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İçindekiler / Contents

The Crop is on Fire: Evidence of Subsistence Strategies from Late Chalcolithic Çukuriçi Höyük

Christoph Schwall[a], Ursula Thanheiser[b], Mario Börner[c], Barbara Horejs[d]

Abstract

The excavations of the Late Chalcolithic settlement phases at Çukuriçi Höyük produced important data on storage facilities and food processing activities. This paper focuses on the botanical remains to reveal detailed information on the inhabitant's subsistence strategies. Since the settlements of the Late Chalcolithic in 4th millennium BC and the initial Early Bronze Age 1 dating around 3000 cal. BCE were destroyed by fire, the assemblage offers ideal conditions for archaeobotanical studies. The analyses show that cereals, pulses, figs, and grapes are dominating and can be associated with food processing and storage installations. For Late Chalcolithic Çukuriçi Höyük the results indicate a coastal community based on a well-scheduled subsistence strategy with intentional surplus production and storage of food. Moreover, the high number of fruits indicate that so called "cash crops"—targeted overproduction of food—may have already played an economic role in the Late Chalcolithic as exchange goods.

Keywords: Late Chalcolithic, western Anatolia, Çukuriçi Höyük, archaeobotany, storage and surplus production

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Özet

Çukuriçi Höyük'te Geç Kalkolitik Dönem'e tarihlenen evrelerde gerçekleştirilen çalışmalar, yerleşmede bu dönemde depolama ve besin hazırlığı aktivitelerine dair önemli sonuçlar sunmuştur. Bu makalede, yerleşmenin Geç Kalkolitik Dönem sakinlerinin besin ekonomisi hakkında detaylı veriler sunan arkeobotanik kalıntılara odaklanılmaktadır. Yerleşmenin MÖ 4. binyıla tarihlenen Geç Kalkolitik Dönem ve MÖ kal. 3000 civarına tarihlenen Erken Tunç Çağı evreleri bir yangın sonucunda tahrip olduğu için, arkeobotanik kalıntılar ideal korunma koşulları altında günümüze ulaşmıştır. Analizler, tahıllar ve baklagiller ile incir ve üzüm gibi meyvelerin yoğun olduğunu ve besin hazırlığı ve depolama faaliyetleri ile ilişkilendirilebileceğini işaret eder. Sonuçlar, Çukuriçi Höyük'te Geç Kalkolitik Dönem'de deniz kıyısında yaşayan topluluğunun oldukça organize bir besin ekonomisine sahip olduğunu ve besinlerin bilinçli şekilde depolanarak artı ürüne dönüştürüldüğünü göstermektedir. Yanı sıra, arkeobotanik malzeme içerisinde meyvelerin yoğunluğu, kimi besinlerin, tüketim amacının dışında bilinçli şekilde fazlasıyla üretildiğini ve Geç Kalkolitik Dönem'de bu ürünlerin takas malzemesi olarak ekonomik bir rol oynamış olabileceğini önermektedir.

Anahtar kelimeler: Geç Kalkolitik, Batı Anadolu, Çukuriçi Höyük, arkeobotanik, depolama ve artı ürün üretimi

Introduction

This paper aims to investigate the evidence of botanical remains discovered during the excavations of the Late Chalcolithic settlements at Çukuriçi Höyük. During the fieldwork an area of the site with several installations was discovered pointing to well-structured subsistence strategies including surplus production and storage of food inside the settlement. In this context, the results of the excavations at Çukuriçi Höyük enable important insights into subsistence strategies of a Late Chalcolithic central western Anatolian coastal site.

The site Çukuriçi Höyük is nowadays located to the south of the ancient city of Ephesus, approximately 7.5 km away from the coastline (Figure 1). However, paleogeographic studies revealed that the settlement mound was situated close to the sea and next to a lagoon in prehistoric times (Stock et al. 2015). Furthermore, these investigations revealed that the preserved settlement size can be estimated between 200 (N-S) and 100 (E-W) meters and the mound itself consists of 8.5 m of occupation layers (Stock et al. 2015).

The extensive excavations at Çukuriçi Höyük yielded evidence of settlement phases dating from the 7th to the 3rd millennium BCE and belonging to the Early (ÇuHö XIII-XII) and Late (ÇuHö XI-VIII) Neolithic, the Late Chalcolithic (ÇuHö VII-Vb; Figure 2) and Early Bronze Age 1 (ÇuHö Va-III) periods (Horejs 2017, 17, fig. 1.5). The Late Chalcolithic can be separated into four different settlements (ÇuHö VII, VIb-a, Vb) —partially detected underneath the architecture of phase ÇuHö IV in the middle and northern parts of the mound (Figure 2-3;

Schwall 2018; Schwall and Horejs 2018)— which will be discussed in this paper. Additionally, subphase ÇuHö Va represents the very beginning of the Early Bronze Age at the site and will be included due to a similar architectural outline which stands in contrast to the subsequent Early Bronze Age settlement phases ÇuHö IV-III (Grasböck et al. in press). This timeframe is securely confirmed by 31 radiocarbon dates on short-lived plants, which range between 3350 and 2950 cal. BCE (Schwall 2018, 167-170). Therefore, we can attest a transition without hiatus from the Late Chalcolithic to the Early Bronze Age periods at Çukuriçi Höyük.

Interestingly, different material studies on the Late Chalcolithic period of the site already pointed out that specialized craft activities like metal or textile production and, therefore, division of labor were performed within this permanent settlement (e.g., Horejs 2014; Mehofer 2014, 464-466; Schwall 2018, 277-285). In addition, the evidence of intentional surplus production during the Late Chalcolithic period in western Anatolia and the East Aegean was discussed based on the published data in this region (e.g., Horejs and Schwall 2015, 464-466). The recently published paper on storage pits and surplus production from the Middle Chalcolithic site of Barcın Höyük (Gerritsen 2021) suggests organized surplus strategies as early as the beginning of the 5th millennium BCE. Therefore, it is no longer a question of whether, but to what extent surplus production as "a household production beyond its annual immediate needs" (Prats et al. 2020, 3) was managed at Late Chalcolithic Çukuriçi Höyük—possibly for economic reasons? In this study, the results of the archaeobotanical analyses should be assessed together with the architectural remains and installations discovered during the excavations at Çukuriçi Höyük. Detailed information about the architectural remains of the settlement phases ÇuHö VII to V are provided in the supplementary data in order to concentrate on the installations which are used in context of surplus production.

Beside small-scaled circular buildings which can be interpreted as storage facilities (Horejs 2014, 32; Kouka 2014, 46, 53), so-called 'stone row structures' provide evidence for drying platforms (Schwall 2018, 176-178). The installations consist of parallel single vertical stone rows with horizontally placed flat stones on the top and a possible wooden surface (Figure 4a). Due to the distance between the ground and the platform, the crop was protected against moisture and, moreover, the circulation of air supports the drying process. Next to these structures, food preparation took place as attested by stone tools like mortars, pounders and grinding stones. When looking at the settlement phases ÇuHö VII to V (Figure 2), it is striking that—due to the relatively little knowledge about the construction of phase ÇuHö VII—drying platforms (SR 1-6) were detected in every settlement since phase ÇuHö VI. In phase ÇuHö VI the platforms seem to be related to domestic buildings. From phase ÇuHö V onwards the area was exclusively used for storage purposes and for food preparation activities pointing to a possibly communally arranged surplus production by the settlement's inhabitants. At the latest

from subphase ÇuHö Va onwards, the initial Early Bronze Age, a visible boundary of the area was created with an enclosure wall (Figure 4a). However, the question of the precise function of the wall must remain open. It can only be assumed whether the enclosure may have served as protection against animals or to allow access to the storage area to particular inhabitants or groups of the site. Nevertheless, a separated area for such purposes suggests a spatial subdivision of the inner settlement structure for specific labour activities such as intentional surplus production of foodstuffs.

Archaeobotanical Analyses

Crucial for the assessment of the surplus production is precise analyses of the charred remains recovered from the 'stone row structures' and contexts in their direct vicinity. The botanical samples discussed here were handpicked or extracted by flotation from levelling layers or sealed contexts belonging to distinct installations which are presented in the following section.

Under the climatic and edaphic conditions in western Anatolia any plant material and plant-based foodstuff will deteriorate quickly. This is due to micro-organisms which feed on the organic matter. Preserved is only what is transformed into a substance unfit for decomposition. The most widespread of such transformations is charring, the reduction of organic material to almost pure carbon by heat (fire) in the absence of sufficient oxygen for combustion. Once charred, plant remains may survive for millennia. However, charring also works as a filter since only a fraction of the plants or plant products present at a site will eventually be exposed to fire. In addition, many plant parts such as oil-rich seeds, and delicate items such as leaves or flowers, do not survive charring in a recognisable form and are therefore lost for the archaeobotanical record of a site. Most likely to survive in charred form is foodstuff requiring cooking, such as cereals, and the fuel employed. Leafy vegetables, herbs and spices and any salad plants, fruits, berries, and nuts which are eaten raw are usually rare in a charred archaeobotanical assemblage. Correspondingly, the density of archaeobotanical remains is generally very low on Çukuriçi Höyük and the dominant find is cereal grains. However, the areas dating to the Late Chalcolithic (ÇuHö VI-Vb) and the initial Early Bronze Age (ÇuHö Va) discussed here were repeatedly destroyed by fire which resulted in an abundance of charred plant remains visible to the naked eye during excavation (Figure 4b-c). The bulk of the soil samples were taken from the occupation layers of distinct activity zones and selected levelling layers. These were processed and analysed according to international standards with a smallest mesh size of 0.5 mm and the mineral fraction was screened (Jacomet and Kreuz 1999, 95-112; Pearsall 2001, 11-97; and for Çukuriçi Höyük in particular: Thanheiser et al. forthcoming). All botanical remains are preserved by charring.

ÇuHö VIb

Numerous charred remains (n=2387) were recovered from an occupation level of subphase ÇuHö VIb which can be associated with the activity zone of 'stone row structure' SR 5. Below a levelling layer (SU 1447) upon the occupation level (SU 1448) an accumulation of charred remains (SU 4504) were found next to a jar, a mortar, and a tripod cooking pot (SU 1451, 1492) in the direct vicinity of SR 5 (Schwall 2018, 122-124, figs. 21, 23). The assemblages of both the materials associated with the occupation level (n=2242) and the levelling layer (n=145) are dominated by grape pips (Figure 5; Table S1). Pulses are subdominant; cereals and wild growing plants occur in equal proportions nowhere exceeding 5% of the assemblage. It can be assumed that grapes and pulses were dried on SR 5 and that the few cereal grains and the single whole fig derive from a previous drying event. The wild growing plants may be the remains of fuel used for heating or from other activities in this area which indicate food processing and preparation for cooking in the direct vicinity of architecture. Due to the subsequent levelling of the area, the plant remains from SR 5 were spread and correspondingly the two assemblages are very similar in composition.

ÇuHö VIa

In subphase ÇuHö VIa significant amounts of botanical remains (n=2055) were discovered from two areas: the 'stone row structure' SR 3 and the filling of a storage vessel.

The material related to SR 3 comes from the associated occupation level (SU 5585) and levelling layers (SU 5465, 5539) covering the installation (Schwall 2018, 145-146, fig. 42). The material from the occupation level (n=1115) and the above situated levelling layers (n=868) show clearly that cereals and pulses are dominating (Figure 6; Table S1). Moreover, it is striking that about 13% of wild growing plants (mainly grass) were found on the occupation level indicating a conscious drying of grass or its use in the vicinity of SR 3. Additionally, fruit (fig and grape) among the remains suggest that—like on SR 5—different crops were dried on the platforms. Of particular interest is also an olive stone which was among the charred remains.

The storage vessel was situated northeast of SR 3 in close distance to the dwelling RH 1 and placed in a pit (Schwall 2018, 145, 147, figs. 43-44). Due to the destruction and subsequent levelling of the area only the lower part with a remaining filling (SU 5445) was preserved. The material (n=72) contains mainly pulses (63%); other materials in lower quantity may have got inside the vessel during its destruction and levelling.

ÇuHö Vb

The highest number of botanical remains (n=4794) was recovered in subphase ÇuHö Vb. The excavated area can be divided into a western (RB 1, SR 2) and eastern (SR 1, SLK 1) activity zone.

Due to the immediate proximity of the circular building RB 1 and the 'stone row structure' SR 2, it is worth considering both structures in the west together (Schwall 2018, 148-155). Data are available from an occupation level (SU 5490) west of SR 2 and from levelling layers covering RB 1 and SR 2 (SU 5450, 5467, 5477). Most of the plant remains (n=2133) come from the levelling layers (Figure 6; Table S2). Dominant are pulses (54%) followed by cereals (30%, mainly barley) and grapes (12%). Interestingly, two olive stones and one pistachio are among the assemblage. In the material of the occupation level (n=88), the density of plant remains is much lower (8.8 items per liter) than in the levelling layer (20.4) and exhibits the usual range of plant remains, however with an absence of grape and an emphasis on whole figs; again, one olive stone is present.

The eastern activity zone consists of different features next to 'stone row structure' SR 1 (Schwall 2018, 155-159). SR 1 and the associated occupation level (SU 5325) were covered by a levelling layer (SU 5302). South, in front of this installation a smaller (SU 5573) and a bigger (SU 5329) pit were situated in close distance to the filled (SU 5576) stone clay construction SLK1. The results of the levelling layer (n=648), the occupation level (n=997), and the big pit (n=664) show a mixture of cereals, pulses, figs and grapes with fig being clearly dominant in the area of SR 1 (Figure 7; Table S2). In contrast, the sample from the small pit (n=181) contains more than 80% grape pips indicating a possible temporary storage next to the drying platform. The percentage composition of the remains found in the filling of SLK 1 (n=83) strongly resembles the amounts of the levelling layer. Thus, it can be assumed that the sediment found inside SLK 1 is rather a part of the levelling layer than a separate filling.

ÇuHö Va

A large number of botanical remains (n=4601) is available for the activity zone of circular building RB 2 and 'stone row structure' SR 4 in subphase ÇuHö Va (Figure 8; Table S2). Beside the internal occupation level of RB 1 (SU 5434) and the attached level of SR4 (SU 5525), a significant amount of remains was recovered from the levelling layers (SU 5435, 5486) covering the remains of RB 2 (Schwall 2018, 160-164). On the occupation level of SR 4 (n=56) pulses (43%) and figs (36%) constitute the majority of finds with a small admixture of cereals and grapes. By far the richest sample comes from the levelling layer above RB 2 (n=4518) which is more representative than the sample from the occupation level (n=27) of the building itself. Here pulses dominate with 85%; cereals and grape occur in equal proportions (7%). The internal occupation level of RB 2 itself contains only a few botanical remains with again a dominance of grapes followed by pulses and cereals.

Discussion of the Archaeobotanical Results

The 23 samples from the above-mentioned settlement layers yield a total of 13837 items. These remains can be grouped into three categories: staple food (cereals and pulses), tree crops (figs, grapes and olives), and wild growing plants. Together the food plants represent 96.4% of the archaeobotanical assemblage. The wild growing plants range between 1 and 6% in any context with the exception of 'stone row structure' 3 (SR 3) where c. 13% of the assemblage derives from wild growing plants, especially grasses. These wild growing plants may represent segetals brought in together with the harvested crops. Alternatively, they also could be ruderals growing in the vicinity of the installations, withered plants collected to kindle a fire or plants incorporated into the archaeobotanical assemblage via the use of dung as fuel.

Cereals are represented exclusively by grain whereas chaff and straw are missing. Dominant among the identifiable grains is barley (*Hordeum vulgare*) followed by hulled (*Triticum monococcum*, *T. dicoccum*) and naked wheats (*T. aestivum* s.l./*durum*). However, due to a high degree of fragmentation and abrasion a large proportion of grains remains unidentified (Cerealia). The lack of chaff and straw in combination with the low percentage of possible segetals suggests that processed grain ready for milling got charred.

Pulses are usually underrepresented on sites with exclusively charred remains since they react badly to heat and are often destroyed beyond recognition. At Çukuriçi Höyük the pulses appear to be well preserved. They are present mainly as whole seeds. However, among the 6300 recovered items not even one is preserved with its hilum and the hilum impression is mostly not visible due to abrasion. In addition to the identified specimens belonging to lentil (*Lens culinaris*), fava bean (*Vicia faba*), Indian pea (*Lathyrus sativus*), bitter vetch (*Vicia ervilia*), and common vetch (*Vicia sativa*) the assemblage contains two distinctive Fabaceae types: type 1 and type 2. The former was previously identified as *Vicia palaestina* which, so far, has not been recovered at archaeological sites and, based on the lack of mentions in ethnographic literature, has no tradition for human consumption. Since there appears to be a gradual transition from this type to other taxa with seeds of similar size, the identification is kept pending. For the latter type no corresponding form was found so far. It is distinctly wedge shaped with a truncated base.

Tree crops are represented in particular by grape (*Vitis vinifera*) and fig (*Ficus carica*) which are important sources of sugar. Both can be eaten fresh or can be dried for future consumption. Beside these, evidence of pistachio (*Pistacia* sp.) and olive (*Olea europaea*) can be added. The latter is known from already published data from phase ÇuHö VII (Thanheiser and Wiesinger 2011, 53) and is also present in later Late Chalcolithic (n=10) and Early Bronze Age 1 (n=11) layers (Table S3).

The recovered set of plant remains from the Late Chalcolithic settlements compares well with results from the previous studies of the phases ÇuHö VII to VI: an emphasis on barley and high numbers of pulses combined with the absence of cereal chaff and a lack of potential segetals (Thanheiser and Wiesinger 2011).

When comparing the evidence from Late Chalcolithic Çukuriçi Höyük with data from contemporaneous sites in the area, it becomes evident that only few systematic studies are available. Data is published from the İzmir region, Bakla Tepe V and Liman Tepe VIIa (Oybak and Doğan 2008; Maltas et al. 2021), and the northern Troad, Kumtepe IB (Riehl 1999a, 374, 396-397; Riehl 1999b, 39-40; Riehl and Marinova 2008, 303-305; Riehl et al. 2014a, 739-747; Riehl et al. 2014b, 374-378), as well as the Lake District, Kuruçay Höyük 6-3A (Nesbitt 1996; Stroud 2016, 301-309). At Kumtepe samples with a low density of plant remains derive from pits (Riehl 1999a, 373). In contrast, the installations for drying agricultural products at Bakla Tepe, the burnt house at Liman Tepe as well as the stored crops at Kuruçay Höyük yield high numbers of botanical remains (Nesbitt 1996, 90, 134-135; Maltas et al. 2021, 258). Again, the recovered plant assemblage on all sites is very similar to Çukuriçi Höyük albeit with a bigger range of pulses. The preferred cereal is barley in Liman Tepe (Maltas et al. 2021, 258) and Kumtepe (Riehl 1999a, 397) while all other sites show a prevalence of hulled wheat. In addition, the storage of linseed is attested in Kuruçay Höyük (Nesbitt 1996, 90; Stroud 2016, 199-205). Grape and fig are present throughout but gain in importance in the Early Bronze Age and another attestation of the utilisation of olive comes from the burnt house at Liman Tepe (Maltas et al. 2021, 258).

Excursus: On Olives and their Early Evidence in the Aegean and Western Anatolia

The European olive (*Olea europaea* L. ssp. *europaea*[1]) is economically an important crop and together with grape, fig and date it comprises the oldest group of woody plants on which horticulture was based in the Old World (Zohary and Spiegel-Roy 1975). As already emphasised by Colin Renfrew (1972), the production of 'surplus' and the economical basis of the 'Mediterranean triad' (olive, wine, wheat) was crucial for the development of Aegean societies in the Early Bronze Age (Renfrew 1972, 265, 285-286). However, the roots of such an intensification and specialisation of the subsistence strategies seem to date back to the 4th millennium BCE. Therefore, it's important to include the evidence from Çukuriçi Höyük and the central western Anatolia coastal region in a broader context.

[1] The taxonomy of the genus Olea has been under revision and therefore different scientific names exist for the same plant. Here, the most widely used scientific names are used. Compare Green 2002, 'The Plant List' (http://www.theplantlist.org/tpl1.1/record/kew-355112), and the 'Integrated Taxonomic Information System' (IT IS), Taxonomic Serial No.: 32989 (https://www.itis.gov/servlet/SingleRpt/SingleRpt).

The wild progenitor of the domesticated olive, oleaster (*Olea europaea* L. ssp. *oleaster* (Hoffm. & Link) Hegi) is extant throughout the Mediterranean Basin where it is a common constituent of *maquis* and *garrigue* (*phrygana*) formations, Mediterranean shrubland of mid-latitudes typically consisting of densely growing sclerophyllic shrubs and a soft leafed plant community, occurring discontinuously on calcareous plateaus respectively.

The domesticated olive grows in a wide range of environmental conditions from Istria in the north to the oases of the Western Desert of Egypt in the south. It can survive temperatures in excess of 40°C but is seriously damaged by frost below -7°C. The tree needs a great deal of light but is not particular regarding soil types and thin and stony soils as well as alkaline and even brackish ones can be tolerated. It therefore can be grown on marginal soils and hilly terrain less suited for cereal cultivation. Although it is resilient to water stress, the primary limiting factor for growth and fruit production is the availability of water. Although it is possible to raise olives in areas where precipitation never exceeds 200 mm per year they thrive better in areas with an annual rainfall of 400-600 mm, and they respond well to irrigation (Panisot and Rebour 1961, 40-53). The tree was initially propagated by seeds or by planting basal knobs, characteristic swellings at the base of the trunk (Zohary et al. 2012, 117) but today propagation by cuttings and by grafting is also used (Fabbri et al. 2004, 22-32).The fruit is a drupe of variable size and contains 10-50% fat oil (Roth and Kormann 2000, 84). In general, the distinction of stones from wild and domesticated olives is notoriously difficult since no clear-cut identification criteria exist. A morphometric approach (Terral et al. 2004; Dighton et al. 2017; Fuller 2018) may have some merit when large assemblages have to be assessed. For individual stones it seems futile when the wide range of size and shapes of modern commercial olives is considered.

Olive stones are already present in Epipalaeolithic Ohalo II (Kislev et al. 1992; Weiss 2009) and thousands of waterlogged stones were recovered from the late Neolithic sites of Mt. Carmel (Galili and Weinstein-Evron 1985; Galili and Stanley 1997). Both sites are situated within the natural range of ssp. *oleaster* (Zohary et al. 2012, 119, map 15) and the recovered stones certainly belong to this taxon. Domestication seems to date to the Chalcolithic Period in Palestine where finds of olive stones occur in sites outside the natural range of oleaster olives (Zohary et al. 2012, 120; Deckers et al. 2021). In the Middle and Late Bronze Age olive cultivation and oil production seem to have been well established in areas bordering the eastern Mediterranean coast (Fuller and Stevens 2019, 270-271). In mainland Greece, the Aegean, and Ionian Islands olive is nearly absent for most of the Neolithic period and the few finds are concentrated in Thessaly and the northern part of the area. It becomes increasingly important from the Early Bronze Age onwards (Runnels and Hansen 1986, 301; Valamoti et al. 2018, 185, fig. 1; Fuller and Stevens 2019, 270-271).

Regarding western Anatolia, finds of olive stones are rare. In the Troad they are not detectable until Troy IIa in the 3rd millennium BCE, however, olive wood is attested from Kumtepe IB2 onwards (Riehl and Marinova 2008, 304-305; Riehl et al. 2014a, 743, 745). Unfortunately, it is impossible to distinguish wild from domesticated olive on the basis of wood anatomy. Apart from earlier evidence in Greece (Valamoti et al. 2018), the central western Anatolian coastal region is of particular importance providing the earliest evidence in western Anatolia dating to the 2nd half of the 4th millennium BCE. Beside the material excavated in Liman Tepe in context of the burnt house (Maltas et al. 2021, 257-259, tab. 1; Tuncel and Şahoğlu 2018, 527, tab. 53.1), comparable early evidence comes from Çukuriçi Höyük with olive stones present from settlement phase VII (3350 cal. BCE; Schwall 2018, 167-170) onwards (Figure 9; Table S3). In general, palynological evidence from four Anatolian locations places large-scale olive cultivation rather late, around ca. 1200 BCE in the southwest (Langgut et al. 2019, 11) and during the Late Iron Age in the Troad (Riehl et al. 2014a, 745). Interestingly, recent data provided by a drill core from the swamps at Belevi in the wider catchment area of Çukuriçi Höyük indicate a possible earlier onset of olive cultivation already between 5000 and 4000 cal. BCE (Stock et al. 2020, 11-12, fig. 9). However, the palynological data do not provide evidence of a contemporary olive cultivation of the Late Chalcolithic and Early Bronze Age settlements at Çukuriçi Höyük. Nevertheless, based on the evidence from Bakla Tepe and Çukuriçi Höyük an earlier cultivation in the coastal region of western Anatolia as early as the 4th or 3rd millennium BCE should not be excluded especially when considering the importance of microregional conditions and the connectivity of maritime networks of prehistoric coastal communities.

Evidence of Surplus Production and Storage at Çukuriçi Höyük

The settlement phases ÇuHö VII-V offer exceptional conditions for detailed studies on the subsistence strategies of the associated societies. Especially the botanical remains are well preserved due to fire events marking the destruction of each settlement. Within the excavated areas from subphase ÇuHö VIb onwards drying platforms are attested pointing to a structured and well-organised surplus production and storage on-site. In contrast to the association of these drying installation to domestic dwellings in phase ÇuHö VI, the function of the excavated area changed with the beginning of ÇuHö V pointing to a more communal character with drying platforms and attached circular storage buildings. Since this time the place seems to have been exclusively reserved for food preparation and storage which is impressively demonstrated by the construction of a wall enclosing this area and separating it inside the settlement in subphase ÇuHö VIa. In general, the circular buildings and the 'stone row structures' can be embedded into known storage architecture from western Anatolian and the East Aegean sites (Kouka 2014, 56-57; Horejs and Schwall 2015, 462-465; Schwall 2018, 170-178, 277-279; Maltas et al. 2021, 262-265).

At Çukuriçi Höyük, the analysis of the charred plant remains allow us to reconstruct which foodstuff was prepared and stored at specific installations since most installations feature one or two dominant crops (Table 1). It appears that there is a high variation of food products depending on the settlement phase. The main products are fruits (grapes, figs), cereals, and pulses which points to a targeted and structured surplus production and subsistence strategy. Although olive stones are not preserved in a high quantity, the amount is striking and indicates their utilisation of olive as early as ca. 3350 cal. BCE. However, the question of whether the olives are domesticated or wild must remain open. Beside the variation of foodstuff, especially the products in context of the drying platforms allow us to make chronological statements. Even if it is not possible to date the year exactly, it is possible to determine that the settlements burnt down during the warm season between May and November, based on harvesting time of the respective crop (Table 1).

Table 1. Reconstruction of the foodstuff which was prepared or stored and their harvest time.

Period	Subphase	Structure	Predominant botanical remains	Harvest and drying time
Late Chalcolithic	ÇuHö VIb	SR 5	Grapes	September to November
	ÇuHö VIa	SR 3	Cereals, pulses	May to October
		Vessel	Pulses	May to October
	ÇuHö Vb	SR 1	Grapes	September to November
		Big pit	Figs	June to August
		Small pit	Grapes	September to November
		SR 2	Figs	June to August
		RB 1	Cereals, pulses	May to October
Early Bronze Age 1	ÇuHö Va	SR 4	Pulses, figs	May to October
		RB 2	Pulses, grapes, cereals	May to November

The botanical assemblage features clean products ready for storage or consumption, i.e., by-products of cereal processing (chaff, straw) are absent and the number of potential segetals is very low. Only the assemblage from SR 3 contains a comparatively large amount of wild growing plants. These could be either the remains of fuel for cooking or potential tinder used to torch the settlement. In this context, it is necessary to underline that the excavated settlement phases focused on here provide evidence for free-standing architectural installations consisting of stone sockets with a waddle-and-daub superstructure. Experimental archaeological and

ethnoarchaeological research of fire effects show that burning of wattle-and-daub dwellings in a settlement consisting of free-standing architecture does not automatically cause major damage (Ivanova 2008, 106-109). A burnt horizon of a larger area indicates rather an intentional burning. In particular, the fire impact on the architecture of the extensively exposed subphase ÇuHö Vb at about 96 sq. m suggests such intentional destruction. Whether the conflagration may have had a ritual motive, an accident or possibly resulted from hostile intruders is difficult to answer. Preserved assemblages deposited *in situ*, like pottery vessels or grinding stones and mortars, argue against a planned burning of the settlement by its inhabitants. In particular, the high number of foodstuffs, such as grapes and figs on the platforms, would certainly not have been left behind in the case of intentional destruction.

The analysis of the botanical remains from settlement phases ÇuHö VI-V have shown that during the Late Chalcolithic period the livelihood of the inhabitants was based on a well-scheduled and organised subsistence strategy with intentional surplus production. In combination with the separated area inside the settlement for such purposes from ÇuHö V onwards, the evidence supports that the activities related to intentional surplus production of foodstuffs was crucial for the settlement's inhabitants. However, due to the lack of dwellings in phase ÇuHö V it has to remain an open question if the intentional surplus production was organised in a communal way or decided on by one group only. Of special significance is the high number of tree crops at Çukuriçi Höyük. As argued 'cash crops' (fig, grape, olive) gain in importance in the Eastern Mediterranean during the Early Bronze Age based on evidence from the Levant and Cyprus (Genz 2003; Fuller and Stevens 2019, 266-271; Lucas and Fuller 2020, 255). Therefore, the extraordinary state of preservation of the botanical remains from the coastal site Çukuriçi Höyük allows new insights and indicates that 'cash crops' may have already played an economic role in the Late Chalcolithic of western Anatolia as exchange goods.

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Figure 1.
Location of the sites with comparable botanical data mentioned in the text (map: OeAI-OeAW/M. Börner, C. Schwall).

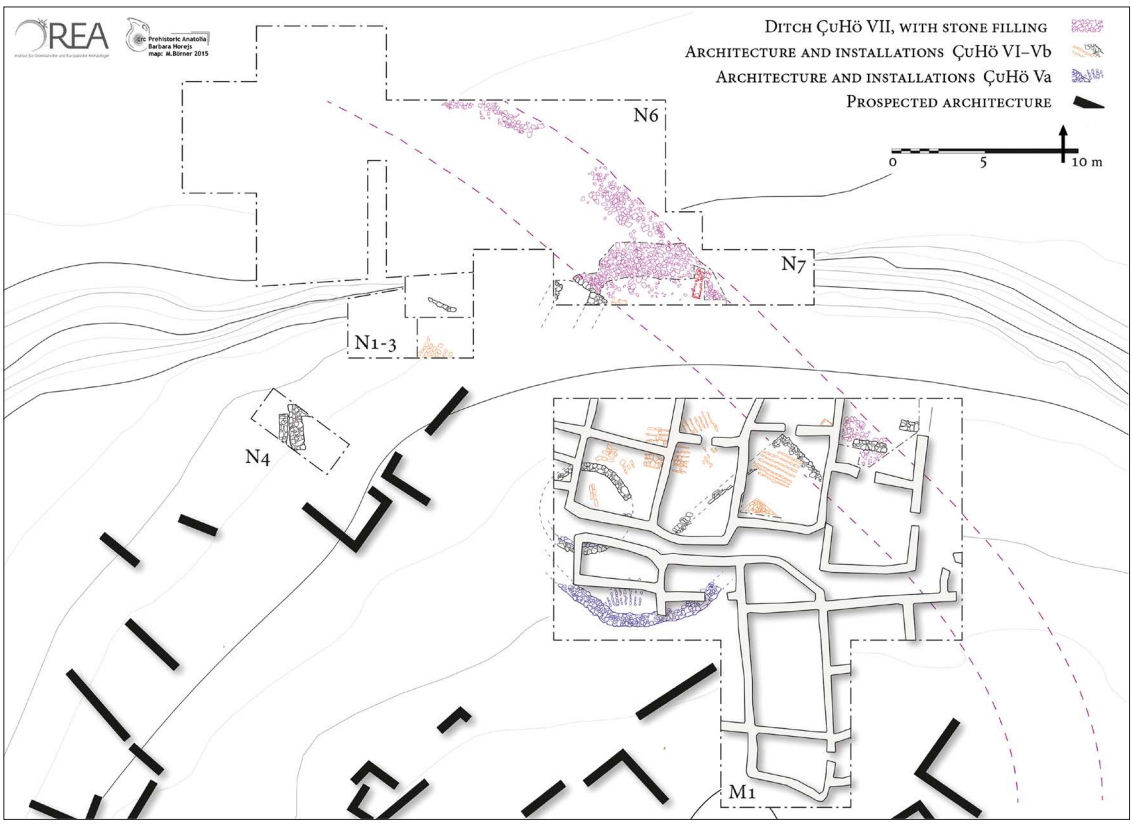

Figure 2. Plan of the architectural remains of the Late Chalcolithic settlement phases ÇuHö VII-V (plan: after Schwall and Horejs 2018, 67, fig. 3).

Figure 3. Photograph of trench M1 with architectural remains of the Late Chalcolithic and Early Bronze Age settlement phases (photo: after Schwall 2018, 136, fig. 33).

Figure 4. (a) 3D reconstruction based on the compiled evidence of the Çukuriçi Höyük V storage and drying area within the settlement (graphic: after Schwall and Horejs 2020, 113, fig. 2). Charred grape pips (b) and a fig (c) from the Late Chalcolithic contexts (photos: after Schwall 2018, 155, fig. 53; 157, fig. 55).

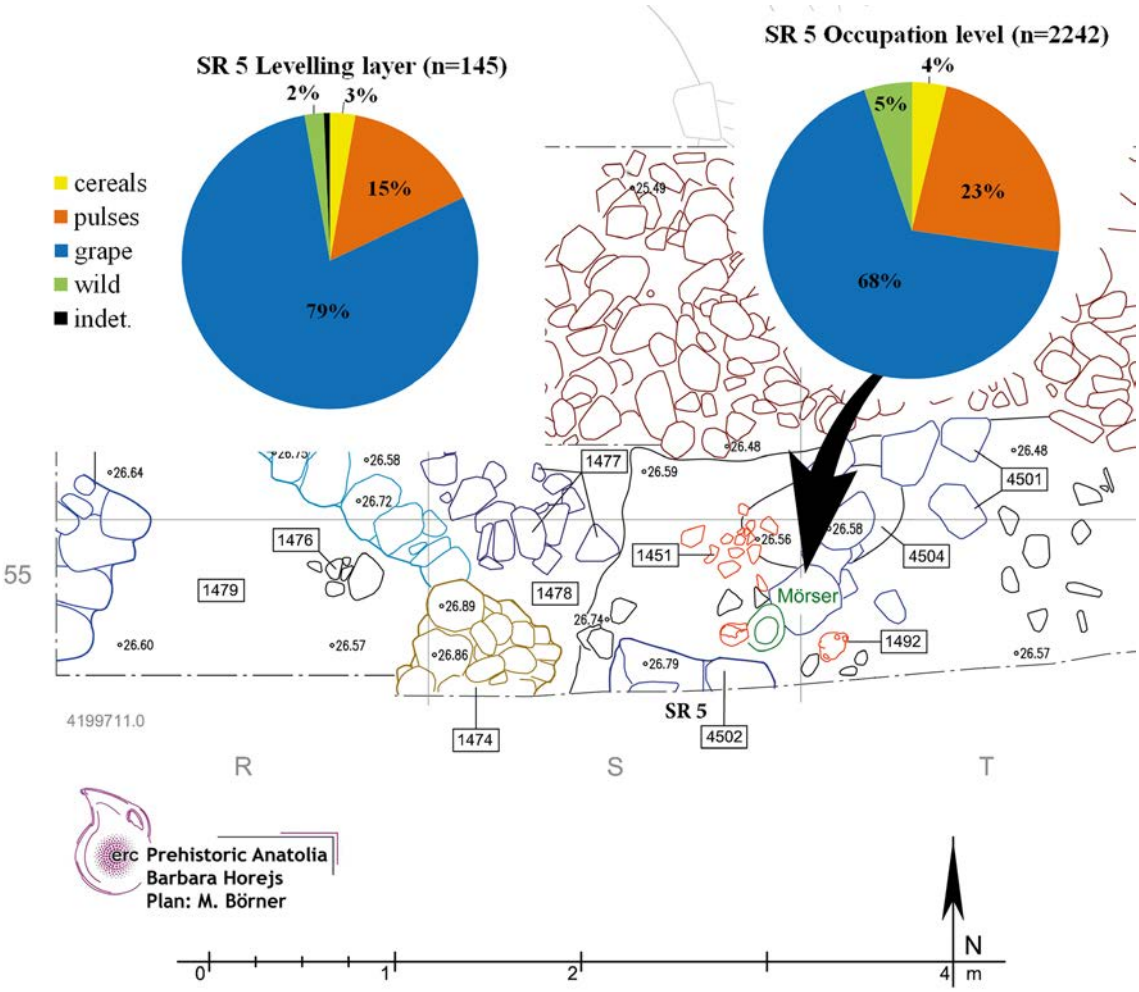

Figure 5. Plan showing the excavated remains of settlement phases ÇuHö VIb in trench N7 with proportions of different plant groups and the sample locations. Percentages <1% are not indicated (plan: after Schwall 2018, 122, fig. 21).

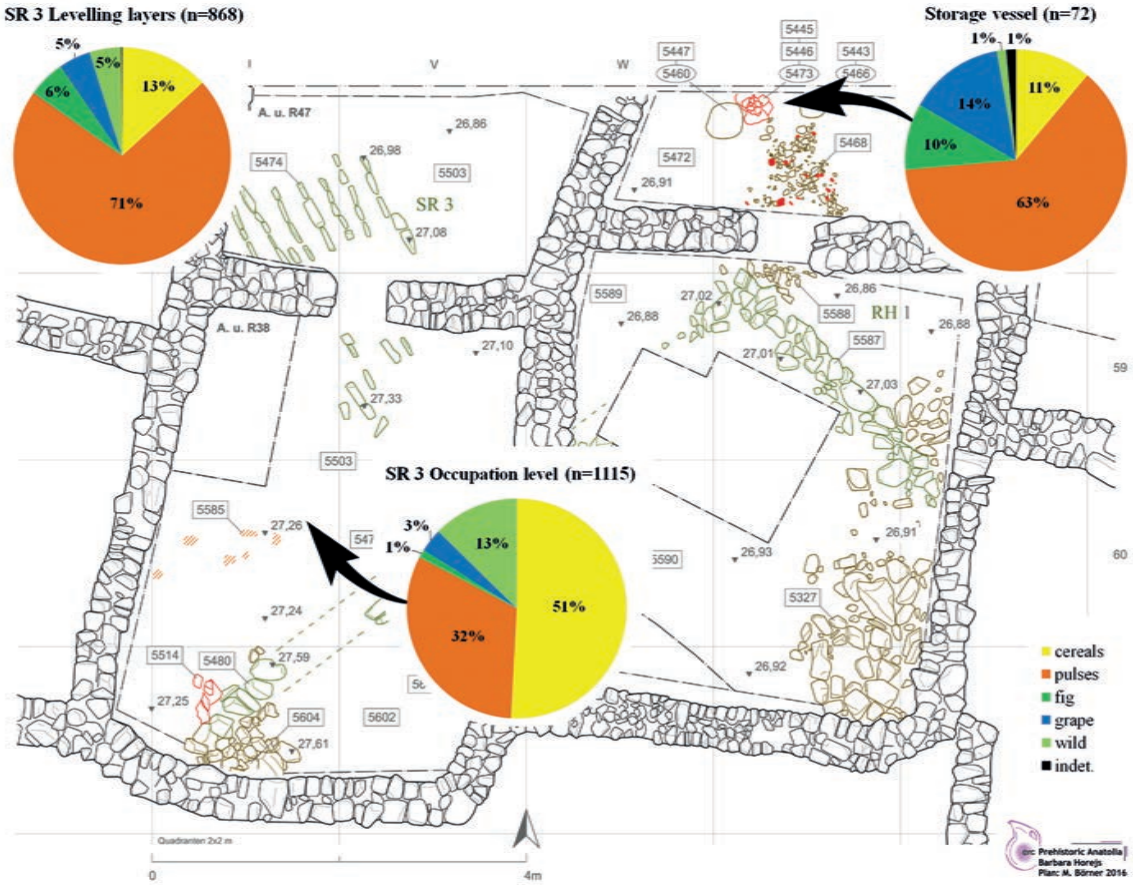

Figure 6. Plan showing the excavated remains of settlement phases ÇuHö VIa in trench M1 with proportions of different plant groups and the sample locations. Percentages <1% are not indicated (plan: after Schwall 2018, 142, fig. 38).

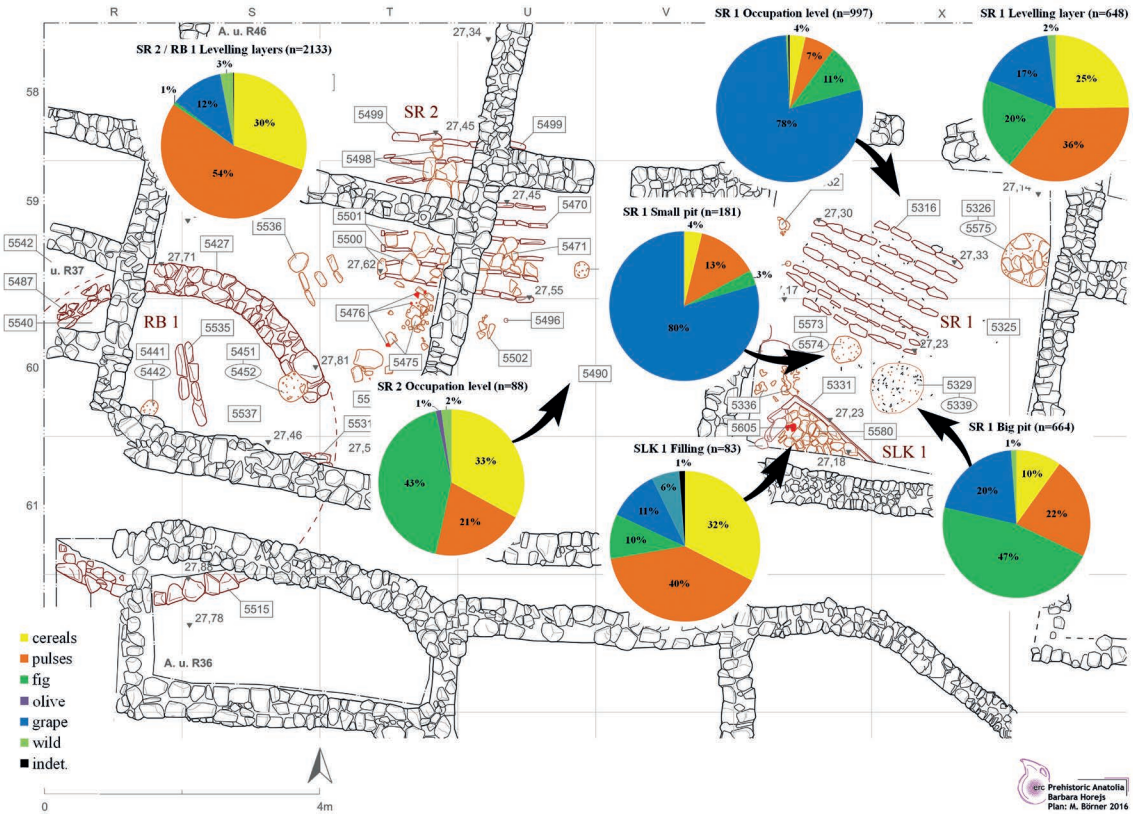

Figure 7. Plan showing the excavated remains of settlement phases ÇuHö Vb in trench M1 with proportions of different plant groups and the sample locations. Percentages <1% are not indicated (plan: after Schwall 2018, 149, fig. 45).

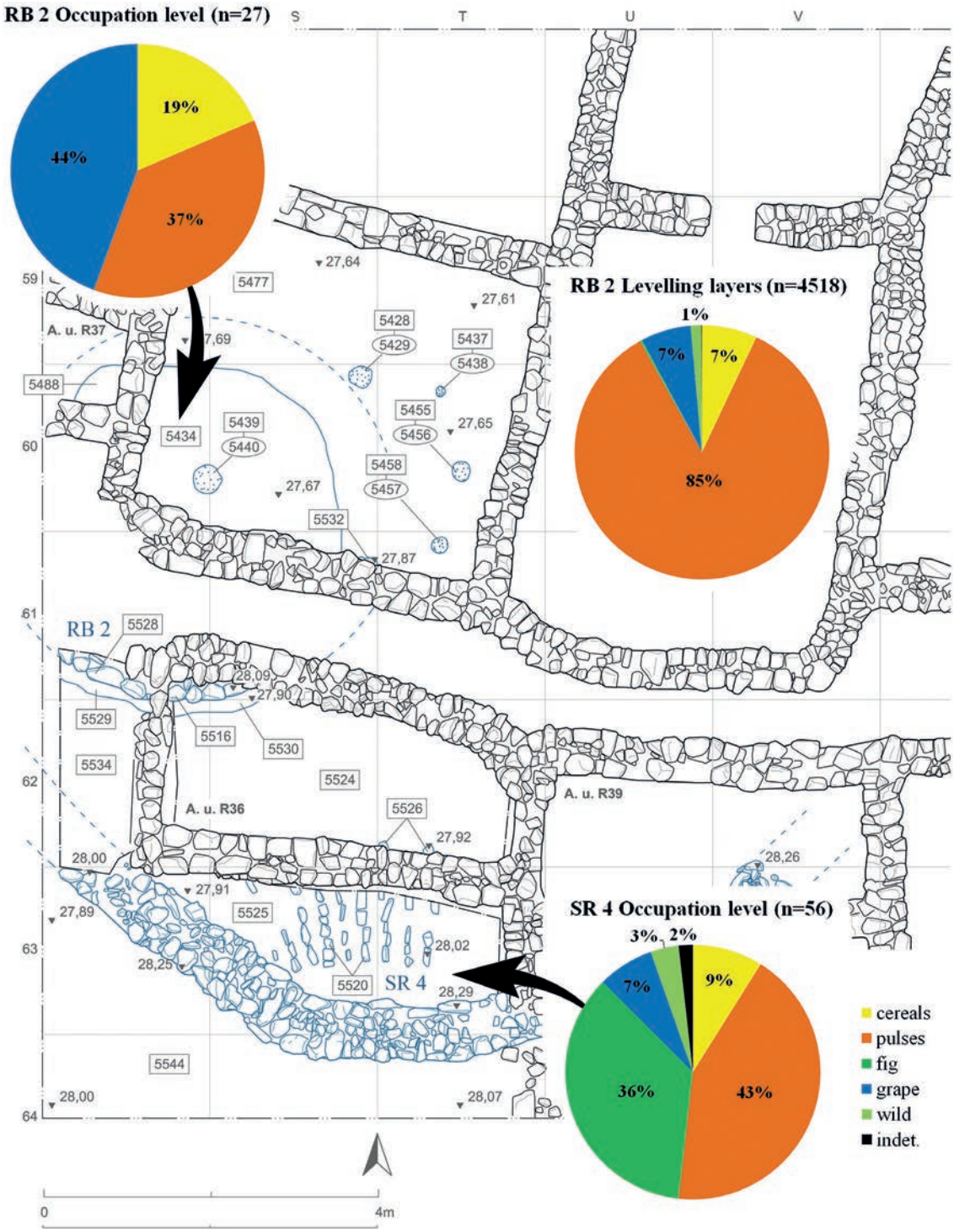

Figure 8. Plan showing the excavated remains of settlement phases ÇuHö Va in trench M1 with proportions of different plant groups and the sample locations. Percentages <1% are not indicated (plan: after Schwall 2018, 161, fig. 60).

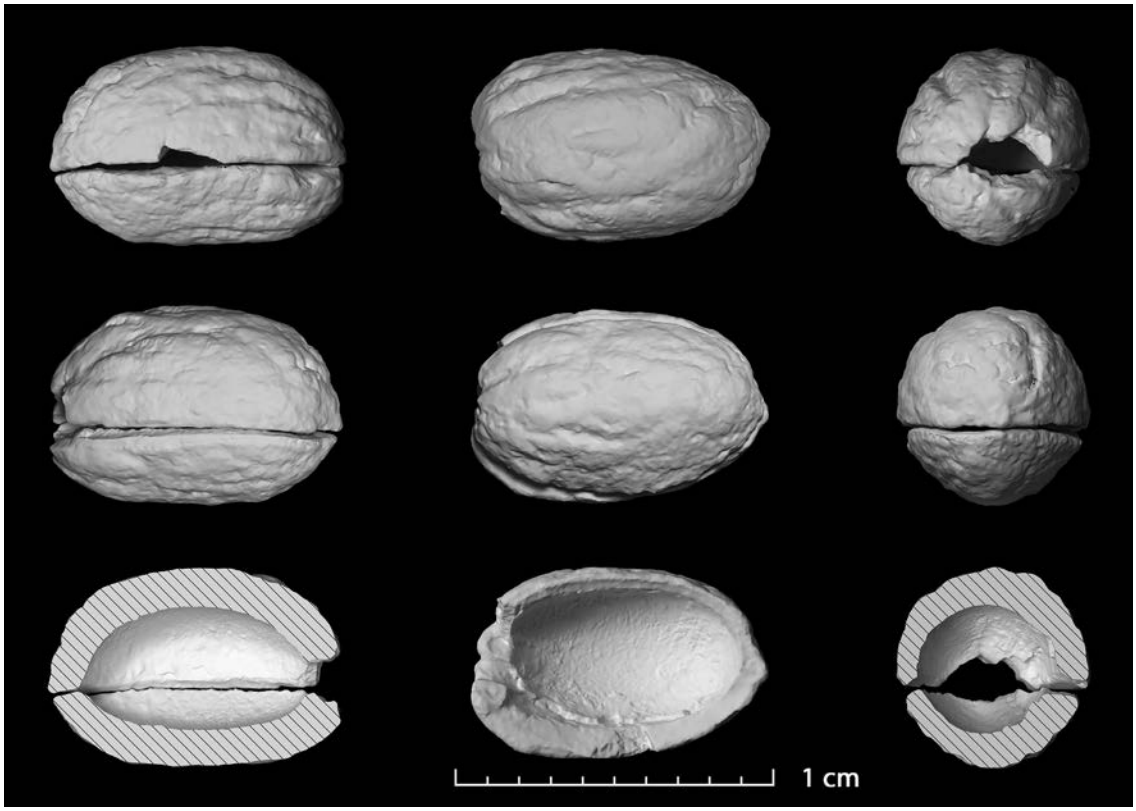

Figure 9. 3D model of a vertically broken Late Chalcolithic olive stone (ÇuHö Vb, SU 5490). Recorded with a structured light scanner (Breuckmann smartScan), processed with OPTOCAT and laid out with Blender (graphic: OeAW-OeAI/M. Börner).

Supplementary Data

The Settlement Phases Çukuriçi Höyük VII to V

ÇuHö VII

The oldest settlement of the Late Chalcolithic period (ÇuHö VII) was surrounded by a ditch (width: 6 m; depth: 2.5 m) which has presumably functioned as a defensive structure (Figure 2; Horejs 2014, 19-22; Schwall 2018, 131-135). After a certain time, this settlement enclosure was filled with material consisting of a high number of stones and sediments strongly indicating fire exposure (Schwall 2018, 129, fig. 27). It seems that the settlement was destroyed by fire and the remains of the dwellings and installations were taken for filling up and levelling the ditch area.

ÇuHö VIb

The subsequent settlement phases Çukuriçi Höyük VI and V are divided in two subphases (b and a) because no clear change of an architectural layout was detected (Schwall 2018, 118). Remains of subphase ÇuHö VIb were discovered in trench N7 und M1. In trench M1 two wall sections were directly positioned upon the ditch filling (Schwall 2018, 139-141). Also, in trench N7 structures were built upon the levelled ditch area pointing to an expansion of the settlement during this phase. At this point it is necessary to note that due to recent destruction activities caused by the agricultural use of the site (Horejs 2017, 12; Schwall 2018, 116), the question must remain open whether the subsequent Late Chalcolithic and Early Bronze Age phases (ÇuHö VI-III) were surrounded by an outer settlement enclosure or not. Nevertheless, in subphase ÇuHö VIb two wall sections as well as a partially detected 'stone row structure' (SR 5)—a platform consisting of parallel single vertical stone rows with horizontally placed flat stones on the top and a possible wooden surface (Horejs and Schwall 2015, 464, fig. 7; Schwall 2018, 172, fig. 65; 176-178; Schwall and Horejs 2018, 59)—were recorded (Schwall 2018, 120-127). Interestingly, in the direct vicinity of the platform SR 5 a mortar, two ceramic vessels—a jug and a tripod cooking pot—and a high number of charred remains (Schwall 2018, 124, fig. 23) were excavated underneath a levelling layer. Thus, also here a destruction by fire becomes apparent.

ÇuHö VIa

In settlement subphase ÇuHö VIa the badly preserved remains of a presumably rectangular building (RH 1) measuring at least 8.1 to 3.4 m were uncovered next to a 'stone row structure' (SR 3) represented by remnants of parallel stone rows (Schwall 2018, 141-148). In the

southwestern area next to the wall of RH 1, sherds of a large 'cheese pot' were excavated (Schwall 2018, 144, fig. 41). Additionally, in the north of the RH 1 the remains of a lower part of a large storage vessel was found *in situ* with its partially preserved content (Schwall 2018, 147, figs. 43-44). Even the state of preservations of the architecture of this subphase is not ideal, charred remains found in context of the SR 3 indicated that the settlement was destroyed by fire.

Further evidence of another structure was detected in trench N1-3. A partially discovered 'stone row structure' (SR 6) can be associated with this subphase due to its position at a similar level (Horejs 2018, 702-703).

ÇuHö Vb

This settlement subphase clearly shows a change of the building structure. Remains of a circular building (RB 1), two 'stone row structures' (SR 1-2) as well as a stone clay construction (SLK 1) attest activities regarding stockpiling (Schwall 2018, 148-159). Beside RB 1 with an internal diameter of 4 m, nearly completely preserved 'stone row structures' were discovered in subphase ÇuHö Vb with dimensions of 2.4 to 2.4 m (SR 2) and 2.2 m to 1.6 m (SR 1). The particularly good preservation of SR 2 with flat stone slabs upon the vertical stone rows shows the structure of this installation type. SLK 1 was only partially recorded within the trench. The wall of this composite structure was built up with stones and clay. Inside the installation stones were covering the ground. Taking all recorded installations of subphase ÇuHö Vb into account, the function can be classified as a storage area. This assumption is supported by remains of large storage vessels which were found in the destruction layer above RB 1 and food processing tools (a grinding stone, a fragment of a mortar, and a pounder; Schwall 2018, 157, fig. 56) found *in situ* near a 'stone row structure' (SR 1). The high amount of charred remains, especially grape seeds, and figs (Schwall 2018, 155, fig. 53; 157, fig. 55), in the context of the 'stone row structures' indicate that these installations were used for drying purposes as well as protection against moisture from the floor. The botanical remains detected inside the circular building suggest a use as long-term storage. Beside the high amount of charred material, the secondary, partially heavily burnt pottery and objects found on this occupation level attest that subphase ÇuHö Vb was destroyed by fire.

ÇuHö Va

Similar installations were also detected in subphase ÇuHö Va (Schwall 2018, 159-164). A circular building (RB 2) was built almost congruent but with a slightly smaller internal diameter (3.5 m) upon the former RB 1. Nearby, the remains of a 'stone row structure' (SR 4) with charred remains between the stone rows was uncovered. The fact that both buildings were constructed upon each other as well as attached drying platforms points to a continuation of the same functional pattern of this area in settlement phase ÇuHö V. However, it is interesting

that in this sub-phase a wall up to 0.85 m thick was unearthed, which enclosed the circular building and the 'stone row structure' (Schwall 2018, 162, fig. 61). It can be assumed that the structure was an enclosure that did not exist in subphase ÇuHö Vb or at least was not located in the direct vicinity of the installations. In any case, there are clear signs of destruction by fire in this sub-phase as well.

Archaeobotanical Studies

Supplementary Table 1. Archaeobotanical taxa from settlement phase ÇuHö VI (abbreviations: LL=Levelling layer, OL=Occupation level, RO=Room, OV=Oven).

Subphase	**VIb**		**VIa**		
Context	SR 5	SR 5	SR 3	SR 3	Vessel
Feature type	LL	OL	LL	OL	OL
Stratigraphic Unit(s)	1447	1448, 1451 1492, 4504	5465 5539	5585	5445
Sample volume (l)	13	41,11	32,41	18,2	11
Density (items per litre)	11,2	54,5	26,8	61,3	6,5
Total number of remains	145	2242	868	1115	72
Cereals					
Hordeum vulgare	2	39	75	48	
Triticum monococcum		1		30	
Triticum monococcum/dicoccum		5			
Triticum dicoccum			1	53	1
Triticum aestivum s.l./durum				14	
Triticum sp.		1		68	
Cerealia	2	39	39	354	7
Pulses					
Lathyrus sativus	4	132	40		
cf. Lathyrus sativus			4		
Lens culinaris	2	4	3	15	
cf. Lens culinaris		2	10	27	
Vicia ervilia		2			
Vicia faba		3	3		
Vicia sativa		65	62	62	
cf. Vicia sativa			41	251	
Fabaceae CUK-Type 1	3	52	3		2
Fabaceae CUK-Type 2		47	4		3
Fabaceae (cultivated)	13	218	450		40

Subphase	VIb		VIa		
Oil/Fibre Plants					
Linum usitatissimum			1		
cf. Linum usitatissimum		1			
Fruit					
Ficus carica fruit		1	49	14	7
Olea europaea			1		
Vitis vinifera	115	1514	40	38	10
Wild Growing					
Caryophyllaceae		1			
Fabaceae		79	8	2	
Galium sp.		1			
Poaceae Lolium-Type		26	33	139	1
Poaceae	3	7			
Indeterminate					
Indeterminate	1	2	1		1

Supplementary Table 2. Archaeobotanical taxa from settlement phase ÇuHö V (abbreviations see Table S1).

Subphase	Vb							Va		
Context	SR 2/ RB 1	SR 2	SR 1	SR 1	SR 1	SR 1	SLK 1	SR 4	RB 2	RB 2
Feature type	LL	OL	LL	OL	OL	OL	LL	OL	LL	OL
Stratigraphic Unit(s)	5450 5467 5477	5490	5302	5325	5329 (Big pit)	5573 (Small pit)	5576	5525	5435 5486	5434
Sample volume (litre)	104,5	10,05	40,07	26,26	54,71	10	23,7	13,01	60	10,4
Density (items per litre)	20,4	8,8	16,2	38,0	12,1	18,1	3,5	4,3	75,3	2,6
Total number of remains	2133	88	648	997	664	181	83	56	4518	27
Cereals										
Hordeum vulgare	207	12	43	4	16	2	4		81	1
Triticum monococcum	2		8							
Triticum monococcum/ dicoccum	3		12	2					3	1
Triticum dicoccum	7			2			1		13	2
Triticum aestivum s.l./ durum									4	

Subphase	Vb							Va		
Triticum sp.	5		1	3					1	1
Secale cereale	1									
Cerealia	424	17	97	24	50	5	22	5	216	
Pulses										
Lathyrus sativus	57			1	12	3	2		173	
cf. Lathyrus sativus	15							3	14	
Lens culinaris	14	3	1	2	2	2			13	
cf. Lens culinaris									33	
Vicia/Lathyrus sp.	53									
Vicia ervilia	7		2	1	2				2	
Vicia faba	4	1	1						10	
Vicia sativa	112	4		12	7				255	
cf. Vicia sativa	9								734	
Fabaceae CUK-Type 1	54	1	15	1	4		2		65	
Fabaceae CUK-Type 2	19						3		86	
Fabaceae (cultivated)	810	9	214	49	119	19	26	21	2450	10
Fruit										
Ficus carica fruit	16	38	132	107	309	6	8	20	13	
Olea europaea	2	1								
Pistacia sp.	1									
Vitis vinifera	248		110	781	134	144	9	4	288	12
Wild Growing										
Malva sp.					1					
cf. Linum sp.			1							
Fabaceae Trifolium-Type									1	
Fabaceae	23		1		2				40	
Lamiaceae										
Poaceae Lolium-Type	37	2	6	5	5		5	2	20	
Poaceae			4							
Indeterminate										
Indeterminate	3			2			1	1	1	
Indeterminate fruit									2	
Indeterminate amorphous charred object				1	5					

Supplementary Table 3. Evidence of olive stones from Late Chalcolithic and Early Bronze Age Çukuriçi Höyük (abbreviations see Table S1).

Period	Late Chalcolithic						Early Bronze Age 1			
Subphase	VII	VIb	VIb	VIa	Vb	Vb	IV	IV	IV	IV
Context	Burial	Ditch	Ditch	SR 3	SR 2	SR 2	RO 43, OV 48	Path	RO 41	RO 38
Feature type	LL	LL	LL	LL	LL	OL	Fill	LL	OL	OL
Stratigraphic Unit	317	4511	1449	5465	5477	5490	5577	687	5301	5310
Sample volume (l)	20	40,01	0,01	20,01	64,5	10,05	10	30	30	40
Olea europaea	2	3	1	1	2	1	4	1	2	4

ARKEOLOJİ BİLİMLERİ DERGİSİ

TURKISH JOURNAL OF ARCHAEOLOGICAL SCIENCES

Amaç ve Kapsam

Arkeoloji bir süredir geçmişin yorumlanmasında teknoloji ve doğa bilimleri, mühendislik ve bilgisayar teknolojileri ile yoğun iş birliği içinde yeni bir anlayışa evrilmektedir. Üniversiteler, ilgili kurum ya da enstitülerde yeni açılmakta olan "Arkeoloji Bilimleri" bölümleri ve programları, geleneksel anlayışı terk ederek değişen yeni bilim iklimine adapte olmaya çalışmaktadır. Bilimsel analizlerden elde edilen sonuçların arkeolojik bağlam ile birlikte ele alınması, arkeolojik materyallerin, yerleşmelerin ve çevrenin yorumlanmasında yeni bakış açıları doğurmaktadır.

Türkiye'de de doğa bilimleriyle iş birliği içindeki çalışmaların olduğu kazı ve araştırma projelerinin sayısı her geçen gün artmakta, yeni uzmanlar yetişmektedir. Bu nedenle Arkeoloji Bilimleri Dergisi, Türkiye'de arkeolojinin bu yeni ivmenin bir parçası olmasına ve arkeoloji içindeki arkeobotanik, arkeozooloji, alet teknolojileri, tarihlendirme, mikromorfoloji, biyoarkeoloji, jeokimyasal ve spektroskopik analizler, Coğrafi Bilgi Sistemleri, iklim ve çevre modellemeleri gibi uzmanlık alanlarının çeşitlenerek yaygınlaşmasına katkı sağlamayı amaçlamaktadır. Derginin ana çizgisi arkeolojik yorumlamaya katkı sağlayan yeni anlayışlara, disiplinlerarası yaklaşımlara, yeni metot ve kuram önerilerine, analiz sonuçlarına öncelik vermek olarak planlanmıştır.

Arkeoloji Bilimleri Dergisi uluslararası hakemli bir dergidir. Dergi, Ege Yayınları tarafından çevrimiçi olarak yayınlanmaktadır. Kazı raporlarına, tasnif ve tanıma dayalı çalışmalara, buluntu katalogları ve özgün olmayan derleme yazılarına öncelik verilmeyecektir.

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TURKISH JOURNAL OF ARCHAEOLOGICAL SCIENCES

Aims and Scope

Archaeology is being transformed by the integration of innovative methodologies and scientific analyses into archaeological research. With the establishment of new departments, institutes, and programs focusing on "Archaeological Sciences", archaeology has moved beyond the traditional approaches of the discipline. When placed within their archaeological context, studies can provide novel insights and new interpretive perspectives to the study of archaeological materials, settlements and landscapes.

In Turkey, the number of interdisciplinary excavation and research projects incorporating scientific techniques is on the rise. A growing number of researchers are being trained in a broad range of scientific fields including but not limited to archaeobotany, archaeozoology, tool technologies, dating methods, micromorphology, bioarchaeology, geochemical and spectroscopic analysis, Geographical Information Systems, and climate and environmental modeling. The Turkish Journal of Archaeological Sciences aims to situate Turkish archaeology within this new paradigm and to diversify and disseminate scientific research in archaeology. New methods, analytical techniques and interdisciplinary initiatives that contribute to archaeological interpretations and theoretical perspectives fall within the scope of the journal. The Turkish Journal of Archaeological Sciences is an international peer-reviewed journal. The journal is published online by Ege Yayınları in Turkey. Excavation reports and manuscripts focusing on the description, classification, and cataloging of finds do not fall within the scope of the journal.

ARKEOLOJİ BİLİMLERİ DERGİSİ

TURKISH JOURNAL OF ARCHAEOLOGICAL SCIENCES

Makale Gönderimi ve Yazım Kılavuzu

* *Please see below for English*

Makale Kabul Kriterleri

Makalelerin konu aldığı çalışmalar, Arkeoloji Bilimleri Dergisi'nin amaçları ve kapsamı ile uyumlu olmalıdır (bkz.: Amaç ve Kapsam).

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Her makaleye 200 kelimeyi aşmayacak uzunlukta Türkçe ve İngilizce yazılmış özet ve beş anahtar kelime eklenmelidir. Özete referans eklenmemelidir.

Yazarın Türkçesi veya İngilizcesi akıcı değilse, özet ve anahtar kelimelerin Türkçe veya İngilizce çevirisi editör kurulu tarafından üstlenilebilir.

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- Özet (Türkçe ve İngilizce)
- Anahtar kelimeler
- Metin
- Kaynakça
- Figürler
- Tablolar

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- Gönderilen yazılar başka bir yerde yayınlanmamış veya yayınlanmak üzere farklı bir yere gönderilmemiş olmalıdır.
- Makaleler özgün ve bilimsel standartlara uygun olmalıdır.

- Makalelerde cinsiyetçi, ırkçı veya kültürel ayrım yapmayan, kapsayıcı bir dil kullanmalıdır ("insanoğlu" yerine "insan"; "bilim adamı" yerine "bilim insanı" gibi).

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Metin ve Başlıkların Yazımı

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- Yabancı ve eski dillerdeki kelimeler *italik* olmalıdır.
- Başlık ve alt başlıklar **bold** yazılmalıdır.
- Başlıklar numaralandırılmamalı, italik yapılmamalı, altları çizilmemelidir.
- Başlık ve alt başlıklarda yalnızca her kelimenin ilk harfi büyük olmalıdır.

Referans Yazımı

Ayrıca bkz.: Metin içi Atıflar ve Kaynakça Yazımı

- Referanslar metin içinde (Yazar yıl, sayfa numarası) şeklinde verilmelidir.
- Referanslar için dipnot ve son not kullanımından kaçınılmalıdır. Bir konuda not düşme amacıyla gerektiği taktirde dipnot tercih edilmelidir.
- Dipnotlar Times New Roman karakterinde, 10 punto büyüklüğünde, iki yana yaslı, tek satır aralıklı yazılmalı ve her sayfa sonuna süreklilik izleyecek şekilde eklenmelidir.

Şekiller ve Tablolar

- Makalenin altına şekiller ve tablolar için bir başlık listesi eklenmelidir. Görsellerde gerektiği takdirde kaynak belirtilmelidir. Her şekil ve tabloya metin içerisinde gönderme yapılmalıdır (Şekil 1 veya Tablo 1).
- Görseller Word dokümanının içerisine yerleştirilmemeli, jpg veya tiff formatında, ayrı olarak gönderilmelidir.
- Görüntü çözünürlüğü basılması istenen boyutta ve 300 dpi'nin üzerinde olmalıdır.
- Görseller Photoshop ve benzeri programlar ile müdahale edilmeden olabildiğince ham haliyle gönderilmelidir.
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Tarihlerin ve Sayıların Yazımı

- MÖ ve MS kısaltmalarını harflerin arasına nokta koymadan kullanınız (örn.: M.Ö. yerine MÖ).
- "Bin yıl" ya da "bin yıl" yerine "... binyıl" kullanınız (örn.: MÖ 9. binyıl).
- "Yüzyıl", "yüz yıl" ya da "yy" yerine "yüzyıl" kullanınız (örn.: MÖ 7. yüzyıl).
- Beş veya daha fazla basamaklı tarihler için sondan sayarak üçlü gruplara ayırmak suretiyle sayı gruplarının arasına nokta koyunuz (örn.: MÖ 10.500)
- Dört veya daha az basamaklı tarihlerde nokta kullanmayınız (örn.: MÖ 8700).
- 0-10 arasındaki sayıları rakamla değil yazıyla yazınız (örn.: "8 kez yenilenmiş taban" yerine "sekiz kez yenilenmiş taban").

Noktalama ve İşaret Kullanımı

- Ara cümleleri lütfen iki çizgi ile ayırınız (—). Çizgi öncesi ve sonrasında boşluk bırakmayınız.
- Sayfa numaraları, tarih ve yer aralıklarını lütfen tek çizgi (-) ile ayırınız: 1989-2006; İstanbul-Kütahya.

Kısaltmaların Yazımı

- Sık kullanılan bazı kısaltmalar için bkz.:

Yaklaşık:	yak.	Circa:	ca.
Bakınız:	bkz.	Kalibre:	kal.
Örneğin:	örn.	ve diğerleri:	vd.

Özel Fontlar

- Makalede özel bir font kullanıldıysa (Yunanca, Arapça, hiyeroglif vb.) bu font ve orijinal metnin PDF versiyonu da gönderilen dosyalar içerisine eklenmelidir.

Metin içi Atıflar ve Kaynakça Yazımı

- Her makale, metin içerisinde atıf yapılmış çalışmalardan oluşan ve "Kaynakça" olarak başlıklandırılan bir referans listesi içermelidir. Lütfen metin içerisinde bulunan her referansın kaynakçaya da eklendiğinden emin olun.
- Metin içerisindeki alıntılar doğrudan yapılabilir: '…Esin (1995)'in belirtmiş olduğu gibi' ya da parantez içerisinde verilebilir: 'analiz sonuçları gösteriyor ki … (Esin 1995).'
- Aynı parantez içerisindeki referanslar yayın yılına göre sıralanmalı ve ";" ile ayrılmalıdır: '… (Dinçol ve Kantman 1969; Esin 1995; Özbal vd. 2004).'
- Aynı yazarın farklı yıllara ait eserlerine yapılan atıflarda yazarın soyadı bir kere kullanılmalı ve eser yılları "," ile ayrılmalıdır: '... (Peterson 2002, 2010).'
- Aynı yazar(lar)ın aynı yıl içerisindeki birden fazla yayınına referans verileceği durumlarda yayın yılının yanına harfler 'a', 'b', 'c' gibi alfabetik olarak koyulmalıdır.
- Tek yazarlı kaynakları, aynı yazar adıyla başlayan çok yazarlı kaynaklardan önce yazınız.
- Aynı yazar adıyla başlayan fakat farklı eş yazarlara sahip kaynakları ikinci yazarın soyadına göre alfabetik sıralayınız.
- Aynı yazara ait birden fazla tek yazarlı kaynak olması durumunda kaynakları yıllara göre sıralayınız.
- Dergi makaleleri için doi bilgisi varsa kaynakçada mutlaka belirtiniz.

Aşağıda, farklı kaynakların metin içerisinde ve kaynakçada nasıl yazılacağına dair örnekler bulabilirsiniz.

Tek yazarlı dergi makaleleri, kitap içi bölümler ve kitaplar

Metin içerisinde:

Yazarın soyadı ve yayın yılı (Esin 1995).

Sayfa sayısı bilgisi verilecekse:

Yazarın soyadı ve yayın yılı, sayfa sayısı (Esin 1995, 140).

Dergi makalesi:

Bickle, P. 2020. Thinking Gender Differently: New Approaches to Identity Difference in the Central European Neolithic. *Cambridge Archaeological Journal* 30(2), 201-218. https://doi.org/10.1017/S0959774319000453

Kitap içi bölüm:

Esin, U. 1995. Aşıklı Höyük ve Radyo-Aktif Karbon Ölçümleri. A. Erkanal, H. Erkanal, H. Hüryılmaz, A. T. Ökse (Eds.), *İ. Metin Akyurt - Bahattin Devam Anı Kitabı. Eski Yakın Doğu Kültürleri Üzerine İncelemeler*, İstanbul: Arkeoloji ve Sanat Yayınları, 135-146.

Kitap:

Peterson, J. 2002. *Sexual Revolutions: Gender and Labor at the Dawn of Agriculture*. Walnut Creek, CA: AltaMira Press.

İki yazarlı dergi makaleleri, kitap içi bölümler ve kitaplar

Metin içerisinde:

Her iki yazarın soyadı ve yayın yılı (Dinçol ve Kantman 1969, 56).

Dergi makalesi:

Pearson, J., Meskell, L. 2015. Isotopes and Images: Fleshing out Bodies at Çatalhöyük. *Journal of Archaeological Method and Theory* 22, 461-482. https://doi.org/10.1007/s10816-013-9184-5

Kitap içi bölüm:

Özkaya, V., San, O. 2007. Körtik Tepe: Bulgular Işığında Kültürel Doku Üzerine İlk Gözlemler. M. Özdoğan, N. Başgelen (Eds.), *Türkiye'de Neolitik Dönem. Yeni Kazılar, Yeni Bulgular*, İstanbul: Arkeoloji ve Sanat Yayınları, 21-36.

Kitap:

Dinçol, A. M., Kantman, S. 1969. *Analitik Arkeoloji, Denemeler*. Anadolu Araştırmaları III, Özel sayı, İstanbul: Edebiyat Fakültesi Basımevi.

Üç ve daha çok yazarlı dergi makaleleri ve kitap içi bölümler

Metin içerisinde:

İlk yazarın soyadı, "vd." ve yayın yılı (Özbal vd. 2004).

Dergi makalesi:

Özbal, R., Gerritsen, F., Diebold, B., Healey, E., Aydın, N., Loyet, M., Nardulli, F., Reese, D., Ekstrom, H., Sholts, S., Mekel-Bobrov, N., Lahn, B. 2004. Tell Kurdu Excavations 2001. *Anatolica* 30, 37-107.

Kitap içi bölüm:

Pearson, J., Meskell, L., Nakamura, C., Larsen, C. S. 2015. Reconciling the Body: Signifying Flesh, Maturity, and Age at Çatalhöyük. I. Hodder, A. Marciniak (Eds.), *Assembling Çatalhöyük*, Leeds: Maney Publishing, 75-86.

Editörlü kitaplar

Metin içerisinde:

Yazar(lar)ın soyadı ve yayın yılı (Akkermans ve Schwartz 2003).

Akkermans, P. M. M. G., Schwartz, G. M. 2003. (Eds.) *The Archaeology of Syria. From Complex Hunter-Gatherers to Early Urban Societies (c. 16.000-300 BC)*. Cambridge: Cambridge University Press.

Web kaynağı:

Soyad, Ad. Web Sayfasının Başlığı. Web Sitesinin Adı. Yayınlayan kurum (varsa), yayın tarihi. Erişim tarihi. URL.

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Submission and Style Guideline

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The content of the manuscripts should meet the aims and scope of the Turkish Journal of Archaeological Sciences (cf. Aims and Scope).

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Each manuscript should include a Turkish and an English abstract of up to 200 words and five keywords in both Turkish and English. Citations should not be included in the abstract.

If the author(s) are not fluent in the language of the manuscript, a translation of the abstract and the keywords may be provided by the editorial board.

Manuscripts, figures, and other files should be sent via wetransfer or e-mail to **archaeologicalsciences@gmail.com**

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Each article must contain the following:

- Authors (please provide the name-last name and contact details of each author under the main title of the manuscript)
- Affiliation (where applicable)
- E-mail address
- ORCID ID

The manuscript should contain:

- Title
- Abstract (in English and Turkish)
- Keywords
- Text
- References
- Figures (when applicable)
- Tables (when applicable)

Scientific Standards and Ethics

- Submitted manuscripts should include original research that has not been previously published or submitted for publication elsewhere.
- The manuscripts should meet scientific standards.
- Manuscripts should use inclusive language that is free from bias based on sex, race or ethnicity, etc. (e.g., “he or she” or “his/her/their” instead of “he” or “his”) and avoid terms that imply stereotypes (e.g., “humankind” instead of “mankind”).

Style Guide

Manuscript Formatting

- Manuscripts should be written in Times New Roman 12-point font, justified and single-spaced. Please submit the manuscript as a word document.
- Words in foreign and ancient languages should be *italicized*.
- Titles and subtitles should appear in **bold**.
- Titles and subtitles should not be numbered, italicized, or underlined.
- Only the first letter of each word in titles and subtitles should be capitalized.

References

Cf.: In-Text Citations and References

- In-text citations should appear inside parenthesis (Author year, page number).
- Footnotes and endnotes should not be used for references. Comments should be included in footnotes rather than endnotes.
- The footnotes should be written in Times New Roman 10-point font, justified and single-spaced, and should be continuous at the bottom of each page.

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- Images should be submitted in the dimensions in which they should appear in the published text and their resolution must be over 300 dpi.
- Please avoid editing the figures in Photoshop or similar programs but send the raw version of the figures if possible.
- Tables and graphs prepared in Excel should be sent as both PDF and Excel documents.

Dates and Numbers

- Please use BCE/CE and please avoid using dots without dots (i.e., BCE instead of BC or B.C.).
- Please use a dot for numbers and dates with 5 or more digits (i.e., 10.500 BCE).
- Please avoid using dots for numbers and dates with 4 or less digits (i.e., 8700 BCE).
- Please spell out whole numbers from 0 to 10 (e.g., “the floor was renewed eight times” instead of “the floor was renewed 8 times”).

Punctuation

- Please prefer em dashes (—) for parenthetical sentences: “Children were buried with various items, the adolescents—individuals between the ages of 12-19—had the most variety in terms of grave goods.”
- Please prefer an en dash (-) between page numbers, years, and places: 1989-2006; İstanbul-Kütahya.

Abbreviations

- Commonly used abbreviations:

Approximately:	approx.	Figure:	Fig.
Confer:	cf.	*Id est:*	i.e.,
Circa:	ca.	*Exempli gratia:*	e.g.,
Calibrated:	cal.		

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- When dealing with multiple papers from the same author, single authored ones should be written before the studies with multiple authors.
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Single-authored journal articles, book chapters, and books

In-text:

Last name and publication year (Esin 1995).

If the page number is indicated:

Last name and publication year, page number (Esin 1995, 140).

Journal article:

Bickle, P. 2020. Thinking Gender Differently: New Approaches to Identity Difference in the Central European Neolithic. *Cambridge Archaeological Journal* 30(2), 201-218. https://doi.org/10.1017/S0959774319000453

Book chapter:

Esin, U. 1995. Aşıklı Höyük ve Radyo-Aktif Karbon Ölçümleri. A. Erkanal, H. Erkanal, H. Hüryılmaz, A. T. Ökse (Eds.), *İ. Metin Akyurt - Bahattin Devam Anı Kitabı. Eski Yakın Doğu Kültürleri Üzerine İncelemeler*, İstanbul: Arkeoloji ve Sanat Yayınları, 135-146.

Book:

Peterson, J. 2002. Sexual Revolutions: *Gender and Labor at the Dawn of Agriculture*. Walnut Creek, CA: AltaMira Press.

Journal articles, book chapters, and books with two authors

In-text:

Last names of both authors and publication year (Dinçol and Kantman 1969, 56).

Journal article:

Pearson, J., Meskell, L. 2015. Isotopes and Images: Fleshing out Bodies at Çatalhöyük. *Journal of Archaeological Method and Theory* 22, 461-482. https://doi.org/10.1007/s10816-013-9184-5

Book chapter:

Özkaya, V., San, O. 2007. Körtik Tepe: Bulgular Işığında Kültürel Doku Üzerine İlk Gözlemler. M. Özdoğan, N. Başgelen (Ed.), *Türkiye'de Neolitik Dönem. Yeni Kazılar, Yeni Bulgular*, İstanbul: Arkeoloji ve Sanat Yayınları, 21-36.

Book:

Dinçol, A. M., Kantman, S. 1969. *Analitik Arkeoloji, Denemeler*. Anadolu Araştırmaları III, Özel sayı, İstanbul: Edebiyat Fakültesi Basımevi.

Journal articles and book chapters with three or more authors

In-text:

Last name of the first author followed by "et al." and the publication year (Özbal et al. 2004).

Journal article:

Özbal, R., Gerritsen, F., Diebold, B., Healey, E., Aydın, N., Loyet, M., Nardulli, F., Reese, D., Ekstrom, H., Sholts, S., Mekel-Bobrov, N., Lahn, B. 2004. Tell Kurdu Excavations 2001. *Anatolica* 30, 37-107.

Book chapter:

Pearson, J., Meskell, L., Nakamura, C., Larsen, C. S. 2015. Reconciling the Body: Signifying Flesh, Maturity, and Age at Çatalhöyük. I. Hodder, A. Marciniak (Eds.), *Assembling Çatalhöyük*, Leeds: Maney Publishing, 75-86.

Edited books

In-text:

Last name(s) of the author(s) and publication year (Akkermans and Schwartz 2003).

Akkermans, P. M. M. G., Schwartz, G. M. 2003. (Eds.) *The Archaeology of Syria. From Complex Hunter-Gatherers to Early Urban Societies (c. 16.000-300 BC)*. Cambridge: Cambridge University Press.

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