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Late Chalcolithic Subsistence Patterns in Northwest Iran as Seen from Tepe Gird-i Ashoan, Little Zab Basin

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Abstract

The archaeological site of Tepe Gird-i Ashoan in the Little Zab basin of Piranshahr County was excavated in two consecutive seasons. The work yielded remarkable information about the regional cultural traditions in the Late Chalcolithic period. The recovered material culture indicates the presence of the chaff-faced/Pisdeli pottery tradition, and the relative chronology evinces that the strongest interactions were with Caucasia, Anatolia and Mesopotamia. Notwithstanding the fairly extensive archaeological work in northwest Iran, the Zab basin remains almost totally neglected as regards botanical and zoological studies. The present study explored the biological evidence from the site and attempts a reconstruction of the subsistence patterns prevailing in the Late Chalcolithic northwest Iran in light of the evidence from Gird-i Ashoan. To gain an insight into the regional societies in the 4th and 5th millennium BC, the subsistence patterns of the inhabitants of the Little Zab basin was examined. In effect, recovery of an abundance of ash deposits alongside other burned materials at Gird-i Ashoan permits such interdisciplinary enquiries as archaeobotany and Zooarchaeology. Drawing on excavations as well as botanical and osteological analyses, the present study attempted to explain the local subsistence patterns through a descriptive-analytical approach. Thus, the two major topics addressed here were the subsistence patterns adopted by the mid/late Chalcolithic populations of Gird-i Ashoan, and the animal species represented in the excavated assemblages. Animal husbandry seemingly constituted the major component in the local subsistence system and surpassed agriculture judging from the fact that the faunal evidence outnumbers the floral remains. Therefore, the results of the study pointed to a mixed agro-pastoral subsistence pattern, and attested to the cultivation of bread wheat and barley, indicating that agriculture also played in part in the local economy.

Keywords: Archeology of northwest Iran, Chalcolithic, Subsistence patterns, Zooarchaeology, Archaeobotany.

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Introduction

Two seasons of excavations covered Gird-i Ashoan that currently sits amid the namesake village's houses that girdle the ancient mound (Sharifi 2021). The village is 5 km from the city of Piranshahr (Fig. 1). Rising about 8 m from the main surface level of the village, Tepe Gird-i Ashoan occupies a total area of about 2750 sq m (Fig. 2). The site's surface is covered with an Islamic cemetery as well as scatters of Iron Age III-II ceramics. The Chalcolithic deposit emerged at the depth of -1.7 m from the surface and continued down to -8.8 m. Gird-i Ashoan contains the diagnostic Late Chalcolithic pottery traditions, viz. the Pisdeli and the chaff-faced wares (see Marro 2022). At the lower strata of the mid/late Chalcolithic deposit occurred the LC1 painted pottery of Pisdeli type, also common in northern Mesopotamia (Fisher 2017: 478), and the chaff-faced pottery of the LC2/3 typified its middle and upper strata. Given its proximity to South Caucasia and East Anatolia, the Zab basin exhibits broad reciprocal influences as regards cultural interactions. Based on the current archaeological picture, the cultural span of the chaff-faced pottery encompasses, apart from the Zab basin, broad regions extending from eastern and northern Mesopotamia to Anatolia and southern Caucasia and northwest Iran. Therefore, it culturally shares strong affinities with centers in Anatolia (Gerritsen et al., 2010; Balossi and Restelli 2012; Nannucci 2016), Caucasia (Museybli 2016), and Syria (Brustolon and Rova 2006; Kelly and Buccellati 2019). In Helwing's three folding of the Late Chalcolithic, the earliest subperiod is the Pisdeli (LC1) (Helwing 2012:204), while the chaff-faced ware typifies the LC2-3 (Helwing 2005). The defining attribute of this pottery is the presence of coarse straw, even though this process was tentatively related to the attempts to make the function of pottery more standardized (Palumbi 2011: 214). Within the borders of modern Iran, the culture has been recorded at Gird-i Ashoan and Kul Tepe (Abedi 2014), and beyond this at Kenan Tepe, Arsalan Tepe, Barcin Hoyuk in Anatolia, and at Leila Tepe, Beyuk Kesik, and Mentesh Tepe in Caucasia (Baxaliyef 2010).

The interdisciplinary studies were conducted in Tepe Girdi Ashoan, including the study of plant and bone remains, which we will discuss further. Archaeozoology is dealing with animal remains and the environmental condition of the region in the past (Mashkoor, 2002). Today, in archaeological excavations, the presence of specialists such as Archaeobotanist and Archaeozoologist is necessary for the reconstruction and more detailed understanding of the livelihood and lifestyle of the past, as well as for understanding their cultural evolution (Tengberg et al., 1389:

10). Archaeobotany is dealing with plant remains recovered from ancient sites (Renfrew and Bahn, 2008: 278). The study of the plant remains of the sites during archaeological excavations can include information about the relationship between man and his environment in the past and how to exploit and use the plant resources in the region, examining changes in vegetation over time and space, and also to obtain information about the development process of agriculture and to evaluate its role in the subsistence economy of the communities living in the region (Qassimi, 2018: 29-30; Delle Donne, 2021).

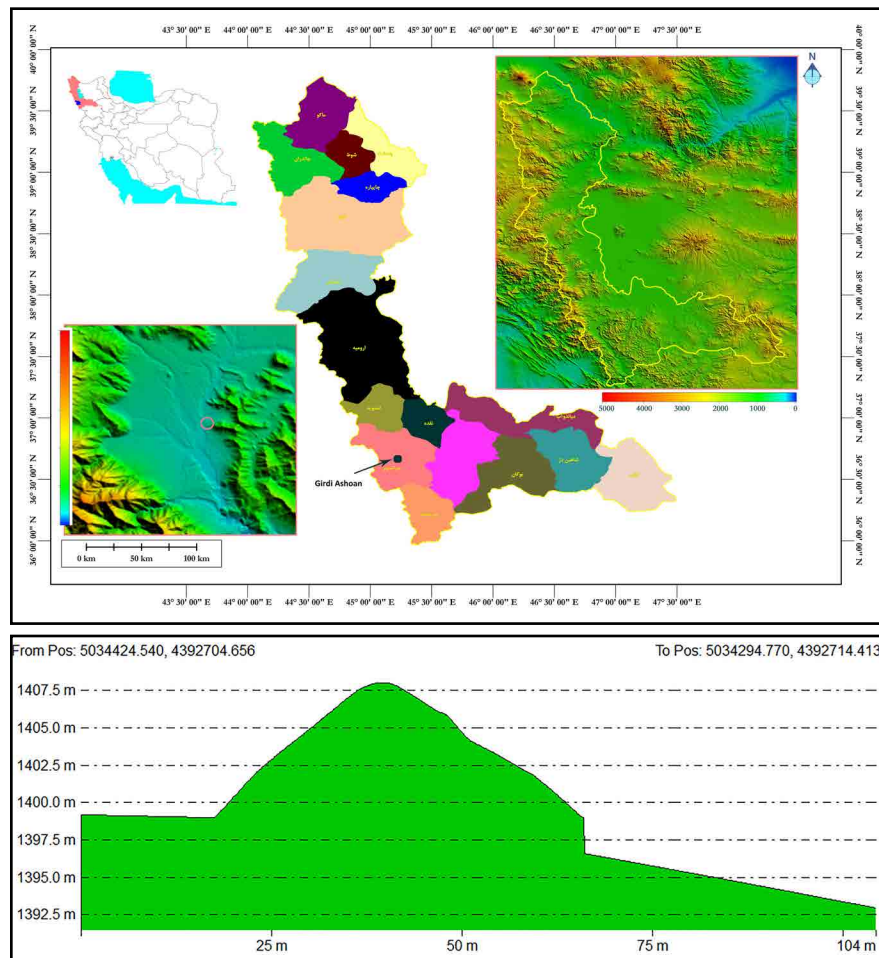
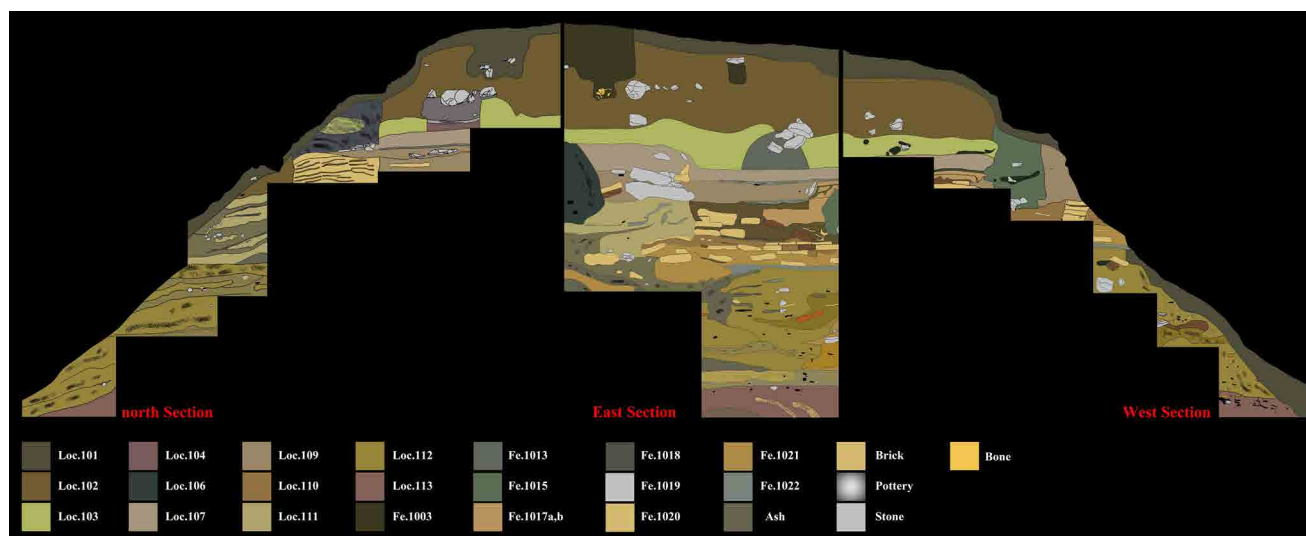


Fig. 1. The position of Tepe Gird-i Ashoan in the map and profile of Girdi Ashoan, (Authors 2020). ▶

Research question: What were the subsistence patterns of the inhabitants of Girdi Ashoan? What was the situation of the agricultural activities and cultivated plants in the site? What was the role of animal husbandry in their livelihoods?

Research Method: Archaeobotanical and Zooarchaeological materials recovered in the Chalcolithic contexts were subjected to laboratory examinations. Field operations included sampling, extracting, and



▲ Fig. 2. Section of the trench, (Authors 2020).

collecting the faunal and floral remains. First, the excavated soils were sifted with a 5m sieve. A total amount of about 150 liters of deposits was then subjected to flotation to recover the surviving plant remains. Light and heavy organic particles from different loci were separated (Table 1). Characterization of the materials was conducted at the laboratory of the Department of Archeology of the Bu-Ali Sina University with a reflection light 1000X digital microscope, in collaboration with an expert from the Seed and Plant Breeding Center of the Agricultural Research, Education and Extension Organization.

History of Scholarship

Even though northwest Iran has been subject of extensive archaeological investigations, limited information still exists about its Chalcolithic cultures. Regarding the Dalma and Pisdeli traditions, the excavations at the mounds of Dalma (Hamlin 1975) and Pisdeli (Dyson 1960) are notable. The late Chalcolithic was hitherto unreported from the Zab basin, so one may regard Gird-i Ashoan with its thick coeval deposits the key site in the region (Sharifi 2022a, b). A pertinent study in the Zab basin is the excavation at Tepe Barveh with its Hasanlu VII painted pottery (Sharifi 2020).

The inception of the fundamental concepts of the study of ancient plant remains from archaeological contexts should be credited to the end of the 19th century. Clarke was the first to use the term Bioarchaeology in a paper in 1972 (Delle Donne 2021). In Iran, such studies were pioneered by Hans Peter Helbæk in the Dehlan plain of Khuzeestan. His work was one of the first and foremost projects related to the study of agricultural

economy in the plain. Other notable works include those by Miller (2003), and Tosi and Coștăntini (1978). As part of relevant studies around the lakes of Zaribar (Zeist & Wright 1963) and Mirabad (Stevens et al., 2006), the pollen samples from the bottom of these lakes were examined to evaluate the changes in local climate and vegetation over an extended period. As regards Zooarchaeology, the evidence from the earliest occupation level in the Ushno-Solduz region, viz. Hasanlu X or Hajji Firuz Period, and the Bronze and Iron Ages deposits at Dinkhah have been investigated (Voigt 1983; Gilbert and Steinfeld 1977).

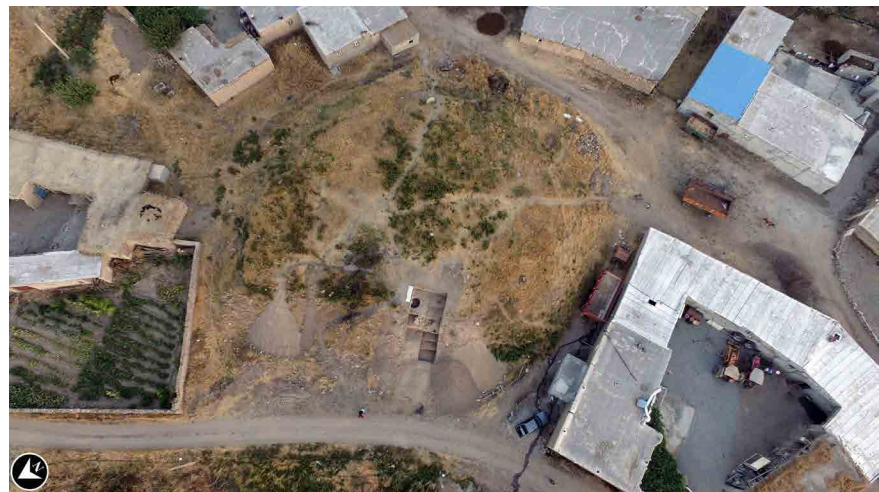
Animal remains from Dinkhah Tepe show the important role of animal husbandry, especially by breeding of sheep and goats, in the local subsistence economy. Cattle was another animal with high economic value. Deer and boar were the gaming animals in both Dinkhah and Hasanlu (Danti, 2016: 10-12). Haftavan Tepe is another site in the northwest of Iran which its faunal remains were studied and showed the important role of sheep, goat and cattle in subsistence economy of the site (Mohaseb & Mashkour, 2017).

Tepe Gird-i Ashoan

Excavation at the site aimed to shed light on the cultural situation of the Zab basin during the mid/late Chalcolithic period (Hasanlu VIII) (Fig. 3). This important site has the potential to furnish information about the subsistence patterns and modes in a Chalcolithic settled community.



Fig. 3. Satellite image of Gird-i Ashoan Tepe, (Authors 2020). ►



Botanical studies

Trench T.G.A was opened on the west side of the site as the north, east and south sides were infringed by residential buildings and a path, which had eradicated parts of the mound, leaving an incision in its side. Some

25 layers were identified at the site. The upper layers (I-II) belonged to the Islamic cemetery, which at the same time contained intrusive sherds of the Iron II-III ceramics. In Layer III, locus 103, emerged the first Late Chalcolithic contexts. Through the analysis of floral remains from Loci 116–118 associated with the chaff-faced ware, thirteen different plant species were identified. Table 1 gives an outline of their relative abundance, geographical distribution, and general characteristics. Following the flotation, all organic remains, including charcoal and seeds, were sorted out. Characterization of 165 pieces of identifiable seeds revealed various plant groups, including cultivated cereals and legumes, weeds, and wild plants, which are described below.

1) Wheat is among the earliest and most dear some plants. Bread wheat belongs to the group of hexaploid wheats, which have 42 chromosomes and come in the two husked and naked varieties. The cultivated species are of the naked variety (Poursaleh 1994: 13–27). Wheat grains were found in the middle and lower layers at Gird-i Ashoan (Loci 116–118), and from among the ash deposits between the depths -6.55 to -8.30. In the sample from Gird-i Ashoan, 52 of the total grains belong to wheat. The considerable difference in weight and size between individual wheat grains might be interpreted as indicating the popular use of different seeds, practice of both rainfed and irrigated cultivation, or possibly effects of varying environmental stresses, particularly annual rainfall (Fig. 4).

2) Barley is an annual plant of the grass family Poaceae, and comes in three different types of diploid, tetraploid and hexaploid defined by the number of present chromosomes. The tetraploid and hexaploid types lack domestic species and the resulting plants are economically insignificant. Domestic barleys are thus of the diploid type. Vavilov's theory ascribes the origination of barley to the dry regions of Southwest and Southeast Asia and North Africa. It has been used as food and fodder for thousands of years. Barley features a broad adaptive range, and gives a higher yield in cold conditions (Behnia 1997: 409–412; Karimi 2007: 168). The common cultivated barely species recovered at Gird-i Ashoan (from depths -7.55 to -8.30) is represented by about 35 grains. At both ends of the grains are visible the remains of husk, a defining factor in distinguishing barley from wheat (Fig. 5).

3) Torilis is a weed native to West Asia (Piyamani et al., 2020: 17). At Gird-i Ashoan it has been recovered in a significant amount because it is an annual weed of wheat fields and is mixed with the crop at harvest. More than 20 instances of this weed species were detected (Fig. 6).

4) Winter vetch (*Vicia villosa*) is the name of a species of the genus *Vicia*. Vetch is a popular crop in cold districts and is particularly favorable as both food and fodder. Some 19 pieces of this species were recorded in the sample (Fig. 7).

5) Lentil is an annual herbaceous plant heavily influenced by the environment. Possessing the highest amount of protein, lentil is among the earliest human plant-based food sources cultivated in most parts of the world. Lentil produces more seeds in nutrient-poor soils (Karimi 2007: 196) (Fig. 8). Our sample contained 22 lentil grains.

6) Rye, buckwheat, occurs as a weed in wheat fields. Its initial cultivation seemingly took place in West Asia and south Russia. As the most winter-hardy of all grains, rye is compatible with harsh weather conditions and poor, infertile soils, thus the designation “the grain of the poor.” Rye grain is longer and narrower than that of wheat, and is used for flour and bread preparation (Behnia 1997: 515–520; Karimi 2007: 310). It was represented in the sample under study by 15 pieces (Fig. 9).

7) *Lolium* is a monocotyledonous genus of the family Poaceae and native to the Mediterranean region. As a weed of cereal crops, it grows in humid and fertile areas such as the Zab basin. Its fruit is bitter due to the presence of series of fungi between the husk and the endosperm. The presence and competition of *lolium* reduces the nitrogen and phosphorus resources of the soil in wheat fields (Esmailzadeh and Eslami 2011: 62; Karimi 2007: 203–202). The sample contained a total of 12 instances of *lolium* (Fig. 10a).

8) Cleavers (*Galium aparine*) is a ubiquitous species in Europe, Asia, North and South America as well as in Iran (Mozaffarian 1996: 242). As a common weed in fields, it makes its way into the crops in the course of reaping wheat and barley. Some 5 grains of this species were identified in the sample from Gird-i Ashoan (Fig. 10 c).

9) Mung bean grows in wheat fields. Given its special characteristics such as being a major fodder, growing in low-yield environments, resistance to cold and water shortage, and serving as fertilizer, is a versatile species. It is represented in the sample by 6 specimens.

10) Cowpea (*Vicia ervilia*) is a plant of the vetch family. As one of the earliest seeds ever used by human, its region of origin is considered to be the Mediterranean. It is frequently found in humid environments. Due to the high nutritional value of its seed, cowpea was cultivated in the past to be used as livestock feed (Qorbani 2016: 17; Hamze'I 2011: 36). The studied sample contained 6 pieces the species.

11) Bromes is one of the largest genera of the grasses, with its diverse species occurring over large parts of the natural lands in Iran (Shariat and Mirzaei 2003: 48). It is represented by 4 examples in the sample.

12) Millet is a species of the family Poaceae. Its cultivation is thought to have been originated in 2700 BC in Africa. Millet grows in a wide range of soils and has a good resistance to water shortage and requires fewer nutrients (fertilizers) compared to other cereals (Karimi 2007: 248). The sample contained 3 examples of the related seeds.

13) Oat belongs to the grass family Poaceae and is grown as animal feed. While its grain does produce flour, the resultant bread will be inferior to those baked from wheat and rye flours. Structurally, oat is quite narrow and elongated (Tajbakhsh and Pourmirza 2007: 176–175; Behnia 1997: 481). While today various nutrient properties have been demonstrated for this cereal type, it is mainly regarded an uncontrollable weed of wheat and barley fields. Some 5 oats grains occurred in the sample.

Depth	LOC	Remains	Species
-755-655	116	52	Triticum aestivum
-830	118		
-755-655	116	35	Hordeum vulgare
-830	118		
-830	118	20	Torilis arvensis
-830	118	19	Vicia villosa
-830	118	22	Lens esculenta Monech
-830	118	15	Secale cereale
-830	118	12	Lolium rigidum guad
-830	118	8	Lathyrus Nissolia
-830	118	6	Ervillia Vicia
-755-655	116	5	Glum aparine
-830	118	4	Brumus
-755-655	116	3	miliaseum Panicum
-830	118	5	Avena sativa
Total 206			

The faunal remains of Girdi Ashoan

During the excavations carried out in Girdi Ashoan, 759 pieces of bones weighing 11212 grams were discovered (Table 2).

Animal remains are divided into identified species, large mammals and small herbivores. The identified species (NISP) are the basis of analysis, including 413 bones (54% of the collection). The unidentifiable bones, which are 346 pieces (46% of the collection), had no identification criteria due to breakage and crushing.

Table 1. Botanical remains (Authors 2020).

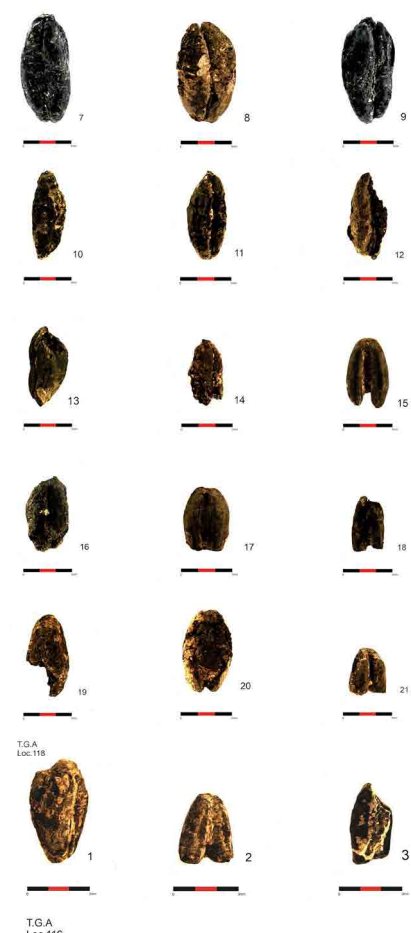


Fig. 4. Remains of common wheat (Authors 2020).



▲ Fig. 5. Remains of barley (Authors 2020).

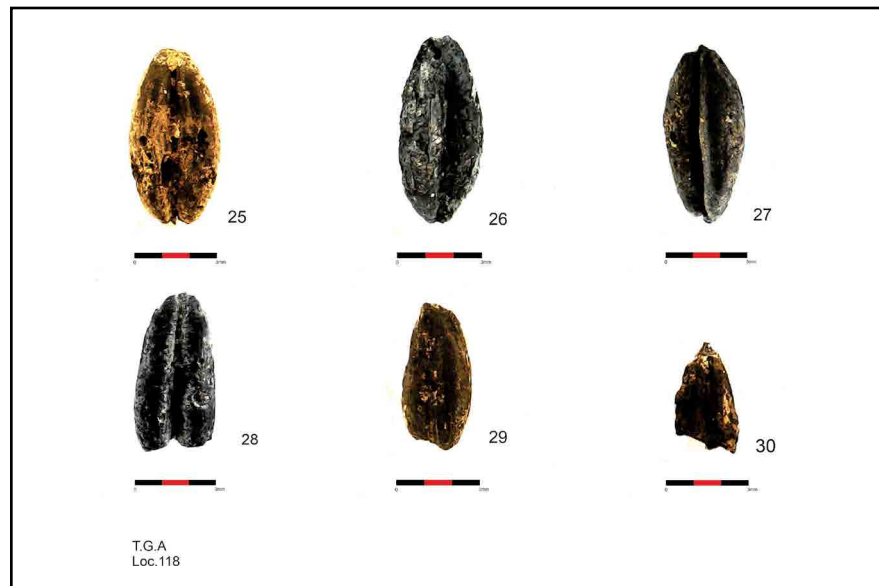


Fig. 6. Remains of torilis (Authors 2020). ▶

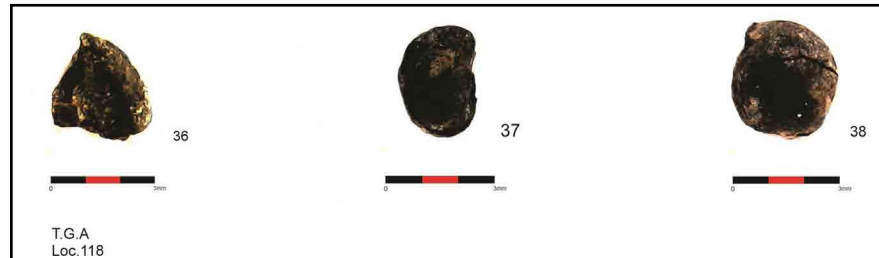
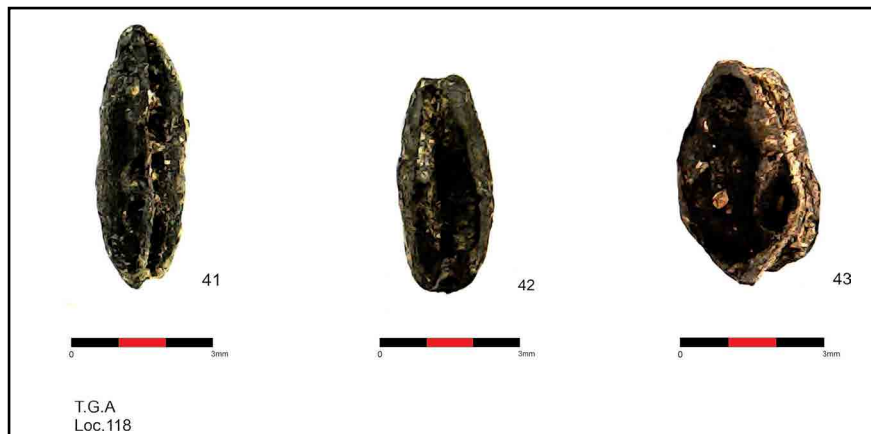


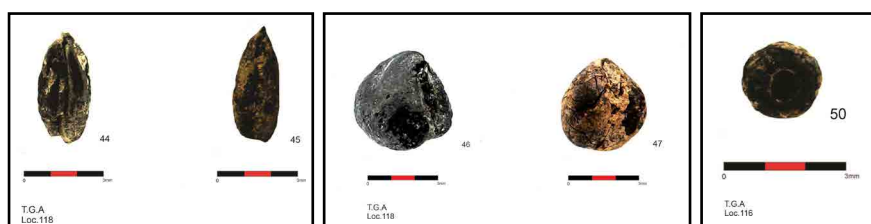
Fig. 7. Remains of winter vetch (*Vicia villosa*) (Authors 2020). ▶



Fig. 8. Remains of lentil (Authors 2020). ▶



◀ Fig. 9. Remains of rye (Authors 2020).



◀ Fig. 10c. Remains of cleavers (Galium aparine) Fig. 10b. Remains of lathyrus; Fig. 10a. Remains of lolium (Authors 2020).

◀ Table 2. The number and weight of remains from each context (Authors 2020).

Trench	Locus	Depth (cm)	NR	WR (G.)
T.G.A	201	(D.6cm)	9	46.7
	201	(6cm)	3	22.7
	202	(D.628cm)	8	45.6
	101	68	18	201
	102	220	72	424
	103	208	2	3.5
		225	85	1224.6
	111	363	44	660.6
		301-362	36	664.8
	112	400	160	3282.8
		587	111	2097.5
		400-587	153	2106.2
	113	640	14	137.6
	1010	170	8	97.3
1013	206-225	31	95.4	
1015	319	4	73.4	
102	12	1	29	
Grand Total			759	11212.7

Table 3. Frequency of number and weight of identified and unidentified remains (Authors 2020). ►

Identification	NR	NR%	Weight (G.)	Weight%
Identified	412	54	9405.5	84
Unidentified	346	46	1807.2	16
Total	759	100	11212.7	100

Unidentified comprise 16% of the collection weight, and the rest (84%) related to the identified bones. This shows the proper protection status of the collection, and the unidentifiable bones are small and crushed with little weight. The Archaeozoological studies indicated the range of species which classified as mammals and birds (Table 4).



Fig. 1: The frequency of identified and unidentified bones, Weight: 11212, Number of bones: 759 (Authors, 2020). ►

Classification of animal species

In the whole collection, 371 pieces of bones weighing 9332.1 grams were identified and the rest are classified in the group of large mammals and small herbivores. The number of identified specimens (NISP) are the basis of the analysis (Table 5).

Caprinae: Caprinae (sheep and goat) generally had the largest proportion in the fauna collection of the ancient sites of the Middle East. The number of domestic sheep and goats in the herds is not always the same (Davis, 1993). The choice of each species depends on the geographical conditions, the lifestyle of the inhabitants and the type of exploitation of the products (Payne, 1973). From the osteological point of view, it is difficult to distinguish the bones of these two species due to their morphological similarities. Therefore, in the classification, most of their bones are placed in the caprini group. However, by using comparative collections and

Table 4. The frequency of animal species, (Authors 2020). ▼

Species	NR	WR (G.)
Bos taurus	86	5499.9
Ovis aries	36	848.8
Capra hircus	34	533.1
Caprinae	198	1811.8
Ovis orientalis	2	442.8
Equus cf. caballus	1	13.3
Equus cf. asinus	1	17.7
Sus scrofa	4	23.8
Canis familiaris	2	29.5
Canis sp.	2	7.8
Canidae	3	18
Mustelidae	1	1
Meles meles	1	4
Hystrix indica	1	20
Lepus europaeus	3	3.1
Muridae	1	0.2
Anatidae	2	1.6
cf. Pelicanus	1	12
Small aves	1	0.5
Testudo	6	25.3
Clam	7	17.9
Small ruminant	282	1047.1
Large mammal	64	760.1
Grand total	757	11405.7

Table 5. Frequency of animal species by means of NISP, MNI and Weight, (Authors 2020). ▼

Species	NISP	Minimum Number of Individual (MNI)	Weight (Gram)
Bos taurus	80	4	5499.9
Ovis aries	36	12	848.8
Capra hircus	32	7	533.1
Caprinae	188	6	1811.8
Ovis orientalis	1	1	442.8
Equidae	2	2	31
Sus scrofa	4	1	23.8
Canis familiaris	2	1	29.5
Canis sp.	2	1	7.8
Canidae	3	1	18
Mustelidae	1	1	1
Meles meles	1	1	4
Hystrix indica	1	1	20
Lepus europaeus	2	1	3.1
Muridae	1	1	0.2
Anatidae	2	1	1.6
cf. Pelicanus	1	1	12
Small aves	1	1	0.5
Testudo	4	1	25.3
Clam	7	7	17.9
Grand total	371	52	9332.1

osteological atlases, some bones can be classified (Helmer and Rocheteau, 1994; Boessneck, 1969). Domestic goat (*Capra hircus*) and domestic sheep (*Ovis aries*) have been identified in Girdi Ashoan. The number of domestic sheep bones is 36 weighing 849 grams and the number of domestic goat bones is 32 weighing 533 grams (Fig. 11). This statistic shows the predominance of domestic caprini (goats and sheep) in the collection. The ratio of sheep to goats is almost the same. This indicates the preference of the residents of the site to breeding both species.

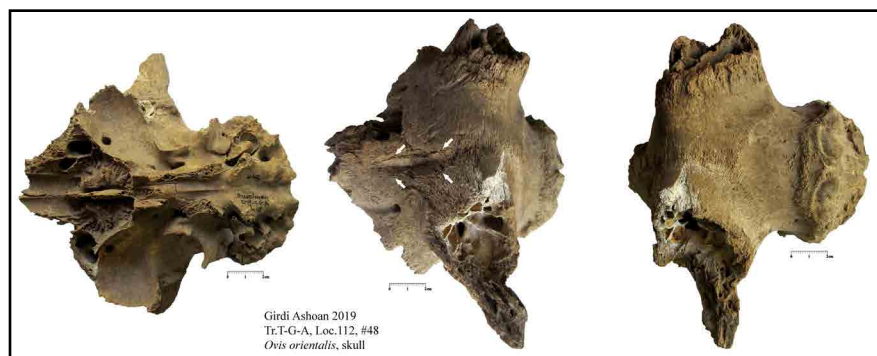
14 goat teeth and 22 sheep teeth were found in Girdi Ashoan. Among goats, six samples were slaughtered between 3 and 6 years, one sample

Fig. 11. Caprinae bones: 1) Horn core of goat, 2) Horn core of sheep, 3) Humerus of goat, 4) Metacarpal of sheep, (Authors 2020). ►



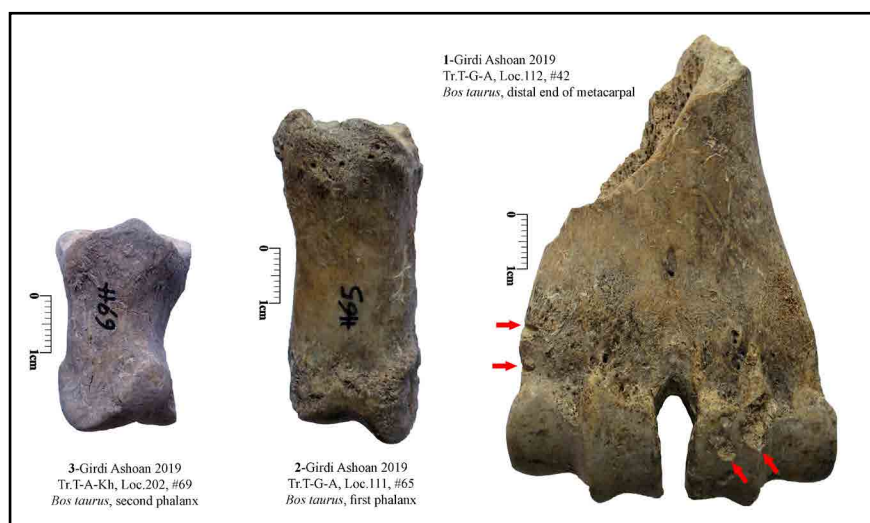
between 2 and 4 years, five samples between 6 months and 2 years and two samples between 6 and 8 years. Among the sheep, six samples were slaughtered between 3 and 6 years, two samples between 2 and 4 years, nine samples between 6 months and 2 years, and five samples between 6 and 8 years. There are a few samples related to young animals under 2 years old. This situation shows that most of the goats and sheep were more than two years old and were mature at the time of slaughter. The only wild sheep identified includes a complete skull from locus 112. The upper parts of the horn cores were broken, but the base remained. There is a deep V-shape crack on the forehead. This depression caused the death of the animal. Perhaps this trace occurred during hunting or fighting with another ram (Fig. 12).

Fig. 12. The skull of wild sheep; the V-shape crack is shown in the center picture, (Authors 2020). ►



Cattle. Two types of cattle, *Bos taurus* and *Bos indicus*, are bred in Iran today (Wilson and Reeder, 1993). Cattle has had great economic importance in the Middle East in the past and nowadays (Uerpmann, 1987). The cattle in Girdi Ashoan includes 80 bones with a weight of 5500 grams from the total remains. The domestic cow is the second dominant species after Caprinae. Based on the morphological characteristics (Boessneck et al.,

1963; Grigson, 1974) and comparison with the comparative collections, these bones attributed to the *Bos taurus* (Fig. 13). Among the 27 bones that can be examined for the age at death, fusion has not yet occurred in four bones and the rest are related to adult animals. There are eight teeth which two samples belonged to the young animals and the rest related to the adults that were slaughtered between 40 months and 6.5 years old. Age estimation shows that cattle were generally more than two years old and mature at the time of death.



◀ Fig. 13. Cattle bones: 1) Metacarpal bone with cut-marks and carnivore biting trace, 2) First phalange, 3) Second phalange, (Authors 2020).

Equidae. The two domestic equine species in the Southwest Asia include horse (*Equus caballus*) and the donkey (*Equus asinus*), as well as the hybrid of these two species (mule) (Uerpmann, 1995). Persian onager (*Equus hemionus onager*) is the only species of wild equidae that continues to live in the deserts of the Middle East (Eisenmann, 1980). The grand coneiforme of an adult Equidae discovered in Girdi Ashoan (Fig. 14). The morphological features of this bone are similar to domestic horses. The beginning of horse domestication dates to the middle of the 4th millennium BC, and some regions such as Turkmenistan are introduced as one of the centers of horse breeding (Outram et al., 2009).

Suidae. Boar is a mammal belonging to humid areas and is present in lowland forests, thickets, reeds, riverside thickets and swamps throughout Eurasia. They are scattered in most regions of Iran, except for the central desert. The domesticated type of boar is placed in the same species as the wild type (Etmad, 215: 1364; Ziaei, 1375: 215). Four bones from faunal remains of Gidri Ashoan allocated to the suidae family, considering the small number of this animal in the collection, probably belongs to the wild species (*Sus scrofa*) (Fig. 14).



▲ Fig. 14a. Carpal bone of horse; Fig. 14b. Scapula and first phalange of boar, (Authors 2020).

Carnivores. Two bones attributed to a domestic dog. Five pieces also belong to the Canidae family (domestic dog, wolf, jackal and fox). From the Neolithic period onwards, the domestic dog has been present as a guard in the village and next to the herds of goats and sheep. Two pieces of bones from the Mustelidae family have also been identified in the collection (Fig. 15).

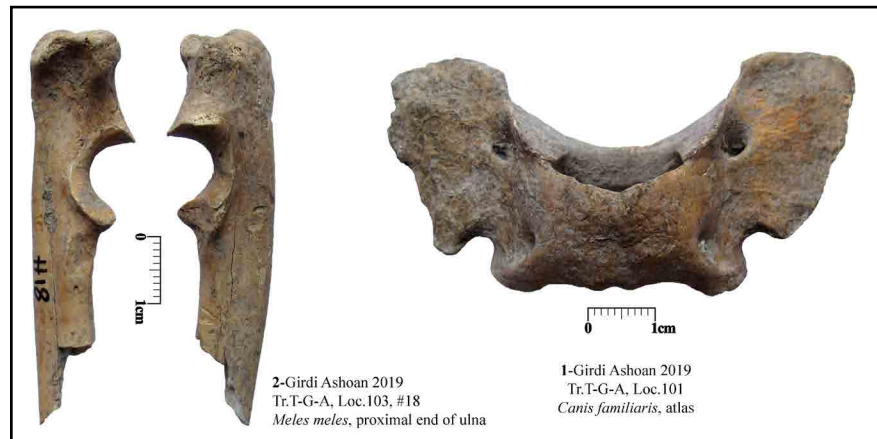


Fig. 15. Carnivora bones: 1) Atlas of dog, 2) Ulna of badger, (Authors 2020). ▶



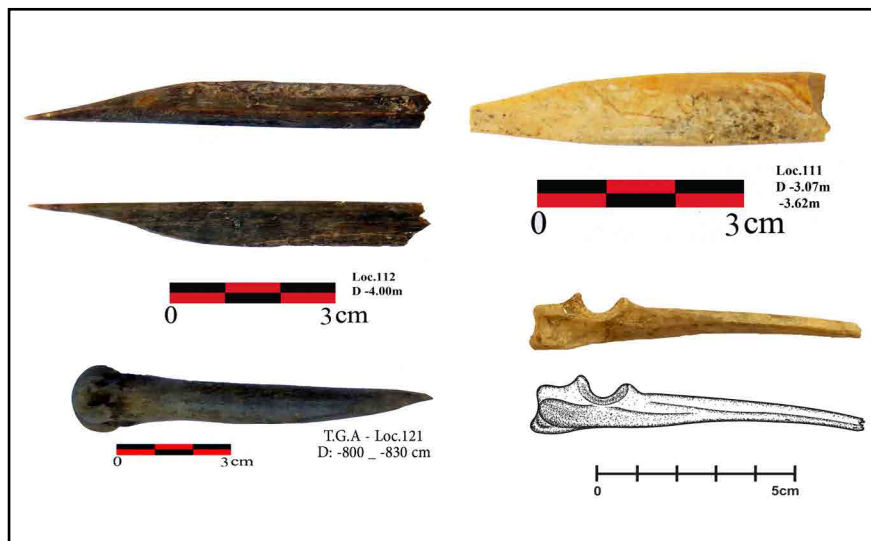
▲ Fig. 16. Metatarsal bones of rabbit (Authors 2020).

Rodents. Four rodent bones were identified in Girdi Ashoan. A lower tooth belonged to the porcupine (*Hystrix indica*). Two metatarsal bones of rabbit (*Lepus europaeus*) were also identified (Fig. 16).

Birds. Birds exist in very small numbers in the collection. A total of four bones allocated to birds in Girdi Ashoan, two of them belong to the Anatidae family due to their size and morphological characteristics. One of the interesting bones of birds belongs to the proximal end of humerus of the pelican. The middle part of this bone was deliberately broken and then polished in order to use as a tool or object (Fig. 17).

Other species. Among the animal remains of Girdi Ashoan, four pieces of tortoise shell and seven pieces of freshwater bivalve shells have been identified. The presence of these bones in the collection shows the proximity of the site to the river and the exploitation of land and water resources (Fig. 18).

Taphonomy. Various human and environmental factors affect bones.



▲ Fig. 17. Proximal end of humerus of Pelican (Authors 2020).

◀ Fig. 18. Tortoise and freshwater bivalve shells, (Authors 2020).

Human traces created on the bones during the processes of dividing the carcass, butchery, cooking, and using bones as tools. Environmental factors such as weathering, sedimentation, humidity, plant roots, soil acids also have different effects on bones (Fernández-Jalvo and Andrews, 2016). By examining the body parts of animals, it is possible to reconstruct the distribution pattern of the skeleton and how to use the animal carcass in the butchering process (Rackham, 1994). The animal bone collection of Girdi Ashoan has a good conservation status. Fragility and erosion of bones due to weathering and changes in humidity were observed only in a few cases.

Human activities include the traces of heating and carbonization of bones and cut marks during butchery process. 21 samples of cut-marks on various bones of Caprinae and cattle were identified. Four bone objects were also identified among the animal remains (Fig. 19), which their surface shows traces of polishing.

21 cases of carnivore tooth and five rodent gnawing marks were observed on the bone surfaces. There were signs of weathering and disease (pathology) on some bones (Fig. 19 and 20; Table 6).

The abundance of body parts of all identified animals is listed in Table 6. The examination of the remaining body parts carried out on sheep, goats, and cattle. In total, there are 268 pieces of Caprinae bones and 87 bones of cattle. Almost all the body parts of sheep are present in the collection. The distribution pattern of the skeleton does not show the abundance of fleshy bones (such as vertebra and ribs, scapula, humerus, radius, ulna, femur and tibia). Almost such a pattern can be seen for the cattle skeleton. In this regard, it can be assumed that Caprinae and cattle were slaughtered within the site and then all their body parts were consumed or discarded



Fig. 19. Bone awls, (Authors 2020). ▶

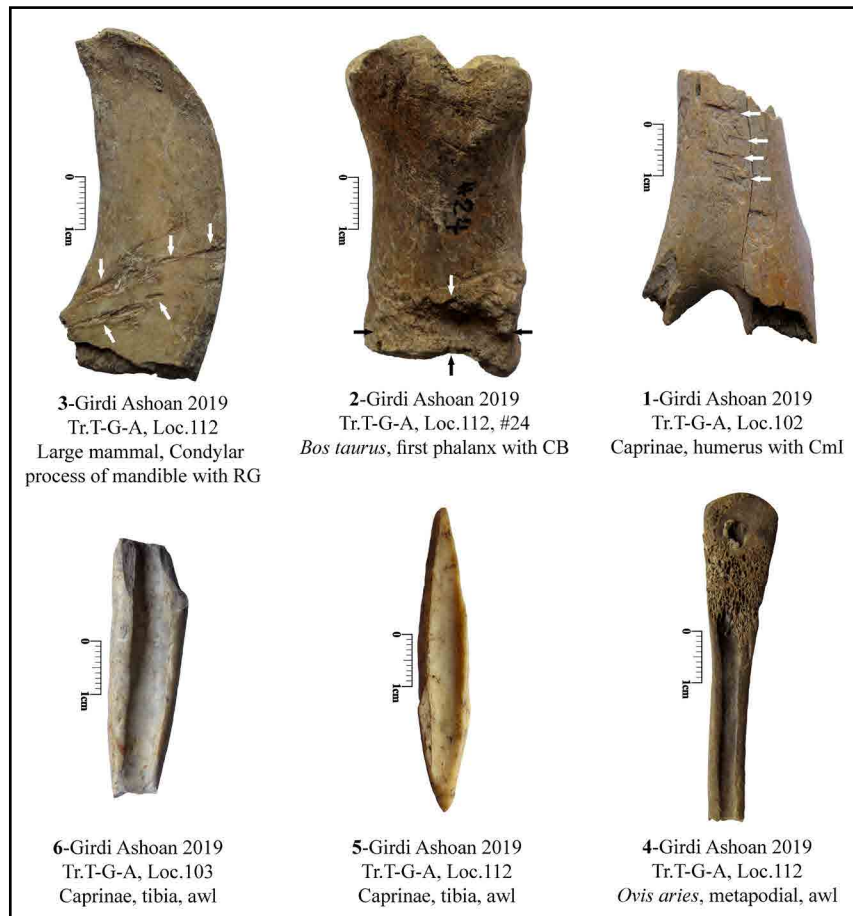


Fig. 20. 1) Cut marks on the humerus of Caprinae, 2) Carnivore biting on the first phalange of cattle, 3) Rodent gnawing marks on the mandible of large mammal, 4) Awl made from sheep metatarsal bone, 5) Awl made from tibia of Caprinae, 6) Awl made from tibia of Caprinae, (Authors 2020). ▶

in the settlement. Note to worthy that meaty bones are not abundant inside the site. Also, the presence of all the bones (skull, vertebra and pelvis) in the collection shows that the bones had the same preservation conditions.

Table 6. The frequency of body parts of each animal (Authors 2020). ▼

Grand total	Large mammal	Small ruminant	Bivalve	Tortoise	Birds	Rodents	Mustelidae	Canidae	Boar	Equidae	Wild sheep	Sheep/Goat	Cattle	Body part
24	4										1	13	3	Skull
3												3		Horn core
3												3		Maxilla
54	2	1				1		2	1			40	7	Mandible
39									1	1		28	8	Tooth
47	6	1						1			1	23	14	Vertebra
95	10	48										30	6	Rib
23	1								1			19	2	Scapula
1					1									Clavicle
45	6	20			2			1				9	6	Humerus
10		1			1		1					5	2	Ulna
31		14										16	1	Radius
18	1	1						1				9	6	Metacarpal
22	2	2						1				13	3	Pelvis
52	4	38				1						6	1	Femur
1												1		Patella
54	1	31										18	4	Tibia
2							1	1						Fibula
8										1		2	5	Tarsal
25		4				3						15	3	Metatarsal
26	2	18										4		Metapodial
20									1			8	10	First phalange
5												2	3	Second phalange
3												1	2	Third phalange
13			7	6										Shell
5														Skull, metapodial, first phalange
2														Pelvis and vertebra
119	18	101												Long bone
9	7	2												Flat bone
759	64	282	7	6	4	5	2	7	4	2	2	268	86	Grand total

Discussion and Analysis

As a mound representing the Middle and Late Chalcolithic period, archaeological excavations at Gird-i Ashoan shed significant light on the prehistoric cultures of the Zab region. The earliest settlement at Gird-i Ashoan contained the Chalcolithic (Pisdeli/LC1) painted pottery, which would be supplanted by the chaff-faced ware of the LC2/3 (Sharifi 2022). The cultural material from the site reveals close affinities with Anatolian cultures (Gerritsen et al., 2010; Balossi and Restelli 2012) alongside strong inspirations from Caucasian cultures (Bakhshaliyev 2020; Marro 2022) and Mesopotamia. In effect, the geographic settings of the Lake Urmia

region were responsible for these interplays throughout history. In general, the excavation at Tepe Gird-i Ashoan produced remarkable information about the Late Chalcolithic cultural traditions in the region. The evidence from the site partially divulge the ways in which the Late Chalcolithic cultures, especially those of Phases II and III, spread over large regions from Caucasia to north Mesopotamia, which can be interpreted as a type of population movement associated with a mixed subsistence mode that relied on agriculture and pastoralism. Of course, the improved climatic conditions marked by a noticeable reduction in cold and the arrival of a climate similar to what today characterizes the region, was an influential factor in this regard. The present paper discussed the subsistence modes practiced by the inhabitants of Gird-i Ashoan through archaeobotanical and zooarchaeological analyses. To this end, the floral and faunal remains from the site were considered given the particular place of the Zab basin in archaeological studies and literature and the knowledge of subsistence patterns, and its essential role in the subsistence and economic patterns of the Chalcolithic communities. The main focus here was on gaining an insight into subsistence patterns of the latter communities. The results of studies on the floral evidence from Gird-i Ashoan indicate the cultivation of bread wheat as the primary crop, followed by common barley, mung bean, lentil, rye and millet. At Tepe Hasanlu, the botanical studies have shown the use of bread wheat, barley, lentils and beans (Hejabri Nobari et al., 2018: 171). In general, one may surmise that agriculture played a role in the economy of northwest Iran. It is noteworthy that the agricultural system that typified the region in antiquity shared close comparisons with the region's present-day methods and crops.

Also, considering the high volume of animal remains, it can be stated that animal husbandry had the important role in the subsistence economy, which the products of Caprinae and cattle were the main resource for inhabitants of Girdi Ashoan.

Conclusion

The multidisciplinary researches conducted in Girdi Ashoan resulted to the important information about subsistence economy of the site during the Late Chalcolithic period. Most of the identified animals belong to mammals. Sheep, goats and cattle were the main source of meat consumption at the site. After the Caprinae, which account for 69% of the whole collection, the cattle ranks next in economic importance with 21%. The number of bones of cattle is less than that of Caprinae, but the weight of cattle bones is more than that of Caprinae. This shows the importance of this animal in

providing milk, meat and labor for the residents of the site. Breeding and exploitation of cattle in Mesopotamia during the Halaf and Ubaid period (half of the 6th millennium to the end of the 5th millennium BC) became popular. The dog is another domestic animal identified in the collection. Also, two Equidae bones were identified. At present, there is not enough certainty to assign the wild boars of the Girdi Ashoan as domestic or wild, but it seems that hunting played a very marginal role in the subsistence economy of the residents of this site. In general, due to the small number of animal remains, it is not possible to explain the hunting situation in Girdi Ashoan Hill. Examining the bone remains of Girdi Ashoan will be useful in knowing the development of animal husbandry developments and patterns of animal exploitation over time in the region.

The questions of major interest in this paper were whether the residents of Gird-i Ashoan were farmers, and which plants they cultivated. In this context, the results showed that in the Chalcolithic period the local economy hinged on agricultural activities connected with the production of grains and legumes, and the local population consisted of farmers who grew wheat, barley and lentils. Of the total identified plant families, two (i.e. cereals and legumes) are cultivated and the rest represent wild species. The floral remains in general consist of cultivated crops and annual weeds from the family Gramineae or grasses. The sample in general indicates the significant dominance of the cultivated crops, suggesting that sowing and reaping of grains and legumes were practiced in the region in the fifth millennium BC. Most of the identified specimens are of cereal family, and the non-agricultural species are well-known types of weeds that grew together with the cultivated grains in fields and were mixed with the crops at harvest and entered the processed food. Thus, their presence definitely testifies the existence of farmlands in this period.

Endnote

1. Number of Remains or Number of Fragments=NR or NF
2. Number of Identified Specimens=NISP

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انجمن علمی باستان‌شناسی ایران

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چکیده

تپه گردآشوان در حوضه رودخانه زاب کوچک شهرستان پیرانشهر واقع شده که طی دو فصل مورد کاوش باستان‌شناسی قرار گرفته است. نتایج کاوش اطلاعات درخور توجهی در خصوص سنت‌های فرهنگی دوره مس و سنگ جدید به دست داد. نتایج مطالعات مواد فرهنگی گردآشوان نشانگر حضور سنت سفالین کاهرو/پیزدلی بوده و گاهنگاری نسبی نشانگر این امر است که بیشترین مناسبات فرهنگی و برهم‌کنش‌ها با مناطق قفقاز، آناتولی و بین‌النهرین می‌باشد. برخلاف مطالعات باستان‌شناسی بسیاری که در شمال غرب انجام گرفته، تاکنون حوضه زاب از منظر مطالعات گیاه‌شناسی و جانورشناسی مغفول مانده است. پژوهش حاضر به مطالعه بقایای زیستی و بازسازی الگوهای معیشتی عصر مس و سنگ شمال غرب ایران می‌پردازد. هدف اصلی این پژوهش تبیین اقتصاد معیشتی تپه گردآشوان در عصر مس و سنگ است. به منظور کسب اطلاعات جوامع هزاره چهارم و پنجم پیش از میلاد به بررسی سیستم‌های معیشتی ساکن در حوضه رودخانه زاب کوچک می‌پردازیم. وجود نهشت فراوان از بقایای خاکستر و دیگر بقایای سوخته عملاً زمینه لازم برای انجام مطالعات میان‌رشته‌ای از قبیل باستان‌گیاه‌شناسی و جانورشناسی را فراهم کرده است. پژوهش حاضر بر مبنای کاوش‌های باستان‌شناسی، مطالعات گیاه‌شناسی و استخوان‌شناسی صورت پذیرفته است و با رویکرد توصیفی-تحلیلی، سعی در تبیین الگوهای معیشتی ساکنان تپه گردآشوان دارد؛ بنابراین این پژوهش به این پرسش می‌پردازد که الگوی معیشتی ساکنان گردآشوان در حوضه رودخانه زاب در عصر مس و سنگ میانی / جدید چگونه بوده است؟ چه طیفی از گونه‌های جانوری را در برمی‌گیرد؟ به نظر می‌رسد دامپروری یکی از ارکان نظام معیشتی بوده و بیشتر از کشاورزی رواج داشته است؛ چراکه میزان بقایای حیوانی بیشتر از بقایای گیاهی بوده است. نتایج مطالعات نشانگر الگوهای ترکیبی دامداری و کشاورزی است و نشانگر کاشت گندم نان و جو است که بیانگر اقتصاد متکی بر کشاورزی است.

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