



DOI: 10.5281/zenodo.3605666

ARCHAEOLOGICAL AND ARCHAOMETRIC OBSERVATIONS ON INHABITATION OF THE HÖYÜK SETTLEMENT IN THE MIDDLE AND LATE BRONZE AGES

Eşref Abay¹, Bora Temür¹, Erim Konakçı² and Barış Semiz³

¹Ege University, Faculty of Letters, Protohistory and Near Eastern Archaeology, İzmir, Turkey

²İzmir Demokrasi University, Faculty of Science and Letters, Protohistory and Near Eastern Archaeology,
İzmir, Turkey

³Pamukkale University, Department of Geological Engineering, Denizli, Turkey

Received: 14/01/2020

Accepted: 19/02/2020

*Corresponding author: Erim Konakçı (erimkonakci@hotmail.com)

ABSTRACT

Höyük Settlement is located within the boundary of Çal district of Denizli Province. It was strategically located on a natural passage and an important centre surrounded by walls during the 2nd millennium BC. Surveys conducted in the Upper Menderes Basin have revealed that the mountainous and plateau areas are at least as densely settled as in lowland sections and these areas have significant importance in archaeological point of view. An intensive archaeological survey was conducted in order to find answers on Höyük settlements. Therefore, The Middle and Late Bronze Age ceramics which were found in the settlement area were evaluated from archaeological and archaeometric perspective. These ceramics were characterized by using typological evaluations, optical microscopy and X-Ray Fluorescence analyses (XRF). Analogical evaluations shown that the settlement's interregional relations reach from Central Anatolian to the West Anatolian shores, but the local features known from Beycesultan are prominent. Archaeometric analyses revealed that the Middle and Late Bronze Age ceramics contain metamorphic rock fragments and very abundant carbonate. Small and fine quartz grains, a small amount of pyroxene and plagioclase minerals and abundant carbonate are observed in these samples. The results obtained from the intensive survey supported the idea that the importance of the settlements in the mountainous and plateau areas increased after the decline seen in the region in 16th century BC.

KEYWORDS: Höyük Settlement, Middle Bronze Age, Late Bronze Age, Inland West Anatolia, Çivril-Baklan-Çal Basin

1. INTRODUCTION

Höyük Settlement was first discovered in 2008, during the surveys conducted by Eşref Abay in the region. Later, during the surveys conducted by Fulya Dedeoğlu in the mountainous part of the region, it was re-examined. As a result of the systematic archaeological surveys in the region in the 1950s and then between 2003 and 2015, more than 250 settlements were identified (Mellaart, 1954; Abay, 2011; Dedeoğlu *et al.*, 2014; Dedeoğlu *et al.*, 2015, p. 151; Dedeoğlu *et al.*, 2016). Early surveys in the Upper Menderes Basin showed that the plains and especially the area around the Menderes River were intensely inhabited. The researches, which have been restarted in 2003 and focused on the mountainous and plateau areas of the basin since 2011, revealed that these areas were inhabited at least as intensely as the plains. In this context, the questions of identity and functions of the settlements in the mountainous and plateau areas gain importance. "Höyük Settlement" which constitutes the subject of the article, provides answers to these questions with both its location and its findings. The intensive surveys in the settlement and the archaeometric analysis of the found ceramics have contributed to our understanding of the settlement patterns of the 2nd millennium BC by providing a new perspective to the studies focused on the plains.

The Upper Menderes Basin, where the Höyük settlement is located, represents a relatively developed process in terms of social organization at the beginning of the Middle Bronze Age (hereafter MBA) and Late Bronze Age (hereafter LBA). During this time, it is understood that the plains and mountainous areas were intensively inhabited by settlements adopting different settlement patterns. These settlements, which have an organized hierarchical distinction among themselves, have a ceramic culture fully compatible with plain settlements in terms of character and quality. Analysis in the field of ceramic production shows that this homogeneity has become more prominent in the MBA. As a matter of fact, starting from the MBA, written sources show that the basin is part of the Arzawa Kingdom. Archaeological findings such as palaces and public buildings, temples and elite houses (Lloyd *et al.*, 1965, pp. 3–66; Dedeoğlu and Abay, 2014, pp. 4–7) pointing to the complex social structure in Beycesultan Höyük, 35 km away from the Höyük settlement, show that the settlement was political and economic centre in terms of its location in the Arzawa region during this period. On the other hand, it is understood that this structure, which we define mainly from Beycesultan Höyük, began to disappear with the beginning of the LBA after the 16th century BC. It is understood that

Beycesultan lost its importance in the LBA and inhabitation was relatively sparse. This raises the question of whether the importance of relatively more protected castle-type settlements on natural routes, such as the Höyük Settlement, has increased during the LBA. The fact that no research has been conducted in the mountainous parts of the basin, which is understood to have been inhabited extensively during the LBA, increases the importance of the data obtained from the Höyük Settlement. In this article, it is aimed to find answers to these questions by examining the settlement of Höyük in detail. In addition to archaeological data, archaeometric surveys on pottery will provide an insight into whether there is a difference in material culture in terms of the MBA and LBA.

2. LOCATION OF THE SITE

The Baklan-Çivril-Çal Basin, where the Höyük Settlement is located, covers an extremely large area in western Anatolia including the towns of Çal, Baklan and Çivril within the borders of today's Denizli Province (Fig. 1). The topography of the region consists of mountains, plateaus and hills surrounding an exorheic basin, which is 815,6 km² and 800–850 meters above sea level (Semiz *et al.*, 2018). The basin is also located on natural routes that provide transport and communication with the surrounding regions; on the northeast Küfü Stream Strait and Düzbel Pass reach the Afyon Sandıklı Plain, the valley to the north reaches Uşak, the natural route to the east leads to Dinar and then to the Lakes Region. Many water sources make the basin plains fertile. The most important one is the Büyük Menderes River which is the largest river of not only the Menderes Basin but also Aegean Region with a length of 584 km. Besides, there are still lakes and dried old lake beds in the region. Çivril and Baklan plains are connected to the Çal basin via Seyitler Strait on the west. Çal basin is 17 km wide (Ceylan, 1998, p. 155). The Çal basin floor has the appearance of an alluvial valley plain surrounded by Büyük Çökelez Mountain, Çal and its environments. Researches have shown that plateau and mountainous areas are subject to dense settlement as much as plains in the MBA and LBA (Dedeoğlu *et al.*, 2014, pp. 366–376; Dedeoğlu *et al.*, 2015, pp. 151–160; Dedeoğlu *et al.*, 2016, pp. 553–563).

The Höyük Settlement is located at the border point of the natural valley in the Baklan Basin where the Çal plateau reaches the Çivril-Baklan plain (Fig. 1). Settlement is located approximately 1,5 km southeast of the village of Aşağı Seyit/Çal, at 828 meters high and built on a natural hill extending northeast and southwest. Settlement extends to an area of approximately 6 hectares and has a total area

of 7-8 hectares including the cemetery. The Büyük Menderes River flows 120 meters away from the north-western slope of the Höyük settlement. Among these settlements, archaeological excavations are continuing at Ekşi Höyük and Beycesultan Höyük, which are located 8 and 35 km from Höyük Settlement respectively. The latter was a major settlement during the Middle and Late Bronze ages

(Lloyd *et al.*, 1965; Lloyd, 1972; Mellaart *et al.*, 1995; Dedeoğlu and Abay, 2014). Besides these two settlements, there are also Asopos Hill/ Laodikeia (Konakçı, 2014a), Kusura (Lamb, 1937, pp. 1-64, 1938, pp. 217-273) and Aphrodisias (Joukowsky, 1986) excavations with prehistoric levels in the immediate vicinity.

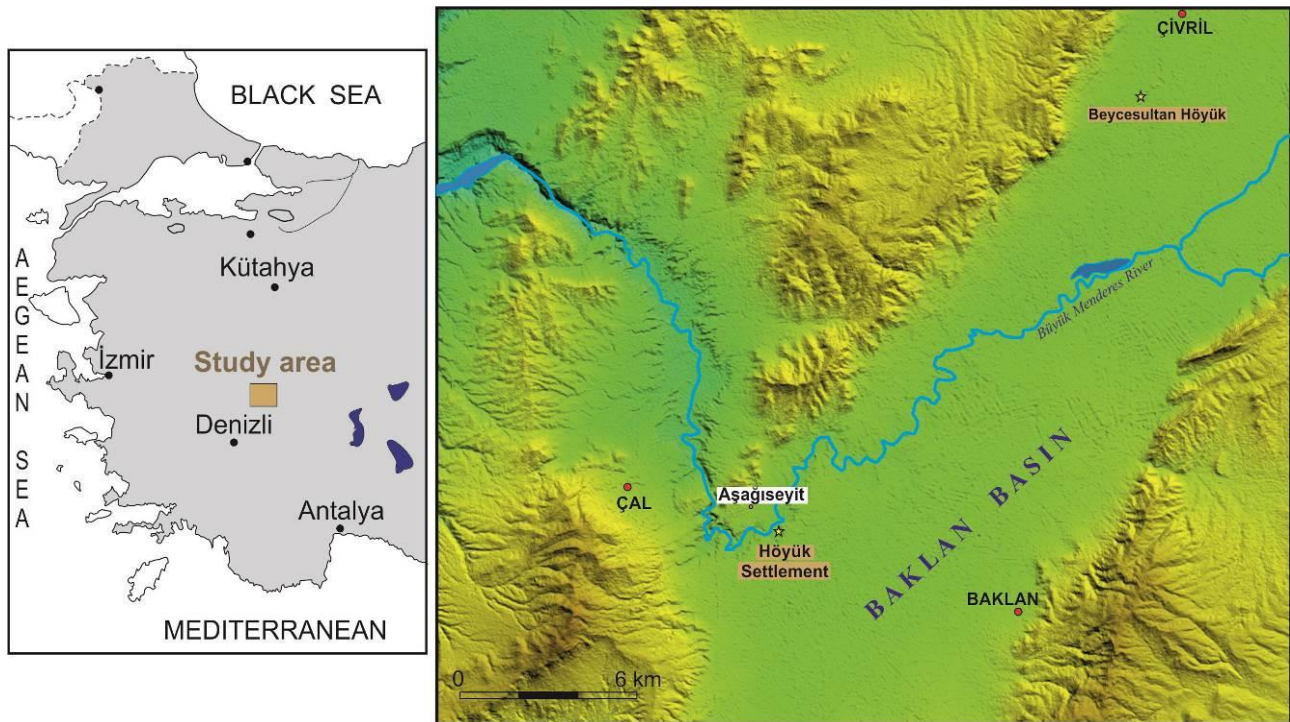


Figure 1 Location of the Höyük Settlement in Upper Meander Basin (Denizli - Western Anatolia)

3. INTENSIVE ARCHAEOLOGICAL SURVEYS IN HÖYÜK SETTLEMENT

During the intensive surface survey conducted on Höyük settlement, 5 sampling locations were established considering the area's topography and width (Fig. 2-4). The locations which were formed by a team of 10 (Fig. 5), were investigated in detail and all archaeological finds found in these areas were analysed. Architectural elements identified on the surface were examined with detailed aerial photographs and inferences were made about the planning of the settlement during different periods. Available data shows that the Höyük settlement is a

fortress type settlement surrounded by walls and the highest part of the mound was inhabited during the Roman Times, MBA and LBA. A cemetery was found 800 m south of the mound and pithoi fragments found on the surface indicate that it was used during the MBA and LBA.

Remains of a city wall surrounding the plain on the upper part of the mound were discovered. There was probably a second fortification wall surrounding the settlement. The central part, which seems to have been inhabited most intensively, should be the part where the citadel was located. The layers on the hillside of the mound are not protected due to erosion.



Figure 2 Höyük Settlement's Satellite image UTM 4,214,638.711 Latitude-Longitude: 717,412.206

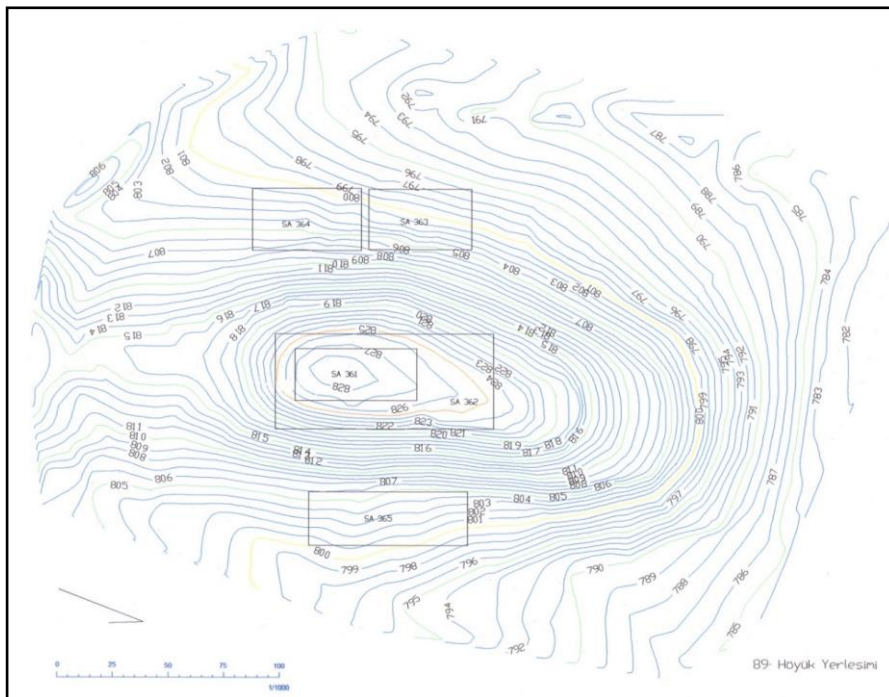


Figure 3 Topographic Plan and sample collection areas of the Höyük Settlement



Figure 4 Höyük Settlement from the North

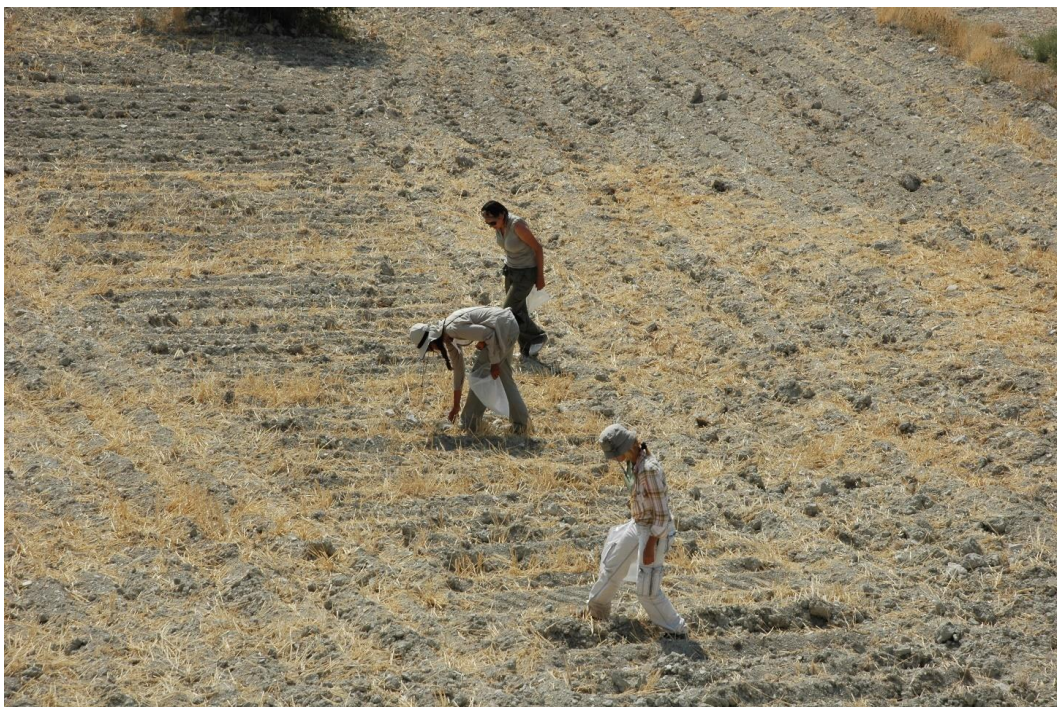


Figure 5 Post-harvest status of agricultural land on the Höyük

When the sample collection areas are evaluated, it is understood that the settlement tended to grow gradually starting from the Late Chalcolithic Age. The settlement established during this time continued strengthening its latitudinal inhabitation in the Early Bronze Age (hereafter EBA) I and II. There are no ceramics belonging to the EBA III. It can be stated that the settlement was either shrunk or abandoned during this period. The settlement, which expanded its borders again during the MBA, experienced its population peak in the LBA. Inhabitation of the settlement in a dense and wide area continued to be seen in the Early and Late Roman periods (Fig. 6). The Roman ceramics found in the highest part of the settlement, which was surrounded by city walls, show that this section maintains its importance after the MBA and LBA. Observations reveal that Late

Chalcolithic and EBA I-II ceramics are denser on the slope sections (SA363-364) rather than central section of the mound and during these periods northern part of the hill was subject to a more intensive inhabitation. Stone blocks of standard sizes and elliptical traces seen in satellite pictures identified in the sample collection areas SA361 and SA362 suggest that there was a fortification wall surrounding the central part of the mound during MBA and LBA. The citadel of the settlement was enlarged during the MBA and LBA and was inhabited more intensively. (Fig. 6). Also, architectural remains at the top of the mound (SA361) show that there was a tower in the Hellenistic and Roman periods in this area. These data show that the settlement had an important military identity established at a strategic point for many years.

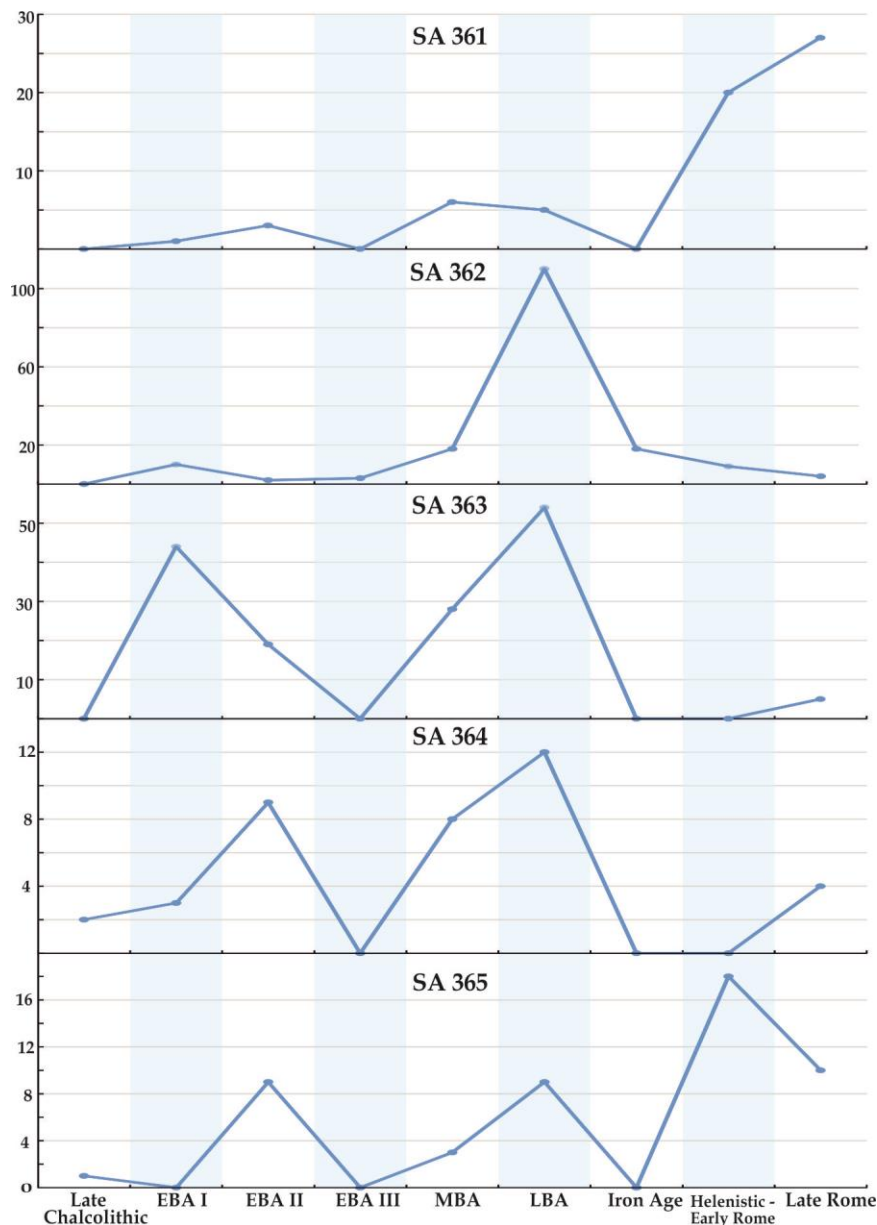


Figure 6 Distribution of ceramics in sample collection areas (SA361, SA362, SA363, SA364, SA365)

In the eastern and western parts of the Höyük (mound), stone walls (fortifications) which were thought to have function in different periods, and in which used different construction techniques, were identified. The first observations show the existence of two fortifications; one of them belongs to the inner castle and the other one belongs to the outer castle. The pottery sherds dating to the EBA I-II, MBA, LBA and Roman periods were found during the surveys. The presence of pottery dating back to the 2nd millennium BC on the settlement intensifies the argument that it was a fortress settlement used during the Middle and Late Bronze Ages. At the highest point of the Höyük, the intensity of the Early Roman and Late Roman ceramics from the 3rd-4th century

AD suggests that there was a defensive structure in this area.

4. MIDDLE AND LATE BRONZE AGES POTTERY

The MBA ceramics of the Höyük Settlement show the highest amount of ceramics which can be evaluated under the brown, coarse and red ware groups (for the new analysis method on pottery surface colours see Bratitsi *et al* 2018). When the surface properties of ceramics are evaluated in general, it is seen that the thick primer application is the most common surface treatment. Most of the ceramics found are not burnished. The ceramics of the MBA ceramics contain mostly stone, sand, mica and lime, and most of them are well fired.

When the forms of the ceramics dating to the MBA are considered, it is seen that the bowls and pots were majority. The MBA ceramics found in the settlement are mostly neckless pots with outwardly-thickened rims. Steep, inwardly-inclined and outwardly-inclined examples of these pots are seen (Fig. 10: 1-4). Similar pots are seen in Asopos Hill (Konakçı, 2014a, p. 120 illus. 4: 8), MBA layer of Aphrodisias (Joukowsky, 1986, p. 679 Plate 485: 13), Bademağacı (Umurtak, 2003, pp. 58, 65, 68 Fig. 3: 5-6; 72, Fig. 7: 9.), VI. layer of Bademgediği (Meriç, 2003, p. 95 Fig. 17: 49-50), the early VI. layer of Troy (Blegen *et al.*, 1953 Pl. 423: 35, 457), Kadıkalesi (Kan, 2005 Fig. 17: c-d), III. layer of Miletus (Raymond, 2005, p. 262 Fig. 3.31), Smyrna / Bayraklı (Bayne, 2000, pp. 76, 272 Fig. 17: 2.), Kocabaştepe MBA 3 (Aykurt, 2004, p. 114 Pl. 45: a-b), Panaztepe (Günel, 1999a, p. 48 Pl. 94: 1), phase XIa of Ayasuluk Hill (Konakçı, 2015, p. 394 illus 2: 11), Çavlum Cemetery (Bilgen, 2005 LXX: 1), Demircihöyük (Kull, 1988, pp. 228, 230 Taf 2: 8, Taf 7: 3, 5, Taf 13: 17, Taf 24: 3, Taf 25: 17), 8a on the northwest slope of Yukarışehir in Boğazköy (Orthmann, 1963 Tafel 36: 357) and Gordion no 12 of Megaron Va (Gunter, 1991, p. 78 Fig. 22: 455).

Hemispherical bowls with outwardly-thickened rims are another form found in the settlement. The rims of these bowls either rise outwardly or inwardly. Bowls with similar form were found in Beycesultan's V, IVc, IVc, IVb and IVa layers (Lloyd *et al.*, 1965, pp. 86, 104, 120, 132 Fig 2: 1-16; 13: 11-16; 24: 23-24; 32: 2-4), Asopos Hill (Konakçı, 2014b, p. 75 illus 1-2: ÇT6), Aphrodisias Bronze Age 4-MBA layer (Joukowsky, 1986, p. 665 Pl. 454: 10, 11; 477: 6, 9), in Kusura C phase (Lamb, 1937, pp. 24-25 Fig. 9: 3), Bademağacı (Umurtak, 2003, pp. 63, 66 Fig. 1: 8), Limantepe's III. Layer (Günel, 1999b, p. 68 Abb 12: 9), Panaztepe (Günel, 1999a, p. 45 Pl. 36: 1, 3, 6; 39: 1, 5; 40: 1-3, 6, 7; 41: 3, 4, 6; 42: 1, 4, 6; 43: 3-5), the 3rd layer of MBA in Kocabaştepe (Aykurt, 2004, p. 74 Pl. 20: c; 21: a-d), Miletus' III. Layer (Raymond, 2005, pp. 238-239), Smyrna / Bayraklı (Bayne, 2000, pp. 64, 65, 270, 271 Fig. 8: 7; Fig. 9: 4), Early Phase of Troy VI (Blegen *et al.*, 1953 Pl. 425: 26.), Ayasuluk Hill (Konakçı, 2015, p. 393 illus 1: 5), Gordion Megaron 10, layer 14 (Gunter, 1991, p. 55 Fig. 9: 168, Fig. 11: 199, Fig. 21: 441), MBA layers in Demircihöyük (Kull, 1988, p. 232 Taf 8: 2; 9: 13), 8 c-d layers on the northwest slope of Yukarışehir in Boğazköy (Orthmann, 1963 Taf 22: 201).

When we evaluate the forms in general that were found during surface surveys in Höyük settlement dated back to MBA, similar forms are seen in Beycesultan VI. and Vb layers (V and IVa-c in old stratification), Asopos Hill VI. layer, Aphrodisias Bronze 4-MBA and MBA layers, Kusura C phase, in the

Coastal Aegean; in Kocabaştepe MBA 3 layer, Bademgediği Hill VI. layer, Panaztepe MBA layers, Troia Early VI. layer, Limantepe III. layer, Miletus III. layer, Smyrna / Bayraklı, Ayasuluk MBA XIa and XIb phases, Lakes Region; in Bademağacı MBA deposit; in Central Anatolia; Çavlum MBA cemetery, Demircihöyük MBA layers, northwest slope of Boğazköy 8a-d layers and Gordion MBA layers. When the forms of the ceramics and ware groups found in the Upper Menderes Basin are taken into consideration, similarities are seen between Beycesultan V. layer, Asopos Hill VI. layer, Kusura C, Aphrodisias MBA layers.

When the LBA ceramics found in the Höyük settlement are evaluated, Brown, Red and Buff coloured samples are the most common groups. When the surface properties of the ceramics were examined, it was determined that thin and thick primer application was the most common surface treatment. While burnishing is observed intensively especially in the ceramics exhibiting the "Early Phase" characteristics of the LBA, relatively limited number of burnished samples are observed in the "Late Phase". It is known that thick priming and burnishing treatments decreased during the Late Phase of the LBA. Apart from coarse ceramics, smooth surface is another essential feature. Stoneware, sand, mica and lime content are dense in the ceramics. Apart from coarse ceramics, it is another characteristic feature that they are thin in size and less in proportion. Most of the ceramics found in LBA settlements are well fired.

The most common forms found in Höyük settlement's LBA period are bowls and pots. In addition to these forms, pithoi and various forms of handle, lug, stem, base and body fragments were found.

In the Höyük settlement, shallow bowls softly connected to stem with simple rim and steep rim are among the detectable forms (Fig. 11: 2). The similar ones were found in Beycesultan II. and I. layers (Mellaart *et al.*, 1995, pp. 40, 67 Fig. 18a: 8; 31: 13), Asopos Hill V. layer (Konakçı, 2014a, p. 119 illus III: 1) Aphrodisias LBA II. and III. layers (Joukowsky, 1986, pp. 685, 689 Pl. 448: 34; 490: 22), Panaztepe (Günel, 1999a, p. 41 Pl: 1; 2; 3), Ayasuluk Hill X. layer (Konakçı, 2016, p. 152 Fig. 4: ÇT4), Porsuk V. layer Gordion, Megaron 10 layer 5 (Gunter, 1991 Fig. 17: 70, 348, 350) and Demircihöyük (Kull, 1988, p. 236 Taf. 16).

In addition, bowls softly connected to stem with inwardly and outwardly thickened rims are also found (Fig. 12: 3, 5). The bowls of similar form were found in the Smyrna / Bayraklı excavations (Bayne, 2000, pp. 74, 272 Fig. 15: 7), Panaztepe (Günel, 1999a, p. 41 Pl. 5: 1-3), Ayasuluk Hill X. layer (VF7), Gordion no 10 megaron, layer 7 (Gunter, 1991, p. 65 Fig.

15: 295) and Demircihöyük IKL 10/11 trench phase 4/5 (Kull, 1988, p. 234 Taf. 13: 8).

Neckless pots with outwardly-thickened edges and inwardly curved rims were found in the Höyük settlement (Fig. 12: 3). Similar samples can be seen in Aphrodisias LBA layer II (Joukowsky, 1986, pp. 691, Pl 491: 10; 693, Pl 492: 1, 6), Smyrna / Bayraklı excavations (Bayne, 2000, pp. 78, 272 Fig. 19: 2), Troia Late VI (Blegen *et al.*, 1953 Pl. 442: 9, 14) and Troia VIIa (Blegen *et al.*, 1958 Pl. 253: 11), Panaztepe (Günel, 1999a, p. 47 Pl. 80: 3-4), Ayasuluk X. layer (Konakçı, 2012 Pl. 34:2), Gordion no 12 Megaron layer Vb (Gunter, 1991, p. 77 Fig. 21: 438, 439), Demircihöyük (Kull, 1988 Taf. 12: 4; Taf. 26: 12) and Porsuk V. layer (Dupré, 1983, pp. 165, Pl 28: 171, 172, Pl 29:177-181).

5. MATERIALS AND METHODS

In order to find out the structural, chemical and mineralogical characteristics of the ceramic samples, which show differences (colour, shape etc) according to their macroscopic qualities, 5 samples in MBA and 5 samples in LBA were selected (Fig. 7). In addition, the samples were compared with those of the Höyük settlement samples used in the Semiz *et al.* 2018. For archaeometric analysis, mineralogical-petrographical properties of the samples were determined by optical microscope studies; chemical compositions were determined by X-ray fluorescence spectrometry (XRF).

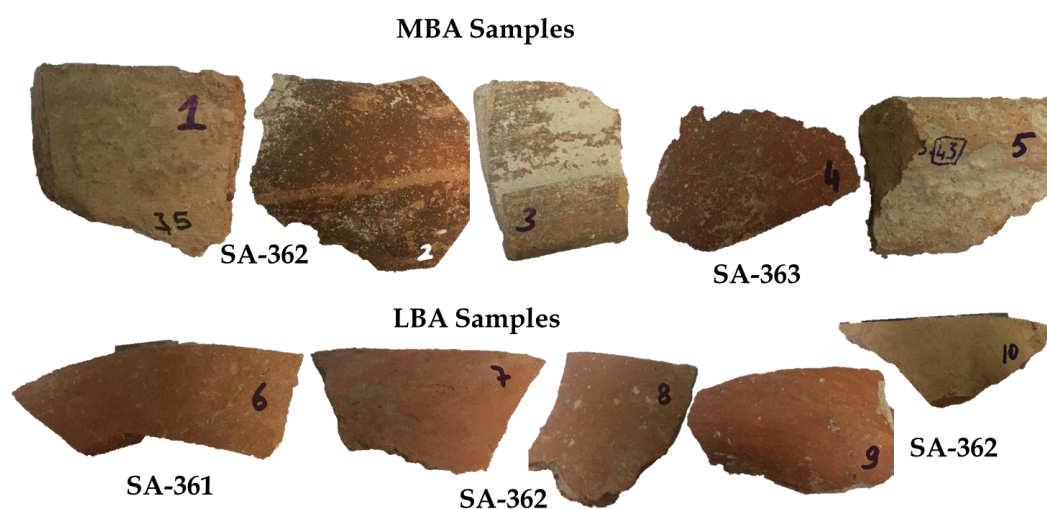


Figure 7 Middle and Late Bronze Age Ceramic Samples

Thin sections for petrographic studies were performed on all ceramics in the settlement and made in Pamukkale University (PAÜ) Geological Engineering Department thin section laboratory. Thin sections of the samples were cut to show all the layers of the ceramic samples from the outer side to the inside. The mineralogical and petrographical characteristics of the samples were studied through an examination of these thin sections by using a Leica brand polarizing microscope at the Geological Engineering Department. Two MBA and three LBA ceramics were examined by XRF method (see another XRF analysis from Anatolia Liritzis, 2005). The chemical composition was determined at the Advanced Technology Application and Research Center at Pamukkale University using Spectro XEPOS Polarized Energy Dispersive X-Ray Fluorescence spectrometer (PEDXRF) for major and some trace elements. The instrumentation was equipped with a 50 W Pd end window X-ray tube and the spectral resolution was 160 eV (1000 cps Mn

K α). During the measurement the sample chamber is flushed with Helium. United States Geological Survey (USGS) standards, which are referred as GEOL, GBW-7109 and GBW-7309 were used for XRF analysis. Ceramic samples were crushed in a tungsten carbide crushing vessel, and 6.25 g of powdered sample was mixed with 1.4 g of wax (M-HWC). The mixture was pressed at 18 N in an automatic press to obtain a pressed disc (Semiz, 2017).

6. ARCHAEOMETRIC ANALYSES

Almost all of the ceramic samples (MBA and LBA) are composed of coarse-grained, angular and semi-angular grains of minerals and metamorphic rock fragments, which is dimensions vary between silt (0.02 mm) and sand (1-2 mm).

According to optical microscope studies, MBA samples (1, 2, 3, 4, 5) have similar mineralogical compositions. As a result of the investigations, it was determined that the samples contain abundant

quartz, muscovite, plagioclase, clinopyroxene, carbonate and metamorphic rock fragments (Figs. 8a and b). The rock fragments are in the form of micaschists, quartzite and rarely marbles. Minerals in sample 2 exhibit a preferred orientation (Fig. 8a). Quartzite length in the Sample 4 has an average long axis of 1.7 mm (Figs. 8c and d). The carbonate rocks contents are sometimes encountered as calcite and limestone. In MBA samples, small and abundant quartz grains, an abundant amount of pyroxene (0.3 mm) and plagioclase (0.2 mm) minerals and abundant carbonate are observed. All MBA samples are similar to the examples of subgroup 1a defined

by Semiz et al 2018. LBA samples (6, 7, 8, 9, 10) contain abundant quartz, muscovite, plagioclase, clinopyroxene, carbonate and metamorphic rock fragments. A significant orientation in Sample 6 is generally observed in the samples (Fig. 8e). Clinopyroxene and coarse plagioclase (0.7 mm) minerals as well as abundant carbonate and quartzite pebbles are observed in the samples (Fig. 8f). The rock fragments are in the form of micaschists, quartz-mica schist, quartzite (Fig. 8g). This rock fragment lengths are maximum 2.3 mm in quartzite and 1.4 mm in mica-quartz schist. Some samples are also characterized by a porous area (Fig. 8h).

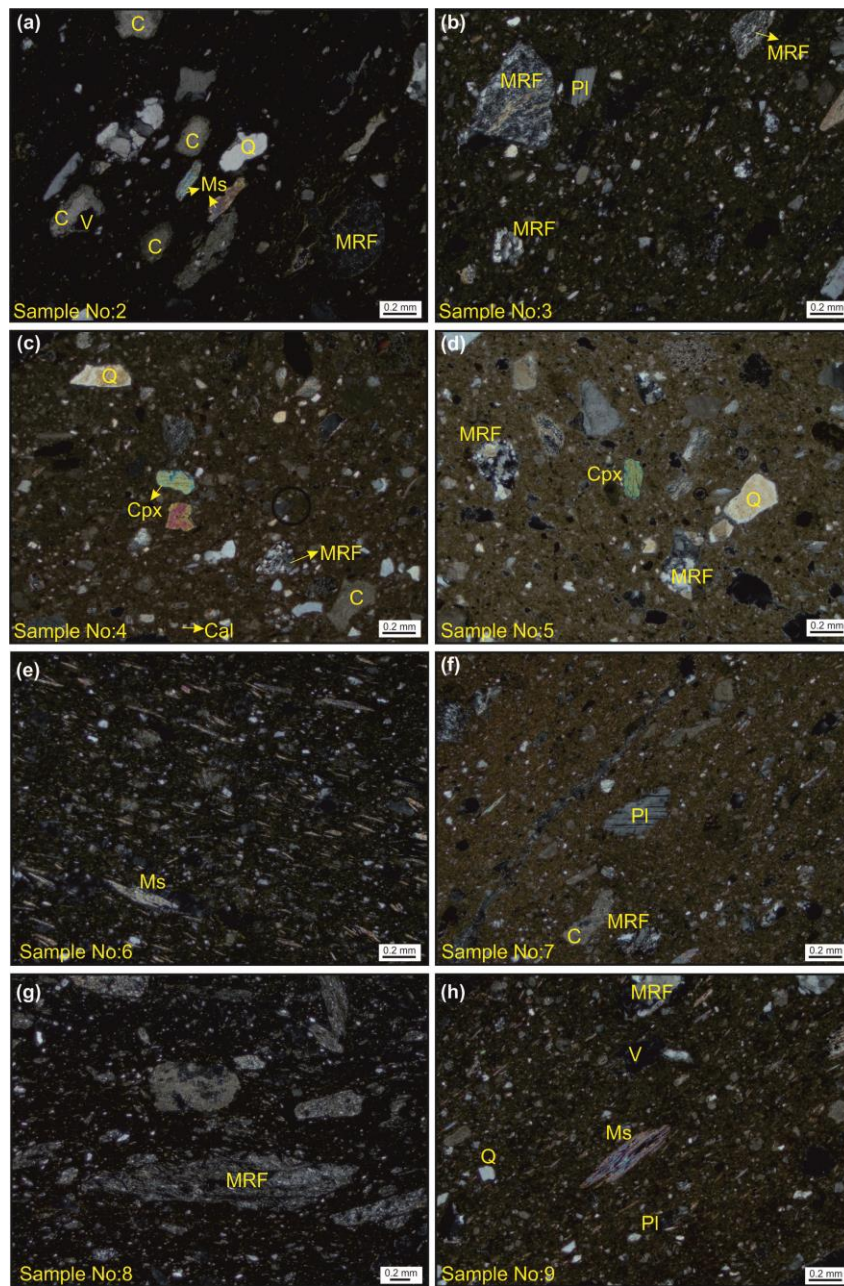


Figure 8 Photomicrographs (Transmitted light, crossed polarization) of select ceramic samples (Ms: Muscovite; MRF: Metamorphic rock fragments; Q: Quartz; Pl: Plagioclase; C: Calcite; Cpx: Clinopyroxene; V: Void)

We followed the some characterization studies suggested by Liritzis *et al.*, 2020. Concentration of some trace (in ppm) and major (in wt%) elements in selected ceramic samples are reported in Table 1. All measured elements were determined with each other by means of bivariate plots and compared with chemical groups by Semiz *et al* 2018.

According to XRF results, MBA samples contained SiO₂ (54.89%) and CaO (14.10 %). Abundant levels of SiO₂ are related to the abundant quartz, plagioclase minerals and metamorphic rock fragments. The SiO₂ (54.52 %) contents of the LBA samples are approximately similar to MBA samples. The highest CaO content belongs to the sample 3 with an

average of 17.15%. High CaO content are related to carbonate minerals and marble. The CaO (11.35%) contents of the LBA samples are lower from MBA samples (Fig. 9a and b). The highest TiO₂ (1.0 %) was observed in LBA samples and lowest TiO₂ content in MBA samples (0.89 %) (Fig. 9c). The highest Fe₂O₃ (8.25 %) and MgO (4.96 %) concentrations were observed in LBA samples (Fig. 9d). High Fe₂O₃ likely reflect the abundance of hematite/magnetite and clay minerals. In Subgroup 3a sample form Semiz *et al* 2018, MgO contents also show significant differences. All MBA and LBA samples are high concentrations, which can be related with dolomitic carbonate rocks.

Table 1: Chemical analyses of the representative ceramic samples (MDL: Minimum detection limit; E27 analysis result taken from Semiz *et al* 2018)

Element	Unit	MBA			LBA			
		MDL	E27	2	3	6	7	9
SiO ₂	%	0.011	54.94	56.25	53.47	55.36	53.89	54.32
TiO ₂	%	0.010	0.85	0.95	0.87	1.05	0.93	1.02
Al ₂ O ₃	%	0.009	14.83	15.93	13.58	16.22	12.73	16.31
Fe ₂ O ₃	%	0.022	6.31	7.45	6.26	8.18	8.20	8.37
MnO	%	0.003	0.12	0.10	0.12	0.17	0.15	0.18
MgO	%	0.017	3.45	2.76	3.29	3.45	7.43	4.00
CaO	%	0.010	14.89	10.26	17.15	10.92	12.37	10.76
Na ₂ O	%	0.067	0.90	1.43	1.14	1.03	1.45	1.31
K ₂ O	%	0.014	3.28	4.22	3.52	3.14	2.20	3.25
P ₂ O ₅	%	0.002	0.31	0.37	0.28	0.27	0.28	0.30
Cr ₂ O ₃	%	0.002	0.01	0.02	0.02	0.04	0.06	0.04
SO ₃	%	0.020	0.06	0.11	0.19	0.07	0.17	0.09
Total			99.96	99.85	99.89	99.87	99.85	99.94
Ba	Ppm	2.0	1136.0	1050.0	1200.0	660.0	762.0	954.0
Rb	Ppm	0.5	111.3	134.3	118.7	113.0	79.1	104.7
Sr	Ppm	0.5	458.3	479.3	533.9	220.4	316.2	248.5
Y	Ppm	0.5	24.6	25.3	25.4	31.5	24.8	30.4
Zr	Ppm	1.0	222.2	228.3	254.8	240.7	221.0	217.0
Nb	Ppm	1.0	16.1	22.8	19.6	22.0	18.0	23.3
Th	Ppm	1.0	16.9	23.7	20.1	17.8	14.9	17.5
Ni	Ppm	0.5	133.5	143.1	159.4	257.1	310.9	265.8
V	Ppm	1.0	111.5	136.1	121.5	155.7	156.2	159
Hf	Ppm	0.5	7.6	6.9	6.8	9.9	6.6	6.5
Pb	Ppm	1.0	22.5	35.9	34.0	22.0	23.9	26.0
Co	Ppm	3.0	60.0	50.3	52.1	97.2	79.2	74.1
Cu	Ppm	0.5	32.1	26.5	30.1	36.7	46.9	38.4
Zn	Ppm	0.5	73.3	85.7	74.4	88.0	87.2	91.5

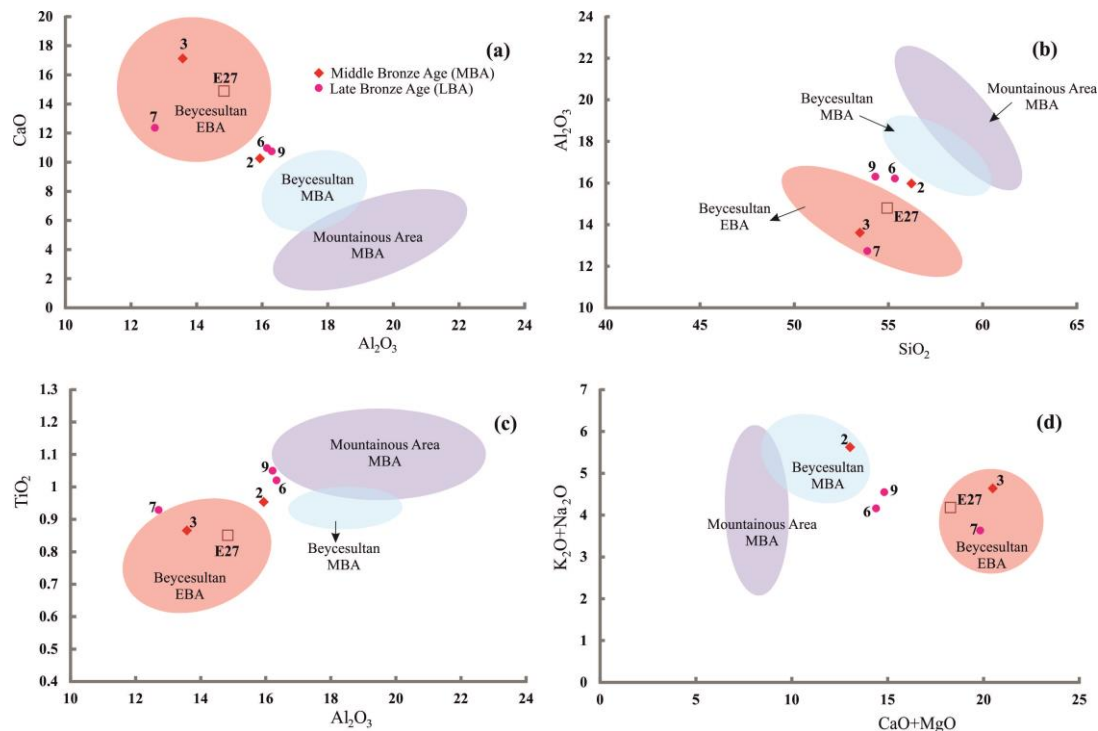


Figure 9 Relationships between (a) CaO and Al₂O₃ (b) Al₂O₃ and SiO₂ (c) TiO₂ and Al₂O₃ (d) K₂O+Na₂O and CaO+MgO in select samples (red area: Beycesultan EBA; blue area: Beycesultan MBA; purple area: Mountainous MBA from Semiz *et al.*, 2018)

As a result of the evaluation of the chemical analysis results and the comparison with the Semiz *et al.* 2018, previously conducted in the region, MBA and LBA samples show similar characteristics. This situation can be evaluated as they use similar clay beds even if they are in different periods. When compared with other samples in the region, the samples show that they are strictly separated from the MBA mountainous region samples. Similarly, it is observed that they show similar features to the samples of the Beycesultan, ie, the ovalic cuts and the samples of the EBA period and their approximate values to the MBA Beycesultan samples (Fig. 9). In this case, it is related to the excess amount of carbonate observed in them. Because the carbonate rocks in the plains are interpreted as being added to these ceramics as a contribution during production.

7. DISCUSSION AND CONCLUSION

Surveys carried out in the Upper Menderes Basin, which has a dense settlement texture since the Neolithic Age, revealed that different geographic units have different settlement patterns. As a result of the surface surveys, it has been revealed that settlements inhabited especially during the 2nd millennium BC can be classified as Central Settlements, Secondary Central Settlements, Clustered Settlements around the Centre, Strategic Settlements along the Road, Plato Area Settlements and Over Hill Settlements (Dedeoğlu, 2009, p. 224). Such settlements are usual-

ly on natural hills within plateau areas. Considering the geography and location selection, they are established for security purposes. These settlements are located on the high points of the plateau areas and have a scattered appearance. The geography of these settlements, which seem to have a military function, with limited agricultural land, offers mainly suitable conditions for animal husbandry in terms of economic input. Höyük settlement can be defined as an over hill settlement built for security purposes on the roads leading to the safe basin. However, the Great Menderes River flowing just in front of the settlement and the arable land surrounding this river differentiates the settlement from other established settlements for security purposes and also offers the opportunity to benefit from agricultural lands economically.

It is possible to define the MBA as a period in which the tendency of centralization reached its peak as in the Upper Menderes Basin during the EBA III and the whole the Central and Western Anatolia. It is understood that the city states, which started to be seen in the EBA III, continued their existence in this period as well. Troia (Easton *et al.*, 1993, p. 50), Seyitömer (Bilgen *et al.*, 2015, p. 64), Çine Tepecik (Günel, 2006, p. 23), Kaymakçı (Christopher H. Roosevelt *et al.*, 2018, p. 649) castles excavation data show that settlements surrounded by fortification walls come to the fore during this period. The Akkad seals found in Seyitömer excavations are also

important in terms of showing that inter-regional relations dating back to Mesopotamia have been established since the EBA III period (Bilgen, 2014, p. 198).

Public structures unearthed in layers 5-10 of Beycesultan (layers I-V in the first excavations) revealed that the settlement could have been an important administrative centre since the beginning of the 2nd millennium BC. The earliest layer of the MBA; The burnt palace (layer V according to the old stratigraphy), public structures and shrines in this layer exemplify this identity of the settlement. Compared to the palaces seen in Asia Minor world; Knossos, Phaistos, Malia settlements in Crete in beginning the 2nd millennium BC, and in the settlements of Bogazköy and Alacahöyük in Central Anatolia; the presence of the palace in Beycesultan, which is earlier and more contemporary than most, has a great importance in terms of understanding centralization and the socio-economic structure of the region. Beycesultan, which was known to be an important administrative centre at the beginning of the 2nd millennium BC, continued to maintain this identity for many years despite the shrinkage of its size. Particularly the structure and worship areas defined as the "small palace" found in the V. layer (II. layer in the old stratigraphy) and the spread of the settlement over a large area compared to its contemporaries in the region illustrate that it may have been preserved as a central settlement during the 2nd millennium BC (Lloyd *et al.*, 1955, p. 52, 1956, p. 104; Lloyd, 1972, p. 10). In this context, the identity and

function of the Höyük settlement is of great importance in understanding the socio-political structure of the region. The available data indicate that the Höyük is a settlement in the Menderes basin, which has the capacity to provide economic input from agricultural activities on the road route leading to Çivril-Baklan plains where Beycesultan, the largest central settlement of the region, is located. The strategic importance of the settlement point shows that the Höyük has preserved its defined identity not only during the 2nd millennium BC but until the Late Roman Period.

When we evaluate these results obtained from the Höyük settlement on a regional scale, it is seen that the mountainous and plateau areas that reach the central settlements such as Beycesultan and Kepir mound located in Çivril and Baklan plains host the settlements surrounded by walls to ensure the security of these settlements. However, it is not possible to say that the only function of these settlements is security. These settlements probably used agricultural land around them, and they continued their existence besides their military functions with activities such as animal husbandry. At this point, another result of the rich LBA data obtained from the researches carried out in Höyük settlement is that the settlements in the mountainous and plateau areas gained importance in parallel with the decline in the Upper Menderes basin immediately after the 16th century BC.

ACKNOWLEDGEMENTS

We would like to thank Fulya Dedeoğlu for sharing the data of the surface survey which she conducted in the mountainous parts of the basin. We also like to thank Muhip Çarkı, Mehmet Yurtsever for helping drawing topographical map and Ayşen Çelebi for helping us preparing the plates.

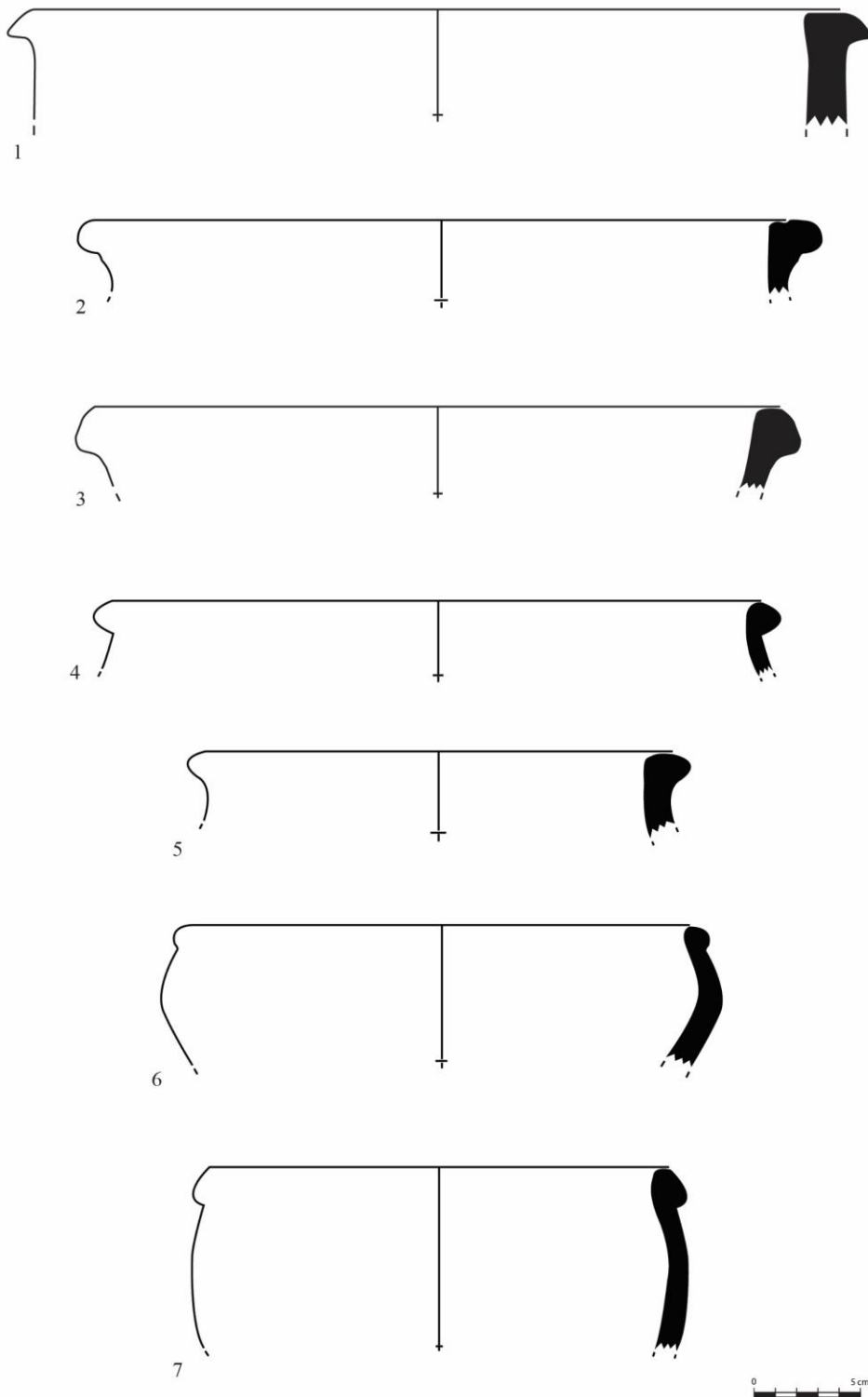


Figure 10 Höyük Settlement Middle Bronze Age Ceramic Examples

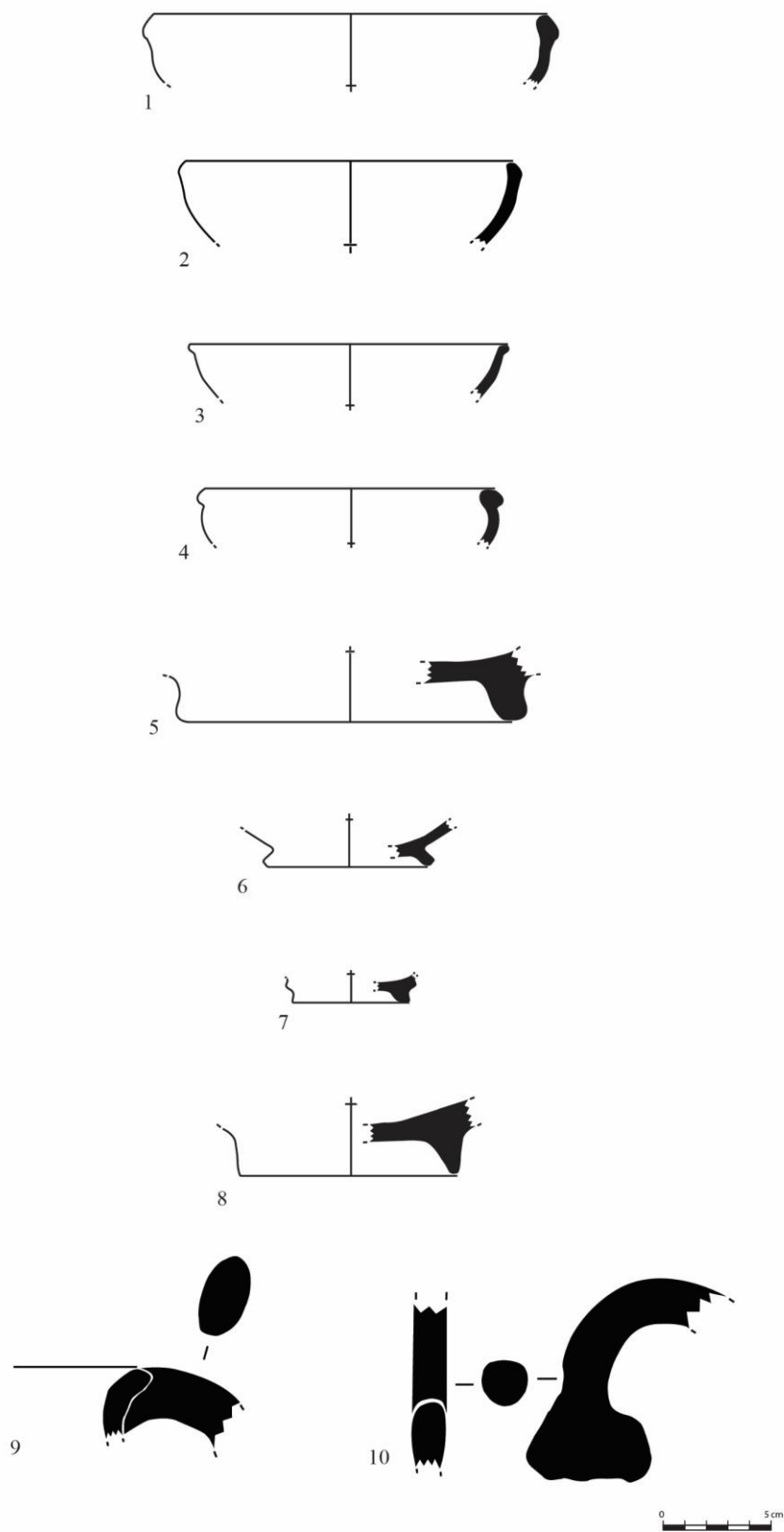
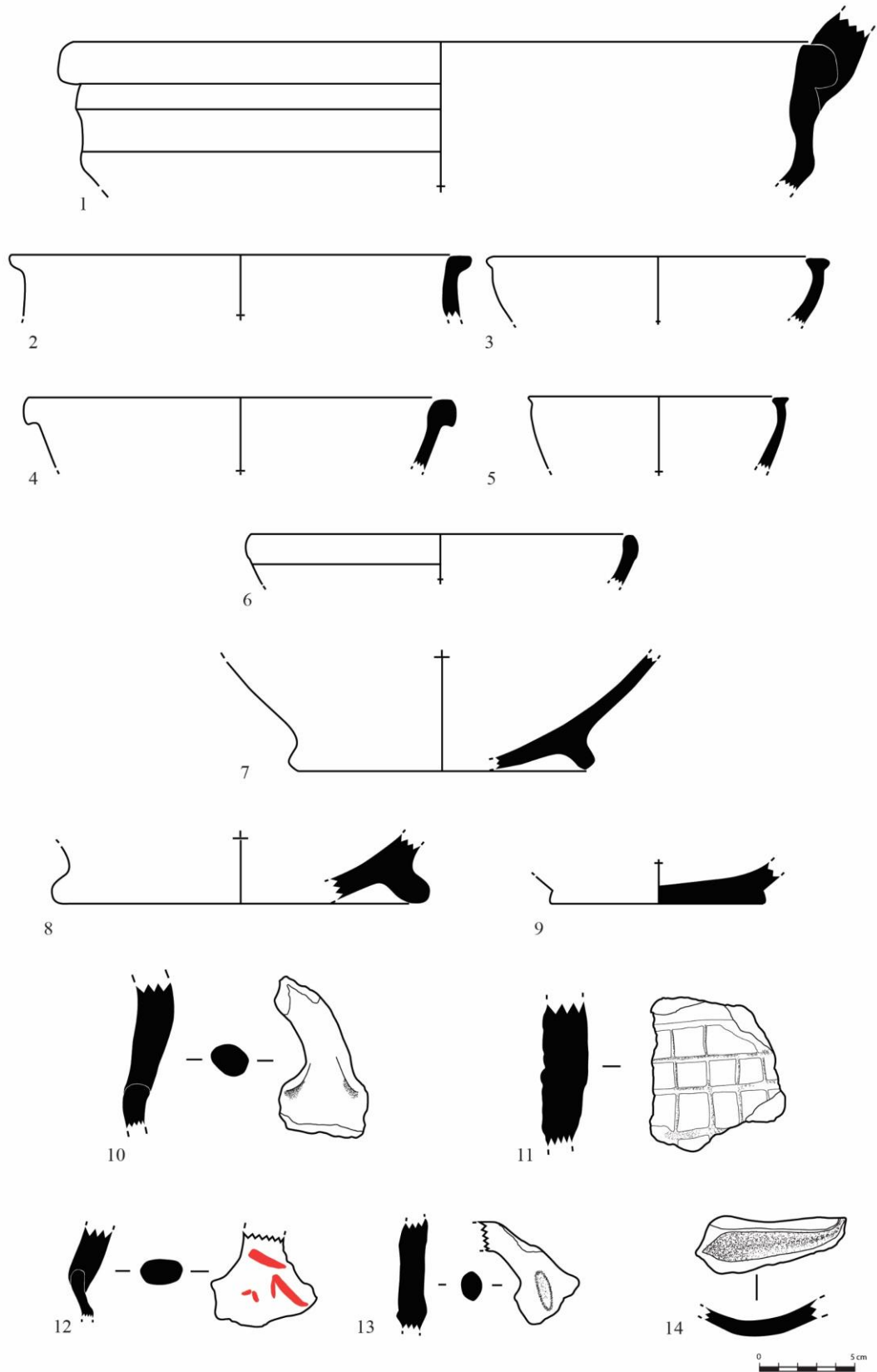


Figure 11 Höyük Settlement Late Bronze Age Ceramic Examples



CATALOG

Fig. 10: Höyük Settlement Middle Bronze Age Ceramic Examples

1- **Period:** Middle Bronze Age, **Ceramic No.** 89/SA362/34, **Clay Colour:** 2,5YR 4/4-Red Brown, **Interior Colour:** 2,5YR 4/2-Brown, **Exterior Colour:** 2,5YR 4/3-Dark Brown, **Inclusion:** Grit, Mica, Limestone, **Interior Surface:** Unburnished, **Exterior Surface:** Unburnished, **Firing:** Hard, Wheel made.

2- **Period:** Middle Bronze Age, **Ceramic No.** 89/SA363/53, **Clay Colour:** 10YR 5/4-Light Brown, **Interior Colour:** 7,5YR 6/2-Light Brown, **Exterior Colour:** 7,5YR 6/2-Light Brown, **Inclusion:** Grit, Mica, **Interior Surface:** Unburnished, **Exterior Surface:** Burnished, **Firing:** Hard, Wheel made.

3- **Period:** Middle Bronze Age, **Ceramic No.** 89/SA363/43, **Clay Colour:** 10YR 5/4- Light Brown, **Interior Colour:** 7,5YR 6/2-Light Brown, **Exterior Colour:** 7,5YR 6/2-Light Brown, **Inclusion:** Grit, **Interior Surface:** Unburnished, **Exterior Surface:** Burnished, **Firing:** Hard, Wheel made.

4- **Period:** Middle Bronze Age, **Ceramic No.** 89/SA363/50, **Clay Colour:** 10R 5/6-Red, **Interior Colour:** 5YR 5/3-Brown, **Exterior Colour:** 2,5YR 5/4-Brown, **Inclusion:** Grit, Mica, **Interior Surface:** Unburnished, **Exterior Surface:** Burnished, **Firing:** Hard, Wheel made.

5- **Period:** Middle Bronze Age, **Ceramic No.** 89/SA363/52, **Clay Colour:** 7,5YR 6/3-Light Brown, **Interior Colour:** 7,5YR 8/6-Beige, **Exterior Colour:** 7,5YR 8/6-Beige, **Inclusion:** Grit, Mica, **Interior Surface:** Unburnished, **Exterior Surface:** Burnished, **Firing:** Moderate, Wheel made.

6- **Period:** Middle Bronze Age, **Ceramic No.** 89/SA363/47, **Clay Colour:** 2,5YR 4/4-Red Brown, **Interior Colour:** 2,5YR 4/3-Dark Brown, **Exterior Colour:** 7,5YR 8/6-Beige, **Inclusion:** Grit, Mica, **Interior Surface:** Burnished, **Exterior Surface:** Burnished, **Firing:** Hard, Wheel made.

7- **Period:** Middle Bronze Age, **Ceramic No.** 89/SA363/49, **Clay Colour:** 10YR 6/4- Light Brown, **Interior Colour:** 2,5YR 5/4-Brown, **Exterior Colour:** 2,5YR 5/4-Brown, **Inclusion:** Grit, Mica, **Interior Surface:** Burnished, **Exterior Surface:** Burnished, **Firing:** Hard, Wheel made.

Fig. 11: Höyük Settlement Late Bronze Age Ceramic Examples

1- **Period:** Late Bronze Age, **Ceramic No.** 89/SA362/39, **Clay Colour:** 5YR 5/4-Brown, **Interior Colour:** 5YR 5/2-Brown, **Exterior Colour:** 5YR 5/2-Brown, **Inclusion:** Mica, **Interior Surface:** Burnished, **Exterior Surface:** Burnished, **Firing:** Hard, Wheel made

2- **Period:** Late Bronze Age, **Ceramic No.** 89/SA363/51, **Clay Colour:** 5YR 5/4-Brown, **Interior Colour:** 5YR 5/2-Brown, **Exterior Colour:** 5YR 5/2-Brown, **Inclusion:** Mica, **Interior Surface:** Burnished, **Exterior Surface:** Burnished, **Firing:** Hard, Wheel made.

3- **Period:** Late Bronze Age, **Ceramic No.** 89/SA362/36, **Clay Colour:** 7,5YR 6/4-Light Brown, **Interior Colour:** 2,5YR 5/6-Red Brown, **Exterior Colour:** 10R 5/6-Red, **Inclusion:** Mica, **Interior Surface:** Burnished, **Exterior Surface:** Burnished, **Firing:** Hard, Wheel made.

4- **Period:** Late Bronze Age, **Ceramic No.** 89/SA362/42, **Clay Colour:** 5YR 6/6- Light Brown, **Interior Colour:** 5YR 5/4-Brown, **Exterior Colour:** 5YR 5/4-Brown, **Inclusion:** Mica, **Interior Surface:** Burnished, **Exterior Surface:** Burnished, **Firing:** Very hard, Wheel made.

5- **Period:** Late Bronze Age, **Ceramic No.** 89/SA363/46, **Clay Colour:** 7,5YR 5/3-Light Brown, **Interior Colour:** 10YR 7/2-Light Brown, **Exterior Colour:** 2,5YR 5/4-Brown, **Inclusion:** Grit, **Interior Surface:** Unburnished, **Exterior Surface:** Burnished, **Firing:** Hard, Wheel made.

6- **Period:** Late Bronze Age, **Ceramic No.** 89/SA362/41, **Clay Colour:** 7,5YR 5/4-Brown, **Interior Colour:** 2,5YR 6/4-Light Brown, **Exterior Colour:** 10R 5/4-Light Brown, **Inclusion:** Grit, Mica, **Interior Surface:** Burnished, **Exterior Surface:** Burnished, **Firing:** Hard, Wheel made.

7- **Period:** Late Bronze Age, **Ceramic No.** 89/SA362/40, **Clay Colour:** 5YR 5/4-Brown, **Interior Colour:** 5YR 5/4-Brown, **Exterior Colour:** 5YR 5/4-Brown, **Inclusion:** Grit, Mica, **Interior Surface:** Unburnished, **Exterior Surface:** Unburnished, **Firing:** Moderate, Wheel made.

8- **Period:** Late Bronze Age, **Ceramic No.** 89/SA363/44, **Clay Colour:** 7,5YR 6/6-Light Brown, **Interior Colour:** 7,5YR 5/3-Light Brown, **Exterior Colour:** 7,5YR 5/3-Light Brown, **Inclusion:** Grit, Mica, **Interior Surface:** Unburnished, **Exterior Surface:** Unburnished, **Firing:** Hard, Wheel made.

9- **Period:** Late Bronze Age, **Ceramic No.** 89/SA363/48, **Clay Colour:** 7,5YR 5/4-Brown, **Interior Colour:** 2,5YR 6/4-Light Brown, **Exterior Colour:** 10R 5/4-Light Brown, **Inclusion:** Grit, Mica, **Interior Surface:** Burnished, **Exterior Surface:** Burnished, **Firing:** Hard, Wheel made.

10- **Period:** Late Bronze Age, **Ceramic No.** 89/SA363/54, **Clay Colour:** 7.5YR 5/3-Light Brown, **Interior Colour:** 10YR 7/2-Light Brown, **Exterior Colour:** 2.5YR 5/4-Brown, **Inclusion:** Grit, **Interior Surface:** Unburnished, **Exterior Surface:** Burnished, **Firing:** Hard, Wheel made.

Fig. 12: Höyük Settlement Late Bronze Age Ceramic Examples

1- **Period:** Late Bronze Age, **Ceramic No.** 89/SA363/63, **Clay Colour:** 7.5YR 5/6-Light Brown, **Interior Colour:** 7.5YR 5/6-Light Brown, **Exterior Colour:** 7.5YR 5/6-Light Brown, **Inclusion:** Noninclusion, **Interior Surface:** Burnished, **Exterior Surface:** Burnished, **Firing:** Hard, Handmade.

2- **Period:** Late Bronze Age, **Ceramic No.** 89/SA363/85, **Clay Colour:** 5YR 5/6 Light Brown, **Interior Colour:** 5YR 5/3-Brown, **Exterior Colour:** 5YR 5/3-Brown, **Inclusion:** Grit, Mica, **Interior Surface:** Burnished, **Exterior Surface:** Burnished, **Firing:** Hard, Wheel made.

3- **Period:** Late Bronze Age, **Ceramic No.** 89/SA363/58, **Clay Colour:** 7.5YR 5/4-Light Brown, **Interior Colour:** 7.5YR 5/4-Light Brown, **Exterior Colour:** 7.5YR 5/4-Light Brown, **Inclusion:** Grit, **Interior Surface:** Burnished, **Exterior Surface:** Burnished, **Firing:** Hard, Wheel made.

4- **Period:** Late Bronze Age, **Ceramic No.** 89/SA363/65, **Clay Colour:** 7.5YR 6/6-Light Brown, **Interior Colour:** 7.5YR 6/6-Light Brown, **Exterior Colour:** 7.5YR 6/6-Light Brown, **Inclusion:** Grit, **Interior Surface:** Non-slipped, **Exterior Surface:** Non-slipped, **Firing:** Moderate, Wheel made.

5- **Period:** Late Bronze Age, **Ceramic No.** 89/SA363/55, **Clay Colour:** 10YR 5/4-Light Brown, **Interior Colour:** 10YR 5/4-Light Brown, **Exterior Colour:** 10YR 5/4-Light Brown, **Inclusion:** Grit, Chaff, **Interior Surface:** Burnished, **Exterior Surface:** Burnished, **Firing:** Hard, Wheel made.

6- **Period:** Late Bronze Age, **Ceramic No.** 89/SA363/68, **Clay Colour:** 5YR 6/6- Light Brown, **Interior Colour:** 5YR 6/6-Light Brown, **Exterior Colour:** 5YR 6/6-Light Brown, **Inclusion:** Grit, **Interior Surface:** Unburnished, **Exterior Surface:** Burnished, **Firing:** Hard, Wheel made.

7- **Period:** Late Bronze Age, **Ceramic No.** 89/SA363/74, **Clay Colour:** 5YR 4/3-Brown, **Interior Colour:** 5YR 6/4- Buff, **Exterior Colour:** 5YR 5/6-Brown, **Inclusion:** Grit, Mica, **Interior Surface:** Unburnished, **Exterior Surface:** Burnished, **Firing:** Hard, Wheel made.

8- **Period:** Late Bronze Age, **Ceramic No.** 89/SA363/83, **Clay Colour:** 7.5YR 7/6- Light Brown, **Interior Colour:** 5YR 5/3-Brown, **Exterior Colour:** 5YR 5/3-Brown, **Inclusion:** Grit, **Interior Surface:** Burnished, **Exterior Surface:** Burnished, **Firing:** Hard, Wheel made.

9- **Period:** Late Bronze Age, **Ceramic No.** 89/SA363/84, **Clay Colour:** 2.5YR 5/6-Red Brown, **Interior Colour:** 2.5YR 6/6-Orange, **Exterior Colour:** 7.5YR 7/2- Light Brown, **Inclusion:** Grit, Mica, **Interior Surface:** Unburnished, **Exterior Surface:** Unburnished, **Firing:** Moderate, Wheel made.

10- **Period:** Late Bronze Age, **Ceramic No.** 89/SA363/57, **Clay Colour:** 2.5YR 3/6-Red Brown, **Interior Colour:** 2.5YR 4/3-Dark Brown, **Exterior Colour:** 2.5YR 6/4-Light Brown, **Inclusion:** Grit, Limestone, **Interior Surface:** Unburnished, **Exterior Surface:** Unburnished, **Firing:** Moderate, Wheel made.

11- **Period:** Late Bronze Age, **Ceramic No.** 89/SA363/59, **Clay Colour:** 5YR 5/6-Light Brown, **Interior Colour:** 5YR 5/6-Light Brown, **Exterior Colour:** 5YR 5/6-Light Brown, **Inclusion:** Grit, **Interior Surface:** Unburnished, **Exterior Surface:** Unburnished, **Decoration:** Kabara Decoration, **Firing:** Moderate, Wheel made.

12- **Period:** Late Bronze Age, **Ceramic No.** 89/SA363/61, **Clay Colour:** 7.5YR 5/6-Light Brown, **Interior Colour:** 10YR 8/3- Buff, **Exterior Colour:** 10YR 8/3- Buff, **Inclusion:** Non-inclusion, **Interior Surface:** Burnished, **Exterior Surface:** Burnished, **Decoration:** Painted Decoration, **Firing:** Hard, Wheel made.

13- **Period:** Late Bronze Age, **Ceramic No.** 89/SA363/78, **Clay Colour:** 2.5YR 3/6-Red Brown, **Interior Colour:** 2.5YR 4/3-Dark Brown, **Exterior Colour:** 2.5YR 6/4-Light Brown, **Inclusion:** Grit, Limestone, **Interior Surface:** Unburnished, **Exterior Surface:** Unburnished, **Firing:** Moderate, Wheel made.

14- **Period:** Late Bronze Age, **Ceramic No.** 89/SA363/71, **Clay Colour:** 2.5Y 6/3-Light Brown, **Interior Colour:** 2.5Y 6/3-Light Brown, **Exterior Colour:** 10YR 6/3-Light Brown **Inclusion:** Mica, Grit, **Interior Surface:** Unburnished, **Exterior Surface:** Burnished, **Firing:** Hard, Handmade.

REFERENCES

- Abay, E. (2011) Preliminary Report on the Survey Project of Çivril, Baklan and Çal Plains in the Upper Meander Basin, Southwest Anatolia, *Ancient Near Eastern Studies*, Vol. 48, pp. 1-87. doi: 10.2143/ANES.48.0.2119587.
- Aykurt, A. (2004) *Kocabas Tepe Orta Tunç Çağı seramik örneklerinin Ege arkeolojisindeki yeri ve önemi*. Hacettepe Üniversitesi.
- Bayne, N. (2000) *The grey wares of north-west Anatolia: In the middle and late Bronze Age and the early Iron Age*

- and their relation to the early Greek settlements. Bonn, Rudolf Habelt Verlag (Asia Minor Studien 37).
- Bilgen, N. A. (2005) *Çavlum: Eskisehir Alpu Ovası'nda Bir Orta Tunç Çağı Mezarlığı*. Eskişehir, Anadolu Üniversitesi Edebiyat Fakültesi Yayınları.
- Bilgen, N. A. (2014) Seyitömer Höyük Kazısı, Ünan, S. (ed.) *Kütahya Müzesi 2013 Yıllığı*. Kütahya, Kütahya Valiliği, pp. 196-202.
- Bilgen, N. A. and Bilgen, Z. (2015) Orta Tunç Çağ Yerleşimi, Bilgen, N. A. (ed.) *Seyitömer Höyük I*. İstanbul, Arkeoloji ve Sanat Yayınları, pp. 61-118.
- Blegen, C. W., Boulter, C. G., Caskey, J. L. and Rawson, M. (1958) *Troy Settlements VIIa, VIIb and VIII*. New Mexico, Princeton University Press.
- Blegen, C. W., Caskey, J. L. and Rawson, M. (1953) *Troy III: The Sixth Settlement*. London, Princeton University Press.
- Bratitsi, M., Liritzis, I., Vafiadou, A., Xanthopoulou, V., Palamara, E., Iliopoulos, I., Zacharias, I. (2018) *Mediterranean Archaeology and Archaeometry*, Vol. 18, No. 2, pp. 175-212. doi: 10.5281/zenodo.129163.
- Ceylan, M. A. (1998) *Baklan-Çivril Havzası ve Yakın Çevresinin Hidrojeomorfolojik Etüdü*. Marmara Üniversitesi.
- Christopher H. Roosevelt, Christina Luke, Sinan Ünlüsoy, Canan Çakırlar, John M. Marston, Caitlin R. O'Grady, Peter Pavúk, Magda Pieniżek, Jana Mokriřov, Catherine B. Scott, Nami Shin and Francesca G. Slim (2018) Exploring Space, Economy, and Interregional Interaction at a Second-Millennium B.C.E. Citadel in Central Western Anatolia: 2014-2017 Research at Kaymakçı, *American Journal of Archaeology*, Vol. 122, No. 4, p. 645. doi: 10.3764/aja.122.4.0645.
- Dedeođlu, F. (2009) Denizli-Çivril İlçesi Yüzey Arařtırması Verileri Iřığında M.Ö. 2. Binyılda Yukarı Menderes Havzası Yerleşim Düzeni, Sađlantımur, H. and Abay, E. (eds) *Altan Çilingirođlu'na Armađan, Yukarı Denizin Kıyısında Urartu Krallığı'na Adanmıř Bir Hayat*. İstanbul, Arkeoloji ve Sanat Yayınları, pp. 219-234.
- Dedeođlu, F. and Abay, E. (2014) Beycesultan Höyük Excavation Project: New Archaeological Evidence from Late Bronze Layers, *Arkeoloji Dergisi*. M. N. Ayaçlar et al. (Eds). İzmir, Ege Üniversitesi Edebiyat Fakültesi Yayınları, Vol. 19, pp. 1-39.
- Dedeođlu, F., Konakçı, E. and Çarkı, M. (2014) Yukarı Menderes Havzası Dađlık Kesim Yüzey Arařtırması Projesi 2012 Yılı Çalıřmaları, Özme, A. (ed.) *31. Arařtırma Sonuçları Toplantısı*. Muđla, Kltr ve Turizm Bakanlıđı, pp. 367-376.
- Dedeođlu, F., Konakçı, E. and Ozan, A. (2015) Yukarı Menderes Havzası Dađlık Kesim Yüzey Arařtırması Projesi 2013 Yılı Çalıřmaları, Özme, A. (ed.) *32. Arařtırma Sonuçları Toplantısı*. Ankara, Kltr ve Turizm Bakanlıđı, pp. 151-160.
- Dedeođlu, F., Ozan, A. and Konakçı, E. (2016) Yukarı Menderes Havzası Dađlık Kesim Yüzey Arařtırması Projesi 2014 Yılı Çalıřmaları, Keskin, C. (ed.) *33. Arařtırma Sonuçları Toplantısı*. Ankara, Kltr ve Turizm Bakanlıđı, pp. 553-562.
- Dupr, S. (1983) *Porsuk I La Ceramique de L'age du Bronze et de L'age du Fer*. Paris, Editions Recherche sur les Civilisations.
- Easton, D. F. and Weninger, B. (1993) Troia VI Lower Town - Quadrats I8 and K8: A Test Case for Dating by Pottery Seriation, Korfmann, M. (ed.) *Studia Troica 3*. Mainz, Philipp von Zabern, pp. 45-96.
- Gnel, S. (1999a) *Panaztepe 2: M.Ö. 2. Bine Tarihlendirilen Panaztepe Seramiđinin Batı Anadolu ve Ege Arkeolojisindeki Yeri ve Önemi*. Ankara, Türk Tarih Kurumu.
- Gnel, S. (1999b) Vorbericht ber die mittel- und sptbronzezeitliche Keramik vom Liman Tepe, *Istanbul Mitteilungen*, No. 49, pp. 41-82.
- Gnel, S. (2006) Çine-Tepecik Höyüđü 2004 Yılı Kazıları, Olřen, K., Dnmez, H., and Özme, A. (eds) *27. Kazı Sonuçları Toplantısı*. Ankara, Kltr ve Turizm Bakanlıđı, pp. 19-28.
- Gunter, A. C. (1991) *Gordion Excavations Final Reports III: The Bronze Age*. E. L. Kohler (Ed.). Pennsylvania, University of Pennsylvania Museum of Archaeology and Anthropology.
- Joukowsky, M. S. (1986) *Prehistoric Aphrodisias I: Excavations and Studies*. Court-Saint-tienne (Archaeologia Transatlantica III).
- Kan, H. (2005) *Anaia-Kadıkalesi M.Ö.2. Binyıl Seramikleri*. Ege Üniversitesi.
- Konakçı, E. (2012) *Büyük ve Küçük Menderes Havzalarındaki MÖ 2. Binyıl Kltrlerinin Yeni Veriler Iřığında Deđerlendirilmesi*. Ege Üniversitesi.
- Konakçı, E. (2014a) Laodikeia'nun ilk Yerleşimi Asopos Tepesi, řimřek, C. (ed.) *10. Yılda Laodikeia (2003-2013 Yılları)*. İstanbul, Ege Yayınları, pp. 87-122.
- Konakçı, E. (2014b) Laodikeia Asopos Tepesi Orta Tunç Çağı Seramiđi, Dnmez, H. (ed.) *29. Arkeometri*

- Sonuçları Toplantısı*. Muğla, Kültür ve Turizm Bakanlığı, pp. 63–76.
- Konakçı, E. (2015) Ayasuluk Tepesi Orta Tunç Çağı Seramiği Üzerine Bir Değerlendirme, Şimşek, C., Duman, B., and Konakçı, E. (eds) *Mustafa Büyükkolancı'ya Armağan*. İstanbul, Ege Yayınları, pp. 381–405.
- Konakçı, E. (2016) Geç Tunç Çağı'nda Ayasuluk Tepesi, *Pamukkale Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*. M. Arslan, Ö. Özpençe, and Y. Beyazıt (Eds), Vol. 25, No. Ek 1, pp. 135–165. doi: 10.5505/pausbed.2016.18199.
- Kull, B. (1988) *Demircihüyük V: Die mittelbronzezeitliche Siedlung*. Mainz.
- Lamb, W. (1937) Excavations at Kusura near Afyon Karahisar, *Archaeologia*, Vol. 86, pp. 1–64. doi: <https://doi.org/10.1017/S0261340900015332>.
- Lamb, W. (1938) Excavations at Kusura near Afyon Karahisar: II, *Archaeologia*, Vol. 87, pp. 217–273. doi: <https://doi.org/10.1017/S0261340900010547>.
- Liritzis, I., Laskaris, N., Vafiadou, A., Karapanagiotis, I., Volonakis, P., Papageorgopoulou, C., Bratitsi, M., (2020) Archaeometry: An Overview, *Scientific Culture*, Vol. 6, No. 1, pp. 49–98. doi: 10.5281/zenodo.3625220.
- Liritzis, I., (2005), Ulucak (Smyrna, Turkey) Chemical Analyses of Ceramics and Soils and and Obsidian Hydration Dating, *Mediterranean Archaeology and Archaeometry*, Vol 5, No 3 , pp. 33-45.
- Lloyd, S. (1972) Beycesultan Vol. III, Part I: Late Bronze Age Architecture. Londra, British Institute at Ankara.
- Lloyd, S. and Mellaart, J. (1955) Beycesultan Excavations: First Preliminary Report, *Anatolian Studies*. British Institute at Ankara, Vol. 5, pp. 39–92. doi: 10.2307/3642324.
- Lloyd, S. and Mellaart, J. (1956) Beycesultan Excavations Second Preliminary Report, 1955., *Anatolian Studies*. British Institute at Ankara, Vol. 6, pp. 101–135. doi: 10.2307/3642405.
- Lloyd, S. and Mellaart, J. (1965) *Beycesultan Vol. II: Middle Bronze Age Architecture and Pottery*. Londra, British Institute at Ankara.
- Mellaart, J. (1954) Preliminary Report on a Survey of Pre-classical Remains in Southern Turkey, *Anatolian Studies*. British Institute at Ankara, Vol. 4, pp. 175–240. doi: 10.2307/3642379.
- Mellaart, J. and Murray, A. (1995) *Beycesultan Vol. III, Part II: Late Bronze Age and Phrygian Pottery and Middle and Late Bronze Age Small Objects*. Londra, British Institute of Archaeology at Ankara.
- Meriç, R. (2003) Excavations at Bademgediği Tepe (Puranda) 1999-2002 A Preliminary Report, *Istanbulur Mitteilungen*, No. 53, pp. 79–98.
- Orthmann, W. (1963) *Fruhe Keramik von Bogazköy: aus den Ausgrabungen am Nordwesthang von Büyükkale*. Berlin, Verlag Gebr. Mann.
- Raymond, A. E. (2005) *Miletus in the Middle Bronze Age and Minoan Presence in the Eastern Aegean*. University of Toronto.
- Semiz, B. (2017) Characteristics of clay-rich raw materials for ceramic applications in Denizli region (Western Anatolia), *Applied Clay Science*. Elsevier Ltd, Vol. 137, pp. 83–93. doi: 10.1016/j.clay.2016.12.014.
- Semiz, B., Abay, E., Dedeoğlu, F., Konakçı, E. and Ozan, A. (2018) An Archaeometric Investigation of Early and Middle Bronze Age Pottery from the Upper Meander Basin in Southwestern Anatolia, *Mediterranean Archaeology and Archaeometry*, Vol. 18, No. 3, pp. 121–150. doi: 10.5281/zenodo.1461625.
- Umurtak, G. (2003) A study of a group of pottery finds from the MBA deposits at Bademağacı Höyük, *Anatolia Antiqua*, Vol. 11, No. 1, pp. 53–74. doi: 10.3406/anata.2003.994.