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Table of Contents

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Revisiting the Archaeological Stratigraphy of Hotu Cave, Iran: Preliminary Report of the 2021 Excavation

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Abstract

The Mesolithic period and its transition to the Neolithic period in Western Asia is one of the most important stages of human cultural evolution during which. humans gradually changed their way of life and cultural behavior. After millennia of living as mobile hunter-gatherers, these changes in human lifestyle were so significant that some scientists consider them to have triggered the Anthropocene (Smith and Zeder, 2013). Therefore, the study of the Mesolithic hunter-gatherer way of life and its transformation into a Neolithic society is crucial for investigating the first steps and possible triggers of this fundamental change. A small number of important archaeological sites in the southeastern edge of the Caspian Sea coast provide rich sequences of hunter-gatherers dating from about 15,000 to 10,000 years ago with abundant cultural materials. One of those, Hotu Cave located nearby the modern Iranian city Behshahr, was firstly described by the American anthropologist Carlton Coon in 1949 and then excavated by him in 1951. Due to various reasons, a proper report on this cave was never presented. Our new activities at the site after 70 years aim to establish a secure chronology from the Mesolithic to the Parthian period and to link obvious gaps in the cave sequence to climatic and environmental changes during the Late Pleistocene and Holocene. The new excavation at Hotu Cave is not only useful to contextualize the data from the Coon excavations, but has also helped us to generate additional data to propose a regional chronology from the Mesolithic onwards. In this paper we present not only the current data on the chronology of the cave, but also all the chronological schemes attempted by scholars, which we have brought together. Our project not only includes activities in Hotu Cave, but also carried out excavations in 2022 and 2023 at the two other key sites of the relevant Mesolithic-Neolithic transitional horizon, Kamarband Cave and Komishani Tappe, which lies in front of Komishani Cave. The material culture from the recent excavations is very important in proposing a new model of the transition from the Mesolithic to the Neolithic for the Iranian highlands that goes beyond the Zagros region, which – until now – has been considered an independent core region of early domestication and Neolithization.

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1. Introduction

The environmental and cultural importance of northeastern Iran lies in the connection of the Eurasian region with southwestern Asia. These factors may have played a key role in the movement of early farmers into South Asia and Central Asia during the Neolithic (Nishiaki et al, 2022; Taylor et al, 2021; Pollock et al, 2019; Matthews and Fazeli Nashli, 2022). The northern slopes of the Alborz Mountains and the southeastern coast of the Caspian Sea, with their high biological potential and ecotone, provided a rich habitat with abundant resources for the last hunter-gatherer communities due to their lush vegetation patterns.

It is important to mention that due to the dense vegetation in the southeastern region of the Caspian Sea, archaeological sites are much more difficult to find. However, the Mesolithic cultural features in the explored cave sites such as Al-Tepe (Ali Tepe), Hotu, Kamarband (or Coon's "Belt Cave") and Komishani have more remarkable data than other parts of Iran, such as the Zagros region (Coon, 1957; McBurney, 1968; Vahdati Nasab *et al.,* 2011; Jayez *et al.,* 2024). Some of these sites were excavated in the 1950s, others were identified and excavated through urban activities, and some of them were purposefully excavated (Jayez, 2011; Hashemi and Vahdati Nasab, 2014; Jayez and Vahdati Nasab, 2016). However, the reality is that excavations during these earliest times of "modern" archaeology cannot provide us further insights on economic subsistence, social and human-environmental dynamics or other aspects of life in the transitional phase between hunter-gatherer (Mesolithic) and food-producing communities (Neolithic).

During his excavation of Kamarband Cave in 1949, Carleton Coon also identified Hotu Cave and excavated it in 1951 with funding from the University of Pennsylvania (Coon, 1957). When Coon began excavating Hotu Cave, he was still in the early stages of his archaeological career. Despite his extensive efforts to record and describe the finds, he was unable to apply interdisciplinary sciences such as archaeobotany and geoarchaeology.

With the first re-examination of Coon's explorations, became clear that also his radiocarbon dating showed a significant difference of almost 2,000 years (McAuley, 2013). Actually, all those insufficient circumstances were realized by Carleton Coon himself. He consciously mentioned in his book "The Seven Caves" in 1957 that the final report of Hotu Cave had not yet been written and he is not sure whether it will ever be written in the future. He also remarked that although a sufficient number of layers from the Neolithic to the Iron Age had been excavated to provide good cultural remains for study by experts, the underlying layers were not adequately sampled for analysis. Coon explains, "someone should come back and dig up the rest of these deposits; for I have worked this part by trial and error and left the rest to others to analyse". (Coon, 1957: 201). Therefore, 70 years later in spring and summer 2021, Coon's excavations in Hotu Cave were resumed and carried out by an Iranian team led by Hassan Fazeli Nashli. The 10 m deep, rich archaeological layers of Hotu Cave cover the Mesolithic, the Early (or Non-Ceramic) Neolithic, the Late (or Ceramic) Neolithic, the Chalcolithic, the Iron Age and the Parthian era. Due to the wealth of information, this article is limited to the Mesolithic and Neolithic finds and focuses on a review of Coon's excavation and chronology, supported by our freshly obtained C14 dating results on samples from the 2021 re-excavation. We hope to cover other settlement culture strata in the cave in future articles.

2. Location of Hotu Cave

Hotu Cave (N 36041’17.88, E53029’47.63) is one of the most famous caves in the Iranian plateau and contains layers from the Mesolithic to the historical period. The cave has a protected interior area of about 142 square meters and is located about 8 km west of the city of Behshahr in a limestone formation 38.28 meters above sea level. The coast of the Caspian Sea is 13 km away (Figs. 1 & 2). Today the site is located within the boundaries of the village of Shahid Abad (formerly Trojen).The Jurassic limestone contains rich marine fossils of ammonites of the genus Periapices, dating back 150 and 65 million years. In the course of the Hotu excavations in 2021, a total of seven fossils were found in the Mesolithic layers (Fig. 3).

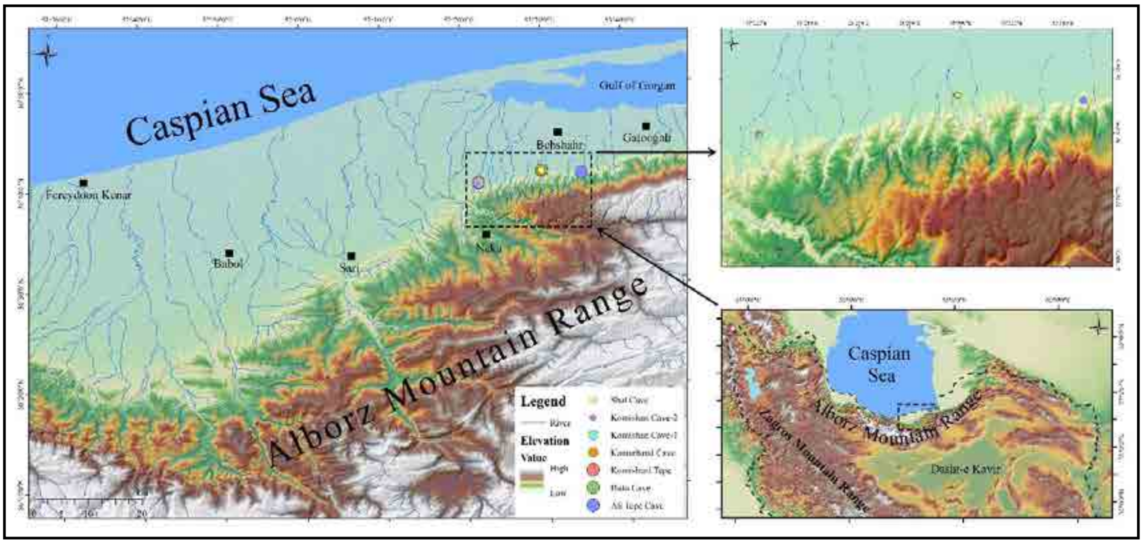


Fig. 1: The location of Hotu and Kamarband caves in the today’s Iranian Mazandaran Province

Fig. 2 left: Hotu and Kamarband caves; right: entrance of the Hotu cave in 2021

3.Carleton Coon’s Excavation in Hotu Cave

On October 21, 1949, during the ongoing excavation of Kamarband Cave, workers brought Carleton Coon to “Rustem Qala`a Cave”, located behind a village of the same name. Although, the cave entrance had been destroyed by a dynamite explosion, Coon classified “Rostam Kolah Cave” as contemporary with Kamarband Cave on the basis of its surface finds (pottery and stone tools). However, he refrained from excavating this cave

Fig. 3: Fossils obtained from the re-excavation of Hotu Cave

as it was difficult to access. Coon writes in his book "The Seven Caves" about the Hotu Cave: that this cave was buried underground for a long time (Coon, 1957: 231). On his way back from "Kollareh Cave", two of his workers named Parviz and Morad informed him about the existence of "Hotu Cave" (Coon, 1957: 162). The entrance to the cave was completely buried by sediment deposits but blasting for stone extraction had created a hole in front of the cave. On his first visit inside the cave, he encountered a layer of bat guano, which made him realize that this space had been inactive for a long time. During his examination, he found the main entrance, which was filled with soil and gravel. The workers named this cave "Hotu" or "Otu", which means either flatiron because a stone in it looked like a flatiron (in Persian).

In February 1951, Coon returned to Behshahr for the second time. This season he was accompanied by Louis Dupree and his wife (Coon, 1957: 164). He began clearing the cave entrance, which had been blocked by mining operations, and excavated a large amount of soil from the backfilled entrance, which had been sedimented and filled for some time. By this time, excavations had been completed in two trenches, B and C, in the front part of Kamarband Cave (Coon, 1957: 231). From March 14 to April 21, the excavations in Hotu lasted five weeks. The first trench, Trench A, measuring 3 x 5 square meters and 12.50 meters deep, was excavated for stratigraphy (Fig. 4), with the first seven meters consisting of soft soil with sands underneath, which according to Coon resembled Pleistocene soil. The cave was probably abandoned for several thousand years. A thick layer of 20 to 30 centimeters of bat guano and mud covered the cave surface. Underneath was about 80 centimeters of clay mud with cultural finds such as animal bones and pottery from the Iron Age. A continuous series of ash, charcoal, and stones in various colors continued down to a depth of 1.60 meters, where the third significant soil change and a second set of silt deposits were found, consisting of darker and brighter layers in lower depths.

Coon describes the Mesolithic and Neolithic periods as follows: At a depth of 4.80 or 4.60 meters the fourth major soil change was found, beneath which a single layer of soil continued to the surface of stones laid on top of the sands deposited below. These large limestone slabs may have fallen from the ceiling due to wet weather or earthquakes. These slabs were laid on top of the sand. Below the slabs, Trench A was merged into the smaller excavation area Trench D. A number of painted pottery sherds and accurately chipped stone bladelets were found in this section, leading him to believe that he had reached the Neolithic layer. He writes that the Neolithic period of this site is different and comparable to the pottery found in the Turkmenistan region reported by Raphael Pumpelly, similar to that found in the Iranian plateau (Coon, 1957: 185).

Coon emphasized that no metal objects were found in these layers, while bone and stone objects were predominant. The bone findings suggest that domestic animals coexisted in Neolithic contexts, with rarer findings of cattle bones as the depth of the excavation increased, with only domesticated sheep and goat bones found in lower (= older) layers. Coon mentions a plausible idea at this point: When they left Hotu, some of them may have gone to the plateau, bearing their painted pottery to Sialk.

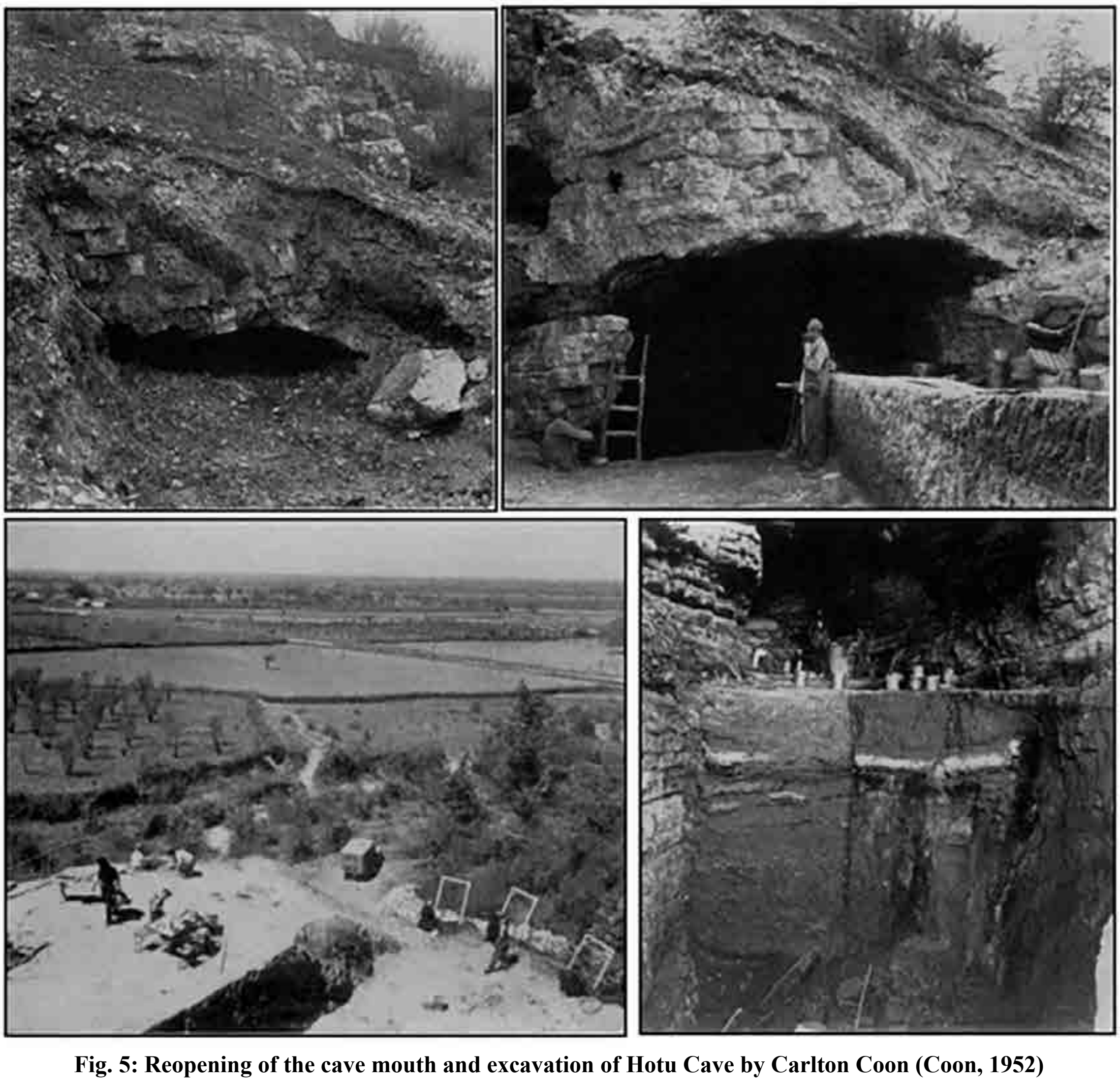


Fig. 5: Reopening of the cave mouth and excavation of Hotu Cave by Carlton Coon (Coon, 1952)

At a depth of 5 meters, the end of this horizon was reached. The sediments consisted of loose, high-clay content soil of brownish color, with finds of polished ground stones, chisels and flint blades with sickle sheen. The associated soft and unpainted pottery Coon compares to ceramic sherds found in Kamarband Cave. When reaching the very bottom of the Neolithic layers, a completely different type of sediment appeared, which was heavy, moist and loamy gray-colored. No pottery was found in this layer, but there were plenty of stone tools similar to the above-mentioned. Some flint flakes reached a depth of 50.8 centimeters (upper layer, Neolithic context). Very noteworthy are the finds of two human long bones and large stone slabs that spread throughout the entire space of Trench A. The latter are seen by Coon as most likely fallen from the ceiling and walls of the cave during the latest Neolithic occupation in Hotu (Coon, 1952: 242-243; Coon, 1957: 186), describing an ancient cataclysm, possibly an earthquake.

Beneath the stone slabs was a layer of sandy and very soft soil, which made it difficult to continue the excavation. Due to a lack of oxygen and light, the excavation was interrupted for a while and trench B was opened. This trench comprised from the edge of the ceiling to the beginning of Trench A with a length of seven meters. When the excavation of Trench B was finished, Coon started Trench C five meters further into the open space to facilitate the excavation and to get light into the cave (Coon, 1957: 188). When a depth of 7.15 m was reached, two flint cores were found that Coon originally identified as Paleolithic tools - actually a cleaver and the other a hand axe (Coon, 1957: 196), which encouraged him to excavate Trench D to a depth of 7.6 meters (Fig. 6).

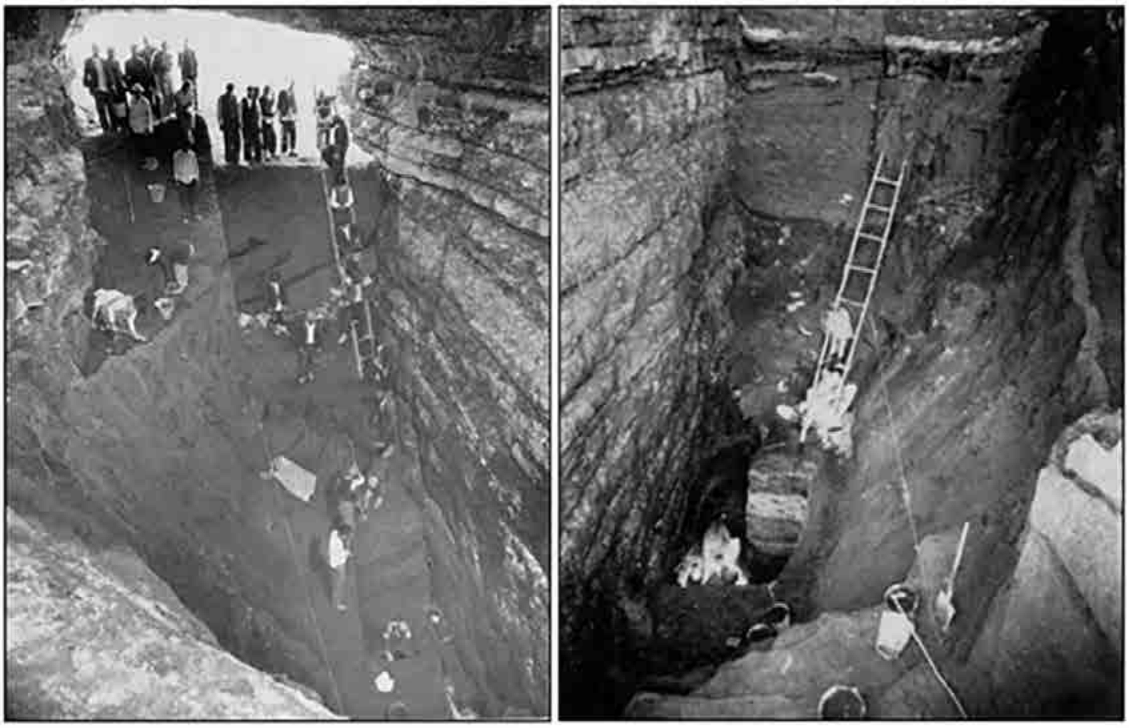


Fig. 6: View of Trench D in Hotu Cave (Coon, 1952; Coon, 1957)

4. Trench D

Major features and horizons excavated in Trench D can be summarized as follows: at a depth of 2.40 meters, four layers of black gravel and three layers of sandy soil (Layers 1-4 and 5-7). the uppermost layers can be assigned to younger activities in the cave, including a first neolithic occupation (layer 3). Significantly, layer 4 consisted of collapsed rock bed splintered into stone slabs of different sizes that possibly have fallen from the cave ceiling similar to Trench A and thus separates the Neolithic from the earlier Mesolithic occupation. The stones scattered around one square foot and up to 20-30 cm height. Two of those stones appear to be responsible for the deaths of two individuals, identified by skeletons no. 2 and 3 (Coon, 1952: 232-233). Apart from these unfortunates, deliberately buried human remains were found on the sixteenth day of the excavation. The first burial, known as Hotu Skeleton 1, was discovered in the second gravel layer 4. Seven centimeters below this burial, two additional skeletons of possible females were found. All individuals did not have any objects with them, but the layer fill contained several lithic tools. As similar items were found in the upper zone of gravel layer 4, Coon became aware of the presence of Neanderthals in Hotu which actually was also the first identification of Neanderthals in Iran at that time (Coon, 1957: 201-206). Though, immediately after the results of the radiocarbon dating, which fall around 7240 cal BCE, he corrected this view. As Coon and his collaborators were about to uncover the burials in the upper half of Trench D, Louis Dupree, apparently due to the large amount of cultural deposits that exceeded their expectations combined with budget constraints and extreme excavator fatigue, quickly excavated Trench D to the virgin soil at a depth of 3.13 meters measured from the then modern floor of the cave. Consequently, Coon was unable to publish any finds from Trench D other than the human burials. Until now, little information was available from the Mesolithic and Neolithic periods of Hotu Cave (Coon, 1957: 202-205).

5. Animal bones and paleoenvironment

Coon divided the total of 1,000 animal bones found in Hotu Cave into three sections for research: He examined the bones of goats, sheep, deer, pigs, and seals himself. Fred Ulmer, a zoologist from Philadelphia, worked on the bones of wild cattle and herbivores, and Dr. Fraser from the British Museum studied the bones of rodents, bats, shrews, foxes, and other small mammals, of which 245 were published. With these findings, and based on ecological evidence, Coon attempted to reconstruct the climatic layers of various cultural and natural deposits in Trench D of Hotu and described them as follows. The gravel-infilled sequence below the sandy layers 1-2 indicate a rather non-forested environment, since no seals or rodents were found in this layer A drier climatic phase lay between two humid phases. He also interpreted the abundance of gazelle bones found in secondary layer of sand as a desert or steppe animal so as evidence for increasing drier climatic conditions. In contrast to this, the abundance of limestone chips in gravel layers 3 and 4 indicated relatively wet climatic conditions. The ox, red deer, and pig are forest animals. The sheep is a mountain animal.

Animal bones of gazelle and sheep were found in the succeeding red sand layers 2 and 3, but no evidence of ox, deer or pig. Three seal bones indicate that the Caspian Sea was not far from the cave during that period. In addition, a fauna adapted to cold and dry areas were also found in layer 3. This picture could indicate living conditions when the glaciers of the North Pole were melting, the waters of the Caspian Sea were rising, and the southern coast plain was experiencing an antiperiodic oscillation. Coon believes that the people living in Hotu focused more on gathering hunting animals and raiding bird nests than on hunting. The food sources suggest that these early inhabitants lived primarily on dry land, which enabled them to hunt a variety of prey. In contrast, the later occupants, who resided in the cultural layers of sandstone above, were mountain and forest hunters. They concentrated on hunting wild oxen, red deer, and sheep.

6. Paleo-geography of the site

Hotu Cave is located at the foot of the northern slope of the Alborz Mountains, in the transitional zone between the forested hillsides and the coastal plain at the southeast of the Caspian Sea. It is one of seven caves in the so-called cave belt, which are only a few kilometers away from each other and where, due to geological conditions, karstification has created the caves that were used for settlement in prehistoric and historical times. The climate in the region is characterized as subtropical with dry summers. Due to the Alborz mountain range, which rises up to 5,609 m a.s.l., moist air masses are precipitated on the northern slopes of the Alborz Mountains, leading to numerous continuous surface runoff patterns, and the resulting lush vegetation reflects the climatic conditions. These natural conditions provided optimal conditions for agricultural use and settlement of the surrounding area in historical times, particularly in the Hotu Cave and the wider cave belt region.

The following section discusses various relevant environmental factors and their changes, as well as their potential immediate impacts on the region or on the catchment areas of rivers and settlement zones. Previous natural changes may have led to significant landscape transformations, which can offer insights into possible human-environment dynamics and interactions, as well as potential explanations for breaks in settlement chronology. Specifically, this can address the research hypothesis of whether natural environmental changes may have interrupted the process of Neolithization that was underway in this region around 8,500–8,300 cal. BC. Three relevant natural aspects, namely tectonic activity, sea-level fluctuations, and paleo-climatic conditions, will be highlighted.

First, tectonic activity is important, both in the present day and historically in the study area. As shown on the map, significant seismic and tectonic processes can be observed throughout the Alborz Mountains (Fig. 7). The uplift rates are approximately 4–6 mm per year. Evidence of this tectonically induced uplift is the Khazar Fault north of the Alborz, which exhibits land steps of 40 to 70 meters (Fig. 8).

These tectonic processes, both short-term and continuous, also changed the characteristics of the settlement area's catchment basin in historical times. Tectonic activities in the form of short-term processes, such as earthquakes, mass movements, or tsunamis, could cause not only the immediate destruction of settlements but also alter the morphology and morphological processes. Primarily, through continuous tectonic activity, the local erosion base and the erosion and accumulation processes of the river systems were altered. A lower sea level led to increased erosion in the inflow areas and the formation of terraces, while a higher sea level led to accumulation in these areas. These morphological processes, in turn, caused changes in the settlement areas, for example, an intensified deposition of fluvial or gravitational sediments, which could potentially cover settlements. Additionally, tectonic activities, especially displacements, also impact the river systems, as schematically depicted in Fig. 9. Such geodynamic processes can result in altered erosion and accumulation conditions, which over time could influence the discharge system of a river, causing rivers to lose their water-carrying properties or undergo complete restructuring. In this case as well, intensified erosion of material and

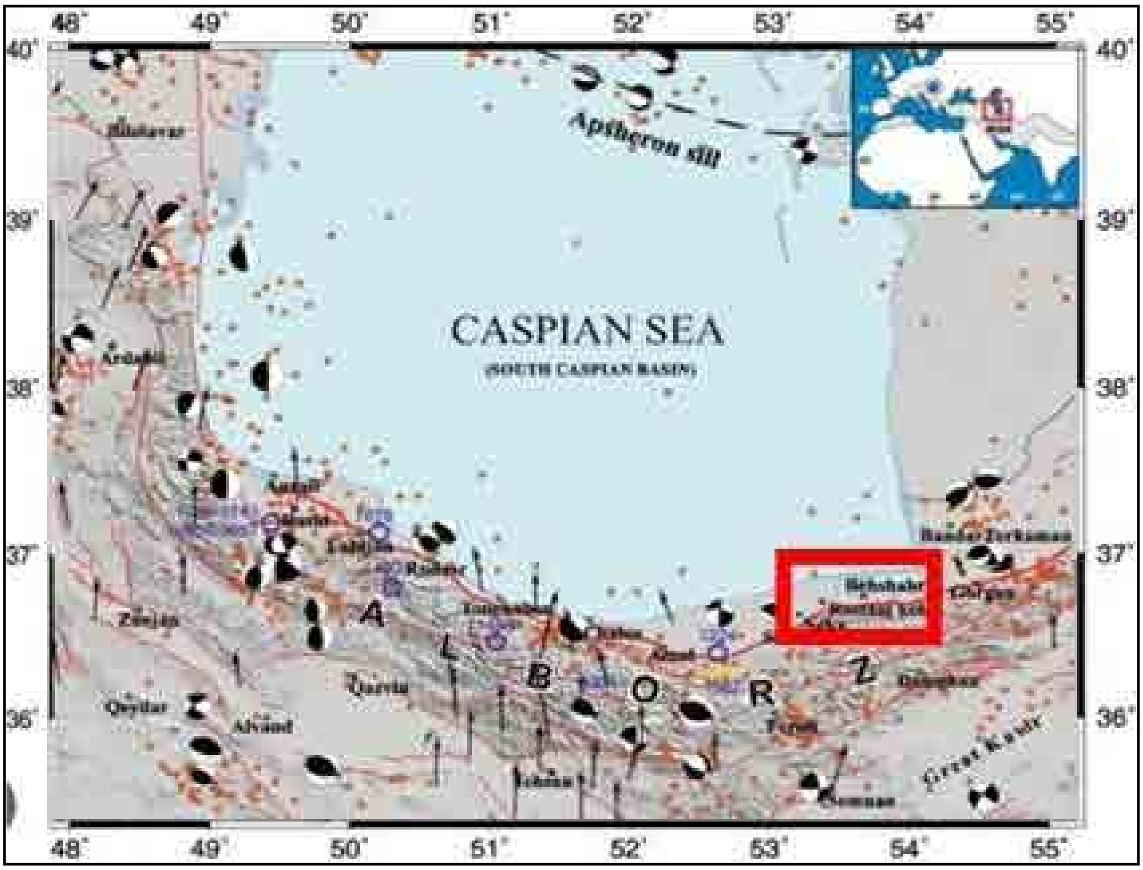


Fig. 7: Tectonic and seismic activity of the Alborz Mountains with the location of the study area (red rectangle) (Nazari *et al.,* 2021).

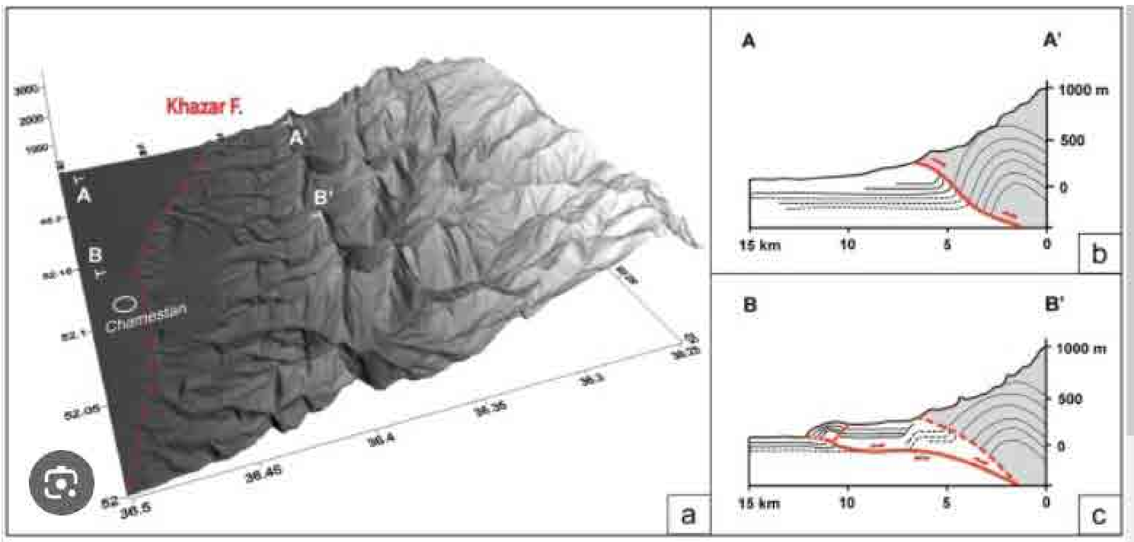


Fig. 8: Khazar Fold along the northern slope of the Alborz Mountains (a) with representation of the topographical step in profile sections (b and c) (Nazari *et al.,* 2021)

its transport could have led to deposition in settlement areas. Erosion, in turn, may have caused the gradual destruction of agriculturally used land.

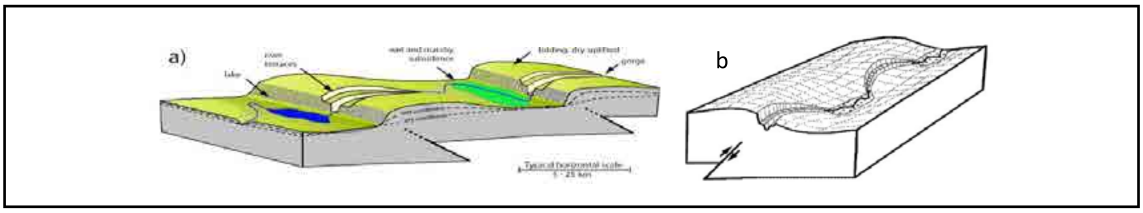


Fig. 9: Schematic illustration of the effects of tectonic activity; a) lifting across the river (Baileya *et al.*, 2011), b) along the river (Baileya/Geoffrey, 1994).

Hotu Cave is located in the southern Caspian lowland. This coastal region is only a few decimeters above the current sea level of the Caspian Sea (-28 m m.s.l.) (Figs. 10 & 11). Over the past 25,000 years, sea level fluctuations of the Caspian Sea can be reconstructed, showing variations ranging from -95 m to +35 m a.s.l. For our period of investigation, the historical sea-level fluctuations around 2400 BC and 9700 BC at -40 m a.s.l., or 4500 BC, 8000 BC, and 9000 BC at -20 m a.s.l., are particularly notable. As an example of the extent of high sea levels, the maximum transgression of the Caspian Sea at -20 m a.s.l. during the Holocene around 7 ka BP is sketched in Fig. 12. Large parts of the coastal plain are flooded and the coastline reaches up to 1500 m to Hotu Cave. These fluctuating sea levels had direct effects on the settlement areas at higher water levels, as the settlement area and its agricultural land were not only flooded and destroyed but also became salinized by the floodwaters, which could have made agricultural regrowth difficult or even impossible after the sea level receded. Along with the sea-level fluctuations, the local erosion base also changed, which, similar to the tectonically induced processes, led to changes in erosion and accumulation processes.

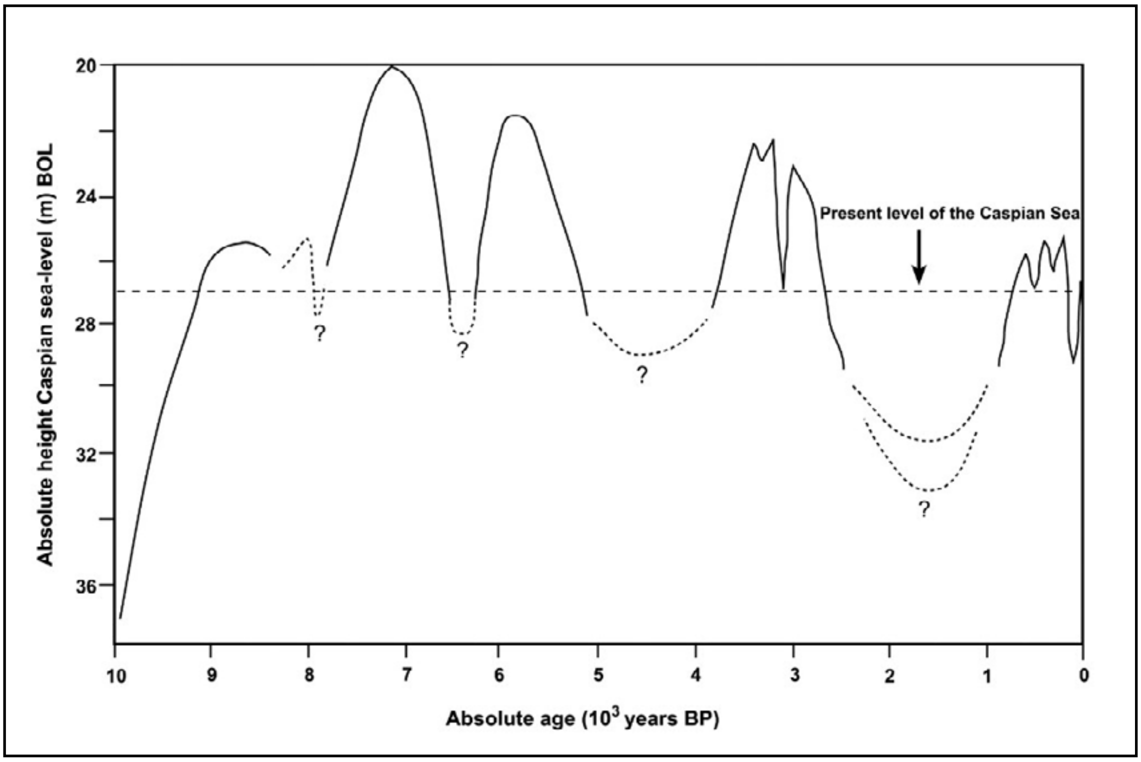


Fig. 10: Sea level changes during Holocene period (Kakroodi *et al.*, 2015)

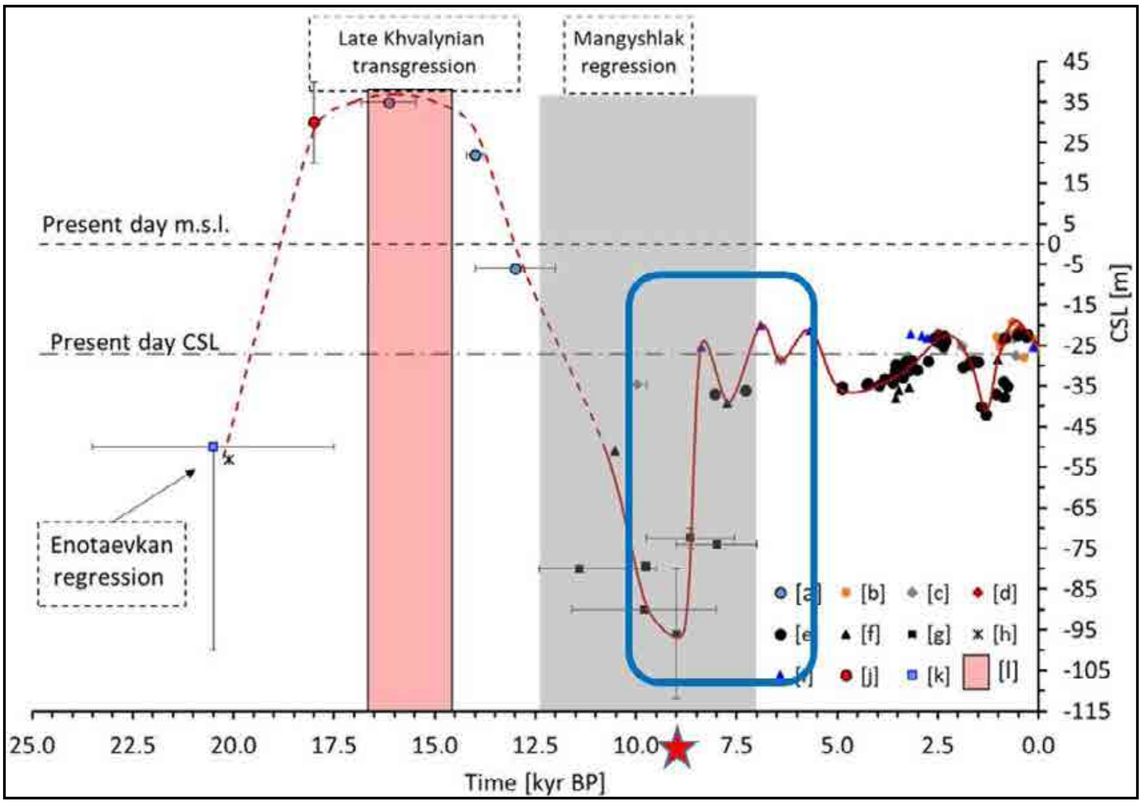


Fig. 11: Sea level changes of the Caspian Sea with the timeframe of the cave sequences (blue rectangle) and the 8.2 ka BP (6.2 ka BC) event (red star) (Koriche *et al.,* 2022)

Fig. 12: Illustration of the maximum transgression of the Caspian Sea during the Holocene around 7 ka BP (-20 m.a.s.l.) with flooded areas and location of the Hotu, Kamarband and Komishan caves.

According to the compilation by Kehl *et al.,* (2023), there is limited data available for paleoclimatic reconstructions for all of Iran, with only data from two sites available for our study area. Paleoclimatic proxy data allow for a good reconstruction of natural changes in historical times, which can, in turn, provide insights into settlement dynamics. Further research is underway to obtain additional data for reconstructing the paleoclimate and sea-level fluctuations in the Gorgan Plain in the southeastern Caspian Sea region, as well as to identify other potential sites for future data collection and investigations. Currently, a database has been compiled from 64 datasets, encompassing results from various methods and which will be further analyzed in relation to specific research questions. Presently, samples from the Komishani (Trench 6) and Gorji Mahale areas are being examined in the laboratory, using various methods such as ICP, 14C dating, grain size analysis, and micromorphology. Future plans include conducting additional sampling in wetlands near archaeological sites.

In addition to the sedimentological analyses of boreholes and existing datasets, GIS and remote sensing methods are being applied to assess landscape changes and land use in historical times. Aerial photographs from the years 1962 and 1970 are available, which will be used to identify additional potential sites for sedimentological investigations. Furthermore, the catchment areas of the rivers that are relevant in the context of settlement areas will be studied along the entire northern slope of the Alborz Mountains. The comparison of different time points (recent, 1970, and 1962) will enable the identification of historical erosion events that may be applicable to the current study period. Morphometric analyses, as well as the detection of terraces and alluvial fans, will provide clues to erosion and accumulation processes at the archaeological sites. Finally, remote sensing analysis of the two main rivers and their tributaries will be conducted to gain further insights into environmental processes and their impacts on settlement areas.

7. New archaeological investigations at Hotu Cave, 2021: "Trench E"

New activities in Hotu Cave took place 70 years after the first explorations of Carlton Coon. These recent investigations aim to establish a secure regional chronology from the Mesolithic to the Parthian period and to link obvious gaps in the cave sequence to climatic and environmental changes during the Late Pleistocene and Holocene. Our excavation of Hotu Cave began in March 2021 and lasted for 70 days. Following Coon's four trenches named A, B, C, and D, we opened a new trench, Trench E (4×2 m), located in the south-west of the cave. The excavation revealed several cultural periods, along with evidence of environmental and climatic changes data that occurred over the millennia. The cultural layers identified in the cave extend from the surface soil down to a depth of 9 meters. In total, eight cultural periods were identified in the sequence of Hotu Cave, spanning from the Mesolithic to the Iron Age and including the Parthian period (Table. 2).

Extensive cultural findings and in total 124 contexts were identified in Trench E, including fireplaces, settlement floors, human burial remains, animal and plant artifacts, stone and pottery sherds, and other small finds. The lowest layer of the cave was located at a depth of 9 meters. Further investigation revealed a sedimentary layer consisting of brownish clay loam, which did not contain any cultural artifacts (see: Figs. 13 & 14). For this area, we can identify a transitional horizon between the Mesolithic layers (121 to 104) and the earliest Neolithic occupation (103 to 77). This transition is significant and can be differentiated by various characteristics. The Neolithic period is further divided

Fig. 13: View of Trench E on the left; The upper layers and on the right side the lower layers in Hotu Cave.

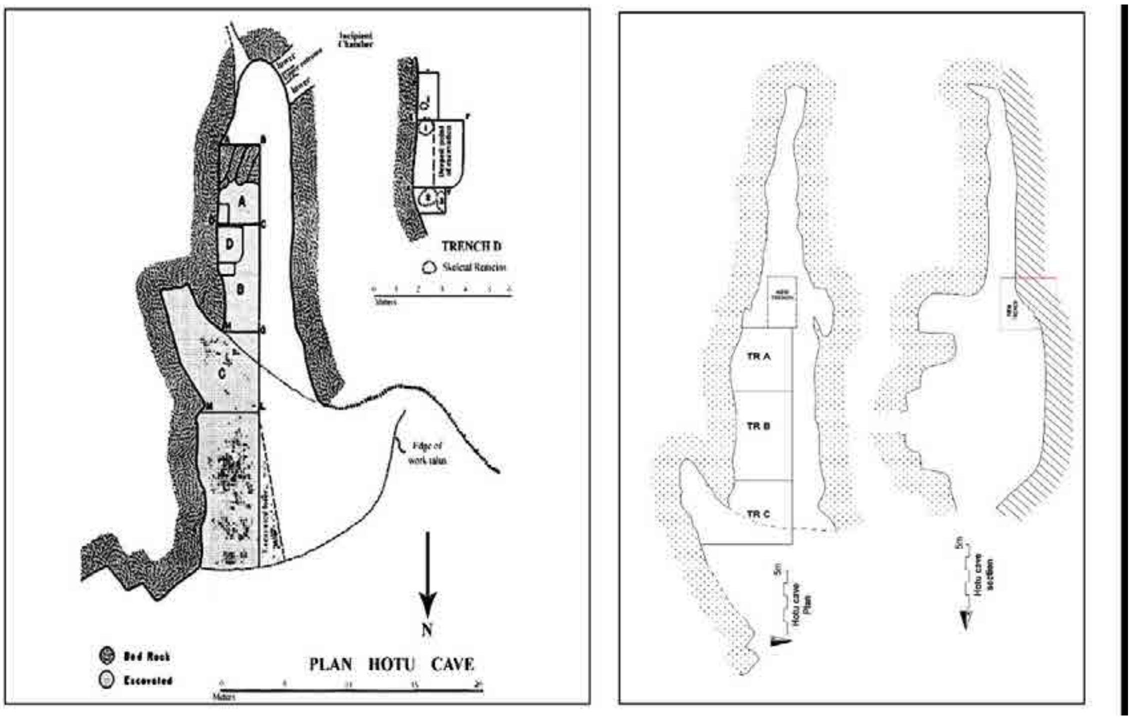


Fig. 14: a) The plan drawn by Coon and the location of the trenches in Hotu Cave. b) The plan of the cave in 2021, with its newly documented southern extension and excavated trench E in 2021

into a non-ceramic and ceramic stage, with the first clay vessel appearing in the relevant context. Contexts from 103 to 58 represent the subsequent Early (non-ceramic) Neolithic period, while contexts 76 and 75 reveal significant gaps of the cultural sequence with infills of sediments without any trace of human occupation These gaps mark distinctive interruptions in the cultural development of the region.

Additionally, for the first time, we can identify a transformation from the Neolithic to the Chalcolithic period, which includes both a "Formative" and a "Transitional Chalcolithic" phase. The material from these horizons provides important archaeological links between the Behshahr region and the cultural developments of the Northern Iranian Plateau..

8. The Mesolithic occupation in Hotu Cave

The Mesolithic period is a cultural phase that follows the Upper Paleolithic period, beginning later around the Caspian Sea. The complete understanding of human occupation in the Caspian Sea region between 21000 and 15000 years ago is still not fully documented. Current data suggests that during the Bølling-Allerød interstadial (ca. 15,000-13,000 years ago), groups of hunter-gatherers with regional identities developed in this area of Iran. These groups were likely not isolated populations; rather, they probably formed a regional identity within a larger social context.

During this period, we observe the use of advanced stone tool technology (Jayez *et al.,* 2024), seasonal and temporary utilization of caves, and potentially year-round movements or increasing sedentism. Additionally, there is evidence of complex ritual systems and social memory, which are reflected in burial practices and craft art.

The deepest layer of the cave, found at a depth of 9 meters, was examined further to confirm its pristine condition. This sedimentary layer, composed of brown clay loam and devoid of any cultural artifacts, may have been deposited in the cave through wind or water activity (see: Fig. 15).

This period marks the first evidence of settlement in Hotu Cave (Fig. 16), which developed on undisturbed soil. It encompasses contexts 104 to 121, spanning from 900 to 670 centimeters within the cave, around 252 centimeters of the cultural layers dating to the Mesolithic period. This layer is approximately 230 centimeters thick and represents one of the longest episodes of settlement in the cave. It includes the remains of two human burials, fireplaces, animal bones, and plant remains. Absolute dating from context 121 indicates 11,945-11,800 BCE, while context 111 shows a date range of 8,130-7,960 BCE, reflecting a period of approximately 2,000 years of continuous occupation. This indicates that before the Younger Dryas, hunter-gatherers inhabited Hotu Cave. The animal remains found in Hotu Cave from the Mesolithic period reveal the exploitation of various species, including Caspian seals, deer, oxen, pigs, canids, equids (horses), gazelles, goats, and sheep. The presence of seal bones, aurochs, and deer suggests that the area had rich environmental resources, as stated by Groene *et al.,* (2023a).

Other significant findings include a large collection of stone and bone tools (Fig. 18). Mesolithic people of Hotu had a chipped stone industry in which both flakes and blades were produced and used in hunting and processing various food sources available in the ecotone. Pointed backed tools in the Mesolithic industry were probably used as projectile armatures and scrapers and notched-denticulated tools were probably used for processing prey carcasses as well as local plant and aquatic food (Jayez *et al.,* 2024).

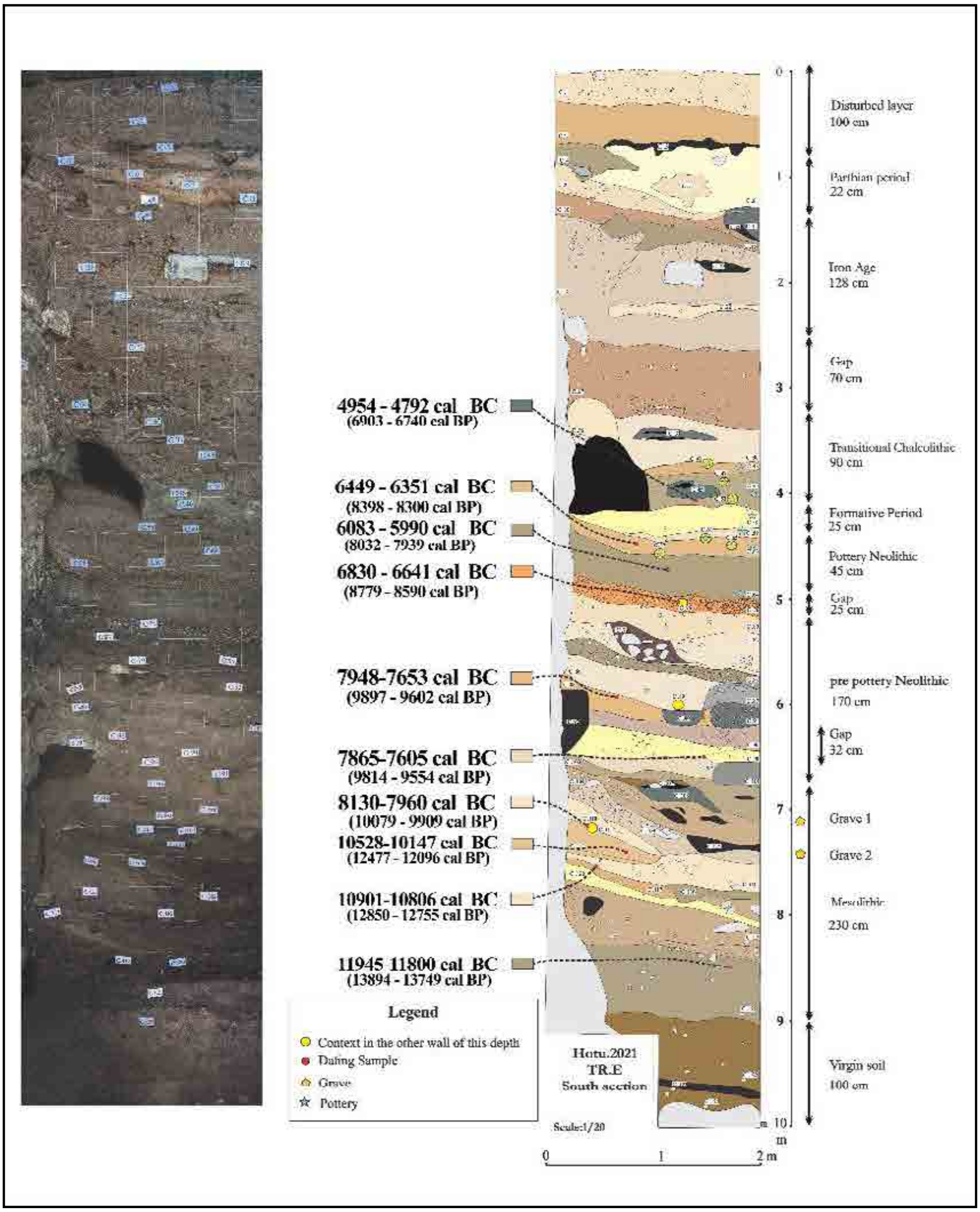


Fig. 15: Profile of Trench E, from virgin soil to the Iron/recent layers with C14 dating.

The presence of medium to large plant remains, which are suitable for human consumption, indicates that hunter-gatherers recognized the importance of plant resources for food during the pre-farming era. Additionally, several fireplaces were discovered, primarily simple in structure and lacking stones, identified as ash and charcoal lenses within the cultural deposits of this period (see: Fig. 19).

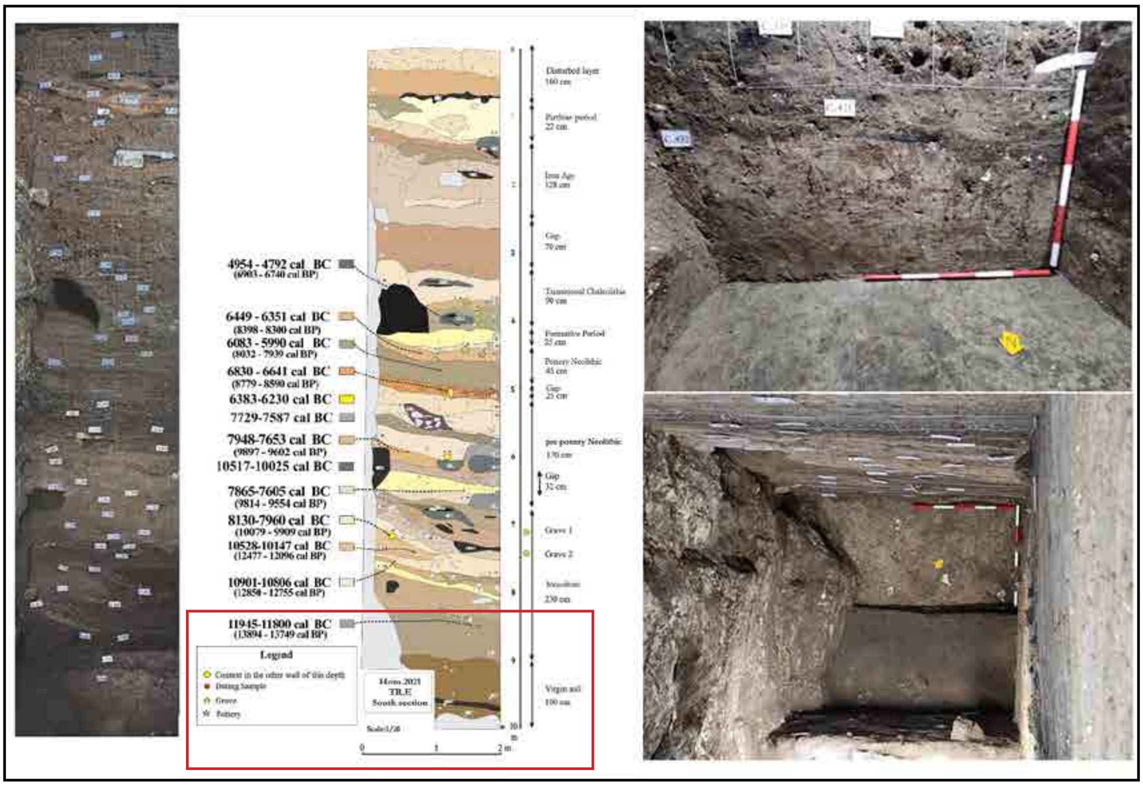


Fig. 16: Virgin soil at a depth of 9 meters from the fixed measurement point, respect. the bedrock of the cave.

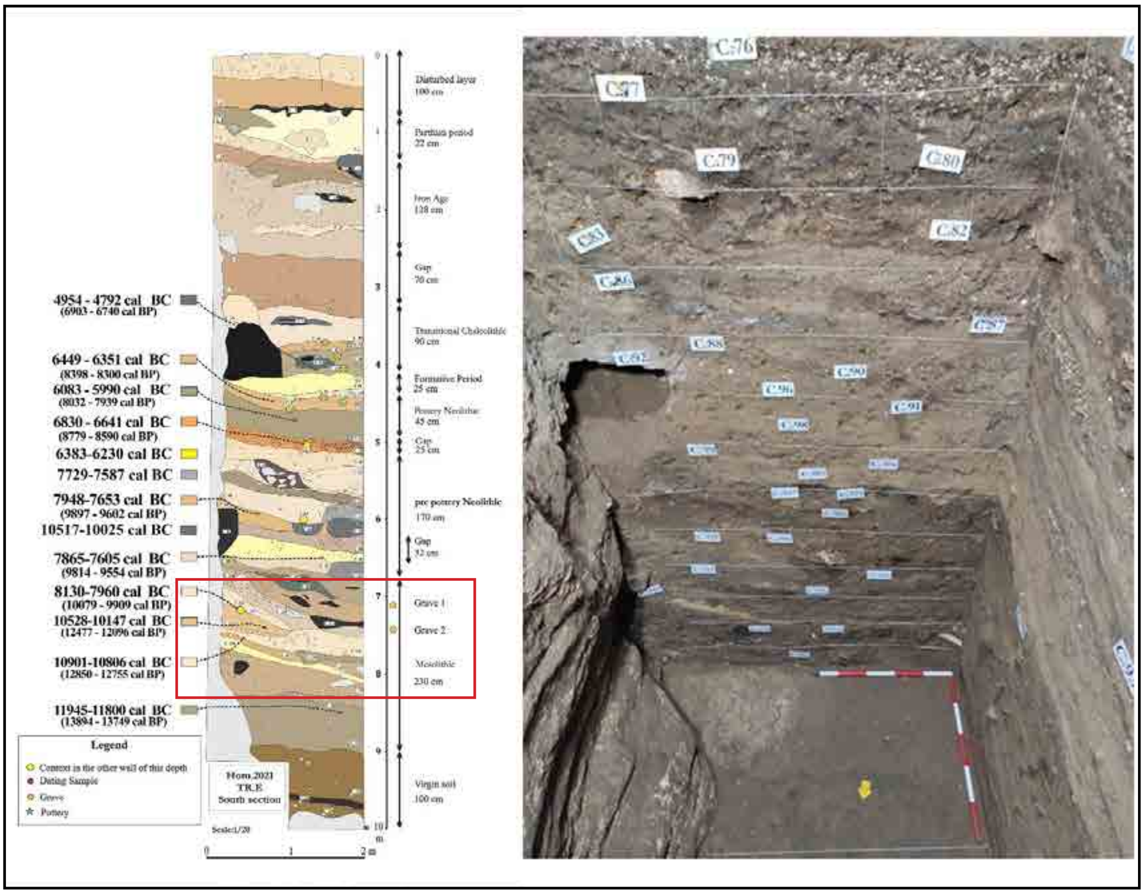


Fig. 17: The Mesolithic period in the stratigraphy section of Hotu cave.

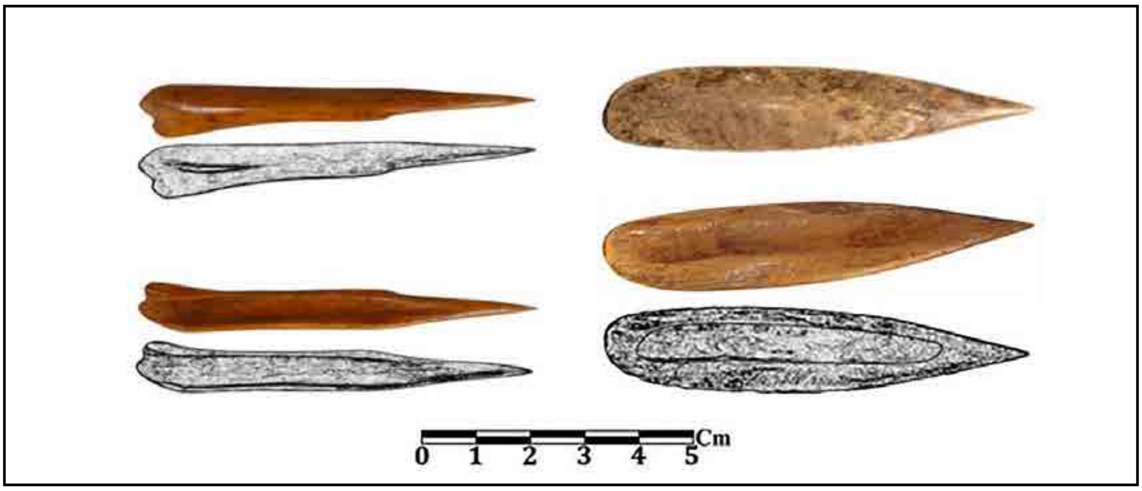


Fig. 18: Mesolithic worked bone tools from Hotu Cave (drawn by Hedayat Kalvari).

Fig. 19: Fireplaces in the Mesolithic period.

Two human burials were discovered in the Mesolithic context (contexts 111 and 114). Burial 1 (see: Fig. 20) contained the remains of an infant buried at a depth of 700 centimeters, making it one of the most unique burials in the southeastern Caspian Sea region. Radiocarbon dating of a bone fragment from this burial indicates a date range of 8,130-7,960 cal BCE. Notable artifacts found in this burial include several black and white beads, animal teeth (from a jackal and possibly a hedgehog), and a bone plaque that was fashioned into a necklace and wrapped around the child's neck. This type of decorated necklace, comprising beads and animal teeth, appears to have been a cultural practice among regional hunter-gatherers. Similar practices have also been observed in Kamarband Cave, Ali Tepe Cave, and Komishani (Fig. 21). The child was buried near a fireplace, and it seems the necklace belonged to an adult, likely one of the parents.

Burial 2 (Fig. 22), located at a depth of 750 centimeters in context 114, contained the remains of a child estimated to be between 4 and 5.5 years old. The child was buried in a fetal position, covered with red ochre clay, with the upper body laid supine, the right hand resting on the stomach, and the lower body bent to the left. No burial objects were found nearby the remains, but only various-sized stone pieces and numerous stone artifacts scattered around. Absolute dating of the skeleton is 10,901-10,806 cal BCE.

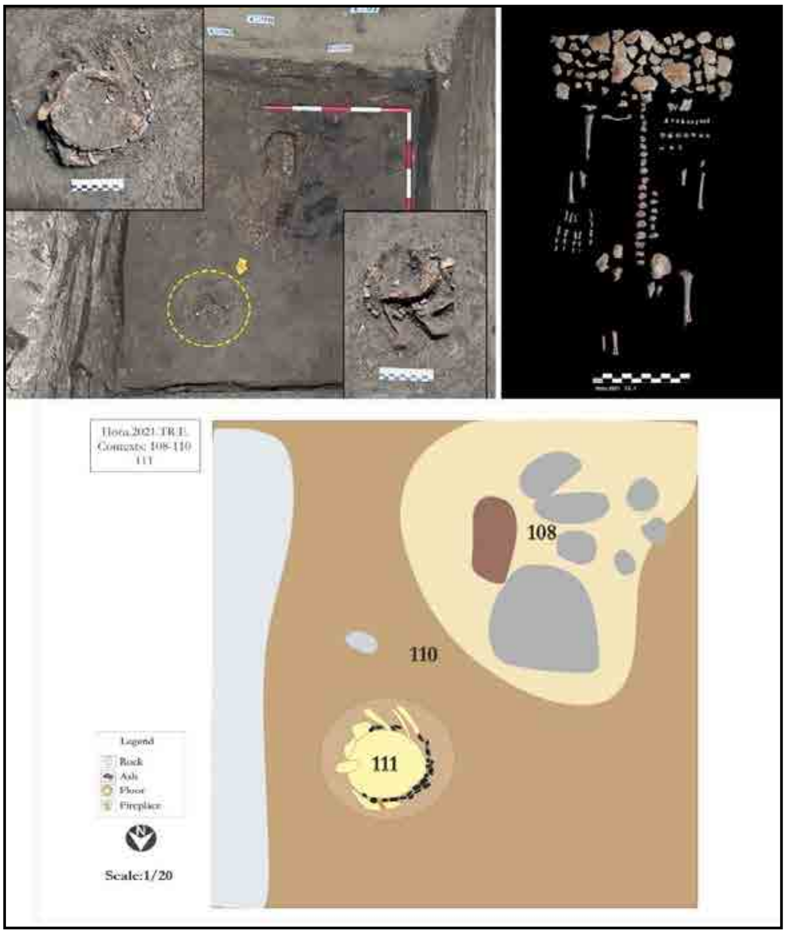


Fig. 20: Burial No 1 is a 3–4-month-old baby with bone remains and a necklace.

Fig. 21: Necklace made of stone beads and animal teeth recovered from human burial No 1 dating into the Mesolithic

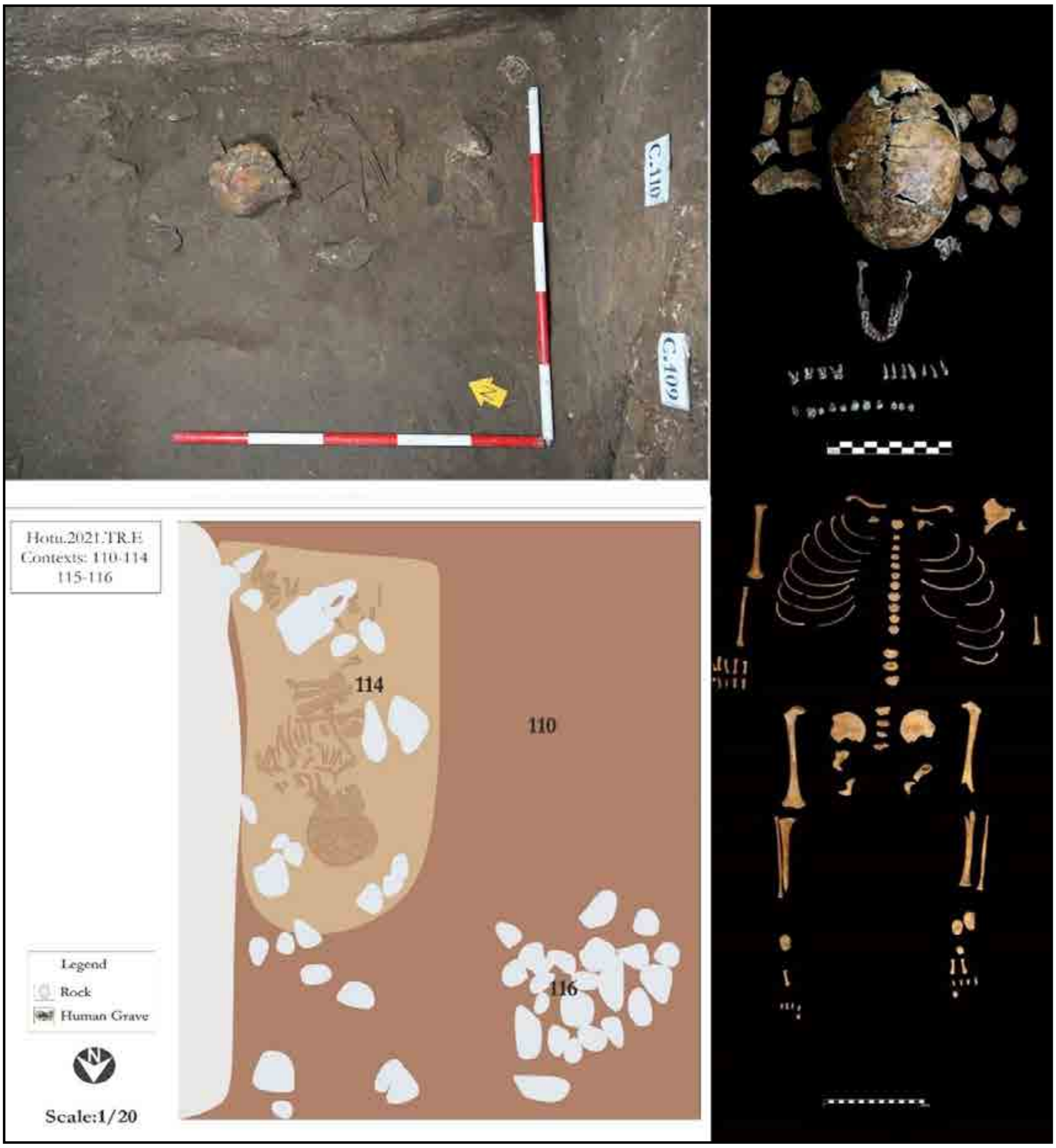


Fig. 22: Burial No 2 is a 4-5-year-old child with bone remains.

One noteworthy shell ornament measuring 3.5×4.03 centimeters was found in the lowest Mesolithic contexts 110 and 118 (Fig. 23). Its method of mounting suggests that it could have functioned as an ornamental pendant, similar to those discovered at the Komishani site (Fazeli Nashli, 2023). This finding indicates a regional cultural tradition that persisted from the Mesolithic into later periods.

Based on the teeth of jackals and hedgehogs, as well as the ornaments and burial types from Hotu, Komishani, and Kamarband caves, we can infer that the Mesolithic period in the southeastern region of the Caspian Sea was quite advanced in bead-making and domestic tools. This advancement is similar to evidence from the Levant, the Zagros, and the Alborz mountains, particularly regarding the relationships between humans and animals (Asouti *et al.,* 2020; Maher *et al.,* 2011; Garrard *et al.,* 2018).

Fig. 23: Decorative shell in the Mesolithic period, context 118, of Hotu Cave.

9. The Early (non-ceramic) Neolithic Horizon

One of the main objectives of the re-excavation of Hotu Cave was to investigate the transition from the Mesolithic to the Neolithic period and to evaluate the changes caused by internal or external stimuli. The Early Neolithic period, observed in the Central Zagros and the Levant after the Younger Dryas climatic event, is estimated to have occurred from around 9,800 to 7,000 BCE (Fazeli Nashli and Thomalsky, 2024; Darabi, 2022). Initially, settlements during this period were mostly seasonal and temporary, as seen at sites like Sheikhi Abad, Chogha Golan, and Eastern Chia Sabz (Darabi, 2022; Zeidi and Conard, 2023; Matthews and Fazeli Nashli, 2022). Over time, these communities reduced their mobility, and by the end of the 9th millennium BCE, permanent settlements began to emerge (Richter and Darabi, 2023; Richter *et al.,* 2021; Zeder, 2024; Groene *et al.,* 2023b). Characteristics of this period include the management of domesticated crops such as wheat, barley, chickpeas, and lentils, as well as efforts toward the domestication of animals like goats. Other findings from this period include the widespread use of blades and microblades, the presence of clay objects such as tokens, the construction of animal and human figurines, the production of stone vessels, and the emergence of milling equipment, including mortars, pestles, and hand mills (Conard and Zeidi, 2013; Weide *et al.,* 2017).

The cultural zone of the Caspian Neolithic once encompassed a vast area that included the northern and southern Caucasus, the eastern Black Sea, the Caspian Sea, the Kuban River basin, the Atrak River basin, Dagestan, Georgia, Azerbaijan, and Armenia. Today, each region is assessed based on the unique characteristics of its Neolithic lifestyle.

In Hotu Cave, the Early Neolithic period spans contexts 103 to 68, with a depth ranging from 670 to 450 centimeters and an approximate thickness of 220 centimeters. Unfortunately, due to limited excavations around the southeastern Caspian Sea, we currently lack comparative information for this period. Additionally, the cultural deposits of the Neolithic period in the Komishan Cave have unfortunately been lost.

The excavation of Hotu Cave reveals a significant hiatus of nearly 1,800 years, from a burial dating back to 10,806-10,901 cal BCE (Burial 2) to another burial dated between 8,130 and 7,960 BCE (Burial 1). Initially, it was assumed that Burial 1, which contained the remains of an infant, belonged to the Neolithic, coinciding with the domestication of goats in Ganj-Dareh, while Burial 2 was thought to be of Mesolithic in date. However, due to the difference of approx. 50 centimeters in depth between these two contexts and the distinct characteristics of the layer textures, it now appears to us that both burials were dug from overlying layers and are actually both related to the Mesolithic period.

The stratigraphy of the Early Neolithic period within the layer sequence features a light brownish texture. Additionally, there is a gap layer (context 98) with an approximate thickness of 32 centimeters present during this period. Three radiocarbon dating samples taken from charcoal in contexts 99 (7865-7605 BCE), context 88 (7948-7653 BCE), and context 77 (6830-6641 BCE) indicate that the cave was occupied during this time (Fig. 24).

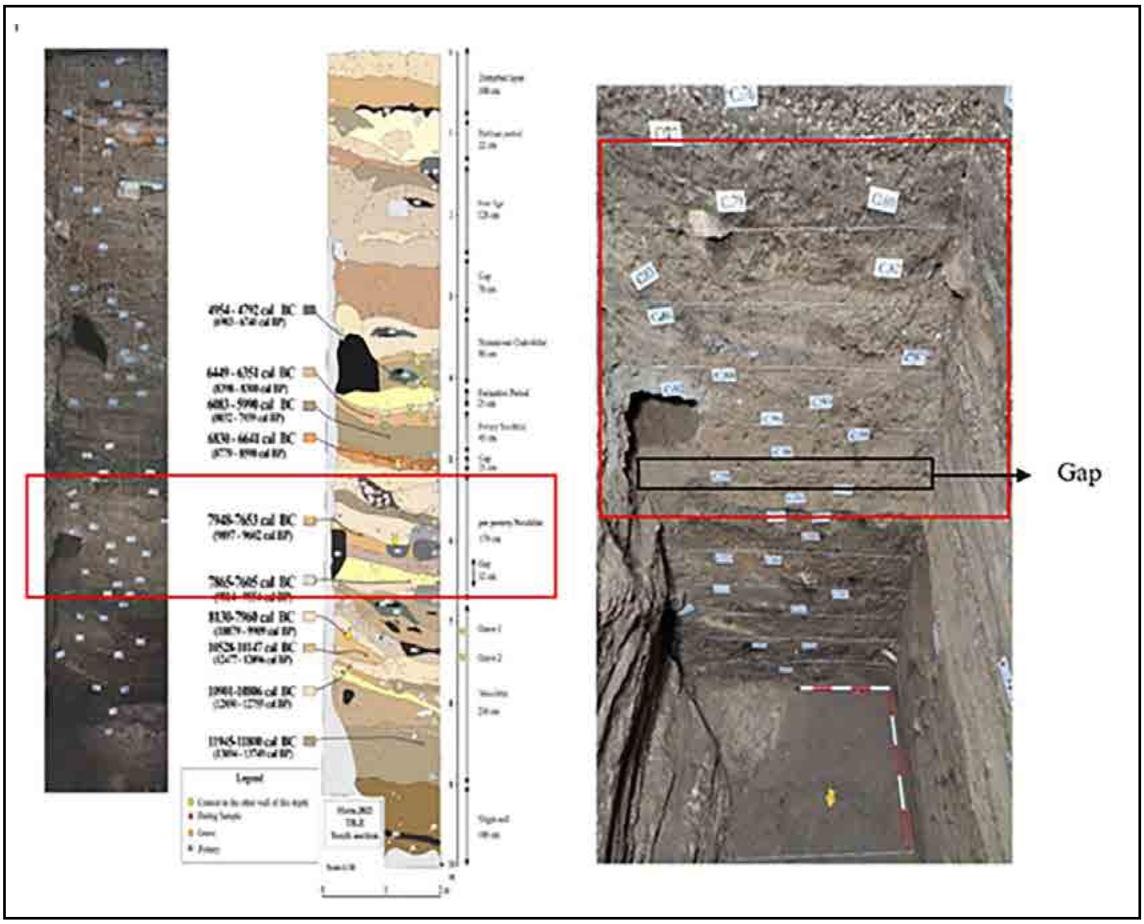


Fig. 24: The Early Neolithic period in the stratigraphy section in Hotu cave.

During the Neolithic period, a total of 24 fireplaces were discovered. Many of these were deliberately structured and constructed, indicating a significant increase in fireplace construction compared to earlier periods (see: Fig. 25). The fireplaces were typically built in pits with average dimensions of 40×50 centimeters and a depth of approximately 15 to 20 centimeters. Various limestone slabs or riverbed stones were used in their construction, and these fireplaces saw extensive use. Some of them were filled with stone chips on top of the ash that accumulated over time.

Loess soil was used for some of the fire installation spaces, resulting in areas with a mix of materials. Environmental deposits tinged these installations in shades from red-brown to orange due to the heat, while the constant high temperatures transformed the soil into baked and solid clays. Additionally, the excavation team uncovered some fired clay, which may indicate the early stages of local pottery production in the region, either accidentally or otherwise (Figs. 26 & 27).

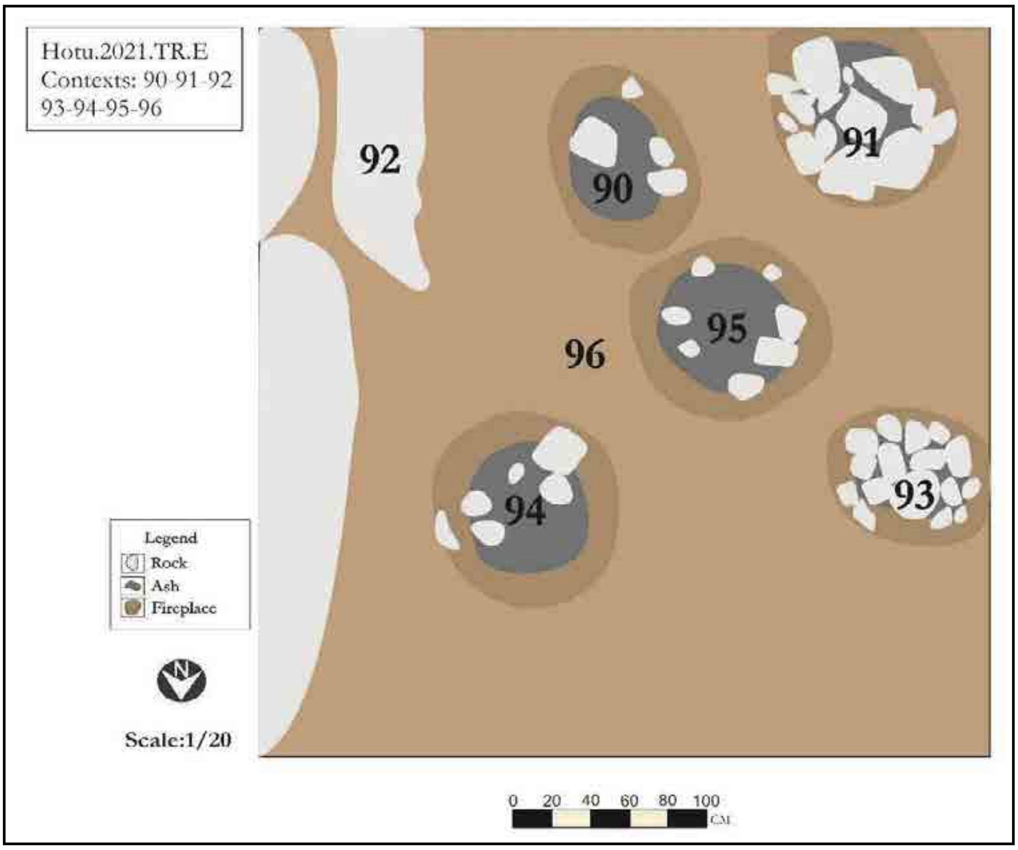


Fig. 25: Several fireplaces in the Early Neolithic period of Hotu Cave.

Fig. 26: Fireplace installations, of heated mud.

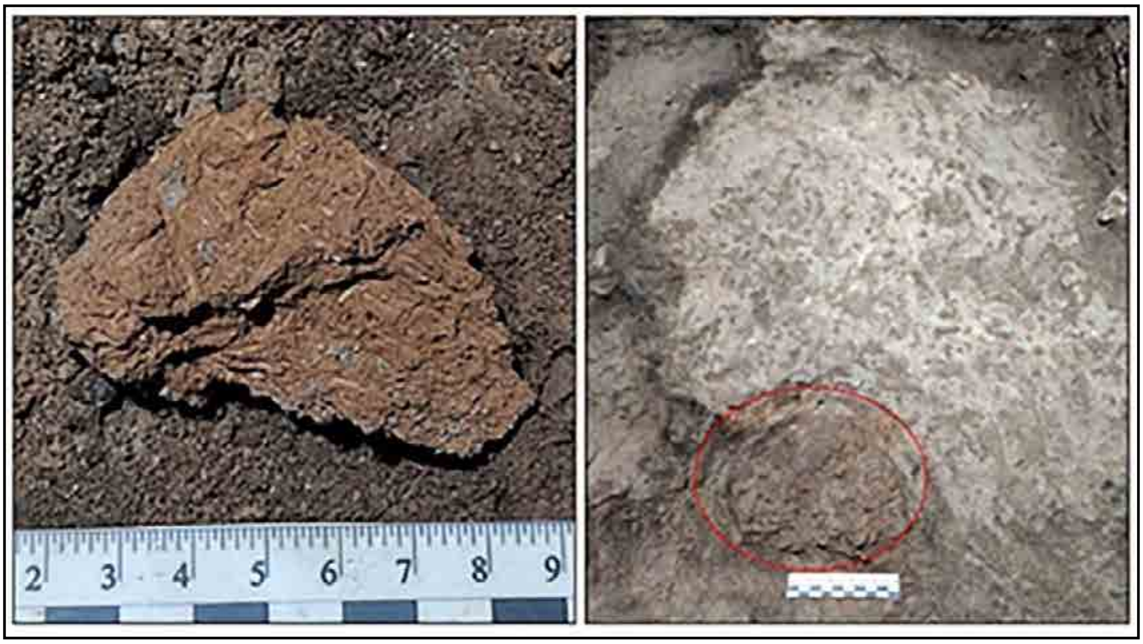


Fig. 27: An example of heated mud for the construction of fireplaces, with visible addition of plant (straw?).

Stone artifacts were commonly discovered from this period. Technologically, from Mesolithic to Neolithic, the chipped stone manifest two major changes which are introduction of the pressure technique for the removal of blades in an advanced stage of technology and the emergence of sickle tools, esp. trapezoids inserted obliquely in hafts. However, the Mesolithic and the PPN assemblage of Hotu also share some characteristics. Besides the continuation of the total dependence on local Behshahr chert, the two assemblages show a similar technological composition, higher percentage of flake tools versus blade tools, and the use of similar tools such as notched-denticulated, various scrapers and backed tools (see: Jayez *et al.,* 2024).

One ground stone artifact from context 88 (without illustration here) measures 14.29×4.06 centimeters, a chisel or polisher made from basalt stone measures 8.3×3.21 centimeters from context 89, a rim fragment of a larger stone vessel measuring 29.65×15.08 centimeters was found in context 95, along with a fragment of a mortar made from granite that measures 15×12.78 centimeters from context 103 (Fig. 28). Other discoveries from this period include baked clay that appears to have been created while using the fireplaces.

The results of zooarchaeological studies in this cave during the specified time period reveal a notable shift in the diet of its inhabitants. In contrast to the Mesolithic period, where only 4% of the animal remains consisted of bone fragments from goats and sheep, the Neolithic period shows a significant increase, with these two species accounting for 98% of total animal remains (excluding microfauna). This indicates the growing importance of goats and sheep compared to the previous period. However, earlier evidence from Coon's investigations suggests that hunting and the selective slaughter of these animals were practiced as well, continuing into the Neolithic. The presence of animal domestication over a prolonged period indicates that when humans initially settled in the region during the Mesolithic, they were already familiar with hunting wild goats and sheep (Groene *et al.,* 2023b). After a significant gap between the layers pre pottery neolithic and pottery neolithic, these populations recognized the importance of these species in their diet and eventually transitioned to a system of selective and purposeful slaughter. Despite

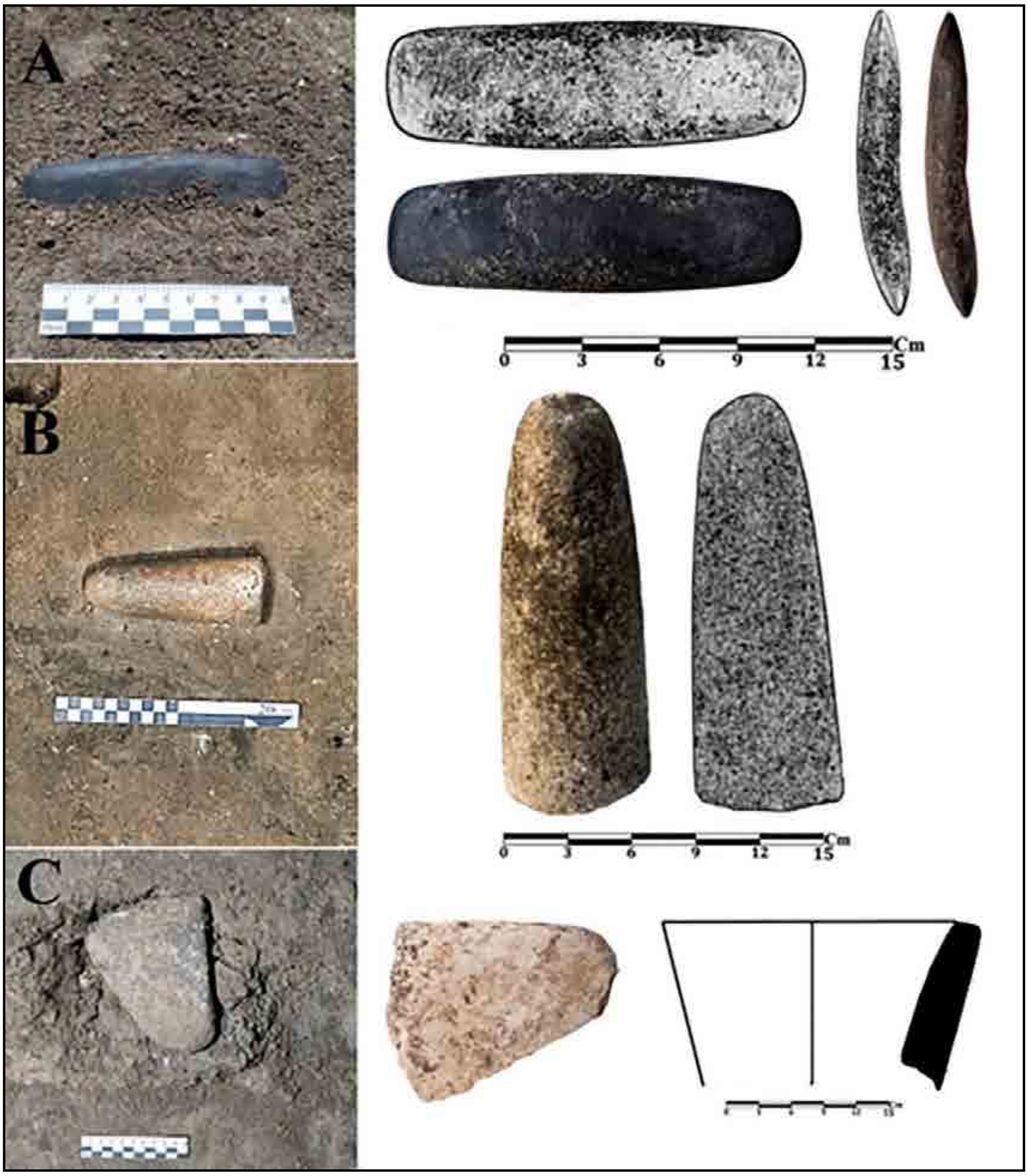


Fig. 28: Stone artifacts obtained from the Early Neolithic context: A) chisel/polisher; b) mortar fragment; c) rim of a stone vessel (drawings by Hedayat Kalvari)

limited excavation space and the scarcity of animal remains, further archaeological work is needed to accurately identify morphological changes in the domesticated species. Nonetheless, evidence of animal domestication persists within local structures, suggesting the possibility that domestication may have originated from another region nearby.

Since this study is focused on the transition between the Mesolithic and Neolithic, we will compare only the findings from Trench D, which are contemporary with this timeframe. While Coon was occupied with the excavation of the human burials, his colleague, Louis Dupree completed the excavation of Trench D within two days. There is only one stratigraphic layer plan for this trench, which Coon used to give initial descriptions of soil types and natural findings.

The plan drawn in 1951 indicates that some cultural layers from Coon's excavations overlap with layers of our new trench E opened in 2021. Particularly comparable are the numerous scattered stones on the cave floor and in the upper part of Trench D that we also observed in Trench E. The contexts identified include Context 76 with a layer of gravel 2, Context 77 with a layer of sand 2, Context 83 with a layer of gravel 3, and Context 92 with stone rubble inside gravel 4, all of which are part of the same horizon (Fig. 29).

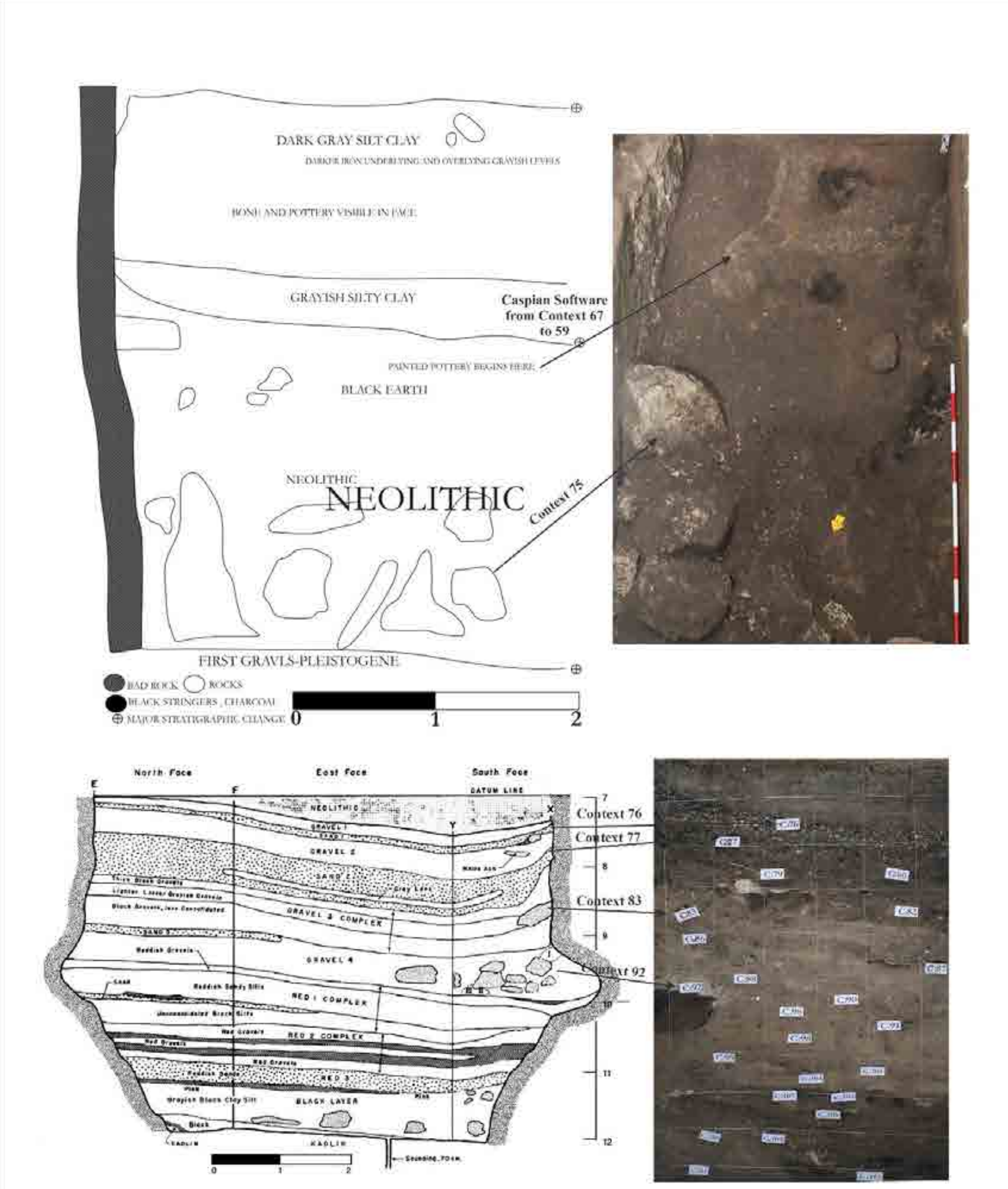


Fig. 29: Stratigraphy of Trench D (Top: left) in comparison of the profile of Trench E (right).

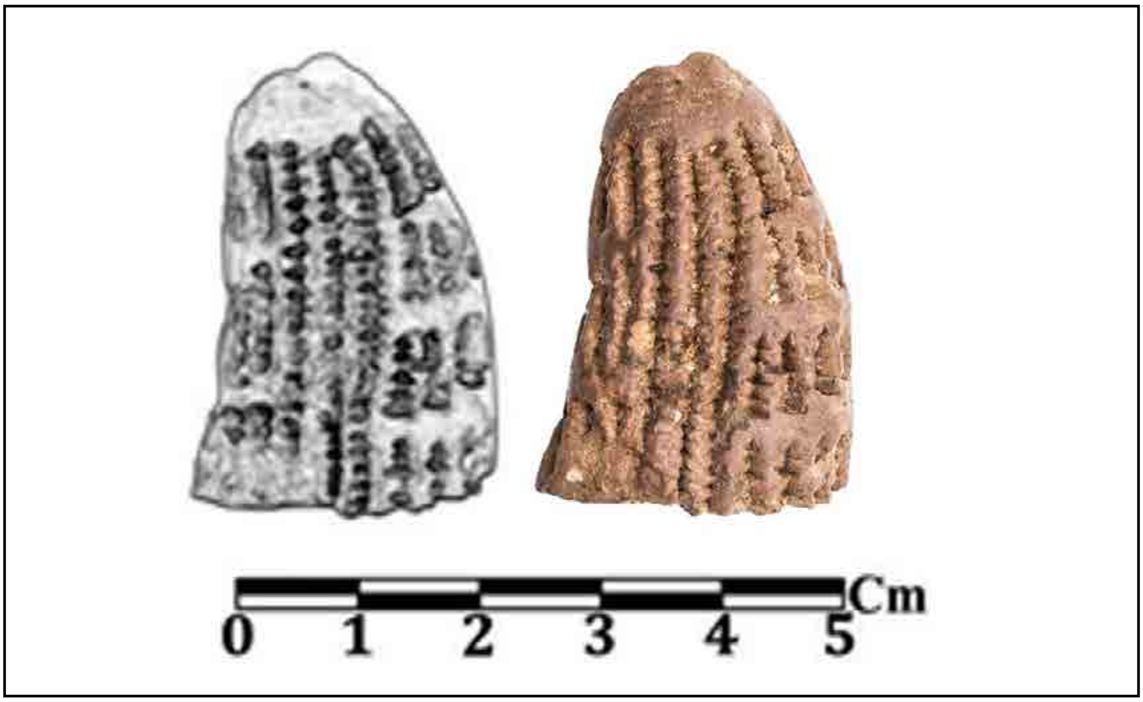


Fig. 30: Clay object obtained from the Early Neolithic period, Context 110, Hotu Cave (designed by Hedayat Kalvari)

An unidentified clay object, a unique finding from the Neolithic period, has been discovered in Hotu Cave. This heated clay object, adorned with linear and incised or impressed designs created using a very specific plant stipe (?) or a shell rim. The object measures 4.5×2 centimeters and was retrieved from context 110 (Fig. 30). Its age dates to approximately the 9th millennium BCE, which is noteworthy. Despite its surprising age, the object is elaborately decorated and likely did not serve any practical purpose, indicating that it may have been used for a possibly ritual function. A similar piece was discovered in layer I of Hotu Cave and in the disturbed sections of Komishan Cave, highlighting the importance of this object (Vahdati Nasab *et al.,* 2011: 115). The existence of two comparable and potentially purposeful objects in different contexts underscores their significance. It is noteworthy that there is no published information about the Neolithic layer in Komishan Cave, which dates back to approximately the 9th millennium BCE. If similar findings were made during the same period, it may suggest the presence of an earliest Neolithic layer in Komishan cave that overlies the Mesolithic period.

10. Occupational gaps

At the end of this period, and just before the beginning of the Pottery Neolithic, it seems that natural events, possibly a series of earthquakes, led to significant changes in the area. The presence of numerous ammonite fossils in the limestone debris supports the hypothesis that parts of the limestone ceiling and cave structure collapsed due to seismic activity. Consequently, the entire surface area of the trench was covered with large stone slabs. Additionally, Carleton Coon noted a substantial number of these stone slabs beneath the Pottery Neolithic layers, suggesting that a layer of the cave ceiling may have collapsed over much of the cave's interior (Fig. 31). It appears that after the cave roof collapsed, rainwater accumulated between the slabs.

Based on the C14 dating, we have observed a significant gap of approximately 400 years between the Early non-ceramic Neolithic and the Pottery-containing Neolithic periods. Determining whether such a cultural gap has regional characteristics is a significant question. Japanese excavations at Sang-e Chakhmaq indicate a cultural gap of approximately 400 years between the west and east mounds. The West Mound of Tappeh Sang-e Chakhmaq was occupied from 7,000 cal BCE until 6,700 cal BCE. In contrast, the East Mound was first inhabited around 6,200 – 6,100 cal BCE and continued to be occupied until approximately 5,300 cal BCE (Pichon *et al.,* 2023; Roustaei *et al.,* 2015; Nakamura, 2014). As previously mentioned, the latest non-ceramic Neolithic layers of Hotu can be assigned between 6,830 and 6,641 cal BCE, while the East Mound of Sang-e Chakhmaq was abandoned around 6,700 cal BCE, coinciding with the end of its occupation.

Fig. 31: View of Context 75, stone slabs, and collapse between the Early Neolithic and Late (ceramic / pottery) Neolithic in Hotu Cave.

11. The Late (ceramic) Neolithic horizon

The Early Neolithic period of the Iranian Highland, and here in particularly the Zagros fringes, is characterized by the appearance of bladelets and their bullet-shaped cores, which are actually the exhausted remnants of the characteristic pyramidal single-platform bladelet cores. This characteristic technology is firstly recognized in caves in Fars Province around 9,500 cal BCE, and seems to be common until ca. 6,500 BCE (Thomalsky, 2016). Similar technologies are known from Central and East Asia, apparently earlier in time, and might have spread from there to Eastern Iran as well (Jayez *et al.,* 2024). In the succeeding Late Neolithic Period, larger blade technology was established altogether with clay vessel production and gradually replaced the bladelet industry, most possibly in favor of the usage for sickle implements. This can be demonstrated also for the Djeitun lithic industry around 6,000 BCE.

In terms of subsistence and economy, evidence from the site of Tappeh Sang-e Chakhmaq indicates that wheat, barley, peas, and lentils were cultivated during this time (De Pichon *et al.,* 2023). Additionally, permanent villages were established throughout northeastern Iran, supported by a farming economy and the use of simple irrigation systems (Pollock *et al.,* 2019; Fazeli Nashli *et al.,* 2024). Also, the inhabitants of Hotu expanded their diet to include pig meat, alongside other resources such as cattle, large deer, and foxes, during the Pottery Neolithic period. Goats were present in both Early Neolithic and Late Neolithic levels, with a ratio of nearly 2:1 compared to sheep. Pigs, likely domesticated, appeared in our animal assemblages from the Pottery Neolithic for the first time. Due to fragmentation, the assemblage contains a significant number of prenatal remains, though not all of these could be identified (de Groene *et al.,* 2023a).

Coon refers to the discovery of a baked clay sculpture and several pieces of baked clay in the Early Neolithic layers of Hotu Cave (Dupree, 1952: 253, 257; Gregg and Thornton, 2012). He notes that, unlike a baked conical clay piece found in layer 10, the conical clay pieces in layers 11 and 12 are unbaked. Over time, the inhabitants of the Mesolithic gradually developed pottery, which was then utilized during the pottery Neolithic period (Coon, 1951: 78). He furthermore briefly mentions these ceramics in a one-page report on Hotu and Kamarband Caves. Matson discusses four pieces of pottery and associates three of them with the early pottery horizon (Matson, 1951).

Robert Dyson was the first archaeologist who wanted to study the pottery collection from the Hotu and Kamarband Caves in detail, which are now stored at the University of Pennsylvania Museum. However, due to concurrent projects he supervised in Hasanlu, his evaluation was published a decade later (Dyson,1991). Dyson identified three pottery horizons in northeast Iran based on the collections from these caves as well as other Neolithic sites in the region. The oldest of these horizons, known as the “Caspian Soft Wares,” dates back to 6610 cal BCE (Thornton, 2013: 243). He described the features of these pottery pieces as lightly fired, handmade, chaff-tempered, thick, and crumbly, with the most common form being a deep bowl resembling a beaker, characterized by slightly concave sides and rounded rims. Pottery of the so-called Djeitun style is found on top of this horizon and has a more recent dating of 6100 BCE (Harris, 2010: 120). Djeitun pottery is characterized by poorly-fired, chaff-tempered ceramics with thin pink to buff slips, decorated with painted linear designs. Dyson identified the final pottery layer before its dating by the presence of Cheshmeh Ali ceramics from the Sialk II period, which dates around 5300-4400 BCE. He also noted a similar pottery sequence at the site of Djeitun itself. Following this, Michael Gregg and Christopher Thornton studied the pottery of both sites to trace the Neolithic pottery tradition from north-central Iran to southern Turkmenistan. They stated that no single piece of Djeitun pottery were present in the collections from Hotu and Kamarband Caves.

12. The (Southeast) Caspian Soft Ware

The emergence of pottery in northern Iran remains a topic of debate. Tsuneki proposed that the Hotu ceramics were created by the settlers of Hotu (Tsuneki, 2017). Conversely, Gregg and Thornton calibrated dates from Kamarband Cave, identifying the oldest pottery from the Early Neolithic period dating back to 7,140 cal BCE (Gregg and Thornton, 2012). This suggests that the Caspian Ceramic Wares in Eastern Mazandaran region appear earlier than in neighboring areas of Central Asia and the Iranian Plateau, although slightly later than in the Central Zagros region.

Gregg and Thornton describe Caspian pottery ware as having a thick cross-section and reddish-brown color, often featuring a thin red stripe on the inner edge (Fig. 32). This pottery includes unique forms such as deep bowls or cups with protruding edges, which are not found anywhere else in northern Iran. Despite this, there are several pieces of Caspian pottery with a thick reddish-brown slip and a low-baked appearance in the Caspian Soft Wares collection within the ancient Neolithic layer of Hotu Cave. These resemble early container styles found in locations like Tappeh Sang-e Chakhmaq. Additionally, this collection includes a cup with a handle, extending beyond the typical deep bowls and cups (Gregg and Thornton, 2012).

Fig. 32: Pottery Neolithic ceramic sherds recovered from Hotu Cave by Carlton Coon (today stored in the Pennsylvania Museum Archives)

In relation to the re-excavation in 2021, it is important to note that illicit excavations have disturbed portions of the cultural context of the Pottery Neolithic, making it difficult to achieve a clear interpretation. Looters horizontally dug into the cave, and past environmental activities have caused water to wash away soils and cultural artifacts from the upper layers (Neolithic layers) down into the lower layers of the Pottery Neolithic contexts.

In Hotu Cave, pottery from the Neolithic period was found above debris between contexts 74 and 60, with an estimated thickness of 70 cm. Additionally, two samples were analyzed: charcoal from context 63 (dated to 6499-6351 cal BCE) and one bone

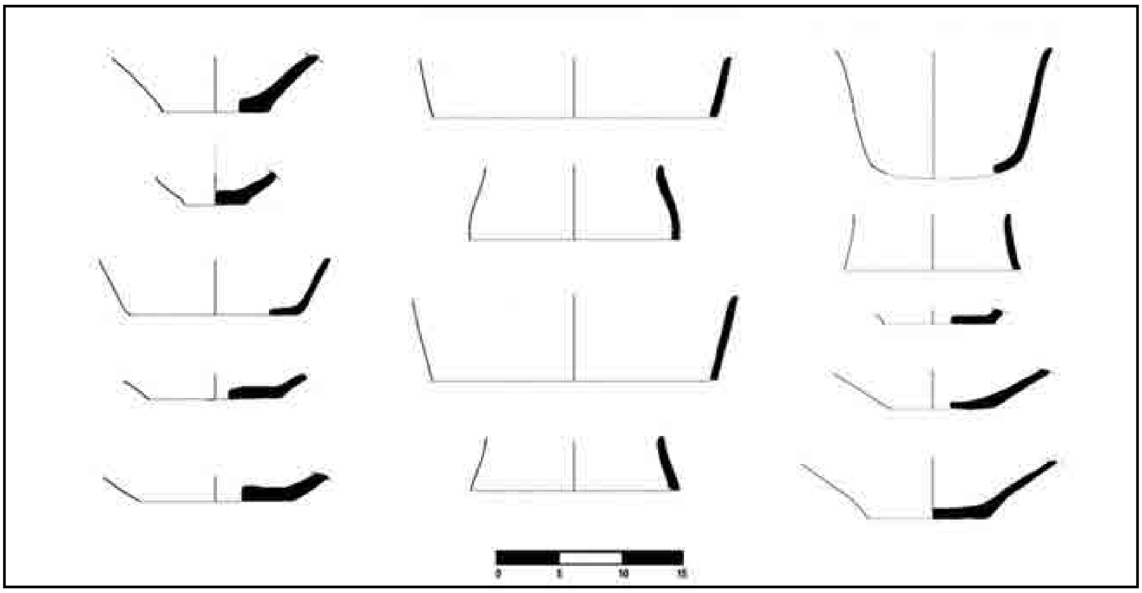


Fig. 33: Bowls, shallow dishes, deep bowls, and shallow flat-bottomed bowls found by Carlton Coon in Hotu Cave (Gregg and Thornton, 2012)

from context 64 (dated to 6083-5990 cal BCE). These results indicate an occupation of approximately 400 years during the Pottery Neolithic. It is significant to mention that the C14 dating from context 64, which originated from the upper layers, where samples have moved and become diffused in the lower layers of Hotu Cave. A total of 24 pottery pieces were discovered in contexts 67, 65, 64, 63, 61, and 59 (see: Fig.s 34, 35 & 36). Carbon-14 dating indicates that context 63 dates back to 6400 BCE. Among the earliest pottery from Neolithic contexts, we found reddish-brown pieces with a thin glazed coating. Earlier, Coon had attributed these to Kamarband Soft Wares, a local pottery tradition that was extensively used in Hotu, known as the "Caspian Soft Wares." It is important to note that pottery from context 67, which was found at a lower depth, has not been dated. Therefore, we suggest that the beginning of the Pottery Neolithic in Hotu Cave should be placed around 6600 to 6500 BCE. The pottery from this period is relatively well-baked and features a reddish-brown edge adorned with a colorful striped design. Unfortunately, only one sample of this type was found, and given its antiquity, further discussion is necessary. However, the stratigraphy appears clear, and only a few pottery pieces from the Pottery Neolithic period were retrieved from Hotu Cave.

This type of ceramic is contemporary with Tappeh Sang-e Chakhmaq, yet it differs from both the Sang-e Chakhmaq and Djeitun cultures. These ceramics feature a reddish slip adorned with geometric designs arranged in horizontal bands, showcasing a new cultural style. The ceramic pieces have a flat base and a carinated body.

13. The Transitional Chalcolithic period

During the Transitional Chalcolithic period, the societies of the north-central plateau of Iran established connections with those in northeastern Iran through the exchange of cultural materials and stylistic influences (Fazeli Nashli *et al.,* 2024; Thornton, 2013; Dyson and Thornton, 2009).

The pottery from this period evolved into a style known as Cheshmeh Ali/Sialk II, which was discovered in the cave at a depth of -415 cm, specifically in context 58.

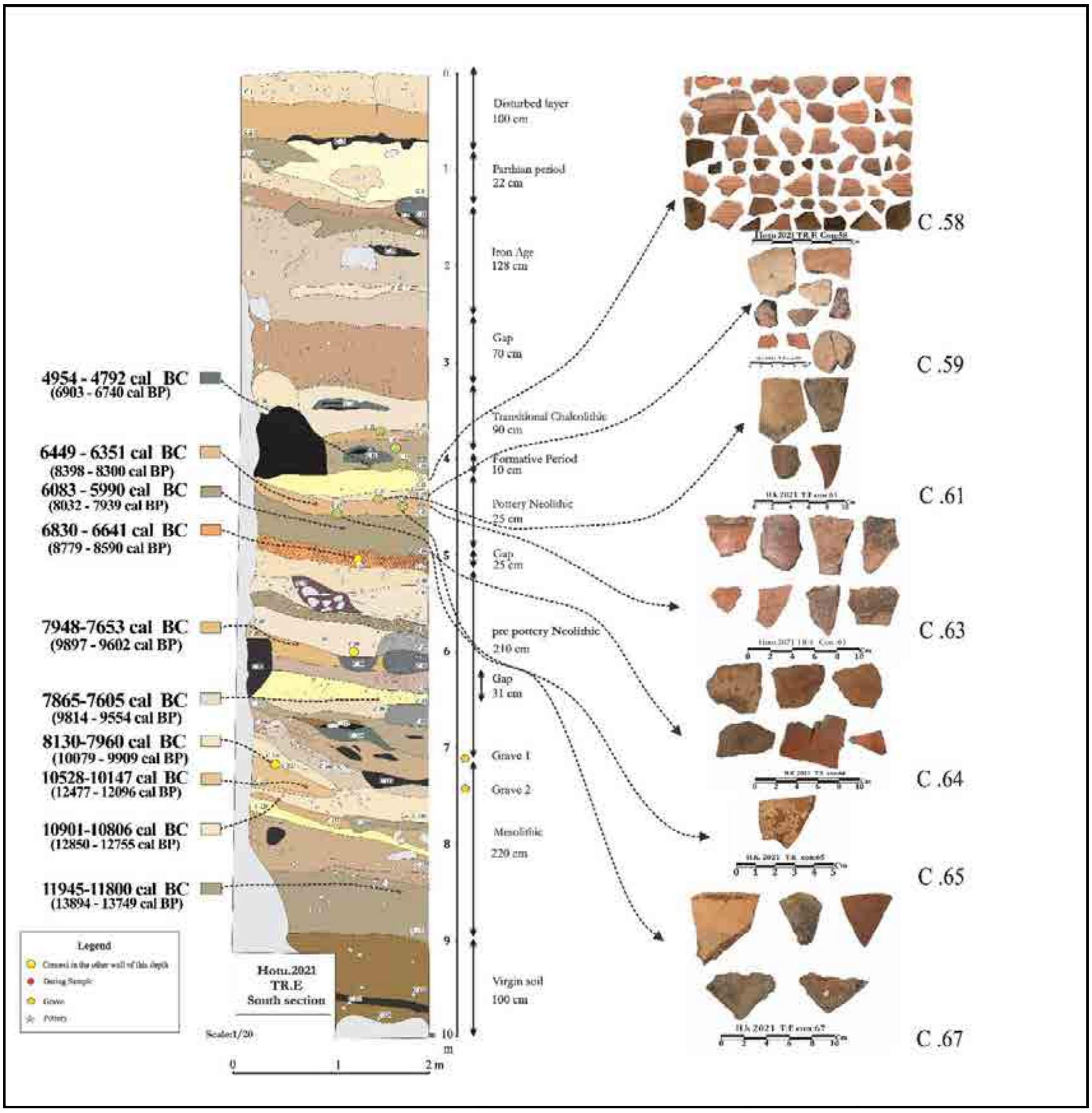


Fig. 34: pottery Neolithic and Formative period find from Hotu Cave in the re-excavation (drawn by Mina Madihi).

However, a carbon dating sample from this pottery indicates a date range of 4,954-4,791 cal BCE at a depth of -370 cm, in context 45. Given that the Cheshmeh Ali pottery type appeared at a depth of -415 cm, which was not dated, it is reasonable to infer that the introduction of red ceramic in the Hotu cave likely occurred much earlier. The origin and spread of the Cheshmeh Ali ceramic ware in northeastern Iran still pose challenges for researchers. This pottery may resemble that of Sang-e Chakhmaq; however, it is actually a few hundred years older than the earliest pieces found in Tappeh Sang-e Chakhmaq (Fig. 37).

The Cheshmeh Ali/Sialk II ceramic type appeared in northeastern Iran around 5500-5300 BCE at sites such as Tepe Pahlavan and Ghaf Khaneh (Akbari Zarrin Qabaei *et al.,* 2024; Roustaei, 2018). Notably, during the same period, the Transitional Chalcolithic began in the north-central plateau around 5250 BCE. Morteza Hessari proposed a time range for this development of 5,321–5,051 BCE based on findings from Tappeh

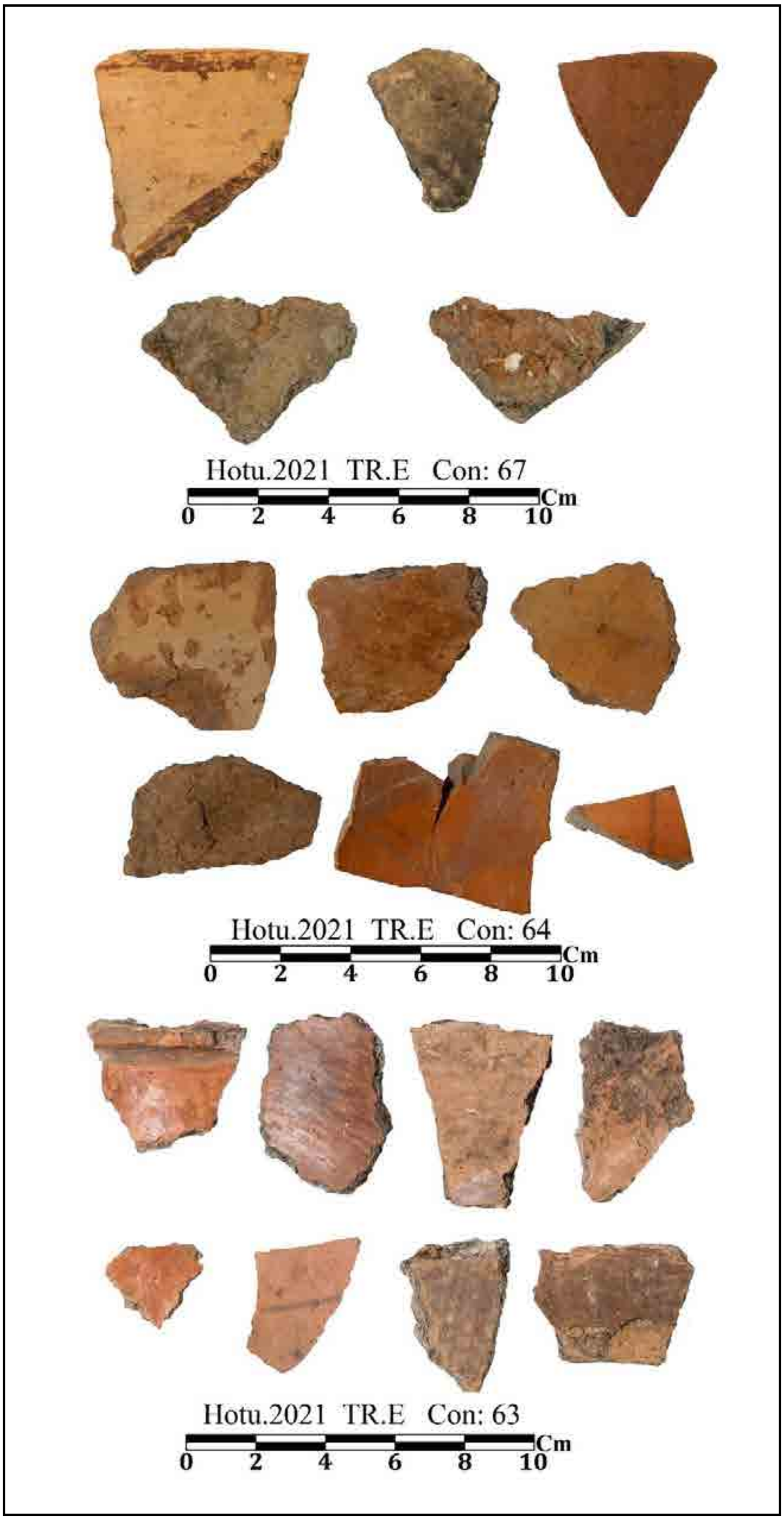


Fig. 35: Pottery Neolithic period obtained from Hotu Cave, Neolithic (Kamarband Software).

Moeinabad (Hessari *et al.,* 2024). The ceramics from the north-central plateau are much finer than those of the Caspian Sea Transitional Chalcolithic type, suggesting that they were likely introduced independently.Dyson has suggested that the Cheshmeh Ali ware appeared in northeastern Iran around 5300-4400 BCE. We believe that the maximum time gap between the emergence of Cheshmeh Ali pottery in northeastern Iran and the northern Central Plateau is approximately less thsn 100 years. Based on the current data, we can propose that the beginning of Cheshmeh Ali ceramics was an independent innovation in northeastern Iran, rather than a result of demographic diffusion from the northern Central Plateau. Numerous C14 dates from Transitional Chalcolithic sites, such as Qaleh Khan, indicate a timeframe of 4,954 – 4,791 cal BCE (Garazhian *et al.,* 2024).

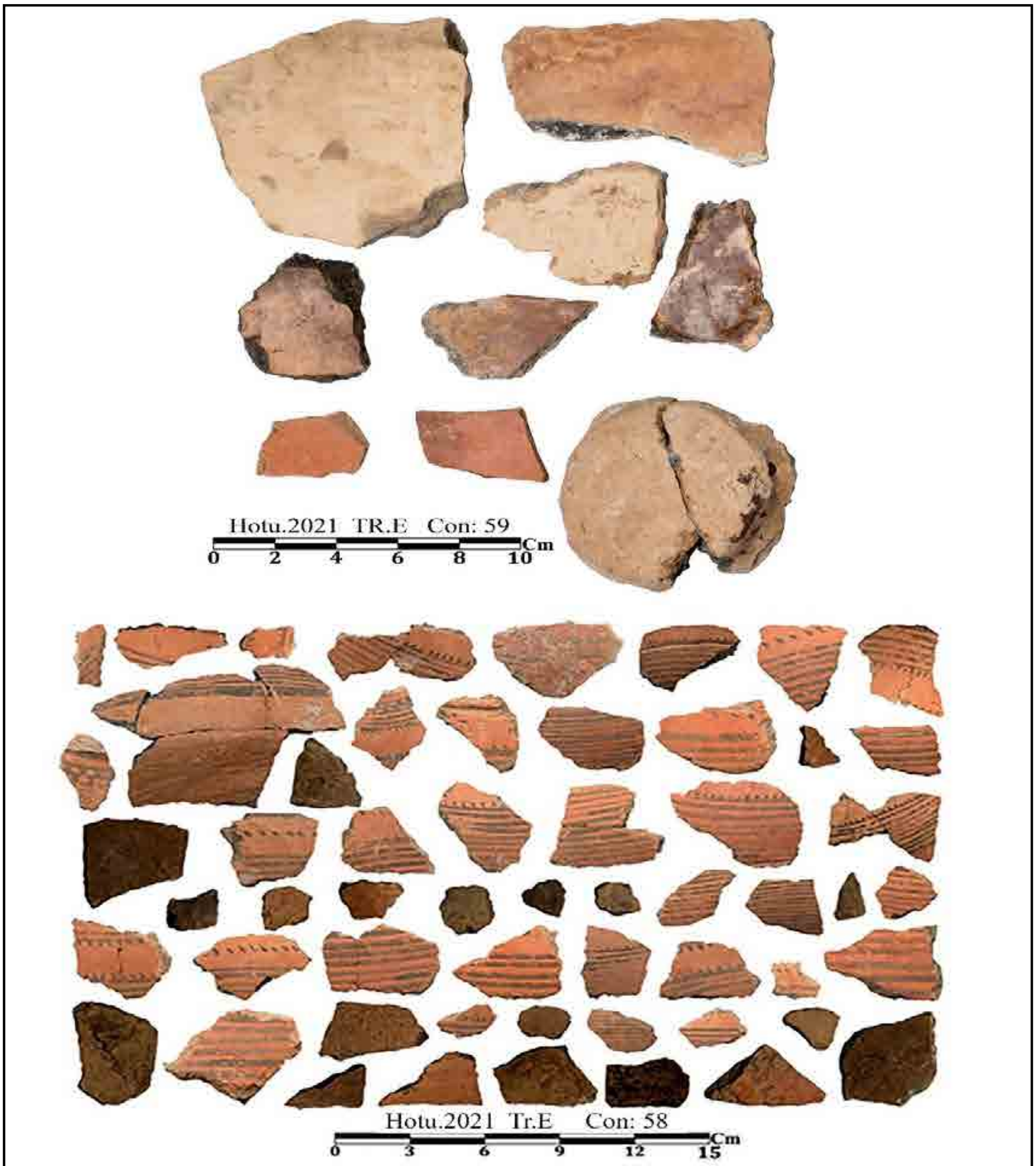


Fig. 36: Selected pottery sherds from Hotu Cave, Formative Period.

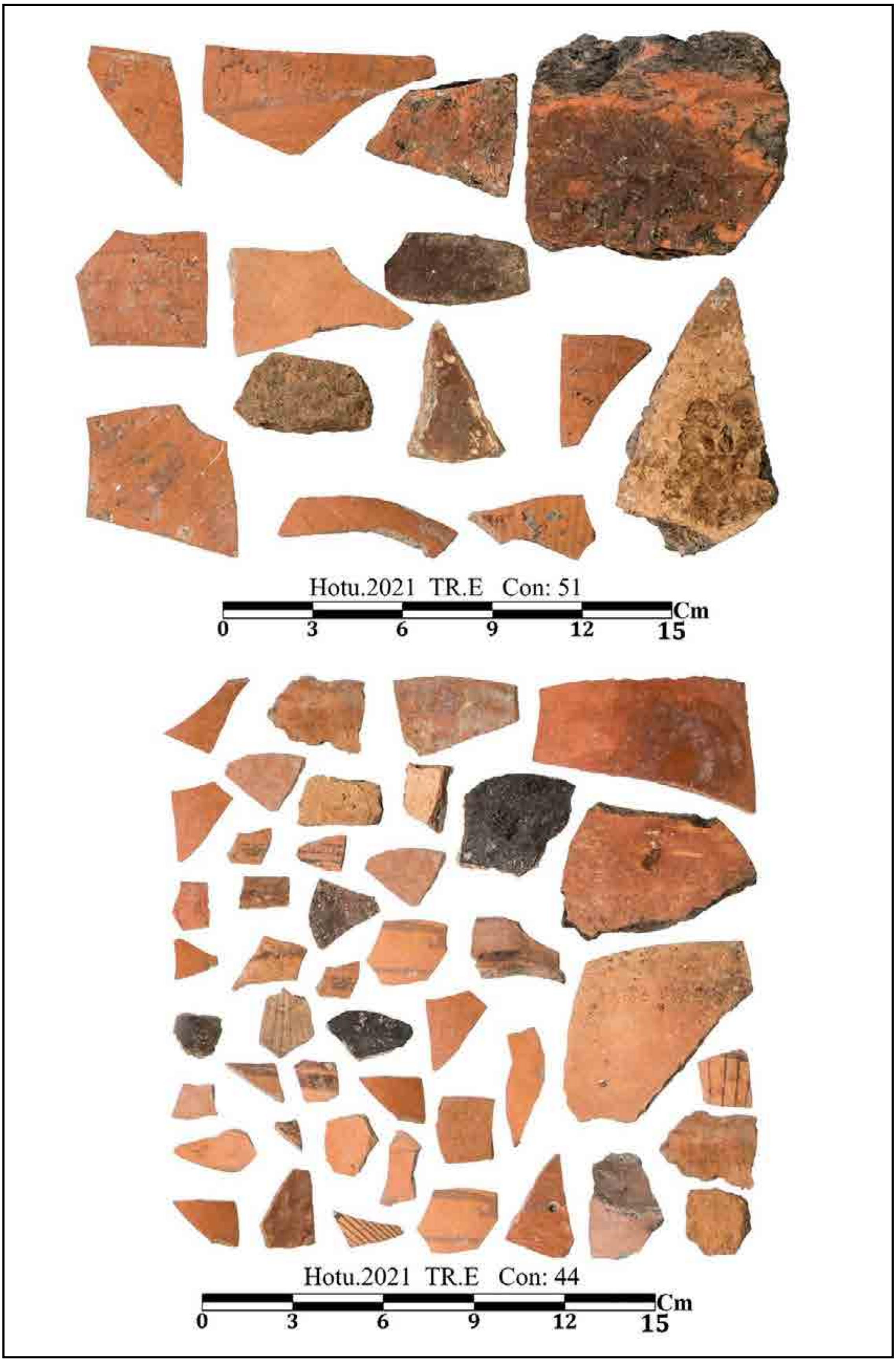


Fig. 37: Typical pottery wares and decorations from Hotu Cave, Transitional Chalcolithic period.

14. Absolute dating results based on the re-excavation of Hotu Cave

Hotu Cave is one of the oldest Mesolithic caves in Iran. It has been dated multiple times (Gregg and Thornton, 2012; Coon 1950, 1951), but several errors necessitated a re-excavation of the cave in 2021. Radiocarbon samples from Coon were analyzed by renowned radiocarbon expert Elizabeth Ralph, who tested 22 samples from 17 layers of Hotu Cave. Coon's materials were sent to two laboratories for verification, yielding dates of 9190 ± 590 years by Ralph and 9480 ± 250 years by Dr. J. Laurence Kulp from Columbia University (Coon, 1957: 207; Ralph, 1955: 150-151).

In 2013, Jennifer McAuley dated the skeleton found in Hotu Cave using AMS dating based on a single tooth. She believed that most samples were contaminated with plastic, urethane, wire, and glue, making them unsuitable for dating. Her results indicated dates of 10985 ± 15, 10720 ± 70, 10610 ± 10, and 11045 ± 15 years ago (McAuley, 2013).

Coon proposed four cultural periods based on data from Trench D. The Neolithic period began around 6120 ± 500 BCE. This was followed by the Vole Mesolithic period, which includes three human burials dating back to 7240 ± 590 BCE. The Vole Mesolithic period itself dates back to 7270 ± 570 BCE. Lastly, the Mesolithic (Seal Hunters) period dates back to 9910 ± 810 BCE. Furthermore, Coon notes that these dates align perfectly with those from Kamarband Cave, suggesting that both caves were inhabited around 10,000 BCE (Coon, 1957: 209).

Nine samples for carbon-14 dating were collected during the 2021 excavation activities in Hotu Cave (Fig. 38) comprising both charcoal and bone samples, to determine the absolute ages of the Mesolithic and Neolithic periods, and in particular the transition between the Early Neolithic and Late Neolithic. To prevent contamination, each sample was carefully placed in aluminum foil using tweezers and assigned with precise coordinates placed onto the sample tissue. These samples were analyzed using radiocarbon measurement techniques with Accelerator Mass Spectrometry (AMS) at the Beta Analytic Testing Laboratory in the United States. The results, presented with a 2-sigma error, were then processed using OxCal software version 3.2 (Figs. 38 & 39).

The dating results from four samples collected from the Mesolithic period at Hotu Cave include one charcoal sample and three bone samples. The earliest date identified is 11,945-11,800 cal BCE from context 121, located at a depth of 845 cm. The second sample, taken from context 115 at a depth of 750 cm (Burial 2), dated to 10,901-10,806 cal BCE. The third sample, found at a depth of 740 cm in context 113, yielded a date of 10,528-10,147 cal BCE. Additionally, the end of this period is dated to between 8,130 and 7,960 cal BCE in context 111 (Burial 1), situated at a depth of 720 cm.

These two burials are approximately 1800 years apart, yet only about 30 cm of sediment separates their layers. Given the close proximity of the two burials, it is likely that pit digging from above may have caused disturbance to the lower layers. Consequently, the dating of this period remains uncertain until further samples from the fire provision and adjacent plant layers in these burials can be analyzed to clarify this ambiguity. Three radiocarbon dates from the Early non-ceramic Neolithic period were obtained. The beginning of this period is represented in context 99, where a sample taken from a depth of 632 cm dates to between 7,865 and 7,605 cal BCE. There is a noted hiatus in context 98, which has an approximate thickness of 32 cm. Another sample from context 88, extracted at a depth of 590 cm, dates to between 7,948 and 7,653 cal BCE. The final test sample comes from context 77, which is recognized as the last settlement layer before the

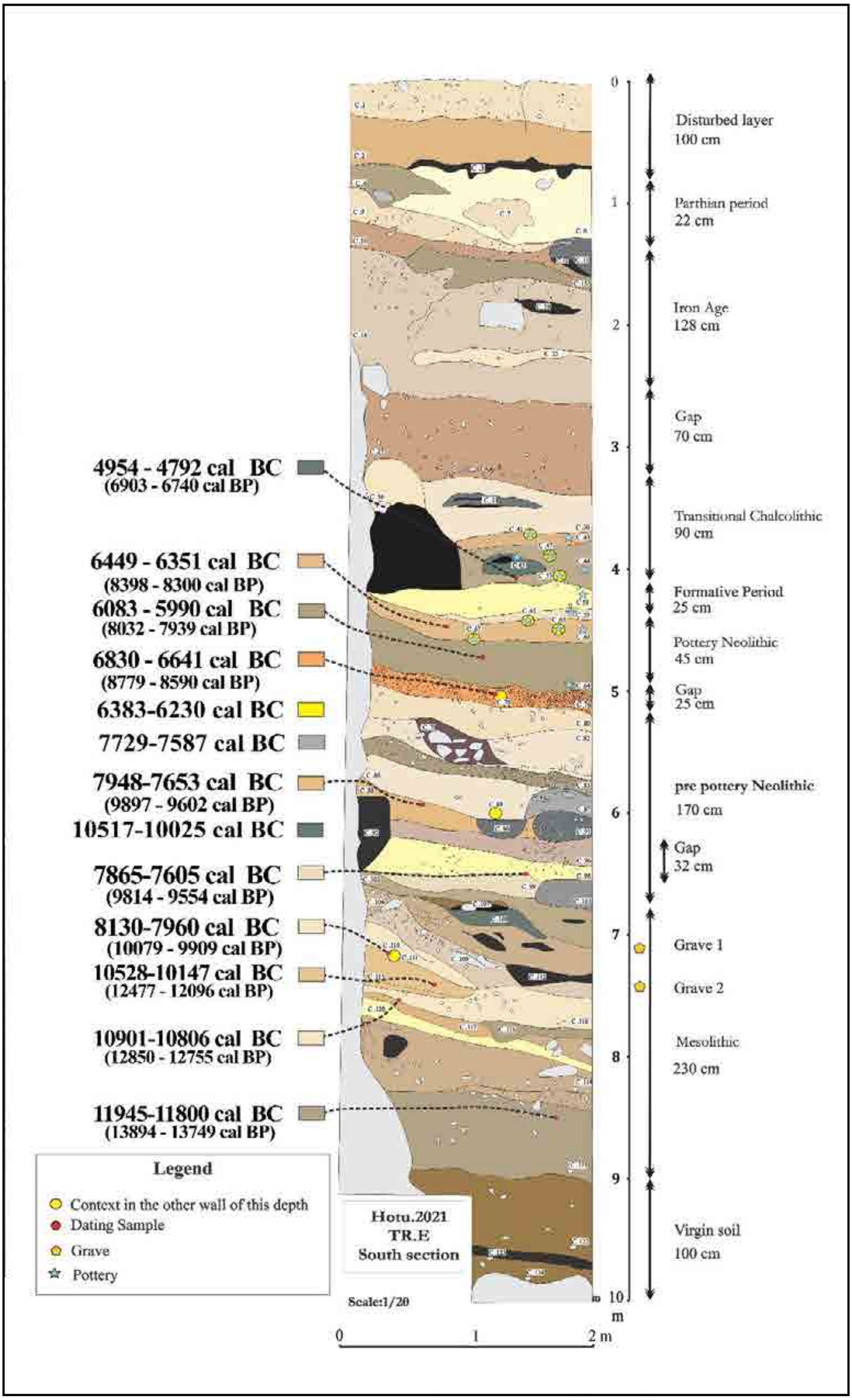


Fig. 38: The stratigraphy section of Trench E and the absolute dating in the Mesolithic and Neolithic period of Hotu Cave, (designed by Mina Madihi)

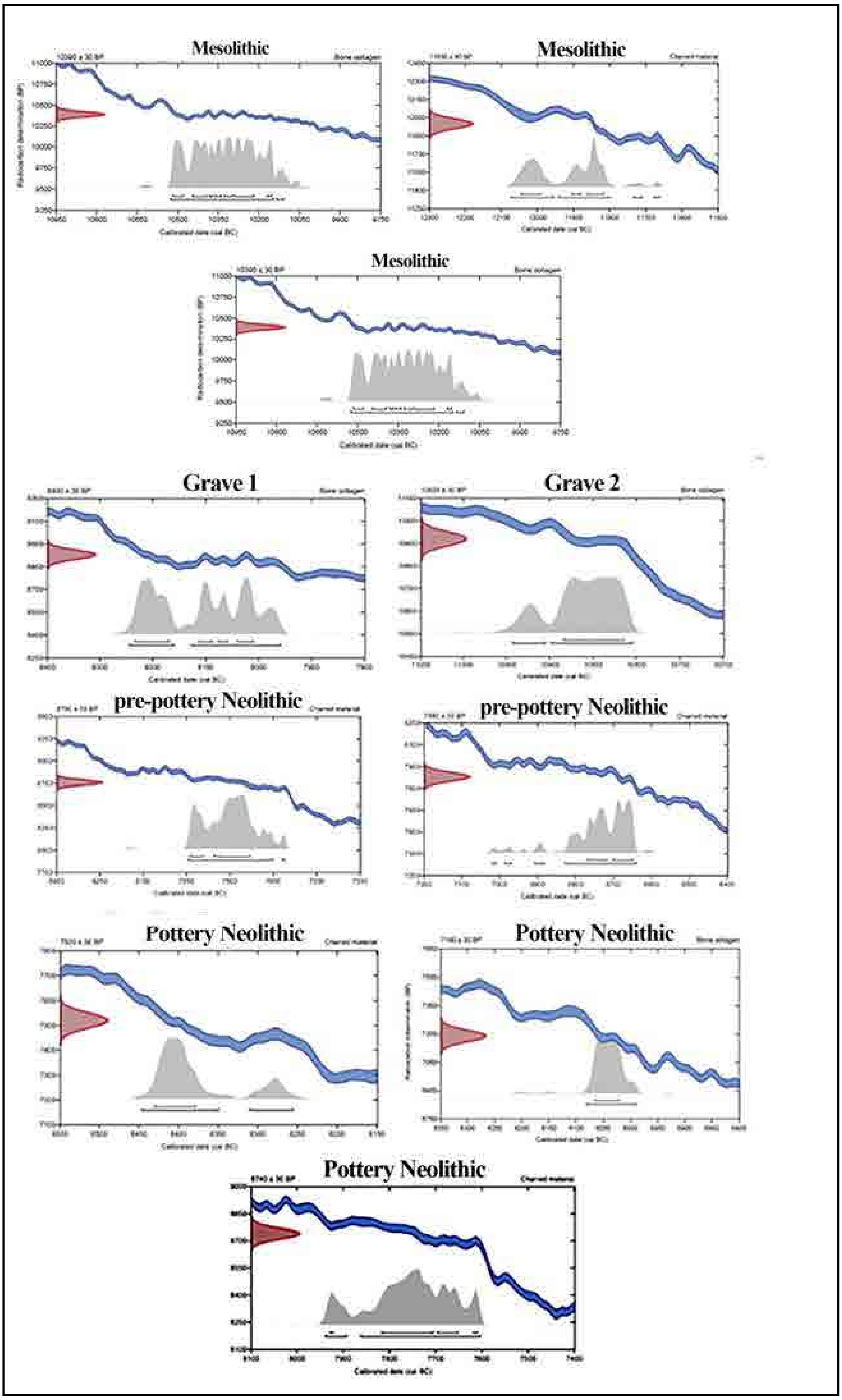
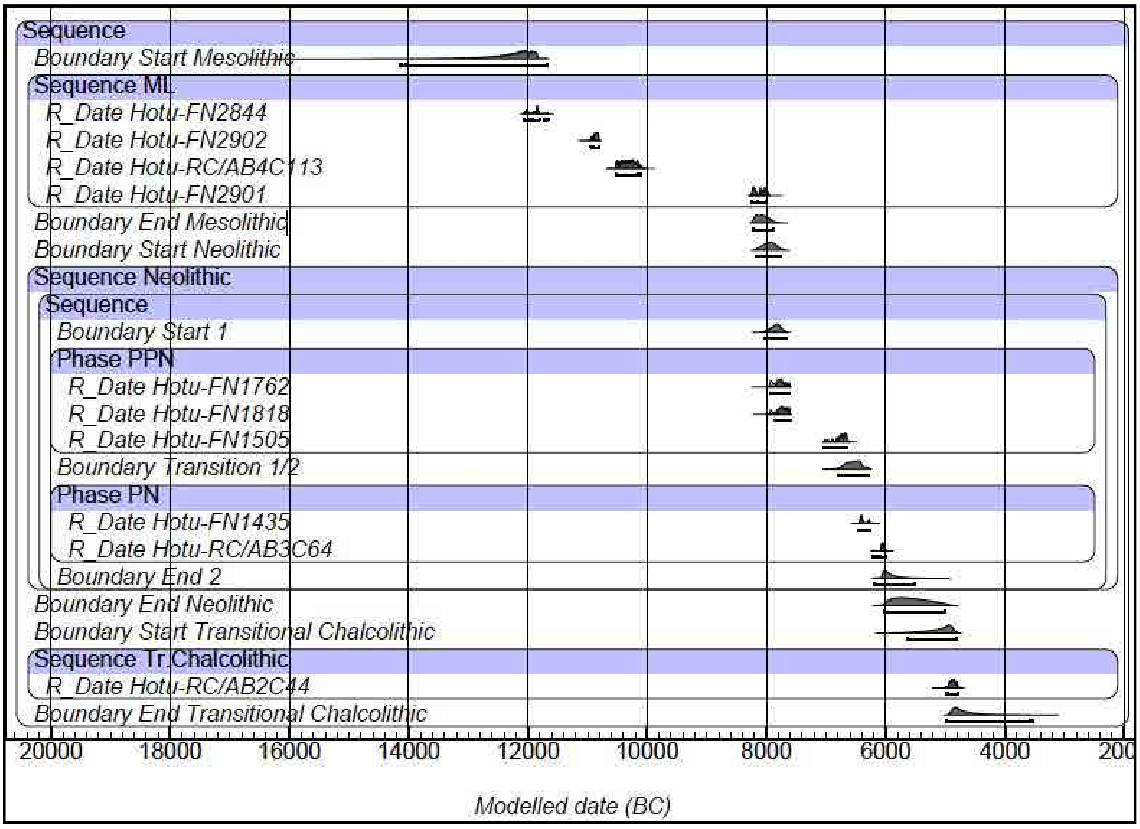


Fig. 39: Calibrated and modeled the absolute chronology diagram of the Mesolithic and Neolithic periods of Hotu Cave

Table 1: Ox Cal model of absolute chronology of Hotu Cave samples



earthquake that affected context 75, marking a significant hiatus in the cave's occupation. This sample, taken from a depth of 504 cm, dates to between 6,830 and 6,641 cal BCE.

The Late (ceramic) Neolithic period begins in context 67; however, due to the lack of charcoal samples for radiocarbon testing, we selected samples from context 64 (one bone sample) and context 63 (one coal sample). The sample from context 64 dates between 6,083 and 5,990 cal BCE, while the sample from context 63, taken from a depth of 442 cm, falls between 6,449 and 6,351 cal BCE. These results demonstrate that the cave was inhabited from 11,945-11,800 cal BCE to between 6,449 and 6,351 cal BCE (spanning the Mesolithic to the Pottery Neolithic periods), though this settlement was not continuous. One key distinction between the recalibrated dates presented by Gregg and Thornton and the absolute dating from the re-excavation survey is a difference of 1,000 to 2,000 years in the calibrated dates provided by Gregg and Thornton. In contrast, the time difference in the recalibrated dating is only about 300 to 100 years. Therefore, we have achieved more accurate dating.

15. Conclusion

The re-excavation project at Hotu Cave in 2021 aimed to identify the stratigraphy of the cave and examine its occupation periods. Over the course of 70 days, the team excavated 10 meters and uncovered evidence of seven cultural periods: the Mesolithic, Neolithic (both Early /or non-ceramic and Late/ceramic phases), Transitional Chalcolithic, Iron Age, and the Parthian period.

The findings from the new excavation revealed several gaps in the archaeological record, prompting a revision of Carleton Coon's previously established occupation history

Table 2: Comparative Chronology proposed by Carleton Coon 1957 and Ralph 1955, Gregg and Thornton 2012 and the excavation of 2021.

Period	Radiocarbon dating by Coon, 1957 and Ralph, 1955	Calibrated by Gregg and Thornton, 2012	Revision excavation by Fazeli Nashli, 2021	
			Absolute data	context
Islamic	1220± 230 BP = 730 AD	565-1020 cal AD	324 - 418 cal AD	8 to 1
Parthian?	2200± 280 BP = 250 BC	760-40 cal BC		9
Early Iron Age	2685± 210 BP = 735 - 1000 BC 2950± 230 B.P = 735 – 1000 BC			27 to 10
Painted Pottery/Transitional Chalcolithic (Cheshmeh-Ali Ware)	4830± 480 B.P = 2880 B.C	4345-3105 Cal BC	4954 - 4791 cal BC	57 to 30 59 to 58
Neolithic Software	6385± 425 B.P = 4435 B.C	5975-5050 Cal BC	6083 - 5990 cal BC 6449 - 6351 cal BC	67 to 60
Sub-Neolithic (non-ceramic) Early Neolithic	8070± 500 BP = 6120 BC (TR. D)	7940-6650 cal BC	6830 - 6641 cal BC 7865 - 7605 cal BC	103 to 77
Mesolithic	9190± 590 BP = 7240 BC (TR. D)	9800-7975 cal BC	8130 - 7960 cal BC 10901-10806 BC 10528 - 10147 cal BC 11945-11800 B.C	121 to 104
	9220± 570 BP = 7270 BC (TR. D)	9875-8000 cal BC		
	11860± 840 BP = 9910 BC (TR. D)	13920-11350 cal BC		

of Hotu Cave. During his excavations, Coon reached a depth of 12.5 meters in Trench D and documented five human burials, animal bones, pottery, and various special finds.

In contrast, our 2021 excavation in Trench E's lower layers uncovered two human burials, several fireplaces, stone artifacts, and both plant and animal remains. These discoveries indicate that Hotu Cave was inhabited by the last hunters and gatherers from 11945 BCE during the Mesolithic period, transitioning to practices of agriculture and animal husbandry in the Neolithic. The excavation conducted in 2021 reveals that there were significant periods of inactivity during the Holocene period. Some of these hiatuses may have been local, while others could represent a regional phenomenon. The inhabitants of the cave adapted their way of life according to environmental factors and adjusted to changing conditions. For instance, during periods of high fluctuation in the Caspian Sea, when the distance between the coast and the cave was minimal, the hunters primarily relied on hunting Caspian seals. However, as the water level dropped and plains gradually emerged along the southern shores of the Caspian Sea, increasing the distance between their settlement and the shore, the hunter-gatherer communities shifted their focus to hunting herbivorous mammals like deer.

In recent years, significant archaeological researches have been carried out on both sides of the Alborz Mountains. From the recent archaeological research programs, we not only revised the chronology both sides of Alborz Mountain but also scrutinize the patterns of human community movement and human-environment interactions during the Holocene period. Some of these paleo-environmental changes significantly impacted human societies, leading to the abandonment of agricultural lands, and forcing people to abandon their homeland until nature returned to its natural state after a few centuries, allowing agricultural life to flourish again. For example, at Hotu Cave, Kamarband and Komishani, some of these phenomena can be observed which is related to climate events such as 10.2 ka, 8.2 ka, and 7.2 ka. In this paper we also address some evidence of the 7.2 ka climate event is significantly associated with the Caspian Sea regression which obviously caused major changes in the human occupation pattern. These changes can be observed not only in the archaeological sites of the northern part of the Alborz Mountains but also clearly in the northern part of the Central Iranian Plateau. Ancient sites such as Sialk, Zagheh, Ebrahim Abad and Moein Abad clearly show the effects of climate change and systematic cultural collapse after 5000 BCE. In northeastern Iran, from Tappeh Sang-e Chakhmaq, Tepe Pahlavan to Hotu cave, we have witnessed such phenomena. In conclusion, recent research highlights the need for a review of the overall climatic changes during the Holocene period, and therefore, in the future, there should be interdisciplinary research programs between archaeologists and paleo-climatologists to reconstruct the depth and extent of climate changes and their impacts on human societies.

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بازنگری لایه‌های باستان‌شناسی غار هوتو، ایران: گزارش مقدماتی کاوش‌های باستان‌شناسی سال ۱۴۰۰

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چکیده

دورهٔ میان‌سنگی و گذار آن به دورهٔ نوسنگی در جنوب‌غرب آسیا، یکی از مهم‌ترین مراحل تحول فرهنگی انسان است که در آن جوامع انسانی به تدریج شیوهٔ زندگی و رفتار فرهنگی خود را تغییر داده و وارد عصر جدید شدند. انسان پس از هزاره‌ها سبک زندگی به‌عنوان شکارچیان و خوراک‌جویان سیار وارد دوره‌ای شدند که برخی از دانشمندان آن را عامل شروع دورهٔ آنتروپوسن (دورهٔ انسانی) می‌دانند؛ بنابراین، مطالعه و شناخت شیوهٔ زندگی شکارچی-گردآورنده‌های دورهٔ میان‌سنگی و ورود آن به عصر نوسنگی بسیار ضروری می‌باشد. درحال حاضر، چندین استقرارگاه‌های باستان‌شناسی مهم در محدودهٔ نوار جنوب‌شرقی سواحل دریای خزر مورد پژوهش قرار گرفت که دارای توالی‌های غنی از شکارچیان و گردآورندگان خوراک از حدود ۱۵,۰۰۰ تا ۱۰,۰۰۰ سال پیش را نشان می‌دهد. این غارها ازلحاظ موادفرهنگی این دوره بسیار چشمگیر است و قابل‌مقایسه با هیچ جای ایران نیست. یکی از این مکان‌ها، غار هوتو است که در نزدیکی شهر امروزی بهشهر واقع‌شده و نخستین‌بار در سال ۱۹۴۹ و ۱۹۵۱م. توسط انسان‌شناس آمریکایی کارلتون کوون کاوش شد؛ اما متأسفانه به‌دلایل مختلفی گزارش مناسبی از این غار هرگز ارائه نشد. فعالیت‌های جدید ما در این غار پس از ۷۰ سال به‌دنبال تحقق یک تقویم گاهنگاری درست و مطمئن از دورهٔ میان‌سنگی تا دورهٔ اشکانی و پیوند دادن خلأهای واضح در توالی غار و تغییرات اقلیمی و محیطی در سال ۱۴۰۰هـ.ش. بوده است. کاوش جدید در غار هوتو، نه‌تنها برای جانمایی داده‌های حاصل از کاوش‌های کوون مفید است، بلکه به ما کمک کرد تا بتوانیم توالی جدیدی را برای این غار پیشنهاد نماییم. در این پژوهش، ما نه‌تنها داده‌های کاوش سال ۱۴۰۰ را شرح داده‌ایم، بلکه تمام پیشنهادهای دوره‌بندی که توسط کارلتون کوون، مایکل گرگ و کریستوفر تورنتون را نیز جمع‌بندی و با داده‌های جدید ترکیب کرده‌ایم. پروژهٔ ما نه‌تنها شامل داده‌های غار هوتو می‌باشد، بلکه کاوش‌های اخیر در دو محوطهٔ مهم و کلیدی دیگر، یعنی غار کمربند و تپه کمیشانی را با هم مقایسه کرده‌ایم. براساس کاوش‌های اخیر در منطقه می‌توان مدلی جدید از گذار به دورهٔ میان‌سنگی به نوسنگی جنوب‌شرق دریای کاسپی پیشنهاد نمود. همچنین داده‌های اخیر نشان می‌دهد که شاید این منطقه، یکی از کانون‌های اولیهٔ اهلی‌سازی حیوانات و گیاهان درنظر گرفته شود که برای تدوین این مهم باید منتظر نتایج دیگر داده‌ها باشیم.

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An Interim Report of the New Excavations at the Neolithic Site of Chogha Golan, Ilam Province, Western Iran

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Abstract

Chogha Golan has previously found a spectacular place in studies of the emergence of early agriculture and sedentary life in western Asia. Earlier brief work by the University of Tübingen in 2009-2010 suggested that Chogha Golan was inhabited between ca. 9700-7600 BC and witnessed a long initial experimentation with food production. However, despite this significant archaeological position, the site was left without further fieldwork until a new stage of excavations was initiated in 2023, aimed at investigating the diverse nature of the long-term resilience of the inhabitants of the Zagros foothills over the course of the transition to the Neolithic. In this regard, the first season of the excavations was carried out in October-November 2023. Accordingly, an 4×8 m area was excavated at the top of the site. As a result, 5 occupational phases were distinguished based on architectural remains within 285 cm of residential sequence yet excavated. However, the virgin soil was not reached, leaving investigation of remaining underlying levels to the next season. This article presents the preliminary results of the 2023 excavations and then contextualizes their significance for a better understanding of the Neolithization process across the Zagros region.

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1. Introduction

The 'hilly flanks' of the Zagros Mountains played an important role in the formulation of early theories about the origins of agriculture and sedentary life. In the last seven decades, however, they have been less and less explored. In the 1940-50s, the pioneering investigations of R. Braidwood (1960) laid the foundation for the subsequent intensification of work in the 1960-70s, when key sites such as Ali Kosh (Hole *et al.,* 1969), Ganj Dareh (Smith, 1990) and Guran (Mortensen, 2014) were excavated. However, later political instability shifted the focus of research to the Levant and more recently to the upper reaches of the Euphrates and Tigris rivers along the Taurus, with the result that the Zagros received little attention (see Darabi 2015; Matthews and Fazeli Nashli 2022; Watkins 2024; Zeder 2024a). Since the late 2000s, several new projects have been undertaken in the central Zagros of Iran, where a considerable amount of promising evidence has come from the sites of Sheikhi Abad (Matthews *et al.,* 2013), East Chia Sabz (Darabi *et al.,* 2011) and Chogha Golan (Zeidi *et al.,* 2012). Together with the revision of Ganj Dareh and Asiab (Darabi 2019; Richter *et al.,* 2021), they contributed to a better understanding of the transition to Neolithic life during the first three 'creative millennia' of the Holocene, when local societies took their first steps towards socio-economic transformations, including early cultivation and animal husbandry (Darabi, 2022; Zeder, 2024b). Accordingly, we are now in a position to estimate the beginning of 'low-level food production' on the flanks of the Zagros and Chogha Golan has contributed significantly to this estimate. According to the data published so far, people experimented with a wide range of plants at this site for a long time. Thus, over a long period of occupation spanning the 10th -8th millennia BC, there is evidence for a shift from the collection of wild plants to the cultivation of selected species, namely two-row barley, lentils and emmer (see Riehl *et al.,* 2012; 2016). However, later archaeobotanical reassessments have suggested that early domesticated species appeared abruptly at the site in the upper layers dating to the early 8th millennium BC (see Weide *et al.,* 2018). Together with the evidence from the synchronous site of Sheikhi Abad (Whitlam *et al.,* 2018), this called into question the local origins of agriculture throughout the Zagros region. However, this idea is generally based on a short stratigraphic excavation at Chogha Golan (see below).

The Transitional Neolithic (ca. 9800-8000 BC), during which time pivotal transformations towards Neolithic life took place, has been very little studied in the central Zagros. The layers presenting evidence of this period have been excavated in a very small area, less than 10 square meters on a regional scale. This highlights the importance of carrying out long-term and large-scale excavations at the relevant sites in order to address the key questions of 'why' and 'how' societies began to change the socio-economic aspects of their lives during the Transitional Neolithic. In this context, a new project entitled Tracing the Resilience of Neolithic Societies in the Zagros Foothills was launched in 2023. This project, led by H. Darabi, focused on Chogha Golan, a site that previously presented a long sequence dated to ca. 9700-7600 BC (see below). Accordingly, the first step was taken by conducting new excavations in October-November 2023. This article reports preliminary results of the excavations and, placing them within a regional context, argues how they could help our better understandings of the Neolithization process in the Zagros region.

2. Chogha Golan: Natural Setting and Research Background

Chogha Golan (X 618238; Y 3693852) is located 30 km north of the city of Mehran in the Amirabad region, Ilam province, western Iran (Fig. 1). The site lies 100 m from the right bank of the Konjan Cham River and about 4 km south of the village of Golan (Fig. 2). It rises 7-8m above the surrounding areas at an altitude of 495m above sea level. A late Islamic branch of the qanat passed along the eastern edge of the site. Chogha Golan is distinguished from the surrounding area by its light and grayish soil, which has a high intensity of artifacts, especially lithics and grinding stones amidst the cultivated fields (Fig. 3). The site is situated in a rolling landscape consisting mostly of Aghajari marl overlain by Quaternary alluvium. Only 1 km east of the site, the Gachsaran Formation consisted of gypsum over a wide area. 5 km further north, the limestone ridge of Shah Nakhjir forms the first range of the Zagros Mountains. We can therefore imagine how important these different microenvironments were for the formation of Chogha Golan at the beginning of the Holocene.

In 1993, the site was first reported to the Provincial Cultural Heritage Office in Ilam. As a result, samples of surface lithics were sent to Tehran, where they were assigned to the Neolithic period. Accordingly, the late A. M. Khalilian visited and documented Chogha Golan as a 'proto-Neolithic' site (Khalilian 1999; see also Nokandeh 2010). Until then, the site was referred to as Chogha Khulaman. In 1999, it was delineated by G. Nokandeh, who suggested an area of 3h as its original size (Nokandeh 2001). Since then, Chogha Golan has been the main official name in the literature. In 2008, using the data available at the time, H. Darabi wrote his master's thesis on the site and proposed it as a suitable site for the study of the Neolithization of the Mehran Plain[1] (Darabi and Fazeli Nashli 2009). The first excavations were carried out by the University of Tübingen under the direction of N. J. Conard and M. Zeidi in 2009-2010.[2] Their aim was to collect organic and inorganic materials to be analyzed for the reconstruction of the environmental conditions and subsistence economy of the site's inhabitants (Zeidi *et al.,* 2012:260).

For this purpose, they excavated an area of 4×2 m to a depth of 1.5 m. In addition, the stratigraphic data came from a smaller, 2×1.5 m deep sounding, which was opened in the immediate vicinity of a looting pit at the top of the site. As a result, 11 archaeological horizons (phases) were documented within 8 m of the excavated sequence overlying the virgin soil. The sequence was radiocarbon dated to ca. 9700-7600 BC (Conard and Zeidi 2013; Starkovich *et al.,* 2016; Riehl *et al.,* 2013; Zeidi and Conard 2013). Among other finds, botanical remains from Chogha Golan have received more attention. Accordingly, the site was first regarded as an initial center for the cultivation of two-row barley, emmer and lentil (see Riehl 2015; Riehl *et al.,* 2012; 2013). However, later analyses suggested that the earliest morphologically domesticated crops at this site emerged suddenly in the early 8th millennium BC, again pointing to external origins of early agriculture in the Zagros region (Weide *et al.,* 2017; 2018). Under these circumstances, the origin and development of agriculture at the site is still unclear. Despite the site's key position, particularly when it comes to the origins of agriculture in western Asia, the excavations have not continued since 2010.

3. Aims

As discussed above, there are already a considerable number of Neolithic sites in central Zagros (see: Fig. 1), and yet very little is known about the transition to the Neolithic. On a

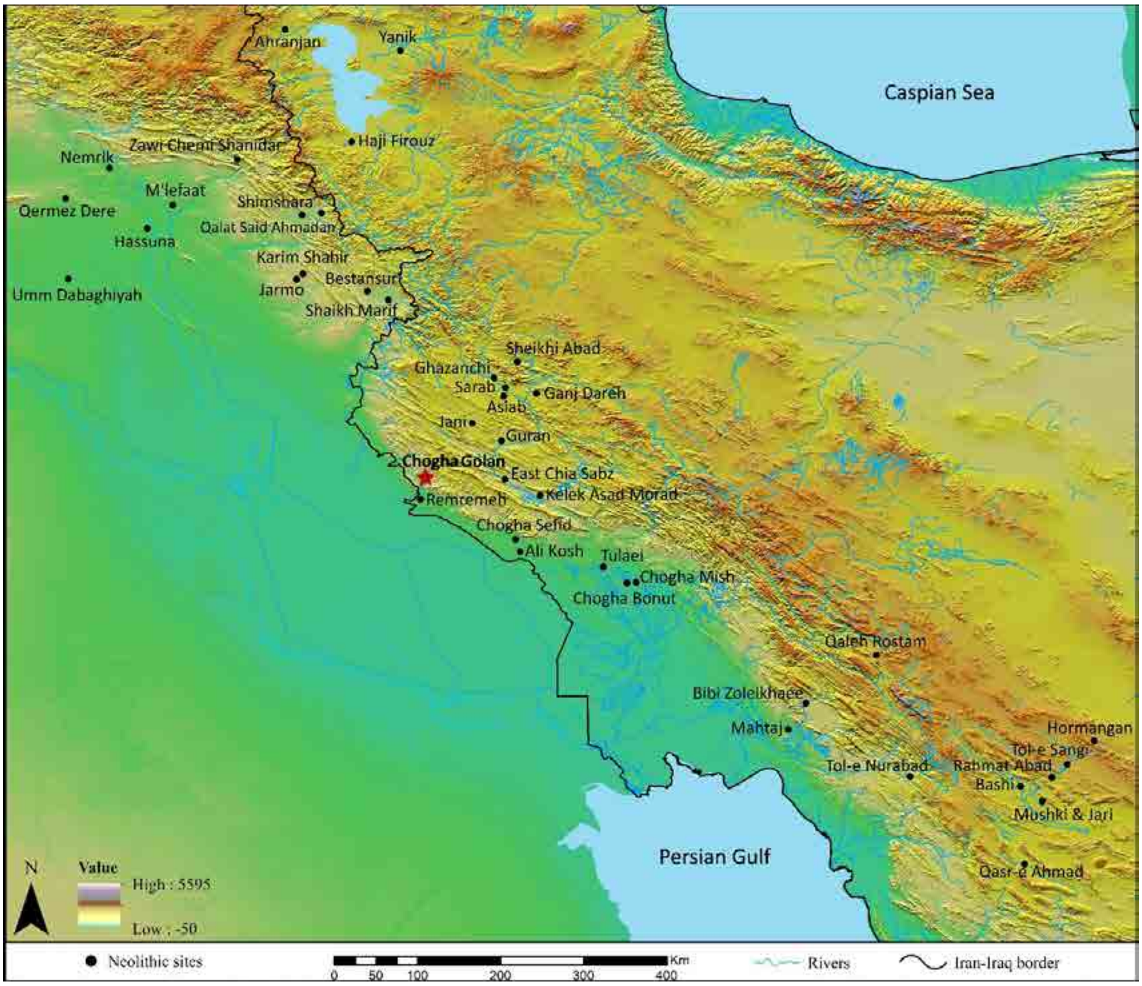

Fig. 1. Map showing the distribution of main Neolithic sites, including Chogha Golan, throughout the Zagros region (map: H. Ghobadizadeh).

wider geographic scale, the role of climate and environmental changes and the acceleration of population are widely acknowledged in investigating the Neolithic transition in western Asia (see Watkins 2024; Zeder 2017; 2024b). However, these discussions have not yet been systematically applied to the central Zagros to identify the most likely catalysts for the Neolithization process and the socio-economic transformation of the region. In order to clarify these key issues, the new stage of excavations at Chogha Golan was carried out between October 10 and November 20, 2023. The general aims of the project are therefore to:

- Investigate the nature of the emergence of agriculture in the Zagros foothills (subsistence resilience)
- Study the initial steps towards village life (residential resilience)
- Document the technological evolution of human societies in the Zagros foothills (techno-economic resilience)
- Assess the settlers' interactions with their environment and contemporary societies over time (eco-cultural resilience)

4. The 2023 Excavations

Based on the results of previous excavations and the topography of the site, we decided

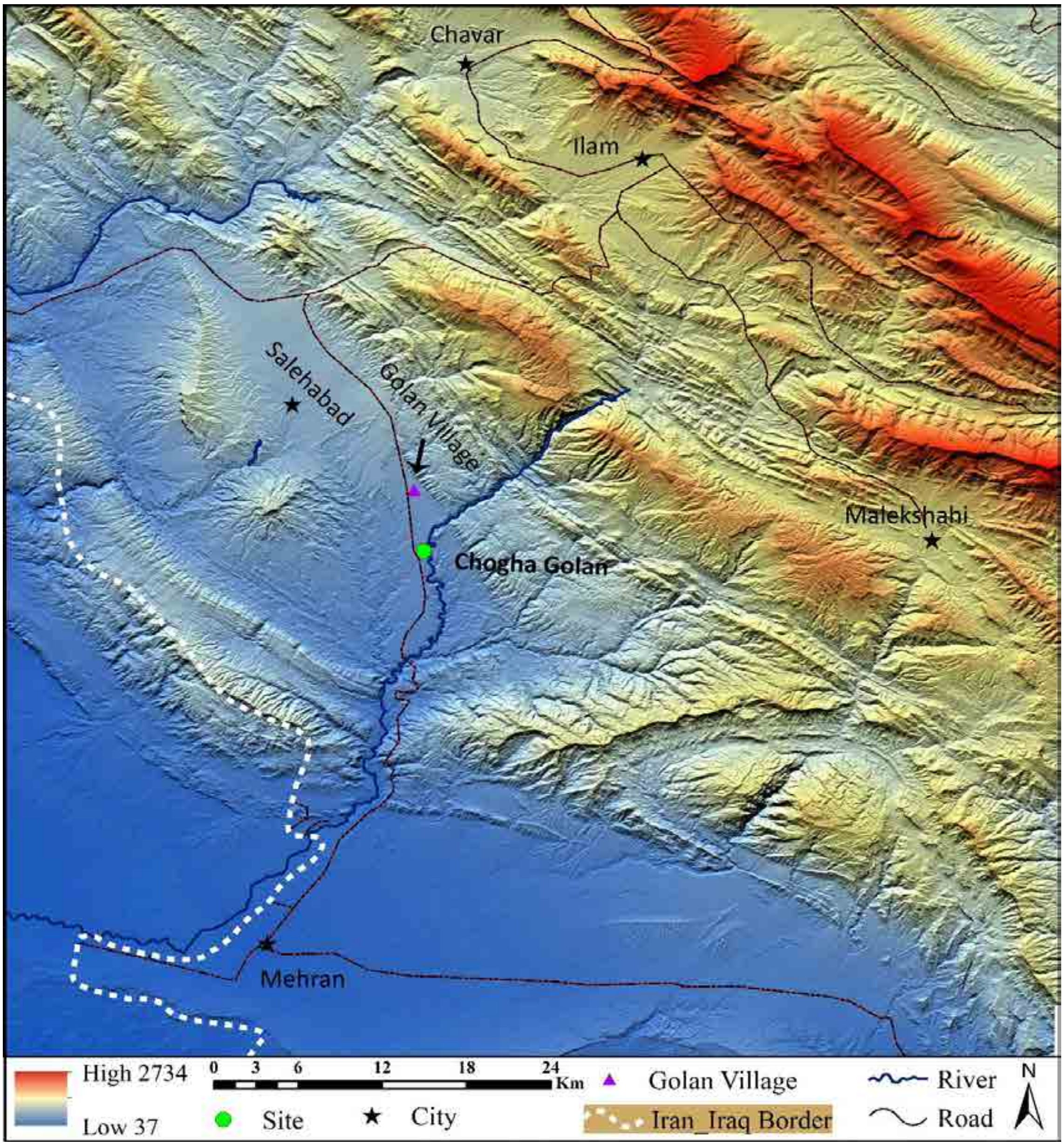

Fig. 2. The location of Chogha Golan on the right bank of the Konjan Cham River map (map: H. Ghobadizadeh).

to place our excavation area at the elevated central part of the site, where we expected to uncover a considerable amount of stratified architectural remains. This strategy was supported by evidence already revealed in the nearby looting pit at the summit of the mound, where the traces of several white plaster floors had been documented. We therefore opened up an 8×4 m area, designated Area I, in 2023. The excavation was initially carried out across the entire trench. Due to time constraints, we subsequently limited excavations to a smaller area of 3.5×2.5 m in the south-eastern corner, where stratigraphy was the main objective (Fig. 4). As evidenced by the architectural remains, five phases were distinguished within 285 cm of deposits, a depth at which the excavation stopped without reaching virgin soil (Fig. 5).

Phase 1 is represented by the appearance of three rooms built from a combination of clay slabs or strips, pise and mud bricks. Of these, only the central room, measuring 3.0

Fig. 3. Aerial view of Chogha Golan showing the location of former and new excavation areas, looking north-west (photo: H. Darabi)

Fig. 4. Aerial view of the excavation area in 2023 (photo: H. Darabi)

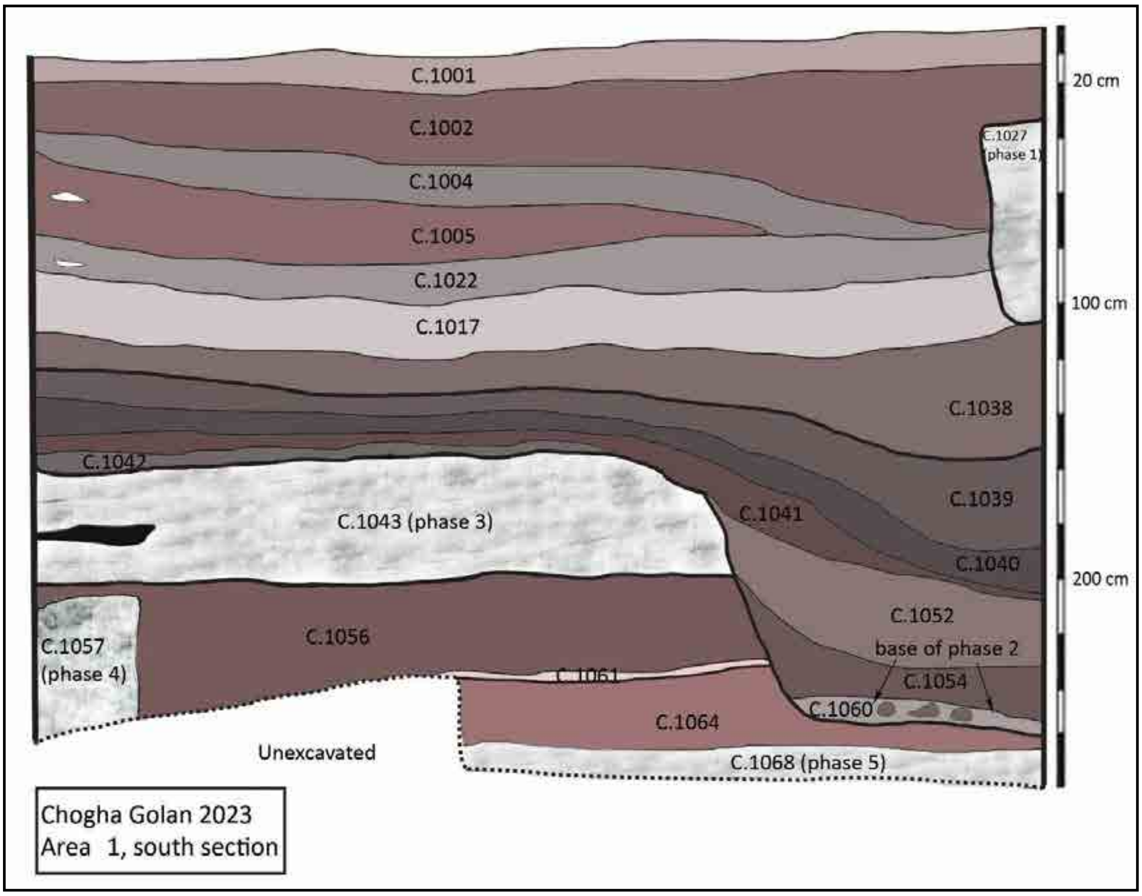

Fig. 5. Profile of the southern section in Area I showing distinguished phases separated by bold lines (drawing: H. Darabi)

× 2.0 m, was almost completely exposed in the excavation area. Interestingly, a circular pit with a diameter of 110 cm was uncovered in the middle of the central room. This had been dug down to 112 cm into the underlying deposit and contained a pair of animal horn cores. They were located at opposite positions in the northern and southern corners of the pit (Fig. 6). It is evident that they were deliberately placed in the pit, which itself was plastered with clay and covered with a layer of packed clay. The placement of animal horns and skulls was a common ritual behavior in the early Neolithic, as observed at other sites such as Ganj Dareh (Smith 1990), Sheikhi Abad (Matthews *et al.,* 2013) and Ali Kosh (Darabi *et al.,* 2024).

Phase 2 consists of an industrial area, including a partially exposed gypsum kiln and its burnt surroundings, in the southwest corner of the trench at a depth of 80-160 cm below the surface. In addition, part of a deep, large refuse pit (175 cm deep) was found in the eastern area of the trench. It seemed that the pit was used in connection with the nearby industrial area. It had been dug into the underlying phases 2-4, with a maximum depth of 260 cm.

Phase 3 is represented by the remains of a mudbrick structure and associated collapse, exposed between 160-200 cm below the surface. The nature of the structure is unknown. However, it was probably part of a platform.

Phase 4 is indicated by the remains of two walls of pise and mudbrick and their white plastered floors at a depth of 200-260 cm. In one partially excavated room, a mortar was

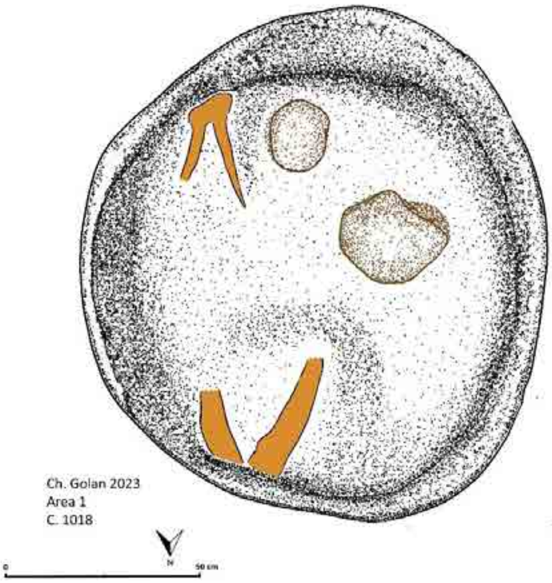

Fig. 6. Animal horn placed in a pit (photo and drawing: H. Darabi)

attached to the white floor. The floors and walls were elaborately plastered with gypsum and then decorated with red ochre.

Phase 5 consists of two wall stubs built of a combination of pise and mud bricks at a depth of 244-285 cm. A white plaster floor was also uncovered in connection with the walls. The relevant floor was again decorated with red ochre.

In an attempt to stratigraphically and chronologically correlate these phases with the former excavations we may generally and tentatively point to the upper four Archaeological Horizons (AHs 1-4) that have been radiocarbon dated to ca. 8200-7600 BC (see Riehl *et al.,* 2013). However, a more precise reconciliation requires not only excavation at underlying layers but also a detailed publication of the former stratigraphy.

5. Finds

The 2023 excavation yielded a variety of finds, including lithics, ground stones and objects made of clay, stone and bone. In total, a collection of 11462 pieces of lithics (cores, tools and debris) was found. The collection is still under study. However, a preliminary visual analysis shows that various types of chert of medium and high quality were used as raw material. According to their color, we can divide them into samples of black, dark gray, light gray, reddish brown and beige chert. No obsidian was found. All these types of raw material are locally available as outcrops and nodules or cobbles that sometimes preserved their cortex (see also Zeidi and Conard 2013:318). They were all knapped on-site as suggested by the presence of their cores and debris, including cortical flakes. It appears that the raw material in Phase 1 was more variable than in the lower phases. In addition, dark chert was more abundant in the uppermost phase. The cores show scars of blade, bladelet and flake. Amongst others, the bullet-shaped cores are predominant in the collection, indicating that bladelet production was a priority (Fig.7). The tools can be divided typologically into notches, denticulates and utilized, retouched and, to a lesser extent, backed pieces. Some micro-bruins, drills and shiny blades are also present.

Fig. 7. Samples of the bullet-shaped cores found in the 2023 excavations (photo: H. Darabi)

A total of 27 clay objects were documented as figurines (n.16), tokens (n.7) and unidentifiable fragments (n.4). Most of the figurines depict schematically anthropomorphic females and are conical in shape. They are also headless and sometimes show further details such as breasts and shoulders. In one case, both eyes are represented by two indentations and the nose is also indicated between them. Stab-marks are visible on some figurines (Fig. 8). In addition, two samples showed patches of red ochre. No samples indicating animal figurines were found. The figurines are generally reminiscent of the conical samples from Ganj Dareh (Broman Morales and Smith 1990). However, figurines with eyes and breasts were also reported from Jarmo/Charmo in Iraqi Kurdistan (Broman Morales 1983). The tokens found are small pieces of fired clay in spherical, circular and cubic shapes. They are frequently reported from Neolithic sites. Tokens are commonly interpreted as counting tools and precursors of writing systems (Schmandt-Besserat 1992) and, more recently, as multi-functional artifacts (Bennison-Chapman 2018).

Overall, 47 samples of complete and broken ground stones were recovered from the excavation though a large number can be seen on the surface of the site. They were made of limestone and igneous rocks such as basalt and granite. Sometimes sandstone, marble and even chert were also used as other types of raw material. Most of the samples were found at the bottom of the pit in Phase 2. The collection is typologically divided into mortars, pestles, pounders, stone vessels, grooved stones and combined items. Stains of red ochre are evident on some of the samples. The combined items represent at least two types of ground stones at the same time (e.g. quern-mortar, pestle-slab). This indicates the circulation and change of their use over time. In one case, a slab-chopping tool was found from the industrial area where gypsum boulders had been heated and processed (Fig. 9). It shows remnants of red ochre and incised lines on the surface, suggesting that it was

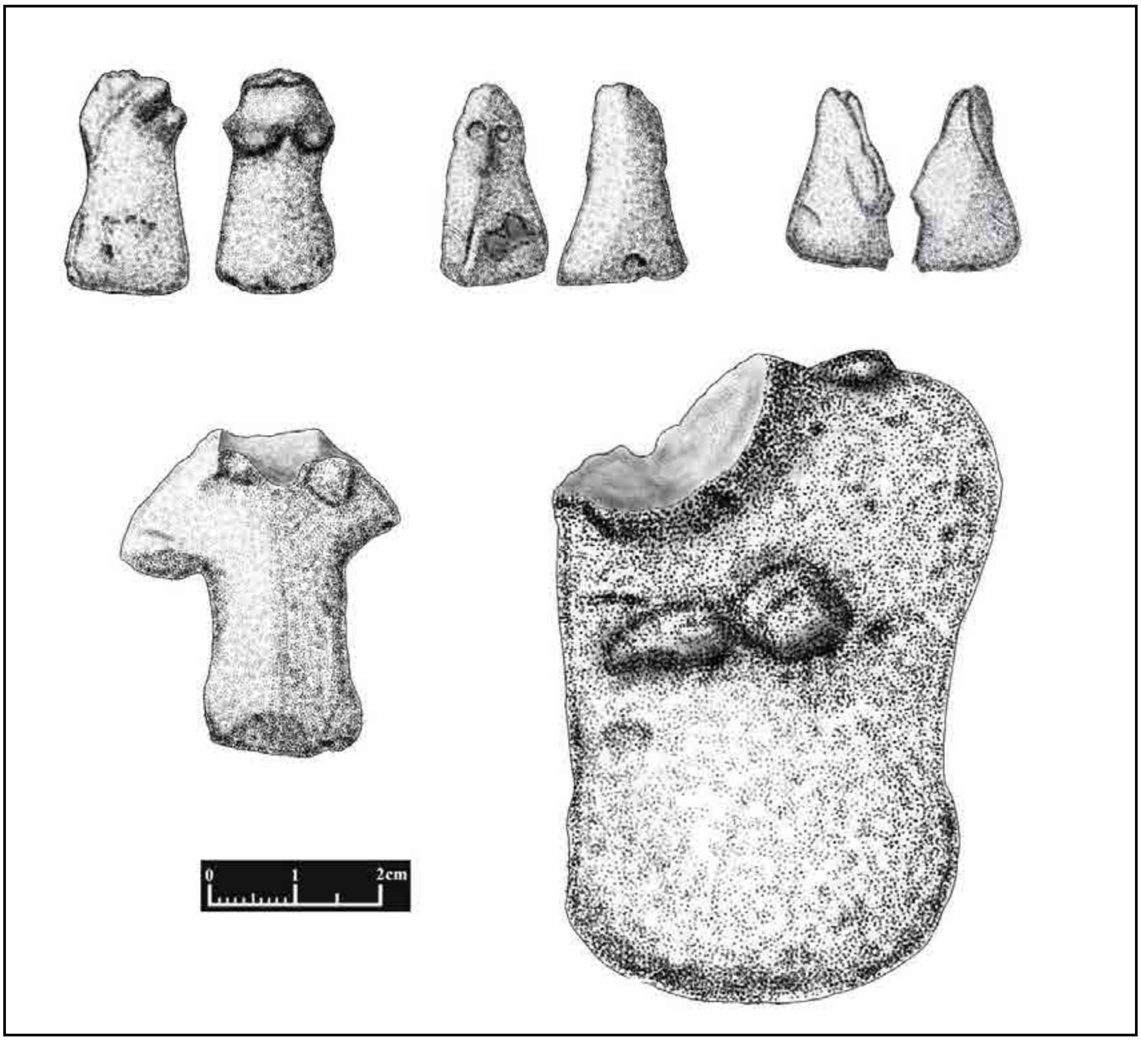

Fig. 8. Some human figurines from the 2023 excavations (drawings: H. Darabi)

Fig. 9. The working plate-chopping tool found from the industrial area in phase 2 (drawing and photo: H. Darabi)

used as a working plate, but was also modified and used as a chopping tool, presumably for breaking up chunks of gypsum.

In addition to the finds mentioned above, a number of other objects made of stone and bone were also recovered. These include six awls made of bone, two stone beads, two pieces of bone pendants, and four stone plaques that were decorated with incised lines and shallow holes (Fig. 10).

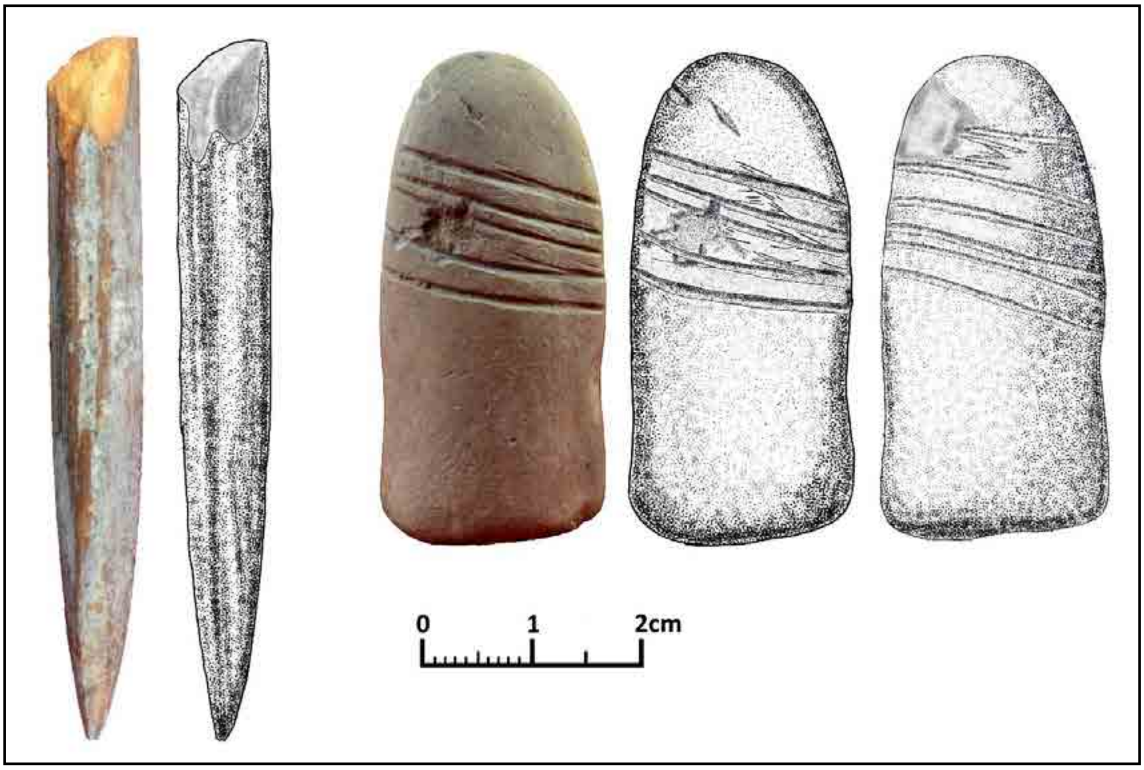

Fig. 10. A bone awl and a stone plaque incised with parallel lines (drawings and photos: H. Darabi)

6. Concluding remarks

In the foothills of the Zagros, Chogha Golan shows the longest uninterrupted sequence (ca. 9700-7600 BC) of inhabitations during the transition to the Neolithic (Fig. 11), the era of 'creativity and innovation' in the first three millennia of the Holocene coinciding with fundamental changes in food production and village life. As T. Watkins (2024:26) notes, "the first sedentary communities and the beginnings of cultivation practices arose among 'logistically organized' collectors". In this context, Chogha Golan seems to have best situated to allow access to a range of diverse resources in the adjacent ecological zones. Compared to contemporary regional sites, which generally sized 0.5-1 hectare, Chogha Golan is an unusually large settlement for the period. Our reassessment of the delineated area revealed that the site was up to 5.5 hectares in size though this whole area was not synchronously under occupation. Together with the long sequence, this makes Chogha Golan a uniquely spectacular site in the entire Zagros region. This peculiarity should be seen in the context of a particularly rich and sustainable environment that not only provided the inhabitants with an increasing ecological knowledge, but also supported population growth and intensity over time. Although the development of the site in different phases is not yet known, Chogha Golan could be an early Neolithic 'mega-site' at the Zagros due to its unusually large area and long sequence. This makes it an ideal place to study the socio-economic transformations towards Neolithic life. In this regard, the emergence and development of cultivation, animal husbandry, sedentarization and also technological changes could be traced at Chogha Golan. Our excavations have shown that white plaster was an abundantly used material for building houses due to its availability over time. The discovery of an area where the gypsum was apparently heated and processed draws special attention. A close relationship between the production and use of white plaster, together with red ochre, and the abundance of grinding stones deserves close consideration. This indicates that ground stones can be seen not only in connection with the processing of plant materials, but also of red ochre and gypsum at this site. The discovery of a large mortar with plaster remains in its depressions suggests that it was used to process white plaster. In addition, the presence of red ochre is also clearly visible on some samples of grinding stones. Traditionally, ground stones are taken in relationship to food production (see Wright 1992; 1994). However, the appearance and diachronic change of ground stones and their relationships to changes in subsistence strategies are not yet known in the Neolithic Zagros, indicating a great importance of further excavations at Chogha Golan, where a widespread plant-based subsistence is already documented (Riehl *et al.,* 2013; Weide *et al.,* 2017; 2018). Moreover, high density of ground stones at the site may have resulted from long-lived subsequent occupations. The excavation of the underlying layers/phases will also allow us to investigate the diachronic techno-typological evolution of the lithics and their links with other socio-economic transformations including the emergence of agriculture at the site. Recently, it has been claimed that pressure technique

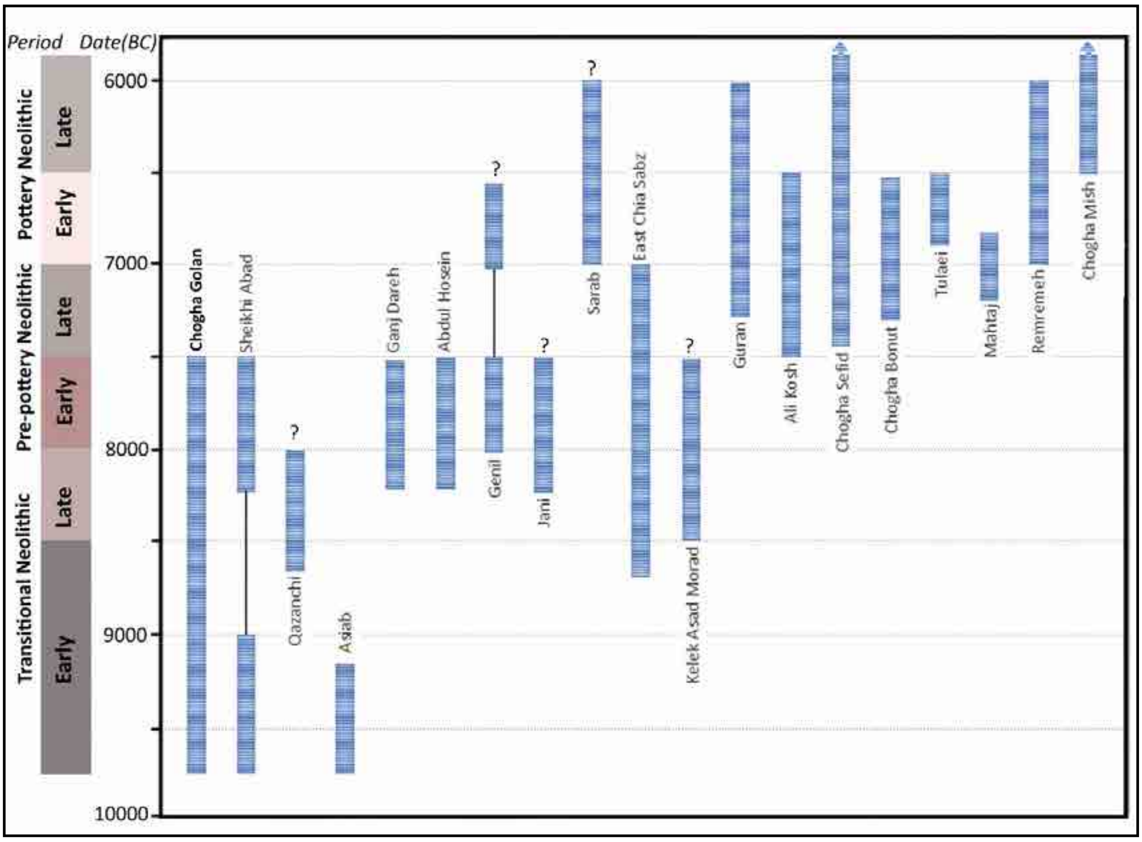

Fig. 11. Chronological placement of Chogha Golan among other key Neolithic sites in the central Zagros (chart: H. Darabi)

was in use since the beginning of the settlement of Chogha Golan (Zeidi and Conard 2024). This idea is not consistent with the results of other Neolithic sites in the region. Instead, regional evidence shows that the pressure technique in the production of stone tools, known as the M'lefatian tradition, was prevalent from the late 9th millennium BC (Nishiaki and Darabi, 2018). This is also underlined by further analysis of the new lithic samples from the lowest layers of the site.

Both previous and recent excavations at Chogha Golan have highlighted the creativity of societies resulting from their resilient strategies during the first two millennia of the Holocene in the Zagros foothills. Undoubtedly, carrying out further excavations at the site and also post-fieldwork studies, including zooarchaeological and archaeobotanical analyses, will shed light on this (r)evolutionary but still little-known period in the Zagros and more broadly in the Eastern Fertile Crescent.

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8. Endnote

1. In fact, Hojjat Darabi had not only laid the theoretical foundations but had also made the initial local administrative arrangements to subsequently conduct excavations at the site for his doctoral thesis. But then he suddenly realized that the excavation was to be carried out by the University of Tübingen. Originally, the then director of the Iranian Center for Archaeological Research orally agreed to the joint excavation. However, as he left his position, this plan was actually changed and the Tübingen team carried out the excavations alone.
2. The excavations were undertaken as part of the Tübingen-Iranian Stone Age Research Project (TISARP), while this project was originally intended to focus on the Stone Age, i.e., the Paleolithic (see Conard and Zeidi 2012:366).

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چکیده

چغاگلان پیش‌تر به‌عنوان مکان بسیار مهمی در مطالعات مربوط به ظهور کشاورزی اولیه و استقرار دائمی در جنوب‌غرب آسیا شناخته شده است. کارهای مختصر قبلی دانشگاه توبینگن در سال‌های ۹-۱۳۸۸ نشان‌داد که چغاگلان در حدود ۹۷۰۰-۷۶۰۰ پیش‌ازمیلاد مسکونی بوده و شاهد یک دورهٔ طولانی از تجارب اولیه در تولید غذا بوده است؛ با این‌حال، باوجود این جایگاه مهم باستان‌شناسی، این محوطه تا آغاز مرحلهٔ جدیدی از کاوش‌ها در سال ۱۴۰۲هـ.ش. بدون پژوهش میدانی رها شده بود. در این سال یک پروژهٔ جدید با هدف بررسی ماهیت متنوع تاب‌آوری بلندمدت توسط ساکنان کوهپایه‌های زاگرس در طول گذار به نوسنگی شروع شد. در این‌راستا، نخستین فصل کاوش‌ها در ماه‌های مهر و آبان ۱۴۰۲ انجام شد. بر این‌اساس، ترانشه‌ای به ابعاد ۸×۴ متر در بالای محوطه کاوش شد؛ در نتیجه، ۵ فاز استقراری براساس بقایای معماری در یک توالی به ضخامت ۲۸۵ سانتی‌متر شناسایی گردید. با این‌حال، کاوش به خاک بکر نرسید و مطالعهٔ لایه‌های زیرین باقی‌مانده به فصول بعدی موکول شد. این پژوهش، نتایج اولیهٔ کاوش مذکور را ارائه کرده و سپس اهمیت آن‌ها را در بستر جغرافیایی زاگرس برای درک بهتر فرآیند نوسنگی‌شدن این منطقه موردتوجه قرار داده است.

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Caspian Neolithic Software vs. Djeitun Pottery: New Absolute Dating from the Pottery Neolithic of Eastern Mazandaran

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Abstract

After 70 years we still have very little knowledge about the Epi-Paleolithic, Pre-pottery Neolithic (PPN), and Pottery Neolithic (PN) periods in the eastern Mazandaran plains. Unreliable excavation methods, the application of personal taste in collecting data, and uncertain analyses are among the issues we face in Coon`s excavations at the Hotu and Kamarband caves. Additionally, there are no detailed reports of pottery from the caves by Coon. In the following years, only general information and a few pictures and drawings by archaeologists were published, which, although helpful, weren't enough. In the last two decades, despite the excavations and field surveys that have been carried out, there have been no attempts to reinterpret the Caspian Neolithic Software (the CNS pottery type). Touq Tappeh and Tappeh Valiki, located in the Neka Plain, are two CNS sites that yielded over 2500 sherds belonging to the PN. Analysis of the pottery assemblage suggests a need to revise our assumptions about the CNS type. The diversity in production and decoration reflects household production, although they show a specific pattern at regional and inter-regional levels. It has come to our attention that while some researchers have referred to this pottery as the Djeitun/Chakhmaq style, new absolute dates tell a different story. The sherds presented in this paper can be categorized into two groups - regional and inter-regional - with the majority belonging to the CNS type. The dating of Touq Tappeh suggests that the PN layers belong to 6250-5800 BC. Meanwhile, dating from Hotu indicates that the PN began around 6400 BC, and at Tappeh Valiki, it started around 6600 BC. Consequently, the CNS culture in the eastern region of Mazandaran is now considered the oldest Pottery Neolithic culture in northeastern Iran.

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1. Introduction

The southeastern littoral of the Caspian Sea encompasses a wide area including the Neka, Behshahr, and Gorgan plains. Despite archaeological field projects in Behshahr and Neka plains, there is little understanding of settlement patterns, cultural processes, economic and social developments, and regional and inter-regional interactions during prehistoric periods. In addition, we still do not have an absolute chronological sequence from different prehistoric periods of this region, and our knowledge about cultural gaps and continuity, especially the transition from the Epi-Paleolithic to the Neolithic, the PPN and PN periods, and the transition from PN to Chalcolithic, is very limited (Abbasnejad Seresti, 2020). Pottery, as one of the most important pieces of data in archaeological analysis and interpretations, plays a crucial role in understanding the Neolithic developments of this region and clarifying some of the aforementioned ambiguities.

Archaeological excavations in the Hotu and Kamarband caves, as well as field surveys in the Neka and Behshahr plains, have led to the discovery and introduction of Neolithic pottery types in this region. However, we are still striving to better understand the sequence of technology and typology of this pottery. In recent years, the study of the CNS type and its relationship with adjacent regions has become an important topic. Researchers, such as Roustaei (2013, 2015, 2016a), have interpreted the spread of Neolithic packages to the eastern Mazandaran plains based on the analysis of Neolithic sherds. Therefore, it is necessary to carefully analyze and compare the CNS type and its relationship with adjacent regions.

2. Research Background

Carlton S. Coon excavated the Hotu and Kamarband caves in 1949 and 1951, identifying the Epi-Paleolithic, PPN, PN, Chalcolithic, Iron Age and Historic-Islamic periods (Coon, 1951, 1952). Later, Charles McBurney excavated Ali Tappeh Cave, a few kilometers east of Hotu and Kamarband and all of its layers belonged to the Epi-Paleolithic (McBurney, 1968). The excavation at Komishan Cave in 2009 led to the discovery of Epi-Paleolithic and PPN deposits. Unlike the Epi-Paleolithic layers, the PPN layers were disturbed (Vahdati Nasab, 2009). The site of Touq, which was identified along with several other Neolithic sites during an archaeological field survey, was excavated to understand the early stages of the PN in the region (Mahfrouzi, 2007). To study the Neolithization process in eastern Mazandaran, an archeological field survey was conducted in the Neka and Behshahr plains (Ramezanpour *et al.,* 2013). However, the data from this survey, including the pottery, have not been well studied and introduced (Asadi Ojaei *et al.,* 2024a). The excavation of the Komishani open site in Neka in 2017 is another field program that was conducted to determine the chronological sequence of the Epi-Paleolithic and Neolithic, to study the Neolithization process in the region (Fazeli Nashli, 2017). Stratigraphic excavations of Touq Tappeh and Tappeh Valiki have been carried out to achieve the chronological sequence of the Neolithic period and to study the Neolithization process (Abbasnejad Seresti, 2020; Abbasnejad Seresti & Nemati Loujendi, 2022). In recent years, Hotu and Kamarband were re-excavated (Fazeli Nashli, 2021a, 2021b). Also, in the most recent field survey, with an emphasis on the PN period, new evidence of Neolithic settlements in the region (plains and highlands) has been recorded (Asadi Ojaei, 2023).

3.Research Problem

Since the first excavations by C.S. Coon, the Neolithic pottery from eastern Mazandaran has not been introduced as thoroughly as those of the adjacent regions (e.g., Djeitun type). What features does the CNS type have? By comparing the form and decorations of new pottery assemblages from Touq Tappeh and Tappeh Valiki with regional and inter-regional collections, what common and different features can be recognized? Where does the CNS type originate, and finally, what can the pottery tell us about the end of the CNS culture?

4. Research Methods

Excavations at Touq Tappeh and Tappeh Valiki (see below) are the first systematic excavations of PN sites in the plain (Abbasnejad Seresti, 2020; Abbasnejad Seresti and Nemati Loujendi, 2022). From Touq Tappeh and Tappeh Valiki, 1,506 and 1247 sherds, respectively, were recovered from Neolithic layers and have been primarily studied. The absolute dating of these sites has been used to construct a technological and typological sequence. Although, the technical features recognized by visual observation, we are waiting for the petrographic analysis. Additionally, the results will be compared with published regional and inter-regional pottery collections.

5. Geography and Environment

Geographically, the region is located at the eastern end of Mazandaran province, in the Behshahr and Neka plains. In the southeastern Caspian Sea, the presence of both the Sea and the Alborz Mountains has prevented moisture exchange between the northern and southern regions, creating two completely different climates on the northern and southern slopes. The plains and northern Alborz slopes are very rich in plants, animals, marine resources, food and raw resources compared to the southern slopes. Human traces in this region can be seen from the Epi-Paleolithic period to today.

Fig. 1: General view of Touq Tappeh and Tappeh Valiki

Touq Tappeh (41.90' 42' 36º N and 54.79' 20' 53º E) and Tappeh Valiki (36° 42' 57.74" N and 53° 17' 29.64" E) are located in the Neka plain, about 15 km from the Caspian Sea coast and 7 km from the northern Alborz slopes, at heights of 6 meters asl[1] and 5 meters above the surrounding lands (Fig. 1 and 2). The sites are 5 kilometers apart, with Tappeh Valiki to the east and Tappeh Touq to the west. As mentioned, Tappeh Touq was first discovered in 2007 by Ali Mahfrouzi under the ASEC project titled 'Educational Excavation of Undergraduate Students'. The sequence of the PN, the Bronze Age, and the Iron Age was proposed (Mahfrouzi, 2007). In 2020, this site was excavated under prehistoric archaeological research of eastern Mazandaran to study the Neolithization and food production process in this region. During this excavation, the PN (the CNS culture), Chalcolithic along with PN, the Bronze Age, and the Iron Age were identified through pottery assemblage (Abbasnejad Seresti, 2020). Meanwhile, the first excavation of Tappeh Valiki in 2022 indicated the presence of the PN (the CNS culture), Chalcolithic along with PN, and the Iron Age mixed with the historical period (Abbasnejad Seresti & Nemati Loujendi, 2022).

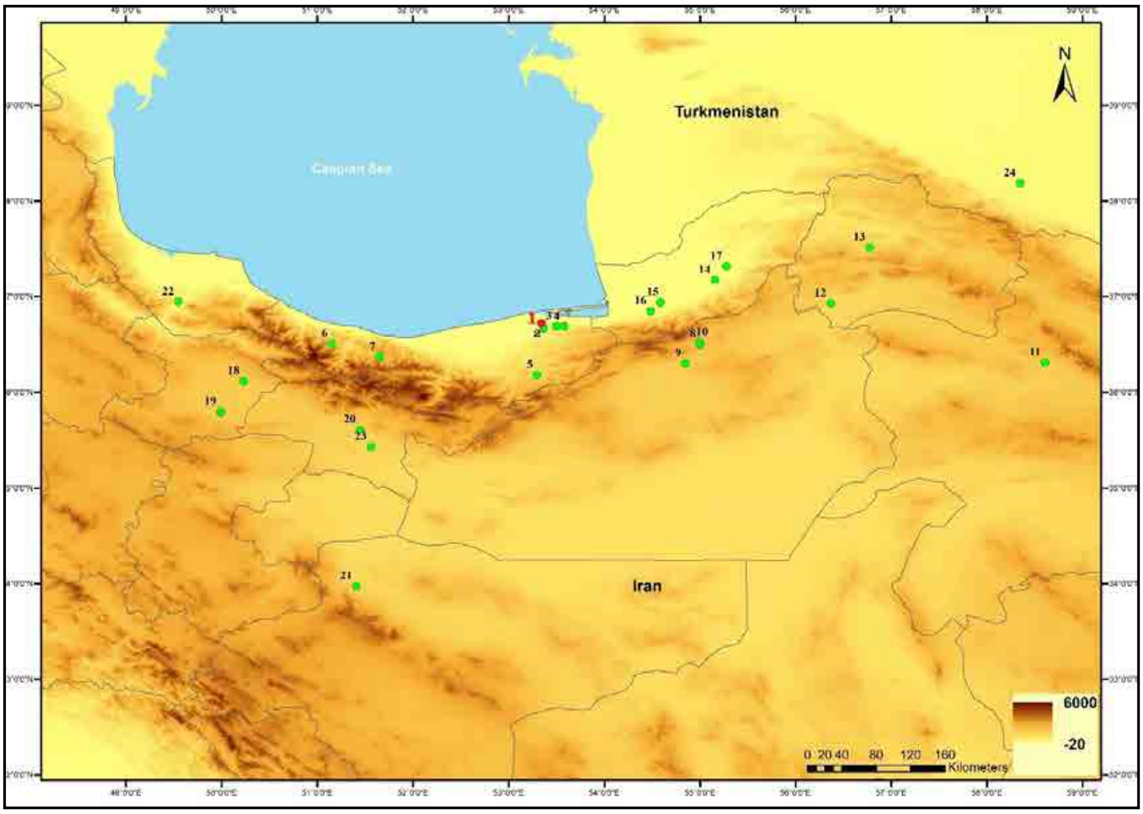


Fig. 2: Map of the PN sites of eastern Mazandaran and adjacent regions: 1) Touq Tappeh and Tappeh Valiki; 2) Komishan Cave and Komishani open site; 3) Hotu and Kamarband caves; 4) Ali Tappeh Cave; 5) Qale`pey; 6) Rashak III Cave; 7) Ashkul Cave; 8) Sang-e Chakhmaq; 9) Klateh Khan; 10) Deh Kheir; 11) Tappeh Baluch; 12) Pahlevan; 13) Qale Khan; 14) Yarim Tappeh; 15) Tureng Tappeh; 16) Pookerdval; 17) Aq Tappeh 18) Ebrahim Abad; 19) Chaharboneh; 20) Cheshmeh Ali; 21) Tappeh Sialk; 22) Shahran; 23) Tappeh Pardis; 24) Djeitun.

6.A Glance at Epi-Paleolithic to PN Dating in Eastern Mazandaran

Since the first excavations carried out by Coon, different dates have been presented. These dates can be divided into two stages through the 75 years history of Mesolithic and Neolithic studies in eastern Mazandaran. According to the new dates, a chronological table can be presented for the Epi-Paleolithic, the PPN, and PN (Abbasnejad Seresti *et al.,* in press).

1) The dating of charcoal samples obtained from the excavations of Hotu and Kamarband caves (Ralph, 1955) was the first absolute dates in the region. However, this

dating faced problems such as the use of non-scientific methods and personal taste in recovering and recording materials (Gregg & Thornton, 2012: 56), which were not very reliable despite recalculation and calibration (Table 1). According to these calibrated dates, the Epi-Paleolithic in Hotu and Kamarband started from 14000-11000 and ended in 8000-7600 BC; the PPN was dated from 7940 to 6465 BC, and the PN from 7140 to 5050 BC (Ralph, 1955; Gregg & Thornton, 2012; Thornton, 2013). In Ali Tappeh Cave, all its layers belong to the Epi-Paleolithic (McBurney, 1968); the re-calibration of the previous dates provides an average of 10991-11510 BC[2]. According to new dating (2-sigma), the Epi-Paleolithic in Hotu Cave began at c. 11945-11800 BC and ended at c. 8130-7960 BC. The oldest Pre-Pottery Neolithic layers are dated to c. 7948-7653 BC. The Pottery Neolithic started from c. 6449-6351BC (de Groene *et al.,* 2023). Two C14 dating samples from the Epi-Paleolithic layers of Komishan Cave have suggested a date around 12069-10632 BC. Since the Neolithic layers of this cave were extremely disturbed, the Pre-Pottery Neolithic has been identified only through the study of lithic assemblages (Vahdati Nasab *et al.,* 2011). The oldest date from the Komisani open site is c. 9256-9242 BC, which belongs to the Epi-Paleolithic. Additionally, the oldest Pre-Pottery Neolithic layer is dated 8634-8529 BC (Leroy *et al.,* 2019).

Table 1: Chronological table of the Epi-Paleolithic and Neolithic based on old dates and their calibration (Abbasnejad Seresti *et al.*, in press)

Period	The old dating (BP) (after Ralph, 1955)		The new dating (BC) (after Gregg & Thornton, 2012)		Sample
	Kamarband	Hotu	Kamarband	Hotu	
The oldest level of Mesolithic	12215±865	11900±775	13920-11350	13210-11000	Charcoal
The oldest level of PPN	8310±515	8140±490	7940-6650	7630-6465	Charcoal
The oldest level of PN	6575±440	7620±510	5975-5050	7140-6000	Charcoal

The most recent absolute dates were obtained from the two sites of Touq Tappeh and Tappeh Valiki. Two trenches, TT1 with dimensions of 1×4 meters and TT2 with dimensions of 2×3 meters, were opened for stratification in Touq Tappeh. 220 cm of the 4 m layers in this site belong to the PN. Four trenches, Tr1, Tr2, Tr3, and Tr4, were opened in Tappeh Valiki with dimensions of 4×2, 4×1, 2×3, and 5×2 meters, respectively. In this site, except for a thin layer of the Historical and Chalcolithic periods, the rest of the layers belong to the PN, covering about 200 cm in thickness. Nineteen and twelve charcoal samples were collected from the PN layers of Touq Tappeh and Tappeh Valiki, respectively, and finally, 12 samples were selected and sent to Peking University for AMS 14C dating; the results were calibrated with Calib Rev 8.1.0 software. Based on the dating, the TT1 and TT2 in Touq Tappeh show date ranges from 6250-6050 BC and 6000-5800 BC, respectively. Therefore, the PN in this site started by the late 7th millennium BC (Table 2). Based on dated samples from Tr3 and Tr4, and disregarding wayward sample XA57731, the PN layers of Tappeh Valiki show date ranges between 6400 and 5900 BC. Therefore, the early PN in this region started at least by 6400-6300 BC (Table 3). These dates show that the stage of the PN in eastern Mazandaran, which is known as the CNS culture, began at least from the mid-7th millennium BC and continued until the early 6th millennium BC (Abbasnejad Seresti *et al.,* in press).

Table 2: dating of the PN layers at Touq Tappeh (Abbasnejad Seresti *et al.,* in press)

Lab No.	Sample No.	Material	Trench-Context (Depth)	Radiocarbon Age (BP)	1-sigma Date BC	2-sigma Date BC
XA57717	TT-2020-6	Charcoal	TT1- Con 13 (225 cm)	7269±17 BP	6204-6073 cal. BC	6212-6069 cal. BC
XA57719	TT-2020-9	Charcoal	TT1- Con 16 (237 cm)	7334±17 BP	6233-6098 cal. BC	6235-6094 cal. BC
XA57725	TT-2020-14	Charcoal	TT1- Con 19 (267 cm)	7250±17 BP	6197-6058 cal. BC	6209-6050 cal. BC
XA57728	TT-2020-20	Charcoal	TT1- Con 22 (307 cm)	7351±17 BP	6242-6102 cal. BC	6247-6093 cal. BC
XA57724	TT-2020-(9)	Charcoal	TT2- Con 15 (233 cm)	7022±17 BP	5972-5884 cal. BC	5984-5853 cal. BC
XA57726	TT-2020-16	Charcoal	TT2- Con 16 (292 cm)	6973±17 BP	5889-5824 cal. BC	5908-5774 cal. BC
XA57727	TT-2020-17	Charcoal	TT2- Con 16 (315 cm)	6997±17 BP	5907-5842 cal. BC	5972-5819 cal. BC

Table 3: dating of the PN layers at Tappeh Valiki (Abbasnejad Seresti *et al.,* in press)

Lab No.	Sample No.	Material	Trench-Context (Depth)	Radiocarbon Age (BP)	1-sigma Date BC	2-sigma Date BC
XA57732	TV-2022-410	Charcoal	Tr4 – Con 6 (110 cm)	7097±19 BP	6011-5925 cal. BC	6019-5912 cal. BC
XA57730	TV-2022-404	Charcoal	Tr4 – Con 6 (130 cm)	7048±17 BP	5975-5914 cal. BC	5994-5891 cal. BC
XA57731	TV-2022-407	Charcoal	Tr4 – Con 9 (168 cm)	7663±18 BP	6499-6457cal. BC	6566-6449 cal. BC
XA57733	TV-2022-302	Charcoal	Tr3 – Con 14 (178 cm)	7258±18 BP	6201-6065 cal. BC	6210-6060 cal. BC
XA57734	TV-2022-305	Charcoal	Tr3 – Con 22 (234 cm)	7520±18 BP	6424-6392 cal. BC	6441-6276 cal. BC

7. The CNS Type vs Djeitun type

Unfortunately, Coon published little about the Neolithic sherds from the caves in his publications except for a short 1-page report and drawing of two sherds. One of his colleagues, Matson, wrote a short report on only four sherds; Matson attributes three of them to the early pottery horizon, which we believe might be the beginning of the CNS type. These sherds are between 5 and 10 mm thick, and their mixture is organic material. Their slips are light yellowish brown (2.5YR6/4), olive brown (2.5YR4/4), and yellowish olive (2.5YR6/6) in Munsell's color chart. According to Matson's report, the gray core indicates they were fired at low temperatures. The holes, with widths between 0.5 to 4 mm, indicate different degrees of the pottery porosity (Matson, 1951). Robert Dyson (1991) was the first person to examine the Hotu and Kamarband pottery assemblages, which were kept in the University of Pennsylvania Museum. Based on these assemblages, Dyson proposed three horizons; the first two belonging to the Pottery Neolithic, and the last horizon belonging to the Cheshmeh-Ali ware of the Sialk II period (ca. 5300-4400 BC)[3]. Dyson introduced the oldest as the CNS type, which he dated to ca. 6600 BC (Thornton 2013: 243); Fired at low temperatures, handmade, chaff tempered, thick and fragile bodies, with a light buff-brown, chocolate-brown, and red-washed slip, are the features that Dyson listed for the CNS type; although the Neolithic sherds in almost all of cultures are handmade, but to confirm, on some of the sherd`s body (in Touq Tappeh and Ta[[eh Valiki), especially the thick ones, we can clearly observe the traces of fingers (Fig. 3) The most common form was a deep bowl, more like a beaker, with slightly concave walls and a rounded rim (Fig. 4). He then introduced the next horizon, the Djeitun type, which according to Harris, dates to 6100 BC (Harris, 2010: 120); the features are fired at low temperatures, chaff tempered, thick pinkish-buff slip, and decorated with simple linear motifs (Fig. 4: NO. 7). On the other hand, Masson and Sarianidi described Djeitun type as a yellowish-white slip, chaff tempered, handmade, with a carefully polished surface (Masson and Sarianidi, 1972). Coolidge, following Berdiev, attributes the Djeitun potteries to have buff and red slips; she also states that it is not clear if Berdiev refers to the colors of the paste or slip. However, in her thesis the slips of the Djeitun sherds are mostly buff and red. Coolidge introduces the Djeitun culture as an exchange culture (except pottery) that produced pottery at the household level. According to her, the potteries were fired in quite low temperatures and probably in open kilns. She believes that there are generally two pottery types in the Djeitun culture sites: 1) potteries with chaff temper, which were made in the Early and Middle phases (final 7th to mid-6th millennium BC); and 2) potteries with mineral temper (sand), which appeared in the Late phase (late 6th millennium BC). She states that the use of sand as a temper was related to annual production, while the chaff tempered, mostly of stalks and straw of wheat and barley as well as some grains and grass, were produced after harvesting and indicated seasonal production (Coolidge, 2005: 110).

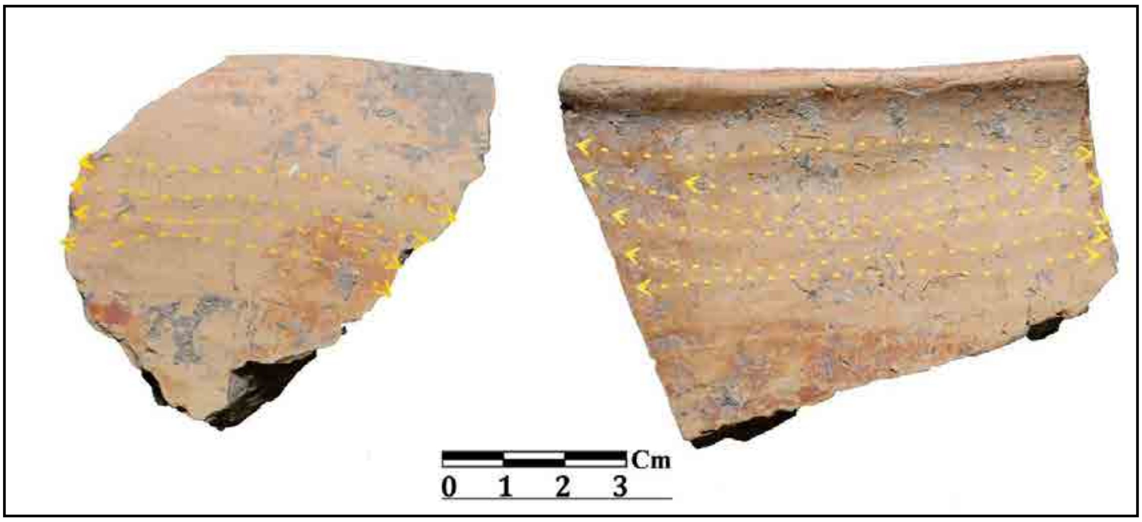


Fig. 3. Sherds with traces of fingers from Tappeh Valiki

Excavations at two PN sites, Touq Tappeh and Tappeh Valiki, have brought us new data to understand the early pottery production in eastern Mazandaran. Compared to the features that Dyson listed for the CNS type, we are observing more varied details in these assemblages. Starting from the oldest date, 6600 BC at Tappeh Valiki, the sherds

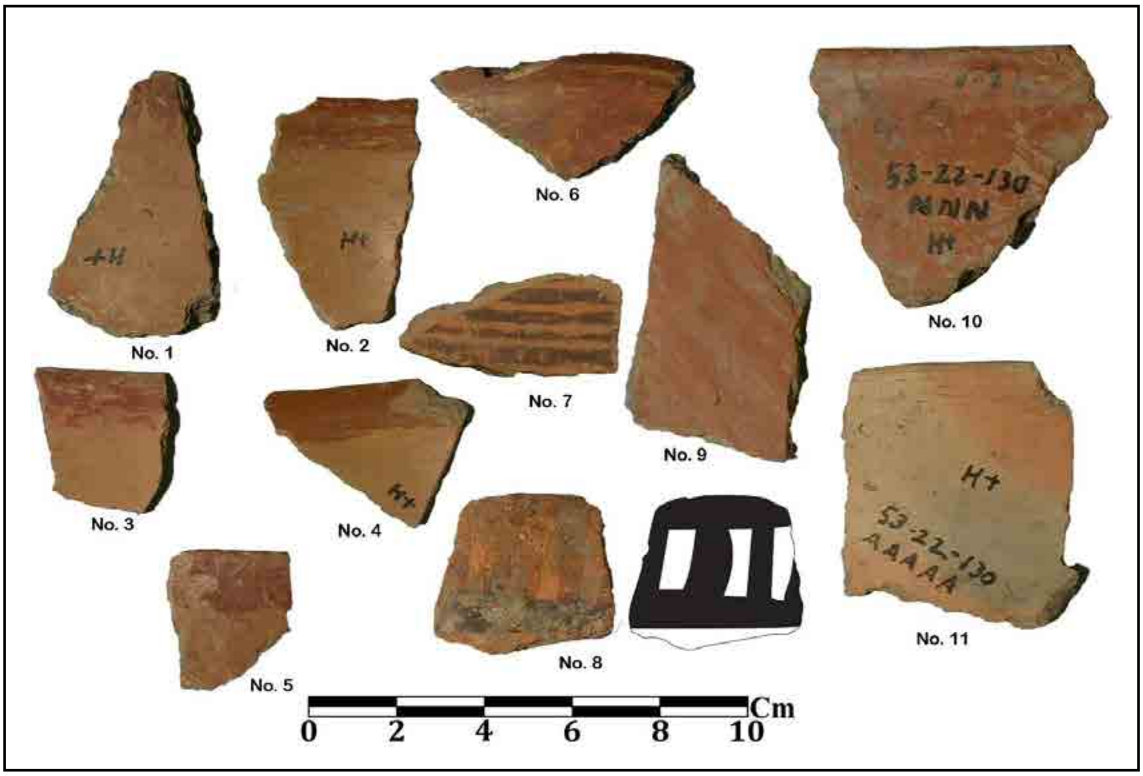


Fig. 4: Neolithic sherds from Hotu Cave (photo by Christoper P. Thornton).

are handmade and mostly thicker than 7 mm, up to 3 cm, though there are sherds as thin as 3 to 4 mm too. All the sherds have chaff temper; although they have been rated from coarse to fine, a few sherds have a mineral temper too; the mineral temper can be because of either lacking chaff in temper or added by potters to temper specifically, although we need petrographic analysis for more reliable resultes. Using coarse chaff in the majority caused high porosity of the sherds; however, there are sherds with low porosity as well due to the use of fine chaff. Almost 90% of the sherds were fired at low temperatures. Besides beakers, rim sherds show forms such as shallow open-mouth bowls, deep bowls, pots with a baked rim, and deep closed-mouth bowls. Base sherds show forms such as shallow flat-bottomed bowls, deep flat-bottomed bowls, and shallow dishes (Tables 4 and 5). The slips are varied, including pink, red, brown, yellow, white, and a grayish-brown spectrum, with pinkish, yellowish, reddish, and brownish being more frequently used. These features continued to appear until the end of the PN at Tappeh Valiki (6600-5900 BC) and Touq Tappeh (6250-5800 BC).

Pottery from Djeitun have been already described (see above); however, it is worth looking at the pottery features of a few other Djeitun sites in northeastern Iran. At Pookerdvall in Gorgan Plain, Neolithic sherds are all handmade, chaff tempered, with thick yellowish-buff (mostly), brown, and red slips; most of the sherds have complete firing (Zeyghami, 2009). Neolithic sherds from Aq Tappeh, another PN site in this region, are handmade, sand tempered, and low-fired; there is no mention of slip, although the excavators proposed two different slip colors on some of the sherds (Malek Shahmirzadi & Nokandeh, 2000). Recent excavation at Eastern Sang-e Chakhmaq yielded 2,900 Neolithic sherds which, according to the excavator, indicate the same features in all layers. The majority of the sherds have incomplete firing which causes a grey or black core; all are handmade and chaff tempered (coarse to fine). The most frequent slips are light brownish-cream, cream, orange, or buff-cream (Roustaei *et al.,* 2015; Roustaei, 2014). Pottery from two other PN sites, Deh Kheir and Kalateh Khan, are the same as the Eastern Sang-e Chakhmaq type; however, at Deh Kheir, the majority of the sherds are well-fired (Rezvani and Roustaei, 2016; Roustaei, 2016b). Looking at Tables 4 and 5 and comparing the forms from PN sites (including eastern Mazandaran), we observe that the forms remain the same from the earliest time and even continued into the Chalcolithic periods.

Since the forms and production methods of pottery in these sites show almost the same pattern from the lower to the upper layers, it seems that decoration is more suitable for comparing the CNS and Djeitun types. Regarding the motifs on pottery, three groups can be identified in the Touq Tappeh and Tappeh Valiki assemblages. The first two groups are the CNS type with differences in motifs. The first painted sherds group includes colored bands on the rim that Dyson mentioned as one of the specific features of the CNS type (Fig. 4: No. 1-5). At Tappeh Valiki's earliest PN layers, 6600 BC, this motif appeared (Fig. 5: No. 1, 2, 5, 6) and continued until the end of occupation in both sites (Fig. 6: No. 16, 18; Fig. 7: No. 18; Fig. 8: No. 6, 33), although there are other motifs too (Fig. 5: No. 3). Note that the color bands also appear on the interior part of the rim and mixed with other motifs as well (Fig. 6; Fig. 8; Fig. 9). Another painting method is the Decorative Outer Slip (DOS); it seems that very thin layers of color have been added to sherds using feathers or plants (Asadi Ojaei *et al.,* 2024a). This method appeared for the first time at Tappeh Valiki, context 23, belonging to 6450 BC (Fig. 7: No. 6); this method continued to appear on the sherds until the end of occupation in both sites. The only comparable examples outside eastern Mazandaran were found at Pookerdvall and Aq Tappeh in the Gorgan Plain (Table 6). This method has not been reported from other PN sites in northeastern Iran.

The second group was thought to have been seen only in sites inside the plain, by excavations at Tappeh Valiki and Touq Tappeh. However, a similar sherd was also recognized from Coon's excavation's pottery assemblage of Hotu Cave (Fig. 4: No. 8). The motifs of this group include various types of horizontal ladder on the rim, and some include colored bands on the inner part of the rim (Table 7). While some are very accurate and fine, others show inaccurate painting by carelessness and poor quality. This group was recovered in contexts 15 and 16, TT2, at Touq Tappeh, and context 6, Tr4, at Tappeh Valiki, and according to the dating, they appeared in both sites from 6000 BC until the end of their occupations. Unfortunately, we do not know the date for the sherd from Hotu cave.

The third group is inter-regional sherds, due to similarities with the Djeitun type, and has been recognized in Gorgan Plain sites such as Aq Tappeh and Pookardvall, on the plateau at sites such as East Sang-e Chahmakh, Kalateh Khan, and Deh Kheir, as well as at Djeitun culture sites in southern Turkmenistan (Table 8). The first inter-regional group is the shady motif[4] recovered from Touq Tappeh and Tappeh Valiki, dating to 6000 BC. This motif in the Djeitun culture appeared from Phase I, which belongs to the final 7th and early 6th millennium BC (Coolidge, 2005). Another motif is the crossed lines in the form of grid designs or, as Coolidge named it, net designs. The motif has only been found at Touq Tappeh and dates back to 6250-5800 BC. Similar sherds have been observed

Table 4: common forms of rim sherds

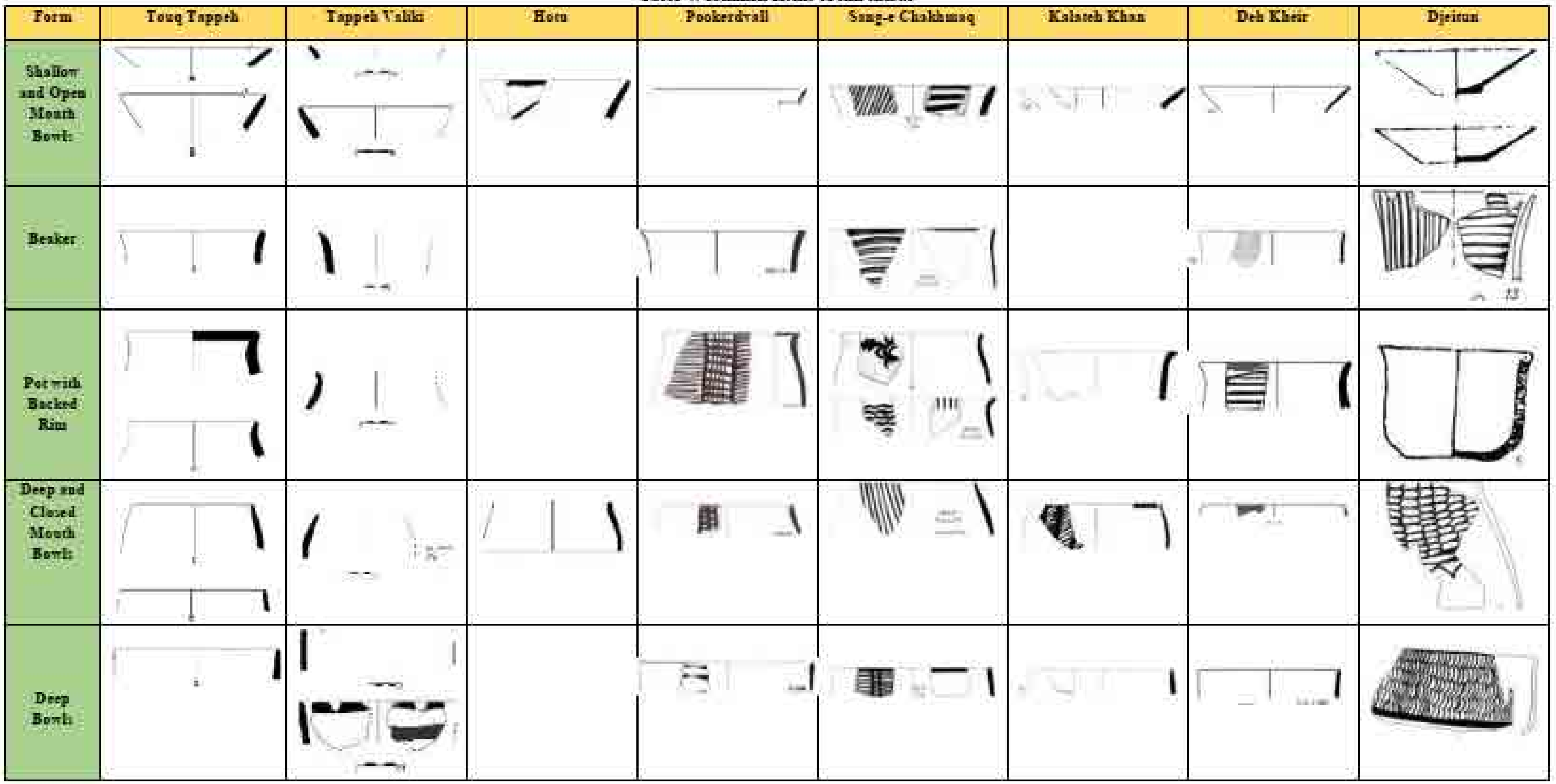
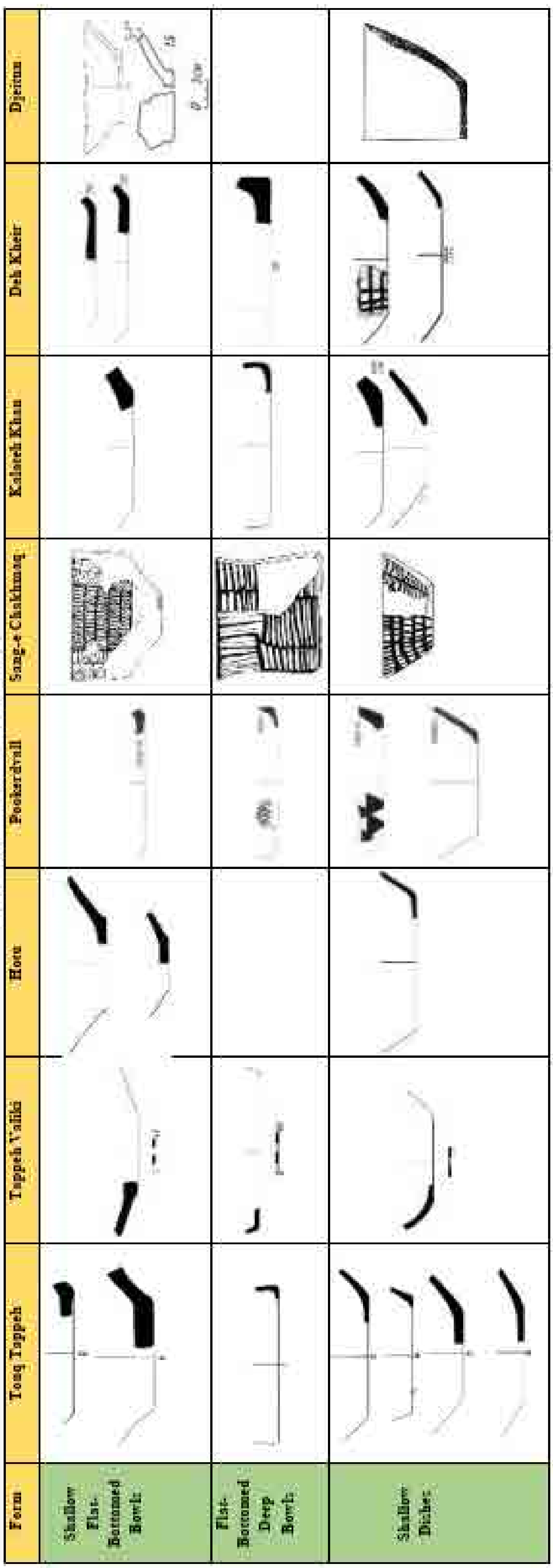


Table 5: common forms of base sherds



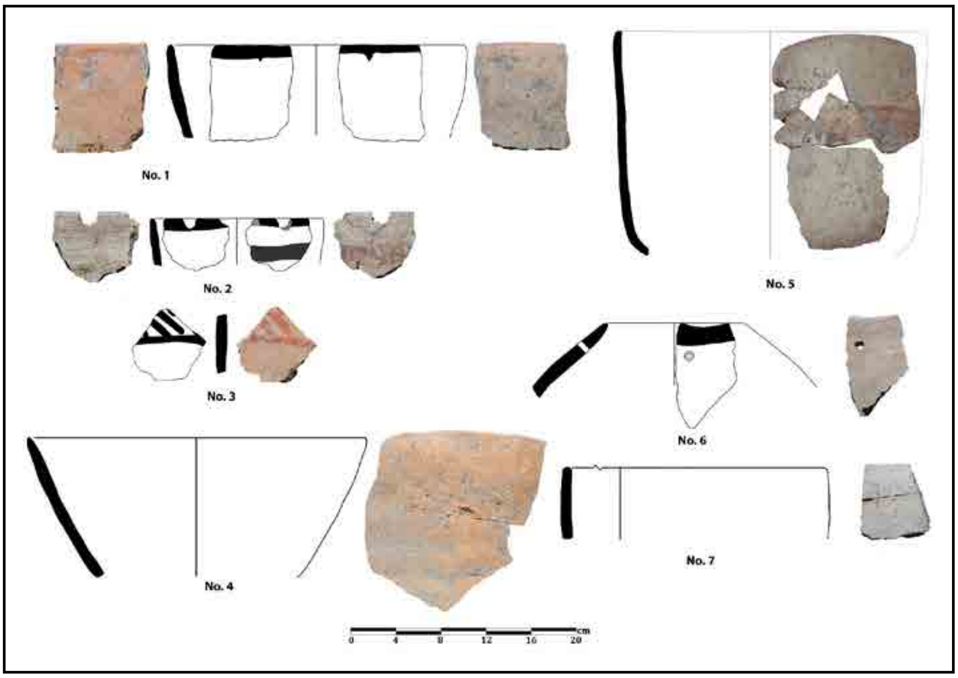


Fig. 5: Selections of Neolithic sherds from Tappeh Valiki, context 9.

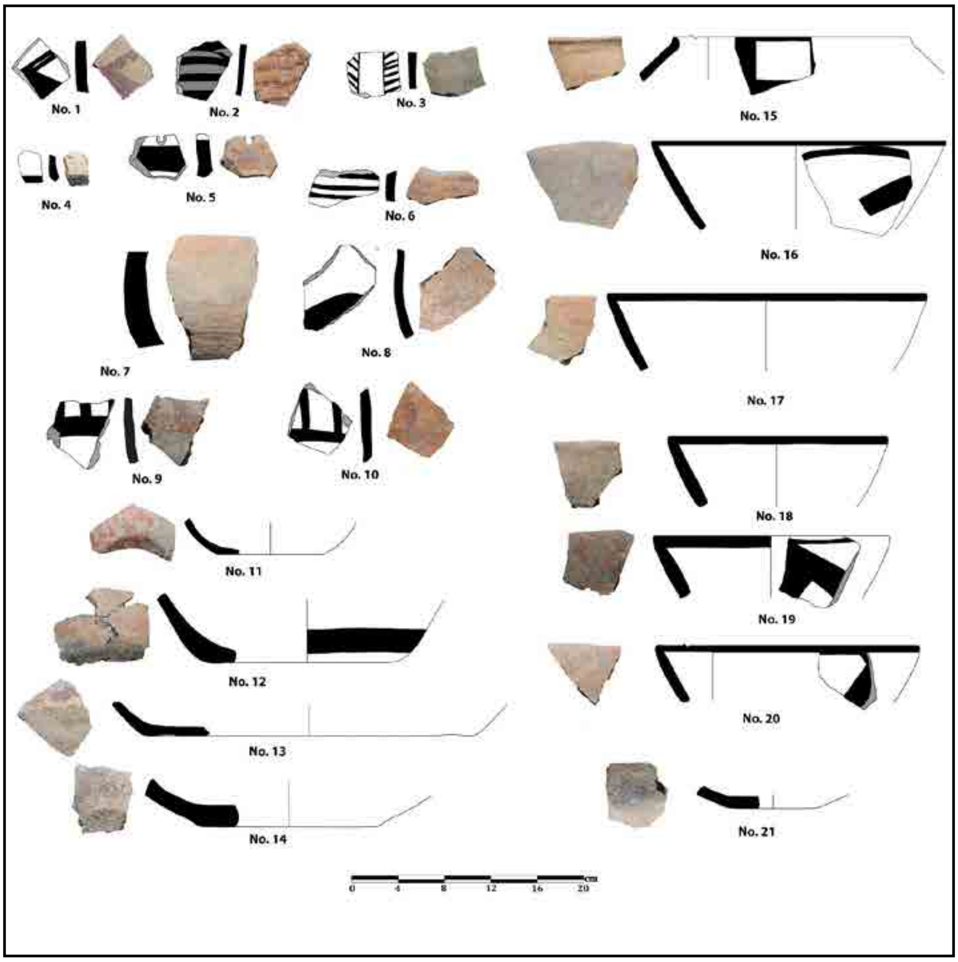


Fig. 6: Selections of Neolithic sherds from Tappeh Valiki, context 6

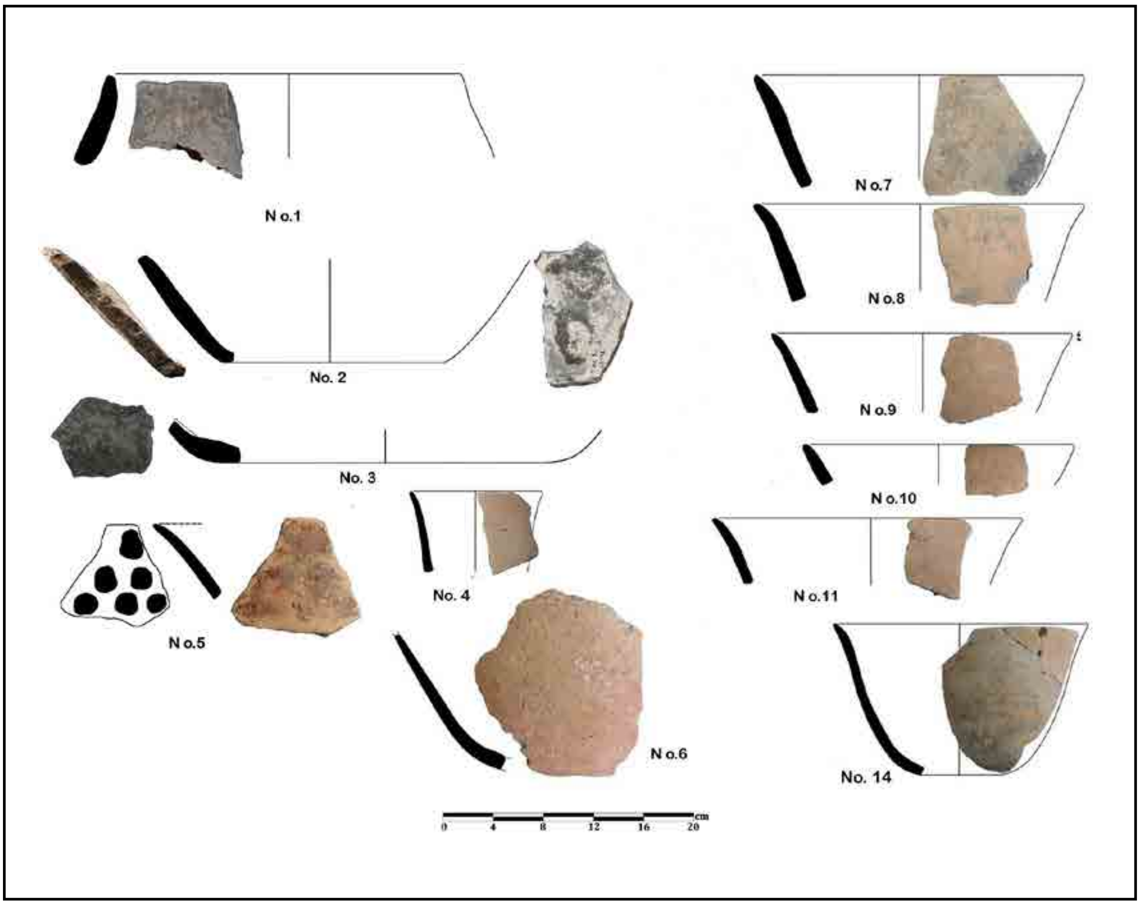


Fig. 7: Neolithic sherds from Tappeh Valiki, Tr3; context 14 (1-3); context 21 (4, 5, 14); context 22 (7-11); context 23 (6).

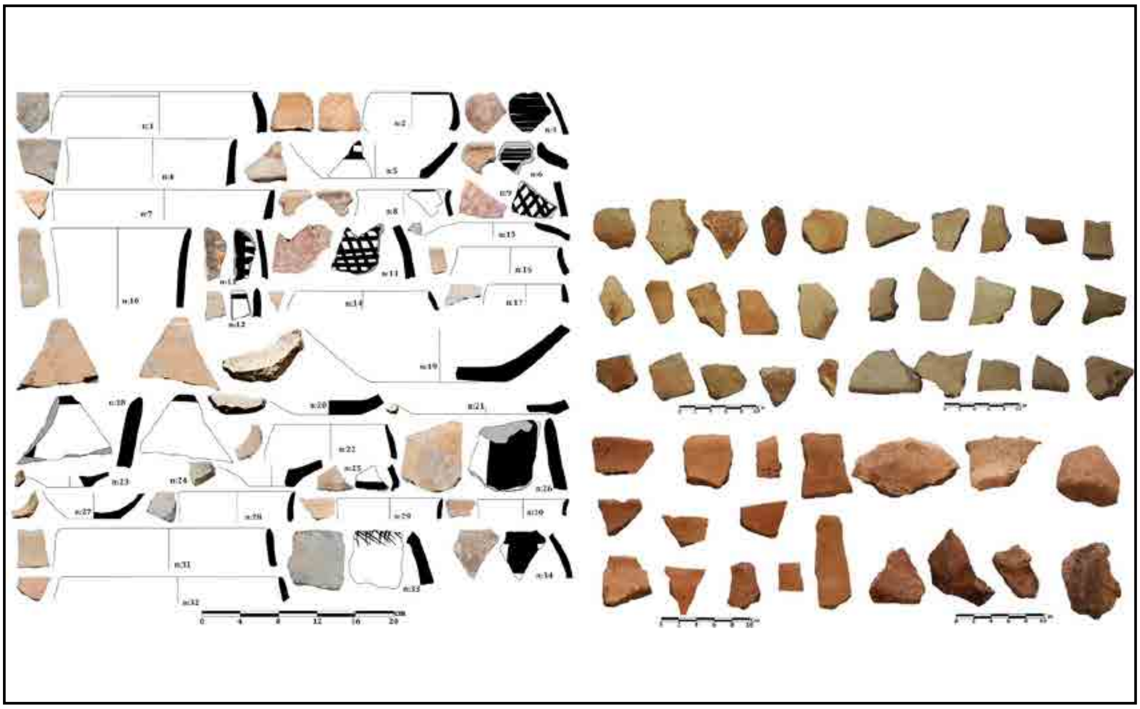


Fig. 8: Neolithic painted and plain sherds from Touq Tappeh, TT1

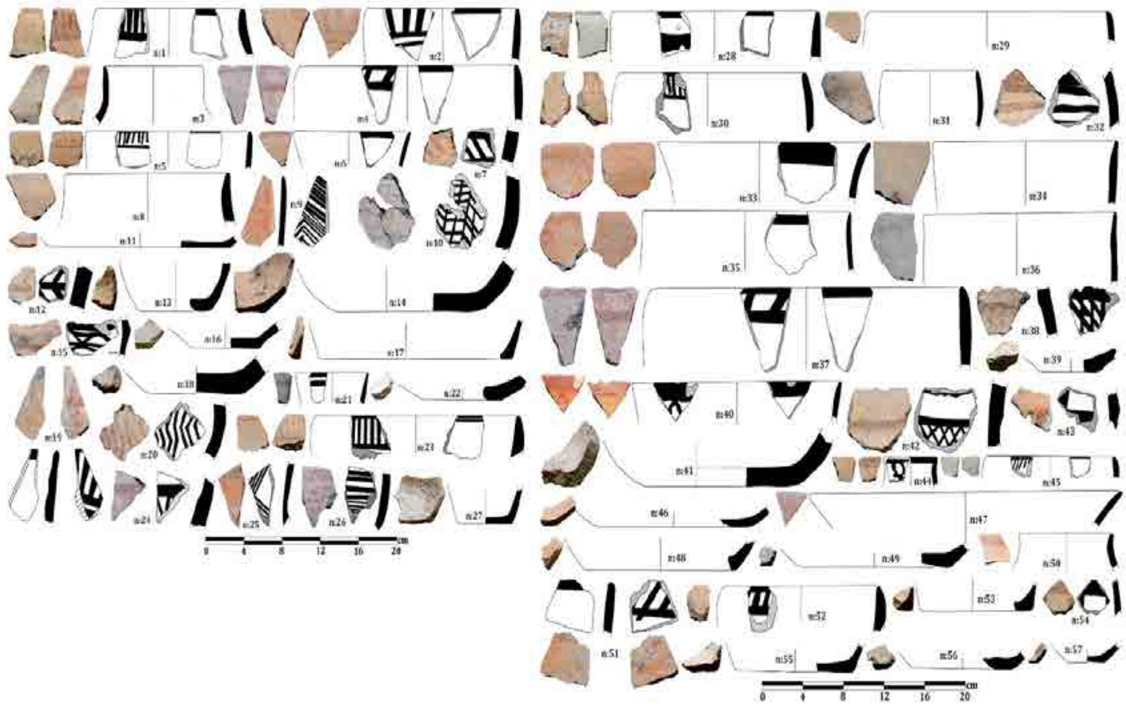


Fig. 9: Neolithic painted and plain sherds from Touq Tappeh, TT2

Table. 6: Sherds with the DOS decoration method

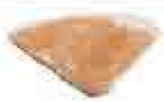
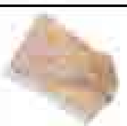
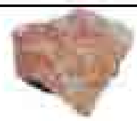
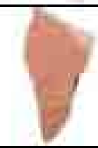
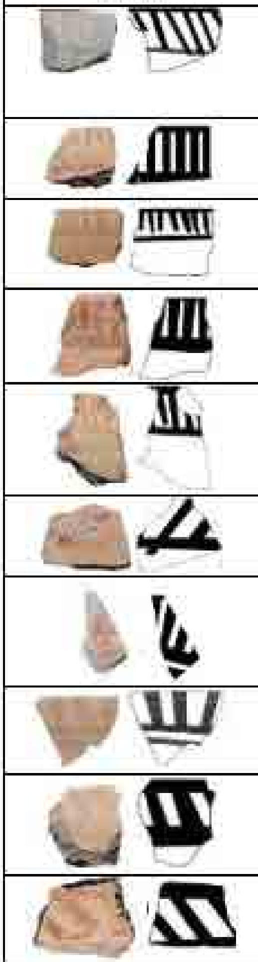
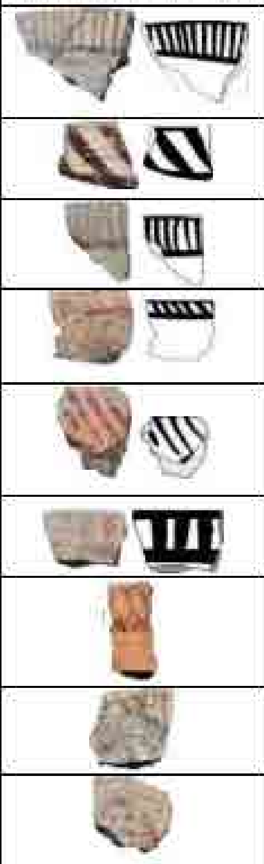
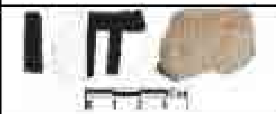
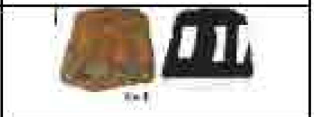
Touq Tappeh (Abbasnejad Seresti, 2020)	Tappeh Valiki (Abbasnejad Seresti and Nemati Loujendi, 2022)	Tappeh Abbasi (Abbasnejad Seresti, 2009)	Eastern Mazandaran (Asadi Ojaei *et al.*, 2024a)	Tappeh Pookerdvall (Zeyghami, 2009)
				
				
				
				
				
				

Table 7: Regional ladder motif sherds

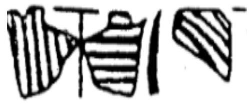
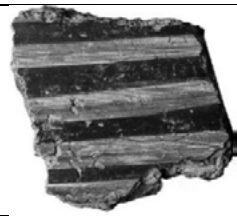
Touq Tappeh (Abbasnejad Seresti, 2020)	Tappeh Valiki (Abbasnejad Seresti and Nemati Loujendi, 2022)	Seyed Qasim (Asadi Ojaei *et al.*, 2024a)	Hotu Cave (Photo by C.P. Thornton)
			

at Pookerdvall and Togolok (Fig. 10). Pookerdvall has no reliable dating, and Togolok belongs to Phases I and II of the Djeitun culture. However, according to Coolidge, the grid motif appeared from Phase II, which belongs to the middle 6th millennium BC. At Tappeh Valiki, context 21, a dots motif sherd was recovered. The dating of context 21, which is concurrent with context 22, is 6450-6300 BC. This motif has been observed in PN sites such as Sialk in the central plateau, East Sang-e Chkhmaq in the Shahrud plain, Dik Seyyed in the Gorgan plain, and Djeitun sites in southern Turkmenistan like Pessedjik, Togolok, Chopan, and Bami (Fig. 11). According to Coolidge, this motif, along with grid design, appeared from Phase II in Djeitun sites, which belongs to the middle 6th millennium BC. More sherds can fit into this group; however, due to the lack of proper pottery references, we cannot be sure yet (Fig. 12).

8. Discussion and Results

In recent decades, pottery connections between these regions in northeastern Iran and southern Turkmenistan led to the introduction of Sang-e Chakhmaq as the origin of the spreading Neolithic lifestyle (Roustaei, 2013; 2016a). The Western mound, due to only six sherds recovered in old and new excavations of the site (Masuda *et al.,* 2013;

Table 8: Inter-regional group

Touq Tappeh		**Tappeh Valiki**	
			
Deh Kheir (Rezvani and Roustaei, 2016)	**Kheir Abad** (Roustaei 2014)	**Aq Tappeh** (Malek Shahmirzadi and Nikandeh, 2000)	**Djeitun** (Coolidge, 2005)
			
Yarim (Roustaei, 2016a)	**Eastern Sang-e Chakhmaq** (Roustaei *et al.*, 2015)		**Deh Kheir**
			
Pookerdvall (Zeyghami, 2009)	**Kalateh Khan** (Roustaei 2016b)	**Muzzafar Tappeh** (Asadi Ojaei *et al.*, 2024a)	**Tappeh Fakhi** (Asadi Ojaei *et al.*, 2024a)
			

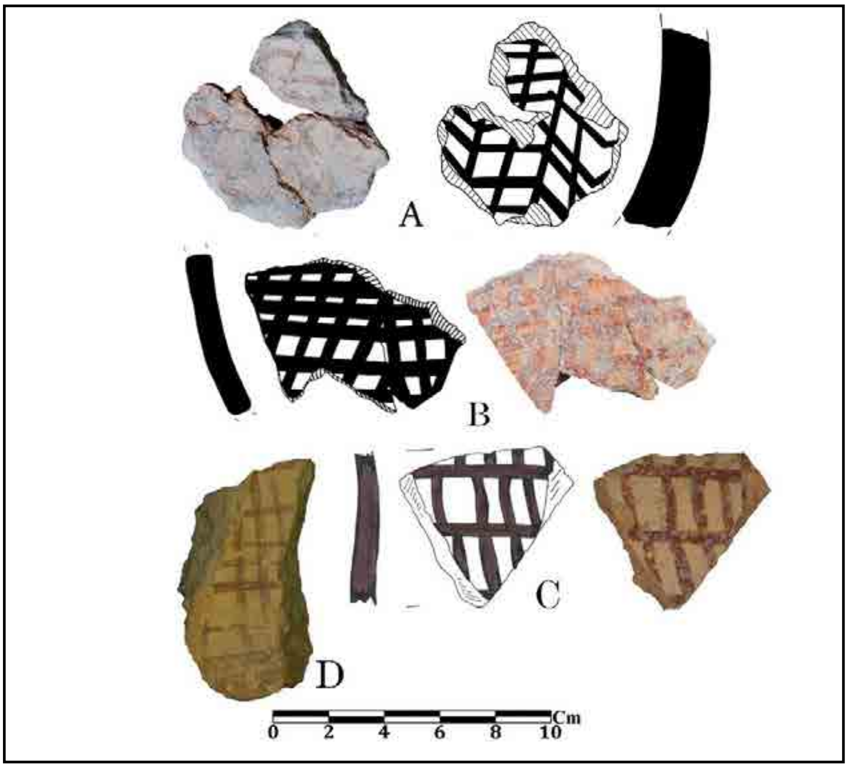


Fig. 10: Sherds with a grid pattern: A) Touq Tappeh, TT2, Context 16; B) Touq Tappeh, TT1, Context 13; C) Pookerdvall (Zeyghami, 2009); D) Togolok (Photo by S. K. Asadi Ojaei)

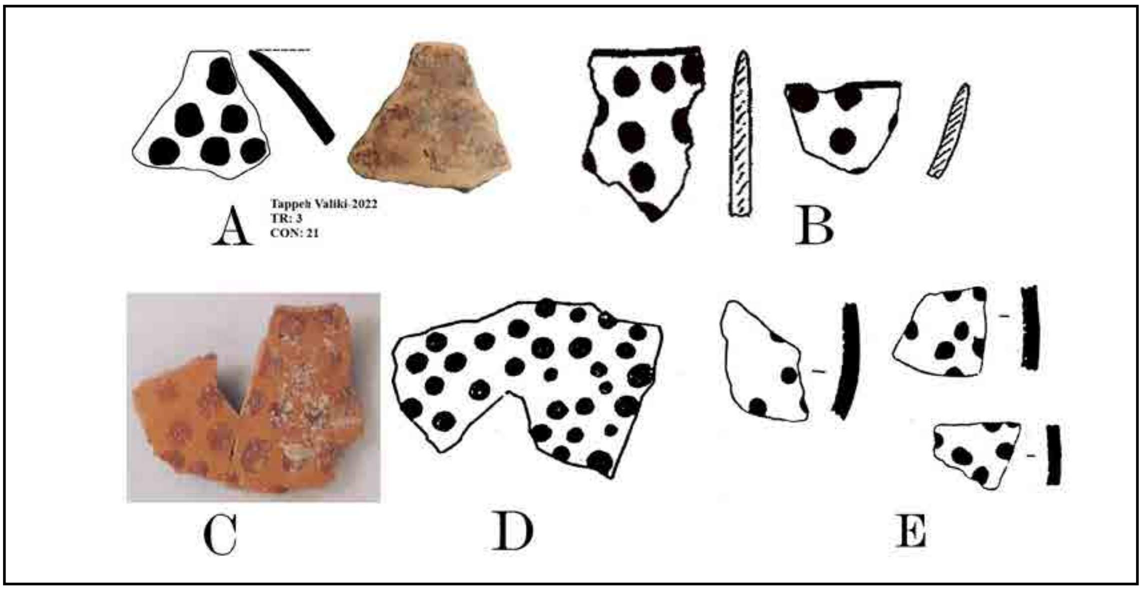


Fig. 11: Dot motif sherds: A) Tappeh Valiki; B) Sialk I (Ghirshman, 1938); C) East Snag-e Chakhmaq (Tsuneki, 2014); D) Togolok Phase 2 (Coolidge, 2005); E) Pessedjik (Coolidge, 2005)

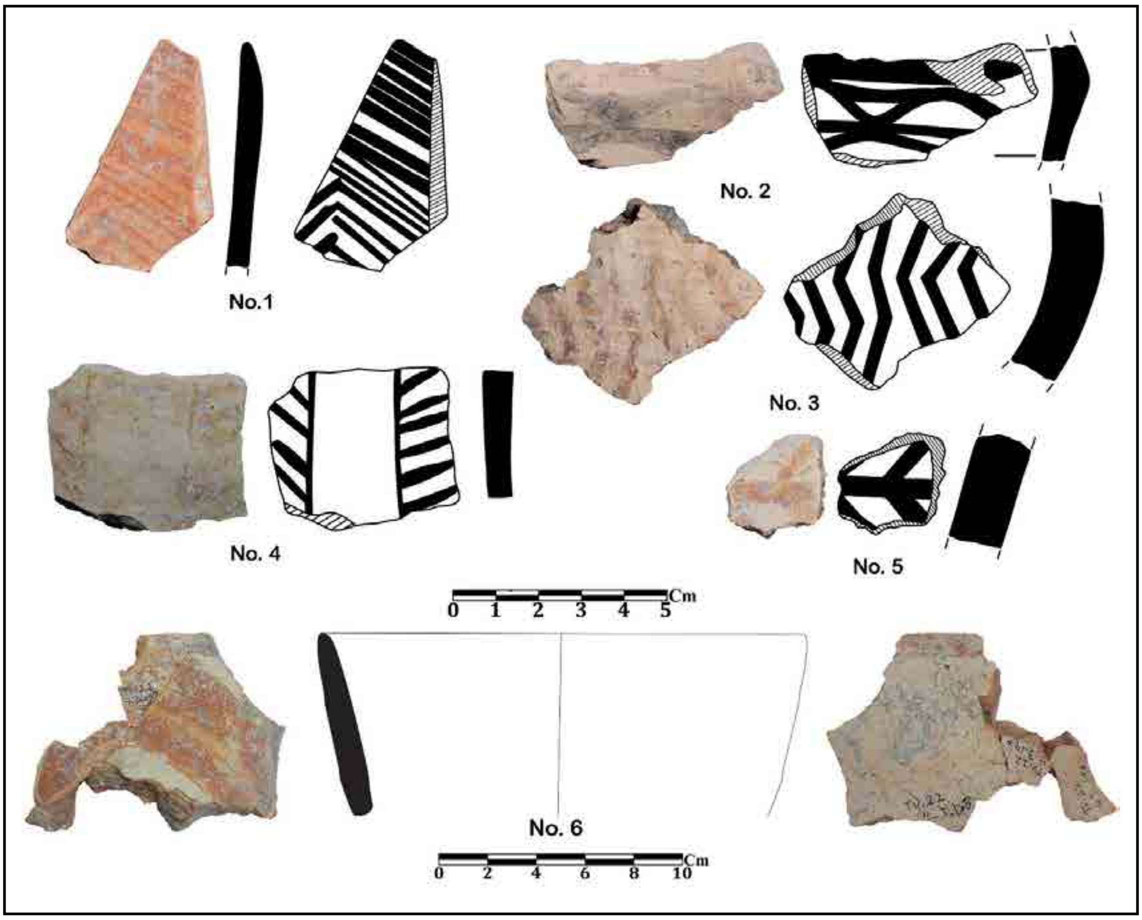


Fig. 12: Sherds that possibly belong to the inter-regional group: Touq Tappeh (NO. 1, 2, 3, 5); Tappeh Valiki (No. 4 and 6)

Tsuneki, 2014; Roustaei *et al.,* 2015), has been introduced as Aceramic/Proto-ceramic Chakhmaq and the Eastern mound as Ceramic Chakhmaq (Roustaei and Rezvani, 2021: 256). Additionally, Christopher Thornton stated that the origins of the Djeitun type probably should be sought in northeastern Iran, and at the time of publishing his paper, Sang-e Chakhmaq was a suitable nomination (Thornton, 2013), probably because the CNS type was not well described, and there weren't reliable dates from the PN sites of eastern Mazandaran.First, it should be stated that pottery and clay firing techniques did not appear suddenly in this region; Coon mentioned a baked clay figure and several pieces of baked clay in the Epi-Paleolithic layers of Hotu (Dupree, 1952: 253, 257). Also, Coon points out that, unlike a baked conical clay found in layer 10, the other ones in levels 11 and 12 are raw (Coon, 1951: 78). In the excavation of the Komishani open site, a few pieces of baked clay were found in the Epi-Paleolithic layers (Fazli Nashli *et al.,* 2017: 362). Therefore, the technology of pottery production was probably achieved gradually by the inhabitants before the PN started. The features that Dyson described for the CNS type were very general, while we can observe more detailed features by looking at the Touq Tappeh and Tappeh Valiki sherds. The slips are in the pink, yellow, red, and brown range; the temper is mostly chaff, which differs from coarse to fine, and also mineral. Likewise, the thickness differs from 3 cm to 3 mm, and the porosity differs from high to low. The firing also differs from low firing to well-firing and probably was done in open kilns. The forms mentioned above from Tappeh Valiki and Touq Tappeh, compared with the Hotu and Kamarband pottery assemblages (Gregg and Thornton, 2012; Fazeli Nashli, 2021a) and other Neolithic sites of eastern Mazandaran (Asadi Ojaei *et al.,* 2024a), show many similarities. In the inter-regional scope, such forms can also be seen in sites such as Pookerdvall, Eastern Sang-e Chakhmaq, Deh Kheir, Kalateh Khan, and Djeitun type sites.

Fig. 13: The CNS type sherds gathered by Dyson from Sang-e Chakhmaq (Thornton, 2013: 248, Fig. 15.10[5])

In his book Cave Explorations in Iran 1949, Coon reported the discovery of 174 pottery sherds from Kamarband Cave, all of which—except for a few pieces found at level 10 (the boundary between the Epi-Paleolithic and the PPN)—were obtained from level 7. Coon stated that level 7 is the period when the "Software type" (the CNS) was used, dating back to before 5000 BC (Coon, 1951: 78). The old dating of Hotu and Kamarband has shown that the PN culture exhibits the oldest Neolithic pottery in northeastern Iran. In Kamarband Cave, three dates from Trench C, 95-105 cm depth, for the PN layers have been presented. Greg and Thornton, with 68% confidence, recalibrated these dates to: 1) 8285-6466 BC 2) 7140-6000 BC 3) 7125-6030 BC (Gregg and Thornton, 2012: 91, Table 2).

Eventually, the date of 6610 BC was proposed by Dyson for the beginning of the PN. Another reason for this date can probably be seen in the paleo-climatic studies of the Caspian Sea. Alluvial and wetlands resulting from the Neo-Caspian transgression at 10,200 BP along with the warm and humid climate of the Holocene appeared after the 8.4k regression of the Caspian Sea in 8800-8400 BP, making the plains a very suitable environment for settling (Kakroodi *et al.,* 2015; Kakroodi, 2012). Preliminary sedimentological studies in the Tappeh Touq and Tappeh Valiki show that these areas were formed on these swampy and wetland sediments. Since both sites belong to the PN, it can be said that communities in the plains knew the pottery production technique very well; therefore, a relative date of 6600-6400 BC can be proposed for the start of the PN in the eastern Mazandaran. However, as mentioned, Coon's dating and its calibration is not very reliable, and relative dating does not solve much of a problem for us. Therefore, it was necessary to gain new absolute dates from the PN sites. The new dating of the PN levels of Hotu shows a date between 6450-6350 BC, which is equal to the minimum relative dating we considered; however, C14 dating from Touq Tappeh and Tappeh Valiki shows a date between 6600-5800. Therefore, it seems likely that the CNS type is the oldest PN culture in northeastern Iran.

8. Conclusions

The excavations of Touq Tappeh and Tappeh Valiki are the first systematic excavations of the PN sites of the eastern Mazandaran plains carried out to study Neolithization and the food production process. Materials such as plants, bones, lithics, paleo-climatology data, and of course pottery were recovered for this study. Some of these materials have been studied, while others are ongoing. The necessity of studying Neolithic pottery at this site arose because there is no access to the CNS type of Hotu and Kamarband from Coon's excavations. Therefore, the excavations of these PN sites are currently the only source providing knowledge of the CNS type. A preliminary study has shown that the majority of the sherds are similar to the features Matson and Dyson described from the CNS in the Hotu and Kamarband assemblage. However, they show more detailed features, such as mineral temper observed along with chaff temper, and despite the coarse and thick sherds, there are also very thin and fine ones.

The painted sherds can be divided into two categories, geometric and DOS based on the painting method, and based on motifs, they can be divided into two regional and inter-regional groups. The horizontal ladder motif that was previously thought only to be found in plains, had a similar sherd in Hotu assemblages from Coon`s excavation. The inter-regional group, which includes a few pieces, is comparable to sherds from sites

Also, regarding other physical features such as temper, slips, firing, porosity, and thickness, the CNS and Djeitun types show many similarities. In addition, the pottery gathered from Sang-e Chakhmaq during Robert Dyson's visit to the site was analyzed petrographically by Christopher Thornton. He stated that in the uppermost layer of the Western Sang-e Chakhmaq, which is highly disturbed, a large number of reddish-brown sherds with a highly burnished slip were gathered, indicating the initial stages of pottery production. Dyson (Dyson, 1991: 226) without a doubt, considers them to be the CNS type (Fig. 13). Thornton stated that in general, there is not much difference between the materials of the CNS and Djeitun type sherds from Sang-e Chakhmaq. The only distinguishing feature is the white to cream slip in the Djeitun sherds and the pinkish-buff slip in the CNS sherds (Thornton, 2013).

However, comparing the motifs between these two types indicates very little connection between eastern Mazandaran and adjacent regions. So far, dots, shady, and grid patterns have been introduced as motifs that establish this poor connection, although other sherds might show more similarities. The Djeitun type motifs (Fig. 14) compared to the CNS type are very different; in phase I, the motifs generally include wavy or straight horizontal stripes on both sides of parallel vertical lines, bracket-like designs, and rarely triangular motifs. In phase II, the previous motifs were replaced with delicate grid and dot patterns, and triangular patterns increased as well. In phase III, smaller and more crossed motifs appeared, and also for the first time, the insides of the sherds were painted. The motifs are in the form of horizontal wavy patterns, vertical zigzags, and tree-shaped patterns (Masson and Sarianidi, 1972; Coolidge, 2005). So far, none of these motifs have been observed in Neolithic pottery collections from the excavations in eastern Mazandaran.

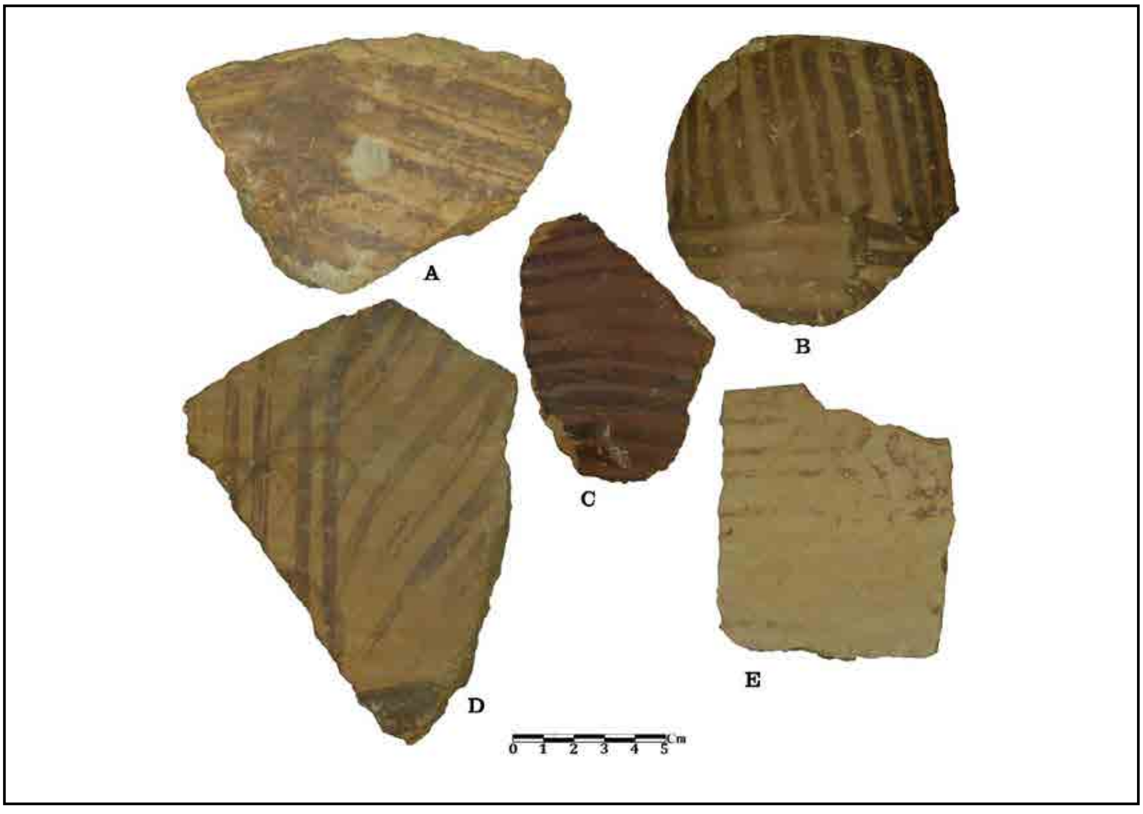


Fig. 14: Selections of the Djeitun type sherds: Djeitun (A, D, E); Togolok (B); Pessedjik (C) (photo by S. K. Asadi Ojaei)

such as Eastern Sang-e Chakhmaq in Bastam Plain, Pookerdvall, Yarim, and Aq Tappeh in Gorgan Plain and Djeitun sites in southern Turkmenistan. Although they have been introduced as inter-regional sherds, it does not mean that they are imported. Rather, the Touq Tappeh and Tappeh Valiki assemblage show a local and regional type, which we have called the CNS type, and they can be seen in all PN sites of eastern Mazandaran, both in the plains and highlands.

Relative dates show that the CNS type was produced in the first half of the 7th millennium BC and its roots can be seen in the fired figurines and clays in the Epi-Paleolithic of Hotu, Kamarband, Komishan, and the Komishani open site. The oldest dates presented for the PN sites in the adjacent regions belong to the end of the 7th and early 6th millennium BC, which is contemporary with the dating of the PN layers of Touq Tappeh. However, looking at the new dates from Hotu and Tappeh Valiki, the date of pottery production in the region has been pushed back to 6600-6400 BC. Also, designs such as dots indicate this motif might have been applied on sherds from Tappeh Valiki earlier than the Djeitun type. It is not known when and how the production of the CNS type began and spread in eastern Mazandaran and probably northeastern Iran, but now it can be said, with more certainty, that the CNS type is the oldest PN culture in northeastern Iran (Table 9).

Table 9: Chronology of Epi-Paleolithic and Neolithic of northeastern Iran and southern Turkmenistan

Region	**Southeast Caspian Sea**	**Central Plateau (Chahar Boneh)**	**Semnan Plain (Sang-I Chakhmaq)**	**Northeast Iran (Qaleh Khan)**	**South Turkmenistan (Djeitun)**
Period					
Epi-Paleolithic	14000-8600 BC	---------	---------	---------	---------
Pre-Pottery Neolithic	8600-6700 BCE	---------	7200-6600 BCE	---------	---------
Pottery Neolithic	6600-5800 BCE	6000 BCE	6200-5700 BCE	5800 BCE	6100 BCE

However, to answer the big questions, such as the origin of the PN of eastern Mazandaran (the CNS type) and northeastern Iran (Djeitun type); what happened to the CNS culture after the early 6th millennium BC; and the nature of pottery connections between eastern Mazandaran, northeastern Iran, and southern Turkmenistan; we need more excavations as well as petrographic studies of Neolithic sherds of Touq Tappeh and Tappeh Valiki sherds to compare them with other assemblages of regional and inter-regional sites. Another issue we face is the lack of absolute dates from the Gorgan Plain, as one of the possible paths of connection between eastern Mazandaran (the CNS type) and south Turkmenistan (Djeitun type). Finally, we need to collectively study and analyze the Neolithic pottery findings from eastern Mazandaran, northeastern Iran, and south Turkmenistan as a comprehensive dataset to gain insights and address the mentioned problems.

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10. Endnote

1. Above Sea Level
2. Calibrated by Calib Rev 8.1.0, based on dating provided by Coon for Kamarband Cave and McBurney for Ali Tappeh Cave (Asadi *et al.,* 2024b).
3. Dyson introduces the same pottery sequence in the Eastern Chakhmaq (Thornton, 2010)
4. This motif is formed by parallel color bands and between them is filled by very thin lines which are the same color but very pale. The name shady is translated from the Persian word
5. The photo on the original paper is black and white

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سفال پوک نوسنگی کاسپی در مقابل سفال جیتونی: تاریخ‌گذاری مطلق جدید از دوران نوسنگی باسفال شرق مازندران

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چکیده

پس از گذشت ۷۰ سال هنوز اطلاعات بسیار اندکی درمورد دوره‌های فراپارینه‌سنگی، نوسنگی بدون‌سفال و نوسنگی باسفال در دشت‌های شرق مازندران داریم. روش‌های کاوش غیرقابل اعتماد، اعمال سلیقهٔ شخصی در جمع‌آوری داده‌ها و تحلیل‌های نامشخص ازجمله مسائلی است که در کاوش‌های کوون در غارهای هوتو و کمربند با آن مواجه هستیم. علاوه‌بر این، هیچ گزارش دقیقی از سفال غارها توسط کوون وجود ندارد. در سال‌های بعد نیز تنها اطلاعات کلی و چند تصویر و طرح توسط باستان‌شناسان منتشر شد که اگرچه مفید بود، اما کافی نبود. در دو دههٔ اخیر باوجود کاوش‌ها و بررسی‌های میدانی انجام‌شده، تلاشی برای معرفی سفال پوک نوسنگی کاسپی صورت نگرفته است. توق‌تپه و تپه ولیکی، واقع‌در دشت نکا، دو محوطهٔ فرهنگ سفال پوک نوسنگی کاسپی هستند که بیش از ۲۵۰۰ قطعه متعلق به دورهٔ نوسنگی از آن‌ها به‌دست آمده است. تجزیه و تحلیل این دو مجموعهٔ سفال نوسنگی نیاز به تجدیدنظر در مفروضات ما درمورد گونهٔ سفالی را نشان می‌دهد. تنوع در تولید و تزئین منعکس‌کنندهٔ تولیدات خانگی است، اگرچه آن‌ها الگوی خاصی را در سطوح منطقه‌ای و فرامنطقه‌ای نشان می‌دهند. ما تصور می‌کنیم، درحالی‌که برخی محققین از این سفال با عنوان جیتونی/چخماقی یاد کرده‌اند، مقایسهٔ آن‌ها با استفاده از تاریخ‌گذاری‌های مطلق جدید، احتمالاً داستان دیگری را بیان می‌کند. قطعات ارائه شده در این پژوهش را می‌توان به دو گروه تقسیم کرد؛ منطقه‌ای و فرامنطقه‌ای، که اکثریت آن متعلق به نوع پوک نوسنگی کاسپی هستند. قدمت طوق‌تپه حاکی از آن است که لایه‌های نوسنگی باسفال مربوط به ۵۸۰۰-۶۲۵۰پ.م. است. درحالی‌که، تاریخ‌گذاری از هوتو نشان می‌دهد که این دوره در حدود ۶۴۰۰پ.م. و در تپه ولیکی حدود ۶۶۰۰پ.م. آغاز شده است. درنتیجه فرهنگ سفال پوک نوسنگی کاسپی در منطقهٔ شرق مازندران درحال‌حاضر قدیمی‌ترین فرهنگ نوسنگی در شمال‌شرق ایران محسوب می‌شود.

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Relative Chronology Based on the Classification and Typology of the Chalcolithic Pottery of Tepe Morad Abad VIII, Orzuiyeh Plain (Kerman Province)

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Abstract

The Orzuiyeh Plain stands as a crucial region for understanding prehistoric, particularly Chalcolithic, settlements in southwestern Kerman Province. While sites like Gaz Tavileh, Morad Abad XII, and Vakil Abad have seen limited archaeological exploration, they have yielded insufficient data on the sequence of Chalcolithic occupation. To address this gap, a stratigraphic investigation of Tepe Morad Abad VIII, a prominent Chalcolithic mound in the area, was undertaken to establish a relative chronology and delve deeper into Chalcolithic life and pottery traditions. The mound's substantial depth and scattered pottery fragments suggested a lengthy occupation spanning multiple cultural periods, likely associated with the Yahya Pottery Culture. Through meticulous field and library research, a detailed analysis of pottery artifacts revealed a clear sequence of Chalcolithic occupation across 60 distinct layers. Of the 2413 recovered sherds, 918 underwent in-depth study, including drawing and classification. The findings indicate continuous habitation at Tepe Morad Abad VIII throughout Yahya Periods VI, VC, VB, and VA, spanning from the early to late Chalcolithic era, with an estimated timeframe of 5600 to 4200 BCE.

Keywords:
Yahya Culture,
Middle Chalcolithic,
Chalcolithic Pottery,
Orzuiyeh Plain, Morad Abad VIII.

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1. Introduction

The Neolithic period marked a pivotal shift in human societies as increased interaction with the environment fostered the emergence of agriculture and animal husbandry. These foundational developments shaped the subsequent Chalcolithic period, where societies were increasingly reliant on farming and herding (Matthews and Fazeli Nashli, 2022: 111). Chalcolithic culture flourished across the Iranian Plateau as the Neolithic waned, its growth intimately connected to the surrounding environment (Talai, 2013: 49). Early investigations at Iblis, Yahya, and the Dolat Abad Orzuiyeh plain provided invaluable insights into southeastern Iran and Kerman's prehistoric past (Fig. 1). However, the absolute dating of these sites remained uncertain until more recent excavations at Gav Koshi Esfandagheh (Alidadi Soleimani and Fazeli Nashli, 2018), Dehno-ye-Shahdad (Eskandari, 2018), and the Vakil Abad mound in the Orzuiyeh plain (Shafiee *et al.,* 2019) which refined the chronology. Despite extensive exploration of the Orzuiyeh plain's Chalcolithic mounds, evidence of a continuous pottery tradition has remained elusive. This is due to the single-period occupation of some sites (such as Vakil Abad and Gaz Tavileh) and the lack of complete stratigraphic excavations (down to virgin soil) in others, like ata Morad Abad XII. Prickett, in her study of the Morad Abad River area (east of the Orzuiyeh plain), suggested a shift in settlements from Yahya Period VI (Early Chalcolithic) to the northern part of this river (Prickett, 1986b: 234). Additionally, the extensive nature of the latest Middle Chalcolithic settlements and the abundance of their cultural materials compared to the previous period, have led to the generalization of the dating of these period mounds in the area to Yahya Period VA. This has created ambiguities regarding the earliest settlements in this region.

Consequently, stratigraphic excavations at Tepe Morad Abad VIII were deemed essential to establish a relative chronology and to gain a more complete understanding of Chalcolithic settlements and the continuity of pottery traditions in the Orzuiyeh plain. Due to its significant size, height (making it one of the tallest Chalcolithic mounds in the Morad Abad River basin), and strategic location at the confluence of several water channels, Tepe Morad Abad VIII was selected for stratigraphic excavation. Therefore, the ceramic evidence from this research has answered several important questions about the cultural layers of this ancient mound. For example, considering the height of the deposits, how many Yahya cultural periods does it encompass, and which specific Yahya periods does it represent? Moreover, if the deposits of Morad Abad VIII span multiple periods, did the ceramic traditions there evolve in parallel with the broader Yahya pottery culture? In addition, according to the stratigraphic analysis, were the cultural deposits formed continuously or with interruptions?

This research, employing a descriptive-analytical approach and data from both fieldwork and literature reviews, will classify and categorize the ceramics recovered from the excavation in order to answer the research questions. Tepe Morad Abad VIII, previously identified as "R6" in earlier archaeological studies (Prickett, 1986b:229), is also known locally as "Tepe Najf Ali" due to its proximity to the fields of a man named Najf Ali. The designation "Morad Abad VIII" is based on the naming convention for Chalcolithic mounds around the Morad Abad River, which in recent archaeological surveys of the Orzuiyeh plain have been numbered from I to X (Alidadi Soleimani, 2009) (Fig. 2).

Fig. 1. Excavated Chalcolithic sites in the Kerman region

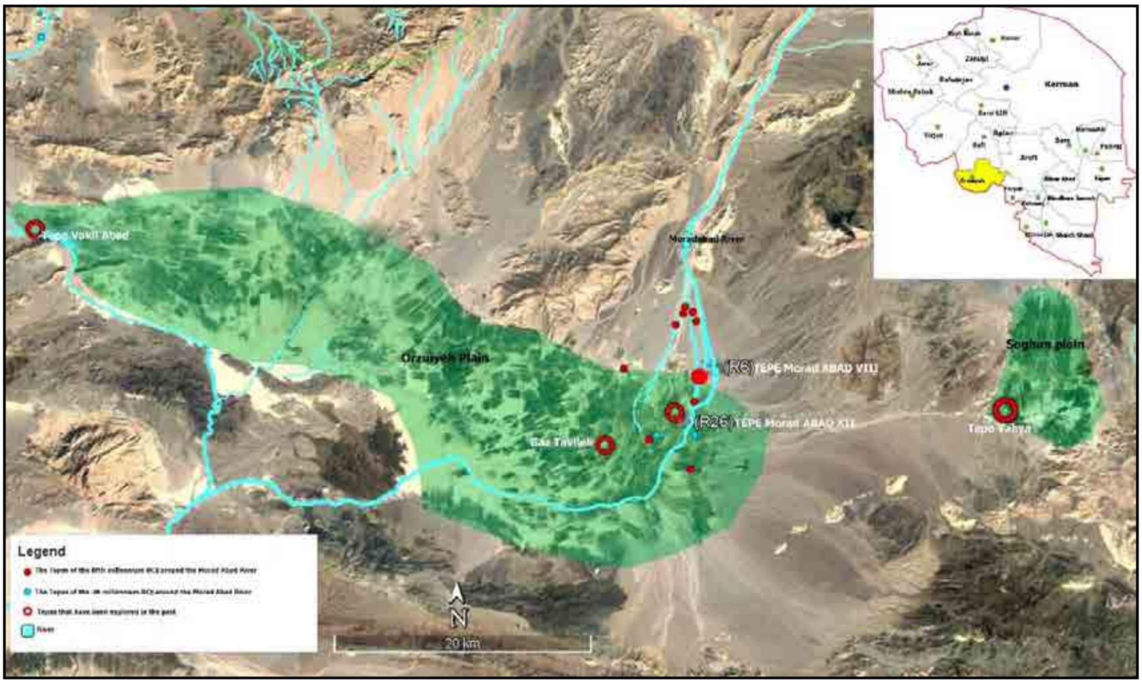


Fig. 2. Orzuiyeh and Soghan plains with identified fifth-millennium BCE settlements around the Morad Abad River

2. Geographical and Archaeological Context of Tepe Morad Abad VIII Southeastern Iran

Tepe Morad Abad VIII is situated at the geographical coordinates 31°36’631”N and 46°32’55”E, 27 kilometers east of Shah Maran (the center of Orzuiyeh County) on the northeastern flank of the Orzuiyeh Plain. Located in the northern basin of the Morad Abad River, this mound is 24 kilometers from the ancient site of Yahya (in the Soughan Plain) and 53 kilometers from Tepe Vakil Abad (dating to the Middle Chalcolithic period, west of the Orzuiyeh Plain). Several other Chalcolithic mounds are situated along the northern basin of the Morad Abad River (the Goushk River basin). Tepe Morad Abad VIII, the largest and most extensive of these mounds, occupies a position where the slope of the northern mountain foothills is at its gentlest, meeting the plain. At this point, the Morad Abad River, joined by several flood channels, reaches its greatest width (Fig. 3).

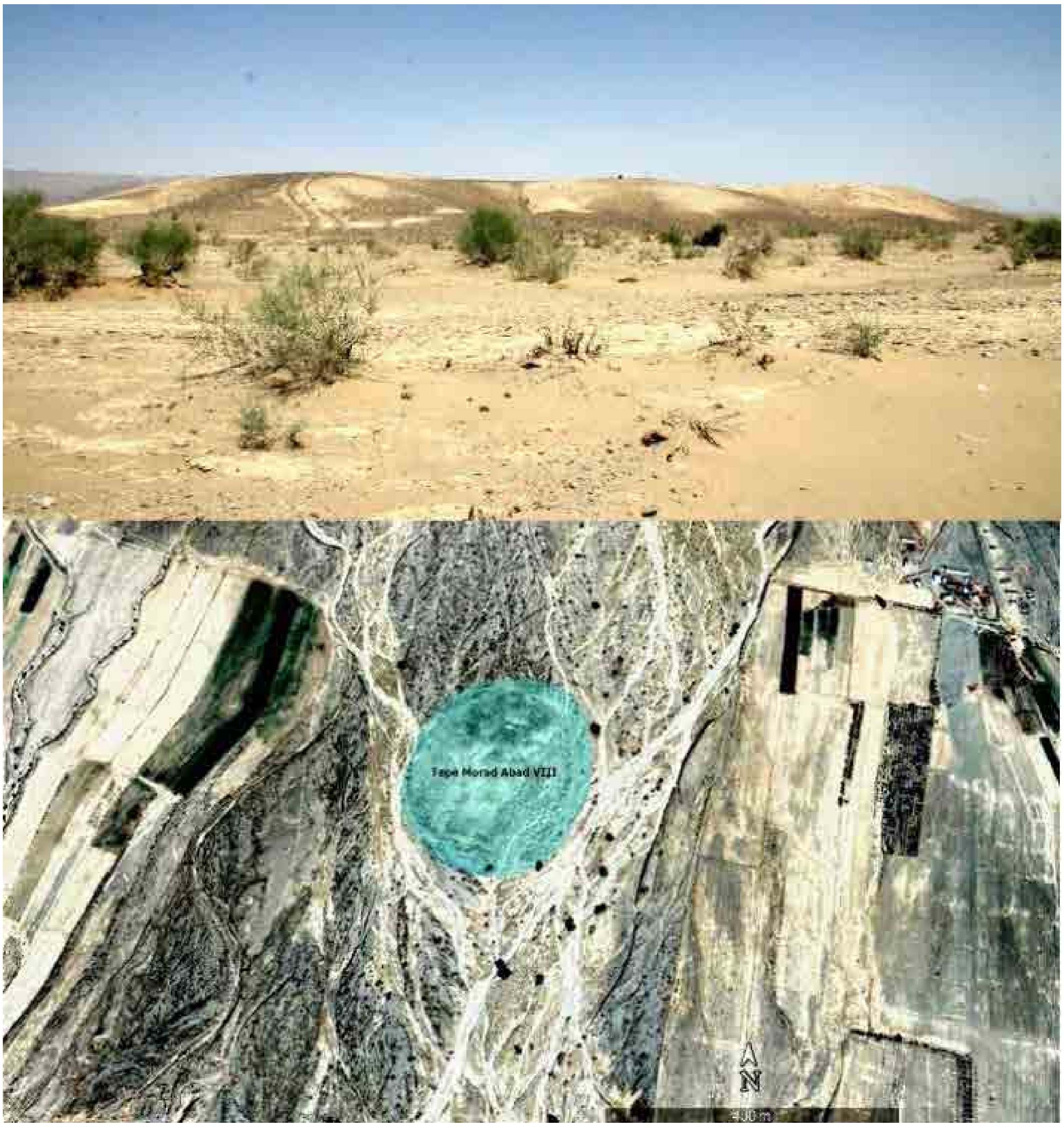


Fig. 3. Northern facade of Tepe Morad Abad VIII and its aerial position relative to the Moradabad River

3. A History of Archaeological Research and Chronologies for the Early and Middle Chalcolithic Periods of Kerman

Understanding the prehistoric sites in the Orzuiyeh Plain began with scattered surveys conducted by a Peabody Museum Harvard University archaeological team led by C.C. Lamberg-Karlovsky in 1967, followed by excavations at the ancient site of Tepe Yahya in the Soughan Plain in 1968 (Karlovsky et al, 1986). These surveys included test pits at Gaz Tavileh and Morad Abad R26 in the Dolat Abad Plain (the eastern extension of the Orzuiyeh Plain) and along the Ghader Abad (Morad Abad River) and Goushk rivers (the northern basin of the Morad Abad River) by Martha Prickett, a member of the Tepe Yahya excavation team (Prickett, 1986a: 831-928, 938). Excavations at Tepe Yahya began in 1968, and Thomas Wight Beale suggested that the site had been continuously occupied for over 5000 years with only two interruptions: one during the late 4th millennium BCE between periods VA and IVC (Late Chalcolithic) and another during the 2nd millennium BCE between periods IVA and III (Wight Beale, 1986a: 11). Based on radiocarbon dating, he proposed a date of 4900-3900 BCE for the earliest layers of Yahya (Period VII), which he attributed to the Neolithic period (Wight Beale, 1986a: 11). This chronology has been revised several times by excavators at Tepe Yahya. Wight Beale suggested that Period VII at Yahya was the only period belonging to the 5th millennium BCE, and Periods V and VI belonged to the 4th millennium BCE (Wight Beale, 1986a: 11). However, subsequent excavations and chronologies have refuted this view (Eskandari, 2018: 25).

Based on radiocarbon dating from excavations at Tepe Gav koshi in southern Espandagheh-Jiroft Plain, Alidadi Soleimani suggests that Neolithic settlements in southeastern Iran date back to 7175-6650 BCE (late 8th to mid-7th millennia BCE) and continued into the late 7th millennium BCE (6200-6000 BCE) (Alidadi Soleimani& Fazeli Nashli. 2018: 26). This necessitates a reevaluation of the chronology for Tepe Yahya. As mentioned earlier, Prickett conducted limited excavations at Chalcolithic mounds in the region during her surveys in the Morad Abad Plain, including a stratigraphic excavation at Tepe Gaz Tavileh in the southern part of the Dolatabad Plain (Morad Abad River basin) (Prickett, 1986a: 831 – 928. 938). Prickett suggested that radiocarbon and stratigraphic data from both Tepe Yahya and Tepe Gaz Tavileh (R37) indicate that settlement at Tepe Yahya began somewhat later than in the Morad Abad River basin (Dolatabad Plain) (Prickett, 1986b: 228). At Tepe Gaz Tavileh, located in the Morad Abad River basin, Prickett collected 15 radiocarbon samples and obtained dates of 4690, 4700, 4720, 4890, 4900, 4920, 5260, and 5940-5215 BCE for various architectural phases (Prickett, 1986a: 831-928, 938).

Among the dates reported for Gaz Tavileh, one particularly noteworthy range is 5940-5215 BCE. Prickett seems to have hesitated to propose this date, perhaps due to caution or to maintain a distance from Karlovsky's proposed chronology. The most recent absolute dating in the Orzuiyeh Plain comes from the stratigraphic excavation of Tepe Vakil Abad in the Khabr River basin (western Orzuiyeh Plain or Vakil Abad Plain) in 2016, co-directed by Hekmat Allah Molla-Salehi and Mojgan Shafiee. This excavation revealed approximately 4 meters of cultural deposits from the Middle Chalcolithic period (Yahya VA). Radiocarbon dating of charcoal samples from Tepe Vakil Abad indicates that the Yahya VA cultural phase began in the early 5th millennium BCE (4800 BCE) and continued for about 500 years. These findings contradict earlier chronologies for Tepe Yahya and Tepe Morad Abad (Shafiee et al, 2019: 92). Alidadi Soleimani, in a recent archaeological survey of Orzuiyeh County, identified additional Chalcolithic settlements in the western part of the Orzuiyeh Plain, building upon Prickett's surveys of the Dolatabad Plain. These findings suggest a migration of human communities from east to west across the plain (toward the Khabr River basin) in the early 4th millennium BCE. The most recent research on the Chalcolithic period in the Orzuiyeh Plain is the stratigraphic excavation of Tepe Morad Abad VIII (Naseri Taherani, 2022), aimed at establishing a relative chronology for the site.

Outside the Orzuiyeh Plain, Tal-i Iblis in the Bardsir Plain of Kerman is another crucial site for understanding the prehistory of southeastern Iran. Stein first visited Iblis in 1932 (Malek Shahmirzadi, 2012: 406), and Caldwell conducted excavations there in 1966 (Caldwell, 1967). According to Caldwell's absolute dating, the early periods of Iblis (0, I, II), comparable to the known periods at Morad Abad VIII, fall within the mid to late 5th millennium BCE. Iblis Period 0, characterized by coarse, porous pottery with abundant plant temper known as Lalehzar coarse ware, is dated to the mid-5th millennium BCE (4500 BCE). Iblis Period I (4400-4200 BCE), continuing the Lalehzar coarse ware tradition, is also associated with a buff ware painted pottery known as Bardsir ware. Iblis Period II (4200-4000 BCE) is characterized by the continuation of some Bardsir Andehnod Lalehzar coarse ware; along with a red painted pottery called Iblis ware (Malek Shahmirzadi, 2012: 408). Later excavations by Eskandari at Tepe East Dehno in the Shahdad Plain, where the pottery was comparable to Iblis I, necessitated a reevaluation of the Iblis chronology. Absolute dating of pottery comparable to Iblis I at Tepe East Dehno yielded dates of 4750-4500 BCE, placing it in the first half of the 5th millennium BCE. This date is 500 years earlier than the date Caldwell proposed for the Bardsir culture (Eskandari, 2018: 33), (Table 1).

Table 1. Chronologies for the Early and Middle Chalcolithic in Kerman

Area	Period	Date
Orzuiyeh and Soghan plains	Yahya VII	5700-5500BCE
Orzuiyeh and Soghan plains	Yahya VI	5500-5300 BCE
Orzuiyeh and Soghan plains	Yahya VC,VB	5300-4800 BCE
Orzuiyeh and Soghan plains	Yahya VA	4800-4200 BCE
Iblis plain	Iblis 0	5500-5300 BCE
Iblis plain	Iblis I	5300-4800 BCE
Iblis plain	Iblis II	4800-4200 BCE

4. Stratigraphic Excavation of Tepe Morad Abad VIII

A stratigraphic excavation trench was established at the southernmost part of Tepe Morad Abad VIII, the highest point of the mound due to the north-to-south slope of the plain. This location (geographic coordinates: 3136631-463255, elevation 1112 meters above sea level) was Chosen because the northern part is more susceptible to erosion from seasonal floods. The trench, measuring 3 meters east-west and 2 meters north-south, was excavated vertically until virgin soil was reached (Fig. 4).

Excavations revealed 60 cultural layers extending to a depth of 780 centimeters below the datum. Each layer, characterized by its specific soil profile, was assigned a

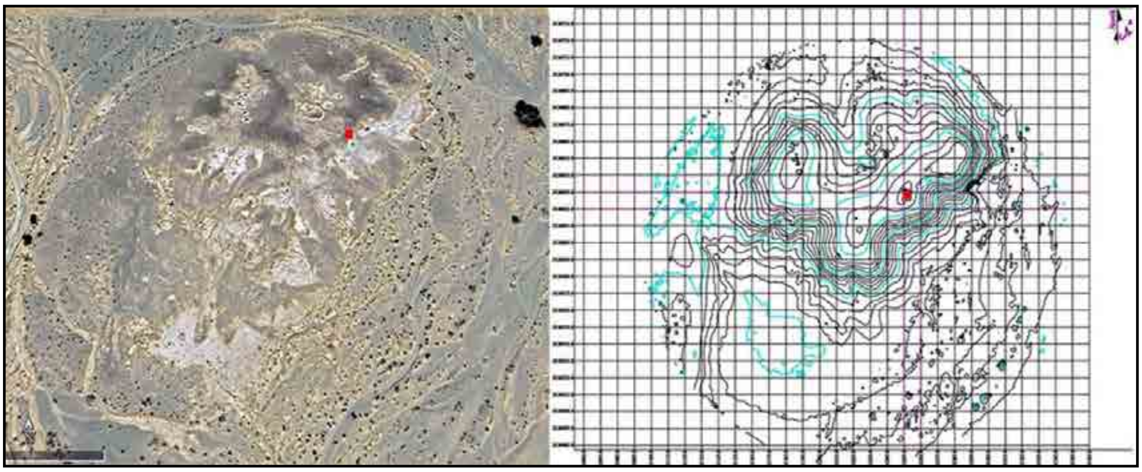


Fig. 4. Topographic map of Tepe Morad Abad VIII indicating the location of the excavation trench.

context number beginning with 1001. The upper portion of the excavation, down to 660 centimeters, showed relatively little evidence of flooding. However, the lower 120 centimeters indicated repeated flooding events, with 13 contexts representing settlements that had been submerged (Fig. 5).

The relative chronology of the cultural periods at Tepe Morad Abad VIII is based on absolute dating methods used in previous excavations in the Orzuiyeh Plain (Tepe Yahya, Gaz Tavileh, Morad Abad X, Tepe Vakil Abad) and neighboring areas (Tel Iblis and Tepe Dehno) in the Kerman region (Table 2). A comparative study of pottery from Tepe Morad Abad VIII with other regions, especially Tepe Yahya (a key site in the prehistory of southeastern Iran), was conducted to classify and categorize the pottery, and to gain a comprehensive understanding of the cultural layers and relative chronology of the site. To this end, all pottery from the excavation trench was collected and categorized based on material, type, decoration, and firing. Then, decorated pottery and fragments that could be reconstructed were selected as representative pottery for study.

Table 2. Proposed Relative Chronology of Tepe Morad Abad VIII (Colored sections indicate the Morad Abad VIII period)

Suggested dating	The formation of Gav Koshi	Gav Koshi	Yahya VII	Yahya VI (Iblis0)	Yahya VC-VB (Iblis I)	Yahya VA (Iblis II)
Gav Koshi (Alidadi Soleimani & Fazeli Nashli 2018: 94 and unpublished reports)	7176-6650 BCE	6200-6000 BCE	5700-5500 BCE	5500-5300 BCE	5300-4700 BCE	
Tepe Yhya (Wight Beale, 1986b: 39)			4900-3900 BCE	3900-3800 BCE	3800-3600 BCE	3600-3300 BCE
Gaz Tavileh (PRICKET, 1986: 831 – 928, 938)			5200-4700BCE			
Tel Iblis (Caldwell, 1967: 13)					4400-4200 BCE	4200-4000 BCE
Tepe Dehno (Eskandari, 2018: 34)					5300-4700 BCE	4700-4100 BCE
Tepe Vakil Abad (Shafiee et al., 2019: 92)					5300-4800 BCE	4800-4200 BCE
Tepe Morad Abad VIII				5600-5300 BCE	5300-4800 BCE	4800-4200 BCE

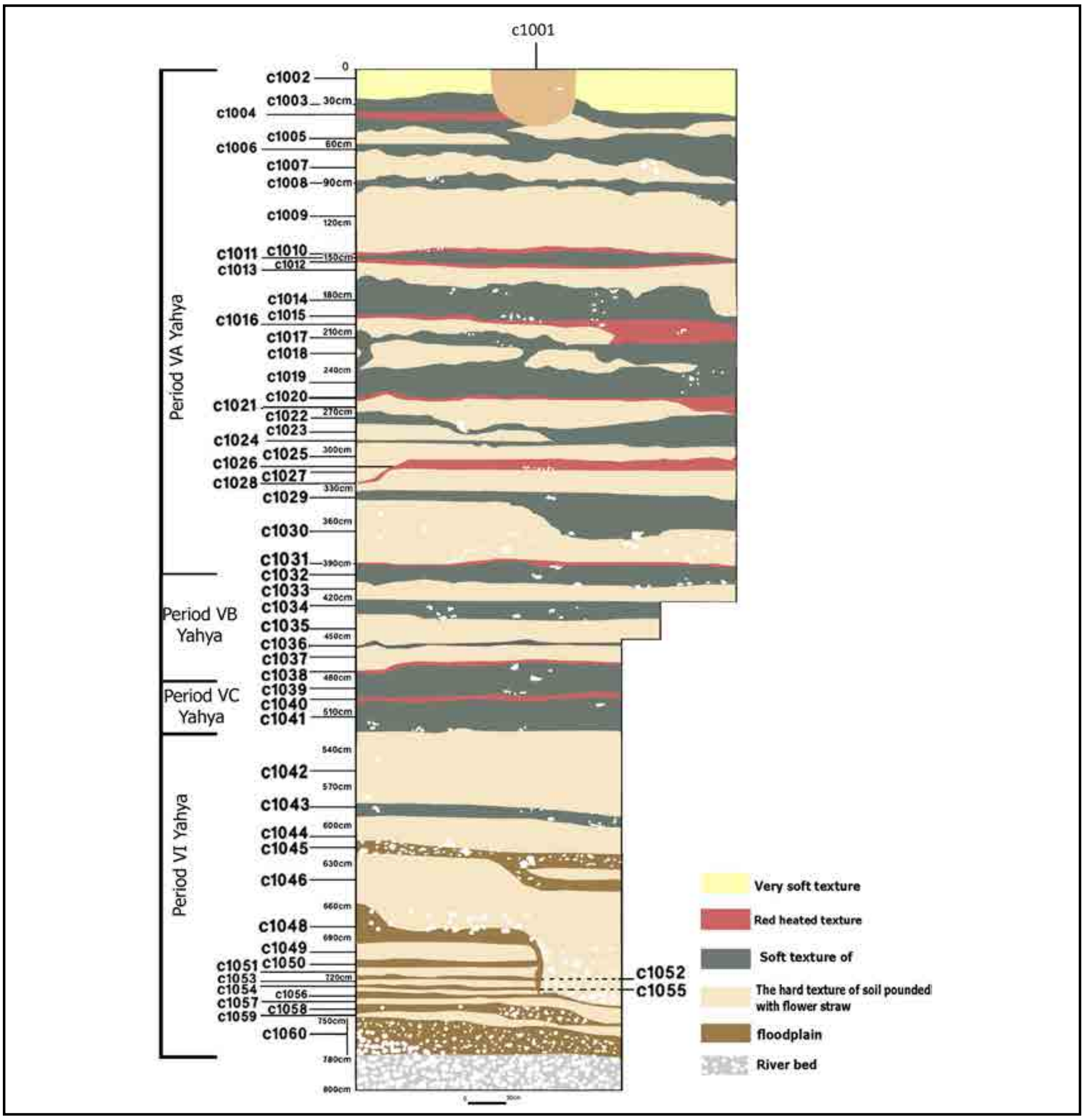


Fig. 5. Stratification plan of the southern workshop area at Tepe Morad Abad VIII.

5. The Pottery of Tepe Morad Abad VIII

The stratigraphic excavation at Tepe Morad Abad VIII yielded 2413 handmade pottery sherds. These sherds were categorized based on their material, type, decoration, and firing technique. Of these, 918 sherds were selected for detailed study, including drawing and classification. The recovered pottery was divided into four main groups, indicating continuous changes in the pottery's paste, decoration, surface color, and shape over time. The first pottery group, comprising 49 sherds, was recovered from a depth of 0-45 centimeters below the datum point (the uppermost settlement layer). The paste of these vessels ranges from fine to medium-grained and exhibits a color range from reddish-brown to buff. They are typically coated with a thin buff slip and contain a temper of wind-blown sand with very fine plant inclusions. Some examples also exhibit a coarser paste with a temper of small plant particles and well-worked sand. Vessel forms in this group include small open bowls, closed cup-shaped vessels, vessels with a simple flat base, and examples with a footed base. The predominant decoration consists of black geometric designs on a buff and reddish-brown background. This pottery group is correlated with the late Yahya VA period (Chalcolithic) (Fig. 6).

The second group comprises 1,316 pottery sherds recovered from a depth of 45-400 centimeters below the datum point. This group is dominated by fine to medium-grained pottery with red paste and slip. In the upper layers of this group (Yahya VA1), the red paste and slip are darker, while in the lower layers (Yahya VA2), they are lighter. Also found in this group are limited quantities of pottery with red paste and buff slip, pottery with buff paste and slip, and a small number of coarse, simple wares tempered with straw,

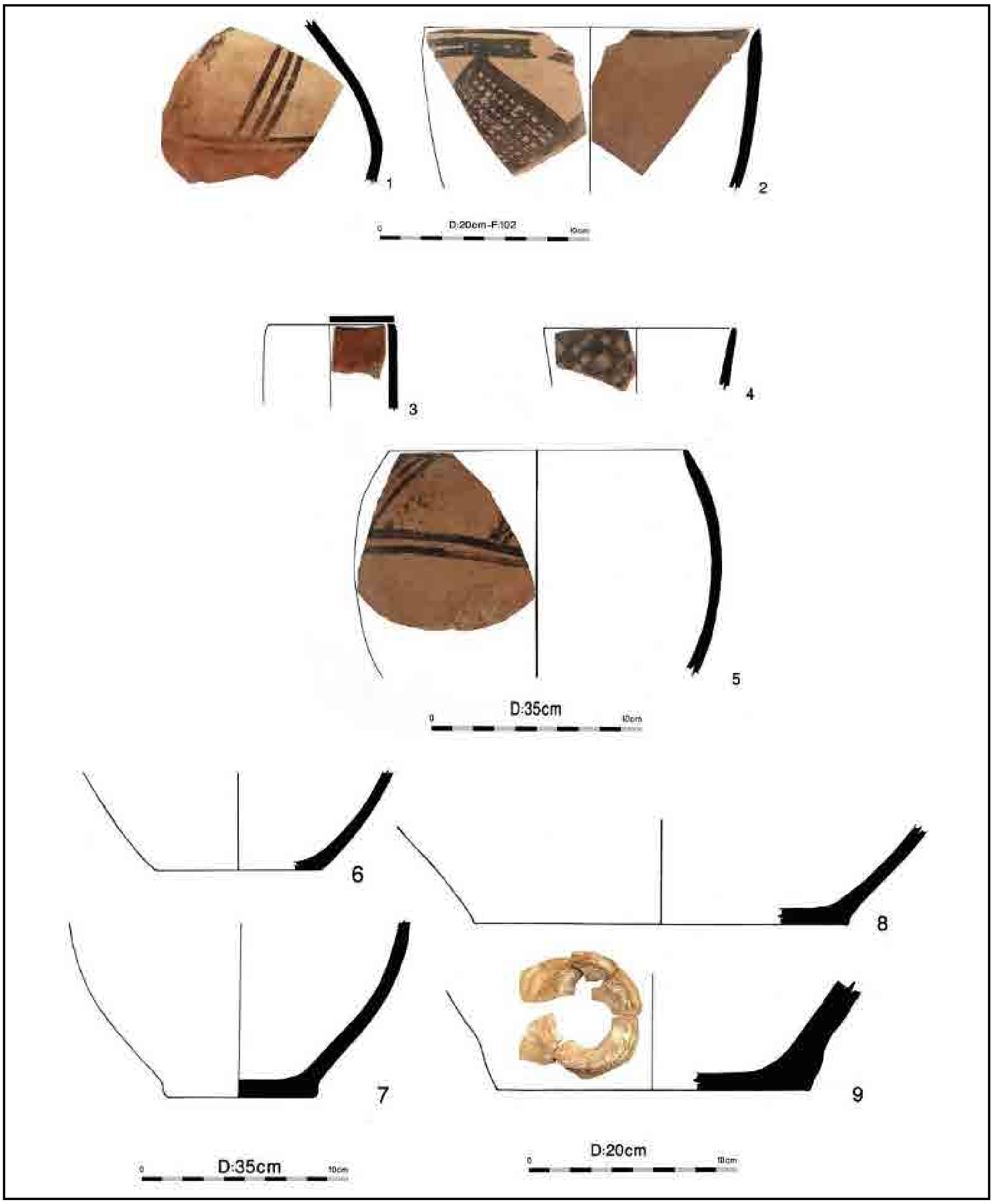


Fig. 6. Pottery samples, first group, from the late VA period of Yahya, recovered from Tepe Morad Abad VIII.

continuing the traditions of the earlier layers. Vessel forms in this group include open-mouthed jar or vase-shaped vessels, conical bowls, closed-necked globular jars, small bowls and cups, cylindrical cups, flat-based and dish with base (lower layers), and two-part vessels with grooved rims (lower layers).

This group is characterized by a prevalence of black geometric designs on a red background, a feature absent in earlier layers. A notable trend in the upper layers is the use of zigzag or chevron patterns, often confined to a narrow band near the rim (VA1). In contrast, the lower layers (VA2) exhibit wider bands of these patterns that extend to the mid-section of the vessels, indicating a significant change in decorative motifs. Additionally, the upper layers show the emergence of potters' marks on the bottom of the vessels. While pottery with black designs on a buff background continues the traditions of earlier layers, the overall characteristics of the second group align with those of the Yahya VA1 and VA2 periods (Figs. 7 & 8).

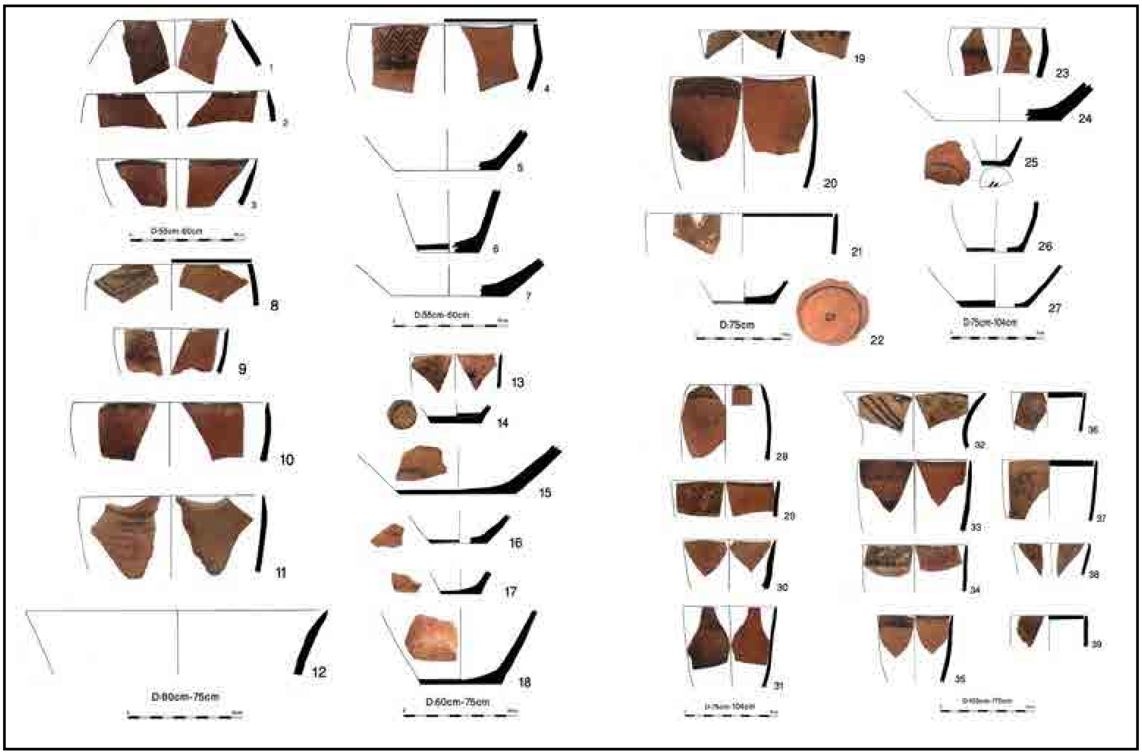


Fig. 7. Pottery samples, second group, from the VA1 period of Yahya, recovered from Tepe Morad Abad VIII.

The third group consists of 342 pottery sherds recovered from a depth of 400-535 centimeters below the datum point. This group features a mix of fine to medium-grained pottery and a prevalence of coarse ware tempered with large pieces of straw. Vessel forms include cylindrical cups, goblet-shaped vessels, conical cups and bowls, globular jars, vase-shaped vessels, a limited number of vessels with ring bases, and the emergence of vessels with a coarse, smoky-fired paste and inwardly curved bases.

A notable characteristic of this group is the absence of black designs on a red slip and the prevalence of black designs on a buff slip. Zigzag or chevron patterns on a buff background, extending to the mid-section of the vessels, are also common. Other distinctive features found in the lower layers include open-mouthed, dish with base with

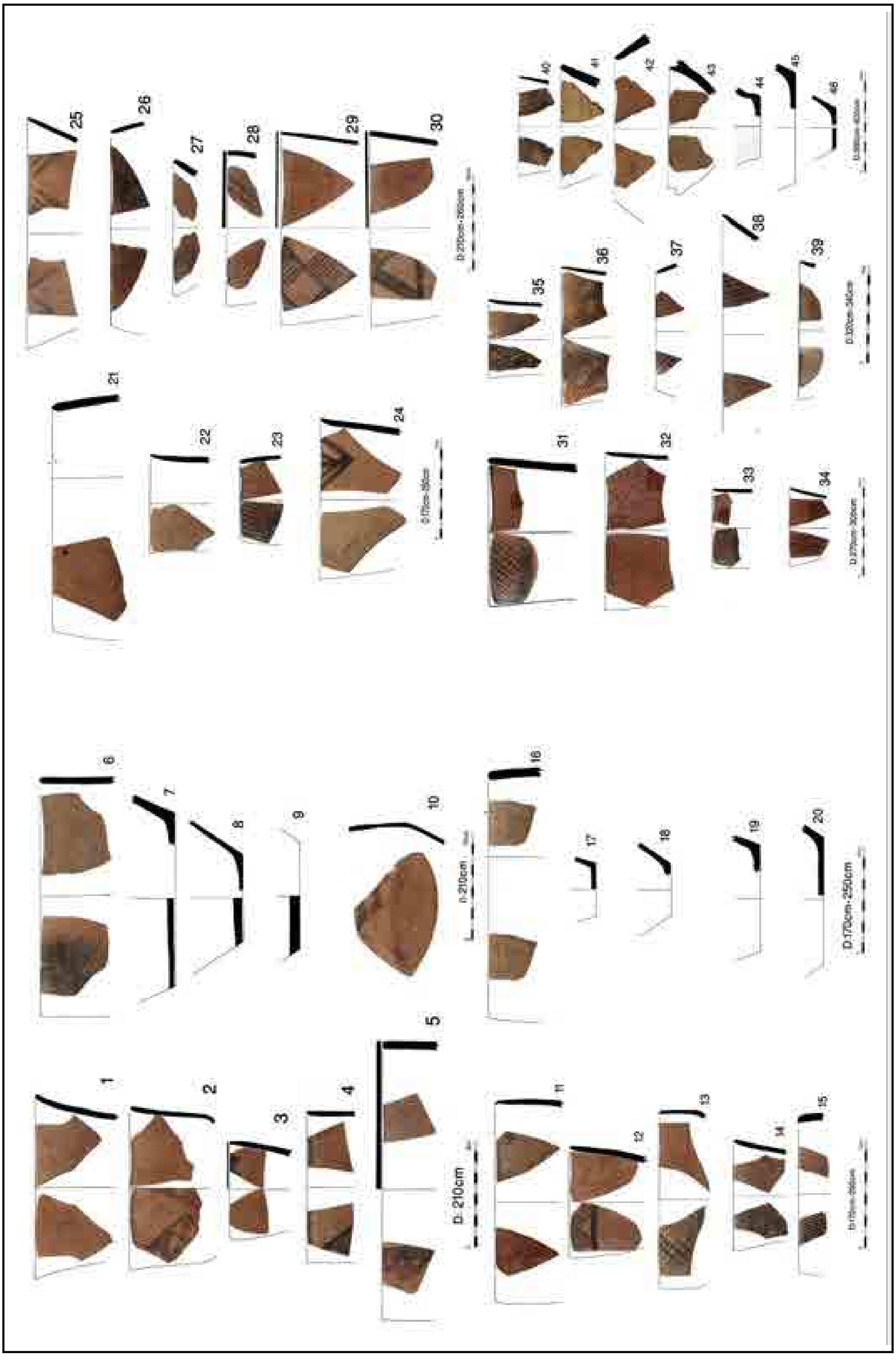


Fig. 8. Pottery samples, second group, from the VA2 period of Yahya, recovered from Tepe Morad Abad VIII.

buff paste and internal decoration, "Lapui ware" (with burnished slip), coarsely-made vessels with applied relief decoration, and painted coarse ware. The pottery of the third group aligns with the pottery of the Yahya VC and VB periods (Middle Chalcolithic) (Figs. 9 & 10).

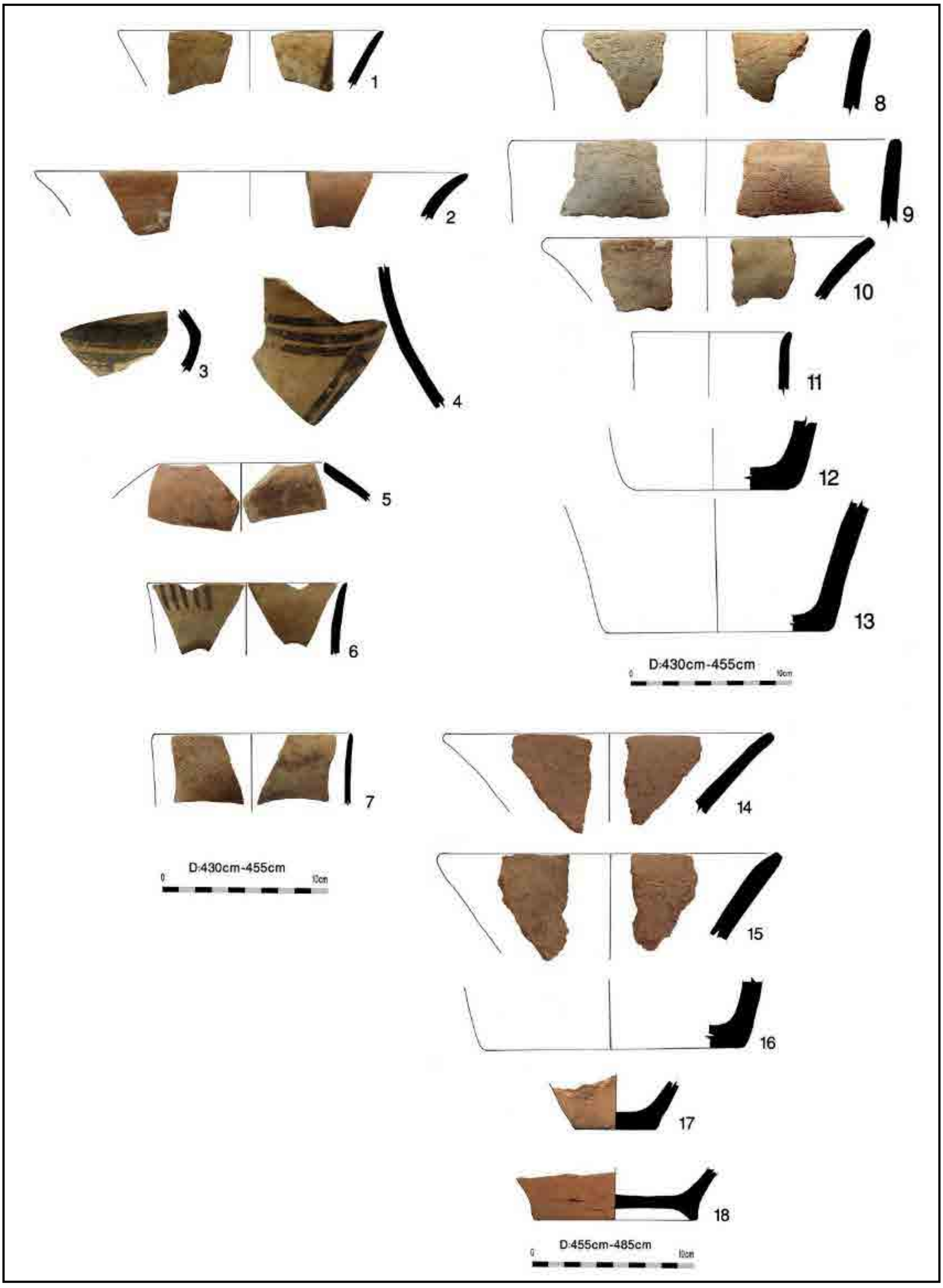


Fig. 9. Pottery samples, third group, from the VB period of Yahya, recovered from Tepe Morad Abad VIII.

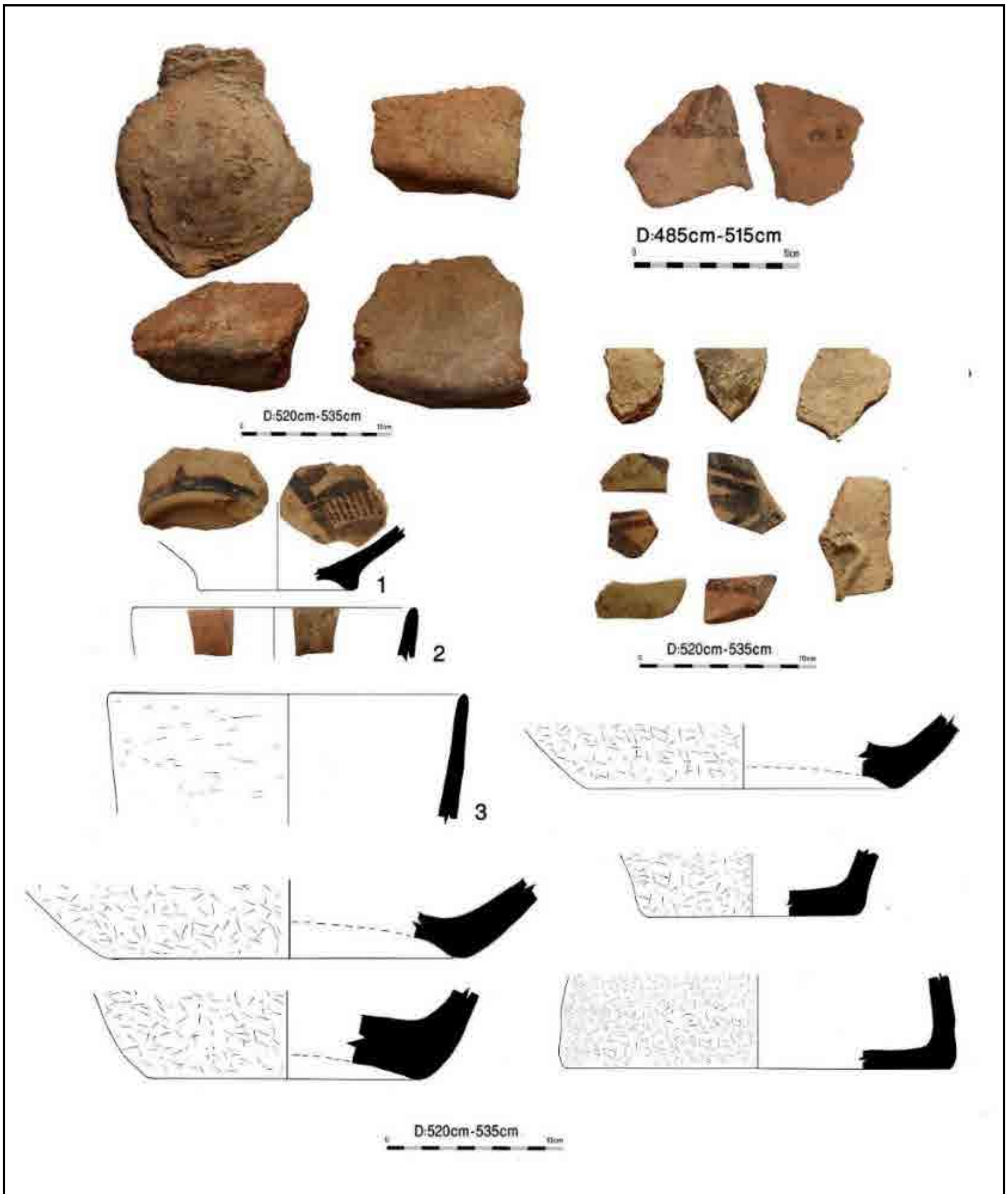


Fig. 10. Pottery samples, third group, from the VC period of Yahya, recovered from Tepe Morad Abad VIII.

The fourth group comprises 706 pottery sherds recovered from a depth of 535-780 centimeters below the fixed datum point. This group is dominated by coarse ware with large straw temper and little to no finishing, with a scarcity of fine to medium-grained pottery. Vessel forms include small and large, coarsely made bowls with simple rims and globular, conical, or cylindrical bodies, Stemmed glasses with the rim turned inside, vase-shaped vessels, and necked jars. The lower layers introduce two-part vessels and waisted jars or jugs. Decorated pottery is absent in this group. The pottery in this group aligns with the pottery of the Yahya VI period (Early Chalcolithic) (Fig. 11).

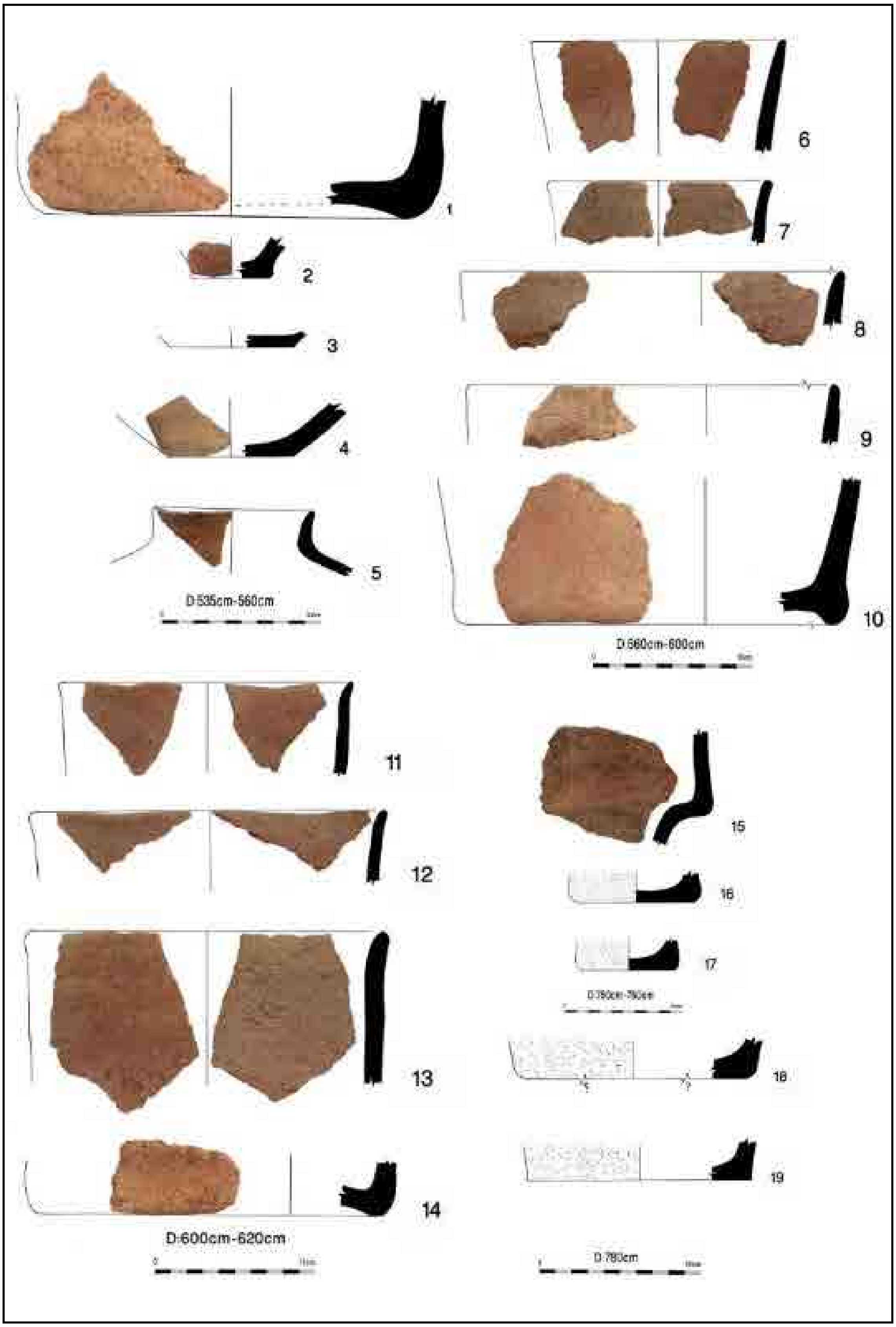


Fig. 11. Pottery samples, fourth group, from the VI period of Yahya, recovered from Tepe Morad Abad VIII.

Based on the characteristics of the four pottery groups from Tepe Morad Abad VIII, as discussed above, the changes observed in the paste, slip, and decoration of the pottery within each group indicate alterations in pottery-making traditions over time. This temporal change is evident in the provided diagram (Diagrams 1 and 2).

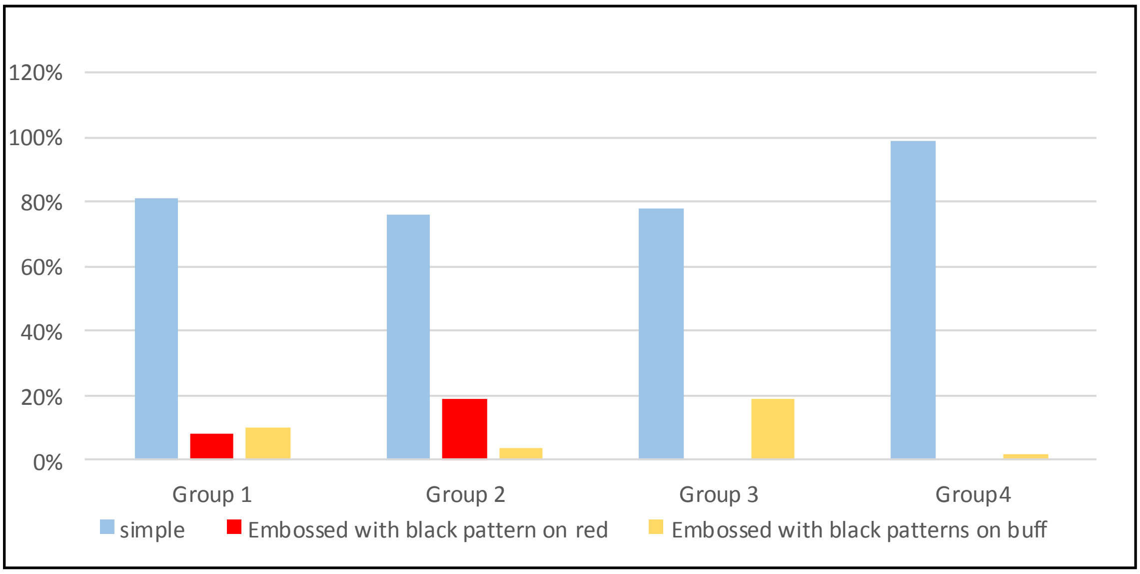


Chart 1. Pottery Decoration Abundance at Tepe Morad Abad VIII

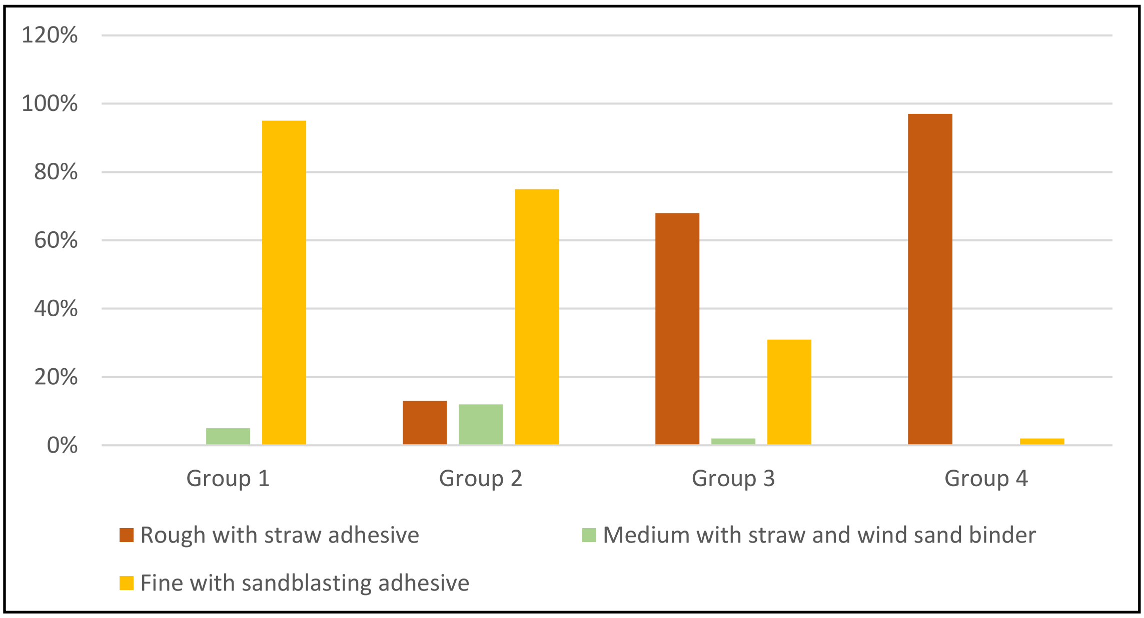


Chart 2. Pottery Temper Abundance at Tepe Morad Abad VIII

6. Relative Chronological Dating of Pottery through Comparative Studies at Tepe Morad Abad VIII

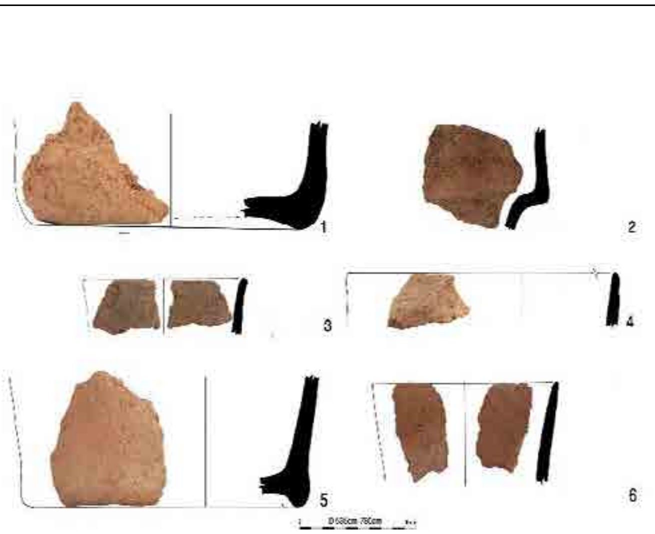
The pottery found at Tepe Marad Abad VIII was divided into four main groups, as explained in previous sections. These four groups were then grouped into two larger time periods: the early Chalcolithic period and the middle Chalcolithic period. These periods and their significance will be explained in more detail in the following sections.

6-1. Early Chalcolithic Period (5600 – 5300 BCE)

The pottery of Group 4 at Tepe Marad Abad VIII exhibits types comparable to those found in Yahya VI (Early Chalcolithic). However, no evidence of earlier types (Yahya VII - the transitional period from the Neolithic to the Chalcolithic, the earliest known period at Yahya) was found in this group (Wight Beale, 1986b:39). Examples of coarse pottery from Yahya VI are comparable to the transitional period (from the Neolithic to the Chalcolithic of Fars) at Shams Abad or Bakun B1 in Fars, known for its undecorated coarse pottery and dated to 5400-5200 BCE (Old Fars) (Alizadeh, 2006: 10). Wight Beale found that people who made pottery during the Yahya VI period (around 5600-5300 BCE) used a lot of big pieces of straw to hold the clay together. This made the vessels weaker and easier to break compared to vessels made earlier in the Yahya VII period (the transitional period from the Neolithic to the Chalcolithic) (Wight Beale, 1986b:39). Prickett, based on ceramic findings from the Goushk Plain survey (north of the Morad Abad River basin), distinguishes Yahya VII pottery from Yahya VI pottery, describing the former as having a dense paste and a polished exterior surface (Prickett, 1986a:1378). Another characteristic of the emergence of Yahya VI is the two-part pedestaled jar form, first observed in Yahya VIB.2. This pottery form, based on the chronological table of Yahya pottery types, is seen from Period VI to Period VB (Early Chalcolithic to the mid-Middle Chalcolithic) (Wight Beale, 1986b: 40-43).

Due to its association with Group 4 pottery at Morad Abad VIII, it was considered to belong to the Yahya VI period. This, along with other supporting evidence, indicates the formation of the earliest settlements on this site during the Early Chalcolithic period (Figs. 1-6 in Table 3). Unlike the sites observed in the western part of the Orzuiyeh plain, which are often situated on a natural hill base, the earliest settlement layers of Morad Abad VIII were established at the same level as the Morad Abad plain and river. Despite being repeatedly affected by floods and river currents, the extremely favorable location, including fertile soil and abundant water, ensured the continuity of settlement

Table 3. Pottery Comparison: Morad Abad VIII vs. Yahya, Iblis, and Neighbors (Early Chalcolithic)

Row	Early Chalcolithic period pottery of Morad Abad VIII	Comparable examples
1		**Yahya VI, Iblis 0** (Wight Beale, 1986: Fig. p 44, 48; Caldwell, 1961: Figures p 117, 119, 206). **Shams Abad (Bakun B1)** (Sardari & Rab, 2018: Figures p 655; Sardari, 2011: Figs. p 82).

and created a relatively safe platform (approximately 1.5 meters high) of residential and flood deposits for subsequent settlements.

Therefore, based on the ceramic evidence, the settlement at Morad Abad Tappeh began in the Early Chalcolithic period (Yahya VI) and, after passing through this period, entered the short Yahya VC period, where the beginning of cultural changes in the pottery is evident. According to the chronologies, this cultural period at Yahya lasted about 300 years. Prickett found that people lived in Gaztavile, located in the southern part of the Morad Abad River basin in the Orzuiyeh plain, during the Yahya VII period. Due to decreased floods and water scarcity in the region, as described by, settlement shifted to the northern basin of the Goushk River during the Yahya VI period(Prickett, 1986b: 234). Evidence of this early settlement, including multiple water channels, is found at Tepe Morad Abad VIII.

6-2. Middle Chalcolithic Period (5300– 4200 BCE)

Significant evidence of the emergence of VC pottery (marking the beginning of the Middle Chalcolithic period) has been found in Group 3 pottery at Tepe Marad Abad VIII. This period can also be considered as a transitional phase from the Early Chalcolithic to the Middle Chalcolithic. In addition to the continuation of coarse pottery from the Yahya VI period (Early Chalcolithic), the appearance of new pottery types brought Morad Abad VIII into the short Yahya VC period. One of the indicators of the beginning of the Yahya VC period is the emergence of shiny pottery known as Lapui. This type of pottery was prevalent until the Yahya VA2 period, which is quite different from VC. In the chronology presented in the excavation report of Tepe Yahya, Lapui pottery is very rare in the VIB1 period, rare in the VIA period, common in the VC period, very common in the VB period, common in the VA2 period, and rare in the VA1 period (Wight Beale, 1986b: 55, 39). This type of pottery was also observed in Group 3 pottery at Morad Abad VIII, matching both in terms of vessel form, color, and surface color with the type found in Yahya VC (Figs. 11 and 20 in Table 4).

A further critical indicator of the onset of the Yahya VC period, marking the commencement of the Middle Chalcolithic era, is the emergence of coarse pottery adorned with broad bands of color. This pottery typology spans from the VIB to the VC phases of the Yahya sequence (Wight Beale, 1986b: 42). Examples of this pottery type, identified within Group 3 ceramics at Morad Abad VIII, exhibit a striking congruence with Yahya counterparts in terms of both clay composition and decorative motifs. Consequently, in conjunction with other evidence pertaining to the initiation of the Middle Chalcolithic within Group 3 ceramics, the presence of the Yahya VC phase at Morad Abad VIII is substantiated (Figs. 9 and 17 in Table 4).

Another intriguing ceramic find in Group 3 is the example of relief-decorated pottery. While absent from the Yahya reports, this pottery type is characteristic of the coarse ware of the Lalehzar phase at Iblis in the Bardsir Plain, where the excavator attributed it to the Neolithic period (Caldwell, 1967: 120). Malek Shahmirzadi correlated it with the Tel Bakun B phase in Marvdasht, Fars (Malek Shahmirzadi, 2012: 400). Recent radiocarbon dating from stratified excavations at Dehno and VaKil Abad has significantly revised the chronology of the region's Chalcolithic period, pushing it back by a millennium (Eskandari, 2018:34) (Mojgan shfiee, 2019: 92). Considering this new evidence, and upon examining the ceramic characteristics of the Yahya VI to VC periods in Group 4 pottery at Morad Abad VIII, a reassessment of the pottery with Lalehzar characteristics at Tal-i Iblis is necessary. Specifically, the distinctive examples with added motifs, previously attributed to the Neolithic by Caldwell (1967), should be reassigned to the Early and Middle Chalcolithic periods (Yahya VI to VC). The evidence presented in Figures 15 and 16 of Table 3 supports this reassignment.

The VC ceramic culture provided the foundation for the re-emergence of fine, painted pottery featuring black designs on a buff-colored background. This type of pottery was prevalent from the VC to the VA1 periods at Tepe Yahya. However, the VC examples exhibit distinct characteristics in terms of decoration (confined to the base of vessels), paste, and form compared to subsequent periods (Wight Beale, 1986b: 61-62). Examples of this decorated pottery were discovered in the earliest layers of Group 4 ceramics at Morad Abad VIII (Figs. 7 and 8 in Table 4). During the Yahya VI to VC periods, the southwestern region of Iran witnessed an increasing influence from the Ubaid culture. The emergence of pottery with black designs on a buff-colored background is likely a result of this influence. In the VC period, the first instances and examples of this new type of black-on-buff ware, albeit in limited quantities, became apparent. These vessels are comparable to those found at Jafar Abad, Bakun B2 and Gap. The VC-period black-on-buff ware may indicate a direct western introduction. However, by the VB period, these fine, well-made vessels were widely produced locally (Lamberg-Karlovsky and Wight Beale, 1986: 266).

Upon reaching a depth of 485 centimeters below the fixed point of the excavation grid at Tepe Morad Abad VIII, and having passed through less disturbed settlement layers by floods, a new phase of ceramic development became evident. This phase is characterized by a prevalence of fine, buff-colored ware decorated with black designs, and a noticeable increase in the proportion of fine wares relative to the coarser types of the preceding period. The form, decoration, and surface color of these new ceramics align with the VB period at Yahya (Figs. 18-40 in Table 4). The VB ceramic type in Fars is known as the Bakun (B2) ware (Prickett, 1986b: 237).

To compare the Yahya VB buff-colored ware's overall style with contemporary ceramics, we examined examples from the central plateau and western regions. These included the Bakun ware of Fars, the Middle and Late Susiana ware of Khuzestan, the Middle and Late Chalcolithic ware of Zagros, and the Sialk VII-4III ware of the central plateau (Hezhabri *et al.,* 2012: 84). According to the Yahya excavation reports, one of the most significant characteristics of the short VB period is the prevalence of buff-colored ware with black designs, particularly those with a chevron pattern. Based on Wight Beale's chronology, these vessels were very rare in the VIA period, rare in the VC period, very common in the VB period, common in the VA2 period, and again rare in the VA1 period (Wight Beale, 1986b: 58-70). Between 45 and 400 centimeters below the fixed point of the excavation grid at Morad Abad VIII, alongside the VB ceramic culture, a new type of pottery with black designs on a red background was discovered. This new pottery constitutes the second group of ceramics at Morad Abad VIII. In this group, the VB ceramic style continues with some modifications, but there is a significant decrease in the use of coarse pottery with large straw temper. Pottery with black designs on a red background was common during the VA2 and VA1 (Middle Chalcolithic) periods at Tepe Yahya (Wight Beale, 1986b: 72-76) and can also be divided into VA1 and VA2 types in Morad Abad VIII, similar to the pottery at Yahya (Figs. 41-88 in Table 4).

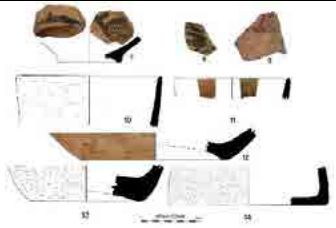
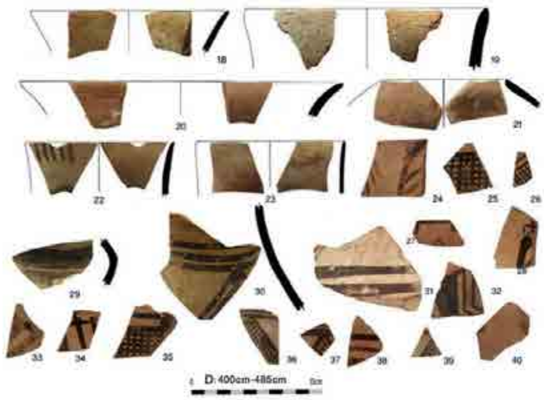
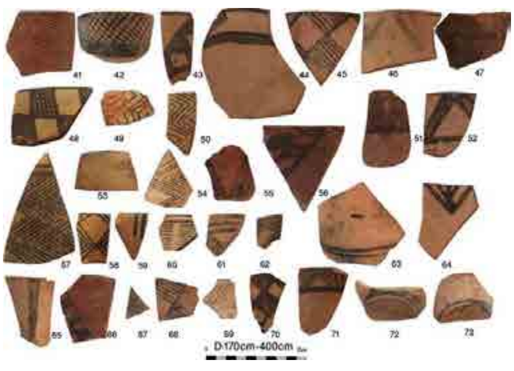
Within the first 20 centimeters of the uppermost and most distinct stratum in the excavation of Morad Abad III, evidence of continued occupation was found. This 45-centimeter-thick stratum has a disturbed and very soft texture, likely due to alluvial fan activity and seasonal flooding, resulting in a weathered, powdery consistency. Although the pottery found in this layer is limited, it continues the tradition of Yahya VA ceramics. The pottery exhibits no similarities to the post-VA Yahya period or the Chalcolithic period as reported by Prickett at this site (in her study of the Goushk River basin) and other mounds in the Morad Abad plain, such as Morad Abad XII (Prickett, 1986b: 244). Therefore, the pottery of this layer, classified as Group 1 in the ceramic typology of Morad Abad VIII, can be attributed to the late Chalcolithic period, albeit with slight differences in paste composition. Consequently, it has been placed in a separate group due to both the distinct nature of the stratum and the unique characteristics of the ceramic paste.

The Iblis IV and V (Chalcolithic) ceramics discovered by Prickett during excavations at Morad Abad XII were found within burials situated in a disturbed, superficial stratum (the uppermost settlement layer) with a very soft texture. This texture is similar to that of the initial layer excavated at Morad Abad VIII. In contrast, VA period (Early Chalcolithic) ceramics were found outside of burials within the same soft stratum (Prickett, 1986a: 943-960). Therefore, the latest settlement layer at Morad Abad XII can be attributed to the VA period, followed by subsequent burials from the Iblis IV and V periods (late Chalcolithic) within the same final settlement layer.

Prickett suggests that during this period in the Morad Abad plain, there is evidence of societal disintegration, with communities living in smaller, transient groups (Prickett, 1986b:236). It is possible that Iblis IV and V represent a period of expansion, migration, or a nomadic lifestyle in the region, the reasons for which are still unclear (Lamberg Karlovsky and Wight Beale, 1986:267-268). Based on the ceramic evidence, the uppermost settlement layer in the stratigraphic excavation at Morad Abad VIII indicates the final stages of occupation of this site during the VA period. Prickett, based on her research in the Morad Abad plain, suggests that the VA period marks the end of significant settlement in the Dolat Abad region (the Morad Abad river basin) (Prickett, 1986b: 237-238). However, recent studies suggest that while post-Chalcolithic settlements may have decreased, they did not entirely cease. For example, Tepe Gaze Bahar in the central part of the Morad Abad plain, which belongs to the Chalcolithic period (Alidadi Solimani, 2009), supports this idea. Prickett posits that it took approximately three thousand years for permanent settlements to re-establish themselves in the region (until the introduction of Qanats), after which new settlements were formed in different parts of the Morad Abad plain (Prickett, 1986b: 37-38). According to absolute chronologies, the Yahya VA period lasted about 600 years, making it longer than other Chalcolithic cultural periods (Table 2). Based on his research in the Morad Abad river basin, Prickett argues that the VA period was actually the period of maximum settlement in the region, with over 53 archaeological sites in the area dating to this time (Prickett, 1986b: 37-38).

Recent studies in the Orzuiyeh plain reveal that, despite the destruction of some settlements due to flooding, most of the remaining, visible prehistoric settlements in the Morad Abad river basin belong to the Yahya VA period (Middle Chalcolithic) (Alidadi Solimani, 2009). However, Prickett also notes the diversity of pottery in the Soughan and Shahmaran-Dolat Abad regions throughout the Yahya VA period (Prickett, 1986b: 217). This is consistent with the pottery from the VA period at Morad Abad VIII, which, like

Table 4. Pottery Comparison: Morad Abad VIII vs. Yahya, Iblis, and Neighbors (Middle Chalcolithic)

Row	Middle Chalcolithic period pottery of Moradabad VIII	Comparable examples
1		**Yahya VC** (Wight Beale, 1986b: Figure p 42, 48). **Middle susiana** (Dollfus, 1997: Figures p 31)
2		**Iblis 0** (Caldwell, 1967: Figs. p120).
3		**Yahya VB** (Wight Beale, 1986b*:* Fig. p 56, 60, 65). Iblis I (Caldwell, 1967: Fig. p. 126, 126, 128, 208). **Bakun B2** (Hejbari Nobari, et al., 2012: Figures p. 91, 93, 94; Taheri, 2015: Figures p 122, 127, 131, 140*;* Alizadeh et al., 2006: Figurs p 179; Alizadeh,2009: Figurs p 273). **Middle Susiana** (bajuorvand et al., 2018: Fig. p 49, 51, 52*;* Delougaz & Alizadeh, 1996: Figure plat: 56, 57, 59, 60, Alizadeh. 1992*:* Figures p 83, 85, 91, 99, 109, 147). **Sialk III:** (Ghirshman, 1939: Fig. p 240-259). **Ubaid 3** (Nadali & Polcaro, 2020: Figure p 77, 79; Jasim *et al.,* 2021: Figures p 360-378).
4		**Yahya VA2** (Wight Beale. 1986b: Figure p: 60, 64, 70, 71, 74, 75,). **Iblis II** (Caldwell, 1967: Figur p 130, 132, 133, 175). **Sialk III** (Ghirshman, 1939: Figure p 240-259) **Bampur** (Mutin *et al.,* 2017: Figure p, 7). **Ubaid 3** (Nadali & Polcaro,2020. Figure p 77, 79; Jasim *et al.,* 2021: 360-378)
5		**Yahya VA1.** (Wight Beale, 1986b: Figures p 74, 77, 79) Iblis II (Caldwell, 1967: Figs. p131, 173, 210) **Bampur** (Mutin *et al.,* 2017: Fig. p, 7)

the pottery found in Prickett's survey of the Dolatabad plain and the excavated pottery from Tepe Yahya, exhibits a wide variety of motifs and forms. Lamberg-Karlovsky suggests that during the VA period, there existed a favorable economic situation based on a settled agricultural lifestyle. The distribution of pottery from this period extends from Chah Hosseini in eastern Iran to Haji Abad along the Bandar Abbas-Kerman highway in the west, covering a distance of approximately 475 kilometers, and from Shahdad in northern Kerman to southern Minab, spanning over 500 kilometers on the north-south axis (Lamberg-Karlovsky, 1986: 8-9). Furthermore, recent archaeological investigations in the Jiroft region support the number and extent of Yahya VA settlements in the southern part of the Jiroft plain, adjacent to the eastern part of the Orzuiyeh plain, confirming the widespread nature of these settlements (Pfälzner et al, 2019). Overall, based on the map provided by Prickett, settlements with Yahya VA ceramic culture have been identified as far as the Khash region, in the northeastern part of the Bampur Valley (Prickett, 1986a: 765).

7. Discussion of the Archaeological Record at Morad Abad VIII

Martha Prickett's investigations in the Dolatabad plain (Morad Abad River basin) and the stratigraphic excavation at Morad Abad VIII clearly demonstrate that the settlement, which originated in the southern part of the Morad Abad River basin (at Tepe Gaz Tavileh) during the Yahya VII period, continued northward to Morad Abad VIII from the Yahya VI period onward due to the region's abundant water resources. This settlement continued uninterrupted until the end of the Chalcolithic period (Yahya V). The continuity of the Yahya ceramic culture from the Early Chalcolithic to the end of the Middle Chalcolithic period, along with other evidence of subsistence such as agricultural and pastoral products1 at Morad Abad VIII, indicates the favorable location of this site for the inhabitants of the Morad Abad river basin during the Chalcolithic period. This is attributed to the abundant surface water2 , fertile agricultural soil , and accessible pastures for grazing livestock up to the northern mountain ranges, ultimately making it a central hub for meeting the subsistence needs of the inhabitants of the Morad Abad river basin, and perhaps even the Orzuiyeh and Soughan plains, for an extended period during the Chalcolithic period.

Yahya V, based on archaeological evidence, is a period of significant growth, prosperity, and an increase in the number of settlements, resulting in the development and flourishing of the southeastern region of Iran. This period is divided into three sub-periods (VC, VB, and VA) in the Yahya Tepe chronology based on changes in ceramic traditions. Through comparative studies, these three periods are clearly observable at Tepe Morad Abad VIII. The importance of studying the ceramics from Morad Abad VIII lies in the presence of highly diagnostic pottery that aids in identifying each phase of settlement at this site, reinforcing relative chronologies. The stratigraphy and relative chronology of Morad Abad VIII (R6) indicate that this site was continuously occupied by Chalcolithic communities for approximately 1400 years, from the mid-6th millennium BCE to the late 5th millennium BCE. Therefore, based on the available radiocarbon data and ceramic analysis, a relative chronology spanning from 5600 BCE (Yahya VI period) to 4200 BCE (late Yahya VA period) is proposed for the settlement at Morad Abad VIII. This encompasses four cultural periods: the Early Chalcolithic (Yahya VI) and the Middle Chalcolithic (VC, VB, and VA periods) (Table 2).

8. Conclusion

Recent archaeological research in southeastern Iran has necessitated a reevaluation of the early chronologies of the prehistoric periods in this region, particularly for the ancient site of Tepe Yahya, which has served as a reference for the study of prehistoric pottery in the area. Previously, there was no knowledge of Neolithic sites in southeastern Iran, and the oldest archaeological layers at Tepe Yahya, which were located on virgin soil, had been attributed to the Neolithic period. Excavations, stratigraphic studies, and dating conducted for the Neolithic and Chalcolithic periods have been a significant step in revising and refining the prehistoric chronology of the region. As a result of these excavations, the attribution of the Neolithic period to Yahya VII has been rejected, and the chronology of the Chalcolithic period in the region has been pushed back by nearly a millennium. Consequently, the relative dating of the cultural layers at Tepe Morad Abad VIII can now be done with greater certainty based on recent absolute dating.

Previous excavations and archaeological investigations in the region have noted the existence of a considerable number of distinctive pottery types of a local production tradition during the Early and Middle Chalcolithic periods. Comparative studies conducted on the pottery from the excavations at Tepe Morad Abad VIII show that the ceramic production culture in the settlement layers of this site, during the 6th and 5th millennia BCE, was connected to and comparable to the pottery culture of neighboring regions, similar to the ones observed at Tepe Yahya. The local tradition of the region continued with fluctuations in subsequent periods, confirming previous findings. In summary, based on cultural findings, especially pottery and evidence of agriculture and animal husbandry, as well as the site's location, the community at Morad Abad VIII was able to develop into a sophisticated pastoral and agricultural society during the Early and, especially, the Middle Chalcolithic periods.

9. Acknowledgements

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10. Endnote

1. A significant number of burnt wheat and barley grains, as well as fragments of animal bones from domesticated animals such as goats and sheep, were found during the stratigraphic excavation of Tepe Morad Abad VIII
2. At Tepe Morad Abad VIII, several water channels converge, and the river reaches its widest point in this section.
3. The slope of the land decreases significantly in this area, causing the river to deposit sediment in this section.

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گاهنگاری نسبی براساس طبقه‌بندی و گونه‌شناسی سفال دورۀ مس‌وسنگ تپه مرادآباد VIII دشت ارزوئیه (استان کرمان)

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چکیده

دشت ارزوئیه یکی از مهم‌ترین بسترهای جغرافیایی بوده که استقرارهای پیش‌ازتاریخ (خصوصاً مس‌وسنگ) در جنوب‌غرب استان کرمان را دربر گرفته است. در این دشت کاوش‌های باستان‌شناسی محدودی در محوطه‌هایی مانند: گزطویله، مرادآباد XII و وکیل‌آباد انجام‌شده، اما نتایجی از توالی استقرار در چند دورۀ فرهنگی مس‌وسنگ به‌دست نیامده است؛ لذا، لایه‌نگاری در تپۀ مرادآباد VIII که از مرتفع‌ترین تپه‌های دوران مس‌وسنگ در این منطقه است، با هدف گاهنگاری نسبی و تکمیل اطلاعات درخصوص استقرارهای دوران مس‌وسنگ و تداوم فرهنگ سفال این دوره در دشت ارزوئیه ضروری به‌نظر رسید. با توجه به ضخامت نهشته‌ها و سفال‌های پراکنده بر سطح تپۀ مرادآباد VIII وجود چند دورۀ فرهنگی متوالی، مطابق با فرهنگ سفال مس‌وسنگ یحیی انتظار می‌رفت. در این تحقیق که به روش مطالعات میدانی و کتابخانه‌ای و رویکرد توصیفی-تحلیلی، انجام‌شده است، توالی فرهنگ سفال مس‌وسنگ در استقراری طولانی‌مدت آشکار شد و ۶۰ لایۀ فرهنگی شناسایی و ۲۴۱۳ قطعه سفال به‌دست آمد که ۹۱۸ قطعه قابل مطالعه، طراحی و گونه‌شناسی شدند. نتایج نشان‌داد که تپۀ مرادآباد VIII در دوره‌های VI, VC, VB و VA یحیی (از مس‌وسنگ قدیم تا پایان مس‌وسنگ میانی) بدون‌وقفه مسکونی بوده و تاریخ نسبی ۵۶۰۰ تا ۴۲۰۰ پ.م. برای آن پیشنهاد شد.

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Late Chalcolithic to Late Bronze Age Settlement Patterns in the Gorgan Plain (ca. 3200-1600 BCE)

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Abstract

The Gorgan Plain in Golestan Province is one of the most archaeologically rich regions in Iran. Given its favorable climate, the Gorgan Plain has been an attractive location for settlement by agricultural villagers for millennia. In the 19th and 20th centuries, the region attracted the attention of European travelers and archaeologists, who were fascinated by the Great Gorgan Wall, the remains of medieval cities, as well as the hundreds of ancient mounds that dot the plain. Despite over one hundred years of archaeological survey in the Gorgan Plain, however, we still know very little about historical trends in settlement before the Iron Age. Through the digital integration of five previously published surveys of the Gorgan Plain and a novel remote survey methodology using Google Earth, it has been possible for the first time to perform a basic characterization of the late prehistoric settlement patterns of the Gorgan Plain.

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1. Introduction

The archaeological landscape of the Gorgan Plain has been surveyed on multiple occasions, resulting in the accumulation of a large dataset comprising the locations, dimensions, toponymy, and cultural aspects of hundreds of ancient settlements in the region (Abbasi 2011; Arne 1945; Kayani 1974; Mortezaei and Farhani 2008; Sauer *et al.,* 2013; Shiomi 1976, 1978). However, because these surveys were conducted over disparate decades by scholars with distinct disciplinary and national backgrounds, synthesis of these data has proven elusive until recently. Despite differences in methods and approach between these surveys, the data presented in their reports are structured in similar ways. These similarities afford relatively easy integration of their results into a unified regional database. This article presents the procedure by which these surveys were characterized, compared, and augmented through a remote virtual survey protocol. This methodology focused on three major objectives: (1) examining the extent to which the information presented in the published surveys was comparable and (2) assessing the accuracy of the published surveys, and (3) "visiting" each reported site location in Google Earth to verify whether there was indeed a mound-settlement in that location and to record its characteristics through visual inspection of satellite imagery. This information was registered in a Microsoft Access database, which also encoded chronological information reported by the legacy surveys. This reported chronological data was supplemented by a review of published photographs and illustrations of pottery, as well as examination of a collection of survey ceramics from the Gorgan Plain stored in Sweden in order to validate and update the region's site chronology.

This procedure led to two primary results. First, the recognition that the spatial data presented in these legacy surveys is generally reliable, despite variations in coordinate systems and methods of recording site attributes, and second, the identification of a large sample of previously unidentified, likely prehistoric, mounded settlements. Furthermore, the creation of a digital site database for the Gorgan Plain made it possible to perform Exploratory Data Analysis on the historical development of settlement patterns in this region. This analysis charts change over time in settlement distributions, focusing on variation in site location, numbers of sites, and site-size from the Late Chalcolithic to the Late Bronze Age (ca. 3200-1600 BCE). The results of this procedure show that the Gorgan Plain exhibits a unique trajectory of transformations in its settlement geography in comparison to the neighboring areas such as the Caspian Littoral, the North Central Iranian Plateau, Khorasan, and southern Central Asia.

2. Examination and augmentation of previous surveys of the Gorgan Plain

The historical landscape of the Gorgan Plain has long fascinated European travelers, with reports on and accounts of the location and characteristics of archaeological, geological, and hydrological features of the region appearing as early as the mid-19th century (e.g., Arne 1935; De Bode 1844; De Morgan 1890; Hedin 1918; Rabino 1928; Thompson 1938). While these early reports identified dozens of archaeological sites, systematic archaeological site prospection was not initiated until 1933 when T.J. Arne and W. Schweitzer created the first cartographic archaeological map of the region (Arne 1945: 12-22). Archaeological survey of the Gorgan Plain has continued intermittently ever since, conducted by both foreign and Iranian researchers. One of the main aims ongoing research by the present author has been to integrate, synthesize, and extend the results of these regional surveys of the Gorgan Plain conducted between 1931 and 2009. Such work faces many challenges, resulting from the heterogeneity of source-data collected during disparate decades, under diverse disciplinary paradigms, and using differing recording methods (Alcock and Cherry 2004; Allison 2008; Witcher 2008).

These obstacles are insurmountable, however. Indeed, over the past decade, archaeologists have developed a number of ways to harmonize the morphological, chronological, and locational information contained within legacy data sources (Lawrence *et al.,* 2012). Here the procedures and results of source criticism conducted on the surveys of the Gorgan Plain are discussed. This procedure begins by characterizing the reported data followed by comparison of the sources based on their survey design, methods geographic representation, and modes of site description. The published and unpublished records from four of these surveys and one site gazetteer constitute the primary sources of legacy survey data used in this analysis (Abbasi 2011; Arne 1945; Mortezaei and Farhani 2008; Sauer *et al.,* 2013; Shiomi 1976, 1978). These sources offer comprehensive coverage of the parts of Golestan province that are most dense in archaeological sites, i.e., the zone south of the Gorgan Plain river and north of the Alborz mountains (Fig. 1).

According to the three categories of evaluation criteria—survey design, geographic representation, and site description—the surveys exhibit less diversity in their structure than might otherwise be expected, especially given the eighty years separating the earliest from the most recent surveys, as well as the range of disciplinary and national backgrounds of the researchers involved. This similarity can be explained by the nature of the settlement record in the region, for two related reasons: (1) the Gorgan Plain is a landscape of tells and (2) in general, low-intensity large-scale approaches to mapping landscapes of tells tend to record similar categories of information. The basic variables recorded by previous surveys include location, toponymy, morphology, and surface finds; additional variables may or may not include taphonomy, textual descriptions, and graphic representations (Table 1).

3. Using Google Earth to evaluate reported site locations

In recent years, scholars have begun to extend the domain of comparative survey by augmenting existing records through systematic remote site prospection (e.g., Franklin and Hammer 2018; Green and Petrie 2018; Hammer *et al.,* 2018; Hammer and Lauricella 2017; Thomas and Kidd 2017). Thus, in addition to the descriptive source criticism detailed in the previous section, this analysis also involved a virtual remote survey (Gorgan Plain Survey Restudy, hereafter GSR) in order to re-locate and re-record previously reported site locations and to systematically examine Google Earth satellite imagery for previously unreported tell-settlements in the region. Altogether, over 1200 unique sites were extracted from the five sources (Table 2, Fig. 2). For the purpose of this analysis, not all sites were "visited," with the sample restricted to only those sites dating to the period of focus, i.e., the Late Chalcolithic through Late Bronze Age. There were 851 sites in the database dating to this interval, all of which were checked in Google Earth. As a result of this procedure, a sample of 663 unique sites was confirmed, with the gap between the reported and recorded sites being due to two factors: (1) a large number of sites reported in multiple surveys turned out to in fact be the same site and (2) numerous sites could not be located for a variety of reasons (Table 2; Fig. 3).

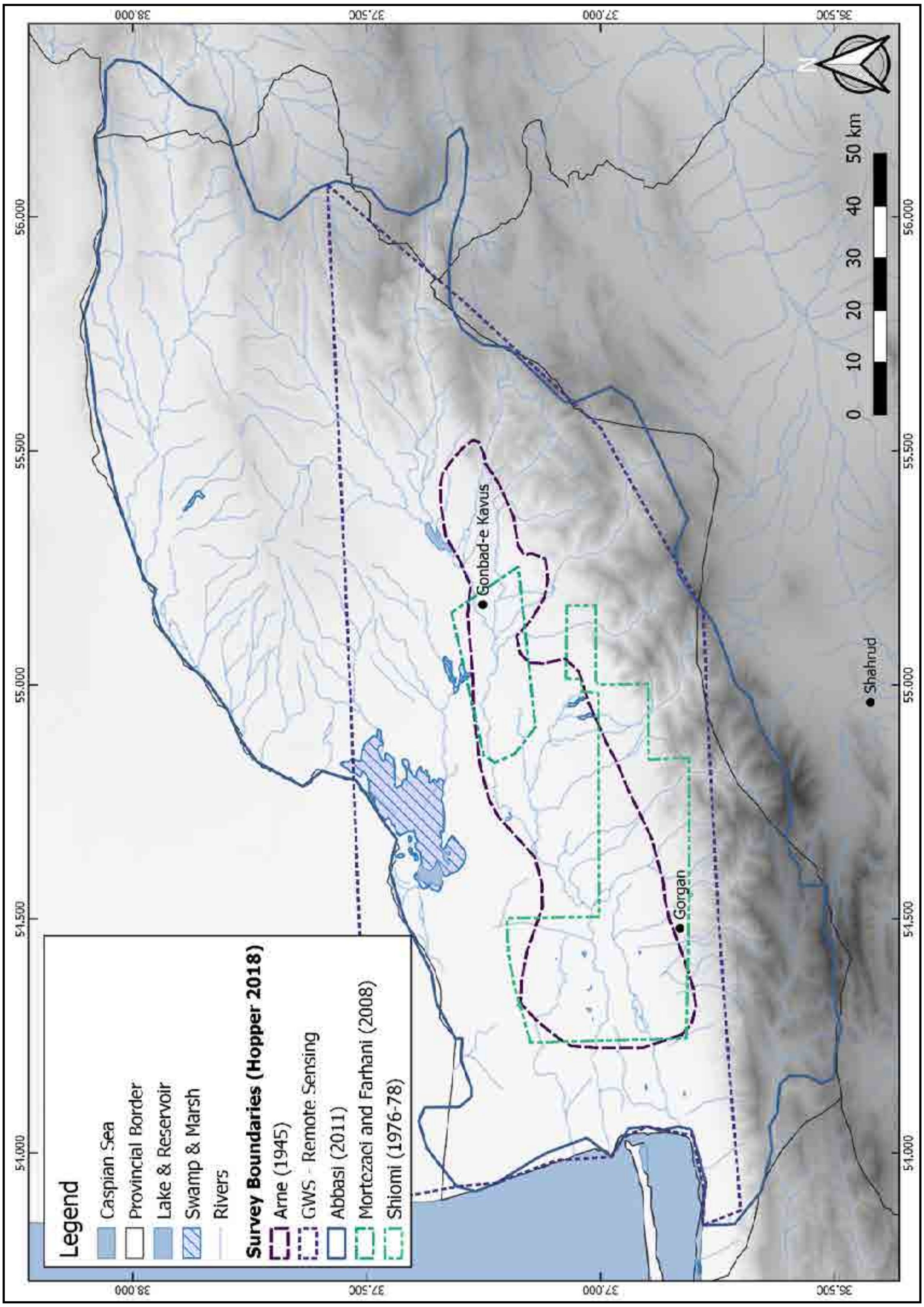

Fig. 1. Map of the Spatial Extent of the Survey Sources (Survey boundary polygons created and generously shared by Dr. Kristen Hopper (pers. comm. 2018).

Table 1. Comparison between the source surveys in terms of Site Description

Survey	Base Measurements	Height Measurements	Graphic Representation of Morphology
Abbasi 2011	None	None	None
Arne 1945	About Half	About Half	About Half (Sketches)
Mortezaei and Farhani 2008	All	All	None
Sauer et al. 2013	More than Half	More than Half	Many (Satellite Imagery)
Shiomi 1974-6	Calculable	All	All
	Morphology Description	**Ground Conditions**	**Chronology Assessment**
Abbasi 2011	None	None	All
Arne 1945	About Half	Infrequent	Infrequent
Mortezaei and Farhani 2008	None	None	All
Sauer et al. 2013	All	All	All
Shiomi 1974-6	All	More Than Half	More Than Half
	Chronology Type	**Surface Remains Described**	**Surface Sherds Depicted in Publication**
Abbasi 2011	1	None	See Abbasi 1394
Arne 1945	3	Less Than Half	No
Mortezaei and Farhani 2008	2	None	No
Sauer et al. 2013	1	All	Less than Half
Shiomi 1974-6	3	More Than Half	No
Key	**Chronology Types**		
1	"Age" System	e.g. Neolithic, Chacolithic, Early Bronze, etc.	
2	"Era" System	e.g. Prehistoric, Historic, Islamic	
3	"Pottery" System	e.g. Painted, Grey, Glazed, Islamic	

Table 2. Aggregate Site Data (All Sources)

Count Type	Count
Unique Sites in Database	1213
Unique Sites Checked in Google Earth	851
Unique Sites Not Checked in Google Earth	363
Unique Sites Checked in Google Earth with Positive Identification	663
Unique Sites Checked in Google Earth without Positive Identification	187
Unique Sites Reported in Multiple Surveys	133
Unique Sites Reported in Multiple Surveys with Positive Identification	129
Unique Sites Reported to date to ca. 3200-1600 BCE	241
Unique Sites Reported to date to ca. 3200-1600 BCE with Positive Identification	184

Additionally, over one-hundred "new" sites were identified through the systematic virtual prospection routine that had not been previously reported by the main sources (Fig. 4). These new site identifications are spread fairly evenly throughout the Alborz Piedmont and the forest-steppe zone between the foothills and the Gorgan Plain River. As with the overall site-database, few of these sites were identified north of the Gorgan Plain river, and surprisingly few tell-settlements were identified in the upland valleys of the Alborz surrounding the plain. The apparent lack of tells in these zones likely results from the fact that settlements in the uplands are by necessity built on or into hillsides and therefore erode at a more rapid rate than in the lowlands. Consequently, in the

Alborz valleys, sites signature that would be readily apparent on the ground are undetectable through visual inspection of satellite photography. Similarly, we should expect that distinct erosional processes north of the Gorgan Plain river are also occluding site-signatures in this area from simple visual inspection of satellite imagery.

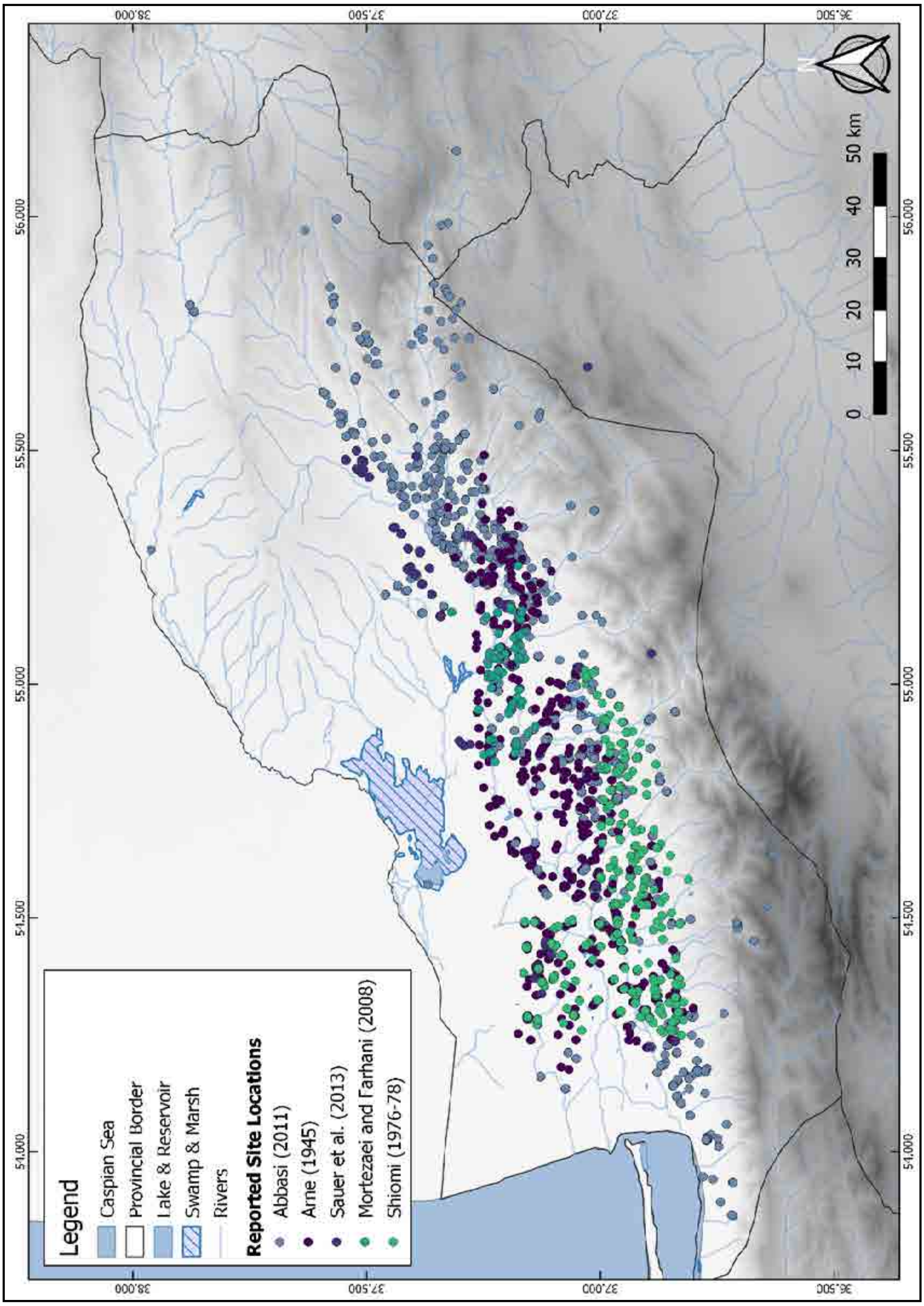

Fig. 2. Reported site locations by source

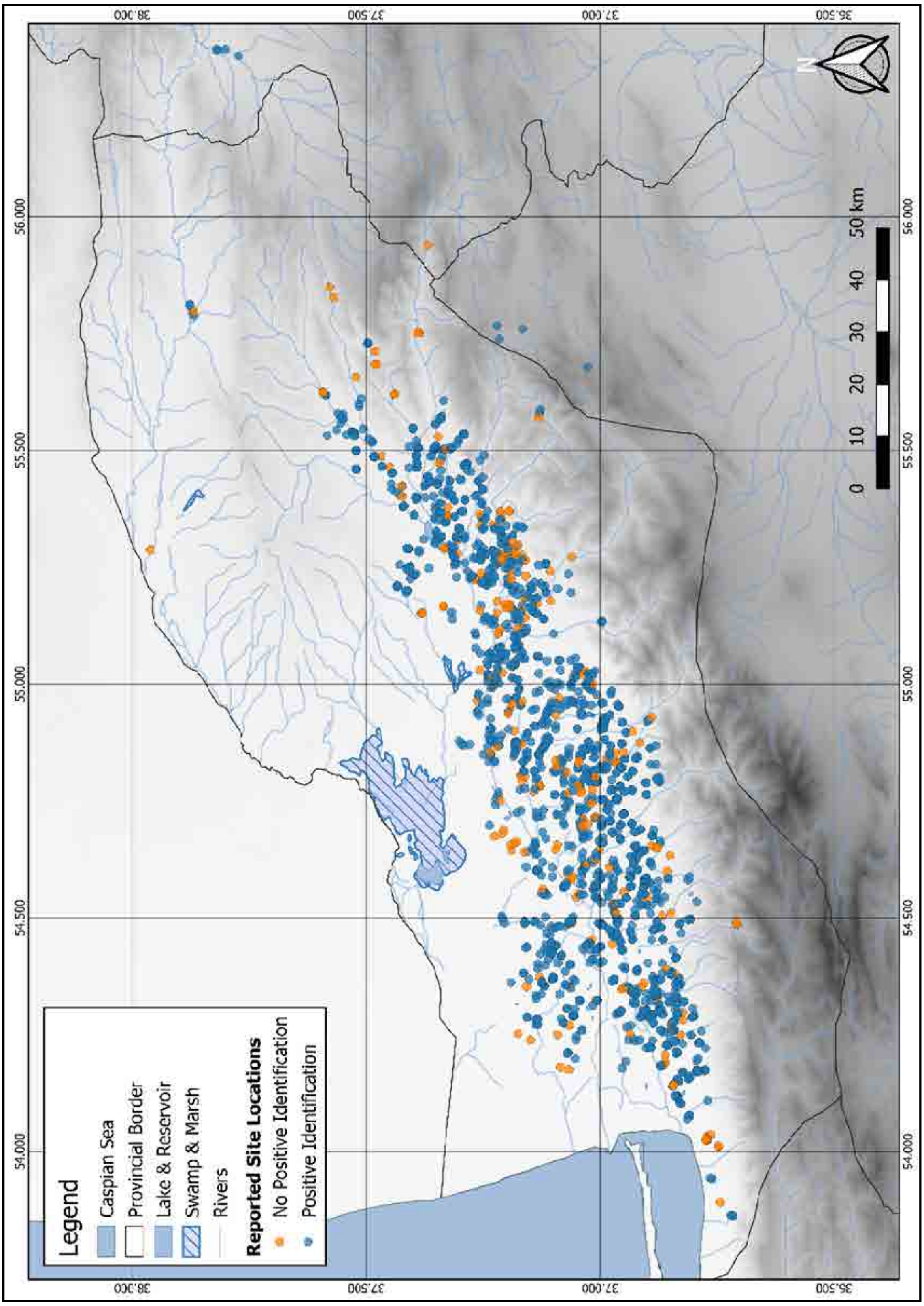

Fig. 3. Geographic Distribution of Positive versus No Positive Identification

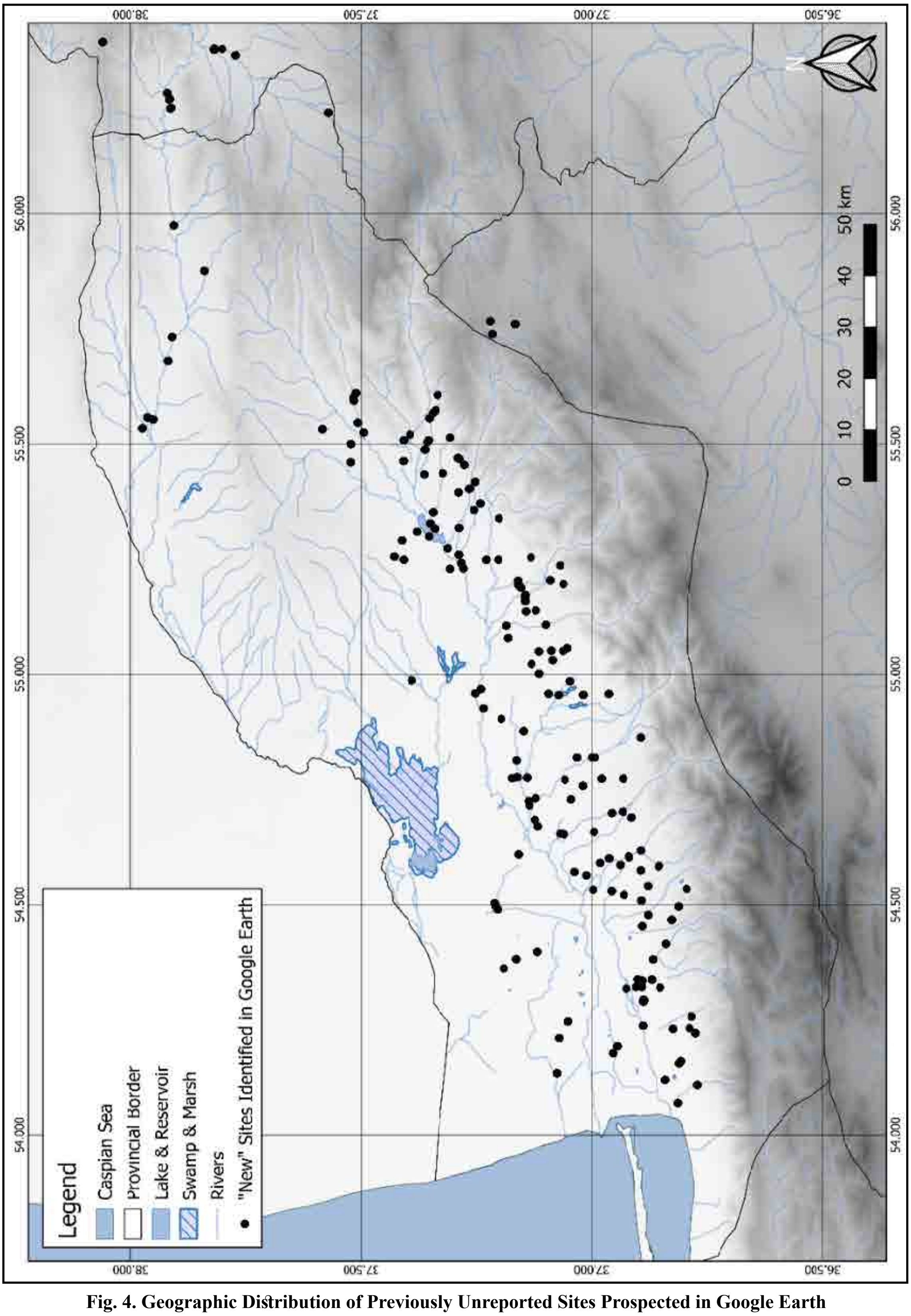

Fig. 4. Geographic Distribution of Previously Unreported Sites Prospected in Google Earth

On the other side of the coin, we must ask why so many "new" sites were identified in areas that were repeatedly surveyed before. Why were these sites not reported in the on-the-ground surveys? Could the translation of data from analog to digital formats be a factor? Or is it the case that previous surveys simply missed numerous sites? What other factors might account for the density of "new" site identifications in repeatedly-surveyed areas? In any case, these "new" site identifications are of great value, as they should be the first stops on future surveys in order to study their surface remains and attempt to assess first and foremost whether they are in fact actually archaeological sites at all, and if they are, to evaluate their chronology and suitability for further investigation.

4. Evaluating Reported Settlement Chronology

In terms of data integration, the temporal dimension of these surveys is perhaps the most challenging. The chronological information presented in the sources is patchy, coarse, and varies considerably in its overall usefulness. At best, the previously reported chronological information can be checked and verified with reference to collections of surface ceramics and excavated materials. At worst, we have to take the chronologies given by previous researchers at face-value. This section presents both the chronological dimension of each of the surveys (and show how this information was incorporated into the GSR database) and the results of analysis of the surface pottery available in both published sources and museum collections.

5. Reported Chronological Information

The chronological information reported from the legacy sources takes one of three forms. In the first, the site data is organized and presented according to chronological criteria (Abbasi), where the site lists and their distribution maps are tied to broad culture-historical periods (e.g., "Chalcolithic" or "Early Bronze Age"). In the second, chronological assessments are appended to site attribute tables (Mortezaei and Farhani, Shiomi), where the assignments may be either culture-historical (e.g., "Bronze Age") or era-based (e.g., "Prehistoric" or "Historic"). The third form is a combination of a matrix that displays the presence/absence and confidence level of different diagnostic ceramic types, accompanied by a narrative description of the surface ceramics (Gorgan Plain Wall Survey). Finally, the Arne survey did not make culture-historical chronological assessments of surveyed sites but did report some general information about potentially diagnostic surface ceramics. It should be noted that the surveys by Arne, Shiomi and the Gorgan Plain Wall Survey have extensive surface ceramic collections; in the case of Arne, restudy of the survey ceramics was conducted specifically for this analysis, and in the case of Shiomi and the Gorgan Wall project, study of these collections is either in press or in progress.

The chronological assessments for this study were first based entirely on the reported information from the published surveys. These reported assessments were limited to only those designations where the sources made an explicit and unambiguous assignment of a particular period to a given site. It should be noted that many sites belong to multiple periods, and that Figure 5 depicts the total number of reported assessments per chronological component in aggregate, not the number of sites. When comparing the distribution of reported chronological assessments to the numbers of sites for which the GSR resulted in a positive site identification, we see that the recovery rate across time periods ranges between 75-90% for each. This is similar enough to the overall average (ca. 80%) to suggest that positive identification of sites is not biased against sites dating to any particular period during this interval.

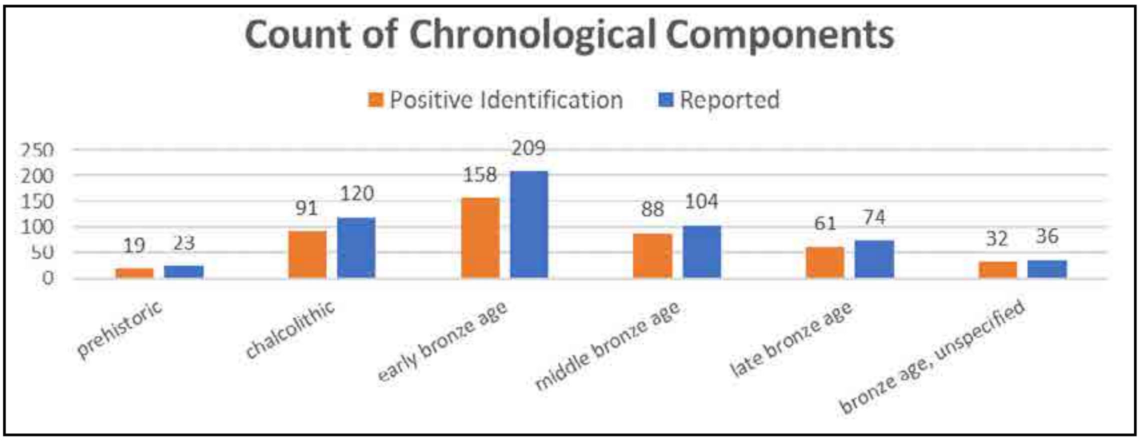

Fig. 5. Counts of Sites by Chronological Categories and Positive Identification

Another important dimension of the chronological assessments is their distribution across the legacy sources. With only a few exceptions, most (462/501 or 92%) of the chronological assessments of the Chalcolithic through Late Bronze Age are reported from just one source (Abbasi). A small number of sites can be considered to be "reported" to date to the Chalcolithic on the basis of textual description of diagnostic ceramic types, particularly Caspian Black on Red Ware, in the sources (Arne, Mortezaei and Farhani, and Shiomi). The remainder of the sources either report general assessments of sites as belonging to the Bronze Age, or else are designated as merely Prehistoric. The operational definitions of what these periods correspond to is presented below.

The reported chronological information presented above can be further refined with reference to the surface ceramics collected by these surveys, which are all incompletely published (e.g., Arne 1935, 1945: 21-22; Bylin-Althyn 1937; Ohtsu *et al.,* 2010, 2012; Sauer *et al.,* 2013: 102-125). Further analysis should focus on tracking down whatever records underpin Abbasi's chronology, any photographs and field documentation of surface ceramics collected by the Gorgan Plain Wall Survey project, and to contact the keepers of the Shiomi surface ceramics collections, which are split between Tehran and Hiroshima. Until then, what little information is presently available is described below.

6. Recorded Chronological Information

Both the published and unpublished surface ceramics are few in number. On the published side, there are only three publications that present images of diagnostic surface pottery explicitly linked to a single site (Abbasi 2016; Ohtsu *et al.,* 2010, 2012). On the unpublished side there are several collections, but only one was available for the purposes of this analysis (i.e., Arne). For both published and unpublished collections, the diagnostic material often amounts to a single sherd; unfortunately, this diminishes the confidence we may put in these chronological determinations, but as is often the case with legacy data, you must start with what is available. In other cases, there is much more material, but it is not always particularly diagnostic of a single period as certain common forms of pottery were in use for long periods of time.

This analysis of published and unpublished surface ceramics resulted in the recording of a chronological determination for 52 sites (Table 3). Given the discrepancies surrounding the identification of particular ceramic types described above and the major disjunctures in understandings of the relationships between strata at key excavated sites and the 3-age system for the region, it is reasonable to ask whether these recorded designations can be used alongside the reported chronologies in any straightforward fashion.

Table 3. Recorded Chronological Determinations by Source and Period

	Chalcolithic	*Early Bronze Age*	*Middle Bronze Age*	*Total*
Abbasi, 2016: 138, Fig. 102	27	0	0	27
Arne Collections in Sweden	13	7	0	20
Ohtsu et al., 2012: Plates I-III	3	1	1	5
Total	**43**	**8**	**1**	**52**

The major remaining chronological concern is the status of the sites designated "Early Bronze Age" in Abbasi's gazetteer, which he designates as Narges IIIc and Torang IIA-IIB (2011: 240-241; 2016: 6). This is an unfortunately incorrect correlation between site-strata and culture-historical eras. Indeed, Narges IIIc clearly belongs to the Chalcolithic and Abbasi dates this to the second quarter of the 4th millennium (Abbasi 2011: 241). Moreover, Abbasi's description of the ceramics of Narges IIIc are clearly those of Torang IIA-IIB, including short and squat slightly carinated jars, as well grey-black sherds with appliqué ridges, knobs, incised grooves, and combinations of the three along with Black on Red Painted Ware, which is described as burnished, which we can comfortably identify as Caspian Black on Red rather than Aq II. He also claims that many of the Narges IIIc finds have great similarities to Shah III-IIb, whose "proposed chronology is the second half of the 4th millennium" (Abbasi 2011: 241). Thus, Abbasi has clearly conflated the Early Bronze Age and the Chalcolithic, which is plain to see from his chronograms, where he consistently and incorrectly designates Torang IIA-IIB as Early Bronze Age (2016: 6). Curiously, however, when surface ceramics are presented as photographs or illustrations, they are generally assigned to the correct era (e.g., Abbasi 2016: 139, Fig. 102). Yet, there is no evidence to suggest that the site chronology presented in Abbasi's gazetteer is based on a detailed or systematic examination of the surface finds from the sites listed and thus seems more likely to comprise a re-presentation of information contained in other reports. The conflation of the Early Bronze Age and Chalcolithic strata and pottery types in the text of the gazetteer seems therefore unlikely to have been propagated. The best course of action, therefore, is to treat the reported information as if it were correct, with the full knowledge that this cannot be verified without reference to the source reports and collections.

Other concerns with the recorded chronological framework include: the flattening of the Chalcolithic period into one phase and the generally non-diagnostic character of much of the published survey pottery from the Shiomi survey and the Arne collection. For example, the distinction between Aq II and Caspian Black on Red Ware is an important one temporally, but which has escaped all previous authors as a salient chronological diagnostic. Therefore, while this distinction can be maintained in materials to which the present author has had access, it is not present in any of the other sources and thus not operationalizable for analysis at present. The confidence threshold required for these materials to be included in the sample under analysis was therefore quite strict, thus greatly reducing the size of the analytical sample compared to what is potentially available. The sample can only be increased with reference to a larger and more diagnostic sample of surface pottery, to say nothing of the benefits that a larger sample of stratigraphically controlled excavated material would provide. In summary, the reported and recorded chronological information may be provisionally treated as analytically compatible, with the full knowledge that both the frameworks themselves and the correlation between them are provisional and likely subject to substantial future revisions.

7.Chalcolithic and Bronze Age Settlement Patterns of the Gorgan Plain

With all the preceding information about the nature and quality of the spatial and chronological data from both the reported survey data and my restudy protocol, we can examine the basic organization of the settlement distribution of the Gorgan Plain and how it changes over the course of the third millennium. The analysis of the settlement patterns begins by specifying the quantitative parameters of the sample to be analyzed (i.e., only those sites for which a positive identification was made during the Gorgan Plain Survey Restudy), and then examining the spatial distribution of site counts over time. Then the intersection of chronology and site size (i.e., base area in hectares) is analyzed, before re-introducing location to the analysis.

8.Site Size Distributions Over Time

While site size is reported in a number of formats across the sources, the one constant measurement present in all surveys is base area. Moreover, base area can be measured in Google Earth by drawing a polygon around the boundary of the site and measuring that polygon. This is likely not the most accurate method of measurement, but there are few reasons to believe that field measurements derived from the use of analog theodolites between forty to eighty years ago would be any more or less reliable. The following charts represent five different ways of visualizing key basic descriptive parameters of the distribution of site sizes over time without considering location.

The overall distribution of base area measurements does not change dramatically in its overall shape between the four time periods (Fig. 6). First, and most simply, the minimum and maximum base area measurements hold constant over these four periods. This can be explained with reference to two observations: (1) in each period there is at least one site sized 0.1 ha or less, and (2) the base-area estimate for Torang Tappeh cannot be chronologically subdivided on the basis of presently available information. It seems unlikely that Torang Tappeh covered 34 ha for the entirety of its prehistoric occupation, and indeed may be smaller or in fact even larger at different intervals. Moving away from their extremities, the most notable feature of these distributions is their strong skew toward the lower end of the size spectrum, with the plurality of sites in each period smaller than 3 ha in all periods. The distribution of larger sites (outlier points on the plot) does change between the periods, with a significant increase in the number of sites larger than 5 ha during the Early Bronze Age, and a decline in the numbers of sites larger than 5 ha from the Early Bronze Age to the Middle Bronze Age and from the Middle Bronze Age to the Late Bronze Age.

The site-size distributions are visualized in the form of a histogram in Figure 7, which goes some way toward disaggregating the summary presented in Figure 6. What it most clearly shows is both the numerical dominance and the changing proportion of sites whose base area measures between 1.0 and 2.0 over time. Additionally, it provides

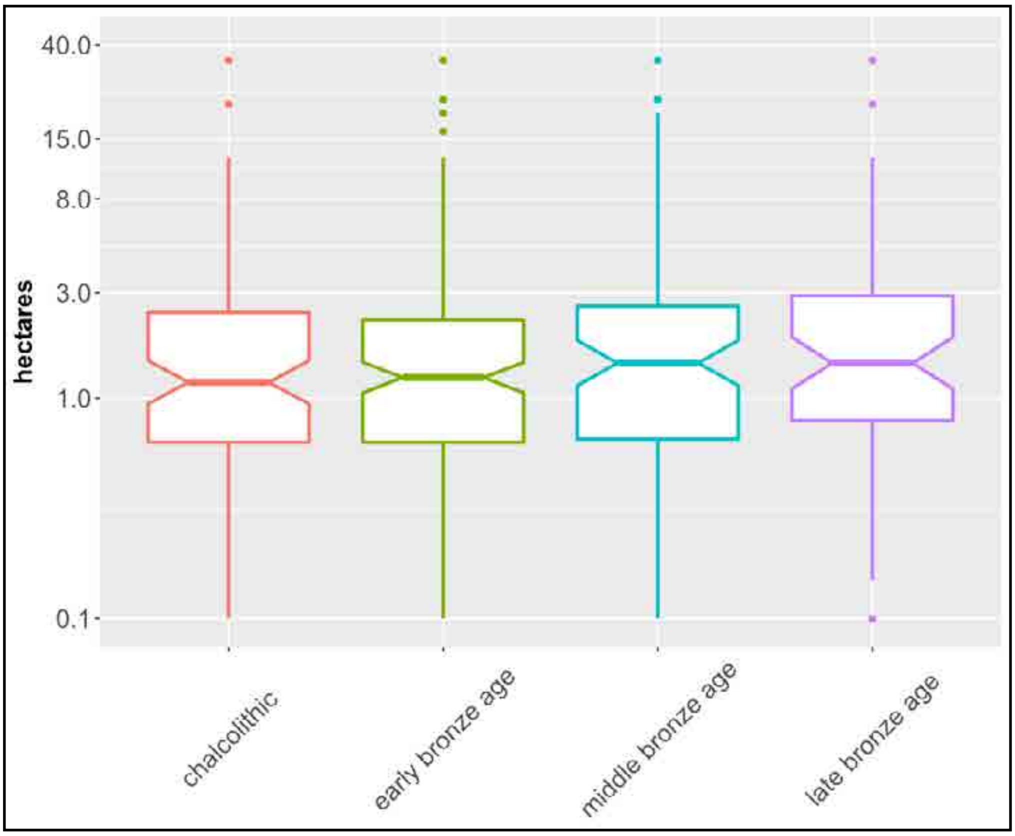

Fig. 6. Box-and-Whisker Plot of Site Size Distribution Grouped by Period (Scaled log10)

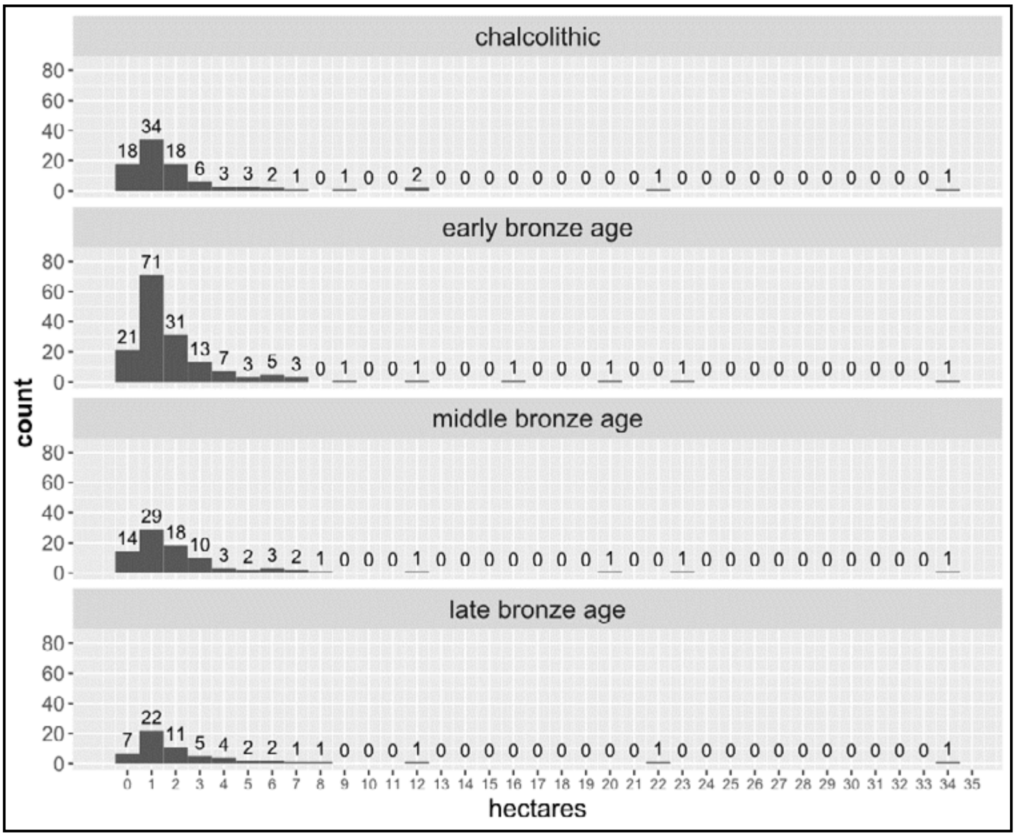

Fig. 7 Histogram of Site Size Distribution Grouped by Period

an alternative way of viewing the distribution of the medium- and large-sized sites. Particularly noticeable from this chart is the small number of sites in all periods the larger than 10 ha; there are 4 in the Late Chalcolithic, 5 in the Early Bronze Age, 4 in the Middle Bronze Age, and only 3 in the Late Bronze Age.

Fig. 8 re-aggregates the size distributions, for the purpose of examining the median, mean and sum of site sizes over time. While it is clear from Figures 6 and 7 is that the overall distribution of site sizes is skewed strongly toward the lower end of the spectrum (i.e., smaller sites are more common than larger sites), there are also more subtle trends that can be observed in median and average site base area over the four periods. Principally, there is an increase in the median site base area from 1.15 ha in the Chalcolithic to 1.24 ha in the Early Bronze Age, followed by another increase to 1.45 ha in the Middle Bronze Age, which holds constant to the Late Bronze Age. The trendline of the mean site base area is similarly shaped, rising from 2.49 ha in the Chalcolithic to 3.04 ha in the Late Bronze Age, a percent increase (22.1%) roughly comparable to that over the same interval in the median size (26.9%). The trajectory of mean site-size differs, however, in that the mean site base area drops from the Chalcolithic to the Early Bronze Age, likely due to the doubling of the number of sites between 1-2 ha in size between these two periods, before rising more sharply between the Early Bronze Age and Middle Bronze Age.

In terms of aggregate site base area over time, there is a noticeable increase from the Chalcolithic to the Early Bronze Age (i.e., from 224 to 372 ha, an increase of 166%), followed by a 35% decrease to 242 ha in the Middle Bronze Age and a further 28% decrease to 176 ha in the Late Bronze Age. The aggregate base area figures are partly a factor of the raw counts of numbers of sites, which show the same distribution (i.e., Fig. 5), but are also affected by the aforementioned trend toward slightly larger median and average site sizes over time. Thus, the main trend over time appears to be overall growth from the Chalcolithic to the Early Bronze Age, both in terms of aggregate occupied hectarage and number of sites, followed by two successive periods in which the total number of sites and aggregate occupied hectarage declines.

SV = Small Village (0-3 ha); LV = Large Village (3-8 ha); ST = Small Town (8-15 ha); LT = Large Town (15-40 ha)

Fig. 9 presents another way of breaking down the changes in settlement demography by computing the proportions that different size classes of sites contribute to the overall count (left) and aggregate occupied area over time (right). With regard to small villages (i.e., sites between 0.1-3 ha, shown in purple), these contribute the overwhelming plurality of site counts in all periods (consistently between 78-84%), but their proportional contribution to the total occupied area exhibits more variation from period-to-period. To wit, after increasing from the Late Chalcolithic to the Early Bronze Age, the proportion of the aggregate settled hectarage contributed by small villages decreases from the Early to Middle Bronze Age and again from the Middle Bronze Age to the Late Bronze Age. It is a significant result that during the Early Bronze Age 84% of the sites were small villages and that these sites contributed 43% of the total occupied area in the region but that by the Late Bronze Age these figures had declined to 78% of the total sites being small villages but only contributing 33% of the total occupied area.

As regards large villages (i.e., sites between 3-8 ha, shown in green in Fig. 9), the proportion that these sites contribute to the total of both site counts and aggregate occupied area increases period-to-period over the entire span. The numerical proportion

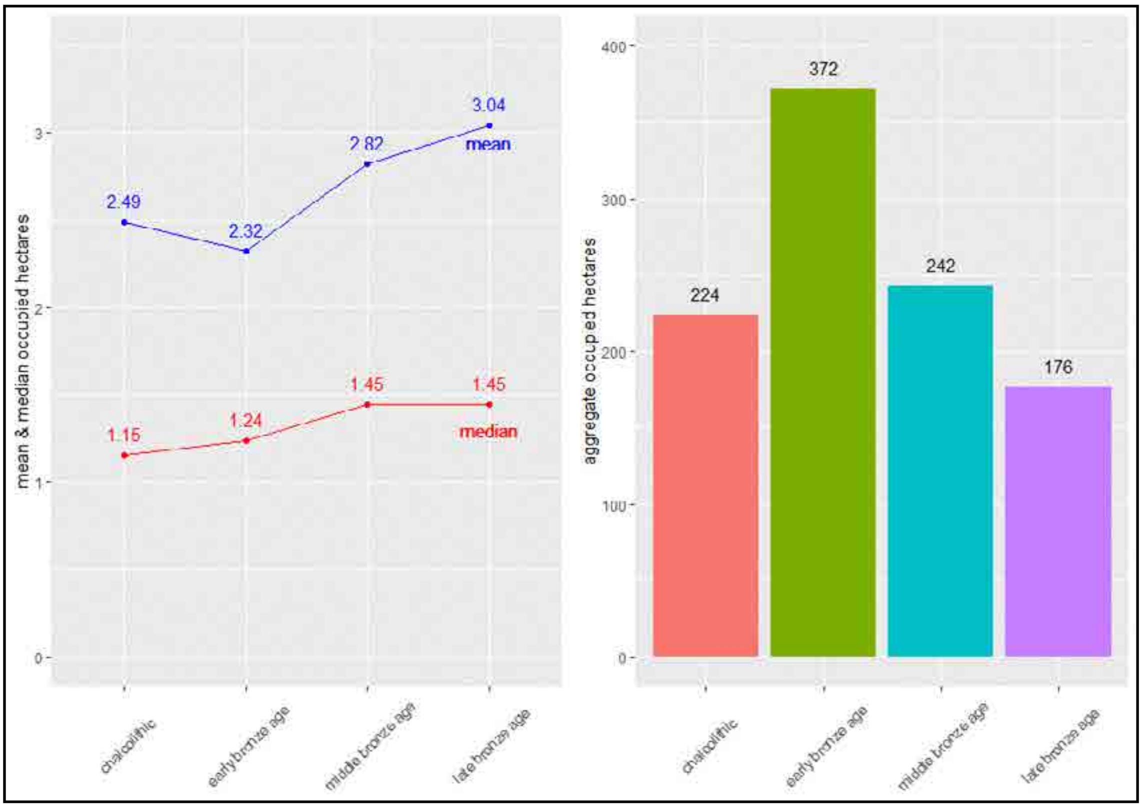

Fig. 8. Descriptive Statistics (Mean, Median, and Aggregate Occupied hectares by Period)

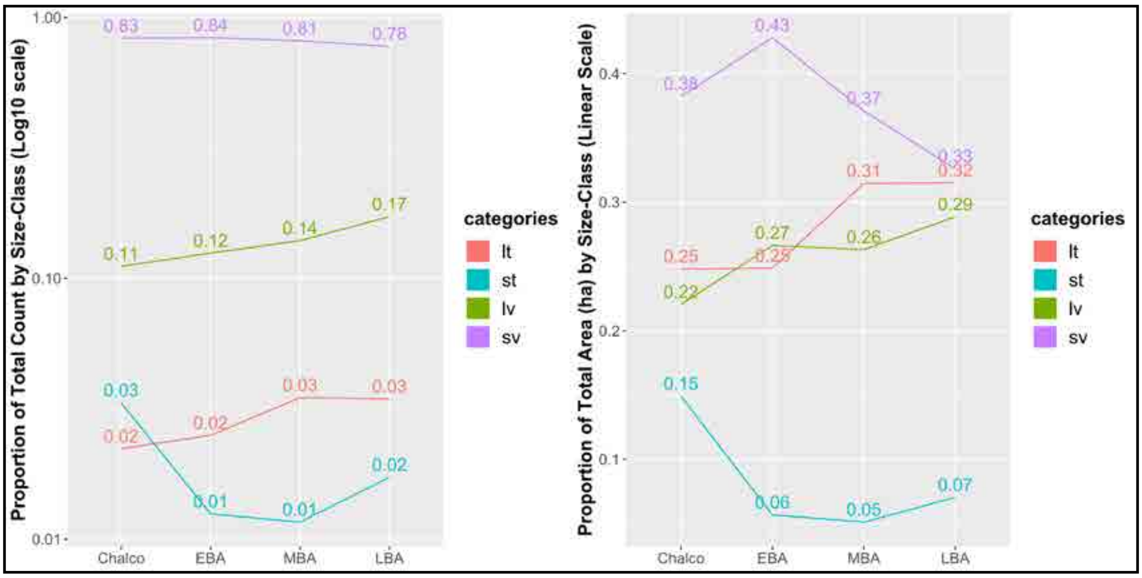

Fig. 9. Population Distribution between Large and Small Settlements Over Time

of large villages relative to the overall sample increases from 11% in the Chalcolithic to 17% in the Late Bronze Age. In terms of the contribution that large villages make to the overall occupied area, this proportion increases from the Chalcolithic to Early Bronze Age (22% to 27%), remains basically the same from the Early to Middle Bronze Age, before increasing again to 29% in the Late Bronze Age. Thus, over time, large villages become more prevalent and constitute a larger proportion of the population of the region.

Small towns (i.e., sites between 8-15 ha, shown in blue) contribute a low percentage of the count and aggregate area in all periods. Their greatest proportional prevalence is in the Late Chalcolithic and in the Late Bronze Age, but at no point is this figure greater than 3% of the total number of sites. Most interestingly, during the Chalcolithic, small towns contribute 15% of the aggregate occupied hectarage of the region, but never more than half of that figure in any of the subsequent periods. Nevertheless, the numerical proportion and proportion of aggregate occupied area increase from the Middle Bronze Age to the Late Bronze Age, though in both of these periods, small towns are the least frequent size-class and constitute the smallest proportion of the total occupied area.

The large towns (i.e., sites between 15-40 ha, shown in red) are a bit trickier to interpret, given what we know and don't know about the change in size of Torang Tappeh over time, but given this caveat, the notable trends are that they contribute a small proportion of the total site count in all periods (in no period are there more than four such sites), but their proportion of the overall aggregate area is consistently between one-quarter and one-third of the total. Between the Chalcolithic and Early Bronze Age, the proportion of aggregate area holds at 25%, and increases through the Middle Bronze Age to 32% in the Late Bronze Age.

Now, of course taking base area measurements as corresponding to occupied hectarage is not an unproblematic assumption, nor is taking occupied hectarage as a proxy for population/demographic trends (Drennan *et al.,* 2015). In the absence of better sources of population proxies, we have to make do with what information is available. Nevertheless, several clear trends can be observed via simple population distribution proxies. Most notable among these are: 1) a large increase in overall settled area from the Chalcolithic to the Early Bronze Age, which appears to be due to an increase in the total number of sites, but especially from growth in the number sites sized between 1-2 ha and 5-10 ha; and 2) a restructuring of the "demographic profile" from the Early to Middle Bronze Age, where the average and median site sizes increase, but the overall count of sites and occupied hectarage decreases, a trend which continues into the Late Bronze Age. This change appears to be due to the increase over time in both the numerical and areal proportion of large villages relative to the aggregate (Fig. 9). Another significant trend to observe is the convergence in areal proportion contributed to the total by large towns, large villages, and small villages in the Late Bronze Age, where they are almost the same, despite their numerical-proportional differences. This suggests that during this time, the population concentrated especially in a greater number of large villages as compared to before. Whether this represents stability and growth in sites established in the Middle Bronze Age or an entirely different pattern of agglomeration will remain the subject of future inquiries.

In summary, it appears that the greatest proportion of the population of the Gorgan Plain lived in small villages in all periods considered here. However, the proportion of the population living in large villages, small towns, and large towns steadily increased period-over-period across this interval until the Late Bronze Age, when the aggregate occupied hectarage was nearly equally comprised of small villages, large villages and large towns. The change in site-size distributions over time discussed above are interesting in their own right but become all the more compelling when the third key variable (location) is re-introduced.

9. Site Location Distribution Over Time

There are several notable patterns in the spatial distribution of sites in the Gorgan Plain during this period. First and foremost, there appear to be three distinct zones of settlement, one in the west of the plain, one in the central plain, and another in the east. Additionally, site locations appear to shift steadily southward over time. And finally and most curiously, in all four periods there appears to be a spatial gap between the central and eastern portions of the plain where there are no reported or recorded site locations (see: Figs. 10-13). This "gap" may be misleading, however, as the GSR protocol documented at least nine mounded sites in this area during the process of reviewing the reported site locations in Google Earth and there are likely more yet to be found; moreover, a large number of later sites are reported in this location by Abbasi. Perhaps this gap is the result of access to this area being restricted for fieldworkers, as it is not covered by any of the intensive on-the-ground surveys (see: Fig. 1). In the satellite imagery, it does not appear unusual in any way such to suggest modern climate or topographic conditions occluded archaeological visibility, and it is bounded on all sides by inter-city roads and the province's main arterial highway.

With respect to the size-location distribution of sites dated to the Chalcolithic, the focus of occupation seems to be concentrated at opposite ends of the plain. The number of sites appears to be about equivalent between the western and eastern halves of the plain, but the size distribution differs. During this period, the western half of the plain appears to be more split between large and small sites. Both of the 15+ ha sites are in the western plain, but with only one 8-15 ha sized site and four 3-8 ha sized sites and the remaining under 3 ha. In the eastern half of the plain there are no 15+ ha sites, but more 8-15 ha sized sites and the same number of 3-8 ha sites.

Settlement also appears to be more spatially concentrated in the eastern half of the plain as compared to the west, where there is more average distance between the sites. In both cases, and as will be seen throughout the following examples, settlement tends to cluster quite closely to permanently watered rivers and streams.

In the Early Bronze Age, the division between the western and eastern halves of the plain is less clear-cut, especially as there is more settlement along the Kara Su River in the far west of the plain, compared to in the Chalcolithic. The notable change in the settlement distribution (in addition to the notable increase in numbers and sizes of sites overall) is that settlement considerably expands in the central part of the plain (near the intersection of 37.00° Lat, 55.00° Long), with a large number of new small sites, but also several larger sites of different size classes as well, including two new sites >20ha. The site distribution in the eastern plain changes as well, with the core area from the Chalcolithic still densely populated with sites, but with some expansion in the number of sites, particularly to the south of the modern reservoir. A new intermediate-sized site appears just north of the Gorgan Plain River during this period, and one of the older intermediate-sized sites from the Chalcolithic appears to grow considerably in size.

In the Middle Bronze Age, the most notable change is in the marked decrease in the number of sites overall. Most of the intermediate- and large-sized sites are still occupied, but the number of small settlements surrounding them is noticeably less. In particular, the number of sites in the central and especially the eastern parts of the plain appear to be considerably reduced compared to the preceding period. The western-most part of the plain, by contrast, appears relatively stable though some small sites from the previous

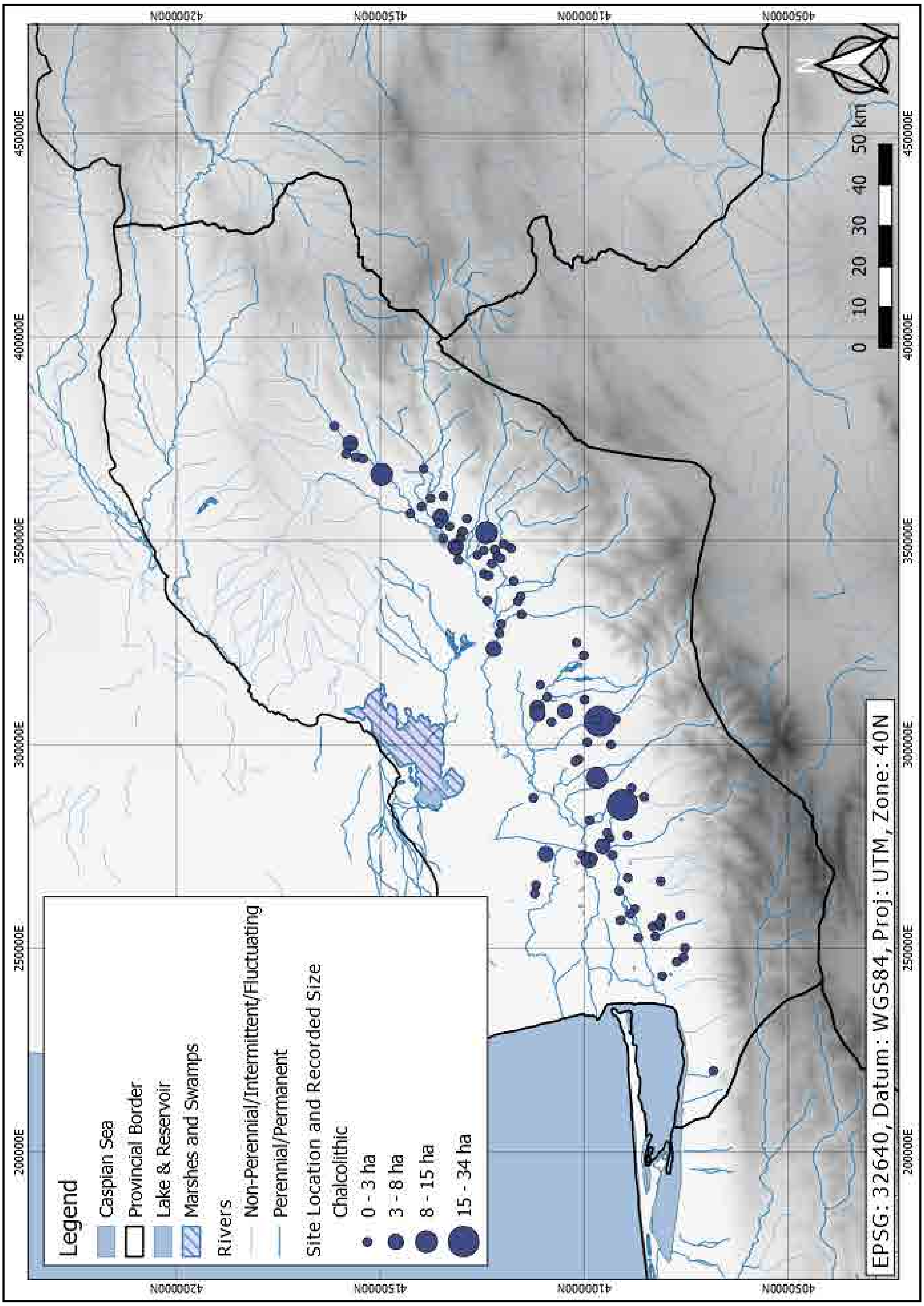

Fig. 10. Geographic Distribution of Site Size Classes (Chalcolithic)

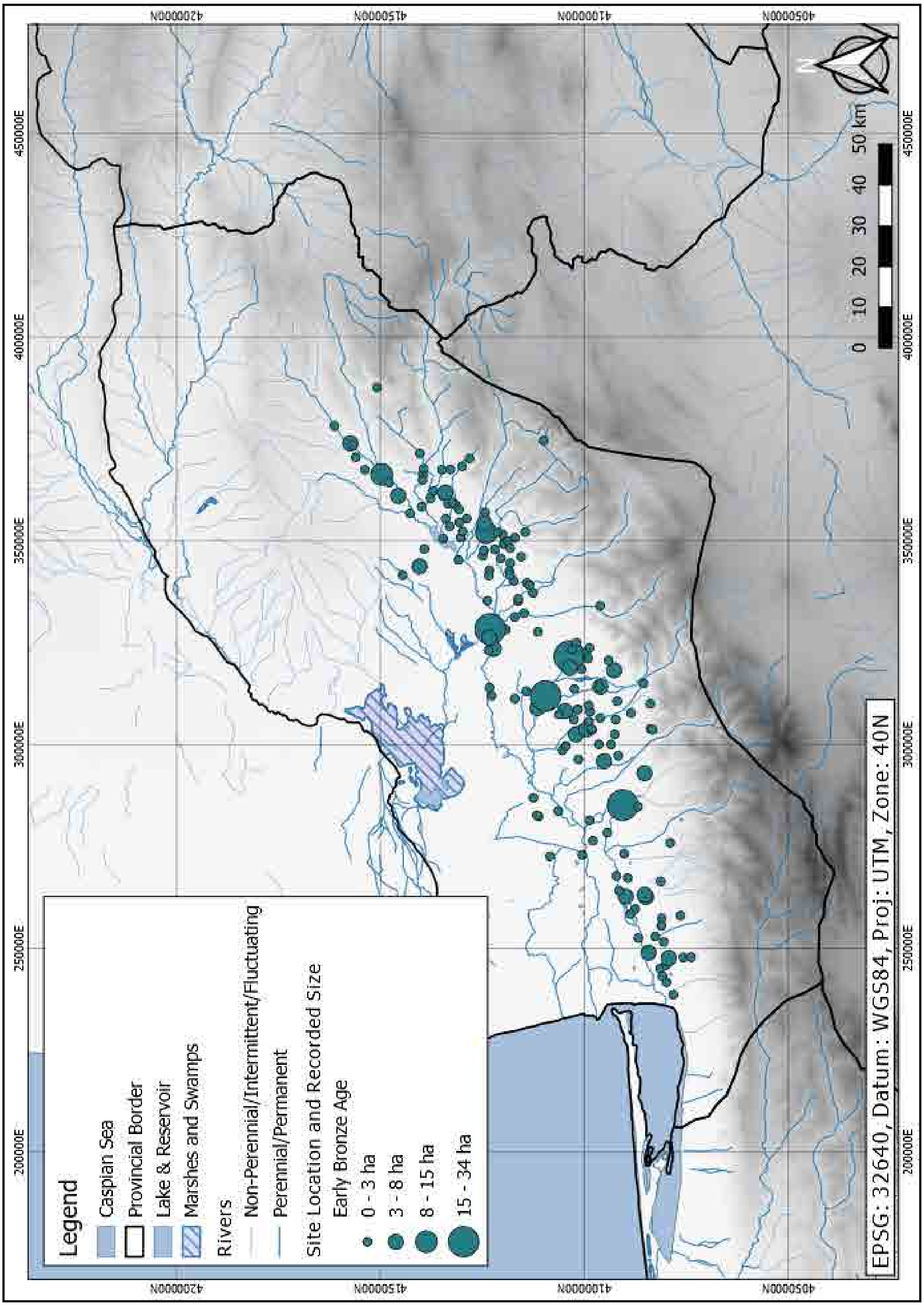

Fig. 11. Geographic Distribution of Site Size Classes (Early Bronze Age)

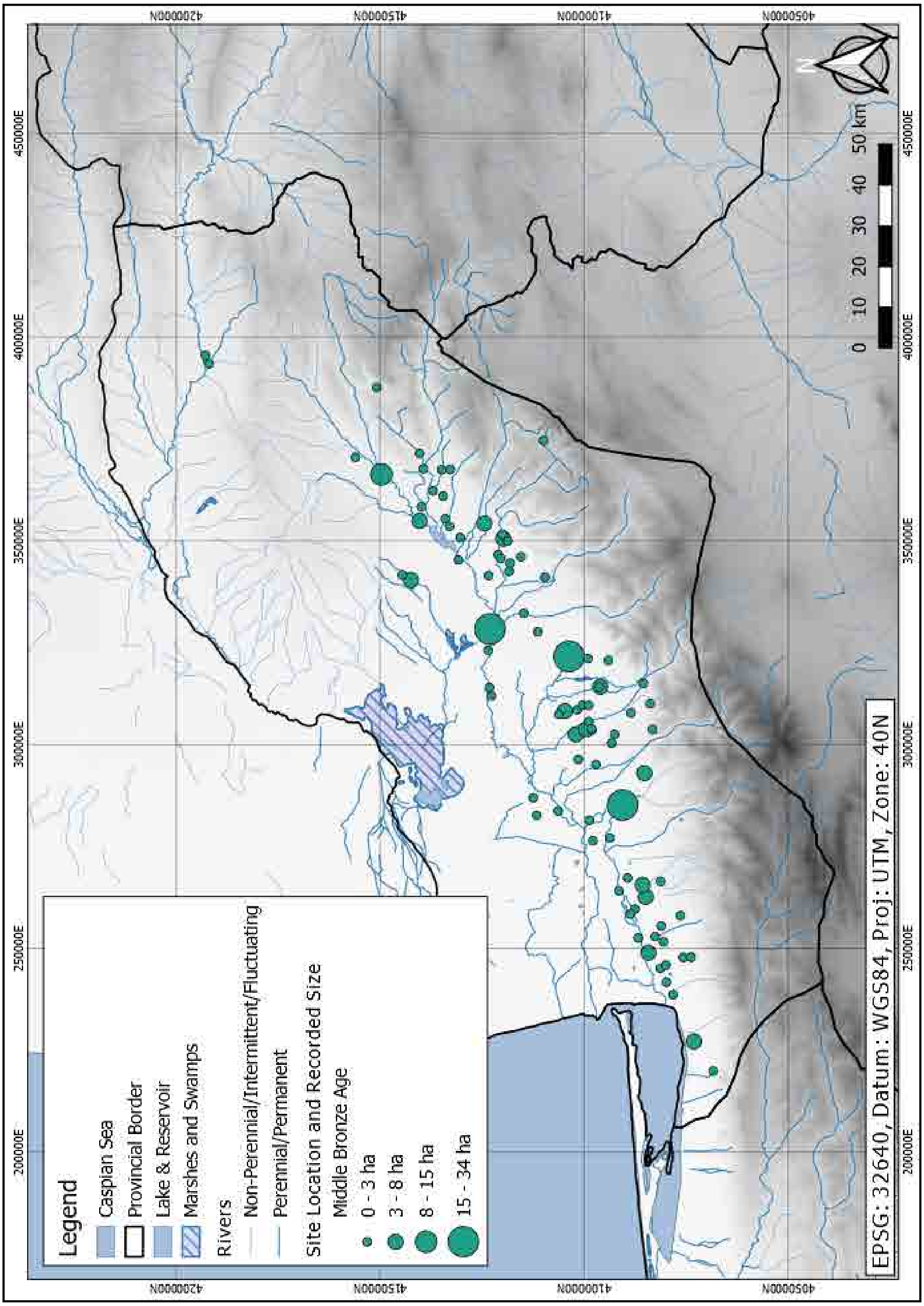

Fig. 12 Geographic Distribution of Site Size Classes (Middle Bronze Age)

period do not continue to be occupied. There is also one fewer site in the largest site-size class in the Middle Bronze Age (n=3) as compared to the Early Bronze Age (n=4), but the three that remain were continuous occupations from the EBA, rather than new settlements.

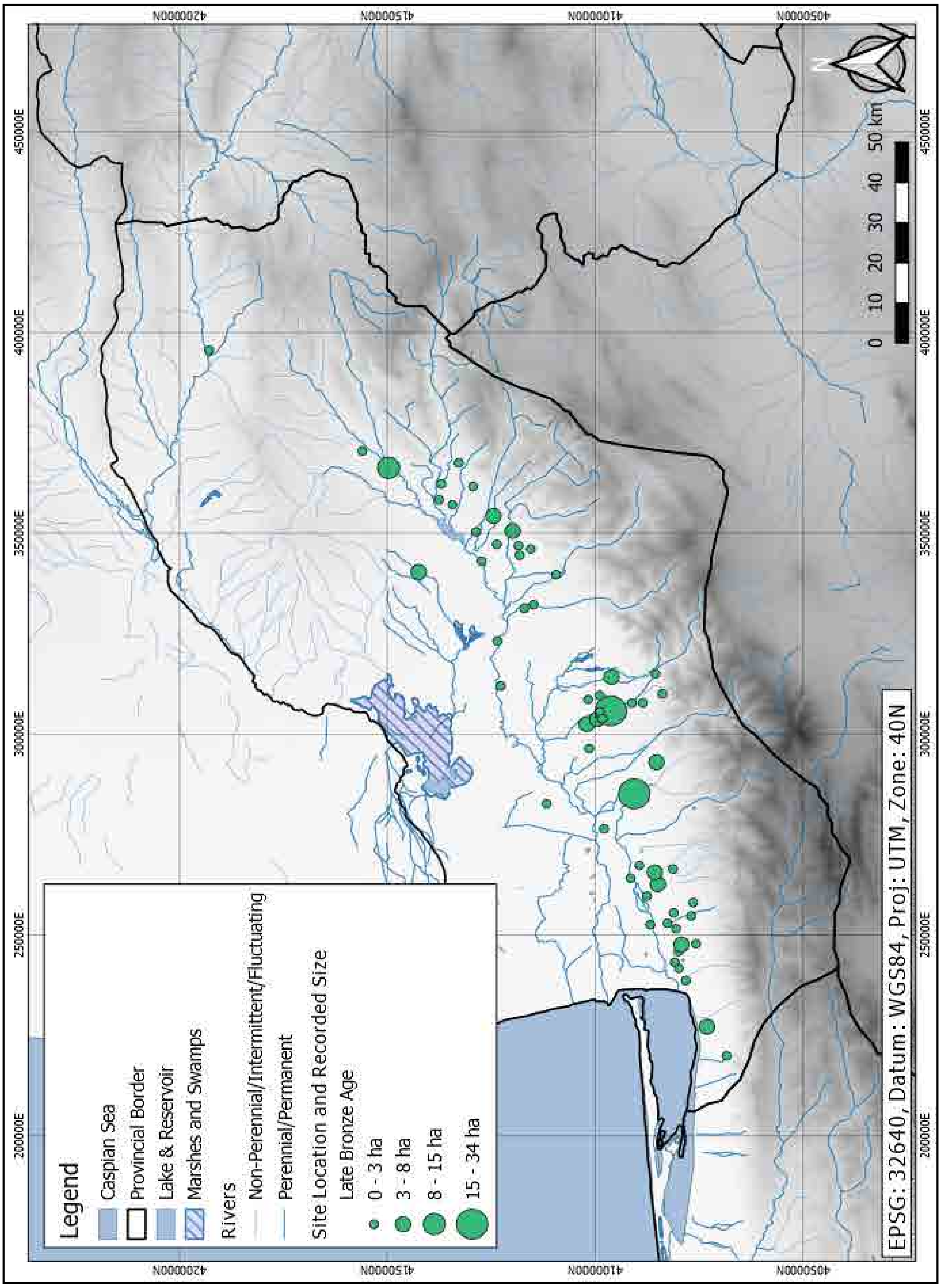

Fig. 13. Geographic Distribution of Site Size Classes (Late Bronze Age)

During the Late Bronze Age, the trend toward the reduction in site numbers continues, however some interesting spatial trends emerge. In the westernmost part of the plain, there are no sites larger than 8 ha, but this area has more 3-8 ha sized sites than the other two zones. The central zone continuing to be home to the largest centers, as in the preceding period, with the two 15+ ha sized sites located here; in contrast to previously, however, there are no 8-15 ha sized sites in this zone during this period. In the eastern plain, there is one site sized 8-15 ha and three sites sized 3-8 ha. Settlement appears densest in the central plain and concentrated along a single river channel. Settlement is least dense in the eastern zone of the plain, which is a new development compared to previous periods.

To summarize, the Gorgan Plain's settlement patterns differ from the macro-region as a whole. Whether we agree with Tosi's model for the overall region of the "Lands East of Sumer"—i.e., that during the late fourth to early third millennium some of the villages in greater Khorasan grew into towns and became centers of more advanced craft production as well as the central nodes in emergent networks of cultural integration, followed by the early-to-mid-3rd millennium, when some of these towns grew into proto-urban centers, which were larger and more complex settlements within which markers of social differentiation were increasingly observed, which continued to extend their cultural influence over ever larger territories (Tosi 1986: 158), culminating in the formerly proto-urban centers developing into fully urban cities, attaining their maximal territorial hegemony, and exhibiting increasingly hierarchical social complexity by the mid-to-late-3rd millennium (Tosi 1974, 1977), before collapsing by the turn of the second millennium, marked by the rapid decline in size and complexity of the central sites and a breakdown in regional-scale cultural integration (Biscione 1977; Tosi 1986: 158; cf. Hiebert 1994; Kohl 1984, 2007)—the evidence presented here presents a dense record of settlement primarily comprising small villages and towns with little evidence for proto-urbanism aside from at Torang Tappeh. Thus, settlement patterns represent another point of distinction that mark the Gorgan Plain as unique among the regions of Eastern Iran, southern Central Asia, Afghanistan, and the Indo-Iranian borderlands. In particular, the Gorgan Plain exhibits its greatest number of sites, largest amount of occupied area, and highest number of possible "centers" during the Early Bronze Age, i.e., earlier than predicted by Tosi's model, which would expect these figures to characterize the Middle Bronze Age. The Late Bronze Age of the Gorgan Plain also departs from Tosi's prediction, in that while there does appear to be a decline in population (understood through the rough proxy of site counts and aggregate occupied area), it is hardly the case that this is the result of the disappearance of centrality; indeed, settlement appears to concentrate to a greater degree than before in large villages and large towns.

Finally, it should also be noted that the sites tend to be located further south over time (Fig. 14). The northern and southern limits of the settlement distribution are relatively stable over time, which is unsurprising given the ecological barriers (i.e. the Turkmen Sahra to the north and the Alborz Mountains to the south). The mean, as well as the second and third quartiles, move steadily southward over time, however. This is an interesting observation, but one which is likely to be related to environmental factors beyond the scope of this analysis. Nevertheless, investigation into the causes and impacts of this shift are certainly an area for further research, especially in light of the increasingly detailed paleoclimatic and geomorphological record available for the Caspian basin more generally, but the southern littoral in particular (see Leroy *et al.,* 2019; Shumilovskikh

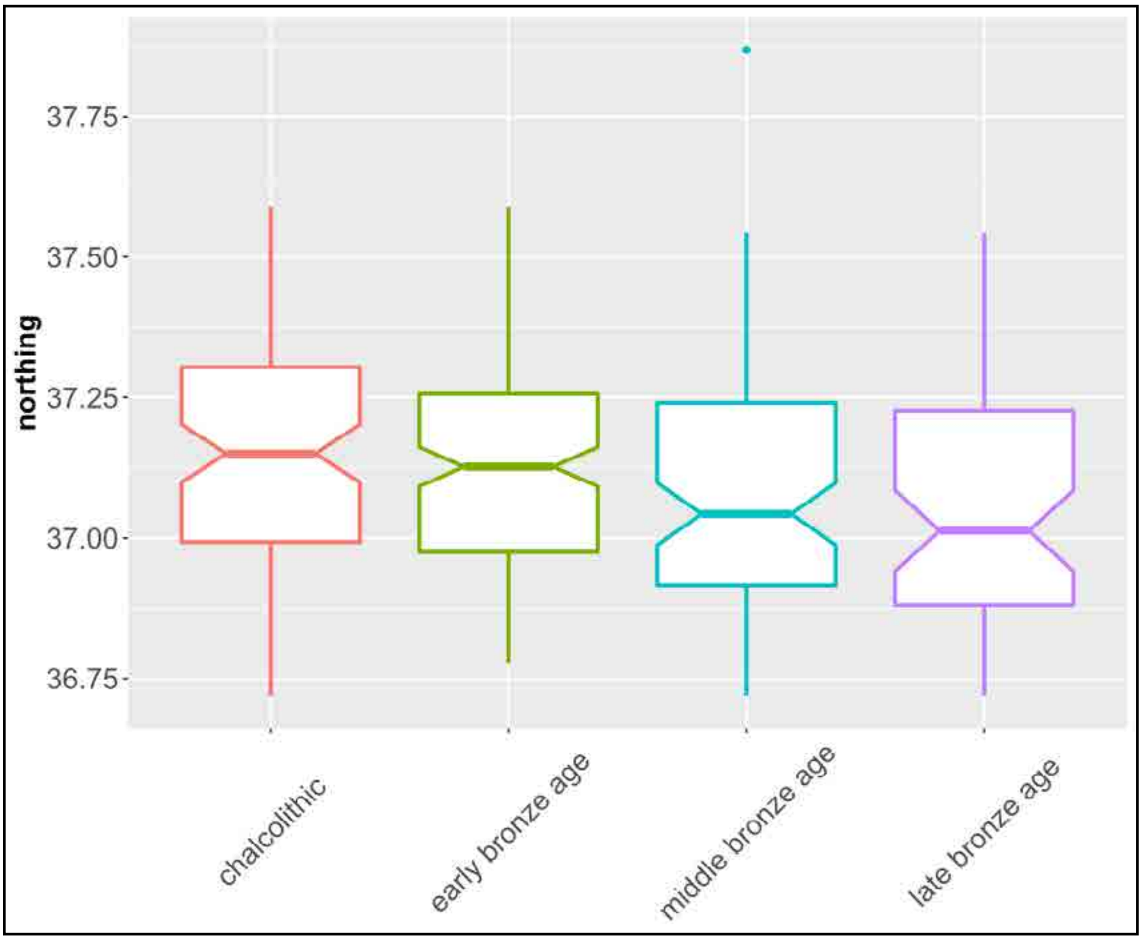

Fig. 14. Southward shift in Settlement Distribution over time

et al., 2016). This could perhaps be connected to Ali Mousavi's hypothesis about changing patterns of resource use and the availability in particular of fuel for ceramic and metallurgical production (Mousavi 2008). Could the shift of settlement southward over time be caused by the increased need for and decreasing supply of timber reserves? Could it also be related to the effects of the 4.2ka climate event (Helama 2024; Kaniewski *et al.,* 2008; Ran and Chen 2019; Weiss 2012)? Or some combination of all three, and potentially more, factors?

10. Conclusion

In this paper, the Chalcolithic and Bronze Age settlement record of the Gorgan Plain has been analyzed as an integrated regional dataset for the first time. This complex landscape of tells has been surveyed multiple times over the course of the past eighty years. These survey records vary in their quality and reliability, but digitization of paper records and the conversion of the flat tables of the source information into a relational geospatial database was augmented by the Gorgan Plain Survey Restudy protocol. While the quantitative analytical methods used in this paper are relatively simple, they constitute the necessary first steps toward more sophisticated investigations. Indeed, prior to this analysis, the main observation that could be made about the settlement patterns of the Gorgan Plain is that the region contained between 200-300 sites dating to the third millennium. Through the application of basic Exploratory Data Analysis techniques—including summary statistics of site-sizes through box-and-whisker plots and histograms, along with the computation of the changing proportions of counts and area contributed to the total by sites of different size classes and visual inspection of distribution maps—we now have a much better sense of the subtleties of historical and spatial trends of settlement in the Gorgan Plain during the Chalcolithic and Bronze Age.

Finally, a surprising result was the discovery that site locations steadily trend southward over time, which remains to be explained, but may perhaps be due to changing patterns of resource use or climate shifts. Indeed, the question of climate change and its impact on settlement in the Gorgan Plain is an important one for three reasons. First, the Caspian Sea experienced a low-stand between ca. 7-3.5kya, with a minimum elevation above sea level approximately 5-6 meters below its current level at ca. 3.9kya, i.e., approximately 1900 BCE (Leroy *et al.,* 2013, 2019; cf. Kakroodi *et al.,* 2012: Fig. 12). Consequently, it is highly likely that there are an unknown number of sites currently inundated below the Caspian Sea. Second, due to the high rate of alluviation and colluviation in the region, an unknowable number of small sites likely lay buried under riverine and wind-blown sediment, especially along the main channel of the Gorgan Plain and in the loess belt located to the north and east of Gonbad-e Kavus (Asadi *et al.,* 2013; Karimi *et al.,* 2011; see also Leroy *et al.,* 2019). Third, the Gorgan Plain forms a contiguous geographic space with the plain of Mazandaran immediately to the west; twenty-four prehistoric sites have been documented just in the two easternmost counties of the province, bordering the Gorgan Plain (Mahfroozi 2003: Fig. 1; Piller 2012). Future analysis of the distribution of ancient settlements in the Gorgan Plain must take all three of these factors into account.

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الگوهای استقراری از دورهٔ مس‌وسنگ جدید تا عصر مفرغ جدید در دشت گرگان (حدود ۳۲۰۰-۱۶۰۰ پ. م.)

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چکیده

دشت گرگان در استان گلستان، یکی از غنی‌ترین مناطق باستان‌شناسی در ایران به‌شمار می‌رود. با توجه به اقلیم مساعد آن، دشت گرگان برای هزاران سال مکانی جذاب برای سکونت روستاییان کشاورز بوده است. در قرن نوزدهم و بیستم میلادی، این منطقه توجه سیاحان و باستان‌شناسان اروپایی را به خود جلب کرد که آنان مجذوب دیوار بزرگ گرگان، بقایای شهرهای قرون وسطایی و هم‌چنین صدها تپهٔ باستانی که موجود در دشت گرگان شدند. با این‌حال، باوجود بیش از یک‌صد سال بررسی باستان‌شناسی در دشت گرگان، هنوز اطلاعات بسیار کمی درمورد روندهای تاریخی سکونت قبل از عصر آهن وجود دارد. با استفاده از یکپارچگی دیجیتال پنج بررسی قبلاً منتشر شده از دشت گرگان و یک روش جدید بررسی از راه دور با استفاده از گوگل ارث، برای اولین‌بار امکان انجام یک توصیف بنیادی از الگوهای سکونت دیرینه‌تاریخی دشت گرگان فراهم شده است.

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Excavation at Sarcham, A Multi-Period Archaeological Site in Hawraman Region, Kurdistan Province, Iran

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Abstract

The archaeological site of Sarcham is situated in the southwestern region (Hawraman Region) of Kurdistan Province in western Iran. It was excavated as part of the Darian Dam Archaeological Salvage Project (DDASP) in 2015, revealing a multi-period site with cultural deposits spanning four distinct archaeological periods. This paper aims to present the findings from the excavation season, highlighting the significance of each period. The cultural sequence of site includes the Middle Chalcolithic (Se Gabi phase), Middle Bronze Age, Late Bronze Age, and the Parthian/Sassanid era. The Middle Chalcolithic pottery discovered at Sarcham bears resemblance to that of the Seh Gabi period in the Central Zagros region. Similarly, the Middle Bronze Age pottery assemblage exhibits similarities with those found in the Central Zagros (late phases of Godin III), Northwestern Iran, and Anatolia. This excavation marks the first discovery of a Middle Bronze Age/Late Bronze Age site in Kurdistan Province. Furthermore, our research indicates that certain grey ware previously attributed to the Iron Age I period actually originated in the Bronze Age. The uppermost layer of the site, albeit somewhat disturbed, yielded pottery fragments dating to the Parthian/Sassanid period. This study sheds new light on the archaeological significance of Sarcham and contributes to the understanding cultural history of the region.

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1. Introduction

Archaeological investigations in Kurdistan Province have a long and extensive history. Notable sites, such as the Karaftou Cave, were studied in the end of the 19th century by De Morgan (1896). At Tepe Ziwiye, Cuyler Young conducted a brief sounding in 1964 (Young, 1965), and in more recent years, Nosratollah Motamedi led several seasons of archaeological excavations (Motamedi, 1997). In 1971, Swiny conducted a comprehensive survey of a large region in the northwest of Iran, including the northeastern parts of Kurdistan Province (Swiny, 1975). Later, the Iranian team excavated Kani Mikaiil cave, resulted to identifying Chalcolithic remains (Roustaei *et al.,* 2002). The cemetery of Kul Tarike, dating to the Mannaean period, was also excavated (Rezvani and Roustaei, 2007: 139). The most recent prehistoric archaeological project in Kurdistan Province took place at Tepe Kalanan, where remains from the Godin VII period were uncovered (Saed Mucheshi, 2010).

Additionally, various surveys and excavations have been conducted in different areas of the province, including the Marivan plain (Mohammadifar and Motarjem, 2008), Bijar (Sharifi and Motarjem, 2018), and the Zagros graveyard in Sanandaj (Saed Mucheshi, 2012). However, despite these commendable efforts, the field of archaeology in Kurdistan faces significant challenges. The absence of intensive and systematic survey and excavation, coupled with a shortage of consistent publication, remains a critical issue that needs to be addressed.

The archaeological excavation at the Sarcham site in the Kurdistan Province has yielded valuable insights into the prehistoric, proto-historic, and historic eras in the region. The excavation uncovered material culture spanning the Chalcolithic, Bronze Age, and Historical periods, shedding light on the subsistence strategies and cultural practices of past inhabitants. Despite the challenging environment that limited agricultural activities, the excavation at Sarcham has provided a unique perspective on the cultural evolution in this intermediate region. This paper aims to introduce and interpret the findings at Sarcham, exploring the archaeological periods represented, the absolute and relative chronological framework of each period, the cultural interactions with other regions, the architectural features uncovered, and the subsistence strategies of the ancient inhabitants. This paper seeks to enhance our understanding of the prehistoric and proto-historic occupations of the Kurdistan Province and the impact of the challenging environment on human settlement patterns and cultural practices.

2. Geographical landscape

The Sarcham site, situated in the Sarvabad County within the Hawraman region of the Kurdistan Province. Located in the northern part of the Central Zagros region, the site covers approximately one hectare and is located at coordinates 35° 09’ 41.75” N, 46° 26’ 8.92” E, with an elevation of 885 meters above sea level. Notably, it lies nearly 25 kilometers east of the Iran–Iraq border (Fig. 1). Sarcham lies in the southern foothills of Mount Koosalan and rests along the northern bank of the River Sirwan. The former village of Rowar, now submerged due to the rise of the Darian dam water, was situated just south of the site (Fig. 2). In its place, a new village has been established to the east.

The Sirwan River receives contributions from streams originating in nearby mountains, including Koosalan and Shaho. After traversing various watercourses within Iranian Kurdistan, it enters Iraqi Kurdistan and eventually flows into the Darbandikhan dam lake.

The Hawraman region, which encompasses parts of both the southwestern Kurdistan and northwestern Kermanshah provinces, features rugged mountainous terrain with steep slopes. Consequently, two distinct types of sites have emerged in this area: permanent villages situated at lower altitudes and temporary summer camps perched at higher elevations. Hawraman topography is characterized by steep or sloping mountain ranges, devoid of extensive plains. The vegetation, dominated by oak and pistachio forests, further reflects the unique geographic configuration of this region. Unlike other parts of the Kurdistan province, Hawraman lacks agricultural plains entirely. This challenging environment significantly impacted the subsistence strategies of local inhabitants and influenced the formation processes of archaeological sites. In contrast to the flat or lowland regions, where walls predominantly consist of mud bricks, the architectural remnants in the Hawraman area predominantly employ stone construction. The cultivation of grains within this region is severely restricted, prompting the local inhabitants to source essential grains, particularly wheat, from neighboring areas both historically and in the present day.

3. Research Background and Excavation Methodology

In recent years (2015-2016), the Darian Dam Archaeological Salvage Project (DDASP) has undertaken comprehensive surveys and rescue excavations in the Hawraman region. Among the sites investigated, Sarcham stands out as a significant archaeological site (Biglari *et al.,* 2017). In the autumn of 2015, a rescue excavation was conducted under the direction of Amir Saed Mucheshi (2015). During the archaeological survey at Sarcham, a diverse assemblage of artifacts identified, including mortars, pottery vessels, and ground stone implements. The site, although currently under cultivation, had previously hosted gardens. This historical land use was facilitated by ingenious water management systems that harnessed resources from higher elevations. Notably, the steep topography of the Hawraman region has contributed to the pronounced erosion of ancient sites, a phenomenon clearly observable at Sarcham.

The excavation methodology used adhered to the principles of the single context system. Given that a single stratigraphic layer may encompass diverse contexts, distinct context numbers were assigned to each cultural deposit encountered. The comprehensive recovery process involved the separate collection of finds, artifacts, botanical specimens, and faunal remains. Notably, each archaeological object received a unique Registry Number (RN). Specifically, contexts containing ash deposits underwent careful collection and flotation. All retrieved objects were meticulously preserved for subsequent analyses. The pottery assemblage was documented through drawings, measurements (including rim and base profiles), and detailed descriptions. Following this initial examination, diagnostic potsherds were selectively chosen for further illustration and photography, while non-diagnostic fragments were earmarked for registration and subsequent statistical assessments.

Some samples for laboratory analyses included (XRF, XRD, Thermoluminescence dating, and AMS radiocarbon dating) were selected from each chronological period. Thermoluminescence dating was conducted at the Thermoluminescence Dating Laboratory of the Research Institute of Cultural Heritage and Tourism (RICHT). Additionally, six bone samples underwent C14 analysis at Paleo Labo Co., Ltd. in Japan.

Informed by preliminary assessments and a comprehensive site study, our excavation efforts focused on four distinct trenches within the archaeological site. These trenches were

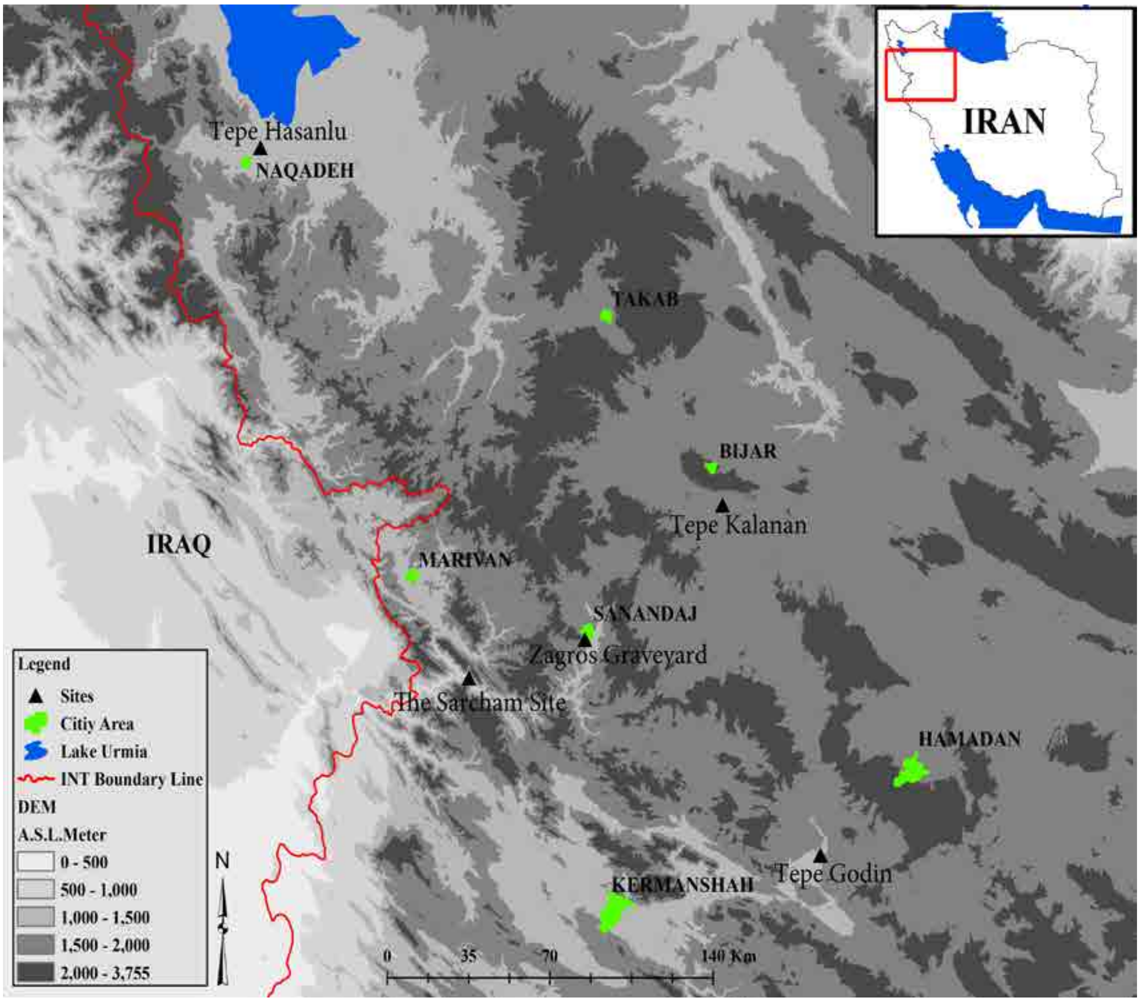

Fig. 1: Location of Sarcham site in western Iran

designated as follows: Trench A (located centrally), Trench B (southern side), Trench C (northeast of Trench B), and Trench D (northern extent) (Fig. 3). While Trenches B (3×2 meters) and C (2×2 meters) were relatively small, Trenches A (5×10 meters) and D (3×12 meters) constituted broader and deeper excavations.

The site, at the time of excavation, was interspersed with pomegranate orchards, which constrained the dimensions of our trenches. The context number of Trench A to D started from 1000 to 4000 respectively. As a result of recent human interference and disturbance like agriculture, gardening, flattening, and fencing, the surface of the site was gradually destroyed. Despite this limitation, we meticulously documented surface data. Our preliminary assessment revealed a multi-period ancient site, with stratified layers yielding valuable insights. The recovered artifacts spanned distinct historical epochs: Parthian/Sassanid Era (Period I), Late Bronze Age (Period II), Middle Bronze Age (Period III), Middle Chalcolithic Period (Period IV). Notably, Trench A yielded evidence of pottery dating back to the end of the second millennium BC and the beginning of the first millennium BC. However, the uppermost layer of this trench suffered disturbance due to agricultural activities. In the upper strata of Trench A, Parthian/Sassanid and Iron Age pottery were found together.

Fig. 2: Environmental setting of the site

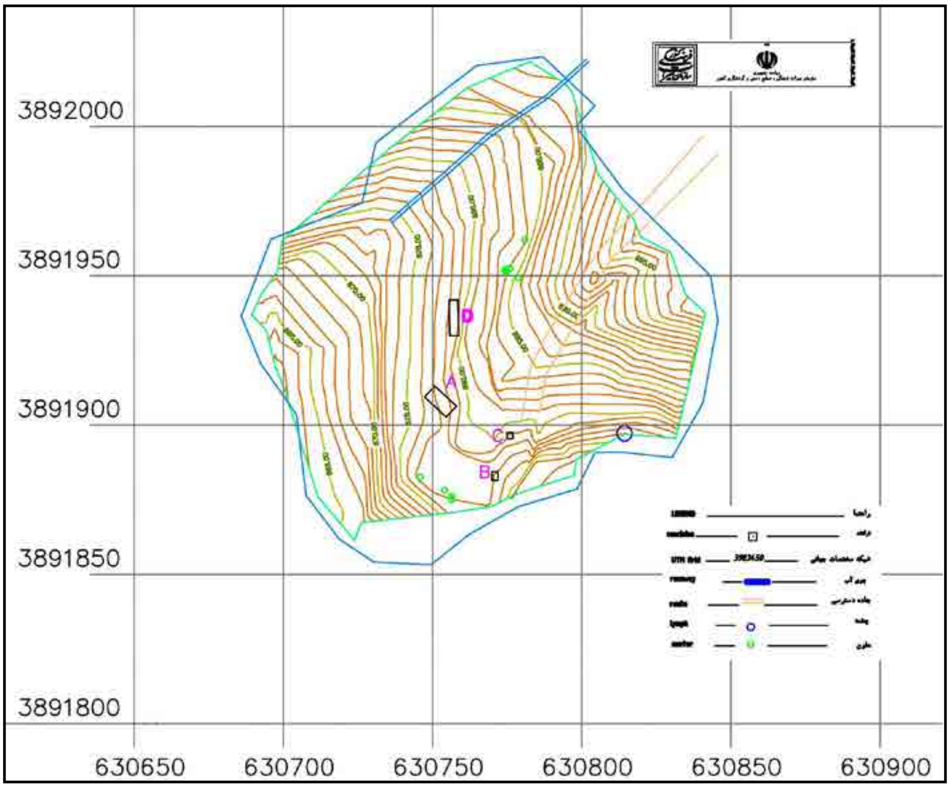

Fig. 3: Location of the trenches on a topographic map of Sarcham site

4. Excavations and Periodization

4.1. Trench A

Trench A, measuring 5×10 meters, was opened in the central part of the site, strategically targeting areas anticipated to yield architectural remains and cultural deposits (Fig. 4a, b). The excavation reached a depth of 230 centimeters. The stratified materials recovered from Trench A span distinct historical epochs, including: Parthian/Sassanid Period (Period I), Early Iron Age (Disturbed), and Middle Bronze Age (Period III) (Fig. 4c, d). Approximately 15 contexts associated with these periods were excavated. Notably, the upper layers of Trench A exhibit a complex mixture of materials. This phenomenon is particularly pronounced in the southern half of the trench, where Parthian/Sassanid, Iron Age, and Bronze Age pottery coexist. Unfortunately, the presence of modern artifacts, such as an iron nail, attests to the disturbance and even destruction of some of these upper layers. Local villagers report that this specific area of the site underwent leveling and infilling in recent years, thus presenting a possible reason for these disturbances.

The uppermost architectural feature encountered in Trench A lies along the eastern side of the trench. Structures from this uppermost level were constructed from substantial rock slabs (Fig. 4b). A subsequent architectural element unearthed in the lower strata, characterized by a sparse arrangement of stones, primarily observed in the southern section. Unlike the first wall, this secondary structure constructed with smaller stones. Within this trench, the Parthian/Sassanid period pottery, including buff and orange wares (Fig. 5), alongside Middle Bronze Age buff and grey ceramics were found (Fig. 6). Given the disturbances of some layers of this trench, we interpret that the uppermost stratum, associated with the first wall, corresponds to the Parthian/Sassanid period (Period I of Sarcham). In the other hand, the lower layers, marked by small stone architecture, belong to the Middle Bronze Age (Period III Sarcham).

Period I and Period III in Trench A: The potsherds recovered from Trench A present a fascinating puzzle due to their uncertain contexts. While careful analyses are somewhat limited, the undisturbed layers within the trench have yielded valuable information, particularly regarding the Middle Bronze Age occupation of the site. A total of 820 potsherds were collected from contexts associated with the Parthian/Sassanid period (Period I). Among these, the prevailing surface colors are orange (712 = 86.82%) and grey (108 = 13.17%). The pottery assemblage exhibits a diverse range of forms, including buff, red, and brown wares. Within this collection, 9.2% represent fine orange ware, 56.7% fall into the category of medium quality, and 34% are coarse. In contrast, the grey ware group comprises 5.8% fine, 66.9% medium, and 27.1% coarse specimens.

The firing quality of the potsherds varies: 46.5% are well-fired, while the remainder falls into the under-fired category. Slip application also shows diversity, with 27.6% featuring a thin slip and 72.4% displaying a thick slip. The production techniques are equally diverse, with 21.5% being wheel-made and 78.5% being hand-made. Notably, all pottery vessels were tempered with small or medium grit. Two thermoluminescence samples, analyzed by the Laboratory of Iranian Cultural Properties at the Research Center for Conservation of Cultural Relics, provide chronological context. A sample from context 1011 yields a date of 1830±125 years ago, while another sample indicates 1780±120 years ago. Consequently, this context aligns with the end of Parthian or the early Sassanid period (Fig. 7). However, it is essential to note that human disturbances have affected parts of this context. Remarkably, potsherds from the historical period and

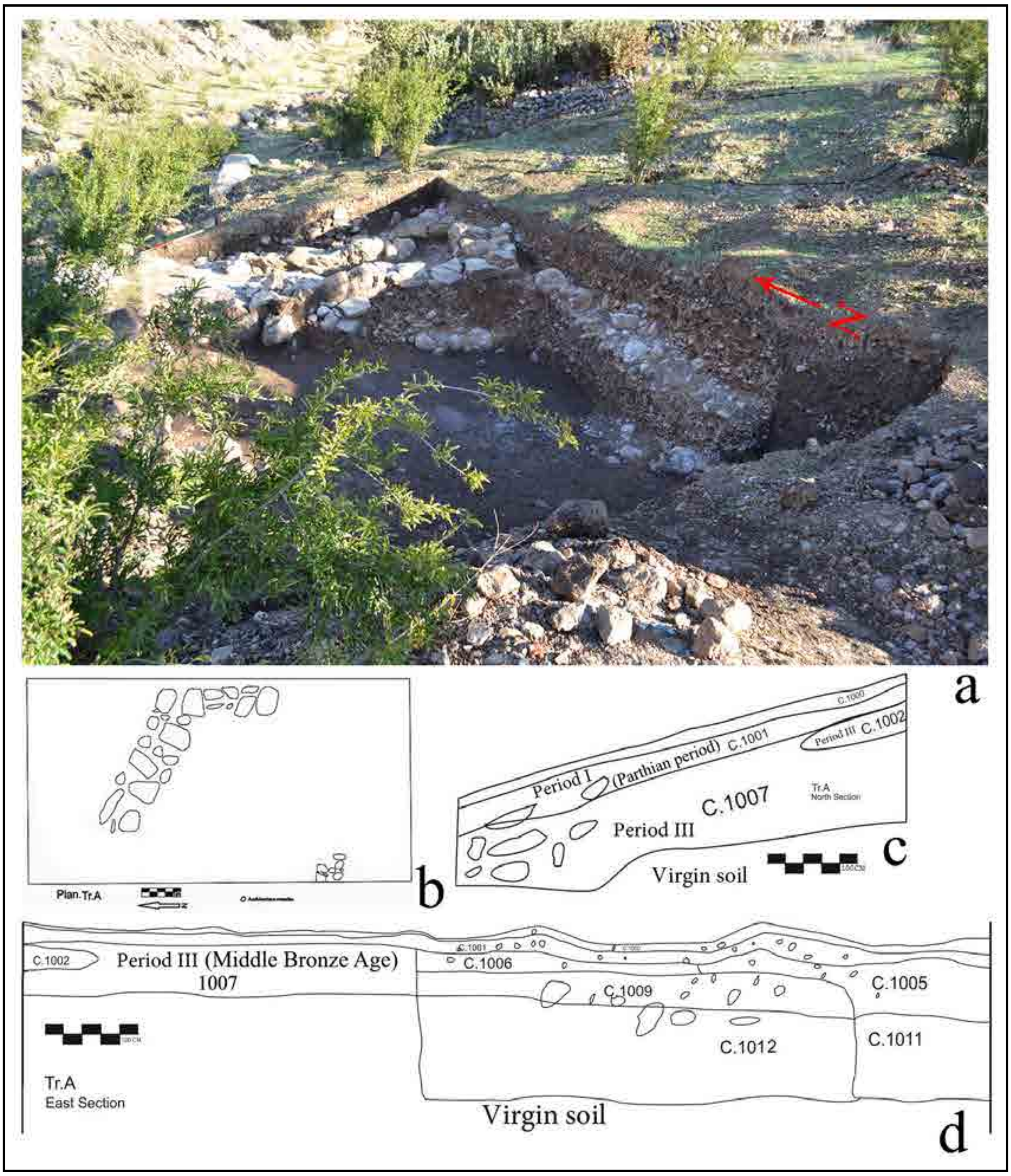

Fig. 4a: Trench A; 4b: Plan of Trench A, 4c: north sections of Trench A, 4d: East sections of Trench A

the first millennium BC coexist within this intriguing archaeological layer.

The most common vessel forms for this period include: Jars with short necks, bowls, hole-mouth vessels with horizontal bands under the rim, hemispherical hole-mouth bowls, funnel-necked jars, and open mouth bowls. These vessels exhibit characteristic ornamentation, such as small parallel bands applied beneath the rim and incised grooved designs (Fig. 5). In addition to pottery, our excavations yielded a few iron artifacts and other small finds (Fig. 8: upper row).

Period III (Middle Bronze Age) lies stratigraphically beneath Period I (Parthian/ Sassanid period). While some contexts within Period I were disturbed, the lowermost layer in the northern part of Trench A (Period III) remains remarkably intact. Our analysis

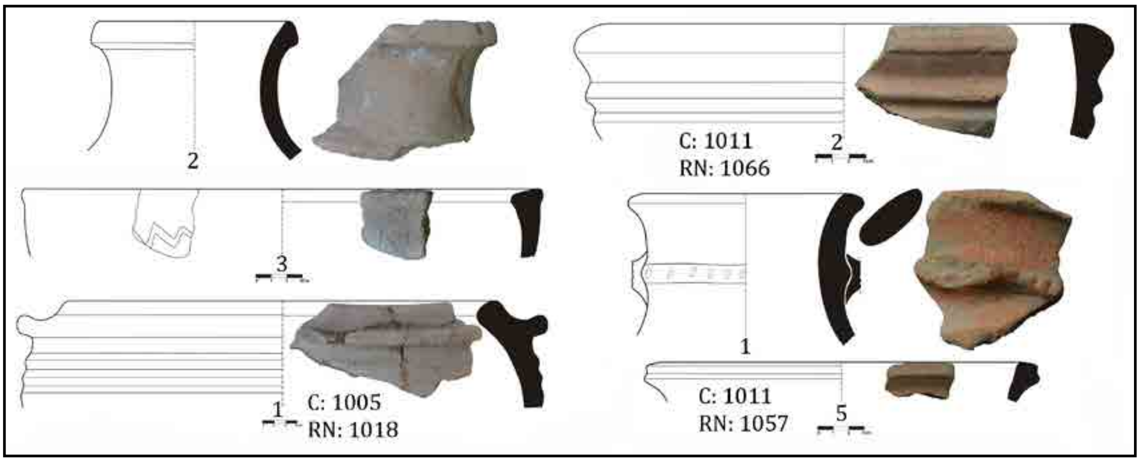

Fig. 5: Period I (Parthian/Sassanid) potteries from Trench A

Potteries Registry

Fig. 5: Period I (Parthian/Sassanid Period), Trench A

1005 (context number)/1018 (registry number): 2 (excavation number of pottery); Rim fragment of a jar with a short neck which the rim is thickened; rim diameter: 6 cm; medium texture; orange; thin slipped on the exterior and interior; grit inclusion; under-fired, wheel-made.

1005/1018: 3; Rim fragment of a bowl with a thick rim and incised grooved decoration under the rim; rim diameter: 16 cm: medium texture; orange; thin slipped on the exterior and interior; grit inclusion; under-fired, hand-made.

1005/1018: 1; Rim fragment of a hole-mouth vessel with a horizontal band under the rim; small parallel bands under the rim; rim diameter: 36 cm; coarse texture; orange; thick slipped on the interior and exterior; grit inclusion; under-fired; hand-made.

1011/1066: 2; hemispherical hole-mouth bowl with rim with concave and grooved rim; rim diameter: 14 cm; medium texture; orange; thin slipped on the interior and exterior; grit inclusion; well-fired; wheel-made.

1011/1057: 1; Rim fragment of jar with a short neck and a horizontal band; rim diameter: 5 cm; medium texture; orange; grit inclusion; well-fired; wheel-made.

1011/1057: 5; Rim of open mouth bowl; rim diameter: 9 cm; fine texture; orange; thin slipped on the interior and thick slipped on the exterior; grit inclusion; well-fired; hand-made.

of the 517 potsherds from Period III reveals the following details: The most common surface color was buff (376=72.72%) and the next group was grey wares (141=27.27%). 6.4% of buff ware was classified as fine, 57.5% medium and 36% coarse; from the grey ware, 8.7% were fine, 72.5% medium, and 18.6% coarse. 22% of potsherds are well-fired and 78% are under-fired. 25.7% have a thick slip and 74.3% have a thin slip. 3.4% were wheel-made and 96.6% hand-made.

Two AMS C14 results provide chronological context for specific contexts: Context 1005: Dates to 1128-976 cal. BC; Context 1007: Dates to 1621-1506 cal. BC (Fig. 9). The latter sample, taken from an undisturbed layer in the northern part of Trench A, appears contemporaneous with Period III in Trench D. Unfortunately, the first sample, associated with the Early Iron Age context, lacks reliable data.

4.2. Trench B

Trench B (3×2 meters) was opened in the southern part of the site (Fig. 3). Some Chalcolithic pottery was identified on the surface of the trench. However, excavation revealed primarily natural contexts, with a few disturbed potsherds.

4.3. Trench C

Trench C is small (2×2 meters), located in the southeastern part of the site, adjacent to Trench B (Figs. 3 and 10). This trench included Middle Bronze Age (Period III Sarcham), based on the presence of buff and grey ware. One wall, oriented north to south, measuring 2 meters in length and 72 centimeters in width-similar to the architectural phase observed in Trench D. The size limitation of the trench precluded precise measurements of the wall. In addition of potsherds, mortars, hand stones, and grinding stones were found.

Period III in Trench C: The ceramic assemblage from Trench C, comprises two main types: buff ware (67 n=69%) and grey ware (30 n=31%). Due to the limitations of excavation area, precise analysis remains elusive. However, parallels can be drawn between this pottery and that found in Trench D and Hasanlu VI (Fig. 6). The buff pottery can be divided to three groups, including fine (11.11%), medium (48.14%) and coarse wares (40.7%). The classification for grey potteries is as follows: fine (3.4%), medium (37.9%) and coarse wares (58.6%). Most of the potteries (88%) are hand-made and grit (95%) commonly used for temper and the rest (5%) have mixed temper. 88% of the assemblage is low-fired and only 12% are well-fired. Approximately 90% of the pottery exhibits inner and external surface washing, often with a thin wash. Some pottery from this period features a polished surface. The carinated bowls (Fig. 6; 3003/3006: 1, 3003/3010: 2) closely resemble the Period III pottery found in Trench D (Fig. 6).

4.4. Trench D

Trench D, measuring 3×12 meters, was strategically excavated north of Trench A, with the anticipation of unearthing significant archaeological deposits (Fig. 11a, b). 13 distinct contexts were excavated, spanning from the surface layer (4000) down to the virgin soil (4013). At its maximum depth, the material culture layer in this trench reaches 305 centimeters. The material culture within this trench exhibits a stratigraphic sequence encompassing the Late Bronze Age (Period II), Middle Bronze Age (Period III), and Middle Chalcolithic (Period IV) (Fig. 11c, d).

Period II of Trench D: The uppermost layer (contexts 4001 and 4002) primarily consists of monochrome buff ware, with a minor presence of grey ware. Notably, contexts 4001 to 4002 exclusively belong to the Late Bronze Age (Fig. 12). Contexts 4003 to 4009 represent the Middle Bronze Age (period III). These layers immediately follow the Late Bronze Age deposits. Contexts 4010 to 4012, dating to the Middle Chalcolithic, underlie the Period III remains. There is no gap between the Late Bronze and Middle Bronze Age deposits. No cultural material was discovered during period I (Parthian/Sassanid Period) in Trench D.

The Late Bronze Age (Period II), 2635 potsherds were recovered comprises 2284 pieces of Buff Ware (86.7%) (buff to orange) and 351 pieces of Grey Ware (13.3%). 10.5% of pottery of period II is wheel-made and remainder hand-made. 29% are well-fired and 71% are under low fire temperature. All potsherds exhibit a grit temper. The inner and outer surfaces of the wares have a thin slip. Fine grey ware includes less than

1% of the assemblage, medium grey ware makes up 63%, and grey coarse ware 39%. Most of Buff ware are coarse (51.4%) and medium (48%), and just 0.38% are fine.

The common vessels of this period are cups (Fig. 12; 4001/4017: no 13), dishes (Fig. 12; 4001/4006: no: 42), plain S-shaped bowls (Fig. 12; 4001-4002, no: 6; Fig. 12: 4001/4006: 14, Fig. 12: 4001/4011, no: 4, Fig. 12: 4001/4017: no: 14), pitchers (Fig. 6: 4001/4006: 30), vases (Fig. 12; 4002/4010: no: 1) and beakers (Fig. 12: 4001/4002: 142, 144), and carinated bowls (Fig. 12: 4001/4002: 1).

Additionally, two hand stones, two pounders, a mortar and a pestle were recovered (Fig. 8, middle row). One AMS 14C sample from context 4001 dated to 1436-1297 cal. BC (Fig. 9). One thermoluminescence sample from context 4001 dates to 3300±210 years ago, corresponding with the 14C dating (Fig. 7).

Period III in Trench D: Period III, corresponding to the Middle Bronze Age, is stratigraphically situated below Period II at the excavation site. Two distinct walls oriented east-west were identified, both attributed to Period III (Fig. 11b) based on the pottery assemblage (?). The first wall, characterized by a robust structure measuring 110 cm in width, was unearthed at the northern corner of the trench (Fig. 11c). The second wall, spanning 130 cm in width, was positioned towards the middle of the trench. Owing to the limited extent of the trench, only a segment of this wall was visible, with other aspects remaining obscured. An irregular stone structure was found between these masonry walls, displaying signs of disarray rather than deliberate construction, suggesting it may have been a previously destroyed structure. These architectural features, along with associated debris, are believed to pertain to Period III. Noteworthy discoveries within this context include thick layers of ash, unearthed predominantly in the western section, interspersed with potsherds and animal bones. The transition from Middle Bronze Age deposits to Middle Chalcolithic remains occurred at a depth of 230 cm (Fig. 11d). A total of 595 potsherds from Period III were recovered, with 87% (518) categorized as buff ware and the remaining 13% (77) as grey ware (Fig. 6). The grey potsherds predominantly exhibit coarse fabric (57%), followed by medium (39%) and fine ware (4%). In contrast, the buff ware category comprises mainly coarse pottery (75%), with lesser proportions of medium (22.7%) and fine ware (2%). Approximately 14.5% of the potsherds were wheel-made, while the majority (85.5%) were hand-made. Nearly half of the pottery fragments were well-fired, while the rest exhibited under-firing. The pottery commonly features a thin washed surface and is tempered with grit. In addition to pottery, various small artifacts were excavated, including a hand stone and two pounders (Fig. 8: lower row). Prominent vessel types from this period include plain open bowls (Fig. 6: 4003/4013: no: 6), plain closed bowls (Fig. 6: 4003/4030: no: 3), and plain S-shaped bowls (Fig. 6; 4003/4013: no 1 and 2). A noteworthy find includes a fragment of a large pot displaying a lug in Trench A (Fig. 6: 1002/1008: no: 1). Two AMS radiocarbon dates (from context 4004) indicate a timespan 1529–1665 cal. BC and 1747–1905 cal. BC (Fig. 9).

Period IV in Trench D: The stratigraphic layer representing Period IV (Middle Chalcolithic) exhibits a thickness of approximately 75 cm, extending from a depth of 230 cm to 305 cm within the excavation site. In contrast to the overlying stratum, the excavated portion of Period IV predominantly comprises pottery fragments, with an absence of discernible architectural structures. Positioned directly beneath the remains of Period III, Period IV deposits are localized in the northern corner of Trench D (Fig. 11d). The secondary architectural wall associated with Middle Bronze Age deposits cuts

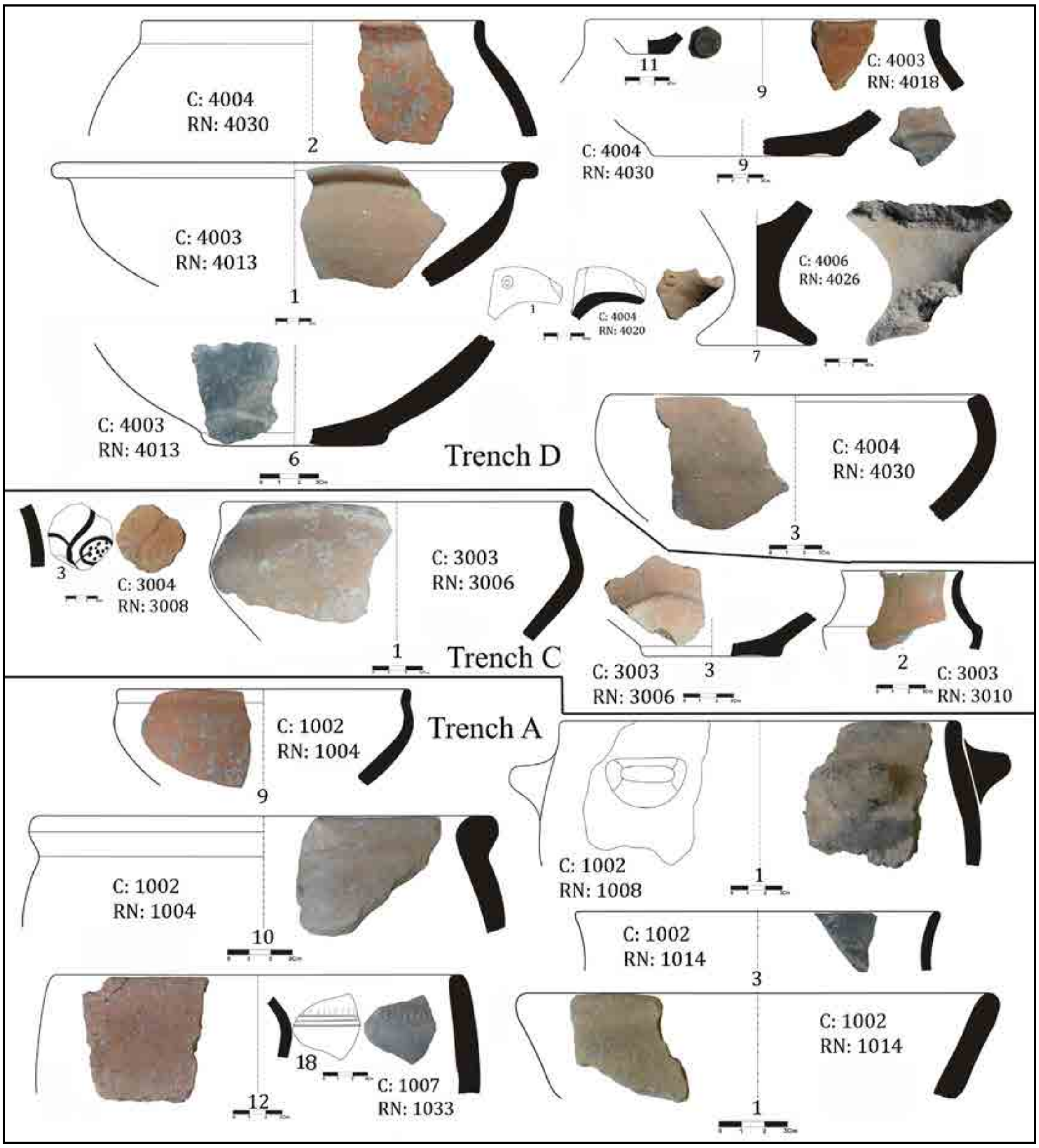

Fig. 6: Period III (Middle Bronze Age) potteries from Trenches A, C, and D

Potteries Registry[2]

Fig. 6, Period III (Middle Bronze Age), Trench D, C and A

Trench D

4004/4030: 2; rim fragment of jar; medium texture; rim diameter: 19 cm; brown; thin slipped on the interior and on the exterior; grit inclusion; well-fired; hand-made.

4003/4013: 1; rim fragment of bowl; medium texture; rim diameter: 23 cm; buff; thin slipped on the interior and on the exterior; grit inclusion; well-fired; wheel-made.

4003/4013: 6; base fragment of bowl; coarse texture; base diameter: 9 cm; grey; thin slipped on the interior and on the exterior; grit inclusion; under-fired; hand-made.

4003/4018: 11; button base of a beaker?; medium textured; base diameter: 3 cm; grey; without slip; grit inclusion; well-fired; wheel-made.

4003/4018: 9; rim fragment of a jar; coarse textured; rim diameter: 24 cm; brown; thin slipped on the interior and on the exterior; grit inclusion; under-fired; hand-made.

4004/4030: 9; base fragment of bowl; base diameter: 13 cm; medium texture; brown; thin slipped on the interior and on the exterior; grit inclusion; under-fired; hand-made.

4004/4020: 1; a fragment of open spout with a circle ornament; medium texture; buff; thin slipped on the interior and on the exterior; grit inclusion; well-fired; hand-made.

4006/4026: 7; base fragment; medium textured; base diameter: 7.5 cm; buff; thin slipped on the interior and on the exterior; grit inclusion; under-fired; hand-made.

4004/4030: 3; rim fragment of hemispherical bowl; medium textured; rim diameter: 21 cm; buff; thin slipped on the interior and on the exterior; grit inclusion; under-fired; hand-made.

Fig. 6/Trench C:

3004/3008: 3: body potsherd with red painted motifs which include lines and dots motifs; medium texture; buff; thin slipped on the interior and on the exterior; grit inclusion; well-fired; wheel-made.

3003/3006: 1; rim fragment of carinated bowl; fine textured; rim diameter: 23 cm; buff; burnished on the exterior; grit inclusion; under-fired; hand-made.

3003/3006: 3; base fragment of bowl; medium texture; base diameter: 9 cm; buff; thin slipped on the interior and on the exterior; grit inclusion; under-fired; hand-made.

3003/3010: 2; rim fragment of carinated bowl; fine textured; rim diameter: 7 cm; buff; burnished on the exterior; grit inclusion; under-fired; hand-made.

Fig. 6/Trench A:

1002/1004: 9; plain S-shaped bowl; rim diameter: 13 cm; fine texture; orange; thin slipped on the interior and on the exterior; grit inclusion; well-fired; wheel-made.

1002/1004: 10: rim fragment of hole-mouth jar with everted rim; rim diameter: 20 cm; medium texture; buff; thin slipped on the interior and on the exterior; grit inclusion; under-fired; hand-made.

1007/1033: 12: rim fragment of bowl; coarse texture; rim fragment: 30 cm; buff/brown; thin slipped on the interior and on the exterior; grit inclusion; under-fired; hand-made.

1007/1033: 18; Body fragment of a bowl with incised grooved decoratio, medium texture; gray; thin slipped on the exterior and interior; grit inclusion; under-fired, hand-made.

1002/1008: 1: rim and body fragment of jar with a lug on the body; medium texture; rim diameter: 22 cm; buff; thin slipped on the interior and on the exterior; grit inclusion; under-fired; hand-made.

1002/1014: 3: rim fragment of a jar: fine texture; rim diameter: 15 cm; grey; burnished on the interior and on the exterior; grit inclusion; under-fired; wheel-made.

1002/1014: 1; rim fragment of bowl; coarse texture; rim fragment: 20 cm; buff; thin slipped on the interior and on the exterior; grit inclusion; under-fired; hand-made.

slightly into the uppermost layers of the Period IV strata.

The ceramic assemblage of Period IV encompasses a variety of pottery types, including plain chaff-tempered, red-slipped, impressed ware, and a limited number of Seh Gabi painted ware pieces, notably Black on Buff (BOB) examples (Fig. 13). The absence of typical Dalma monochrome and bichrome pottery within this layer serves as a key indicator linking it to the Seh Gabi cultural horizon, specifically identified as Godin IX within the chronological framework established by Kangavar (Henrickson, 1985). While impressed ware is a characteristic ceramic form of the Dalma layer (Godin X), it is important to note that Dalma impressed ware extends into the later phase of Godin VII (Late Chalcolithic) (Henrickson,1983). A total of 1882 potsherds were recovered from Period IV, with red pottery comprising 87% (1636) of the assemblage and buff pottery accounting for the remaining 13% (246). Approximately 11% of the pottery in this layer is wheel-thrown, while the majority is handmade. Of the pottery fragments, 46% exhibit evidence of thorough firing. Chaff or vegetal material is commonly used as a temper. The buff pottery is further classified into coarse ware (34%), medium ware (61%), and fine ware (5%), mirroring a similar distribution in the red pottery category: coarse ware (49.3%), medium ware (49.8%), and fine ware (0.7%). A notable portion of the red pottery (13.1%) features a thick slip, while the majority (87%) showcases a thin slip.

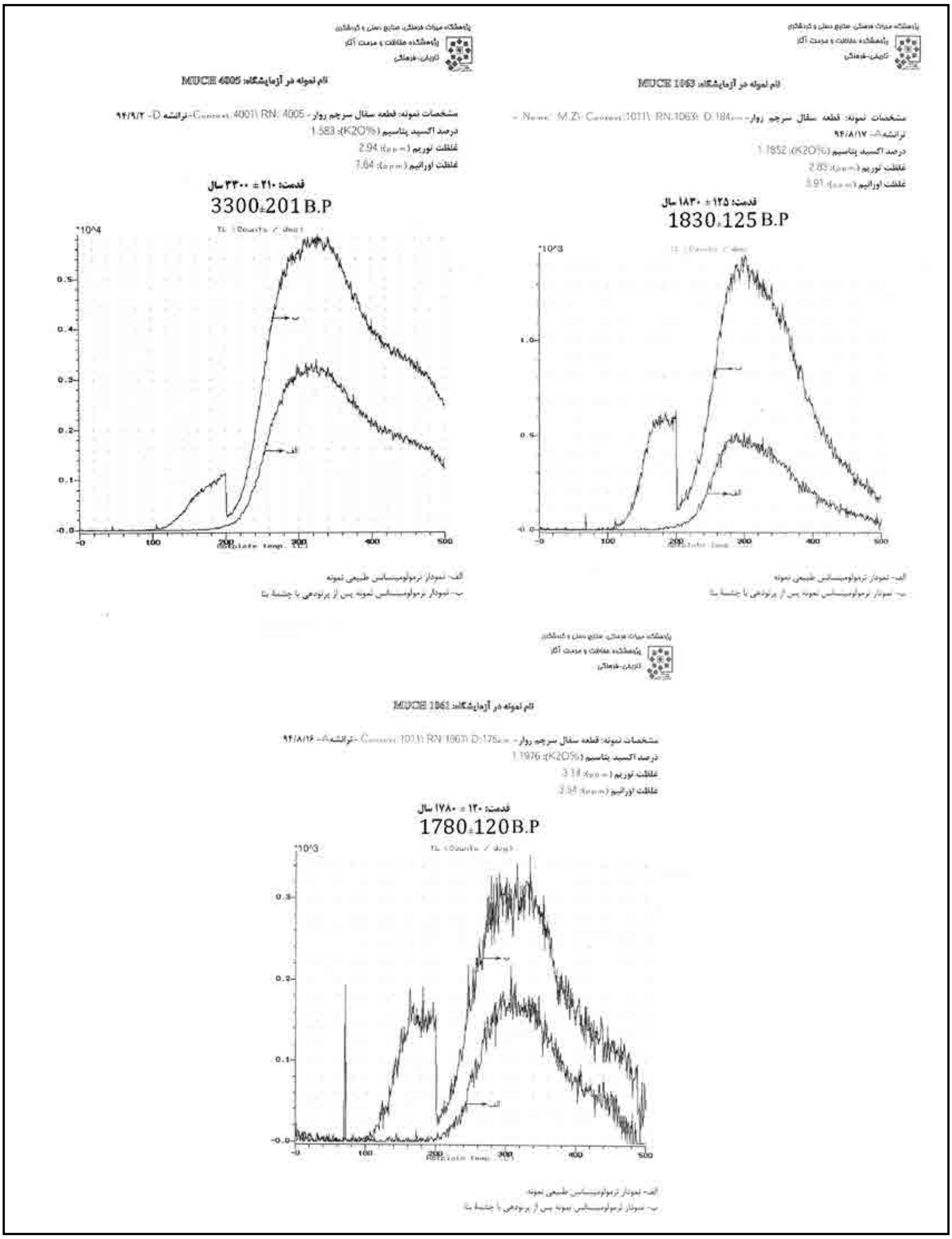

Fig. 7: Thermoluminescence dating of Sarcham Site potteries

Impressed pottery pieces constitute 14.7% (241) of the red pottery fragments. In addition to the pottery finds, two lithic tools and a fragment of a stone object were uncovered within this period. Common vessel forms from this period include globular hole-mouthed vessels (Fig. 13: 4010/4045: no: 9), angular hole-mouthed vessels (Fig. 13: 4010/4045: no: 21), open hemispherical bowls (Fig. 13: 4010/4037, no: 27), wide-mouth necked or collard pots with low, everted necks (Fig. 13: 4010/4037: no: 19), conical bowls (Fig. 13;

Table 1: radiocarbon dates of Sarcham

Lab code	Trench/ Context/ Period	$\delta^{13}C$ (‰)	14C age (yrBP±1σ)	14C dates Calibration		Material
				1σ Calibration	2σ Calibration	
PLD-35387 Sample 1	Tr. A, Con. 1005 (Early Iron Age)	-22.42±0.29	2880±25	1108-1099 cal BC (6.5%) 1089-1013 cal BC (61.7%)	1188-1181 cal BC (0.7%) 1154-1149 cal BC (0.4%) 1128- 976 cal BC (93.7%) 952- 946 cal BC (0.6%)	Bone
PLD-35388 Sample 2	Tr. A, Con. 1007 (Middle Bronze Age)	-20.40±0.33	3285±25	1610-1572 cal BC (34.8%) 1566-1530 cal BC (33.4%)	1621-1506 cal BC (95.4%)	Bone
PLD-35389 Sample 3	Tr. D, Con. 4001 (Late Bronze Age)	-20.65±0.26	3110±25	1424-1385 cal BC (41.4%) 1340-1311 cal BC (26.8%)	1436-1297 cal BC (95.4%)	Bone
PLD-35390 Sample 4	Tr. D, Con. 4004 (Middle Bronze Age)	-20.73±0.31	3505±25	1883-1868 cal BC (11.4%) 1847-1775 cal BC (56.8%)	1905-1747 cal BC (95.4%)	Bone
PLD-35391 Sample 5	Tr. D, Con. 4004 (Middle Bronze Age)	-20.52±0.27	3325±25	1640-1604 cal BC (36.0%) 1584-1544 cal BC (30.4%) 1538-1535 cal BC (1.8%)	1682-1677 cal BC (1.0%) 1665-1529 cal BC (94.4%)	Bone
PLD-35392 Sample 6	Tr. D, Con. 4012 (Middle Chalcolithic Period)	-32.76±0.24	5495±30	4361-4329 cal BC (68.2%)	4445-4420 cal BC (5.6%) 4397-4387 cal BC (1.3%) 4374-4320 cal BC (78.5%) 4293-4265 cal BC (9.9%)	Bone

4010/4045: no: 16), collard jars (Fig. 13: 4010/4038, no: 24), trays (Fig. 13: 4010/4045, no: 38), and open hemispherical bowls (Fig. 13; 4010/4045: no: 15). Radiocarbon dating through AMS 14C analysis indicates a chronological range of 4400-4374 to 4320 BC cal. for this period (see: Fig. 9).

5. Absolute and Relative Chronology

Six 14C samples were analyzed on bone specimens discovered from the Sarcham archaeological site in Paleo Labo Co., Ltd, Gunma province, Japan (Table 1). The radioactive carbon dating was conducted using the accelerator mass spectrometry (AMS) technique. Specifically, six bone samples (PLD - 35387 and PLD - 35388) were obtained from Trench A, while an additional four samples (PLD - 35389 to PLD - 35392) were extracted from Trench D. The samples underwent preparation and analysis using a Pareo Lab compact AMS system (1.5 SDH, manufactured by NEC). Following correction for isotope fractionation effects, the 14C concentration data were utilized to determine the 14C age and corresponding calendar year. Collagen extraction was performed on the bone samples, and the carbon and nitrogen contents were quantified using the vario MICRO CUBE (Elemental), an elemental analyzer for gasification pretreatment. The carbon-to-nitrogen (C/N) molar ratio was subsequently calculated based on the measured carbon and nitrogen contents.

The following analysis focuses on the 2σ calendar year range (95.4% probability) and presents the organized results. Both dating samples analyzed in this study were bone specimens, and the carbon-to-nitrogen (C/N) ratio was assessed to validate the collagen quality. Typically, collagen extracted from bone exhibits a C/N ratio ranging from 2.9 to 3.6 (DeNiro, 1985). In this study, the C/N ratios of collagen extracted from each sample ranged from 2.92 to 3.41, falling within this established range. Therefore, it can be inferred

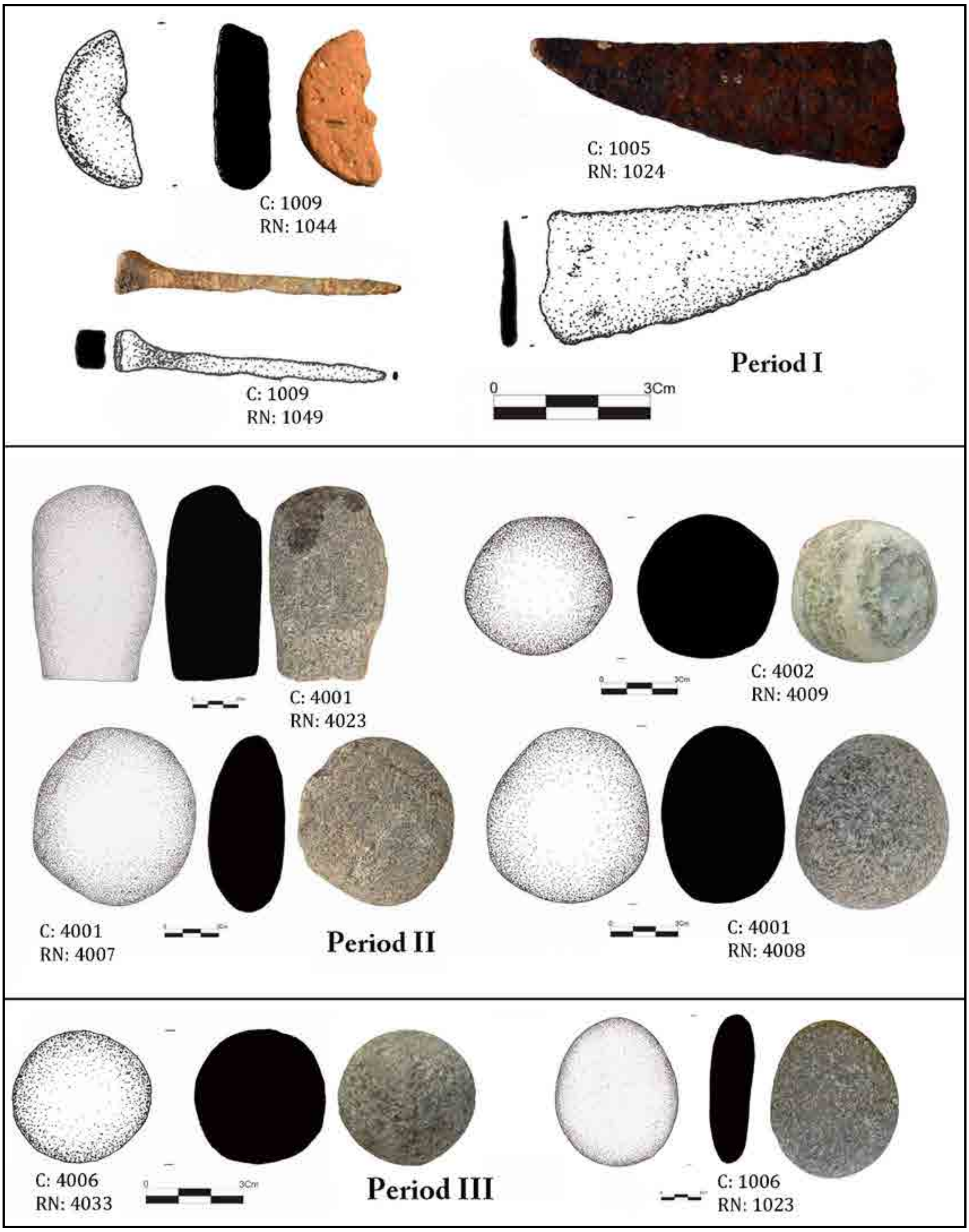

Fig. 8: Small finds of Trenches A, C, and D (Period I, II, and III)

that the likelihood of collagen alteration or the introduction of exogenous carbon in these bone samples is minimal.

This section dealing with the relative chronology of the site based on the pottery assemblage and absolute dating. As mentioned previously, the archaeological excavation conducted at Sarcham has revealed evidence of four distinct archaeological periods: the historical period (Parthian/Sassanid, referred to as period I), Late Bronze Age (period II), Middle Bronze Age (period III), and Middle Chalcolithic (period IV). However, due to the constraints of the excavation process, no architectural remains corresponding to periods II and IV were identified. The remnants of these periods primarily comprise pottery, faunal remains, and various small artifacts. Potsherds dating back to the Early Iron Age were recovered from the site surface and a disturbed layer within Trench A, although the in situ layer from this period remains elusive. The surface layers of the site have been destroyed by agricultural activities.

The pottery fragments from period IV encompass plain buff chaff-tempered, red slipped

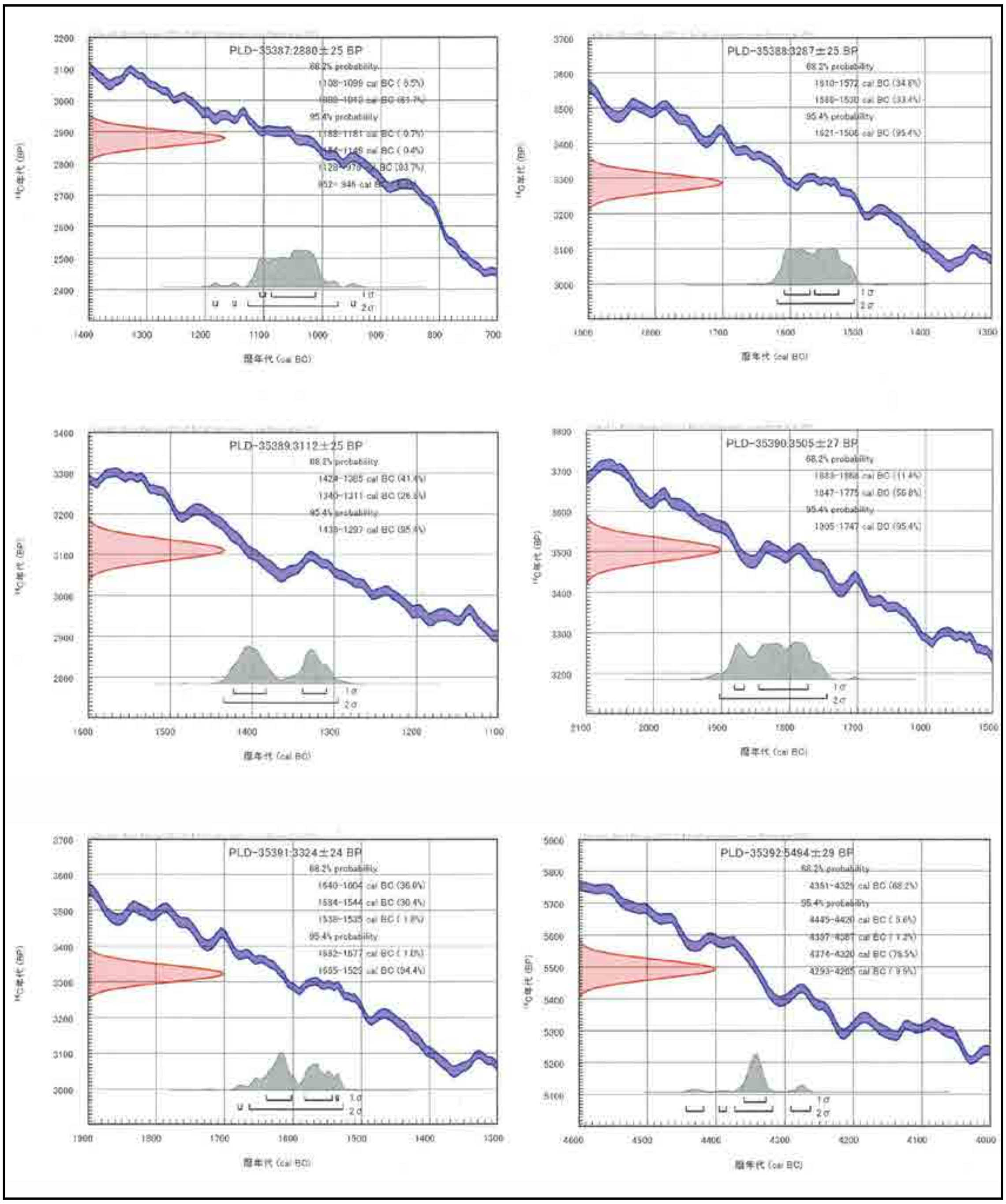

Fig. 9: 14C dating of Sarcham Site

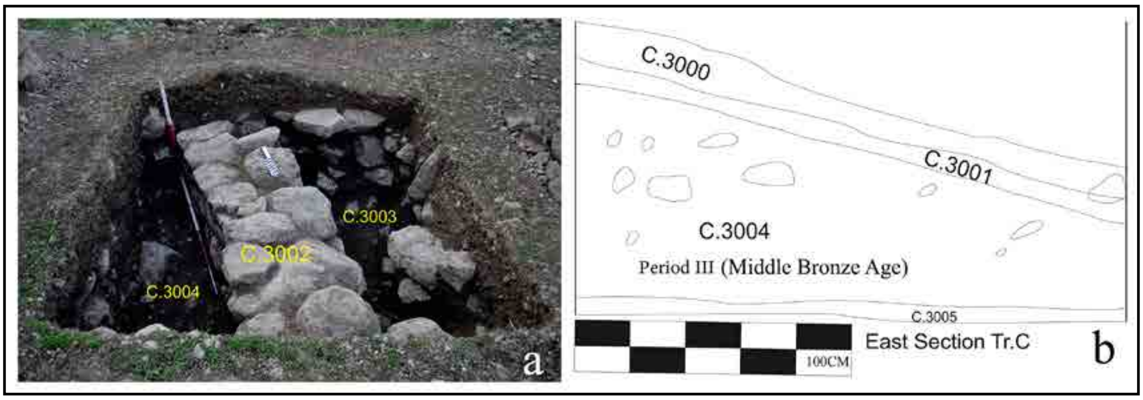

Fig. 10: Architecture discovered at Trench C; 10b: East section of Trench C

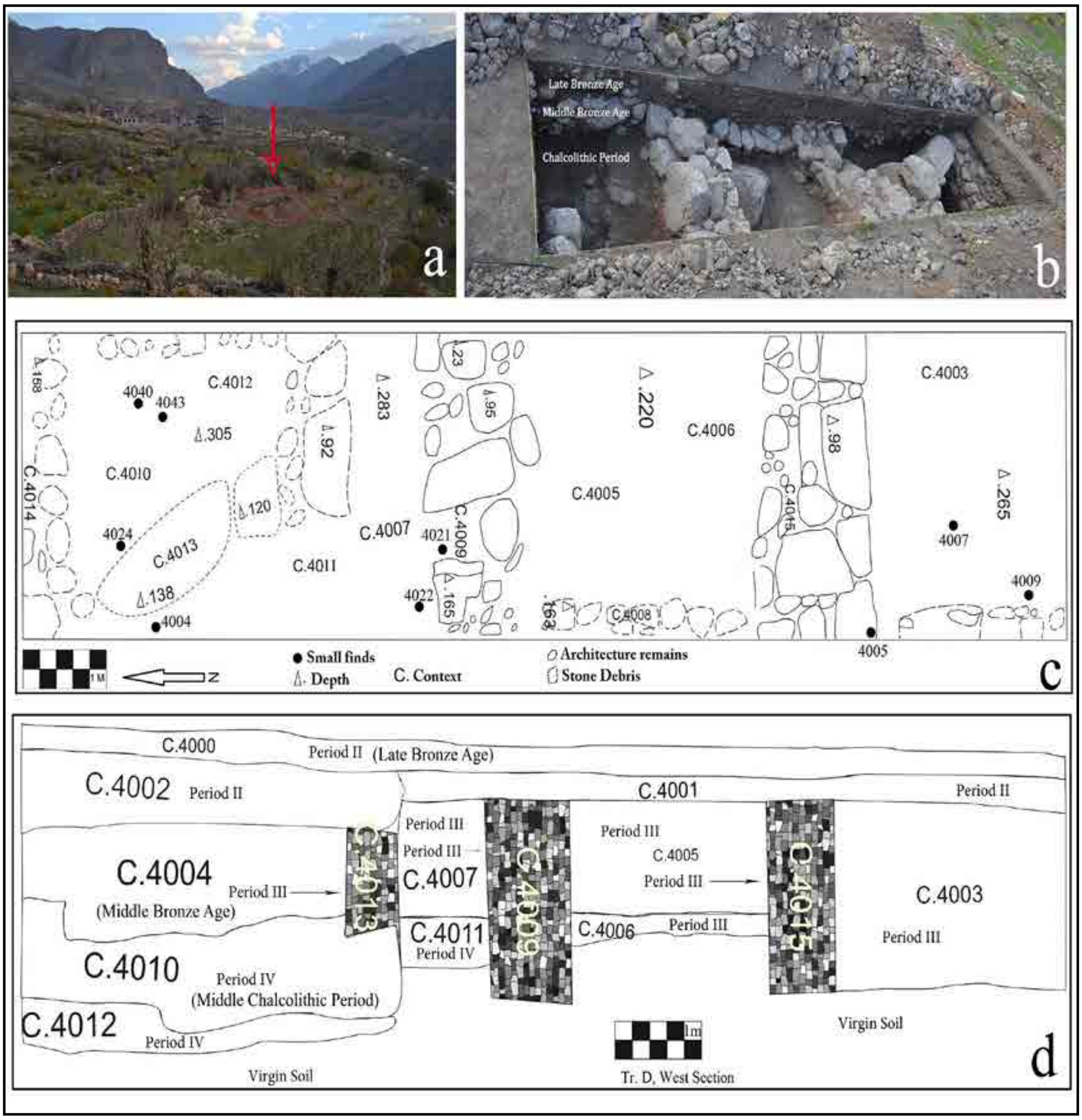

Fig. 11a: Location of Trench D; viewed from north side of site; 11b: Solid period III architectural remain from trench D; 11c: Plan of Trench D; its architecture is belong to period III; 11d: West section of Trench D

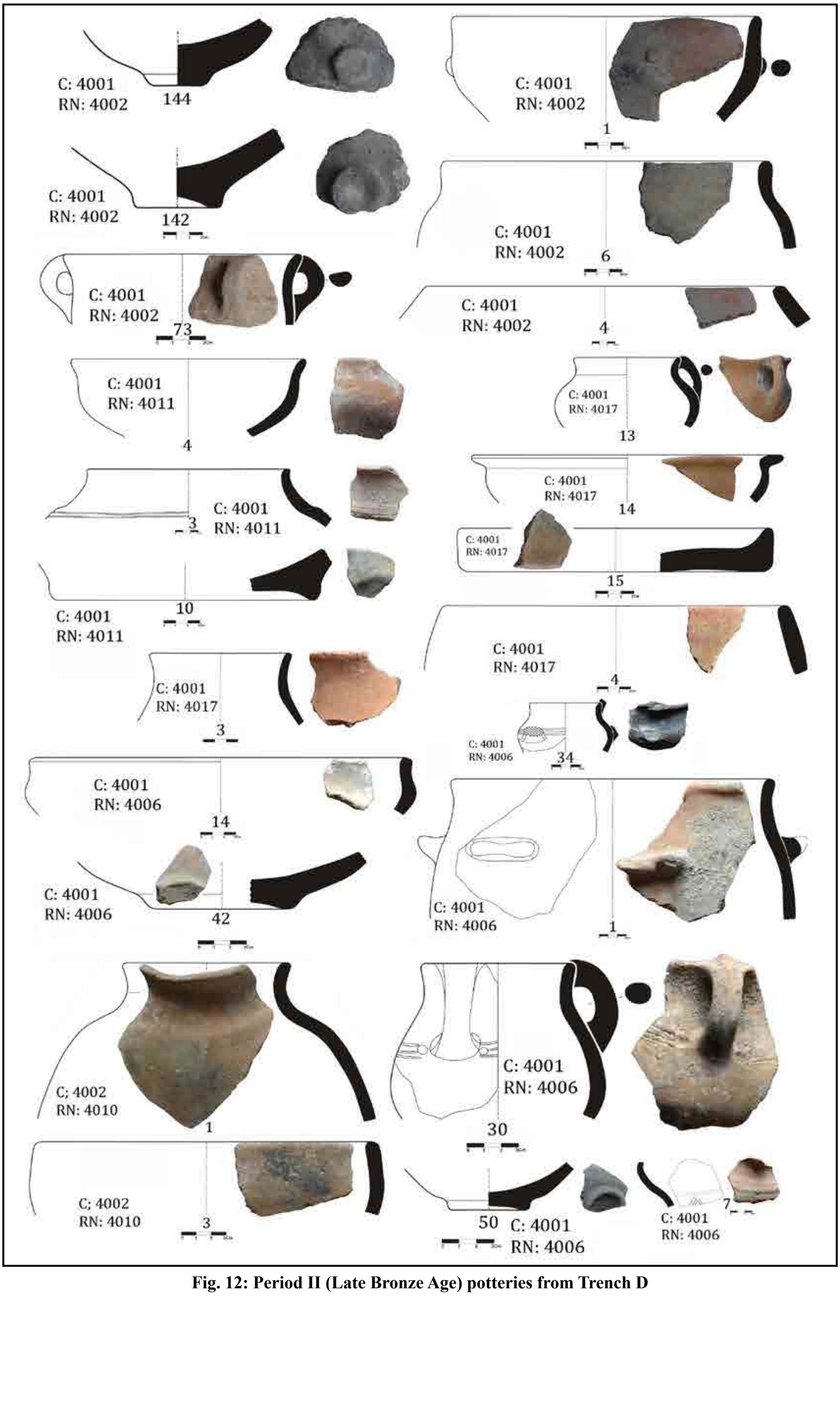

Fig. 12: Period II (Late Bronze Age) potteries from Trench D

Potteries Registry

Fig. 12: Period II (Late Bronze Age), Trench D

4001/4002: 144; ring base of globular beaker; base diameter: 1.5 cm, medium texture; grey; thin slipped on the interior and exterior; grit inclusion; under-fired; hand-made.

4001/4002: 142; ring base of globular beaker; base diameter: 3.2 cm, medium texture; grey; thin slipped on the interior and exterior; grit inclusion; under-fired; hand-made.

4001/4002: 73: a fragment of pot with vertical handles which the handle connected to the rim; rim diameter: 14.5 cm; medium texture; grey; without slip; grit inclusion; well-fired; wheel-made.

4001/4011: 4; plain S-shaped bowl; rim diameter: 19 cm; thin slipped on the interior and on the exterior; brown; grit inclusion; under-fired; wheel -made.

4001/4011: 3; fragment of jar with everted rim with two parallel incised lines on the shoulder; rim diameter: 30 cm; medium texture; buff; thin slipped on the interior and on the exterior; grit inclusion; under-fired; wheel-made.

4001/4011: 10; ring base; base diameter: 21 cm; medium texture; grey; thin slipped on the interior and on the exterior; grit inclusion; under-fired; hand-made.

4001/4107: 3; a fragment of flaring rim; rim diameter: 12 cm; coarse texture; buff; thin slipped on the interior and on the exterior; grit inclusion; well-fired; wheel-made.

4001-4006: 14; plain S-shaped bowl; rim diameter: 31 cm; medium texture; buff; thin slipped on the interior and on the exterior; grit inclusion; well-fired, hand-made.

4001-4006: 42; ring base of a bowl; base diameter: 8 cm; fine texture; buff; thin slipped on the interior and on the exterior; grit inclusion; under-fired, hand-made.

4002/4010: 1; rim and body fragment of oval jar with everted rim and narrow neck; medium texture; rim diameter: 11 cm; buff; thin slipped on the interior and on the exterior; grit inclusion; under-fired; wheel-made.

4002/4010: 3; rim fragment of globular bowl; medium texture; rim diameter: 22; buff; thin slipped on the interior and on the exterior; grit inclusion; under-fired; wheel-made.

4001/4002: 1; carinated bowl with a knob on the body; rim diameter: 23 cm; medium texture; reddish-brown; thin slipped on the interior and exterior; grit inclusion; under-fired; hand-made.

4001/4002: 6; pot with enlarged rim; rim diameter: 22 cm; medium texture; buff, without slip; grit inclusion; well-fired; hand-made.

4001/4002: 4; hole-mouth pot; rim diameter: 45 cm; medium texture; reddish-brown; thin slipped on the interior and on the exterior; grit inclusion; under-fired; hand-made.

4001-4017: 13; rim and body fragment of cup with a vertical handle; rim diameter: 10 cm; fine texture; buff; thin slipped on the interior and on the exterior; grit inclusion; well-fired; hand-made.

4001-4017: 14; rim fragment of plain S-shaped bowl with everted rim; rim diameter: 16 cm; fine texture; buff; thin slipped on the interior and on the exterior; grit inclusion; well-fired; wheel-made.

4001-4017: 15; rim and base fragment of tray; base diameter: 24 cm; medium texture; buff; thin slipped on the interior and on the exterior; grit inclusion; under-fired; hand-made.

4001-4017: 4; rim fragment of bowl; rim diameter: 30 cm; coarse texture; reddish-brown; thin slipped on the interior and on the exterior; grit inclusion; under-fired; hand-made.

4001-4006: 34; rim and body fragment of cup with a vertical handle and five parallel incised lines on the shoulder; medium texture; rim diameter: 7 cm; grey; thin slipped on the interior and on the exterior; grit inclusion; well-fired; hand-made.

4001-4006: 1; rim and body fragment of jar with a lug on the body; medium texture; rim diameter: 27 cm; buff; thin slipped on the interior and on the exterior; grit inclusion; under-fired; hand-made.

4001/4006: 30; rim fragment of a pitcher, medium texture; rim diameter: 10 cm; buff; thin slipped on the interior and on the exterior; grit inclusion; under-fired; hand-made.

4001/4006: 50; a fragment of ring base; medium texture; base diameter: 4 cm; grey; thin slipped on the interior and on the exterior; grit inclusion; well-fired; hand-made.

4001/4006: 7; body potsherd with a raised ridge which have a oblique incised lines on there; medium texture; buff; thin slipped on the interior and on the exterior; grit inclusion; well-fired; hand-made.

Fig. 13: Period IV (Middle Chalcolithic), Trench D

4010/4045: 15; rim fragment of open bowl; medium texture; rim diameter: 34 cm; buff; red thin slipped on the interior and on the exterior; chaff inclusion; well-fired; hand-made.

4010/4038: 2; rim fragment of hole-mouth jar; medium texture; rim diameter: 37 cm; brown; thin slipped on the exterior; chaff inclusion; under-fired; hand-made.

4010/4045: 12; rim fragment of oval bowl; medium texture; rim diameter: 11 cm; buff; red thin slipped on the interior and on the exterior; chaff inclusion; well-fired; hand-made.

4010/4045: 16; rim fragment of everted simple bowl; medium texture; rim diameter: 14 cm; buff; red thin slipped on the interior and on the exterior; chaff inclusion; under-fired; hand-made.

4012/4047: 13; rim fragment of hole-mouth jar which everted rim; medium texture; rim diameter: 16 cm; buff; thin slipped on the interior and on the exterior; chaff inclusion; under-fired; hand-made.

4010/4045: 5; rim fragment of hole-mouth jar with curvature in the shoulder; medium texture; rim diameter: 11 cm; buff; red thin slipped on the interior and on the exterior; chaff inclusion; under-fired; hand-made.

4010/4037: 27; rim fragment of hemispherical bowl; fine texture; rim diameter: 17 cm; buff; thin slipped on the interior and on the exterior; chaff inclusion; well-fired; wheel-made.

4010/4045: 21; rim fragment of hole-mouth jar; medium texture; rim diameter: 13 cm; buff; fingertip impressed on the exterior; chaff inclusion; under-fired; hand-made.

4010/4045: 9; rim fragment of globular hole-mouth jar; coarse texture; rim diameter: 28 cm; buff; fingertip impressed on the exterior; chaff inclusion; under-fired; hand-made.

4010/4045: 38; a fragment of tray; medium texture; rim diameter: 19 cm; buff; thin slipped on the interior and on the exterior; chaff inclusion; under-fired; hand-made.

4012/4047: 19; a body potsherd; fine texture; buff; thin slipped on the interior and on the exterior; geometric black painted; chaff inclusion; well-fired; wheel-made.

4012/4047: 11; rim fragment of vertical simple bowl; medium texture; rim diameter: 24 cm; buff; thin slipped on the interior and on the exterior; chaff inclusion; under-fired; hand-made.

4012/4047: 22; rim and base fragment of bin; medium texture; rim diameter: 23 cm; buff; thin slipped on the interior and on the exterior; chaff inclusion; under-fired; hand-made.

4010/4038: 40; a body potsherd; fine texture; tan-buff; burnished; geometric thick black painted; chaff inclusion; well-fired; wheel-made.

4010/4037: 19; rim fragment of everted rim bowl; medium texture; rim diameter: 19 cm; thin slipped on the interior and on the exterior; chaff inclusion; well-fired; hand-made.

ware, impressed ware, and a limited number of Seh Gabi Painted ware pieces. Henrickson has highlighted a distinctive Seh Gabi Painted type within this period, characterized by un-slipped, tan-buff fine ware with prominently black paint exhibiting a thick and shiny surface (Henrickson, 1985: 70). These potsherds can be compared with the black painted ceramics found at Sarcham. Comparative analysis of this pottery assemblage aligns it with the Seh Gabi period (Henrickson, 1985; Young, 1969; Young and Levine, 1974: 6-7; Levine and Young, 1987: Fig. 9-10), corroborated by radiocarbon dating results placing it within the range of 4500/4400 to 4200 BC. The mid-5th millennium BC stands out as a pivotal prehistoric epoch in western Iran, marked by a widespread expansion of archaeological sites across Kurdistan Province, spanning diverse landscapes such as plains, foothills, high valleys, caves, and rock shelters (Saed Mucheshi and Azarshab, 2014; Saed Mucheshi, 2010). A similar trend is observed in Chalcolithic sites within Hawraman, a mountainous region.

The Middle Bronze Age represents a relatively understudied archaeological epoch within Kurdistan province. Radiocarbon analyses conducted on Period III materials at Sarcham indicate the presence of artifacts dating back to the first half of the second millennium B.C., offering novel insights into a Middle Bronze Age site in Kurdistan. Notably, the pottery recovered from this period diverges from the typical painted Urmia and Godin III wares, except for one piece, revealing the prevalence of grey wares instead. While these ceramics are commonly associated with Iron Age contexts, radiocarbon dating at Sarcham firmly situates this pottery within the early 2nd millennium BC. Alongside the grey ware, fragments resembling buff potsherds akin to those from Period II (Late Bronze Age) were recovered. Some pottery forms from Sarcham III, such as the simple hemispherical and carinated bowls, bear resemblance to the potteries of Godin III: 2 and Godin III: 1 (Henrickson, 1985: 579; Henrickson 1986: fig. 16). Furthermore, bowls featuring an outward edge (Fig. 6; 4003/4013, 1) are reminiscent of 2nd millennium B.C. pottery discovered at Dinkha Tepe in northwestern Iran (Hamlin, 1974: fig. 3, no. 27). Analogous forms observed in Sarcham III can also be found at Dinkha from the same period. The hemispherical bowl (Fig. 6: 4004/4030, 3) and carinated vessels from layer III exhibit similarities to Haftavan VIB (Edwards, 1981: Figs. 18 and 19) from the 2nd millennium B.C. Additionally, parallels can be drawn between the pottery of this period and that of Hasanlu VIb during the Middle Bronze Age, particularly evident in spherical vessels featuring incised decorations (Fig. 6: 1007/1033, 18) (Danti, 2013: Fig. 17a and 17b). Plain S-shaped bowls and carinated vessels from Period III (Fig. 6: 1002/1004, 9) in Trench A and Trench C (Fig. 6: 3003/3010, 2; 3003/3006, 1) bear resemblance to Anatolian carinated bowls from the Muş region dating back to the 2nd millennium BC (French and Summers, 1994: Figs 3, 4).

During the Late Bronze Age (Period II), two distinct groups of pottery were prevalent: buff and grey wares. The latter variety was notably discovered in the northwestern regions of Iran and the southern Alburz area, exemplified by findings at sites such as Hasanlu V (Young, 1965), Khurvin (Vanden Berghe, 1964), and Sialk V (Ghirshman, 1938). Notably, Tepe Godin served as a cemetery, with only a few burials identified, prompting Young to draw comparisons between the material culture of these burials and those at Giyan I4-I3 (Young, 1969: 19). While the aforementioned pottery has traditionally been associated with the Iron Age I, it is worth highlighting the prevalence of beakers as the typical form within these burials, a characteristic also observable in Period II as evidenced at Sarcham. These beakers, alongside similar cups, were used in the context of Giyan I (Contenau and Ghirshman, 1935, Pl. 10, 12, 13, 14, 15, 16, 19, 20) and Sarcham. The resemblance of Period II pottery extends beyond these sites, with certain common vessels like plain S-shaped bowls, beakers, and vases bearing striking similarities to the beakers (Overlaet, 2003: 116), pitchers (Ibid: 81), and plain S-shaped bowls (Ibid: 126) discovered at Pusht-I Kuh. Notably, while the chronology of the latter is firmly placed within the Iron Age I, this observation raises questions regarding the persistence of certain pottery forms or potential chronological discrepancies.

Some of the knob-applique pottery found in Period II exhibits similarities to similar/comparative pottery discovered in the southern Urmia basin. The pottery unearthed from the latter half of the second millennium B.C in both Sarcham and the Urmia basin displays a reddish-brown color and is decorated with small knobs (Kroll, 2005: Fig. 2, 7; Sarcham: Fig. 12: 4001/4002, 1). Additionally, incised horizontal lines, nail impressions, and other decorative motifs can be observed on the pottery from this era (Sarcham: Figs. 12: 4001/4006, 34; 4001/4011, 3; Figs. 12: 4001/4006, 7; 4001/4006: 30). Such ornamentation is recognized as a characteristic feature in Pusht-I Kuh as well (Overlaet, 2003: 92).

The archaeological remains from Period I, recovered solely from Trench A and originating from disturbed and uncertain contexts, are dated to the Parthian/Sassanid era. Pottery from this period exhibit colors such as orange, brown, red, and buff. The Parthian/Sassanid pottery was discovered predominantly in the upper phase and the southern part

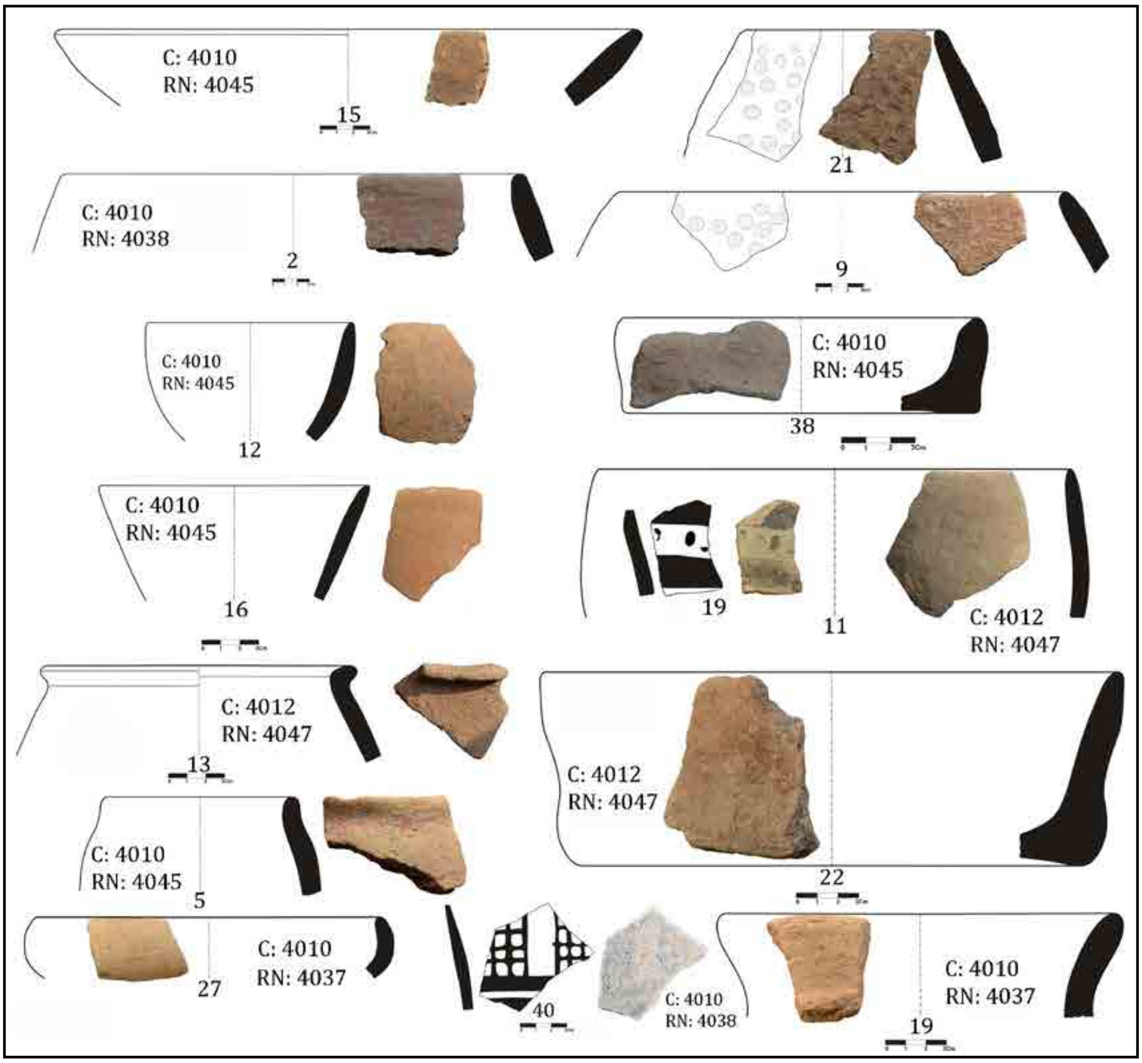

Fig. 13: Period IV (Chalcolithic period) potteries from Trench D

Potteries Registry[2]

Figure 13: Period IV (Middle Chalcolithic), Trench D

4010/4045: 15; rim fragment of open bowl; medium texture; rim diameter: 34 cm; buff; red thin slipped on the interior and on the exterior; chaff inclusion; well-fired; hand-made.

4010/4038: 2; rim fragment of hole-mouth jar; medium texture; rim diameter: 37 cm; brown; thin slipped on the exterior; chaff inclusion; under-fired; hand-made.

4010/4045: 12; rim fragment of oval bowl; medium texture; rim diameter: 11 cm; buff; red thin slipped on the interior and on the exterior; chaff inclusion; well-fired; hand-made.

4010/4045: 16; rim fragment of everted simple bowl; medium texture; rim diameter: 14 cm; buff; red thin slipped on the interior and on the exterior; chaff inclusion; under-fired; hand-made.

4012/4047: 13; rim fragment of hole-mouth jar which everted rim; medium texture; rim diameter: 16 cm; buff; thin slipped on the interior and on the exterior; chaff inclusion; under-fired; hand-made.

4010/4045: 5; rim fragment of hole-mouth jar with curvature in the shoulder; medium texture; rim diameter: 11 cm; buff; red thin slipped on the interior and on the exterior; chaff inclusion; under-fired; hand-made.

4010/4037: 27; rim fragment of hemispherical bowl; fine texture; rim diameter: 17 cm; buff; thin slipped on the interior and on the exterior; chaff inclusion; well-fired; wheel-made.

4010/4045: 21; rim fragment of hole-mouth jar; medium texture; rim diameter: 13 cm; buff; fingertip impressed on the exterior; chaff inclusion; under-fired; hand-made.

4010/4045: 9; rim fragment of globular hole-mouth jar; coarse texture; rim diameter: 28 cm; buff; fingertip impressed on the exterior; chaff inclusion; under-fired; hand-made.

4010/4045: 38; a fragment of tray; medium texture; rim diameter: 19 cm; buff; thin slipped on the interior and on the exterior; chaff inclusion; under-fired; hand-made.

4012/4047: 19; a body potsherd; fine texture; buff; thin slipped on the interior and on the exterior; geometric black painted; chaff inclusion; well-fired; wheel-made.

4012/4047: 11; rim fragment of vertical simple bowl; medium texture; rim diameter: 24 cm; buff; thin slipped on the interior and on the exterior; chaff inclusion; under-fired; hand-made.

4012/4047: 22; rim and base fragment of bin; medium texture; rim diameter: 23 cm; buff; thin slipped on the interior and on the exterior; chaff inclusion; under-fired; hand-made.

4010/4038: 40; a body potsherd; fine texture; tan-buff; burnished; geometric thick black painted; chaff inclusion; well-fired; wheel-made.

4010/4037: 19; rim fragment of everted rim bowl; medium texture; rim diameter: 19 cm; thin slipped on the interior and on the exterior; chaff inclusion; well-fired; hand-made.

of the wall within Trench A, encompassing approximately two-thirds of its area. This distribution can be attributed to the leveling of the upper phase of the Sarcham site and the infilling of its uneven parts. Within specific contexts (1000, 1001, 1005, 1009, 1011, 1012, 1014, and 1015), Parthian/Sassanid pottery, alongside a limited quantity of Bronze/Iron Age pottery, was identified. Consequently, a portion of the pottery discovered exhibits characteristics of gray or buff pottery from earlier periods. Broadly speaking, the pottery assemblage in Sarcham I is predominantly composed of orange and buff pottery, with a smaller number of pale brown and red pottery fragments also recovered. Distinguishing between the gray ware of the Bronze/Iron Age and that of the Parthian/Sassanid era proved challenging. Various vessel forms were identified, including jars with short necks, bowls with thick rims and incised grooved decorations beneath the rim, hole-mouth vessels featuring horizontal bands under the rim, hemispherical hole-mouth bowls, open-mouth bowls, and jars with short necks (Fig. 5), which bear resemblance to Parthian/Sassanid pottery found in western Iran (Haerinck, 1983).

6. A Short Account on Sarcham Faunal Remains

The zooarchaeological analysis of animal bones from Sarcham was conducted at the Bioarchaeology Laboratory, Central Laboratory of the University of Tehran in 2016. This assemblage comprises 603 bones and bone fragments, totaling 6 kilograms in weight. The bones were recovered from Trench A (325 specimens, 1149.3 grams), Trench C (85 specimens, 474.2 grams), and Trench D (193 specimens, 4383.4 grams). The preservation of the assemblage was notably poor, with the majority of the remains (395 pieces, 65.5%) being fragmented, leaving only 208 specimens (34.5%) identifiable taxonomically.

The Sarcham assemblage is derived from refuse associated with consumption activities. Evidence of anthropogenic modifications, such as cut marks, chopping marks, and signs of heating, calcination, and burning, are prevalent on sheep/goat, cattle, and boar bones (17 specimens) within the assemblage (Fig. 14a & 14b). Furthermore, distinctive traces left by rodents and carnivores (43 specimens) are observable on the skeletal elements of ungulates (Fig. 14c, 14d & 14e).

In the bone identification process, we used the osteological reference collections at the Bioarchaeology Laboratory, as well as with various osteological atlases (Clutton-Brock *et al.,* 1990; Helmer and Rocheteau, 1994; Helmer, 2000; Halstead *et al.,* 2002). Quantitative analysis was conducted using four key metrics: Number of Remains (NR) encompassing

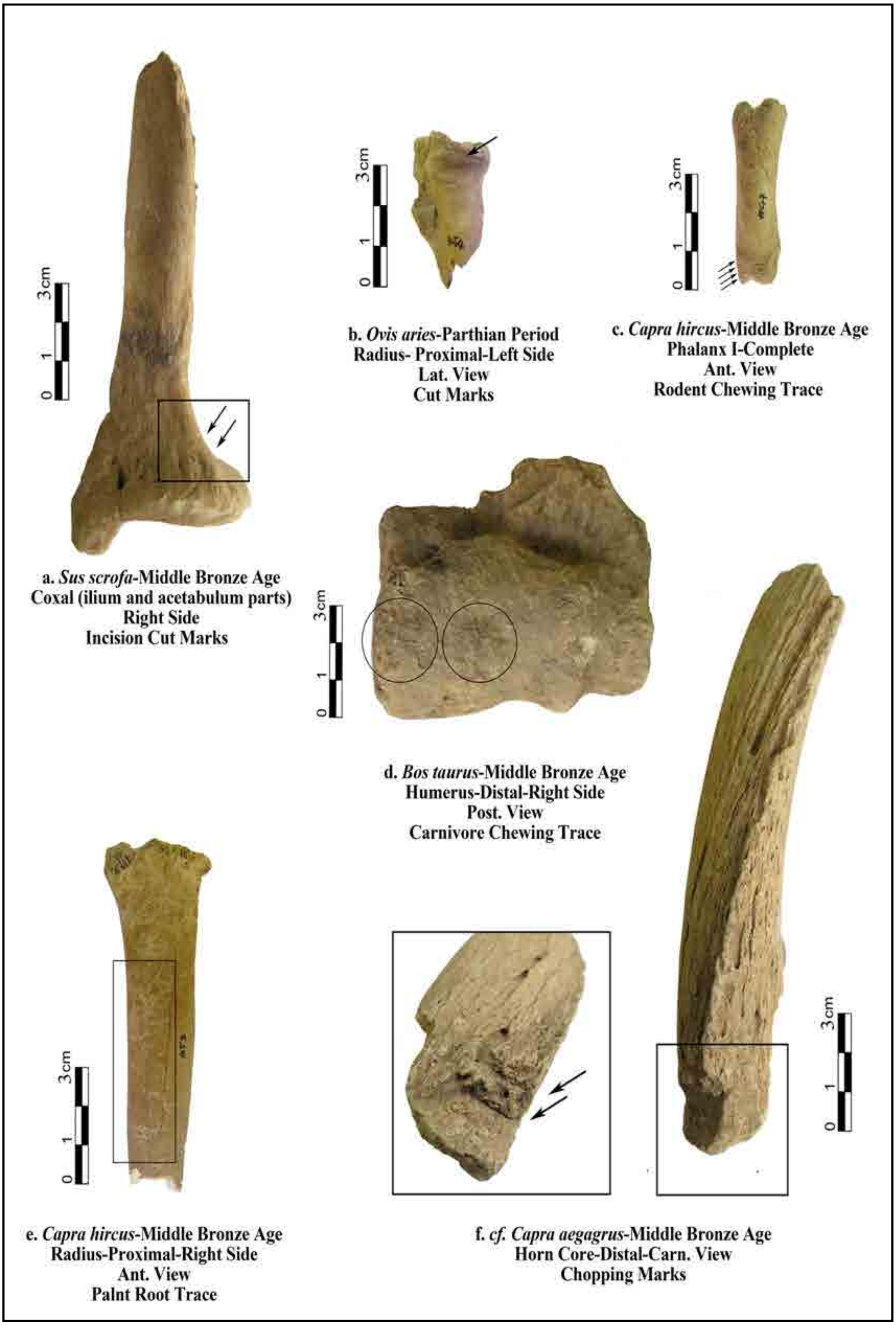

Fig. 14: Anthropogenic, rodent, carnivore and natural traces on the surface of animal bones at Sarcham

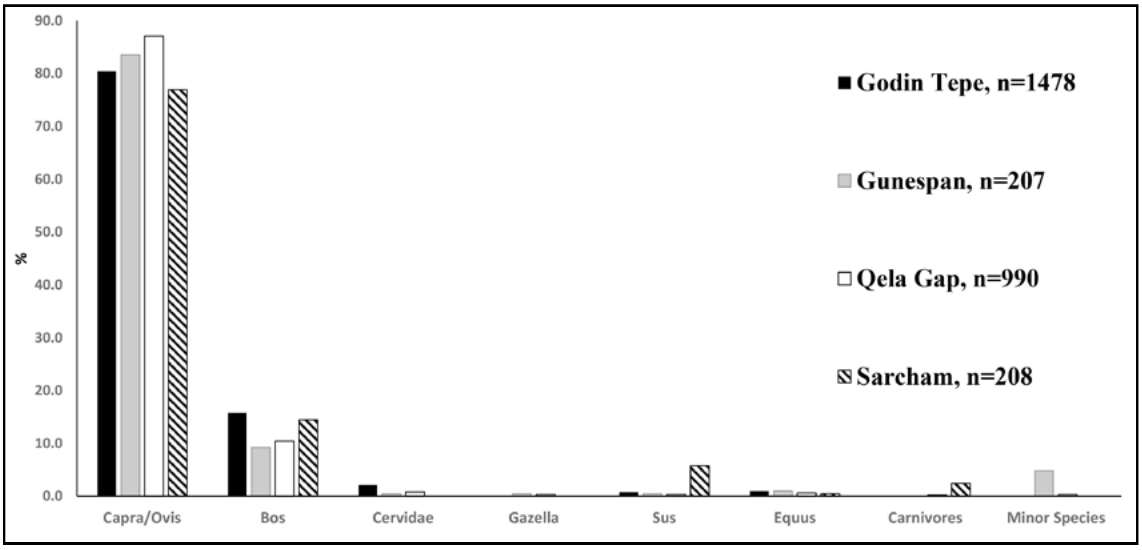

Fig. 15: Distribution of identified species at Tepe Godin, Gunespan, Qela Gap and Sarcham Rowar, during the MBA and LBA, in the Central and Northern Zagros regions

all identifiable and unidentifiable bones, Number of Identified Species (NISP), Minimum Number of Individuals (MNI) (Mashkour, 1993). Additionally, we applied bone weighting techniques to assess fragmentation levels and estimate the nutritional value associated with each species present in the assemblage. This approach was based on the recognized correlation between skeletal weight and meat yield (Davis, 1987; Uerpmann, 1973).

The zooarchaeological analysis encompasses three distinct chronological periods: the Middle Bronze Age, Late Bronze Age (MBA and LBA) and the Parthian/Sassanid period. The majority of the assemblage belongs to the MBA (412 specimens, 3940 grams), followed by the Parthian/Sassanid period (112 specimens, 293.7 grams) and lastly the LBA (79 specimens, 1774 grams). Taxonomic identification was achievable for only 143 specimens from the Middle Bronze Age, 45 from the Late Bronze Age, and 20 from the Parthian/Sassanid period. Accordingly, a total of 208 bones (34.5%) were identified, which included the small portion of faunal assemblage. Some of the unidentifiable bones could still be categorized as large, medium, or small mammals, or small ruminants.

Bronze Age (Middle & Late Bronze Age): The faunal assemblage from the Middle Bronze Age (MBA) and Late Bronze Age (LBA) comprises a limited number of identified species. Therefore, we have combined the data from these two periods for our analysis.

Caprines: The predominant species identified in the assemblage are sheep/goat, accounting for the majority of the identified remains (142 specimens, 75.5%). Among the identified specimens, 7 were attributed to domestic sheep (Ovis aries), 45 to domestic goat (Capra hircus), and 3 to wild goat (Capra aegagrus), while 87 specimens could not be classified as either sheep or goat. The bones exhibit butchery and cooking marks such as cut marks, chopping marks, and evidence of heating and firing. Notably, a heavy cut mark on the skull for the separation of horn core, possibly from a wild goat in the MBA, is noteworthy (Fig. 14f). Similar practices have been observed at other archaeological sites such as Qela Gap-MBA (Amiri *et al.,* 2020) and Gunespan-Iron Age III (Amiri *et al.,* 2021), suggesting the potential use of horn sheaths for crafting purposes. These marks may indicate the utilization of horn sheaths for specialized containers or the production of items like knife handles through melting the sheaths (Schmidt, 1972).

Cattle: The cattle (Bos taurus) population at Sarcham during the Middle and Late Bronze Ages (MBA & LBA) is represented by 30 remains, comprising both adult individuals (over 4 years old) and juveniles (under 20 months). Cattle were primarily utilized for meat and potentially milk consumption. No evidence of pathologies indicative of the use of cattle as draft animals was found at the site.

Boar: Wild boar or domestic pig (Sus scrofa/Sus scrofa domesticus) accounts for 5% of the remains. On the Iranian Plateau, suids typically constitute less than 10% of the Number of Identified Specimens (NISP) before the Iron Age in most regions (Mashkour, 2006).

Equids: Only one fragment of a coxal bone was recovered from the MBA, but it was not diagnostically identifiable to the species level.

Dog: Three fragments of domestic dog (Canis familiaris) were identified from the MBA.

Minor species: Seven complete Gastropod mollusks from the MBA were also retrieved.

Parthian/Sassanid Period: A total of 20 taxonomically identifiable specimens from the Parthian/Sassanid period were documented, including 5 specimens of domestic goat (Capra hircus), 2 specimens of domestic sheep (Ovis aries), 11 specimens classified as either sheep or goat, and 2 specimens of boar (Sus scrofa/Sus scrofa domesticus). Additionally, 92 bone and teeth fragments could not be taxonomically identified and were grouped into two main categories: mammals and small ruminants.

Discussion: In total, 92% of the faunal assemblage comprised domestic animals, while 8% belonged to wild species. During the Bronze Age (MBA & LBA), sheep/goat and cattle were the primary sources of food provision, reflecting a clear preference for small herbivores evident in the comparison of the total weight of caprines (1964 grams) to that of cattle (1383 grams). This is clearly an indication of dependence on small and large domestic herds, which has had a social and economic role in the Zagros Mountains since the domestication of sheep and goat (Abdi, 2003). A similar dietary trend is observed when comparing the faunal assemblage of Sarcham with that of contemporaneous sites in the Bronze Age Zagros Mountains (Fig. 15), such as Godin Tepe (Gilbert, 1979) in Kangavar Plain, Gunespan (Amiri *et al.,* 2021) in Malayer Plain, and Qela Gap (Amiri *et al.,* 2020) in Azna Plain. These sites also exhibit a reliance on sheep, goat, and cattle herding. While cattle remains are less abundant, they play a crucial role as a meat source, as evidenced by their higher contribution to the overall weight of the assemblage. Notably, the limited presence of suids raises questions about their domestic or wild status, given the substantial wild boar populations inhabiting the Zagros Mountains.

7. Conclusion

The archaeological excavation conducted at the Sarcham site represents significant information in the Hawraman region, as it unearthed material culture spanning the Chalcolithic, Bronze Age, and historical periods. The strategic positioning of the site adds to its significance, given the rugged and mountainous terrain characteristic of the Hawraman region, which sets it apart from other areas within Kurdistan Province. The inhabitants of this region predominantly engage in livestock husbandry and horticulture, underscoring the historical importance of human habitation in this challenging environment.

The excavation at the Sarcham site holds particular interest as it provides insight into a region that historically lacked the agricultural capacity for grain cultivation. Surveys conducted in the broader Hawraman area have revealed a scarcity of settlement sites, especially from prehistoric eras, making the existence of sites like Sarcham particularly noteworthy for scholarly investigation. Despite the relatively modest scale of our excavation project, the findings at Sarcham indicate a Chalcolithic tradition similar to the Seh Gabi period (4500-4250 BC) in the Central Zagros region.

Subsequent to a hiatus, settlement activity at the site recommences in the early second millennium BC, persisting until the middle of the same millennium during the Middle Bronze Age. The Late Bronze Age occupation continues uninterrupted until 1200 B.C., characterized by the presence of simplistic pottery similar to examples found in the Central Zagros region, albeit lacking the painted pottery tradition. Notably, the pottery styles from this period exhibit similarities in form with those found in northwestern Iran and Anatolia, suggesting cultural connections across regions.

The Bronze Age occupation at Sarcham adheres to a tradition of homogeneity, with the differentiation between the Middle and Late periods established through stratigraphic analysis and absolute dating methods. Resettlement at the site occurs during the Parthian/Sassanid Period, marking a renewed phase of human activity. Zooarchaeological investigations conducted at Sarcham during the Parthian/Sassanid period and Bronze Age reveal a reliance on domestic animals such as sheep, goats, and cattle, with a noteworthy emphasis on the utilization of boars, adding a unique dimension to faunal assemblage of the site.

8. Acknowledgment

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چکیده

محوطهٔ باستانی سرچم در جنوب‌غربی استان کردستان (منطقهٔ هورامان) در غرب ایران واقع‌شده است. این محوطه به‌عنوان بخشی از پروژهٔ نجات‌بخشی باستان‌شناسی سد داریان (DDASP) در سال ۱۳۹۴هـ.ش. کاوش شد و یک محوطهٔ چند دوره‌ای با نهشته‌های چهار دورهٔ باستان‌شناسی را نشان می‌دهد. هدف این پژوهش، ارائه یافته‌های حاصل از کاوش و معرفی دوره‌های مختلف شناسایی شده آن است. توالی فرهنگی محوطه شامل دورهٔ مس‌وسنگ میانی (مرحلهٔ سه‌گابی)، عصر مفرغ میانی و جدید و عصر اشکانی/ساسانی است. سفال‌های دورهٔ مس‌وسنگ میانی به‌دست آمده از محوطهٔ سرچم با سفال‌های دورهٔ سه‌گابی منطقهٔ زاگرس‌مرکزی؛ و به‌همین ترتیب سفال‌های دورهٔ مفرغ با منطقهٔ شمال‌غرب ایران، آناتولی و نیز با نمونه‌های فاز پایانی گودین III دارای تشابه است. کاوش در محوطهٔ سرچم برای نخستین‌بار داده‌هایی از دورهٔ میانه و جدید عصر مفرغ در استان کردستان را آشکار ساخت. سفال‌های به‌دست آمده دال‌بر این است که برخی از ظروف خاکستری که قبلاً به دورهٔ آهن I نسبت داده می‌شد، از عصر مفرغ منشأ گرفته است. لایهٔ فوقانی این محوطه، هرچند تا حد زیادی آشفته بود، دارای سفال‌هایی از دوران اشکانی/ساسانی است. این مطالعه بر اهمیت باستان‌شناختی سرچم تأکید و به درک تاریخ فرهنگی منطقه کمک می‌کند.

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A Discussion on the Stone Composite Figurines in BMAC/GKC and its Influence[1]

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Abstract

In the last century, a group of Bronze Age composite stone female figurines, known as "Bactrian princesses", appeared in the antique market, and were suspected to come from Afghanistan. Later, during scientific archaeological excavations, similar female figurines were discovered in southern Turkmenistan and northeastern Iran, corresponding to the Late Namazga V period. There are many discussions about the origin of this composite stone female figurine. Traditionally, it is believed that they have clear Elamite elements and were influenced by the culture of the southern Iranian plateau. From the Neolithic to the Bronze Age in Central Asia, archaeological remains show close connections with the populations on the Iranian plateau. Clay female statues were used both in Central Asia and Iran for a long time, and based on them, statue tradition with local cultural characteristics was relatively independently developed. The new composite stone female statues in Namazga V were different from the early Central Asia traditions, which were made of clay and in a schematized shape. The decorations on the surface of these composite stone figurines have a great similarity with the images of elites from the Old Elamite Dynasty. Also, the stone materials, mainly chlorites and marbles, can be traced to southeastern Iran. The appearance of these composite stone figurines shows a change that happened in Southern Central Asia society, corresponding to the transition that people moved from Kopet Dag Piedmont to the Murghab Delta. The integration of Central Asian local culture and Iranian culture was ideologically reflected in these figurines.

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1. Introduction

Central Asia is located at the crossroad of Eurasia, made a connection between the Iranian Plateau, the Steppe, South Asia, and China. Under the influence from the Zagros farmers expansion, about 7000 years ago, sedentary agriculture appeared along both the north and south sides of Kopet Dag piedmont areas. In comparison, with the small alluvial delta, the northern piedmont shows a much more fluorescent and continuous cultural development. From the stratigraphy of Namazga Depe, along with the stratigraphy from Anau South, there is a period of continuous local development, from Namazga Culture I (Early Chalcolithic Period) to Namazga Culture VI (Late Bronze Age). During the first half of the third millennium BC, the Middle Bronze Age, in Altyn Depe and Namazga Depe, this place shows a cultural prosperity. While, around 2300 BC, the settlements went to a decline in the Kopet Dag Piedmont. Almost at the same time, a complicated settlement system was built mostly on the natural soil in the Murghab Delta, centered with Gonur Depe. Based on the similarities in architecture, pottery, and burial customs, Soviet archaeologist V. Sarianidi named such an archaeological phenomenon as "Bactrian-Margiana Archaeological Complex (Sarianidi, 1974)", BMAC for short. With more related archaeological remains found, more terminologies such as "Oxus Civilization (Francfort, 1987)", , "Namazga Culture (Массон, 1956)" and so on. Recently, with more sites and relics found inside the territory of "Khorasan" "Greater Khorasan Civilization (Biscione and Vahdati, 2020)", GKC for short. The territory for the BMAC/GKC includes Northeast Iran, Southern Turkmenistan, Southern Uzbekistan, Tajikistan, and Northern Afghanistan. The chronology for the BMAC/GKC is between 2250 BC and 1500 BC (Lyonnet and Dubova, 2020).

The appearance of BMAC/GKC shows a great leap in the social development of Southern Turkmenistan, which makes archaeologists start the discussion of the origins of these populations. There are mainly two perspectives about the appearance of BMAC/GKC society. One perspective is that most of the population in Murghab might come from Northern Mesopotamia or Iran (Sarianidi, 2007). Another perspective thinks that the majority of the population was locally developed, mainly based on the typology of ceramics and other daily-used objects. While, large quantities of new elements, like mosaic decorations, chariots in the burials, muti-room sepulture, and palace-temple architecture complex, show a great change that happened during the end of the Middle Bronze Age and Late Bronze Age.

The composite figurines also appeared as one of the new elements. For the period before the Middle Bronze Age, most of the figurines in southern Central Asia were made of clay. The seated stone composite figurines show a new emerging technology and art style, which is quite different from the early figurine tradition in Central Asia. Therefore, we might give a hypothesis that the appearance of composite figurines is related to the social change during the second half of the 3rd Millennium BC.

2. Composite seated women figurines in Third and Second Millennium BC

Since 1960s, when the first time impressive figurines were shown on the antique market, the "Bactria Princess" attracted the attention of scholars. During this period, tomb-robbing activities were rampant in Afghanistan, causing great damage to the prehistory research in Central Asia. After the scientific archaeological excavation in Murghab Delta, several composite seated figurines were found in an archaeological context. M. Vidale accounted for all the composited seated women figurines' fragments found during the excavation as 15 (Vidale, 2017). 14 of them are found in the Murghab Delta in Turkmenistan, including Gonur Depe (Fig. 1, 2, 3), Togolok 21, and Adji Kui. One was found in Northeast Iran, at the site Karim Abad (Dana, 2020, Fig. 4), and another is found in Gavand (Vahdati and Meier, 2020), South Khorasan. There are also some traces of figurine production found in Gonur Depe and Togolok (Hiebert, 1994). In addition, a large number of collections without detailed background also appeared in museums.

Fig. 1, 2 & 3: Composited stone figurines from Gonur Depe (Sarianidi, 2007, Fig. 38, 39, 54, 55)

Fig. 4: Composite stone figurine from Karim Abad (Photo by author in the Great Khorassan Museum, Iran)

The most attractive points of these composite figurines are the wide shoulders, immaculate faces, and mysterious huge coats. The body and head decorations are made of steatite, sometimes chlorite or serpentine. The surface carved decorations were generally in an extended shape, including triangle, curved triangle or bold S-line, recalling to the wool kaunake in earlier Mesopotamia. The face, neck, and hands parts are made of white stone, like marble, alabaster, or limestone. On their faces, the eyes are usually carved with an almond shape. There are also decorations on their heads, in the shape of a disc with raised edges, which might represent the crown or turban. The lower body of the figurines is mostly protruding, like a seating or kneeling position, with two white arms putting on it. Overall, they have a relatively abstract and simplified shape.

The context where figurines founded are related to the burial. They were put inside the burial chambers or in the sacrificial pit closed to the burials. Their chronology corresponds to the usage period of Gonur Depe, which is the late 3rd Millennium BC and the beginning of the 2^{nd} Millennium BC.

What kind of character does this kind of figurine represent? What was it used for? There are many interpretations, including that they represent the dead themselves, or Sumerian deity. Sarianidi holds a view of western origins of them (Sarianidi, 2007). Vahdati and Meier think the figurines indicate a divine nature (Vahdati and Meier, 2020). P. Amiet pointed out the transit of context from ritual space in Elam into the cemeterial space in Central Asia, he also thinks that this portrait is the copy of the queen from Elam(Amiet, 1986).

Seated women statues with kaunakes and crowns can be found in Mesopotamia and Elam. In Elam, the statue closest to the BMAC/GKC figurines is the stone-made statue of Narundi from excavation in Susa. However, it is in a life-size. To the west, in Mari (Fig. 5) and Ebla (Fig. 6), seated women statues were found in the temples or palaces. In Susa, no composite statues made of marble and chlorite were found., but mostly with clay and bronze. For these figurines, the details of a chair or throne are carved out consciously. Also, the feet are additionally made under the edge of kaunakes. The portraits from Mesopotamia and Elam lack of exaggerated shoulders, and they are more true portrayals of an elite woman.

Fig. 5 & 6: Statues from Mari and Ebla (Parrot, 1956, Plate. XXXVII; Matthiae, 2010, Plate. XIV)

For the statues and images found in Elam, there are also some differences between Iran and Central Asia. The identity of seated women on the seals from Fars shows a great similarity with the profile portrait of composite figurines. Seals from Ancient Anshan (Fig. 7), Tal-i Malyan, called “Anshanite” type, dated to the early phase of the third millennium BC. D. Potts holds the perspective that, the appearance of these portraits shows the direct influence of BMAC/GKC iconography on Anshan, instead of the Elamite influence on Central Asia (Potts, 2008). It is worth noting that, the character image on the seals usually appears with other characters, and rarely alone.

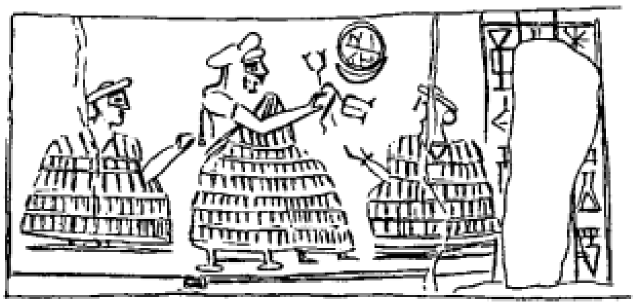


Fig. 7: Seals of “Anshanite” type (Potts, 2004, Fig. 5.7)

During the Bronze Age, a close connection between Mesopotamia, the Iranian plateau, and Central Asia made the statues of the seated goddess with kaunakes a common cultural symbol. But the figurines from BMAC/GKC show their uniqueness, one feature is that they appear in the burial context, and the other feature is their abstract appearance. It is necessary to give consideration to the process of how the uniqueness formed, and its relationship with the societal change that happened in Southern Central Asia.

3. The statue tradition in Central Asia and Elam

The worship of the anthropomorphic figurines can be traced to the Upper Paleolithic (Gimbutas, 1991). The female goddess statues are found all over the world, which show a cultural commonality for humans in the prehistoric period, that is, the worship of fertility and harvest.

4. The figurine tradition in Southern Central Asia

The earliest figurine found in Southern Central Asia belongs to the Djeitun Culture, around 6500 BC – 4500 BC (Hiebert, 2003). The excavation shows a great amount of clay figurines, with mostly animals, and a few human figures.

During the Chalcolithic Period (Namazga I-III), in the site of Kopet Dag Piedmont area, Kara depe, Ilgynly Depe, and Altyn Depe, early figurines appeared (Fig.8). Most of them have wide shoulders, the curved conical thighs make the overall look more abstract. For the large-scale excavation in Tedjen Delta, a great number of figurines were found in the Geoksyur Oasis (Fig. 9). They have a three-dimensional shape, with prominent breasts and buttocks, and a conical lower body, with painted motifs on the thighs and belly. The facial shape is relatively simple, details are not obvious. With the expansion of farmers from Geoksyur Oasis, in Sarazm, Tajikistan, stylized clay figurines were also found. In Ilgynly Depe, there are stone-made figurines in an abstract triangle shape (Fig. 10). Because the site is much closer to the stone deposits.

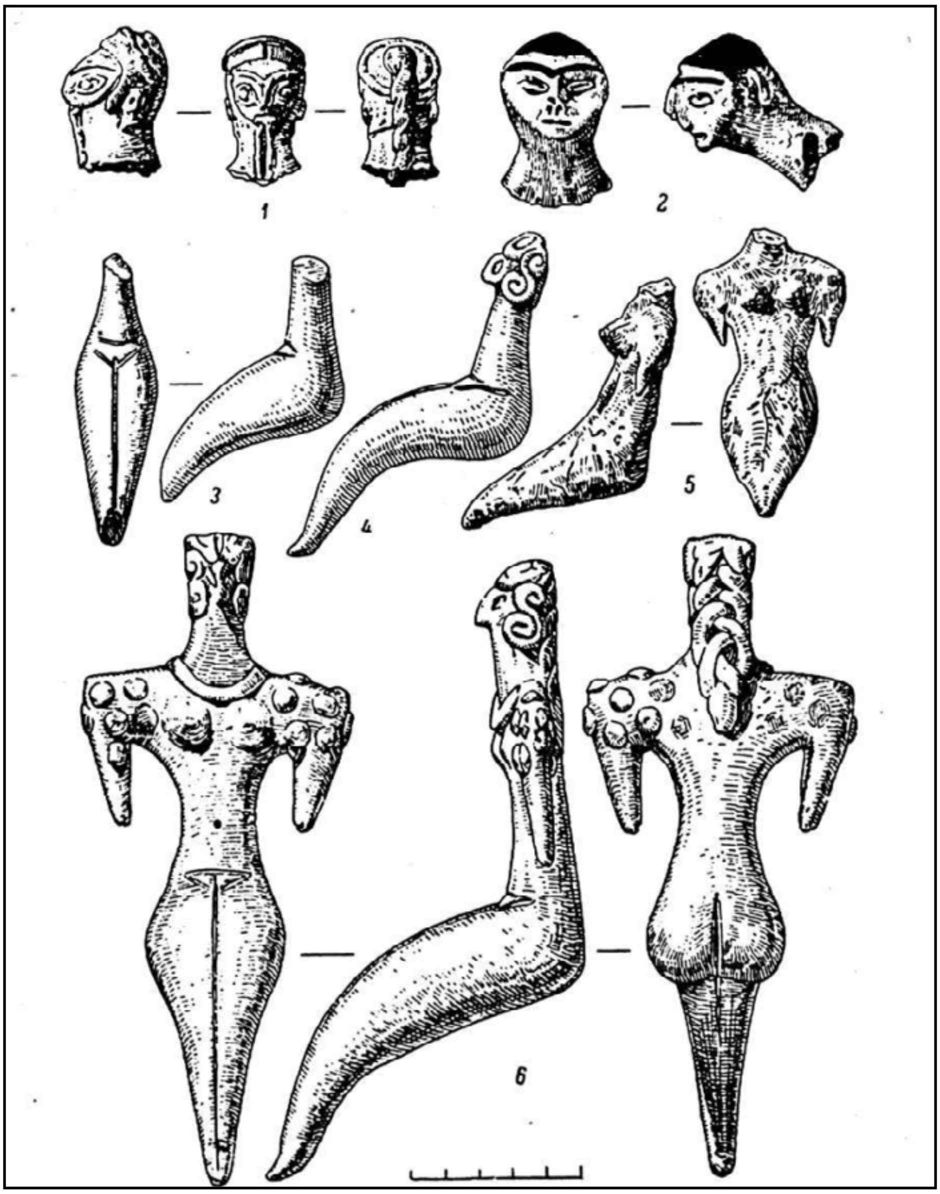


Fig. 8: Figurines from Kara Depe (Masson, 1966, Pic. 26)

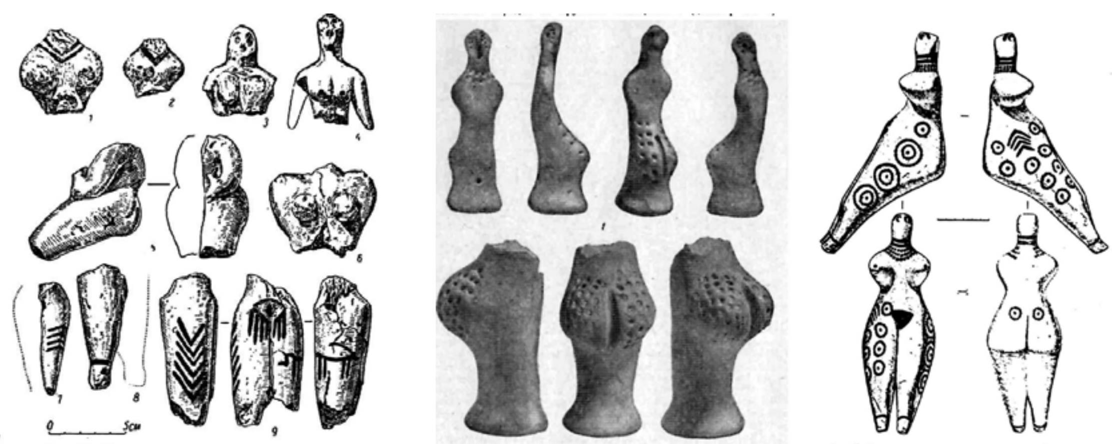


Fig. 9: Figurines from the Geoksyur Oasis (Khlopin,1964, Fig. 55, 26, 45)

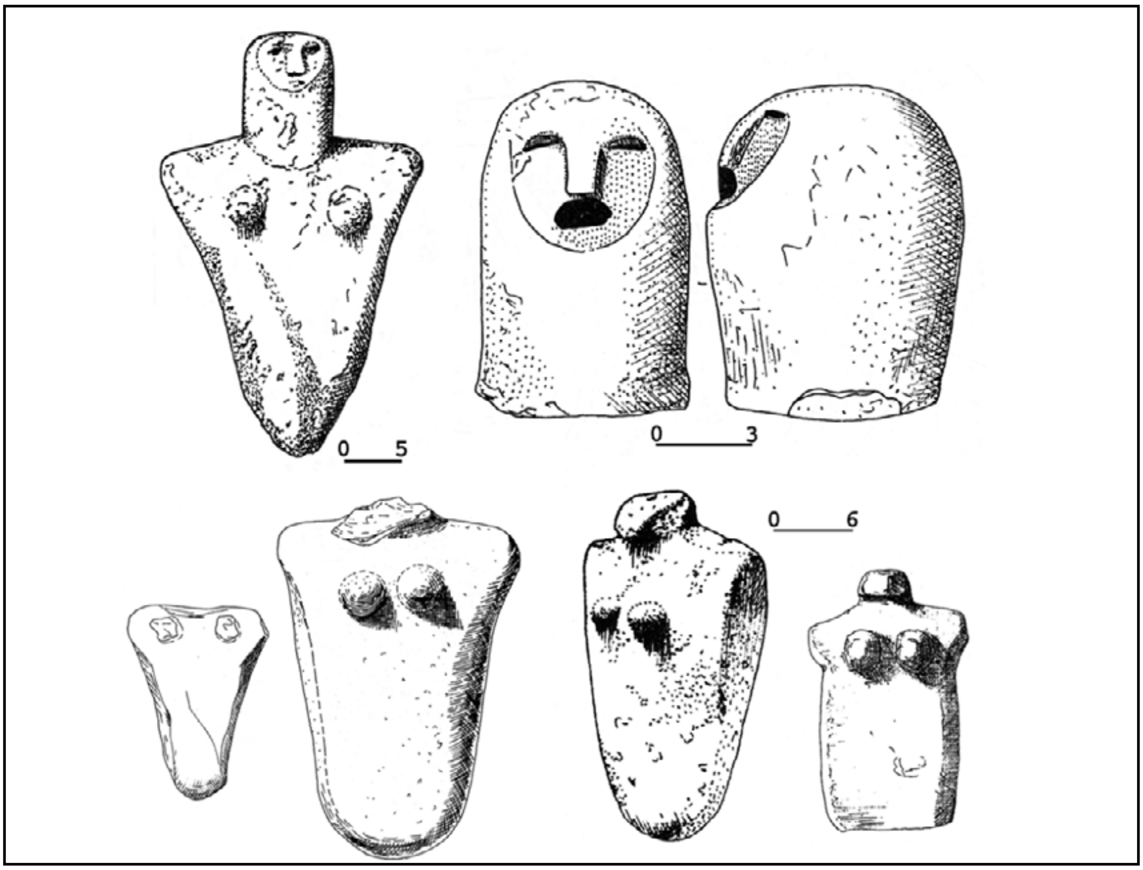


Fig. 10: Stone Figurines from Ilgynly-depe (Bonora and Vidale, 2013, Fig. 9.7)

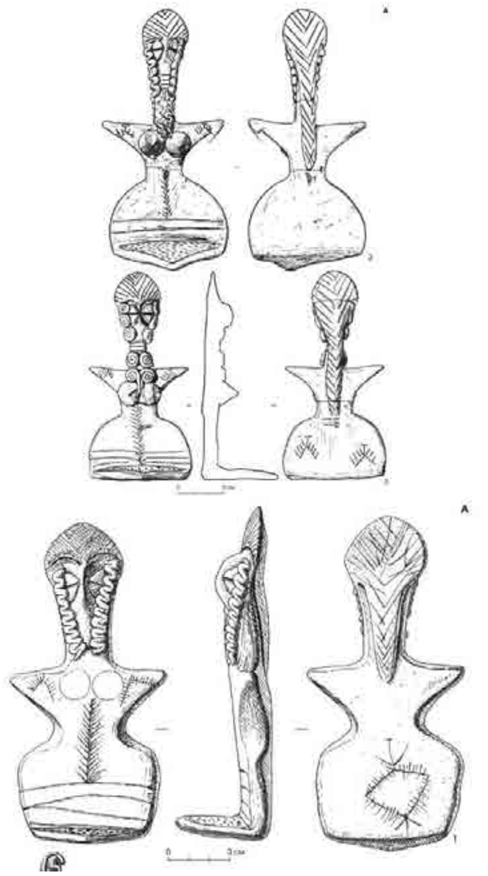
During this period, the figurines were located in a household context, close to the fireplace, or put inside the wall. Their presence is often explained as being related to protecting the family.

About 3000 BC, in the Namazga VI phase in Northern Kopet Dag piedmont, huge tepe-type settlements were developed at the end of the small alluvial delta. There is an expansion in the scale of size and a clear division in the functional quarter within the settlement. In Altyn Depe, there are quarters for resident, handicraft, religion and elites. This phenomenon represents the development of local society into complexity and class.

The number of figurines from the Altyn Depe shows a great increase in the worship of mother-goddesses. Most of the figurines were found in the burials within the settlement. Just like the figurines from Geoksyur Oasis, on the surface of the figurine's body, especially on the thighs and belly, there are some incised motifs, which might represent a certain meaning.

This tradition for the clay figurines continued until Namazga V and VI in Murghab Delta, related figurines can be found in Togolok, Adji Kui, and Gonur Depe. While there are also little differences in the decoration (Table. 1; Salvatori, 2004). The figurines from Kopet Dag piedmont are characterized by the intricate head decoration, long hairs arranged in a flowing plait along the back and two plaits along the breast (Masson, 1988). However, the figurines from the Murghab Delta have a triangular head, often with two holes on the larger side and no traces of applied rolls to portray the hair. What is important is, that their figurines were mostly found in a burial context.

Table. 1: Figurines from Kopet Dag Piedmont and Murghab Delta

Kopet Dag Piedmont (Altyn Depe) (Kircho & Aleksin, 2005: Plate. 31A, 11)	Murghab Delta (Gonur Depe) (Dubova, 2008: Pic, 25; Sarianidi, 1990: Tablet, XXII)
	 

To make a conclusion, the figurines tradition in Central Asia prefers an abstract shape. The artisans used artistic, simplified forms to represent the human body. However, in Murghab Delta and Kopet Dag Piedmont, there are a few figurines in realistic, rough shapes, which we will discuss later, and they do not occupy a dominant position.

The usage of figurines inside the burial context also belongs to the Central Asia tradition of the Bronze Age. Since the period of Namazga IV, the emergence of the residential burial within the settlement caused the figurines to change from a household context to a burial context.

2) The figurine tradition in Elam

Within the territory of Elam during the Bronze Age, including the Khuzistan lowland and Fars highland, the portrait of women can be found in figurines, plaques, and seals. However, because of the insufficient archaeological excavation, known Bronze Age figurines mainly come from large settlements like Susa and Haft Tepe.

The Khuzistan Plain is located between Mesopotamia and the Iranian Plateau. As a middle location, cultural power from both sides takes turns controlling this land, resulting in cultural diversity both chronologically and synchronically (Potts, 2008). Since the Neolithic Period, the figurines in Elam are relatively abstract. During the Susa II Period, prayer position figurines made of stone or clay appeared, called votive statues, and they were popular in Mesopotamia, Levant, and Elam. Most of them were found in the chapel, in a regional context.

During the third millennium BC, the technology for making figurines in Elam was at a high level. The detailed rendering of the figurine demonstrates the artist's deep knowledge of the human body structure. From the temple for Narundi in Susa (ca. 2100 BC, see Metropolitan Museum of Art, 1992), there is a life-size statue of Narundi (Fig.11), that shows a similar appearance to the elite women from Mari and Ebla, made of limestone. Also, till 2100 BC, there were numerous naked women clay figurines working as amulets, made with single-faced molds (Fig. 12; Álvarez-Mon, 2018).

Fig. 11 & 12: Statues and figurines from Susa (Metropolitan Museum of Art, 1992, P.91, P.190)

The characteristics of Elamite figurines show a great influence from Mesopotamia. The body of figurines in Elam is long and slim, usually in a standing position, seldom in a sitting position. Sometimes, women in a seated position can correspond to goddesses from the inscription. Elamite figurines focus on the details of the human body and are relatively realistic.

Although the figurines in Elam and BMAC/GKC show the same clothing elements and female themes, it prove the absolute influence of Mesopotamian culture. However, from the artistic style perspective, Elam figurines are more realistic and slender. Therefore, it is hard to say that the composite stone figurines are exported directly from Elam. Modifications and localization were made to the sculpture art and female worship in BMAC/GKC.

5. The transition of figurines: from Elamite to Central Asia

Mainly the differences in material and context for figurines, show the localization of female deities after came to Central Asia.

1) The transition of material

In the Elamite territory, there were few examples of using soft black stone to make sculptures but with more clay in a different appearance. The image of a seated female appeared more on the seals. The composite figurines found in the BMAC/GKC territory are mainly made of chlorite, alabaster, and marble.

These materials are not locally produced and can only be obtained from the mountain region, including the mountain region in Northeast Iran and the Central Plateau. From the new research in Iran, there are considerable Bronze Age sites found in Khorasan (Tahmasebi, 2020), distributed inside valleys. Among these, sites are located close to several important deposits, although no clear archaeological evidence of resource extraction was found nearby. The same bronze decoration was found in Chalow and Gonur, proving that they are synchronic. It can be assumed that the reason for this group of people to come here was related to the development of resources, but more evidence is still needed.

We cannot make sure if the figurines in BMAC/GKC were made outside the territory by Iranian artisans, or locally processed. However, the emergence of composite statues must have been an innovation for Eurasia at that time. For the research of glyphic art, Winkleman once pointed out the BMAC populations might modify the art theme, or use them on the new media (Winkleman, 2013). Obviously, this model can also be applied in the figurine art. And also, for the production of ivory artifacts, we might know that there were Indus artisans who brought with their materials and technology, and created objects that met local aesthetic needs (Frenez, 2018). It is not strange for a prehistoric metropolis. It represented a strong and traditional localism was controlled the handicraft industry, and decided how would the artifacts look like.

2) The transtation of context

In Central Asia, the usage of figurines in burials was finalized after the NMG IV, around the first half of the 3rd Millennium BC. At the same time, female figurines have already appearred in Elam and Mesopotamia. From the continuous cultural and burial customs, the composite figurines were accepted as a new element into the elite class of BMAC/GKC in the second half of the 3rd Millennium BC from the southwest.

In the earlier period, the figurine from Mari is in a temple context, and the figurine from Ebla is in a palace context. The statue from the Susa is in a temple context, according to the inscription and elements for the statue, the identity of it belong to a goddess (Narundi, Metropolitan Museum of Art, 1992), dedicated by Puzur-Inshushinak. They were especially displayed in a public monument, more to publicly emphasize the relationship between those in authority and God. While, the background for the figurines inside the burials was more private. The character of personal belonging is much clearer.

Thus, from the temple-palace to the burial, the figurines became personal belongings from a public symbolism.

To sum up, the figurines of "Bactria Princess" might be originally imported as an immaterial ideology, and be modified on the new materials in Central Asia. They only existed in minority groups, probably among some elites and businessmen. They didn't become popular among all the social classes, the traditional terracotta still took a big part in the Murghab society.

A common point emerged in the female statues leaving their cradle, which is the strong originality. As the spread of ideology, both toward the East and west, this female deity both been modified in Syria and Central Asia. This confirms the change and adaptation of ideology in the context of peripherality.

So, how these figurines came into Central Asia?

6. The materials exchange and the network behind

The BMAC/GKC territory, especially in the Murghab, is just like the alluvial plain in fertile Southern Mesopotamia. The large areas for farming might provide adequate grains for the residents. While, natural resources, like metal, timber, and semi-stones, can be only found in the highlands surrounding the farming land. To a certain extent, the lack of materials for the production of luxuries required by a hierarchical social system will stimulate the development of trans-regional trade.

Obviously, the administration and maintenance of a huge material exchange network need a powerful administration system. This characteristic can be proved through the spectacular public monument, class differentiation in funeral customs, and a large-scale settlement system in Murghab Delta. Roughly the same period as the early stages of BMAC, within the territory of Iran, there are several developed complex societies and evidence for long-distance communication. The middle to the late phase of the third millennium BC corresponds to the Old Elamite Dynasty, Shimashki Dynasty and the Sukkalmah Period, a powerful state rise in southwestern Iran. In Eastern Iran, the famous Shahr i Sokhta in Helmand Valley can be treated as a city center. In Period III (2600 BC-2450 BC) and Period IV (2450 BC-2200 BC), there is a double wall surrounding the central area, with public monumental architecture. In the large necropolis, there are populations from Central Asia, Indus, and Southern Afghanistan.

There is no doubt that during the Sukkalmah period, the power of Elam came to its peak, and had a great influence on the surrounding areas, as far as Syria. According to the Archives administratives de Mari and Archives royales de Mari, during the 19th to 18th centuries BC, large quantities of Elamite tin were traded into Mari. Especially in the Tianshan Mountain areas in Tajikistan, and the border between Iran and Afghanistan, there are massive metal deposits and semiprecious stones, including copper, tin, alabaster, and lapis lazuli. During the period of the Bronze Age, class differentiation, the formation and development of states, and elites' demand for luxury goods caused the large-scale circulation of raw materials.

The direct exchange is not obvious between Mesopotamia and Central Asia. But in Susa, Shahdad, and Shahr-i Sokhta, there are many relics that can be traced directly to BMAC/GKC. It is possible that the elites in BMAC/GKC have an indirect influence from Mesopotamia and elites, and Elam and eastern Iran played critical roles in this huge network. Contact with other cultures will stimulate the development of local society, thereby forming a political system like that of the country.

In the territory of BMAC/GKC, we might find that for the common people in a large proportion, the original tradition keeps its own way, while hundreds of new elements from the south also become a part of the BMAC/GKC society. Foreign things appear more frequently in elites' lives or in central areas. Especially in ideology, like the burial customs, images, and decorative arts, foreign cultures would have a greater influence on the elite class. An example of homogeneity is the royal families from Parthian, with a Hellenistic tendency in their ideology.

7. A case study: Elamite influence on the BMAC/GKC clay figurines

Interesting finds were several clay figurines from Murghab Delta (Gonur Depe and Togolok 21, Fig. 13, 14, 15). Their head decorations and faces are close to the stone figurines. While, we may treat it as a kind of transitional phase, or a mixture of the traditional clay figurines and new stone figurines. The upper body of the figurines is similar to the statues in Elam and Mesopotamia, with big almond-shaped eyes, head decoration with protruding edges, and a prayer position, just like the votive statues; while the lower body is similar to the traditional, conical legs in a position of sitting at an obtuse angle in early South Central Asia. Fragments were also found in Togolok 21. The appearance of mixed characteristics provides a possibility when local artisans try to make an innovation in the sculpture art. Sarianidi gives a hypothesis that this is due to the lack of stone (Sarianidi, 2007)

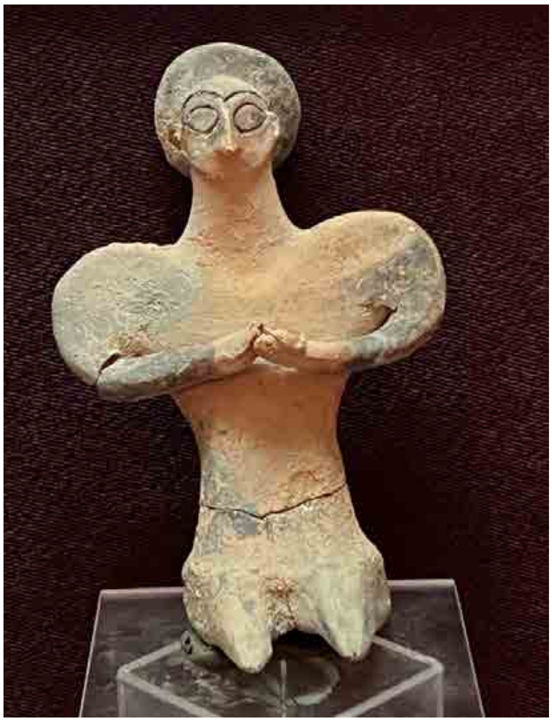



Fig. 13 & 14: Clay Figurines from Gonur Depe Grave No. 3155
(Left: Dubova, 2004, Pic. 14; Right: Photo by author in the National Museum of Turkmenistan)

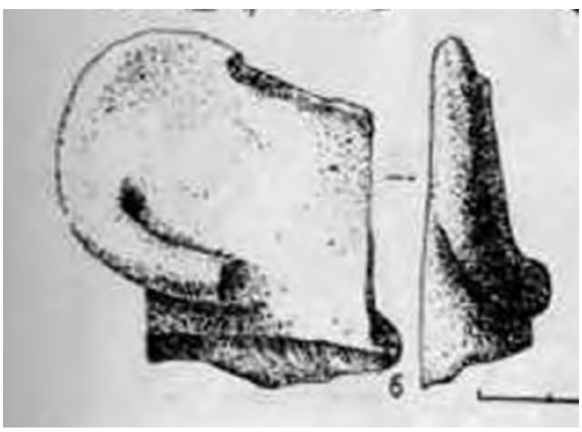


Fig. 15: Fragments of Clay Figurines from Togolok 21(Sarianidi, 1990, Fig. LXXVIII)

What important is that, before the Namazga V, there were no figurines with positions of prayer in Central Asia, except for only one stone statue from the Gelot cemetery (Date: 2128-2981 BCE, Fig. 16). But after the Namazga VI, the figurines with prayer positions can be found in many sites, especially in Bactria, like Dzharkutan, Kangurttut, and Buston Cemetery. In Namazga Depe in Kopet Dag Piedmont, a fragment of a prayer figurine was also found (Fig.20).

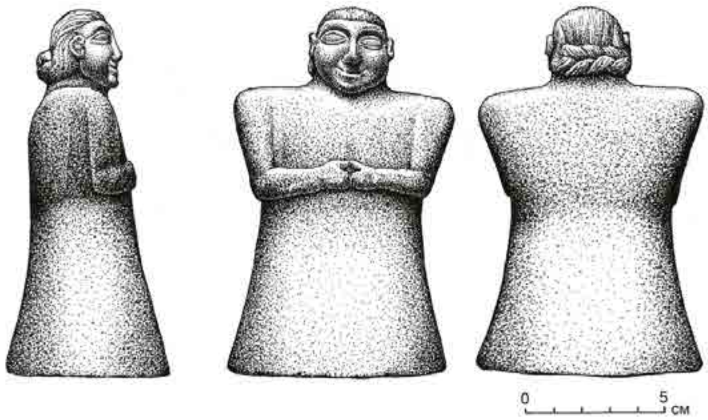


Fig. 16: Stone Figurine from Gelot Cemetery (Vinogradova, 2018, Pic. 38)

In Surkhandaryo, Uzbekistan, the bronze age culture was developed based on the expansion of sedentary farmers from southern Turkmenistan. Mainly the typology of ceramics and metals, burial architecture, and burial customs, show similarity with the society in the Murghab delta. While in respect to figurine tradition, there is little similarity with Margiana. In Sapallitepe, one of the earliest settlements in Surkhandaryo Plain, located along the Ulanbulaqsai in front of the Kugitangtau Mountains, only a few anthropomorphic figurines were found, in an abstract form. In the largest settlement in Surkandaryo Plain, Dzharkutan, one figurine with a prayer position was found (Fig. 17). In Bustan VI cemetery, in a later period around the second half of the second millennium BC, several clay figurines were found inside the burial context (Fig. 18, 19). The figurines from the Surkhandaryo Plain show the characteristics of a round head, a blurry face, and a prayer position.

Fig. 17: Figurine from Dzharkutan (Photo by author in the State Museum of History of Uzbekistan)

Fig. 18 & 19: Figurines from Buston VI (Avanesova, 2013, Photo. VIII, IX)

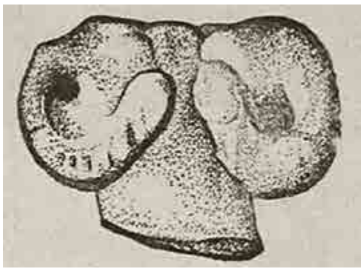


Fig. 20: Namazga Depe (Rempel, 1951, Pic. 5)

The mountain areas in Tajikistan, located in the north and east to Surkandaryo, have close relationships both with farmers from the river basin and pastorals from the Tianshan Mountain. Prayer figurines are found in the cemetery of Kangurttut (Fig. 21).

The figurines found in Northern Bactria, centered in the Surkhandaryo basin, seem to be regarded as a relatively independent tradition from the Murghab Delta, figurines were few, but the votive statues were relatively common. This interesting phenomenon might represent a connection between Bactria, Margiana, and Elam. The votive statues from Elam were not widely accepted by the residents in Gonur Depe but survived in the Bactria.

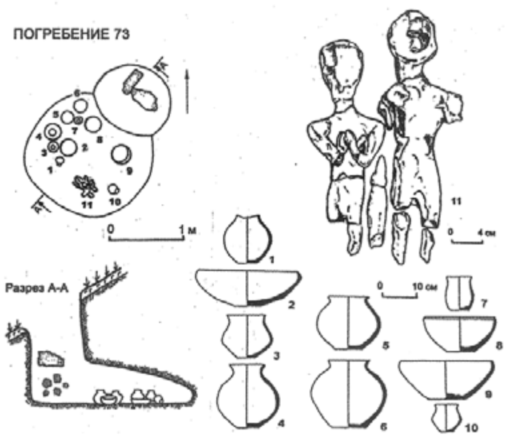


Fig. 21: Figurine from Kanguttut cemetery (Vinogradova, *et al.,* 2008, Pic. 45)

8. Conclusion and Further Discussion

In Central Asia, there is a continuous tradition compared with local societal development. Since the Bronze Age, which started in 3000 BC, the figurines have been characterized by an abstract appearance and burial context, mainly made of clay. The composite stone figurines found in Murghab Delta and Northeast Iran break out of the original Southern Central Asia tradition in decorative arts and materials. But in art style and context, they kept the central Asia tradition, and are different from the figurines from Elam, made by local craftsman. Therefore, during the Bronze Age, there is a combination of Central Asia and Iran Plateau in figurine making.

The trans-regional interaction brought society with a huge development, which might be the reason for the appearance of composite stone figurines. View from the subjective, the continuous development of a sedentary agricultural society resulted in class differentiation, and elites needed to obtain luxury goods to stabilize their status. View from the objective, the rich resources and powerful local administration in East Iran and Elam territory provided motivation and convenience for BMAC/GKC residents to contact the outside world. Enjoying foreign culture has become a hobby of local elites.

For further consideration, what makes the Goddess stop her step? The composite stone figurines were concentrated in the Murghab Delta and its surrounding areas, while in the territory of Northern Bactria, we can see the figurines' position of votive statues in many sites. What does this phenomenon mean?

Ideologies represented by figurines are often linked to aspects of society, identity, or religion. From the view of the policy or social organization, there must be a difference between the Surkhandaryo, Balkh Delta, Murghab Delta, and Northeast Iran. And we need more archaeological materials to unravel this mystery.

9. Endnote

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بحثی دربارۀ تندیسک‌های سنگی ترکیبی در فرهنگ‌های مروی بلخی و تأثیرات آن‌ها

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چکیده

در قرن گذشته، گروهی از مجسمه‌های سنگی زنانۀ ترکیبی عصر مفرغ، که به «پرنسس‌های باختر» معروف هستند، در بازار عتیقه‌جات پدیدار شدند و مشکوک به منشأ افغان بوده‌اند. بعدها، در خلال کاوش‌های علمی باستان‌شناسی، مجسمه‌های مشابه زنانه در جنوب ترکمنستان و شمال‌شرقی ایران کشف شد که مربوط به دورۀ دیرینۀ نمازگاه V است. بحث‌های بسیاری دربارۀ منشأ این مجسمه‌های زنانۀ سنگی ترکیبی وجود دارد. به‌طور سنتی، اعتقاد بر این است که آن‌ها عناصری واضح از تمدن ایلامی دارند و تحت‌تأثیر فرهنگ فلات جنوبی ایران قرار گرفته‌اند. از دوران نوسنگی تا عصر مفرغ در آسیای مرکزی، بقایای باستان‌شناسی ارتباطات نزدیکی با جمعیت‌های فلات ایران نشان می‌دهد. مجسمه‌های سفالی زنانه برای مدت طولانی در آسیای مرکزی و ایران استفاده می‌شدند و براساس آن‌ها، سنت مجسمه‌سازی با ویژگی‌های فرهنگی محلی به‌طور نسبتاً مستقل توسعه‌یافته است. مجسمه‌های جدید سنگی ترکیبی در نمازگاه V با سنت‌های اولیه آسیای مرکزی که از خاک رُس ساخته می‌شدند و در شکل‌های ساده، متفاوت بودند. تزئینات روی سطح این مجسمه‌های سنگی ترکیبی، شباهت زیادی با تصاویر نخبگان از سلسلۀ ایلامی قدیم دارند؛ همچنین، مواد سنگی، عمدتاً کلریت و مرمر، می‌توانند به جنوب‌شرقی ایران نسبت داده شوند. ظهور این مجسمه‌های سنگی ترکیبی تغییراتی را در جامعۀ جنوبی آسیای مرکزی نشان می‌دهد که با انتقال مردم از دامنه‌های کوپت‌داغ به دلتای مرغاب هم‌راستا است. ادغام فرهنگ محلی آسیای مرکزی و فرهنگ ایرانی به‌طور ایدئولوژیک در این مجسمه‌ها انعکاس یافته است.

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The 2024 Excavation Campaign at Kani Shaie: New Data on the Earliest Early Bronze Age and the Hellenistic-Parthian Occupations

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Abstract

Kani Shaie is an important archaeological site in the Sulaymaniyah Province of Iraqi Kurdistan. Sitting in the center of the Bazyan Valley, it is located on a major communication axis that connects northern Mesopotamia via Kirkuk with the central Zagros Mountains of western Iran. Its main occupation spans the Chalcolithic and Early Bronze Age, from ca. 6000 to 2000 BCE. Later occupation of the Late Bronze Age, Neo-Assyrian period, and the Hellenistic-Parthian period is also well-represented in the lower mounded area of the site. Throughout these millennia, Kani Shaie was a major focus of settlement within the Bazyan Valley. While never reaching more than 3ha in size, occupation in each period attests to the settlement's function as a local center that was connected within the exchange networks of southwest Asia. As such, Kani Shaie is of particular importance to connect the archaeology of western Iran with the Mesopotamian world. In this article, we present the excavation results of the 2024 season when two impressive architectural complexes were investigated. The first dating to the beginning of the Early Bronze Age, ca. 3000 BCE, in the aftermath of the collapse of the Uruk exchange network. The second belonging to the Hellenistic-Parthian period and likely connected to the southern expansion of the Adiabene kingdom.

Keywords:
Campaign Exploration 2024, Kani Shah, Early Bronze Age, Hellenistic-Parthian, Hellenistic.

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1. Introduction

Provides critical insight into the transition from the Late Chalcolithic (LC; ca. 4500-3100 BCE) to the Early Bronze Age (EBA; ca. 3100-2000 BCE). The site occupies a strategic location between the Mesopotamian plains and the Zagros Mountains, positioning it as a central point for the exchange and interaction between these regions (Fig. 1). The Kani Shaie Archaeological Project (KSAP) has conducted multiple excavation seasons, uncovering a rich stratigraphic sequence that spans several millennia of occupation (Fig. 2) (Ahmad & Renette 2023; Renette 2016; 2018; 2024; Renette *et al.,* 2021; Renette *et al.,* 2023; Renette *et al.,* 2024; Tomé *et al.,* 2016).

Kani Shaie's significance lies not only in its stratigraphy, which covers the Late Chalcolithic and Early Bronze Age periods, but also in its role as a hub within the regional socio-economic networks. The site's architectural, ceramic, and material culture provides key evidence for understanding the dynamics of settlement development, regional trade, and cultural interactions in the broader Near Eastern context. The 2024 excavation campaign was aimed at furthering these understandings, particularly focusing on the ceramic assemblage and the architectural phases spanning the transition from the LC to the EBA.

This article synthesizes the findings from the 2024 excavation season, highlighting the key results from both the stratigraphic layers and the material culture, particularly ceramics. During the 2024 season, excavations revealed three phases of occupation within a large, circular enclosure wall (so-called EBA "Round Building": Renette 2009; Heil 2011). These findings are placed within the broader framework of regional developments during the final stages of the LC and opening centuries of the EBA, shedding light on the nature of cultural exchanges, and the local adaptations that occurred in the northern Mesopotamian and Zagros regions.

In addition, we include a separate discussion of the late 1st millennium BCE occupation in the Lower Town of Kani Shaie. While separated in time, major results in excavation in this area (Area D) similarly demonstrate the importance of Kani Shaie as a small, yet central location within the Bazyan Valley and by extension in a crucial corridor connecting the Transtigridian plains of Erbil, Kirkuk, and Chemchemal with the western Zagros Mountains. This longue durée continuity of centrality within the Kani Shaie sequence attests to an enduring approach to the landscape of the Sulaymaniyah region despite major historical transformations.

2. Excavation Strategy and Results

The 2024 excavation campaign at Kani Shaie focused on expanding our understanding of the site's complex stratigraphy and architectural developments, particularly in Area A, which has been the primary focus of excavations over the past several years (Fig. 3). Building upon the findings of 2023, the primary objective of this season was to explore the earlier levels, especially Levels 8 and 9, which correspond to the earliest Early Bronze Age (EBA) occupations at the site, which also contained residual Late Chalcolithic 5 (LC5)/Uruk-period material culture and ceramics. Whilst not directly related to the EBA levels, these residual LC5 sherds provide important clues for further excavation seasons regarding the Late Uruk/LC5 occupation at Kani Shaie. The 2024 fieldwork was designed to address key stratigraphic and architectural ambiguities while continuing to unearth crucial material evidence for the transitions between the LC5 and EBA.

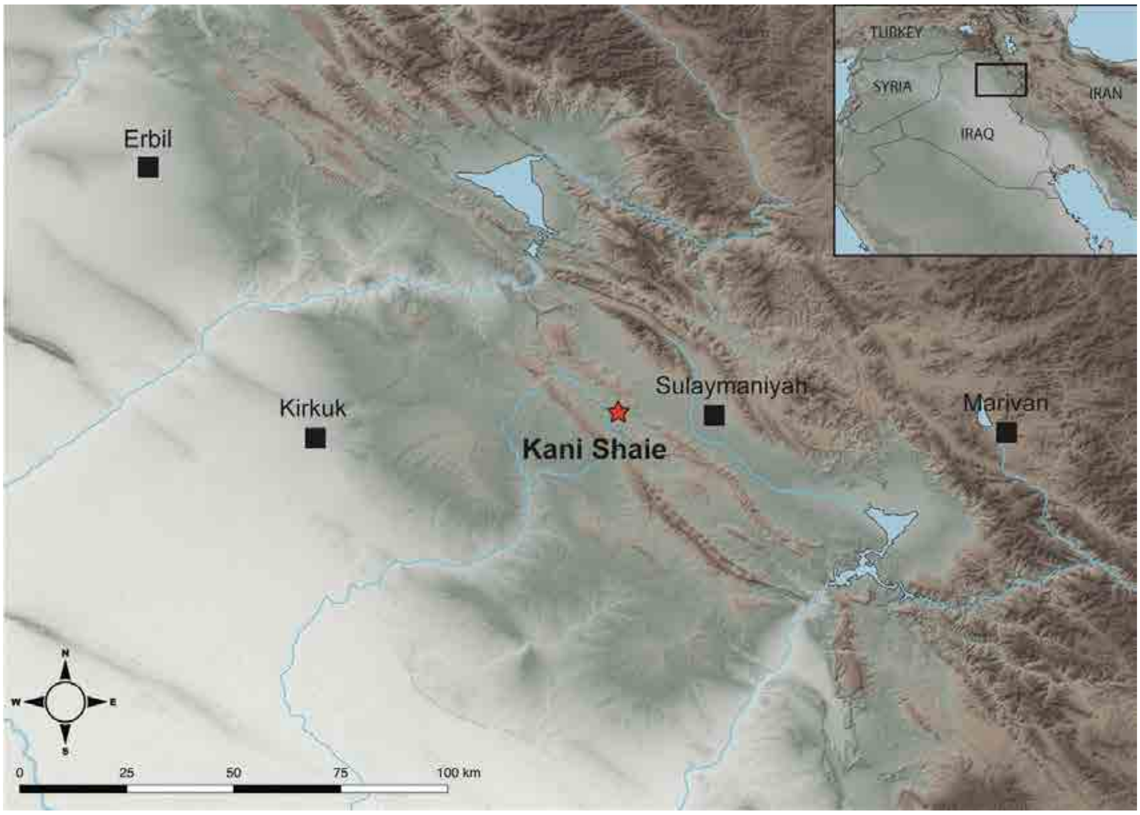

Fig. 1: Map of Sulaymaniyah region in Iraqi Kurdistan showing the location of Kani Shaie (map by S. Renette).

Fig. 2: Overview of the site of Kani Shaie (KSAP).

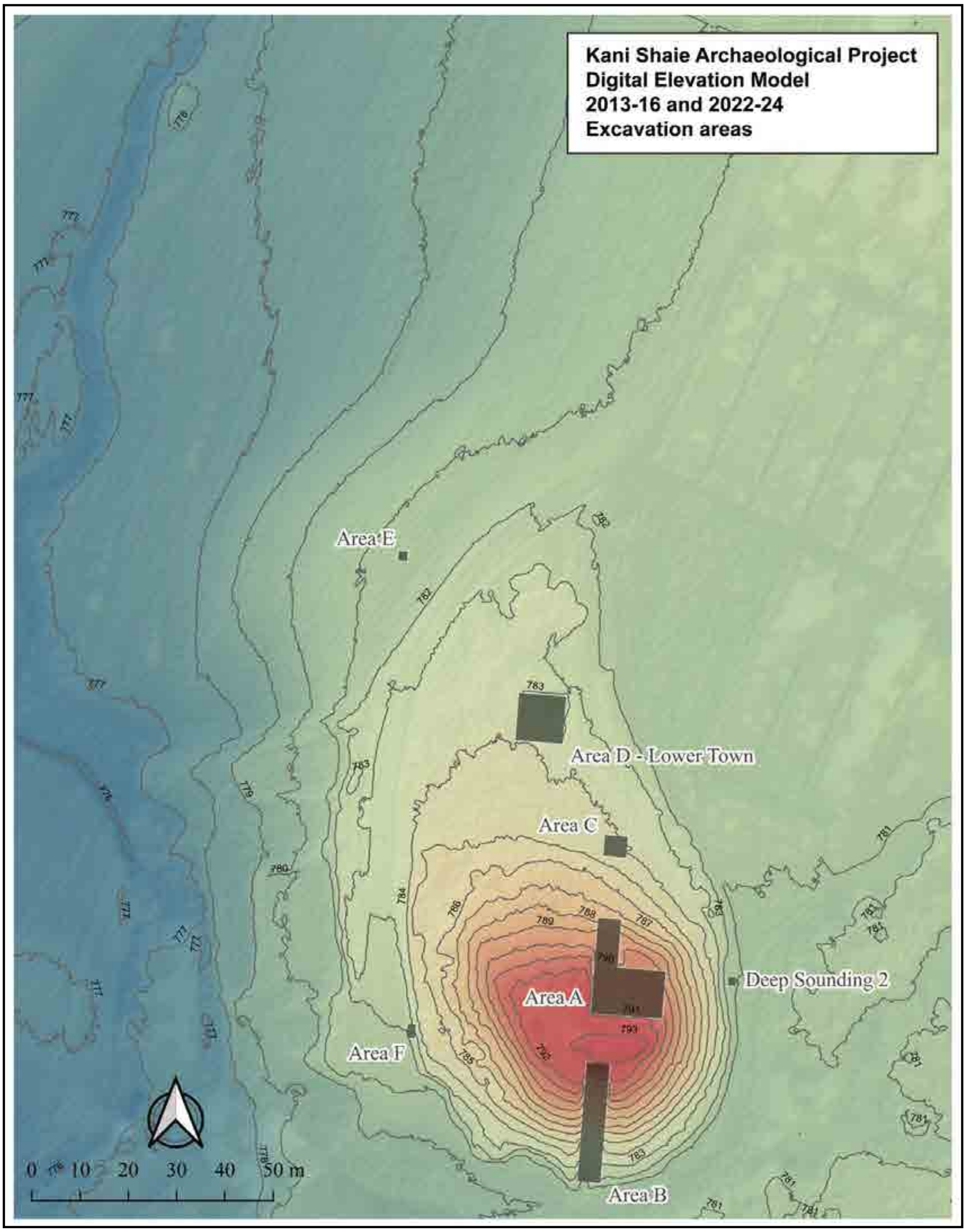

Fig. 3: Digital Elevation Model of Kani Shaie with the location of the excavation areas (DEM by H. Naccaro).

Simultaneous work in the lower mounded area of the site continued a 10x10m trench in Area D. Excavation of this trench was started in 2023 with the two-fold purpose of documenting in better detail the late occupation at the site and to determine whether the EBA settlement extended over a lower town or was restricted to the Main Mound. Given the significant 2024 results that exposed an important Hellenistic-Parthian occupation, the aims for Area D have necessarily been adjusted to a multi-year plan to document the large-scale stone architecture of that period. The Hellenistic-Parthian occupation of the Sulaymaniyah region has not yet been studied in great detail and early survey work struggled with identifying sites of this period due to poor chronological knowledge of its ceramic typology (Altaweel *et al.,* 2012). In recent years, the Parthian- to Sassanian-period occupation of the region has increasingly become a focus of major investigation. This new work at Kani Shaie promises to contribute significant information to this frontier in archaeological fieldwork in Sulaymaniyah.

3. Area A – Trenches 4500 and 6500

In 2024, the excavation of Area A continued in Trenches 4500 and 6500, focusing on the transition from the Uruk period to the Early Bronze Age, a period that remains poorly documented throughout the region. Building upon the excavation in 2023, where Level 7 was fully explored, we began by revisiting the earlier levels, particularly Level 8, which was anticipated to represent the earliest Early Bronze Age occupation on the mound, dating to approximately 2950 BCE. Furthermore, we were particularly interested in the underlying occupation layers, which we hypothesized to be part of the Uruk period (LC5).

Level 8 consists of three phases of occupation associated with a large, circular enclosure wall (Fig. 4). The preservation conditions of the EBA levels at Kani Shaie present a serious challenge. Such difficult conditions have been observed at sites throughout this region (e.g., Matthews *et al.,* 2020). As a result, separation of subphases of occupation is often frustratingly difficult during excavation. Nevertheless, based on careful stratigraphic analysis, we identified three distinct occupation phases that are characterized by significant rebuilding activities within the enclosure wall. The final plans for these phases are still in progress as the analysis of contexts and stratigraphy is ongoing. We present here an abbreviated summary of each level, followed by a discussion of our interpretations.

3.1 Level 8a

The excavation strategy for 2024 in Trench 4500 involved exposing the architectural layout of Level 8, which had become visible in the previous season. Our primary goal was to understand the arrangement of walls and features in this level, including the identification of space fills and the spatial organization of the area. However, the excavation of the southern part of the trench revealed unexpected findings, particularly a substantial reorganization of the space. Particularly, a ca. 3m wide mudbrick wall followed the northern and eastern contour of the edge of the mound in Area A. This curving wall can be projected beyond the excavated area and has been encountered in a stratigraphic sounding on the southern slope (Area B) in 2016. This enclosure wall can be estimated to be ca. 30m in diameter.

Level 8a remains, consisting of the uppermost deposits from activity near the end of the lifespan of the enclosure wall, were however poorly preserved. The major rebuilding in level 7 leveled and erased part of 8a occupation. Within the remaining deposits, significant new wall construction already indicate that the enclosure wall had fallen in disrepair and was gradually transformed to contain new spaces built into the wall itself and against its exterior.

3.2 Level 8b

Level 8b was primarily characterized by a large rectangular food storage and processing

Fig. 4: Vertical Photograph of Area A during excavation in 2024. The large enclosure wall is highlighted. (KSAP).

installation, which was marked by a notable bin feature. This rectangular bin, which was filled with large quantities of burnt botanical remains—including grains, legumes, and pulses—was an important discovery, as it suggests that food storage was a central activity during this phase. Adjacent to the bin, we uncovered numerous clay sealings bearing cylinder seal impressions, including a steatite seal with a geometric design, which were indicative of administrative practices or storage regulation. These sealings were likely used to mark the contents of the storage bin, pointing to an early form of organization and control over food resources.

Within the open area of Level 8b, we also identified a circular oven, or "tannur", which was cut into an earlier wall. This oven was associated with a small bin installation, suggesting that this space was also used for food preparation, further corroborating the interpretation of Kani Shaie as a center of food production and storage during the early part of the Early Bronze Age. The architectural layout in this area indicated that Level 8b was characterized by substantial rebuilding, possibly following a destruction of earlier structures.

3.3 Level 8c

The excavation of Level 8c revealed additional complexities. This layer was marked by an open area in the southwestern quadrant of Area A, which showed evidence of frequent cooking-related fire activities. The space was filled with black ash and stamped earth surfaces, suggesting repeated use for food processing or communal activities. The rest of Area A in this phase consisted of a built-up area with several rooms, which collapsed at the end of the occupation, leaving behind mudbrick rubble and complete vessels.

3.4 Level 9

The deepest layer reached in 2024, Level 9, is hypothesized to represent the earliest Early Bronze Age occupation on the Main Mound of Kani Shaie, dating to approximately 3000 BCE. This level remains largely unexcavated, with the focus of the 2024 season being to establish its stratigraphic relationship with the overlying levels. The presence of kilns and other ceramic production features in the strata associated with Level 9 also hints at craft production at the site during this phase. The continuation of this work in future seasons will be crucial for understanding the social, economic, and political dynamics of Kani Shaie during the initial EBA settlement phase and crucially, in understanding the transition from the LC Uruk levels to the EBA.

3.5 Complex Architectural Development and Social Organization

The stratigraphy across Levels 8 and 9 highlights a series of architectural and social transformations at Kani Shaie. The continuous occupation across these levels, with frequent reconstructions and spatial reorganizations, suggests a dynamic settlement that adapted to changing needs and social conditions of its inhabitants. In particular, the shift from large, communal structures in Level 8 to more specialized and compartmentalized spaces in Level 7 indicates a move towards greater social differentiation and a more complex form of organization.

In Level 7, we observed a major social shift, as larger-scale storage and food production activities were relocated to dedicated rooms, with restricted access and greater regulation of space. The presence of a large grill-based storage structure in Level 7 further indicates the importance of food distribution and management during this phase. The collapse of this structure, likely caused by a conflagration, marks the abrupt end of this phase of occupation, followed by a hiatus that was potentially marked by further changes in social organization and material culture.

3.6 The Role of Food Storage and Economic Practices

Throughout the excavation of Level 8, food storage and production were clearly central to the site's function. The discovery of multiple grain storage bins, including the large rectangular bin in Level 8b and additional bins in Level 8c, provides evidence for the management of food resources at Kani Shaie. These storage features, along with the associated sealings, suggest that the inhabitants of the site engaged in both the production, storage and distribution of surplus food, likely for local consumption by the local inhabitants.

The lack of grinding stones found in association with the storage bins is particularly notable. This absence raises questions about the purpose of the stored grains—whether they were intended for long-term storage, transport, or possibly as commodities in trade, or perhaps that the grain processing took place in other, as yet unexcavated areas of the site. The continued excavation of these areas will be essential for understanding the broader economic role of Kani Shaie in the Early Bronze Age and its connections to other settlements in the region.

The dedicated storage and food production installations of Level 8 within a large, communal building were relatively small. In Level 7, the architectural layout and scale of occupation changed dramatically, but the principle focus of activity remained on storage and food production. The large enclosure wall and its internal architecture were deliberately filled in with clay packing and occasionally mudbricks to create a platform area to support the construction of a multi-room architectural complex and an associated, large storage structure with a grill foundation consisting of at least four parallel rows of mudbricks. Circulation and access within this complex were restricted through a series of small spaces and limited doorways. Access to the large storage structure was from within this complex and controlled by repeated closing and sealing the doorways. Remains of door sealings were found in a narrow corridor that connected the storage structure and a large rectangular room that could only be reached through a single door and beyond a series of small, restricted spaces.

Throughout the early centuries of the EBA, we can trace at Kani Shaie a development of communal strategies to store food surplus, consisting mainly of grain (barley and emmer) and pulses (chickpeas, lentils, peas). Initially, a large enclosure wall contained dedicated storage and food preparation areas. Deposits in this "Round Building" accumulated rapidly and necessitated a rebuilding (Level 8b). A final occupation (Level 8a) re-used the enclosure wall by adding spaces. Eventually, a radically new design was implemented that significantly increased the size of the storage facilities, concentrated storage within a single large structure, and implemented much more restriction of access. The communal storage aspect of the Level 8 enclosure became replaced by administrative control over food staples that necessitated new forms of spatial organisation.

3.7 Preliminary Summary of the Early Bronze Age Ceramics

The primary goal for the 2024 season at Kani Shaie was continuing the complete documentation of the pottery from the Early Bronze Age strata at the site which had been initiated in prior seasons (2022, 2023). Processing the ceramics excavated this season was straightforward and directly continued from the procedure initiated in 2022. This process involved washing and sun-drying all the sherds before full counting of all sherds from a specific context. Almost 12,500 ceramic sherds were processed from the 2024 excavations. Full documentation of the pottery was completed using an Excel spreadsheet with around 700 sherds individually catalogued from 2024, with a further c.700 sherd from EB contexts of other excavation seasons also added to the database, giving a total of 4300 sherds now fully documented from the EB at Kani Shaie. All important features of the individual sherds were noted and classified, including form type, ware group, inclusions, forming techniques, dimension, photo/drawing numbers etc. In addition, over 100 pages of A4 drawings were completed during 2024 and await digitization. Finally, in continuity with 2023, photomicrographs were taken of every documented sherd using a Dino-Lite USB microscope to aid in directing the future sampling strategy for archaeometric analysis and enable more precise fabric groupings. Whilst specific conclusions and discussion of the data obtained through analysis of the EBA are not yet possible as the data is subject to ongoing analysis, a number of preliminary conclusions are possible: It is possible to notice differences in the ceramic assemblage from the 2023 season and those of 2024.

Firstly, the material excavated in 2023 and the earlier excavated contexts of 2024 (that is, chronologically later), feature a higher quantity of painted designs, and, in general, the painted decorations are more simplistic in the chronologically earlier phases. Also noteworthy is the quantity of coarse wares and undiagnostic sherds seems to be much higher within the 2024 excavated contexts. It remains to be seen whether this is relates to chronological subdivisions, though, given the changing nature of the archaeology, and the more industrial functionality of the earlier EB phases, it may indeed relate to functionality and differing use of spaces within the structures excavated.

Much of the painted wares relate closely to the so-called LC-EB Transitional types, and date quite closely within the ETG2 ARCANE Chronology with close comparatives noted particularly from sites of the Eski Mosul region of north-western Iraq, with Tell Karana 3 and Tell Fisna providing particularly close comparatives (Numoto 2003; Rova, 2003; Fig. 4). Characteristic vessels include small painted cups and medium sized jars with geometric designs arranged in single registers to the upper body of the vessels (e.g., Fig. 5 m, o). Limited quantities of vessels feature triangular motifs with internal cross-hatching, closely matching LC-EB transitional vessel types noted at Nineveh (e.g., Gut 1995; Tafel 71.1085). The assemblage from Kani Shaie Level 9 is dominated by small cups and bowls, often with simple tapered or beaded rims, with additional variants featuring somewhat carinated shoulders. Plain, unpainted variants of these same forms are also noted, with comparatives to several sites of northern Mesopotamia and western Iran including those of the Eski Mosul region such as Tell Thuwaij (e.g., Numoto 2003: Fig. 22) along the Lesser Zab and toward the southern shores of Lake Urmieh including Rick Abad Tepe (Binandeh 2023; Fig. 5), Gird Morvan (Aghalary *et al.,* 2024; Fig. 17) and Tepe Silveh, Piranshahr (Abedi *et al.,* 2020: Fig. 2)

Generally, the painted designs of these earlier vessels are much more simple than those of the subsequent EB phases (such as those excavated in 2023, see for example Tomé *et al.,* 2016; Fig. 4; Lewis 2024). Sherds from these earliest EBA levels (Level 9) feature very simple painted designs usually consisting of horizontal bands to the vessel rim, thick horizontal stripes or in some cases, paint covering much of the whole vessel exterior (e.g., Fig. 5 r,s,t,u) with close comparatives noted at Barveh Tepe along the Lesser Zab, (Sharifi and Helwing 2023; Fig. 11) and Gird Morvan, Piranshahr (Aghalary *et al.,* 2024 Fig. 17.E) whilst additional comparatives from Iraqi Kurdistan include those from Girdi Lashkir phase 3-4 (Molist *et al.,* 2019: Fig. 6.5-7) and the Upper Greater Zab Survey (Kolinski 2024: Fig. 5). Other common motifs include alternating horizontal bands interspaced with chevrons or variants of this (Fig. 5 m). One vessel, a thin walled bowl with beaded rim, features a cream slip and unusual polychrome decoration compares very well to examples from Tell Fisna level 6 dated to the ETG2b (Fig. 5 o. See Numoto 2003: Fig. 8.57). Quadruped painted designs appear to be more common in Level 9 than in subsequent levels of Level 8-7 (Fig. 5 g, h, i, j, k, l) and within Level 9 are often found depicted alongside geometric designs (Fig. n), whilst later cups from Levels 8-7 solely featured these painted quadruped designs. Stylistically, the design of these quadruped vessels varies from incredibly schematic (e.g., Fig. j, n) to somewhat more “realistic” (Fig. 5 h, i). It is unclear as yet if this represents a chronological subdivision, or elements of individual stylistic choice by the potters. General comparatives to the painted wares are noted from within Iraqi Kurdistan including Satu Qala (Pappi and Coppini 2024: Fig. 5) and the western Sulaymaniyah Survey (Lucian, 2024: Fig. 6. 2; 7.8-9), and along the

Lesser Zab and Lake Urmieh region of north-western Iran; Tepe Se-Girdan (Binandeh 2014; Sohrabi and Ebrahimi 2015, cited in Ebrahimi *et al.,* 2021), Kul Tepe Ajabshir (Ebrahimi *et al.,* 2021) and Ali Abad Tepe (Faraji *et al.,* 2015). Paint colour of these small cups varies, though is generally either a red or red-brown, or black in colour with fabrics featuring fine mineral temper.

What is noted is that the earliest EB levels at Kani Shaie (Level 8-9) feature a higher quantity of painted jars than in subsequent phases, again featuring simple horizontal, red-brown-red painted band(s) to the vessel upper body and rim, with some featuring a thin pale buff-brown slip to the exterior surface (Fig. 5 v,w,x). Fabrics of these jars are characterised by a vegetal temper. Comparatives are noted primarily from the Eski Mosul region, particularly from Tell Fisna (e.g., Numoto 2003: Fig. 9.65, 66) and date to the Transitional Ninevite 5 period or ETG2.

Pedestal bases are common within Level 8, and though unsure which vessel they were from, it is deemed likely they were from chalices or jars with globular bodies based on comparatives from the early EBA in northern Mesopotamia and north-western Iran: Those examples from Kani Shaie often (though not always) feature horizontal bands of paint, and are commonly noted at early Ninevite 5 sites of northern Mesopotamia, again primarily the Eski Mosul Region such as Tell Kutan (Bachelot 2003: Fig. 26.4, 26.11, 27.4) and Rijim (Bielinski 2003: Fig. 13.2, 4) but also from Nineveh (Gut 1995: Tafel 84.1186-1187) and the western Sulaymaniyah Survey, Iraqi Kurdistan (e.g., Luciani 2024: Fig.8.1)

Hasan Ali Ware (Fig. 5 a,b,c) marks a substantial proportion of the painted corpus in these phases at Kani Shaie, though seems from initial observations to belong to Level 7-8 (based on radiocarbon dating of 2897-2877 BCE 68%; Renette et al., 2023: Table 3). The Hasan Ali Wares are marked by more complex geometric painted designs, most commonly including bands of lozenges with alternating dots, cross-crosses and painted lozenge bands. Additional painted motifs include complex square designs with internal elements (6713-1; with comparatives at Barveh Tepe (Sharifi 2020; Fig. 13. PN.44) whilst other examples feature these alternating lozenges alongside this square design, with close comparatives to extant Hasan Ali Ware from the Lake Urmiah Region (e.g., Kroll 2005; 2017)

Black on Orange Wares are another notable ceramic type commonly found within Level 7-8, and also it seems from Level 9. These sherds (e.g., Fig. 5 e) are primarily from small cups with simple or narrow tapered rims and are found curiously within the same levels (and sometimes contexts) as the Hasan Ali Ware (contra Helwing and Neumann 2014; 53). Black on Orange Ware is characterised, as name would suggest via a deep orange fabric and thick, dark black paint. Common motifs include ladder designs and sometimes horizontal registers of chevrons interspaced with black painted rectangles (e.g., Barkaram Tepe, Piranshahr (Bodaqi *et al.,* 2021; Fig. 7). Rare examples feature bichrome red paint alongside the black painted designs (Fig. 5 f)

Scarlet Ware (Fig. 5 d) is also present within these lower EBA levels, and whilst mostly body sherds, several rim sherds are present allowing further discussion. The primary form so far noted from Kani Shaie Level 9(-8) are squat globular jars with simple tapered rims featuring red painted bands to the rim with thin black painted geometric designs below, commonly including chevrons, “bow-ties” and linear bands. Comparisons are noted from Bani Surmah (Haerinck and Overlaet 2006; Fig. 11) and Kalleh Nisar, Pusht-i

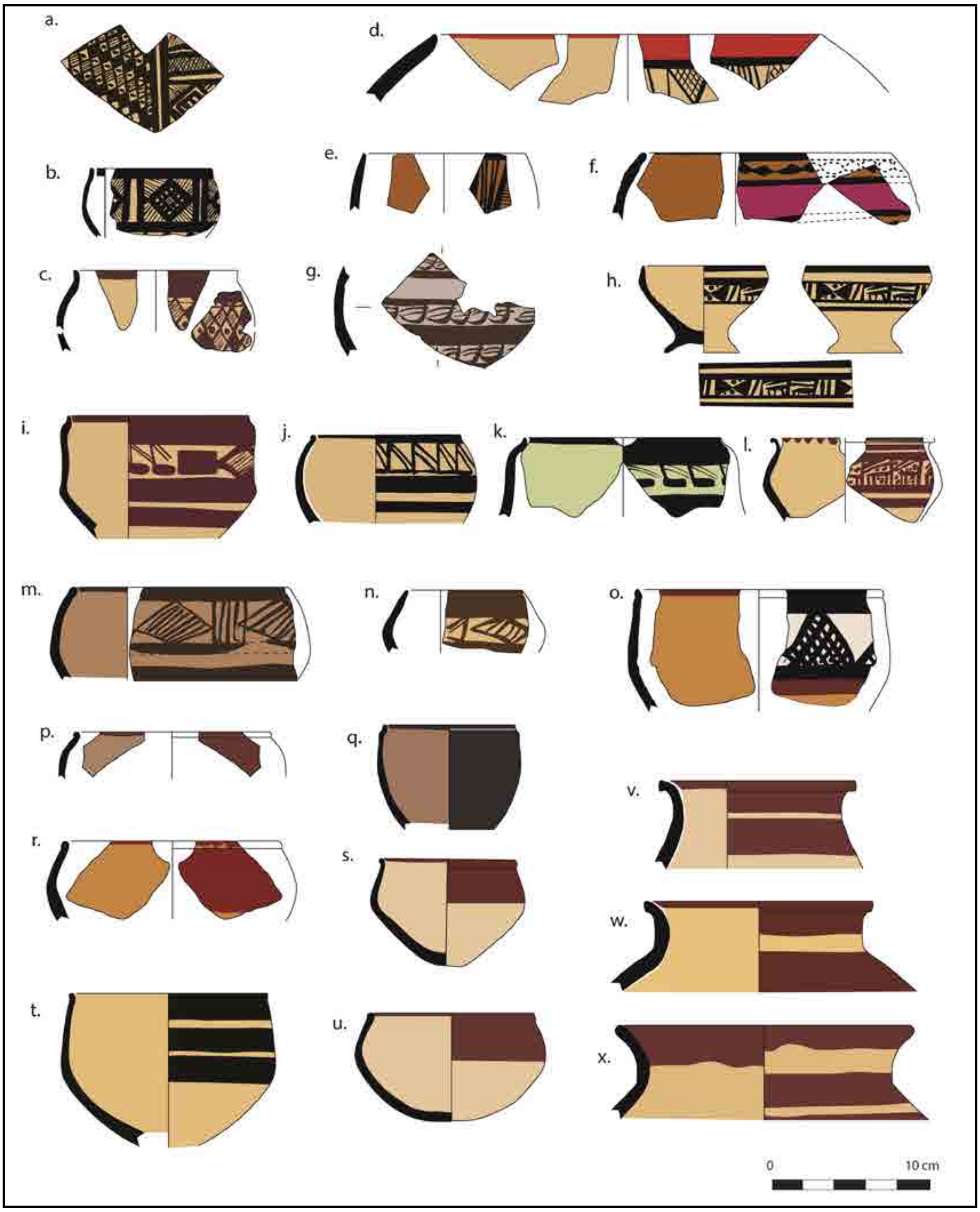

Fig. 5: Selection of early EBA painted wares of Area A level 8 (drawings by M.P. Lewis).

Kuh (Haerinck and Overlaet 2008; Fig. 12-13) and Tell Gubba (Fujii 1981; Fig. 17.1-3; Ii 1993). The designs of these vessels and indeed of all Scarlet Ware vessels from Kani Shaie are limited to the upper shoulder panel, and completely absent from below the shoulder carination and are exclusively limited to geometric designs, with no examples of zoomorphic or anthropomorphic motifs, as are common in south-central Iraq and western Iran (e.g., Del Bravo 2014).

Plain wares are dominated by holemouth jars with applique knobs, strap handles, or inverted crescent lugs (e.g., Fig. 6 e,f,g,h) a widespread cooking pot form from the northern Mesopotamian EBA observed from Leilan period IIIb (Schwartz 1988: Fig. 45) and Raqai level 4 (Schwartz and Chomowicz 2015; Fig. 4.23) the Eski Mosul region at Karrana 3 (Wilhelm and Zaccagnini 2003: Pl.XLI), Fisna (Numoto 2003: Fig. 14. 124-126) also Satu Qala, Iraqi Kurdistan (Pappi and Coppini 2024: Fig. 10c). Also noted are large square profile vessels with internal applique lugs (Fig. 6 i), perhaps functioning as a pot stand or for holding other vessels. Other vessels characteristic of these lower EB phases include jars with thickened, sometimes flattened or everted rims, and long sloping shoulders (Fig. 6 a). Given their size and oft vegetal temper, it is deemed likely they were used for liquid storage. Flat ceramic discs in thick, coarse clay are also noted (Fig. 6 d), and seem to have been used either as pot stands/trays, or as lids, and though relatively uncommon, they are another very widespread early EB/Ninevite 5 ceramic form noted across northern Mesopotamia, with examples observed at sites of the Khabur of northeastern Syria including Tell Raqai level 4 Fig. 4.24) and Leilan period IIIb (Schwartz 1988: Fig. 45). Remaining plain ware jars are dominated by jars with simple, everted rims (Fig. 6 b,c) and broadly compare to those from the Kurdistan Region of Iraq and north-western Iran including Tepe Silveh, Piranshahr (Abedi *et al.,* 2020). Exact parallels for the plains wares of these early phases of the EB have been more difficult as yet to establish, given the over-emphasis in publications on the painted wares of the opening centuries of the EBA. Full publication therefore of the plain wares from the EB phases at Kani Shaie in the near future is expected to contribute a significant amount to this lacuna, and aid in further identification of plain wares from this period.

Other typical undecorated vessels include “slosh proof jars” with their characteristic inward flange, and sometimes featuring thick handles (Fig. 6 k, l). The presence of these vessels within these early levels is interesting, and considerably earlier than those from Godin III:6 (e.g., Henrickson 1984; Fig. 72.1-2). Whilst no handles have been found attached to the examples from Kani Shaie, it is likely that the tubular handles found as separate sherds were originally part of these same slosh-proof jars (e.g., Henrickson 1984; Fig. 72.1) Finally, jars with pierced bases, perhaps used in brewing or such like were noted from the earliest EB phases a Kani Shaie with comparative examples from Karrana 3 (Wilhelm and Zaccagnini 2003; Pl. XLIV.522).

Another common form of these earliest EB levels at Kani Shaie are BRBs (Fig. 6 j). These vessels are of course eponymous with the mid-late LC and the Uruk Phenomenon, and have been found throughout almost all phases at Kani Shaie (e.g., Tomé *et al.,* 2016; Renette *et al.,* 2021) . They were also documented in chronologically later phases throughout much of the EB strata at Kani Shaie, though in small quantities and likely represent residual sherds. It seems then, that it is only these very earliest EB levels (in addition of course to the LC levels) where BRBs were used as vessels. This very much agrees with discussions by Rova (Rova 2014; 2) and others from the Tigridian region more generally where these conspicuous vessels indeed continue to be produced in post-Uruk levels. It remains to be seen however it is also possible that small quantities of typically Uruk ceramics may also continue to be produced in these earliest EB levels.

Whilst the excavations in 2024 did not reach in-situ LC5 levels, moderate quantities of a wide range of characteristic LC5 ceramic forms were present from EB levels including band rim bowls, triangle incised designs on jars, nose lugged jars, cooking pots with

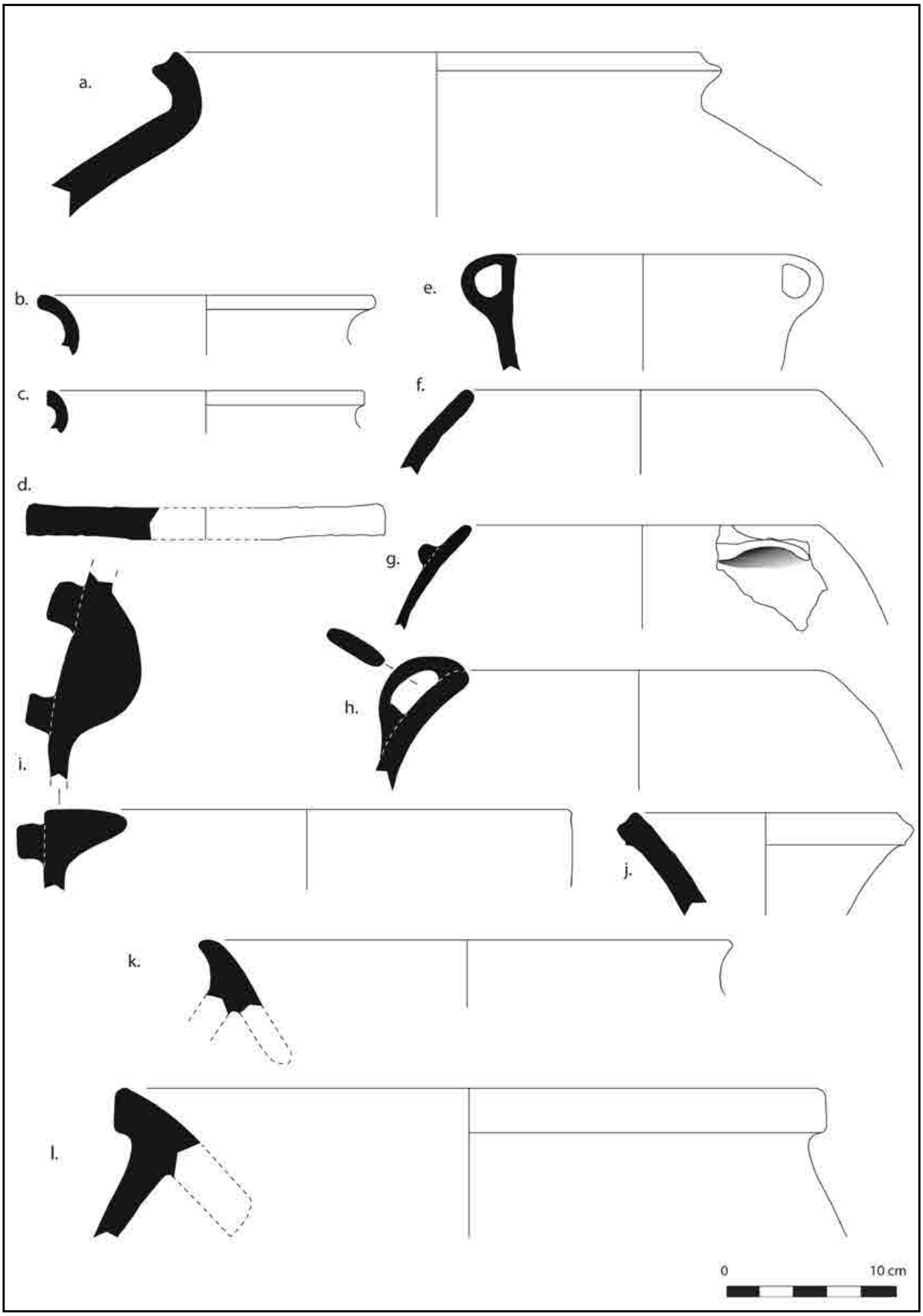

Fig. 6: Selection of early EBA plain wares of Area A level 8 (drawings by M.P. Lewis).

extended, often incised lugs, torpedo jar necks, Uruk trays, reserved slip decoration, and drooping spouts. Fabrics of these LC5 sherds primarily appear to feature a mixed vegetal-mineral temper.

4. Area D – LT-1000 – The Lower Town Trench

In 2024, the excavation of Trench LT-1000 (10x10m) in the Lower Town of Kani Shaie focused on gaining a better understanding of the later periods of occupation at the site, particularly the Neo-Assyrian and Parthian periods (1st millennium BCE). While the ultimate goal was to reach the underlying Early Bronze Age (EBA) occupation in the lower mounded area to determine the extent of a lower town, the late Iron Age occupation proved to be more substantial than anticipated. The focus of the excavations in the low mounded area has now shifted to investigate this significant later occupation in more detail.

The trench was initially opened in 2023. Immediately below the surface, part of a large building was immediately uncovered, with only the stone foundations remaining. The associated deposits, all within the upper 0.5m of the trench, were heavily disturbed by plowing, pits, eroded remnants of human activity, and animal burrows and large roots. In fact, the density of large, deep roots in the southern part of the trench, all of which were severely burnt, indicate that this part of the lower mound was covered by trees in the relatively recent past, and that a fire had resulted in their removal. Still in the 2023 season, a sounding in part of the trench was excavated to determine the underlying stratigraphy, which would guide the excavations of the following year. In this sounding, more large-scale stone architecture foundations were discovered.

The 2024 excavation continued to focus on stratigraphic reliability and contextual information to better understand both the later and earlier periods of the site's history. Careful excavation across the entire 10x10m trench allowed the partial documentation of the same type of large pits that disturbed so much of the EBA occupation on the Main Mound. Even though these pits in the lower mounded area are largely devoid of artifacts, the occasional Middle Islamic cooking pot sherd provides support for assigning the pits to the same chronological range as those on top of the mound. Despite these disturbances, through careful excavation, poorly preserved remains of small-scale architecture and pottery kilns could be traced. Based on associated pottery, these remains date to the Parthian period. However, the main focus of the excavations was on the underlying post-Assyrian occupation (tentatively dated based on ceramics to the Achaemenid-Hellenistic period). This lower level consists of substantial stone foundation architecture that once supported adobe architecture, although it remains unclear whether this consisted of mudbrick or pisé. Within the excavated area, the architectural complex formed by these stone foundations contained a courtyard, a small staircase entrance and small rooms. The main spaces of the complex lay outside the trench and will be targeted in future fieldwork seasons.

4.1 Level 1: Surface Remains

Level 1 of Trench LT-1000 contained the foundations of large stone walls running north-south, marking the remains of a much larger building. These walls, situated immediately below the surface, were partially disturbed, due to intensive deep plowing in the past decades. The stone foundations consist of well-laid, exterior-facing large stones and small stone filling. Given its presence close to the surface, the date of this structure remains difficult to determine with certainty. Pottery from the same upper level is very mixed, with mainly Parthian-period pottery as well as Middle and Late Islamic sherds, and occasional LC and EBA sherds (possibly slope wash from the Main Mound and spread over the lower mounded area by plowing). Given the predominance of Parthian period pottery, our first inclination was to date the structure to this period and consider later pottery as intrusive from ephemeral activity at the site. No clear architectural remains of the Middle or Late Islamic period have been as yet discovered at Kani Shaie, but the site was clearly regularly used by local people in the last few centuries for agricultural activities, as camp site, or possibly small-scale ephemeral occupation that has completely eroded away. In the 2024 season, further supporting evidence was obtained to date this structure much later, to the Ottoman period. A couple of the Middle Islamic period pits (ca. 11th-12th c. CE; Ahmed & Renette 2023) appear to be covered by the stone wall foundation, rather than the pits cutting the wall, although it must be emphasized that pit edges and cuts are very difficult to identify in the upper levels at Kani Shaie due to intensive processes of soil formation. If correctly interpreted, this then provides a terminus post quem, with the walls being constructed any time in the past 700 years. We favour an Ottoman date, possibly 18th or 19th century, based on the numerous finds of pipe fragments of this period and few finds of pottery that can be dated as such. This might fit with the regional control of the Baban Principality during this period, or possibly with the Ottoman attempt to reestablish dominance in this region in the later 19th century (Jwaideh 2006). In the final week of excavations, a geomagnetic survey was carried out, which provided an initial map of the building's plan, though detailed results are still being processed. Due to heavy disturbances in the upper deposits due to agricultural activities, large amounts of scrap metal discarded in fields throughout the region, and a high density of large stones up to 1 meter deep across the site, geomagnetic survey has proven only minimally productive at Kani Shaie. Nevertheless, this data will be crucial for clarifying the building's chronological placement and function in the context of the Lower Town's occupation.

4.2 Level 2: Middle Islamic Pits

Beneath the stone foundations of Level 1, a thick 0.5m layer of deposits were slowly excavated but no clear associated architecture could be identified. Given the absence of Sasanian or Early Islamic material, a hiatus of activity at the site for ca. 1,000 years is evident. During this time, any surface features would have eroded and non-substantial architecture (small mudbrick or pisé structures) in the upper meter would have undergone soil formation processes due to consistent rain and snow percolation, animal activity, and plant roots. Additionally, the nearby Main Mound underwent heavy erosion, especially on its northern slope, from where soil washed down over the low mounded area during centuries of abandonment.

By the Middle Islamic period, bell-shaped pits reaching ca. 2m deep were dug both on the Main Mound and across the lower mounded area. The exact purpose of these pits remains unclear. A few of the pits on the Main Mound contained large amounts of pottery, along with pieces of glass and metal, all of which had clearly broken and were discarded as trash. Lower in several of these pits, concentrated deposits of organic trash (animal bones and plant remains) were capped by layers of stone. In a recent publication, we postulated that these pits might have originally be dug to serve as food storage and subsequently used to discard of trash. Given the complete absence of architectural remains of this period anywhere on the site, we interpret this activity to be the result of annually recurring occupation by a group of nomadic households (Ahmed & Renette 2023). However, the large number and incredible density of such pits across the site remains difficult to understand. The pits in the excavated trench in the lower town contain very little artifactual material and are filled with medium to large stones. Consistent finds of small numbers of Middle Islamic pottery (especially easily recognisable cooking ware) and occasional pieces of glass confirm their date as well as their ubiquity throughout the trench despite difficulties with clearly delineating their cuts.

4.3 Level 3: Transitional Features

Level 3 encompasses the 0.5m of gradual deposits in which the Middle Islamic pits were dug (but they reach even deeper through Levels 4 and 5). In this gradual accumulation of deposits, cooking installations ("tannurs") and small ashy traces of fire activities were identified at different elevations. Small pits were also dug down from this level, cutting into the underlying levels. No associated architecture was present, or had been completely eroded away. The pottery from Level 3 contains many clearly identifiable Parthian types of pottery, including yellow, green, blue, and black glazed sherds, and several so-called "fish plates". Additionally, a residual find of a partially worn Neo-Assyrian frit cylinder seal, most likely from pit fill, attests to Kani Shaie's importance during the Iron Age. Neo-Assyrian occupation has so far only been explored in two small soundings in 2016 where substantial stone foundation walls were identified.

4.4 Level 4: Parthian and Pre-Parthian Features

At the bottom of Level 3 a clearly separate stratum of deposit is visible in the sections. This Level 4 contains poorly preserved remains of small-scale architecture, pottery kilns, and small pits that can be securely dated to the Parthian period (a more precise date within this period remains to be determined through detailed ceramic analysis and forthcoming radiocarbon dates). The kilns, including a relatively large installation in the southeast corner of the trench, were partially dug down into the lower level 5. Pottery slag, as well as iron slag, became a frequent find in level 4, but the kilns themselves were too poorly preserved and mostly empty to allow a reliable identification of their specific purpose. Nevertheless, they attest to a significant craft production at Kani Shaie during the Parthian period that will hopefully become better defined with additional excavation in the future. The small-scale architecture consisted, as much as could be identified, of single row mudbrick walls without stone foundations. In at least two instances, interior spaces contained surface made of irregularly laid small stones.

Below the Level 4 architecture, large, oval-shaped pits were dug out, targeting the underlying stone architecture of Level 5 (see below). These pits were dug down from Level 4 but before the construction of the architecture and kilns in this area. Ruins of the Level 5 architecture might have still been visible at the surface during this period considering that the top of stone foundations and a stone slab pavement from that earlier level already became visible during excavation. Probably this part of the mound was not occupied immediately, but instead stones were dug up for construction elsewhere, either in another part of Kani Shaie or in another location in the Bazyan Valley. In this context, it is interesting to note that there are remains of stone foundation architecture in the uppermost level of the Main Mound that might be associated with Parthian pottery (although the top level there is too disturbed by Middle Islamic pits and Ottoman graves to be certain).

4.5 Level 5: Hellenistic to Early Parthian Architecture

The lowest level reached in 2024, and which will remain the focus of excavations in this part of the site, showed a marked difference in ceramics and architectural features from the later levels. The architecture in this level consists of substantial, multi-course stone foundations (Fig. 7). Walls were consistently ca. 1m wide with well-constructed flat exterior stone faces, oriented southwest-northeast (the prevailing orientation of architecture in all periods at Kani Shaie). At least three layers of stones form these foundations, but in many locations the bottoms have not yet been reached and it could not yet be ascertained whether these were partially dug in or fully standing above ground. Where these stone wall foundations were fully preserved, the top was intentionally made horizontal to support an adobe superstructure. The decay of this superstructure resulted in a thick deposit, but nothing of it remains. Since no trace of mudbricks have so far been detected anywhere in the trench, the use of pisé for the superstructure appears the most likely.

Most of the trench is occupied with a rectangular courtyard and an exterior space in the northwestern quadrant. In that exterior space, a large, smashed storage jar was discovered. Two more such storage jars were also found in an adjoining sounding in 2016. Despite being in-situ, collapse from the superstructure caused their destruction. Otherwise, this space was largely disturbed by cuts from Middle Islamic pits, including large stones in their fill. The courtyard area was equally disturbed by later pits, but throughout its central axis a pebble pavement was constructed that led toward a small staircase and entrance with door socket. In the southwestern quadrant of the trench, the edge of a building was exposed. The floor of this building was higher and constructed with a stone slab pavement (again disturbed by several pits). A small room, ca. 1.5m wide, could be reached by a descending staircase. In future seasons, we plan to expand this excavation area to expose more of the building.

The exact date of this building is not yet fully ascertained but falls within the post-Assyrian period. The appearance of red-slipped wares support an Iron Age date earlier than the Parthian period occupation of Level 4. The upper deposits of Level 5 contain pottery that suggests a Hellenistic date, such a “dog tooth” decoration and “fish plates”. However, the length of the use of the Level 5 building might have been substantial as there are indications of alterations and use of the architecture after the courtyard pavement was already covered by deposits. Currently, we hypothesize two phases of use, one being the primary use in the years following the initial construction and a secondary phase when the building was falling in disrepair but continued to be inhabited and adjusted for new needs. This later phase likely falls within the Hellenistic (Seleucid or early Parthian) period, but the initial construction could have been as early as the Achaemenid period. The chronology of post-Assyrian pottery remains unresolved and hindered by a conservative ceramic assemblage that remained largely unchanged from the 6th to 3rd centuries BCE. One challenge in the coming years at Kani Shaie will be to build a detailed ceramic chronology for the different occupation levels, tied to radiocarbon dates, in an attempt to

Fig. 7: Vertical Photograph of Area D during excavation in 2024. Main walls are highlighted in dark yellow with preserved pavement and staircases in light yellow. (KSAP).

detect small changes in vessel shapes or frequencies in the overal assemblages.

5. Conclusion

The 2024 excavation season at Kani Shaie achieved two major breakthroughs in the archaeology of the Sulaymaniyah region of Iraqi Kurdistan. First, the previously undocumented transition of ca. 3100-2900 BCE from the Late Chalcolithic ("Uruk") to the Early Bronze Age was investigated in significant detail. During this transition, the settlement at Kani Shaie underwent major architectural transformation with the construction of a large, circular enclosure wall that encompassed dense food storage and production areas. This interior space accumulated very rapidly as a result of continuous activities, including those entailing fire. The interior courtyard area was repeatedly filled with black ash. These spaces were rarely cleaned out, and instead excavations documented an uninterrupted accumulation of various surfaces, ad hoc activity areas, and at least three rebuildings of interior spaces. This type of Early Bronze Age architectural complex is by now well documented across northern Mesopotamia, from the Middle Khabur in the Jezirah to the Hamrin Valley on the Diyala/Sirwan River (Heil 2011; Renette 2009; Schwartz 2015). Kani Shaie is the first confirmed construction of this type further east at the foot of the Zagros Mountains. These “Round Buildings” clearly were part of a widespread practice of communal storage within remarkably similar small settlements, despite highly regionalized ceramic traditions. Communities from the Jezirah steppelands to the Zagros foothills shared closely related socioeconomic organization while adoption distinct cultural practices of visual expression and potentially food consumption, as visible in the painted ceramic record. This challenges earlier assumptions of fairly isolated communities within separated regional cultural traditions (Akkermans & Schwartz 2003: 211-232; Ristvet 2017; Rova & Weiss 2003; Schwartz 1985). The origins of the interaction sphere that encompassed these dispersed communities needs to be sought in the aftermath of the collapse of the long-distance, directional networks of the Uruk world of the late fourth millennium BCE. At a time when southern Mesopotamia turned inward, disconnecting itself from trade networks or at least no longer attempting to gain direct control over the flow of resources, the communities across northern Mesopotamia and the northern Zagros Mountains developed new, bottom-up exchange networks that were no longer governed by growing urban centres. Instead, small settlements took on increasingly central roles as places of gathering for dispersed communities and the organisation of large-scale communal storage of food staples. Such storage might have served for the purpose of large feasting events to facilitate social relationships that were essential for the maintenance of exchange networks. Alternatively, or additionally, collective storage and production of food staples could have been organized to deal with the surpluses of production left behind in the aftermath of network collapse and turned toward new purposes such as risk management. The constant availability of collective surpluses could have sustained communities in their continued production of specialized goods or other endeavours, preventing a need to return to a subsistence-level economy.

The second major contribution is the discovery of a substantial architectural complex of the post-Assyrian period. Recent archaeological work in Sulaymaniyah is rapidly demonstrating the importance of this region. The Rabana-Merquly fortification and cultic complex at Mount Piramagrun has tentatively been identified as the ancient city of Natounia, summer residence of the kings of Adiabene (Aziz Zamua 2011; Brown *et al.,* 2022). The complex controlled the important Tanjaro Plain that connected the Erbil region with the agriculturally productive Shahrizor Plain where excavations at Yassin Tepe and survey in the Shahrizor Plain have also identified significant Parthian-period occupation (Altaweel *et al.,* 2012: 26; Miglus *et al.,* 2013; Mühl & Fassbinder 2016). Preliminary results from survey in the Bazyan Valley identified a high density of occupation during both the Parthian and Sassanian period. Excavations at Kani Shaie have now confirmed that the Bazyan Valley was fully integrated in the economic development and growth in political importance of the Sulaymaniyah region during these periods. While the exact nature of the architectural complex at Kani Shaie remains to be determined, the scale of the stone wall foundations and the layout with courtyard into a raised building exceed regular domestic structures and potentially are part of an administrative outpost or substantial elite mansion.

Work at Kani Shaie will continue at least until 2026 with expansion of excavation area and a detailed investigation of the Late Chalcolithic Uruk settlement. Simultaneously, survey of the Bazyan Valley will resume. LC and EBA material has been rare in previous survey work, suggesting that Kani Shaie might have served as the main demographic centre in this small valley in an otherwise sparsely populated landscape. As such it might have served as main stopping point or gathering place connecting communities from the Chemchemal region to the west and the Tanjaro-Shahrizor Plains to the east. In contrast, during the Hellenistic, Parthian, and Sassanian periods, the valley became densely occupied and exploited. However, the survey will also target other periods of occupation that have as yet remained poorly investigated in this region, with particular focus on the Neolithic and the Middle to Late Bronze Age.

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گزارش کاوش ۲۰۲۴ در کانی‌شائی: داده‌های جدید دربارۀ اوایل عصر مفرغ و سکونتگاه‌های هلنیستی-پارتی

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چکیده

کانی‌شائی یکی از مهم‌ترین استقرارگاه‌های باستان‌شناسی مهم در استان سلیمانیۀ اقلیم کردستان عراق است. این مکان در مرکز درۀ بازیان واقع‌شده و در محور ارتباطی اصلی قرار دارد که شمال میان‌رودان را از طریق کرکوک به رشته‌کوه‌های زاگرس‌مرکزی در غرب ایران متصل می‌کند. دورۀ اصلی این محوطۀ باستانی به دورۀ مس‌وسنگ و اوایل دورۀ مفرغ (مفرغ قدیم)، از حدود ۶۰۰۰ تا ۲۰۰۰پ.م. برمی‌گردد. دوره‌های بعدی نیز به عصر مفرغ جدید، دورۀ آشور نو و دورۀ هلنیستی-پارتی مربوط می‌شود. در طول این هزاره‌ها، کانی‌شائی به‌عنوان یک مرکز مهم سکونت در درۀ بازیان شناخته می‌شد؛ هرچند که هرگز بیشتر از ۳ هکتار وسعت نداشت، سکونت در هر دوره نشان‌دهندۀ عملکرد این سکونتگاه به‌عنوان یک مرکز محلی بود که در شبکه‌های تبادل جنوب‌غرب آسیا ارتباط داشت. به‌همین‌دلیل، کانی‌شائی اهمیت ویژه‌ای در پیوند باستان‌شناسی غرب ایران و دنیای میان‌رودان دارد. در این پژوهش، نتایج کاوش‌های فصل ۲۰۲۴م. را ارائه می‌دهیم که در آن دو مجموعۀ معماری چشمگیر مورد بررسی قرار گرفت. اولین مجموعه به آغاز دورۀ مفرغ قدیم، حدود ۳۰۰۰پ.م.، پس از فروپاشی شبکۀ تبادل اوروک تعلق دارد. دومین مجموعه به دورۀ هلنیستی-پارتی مربوط می‌شود و احتمالاً با گسترش جنوبی پادشاهی آدیابنه مرتبط است.

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Ritual Practices in the Kura-Araxes Culture: Hearths and Figurines as Markers of Religious Identity

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Kura-Araxes Culture, Hearth, Figurine, Ritual Practices, Religious Identity, Northwestern Iran, South Caucasus, Eastern Anatolia.

Abstract

The investigation and characterization of the Kura-Araxes culture is a key focus of archaeological research in this field. One of the enigmatic aspects of the Kura-Araxes culture is the role of religion, rituals, and associated ritual evidence among its people. This aspect holds particular significance not due to its spiritual or supernatural dimensions, but rather because of the limited, scarce, and largely unknown nature of the cultural evidence. Archaeological findings related to this facet of Kura-Araxes culture, such as figurines, hearths, and possibly architectural elements, have been uncovered across the entire expanse of this culture's territory, from northwest Iran to eastern Anatolia and the South Caucasus. One of the primary objectives of this research is to explore the social identity and ritual beliefs of Kura-Araxes communities, and to identify the symbols, elements, and religious signs of the Kura-Araxes culture. This investigation is based on a combination of library-documentary studies and first-hand archaeological data from excavations in Iran and the broader Kura-Araxes cultural sphere. This research also aims to address the following questions and uncertainties: What insights do archaeological evidence and documents provide regarding the ritual-religious beliefs of Kura-Araxes communities? Additionally, what are the key differences and similarities in the religious beliefs of Kura-Araxes communities across Iran, the Caucasus, and other regions within the Kura-Araxes cultural sphere? More broadly, can we definitively discuss belief systems, religion, rituals, and associated sacred spaces in relation to these communities? The forthcoming study will focus on answering these questions and addressing the stated objectives to clarify some of these ambiguities. The results indicate that while the Kura-Araxes culture and its people did not have dedicated religious spaces or distinct places for their rituals (based on current findings and evidence), it is important to consider two factors: first, the temporal span (3500–2400/2500 BCE) and the continuity of this culture; and second, the contemporary cultures, such as Uruk, which were characterized by established religious practices. Additionally, religious and ritual practices were prevalent among Bronze Age cultures. Therefore, it is unlikely that the Kura-Araxes communities were devoid of religion and rituals. However, rather than a sedentary and fixed culture, if we accept the hypothesis of the Kura-Araxes culture being semi-nomadic pastoral, then their ritual artifacts, such as figurines and hearths, were likely small and portable. Consequently, these artifacts reveal traces of their ritual beliefs, allowing us to consider ritualistic characteristics as part of this culture.

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1. Introduction

During the period from the mid-fourth to the mid-third millennium B.C. (3500–2500/2400 B.C.), significant socio-political, and cultural transformations occurred globally, particularly in West Asia. These transformations included the rise of kingdoms, the establishment of cities, the formation of armies and bureaucracies, the emergence of large-scale economic and specialized production, and the development of official systems of trade, both inter-regional and extra-regional. These changes prompted nomadic herders, rural farmers, and merchant artisans to adapt their lifestyles to the evolving circumstances (Batiuk and Rothman, 2007). The changes and transformations observed during this period were primarily of local (endogenous) origin, although some were influenced by external factors. The initial exogenous influence can be attributed to the spread of Beveled Rim Bowls, a characteristic of the Uruk culture, which reached the Iranian plateau in the 4th millennium B.C. Another significant external cultural impact was the influence of the Kura-Araxes culture on the Iranian plateau, particularly in the northwest and western regions (Abedi *et al.,* 2014a-b; Maziar, 2010; Alizadeh *et al.,* 2015; Abedi and Omrani, 2015; Abedi, 2016a-b; Batiuk *et al.,* 2022). The Kura-Araxes culture, which existed from the mid-4th millennium B.C. (approximately 3500 B.C.) to the mid-3rd millennium B.C. (2500 B.C.), was primarily composed of semi-nomadic pastoralist who were also engaged in agriculture. This culture extended across a vast region encompassing the Caucasus, the Upper Euphrates, the area around Lake Urmia, Eastern Anatolia, and the Levant (Sagona 2018). It played a significant role in the region until its decline at the end of the 3rd millennium B.C. This decline was likely due to a combination of internal pressures, external conflicts, and notably, the occurrence of droughts at the end of the 3rd millennium B.C. (Omrani, 2006). Summarizing a large-scale and long-term phenomenon like the Kura-Araxes culture is challenging due to its significant regional variation and extensive temporal development. Nonetheless, despite this regional and temporal diversity, it is possible to identify a set of cultural markers that emerged with the formation of the Kura-Araxes culture and have consistently been reproduced across both spatial and temporal dimensions (Sagona, 1993). During the excavations, artifacts such as figurines, hearths, and possibly architectural remains have been recovered. These cultural materials and the information derived from them suggest the presence of a specific religious identity and ritual practices within the Kura-Araxes culture. Furthermore, there appears to be a correlation between the persistence and recurrence of these cultural materials across various times and locations and their association with ritual and religious identity within the culture. Religious and ritual identity represents a key aspect of the Kura-Araxes culture. Evidence and related cultural materials, including figurines, hearths, burials, and architectural remains, exhibit commonalities that likely affirm the presence of this cultural characteristic among the Kura-Araxes peoples.

This research utilizes published sources and primary reports from archaeological excavations, incorporating data from cultural materials found at Kul Tepe Gargar, Kul Tepe Sarein, and other relevant sites. A primary objective of this study is to examine the social identity and ritual beliefs of the Kura-Araxes communities, as well as to identify religious symbols, elements, and signs associated with the Kura-Araxes culture. This analysis is based on previous studies, surveys, and excavations, supplemented by first-hand data from recent excavations across Iran and the broader Kura-Araxes cultural region. This research aims to address the following questions and uncertainties: What insights do archaeological documents and evidence provide regarding the ritual and religious beliefs of Kura-Araxes communities? Additionally, what are the differences and similarities in the religious beliefs of Kura-Araxes communities across Iran, the Caucasus, and other regions within the Kura-Araxes sphere? More broadly, can we discuss belief systems, religion, rituals, and associated sacred and ritual spaces in relation to the Kura-Araxes communities? The forthcoming study will focus on answering these questions and addressing the related objectives to clarify these issues and resolve existing ambiguities.

2. The background of archaeological research on the Kura-Araxes culture in the South Caucasus and Northwestern Iran

The Kura-Araxes culture was first identified in 1869 in Azerbaijan through surface surveys that revealed its characteristic pottery within the South Caucasus (Areshian, 2005). Subsequent investigations by Russian archaeologist Boris Kuftin, who conducted extensive research in the region, formalized the term "Kura-Araxes" and contributed to its recognition as a distinct archaeological culture (Kuftin, 1940). In the mid-20th century, scholars such as Kavtaradze, Martirosian, Khanzadian, and Munchaev focused on establishing the chronology and developmental phases of this culture. Later discoveries extended the known geographical distribution of the Kura-Araxes culture. In eastern Anatolia, Kuşay identified the Karaz site in 1942 and 1944, while in northwestern Iran, Brown introduced the culture at Geoy Tepe in 1948 (Burton-Brown, 1951). Further evidence emerged in the Amuk Plain, where a joint British-American excavation project confirmed the culture's presence. Since the 1950s, numerous excavations and surveys have expanded our understanding of the Kura-Araxes culture across diverse regions. Prominent examples include investigations in the South Caucasus (Burney and Lang, 1971), Tell al-Judaidah and Tell Dhahab in Syria, and Sos Höyük in eastern Anatolia (Sagona, 2000). Additional research has been conducted at sites in northwestern Iran, such as Yanik Tepe (Burney, 1961), Godin Tepe in the Central Zagros (Young, 1969), Haftavan Tepe (Burney, 1970), and Tepe Gijlar (Pecorella and Salvini, 1984). These studies collectively highlight the extensive spatial distribution and cultural significance of the Kura-Araxes phenomenon, underscoring its role as a pivotal early Bronze Age culture spanning the South Caucasus, Anatolia, and northwestern Iran (Fig. 1).

Recent research-driven excavations have substantially advanced our understanding of the Kura-Araxes culture, particularly in northwestern Iran. Key sites subjected to extensive study include Kohneh Pasgah (Aqalari, 2008; Maziar, 2010), Kohneh Tepesi (Zalghi and Aqalari, 2007), Kul Tepe Gargar (Abedi *et al.,* 2014a; Abedi and Omrani, 2015; Abedi, 2016; Davoudi *et al.,* 2018), Kohneh Shahr (Ravaz) (Alizadeh *et al.,* 2015; Alizadeh *et al.,* 2018), Kul Tepe Sarein (Ebrahimi, 2019), and Tepe Pirtaj (Sharifi, 2021). In addition, investigations in the Central Zagros region—including Tepe Pisa (Mohammadifar *et al.,* 2009), Tepe Ghurab Malayer (Khaksar and Hemmati, 2013), and Tepe Qaleh Sarsakhti Shazand (Abedi *et al.,* 2014b)—as well as studies on the Qazvin and Tehran plains (Fazeli and Ajorloo, 2013) have contributed significantly to the broader understanding of this cultural horizon. Notably, prior to the past decade, Early Bronze Age research in northwestern Iran was primarily concentrated within the Lake Urmia basin. However, excavations in the Khodaafrin region, prompted by dam construction projects (Zalghi and Aghalari, 2007; Aghalari, 2008), alongside renewed investigations at Kul Tepe Gargar (Abedi *et al.,* 2014a; Abedi, 2016a-b), marked a pivotal expansion of research efforts

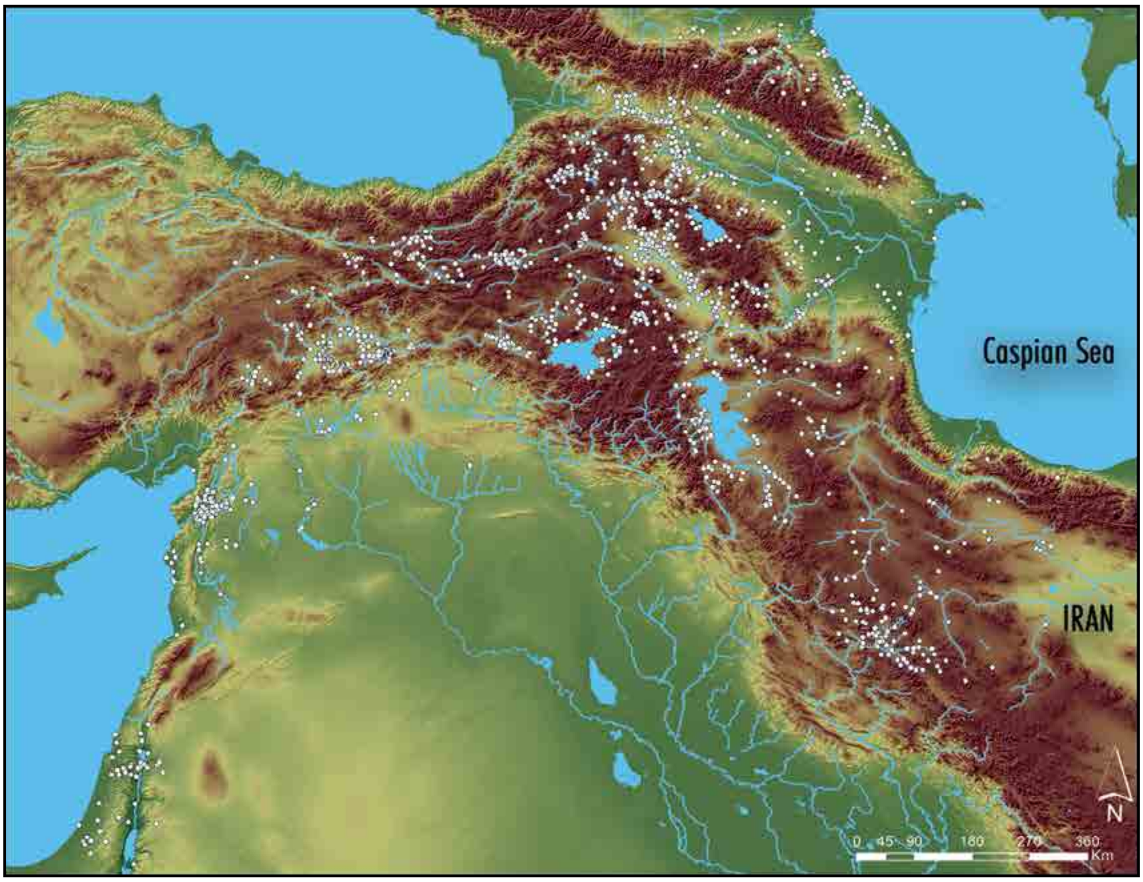


Fig. 1: Distribution map of sites bearing Kura-Araxes Material Culture (after: Batiuk, 2022).

into this cultural domain. These projects have generated critical new data on the Kura-Araxes culture and prompted a partial reassessment of its broader spatial and temporal framework. The resulting publications have contributed to a revised understanding of the cultural dynamics and geographical extent of the Kura-Araxes phenomenon within northwestern Iran.

Research into the ritual and religious identity of the Kura-Araxes culture has been notably advanced by Antonio Sagona, whose 1998 study provided a comprehensive analysis of the social and ritual-religious aspects at Sos Höyük in Eastern Anatolia (Sagona, 1998). Further contributions to the understanding of the ritual landscape of this culture were made by Simonyan and Rothman (2015), who highlighted significant findings from Shengavit. More recent works, including Sagona's 2018 publication and studies by Batiuk and colleagues (Batiuk *et al.,* 2022), have further explored the beliefs and ritual practices associated with the Kura-Araxes culture. Despite these advances, much of the existing scholarship has primarily focused on specific cultural materials—such as hearths and figurines—analyzed in isolation, leaving broader interpretations of the ritual and religious framework of the Kura-Araxes culture relatively underexplored.

3. Ritual Evidence and Practices in Kura-Araxes Culture: Insights from Archaeological Findings in the South Caucasus, Northwestern and Western Iran, Eastern Anatolia, and the Levant.

Social identity theory posits that individuals possess multifaceted self-concepts that fluctuate across diverse social settings. An individual's thoughts, feelings, and behaviors may be shaped by personal, familial, or national identities depending on the specific social context. This conceptualization of social identity offers a fruitful avenue for exploring the interregional convergence of cultural forms and the dynamic processes of cultural transmission (Stein, 2010). The Kura-Araxes traditions shaped their worldview, fostering a shared identity and collective ideals that unified communities. These practices not only reflected their cultural values but also served as a means of social cohesion. Additionally, the integration of ritualized daily activities, such as communal feasting and the symbolic use of hearths, reinforced bonds and expressed their connection to ancestral heritage (Batiuk *et al.,* 2022). The presence of shared cultural phenomena, including pottery styles, burial customs, metalworking techniques, and small artifacts, points to a substantial transformation from earlier periods. The widespread use of animal and human figurines and portable hearths within the Kura-Araxes cultural sphere provides further evidence for a shared socio-religious identity extending across the South Caucasus, Eastern Anatolia, and Northwestern Iran (Fig. 2).

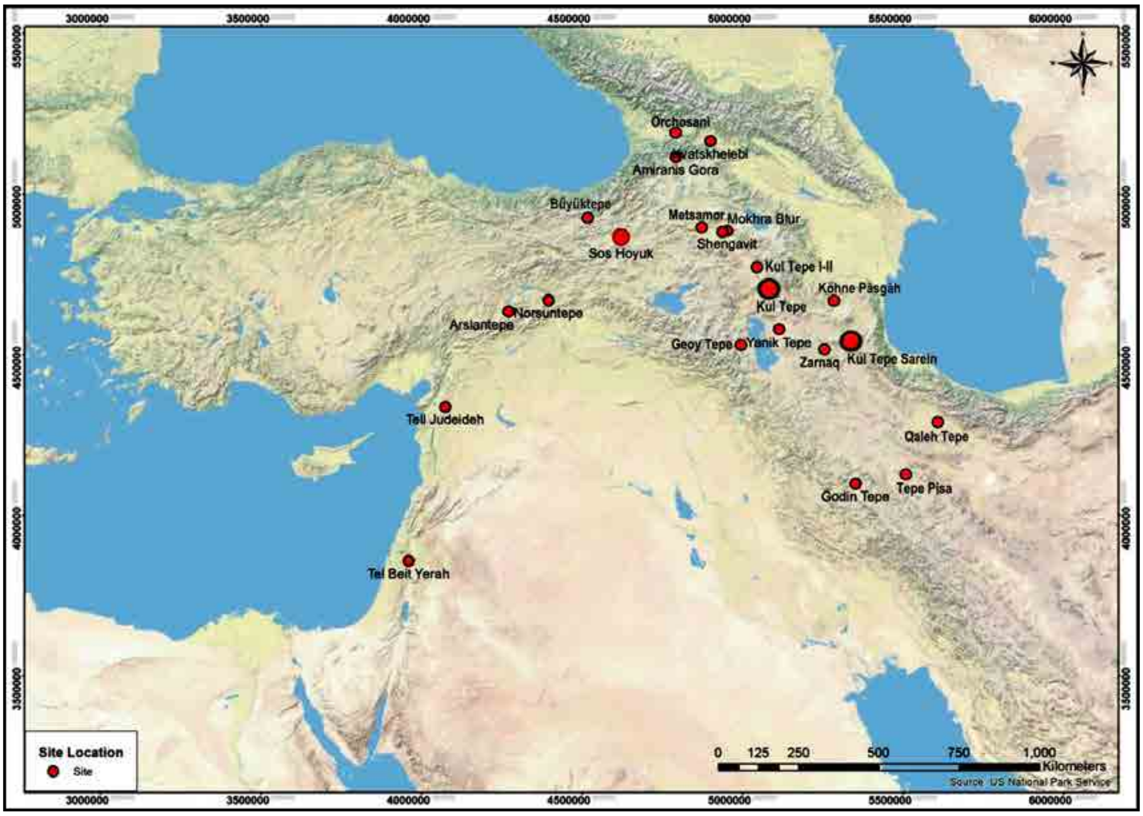


Fig. 2: A map showing the distribution of significant sites with evidence of ritual activities in the Kura-Araxes culture mentioned in the text.

3.1. Architecture

The sacred spaces associated with Kura-Araxes rituals were primarily centered around the household rather than dedicated temples typically used as gathering places for congregations, with a few potential exceptions (Sagona 1998; Simonyan and Rothman 2015; Batiuk *et al.,* 2022). In the Kura-Araxes culture, two architectural styles are predominant: circular and rectilinear plans. To date, no confirmed evidence has been found that distinguishes residential buildings from ritual structures within this culture. In modern societies with organized Great Tradition religions, the authority of religious leaders—such as priests, ministers, rabbis, mullahs, or monks—is reflected in the spatial arrangement of worship. Congregants typically face a designated front where the leader stands or sits, alongside prominently displayed sacred symbols. In contrast, more egalitarian or kinship-based societies often orient their sacred spaces around a central focal point, emphasizing communal equality. This principle is similarly reflected in the sacred spaces of the Kura-Araxes culture, where the central orientation is evident. Benches positioned along the outer walls of rooms with sacred symbols suggest a communal focus on the center of the space. Examples of this arrangement can be observed at various sites from the KA2 phase, including the public feasting center at Kura-Araxes Godin IV:1 (Fig. 4J), the "Red House" at Kvatskhelebi C1 (Fig. 3:7-10; 4J), Building 36 at Arslantepe, and potentially at Shengavit (Fig. 3:1-3; 4I) (Batiuk *et al.,* 2022).

However, there are notable examples, such as in the Pulur (Sakyol) site, where a fire destroyed the structures on Level X, yet a horseshoe-shaped hearth adorned with human and geometric reliefs remained well-preserved (Fig. 3: 4-6; 4K). Similarly, hearths in several small residential houses were also well-preserved, suggesting these locations may have held particular significance (Yalçın, 2020). These hearths were found in association with a large jar featuring an engraved face and several small cups (Fig. 4E) (Koşay, 1976). At Sos Höyük in Anatolia during the Early Bronze Age II (2800-2500 BCE), the residential structures remained relatively unchanged. A single-room house, constructed with brick walls on elevated stone foundations, featured a round ceramic hearth initially equipped with three central projections on the floor and decorated with a double spiral motif. Behind the hearth was a bench positioned along the rear wall, though the precise function of this architectural feature remains unclear (Fig. 3:11,12) (Sagona and Sagona, 2000). At Shengavit, architecture features both circular and rectangular plans that are closely situated. Additionally, two-story grain storage pits, carefully sealed with circular lids, have been found containing wheat and barley. The interior is surrounded by defensive walls, and a hidden tunnel leading towards the Hrazdan River, along with a substantial collection of stone tools, gold beads, and marble and agate scepters, provides strong evidence that Shengavit was a city with advanced agricultural and industrial capabilities, including spinning and symbols of power (Simonyan and Rothman, 2015). At Shengavit, there are rooms located below ground level where hearths are installed, requiring descent via several steps, and these rooms exhibit small-scale architecture with offerings and burned plants found within the hearths (Fig. 3:1-3; 4I). This pattern is also observed at the Pulur / Sakyol Höyük (Simonyan and Rothman 2015). At Kul Tepe in Nakhchivan, an architectural structure, possibly a ritual space, has been discovered. This structure consists of the remains of a circular building. During the excavation, a hearth constructed with stamps, animal bones, and ceramic fragments was found, along with a hearth shaped like a bull's horn. This architecture can be attributed to the early stages of the Kura-Araxes culture. The lower part of the walls is built with river stones, while the upper part is constructed with clay bricks. On the eastern side of the wall, the walkway is covered with river stones and bricks. On the western side, a circular hearth filled with ash was found, surrounded by a mound of ash, animal bones, and ceramic fragments (Baxşəliyev and Quliyeva, 2017).

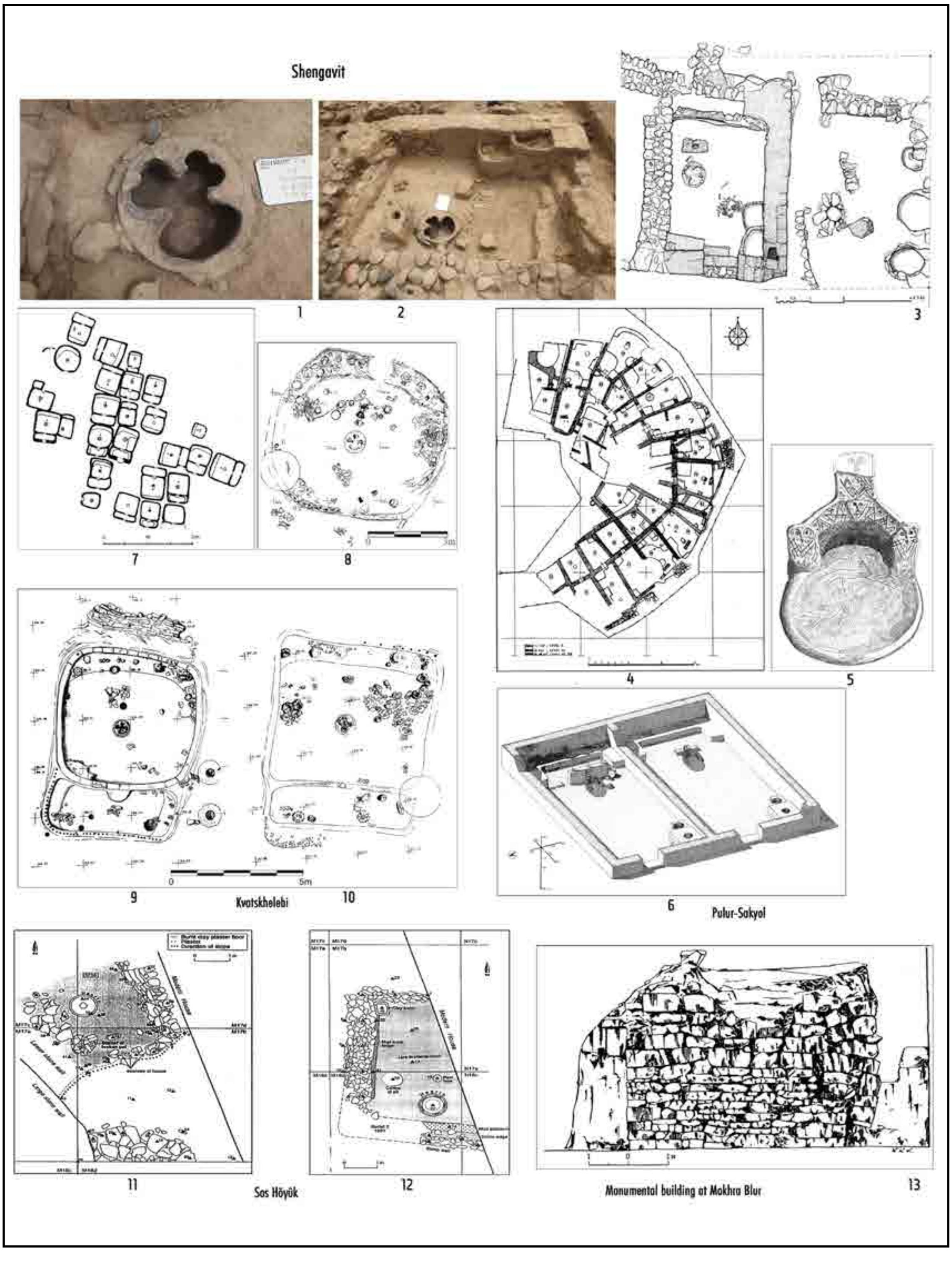


Fig. 3: Ritual buildings of the Kura-Araxes; Shengavit (1) three-lobed hearths (ojagh/ocak), (2) multi-room construction for cult rituals discovered in M:5, (3) plan of cult ritual M5 building (after Simonyan 2015: Figure 7, 8, 14); (4) Pulur-Sakyol (5) radial plan of the village of levels XI and X, (6) a reconstruction of the interior of the houses and one of the "sacred" hearths (after Koşay 1979: Pls. 120, 38, 37); (7-10) Kvatskhelebi, the village and the domestic architecture from level C1. (7 after Sagona 1993: Fig. 6; 8-10 after Džavakhishvili, Glonti 1962: Pls. XI, XIX, XXI); Sos Höyük VB and VC, (11) domestic structures from the Early Bronze Age I (12) and II. (from-Sagona, Sagona 2000: Figs. 1, 2); (13) The monumental building at Mokhra Blur (after Areshian, Kafadarian 1975: Fig. 1) (Figure 4-13 after from Palumbi 2008).

1.3. Heart and Andirons

Sagona and Sagona (2009) propose that the distinction between secular and sacred spaces in the Kura-Araxes context may not align with the perspectives of the culture itself. Instead, they highlight the importance of physical symbols in ritual practices, with the hearth serving as the central sacred emblem (Fig. 3-6). In the Kura-Araxes culture, hearths, like other archaeological evidence within the three regions of this culture's distribution, are found in both fixed and portable forms. In Iran, at Yanik Tepe, Burney describes a fragment of a hearth that features a schematic face decoration on its upper part, with a geometric, checkered pattern of engraved diamonds beneath it (Fig. 5: 17). Some of these hearths are adorned with ringed openings, while others are filled with smaller concentric diamonds (Burney, 1961; Smogorzewska, 2004). A fragment of an engraved object, which is incomplete, may have been part of a hearth or fire altar (Burney, 1961). At Geoy Tepe, a small portable hearth with a burnt black surface was discovered. Its size is unclear, the original design is unknown, and it has undergone restoration (likely similar to the tripod hearths found in Armenia). The hearth's walls contain two nearly identical holes. While the exact height is indeterminate, the form is angular/rectangular (Table 1). This hearth is one of the early excavated examples of the Kura-Araxes culture in northwestern Iran, confirming the presence of this culture (Burton-Brown 1951).

At Godin Tepe, each house contained two hearths: one situated in the corner of the room and another in the center. These houses resembled a type of nomadic tent, featuring a bench made of mudbrick or stone that was used for resting, storage, or protecting goods from moisture. A small internal hearth provided heating and was used for minor cooking, while a larger external oven was primarily used for cooking meals for the household. Several hearth stands from Godin IV, of the simplest cylindrical type, have also been found. The designs and decorations of these hearth stands show stylistic links with those from Yanik Tepe, located east of Lake Urmia. The hearth stands often had handles, facilitating easy transportation by semi-nomadic pastoral groups. The hearth was communal for all household members and did not require formal management (Gopnik and Rothman, 2011:149-152) (Fig. 4J; Table 1).

During the KAII phase of the Kura-Araxes tradition, three-lobed hearths (ojagh/ocak) were positioned near the center of structures at sites such as Norşuntepe, Kvatskhelebi C1 (Fig. 3: 7-10), and the early roundhouse phase at Shengavit (Fig. 3: 1-3; 4I). While this specific hearth design was not universally adopted across the entire Kura-Araxes cultural sphere, it was a prevalent feature in the homeland zone and extended into the Taurus diaspora. In the KA1 phase, sites like Sos Höyük featured ceramic hearths with a distinctive small hole in their otherwise closed tops, often adorned with carved designs, much like the three-lobed hearths. However, ceramic hearths were absent in other regions of the diaspora. Instead, andirons became the primary feature, especially in areas such as the Southern Levant and the central Western Zagros. These andirons, which often coexisted with hearths in homeland sites like Shengavit, were crafted in forms resembling animals, human-like faces, or simple bumps suggestive of facial features (Takaoğlu 2000; Smogorzewska 2004; Batiuk *et al.,* 2022).

Outside of Iran, four fixed hearths resembling horseshoes were discovered at sites such as Orchosani. The hearth bases were placed on a specially prepared soil foundation composed of multiple layers designed to act as thermal insulation. The hearth bases were constructed from pottery fragments, painted with a fired red band, and the walls were filled with additional pottery pieces (Gambashidze *et al.,* 2018). One of the features of Shengavit is the round (spherical) ceramic hearths, with a diameter of 75 to 100 centimeters, a flat base, and walls 25 centimeters high. These hearths have a wide decorative rim at the top and interior surfaces adorned with cloverleaf-like indentations (Fig. 4: A-B; 5:3). Kuftin

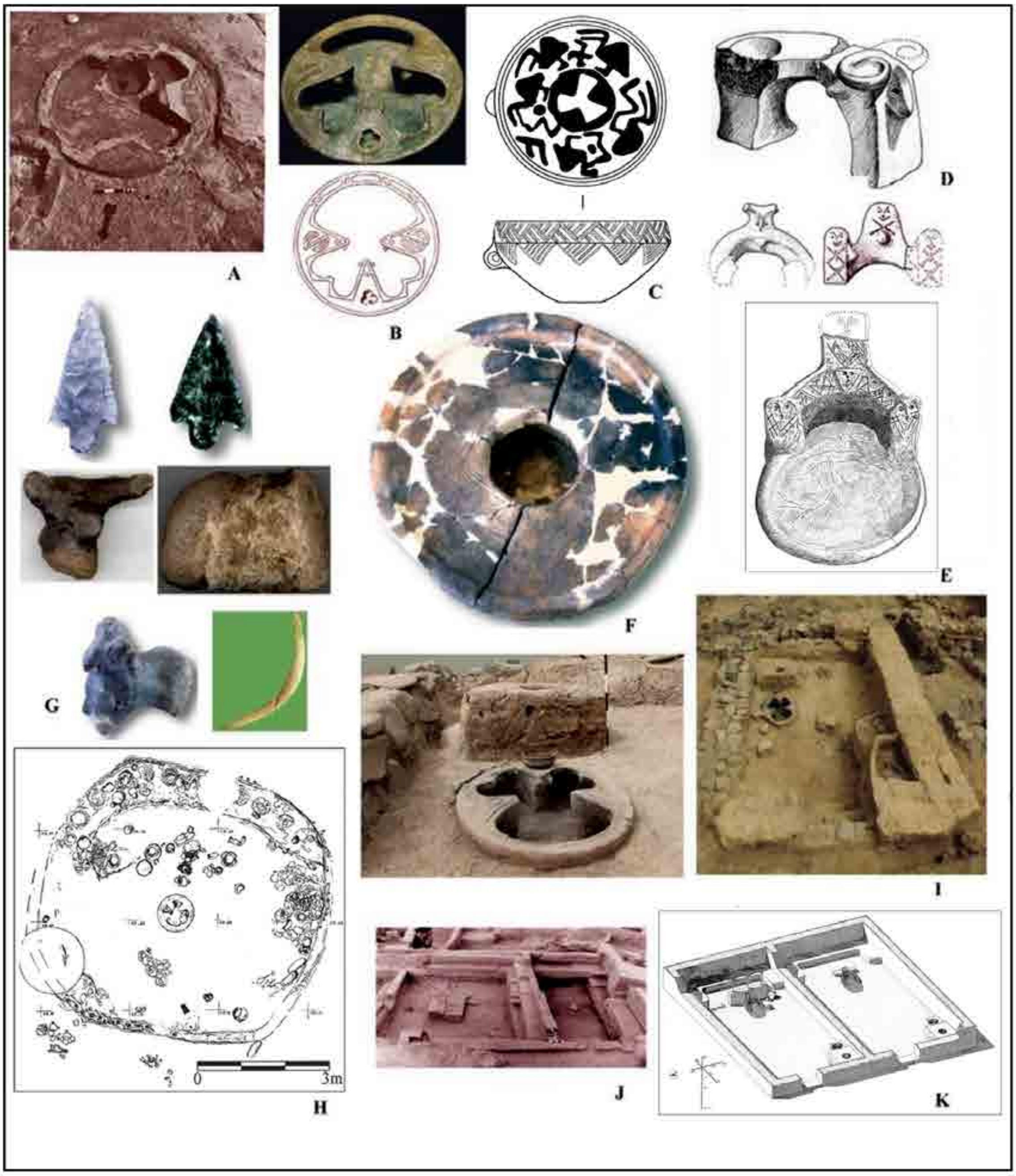


Figure 4: Ritual elements of the Kura-Araxes. A) ceramic hearth at Norşuntepe (after Hauptmann 1982, fig. 18,2); B) Shengavit hearths (after Sardarian 1967, p. 175, fig. 1; Badalyan et al. 2008, p. 1, fig. 102:162); C) bowl from Shengavit (after Badalyan et al. 2015, fig 496); d) Shengavit andiron (after Bayburtian 2015, fig 15); E) andirons and serving vessels in Shrine at Pulur Sakyol (after Koşay 1976, fig. 19:2; Rothman 2003); G) obsidian blades, bull and sheep figurines, phallus, and red deer horn from Erzurum and Shengavit (Simonyan and Rothman 2015, fig. 13); H) Kvatskhelebi round, red house (after Palumbi 2008, fig. 5:3.); I) M5 shrine at Shengavit (Simonyan and Rothman 2015, fig. 10, 11); J) feasting center at Godin IV:1 (after Rothman 2011, fig. 5:3); K) ritual emplacement in houses at Pulur Sakyol (after Koşay 1976, fig. 37) (the whole figures after Batiuk et al. 2022: Fig. 4).

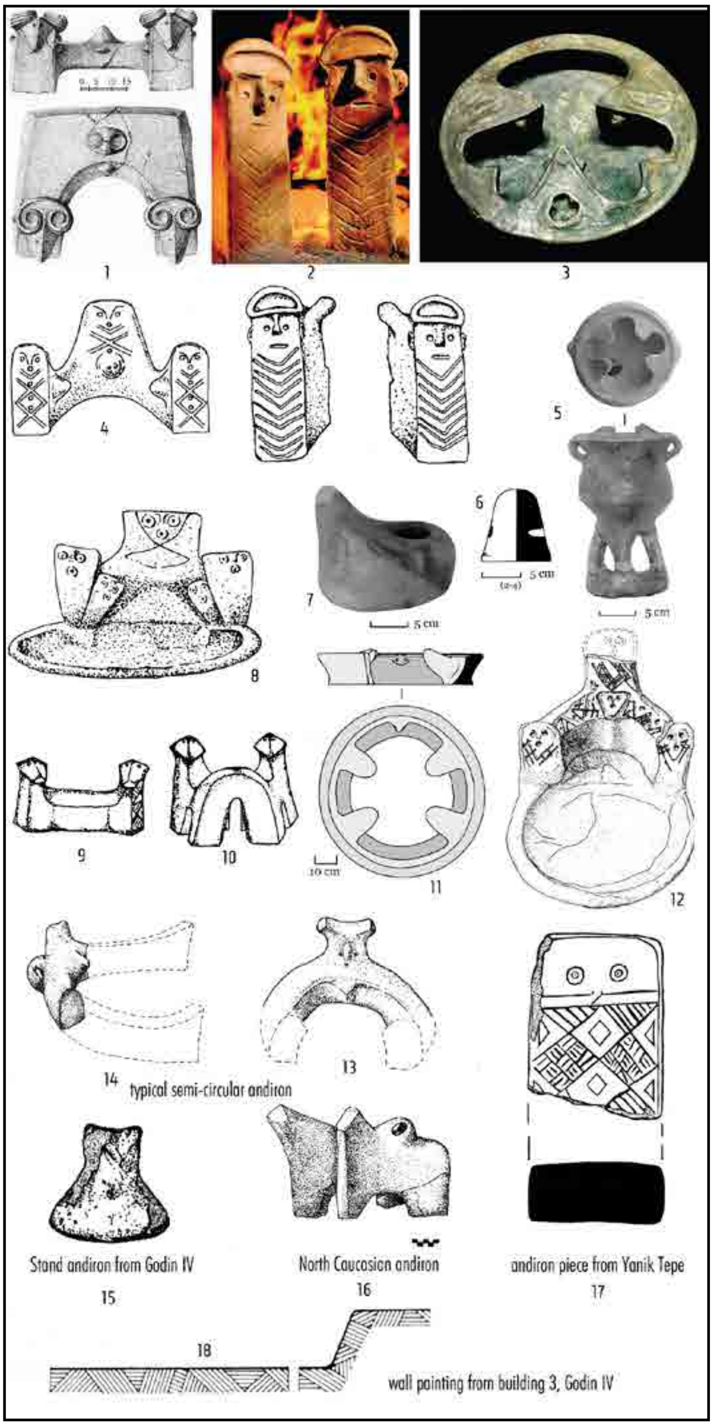


Fig. 5: "Kura-Araxes Kura- Araxes hearths" (1) Kharnut: zoomorphic (after Badalyan, R. 1985), (2) Cinis: anthropomorphic (after after Işıklı 2010) (3) Shengavit: three-leaf shaped fireplaces (after Badalyan et al. 2015); (4) Tabara el-Akrad (after Hood 1951; Takaoglu 2000: Fig. 2b); (5) Kvatskhelebi C2, pedestalled pot with miniature hearth around the rim (after Sagona 2018: Figure. 5.7 (4)); (6) Takhtidziri, andiron (after Jalabadze and Palumbi 2008); (7) Sos Höyük VA, horned andiron (after Sagona 2018: Figure. 5.7 (2)); (8) Pulur (Sakyol) portable hearth (after Koşay 1976); (9-10) Güzelova (after Koşay 1967); (11) Tsikhiagora B2, clay hearth (after Makharadze 2008); (12) Pulur (Sakyol) portable hearth (after Koşay 1976, fig. 19:2; Rothman 2003); (13-14) semi-circular andiron from Caucasus (after Gopnik and Rothman 2011: Figure 5.10); (15) Stand andiron from Godin IV (after Gopnik and Rothman 2011: Figure 5.10); (16) North Caucasian andiron (after Gopnik and Rothman 2011: Figure 5.10); (17) andiron piece from Yanik Tepe (after Burney 1961: PLATE LXXIV: 60); (18) wall painting from building 3, Godin IV (after Gopnik and Rothman 2011: Figure 5.10).

mistakenly described them as portable hearths, but excavations in 2012 confirmed that their bases were actually plastered and fixed with stones (Simonyan, 2015). At Kul Tepe I in Nakhchivan, heating for homes was provided by rectangular and circular hearths. Additionally, at Kul Tepe II in Nakhchivan, alongside rectangular hearths, horseshoe-shaped hearths resembling human figures were also found in the center of the houses. The presence of such features in all homes suggests a form of ritual unity among the people, indicating that each house served as a sacred space or, in other words, a personal

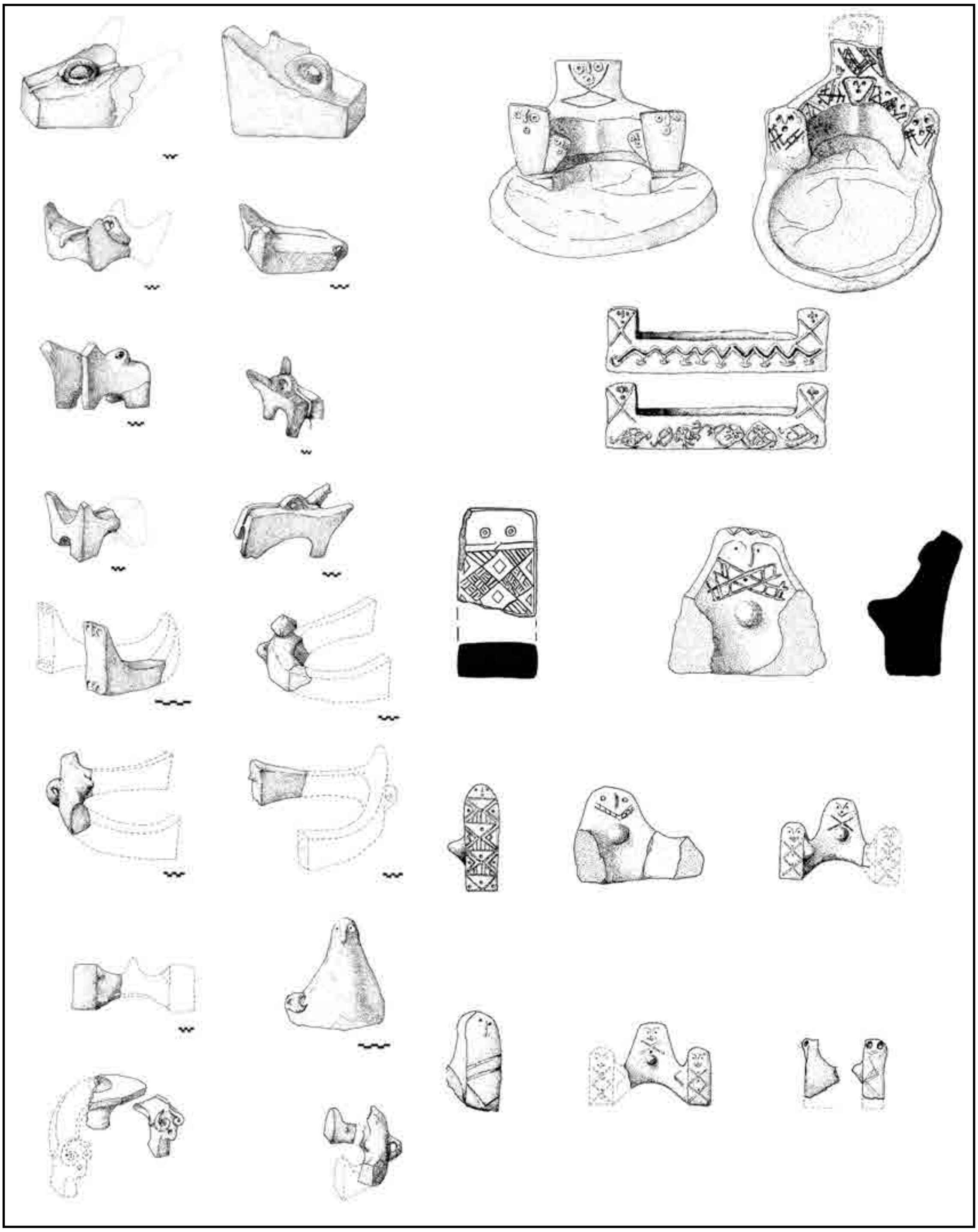


Fig. 6: Hearth, andiron and stove from different sites of Kura-Araxes realm (after Smogorzewska 2004)

temple (Fig. 7) (Baxşəliyev and Quliyeva, 2017). The hearths at Tell Beth Yerah are categorized into two types and three different sizes. These hearths are generally made of mudbrick derived from local soil, with skillfully crafted engraved decorations. The diversity and categorization of the Tell Beth Yerah hearths are remarkable, as they are not identical; they differ in color, surface finish, internal proportions, decorations, and durability. This variation likely suggests that they were considered personal or family

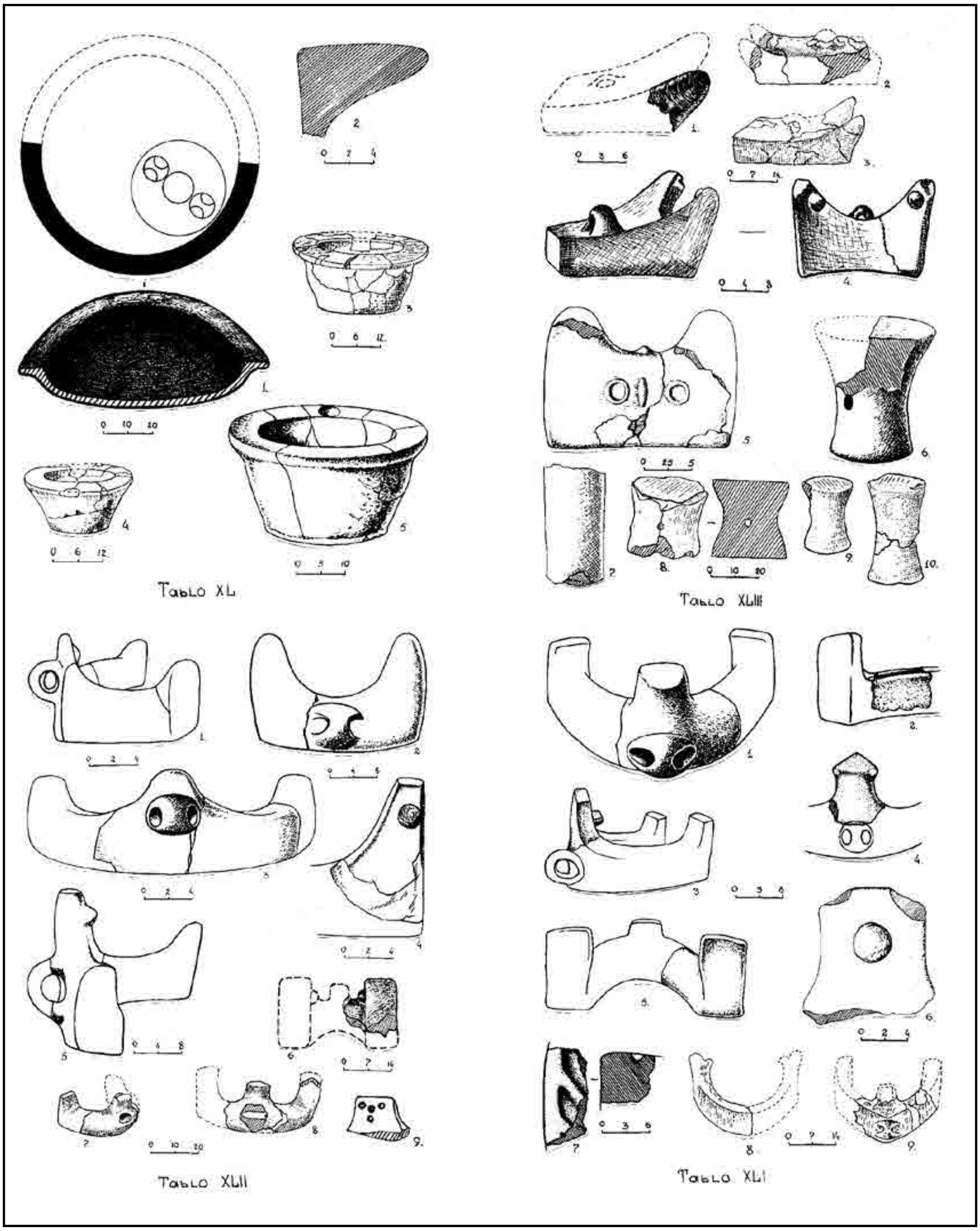


Fig. 7: Hearth, andiron and stove from the Kura-Araxes site of Kul Tepe in Nakhchivan (after Ashurov 2002: Tablo: XL-XLIII).

possessions (Ishoev and Greenberg, 2019). Batiuk and his colleagues (2022) suggest that the symbols associated with the hearth, andiron, and similar ritual objects may hold significant meaning. The three-lobed hearth's shape, resembling a grapevine leaf (Fig. 4: A-B), aligns with the region's ancient tradition of wine production and the ritual role of intoxicants in various cultures, further emphasizing the hearth's symbolic importance (McGovern *et al.,* 2017; Batiuk 2013).

In the M5 shrine at Shengavit (Fig. 3:1-13, 4I) a deep bowl featuring incised designs was placed within one of the lobe depressions. A distinctive bowl from Shengavit (Fig. 4:C) displays a painted depiction of a three-lobed object surrounded by figures, possibly wild birds, circling its interior. The exterior bears an abstract motif, similar to designs identified in ritual contexts at Godin (on the wall of Building 3), on an andiron from Yanik Tepe, and on pottery frequently associated with ritual spaces (Simonyan and Rothman 2015; Batiuk *et al.,* 2022).

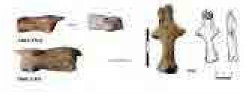
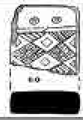
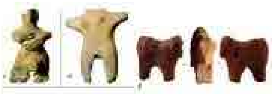
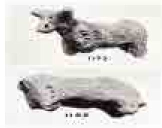
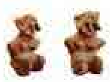
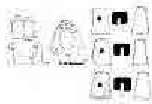
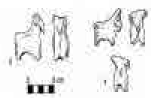
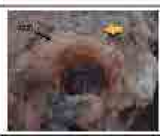
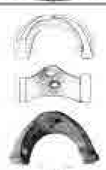
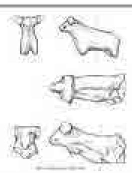
Carvings on hearths and andirons, often depicting faces, may symbolize spiritual presence. Supporting evidence includes male tufa statues and female clay figurines linked to rituals, recovered from homes, graves, and ritual spaces. The hearth's resemblance to a grapevine leaf, coupled with the Caucasus' history of wine production, suggests its ritual significance. Objects like zoomorphic figurines, phallic symbols, arrowheads, and red deer antlers buried near hearths likely symbolize fertility, masculinity, and sustenance. Ritual rooms, typically subterranean with steps, further emphasize their sacred nature (Sagona 1998; Batiuk 2013; Simonyan and Rothman 2015; McGovern *et al.,* 2017; Batiuk *et al.,* 2022). Sagona and Sagona (2009) propose that metallurgy, associated with fire, was part of this symbolic system, though metals are primarily found in burials rather than near hearths.

Fire and smoke creation, along with food and drink, were central to rituals. Andirons show no signs of carbon staining, implying they were positioned above a heat source fueled by coal rather than directly over flames. Ishoev and Greenberg (Ishoev and Greenberg 2019) suggest that andirons may have functioned as a platform where cooking pots were moved from the hearth for serving purposes. At Pulur Sakyol, a hearth and decorated andiron were accompanied by a jar with an incised face and small cups. Sites like Shengavit, Godin IV, and Arslantepe revealed remains of butchered animals, mainly sheep, goats, and cattle, suggesting ritual feasting. Raised platforms at Shengavit and Pulur Sakyol may have been used for burning sacrificial offerings, with liquid channels carved into them. At Aradetis Gora, zoomorphic rhyta, likely for libations, were found in a structure near a hearth. Palynological evidence suggests the use of wine or a grog mixture in rituals, while pure wine was identified in funerary practices at Doghlauri cemetery and Nachivchavebi, indicating beverage choices varied by ritual context (Kvavadze *et al.,* 2019; Batiuk 2021; Batiuk *et al.,* 2022).

2.3. Figurines

The figurines associated with the Kura-Araxes culture can be broadly classified into two primary types: human figurines, which have been recovered from four key archaeological sites (Table 1): Kul Tepe Sarein in Iran (Fig. 15: 2) (Ebrahimi, 2019), Orchosani in Georgia (Fig. 8: 1-11) (Gambashidze *et al.,* 2018), Shengavit (Fig. 7) (Rothman, 2010), and Metsamor in Armenia (Piliposyan, 2014). The human figurine from Kul Tepe Sarein, attributed to the Kura-Araxes II phase, represents a rare example of such artifacts within

Table 1: Comparison of Cultural Materials from Prominent Sites Inside and Outside Iran

Sites outside Iran			Sites within Iran		
Hearth/Andiron	Figurine	Site	Hearth/Andiron	Figurine	Site
-		Orchosani		-	Yanik Tepe
		Shengavit			Geoy Tepe
-		Metsamor	 stand andiron from Godin IV		Tepe Godin
		Kul Tepe I, II	-		Ghaleh Tepe
		Sos Höyük	-		Tepe Pissa
	-	Buyuk Tepe			Kohneh Pasgah
	-	Pulur / Sakyol Höyük	-		Tepe Zarnagh
		Tell Beth Yerah	-	-	-

Iran. Crafted from underfired, brown-colored clay and exhibiting a naturalistic style, the figurine is fragmentary and headless, with only the upper torso preserved (Ebrahimi, 2019). At Metsamor, a significant discovery includes a three-dimensional terracotta figurine depicting a nude, crouching woman adorned with a pointed hat—possibly featuring horns. This figurine constitutes one of the few known female representations from the Kura-Araxes cultural sphere. The possible depiction of horns has been interpreted as a ritualistic element, inviting comparisons with ancient Near Eastern deities, such as Ishtar and Lilitu, who are often associated with fertility and divine symbolism (Fig. 8: 16) (Piliposyan, 2014).

At the Orchosani, notable human figurines have been reported. Due to significant damage, it is not possible to determine the gender of all these figurines, but they include three kneeling women, two human figurines, the heads of two other figurines, and a fragment of a human figurine's arm. These figurines share common features such as schematic torsos, elongated arms with the right arm slightly bent, long necks, protruding chests, and straight backs. The eyes are depicted as deep holes, which appear to emphasize certain religious aspects (Fig. 8: 1-11) (Gambashidze *et al.,* 2018). The male and female figurines from Shengavit, crafted from stone cores and baked clay, measure approximately 80 centimeters in height. They exhibit vertical, rectangular forms with rounded edges that narrow towards the top. The eyes are represented by carved holes on both sides, possibly symbolizing an omnipresent deity capable of perceiving both front and back. These figurines were found in a standing position near hearths (Fig. 7) (Simonyan, 2015). According to Sagona, the scarcity or absence of human figurines in many Kura-Araxes sites is not coincidental, but rather indicative of a form of worship in which the presence of the deity is represented not through human images, but through hearths, decorated vessels, and horned animal figurines (Sagona, 1998). The second category includes animal figurines that are distributed across Iran, Anatolia, and the South Caucasus. These figurines represent various animals, such as cattle, ram, sheep, birds (?), and aquatic species. They generally measure between 3 and 8 centimeters in height. Characteristically, these figurines exhibit a vertical row of shallow depressions on the shoulder area and beneath the horns. The figurines are found in both male and female forms and are often small, fragmented, and incomplete. The context and setting of these findings are predominantly domestic, associated with hearths and food storage facilities, or storage areas, alongside various cooking vessels. The figurines typically exhibit a brown, black, or gray color and display a range of firing conditions and textures, from finely finished to somewhat coarse. Their hands and feet are conical and pointed, suggesting forward movement. These figurines are characterized by a highly stylized and abstract appearance, with minimal complexity, focusing more on the essence of the figurines themselves rather than detailed features (Fig. 10-12; Table 1) (Rothman 2011; Abedi *et al.,* 2014; Abedi 2016; Brown 1951; Simonyan 2015; Ashurov 2014; Rothman 2021; Ishoev & Greenberg 2019; Sagona *et al.,* 1993; Sagona *et al.,* 1991; Yiğitpaşa 2016; Sagona, 1998; Gambashidze *et al.,* 2018; Mohammadifar *et al.,* 2009; Baxşəliyev and Quliyeva, 2017; Naqshineh, 2017; Nobari *et al.,* 2016; Aqalari, 2008).

3.4. Mortuary practices in the Kura-Araxes culture

Mortuary practices in the Kura-Araxes culture represent a second significant category of ritual activity, exhibiting considerable variation in both design and ceremonial elements, even surpassing the diversity observed in the architectural traditions of this culture (Fig. 3-4). Archaeological investigations have identified over 154 sites containing Kura-Araxes graves, with the majority located within the culture's core territories and relatively few discovered in peripheral regions.

Early burials, which include both individual and multiple interments, were typically situated away from settlements. Examples of such isolated graves have been documented at Talin, Jrvezh/Avan, and Maisyan in Armenia; Treli and Kiketi in Georgia; and Ozman Bozu and Uzun Rama in Azerbaijan. These isolated burial practices have often been interpreted as indicative of mobile groups engaged in pastoral economies. However, such examples are exceptions rather than the norm. Most burial grounds, comprising several dozen graves, are located near settlements. Notable examples include the necropolis adjacent to the wall at Shengavit, the cemetery approximately 350 meters northwest of

Fig. 8: Shengavit. Anthropomorphic figurines: A) Female figurine: 1–4, 10 (1–3, 10 - baked clay, 4 - tufa): 1. 2008, necropolis, square A:14; 2. 2003, section 1, square 0:10, locus 015; 3. 2004, grave-field, square B:14/15; 4. 2000, section 2, square L:6; B) Male figurines: (6, 9 - baked clay, 5, 7 - tufa); 5. S. Sardaryan, 2004, p. 459, fig. 52; 6. 2010, square L:6, locus 4008; 7. 2010, square L:6, locus 4021, red tufa; 8. Leg of a red-painted figurine of baked clay, 2005, necropolis, square B:14/15; 9. S. Sardaryan, 2004, p. 461, fig. 54:3; 10. S. Sardaryan, 2004, p. 461, fig. 54:2. (After Simonyan 2015; Table 10).

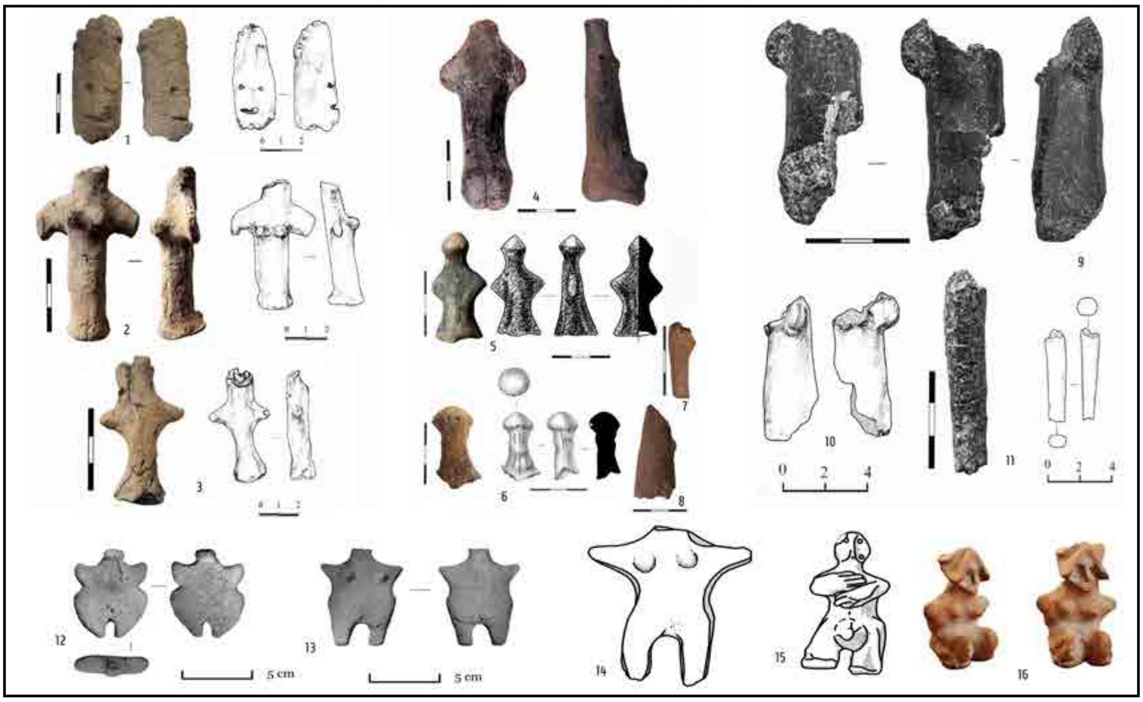


Fig. 9: Orchosani. Late Chalcolithic/Kura-Araxes Anthropomorphic figurines: (1-11) (after Gambashidze et al. /Pl. 159-161); Kura- Araxes human figurines: (12– 13) Agarak (after Badalyan and Avetisyan 2007); (14– 15) Shengavit (after Simonyan and Rothman 2015).

the fortified settlement at Köhne Shahar, and Karnut in Armenia, where graves are closely associated with the settlement. In rarer instances, burials were placed beneath domestic floors, as seen at Chobareti, Amiranis Gora, and Ortsklebi in the Samtskhe-Javakheti plateau of Georgia.

The diversity of burial structures in the Kura-Araxes tradition is striking. Burial types include:

1. Surface burials, where the body was placed on a cleared surface surrounded or covered by stones, or within simple pit graves (e.g., Aradetis Gora, Natsargora, Kvatskhela, Kalavan, Jrarat, Lchashen, Jrvezh/Avan, Talin, and Tsaghkalanj).

2. Rectangular and horseshoe-shaped stone constructions, found at sites such as Nachivchavedi, Chobareti, Kiketi, and Karnut.

3. Cist burials, such as those at Takhtidrizi, Treli, and Elar.

4. Kurgans, ranging from simple stone-covered shaft graves to elaborate structures lined with mudbrick and featuring wooden floors, as observed at Mentesh Tepe and Uzun Rama (Fig. 13).

Multiple burials were common across these burial types, as evidenced at Elar, Berkaber, and Shengavit. Some graves were designed for repeated use, incorporating dromoi or corridor-like entrances, often adorned with stone pylons or thresholds covered by slabs (e.g., Jrvezh, Talin, and Karnut). Bodies were typically positioned on their backs or in a crouched posture with bent arms and legs, and there is emerging evidence for secondary exposure practices at sites like Tsaghkalanj and Gegharot.

Batiuk and colleagues (2022) correctly point out that collective burials in crypts were a distinctive feature of the Kura-Araxes tradition, with examples containing anywhere from three to over 80 individuals. These crypts, such as those at Mentesh Tepe and Uzun

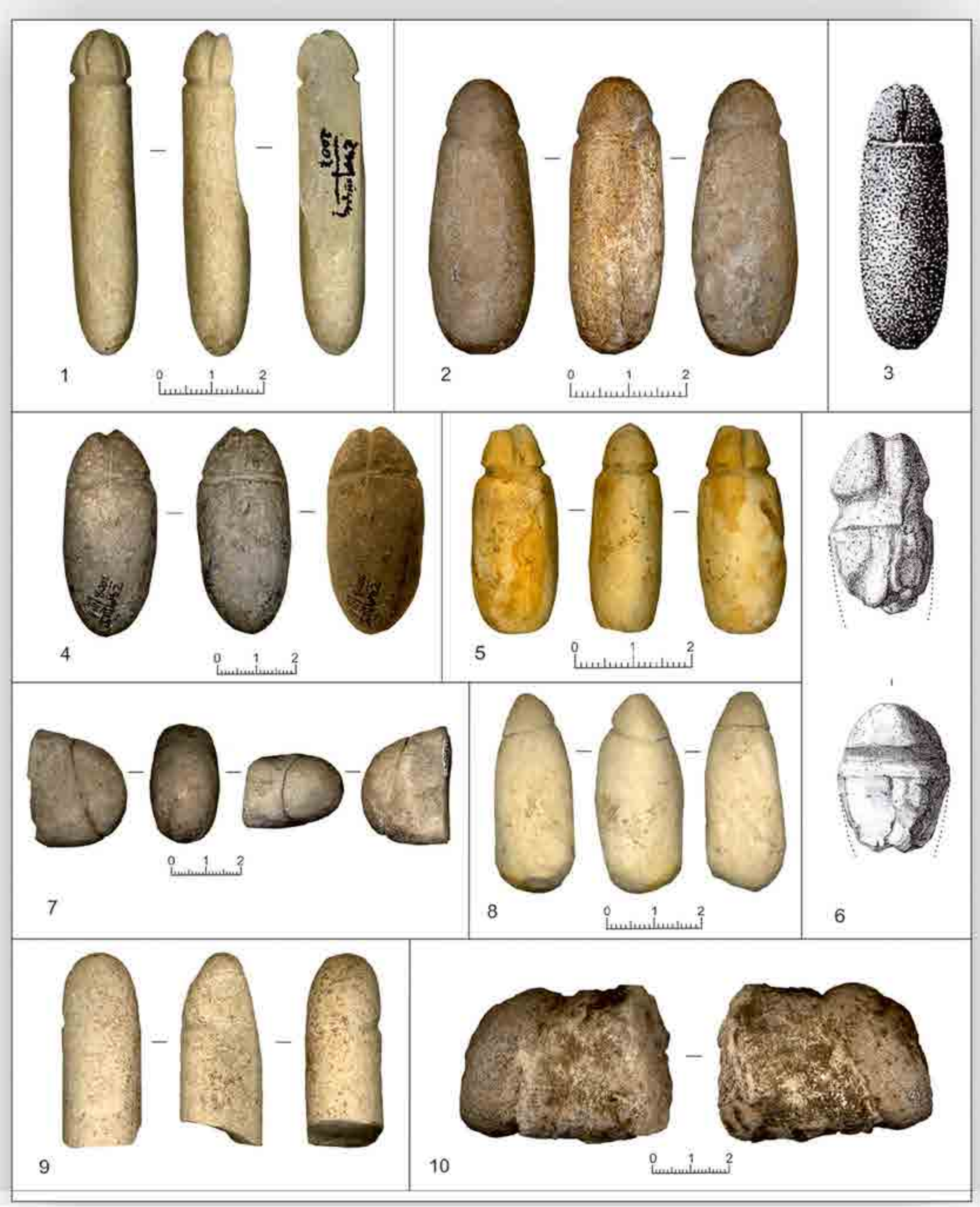


Fig. 10: Shengavit. Phallus-shaped pendant-amulets: 1. 2007, necropolis, square A:15, river-stone; 2. 2009, square J:5, locus 2002, sandstone; 3. S. Sardaryan, 2004, p. 223, table. LIX; 4. 2008, grave-field, river-stone; 5. 2012, square I:14, upper layer, tufa; 6. S. Sardaryan, 2004, p. 224, tab. LXXXIV; 7. 2008, grave-field, sandstone; 8. 2012, square K:5, locus 0000, sandstone; 9. 2009, square J:5, locus 2033, sandstone; 10. 2012, square M:5, locus 24025, limestone. (After Simonyan 2015; Table 11).

Fig. 11: Shengavit. Figurines of animals of baked clay: 1. Lion, 2010, square L:4, Locus 5055; 2-4. Horse: 2. 2010, grave-field, square IV, Locus 13007; 4. 2012, square K:6, locus 1104; 3. Ram, 2010, square L:4, Locus 8010; 5. Goat, 2010, square L:3, locus 8046, "small room", unbaked clay; 6, 7. Goat horn: 6. 2000, site 1, square 0:11, Locus 014; 7. 2012, square M:4, Locus 23001; 8-15. Bull: 8. 2000, square N:11, Locus 061; 9. 2009, square L/M, 12/13; 10. 2012, square M:5, room 1, locus 25002; 11. 2010, square K:6, Locus 1052; 12. 2009, square K:6, locus 1000; 13. 2010, square K:4, locus 6006; 14. 2012, square L:4, Locus 23001; 15. 2010, square L:4. (After Simonyan 2015; Table 9).

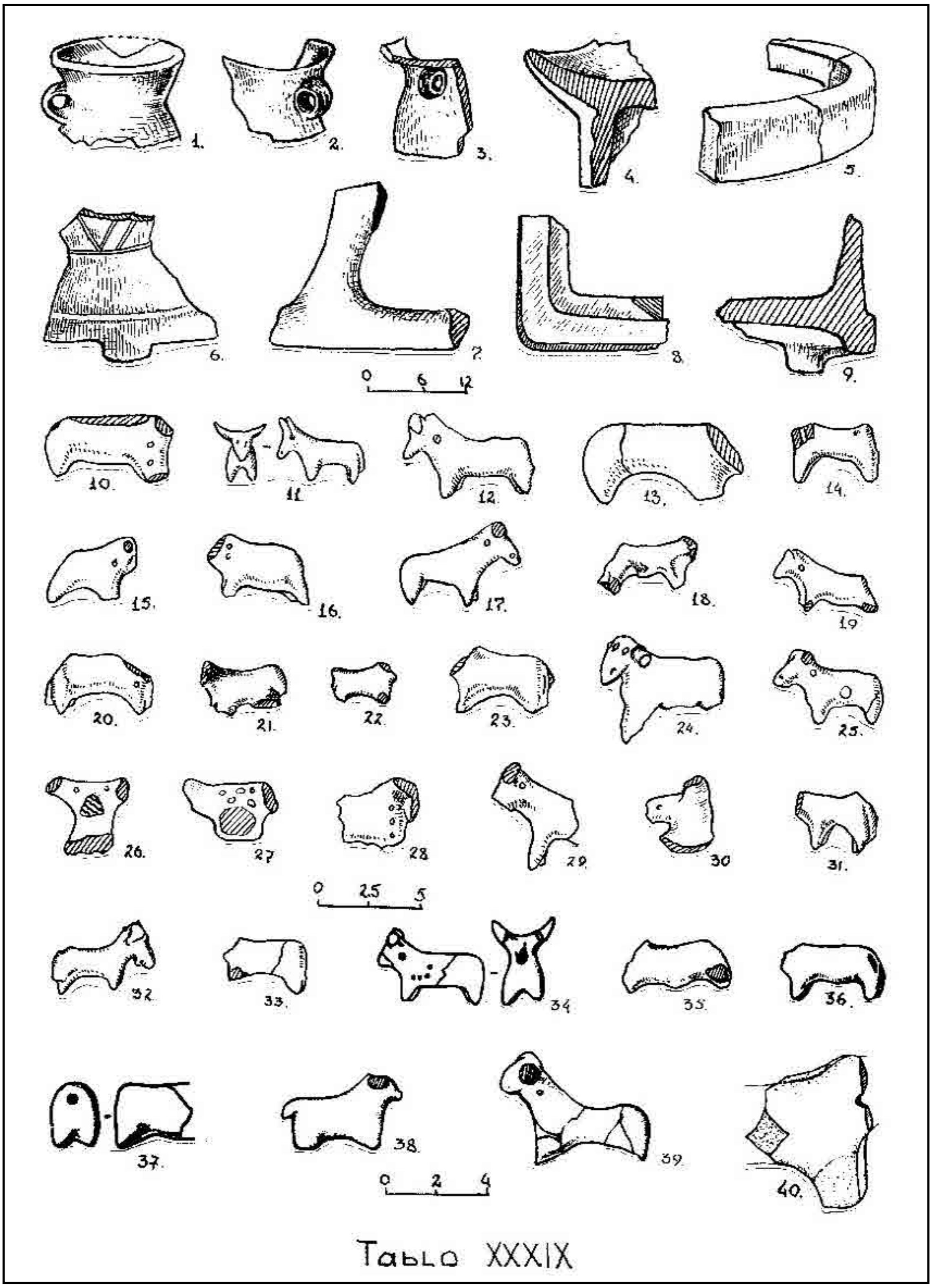


Fig. 12: Animal figurines from the Kura-Araxes site of Kul Tepe in Nakhchivan (after Ashurov 2002: Tablo XXXIX).

Rama, were used sequentially, with earlier remains rearranged to accommodate new interments. The remains, including men, women, and children, likely belonged to related individuals, though this hypothesis awaits confirmation through genetic studies. Some crypts, particularly those in the Kura Basin, were burned after the community's relocation.

They further note that the coexistence of multiple burial types and customs within the same site or region, and across both KA1 and KA2 phases, suggests an absence of centralized planning or uniform ritual traditions. Notably, Kura-Araxes burials lack evidence of significant wealth or status differentiation. Grave goods were modest and standardized, typically including one to three ceramic vessels, obsidian or flint arrowheads, bone spindle whorls, and beads. Copper-bronze items, mainly personal ornaments or simple weapons, were quantitatively limited and did not indicate significant social stratification. Even rare prestige objects, such as a bronze diadem from Kvatskhelebi, were not associated with extraordinary graves, underscoring a lack of overt symbolic markers of status (Batiuk *et al.,* 2025).

4. Ritual Evidence from Kul Tepe Gargar and Kul Tepe Sarein, Northwestern Iran

4.1. Kul Tepe Gargar

The Kura-Araxes phenomenon represents one of the most significant prehistorical periods in northwestern Iran, marking the threshold of urbanization in the Near East. Radiocarbon dates from Kul Tepe Gargar provide an opportunity to reassess the cultural developments and chronology of the 4th and 3rd millennia BCE in northwestern Iran. According to the absolute chronologies established at recently excavated sites in northwestern Iran, the Kura-Araxes culture is proposed to span from approximately 3400/3350 to 2600/2500 BCE (Abedi *et al.,* 2014; Abedi and Omrani, 2015; Abedi, 2016a-b; Davoudi *et al.,* 2018; Khazaee *et al.,* 2011; Maziar, 2010; Alizadeh *et al.,* 2015; Alizadeh *et al.,* 2018). Cultural changes at Kul Tepe reveal a greater transformation compared to the continuity between the Chalcolithic and the Early Bronze Age Kura-Araxes period. While the use of stone and mudbrick architecture and the continuation of circular plans are characteristic of both periods, the pottery evidence shows significant changes both technically and typologically. Pottery with organic temper from the Chalcolithic has been replaced by Kura-Araxes pottery with inorganic temper. Kura-Araxes layers are directly superimposed on the Late Chalcolithic layers, although a 300-year gap separates these two settlement phases. Thus, Kul Tepe can play a key role in defining Kura-Araxes phases I to II and in clarifying the material culture sequence and chronology of the Jolfa Plain and northern parts of northwestern Iran (Fig. 14) (Abedi *et al.,* 2014; Abedi, 2016 a-b; Abedi and Omrani, 2015).

From this strategically significant site, which has been briefly described as having a key role, cultural materials related to the Kura-Araxes ritual, such as sacred building, figurines and hearths, have been reported with great precision. The architectural structure uncovered at Kul Tepe, within Locus 4006, represents a unique and potentially sacred space associated with the Kura-Araxes II period (ca. 2900–2850 BC). This structure stands out from other Kura-Araxes layers at the site due to its distinct design and the remarkable integrity of its contents. Despite the limited excavation area of 2×2 meters, the visible features suggest a specialized and perhaps ceremonial function.

The building contains a well-preserved oven, possibly used for ritual baking, accompanied by related implements such as rolling stones and a bread rolling pin. These features are complemented by the discovery of Nakhichevan Lugged pottery, a hallmark of the Kura-Araxes culture, emphasizing the cultural significance of this space. The structure's flooring underwent three distinct stages of preparation, highlighting the care and intention involved in its construction and maintenance.

One of the most significant finds from this context is a cylinder seal, located directly on the building's floor. This artifact, dated by C14 analysis to 2900–2850 BC, represents one of the earliest securely dated seals from northwestern Iran and the Caucasus during the Early Bronze Age. The seal's association with such a specialized architectural context strongly suggests that the building served as a ceremonial or leadership space, possibly linked to a local chieftain or religious practices. Together, the architectural features and associated artifacts underscore the ritual and cultural importance of this structure within the Kura-Araxes cultural framework (Fig. 14).

These cultural materials exhibit similarities and comparative characteristics with other key Kura-Araxes sites. Specifically, nine clay figurines (Fig. 14: 4-12) dating to the Early Bronze Age have been found, representing various animal species. Based on their appearance, these figurines are categorized into three groups: cattle, ram, and sheep. The figurines are made from fired clay, with a mixture of organic and inorganic materials used in their paste, and were not produced using molds. Due to erosion and moisture, all these figurines exhibit a highly abstract and simplified appearance, with features such as eyes, ears, mouths, and other small body parts often missing. The emphasis is on the overall nature of the figurines rather than their detailed complexity. None of the figurines exceed 4 centimeters in size, and they are found in a range of colors including gray, dark brown, and light brown. The color and finish of the figurines indicate an artist's attempt to approach naturalism or realism. Among the figurines, both intact and broken examples are present. The broken figurines have parts of their legs and heads missing, which appears to be a deliberate act, potentially symbolizing a ritualistic practice or representing a moment of animal sacrifice. These figurines are comparable to the prominent clay figurines recovered from other Kura-Araxes sites in Iran, the South Caucasus, Anatolia as well as Levant. Another aspect of the ritual evidence from this culture is the hearths and andirons, which, like those from other Kura-Araxes sites, include both portable and fixed types. Despite significant damage from erosion, the remaining evidence indicates adequate firing and relatively good durability. The recovered hearths exhibit a somewhat rough and irregular texture, with the base being wider and standing on the ground, suggesting their use as base hearths or possibly as three-legged hearths or andirons. Based on the excavations, the hearths at this site have been found in a variety of forms. These include two-piece hearths, those with opposing symmetrical halves, and others that appear to be cylindrical. The fragments typically feature two holes aligned in opposite directions, which likely served to connect the pieces with a rod for better stability or for hanging purposes. It is probable that these types of hearths were either discarded naturally after use or intentionally broken before being abandoned (Fig. 14: 1-3).

4.2. Kul Tepe Sarein

Kul Tepe Sarein, also known as Anahita, is situated 20 kilometers west of the city of Ardabil and at the center of Sarein. This site encompasses both a mound and a cemetery. Archaeological studies at this site have been conducted with two main objectives: first, to sounding for stratigraphy of its central area and to sounding for demarcating core

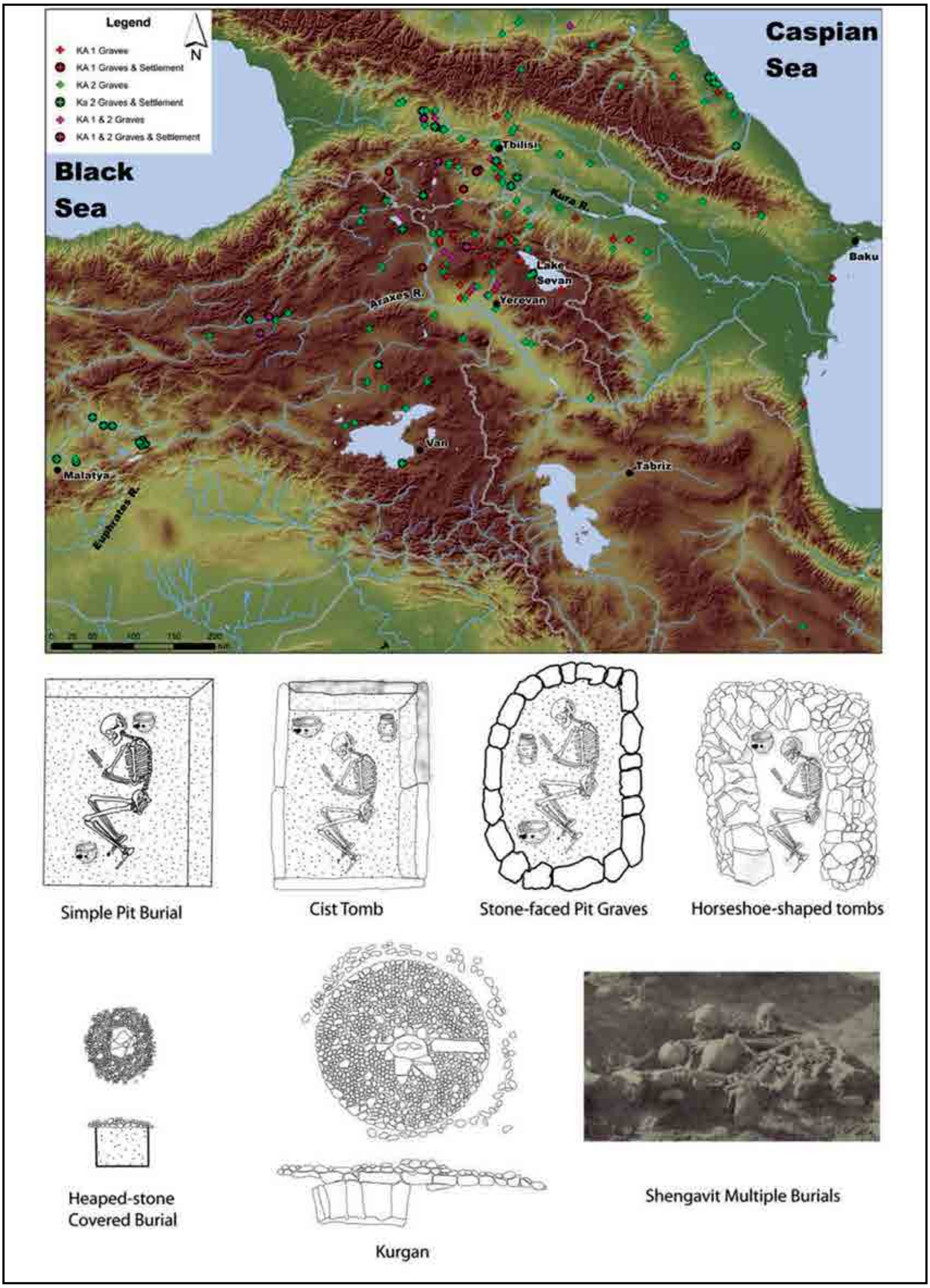


Fig. 13: Burials location and Burial types in the Kura-Araxes (after: Batiuk *et al.*, 2022: Fig. 5).

and buffer zones, and second, to investigate the historical settlements within the site. Among the findings from the excavation are 5,300 different types of ceramics from various phases of the Early Bronze Age, Iron Age, historical periods, and Islamic periods. Additionally, the remains include animal and human bones, needles and nails made of bronze and iron, human and animal figurines made of ceramic, and various ceramic and stone beads. One of the significant discoveries from this season was the identification of a human figurine from the Early Bronze Age layers, specifically associated with the Kura-Araxes culture (Ebrahimi, 2019). In northwestern Iran, at the Kul Tepe Sarein, one of the most significant and aesthetically striking phases of Kura-Araxes architecture has been identified. This architectural phase features thick mudbrick walls with a circular design. Unlike other architectural phases, this one includes two rows of bricks, making it unique in its category. The large mudbricks used in this wall, along with its considerable thickness, and the intricate carved decorations and colored coating on the inner part of the wall, indicate the structure's importance to its inhabitants. This suggests that the building was not a residential structure but served a different purpose. Additionally, the distinctive internal design of the space, the platform within it, and the decorative carved motifs on its facade further support this interpretation. The mudbricks used in this row range in color from light to dark brown, with a dark brown mortar between them, demonstrating high durability. The bricks exhibit various shapes, including rectangular, square, and complete quadrilateral forms (Fig. 15: 1) (Ebrahimi 2019). A total of four figurines (Fig. 15: 2-4) were recovered from this site, which, based on their appearance, include both animal and human types. The animal figurines are categorized into three types: cattle, ram, and sheep. A notable feature of these animal figurines is intentional head fragmentation. Among the human figurines, there is only one, which is incomplete, with only the upper torso remaining, as the head and arms are detached. These breakages are likely not accidental. An important and notable aspect of the human figurines is the absence of any protrusions in the chest, buttocks, and female genitalia, suggesting that the purpose of these figurines was likely to represent male forms. The breakage of these specimens, similar to other sites, appears to be deliberate and may have been intended to symbolize a ritual act or a depiction of animal sacrifice. No molds were used in their creation; instead, they were made from fired clay with a mixture of organic and inorganic materials. These figurines can be compared with those from other sites of the Kura-Araxes culture in Iran, the South Caucasus, and Anatolia. Due to erosion and moisture, all these figurines exhibit a very abstract and simplified appearance, with no discernible eyes, ears, mouth, or other small body parts. Both categories are rendered in a straightforward manner, lacking complexity, likely reflecting the naturalistic tendencies of the maker and the focus on the essence and function of the figurines. None of the figurines exceed 4 centimeters in size, and they are found in shades of gray, dark brown, and light brown.

5. Figurines, Hearths and Andirons: The Principal Evidence of Ritual and Religious Practices in the Kura-Araxes Culture

5.1. Hearths and Andirons

One of the distinguishing elements of the Kura-Araxes culture is the presence of hearths and andirons, which may potentially be related to harsh climatic conditions. However, the fact that these hearths are widespread across different regions cannot be overlooked, indicating a cultural connection among peoples who adhered to their traditions over an

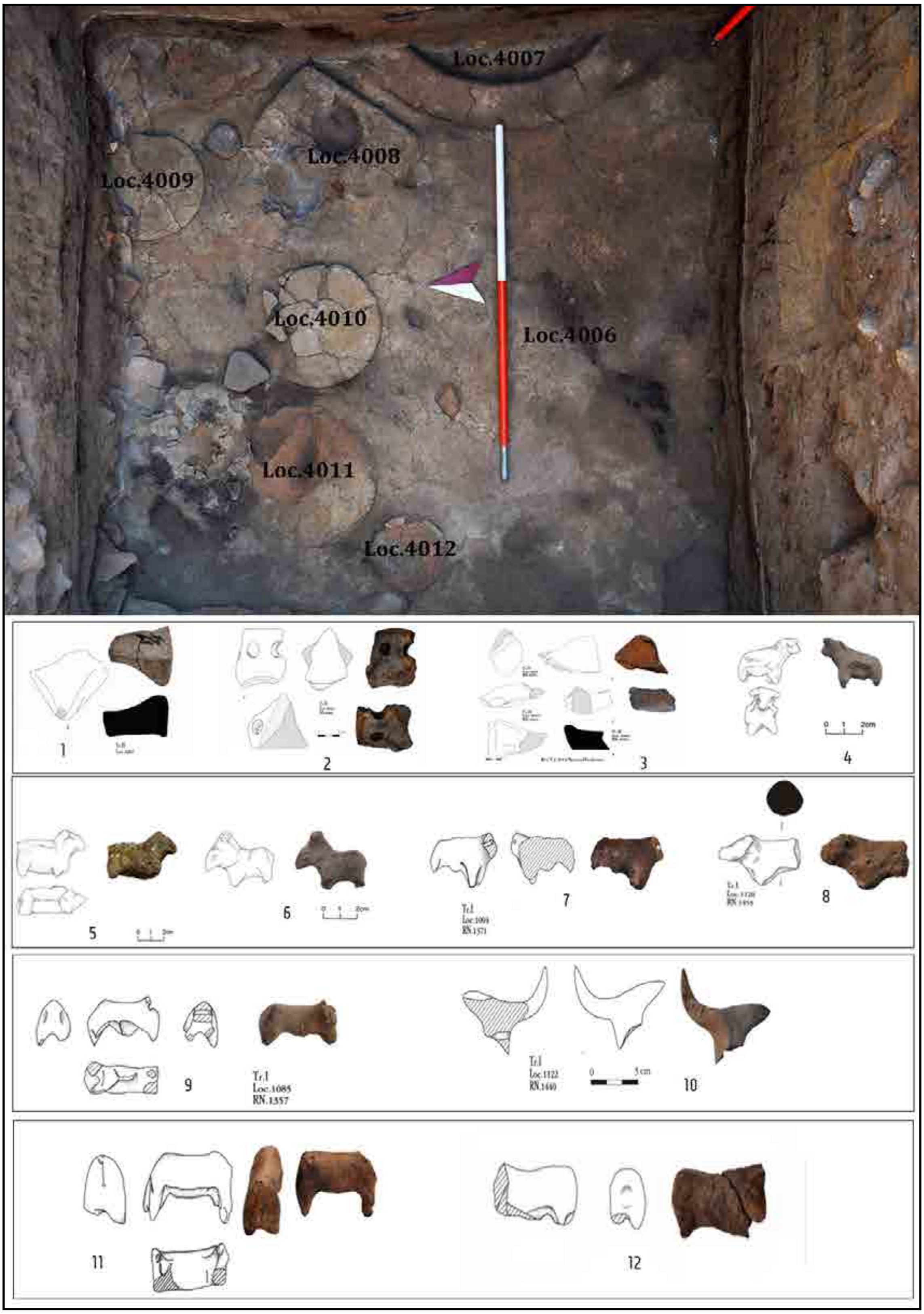


Fig. 14: (1) A unique ritual structure from Kul Tepe Gargar (Kura-Araxes II period); (1–3) Andirons and portable hearths from Kul Tepe; (4–12) Animal-shaped figurines discovered at Kul Tepe.

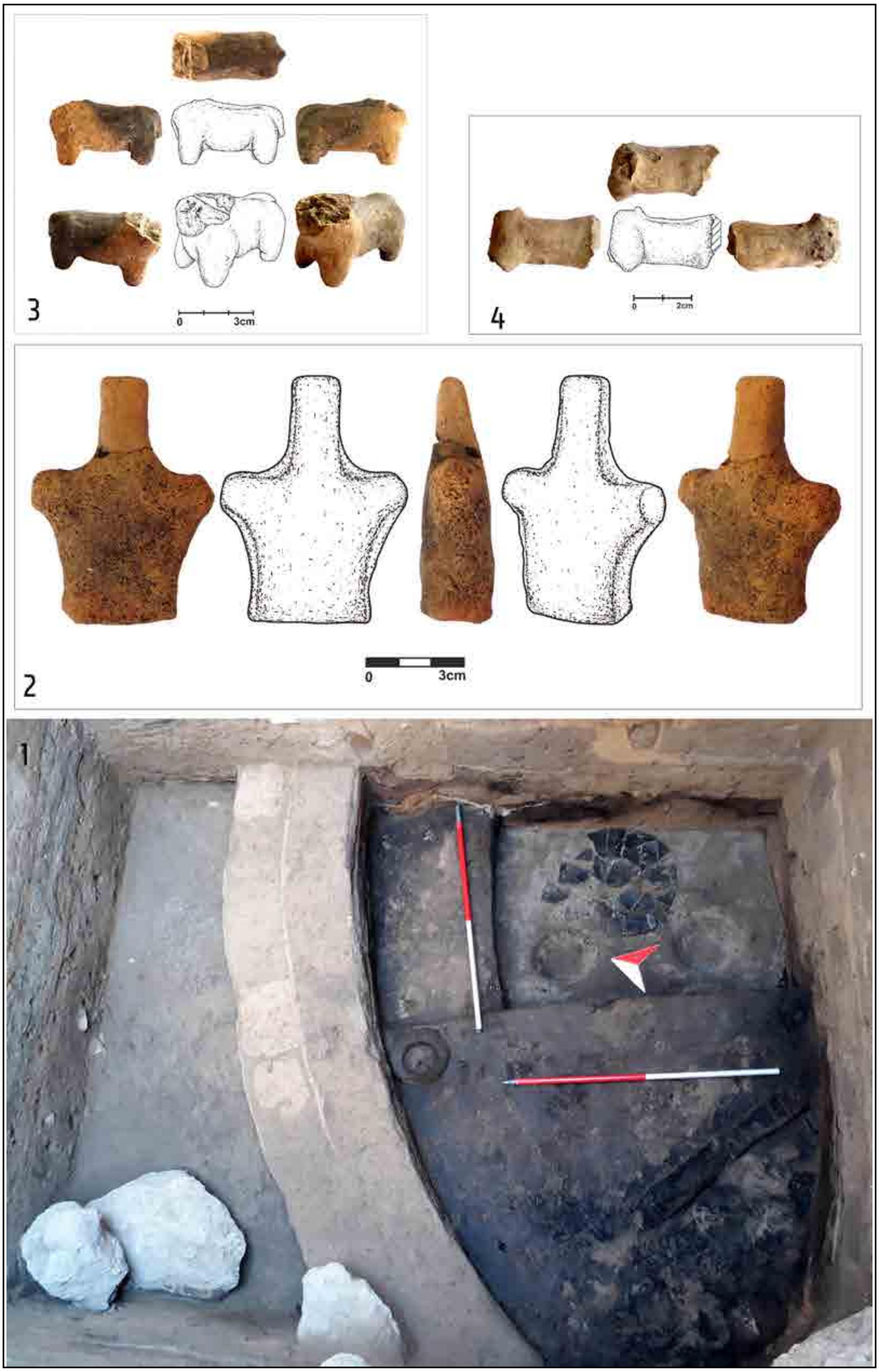


Fig. 15: (1) A unique ritual structure from Kul Tepe Sarein (Kura-Araxes II period); (2–4) Human and animal figurines of Kul Tepe Sarein.

extended period (Yalcin, 2020). This characteristic, along with the handmade red-black burnished wares, defines the regional homogeneity of the culture, which is recognized and appears in a distinct form. This diversity and quantity, in addition to their everyday function, also support the hypothesis of their ritualistic role (Smogorzewska, 2004). hearths are a notable feature and characteristic present in all settlements, regardless of the layout or type of dwelling. They can be either stationary or portable (Table 2).

Table 2: Classification of Hearths in the Kura–Araxes Culture

Site	Classification		Hearth/Andiron	NO
Anatoli (Elazığ-Malatya, Erzurum, Gozalova, Norşuntepe , Pulur/Sakyol, Tepe Cinic, Sos Höyük, Buyuk Tepe; **Georgia** (Amiranis Gora, Orchosani, Khizanat Gora, Ozni; **Armenia** (Shengavit, Tigshin, Gharni, Mokhra Bulur, Armavir, Shresh Blur); Iran (Yanik, Kul Tepe Gargar, Kul Tepe Sarein, Kohneh Pasgah Tepesi); Azerbaijan (Kul Tepe I, II); **Levant** (Tell Beth Yerah)	Horned (Pierced), horseshoe-shaped (U-shaped), and anthropomorphic	1. Simple and segmented (Functional)	**Portable (Functional and Ritual)**	**1**
		2. Decorated and segmented (Ritual)		
	Adhered to the wall on the floor and elevated above ground level (Functional)		**Wall-mounted or fixed (Functional)**	**2**

In most cases, they are made from clay, and the remains of hearths represent some of the best-preserved components of a house, indicating that considerable effort was invested in their construction (Sagona, 1998). These hearths have been a fundamental feature of the Kura-Araxes culture since the beginning of the 4th millennium BCE and have continued as an important cultural element across the extensive cultural and geographical expanse (Table 3).

Table 3: Geographical Distribution of Kura-Araxes Figurines and Hearths

Period	Figurine Type	Hearth/Andiron Type	Key Sites	Country	No
KA II	Animal and Human	Portable and Fix	Kul Tepe Gargar, Kul Tepe Sarein, Tepe Zarnagh, Godin, Tepe Gijlar, Ghaleh Tepe, Tepe Pissa, Kohneh Shahar, Geoy Tepe, Kohneh Pasghah	Iran	**1**
KA II	Animal and Human	Portable and Fix	Shengavit, Metsamor	Armenia	**2**
KA I, II	Animal	Portable and Fix	Sos Höyük, Buyuk Tepe	Anatolia	**3**
KA I-II	Animal and Human	Portable and Fix	Orchosani	Georgia	**4**
KA I-II	Animal	Fix	Kul Tepe I, II	Azerbaijan	**5**
KA II	Animal	Portable and Fix	Tell Beth Yerah	Syro-Palastine	**6**

The quantity and prominence of hearths in architecture, their continuity over time and space, their distinctive forms, and their anthropomorphic and zoomorphic decorations can be interpreted as part of a collection of artifacts associated with specific ritual activities of the society (Buccellati 2004). From a holistic perspective, the precise typology and chronology of various stove types present challenges, largely due to the complex research history and the diversity of terminology across regions. The most common type of fixed hearths consists of a simple, coated depression surrounded by a clay ring or platform. Fuel would be placed in the central depression, often requiring supports at the edge to keep the cooking vessel at an adequate height (Ishoev and Greenberg, 2019). The hearths, which are generally either portable or floor/wall-mounted/fixed, vary in shape, size, and decoration depending on their intended use. Horseshoe-shaped hearths with horned projections have been found in Eastern Anatolia and Armenia, made of clay with a central protrusion. The horn and body sections of some specimens are decorated with animal motifs, created through engraving. U-shaped and anthropomorphic portable hearths have been discovered in the Elazığ-Malatya region of Anatolia. The facial features of a human, such as eyes, nose, and ears, are distinctly visible on the hearth components. The neck, extending prominently below the chin, is adorned with wide, engraved V-shaped lines stacked beneath each other. These hearths likely represented a deity and indicate a social structure where religious elements were predominant (Yiğitpaşa, 2016). In Kura-Araxes architecture, benches are aligned along the walls of rooms, all oriented towards the center. These features have been observed in Godin IV, Kvatskhelebi C1, Building 36 at Arslantepe, and possibly in Shengavit, all of which are associated with Kura-Araxes II. This architectural layout emphasizes the importance of physical symbols within Kura-Araxes culture (Batiuk *et al.,* 2022). In households, the hearth occupies a central physical position, representing the core of family life. It is where food is prepared, offering warmth and light, and serving as a gathering place where men and women can sit together, converse, organize, and discuss various matters. A range of activities, from daily routines to the most intimate family moments, such as preparing meals and drinks or welcoming guests, unfolds around this central element of the home. Moreover, in contemporary languages, the hearth (Ojagh) is often synonymous with the concept of "home." The preparation of daily meals can itself be considered a ritual activity, possessing its own symbolic characteristics, without necessarily being a religious act (Fiese, 2006). Family and social rituals provide a predictable structure, encompassing a momentary time commitment that is regularly repeated. Through symbolic meaning, they contribute to the creation and continuity of group membership and are passed down through generations, encompassing celebrations, traditions, and interactions. These practices help reinforce the reliability of relationships and traditions (Spagnola and Fiese, 2007).

The rituals and customs surrounding the lighting and maintenance of fire among tribal and ethnic communities had their own distinct style and method. Neglecting or disrespecting the fire was considered a grave and detrimental act, viewed as a severe and fatal sin. Fire was always seen as a protective force, capable of neutralizing the dangers posed by harmful and ominous creatures and animals. Even today, despite the urbanization and modernization of most former tribes and communities, the belief in the sanctity of fire and its derivatives, as well as the preservation of its sacredness and reverence, remains deeply ingrained among the elders and middle-aged generations (Siahpour, 2016).

5.2. Figurines

Archaeological excavations at Kura-Araxes sites have yielded a variety of movable cultural artifacts, including numerous human and animal figurines. These artifacts, dated to the early third millennium BC, depict sheep, cattle, rams, and bulls, among other species, and have been recovered from both highland and lowland regions. The specific function and significance of these figurines remain a subject of scholarly debate. While some researchers propose that the figurines may have served as children's toys, others suggest they held religious or symbolic significance. The striking similarity and wide geographic distribution of these artifacts, however, imply a multifaceted purpose, extending beyond simple playthings or exclusive use in official rituals or as talismans.

Consistent with figurines from many ancient contexts, Kura-Araxes examples are frequently small, fragmented, and incomplete, which may reflect their usage, symbolic meaning, or both (Rothman, 2011).

The figurines (Fig. 11-12; Table 1 and 4) primarily depict domesticated animals, including cattle, sheep, goats, rams, and, in rare instances, birds. These figurines are made from clay that matches the clay used for local pottery production. The figurines typically measure between 4 to 8 centimeters in length, 2.5 to 5 centimeters in height, and 1.5 to 3 centimeters in width. They exhibit compact bodies, clearly defined features, and intricately designed limbs, which are relatively smaller compared to other cultural artifacts. The figurines have short, pointed, or simply rounded legs, allowing them to stand securely. Their cross-sections are generally triangular or square with rounded corners. The front quarters, particularly the shoulders, are robust, while the tails are narrow, naturalistic, and occasionally horned. The eyes are depicted as punctured holes, and there is often a horizontal hole through the snout or neck, sometimes accompanied by a narrow indentation. These perforations may have been designed for suspension, allowing the figurines to be carried by individuals or hung on hooks for easy storage. Occasionally, one or two holes may be present beneath or near the tail. The figurines were often painted in red or white with random cross-hatched stripes, but they were not burnished and polished, and the firing was controlled. Some of the figurines appear to have been deliberately broken, with the fractures being too consistent and repetitive to be merely accidental or due to simple separation (Knudsen and Greenberg, 2019). Color has also been used in the figurines, serving as an abstract phenomenon with significant importance in shaping the world, describing it, and facilitating visual communication. On one hand, humans utilized color and decorative patterns to enhance the aesthetic appeal of objects; on the other hand, they found that colored motifs provided a suitable medium for conveying symbolic meanings. Despite spatial and temporal distances, there are remarkable similarities in the methods of construction and finishing observed. This, to some extent, confirms the shared beliefs and ideologies of humans across different cultures (Eslam Maslak and Haririan, 2011).

Table 4: Classification of Kura-Araxes Figurines

Similar Sample	Regions	Classification	Figurine	No
Kul Tepe Gargar, Kul Tepe Sarein, Zarnagh, Godin, Ghaleh Tepe, Tepe Pissa, Geoy Tepe, Kohneh Pasghah, Shengavit, Buyuk Tepe, Sos Höyük, Orchosani, Kul Tepe I, II, Tell Beth Yerah, Other sites	Armenia, Eastern Anatolia, Georgia, Northwest Iran, Azerbaijan, Syro-Palastine	Cow, ram, sheep?, bird, and aquatic animals	Animal	1
Kul Tepe Sarein, Tepe Zarnagh, Shengavit, Orchosani, other sites	Northwest Iran, Armenia, Georgia	Sexual organs and upper torso	Human	2

Before the invention of writing, humans expressed their thoughts through the creation of figurines made from clay, stone, and other materials. The ancient peoples of millennia BCE were not strictly bound to mere imitation of nature. Instead, they often preferred to carve out their imaginative recollections with the chisel or shape them artistically with their fingers from clay and stone, bringing each figurine to life according to their desires, thoughts, and ritualistic beliefs. These small animal and human figurines likely held religious and ceremonial significance. Psychological analyses of these artworks suggest that the artist's intent was not merely to create a piece of art; rather, there was an underlying thought or belief driving the creation of these figurines (Mousavi Haji *et al.,* 2012).

When figurines are uncovered by archaeologists, they are revealed, displayed, reframed, and recontextualized. Their attributed functions—whether as toys or ritual objects—are assumed to be mechanisms for conveying certain concepts. Figurines are not static objects; they are dynamic and inherently mutable artifacts that enable material and social connections. Part of their potential lies in their capacity to shift identities, tell stories, and evoke memory. Detached heads and clay bodies of human and animal forms, often featuring holes or evidence of broken or severed heads, signify a process through which both animals and humans were preserved, surviving death and destruction. It can be argued that figurines do not seek to belong exclusively to the history of imagery or art. Instead, they should be recognized as complex indices, representing multiple contexts and situations that embody fluid and multifaceted identities (Meskell 2017).

Archaeological data on the Kura-Araxes culture is often incomplete due to its widespread distribution across multiple countries, making access difficult and interpretation particularly challenging—especially regarding beliefs and perceptions of the people. In the Kura-Araxes culture, the concept of the afterlife held significant importance. This is evident from the various burial practices, such as kurgans, cists, megalithic structures, and accompanying grave goods, which reflect the deep-rooted beliefs in life after death and, consequently, the existence of a higher power (Poulmarc'h and Le Mort, 2016). The representation of ritual, religious, and social identity in the Kura-Araxes culture can be articulated as follows: it involved the inclusion of objects in graves and the decoration and display of distinctive cultural materials, such as figurines and hearths. Each of these cultural markers reflects their beliefs and traditions; figurines, for instance, may have served as a reflection of how they represented their ritual behaviors and beliefs. However, the quantity and quality of the construction of archaeological artifacts are crucial. Regarding figurines, their numbers are relatively low, which can be considered an indication of the cultural significance of this marker among the people. Unlike pottery, which was produced in large quantities and had daily functional use, figurines should not be viewed in the same context. Three methods were used for the quality and decoration of figurines: molding, perforation, and painting. Regarding Kura-Araxes figurines: 1) No specific location for their manufacture and storage has been identified (based on current findings). 2) The figurines were small in size and weight (which supports the hypothesis of their use by nomadic groups). 3) They feature holes for suspension, either from the neck or from a fixed point; these features may indicate their personal, domestic, and ritual significance among the people. However, it can be asserted that figurine-making in this culture represents an artistic practice with specific and relatively consistent construction techniques. The diversity among Kura-Araxes figurines is relatively limited based on available publications and reports. The few examples recovered, such as cattle, rams, and others, were likely more accessible to people and may have played a significant role in their daily lives.

6. Discussion

Around 3500 to 3300 BCE (Kura-Araxes I), a shared material and cultural package emerged across the South Caucasus, northwestern Iran, and eastern Anatolia. This package included a range of artisanal crafts (from pottery to metallurgy), traditions, tastes, and ornaments, as well as architectural spaces centered around symbolic hearths and surrounding platforms. Burial practices also reflected this shared identity. These elements collectively supported a common identity among small rural communities characterized by an agro-pastoral economy and the absence of centralized institutions. The family likely served as the primary economic, social, and political unit within these societies (Palumbi and Chataigner 2014). The evidence and remnants from the excavated Kura-Araxes sites emphasize the repetition of three elements: animal and human figurines, primarily animal figurines (bulls, rams, and sheep), portable and fixed hearths, and potentially ritual spaces, often in domestic architectural contexts. However, our definition of ritual and religion influences our understanding of religious markers and their recurrence in Kura-Araxes culture. Are we considering ritual and religion from a modern perspective, or as concepts that historically brought people together in the past? From a holistic perspective, any attempt to define ritual in Kura-Araxes culture struggles with a number of concepts and ultimately leads to an archaeological enigma. Most researchers agree that ritual and religion can be understood in two aspects: textual (which does not include Kura-Araxes) and material culture (symbols) (Sagona 2018). It is widely accepted that what distinguishes modern humans from other species is their ability to use symbols (Hodder 2001). Symbols are a central component of ritual, religion, and the key actors in these domains, exercising their agency (Winter 2007). Societies integrate symbols to shape social relationships and group identity (Fogelin 2007). The creation of these symbols also reflects the self-awareness of the creator and carries multiple meanings (Hamilton 1996).

In this period, rituals and religion did not have a public or communal presence; rather, they were practiced within domestic and familial settings, with fire being a central element. People of this era incorporated symbols and ritualistic elements into their lives, with Kura-Araxes culture exemplifying this through figurines (both animal and human) and hearths, which were likely used for ritual and religious practices. These items reflect a reverence for nature and its constituent elements. These beliefs and practices were not confined to northwestern Iran alone but were also present among the people of the Caucasus, eastern Anatolia, and other regions within the Kura-Araxes cultural sphere. The ritual identity of the Kura-Araxes culture during this period differs from that observed in neighboring regions. This divergence can be attributed to the culture's isolation and lack of influence from other cultures. Although religion does not appear to be cohesive and fully developed in this period, ritual beliefs are shared within this culture and are represented by specific symbols. Ritual symbols are evident among the archaeological finds, with their significance increasing over time through repetition and preservation. In this culture, while it cannot be stated that there was a formal worship of symbols (such as hearths and figurines), the appreciation and reverence for fire and the preservation of nature's gifts, such as animals and people, were crucial for their survival. This is symbolized by the broken figurines and both fixed and portable hearths, whether heated or unheated and decorated, found in the excavations. The hearths and figurines of the Kura-Araxes culture exhibit significant similarities in terms of subject matter, technique, style, and appearance across different regions. While they also display regional diversity (due to local environmental factors), similar to pottery, the overall cultural framework remains consistent. Additionally, although the Kura-Araxes culture can be recognized as a distinct people and culture, and while religious practices were common among contemporary societies, identifying specific rituals and religious practices within the Kura-Araxes culture is somewhat more challenging due to the lack of religious structures or shrines/temples in their settlements and domestic artifacts. In efforts to define the role of hearths and figurines and reconstruct the ritual domain, it is important to consider the natural conditions and lifestyle that may have influenced the form of religious beliefs held by the people. Animal husbandry played a significant role in the local economy of this culture. Many earliest Early Bronze Age sites were merely temporary camps used during the migration of herds to seasonal pastures. Hearths, along with other components of the material culture, reflect the nomadic lifestyle of the Kura-Araxes community. Notably, the number of stoves increased in the late fourth millennium BCE, coinciding with the growing importance of animal husbandry and human mobility. In a mobile context, these portable objects could have played significant and potentially religious roles, and they might have been used as portable shrines/temples (Smogorzewska, 2004). The figurines exhibit a naturalistic style and predominantly represent animal groups that are found in the surrounding natural environment and have various uses. The remaining cultural materials from humans reflect their way of life in nature, and the climatic and geographical conditions of the region have influenced their creation. Animal figurines and stoves are lightweight, and their numbers are limited, small, and compact. Specifically, the figurines depict animals such as rams and cattle, which played a significant role in the subsistence of the people, such as the use of their meat, hides, and milk. Additionally, these cultural materials were crafted from the local soil of the settlement area and were readily available. Regarding the figurines, there are perspectives that consider them as toys, educational tools, or ritual objects. If we consider these figurines as toys, a pertinent question arises: why was a nearly identical technique and method used for their creation, despite the lack of a specific place or facility for their production and the significant distance between sites? It can be hypothesized that they were made domestically and personally. In this case, there would have been a significant mindset behind their creation, reflecting a shared cultural practice and nearly uniform construction methods. The educational aspect suggests that these figurines were likely intended to convey a high degree of conceptual and instructional content. In terms of the ritual aspect, nearly all the sites where these artifacts have been found exhibit similar characteristics, such as volume and weight, which facilitated their transport from one location to another. Additionally, intentional breakage on these figurines may symbolize ritualistic practices such as animal sacrifice for the purpose of ensuring fertility and the preservation of the animals themselves, indicating the significant ritualistic role of these figurines.

Another significant aspect is the hearths, which not only attest to the uniformity of material culture but also indicate that similar rituals might have been practiced across the Kura-Araxes culture, from the Transcaucasus to Iran. It should be noted that the presence of a specific factor likely contributed to the creation of symbols: the presence of fire, which made the stoves sacred, and the presence of animals, which endowed the figurines with power. Fire was a crucial cultural and domestic element during this period, and the hearth symbolized the place of fire and its blessings. Regarding the function of these hearths, they have been interpreted as either tripods (pot supports) for holding containers over the fire or as having ritualistic functions. In many cases, these hearths are accompanied by intricate decorations, raising the question of their purpose when subjected to direct fire and eventually discarded after multiple uses. The shape and size of these hearths, as well as their decorations, are consistent, yet their construction is time-consuming, suggesting that there was both a practical and symbolic motivation behind their creation. Despite the lack of comprehensive information and excavations in northwestern Iran and incomplete access to reports from sites outside Iran during the Kura-Araxes period, it can be concluded that nearly all cultural materials, such as figurines and hearths, convey an ideological perspective.

Ritual practices within the Kura-Araxes culture served as a unifying mechanism, fostering cohesion among community members by transcending household and kinship boundaries, thereby contributing to long-term societal stability (Simonyan and Rothman 2015). These rituals, primarily domestic in nature, indicate a social structure that lacked centralized political leadership. However, the potential existence of communal ritual spaces cannot be ruled out. Shrines may have functioned as gathering points for multiple smaller groups within the community. For instance, analogous shrines at Late Bronze Age Gegharot (Smith and Leon 2014) have been interpreted as possible divination centers accessible to various community members (Batiuk *et al.,* 2022).

7. Conclusion

During the Bronze Age in northwestern Iran and its neighboring regions, various distinct ethnic groups coexisted in close proximity, though they were not uniformly distributed. Each cultural group exhibited unique sub-groups, identifiable through symbols and motifs that affirmed their distinctiveness. The religious and ritual identity of the Kura-Araxes culture, as well as the interpretation of ritual data from this period, remains an underexplored topic within Bronze Age archaeology. This study sought to investigate the religious beliefs of Kura-Araxes communities by analyzing archaeological data from two key sites—Kul Tepe Gargar and Kul Tepe Sarein—as well as comparing these findings with evidence from other prominent sites beyond Iran.

The primary aims of this research were to identify religious symbols, elements, and signs associated with this culture and to compare them with similar materials from other regions. The findings revealed that sites yielding significant ritual data consistently displayed shared cultural artifacts across excavated contexts. The most notable evidence included portable and stationary hearths, figurines, and, in rare instances, ritual architecture, all of which were instrumental in identifying and analyzing ritual practices of the Kura-Araxes period.

The analysis indicates that while the Kura-Araxes culture lacked fixed, dedicated spaces for rituals (with a few exceptions), its practices were embedded within a temporal framework (3500–2400 BCE) and closely related to contemporary cultures, such as Uruk, which emphasized religious activities. The portable nature of ritual artifacts, such as figurines and hearths, aligns with the hypothesis of the semi-nomadic or agro-pastoral lifestyle of this culture, reflecting domestic and familial religious practices rather than centralized, institutionalized rituals. This suggests that ritual behavior was an integral characteristic of the Kura-Araxes culture despite the absence of permanent sacred spaces.

In conclusion, the artifacts and findings from both Iranian and non-Iranian sites linked to the Kura-Araxes culture consistently point to their ritual significance. This research provides a foundational perspective on the religious and ritual practices of the Kura-Araxes culture, offering a basis for future studies to further explore this fascinating aspect of Bronze Age archaeology.

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بررسی و تحلیل شواهد آئینی در قلمرو فرهنگ کورا-ارس؛ اجاق‌ها و پیکرک‌ها بارزترین شواهدی از رفتار آئینی و هویت دینی مردمان کورا-ارس

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چکیده

گستردگی و مطالعهٔ شاخصه‌های فرهنگ کورا-ارس یکی از موضوعات موردمطالعهٔ باستان‌شناسان این حوزه است. یکی از مقوله‌های مبهم این فرهنگ، جایگاه دین، آئین، شواهد و مدارک آئینی در بین مردمان کورا-ارسی است. این ویژگی نه به‌دلیل جنبهٔ معنوی و ماورا طبیعی، بلکه بیشتر به‌دلیل منابع کم، کمبود و ناشناخته بودن شواهد فرهنگی از اهمیت ویژه‌ای برخوردار است. شواهد این قسمت از فرهنگ کورا-ارس در کاوش‌ها همانند پیکرک، اجاق و شاید معماری(؟) ظاهر می‌شود و در تمامی قلمرو این فرهنگ از شمال‌غرب ایران تا شرق آناتولی و قفقاز جنوبی تقریباً در همه‌جا رایج بوده است. از مهم‌ترین اهداف این پژوهش، چگونگی هویت اجتماعی، باورهای آئینی جوامع کورا-ارس و شناخت نمادها، عناصر و نشانه‌های مذهبی فرهنگ کورا-ارس برمبنای مطالعات کتابخانه‌ای-اسنادی و داده‌های دست اول کاوش‌ها در ایران به‌صورت أخص و کل قلمرو فرهنگ کورا-ارس بوده است. همچنین این پژوهش در پی پاسخ به پرسش‌ها و ابهامات پیش‌ِرو است؛ مدارک و شواهد باستان‌شناختی چه پیشنهادهایی را در رابطه با باورهای آئینی-مذهبی جوامع کورا-ارسی در اختیار می‌گذارند؟ و به‌عنوان یکی از مهم‌ترین پرسش‌ها، باورهای مذهبی جوامع کورا-ارسی در ایران و قفقاز دارای چه تفاوت‌ها و چه تشابهاتی است؟ به‌طورکلی آیا می‌توان از باور، دین، آئین، مکان‌های مذهبی و آئینی در رابطه با جوامع کورا-ارسی صحبت به‌میان آورد؟ پژوهش پیش‌ِرو عمدتاً در تلاش برای پاسخ به پرسش‌ها و اهداف مطرح شده، خواهد کوشید تا بخشی از این پرسش‌ها و ابهامات را مرتفع سازد. نتایج به‌دست آمده نشان می‌دهند که این فرهنگ و مردمان آن، اگرچه مکان خاص و جایگاهی جدا برای دین و آئین خود نداشته‌اند (براساس یافته‌ها و نتایج به‌دست آمده تا کنون) اما از یک‌سو بازهٔ زمانی (۳۵۰۰-۲۴۰۰/۲۵۰۰ پ.م.) و تداوم این فرهنگ، و از سوی دیگر فرهنگ‌های هم‌زمان، چون اوروک و غیره از دین و آئین بهره‌مند بوده‌اند و همچنین درمیان فرهنگ‌های عصر مفرغ رایج بوده است، مردمان و جوامع کورا-ارس را نمی‌توان یک فرهنگ بدون دین و آئین تصور کرد؛ اما نه به‌صورت یک فرهنگ یکجانشین و ثابت، بلکه اگر فرضیهٔ نیمه‌کوچ‌رو بودن این فرهنگ را بتوانیم بپذیریم، شواهد آئینی کورا-ارس همانند پیکرک‌ها و اجاق‌ها از نظر حجم و وزن کوچک و قابل حمل بوده‌اند؛ پس در نتیجه، ریشه‌هایی از این اعتقادات آئینی را در این شواهد می‌توان دید و شاخصهٔ آئینی را برای این فرهنگ می‌توان درنظر گرفت.

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Torpedo Jars of Iran: Context of Archaeological Discovery and Origin of the Bitumen Coating

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Abstract

One of the most important potteries used in Persian Gulf (Middle East) maritime trade with a large part of the ancient world, including the Persian Gulf, the Gulf of Oman, the Indian Ocean, Sri Lanka, and finally the country of Thailand. (Suriname ship cargo) earthenware jar called Torpedo-jar or storage jar. Although this type of pottery was dated by most researchers to Sassanian era, this type was used in trade and burial from the Parthian period to early Islamic era or 3rd century BC to 9th century AD (Kennet, 2004: 85). The most important feature of these types of jars is the coating of bitumen on its inner surface. So far, archaeologists have not succeeded in finding a kiln for the production of this type of pottery, so it is very important to know the place of pottery production and the bitumen mine used in them. In this article, using the method of geochemical laboratory studies and a comparative study, the bitumen samples taken from the torpedo jars from the south and southwest of Iran were investigated. In this research, 15 pieces of pottery with tar coating belonging to the archaeological excavations of Siraf and Mahruban ports on the coast of the Persian Gulf (south of Iran), related to the Sassanid and Islamic period, and samples from Shush and Shushtra region from the Parthian and Sassanid periods were selected.The sample of the Susa area is from the Iran National Museum and belongs to the archaeological excavations of Susa region, the sample of Ivan-i Karkheh is related to the Dezful region, and the sample of the Dastova area is also related to the Shushtar region in Khuzestan province, southwest of Iran. All bitumen samples were analyzed geochemically with the aim of determining the origin of bitumen in its specialized laboratories in Europe and America. The main result of the research shows the use of bitumen from the bitumen springs of Khuzestan, Lorestan, Ilam and Kermanshah provinces in the studied pottery (Fig. 1).

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1. Introduction

The present article is dedicated to the topic of geochemical analysis of bitumen from "torpedo jars" from Susa, Dastova, Ivan-i Karkheh, Mahruban and Siraf archaeological sites from Iran (Fig. 1).

Bitumen samples collected for laboratory studies in this research are categorized into two groups. The first group pertains to archaeological excavations in Siraf, Mahruban, and Susa in south and southwest Iran. The second group is associated with surface surveys conducted in Ivan-i Karkheh and the ancient site of Dastova (Elymais city in Khuzestan province), located in the southwest and south of Iran, respectively. The chronology of the selected samples indicates that the Shush (Susa) and Dastova samples are from the first millennium BC (Parthian and Elymais), while the Ivan-i Karkheh, Siraf, and Mahruban samples are from the first millennium AD (Sasanian period and early Islam). According to Esmaeili Jolodar's chronology, the Siraf sample is categorized in the context of the early Islamic period(Esmaeili Jelodar, 2021:270-275). However, due to intentional accumulation of intact and fragmented pottery by Muslims to fill the previous architectural space and the comparison of this pottery with Sasanian period examples, these samples could be considered older, probably from the late Sassanid period. As this article focuses on Torpedo Pottery type, which is found across the entire Persian Gulf, the Indian Ocean, and recently in Thailand where the Suriname shipwreck was excavated (Choksy and Nematullahi, 2018: 144-151; Lischi *et al.,* 2020:1-14), it is important to have a deeper understanding of the archaeological background of the study samples.

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1.2. Torpedo Jars: definition, study background and function

One of the most important potteries found in the Persian Gulf, the Gulf of Oman, and the Indian Ocean -including India and Sri Lanka- is the type known as Torpedo Jar. Adams (1970) introduces these containers as Torpedo Fuse Point. this type is also known as a

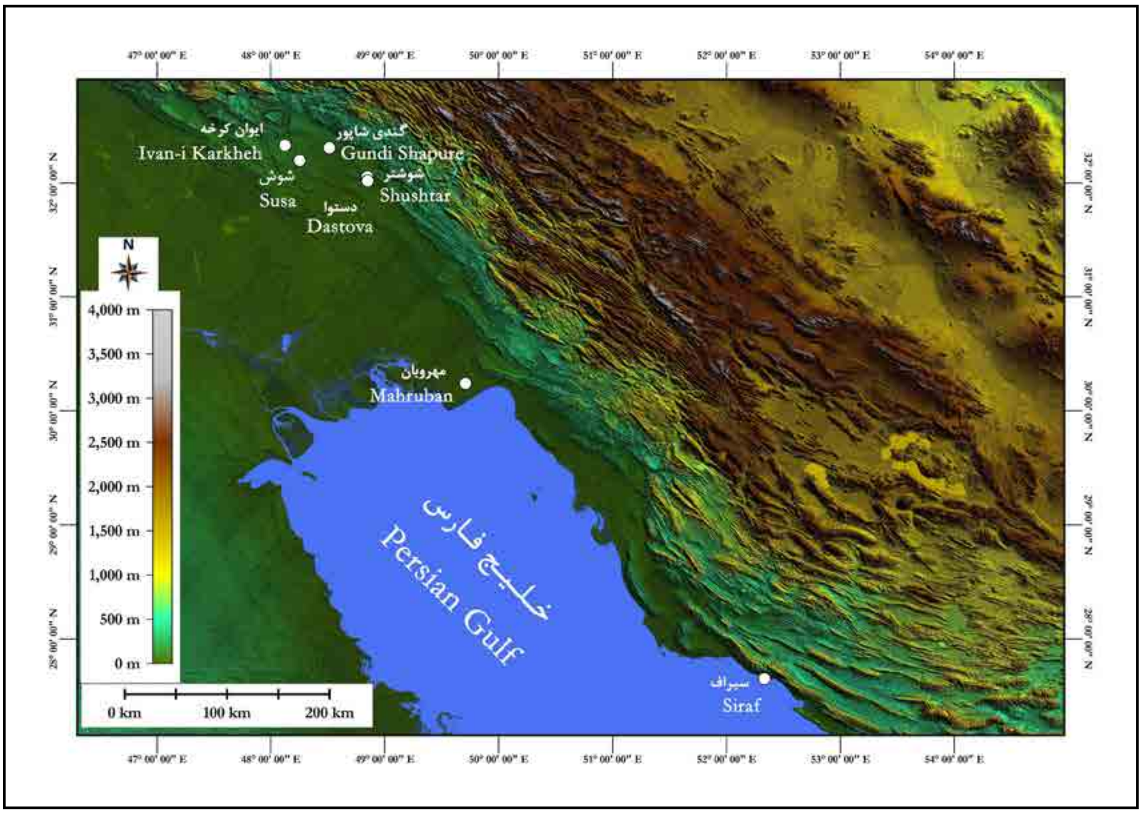


Fig. 1: Map location of the study areas (© Mohammad Reza Rokni).

'Spitzfuss' storage jars.1 The material used for both the interior and exterior coating is bitumen, as confirmed by tests. This coating is also referred to as "Glass Gum" in the Devnimory of India (Tomber, 2007: 976).

These jars typically stand about 100 cm tall and are approximately 35 cm wide. They feature sloping shoulders, thick rims, and either a rounded base or a flat bottom with a smooth, sharp, and well-rounded tip. Often known as Torpedo Jar Pottery or storage containers with ring-necked necks, these types have been discovered across the Persian Gulf and Mesopotamia from the Parthian period to the Abbasid era. The majority of examples date back to the Sassanid era, and were likely used for shipment of liquids. This type of pottery is fired at high temperatures, resulting in a reddish-yellow (7.5-6.8 YR) to pale yellow (2.5-4.8) color with a significant presence of sand and fine-grained particles measuring 0.1mm in thickness. The pottery's surface is smoothed with brushed salt and finished with wet hands, giving it a somewhat sandy texture. Its interior surface is predominantly coated with bitumen. Kennet (2004) believes that this type of pottery originates in Iraq (Kennet, 2004, p.85). The production centers of this pottery type have not yet been identified. However, the widespread presence of this pottery along the Persian Gulf coast, particularly in the major Sassanid cities like Ivan-i Karkheh near Andimshek, has been observed. It has been reported from the Mian Ab in Shushtar Plain (Khosrowzadeh and Aali, 2005: 240, Fig. 50), several ancient ports of Persian Gulf (from Mahruban to Siraf as noted by Esmaeili Jolodar, 2009) Gelalak in Shushtar and Shoghab in Bushehr (Rehbar, 1997; Sarfaraz, 1969). It has also been discovered in the Parthian and Sasanian layers of Susa.

There have been different opinions about the purpose of torpedo jars. The most significant ones include using this pottery to a) transport liquids like water, wine, or other beverages, b) store supplies, and c) bury the bones of the deceased. It is challenging to provide a definitive answer to this question, but the two purposes of transporting liquids and burying the dead align with archaeological evidence and written records (Table 1).

2.1. Archaeological sites

It is important to begin by providing the historical, spatial, and temporal context of the locations where the pottery samples were examined. Following this, the chronology of the chosen samples will be addressed.

2.1.1. Susa: Sample No.3430

Susa is an ancient site in Iran with a history of continuous settlement dating back millennia. As one of the world's oldest cities, Susa has long been a subject of fascination. Archaeological exploration in Susa has spanned 70 seasons from 1850 to 1987 (Mohammadifar, 2014: 65). British, French, Iranian, and international archaeologists have conducted excavations in this area and Stern and his colleagues have published an important article about bitumen's of Torpedo jar (Stern *et al.,* 2007).

The artifact selected from the National Museum of Iran pertains to the Parthian Susa period, bearing the registered number 5667-21233 and number 35. It stands at a height of 95 cm with an opening diameter of 17.5 cm (Fig. 2 and 4). This jar originates from the French archaeological excavations in Susa, although there is a lack of archaeological information regarding its context. Our research indicates that the jar was unquestionably acquired from Susa and was likely transported from Susa to the National Museum of Iran in recent years. Additionally, it is known that a similar specimen was discovered in the excavations conducted by Girshman2 in the cemeteries of Susa (Fig. 3) (Boucharlat and Haerinck, 2011:41, Fig. 19 b&c).



Fig. 2: (left)Torpedo jar from Susa (Boucharlat and Haerinck, 2011:41, fig.19a) Fig. 3) (center) cylindrical jar from Susa in National Museum. Fig. 4) image of inscription or a molded stamp on torpedo jar (right), (© Esmaeili Jelodar).

Boucharlat and Haerinck (2011) suggest that cylindrical jars from Susa coated with bitumen inside and having a round bottom, date back to approximately the first year AD to 225 A.D. (Parthian period). They believe that the other type of jars, namely the torpedo jars with a pointed or torpedo-shaped bottom, date back to the period between 225 BC and 110 BC. (Boucharlat and Haerinck, 2011:58, table1). The pottery of the National Museum closely resembles other similar examples of cylindrical jars discovered at Susa. As a result, its origin is estimated to be from the early first millennium AD to 225 AD., therefore, this pottery can also be dated to the Parthian period (for comparisons see: Fig. 2, 3 and 4 (Boucharlat and Haerinck, 2011:41; Fig. 19b and 19c; Boucharlat *et al.,* 1987, Fig. 69). Cylindrical jars and torpedo jars differ in the shape of the base. Cylindrical jars have a semi-round base.

The significant aspect of the jar selected from the National Museum is the presence of an inscription or a molded stamp on its body at the bottom of the rim. This feature indicates its commercial purpose. (Fig. 4a&b).

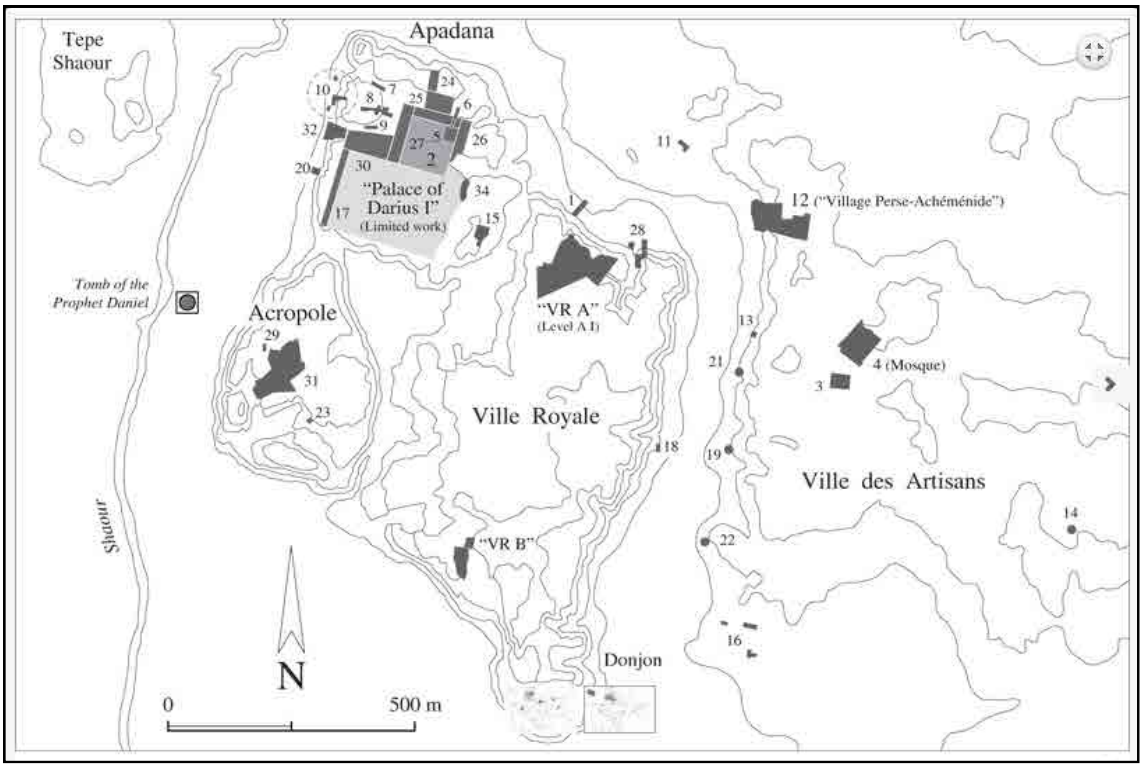


Fig. 5: The main sites (indicated by numerals) worked at Susa by Roman Ghirshman and Marie-Joseph Steve, 1946-68. (Gasche, 2009; Fig. 2).

Fig .6: Arial map of Ivan-i Karkheh in Susiana plain near to Karkheh River (Google earth).

Table 1: Distribution of Torpedo jars in the Ancient Ports of the Persian Gulf, Indian Ocean, East of Africa, India and China.

Site name	location	Date	References
Siraf and Mahruban,	Iran	Sassanid and Early Islamic	Esmaeili Jelodar, 2010
Suriname shipwreck	Thiland	Sassanid and Early Islamic	Choksy and Nematullahi, 2018
Mian Ab e Shushtar	Iran	Parthian, Sassanid and Early Islamic	Khosrowzadeh and Aali, 2005: 240, fig. 50
Mleiha ,Al-Dur, Suhar phase III	UAE and Oman	pre-Islamic period	Kervran, & Hiebert, 1991: 341, fig. 6
Reyshahr	Iran	Sassanid	Khosrowzadeh, 2011: 180
Jazirat al-Ghanam	Kowait	Sassanid	De Cardi 1975, fig. 8: 15,36
Kush	UAE	5th and 6th centuries	Kennet, 2004: 69
Shoghab site in Bushehr	Iran	Sassanid era	Rahbar, 1997
Anuradhapura	Sri Lanka	200 AD to 600 AD) which dates back to about 200-600 AD.	Coningham and Batt, 1999; Coningham, 2006: 5, Table.1.1; Stern et al., 2007: 409-428
Gelalak of Shushtar	Iran	Parthian	Rahbar, 1997; Sarfaraz, 1969
Mantie port	Sri Lanka	Sassanid to the early Islamic	Wijayapala & Prickett 1986: 17
Kateshwar	India	6th century AD	Tomber, 2007: 979
Alagankulam Port	south of India	500 and 1200 AD	Tomber, 2007: 979
Tissamaharama	Sri Lanka	Parthian to the Islamic era	Tomber, 2007: 980
Nagara,Nevasa,Pattanam and Paunar	India	Sassanid layers	Tomber, 2007: 981
Ras Hafun	Somalia	the 3rd to 5th centuries	Smith & Wright 1988: Fig. 9ah

2.1.2. Ivan-i Karkheh: Sample No.3432

Ivan-i Karkheh is an ancient city from the Sassanid period, located 20 km northwest of the ruined city of Shush (Susa), and situated west of the Karkheh River. The city was fortified and had a rectangular shape, with a width of one kilometer and a length of 4 kilometers. The city was surrounded by a wall made of raw clay (Fig. 6). In their article, Gyselen and Gasche (1994) suggest that this city resembles Roman camps, with four nearly equal quarters and a sizable palace and gardens in the royal area. (Gyselen & Gasche, 1994; 30 -31; Vandenberghe, 2000: 680).

Through pottery analysis, Wenke (1976) suggests that Ivan-i Karkheh dates back to the third century AD and likely originated as a Parthian settlement prior to Ardeshir's rule in 224 AD. He has not discovered any evidence of settlement from the Islamic era, indicating that this city was likely abandoned after the Sassanid period. (Wenke, 1976: 72-73). The sources of the early Islamic period also provide brief information about this city. For example, Istakhri *et al.,* (1994) only mentioned the name of this city.

The city of Dastova is situated 3 kilometers south of Shushtar, between two branches of the Karun River: the Gargar River (or Do Dangeh) to the east and the Shotait River (or Chahar dangeh) to the west (Fig. 1). The Gargar river is an artificial canal dating back to the Sassanid period. It was constructed in Shushtar along with the Shadorvan and the Mizan dams after the Achaemenid Darion canal was dried. The boundary between these two branches of the Karun River is referred to as MIĀN Āb (meaning "island" in Persian). Prior to the construction of the Gargar canal, the Achaemenid or post-Achaemenid Darion stream irrigated the agricultural lands of Miān Āb. This city was investigated in 1968 by Ali Akbar Sarfaraz from the General Directorate of Archeology and Popular Culture (Rahbar, 1997;175-176; Sarfaraz, 1969, 73-79). After him, Mehdi Rahbar excavated during three seasons in the years 2003, 2004 (Rahbar, 2003, 2004). In 2014, during Esmaeili Jelodar's field survey with his students from the Department of Archaeology, University of Tehran, sample No.3431 of the torpedo jar was collected from the surface of the area and selected for this laboratory study.

Mehdi Rahbar's excavation report states that torpedo jars were discovered in tomb 5, which was excavated in trench T12. Rahbar dated the tomb to the Seleucid-Parthian period based on the presence of 37 copper and lead coins featuring Parthian and Seleucid iconography. The discovery of Esmaeili team's sample in the same location supports the Parthian dating. (Fig. 7-10).

Fig. 7: Tomb of Gelalak in Shushtar, Khuzestan province (left,© Mehdi Rahbar).

2.1.4. Siraf: Samples No.3437-3444

Siraf or Bandar-I Taheri is located on the 250 km east of Port Bushehr and 35 km southeast of Port Kangan on the beach of the Persian Gulf. (Fig. 11)

Sirāf was one of the most important ports in the Persian Gulf, playing a key role in the region's maritime trade throughout its history. Early Islamic historians frequently

Fig. 8: Top: Sassanid coin. Down left: Parthian coin. Down right: Elemaeane coin. (Rahbar, 2004).

mentioned the name of Sirāf in their writings. (see e.g. Al-Jeyhani 1989: 55-60, 109-128; Muqaddasī 2006: 636-7; Yāghūt 1983: 60, 76; Ibn Faqih 1970: 374-5; Ibn Rusta 1986: 111; al-Masʿūdī: 1965: 143; Semsar, undated: 219, 220; Sūleymān and Abū Zayd-e Sirāfi 2002: 13, 14; Istakhri, 1994: 115, 116; Ibn Ḥawqal 1966: 55, 56; Anonymous 1983: 130, 131; Ibn Balkhi 1995: 328-332; Abul'l-Fidā 1970: 374, 375). Since the beginning of the 19th century, Siraf port has attracted the attention of political officials, history researchers, and foreign archaeologists. (Morier, 1812; Semsar, undated; 331/1; Wilson, 1942; Kempthorne, 1837, 1856; Pezard:2005; Ravaisse. 1914; Pezard, 2005: 133-129 and see also: Lamb, 1964; Stiffe, 1895; Stein, 1937).

The archaeological excavations at Siraf were carried out for seven seasons from 1966 to 1973 by a joint Iranian-British delegation led by Dr. Whitehouse. The results of these excavations were published in the form of numerous articles, particularly in the journal of Iran (Whitehouse, 1968, 1969, 1970, 1971, 1972, 1974, 2009).

After Whitehouse, H. Bakhtiari continued to excavate Siraf for a season in 1975 (Bakhtiari, 1974, 1976). Masoumi, Zarei, Sarfaraz, Sadraei, MirEskandari, Tofighian and Khakzad also conducted limited explorations and surveys in Siraf and its surrounding areas (Masoumi, 2004; Sarfaraz, 2004; Khakzad, 2012, 2015). In 2006-2007, the first and second seasons of the archaeological excavations in Siraf were carried out by Esmaeili Jelodar of the University of Tehran. (Esmaeili Jelodar, 2009). Later, the third season of excavations was also conducted by him in 2022 (Fig. 11).

The prospect of Siraf torpedo-jar pottery

The new phase of archaeological excavations in Siraf took place over two seasons, from 2008 to 2009. Torpedo-jar samples were uncovered during the second season. This phase of the excavations focused on establishing the chronology of Siraf. Two trenches, named A and B, were opened during this season. Seven potsherds selected for analysis were collected in 2009, with one piece originating from trench A and the remaining six from trench B. (Fig. 11). Sample No.3443 from Trench A (table 7), analyzed using C-14 dating, suggests a date range of 850-976 AD (Esmaeli Jelodar, 2021: 201-218). While this points

Fig. 11: Map of the location of the Siraf excavation trenches by Esmaieli Jelodar on the coast of the Persian Gulf on Google Earth map (Google Earth, 2015).
■ Tr. I, II & II excavated by Esmaeili Jelodar in the First Season .
● Tr. A & B excavated by Esmaeili Jelodar in the Second Season.

to its belonging to the early Islamic period, there is a strong possibility that this pottery was actually used in an earlier period, specifically the Sassanid era (Fig. 12, Table 2). The other six specimens were collected from locus 107 of Trench B, which is 80 cm thick. C-14 dated samples from the center of this layer yielded a date of 887 (95.4%)- 985 cal., indicating a date range from the late 10th century AD to the 12th century AD. The specific details about these samples can be found in Tables 3 and 7. Among them, four pieces are associated with the rim and body of the vessel, while three include the pointed base of the torpedo jar along with a part of its body (Figs.13-17, Table 4).

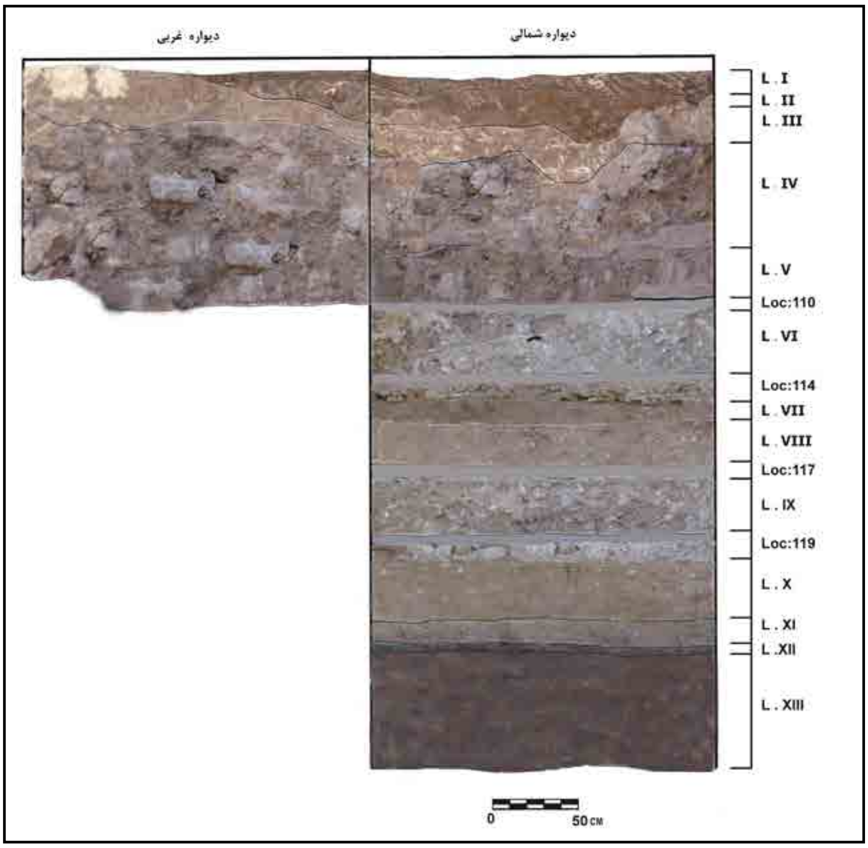


Fig. 12: Stratigraphy of Tr. A, Siraf 2009 (Left,Esmaeili Jelodar, 2021: 212).

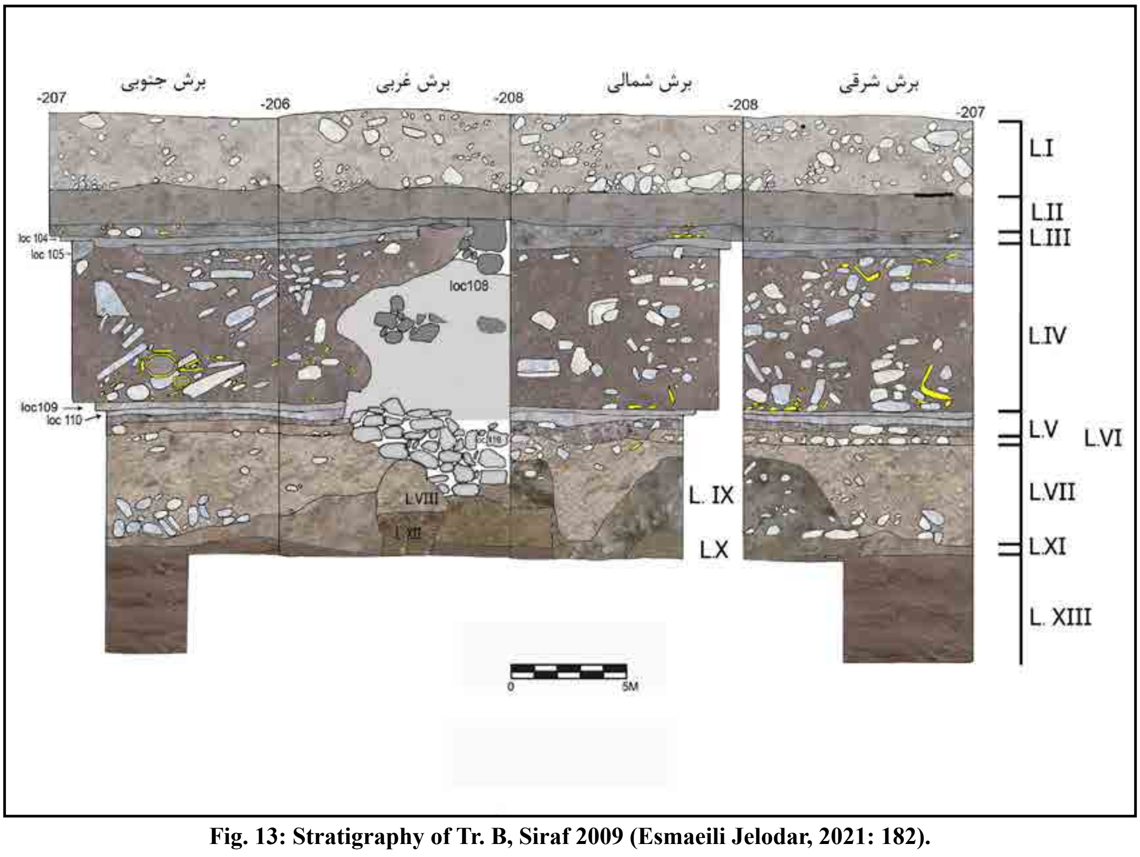


Fig. 13: Stratigraphy of Tr. B, Siraf 2009 (Esmaeili Jelodar, 2021: 182).

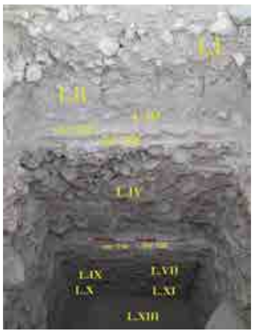


Fig. 14: East wall section of stratigraphy of Tr. B.(left). Fig. 15 &16: The deposit of the Early Islamic period, which is full of Sassanid cultural materials such as torpedo jar, blue- green glaze ware.

Fig. 17: Three torpedo jars from Siraf, Tr. B, loc.107, Layer Ic.

Table 2: Stratigraphy of Tr. A, Siraf 2009 (Esmaeili Jelodar, 2021: 218).

Locous	Layer	sous-phase	Phase	Period
-	XII, XIII	-	-	virgin soil
—	X, XI	-	Ia	I 800-1050 AD
119	IX	IbI	Ib	
117	VIII	IbII		
114 C14 Dating from Loc.114:850-976AD	IV, VII	-	Ic	
110	II, III, IV, V		Id	
-	I	-	-	Surface layer

Table 3: C14 dating result from Siraf,Tr. B, Oxford lab (Esmaeili Jelodar, 2021: 188).

No.	Oxf. No		Tr,	Loc.	Layer	Date
3	Oxa.22844	Bone	B	107	IV	887(95.4%)985 cal.AD

Table 4: Stratigraphy of Tr. B, Siraf 2009 (Jelodar, 2021: 189).

<table>
<tr><th>Locus of architectural structures</th><th>layer</th><th>Sub-phase</th><th>Phase</th><th colspan="2">Period</th></tr>
<tr><td>–</td><td>XIII, XII, XI, X</td><td>–</td><td>–</td><td>–</td><td>Virgin soil</td></tr>
<tr><td>–</td><td>IX, VIII, VII</td><td>IaI</td><td rowspan="2">Ia</td><td>Sassanid and Early Islamic era 400-800AD</td><td rowspan="5">I
Late Sassanid and Early Islamic era</td></tr>
<tr><td>–</td><td>VI, V</td><td>IaII</td><td rowspan="4">800-985 AD
C14 dating: layer IV, Locus 107; 887- 985 cal. AD (95.4%)</td></tr>
<tr><td>108, 110, 119</td><td>–</td><td>IbI</td><td rowspan="2">Ib</td></tr>
<tr><td>109</td><td>–</td><td>IbII</td></tr>
<tr><td>–</td><td>IV</td><td>–</td><td>Ic</td></tr>
<tr><td>105, 108</td><td>–</td><td rowspan="2">-</td><td rowspan="2">IIa</td><td rowspan="3">II
1000-1160 AD</td><td rowspan="3">II
Islamic period
(11-12 century)</td></tr>
<tr><td>104</td><td>–</td></tr>
<tr><td>–</td><td>III</td><td>–</td><td>IIb</td></tr>
<tr><td>–</td><td>II, I</td><td>–</td><td>–</td><td></td><td>Surface soil</td></tr>
</table>

Mahruban: Samples No. 3433, 3444, 3445, 3446

Mahruban was a significant port in the coastal Persian Gulf engaging in extensive trade with other ports such as Basra, Siniz and Genaveh as well as with inland centers like Arrajan in the Behbahan Area. Situated approximately 10 km north of Deylam near the village of Shah Abdollah, the remnants of this site now form a visible natural ridgeline stretching almost 1.5 km with a width exceeding 200 m. (Fig. 18).

Fig. 18: Left: Arial photo of Mahruban in west of Shah Abdullah village on Google Earth. Right: location of trenches A (top) and B (down) on the GIS map of the Mahruban port.

Mahruban was a thriving city from the late Sassanid era to the early Islamic era until the 10th century AD, as indicated by historical sources and archaeological research (Esmaeli Jelodar and Mortezae, 2013; Ibn Faqih 1970: 9, 114; Schwartz, 2003:164; Ibn Rusta, 1986: 111; Istakhri, 1994: 39-40, 115, 120-121, 127; Muqaddasi, 2006: 74, 631, 636; and 672-673; Ibn Ḥawqal, 1966:1, 7, 21 and 55; Al-Jeyhani, 1989: 55, 58, 110, 119; Anonymous, 1983:133; Qudama ibn Jafar 991:137; Qubaidiani Marvzi, 1984:160-163; Gaube, 1981a and b:77-78). In 2009, based on location and extent area of the Mahruban port, two trenches were opened: trench A and B (Fig. 19).

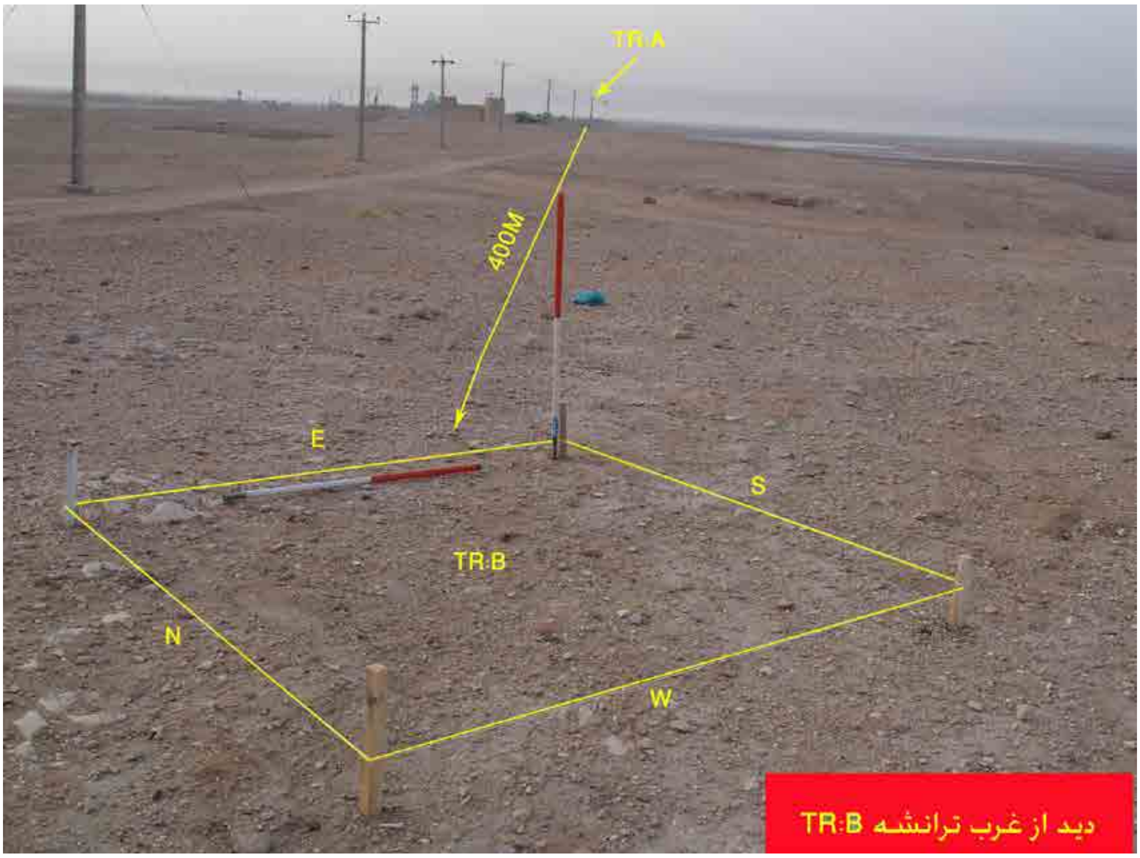


Fig. 19: General view from Trench B.

Fig. 20: Torpedo jar fragments from Locus 117, Tr. B.

Mahruban's Torpedo Shape Pottery Perspective

A Torpedo jar from Mahruban port was obtained for the first time from Locus 108, from a depth of -250 cm in the trench B, from layer IIc, with a chronology of 900-1300 AD. The C-14 dating for this layer is 943 to 1010 AD (Tables 5 and 6), and considering that the sample was chosen from the lowest level of this layer, it is logical to attribute it to the beginning of the 10th century AD (Esmaeili Jelodar and Mortezae, 2013; 343). The existence of early Sgraffito pottery along with Torquize glaze ware with barbotine decoration and their attribution to the Islamic period indicates the presence of this port in the international maritime trade of the Persian Gulf in the early Islamic centuries. However, most statistics related to the torpedo jar tipped pottery were obtained from the deposits of Locus 117 to Locus 122 in Trench B (Fig. 20)

The specimens chosen for laboratory analysis were gathered during a 2009 archaeological dig and consist of sample numbers No.3433, No.3435, and No.3436. These samples originate from a layer that, based on pottery typology for relative chronology and C-14 absolute dating, can be attributed to the late Sassanid and early Islamic Period. They were discovered in a stratum directly above a clearly Sassanid context, suggesting potential usage during the Sassanid era.

Table 5: C14 Dating of Port of Mahruban, Persian Gulf, Iran.1388, Tr. B (Oxford University Laboratory, UK, 2010).

No.	Oxf. No		Tr,	Loc.	Layer	Date
11	Oxa.22800	Tooth	B	108		897(17.8%)922 cal.AD 943(77.6%)1020. cal.AD
12	Oxa.22801	Bone	B	114		544(95.4%)633 cal.AD
13	Oxa.22669	Charcoal	B	114		878(95.4%)985 cal.AD

2.2. Samples analyzed

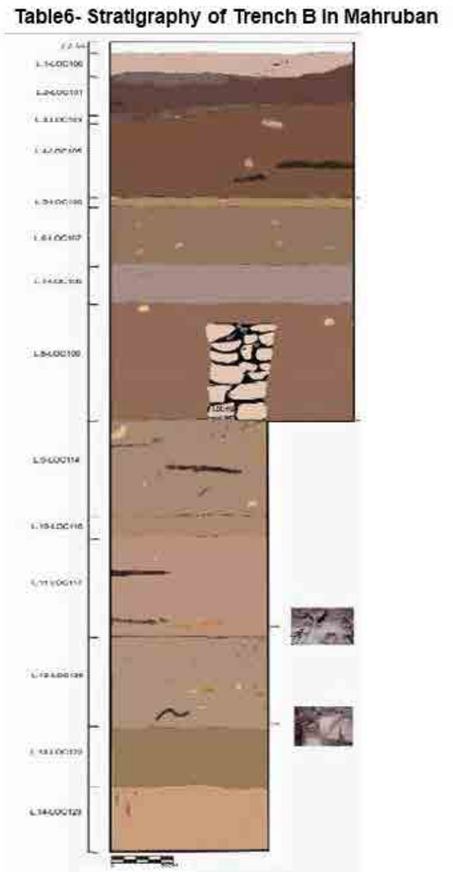
15 samples of bitumen (Table 7), coating the interior face of potsherds from torpedo jars, dated from the Late Sassanid to the Early Islamic period (6th-8th century AD), from one Parthian jar from Susa (247 BCE-224 AD) and from one sample of Dastova of Elimaei-Parthian period, were analyzed to collect molecular data on saturates and aromatics and isotopic data on chromatographic fractions: saturates, aromatics, resins (NSO compounds) and asphaltenes (Table 8). Photos of samples are reproduced in Figures 21 and 22.

2.3. Analytical procedures

Methods used in this study have been described in details in previous papers (Connan *et al.,* 2021, 2022).

Table 6: Stratigraphy of TR. B in Mahruban

LOC	LAYER	LEVEL	C14 DATING(OXF.L)
100	L1	IIC 900-1300AD 330-730AH	
101	L2		
102	L3		
103	L4		
104			
105	L5		
106	L6		
107	L7		
108	L8		897(17.8%)922 cal.AD 943(77.6%)1020. cal.AD
109	L9	IIB IIB 900-1150AD/ 330-480AH	
110	L10	IIA 630 850AD/ 30-240AH	
111			
112			
113			
114			878(95.4%)985 cal.AD 544(95.4%)633 cal.AD
115			
116	L11		
117			
118			
119	L12		
120	L13	I 200-600AD	
121			
122			
123	L14	O	
124			



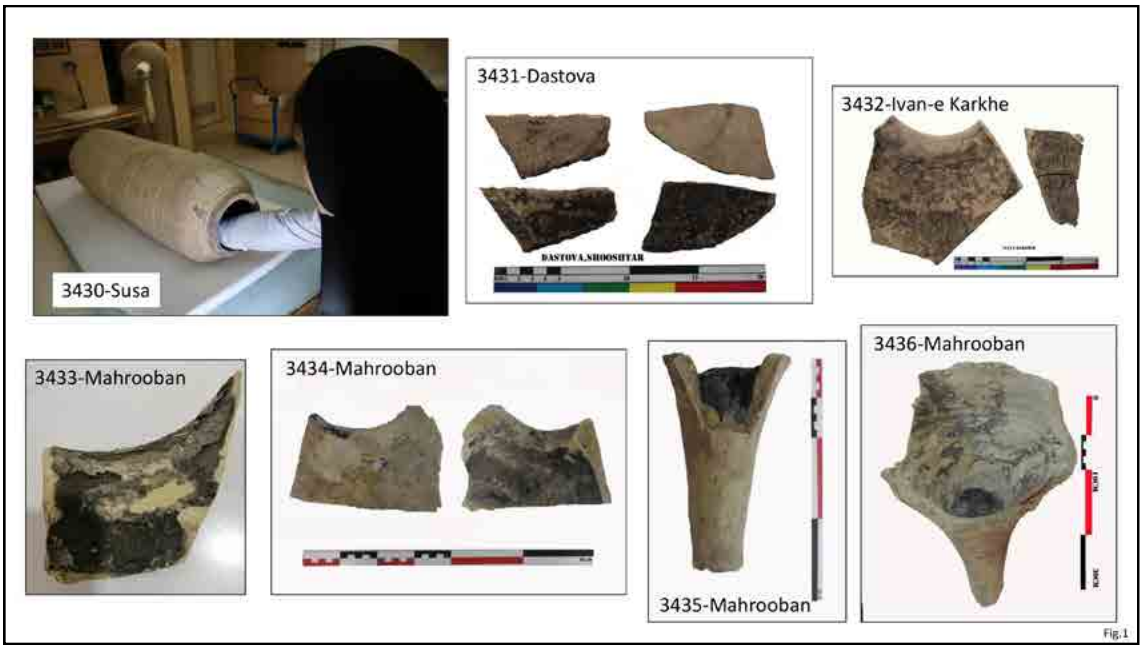


Fig. 21: Photographs of bitumen samples of Susa, Dastova, Ivan-i Karkheh and Maruban.

Fig. 22: Photographs of bitumen samples of Siraf.

3. Results and discussions

3.1. Gross composition

Gross composition data are compiled in Table 8. The scraped samples from potsherds are all rich in bitumen with a dichloromethane extract between 21 and 88 % / weight. Plot of % saturates vs. % aromatics vs. % polars (resins + asphaltenes) and % hydrocarbons (saturates + aromatics) vs. % resins (NSO) vs. % asphaltenes in Figs.23 and 24 shows that bitumens are all extremely rich in polar fractions and therefore are characteristic bitumens of archaeological sites, well documented in the literature (e.g. Connan *et al.,* 2021).

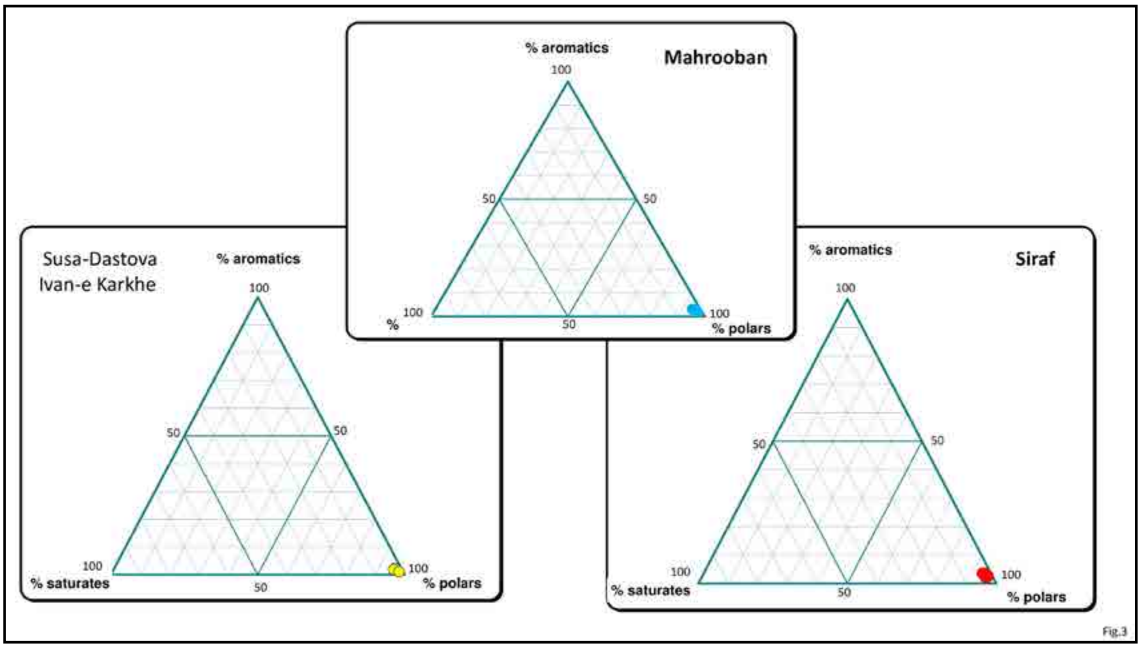


Fig. 23: Gross composition of the dichloromethane extract in ternary diagrams: %saturates vs. %aromatics vs. % polars (resins + asphaltenes) for Susa-Dastova-Ivan-iKarkheh, Mahruban and Siraf.

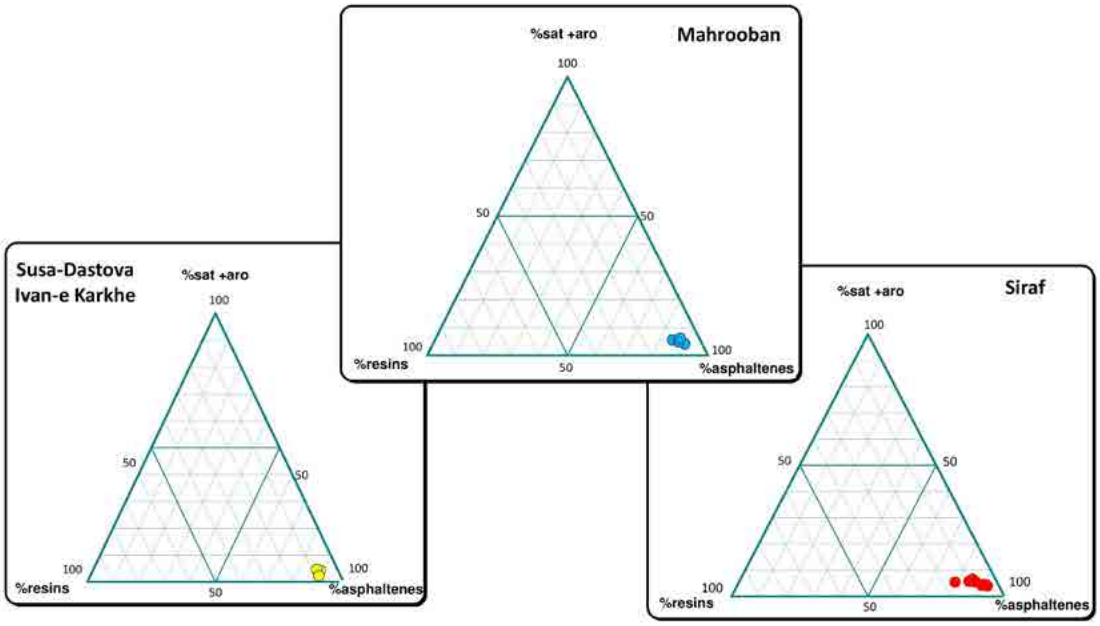


Fig. 24: Gross composition of the dichloromethane extract in ternary diagrams: %hydrocarbons (saturates + aromatics) vs. %resins vs. %asphaltenes for Susa-Dastova-Ivan-i Karkheh, Mahruban and Siraf.

3.2. Isotopic data

Isotopic data are listed in Table 2. Plot of $\delta^{13}C_{sat}$ (‰ /VPDB) vs. $\delta^{13}C_{aro}$ (‰ /VPDB) and $\delta^{13}C_{asp}$ (‰ /VPDB) vs. $\delta^{13}C_{NSO}$ (‰ /VPDB) in Fig. 25 shows a diversified situation among the samples and therefore different sources. By anticipating the rest of the study and taking into account the biomarker data and the presence of 18α(H)-oleanane, it follows that some samples cluster in a group (Fig. 25) where $\delta^{13}C_{asp}$ (‰ /VPDB) is ranging between -26.8 and -27.3 (‰ /VPDB). The occurrence of 18α(H)-oleanane is characteristic of bitumen originating from Iran. This feature is of course not surprising for samples of the Susa area but is informative for the bitumen of Siraf for it orientates the search of their bitumen sources towards Khuzestan, i.e the same area where the bitumen for the Susa samples where collected. Other samples came from other areas with $\delta^{13}C_{asp}$ (‰ /VPDB) ranging between -27.0 and -28.0 (‰ /VPDB).

Plot of δD_{asp} (‰/ SMOW) vs. δD_{NSO}(‰/ SMOW) and δD_{asp}(‰/ SMOW) vs. $\delta^{13}C_{asp}$ (‰/ SMOW) in Figs. 26 shows that bitumen from the potsherds of the Susa area seems to be more oxidized, i.e. more enriched in ^{2}H, than bitumens from Siraf samples. Mahrooban samples display a diversified situation. No relation is recorded between δD_{asp} (‰/ SMOW) and $\delta^{13}C_{asp}$ (‰/ VPDB). δD_{asp} (‰/ SMOW) is not a source indicator but reflects either the stage of oxidation of the bitumen or a possible contribution of ingredients which were stored or processed in the potsherd and were therefore impregnating the bitumen. In the present case the δD_{asp} (‰/ SMOW), which ranges between -100 and -70 (‰/ SMOW), does not suggest any potential contribution of the contents stored in jars.

The data on the samples of this set were compared to data obtained on bitumens from archaeological sites used as proxis (Fig. 27) and oil seeps (Fig. 28) from Iran. Plot of δD_{asp} (‰/ SMOW) vs. $\delta^{13}C_{asp}$ (‰/ VPDB) of archaeological sites (Fig. 29) shows that many samples of Susa, Chogha Ahowan, Tepe Tula'i, are enriched in ^{2}H as compared to what is recorded in this study. Some samples from Susa, Ali Kosh, Chogha Ahowan and Ali

Table 7: Gross composition and isotopic data on bitumens. Significance of abbreviations: EO% (% dichloromethane extract/ sample), sat% = % saturates / EO, aro% = % aromatics /EO, NSO% = % resins (NSO)/ EO, asp% = % asphaltenes /EO.

lab number	location	GeoMark number	Type of amphorae	EO%	sat%	aro%	sat +aro%	NSO%	asp%	pol%	δ^{13}Csat	δ^{13}Caro	$\delta^{13}C_{NSO}$	δ^{13}Casp	δD_{NSO} average	δDasp average
3430	Susa	UNK0872	MITCOV	29.3%	2.1	2.3	4.3	6.9	88.8	95.7	-27.6	-27.0	-26.69	-27.3	-95	-74
3431	Dastova	UNK0873	S?	55.4%	2.7	1.9	4.6	8.2	87.2	95.4	-27.2	-26.2	-26.5	-26.8	-92	-74
3432	Ivan-i Karkheh	UNK0874	C?	44.5%	1.3	1.1	2.3	8.5	89.1	97.7	-27.4	-26.6	-27.1	-27.0	-92	-73
3433	Mahruban	UNK0875	C	64.2%	1.9	2.2	4.1	6.2	89.7	95.9	-28.8	-28.0	-28.1	-28.0	-88	-69
3434	Mahruban	UNK0876	C	73.9%	2.4	3.1	5.5	9.9	84.6	94.5	-28.4	-27.0	-27.2	-27.2	-89	-76
3435	Mahruban	UNK0877	C	72.9%	1.9	2.9	4.8	8.0	87.3	95.2	-28.4	-27.2	-26.9	-27.0	-88	-85
3436	Mahruban	UNK0878	C	68.2%	2.9	3.2	6.1	6.8	87.1	93.9	-28.4	-27.0	-27.1	-27.5	-90	-97
3437	Siraf	UNK0879	C?	32.3%	2.1	3.7	5.9	9.6	84.6	94.1	-28.3	-27.0	-27.4	-27.5	-83	-91
3438	Siraf	UNK0880	S	88.5%	1.5	2.8	4.3	6.2	89.5	95.7	-29.1	-27.7	-27.9	-28.0	-86	-88
3439	Siraf	UNK0881	S?	63.4%	2.5	3.3	5.8	10.1	84.0	94.2	-27.9	-26.8	-26.6	-27.0	-96	-85
3439 bis	Siraf	UNK0882	S?	21.9%	2.1	3.4	5.5	15.3	79.2	94.5	-28.0	-27.3	-27.9	-27.6	-93	-95
3440	Siraf	UNK0883	C	65.0%	2.9	3.7	6.6	8.3	85.1	93.4	-27.7	-26.6	-26.9	-26.8	-96	-83
3441	Siraf	UNK0884	S	39.5%	1.7	2.4	4.1	4.2	91.8	95.9	-29.3	-27.4	-27.5	-27.9	-84	-84
3442	Siraf	UNK0885	S	74.7%	1.7	2.9	4.6	5.6	89.8	95.4	-28.7	-27.5	-27.9	-28.0	-90	-83
3443	Siraf	UNK0886	C	64.8%	2.5	2.0	4.5	4.6	90.9	95.5	-28.2	-27.1	-27.3	-27.3	-82	-87
3444	Siraf	UNK0887	C	35.1%	2.7	2.9	5.5	7.7	86.8	94.5	-27.6	-26.8	-26.6	-27.0	-89	-81
3444 bis	Siraf	UNK0888	C	68.9%	2.8	3.3	6.1	8.1	85.8	93.9	-27.8	-26.8	-26.9	-26.8	-92	-87

Table 8: Information about the samples: location, type of jar, date of samples.

lab number	Site	origin	Register number	photos	archaeological trench	Pottery No.	Locus	Layer/phase	campaign	latitude	longitude	type of torpedo jar (S or C?)	date of the potshed	date absolute dare (bone)	absolute date (tooth)	absolute date (charcoal)
3430	Susa	National Museum of Iran				56667				32°11'26"N	48°15'28"E	MITCOV	Parthian 247 BCE-224 AD			
3431	Dastova	Survey			archaeological survey 2012	1				32°0'22,31"N	48°50'22,80" E	S?	Parthian			
3432	Ivan-i Karkheh				archaeological survey 2012	2				32°19'15,84"N	48°7'35,36"E	C?	Sassanid or Early islamic era?			
3433	Mahruban port	Excavation project	M2/2020		Tr:B	10	117	L11/II or IIa		30°10'58,59"N	50°5'19,54"E	C	Late Sassanid	544(95,4)633 AD		
3434			M4/2020		Tr:B	26	109	L9/IIb		30°10'58,59"N	50°5'19,54"E	C	Early Islamic	670(93%)780 AD	943(77%)1020 AD	878(95,4%)985 AD
3435			M3/2020		Tr:B	3	117	L11/I? or IIa	2009	30°10'58,59"N	50°5'19,54"E	C	Late Sassanid	544(95,4)633 AD		
3436			M1/2020	259-260	Tr:B	32	117	L11/II or IIa		30°10'58,59"N	50°5'19,54"E	C	Late Sassanid	544(95,4)633 AD		
3437	Siraf	Excavation project	S7		Tr:B	828	TGF	Whitehouse Excavation 1968-1969- Great Mosque	1968-1969	27°40'4,03"N	52°20'7,05"E	C?	Late Sassanid? Early Islamic			
3438			S5		Tr:B	3	107	I.c	2009	27°40'4,03"N	52°20'7,05"E	S	Late Sassanid?Early Islamic	782(1,6%)789 cal AD 811(8,1%)847.cal AD 850 (85,5%)976.cal AD		
3439			S3	269-276	Tr:B	2/20;2	107	I.c	2009 code : 2	27°40'4,03"N	52°20'7,05"E	S?	Late Sassanid?Early Islamic	887(95,4%)985 cal.AD		
3440			S6		Tr: B	2/20;3	107		2009	27°40'4,03"N	52°20'7,05"E	C	Late Sassanid? Early Islamic			
3441			S2	278-295	Tr:B	2/21	107	I.c	2009	27°40'4,03"N	52°20'7,05"E	S	Late Sassanid?Early Islamic			
3442			S4		Tr:B	1	107	I.c	2009	27°40'4,03"N	52°20'7,05"E	S	Late Sassanid?Early Islamic			
3443			S8		Tr:A	32	118	I.b1	2009	27°40'4,03"N	52°20'7,05"E	C	Early Islamic			
3444			S1	269-276	Tr:B	2/20;1	107	I.c	2009 code :2	27°40'4,03"N	52°20'7,05"E	C	Late Sassanid? Early Islamic			

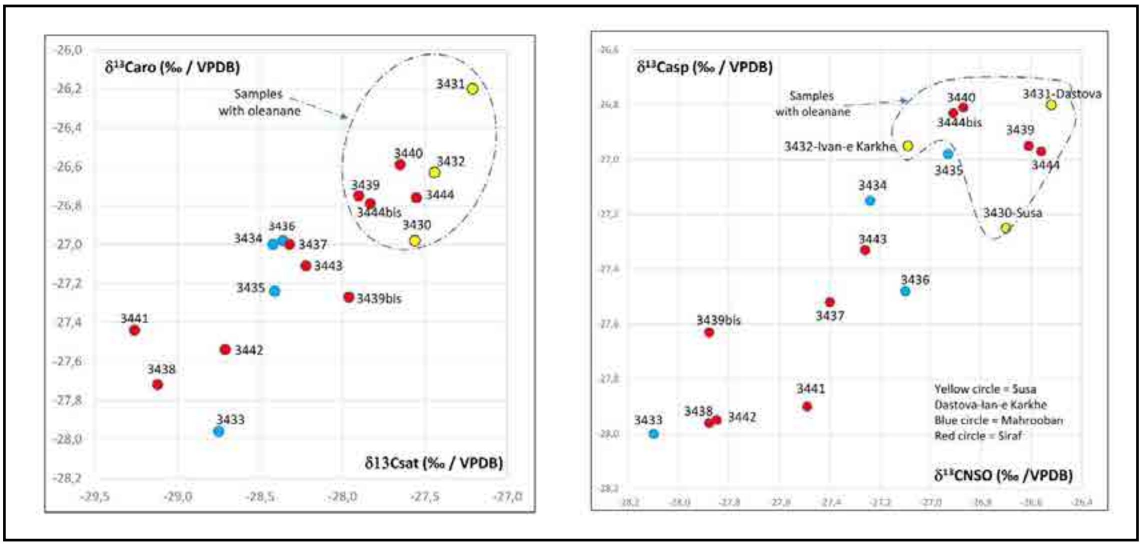


Fig. 25: Plot of δD_{asp} (‰ / SMOW) vs. δD_{NSO} (‰ / SMOW) and δD_{asp} (‰ / SMOW) vs. $\delta^{13}C_{asp}$ (‰ / VPDB). Significance of colours in Fig. 25.

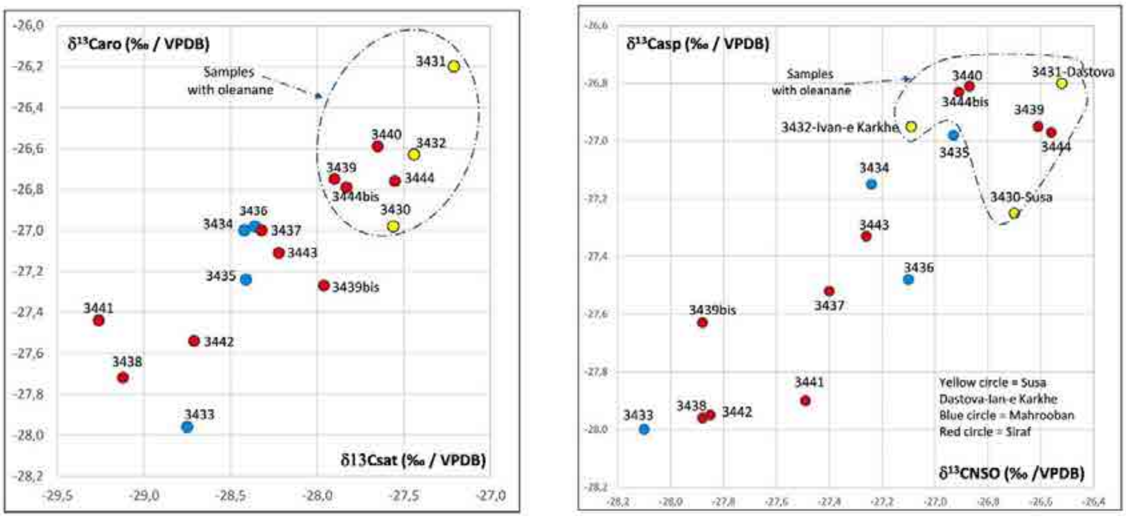


Fig. 26: Plot of δD_{asp} (‰ / SMOW) vs. δD_{NSO} (‰ / SMOW) and δD_{asp} (‰ / SMOW) vs. $\delta^{13}C_{asp}$ (‰ / VPDB). Significance of colours in Fig. 25.

Abad integrate the area defined by the samples of this study. One should notice that the Susa sample is in agreement with a Susa sample from the rim of a Parthian amphorae, previously analyzed. The record of δD_{asp} (‰/ SMOW) as a function of date (Fig. 29) did not show any tend despite the fact that oxidation of bitumen may have been enhanced with age. Plot of δD_{asp} (‰/ SMOW) vs. $\delta^{13}C_{asp}$ (‰/ VPDB) of oil seeps (Fig. 30) point that samples are matching with area of samples defined by Dehluran-Siah Kuh, Sultan/ Pol Doktar and Gilsonites, i.e. samples from Illam, Lorestan and Kermanshah provinces.

3.3. Biomarkers: steranes and terpanes (Table 9)

Mass fragmentograms of steranes (*m/z* 217) and terpanes (*m/z* 191) are reproduced in Fig. 31 and 32.

The sample of Susa (No. 3430) exhibits a rather well preserved distribution of terpanes with a moderate Tm/Ts and gammacerane, a low amount of tricycloploprenanes and a well

Fig. 27: Map of bitumens from archaeological sites of Iran used as proxis in this study.

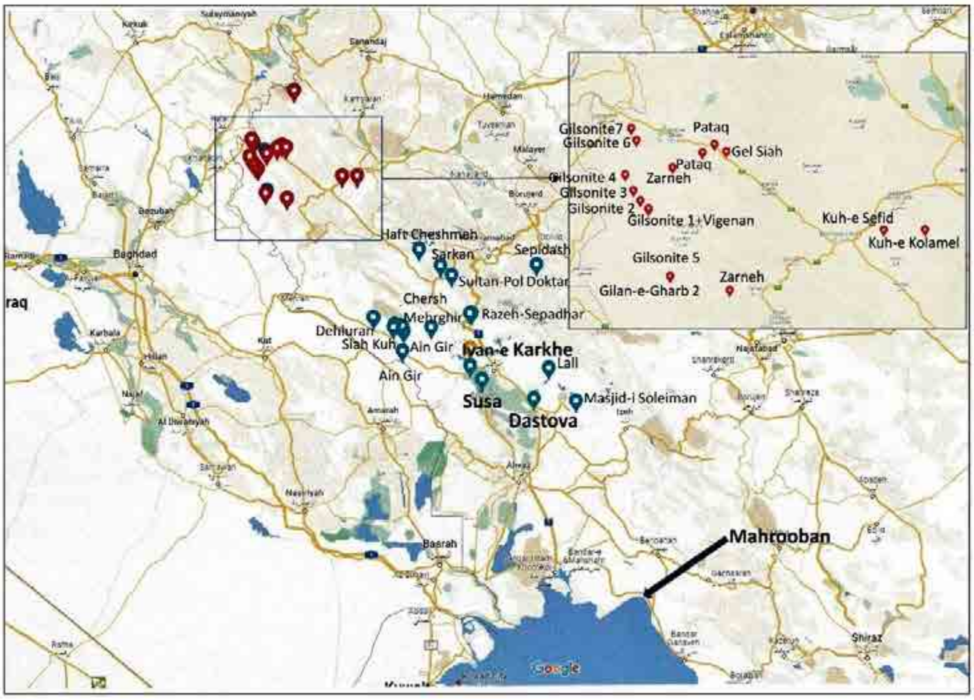


Fig. 28: Map of oil seeps used as references in this study.

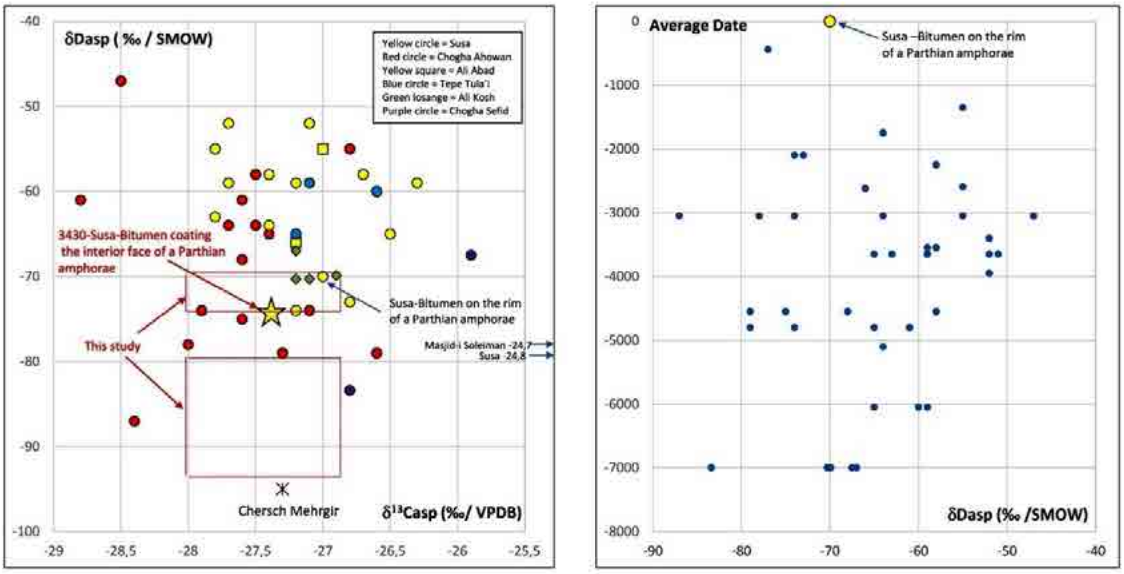


Fig. 29: Plot of δD_{asp} (‰ / SMOW) vs. $\delta^{13}C_{asp}$ (‰ / VPDB) of bitumens from archaeological sites used as proxis. Plot of of δD_{asp} (‰ / SMOW) as a function of date of samples from archaeological sites.

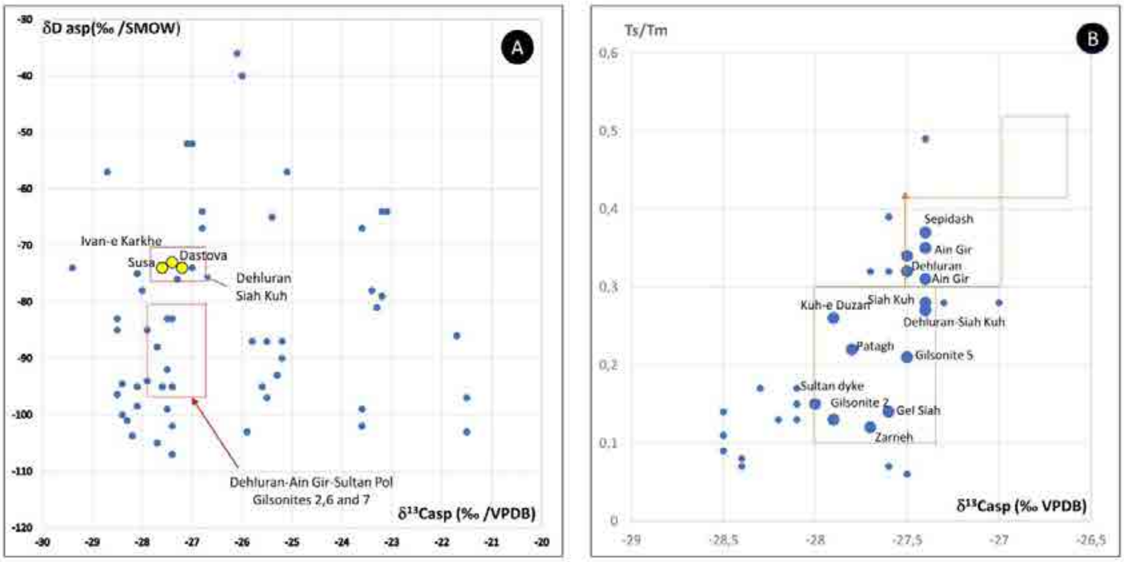


Fig. 30: Plot of δD_{asp} (‰ / SMOW) vs. $\delta^{13}C_{asp}$ (‰ / VPDB) and Ts/Tm vs. $\delta^{13}C_{asp}$ (‰ / VPDB).

present 18α(H)-oleanane. Steranes are biodegraded according to the well-documented sequence: C_{27} steranes are preferentially removed (Seifert and Moldowan, 1979, McKirdy *et al.,* 1983, Sandstrom and Philip, 1984, Seifert *et al.,* 1984, Chosson *et al.,* 1991, Connan *et al.,* 2022). In this set the C_{29}αααR sterane which have the biological configuration, is not selectively degraded as seen in th e Dead Sea asphalt of Tell Yarmuth (Connan *et al.,* 2022).C_{21} and C_{22} pregnanes have been almost removed.

The sample of Mahrooban (No.3435) shows also a well preserved fingerprint of terpanes with a moderate Tm/Ts and gammacerane. 18α(H)-oleanane is questionable and may occur as traces. Steranes are again biodegraded but present a well identified occurrence of C_{27}diasteranes. C_{21} and C_{22} steranes are present and the biological configuration of C_{29}steranes namely the C_{29}αααR sterane has not been selectively degraded.

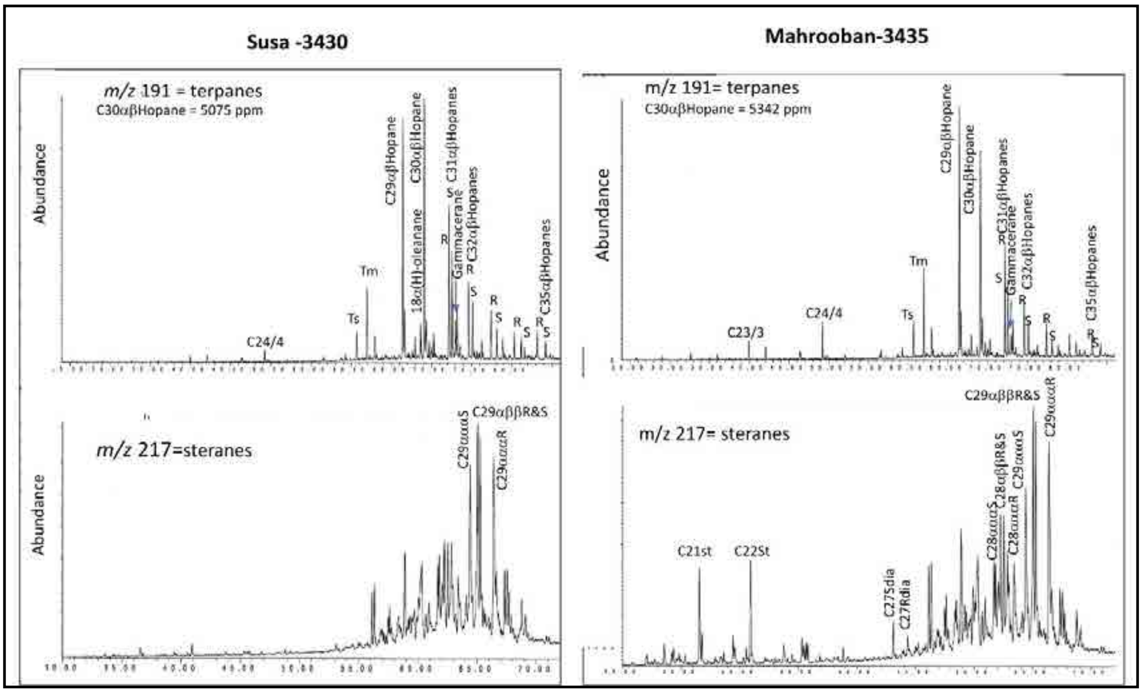


Fig. 31: Mass fragmentograms of steranes (*m/z* 217) and terpanes (*m/z* 191) from Susa (No.3430) and Mahruban (No. 3435).

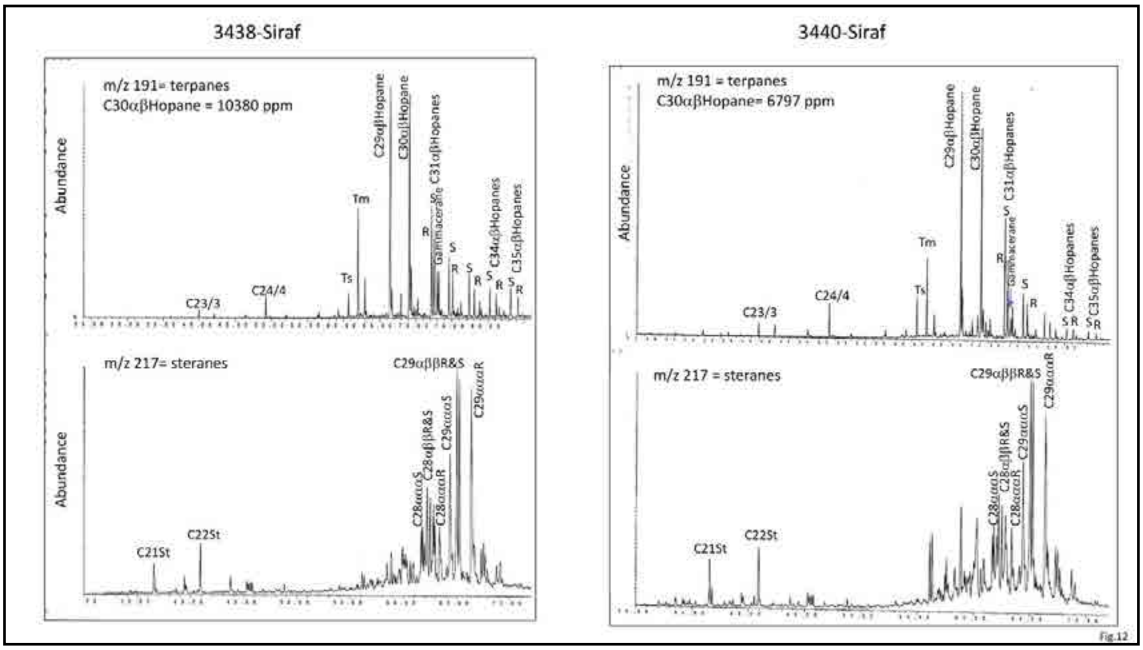


Fig. 32: Mass fragmentograms of steranes and terpanes (*m/z* 191) from Siraf (No.3438 and 3440).

The sample of Siraf N°3440 ressembles the Susa sample with the occurrence of 18α (H)-oleanane , a moderate Tm/Ts and gammacerane and biodegraded steranes in which the biological configuration of C_{29}steranes is not preferentially affected. C_{21} and C_{22} steranes are present. The sample of Siraf N°3438 is contrasted with a high Tm/Ts , more gammacerane , no oleanane and also biodegraded steranes with no C_{27}steranes. C_{21} and C_{22} steranes are present.

A plot of 18α(H)-oleanane vs. $\delta^{13}C_{asp}$ (‰ / VPDB) in Fig. 33a documents three main groups of samples : samples from the Susa area and 4 samples from Siraf (No.3439, 3440, 3444 and 3444bis) which contains 18α(H)-oleanane, samples from Siraf and Mahrooban with traces of 18α(H)-oleanane and samples from Mahrooban (No.3433) and Siraf without 18α(H)-oleanane. No oil seeps analyzed yet are corresponding to samples with 18α(H)-oleanane or traces of 18α(H)-oleanane (Fig. 33b). Obviously their sources are in the Zagros mountains, east or southeast of Susa, in the Khuzestan province. The third group without 18α(H)-oleanane matches a list of gilsonite and oil seeps from Illam, Lorestan and Kermanshah (Fig. 33b). Fig. 34 complete the comparison by referring to archaeological sites. Examples of bitumen with traces of 18α(H)-oleanane are also recorded in Susa and Tepe Senjar. Bitumen from Mahrooban may be originating from the same source, likeley in Khuzestan. Bitumen without 18α(H)-oleanane are matching with bitumens excavated from Chogha Ahowan, Susa, Tall-e Geser (Fig. 34)

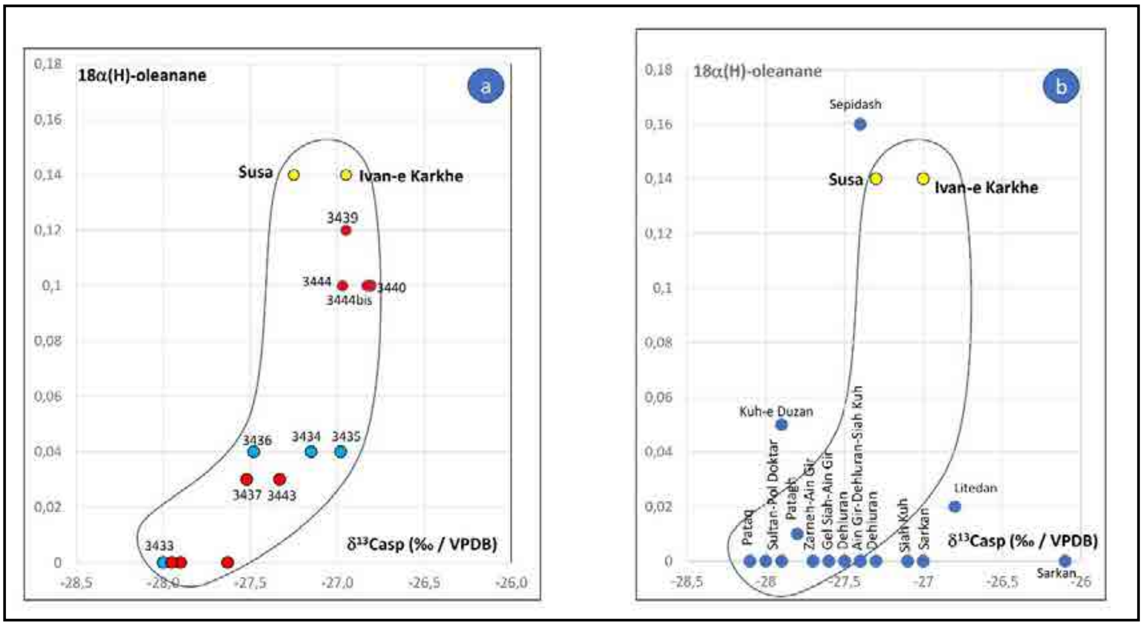


Fig. 33: Plot of 18α(H)-oleanane vs. $\delta^{13}C_{asp}$ (‰ / VPDB). a) samples of this study. b) samples of oil seeps.

A plot Ts/Tm vs. $\delta^{13}C_{asp}$ (‰ / VPDB) is another diagram currently used for correlation purposes. Fig. 35 and 36 gave the results in reference to data collected on oil seeps and archaeological sites. Many samples of both natural oil seeps and archaeological bitumen show properties that match those of bitumens from this study.

Report of results on maps of oil seeps (Fig. 37) and archaeological sites (Fig. 38) provides a synthesis of the potential sources. More gilsonites may be concerned if their $\delta^{13}C_{asp}$ (‰ / VPDB) are enriched of 0.4-0.5 (‰ / VPDB) though alteration and are consequently shifted from -28.3 to -27.9 (‰ / VPDB).

3.4. Aromatics

Mass fragmentograms of triaromatic steroids (*m/z* 231), phenanthrenes (*m/z* 178+192) and dibenzothiophenes (*m/z* 184 + 198) from Susa (No.3430), Mahruban (No.3433) and Siraf (Nos.3440 and 3438) are shown in Fig. 39. Phenanthrenes, dibenzothiophenes

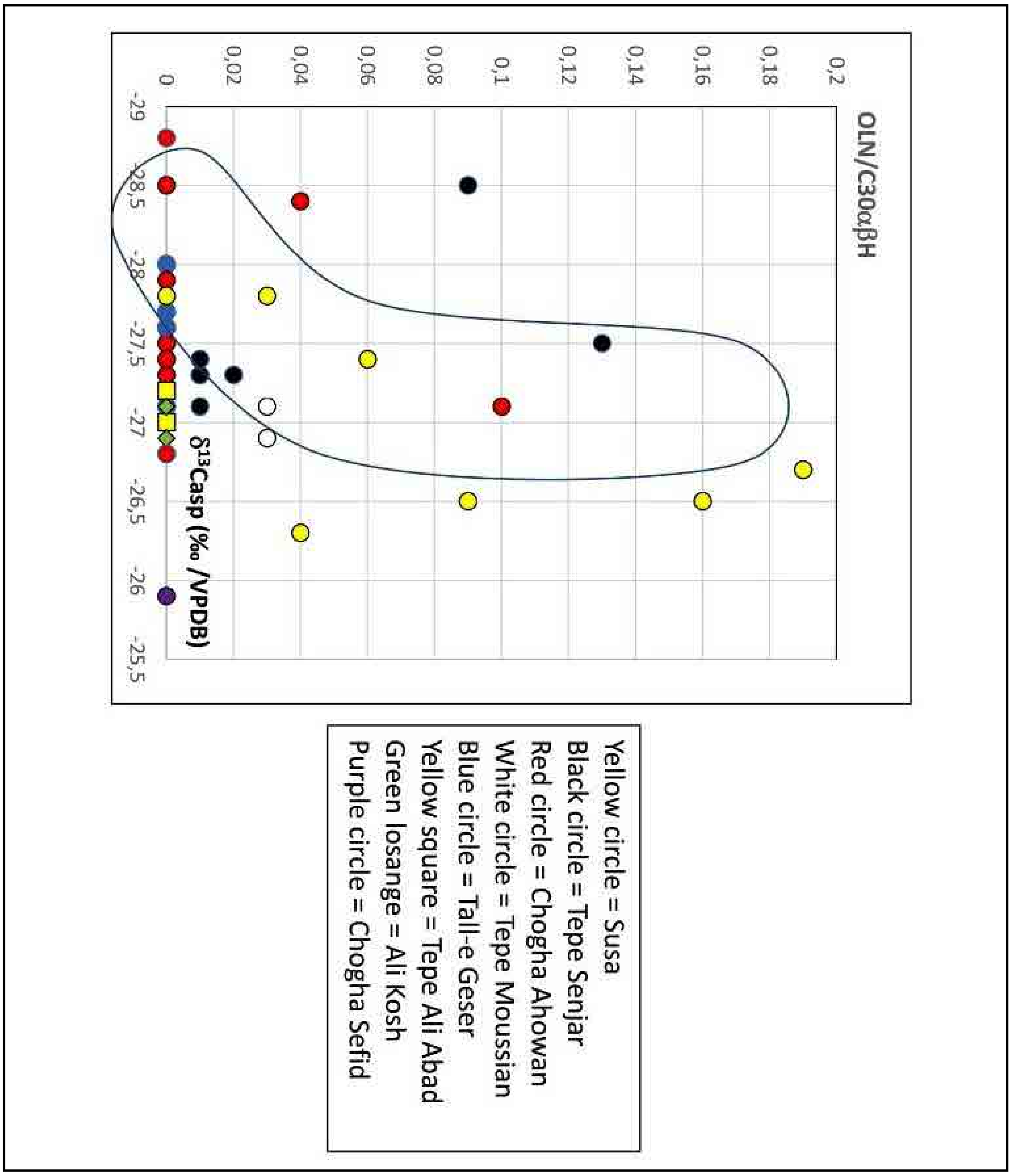


Fig. 34: Plot of 18α(H)-oleanane vs. $\delta^{13}C_{asp}$ (‰ / VPDB): samples of archaeological sites.

and triaromatic steroids are all present. Triaromatic steroids show a very low amount of $C_{26}S$. Patterns of methylphenanthrenes and dibenzothiophenes are consistent with what is observed in Pataq oil seeps and some gilsonites but obviously aromatics of archaeological samples are more altered. Plot of some molecular ratios (4MDBT vs. P/DBT and $C_{27}R/C_{28}R$ vs. $C_{26}S/C_{28}S$, Table 10) of archaeological samples by comparison to those of five gilsonites used as unaltered references confirm that aromatics of archaeological samples are altered. The changes seen in the parameters of Fig. 40 are identical to what has been recorded in the Dead Sea bitumen (Connan *et al.,* 2022).

Table 9: Steranes and terpanes ratios and comment on their fingerprints. Significance of abbreviations: C30 Hopane ppm = C30$\alpha\beta$Hopane in ppm. Tet/C_{23} = C_{24} tetracyclic terpane / C_{23} tricyclic terpane, C_{29}/H = norhopane/ hopane, OL/H = 18α(H)-oleanane / hopane, C31R/H= 17α, 21β, 22R-30-homohopane/ hopane, GA/C31R= Gammacerane/ 17α ,21β,22R-30-homohopane, GA/C30$\alpha\beta$H = gammacerane/ hopane, C35S/C34S=17a,21b-C35 extended hopane (22S)/ 17a, 21b-C34 extended hopane (22S), ster/terp = steranes / terpanes, Dia /Reg = diasteranes / regular steranes, %C_{27}= 5α,14β,17β-20R+20S-cholestane,%C_{28}=5α,14β,17β-20R+20S-24-methylcholestane, %C_{29}=5α,14β,17β-20R+20S-24ethyl-cholestane, C_{29} 20S/R= $C_{29}\alpha\alpha\alpha$S/ $C_{29}\alpha\alpha\alpha$R, $C_{29}{}^{\beta\beta}$S/$\alpha\alpha$R= $C_{29}\alpha^{\beta\beta}$S/ $C_{29}\alpha\alpha\alpha$R, Ts/Tm = 18α-22,29, 30-trisnorneohopane / 17α-22,29,30-trisnorhopane.

Ref	Lab number	Geomark reference	location	C30 Hopane ppm	Tet/C23	C29/H	Ol/H	C31R/H	GA/C31 R	GA/C30αβH	C35S/C34S	ster/terp	Dia/Reg	%C27	%C28	%C29	C29 20S/R	C2ββ S/αR	Ts/Tm	tricyclic	terpanes	steranes	C27 diasteranes	C29ββ steranes R
1	**3430**	UNK0872	**Susa**	5075	2.09	0.92	0.14	0.41	0.36	0.14	0.96	0.16	0.31	1.3	29.4	69.3	0.81	1.03	0.39	almost absent	preserved	biodegraded	absent	R>S
2	**3431**	UNK0873	**Dastova**	281	0.47	1.25	1.64	0.42	0.29	0.12	1.45	0.45	2.71	11	34.5	54.5	2.29	1.69	0.8	present low	biodegraded	biodegraded	present low	R<S biodegraded
3	**3432**	UNK0874	**Ivan-i Karkheh**	3948	2.47	1.15	0.14	0.44	0.28	0.12	1.1	0.13	1.05	12.5	29.3	58.2	1.16	1.17	0.49	low	preserved	biodegraded	present low	R<S biodegraded
4	**3433**	UNK0875	**Mahruban**	22314	3.63	1	0	0.3	0.55	0.16	0.83	0.1	0.04	1.4	17	81.6	0.68	1.28	0.12	low	preserved	biodegraded	absent	R>S
5	**3434**	UNK0876	**Mahruban**	6789	2.39	1.54	0.04	0.36	0.26	0.1	0.92	0.17	0.46	2.2	30.2	67.6	0.57	0.96	0.39	present low	preserved	biodegraded	absent	R>>S
6	**3435**	UNK0877	**Mahruban**	5342	2.02	1.25	0.04	0.37	0.27	0.1	0.92	0.2	0.64	7.6	31.9	60.5	0.66	0.98	0.42	present low	preserved	biodegraded	present	R>>S
7	**3436**	UNK0878	**Mahruban**	6707	2.12	1.44	0.04	0.36	0.26	0.09	0.96	0.18	0.59	5.5	29.5	65	0.58	0.95	0.41	present low	preserved	biodegraded	present low	R>>S
8	**3437**	UNK0879	**Siraf**	8248	2.39	1.02	0.03	0.34	0.5	0.17	0.71	0.16	0.1	0.6	25.5	73.9	0.67	1.2	0.25	present low	preserved	biodegraded	absent	R>>S
9	**3438**	UNK0880	**Siraf**	10380	2.94	1.05	0	0.39	0.51	0.2	0.93	0.13	0.09	3.4	28.1	68.6	0.64	1.03	0.23	present low	preserved	biodegraded	absent	R>>S
10	**3439**	UNK0881	**Siraf**	5796	2.42	1.11	0.12	0.4	0.25	0.1	0.74	0.23	0.1	1.3	25.1	73.6	0.64	0.98	0.52	presnt	preserved	biodegraded	absent	R>>S
11	**3439bis**	UNK0882	**Siraf**	7707	3.01	1.05	0	0.38	0.52	0.2	1	0.12	0.15	9.7	26.6	63.7	0.69	1.12	0.24	low	preserved	biodegraded	absent	R>>S
12	**3440**	UNK0883	**Siraf**	6797	2.58	1.19	0.1	0.37	0.25	0.09	0.86	0.23	0.25	1.1	26.8	72	0.62	1.1	0.52	present low	preserved	biodegraded	absent	R>>S
13	**3441**	UNK0884	**Siraf**	10492	2.72	1.22	0	0.31	0.47	0.14	0.98	0.12	0.09	0.8	24.4	74.8	0.62	1.11	0.2	present low	preserved	biodegraded	absent	R>>S
14	**3442**	UNK0885	**Siraf**	9988	6.06	1.03	0	0.33	0.55	0.18	0.94	0.12	0.07	2.3	18.4	79.3	0.69	1.12	0.22	low	preserved	biodegraded	absent	R>>S
15	**3443**	UNK0886	**Siraf**	8036	3.12	1.43	0.03	0.34	0.27	0.09	0.88	0.14	0.31	3.1	29.2	67.7	0.61	0.95	0.34	low	preserved	biodegraded	absent	R>>S
16	**3444**	UNK0887	**Siraf**	7459	2.37	1.16	0.1	0.35	0.25	0.09	0.87	0.22	0.3	1.5	27.5	71	0.63	0.99	0.5	low	preserved	biodegraded	absent	R>>S
17	**3444bis**	UNK0888	**Siraf**	7007	2.61	1.25	0.1	0.37	0.25	0.09	0.8	0.22	0.27	1.3	26.6	72.1	0.63	0.99	0.51	low	preserved	biodegraded	absent	R>>S

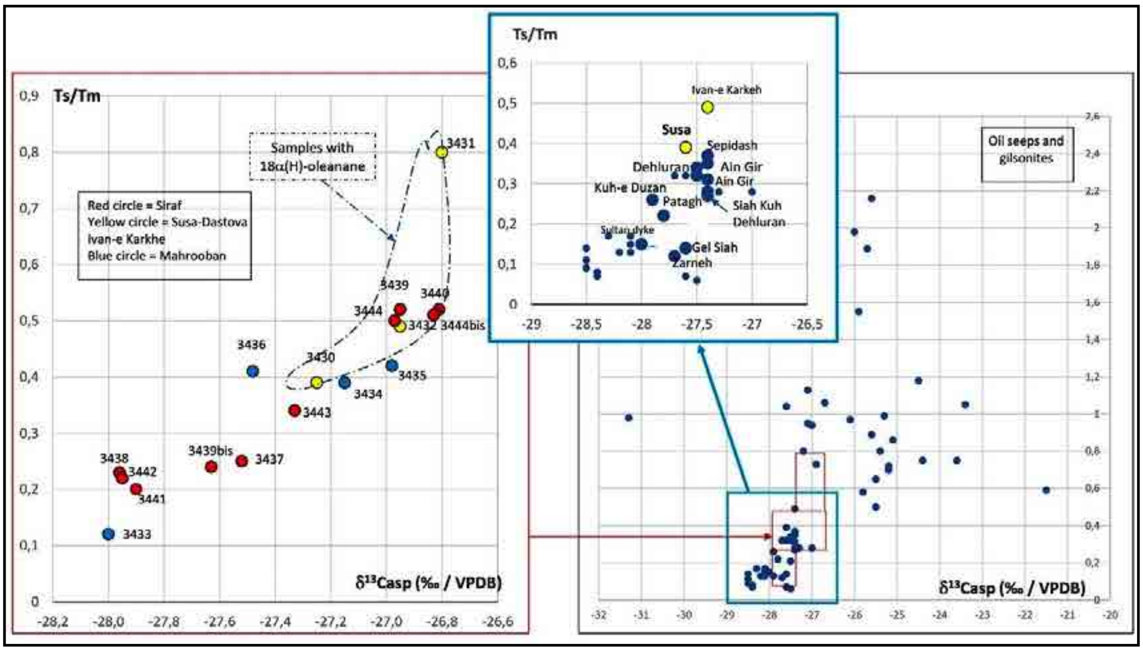


Fig. 35: Plot of Ts/Tm vs. $\delta^{13}C_{asp}$ (‰ / VPDB): samples of this study comp ared to samples of oil seeps and gilsonites

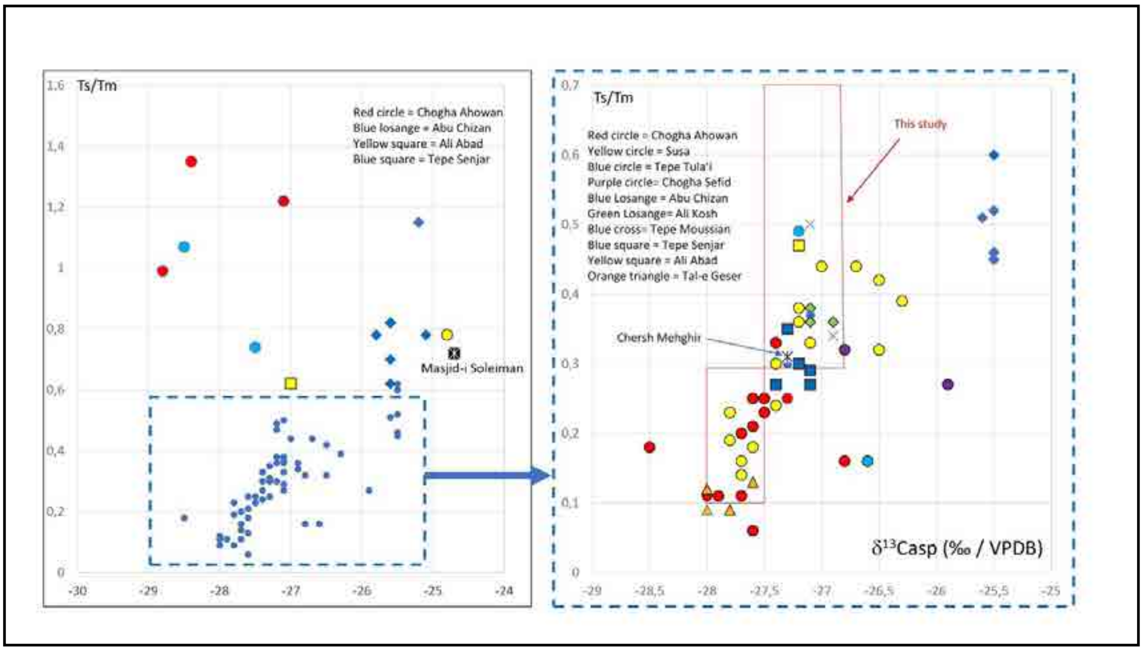


Fig. 36: Plot of Ts/Tm vs. $\delta^{13}C_{asp}$ (‰ / VPDB): samples of this study compared to samples of archaeological sites.

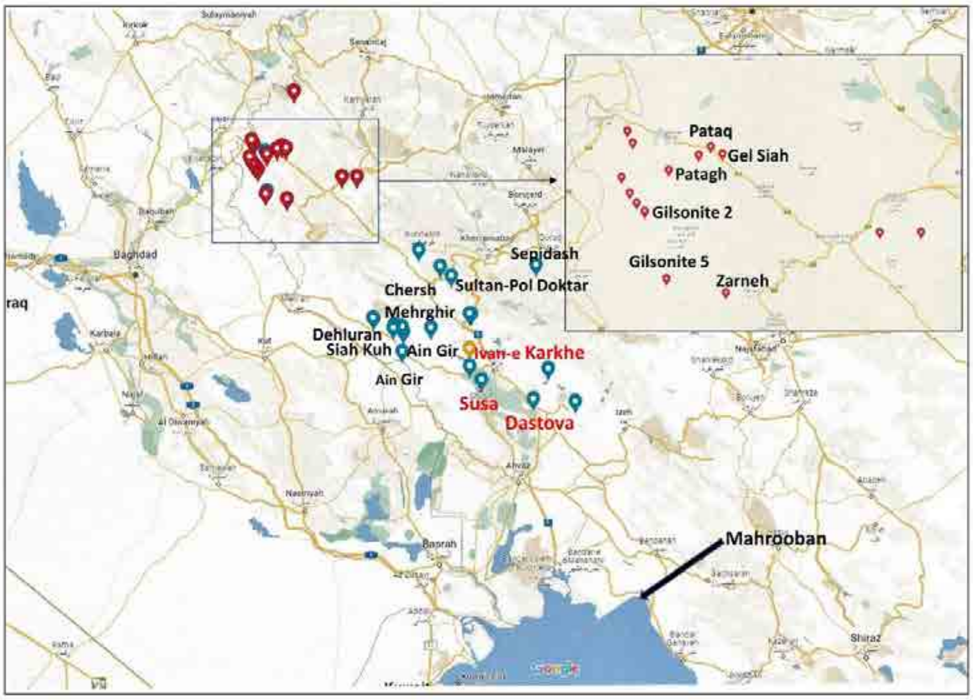


Fig. 37: Map of selected oil seeps identified as potential sources of archaeological bitumens of this study.

Fig. 38: Map of bitumens form archaeological sites which are matching bitumens of this study.

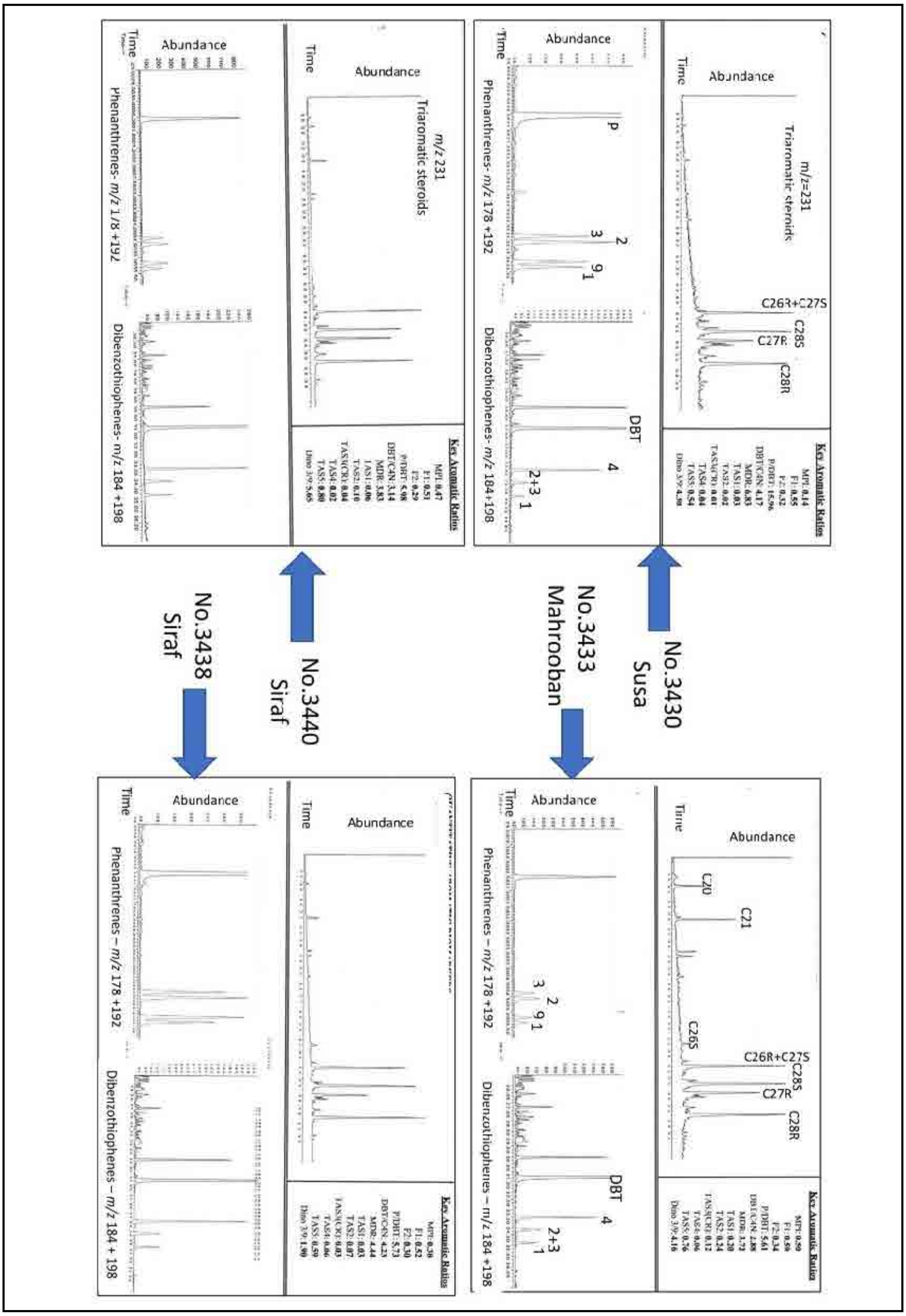


Fig. 39: Mass fragmentograms (*m/z* 231 =Triaromatic steroids, *m/z* 178 +192= Phenanthrenes), *m/z* 184 +198= Dibenzothiophenes) of aromatics of four samples : No.3430 (Susa), No.3433 (Mahruban), Nos.3440 and 3438 (Siraf).

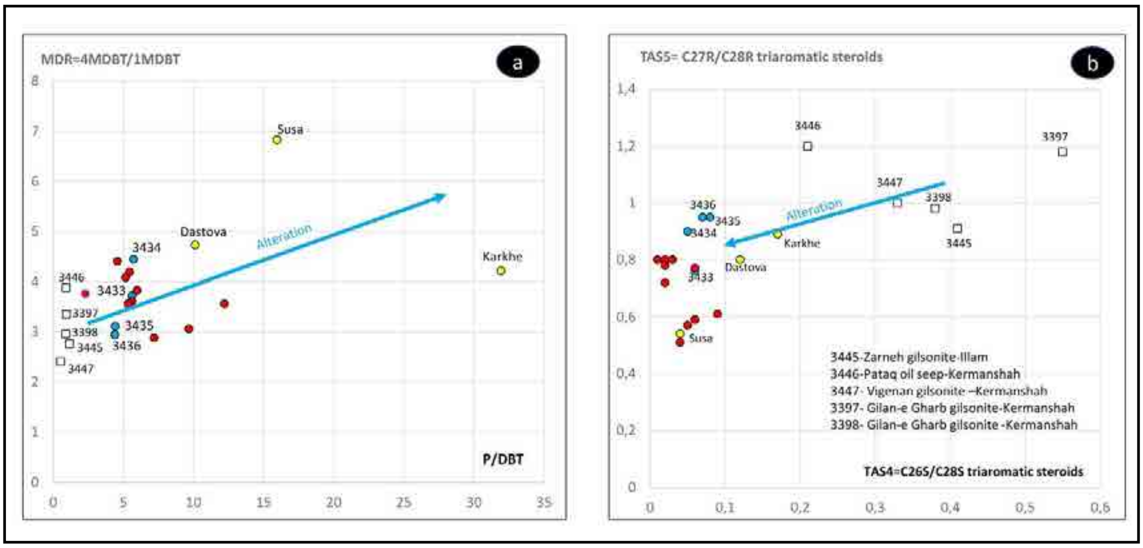


Fig. 40: Plot of some characteristic ratios of aromatics. a) 4MDBT vs. P/DBT. b) TAS5 vs. TAS4.

Table 10: Characteristic aromatic ratios on samples of this study and five representative gilsonites from the Kermanshah province. Significance of abbreviations: MPI = Methylphenanthrene Index = 1.5x[3MP+2MP] / [P + 9MP +1MP], F1= [3MP +2MP] / [3MP +2MP +9MP +1MP], F2= 2MP / [3MP +2MP +9MP + 1MP], P/DBT =phenanthrene/dibenzothiophene, DBT/C4N=dibenzothiophene/C4naphthalene, MDR = 4MDBT/ 1MDBT, TAS1= C20/ [C20+C27] triaromatic sterane, TAS2= C21/ [C21+C28] triaromatic sterane, TAS3 (cracking ratio) = [C20 + C21] / [C20-C28] triaromatic sterane, TAS4= C26S/C28S triaromatic sterane, TAS5= C27R / C28R triaromatic sterane.

lab number	Location	GeoMark reference	C30H ppm	MPI	F1	F2	P/DBT	DBT/C4N	MDR	TAS1	TAS2	TAS3	TAS4	TAS5	Dino3/9
3445	Zarneh Gilsonite	UNK0889	1782	0.73	0.47	0.27	1.16	3.05	2.76	0.36	0.33	0.16	0.41	0.91	3.22
3446	Pataq oil seep	UNK0890	1295	0.61	0.47	0.25	0.92	3.26	3.88	0.24	0.24	0.1	0.21	1.2	3.68
3447	Vigenan Gilsonite	UNK0891	1840	0.67	0.43	0.25	0.53	4.18	2.41	0.44	0.39	0.23	0.33	1	2.33
3397	Gilan-e Gharb Gilsonite	UNK0809	1009	0.69	0.42	0.24	0.94	2.02	3.35	0.64	0.6	0.38	0.55	1.18	3.4
3398	Gilan-e Gharb	UNK0810	1001	0.7	0.43	0.25	0.91	1.55	2.96	0.55	0.49	0.3	0.38	0.98	3.05
3430	Susa	UNK0872	5007	0.14	0.55	0.32	15.96	4.17	6.83	0.03	0.02	0.01	0.04	0.54	4.3
3431	Dastova	UNK0873	281	0.37	0.54	0.3	10.11	1.36	4.73	0.03	0.06	0.02	0.12	0.8	1.99
3432	Kharkheh	UNK0874	3948	0.44	0.54	0.31	31.93	0.73	4.21	0.07	0.07	0.03	0.17	0.89	3.16
3433	Mahruban	UNK0875	22314	0.5	0.59	0.34	5.61	2.88	3.72	0.2	0.24	0.12	0.06	0.76	4.16
3434	Mahruban	UNK0876	6789	0.46	0.62	0.36	4.58	3.08	4.4	0.06	0.12	0.05	0.05	0.9	3.55
3435	Mahruban	UNK0877	5342	0.42	0.53	0.3	4.42	2.18	3.11	0.09	0.16	0.06	0.08	0.95	2.24
3436	Mahruban	UNK0878	6707	0.41	0.54	0.31	4.39	2.26	2.94	0.07	0.15	0.06	0.07	0.95	2.21
3437	Siraf	UNK0879	8248	0.23	0.56	0.32	9.67	2	3.06	0.01	0.07	0.02	0.02	0.72	5.58
3438	Siraf	UNK0880	10380	0.38	0.52	0.3	5.73	4.23	4.44	0.03	0.07	0.03	0.06	0.59	1.9
3439	Siraf	UNK0881	5796	0.44	0.52	0.3	5.61	3.23	3.61	0.05	0.1	0.04	0.01	0.8	4.17
3439 bis	Siraf	UNK0882	7707	0.61	0.53	0.31	12.21	2.28	3.56	0.06	0.09	0.04	0.09	0.61	1.68
3440	Siraf	UNK0883	6797	0.47	0.51	0.29	5.98	3.14	3.83	0.06	0.1	0.04	0.02	0.8	5.65
3441	Siraf	UNK0884	10492	0.36	0.53	0.3	5.44	3.63	4.19	0.05	0.1	0.04	0.05	0.57	2.1
3442	Siraf	UNK0885	9988	0.59	0.47	0.27	7.2	3.31	2.88	0.03	0.07	0.03	0.04	0.51	2.86
3443	Siraf	UNK0886	8036	0.27	0.53	0.3	5.34	2.92	3.56	0.03	0.06	0.02	0.06	0.77	3
3444	Siraf	UNK0887	7459	0.45	0.51	0.3	2.29	3.54	3.76	0.05	0.09	0.04	0.03	0.8	4.87
3444bis	Siraf	UNK0888	7007	0.47	0.52	0.3	5.17	3.28	4.08	0.05	0.1	0.04	0.02	0.78	4.53

4. Conclusion

The method of using bitumen inside pottery jars for insulation or waterproofing has been employed in two types of jars: cylindrical and torpedo-shaped. Archaeological studies presented in this article demonstrate the continuity and utilization of these jar types from the Parthian (including Elymais) and Sassanian periods, persisting through the early Islamic era until the 10th century A.D. The first type is less common compared to the second type, with samples found exclusively in Susa during the Parthian period, and in the same context during the Elymaeans period in Khuzestan.

In their study of Girshman's excavations in Susa, Rémy Boucharlat and Ernie Haerinck (2011) note that both the cylindrical vessel and the torpedo jar tip were found in an archaeological site primarily used for human burial, especially child burial. The act of breaking these jars to place the body inside suggests that their use in burial should be considered a secondary function. The torpedo jar, which was the focus of this research, appears to have been primarily used for carrying liquids. It has been found in various locations in the Persian Gulf. Its presence is also evident in the Oman Sea, East Africa, and the Indian Ocean, with the farthest discovery being the Phanom Surin ship in Thailand (Choksy and Nematollahi, 2018). The use of torpedo jars for burying human bones has only been reported in archaeological excavations in Iran, specifically in the Persian Gulf and Khuzestan Plain. Outside of the Persian Gulf, in locations such as the Indian Ocean, East Africa, and the Oman Sea, there are no reports of torpedo jars being used for burial. Excavations in Susa, Shushtar's Gelalak Tomb, Bushehr port on the Persian Gulf, and the Shoghab cemetery from the Sassanid period have revealed burial samples of these jar graves (Figs.41 to 43). Archaeological studies have indicated that the Gelalak tomb samples in Shushtar and Susa are from the Elimaean and Parthian periods, while examples from Ivan-i Karkheh and Mahruban (with the exception of one piece) are related to the Sassanid period. The samples from Siraf can be dated to both the Sassanid and early Islamic periods.

Fig. 41: Left: General photo of Shoghab graveyard in Bushehr Peninsula, near the coast of the Persian Gulf. Right: Torpedo jar vessels with human bone burials inside, Shoghab graveyard.

The cylindrical vessel and torpedo jar serve the dual purpose of burial and transporting liquids.More recently, Lambourn believes that torpedo jars were used to carry water, but we think that used to store other liquids than water. (Lambourn , 2022). However, further laboratory studies are needed to analyze the remnants of their contents. Additionally, the origin of this pottery and its associated kilns remains undiscovered, necessitating extensive targeted archaeological research, particularly in the southern and southwestern

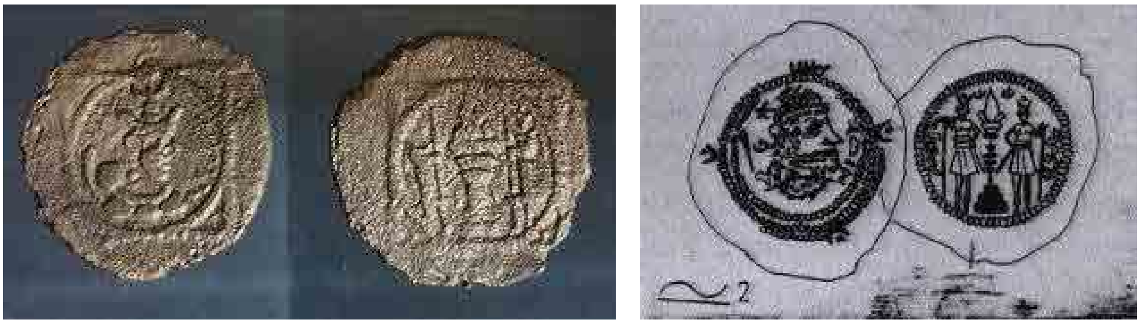


Fig. 42: Sassanian coin from Shoghab Graveyard in Bushehr Peninsula (Rahbar, 2004: fig. 51)

Fig. 43: Aerial photo of Gelalak Tomb, , Torpedo jar vessels with human bone burials inside (Google Earth).

regions of Iran (Khuzestan, Fars, Ilam, and the Persian Gulf coast).

Lab studies show that the origin of the bitumen used for coat the interior face of torpedo jars came from several areas of Iran. Bitumen from the samples of Susa and from some samples of Siraf which contain 18α (H) oleanane, originates from Khuzistan whereas bitumen from other samples of Siraf and Mahruban came for Illam, Lorestan and Kermanshah provinces.

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کوزه‌های نوک اژدری‌شکل ایران: بسترهای کشف باستان‌شناسی و منشأ پوشش قیری آن

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چکیده

یکی از مهم‌ترین سفال‌های مورداستفاده در تجارت دریایی خلیج‌فارس (خاورمیانه) با بخش بزرگی از جهانِ باستان، ازجمله خلیج‌فارس، دریای عمان، اقیانوس هند، سریلانکا و درنهایت کشور تایلند (محمولهٔ کشتی سورینام)، کوزهٔ سفالی به‌نام سفالِ نوک اژدری‌شکل یا کوزهٔ ذخیرهٔ آذوقه است. اگرچه قدمت این نوع سفال را بیشتر محققین به دورهٔ ساسانی منتسب می‌دانند، اما از دورهٔ اشکانی تا صدر اسلام از این نوع خمره در تجارت دریایی و تدفین استفاده می‌شده است. مهم‌ترین ویژگی این نوع کوزه‌ها، پوشش قیر روی سطح داخلی آن است. تاکنون باستان‌شناسان موفق به یافتن کوره‌ای برای تولید این نوع سفال نشده‌اند؛ بنابراین اطلاع از محل تولید سفال و معدن قیر به‌کار رفته در آن‌ها بسیار حائز اهمیت است. در این پژوهش با استفاده از روش مطالعات آزمایشگاهی ژئوشیمیایی و مطالعهٔ تطبیقی، نمونه‌های قیر برداشت‌شده از سفال نوک‌اژدری شکلِ جنوب و جنوب‌غرب ایران مورد‌مطالعه و آزمایش قرار گرفت. در این تحقیق ۱۵ قطعه سفال با پوشش قیر متعلق به کاوش‌های باستان‌شناسی بنادر سیراف و ماهروبان در سواحل خلیج‌فارس (جنوب ایران) مربوط به دورهٔ ساسانی و اسلامی و نمونه‌هایی از منطقهٔ شوش و شوشتر از دوران اشکانی و ساسانی برای برداشت قیر انتخاب شد. نمونهٔ محوطهٔ شوش از موزهٔ ملی ایران و متعلق به کاوش‌های باستان‌شناسی منطقهٔ شوش، نمونهٔ ایوان‌کرخه مربوط به منطقهٔ دزفول و نمونهٔ منطقهٔ دستوا نیز از منطقهٔ شوشتر است. تمامی نمونه‌های قیر با هدف تعیین منشأ قیر در آزمایشگاه‌های تخصصی آن در اروپا و آمریکا مورد تجزیه و تحلیل ژئوشیمیایی قرار گرفت. نتیجهٔ اصلی تحقیق استفاده از قیر چشمه‌های قیر استان‌های خوزستان، لرستان، ایلام و کرمانشاه را در سفال‌های مورد‌مطالعه نشان می‌دهد. همچنین گاهنگاری نمونه‌ها با تکیه‌بر مستندات کاوش و بررسی باستان‌شناسی و مطالعات تطبیقی انجام و بازهٔ زمانی شناسایی شده دورهٔ الیمائی‌ها، اشکانیان، ساسانیان و صدر اسلام را نشان‌داد.

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Study of the Development Process of Herat City During the Kart Dynasty, Based On the Survey of Developments in The Axis of Khiaban-Mazar-e Herat

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Abstract

Tomb Street (Khiaban-Mazar) is described as a complex where the tombs are located on either side of a passageway. "Khiaban-e Herat" (Herat Street) is also a cemetery with tombs along its main axis, and it is one of the most unique and ancient examples of Mazar Street in Khorasan. This article aims to examine the process of early developments in Khiaban-Mazar-e Herat, study the evolution of Herat's urban development during the Mongol-Ilkhanid era and compare it with the developments in Tabriz, the capital of Ilkhanid empire, analyze the similarities and differences between the developments in the two cities and finally evaluate the impacts that these urban changes have had on the expansion process of Khiaban-Mazar-e Herat. The research has been done by the historical-analytical method. This research shows that urban development in Herat was remarkably similar to Tabriz; in Herat, just like in Tabriz, the Mongols were extending the suburbs of the city and establishing commercial uses and aristocratic palace gardens. The process of expansion of Herat's suburbs was so widespread that Herat's ruler, imitating the "Ghazani Wall" in Tabriz, built a massive wall around Herat to encompass all of its new suburbs. With the construction of this wall, Herat's Mazar Street was divided into two parts, North and South, and the south part of the wall within the boundary of the city was separated from the cemetery and led to various uses in Herat.

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1. Introduction

In Islamic urban planning, cemeteries were considered an integral part of the urban landscape and were often located outside city boundaries. While small cemeteries could be established within neighborhoods inside the city walls, larger cities in the Islamic world typically situated their cemeteries beyond the walls (Soltanzadeh, 2011, p. 254). Examples such as the Wadi al-Salam Cemetery in Najaf and the Takht-i Fulad Cemetery in Isfahan illustrate this practice. Similarly, the Khiaban zone in Herat served as the city's primary cemetery, with tombs established as early as the ninth century (Vaeiz, 2007, p. 19). What distinguishes the Khiaban Cemetery in Herat from contemporaneous cemeteries in other Islamic cities is the axial arrangement of graves and tombs along both sides of the main road connecting Herat's suburbs to the city's northern areas. During the fourteenth to sixteenth centuries, particularly in the Timurid era, this distinctive alignment of tombs along streets gained prominence. The practice of building tombs flanking major routes and adorning their façades gave rise to a distinctive architectural form referred to as Khiaban Mazar or "Cemetery Street" (Leisten, 1997, p. 96). The Khiaban Cemetery in Herat predates the Timurid era, serving as a model for the later Timurid Mazar-Street configurations. However, prior to the Timurid developments, significant transformations in Herat's urban planning occurred during the Mongol era. These changes revolutionized the principles of city planning in Herat, paving the way for the innovations that would define the Khiaban Cemetery's prominent architectural and urban role in the Timurid period.

2. Purpose of the research

This study seeks to compare the developments in Herat during the Ilkhanid era and after, with the Mongols' urbanization in Tabriz by analyzing the trends of development in the city of Herat and ultimately aims to specify its impact on the development of Herat-Mazar-street.

3. Research Questions

The most important questions of the present study are: what were the developments of urbanization in Herat city during the Mongol-Ilkhanid era? And, how did these developments relate to the principles of Mongol urbanization principals in other cities in this period, especially in Tabriz? And ultimately, how did Herat's urbanization development affect the growth and development process of the Herat-Mazar-Street during the Mongol era?

4. Research method

The method used in this research is historical-analytical and has been done in three stages to obtain information:

1. Using library studies methodology with a focus on historical texts, documents, articles, archaeological reports and investigations in line with the research.
2. Documentation and maps of the developments of Herat Street and Herat city constructions during the Mongol era based on library study.
3. Analysis of research findings in Herat city and comparison with urban development in Tabriz during the Mongol era, analyzing its impact on Herat-Mazar-Street.

5. Research History

One of the earliest works documenting the development of Herat prior to the Mongol era is attributed to Abd al-Rahman Fami Heravi (2008). Following him, Seyf ibn Mohammad ibn Yaqub-i Heravi (2006), writing in the 14th century CE, authored a history of Herat that examines the city's development up to the mid-Mongol period and the Kartid dynasty, offering unique insights into the events of this era. Later, towards the end of the Timurid period, Zamchi Esfazari (1960) built upon Heravi's accounts, expanding and completing these historical narratives in his own work, covering Herat's transformations from the Mongol era through the Timurid period. Asil al-Din Abdollah Vaeiz (2007) provides valuable information about Herat's cemeteries, including detailed descriptions of the tombs located along Herat Street. Terry Allen (1983) offers a comprehensive study of construction trends in Herat from the Kartid period to the end of the Timurid era, including several maps that elucidate the city's architectural evolution. Beyond Herat, the urban development of Tabriz during the Ilkhanid period has also been a focus of scholarly attention. Asghar Mohammad Moradi and Sanaz Jafarpur Naser (2011; 2013) have explored the structures of Tabriz in the Ilkhanid era, analyzing their influence on Ottoman-era urbanization in two papers. Bahram Ajorloo (2014) examined the role of architectural complexes and residential settlements in shaping Tabriz's development, drawing from historical texts of the Ilkhanid period. Hasan Karimian and Behzad Mehdizadeh (2017) investigated the significance of endowed collections in the architecture and urban design of Ilkhanid cities in Iran. Lastly, Muhammad Ali Keynejad and Azita Belali Oskui (2011) studied the principles underlying urban buildings and complex constructions during this period, with a particular focus on the Rabe Rashidi complex in Tabriz.

6. Herat city and the background of Khiaban-Mazar

The city of Herat, situated in eastern Iran and western Afghanistan, was historically one of the major cities of the Khorasan province. Strategically located along a trade route connecting northern Iran and Transoxiana to southern Iran and India (Allen, 1983, p. 11), Herat emerged as a key commercial hub in eastern Iran. The precise origins of Herat's formation remain scientifically untraceable, but the earliest evidence of settlement is found north of the city walls, in an area known as Kohandez-i Masrakh. This area likely served as Herat's fortress, with the city later expanding southward from this stronghold (Allen, 1983, p. 11). Herat was enclosed by a rectangular defensive wall, which underwent multiple refurbishments over the centuries. Within the walls, the city's quarters were arranged along a network of grid-like roads. The central area housed the Great Foursquare Bazaar, the Jame Mosque lay to the east, and government offices were located in the northern sector (Allen, 1983, p. 13). Access to the city was provided by gates on all sides: Firouzabad Gate to the south, Khosh Gate to the east, Iraq Gate to the west, Qibchaq Gate to the northeast, and the Malik (or Baraman) Gate to the northwest. Beyond the city walls, suburban quarters flourished, with Khiaban-e Herat being one of the prominent neighborhoods located to the city's north. The history of Khiaban dates back to the early Islamic centuries. Geographically, Khiaban was situated north of the Enjil region, a vast area encompassing the entire city of Herat. Hafiz-i Abru (15th century) described the relationship between these regions: "The Enjil region is situated north of the river [Harirud], and the city of Herat is inside this region [...] The Khiaban region is located north of the river and north of the city, connected to the northern part of the Enjil region"

(Hafiz-i Abru, 1970, pp. 18–21). The Enjil and Juy-i No canals, which flowed from east to west, irrigated the northern suburbs, with Khiaban beginning north of the Enjil canal and extending to the north of the Juy-i No canal. One of the earliest mentions of Khiaban comes from Khajeh Abdullah Ansari, who referred to it as "Khodaban" around 1088 CE (Ansari Heravi, 2007, p. 522). Around the same time, Sheikh Abdulrahman Fami Heravi (11th–12th centuries) also mentioned a square in the "Khozaban" region in his writings, referring to it as the work of Muhammad Nouleh, an officer of Yaqub Leis Saffari in the 9th century (Fami Heravi, 2008, p. 66). Approximately two centuries later, in 1228 CE, Yakut al-Hamavi similarly used the term "Khozaban" to describe this region in Herat, noting, "Khozaban, with an O sound in the first letter, followed by Alef, B, and ending with N, is a region in Herat" (Hamavi al-Rumi, 1986, p. 349).

7. Chronicle of the cemetery on Herat Khiaban before the Mongol era

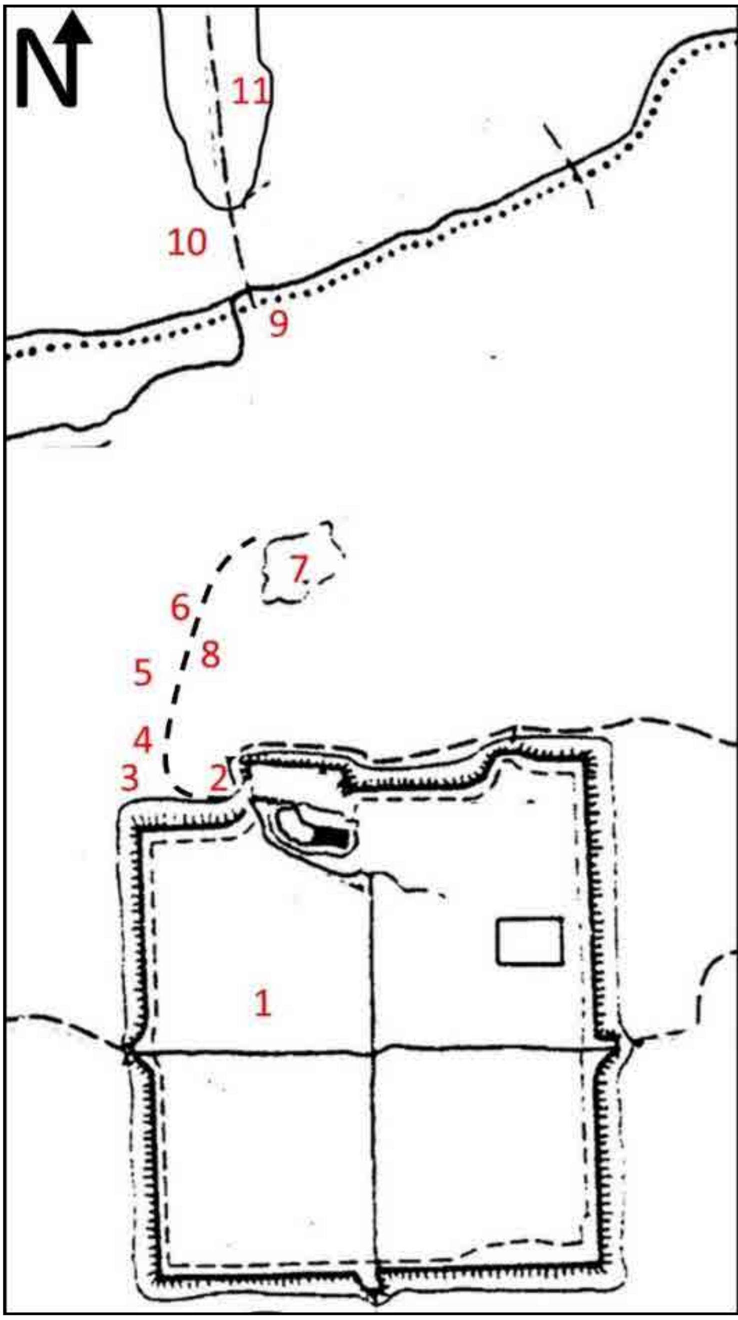
The Khiaban region, in addition to its neighborhoods and extensive farmlands, featured a significant north-south passage. This route not only provided access to the city of Herat but also served as a burial site, with graves situated on both sides of the road. The earliest known reference to the tombs in this cemetery comes from the 11th century CE, in the writings of Khajeh Abdullah Ansari. He recounts: "Leis Poshnjeh [...] said: I was going from Poshanj to Herat [...] as I was passing through the Khodaban cemetery, I saw a woman sitting by a grave" (Ansari Heravi, 2007, p. 522). Ansari further notes: "The grave of Leis is in Khodaban" (Ansari Heravi, 2007, p. 523). In the 15th century, Abdullah Vaeiz also documented the location of Leis Poshnjeh's grave in his writings: "[Leis Poshnjeh's] grave is in the Khiaban, behind the Enjil canal, on a high point, and his disciples are buried around him" (Vaeiz, 2007, p. 22). Vaeiz describes additional graves in the Khiaban cemetery dating back to before the 11th century, including that of Imam Osman Darani, who was buried there in 893 CE (Vaeiz, 2007, p. 19). He also mentions Muhammad ibn Osman Darani, buried alongside his father in 941 CE (Vaeiz, 2007, p. 21), and Sheikh Ammar Sajjestani, whose grave dates to 1030 CE (Vaeiz, 2007, p. 28). Vaeiz further details tombs established contemporaneously with that of Leis Poshnjeh, such as the grave of Sheikh Mohammed-i Gazor, identified as a disciple of Leis Poshnjeh and described as having a well-known tomb in Khiaban-e Herat (Vaeiz, 2007, p. 22). Another significant figure, Sheikh Abu Mansour-i Sukhteh, was noted by Jami as a contemporary of Abdullah Ansari, with his tomb also located in the Khiaban cemetery (Jami, 1991, p. 344; Vaeiz, 2007, p. 33). To identify the specific placement of these graves along the Khiaban route, later Timurid-period texts provide additional insights. Mirkhand, writing in the 15th century, states: "The tombs of the elders and scholars in that valuable area are located on the right and left, and they are countless" (Mirkhand, 2006, p. 519). Similarly, Zamchi Esfazari, also writing during the Timurid period, refers to the Khiaban cemetery, further affirming its historical and cultural significance.

"One of the neighborhoods that don't have peers around the world is Khiaban-e Herat, which is well known for its mild air and countless numbers of its tombs, and there is no word to describe the extent of the graveyard and beauty of the tombs situated in the right and left side of this road"(Zamchi Esfazari, 1960: 387).

Accordingly, it can be said that the cemetery of Khiaban-e Herat was located on both sides of a north-south passageway of this neighborhood. Until the twelfth century, this crossing was completely enclosed in the Khiaban region, beginning at the north of the

Enjil canal and extending until Juy-i no canal. But at the end of the 11th century, an occurrence changed the dimensions of this crossing .Esfazari says:

> *"In 428 AH [1036 AD] the Seljuks attacked Herat but the people of Herat did not allow them to enter the city. At that time people lived in Qohandiz and Rabad, and these two areas were prosperous. [...]The Seljuks attacked Herat every year [...] but they could no" (Zamchi Esfazari, 1960: 387).*



Title of location
1.Herat
2.Malik Gate
3.Tomb of Khajeh Kalle
4.Tomb of Khajeh Yafteh
5.Tomb of Haji Yusef
6.Hazireh-i ChihilGazi
7.Masrakh
8.Masrakh alley
9.Juy-i Enjil
10.Khiaban
11.Khiaban Cemetery

Fig. 1: Location of the tombs in Herat's historical Rabad next to the alley of Masrakh. Marking on the map of Herat, by Terry Allen (1983), is done by the authors based on the documents mentioned in the text.

As mentioned earlier, Qohandez or Masrakh was located in northern Herat between the Enjil canal and the north of the defensive wall, and Heravi (Fifteenth century CE) sets the date of this fortress before the formation of the city of Herat (Heravi, 2006: 76-77). Likewise, Saber Heravi says that during the time of Khajeh Abdullah Ansari, around eleventh century, a huge garden was in this area and the home of khajeh abdullah's father was situated there (Saber heravi, 2007: 54). Presumably, until the 11th century, people lived in this section of Herat and it was considered the "Rabad" in the northern hinterland of the city. With the Seljuks attacks in the early eleventh century, the area was devastated and became vacant of dwellers. This has led the Khiaban cemetery to extend beyond the southern boundaries of the Enjil canal and reach the city's walls. Likewise, the Khiaban-e Herat crossing also passes through this area and reaches the Malik Gate in the northwest of the city. In a report about Khiaban-e Herat, Ute Franke noted the changes along in this crossing; in his excavations in Masrakh, he discovered a diversion along the crossing, and he says the crossing has only deviated from its original route once to access the Masrakh (Franke, 2015: 82). In fact, historical sources also refer to this route as the "Kuche-i Qohandiz"(Alley of Qohandiz) (Heravi, 2006: 155). This deviation confirms that before the Rabad was abandoned, the route started from the Malik gate, was merely headed towards Qohandiz. This can be proved by considering how the graves that belong to the pre-eleventh century are deployed along the route that leads to the Masrakh. Such as the grave of Khajeh Kalle outside the Malik gate (Vaeiz, 2007: 56), the tomb of Khajeh Yaafteh near the bath of King Suleiman, just above the Malik gate (Vaeiz, 2007: 56; Saber Heravi, 2007: 67), the tomb of Haji Yusef in the north of King Suleiman's Bath (Allen, 1983: 94), the Tomb of Khwajeh Chehelgazi, almost opposite the Masrakh (Fekri Saljughi, 1964: 103; Allen, 1983: 94), and finally, the Masrakh cemetery (Mirkhand, 2006: 198) (Fig. 1). In fact, it is after the abandonment of the Rabad that the Masrakh alley expanded until the Khiaban area and joined the Khiaban-e Herat passageway.

8. Herat's destruction by the Mongol invasion

Two years after the Mongol invasion of Iran began in 1221 CE, Tolui, the son of Genghis Khan, led a large army to raid the city of Herat. Following the execution of Malik Shamsuddin Jowzjani, Herat fell under Mongol occupation. According to Heravi, the Mongols forced the people of Herat out of the city, killing the majority of them, leaving only two hundred thousand survivors (Heravi, 2006, p. 110). However, shortly after the Mongol occupation, the citizens of Herat revolted in support of Sultan Jalal al-Din Khwarazm Shah, killing the Mongol-appointed ruler. In response to this defiance, Genghis Khan dispatched a substantial army under the command of Ilakchiday Noein to suppress the rebellion. In 1221 CE, after six months of warfare and siege, Ilakchiday Noein successfully recaptured Herat. Following the victory, the Mongols utterly destroyed the city, dismantling its defensive walls and towers, and massacring its population. Heravi records: "The Mongols cut off all the inhabitants' heads and destroyed all the buildings and houses of the city; they filled the moat with dirt and destroyed the city wall and its towers" (Heravi, 2006, p. 114). This catastrophic destruction rendered Herat abandoned and uninhabitable, a state in which it remained until 1236 CE (Heravi, 2006, p. 130).

9. Urban variations in Herat in the Mongol era

Fifteen years after the destruction of Herat, in 1236, Ögedei Khan (1229 to 1241 AD) commissioned a Herati trader to rebuild Herat. This man, Ezziddin Moghaddam Heravi, brought several families of Herati traders from Transoxiana to Herat for this reason (Heravi, 2006: 141). This is the first sign of a community in Herat since the Mongol invasion. The first action of this society was to revive agriculture in Herat (Ibid: 150). After Ezziddin Moghaddam in 1238, his son, Amir Mohammad Heravi, became the ruler of Herat. At this time, Kherleq, the Mongols sheriff, also accompanied Amir Muhammad. Of their actions, one should point to building the Kherleq palace in the eastern hinterland of Herat as well as the Amir Mohammad bazaar outside of Herat (Ibid: 154). At this time, more families were sent by Ögedei Khan to subsist in Herat and with their help, Amir Muhammad reopened Herat's ancient canals, such as Enjil (Ibid: 158). In the year 1240, Amir Majd al-din Kalivni was appointed by Karguz as the new ruler of Herat (Ibid: 159). During the reign of Amir Majd al-din, the other canals of Herat were completely rebuilt and the city's population increased to 6900 people according to Heravi (Ibid: 163). Moreover, he built a great palace for himself outside the Herat city beside Khajeh Abdullah Taqi's grave (Ahrari, 1931: 36) and the Khosh gate (Zamchi Esfazari, 1960: 119). With the death of Amir Majd al-Din and his successor, in 1247, By the order of Möngke Khan, the reign of Herat and its subordinate territories came under the decree of Shamsuddin, the dynast of the Kartids (Heravi, 2006: 175).

10. Urban Developments in Herat and Khiaban-Mazar-e Herat during the Kartids period

Before the reign of Malik Shamsuddin, most of the constructions were carried out outside the ancient city of Herat and the city's defense wall had not yet been rebuilt until then. Heravi states that at this time Malik Shamsuddin wanted to rebuild buildings inside the city, but the people called on him, wanting the defensive wall to be repaired for safety reasons. Thus, for the first time since the Mongol invasion, Malik Shamsuddin rebuilds the ancient defensive wall of Herat (Heravi, 2006: 217). Marktay, The Mongol officer and sheriff of Herat, also sets up a palace for himself in the southern suburbs of the city (Ibid: 279).

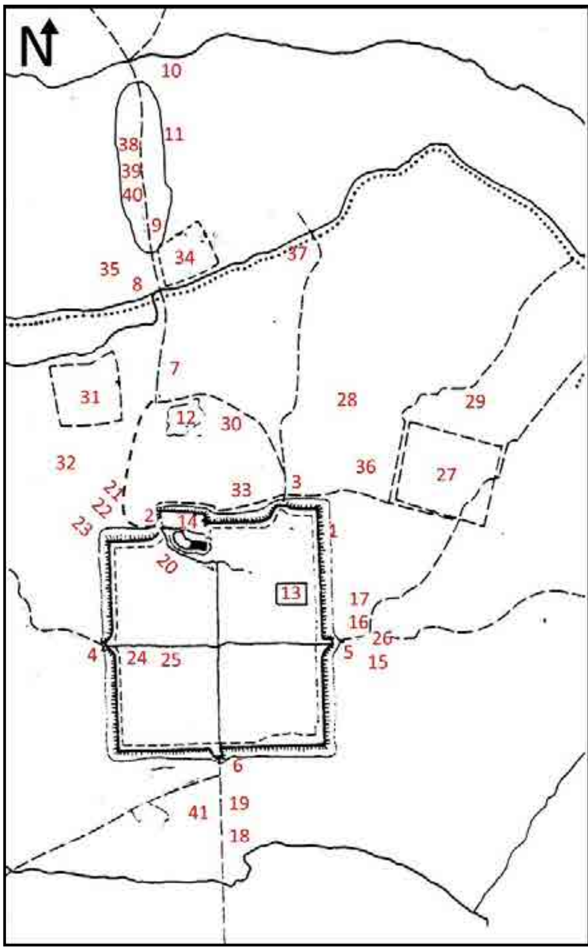
In 1264, a factory was built in the southern outskirts of Herat by the order of Abaqa Khan. Heravi says that Malik Shamsuddin wanted the factory to be built inside the city for the city to thrive more, but Abaqa Khan's envoys insisted on building the factory on the outskirts of the city, saying: "By the order of Genghis Khan, Ögedei Khan, Hulagu khan and Abaqa Khan, the construction of any building by the malik and sheriffs inside the Herat has been banned[……]On the south side of the city, they built a supreme factory and built a market in front of it that stretched to the Firouzabad gate"(Heravi, 2006: 311).

According to Ghazan Khan's decree, in the year 1294, Malik Fakhr al-din replaced his father, Malik Shamsuddin-i Kahin, as the governor of Herat. At this time the defense wall and the ditch of Herat were restored and the height of the city's defense wall was added to (Heravi, 2006: 463). About malik Fakhr al-Din's developmental activities, Heravi states that:

> *"After the defensive wall and the ditch were rebuilt, At the foot of the fence they built a field(Meydan) called Eidgah and a wall all around it and at the foot of the Firoozi fence a Khaneghah full of decorations was also built[….] He built Tareforush mosque in front of the Baraman gate, and constructed a Market, at the foot of the fence[….] And in the tombs and cemeteries of the*

city, such as Gazorgah, Hyadvan(Hyaban), Khajeh Abu al-Valid, Khanjeh Bad and Khajeh Taqi, ordered to recite the Quran"(Ibid: 463-464).

Maybe what Heravi meant from the fence in his text is Herat's castle or the citadel. This citadel was known as the Ikhtiyar Al-din, which was attached to the northern wall of Herat and situated between the gates of Malik and Qebchaq. Based on these documents, Terry Allen supposed the positions of the square, khaneghah, Tareforush mosque, and bazaar within the city and south of Ikhtiyar al-din citadel (Allen, 1983: 13, 18, 94). On the other hand, while addressing the events of 1320, Heravi refers to the Tareforush mosque again, stating it was placed outside the city walls (Heravi, 2006: 768). According to this, the mosque must have been next to the Baraman (Malik) Gate on the northern outskirts of the city. In this part of the text, for the first time since the Mongol invasion, Heravi refers to Khiaban-e Herat calling it "Khiadvan". He separates the Khiaban's cemeteries from the graveyards of Enjil region, like the Khaje Abu al-valid that was located in the north of Zaghan's Garden. This indicates that there was a nominal connection between the graves placed in the south of the Enjil canal and the sepulchers situated in north at this time, because he mentioned all of the cemeteries in Herat in his report, but did not mention any of the graveyards placed in south of the Enjil canal, such as Chihil Gazi, Saed, and Masrakh, that were located along the road.



Title of location	Title of location	Title of location
1.City wall	2. Malik Gate	3.Qebchaq Gate
4.Iraq Gate	5. khosh Gate	6.Firuzabad Gate
7.Khiaban-i Herat(South)	8. Juy-i Enjil	9.Khiaban-i Herat(North)
10..Juy-i No	11. Khiaban Cemetery	12.masrakh
13.Mosqe of Herat	14.Ikhtiar Al-din Citadel	15.Palace of kherleq
16.Hazireh-i Taqi	17.Palace of Majd al-din	18.Factory of Abaqa
19.Bazar-i Abaqa	20. khaniqah-i Fakhr al-din	21.TereForush mosque
22.TareForush Khaniqah	23.Tareh Foroush Karvansaray	24.Falak al-Din Mosque
25.Bazar-i Al-sultan	26.Bazar-i Bujay	27.Sefid Garden
28.Golshan Garden	29.Beit Al-Aman Garden	30.Masrakh Garden
31.Zaghan Garden	32.Suleiman Garden	33.Golesten Garden
34.Marqni Garden	35.Astaneh Garden	36.Khaniqah of Ghiyas Al-Din
37.Mu'ez Al-Din Wall	38. Khaniqah of Moez Al-Din	39. Hazireh-I fakhr-i Razi
40.Minarets of Head	41.Palace of marktay	

Fig. 2: The place of Mongol era works of architecture and urbanization in Herat. Marking on the map of Herat, by Terry Allen (1983), is done by the authors based on the documents mentioned in the text.

In the year 1306 AD, Malik Ghiyath al-Din became the ruler of Herat as his brother's successor. But shortly after, by the order of Öljaitü (the seventh Ilkhan), he was temporarily dismissed from the position and summoned to Soltaniyeh. During this time, the Mongol sheriffs had taken over the Herat city administration and they were constructing several buildings in there, which is reported as follows: "Mohammad Dolday built a Bazaar near the Falk al-din Mosque and named it Suq al-Sultan […] Amir Yasavol rebuilt an old market in south of the city [….] Bujai also built a Bazaar outside the city near the Khosh Gate" (Heravi, 2006: 603). Except for Souq al-Sultan, which was inside the city and next to the Iraq gate (Allen, 1983: 94), two other bazaars had been built outside the city.

When Malik Ghiyath al-Din took the reign back in 1328, a battle ensued between him and Yasur, a Mongol prince. Heravi refers to the constructions in the northern hinterland of Herat for the first time while describing this battle. He points to the gardens and streets of the Bagh-i Sefid (White garden) (Heravi, 2006: 713), which were located in the north of the Malik and Qebchaq gates. This report illustrates the existence of gardens at this time in the northern suburbs of Herat. In fact, in the area where the old Rabad was located until the 11th century, suburb gardens were built at this time. Terry Allen also mentions gardens in this area in his report: Zaghan garden on the west of Khiaban road and south of the Enjil bridge. The Golestan garden in the east of Khiaban road and north of the defensive wall and the Sefid garden at the eastern end of the Khiaban road (Allen, 1983: 94). In this area Saber Heravi also refers to these gardens: Shah Suleiman garden in Baraman Village on the west of Shah Suleiman bath and Khiaban road (Saber Heravi, 2007: 67), Moreover, Masrakh garden in Qohandiz of Masrakh (Ibid: 41), Furthermore, Golshan garden in northwest of Sefid Garden (ibid: 48) and likewise, Beyt al-Aman garden in back of the Sefid and Golshan gardens (Ibid: 51). There are only two gardens mentioned in these reports that belonged to the Kartid era which were placed in the northern part of Enjil. Firstly, the Marqni garden in the northeast of the Enjil bridge and the East of Khiaban road (Allen, 1983: 94), and secondly Astane Garden in front of Marqni garden in the west of Khiaban road (Saber Heravi, 2007: 74). These reports indicate a high density of orchards between the defensive wall and the Enjil canal and they also put forward this hypothesis that, alongside the Khiaban route across this region, besides cemeteries, the gardens also were built alongside them at this time.

Heravi also mentions the Khaniqah that Malik Ghiyas al-din has built in this part of the suburb near the Sefid Garden (Heravi, 2006: 745). Also Zamchi Esfazari (15th century) mentions the constructions of Ghiyas al-Din in the northern suburbs of Herat more than this and says: "In northern part of the Tareforush Mosque, he built a large pond [...]and in the west of Tareforush Mosque he built a Khaniqah and a Karvansaray in front of it"(Zamchi Esfazari, 1960: 507).

In the year 1331 Malik Mu'ez al-din Hussein, the most powerful ruler of Kartid, came to power. The beginning of his reign coincided with the collapse of the Mongol Ilkhanid dynasty (1335 AD). Therefore, he can be considered an independent ruler, far from the influence of the Mongol Ilkhanids. One of the most important events that took place during the reign of Mu'ez al-din Hussein was the construction of the Great Herat fence. He built the fence to strengthen the city's defensive power and wanted this fence to encompass all of the constructions placed in the suburbs. In the description of this fence's extent Zamchi Esfazari states:

" And the fence built by the Malik Mu'az al-din Hussein is infinitely wide.

Its diameter starts from the Enjil Bridge and continues to Darband-i Sheikh-i Khorram and the other diameter starts from Malassian region and continues until Kheim-i Duzan Bridge. That's about one Farsang (6.24km) in two Farsnags (12.48km)" (Zamchi Esfazari, 1960: 81).

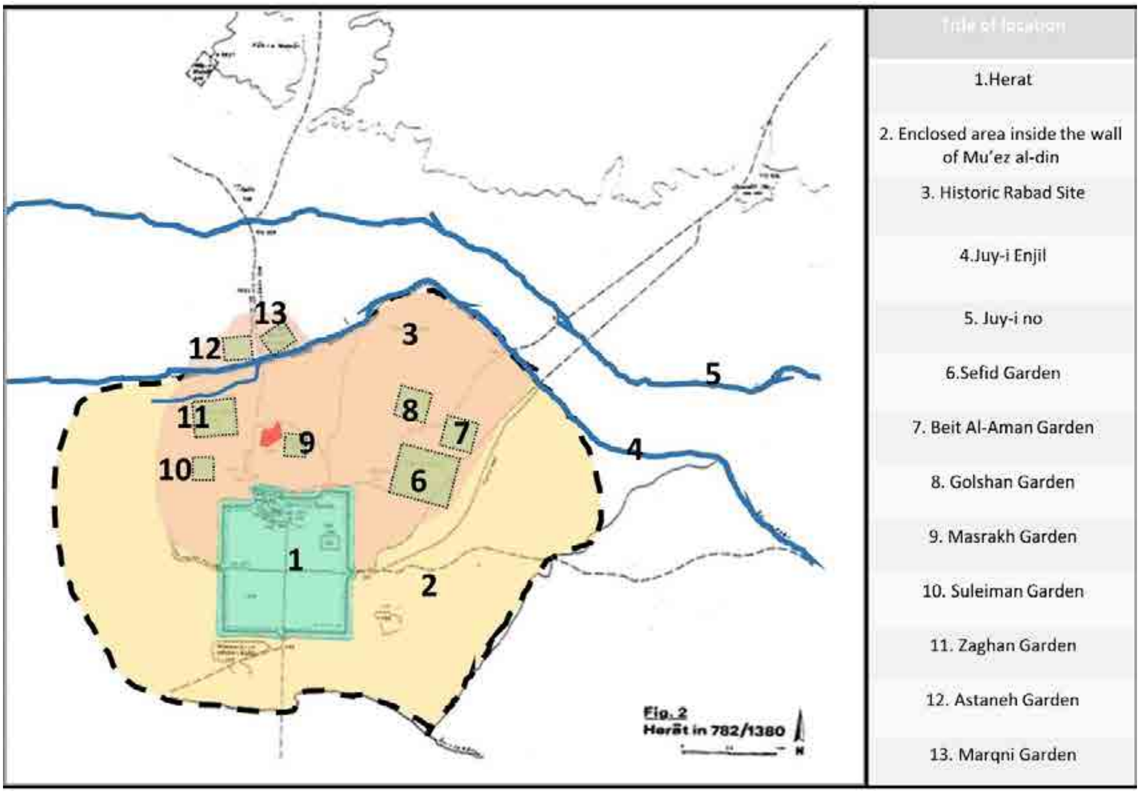


Fig. 3: Herat city area in the late Kartid period Marking on the map of Herat, by Terry Allen (1983), is done by the authors based on the documents mentioned in the text.

Also about the northern border of this fence he states:

The Current defense wall is in the south of Shemiran and Qohandiz [….] [In other words Kohandis and Shemiran] and in the north of them another fence built by Malik Mu'az al-din Hussein used to encompass Shemiran and Qohandiz which is now destroyed."(Zamchi Esfazari, 1960: 77).

Although the full extent of the wall is unclear, it can be understood that the boundary of this wall in the northern part of Herat was accordant with the line of the Enjil canal. In addition to strengthening the defensiveness, this fence was standing against the growth of the city's suburb like a dam and blocked it around the Enjil Canal and it also led to the restoration of the historical Rabad that had remained deserted since the eleventh century. On the other hand, the construction of this fence has blocked the Khiaban thoroughfare and caused the Khiaban cemetery to return to its former borders.

Other buildings erected by Malik Mu'az al-din were also located in the north of Herat. On the Khaniqah that he built on Khiaban-e Herat, Abdullah Vaeiz says: "Malik Mu'az al-din Hussein built a Khaniqah for disciples of Sheikh Shahab al-din Bastami in Khiaban-e Herat […] Sheikh Shahab al-din died in 404[AH] and his tomb is on the Khiaban near the tomb of Fakhr-i Razi"(Vaeiz, 2007: 70). Sheikh Shahab al-din's tomb may have been erected near his Khaniqah. Accordingly, this Khaniqah has been on the west side of the

Khiaban thoroughfare, between the Enjil and the Nou canals, just near the tomb of Fakhr-i Razi (Fekri Saljughi, 1964: 66-68).

The last edifices related to Malik Mu'az al-din, were also located on Khiaban-e Herat, near the tomb of Fakhr-i Razi. This building consisted of two minarets that he built using the insurgents' cutoff heads. According to Zamchi Esfazari, these two minarets were symmetrically constructed on both sides of the Khiaban thoroughfare and were still there until the 14th century (Zamchi Esfazari, 1960-2: 13).

Shortly after the death of Malik Mu'az al-din Hussein, Malik Ghiyath al-Din Pir Ali, the last ruler of Kartids, came to power in 1389. His reign ended in 1381 with the Timur invasion to Herat and the capture of this city. Half a century after the collapse of the Mongol Ilkhanid empire, the Kartid rulers' era in Herat, also came to an end (Fig. 2 &3).

11. Tabriz in the Ilkhanid Period

The Mongol Ilkhanid Empire, established by Hulagu Khan in 1256 following the third Mongol invasion of Iran, extended its dominion over all Iranian territories, as well as Baghdad and Mesopotamia, effectively suppressing all resistance (Qazvini, 1935, p. 138). Despite their rule over Iranian lands, Hulagu Khan and his successors retained their nomadic traditions. During the winters, they migrated to the warmer regions of Mesopotamia and Arran in northern Azerbaijan, while in summer, they resided in the northwestern plains of Iran, particularly in Azerbaijan and Greater Armenia. Living within urban settings was deemed undignified by the Ilkhanids, who preferred establishing camps outside cities (Blair & Bloom, 2003, p. 13). Nonetheless, Ilkhanid urban planning reflected a synthesis of their nomadic heritage and the architectural and urban traditions of the conquered territories, as evidenced in their construction activities, particularly in Tabriz, their primary capital for over a century (Hatef Naiemi, 2019, p. 60). The Mongols' initial foray into urbanization occurred during the reign of Arghun Khan (1291–1295 CE). During this period, the Arghuniyeh Complex was constructed in the Adeliyeh Garden of the Sham district, located in the western suburbs of Tabriz. This architectural complex represented a blend of traditional nomadic patterns and urban design principles for the first time (Hamedani, 1994, p. 1179). Influenced by the Arghuniyeh model, most Ilkhanid-era architectural projects in Tabriz were situated in the suburbs, rather than within the old city itself. Instead of revitalizing existing urban centers, the Mongols often established new settlements on the peripheries of cities (Hatef Naiemi, 2019, p. 231). These suburban settlements, built adjacent to older cities, either maintained an interactive relationship with them or functioned as entirely independent entities (Keynejad & Belali Oskui, 2011, p. 115). Notable examples include the Sahib Abad Garden, the Do Menar Endowment Collection, the Seyed Hamzeh Complex, the Ghiyasiyeh Complex, the Dameshghiyeh Complex, and the towns of Ghazaniyeh and Rashidiyeh (Moradi & Jafarpurnaser, 2011, p. 931). These developments reflect the Ilkhanids' unique approach to integrating their nomadic lifestyle with the urban traditions of the regions they ruled.

One of the principles that led the Mongols to inhabit in the independent settlements outside the cities, was the desire to live the tribal life and maintain the racial originality (Masuya, 2002: 78). Accordingly, the Mongol tribal communities settled in isolated and independent areas of the indigenous urban community and formed independent settlements like the ancient Mongolian "Kuran"1 (Moradi & Others, 2016: 36). In addition to building these independent settlements, the Mongols also were interested in building

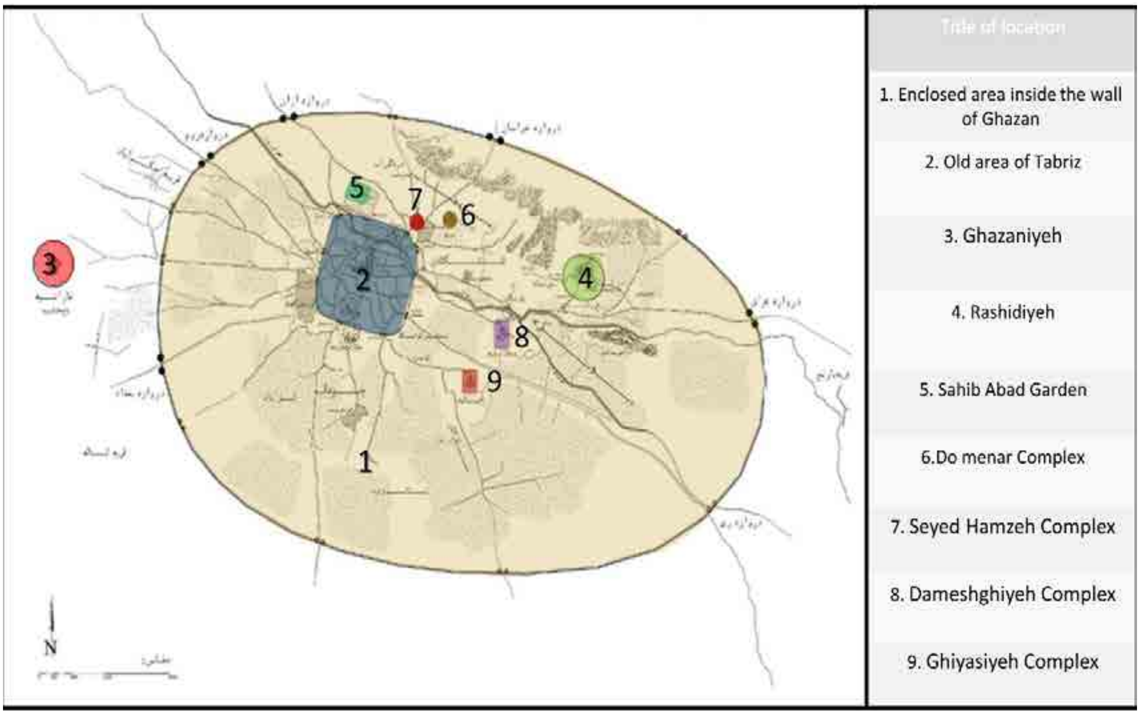


Fig. 4: Tabriz area in the late Ilkhanid Period Marking on the map of Tabriz by Mohammad Moradi and Jafar-purnaser (2011), is done by the authors based on the documents mentioned in the text.

gardens around the old cities. These gardens were usually constructed between the old city and the new residential cores (Karimain & Mehdizadeh, 2017: 50). Building gardens, restricting the city to the boundary of gardens and placing new settlements amid these gardens was rooted in the Mongols nomadic life and inspired by their interest in nature.

After mentioning all these developments, if we are to illustrate the prospect of Tabriz in the middle of the Ilkhanid period, during the reign of Ghazan Khan (1295-1303), we are faced with a multi-core metropolis, which consists of three well-planned urban areas:

- First District: Old city of Tabriz which was the Residence of peasants, traders, and artisans. This area was the commercial and industrial heart of the city.
- Second District: Ghazaniyeh town, which was considered to be the royal residence of the city.
- Third District: The Architectural collections and the residential settlements made based on the endowment principles. These areas were considered to be the residence of the Mongol nobility and elite class of society (Ajorloo, 2014: 4).

The connection between the old city and the new urban cores in the Tabriz metropolis was established with a network of commercial routes that were essentially the same as traditional Bazaars (Moradi & Jafarpurnaser, 2011: 939).

Finally, it should be noted that the most important action of Ghazan Khan in Tabriz was the organization of all these developments. Ghazan Khan built a new fence ten times bigger than the old fence of Tabriz in size. This new fence encompassed all the residential cores and gardens situated on the outskirts of the City (Karimain & Mehdizadeh, 2017: 75). This transformed Tabriz into a metropolitan, with a large defensive wall, which encompassed residential cores situated among numerous gardens (Fig. 4).

12. Analysis

12.1 Analysis of developments in Herat city: Before analyzing the developments of Khiaban-e Herat, we have to look at the events from the perspective of urban developments during the Mongol era in Herat. These events, as noted throughout the paper, have been obtained from historical reports and documents, since it has coincided with developments in Tabriz, in this section, we compare the developments in Herat city with those happened in Tabriz:

12.1.1. Lack of construction inside the city: The historical accounts show that until 1294AD, seventy-five years after the destruction of Herat by the Mongols, no major construction was done inside the Herat city. These documents cite an order, which Mongolian khan, explicitly prohibits any construction in the Herat city. This ban was probably only for the nobles and the rulers and did not include the ordinary people of the city. This is similar to Ilkhanids' special attention to the construction on the outskirts of Tabriz that caused the suburbs of Tabriz to extend during this period.

12.1.2. The Focus on constructing commercial buildings on the outskirts of the City: The Bazaar's routes made the connection between the old city of Tabriz and the new residential cores in the suburbs. Also in Herat, the Mongols focused on expanding Bazaars outside the city walls rather than rebuilding in-town Bazaars. In the south of the city, a newly established factory was connected to the Firouzabad gate in southern Herat with a Bazaar route. Also in the eastern outskirts of Herat, which several palaces and mansions were built in there since the early Mongol era, a Bazaar route established the link between these buildings and the city of Herat.

12.1.3. New Residential locations in outskirt of City: Like Tabriz, which was surrounded by endowed, royal and commercial settlements, some smaller residential cores were also located around Herat. In the first period of Ilkhanid, the Mongols and their rulers erected palaces and mansions in the east and south outskirts of Herat. For instance: The Kherleq palace and mansion of Majd al-din Kalivni in east and Marktay Palace in South.

12.1.4. Expansion of garden constructions in the suburbs: In the city of Tabriz, the gardens were built between residential cores and the old city. By contrast, in the Herat, no evidence was achieved from gardens being located between the city and suburbs, and it was mentioned that most of the gardens were focused exclusively on the northern outskirts of the city. It should be noted that most of the royal palaces and gardens of the Kartid era were built in the Rabad historical part of the city which was situated in the northern outskirts and these constructions make this part of the northern suburb completely revitalized. The most important examples of these gardens are the Sefid Garden in the northeast and the Zaghan Garden in the northwest of Herat. It can be said that this part of Herat was the new core of the royal settlements and was similar to the Ghazaniyeh complex in comparison to Tabriz.

12.1.5. The construction of large defensive walls around the new suburbs: Both in Tabriz and in Herat, with an aim to determine city expansion extent and to protect new suburbs and residential cores, rulers constructed a new defensive wall around the city that was several times bigger than the previous wall and the old city.

12.2. Investigation of developments in Khiaban-Mazar-e Herat: After categorizing the transformations of Herat city during the Mongol era, the impact of these developments on Khiaban-Mzar-e Herat can be categorized in this chronological order:

12.2.1. Transformations of Khiaban-Mazar-e Herat until the twelfth century: Khiaban-Mazar-e Herat, was a cemetery in the north of a major Islamic city, located in the middle of a neighborhood that was situated on the outskirts. One of the major differences that distinguishes this cemetery from other outskirts cemeteries in Islamic cities is that the graves and tombs in this cemetery were located on the two sides of the commercial road that connected Herat to the northern cities of Khorasan and Transoxiana. This is the reason we call the Cemetery of Khiaban-e Herat a Mazar Street.

12.2.2. The demolition of Rabad and its impact on Khiaban-Mazar-e Herat: In the 12th century, the northern Rabad of Herat, located between the city and the Khiaban area, was destroyed. This transformation caused the Khiaban roadway to enter this area and then the cemetery infiltrated this region.

12.2.3. The influence of Mongol invasion on Transformations of Khiaban-Mazar-e Herat: there are no reports of developments in Khiaban area in the historical documents for about seventy-five years after the Mongol invasion, until 1391. The documents of the year 1391 about the activities of Malik Fakhr al-din, shows that tombs of the Khiaban cemetery were in association with the tombs of the Enjil region. This indicates that during the middle decades of the Mongol domination of Herat, Khiaban-Mazar-e Herat was still important and regarded as a religious center.

12.2.4. The significance of Religious functions of Khiaban-Mazar-e Herat in Comparison to Commercial and Residential functions of other Suburb regions: All of the early construction reports of the Mongol era, only cited to commercial and residential buildings built in the suburbs of City. There is no hint about any construction in the northern outskirts of Herat, where the Khiaban cemetery was located, in any of these reports. This could indicate that the Mongols have avoided constructing any commercial buildings on this site because of the sanctity of the cemetery. Even though this part of Herat suburbs was very rich in water resources, there is no sign of palace constructions in this region in the first hundred years of the Mongol era. Reports about constructions in the northern suburbs of Herat and the Khiaban area belong to the middle Mongol era, and are mainly about the construction of religious buildings in this area of Herat.

12.2.5. Dividing Khiaban-e Herat into Residential and Religious Sections by constructing Royal Gardens: It can be deduced from historical documents from the Mongol era that, there has been a unity of religious functions along Herat Street during this period. However, in the late Mongol era, the construction of royal gardens at the beginning of Khiaban-e Herat thoroughfare, between the city wall and the Enjil Canal, makes the Khiaban-e Herat functions divided into two categories: religious and residential.

12.2.6. The construction of a new defensive wall and division of Khiaban-Mazar-e Herat into two sections, internal and external: The construction of a second defensive wall on the outskirts of Herat causes the residential functions that were formed in the region of the historic Rabad, to separate from the religious functions situated on the north of the Enjil canal. This wall at the end of Kartid era creates a boundary, which subsequently causes the Khiaban-e Herat thoroughfare to return to the same region it was before the twelfth century. It also makes this section of Khiaban-e Herat thoroughfare closer to urban life-related functions and away from religious uses.

13. Conclusion

Khiaban-e Herat, characterized by its cemetery and tombs arranged along its central axis, stands as a distinctive example of a Mazar Street within Greater Khorasan. The origins of this historic cemetery date back to the early Islamic centuries, with its gradual expansion stretching along the entirety of the northern outskirts of Herat. During the initial phase of Mongol domination, when Herat was left desolate, activity along the Khiaban-Mazar-e Herat axis came to a halt. However, with the commencement of Herat's reconstruction under the orders of Ögedei Khan, Mongol rulers and administrators undertook significant building projects, including the restoration of the city's watercourses and the construction of commercial and residential facilities on Herat's outskirts. The Mongols' preference for suburban construction, rooted in their nomadic traditions, meant that they largely avoided inhabiting or constructing within the city itself. Despite this, they demonstrated respect for the cemetery located along Khiaban-e Herat, refraining from erecting non-religious structures in this area during the early Mongol period. Over time, as the Mongols' influence waned and local rulers such as the Kartids gained power, there was renewed interest in developing the northern suburbs of Herat, historically the city's rabad (outer town). Late in the Mongol era, the Kartid rulers emulated the royal gardens of the Mongols in cities like Tabriz, establishing palaces and gardens along the southern portion of Khiaban-e Herat. This concentration of gardens distinguished this area from the northern section of Khiaban, which retained its primarily religious and funerary functions. The construction of Herat's Great Wall further divided the Khiaban-e Herat thoroughfare into two distinct sections: northern and southern. Modeled after the Ghazani Wall in Tabriz, this fortification encompassed Herat's suburbs, with the southern part of Khiaban brought within the city's expanded boundaries. This southern section became predominantly used for gardens, tombs, and religious structures. Conversely, the northern portion, located outside the wall, continued to serve as a Mazar Street. In conclusion, under the influence of Mongol urbanization, Herat expanded significantly into its suburbs, culminating in the construction of a massive defensive wall that established it as the largest city in the Khorasan region by the end of the Mongol era. Throughout these transformations, Khiaban-e Herat maintained its historical integrity, with its boundaries fixed by the city's new defenses and its function as a cemetery and religious axis preserved.

14. Endnote

1. According to historical documents, Kuran is one of the most common types of temporary settlement was, which included the establishment of tents around the khan's tent, according to Jami' al-Tavarikh. The tents were placed in Kuran in such a way that they finally formed a circle (Hamedani, 1994, 330).

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بررسی تحول شهر هرات در طول دورۀ ایلخانی برمبنای مطالعۀ تحولات در محور خیابان-مزار

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چکیده

خیابان-مزار به‌گونه‌ای از مجموعه‌سازی گفته می‌شود که در آن مقابر در دو سوی یک معبر استقرار می‌یافته‌اند. خیابان هرات نیز به‌عنوان گورستانی که مقابر در امتداد محور اصلی آن استقرار داشته‌اند، از نمونه‌های منحصربه‌فرد و کهن ساخت خیابان-مزار در منطقۀ خراسان بزرگ محسوب می‌شده است. این پژوهش با هدف بررسی روند تحولات اولیه در خیابان-مزار هرات، تطورات شهرسازی هرات را در طول دورۀ ایلخانان مغول مطالعه می‌کند و ضمن مقایسۀ آن با تحولات شهر تبریز، پایتخت ایلخانان، شباهت‌ها و تفاوت‌ها، میان تحولات این دو شهر را تحلیل کرده و درنهایت، تأثیراتی که این دگرگونی‌های شهری بر روند گسترش خیابان-مزار هرات داشته‌اند را مورد بررسی قرار می‌دهد. این پژوهش با روش تحلیلی-تاریخی صورت‌گرفته و نتایج این پژوهش نشان می‌دهد که تحولات شهرسازی در هرات بسیار مشابه با تبریز بوده است؛ به‌گونه‌ای که در هرات نیز مانند تبریز، مغولان حومه‌های شهر را بسیار گسترش می‌دهند و در این حومه‌ها کاربری‌های تجاری و کوشک-باغ‌های اشرافی را مستقر می‌سازند. روند گسترش حومه‌های شهری در هرات به‌قدری گسترده است که در اواخر عهد مغول، حاکم هرات به تأسی از دیوار غازانی در تبریز، دیواری گسترده بر گرد شهر هرات احداث می‌کند تا تمام حومه‌های جدیدالتأسیس آن را دربر بگیرد. با احداث این دیوار، خیابان-مزار هرات به دو قسمت شمالی و جنوبی تقسیم‌شده و عملاً کاربری قسمت جنوبی آن‌که در داخل محدودۀ دیوار قرار داشته از کاربری گورستانی تفکیک‌شده و به تعامل با کاربری‌های گوناگون در شهر هرات سوق پیدا می‌کند.

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Numismatics of Tabriz Mint during the Ilkhanate Period (Focusing on the Era Hülegü to Öljeitü)

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Abstract

The Tabriz mint is one of the most significant mints from the Ilkhanid period. Since the Hulegu Khan era, Tabriz was officially recognised as the political centre of Ilkhanid rule. This decision, whether ideal or flawed, attracted an influx of artists, scholars, calligraphers, craftsmen, and architects from the vast territories of the Ilkhanid Empire—from Transoxiana to Asia Minor, the plains of Qipchaq and the Transcaucasus to the Mediterranean shores, and from the Persian Gulf to the Strait of Oman. During this time, Tabriz became a major financial, political, scientific, military, and social hub. Historical sources document that Tabriz reached a remarkable level of growth and distinction, with visitors—including tourists, foreign emissaries, and domestic ambassadors—providing vivid descriptions of the city in their accounts. The choice to establish Tabriz as the Ilkhanid political centre appears to have significantly boosted its importance as one of the largest and most prominent mints in Iran during this era, as evidenced by numismatic records. Tabriz's role in minting underwent substantial changes, shaped by shifts across various historical periods, particularly its financial structure. The study of coins from this mint offers valuable insights into some obscure aspects of Iranian history during the Ilkhanid rule. This article examines Tabriz, one of the most influential mints of the Ilkhanid period, by highlighting its unique characteristics, features, and innovations. This paper addresses the question of how coins were minted in Tabriz in comparison to those from other Iranian mints and seeks to understand the factors behind Tabriz's preeminence. Preliminary research suggests that Tabriz, as the Ilkhanid political centre, possessed the necessary conditions to become a major financial institution under the Ilkhanid administration. Following the progression of the Ilkhanid administration from nomadism to a more advanced and sophisticated one, the same development appeared in Tabriz. evolved correspondingly. Attracted a vast array of experts, talented artists, scientists, and craftsmen; fostering a dynamic professional environment that contributed to other Iranian cities in various areas of development. By the latter part of Ilkhanid rule in Iran, particularly during the reigns of Öljeitü and Abu Sa'id, Tabriz became a notable centre of cultural, economic, financial, architectural, artistic, and intellectual achievements. This included advancements in book illumination, painting, and coinage, largely for skilled and talented workers drawn from across the empire. This thesis, therefore, focuses on the unique characteristics of coins minted in Tabriz and explores the reasons for and implications of the Tabriz mint's superiority over other mints within the Ilkhanid Empire.

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1. Introduction

Mints are a core and essential component of any political structure. Regardless of the size of the governing organisation, these institutions inherently reflect the power of the state across political, military, economic, and cultural domains, as all of these are fundamentally linked to financial and economic functions. Analysing the locations and distinctive characteristics of these financial institutions provides a clear view of their political authority, which is essential for maintaining a well-organised administration over a vast territory. Following Hülegü's invasion and conquest of Persian territories, it became evident that a robust financial system was necessary for managing tribute collection, funding military expenses, and logistics. This system was also vital for stabilising the economies of newly conquered regions. Before Baghdad fell, Hülegü established Tabriz and Maragheh as the first administrative centres, where he also received ambassadors from Georgia (Saunders, 1984: 111; Grouse, 1986: 585). Historians recount that after the conquest of Baghdad, Hülegü moved to Tabriz and then redirected his base to Maragheh, where he set up an observatory in collaboration with Iranian administrators. To manage financial affairs and maintain the economic system, the Ilkhans relied on skilled Iranian bureaucrats, such as Khwaja Nizam al-Mulk Juvayni and Khwaja Rashid al-Din Fazlallah Hamadani, followed by Taj al-Din Ali Shah. The Mongols, lacking expertise in these areas, drew heavily on these officials, whose contributions enabled the Mongol rule in Iran to thrive and helped rebuild cities during the conquest.

Over time, especially during the reigns of Ghazan Khan and Öljeitü, these administrative influences contributed to significant Mongol progress and development. The Mongols, initially without knowledge of governance, the arts, or economic management, transformed from a nomadic warrior society into a more urbanised and cultured one. By relying on historical documents, it is clear that this transformation yielded numerous civilizational achievements across the Ilkhanate's vast political domain by the time of Öljeitü and Abu Sa'id. All facets of political, economic, and military growth reflect the Mongols' evolution from destructive conquerors to developers striving for advancement.

Numerous mints across Iran were affected by this progress, and among the prominent mints of the Ilkhanid era were Tabriz. Due to its strategic political, geographical, economic, social, and military position, Tabriz played a critical role in the Ilkhanid financial system. Until the capital shifted to Soltaniyeh, Tabriz mint stood at the forefront of Iranian mints and remained one of the most influential mints throughout the Ilkhanid period. This article analyzes the Tabriz mint, highlighting its unique features, practices, and innovations. This raises the following question: in what ways do Tabriz-minted coins differ from those produced in other cities across Iran, and what factors contributed to Tabriz's financial dominance within the Ilkhanid Empire? Preliminary findings indicate that Tabriz, as an Ilkhanid administrative centre, was well-positioned to develop into a significant financial institution. As the Mongols gradually assimilated into Persian and Islamic culture, their governance advanced beyond their early rudimentary practices to that of a civilised and thriving state. This transformation enabled Tabriz, as the Ilkhanid centre, where attract specialists, artists, scientists, and skilled artisans from across the empire, fostering a professional environment that eventually surpassed that of other Iranian cities. Over time, Tabriz's infrastructure and economy flourished, with the Ilkhans investing in reconstruction efforts and instituting policies of development and expansion.

By the final stages of the Ilkhanid rule in Iran, particularly under Öljeitü and Abu Sa'id, Tabriz reached notable heights in political, economic, cultural, and artistic achievements. Coinage from the Tabriz mint captures valuable historical data that, when studied, reveals unspoken details about the political, social, economic, military, religious, cultural, and intellectual life of the time. This thesis emphasises the role of Tabriz coins as primary sources that shed light on Iran's history during the Ilkhanid rule, aiming to fill historical gaps by examining the Tabriz mint and its numismatic legacy. Many works and articles about Ikhanid coins include Ata Abbas Khani, (2003), Ahmadi, Shatari and Shamri, (2015), Smith, (1987), Torabi Tabatabaei, (1968), Sowaqeb and Emraee, (2017), Razavi, (2009), Sarfarazi, (2010) - Sarfaraz; Avar Zamani, (2001), Shariat, Zade, (2011), Aladini, (2016), Alizadeh Moghadam, (2009) - Niker; Behnamfar, (2009), Watigh, (2007), Yarahmadhi, (2010), Nima, (2005). However, apart from brief discussions of the Ilkhanid period's broader context, this study focuses specifically on the coins minted in Tabriz. By analysing and interpreting the distinctive political, social, economic, and artistic aspects of these coins, this work re-evaluates their historical significance. Key points of this study include the status of Tabriz during the Ilkhanid period, the general characteristics of Ilkhanid coinage through the era of Öljeitü, a selection of Tabriz coin samples, and an in-depth interpretation of their historical context.

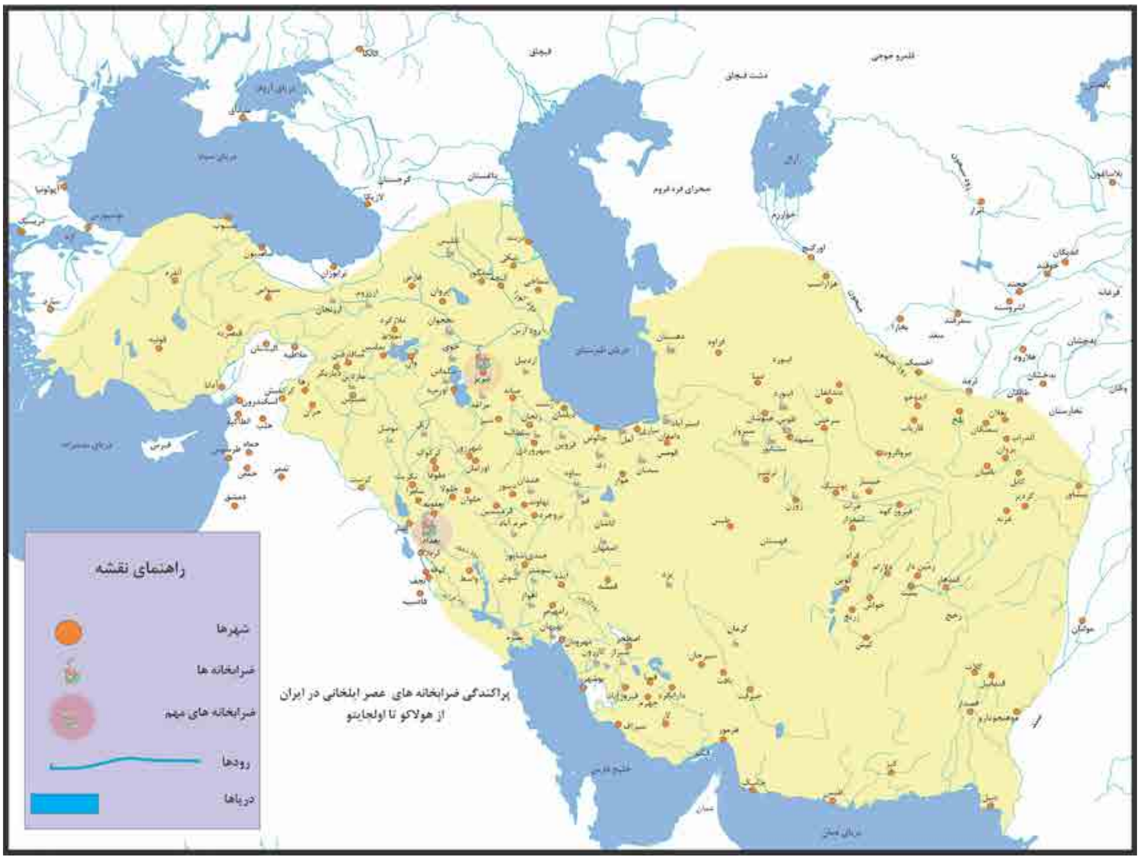
2. A look at Tabriz's position during the Ikhanid era

Historical sources and documents reveal Tabriz's prominent status during the Mongol Ilkhanate. Cities like Tabriz, Maragheh, Ojan, and Soltaniyeh were political, economic, and militarily significant under Ilkhanid rule, as these cities were often selected as centres for the Ilkhanids' political administration from Hülegü's time to Öljeitü. According to records, Tabriz's initial encounter with the Mongols was 617 A.H., when the city faced the Mongol army under the rule of the local Atabakan leader, Uzbek bin Pahlwan. Aware of the Mongols' reputation for destruction, Uzbek negotiated Tabriz's submission by sending offerings, thus preserving the lives and properties of its residents (Saunders, 1984: 79). In 618 A.H., the Mongols attempted another incursion into Tabriz, but Uzbek's minister, Shamsuddin Toghari, organised a defence, even as Uzbek fled to Nakhchivan. Shams Al-Din Toghari led the city's residents in preparing for the war, strengthening walls, barricading streets, and digging trenches around Tabriz. Considering the city's fortified readiness, the Mongols opted for a truce and accepted tributes rather than engaging in battle. Later, as Jalaluddin Mankberni of the Khwarezmian dynasty assumed control of parts of Azerbaijan, including Tabriz, this spurred another Mongol assault on the city. Jalaluddin, unable to repel the Mongols, fled, leaving Tabriz defenceless and at the mercy of the Mongol army (Saunders, 1984: 79; Mortazavi, 2006: 154).Following these events, the Mongols eventually recognised Tabriz's strategic importance. Aba Aga Khan, an Ilkhanid ruler, established Tabriz as his political headquarters, a status he retained until Öljeitü transferred the capital to Soltaniyeh (Benakati, 1999: 427; Iqbal Ashtiani, 1985: 303; Pigulovskaya, 1975: 352-353). Tabriz's prosperity surged during Ghazan Khan's reign, who, after returning from Syria, constructed a vast architectural and cultural complex in the city's Shanab Ghazan district. He also established mosques, schools, a hospital, an observatory, libraries, and baths (Minorsky, 1958: 29; Iqbal Ashtiani, 1985: 303). This period transformed Tabriz into one of the world's leading urban centres, attracting European envoys and merchants, thus elevating the city's international reputation. Administrative and cultural accomplishments in Tabriz were largely due to

Khajeh Rashid Al-Din Fazlullah Hamedani and his colleagues, whose efforts spanned from constructing mints and industrial centres to establishing public amenities, such as hospitals and markets. During Öljeitü's time, Tabriz's Shiite Ilkhanate political centre shifted to Zanjan, yet notable structures like Alishah Mosque and other caravanserais were established in Tabriz (Mashkor, 1958: 501; Aqsari, 1983: 314-315). Throughout the Ilkhanate, Tabriz became a focal point for European trade routes extending from Crimea through Trebizond and onward into the Iranian mainland (Saunders, 1984: 124). The influx of wealth, taxes, and goods into Tabriz supported its growth in culture, science, and art. By Ghazan Khan's era, the city had achieved prominence in disciplines such as literature, philosophy, religious studies, and visual arts. This flourishing led Tabriz to transform into a training centre for artisans, including painting, calligraphy, and illumination. Its minted coins were unique, reflecting these artistic advancements (Abbas Khani, 2003: 12-13). This thriving period for Tabriz, enriched by administrative, cultural and military reforms, left a lasting legacy, evidenced by historical records and artefacts that illuminate the Ilkhanate's impact on the region (Saunders, 1984: 130-131).

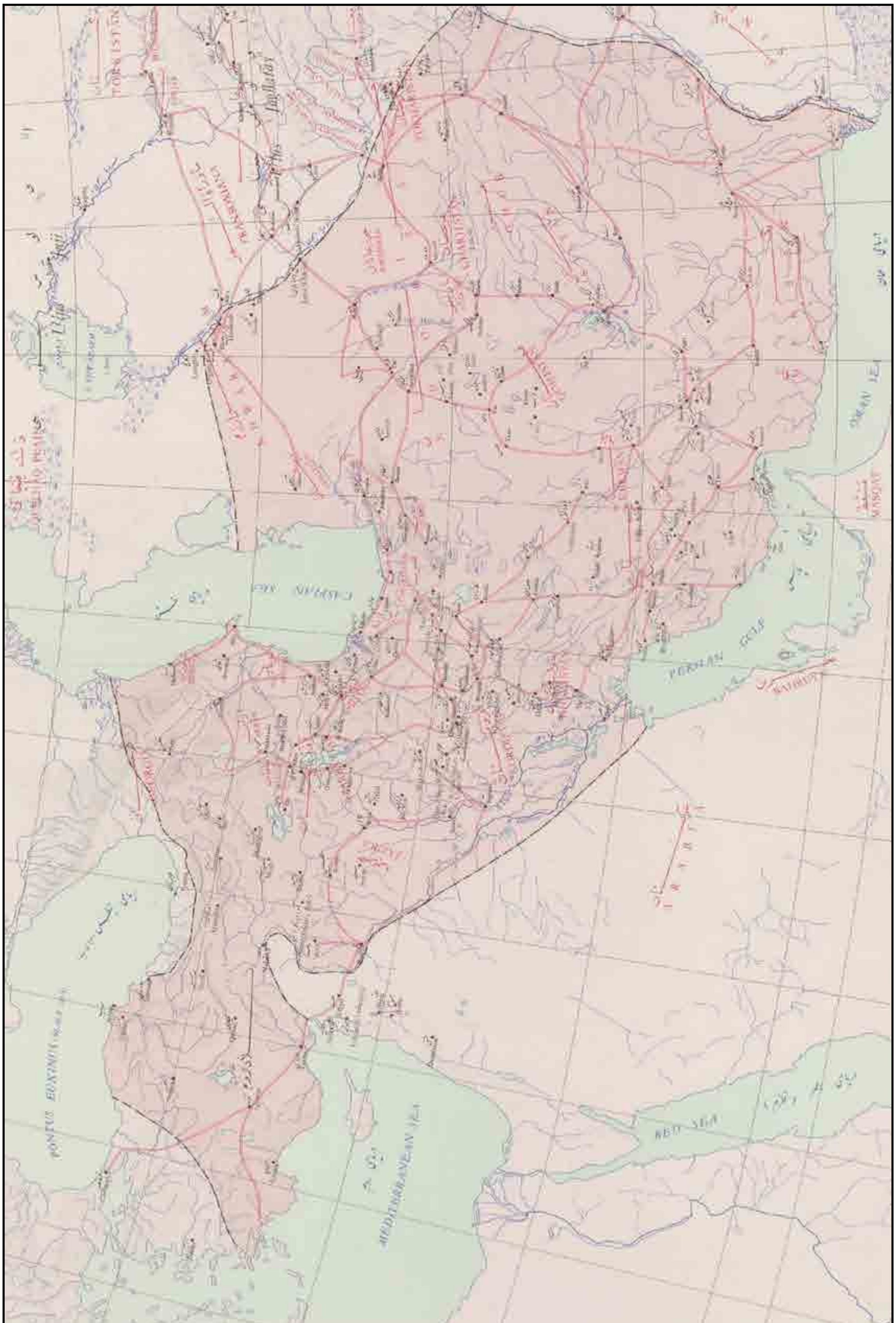
3. General Features of Ilkhanid Coins up to the Era of Öljeitü

Documents and numismatic evidence indicate that the mints of the Ilkhanid period across various cities under the Ilkhanid rule were subject to considerable freedom regarding coinage types. Each mint, depending on its location and the period, produced coins with slogans related to the local religious and political perspectives of the rulers and ministers under the Ilkhanids. Coins from cities like Tabriz, Maragheh, Ojan, Soltaniyeh, Amol, and Baghdad exhibit unique differences in shape and inscription composition. One of the key identifiers for coins minted in Amol was the Shiite-oriented approach of its rulers. Given Amol's Shiite religious orientation, its coin inscriptions differed from those in Tabriz, Maragheh, Ojan, Soltaniyeh, and Baghdad, suggesting that a prominent numismatic feature of Amol-minted coins was the Shiite stance (Sarfaraz and Avar Zamani, 2001: 217).The Ikhanid mints' coin inscriptions can be categorised into several types. Broadly, Ilkhanid coins across three periods reflect evolving governmental attitudes. During the first period, Ilkhanid coins predominantly conveyed an Islamic-Iranian perspective. Many early Ilkhanid coins, such as those from Tabriz, bear Islamic motifs, with inscriptions indicating the Ilkhanids' attempt to legitimise their rule by invoking Islamic principles. For instance, some coins from Hulagu's reign are inscribed with "قل اللهم مالک الملک توتی الملک من تشاء و تنزل الملک ممن تشاء و تعز من تشاء," a verse that carries the message that Mongol rule over Islamic lands was divinely ordained (Al-Imran 1974: 183-186). This message promoted the Mongol rulers' legitimacy, implying that their control over the Khwarazmian Islamic lands was a manifestation of divine will, fostering a sense of Mongol inevitability and dominance. In the second period, coins began to exhibit Mongolian symbols and Uyghur script, highlighting a cultural shift in the Ilkhanids' political attitude as they sought to legitimise their rule with symbols from their Mongolian heritage. Designs included birds, animals, stars, geometric patterns, and other motifs, alongside the names of Ilkhans like Hülegü, Abaqa Khan, Ahmad Tekodar, Arghun, Ghazan Khan, and Öljeitü in Uyghur script. Coins from this period reveal the Ilkhanids' efforts to assert cultural superiority, although these efforts gradually faded as Islamic-Iranian cultural elements regained prominence. The cultural persistence of Islamic-Iranian symbols, often bolstered by skilled Iranian officials such as Attamolk Jowini and Khwajeh Rashid al-Din Fazlullah, further diluted Mongol cultural influence. During the third period, Mongol symbols gradually diminished, especially after Ilkhanid rulers converted to Islam, with some embracing Shiism. Coins from this period increasingly incorporated Islamic and Shiite motifs, including invocations to the Twelve Imams and other Islamic texts, alongside Arabic script. Tabriz, as a central hub of scientific, cultural, and political life, became a distinguished mint. Tabriz coins featured elaborate calligraphy, geometric shapes, and the combined use of Kufic, Uyghur, Arabic, and Persian scripts, reflecting their elevated status. Numismatic evidence suggests that the Ilkhanid period had up to 76 active mints, with Tabriz as the leading mint, followed by Maragheh, Ojan, Soltaniyeh, and Baghdad (Sarfaraz and Avar Zamani, 2001: 217). Alongside these prominent cities, others, including Amol, Isfahan, Yazd, Shiraz, and Herat, participated in coin production, each adding distinct stylistic and symbolic elements. In less prominent cities, coins exhibited simpler artistic techniques. These details underscore the vast and varied numismatic landscape of the Ilkhanid period, characterised by both regional diversity and cultural integration across the empire.



Map 1:Distribution of mints in Iran during the Ikhanid era (taken from Atlas of Iranian History, 1999: 93; Designed by the author).

These cities were considered in the second tier of coinage ranking. Generally, some distinctive features of Tabriz coins can be outlined as follows: Coin production began early in the Ilkhanid period, heavily influenced by Iran's rich culture and Islamic-Iranian customs and beliefs. Some scholars argue that the Ilkhans adopted this practice due to their lack of civilisation and eventual integration into Iranian culture, which they saw as a way to revive Iranian traditions (Bayani, 2014: 201) or, in other words, as a process



Map 2: Iran during the Ikhanid era (Historical Atlas of Iran, 1999).

of “Iranianization.” Others attribute this approach to Mongol religious tolerance. Coins from Hülegü’s time, for example, carry the inscription “محمد رسول‌الله” and, alongside it, “قُلِ اللَّهُمَّ مَالِكَ الْمُلْكِ تُؤْتِي الْمُلْكَ مَنْ تَشَاءُ” (Al-Imran: 26), embodying this perspective (Shpoler, 2016: 203; Sarfrazi, 2018: 48-49; Sawaqab and Hamkar, 2018: 7). On the coin’s reverse, inscriptions often include the ruler’s title, such as “قاآن الاعظم هولاکو ایلخان المعظم، الملک الله، العزه لله، الحمدالله,” while the coin’s edge typically displays the mint location and year. With the Ilkhanids’ conversion to Islam, the names on minted coins shifted to Islamic titles. The rulers’ names and titles were sometimes inscribed in Uyghur script, and occasionally, only the sultan’s name appeared in Persian. This distinction may have helped identify each new sultan from their predecessors. Rulers of this period included Abaqa, Ahmad Tekuder, Arghun, Gaykhatu, Baydu, and Ghazan Mahmoud (Sarfaraz and Avarzamani, 2001: 216-217).

Fig. 1: Hülegü coin (Nyamaa, 2005: 211).

Fig. 2: Coin of Ghazan Khan Mahmud, whose name is Genghis Khan, written in the eighth century BCE Arabic and Uyghur (Nyamaa, 2005: 222).

The sultan's name and title are often written in Persian. The coins of this period, with the exception of the period of Ulijaito (Mohammad Khodabandeh), which was oriented to shiite religion, were coined on the coin with the word "martyrs" and "علـی ولیـالله", after which only the word "martyrs حجتـه" and the name of Rashdi's caliphs were mentioned.

Fig. 3: Abaqa Khan coin (Nyamaa, 2005: 212).

Although in shiite cities until the end of the Ikhanid era, the names of twelve shiite imams were engraved on all coins. the mints of the Ilkhanate can be counted in different cities such as amol, albergo, erbil, ardebil, marage, basra, Baghdad, Tabriz, marage and… motifs on the coins of this period, such as geometrical motifs, flowers and leaves, stars and animal motifs in the Ikhanid period, such as the seljuk period, were engraved on the coins instead of the ruler and the caliph, and also the motif of birds, celestial bodies, crucifixes and bows in this period is visible on and on the back of the coin. as mentioned in historical sources and references of this period, coins with shiite religious phrases were minted by order of Ghazan (Shpoler, 2001: 195).

Fig. 4: Abaqa Khan coin (Nyamaa, 2005: 216).

As mentioned in the previous attributes, until the Ghazan period, there was no single composition or format in coinage. On some coins, the place of minting is bordered and on the back side of the coinage of verses 4 and 5 (Quran, roman sura) is included. an example of this can be found in a coin from Holaco, minted in margin (657 H). (Alaaldinani, 2016: 26) can be mentioned.

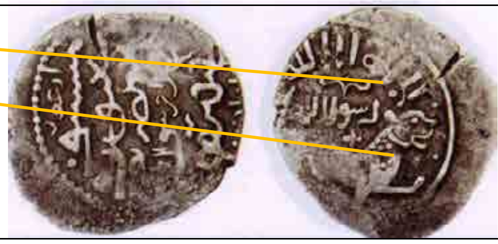
	The sixth tower of history is to strike a coin with a crucifix, and on the side of the coin is the name of Arghun in Arabic, and on the other side of the coin is the name of Arghun in Arabic, .Uyghur, and other titles	
	لا اله الا الله محمد رسول The name Arghun is in Arabic and on the other side of the coin the name Arghun is in Arabic and Uyghur and other titles along with the .star and sun	
	لا اله الا الله محمد رسول The name Arghun is in Arabic and on the other side of the coin the name Arghun is in Arabic and Uyghur and other titles along with the .bird and sun	
	لا اله الا الله محمد رسول In a circle with the image of a lion on the opposite side of the coin, the names of Arghun and Genghis Khan in Arabic and Uyghur, and other titles	

Fig. 5: As in the Seljuk period, instead of using the role of ruler and caliph, they used the role of birds, crucifixion, star, and lion (Nyamaa, 2005: 217-218).

According to the above, it is possible to enumerate the features and peculiarities of coins in a general view such as; the existence of the Islamic - Jewish - Christian slogan is evident in them - the coins of this period before Öljeitü were generally adapted from Kharazm - Shahin coins - due to the arrival of Uyghur - Arabic - persian lines in the coins of this period of Iranian history are considered masterpieces of their era - the existence of islamic symbols including Quranic Verses as well as other christian - Jewish and Uyghur symbols in the coins of this period shows the religious tolerance of the Mongol rulers (Mortazavi, 1962: 2) - some jewish - christian symbols are represented in the coins such as the existence of the star of david - the pentagrams and also the existence of the champa on the coins is a confirmation of this trend (Morgan, 19943: 93 - 135: 180) - the way in which the islamic symbols are placed beside the religious symbols of the first dynasty - the presence of the muslim rulers of the first dynasty.

4. Introduction of some examples of Tabriz coins

As mentioned above, Tabriz was one of the selected cities of Ikhanids for political centrality. Therefore, Holaku, Erbogha, Abaqa khan, Ahmad Tekuder, Argun, Gaykhatu, Baydu, and Ghazan Khan paid special attention to this city. Apart from Tabriz, cities such as Maragheh and Arjan, followed by solanine in the Öljeitü period, were considered as the centres of political government, and in later periods, this city was considered by later Ilkhans such as Abu Saeed.

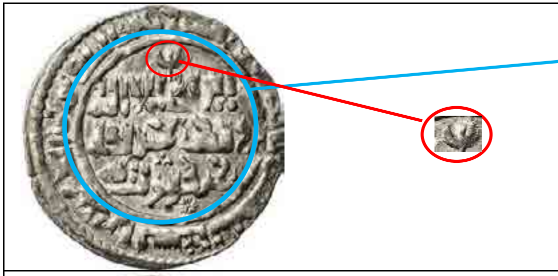
	obverse لا اله الا الله وحده لا شریک له محمد رسول‌الله Hülegü symbol on the coin.
	Reverse قآن الاعظم هولاکو ایلخان المعظم

Fig. 6:Dirham of Holaco Khan in 669 A.H.

One of the most important mints of Mongol Ikhanids was located in this city, and since Tabriz was the centre of political sovereignty of some Ikhanids, many coins were minted in the mint. each of the Ikhanid mints in various cities of Iran had special features and coins in terms of shape, gender, colour, inscription, shapes, script, elegance, and ornaments. According to the existence of artists, illuminators, calligraphers, fine artists, and other issues related to coinage, these features were different from those in other cities. Therefore, to show the peculiarities and characteristics of coinage, there is reference the number of Ikhanid coins minted in Tabriz. Hulagu Khan, the Mongol leader, was dispatched by the Great Khan to march towards the borders of Iran to recapture its cities. by reconquering the cities of Iran and Baghdad, he was able to consider Tabriz as his political centre for a short time. The coin appears to have been minted in Urmia at a weight of 2.55 grammes. on the reverse is the phrase “ «لا اله الا الله وحده لا شریک له محمد رسول‌الله» “ and on the reverse is the phrase “ “ «قاآن الاعظم هولاکو ایلخان المعظم»“. Erbogha was another Mongol Ilkhanate who minted coins in Tabriz. it is as if the Arbogha coins were made of gold.

The coin was minted in Tabriz. On the reverse of the coin is the name of the great Khan Arbogha, with his symbol in the Uyghur script, and on the back of the coin is the phrase “ «لا اله الا الله محمد رسول‌الله و صلی‌الله علیه»” (Nyamaa, 2005: 212). One of the Ikhanids who minted coins in Tabriz was Abaqa Khan. The coin was minted in Tabriz in silver according to documents and numismatic data.

The coin was minted in Tabriz. on the reverse is the name of Abaqa Khan as the great Khan in uyghur with his symbol Ilkhan. on the back of the coin is the phrase “ «لا

	Obverse Arbuqa’s name as the great Khan is written in Uyghur script with the symbol of Ilkhan himself.
	Reverse لا اله الا الله محمد رسول‌الله و صلی‌الله علیه with two continuous circles on the margin of the Qur’anic verse.

Fig. 7:Arbogha coin were made of gold.

	Obverse The name Abaqa Khan (the Great Khan) is written in Uyghur script with the symbol Ilkhan itself.
	Reverse لا اله الا الله محمد رسول‌الله

Fig. 8: Arbugha coins are made of silver.

«الـه الا الله محمـد رسـول‌الله “ (http://malekmuseum.org). Tekuder is another Ilkhanate who, encouraged by Abdul Rahman, converted to Islam and named himself ahmad (Shpolar, 1992: 189). According to the documents and numismaticsdata, on the coin the name of Ahmad Tekuder is written in Uyghur script as Khan the great with the symbol and characteristic of this Ilkhan, and on the back of the coin, like other Ilkhani coins, is the phrase “«لا الـه الا الله محمـد رسـول‌الله»“.

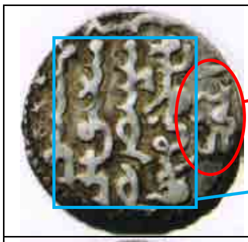
	Obverse The name Ahmad Tekodar as the Great Khan is written in Uyghur script with the symbol of Ilkhan himself. His name is also written in Arabic at the bottom part of the manuscript.
	Reverse لا اله الا الله محمد رسول‌الله A star in the middle of the coin

Fig. 9:Coins of Ahmad Tekodar (Nyamaa, 2005).

In the study of the coins of Ahmad Tekodar, the newly-Muslim Mughal Ilkhan, his name is written in Arabic as “Ahmad” (Boyle, 2002: 514 - Nyamaa, 2005: 215). on the back of the coin is the asterisk (http://malekmuseum.org), among the words” «لا الـه الا الله محمد رسـول الله» “.

	Obverse Ahmad Tekodar’s name as Great Khan is written in Uyghur script with his Ilkhan symbol as well as his name in Arabic below.
	Reverse لا اله الا الله محمد رسول الله With a star in the middle of the coin, the place of minting and the date of minting are written on the margins of the coin.

Fig. 10:Coins of Ahmad Tekodar (Nyamaa, 2005).

According to documents and numismatics data, this coin was minted in Tabriz in 683 A.H. and is made of silver and is round, featuring Uyghur and Arabic inscriptions along with a quadrilateral design on the back (http://malekmuseum.org); another coin from him was found dating back to the year 682 AH, which is also made of silver.

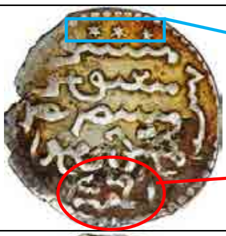
	Obverse Ahmad Tekodar’s name as Great Khan in Uyghur script with Ilkhan’s own symbol and three starsThe name Ahmed in the Arabic letter
	Reverse لا اله الا الله محمد رسول الله In a quadrangular format, in a circular format with a star symbol, the place of minting and the date of the coin’s minting are inserted in the margins of the coin.

Fig. 11: Coin of Ahmad Tekodar dated 682 AH (http://malekmuseum.org).

Arghun was one of the Mongol Ilkhans who assumed the sovereignty of Iran during the Ikhanid era. He left many coins, some of which were minted in Tabriz.

The coin was minted in Tabriz. The mint on the reverse of the coin bears the name of Arghun as the Great Khan in the Uyghur script with the symbol of the Ilkhan, as well as his name in Arabic. The reverse is the phrase “ لا الـه الا الله محمد رسـول الله “ (Nyamaa, 2005: 219). In another example, the Arghun coin comes in a different form, and generally, its process is different from that of other coins he has minted.

	Obverse Arghun’s name as Great Khan in Uyghur script with Ilkhan’s own symbol, Arghun’s name in Arabic below, and three stars on top of the coin.
	Reverse لا اله الا الله محمد رسول‌الله In a quadrangular format, in a circular format with a star symbol, the place of minting and the date of the coin’s minting are inserted in the margins of the coin.

Fig. 12: Coin of Ahmad Tekodar dated 682 AH (http://malekmuseum.org).

	Obverse Arghun’s name as the Great Khan in Uyghur script with the symbol of Ilkhan himself with an eagle and the sign of the Sun in Arabic
	Reverse لا اله الا الله محمد رسول‌الله In the form of a circle, the place of minting and the date of minting are inserted in the margins of the coin.

Fig. 13: Coin of Ahmad Tekodar dated 682 AH (http://malekmuseum.org).

On the reverse of the coin is the name of Arghun in Uyghur script with the symbol of Ilkhan, in addition to other symbols such as eagles and lions, and on the back of the coin is another coin with the phrase “ لا الـه الا الله محمـد رسـول‌الله “ (Nyamaa, 2005: 217).

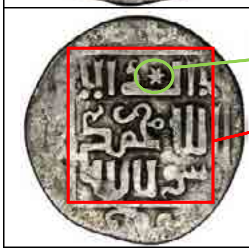
	Obverse Arghun’s name is the Great Khan in Uyghur script, with the symbol of Ilkhan himself and Arghun’s name in Arabic .below the coin
	Reverse لا اله الا الله محمد رسول‌الله In the form of a circle and a square with a star symbol, the place of minting and the date of minting of the coin are written on the edges of the coin.

Fig. 14: Coin of Ahmad Tekodar dated 682 AH (http://malekmuseum.org).

According to Goya’s numismatic data, silver coins from 683 to 690 AH were minted in Tabriz mint, featuring a distinctive symbol of Arghun on the front with a star symbol on the reverse (http://malekmuseum.org). Following Arghun, Gaykhatu assumed political control over Iran on the 23rd of Rajab, 690 AH. His rule, however, was short-lived, as he fled in fear of capture and was eventually killed by a gardener when Baydu invaded Azerbaijan. Gold and silver coins were minted during his rule at the Tabriz mint (Iqbal Ashtiani, 1985: 504-505). The reverse of Gaykhatu’s coins bears his name inscribed in Uyghur script, alongside the title “Great Ilkhan” and the phrase «لا الـه الا الله محمد رسـول‌الله» (Nyamaa 2005: 221).

	Obverse Gaykhatu’s name as Great Khan is written in Uyghur with the symbol of Ilkhan himself, and his name is translated into .Arabic as Irenji Turji
	Reverse لا اله الا الله محمد رسول‌الله و صلی‌الله علیه In the form of gold and a circle, inscriptions are inserted in the margins.

Fig. 15: Coin of Ahmad Tekodar dated 682 AH (http://malekmuseum.org).

In another example of silver Ghiakhto coins, there is a design featuring continuous circles, with a quadrilateral pattern in the centre of the coin. “ الـه الا الله محمـد رسـول‌الله و صلـی‌الله علیـه “ (http://malekmuseum.org).

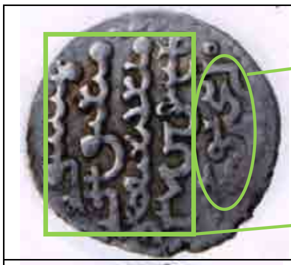
	Obverse Gaykhatu’s name as Great Khan is written in Uyghur with the symbol of Ilkhan himself, and his name is translated into Arabic as Irenji Turji.
	Reverse لا اله الا الله محمد رسول‌الله و صلی‌الله علیه In silver, in the form of a circle with a quadrangular centre, and on the edges of the quadrangles, the place of minting and the date of minting are written.

Fig. 16: Gaykhatu coins minted in the Tabriz (Nyamaa, 2005).

Another example of Gaykhatu coins minted in the Tabriz; the name of Gaykhatu as the great Khan is in Uyghur script with the Ilkhan symbol as well as his name as “Irangi Turji “ in Arabic and are لا الـه الا الله محمد رسول‌الله و صلـی‌الله علیـه upon him in silver in the form of a circle and the centre of the tetrahedron (http://malekmuseum.org).

	Obverse Gekhatu’s name, Great Khan, is written in Uyghur script with the Ilkhan symbol, and his name is also written in Arabic, Irenji .Turji
	Reverse لا اله الا الله محمد رسول‌الله و صلی‌الله علیه In silver, in the form of a circle and a quadrilateral centre, the place of minting and the date of minting are written on the edges of the quadrilaterals.

Fig. 17: Gaykhatu coins minted in the Tabriz (Nyamaa, 2005).

From 694 AH, historical documents and evidence indicate that Goya Baydu assumed political rule over Iran following Gaykhatu’s death in Moghan. Like other Iranian Ilkhanates, Baydu resided in Tabriz, where his coins were also minted. Records show that he held the Iranian throne from Jumada al-Awwal 694 AH until 23 Dhu al-Qi’dah, when he was ultimately arrested and executed by the order of Ghazan Khan Mahmoud (Iqbal Ashtiani, 1985: 504-505).

	Obverse Baydu’s name, Great Khan, is written in Uyghur script with the symbol of Ilkhan himself.
	Reverse لا اله الا الله محمد رسول‌الله و صلی‌الله علیه In the form of gold and a circle.

Fig. 18: The coins minted on the name of Baydu (Nyamaa, 2005).

In the coins minted on the coin, the name of Baydu is in the form of a Great Khan in Uyghur script with the symbol of the Ilkhan, and on the back of the coin is the phrase “ لا الـه الا الله محمد رسول‌الله و صلـی‌الله علیـه “ in gold and in the form of a circle (Nyamaa, 2005: 222).

	Obverse Baydu’s name as Great Khan is written in Uyghur script with the Ilkhan symbol.
	Reverse لا اله الا الله محمد رسول‌الله In a silver mould, in the shape of a circle and in the centre of a quadrilateral, the place of minting and the date of minting are written on the edges of the .quadrilaterals

Fig. 19: The coins minted on the name of Baydu (Nyamaa, 2005).

After Baydu, Khan became the political ruler of Iran. By choosing Tabriz as the centre of his political rule. Ghazan conducted many construction activities, including his famous works. Following conversion to Islam, he adopted the name Mahmoud (Iqbal Ashtiani, 1985: 509 - 511) Numerous coins bearing his name were minted across various mints in the country, totaling 72, with the coins from Tabriz, as the political centre, and from Baghdad holding particular prominence. The Tabriz mint produced gold coins featuring the title of the Ilkhan in Uyghur script as “the Great Ilkhan,” with Ghazan Mahmud’s name inscribed in Arabic in the centre. On the reverse, the coin displays the phrase “لا الـه الا الله محمد رسـول‌الله” along with the second margin phrase “صلـی الله علیـه,” and the third margin records the minting date (Nyamaa, 2005: 223).

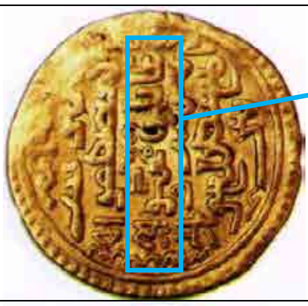
	Obverse Ghazan Mahmud’s name as the great Khan is written in Uyghur script with the Ilkhan symbol, and his name is also .written in Arabic
	Reverse لا اله الا الله محمد رسول‌الله In the form of gold, in the form of a circle, and in the form of a pentagonal

Fig. 20: The coins minted on the name of Ghazan Mahmoud (Nyamaa, 2005).

Continues until year 703 A.H. Following his death, Ghazan Khan, who had no children, designated his brother Mohammad Öljeitü as his successor, leading to Öljeitü’s ascension to the throne in 703 A.H. A significant event during Öljeitü’s reign was his inclination

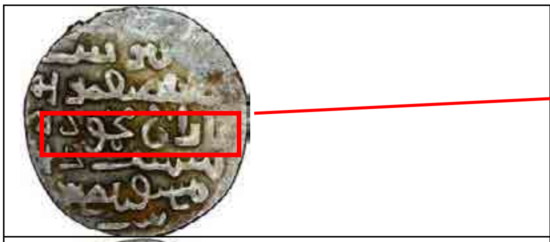
	Obverse Ghazan Mahmoud's name as the great Khan comes from the Uyghur script with the Ilkhan symbol, and in the middle of the coin, the name Ghazan Mahmoud is in Arabic.
	Reverse لا اله الا الله محمد رسول‌الله came in the form of silver, in the form of a circle, in the form of a pentagon, and in the second margin of the prayer -صلی -الله علیه- , and in the third margin of the coinage date.
	Obverse " «السلطان اعظم غازان محمود خلد ملکه» " in Arabic in the form of dot-bordered dirhams
	Reverse لا اله الا الله محمد رسول‌الله came in the form of silver, in the form of a circle, in the form of a tetrahedron, and in the second margin on the date of the coinage.

Fig. 21: The coins minted on the name of Ghazan Mahmoud (Nyamaa, 2005).

towards Shiite Islam and the subsequent relocation of the political centre from Tabriz to the Zanjan Sultanate. As a result, the Soltaniyeh mint gained prominence over other centres, such as Tabriz, Maragheh, and Arjan, temporarily losing its status and importance. However, from 703 to 716 A.H., the year of Öljeitü's death, numerous coins were minted, including those from Tabriz, indicating that it remained one of the leading mints of the Ilkhanid era despite political shifts. A compelling evidence of this assertion is the minting of high-quality coins by Öljeitü's successors in Tabriz. The coins minted during Öljeitü's reign reflected changes in the religious nature of the government, evident in their colour, shape, material, script, inscriptions, arrangement, illumination, calligraphy, and other artistic elements, particularly in the Tabriz mint.

5. Analysis and Interpretation of Tabriz Mint Coins

The coins minted by the Tabriz mint during the reigns of the Mongol Ilkhans—such as Hülegü, Abaqa Khan, Ahmad Tekodar, Argun, Gaykhatu, Baydu, Ghazan Khan, and Öljeitü—exhibit several indices used in coinage. Among these, the Islamic, Jewish, and Christian slogans on all eight Ilkhan coins are noteworthy. It appears that the Tabriz mint took inspiration from Kharazmshahian coins in its adoption of these symbols.

The Tabriz mint, under the political rule of the eight previous Ilkhans, used Uyghur, Arabic, and Persian scripts, which, according to numismatists, are considered masterpieces

Fig. 22: Coins of Sultan Mohammad Kharazm Shah (Nyamaa, 2005).

of their time in the history of Iran. With a tendency towards Islam, some Ilkhans sought to legitimise Mongol rule in Tabriz by incorporating Islamic rituals, including Qur'anic verses, alongside other Christian, Jewish, and Uyghur symbols on their coins. However, some scholars argue that the Mongol rulers, lacking a specific religion, opted for religious tolerance in contrast to other religions (Mortazavi, 1962: 2). This is evidenced by the presence of various symbols on Tabriz coins, including Jewish and Christian motifs, particularly during Argon's reign, such as the Star of David and the crucifix. Additionally, the coexistence of Islamic and non-Islamic symbols reflects the absence of religious fanaticism among the Mongol rulers until the Öljeitü period.

Before Iranian bureaucrats arrived at the Ilkhanate court, coins minted in Tabriz featured Uyghur scripts and Qur'anic verses, serving to legitimise Mongol rule over the Islamic Iranian populace. However, with the entry of prominent figures such as Khajeh Rashid Al-Din Fazlollah Hamedani, Atalmolk Jowini, Shams Al-Din Jowini, Khajeh Nasreddin Toosi, Saad al-Dawla, (a Jewish scholar), and Tajeddin Ali Shah into the Ilkhanate court, Arabic and Persian scripts gradually began to appear on the coins, particularly during the Öljeitü period. This development indicates the growing influence of Iranian elements within the Mongol court. The coins minted in Tabriz represent a synthesis of Mongolian, Iranian, and Islamic symbols, utilising Uyghur and Arabic scripts, along with Qur'anic verses and Persian inscriptions for coin design.

The study of Tabriz minted coins shows that these coins have used common geometrical shapes, which are usually in the form of single circles, continuous circles, continuous circles, double and triple circles, which are in between the two circles in the margin of quranic verses and also in some of them the name and place of coinage is sometimes mentioned in Uyghur, Arabic and rarely Persian.

Additionally, the coins minted in Tabriz during the reign of the six Ilkhans featured distinctive signs or symbols. Typically, each Ilkhan's symbol was inscribed in Uyghur script, positioned either in the middle, bottom, or top of the coin, along with the year, place, and date of minting, also rendered in Uyghur. The presence of various signs and inscriptions on the sides and centre of the coin, coupled with images located in the middle, centre, or margins, distinctly marks the era of the Ilkhans. These features are clearly visible in the coins produced at the Tabriz mint.

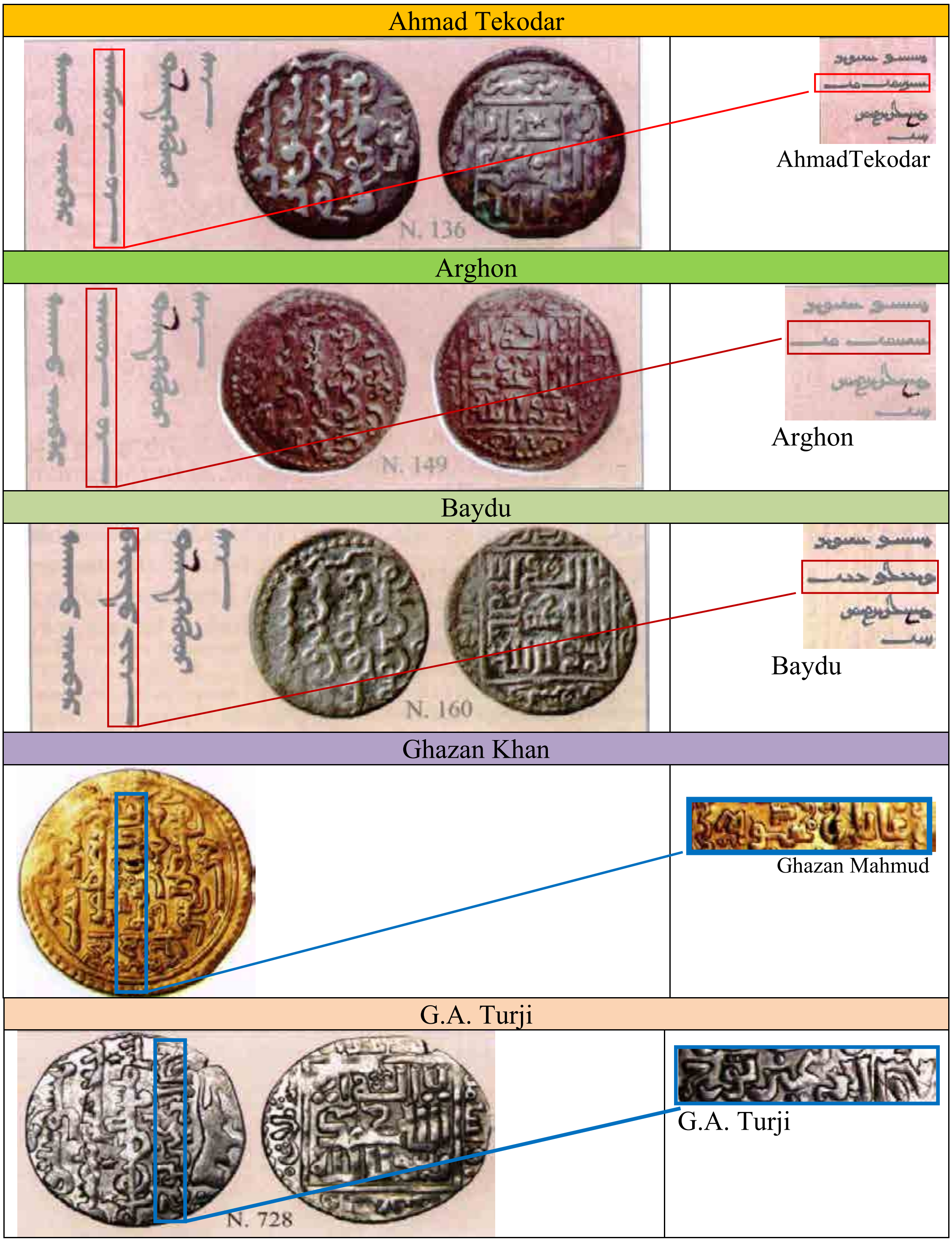


Fig. 23: The coins minted in Tabriz featured Uyghur (Nyamaa, 2005: 108).

Ahmad Tekodar	
Mongolian symbols with Uyghur scripts and Arabic scripts Ahmad	
Arghon	
Mongolian symbols with Uyghur scripts and Arabic scripts Arghon	
Gaykhatu Irangei	
Mongolian symbols with Uyghur scripts and Arabic scripts Irangi	
Ghazan Khan	
Mongolian symbols with Uyghur scripts and Arabic scripts gozan	

Fig. 24: Persian inscriptions for coins (Nyamaa, 2005).

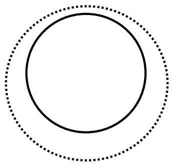
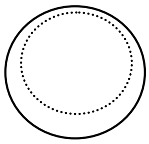
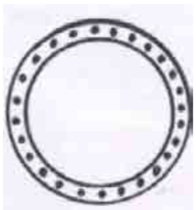
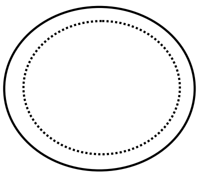
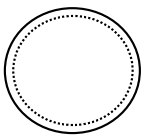
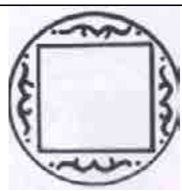
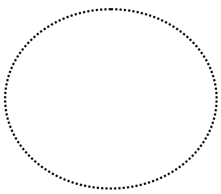
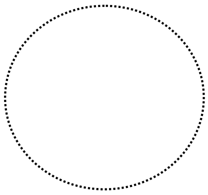
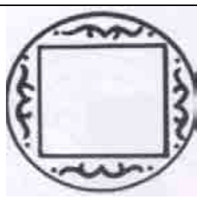
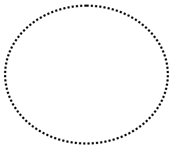
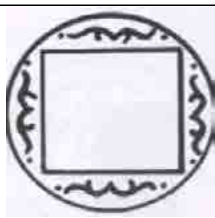
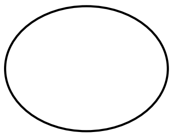
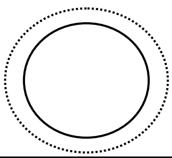
Hülegü		
Using two continuous circles, along with the verse: Quran on the margin		
Using two continuous circles, along with the verse: Quran on the margin		
Arbuqa		
Using two continuous circles, A circle with a verse Quran on the margin		
Using two continuous circles, along with the verse: Quran on the margin		
	Abaqa Khan	
se are two continuous circles along with the Uyghur script.		
The use of a square quadrilateral shape and in the margins of the year: where coins were minted in Uyghur script.		
Ahmed Takudar		
Using a single dotted circle, we obtain along with Uyghur script, star symbols, and Arabic script.		

Fig. 25: Geometric Patterns Used in Ilkhanid Coins (Nyamaa, 2005: 149-150-151-152).

The use of a single dotted circle in the shape of a square quadrilateral and in the margins of the year: the place where coins were minted in .the Uyghur script		
Arghun		
Using a single dotted circle with Uyghur script, star symbols, and Arabic script.		
The use of a single dotted circle in the shape of a square quadrilateral and in the margins of the year: the place where coins were minted in .the Uyghur script		
Gaykhatu		
Using a single dotted circle along with Uyghur script, star symbols, and Arabic script		
The use of a single dotted circle in the shape of a square quadrilateral and in the margins of the year: the place where coins were minted in .the Uyghur script		
Baydu		
Using a single dotted circle with Uyghur script, star symbols, and Arabic script.		
The use of two continuous circles along with the words Shahadatin in the centre		

Continue Fig. 25: Geometric Patterns Used in Ilkhanid Coins (Nyamaa, 2005: 149-150-151-152).

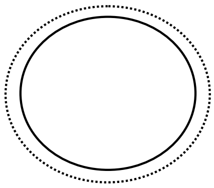
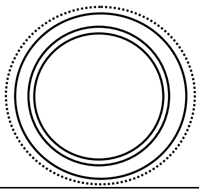
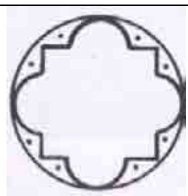
Ghazan Khan		
Using two continuous circles with Uyghur and Arabic scripts in the middle		
Using polygon designs with لا اله slime design with wording الله محمد رسول‌الله		
Öljeitü		
Using four continuous circles with expressions لا اله الله محمد رسول‌الله علی ولی‌الله		
Using polygon and slime designs with wording «ضرب فی ایام دوله المولی السلطان الاعظم مالک رقاب الامم اولجایتو سلطان غیاث الدنیا و الدین خدابنده محمد خلد الله ملکه»		
Abu Said		
Using polygon and slime designs with wording لا اله الله محمد رسول‌الله		
Using polygon and slime designs with wording ضرب فی ایام دوله المولی السلطان الاعظم ابوسعید خلد الله ملکه		

Fig. 26: Geometric Patterns Used in Ilkhanid Coins (Nyamaa, 2005: 149-150-151-152).

Hülegü Khan		
 Ψ	Hülegü Khan	
Gaykhatu		
	Gaykhatu with the lion symbol	
Arghon		
	Oregano Cross Symbol	
	Arghun Symbol Stars and Suns	
	The eagle and the sun.	
	Oregano Symbol of the Lion	

Fig. 27: Practical Symbols on Ilkhanid Coins (Nyamaa, 2005).

Arghon		
	Ergon symbolises the triple star at the top.	
	Arghon in the middle	
Ahmad Tekodar		
	Ahmed symbolises a single star in the middle	
	Ahmed symbolises the triple star at the top.	
Baydu		
	Baydu Symbol at the top of the coin.	
Gaykhatu		
	Baydu Symbol at the top of the coin.	

Fig. 28: Practical Symbols on Ilkhanid Coins (Nyamaa, 2005).

The presence of the names of Rashidun caliphs on the margins of the coins indicates the Sunni affiliation of the Ilkhanate and its courtiers. Additionally, the depiction of a crucifix or cross suggests an intellectual engagement with Christianity by figures such as Arghun and his courtiers, while the inclusion of the Star of David on Arghun’s coins reflects the presence of Jewish figures at court, including Saad Al-Dullah, a physician, and Tajeddin Ali Shah (Mortazavi, 1962: 6; Iqbal Ashtiani, 1985: 307; Morgan, 1994: 94). Each of the Ilkhans of Tabriz employed specific symbols to identify themselves with the populace. For example, the coins of Hülegü and Baydu feature a triangular crescent, symbolising the Mongolian ruler, while lions appear in some inscriptions, typically used to denote authority. Cross-studded coins and the Star of David were commonly associated with Arghun.

Coins minted in Tabriz exhibit additional characteristics common to the mints of various Mongol rulers. These features include geometric designs frequently employed by the Tabriz mint during each Ilkhan rule. Examples of these designs include single circles and continuous circles adorned with five-, six-, or eight-pointed shapes, as well as circles and squares combined with copper gilding, embellished with Qur’anic verses. Continuous marginal circles may contain single-layered, double-layered, or three-layered dots, with inscriptions of Qur’anic verses or specific symbols of the Ilkhan alongside the date and place of minting. The inclusion of Qur’anic phrases such as “قُلِ اللَّهُمَّ مَالِكَ الْمُلْكِ تُؤْتِي الْمُلْكَ مَنْ تَشَاءُ” and other inscriptions like “لا اله الا الله محمد رسول‌الله,” along with the names of the four caliphs—Abu Bakr, Umar, Uthman, and Ali—and “علی ولی‌الله” in the centre or on the edges of the coins constitutes a significant feature of Ilkhanid coinage.

6. Conclusion

The analysis above outlines the reasons for the growth and flourishing of coin minting in Tabriz. First, Tabriz was chosen as the political centre of governance, serving as the main hub for tax collection in the country, a base for funding military expenses, a treasury for paying soldiers, and a primary centre for supplying the army’s provisions. It was also the initial core of the financial and economic framework during the Ilkhanate era, the first centre for establishing an observatory, and the first headquarters for Mongolian bureaucrats. Additionally, Iranian bureaucrats were employed to attract skilled individuals, artists, talented people, scientists, and craftsmen from other cities in Iran to Tabriz, marking the beginning of the city’s cultural, industrial, economic, agricultural, architectural, artistic, and scientific advancements, which subsequently spread to other cities.

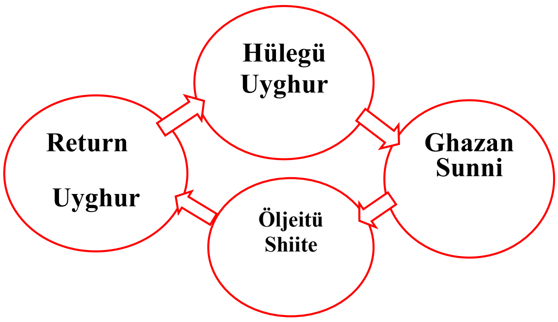
Due to its political, geographical, economic, social, and military position, Tabriz housed some of the major mints that formed the financial structure of the Ilkhanate. The establishment of cultural facilities in Tabriz by the Mongol Ilkhans, such as Ghazan Khan, led to the expansion of cultural, construction, scientific, hospital, religious, administrative, military, economic, and political structures, significantly promoted by figures like Khwaja Rashid al-Din Fazlullah Hamadani and his associates, which were then transferred to other cities. This included reconstruction missions for cities devastated by Iranian bureaucrats, including Bagdad.

The passage of European traders and ambassadors through Tabriz and their reflections on the city’s development in their writings, such as those of Ibn Battuta and Marco Polo, gradually enhanced the city’s global standing and importance. With Tabriz as a political centre, various institutions such as schools, hospitals, mints, administrative centres, industrial facilities, paper manufacturing, weaving, baths, gardens, watermills, caravanserais, and beautiful, ornate buildings adorned with various tiles, arches, and marbles flourished and advanced significantly.

The arrival of foreign travellers and European delegations for political, trade, and commercial purposes from around the world to access the Ilkhanate court, alongside Tabriz's location along European trade routes starting from Crimea, through Trabzon to Tabriz and other Iranian cities, eventually leading to Kashgar and Kansu in China, created favourable conditions for the cultural, scientific, and artistic growth of this city. During this period of ups and downs, Tabriz made significant progress in the fields of science, literature, philosophy, religion, writing, and libraries.

Given the rapid development of Tabriz, the mints of the Ilkhans during this period were the main source of these transformations, greatly influencing the trends that emerged. The Tabriz mint underwent numerous changes from Hulagu to Oljeitu. These transformations impacted various elements such as symbols, imagery, script, language, signs, shape, colour, material and weight, with the coins from this mint reflecting profound changes in accordance with the time, place and nature of the Ilkhans.

As time continued and the duration of this rule increased, fundamental changes in the coins became apparent, gradually moving towards refinement. By the time of Oljeitu's reign, these characteristics reached their peak, leading many numismatists, archaeologists, historians, researchers, and scholars to refer to the coins minted during this period in Tabriz as the golden age of coin production under Mongol rulers in Iran. The coins minted in Tabriz during Oljeitu's reign hold a distinguished and elevated status compared to those from earlier periods.Thus, the minted coins from Tabriz can be categorised into four fundamental periods, each characterised by unique features. For instance, coins from the first period under Hulagu were influenced by the Khwarazmshahids, who bore Islamic and Iranian symbols in Uyghur script. The coins from the first period of the Mongol Ilkhans in Iran featured features such as the emergence of Uyghur, Jewish, Christian, and Islamic symbols. The coins of this era were adaptations of Abbasid and Khwarazmian symbols, incorporating Uyghur, Arabic, and Persian scripts, along with Islamic symbols, including Quranic verses, and other Jewish, Christian, and Uyghur symbols. Certain Jewish and Christian symbols, such as the Star of David, pentagons, and crosses, appeared on the coins. Islamic symbols were placed alongside non-Islamic symbols, reflecting the influence of Iranian bureaucracy in the Mongol court. The use of Persian script on coins, images, and natural elements such as lions, stars, crosses, birds, and the sun indicates the cultural diversity and geographical, religious, and spiritual dispersal of the Mongols. The coins also featured Quranic verses, such as "Say, "O Allah, Owner of Sovereignty,'" until the Baydu period. With Ghazan Khan's conversion to Islam and the beginning of a new era marked by religious transformations in the political, economic, social, cultural, and scientific structures up to Oljeitu's reign, coins from this era exhibited characteristics such as the gradual reduction of Uyghur script on the coins and the establishment of a unified minting system based on the Tabriz mint. This continuity continued to later periods, with the Tabriz mint distinguishing itself through the involvement of artists skilled in calligraphy, painting, gilding, and other intricate crafts in creating Ilkhanate coins. The addition of geometric shapes, such as octagons, hexagons, pentagons, and quadrilaterals (squares and rectangles), and the use of single and multiple circles on the front and back of the coins, along with the utilisation of Kufic, Uyghur, Arabic, and Persian scripts, and Quranic verses inscribed on the reverse side, positioned the Tabriz mint ahead of other Ilkhanate mints. With the onset of Oljeitu rule, the Tabriz mint's direction shifted. Although Tabriz lost its political centrality during this era, the mint began to emulate the Soltaniyeh mint by producing coins inscribed with the Shahadah (declaration of faith) and "Ali is the Friend of Allah," along with the presence of salutations on some coins, geometric designs, floral motifs, stars, and images of animals and birds.The use of names of Shiite Imams and the names of the Rightly Guided Caliphs appeared on the coins, along with representations of the sun and various geometric shapes, such as quadrilaterals or squares, pentagons, hexagons, and octagons, often in circular formats accompanied by inscriptions. The incorporation of Uyghur symbols and scripts into coins became a hallmark of their production. Since Oljeitu aimed to spread Shia Islam throughout Iran, he faced opposition from certain cities resistant to religious change, leading him to retreat from his policies and return to the customs of his ancestors. This shift in political thought prompted further changes in the coinage during this era, particularly in the Tabriz mint. Given the extensive political, economic, social, cultural, and religious changes during the long rule of the Ilkhans, from Hulagu to Oljeitu, the coin minting process during this period followed two distinct approaches: cyclical and linear. The research indicates that the minting process in this era adhered to a combined cyclical model, whereby coins evolved through significant transformations across all dimensions, ultimately returning to their original state.



The first period of Hülegü Uyghur ⇨ The Ghazan period ⇨ Ahl al-Jayto Shia, ⇨ the return of Uyghur.

In terms of the minting process, there seems to be no obvious advancement in the production of coins, as coins are typically minted in the form of dinars, dirhams, and eventually fals. However, when examining the linear progression, this process appears significantly different, as the minting of coins during this period encountered numerous changes and developments compared to earlier times. In this progression, the minting of coins in the Tabriz mint clearly shows a process of advancement and improvement. The coins of this era exhibit full maturity in terms of symbols, images, inscriptions, language, signs, shape, colour, material, and weight, as well as calligraphy, painting, gilding, and other intricate details. When comparing the coins from the reign of Öljaitü to those minted during the reign of Hulagu, we can see that the coins from this period hold a superior position.

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سکه‌شناسی ضرابخانهٔ تبریز در دورهٔ ایلخانی (با تأکید بر دورهٔ هولاکو تا اولجایتو)

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چکیده

ضرابخانهٔ تبریز یکی از ضرابخانه‌های بزرگ عصر ایلخانی است. تبریز از دورهٔ هولاکو به‌طوری رسمی به‌عنوان مرکز حاکمیت سیاسی ایلخانان درنظر گرفته شده بود، این انتخاب درست یا نادرست موجب شد تا تعداد زیادی از هنرمندان، دانشمندان، خطاطان، خوشنویسان، پیشه‌وران، صنعتگران و معماران، از سراسر مرزهای وسیع قلمرو ایلخانی از ماوراءالنهر تا آسیای صغیر از دشت‌های قبچاق و ماورای قفقاز تا سواحل دریای مدیترانه، از سواحل خلیج‌فارس تا منتهی‌الیه دریای عمان به‌سوی تبریز رهسپار شوند و تبریز این دوران را به یکی از بزرگ‌ترین مراکز مالی، سیاسی، علمی، نظامی و اجتماعی دنیای آن روز مبدل کنند که با توجه به گزارش مورخان اوج این تحولات و تغییرات را می‌توانند در دورهٔ غازان‌خان مشاهده کرد. با توجه به شهادت اسناد تاریخی، تبریز این دوران با توجه به بسترها- زمینه‌ها و شرایط جغرافیایی-سیاسی و اداری به درجه‌ای از رشد و تعالی رسید؛ به‌طوری‌که سیاحان و جهانگردان و سُفرای داخلی و خارجی ضمن بازدید از این شهر، توصیف بسیار جالبی از آن در آثار خود آورده‌اند. به‌نظر می‌رسد با این انتخاب این شهر به‌عنوان مرکز حاکمیت سیاسی ایلخانان، برای سالیان متمادی همان‌طوری‌که از شواهد سکه‌شناسی برمی‌آید تبریز یکی از بزرگ‌ترین و مهم‌ترین ضرابخانه‌های ایران این عصر را در دل خود جای داده است. تغییراتی که در ادوار تاریخی در تمامی زمینه‌ها در شهر تبریز به‌وقوع پیوست، بخشی از این تغییرات در ساختار مالی آن -خاصه ضرب سکه‌ها- اتفاق افتاده است که بی‌شک بررسی این بخش از آثار سکه‌های ضرابخانهٔ تبریز در تبیین برخی از تاریکی‌های تاریخ ایران تحت حاکمیت سیاسی ایلخانان بی‌تأثیر نیست؛ از این‌رو گفتار حاضر، درصدد است ضمن معرفی یکی از بزرگ‌ترین ضرابخانه‌های عصر ایلخانی، ویژگی‌ها، اختصاصات و ابتکارات این ضرابخانه را و برخی از ابعاد آن را به تصویر بکشد و با این پرسش، سکه‌های ضربی تبریز نسبت به سایر ضرابخانه‌های ایران از چه ویژگی‌هایی برخوردار است و چرایی و چگونگی برتری این ضرابخانه نسبت به سایر شهرهای ایران تحت تابعیت ایلخانان را به چالش بکشد؟ بررسی‌های اولیه نشان می‌دهد که شهر تبریز به‌عنوان مرکز سیاسی ایلخانان در تمامی زمینه‌ها، شرایط، بسترهای لازم برای تبدیل‌شدن به یک بنگاه بزرگ مالی تحت نظارت ایلخان را داشته است و با پیشرفت تدریجی فکری مغول نیمه‌متمدن از یک جامعهٔ ابتدایی و حرکت به‌سوی جامعهٔ متمدن موجب شد تا تبریز با مرکزیت سیاسی آنان در جذب نیروهای خبره، هنرمند، با استعداد، دانشمندان، صنعتگران، حرف و پیشه‌های متعدد به‌تدریج رو به‌سوی تعالی و رشد ترقی گوی سبقت از سایر شهرهای ایران بُرباید و در دورهٔ پایانی حکومت ایلخانان در ایران -خاصه دورهٔ اولجایتو و ابوسعید- به‌وضوح می‌توان دید که مغولان بیابان‌گرد با استفاده از نیروهای مستعد و اهل فن با مرزهای وسیع تحت تابعیت خود به چه جایگاه از رشد و تعالی در زمینه‌های سیاسی، اقتصادی، مالی، فرهنگی، معماری، هنر، کتابت، تذهیب، نقاشی، ضرب سکه و... رسیده‌اند. اهتمام گفتار حاضر تمرکز بر روی ویژگی‌ها و اختصاصات سکه‌های ضربی تبریز و چرایی و چگونگی تعالی و ترقی ضرابخانهٔ تبریز بر سایر ضرابخانه‌های دیگر تبیین شده است.

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۳۵

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