, Rana Özbal, Burhan Ulaş

The multiproxy and multiscale approach applied to the study and analysis of a large and variegated corpus of evidence from Period VI B1, allowed us to reconstruct, with a high degree of reliability, complex dynamics of occupation and mobility of the community (or communities) that lived at Arslantepe towards the end of the fourth millennium BCE.

The first important result of the micromorphological and geochemical analyses presented in this work has been the identification of the nature of the several overlapping 'black lines' featuring the earliest levels of occupation of Period VI B1, as a result of both long-term and intensive sedimentation of animal dung. It was the result of practices of animal penning at the site, which were repeated at least two, possibly even three times, on the same area of the

settlement on the basis of what appears to be a cyclical pattern of occupation. These data also reveal a close cohabitation between the shepherds and their herds never recorded (and never to be recorded) in other phases of occupation at Arslantepe, thus underlining the specificities of a settlement organisation that could have recalled that of a pastoral campsite. Actually, this suggestion of pastoralism is also justified by faunal data showing a sharp specialisation of the herding strategies on sheep and goat, thus allowing us to contextualise the occupations of Period VI B1 in what appears to be a socio-economic pastoral 'milieu'. On this note, the total absence of cereal remains and evidence of crop-processing activities in these earliest levels could further stress the animal-based subsistence strategies of these pastoral groups.

It has been stressed in the introductory section how pastoralism and mobility are intrinsically linked to each other and that, consequently, different forms of pastoralism require and are linked to different practices (and scales) of mobility. It has also been pointed out that the enormous variation in terms of patterns of mobility (Dyson-Hudson and Dyson-Hudson 1980: 18) means that pastoralism may develop in a fluid continuum of practices, making it hard to classify it in pre-conceived categories. In spite of this continuum, we pointed out some differences that may distinguish so-called nomadic from transhumant pastoralism, especially in relation to patterns of residency, occupation, and seasonal mobility. While the former is characterised by higher residential and higher territorial mobility of the whole community over space and through time, the latter is more usually practiced by segments of a community and is framed within practices of seasonal mobility, carried out between fixed winter and summer locations (Chang 1993). Taking into account these criteria, what type of mobility was practiced by the shepherds of Period VI B1 at Arslantepe?

Isotopic data clearly highlight that caprines of period VI B1 were characterised by more varied diets, and that they were left to graze in vaster areas than in other periods, and that these areas could have corresponded to semi-wild environments.

At the same time, the culling patterns of caprines, by recording the high incidence of old and very young individuals that could not afford long-distance movements stress, show how the animal economy of this community was tightly linked to strategies of mobility. Finally, the culling patterns offer insightful clues on the seasonality of these movements that could have taken place from Arslantepe in early-spring or early-summer. It is very tempting to identify these seasonal movements with practices of transhumance that would have had wide summer pastures available in this region.

As to the directions that these movements may have taken, pottery styles coupled with obsidian sourcing point

to the simultaneous frequentation of both Central and East Anatolia, in the frame of practices of vertical transhumance at long-distance and interregional scale as still practiced nowadays. Furthermore, obsidian data highlight that transhumance towards these latter regions could have also played a fundamental role in channelling the circulation of obsidian towards the Upper Euphrates. However, the seasonal frequentation of East and Central Anatolia, was not exclusively limited to the exploitation of pastures and raw materials. Actually, the strong affinities of the ceramics from Period VI B1 with those of the Kura-Araxes communities from East Anatolia and South Caucasus also speak for intense cultural interaction of these groups with local populations. From this point of view transhumance, beyond economic, was also a social and political practice that involved encounters and interaction with different cultures and communities. These interactions could have deeply shaped the cultural identity of the shepherds from Arslantepe, as clearly shown by their ceramic assemblage, thus transforming them into active vectors of the Kura-Araxes traditions towards west and the other way.

However, the data we have presented in this work, along with those clearly speaking in favour of mobility, also point to the fact people were staying, too.

The architectural sequence of Period VI B1 is the first piece of evidence suggesting that while the earliest levels of Period VI B1 could witness short-term occupations, the following levels, by recording the construction of the large palisade and of the mud-brick Building 36, hint at an increasing investment in the construction of long-lasting buildings with special ceremonial and communal functions and at a somehow planned organization of spaces in the settlement as well. Although not decisive, the architectural data may suggest a process of gradual re-settling of the community, or at least of some segments of the community, possibly in connection with a more stable political appropriation of the settlement and the role it re-acquired in the region. Actually, these data seem to be in line with the archaeobotanical data highlighting that farming, which is an activity that must have implied some type of permanence / or settled way of life, was most probably practiced in Period VI B1. In this respect, the diachronic distribution of the cereal remains shows that while the earliest levels do not record any evidence of cereal grains nor of crop-processing activities, the mature and later phases of Period VI B1 do, thus witnessing farming activities carried out in loco. These data stress that the community of Period VI B1 was based on a variety of strategies of subsistence not only based on animal herding, but also on farming. However, farming may have played a minor role in the economy of Period VI B1, as suggested by both isotopic and archaeobotanical data, highlighting that the fertilization of fields as well as the removal/clearing

of weeds from the crop fields were no longer practiced, thus pointing to a low labour investment that may have also entailed a reduced production. The significant decline in barley reinforces the suggestion that the pastoral economy was dominant and better organised than the agricultural economy, while weed seeds, rather than barley, may have been deliberately collected to meet the shortage of animal feed. Fodder could have been needed in late autumn or in wintertime, once the flocks (and their shepherds) used to come back to Arslantepe after the summer transhumance.

The case study of Arslantepe Period VI B1 is among the rare studies which represent direct evidence of mobility practices linked to prehistoric pastoralism in the East Anatolian highlands. Though, as T. Cresswell pointed out, mobility can be an elusive object of study, we managed to grasp and materialise mobility in its multiple dimensions by bringing together pieces of evidence of different kind and nature that were compared and complemented each other.

This is the result of extensive, stratigraphically controlled and long-term excavation strategies that have produced large amounts of diverse data that allowed us to observe in detail the diachronic evolution of the occupation at Arslantepe. These data enabled us to tie together dynamics of resettling and occupation, subsistence and economic strategies linked to pastoralism, and practices of mobility of a transhumant-type. As to the latter practices, though implying movements from the region of Malatya to neighbouring areas, they seem to have remained deeply anchored to Arslantepe for reasons that must have been at once territorial, political, and ideological.

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Appendix 1. Archaeobotanical taxa of the old and new data of Periods VI A, VI B1, VI B2 and VI C.

Period	VI A	VI B1	VI B2	VI C
Total Context	14	50	5	1
Total Liters	?	79	8,4	3,1+?
References	Balossi <i>et al.</i> 2010	Present study	Present study	Present study & Sadori <i>et al.</i> 2006
		VI B1	VI B2	VI C
<i>Avena fatua</i>		2		11
<i>Avena sativa</i>		1		
<i>Avena</i> sp.		5		
<i>Hordeum vulgare</i>	800	82	2661	149
<i>Hordeum vulgare</i> (fragments)			1413	
<i>Hordeum</i> sp.		67		
<i>Triticum</i> sp.	33	7		
<i>Hordeum spontaneum</i>		1	1	
<i>Hordeum vulgare</i> (glume base)		12		
<i>Hordeum vulgare</i> (rachis internode)		4		
<i>Secale cereale</i>		6		16
<i>Secale cereale</i> (glume base)		1		
<i>Aegilops</i> sp. (glume base)		1		
<i>Hordeum vulgare</i> ssp. <i>distichum</i>				9718
<i>Triticum aestivum/durum</i>	23	141	2	537
<i>T. aestivum</i> subsp. <i>compactum</i> (Host)		3		
<i>Triticum dicoccum</i>	382	9		115
<i>Triticum monococcum</i>	121	4		35
<i>Triticum/Hordeum</i>		146	952	
<i>Hordeum</i> sp. (glume base)				31
<i>Triticum dicoccum</i> (glume base)		115	1	8
<i>Triticum monococcum</i> (glume base)		43	1	3
NGW= <i>Triticum timopheevii</i> (glume base)		1		
<i>Triticum</i> cfr. <i>spelta</i> /NGW	1	2	1	
<i>Triticum spelta</i> (glume base)		3		
<i>Triticum terminal</i> (glume base)		7		
<i>Triticum</i> sp. (glume base)		165		7
Tetraploid glume base				1
Naked wheat (rachis remains - tetraploid)		9		
Naked wheat (rachis remains - hexaploid)		15		
Tetraploid/hexaploid (rachis remains)		10		
Rachis internodes indet.				6
Cereal / Dough pieces		284		3739
<i>Poaceae</i> indet. (fragment)		3557	56	
<i>Poaceae</i> small wild type		5		
Culm		36	1	4
Straw remains		220	94	

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		VI B1	VI B2	VI C
<i>Fabaceae</i>		5		
<i>Fabaceae</i> small		2		
<i>Lens culinaris</i>	83	13		3
<i>Cicer arietinum</i>		6		2308
<i>Cicer arietinum</i> (cotyledon)				994
<i>Lathyrus sativus</i>		1		
<i>Lathyrus</i> sp.	2			
<i>Leguminosae</i>	2			
<i>Medicago arabica</i> sp. mineralized		1		
<i>Medicago minima</i>		1		
<i>Pisum sativum</i>		6	1	6
<i>Pisum sativum</i> (cotyledon)				1
<i>Vicia ervilia</i>		1		
<i>Vicia ervilia</i> (L.) Wild.	8			
<i>Amygdalus</i> sp.		6	1	
<i>Celtis australis</i> (mineralized)		1		
<i>Ficus carica</i>		1		1
<i>Pistacia atlantica/terebinthus</i>		13		
<i>Pistacia</i> nutshell frag.				4
<i>Pistacia</i> sp. (mineralized)		2		
<i>Prunus</i> sp. (mineralized)		2		
<i>Sorbus</i> sp. (seed)		41		
<i>Sorbus</i> sp. (berry)		25		
<i>Sorbus</i> sp. (fragment)		47		
<i>Vitis vinifera</i>		4		2
<i>Vitis vinifera</i> L. subs. <i>Sylvestris</i> (C.C. Gmel.) hegi	6			
<i>Vitis vinifera</i> L. subs. <i>vinifera</i>	5			
Indet. Fruit fragment		5		
<i>Adonis</i>		1		
<i>Asteraceae</i>		7		
<i>Bellevalia</i>		3		
Cfr. <i>Bellevalia</i>		4		
<i>Bolboschoenus maritimus</i>		1		
<i>Bromus</i> sp.	2	3		
<i>Bromus arvensis</i>		4		
<i>Centaurea</i> sp.		3		
<i>Chenopodium</i> cfr. <i>album</i> (mineralized)		1		

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		VI B1	VI B2	VI C
<i>Chenopodium cfr. album</i>		4		
<i>Chenopodium album</i>				2
<i>Coronilla sp.</i>		2	1	
<i>Colutea arborescens</i>		1		
Cyperaceae		3		
<i>Digitariasp.</i>		1		
<i>Euphorbiasp.</i>		1		
<i>Festuca sp.</i>		8		
<i>Galium aparine</i>		5	9	
<i>Galium sp.</i>		4		
<i>Glaucium</i>		1		
<i>Poa annua</i>		1		
<i>Leontodon saxatilis</i>		1		2
<i>Lithospermum sp.</i>	3			
Cfr. Rosaceae	1			
<i>Malva sp.</i>		5		
Ranunculaceae		1		
<i>Phalaris sp.</i>		1		
<i>Polygonum sp.</i> (fruit)				3
Cfr. Polycnemum		1		
<i>Prunus cf. Spinosa L.</i>	2			
<i>Stipa sp.</i>		1		
<i>Taeniatherum caput-medusae</i>		4		
<i>Taeniatherum caput-medusae</i> glume base		3		
<i>Triglochin maritima</i>		2		
<i>Triglochin</i>				1
<i>Valerianella sp.</i>		4		
<i>Vaccaria sp.</i>			1	
İndet Seeds		79	24	12