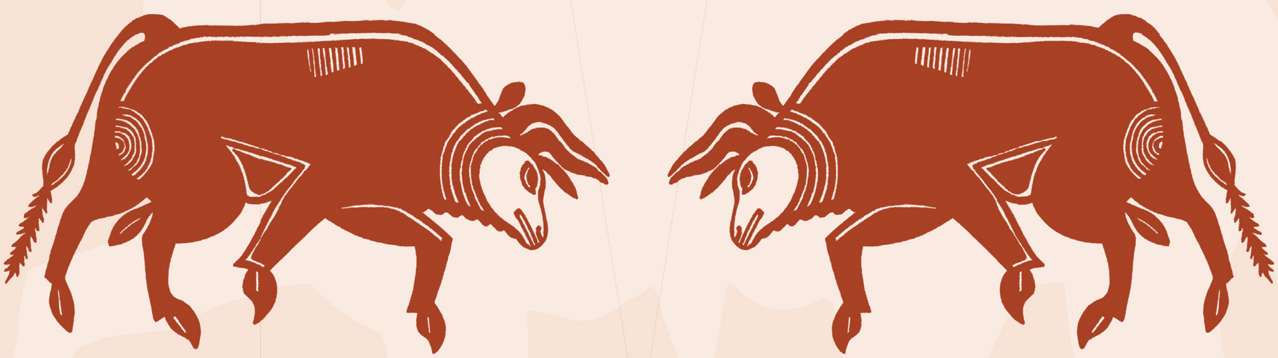
Archaeobiology 3

ARCHAEOZOOLOGY OF SOUTHWEST ASIA AND ADJACENT AREAS XIII



Proceedings of the Thirteenth International Symposium, University of Cyprus, Nicosia, Cyprus, June 7–10, 2017

edited by

Julie Daujat, Angelos Hadjikoumis, Rémi Berthon, Jwana Chahoud, Vasiliki Kassianidou, and Jean-Denis Vigne

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Group photo of the 13th ASWA[AA] meeting June 8th 2017
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Part 2: Subsistence Economies of Early and Late Complex Societies in Southwest Asia and Adjacent Areas

Part 3: Beyond Subsistence: Animals in the Symbolic World of Southwest Asia and Adjacent Areas

FOREWORD

The 13th ASWA conference was hosted by the University of Cyprus, one of the youngest of Europe's universities. In 2019, it was only thirty years since its foundation. Nevertheless, this is a thriving academic institution, which currently consists of eight faculties, twenty-two departments, and eleven research units.

In 1991, and just two years after the university's foundation, the Archaeological Research Unit (ARU) was founded by decree from the Government of the Republic of Cyprus, following the issuance of the dependent legislation by the House of Representatives. The decision to establish the ARU was based on the recommendation of the Interim Steering Committee of the University of Cyprus, which stated the following:

1. Cyprus is offered for primary research in the field of archaeology thanks to its distinctive cultural signature and history, as well as due to the fact that Cypriot archaeology and archaeological research on the island already has a distinguished tradition and international reputation;

2. The subsequent international recognition of the importance of archaeological research in Cyprus should comprise one of the first incentives for choosing the University of Cyprus as a center for postgraduate studies, and will pave the way for the exchange of students and academics between the University of Cyprus and academic institutions overseas.

The faculty members of the ARU, who are also part of the Department of History and Archaeology academic staff, have contributed immensely over the past 28 years to the achievement of the aforementioned objectives for the study and promotion of Cypriot cultural heritage through their research, their teaching, and the practical training they have been providing to students at undergraduate and postgraduate levels. The active study of other regions of the Mediterranean world have not been overlooked either, as members of the ARU academic staff have been carrying out excavations and research projects in Greece, Turkey, and France.

The members of the ARU are actively carrying out research in Pre- and Protohistoric Archaeology, Classical and Byzantine Archaeology but also Archaeometry and Environmental Archaeology, Maritime Archaeology, and Western Art. In the course of the past 28 years, the ARU has laid very stable foundations in all aforementioned specialisations of the archaeological discipline, none of which existed at academic level in Cyprus before the unit's establishment. Through their teaching at undergraduate and postgraduate levels, all members of the ARU academic staff have been contributing to the formation of a new generation of Cypriot archaeologists, equipped with all the necessary knowledge and practical experience needed to excel in this scientific field.

Over the years, the ARU has been very active in organizing international conferences and workshops. The ARU has organized over 50 international conferences, while members of the academic staff have published the proceedings of over 20 scientific meetings held at the ARU.

Thus, when Jean-Denis Vigne came to my office several years ago with the suggestion to co-organize the 13th Archaeozoology of Southwest Asia and Adjacent Areas conference I gladly accepted. The meeting in Nicosia brought together colleagues from all over the world and offered a venue where new results from the field or the laboratory could be presented and discussed. The publication of the conference proceedings enables colleagues who were unable to attend the conference to read about the latest developments in the archaeozoology of this culturally important region.

I would like to close by thanking all the members of the 13th ASWA organizing committee for all the work they have put into bringing so many scholars to Cyprus, many of them for the first time. I would also like to thank the co-editors of this volume for all the work they have put into the publication of the proceedings.

Professor Vasiliki Kassianidou
Director of the Archaeological Research Unit,
University of Cyprus
Nicosia, August 2019

EDITORS' PREFACE

Due to their location at the meeting point of the three Old World's continents—Africa, Asia, and Europe—Southwest Asia and its adjacent areas played a pivotal role in the history of humanity. They received successive waves of our species—*Homo sapiens*—out of Africa. Different processes in several areas of this large region brought about the transition to the Neolithic, and later on the urban revolution, the emergence of empires bringing with them important subsequent religious, cultural, social, and political consequences. Southwest Asia also played a major role in the interactions between East (Asia) and West (Europe) during the last two millennia. The unique importance of Southwest Asia in the history of humanity is strengthened by the, also related to its location, fact that this area is a hotspot of biodiversity, especially in mammals, which were—as everywhere in the world—tightly associated to the history of civilizations in a diversity of roles: game, providers of meat and milk, traded raw material, symbol of prestige and wealth, pets, etc.

Everywhere in the world, the biological and cultural interactions between humans and animals often remain under-evaluated in their heuristic value for understanding complex social and biological interactions and trajectories. This is why, almost half a century ago, archaeologists who were carrying out research and reflecting on such themes founded a very active nonprofit world organization named the International Council for Archaeozoology (ICAZ). This is also why the ICAZ working group "Archaeozoology of Southwest Asia and Adjacent Areas" (ASWA[AA]) was one of the first ones created within ICAZ, constituting one of the largest and most active of ICAZ's working groups.

The ASWA[AA] was formed during the 1990 ICAZ International Conference in Washington, D.C. Its purpose is to promote communication between researchers working on archaeological faunal remains from sites in western Asia and adjacent areas (e.g., Northeast Africa, Eastern Europe, Central Asia, and South Asia). It carries out its mandate mainly through the sponsoring of biennial international conferences. Since 1998, these meetings have alternated in being hosted in Europe or in Southwest Asia: Paris (1998), Amman (2000), London (2002), Ankara (2004), Lyon (2006), Al Ain (2008), Brussels (2011), Haifa (2013), Groningen (2015).

Ongoing armed conflicts and political tensions in several countries of Southwest Asia made it difficult to locate a safe and convenient place that would enable the organizing the 13th ASWA[AA] meeting in within that region. Although Cyprus is currently a member of the European Union, in (pre-)history Cyprus was embedded in the eastern Mediterranean "world." Because of its location, Cyprus was indeed at the confluence of African, Levantine, Anatolian, and Greek cultural streams and, as is common for islands, recombined them in different but always original ways all along its history. Archaeozoology recently provided one of the most convincing illustrations of the tight connection between Cyprus and Southwest Asia, demonstrating that the earliest domesticated mammals, especially cats, pigs, cattle, sheep, and goats, were introduced to the island very shortly after their first incipient domestication on the near continent, that is, during the ninth millennium BC. For all these reasons, Cyprus represented an ideal place to host the 13th ASWA[AA] conference.

Despite the illegal military occupation of part of its territory by a foreign country, the option of hosting the meeting in Cyprus was enthusiastically embraced by all members of the working group, especially because it is open to all nationalities and maintains good diplomatic relationships with a large majority of countries in Southwest Asia. These facts contributed towards the 13th ASWA[AA] meeting in Cyprus (June 7–9, 2017) becoming one of the best-attended ASWA[AA] meetings. It brought together 80 scientists coming from 25 different countries: from Southwest Asia (6 countries), Europe (14 countries), North America (2 countries), and Japan.

They presented their results in 36 oral and 32 poster presentations. They debated the long-term interactions between humans and biodiversity, about the beginning of animal domestication and husbandry, the strategies of animal exploitation from the Paleolithic to modern times, and the symbolic and funeral use of animals through time. They also greatly enjoyed the numerous social events organized, including a fantastic Cypriot mezze dinner, enhanced by a local folk-music band, and a nice excursion to the archaeological sites of Amathous, Kourion, and Khirokitia, and to the museums of Nicosia and Larnaca, which provided ample opportunities for scientific exchanges in a friendly atmosphere.

The hosting of the conference at the new campus of the University of Cyprus was another major reason to the meeting's success. This campus was a convenient and pleasant venue for such a conference, and the strong support of the University of Cyprus, as well as its valuable experience for the organization of such meetings were deeply appreciated by both the scientific organizers and the delegates. Several other partners contributed to the organization: the French archaeological mission "Neolithisation—Klimonas," which is itself strongly supported by the French School at Athens, the Cyprus Department of Antiquities, the French Institute of Cyprus, the French National Center for Scientific Research (Centre National de la Recherche Scientifique [CNRS]), and the French National Museum of Natural History (Muséum national d'Histoire naturelle [MNHN]).

The present volume brings together the texts of 18 of the 68 presentations of the meeting in Nicosia. The editorial board collected the papers and organized their review and editing. We are very grateful to Sarah Kansa (and Open Context), Justin Lev Tov, and Lockwood Press for their constant support in bringing this volume to fruition.

Julie Daujat
Angelos Hadjikoumis
Rémi Berthon, Jwana Chahoud
Vasiliki Kassianidou
Jean-Denis Vigne

2.4 | The Subsistence Economy of a Highland Settlement in the Zagros during the Bronze and Iron Ages

The Case of Gūnespān (Hamadan, Iran)

Sarieh Amiri,* Marjan Mashkour,† Azadeh F. Mohaseb,† and Reza Naseri‡

Abstract

Gūnespān is located in the southeastern part of Malayer, in Hamadan Province in Iran. The main occupation occurred during the Bronze Age and Late Iron Age (Median) periods. The study of archaeozoological assemblages from these periods revealed that sheep/goat and cattle constitute the bulk of the exploited animal resources, showing that these human communities were highly dependent on pastoralism. During the Iron Age, the role of cattle seems to have become more predominant, which might be an indication of agricultural development in this region. Also, another feature in common with other sites in Iran is the increase of suid remains, which shows the growing importance of domestic pig during the Iron Age. In parallel, equid remains are also more numerous. The same pattern is visible when comparing Gūnespān to Godin Tepe and Nush-i Jan. The identified wild species (12%), the majority of which are herbivores, belong to wild sheep (*Ovis orientalis*), wild goat (*Capra aegagrus*), red deer (*Cervus elaphus maral*) or Persian fallow deer (*Dama dama mesopotamica*), wild boar (*Sus scrofa*), and gazelle (*Gazella* cf. *subgutturosa*). Other identified wild taxa are wild or domestic cat (*Felis silvestris/catus*), hare (*Lepus europaeus*), heron (*Ardea* sp.), duck (Anatidae), and tortoise (*Testudo graeca*).

Keywords

Zagros Mountains, Godin Tepe, Nush-i Jan, Bronze Age, Iron Age, Median period, agropastoralism, donkey, onager, chicken

Introduction

In light of long-term archaeological investigations in Iran, much information is now available from Bronze and Iron Ages. Several well-known sites such as Nush-i Jan (Stronach et al. 1978; Stronach and Roaf 2007), Godin Tepe (Young and Levine 1974), Baba Jan (Goff 1977, 1985), and Ziweyeh (Mo'tamedi 1996) have yielded significant information about these periods in Central Zagros. However, the Median culture of Iron Age (IA) III—Median period—has rarely been investigated until now.

The site of Gūnespān is located in the southeastern part of Malayer, 1 km from the Kalan Dam, on the bank of the Kalan River (Hamadan Province, Central Zagros, Iran) in the village of Pattapeh, at an elevation of 1,936 m. The site stands 27 m above the surrounding fields and covers about 3.24 ha (Figure 2.4.1). Gūnespān was excavated over six seasons as part of an archaeological salvage project inside the dam reservoir. The fourth and fifth seasons of excavations were conducted by one of the authors (RN), when four trenches were excavated, revealing IA III and Bronze Age (BA) deposits (Naseri 2009a, 2009b). Gūnespān is represented by a sequence stretching from the BA to the Islamic period. Locally the earliest levels of occupation belong to the Early Bronze Age (EBA) and are contemporaneous to Godin IV and III levels of Godin Tepe (Gopnik and Rothman 2011), although the main occupation is referred to

* Archaeozoology section, Bioarchaeology Laboratory of the Central Laboratory, University of Tehran, Iran
† Archéozoologie, Archéobotanique (UMR 7209), MNHN, CNRS; CP56, 55 rue Buffon 75005 Paris, France / Archaeozoology section, Bioarchaeology Laboratory of the Central Laboratory, University of Tehran, Iran ([mashkour@mnhn.fr], corresponding author)
‡ University of Zabol, Department of Archaeology, Zabol, Iran

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as the Middle and Late Bronze Age (MBA and LBA; Godin III) and IA III (Naseri et al. 2016). The building excavated at the site shows close similarities to other Median architecture at nearby Godin Tepe (Gopnik and Rothman 2011:Figure 2.8) and Nush-i Jan (Stronach and Roaf 2007:Figure 1.9). Archaeozoological studies from these periods are still scarce in this part of Iran and only Godin Tepe (Crabtree 2011; Gilbert 1979) and Nush-i Jan (Stronach et al. 1978) are directly comparable with Gūnespān (Figure 2.4.1).

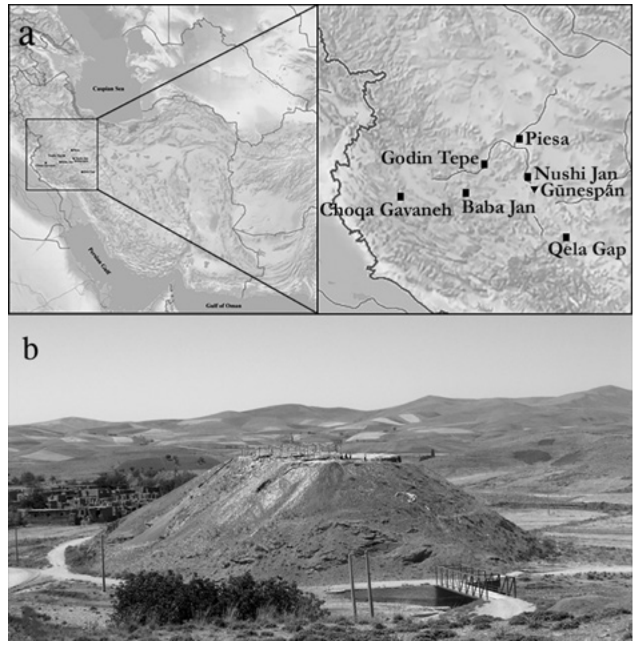

Figure 2.4.1. (a) Location of Gūnespān and other sites in Central Zagros of Iran; (b) general view of Gūnespān.

The Faunal Spectrum of Gūnespān

The archaeozoological study of the faunal remains from the fourth and fifth seasons was undertaken at the archaeozoology section of the Bioarchaeology Laboratory of the University of Tehran (2012–2014). The faunal assemblage of Gūnespān is very small, in comparison to those from Godin Tepe (N = 5,704) and Nush-i Jan (N = 14,862), and its preservation is satisfactory: about 55% of the bones were highly fragmented and 45% of the bones were identifiable to a taxonomic level. The animal remains are consumption waste, as indicated by the presence of cut marks (28%), chopping marks (6.1%), and heated surfaces (17.5%) on some bones.

This analysis derives from a total of 1,004 bone fragments (total weight 9 kg) out of which 94 fragments belong to Godin IV, 467 fragments to Godin III, and 443 fragments to the IA levels (Table 2.4.1).

All anatomical parts of the skeleton are present in the assemblage. For taxonomic identifications, the osteological reference collections of the laboratory were used as well as several atlases (Barone 1986; Hilson 1986; Pales and Garcia 1981; Schmidt 1972; Walker 1985). Caprines—sheep/goat—constitute the bulk of the identified remains (84%, N = 356). To distinguish between sheep and goat, the following references were used: Boessneck 1969; Clutton-Brock et al. 1990; Halstead et al. 2002; Helmer 2000; Helmer and Rocheteau 1994; Payne 1985. A total of 190 specimens could not be identified as either sheep or goat, while 53 specimens were allocated to domestic sheep (*Ovis aries*), 3 to wild sheep (*Ovis orientalis*), 78 to domestic goat (*Capra hircus*), and 4 to wild goat (*Capra aegagrus*). Cattle (*Bos taurus*) bones total 9% of the Number of Identified Species (NISP = 68 specimens). Thus, during the BA (Godin III) and IA III (Median period) the bulk of the site's subsistence economy relied on the exploitation of small and large domestic ruminants with a clear emphasis on small herbivores.

Other taxa were also present at Gūnespān: gazelle (*Gazella* cf. *subgutturosa*, less than 1%), red deer or Persian fallow deer (*Cervus elaphus maral/Dama dama mesopotamica*, 1%), wild boar or domestic pig (*Sus scrofa*, 4.4%), and equids (3.5%) out of which one specimen was identified as a hemione (*Equus hemionus*). Carnivore species consisted of domestic dog (*Canis familiaris*) and wild or domestic cat (*Felis silvestris/catus*). Finally, two hare bones (*Lepus europaeus*), two bone fragments of tortoise (*Testudo graeca*), and seven bird specimens were recovered, including chicken (*Gallus gallus*), a heron (*Ardea* sp.), and a duck (Anatidae; Figure 2.4.2; Table 2.4.1). In total, during Godin III and IA III, 93% of the faunal assemblage belonged to domestic animals and 7% to wild species.

Characterization of Equid and Bovid Populations at Gūnespān

Methodology for Biometric Analyses

Equid remains were measured following codes established by Eisenmann (2007a, 2007b, 2009). The method used to specifically identify the equid post-cranial bones is based on a logarithmic method

Table 2.4.1. Distribution of the faunal remains at Gūnespān.

		Godin IV (Early Bronze)		Godin III (Middle Bronze)		Iron Age III		Total	
		NISP	Weight	NISP	Weight	NISP	Weight	NISP Total	Weight Total
IDENTIFIED SPECIES									
Caprini	*Ovis/Capra*	20	131.8	94	581.3	76	769.6	190	1,482.7
	Capra hircus	3	44.4	48	280.4	27	286.7	78	611.5
	Capra aegagrus			4	14.5	0	0	4	14.5
	Ovis aries	8	126.3	30	182.3	15	198	53	506.6
	Ovis orientalis	1	26.8			2	59.8	3	86.6
Bos taurus		3	40.6	19	398.2	46	1,723.4	68	2,162.2
Gazella subgutturosa				1	9.6			1	9.6
Sus scrofa		1	6	1	8.5	17	454.3	19	468.8
Cervidae		1	168.8	1	14.7	3	85.1	5	268.6
Equidae	Equidae			1	19	11	506.8	12	525.8
	Equus asinus			1	23.7			1	23.7
	Equus hemionus					1	96.2	1	96.2
Carnivores	*Canis familiaris*					1	6.2	1	6.2
	Felis sp.					1	4.4	1	4.4
	Small carnivore			4	4.4			4	4.4
Minor species	*Lepus europaeus*					2	6.6	2	6.6
	Testudo graeca	4	55.4	7	43.4			11	98.8
	Gallus gallus					2	3.6	2	3.6
	Ardea sp.					1	0	1	0
	Anatidea			1	0.6			1	0.6
	Unidentified Aves			2	1.3	1	3.3	3	4.6
Total of identified species		**41**	**600.1**	**214**	**1,581.9**	**206**	**4,204**	**461**	**6,386**
UNIDENTIFIED SPECIES									
Mammals	Large Mammal	9	161.5	30	407	58	825.8	97	1,394.3
	Small Mammal	9	32.6	9	13	20	54.7	38	100.3
Small Ruminant		35	120.6	199	591.4	135	653.3	369	1,365.3
Unidentified				15	12.2	24	56.9	39	69.1
Total of unidentified species		**53**	**314.7**	**253**	**1,023.6**	**237**	**1,590.7**	**543**	**2,929**
Grand Total		**94**	**914.8**	**467**	**2,605.5**	**443**	**5,794.7**	**1,004**	**9,315**

known as Simpson's ratio diagrams (Simpson 1941), where measurements are converted into decimal logarithms and compared with a standard. Here the standard animal is the Persian onager (*Equus hemionus onager*; Eisenmann and Mashkour 2000). Specifically for the first phalanx measurements, we used the mean value of the first anterior phalanges of a Persian onager as the standard, following Dive and Eisenmann (1991).

For other taxa, we used the measurement codes published by von den Driesch (1976). Sheep and goat biometric analysis was also performed using a logarithmic method but with a slight difference: the "Size Index Method" developed by Uerpmann (1979) and simplified by Meadow (1999). This provides a straightforward and easy way to compare various sites and visualize their differences. Because bones or parts of bones have different scale proportions, for example, length and breadth, all measurements are converted to logarithms to diminish the effect of these scale differences. The basic idea is to relate every find measurement to the respective measurement of a known and preferably recent individual, the so-called Standard. The distance from the Standard (S) is then used as an indication (= Index) of the size for the unknown individual (X) from which the find was derived, and a "Log-Size Index" (LSI) or ratio is obtained (LSI = Log X - Log S). For sheep and goat standards, we used measurements from a wild sheep (*Ovis orientalis*) and wild goats (*Capra aegagrus*) as published by Uerpmann and Uerpmann (1994). For cattle standard, we used measurements from a female cow (*Bos primigenius* f. *taurus*) from Carmague (Southern France), as published in Helmer 1992.

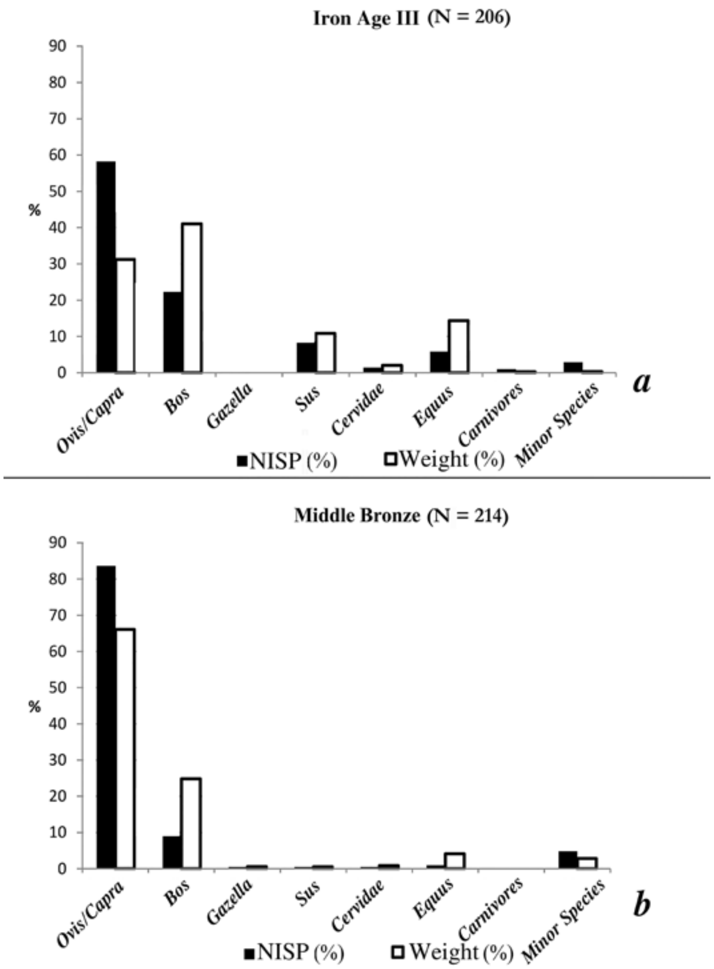

Figure 2.4.2. (a) Taxonomic distribution of the faunal remains at Gūnespān in the Iron Age III (Median period); (b) taxonomic distribution of the faunal remains at Gūnespān in the Bronze Age (Godin III).

Identification of Equid Bones

Of the eight equid bones that were collected at Gūnespān, seven specimens belong to IA III and one to the BA. Only three could be measured: one BA first phalanx, one IA metacarpal, and two superior molar teeth.

Log ratios of the archaeological specimens are projected with the four potential options for the Iranian Plateau alongside the onager, which is used as the Standard (see above, *Methodology for Biometric Analyses*): horse (*Equus caballus*), donkey (*Equus asinus*), hybrids, for instance, mules and hinnies (*E. caballus* X *E. asinus*), and another wild ass, the Turkmen kulan (*Equus hemionus kulan*), besides, of course, the Persian onager (*E. h. onager*) that is already included as the standard.

The profile of Gūnespān's first phalanx is generally much smaller than the one of the donkey (*E. asinus*; Figure 2.4.3a). However it should also be noted that the proportions of this bone and its overall profile are comparable to the one of the horse. The small size of the bone cannot be due to age as the bone belongs to an adult specimen. At this stage of uncertainty, only genetics could bring a secure answer. In either case, the finding is very interesting and should be documented and compared with future finds in the region.

This first phalanx is dated to the second half of the third millennium BC. The earliest remains of identifiable domestic ass (*E. asinus*) on the Iranian

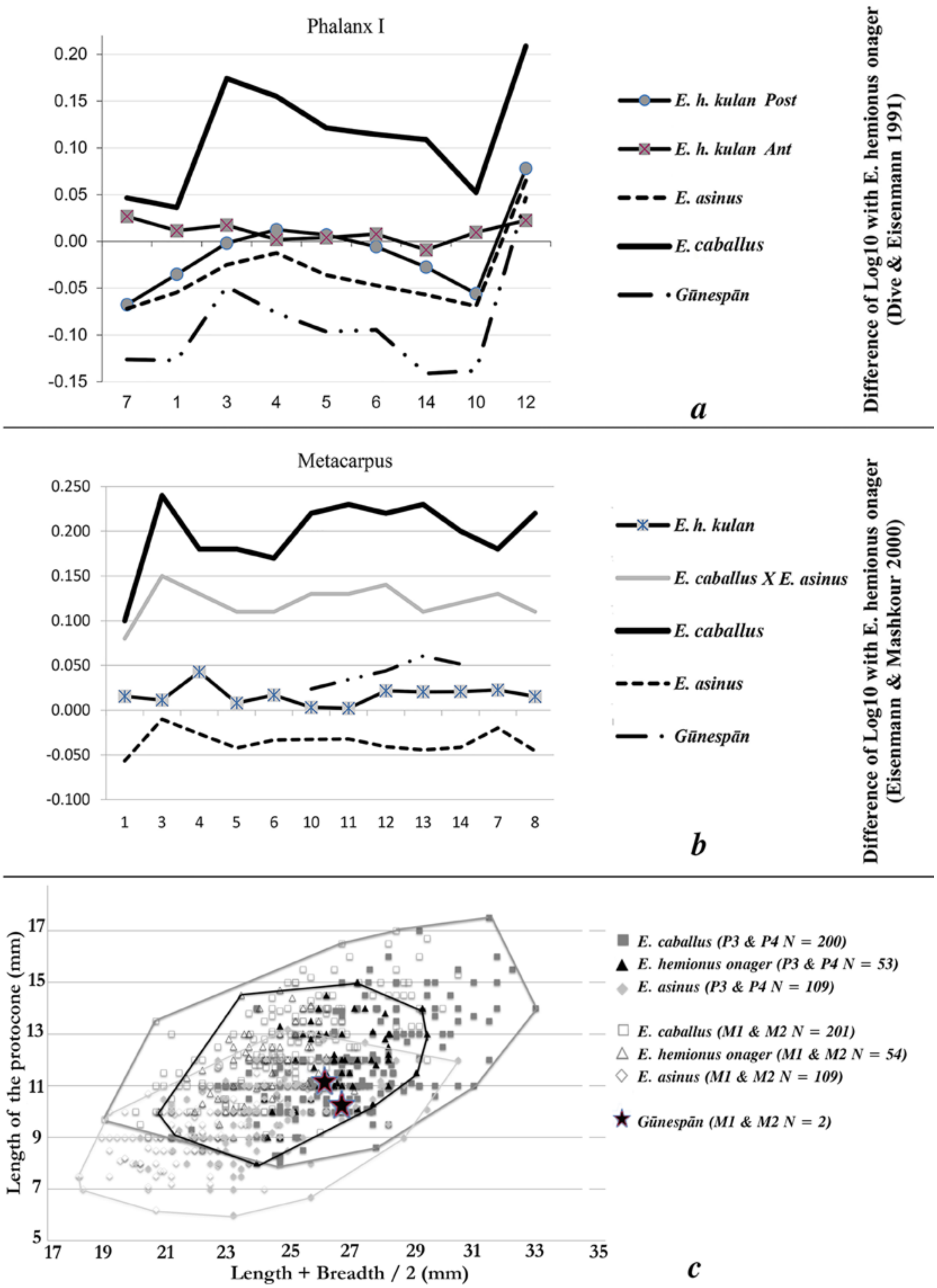

Figure 2.4.3. (a) Logarithmic ratio diagrams of equids' first phalanges; (b) logarithmic ratio diagrams of equids' third metacarpal; (c) bivariate diagram of equids' upper teeth. P: premolar, M: molar. (Modified after Mashkour 2001:214.)

Plateau were found in Qabrestan—mid-fourth millennium BC (Mashkour et al. 1999)—and Arisman—second half of the fourth millennium to early third millennium BC (Benecke 2011). In neighboring regions in Iraq, Turkey, and Syria they are present from the Uruk period (Vila 2006) and might be at the origin of the eastward spread of this animal (Vila and Mashkour 2020).

The presence of domestic ass at Gūnespān is interesting, although it is later than the two other mentioned cases above. Indeed, the presence of donkey remains rare on the Iranian Plateau even during the third millennium. However, as stated above, the possibility that the bone belongs to a very small horse considering its logarithmic profile resemblance with the horse should not be ruled out.

For the IA, the only measurable bone is a metacarpal (Figure 2.4.3b). The logarithmic differences show that this was from a middle-sized animal relatively similar to the standard that is the mean for Persian onager (*Equus hemionus onager*).

The two upper molars found in IA III (context 5005) were compared to modern and fossil measurements (Mashkour 2001:214). We projected the measurements of the upper first or second molar in this graph (Figure 2.4.3c). The two specimens fall in the lower part of the horse variation but are also within the variation of hemiones. The morphology of the teeth in this case presents no diagnostic features that allow distinction between horse and hemione.

The presence of a wild equid at Gūnespān is noteworthy for this period. It is known that hemiones were hunted in the Zagros during prehistory (Bakken 2000; Bennett et al. 2017) and this find adds to the zoogeographic record for the presence of this species in the area. Today the hemione is totally absent from the Zagros and lives only in very remote places, within protected areas in the center of the Iranian Plateau (Denzau and Denzau 1999). It occupies a very different habitat from the Zagros highlands today and lives in steppe to semi-stepped arid zones.

Identification of Sheep, Goat, and Cattle Populations of the Central Zagros

In total, 47 goats, 38 sheep, and 26 cattle bones were measurable (Appendix 2.4.1a–2.4.1c). These were compared to the measurements of other sites in the Central Zagros or Iranian Plateau (Mashkour 2001).

For comparison, we used metric data from several sites in the Zagros region that either predate Gūnespān or are contemporaneous in order to evaluate the diachronic changes in size. The sites of Tepe Asiab (Bökönyi 1977; Zeder and Hesse 2000) and other sites of the Zagros studied by Bökönyi (1977), such as Sarab (Late Neolithic), Siahbid (Early and Middle Chalcolithic), Dehsavar (Late Chalcolithic), as well as Tepe Qela Gap from the Late Neolithic to the LBA (Amiri et al. 2014) are all located in the Zagros region not very far away from Gūnespān.

Goat—*Capra*. Goat measurements were only available for the MBA and IA III. It should be noted that there were no EBA measurable bones for goat. LSI diagrams highlight that the shift in the size of goat populations (Figure 2.4.4a) seems to be between the MBA and IA III. However, the size variation in goat populations within the compared sites is not significant between the IA III level of Gūnespān and most of the sites (Appendix 2.4.2a, see Student *t* test results) except Asiab, an early Neolithic site of the Zagros composed of wild animals, and Sarab, a late Neolithic site composed of a mixture of wild and domestic animals (Bangsgaard and Yeomans, personal communication 2018; Bökönyi 1977). The only highly significant difference ($P < 0.001$) is visible between Qela Gap (Late Chalcolithic) and Gūnespān ($p = 0.001$). In addition, the mean of Asiab can reasonably be used as the minimum limit for the presence of wild goat in other sites. At Gūnespān four specimens are above this limit and can be allocated to wild goats; they are indicated in the graph by black triangles. It is interesting also to note that wild goat hunting was more frequent than sheep hunting, particularly at the nearby sites of Qela Gap and Sarab.

Sheep—*Ovis*. LSI diagrams show that sheep at Gūnespān from the fourth to the first millennium BC (Figure 2.4.4b) were smaller, especially during the MBA and IA III periods, however, with no significant statistical difference compared to the EBA period (Appendix 2.4.2b). The *t* test shows that Gūnespān sheep populations were significantly smaller than that of Asiab. The only other significant difference is between the MBA period of Gūnespān and the Late Chalcolithic population of Gela Gap, where animals are very large. It should be noted that large specimens indicated by LSIs around 0.05 or more were also present during the EBA and IA III and could be

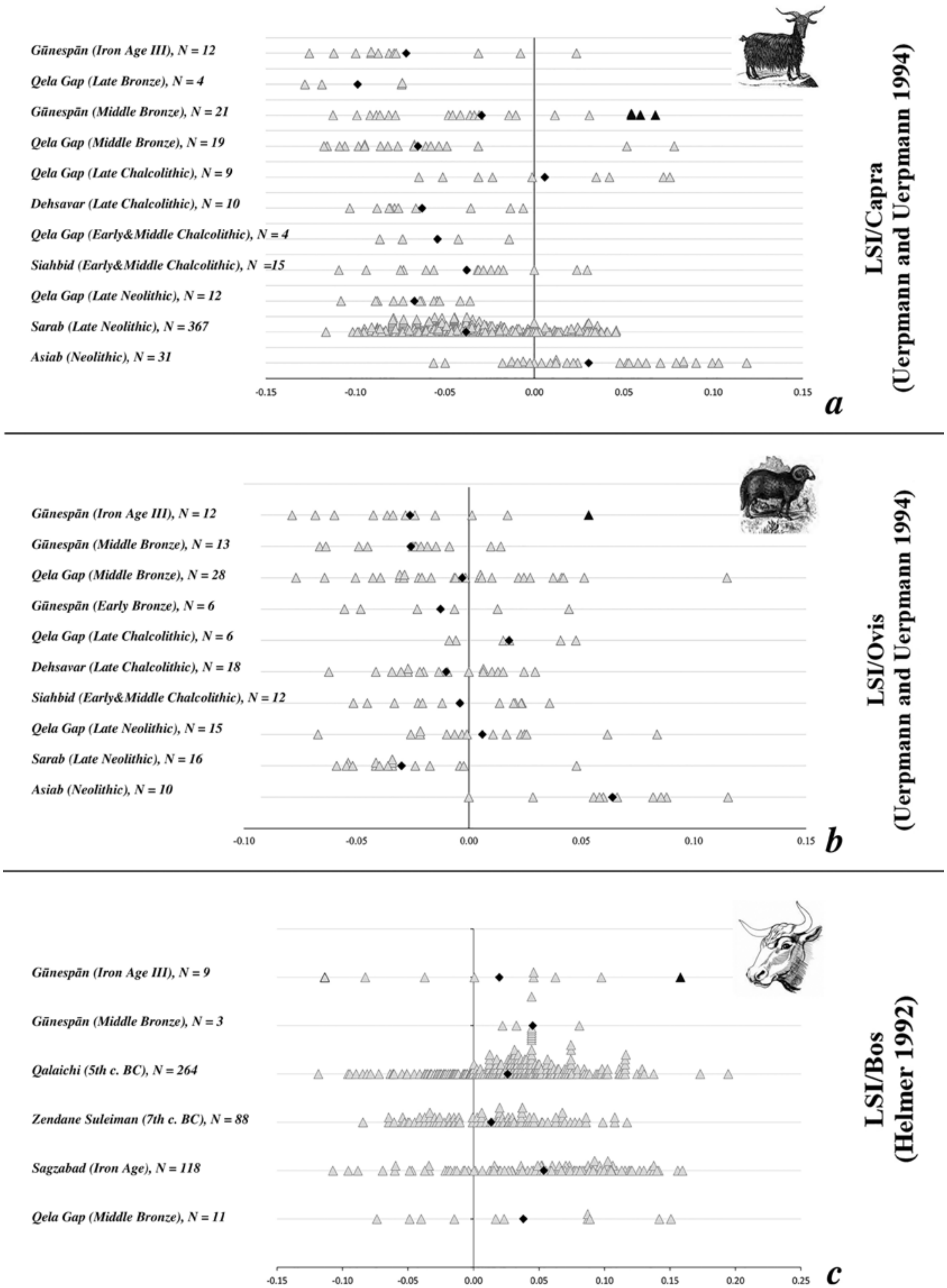

Figure 2.4.4. (a) Comparison of the size of goat (*Capra*) populations at Gūnespān and other assemblages from the fourth to the first millennium BC in the Zagros using Log-Size Index; (b) comparison of the size of sheep (*Ovis*) populations at Gūnespān and other assemblages from the fourth to the first millennium BC in the Zagros using Log-Size Index; (c) comparison of the size of cattle (*Bos*) populations at Gūnespān and other assemblages from the fourth to the first millennium BC in the Zagros using Log-Size Index.

allocated to the wild, here again indicated by a black triangle.

Cattle—*Bos*. The cattle population of Gūnespān was compared to several other nearby populations. The Iranian populations are all larger than the standard on average (Figure 2.4.4c). However, no significant difference is seen between the six compared populations (Appendix 2.4.2c). One specimen—indicated by a black triangle—in Gūnespān IA III is very large and may be either a very large male or an aurochs.

Kill-Off Patterns

The low number of sheep and cattle teeth recovered did not allow a precise analysis of exploitation strategies. For the statistical treatment of the data and for producing a kill-off pattern we used tooth eruption and wear based on Payne (1973) and Helmer and Vigne (2007).

Based on 27 molar and premolar tooth remains and an MNI of 15 individuals, it was only possible to reconstruct kill-off pattern for goats from the BA level. The profile obtained is clearly biased. The absence of isolated teeth and even mandibles of animals under two years of age cannot be explained by taphonomic factors alone or the lack of water sieving during the excavation. In addition, it is surprising to see the high frequency of animals killed between 2–4 years of age (E–F for Payne), which account for almost 70% of the remains (Figure 2.4.5). The remaining part of culled animals is distributed between older specimens (G and H–I).

The absence of animals under two years of age may be a strong indication that at least in the excavated part of the site, where the faunal remains were collected, young goats were not killed or consumed. Also, this truncated profile bears another interesting information that is the indication for the use of hair due to the presence of very old specimens. This idea is also supported by the presence of spindle whorls and bone and bronze needles that are common during the Godin III period in this area (Henrickson 2011).

Identification of Chicken Bones

Very few bird bones were recovered in Gūnespān from the two chronological phases of the LBA and IA. The two humeri that were measured were iden-

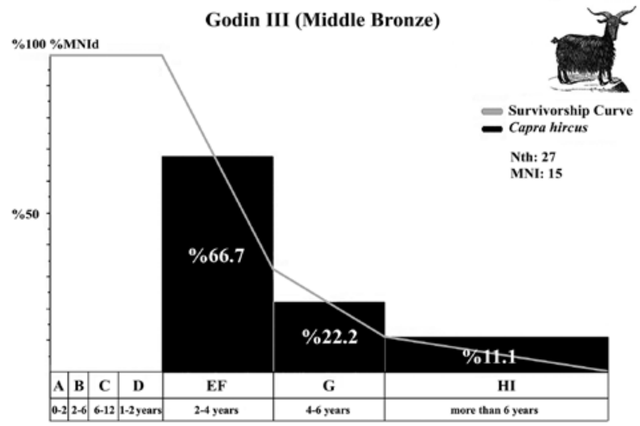

Figure 2.4.5. Reconstruction of kill-off pattern for goats (*Capra hircus*) during the Godin III period.

tified as *Gallus gallus* using the collection of the National Museum of Natural History in Paris (Appendix 2.4.1d). The history of the domestication or introduction of chicken on the Iranian Plateau is not known (Seigle 2018). Very few sites have reported the presence of this taxon and those that do record remains mostly from the LBA and IA (Boessneck and Krauss 1973; Bökönyi 1978; Krauss 1975; Osten-Sacken 2015). The presence of chicken is more clearly documented for antiquity and the medieval period (Mashkour 2013). The two specimens found in Gūnespān can thus be considered the earliest firm evidence that could ideally be subjected to DNA analysis. The limited number of measurements cannot be used for the distinction of *Gallus gallus domesticus*.

Discussion

The taxonomic diversity of Gūnespān provides some indication of the subsistence economy at the site and palaeoenvironmental conditions, particularly during the MBA/LBA (Godin III period) and the IA III. The identified remains from the EBA (Godin IV) are scarce, but several wild herbivores were identified—wild sheep and goat, wild boar, red deer or Persian fallow deer, possibly aurochs and hemione. These animals live in various ecological settings ranging from highlands and piedmonts to steppe forests and arid steppes. Gūnespān is located in a geographical area surrounded by all these varied landscapes within accessible distances. This patchwork situation seems to be very common in many prehistoric sites

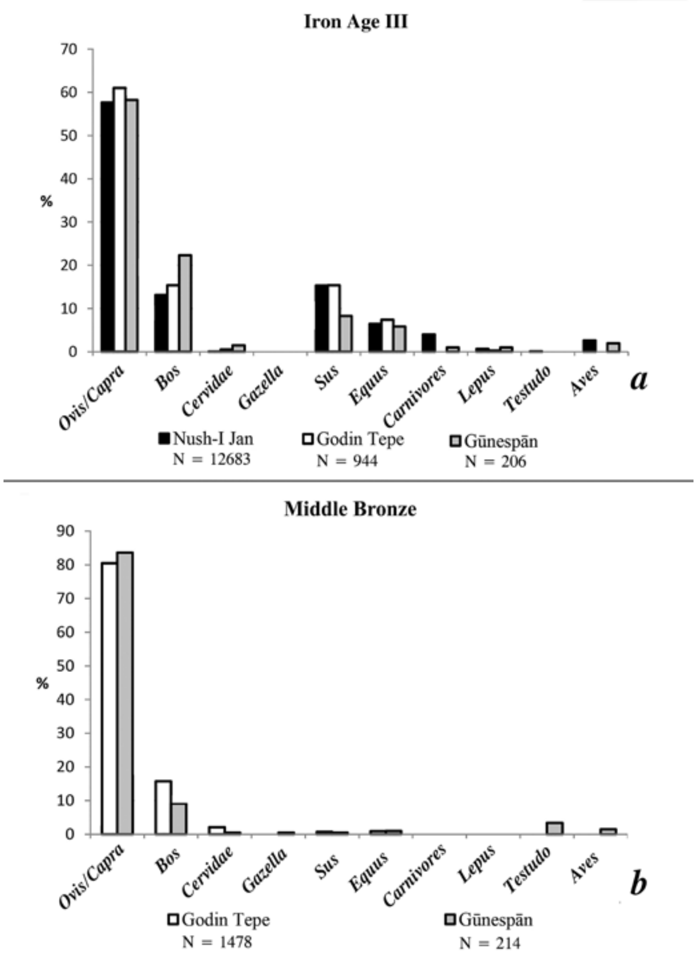

Figure 2.4.6. (a) Distribution of identified species during Iron Age III (Median period); (b) distribution of identified species during the Godin III period.

Figure 2.4.7. Luristan Bronze cheek piece, example with intact bit. Metropolitan Museum, accession no. 1979.352.2, https://www.metmuseum.org/art/collection/search/326620.

of Iran and especially in areas located on the foothills or valleys (Mashkour 2001, 2002). Although the inhabitants of Gūnespān exploited wild animal resources during the MBA, LBA, and IA III, they were highly dependent on agropastoralism. The domestic caprines—sheep/goat—and cattle constitute the most important meat and by-product animal resources at the site during the Bronze and Iron Ages in terms of NISP and weight of recovered bones. The same pattern is visible when comparing Gūnespān to the nearby sites of Godin Tepe and Nush-i Jan (Figure 2.4.6).

Sheep populations of Gūnespān show little difference when compared to other sites of the region except Asiab, while goats show more variation as explained above. It should also be noted that goats outnumbered sheep in Gūnespān. During the IA the role of cattle seems to have become more important, and this is particularly visible in terms of the weight of recovered bones. This trend has been observed generally on the Iranian Plateau (Mashkour 2001:Figure 57) and might be an indication for the emergence of a more agriculturally oriented economy in this period. All collected cattle bones belong to adult individuals. However, it was not possible to document any pathologies on the bones that would suggest the use of cattle as draft animals.

Another feature Gūnespān has in common with other prehistoric trends of subsistence economy in Iran is the increase of suids (Mashkour 2006) and equids (Mashkour 2001, 2002; Mashkour et al. 1999) during the IA. In the case of suids, it seems that human communities showed a growing interest in the animal on the Iranian Plateau over time. However, the proportion of suid remains never exceeds an average 10% of animal resources in most areas. This is the case of Gūnespān with suids representing approximately 6% of the faunal remains, which is lower that the contemporaneous sites of Godin and Nush-i Jan.

As for equids, the development of horse breeding and the spread of the donkey from Mesopotamia are also clearly visible at Gūnespān, despite the small size of the assemblage, as they are in the two aforementioned neighboring sites. This increase might be a response to socioeconomic changes such as the regional development of trade, increased population mobility, and new techniques of war (Hnila Gilibert 2004; Potts 2014:48–58). The profusion of the bronze production highlights the importance of horse and donkey for the LBA and IA societies. Known today as the Bronzes of Luristan (Muscarella 1989, Overlaet 2006; Figure 2.4.7), they include a great number of ornaments, tools, weapons, horse-fittings, and exceptional horse cheek pieces, together with a rich iconography depicting equids.

In relation to herding strategies of the main ungulates, namely, sheep, goat, and cattle, it should be noted that the site is located in a highland region with environmental conditions and pasturelands suitable for these taxa. It is important to integrate the analysis of faunal remains with other finds, such as botanical remains and architecture, which both bring different insights on economic and settlement practices. Most of the botanical remains from the southern part of the site were collected from ash layers and pits, both possible indications for continuous settlement at the site (Naseri 2009b). As for the architectural remains, Gūnespān was a Median complex during the IA, comparable with contemporaneous key sites in the Zagros such as Nush-i Jan and Godin. The building is composed of four rectangular rooms and one more irregular room in the north of the site, all surrounded by an oval fortification wall (Naseri et al. 2016). Such rooms are usually described as storage rooms. Although the precise function of the site could not be defined, it is far from being a minor settlement. The storage rooms, the presence of several pilasters, and part of a fortification point to an administrative or military function of the site. Sheep, goat, and cattle were herded around the site, taking advantage of the available pastures present in the vicinity of Gūnespān. However, we are not able to understand the truncated kill-off pattern for goat during the IA. For the moment we can only report this case as an uncommon kill-off pattern with the absence of animals under the age of two years. Finally, it is interesting to note the presence of chicken in the BA levels.

The archaeozoological study of Gūnespān is the only existing record for the subsistence economy of the Bronze and Iron Ages in the region of Malayer, now buried under the water of the Kalan Dam.

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Appendix 2.4.1. (a) Postcranial bone measurements for goat (*Capra*); (b) postcranial bone measurements for sheep (*Ovis*); (c) postcranial bone measurements for cattle (*Bos*); (d) postcranial bone measurements for chicken (*Gallus gallus*). In “Period” IA = Iron Age; G = Godin. A * after the specimen number—with #—refers to “cf. Wild.”

(a) Goat *(Capra)*

Scapula

Context	Period	Code	SLC	LCG	GLP	LG	BG
3013	IA III	#2	14.7	20.9	28.6	20.5	18.4
3031	IA III	#159	18.4	24.5	28.5	22.8	20.5
4028	IA III	#69	14.2	17.4			16.9
5005	IA III	#59	21.0	20.4		26.2	
2020	G III:5	#21	20.7		31.1	22.7	
2035	G III:6	#45			31.2	23.3	19.8
2045	G IV	#130	19.7	24.5	29.0	24.0	21.3

Humerus

Context	Period	Code	Bd	Dd	Bt	Ht	Ad
3013	IA III	#3	29.2	24.9	27.0	16.8	12.5
3013	IA III	#4			26.5	16.3	12.5
3020	IA III	#121	24.1	20.4	22.0	14.4	10.7
3022	IA III	#165	29.0	24.3	28.5	17.3	13.4
4010	IA III	#139	33.0	26.9	31.5	18.6	14.2
4010	IA III	#140	28.7		27.5	17.2	12.8
3049	G III	#155	28.2		27.9	15.7	13.3
2008	G III:4	#95	34.9	29.4	32.8	19.3	15.1
2015	G III:5	#87	31.9		30.5	17.0	15.2
2020	G III:5	#23		23.8		16.7	12.8
2035	G III:6	#49	29.5	24.8	27.1	15.4	13.3

Radius

Context	Period	Code	Bp	Dp
2002	G III:2	#164	29.0	15.8

Metacarpal

Context	Period	Code	GL	Bp	Dp	Bd	Dd	Sd	Sd ap	3M	4M	3L	4L
4010	IA III	#141				23.2	15.2			10.3	10.2	10.0	9.5
2020	G III:5	#16	95.8	22.7	16.3	25.0	15.6	14.5	9.9	11.0	9.3	10.8	8.4

Femur

Context	Period	Code	Bp	Dp	Dc
2008	G III:4	#96	36.7	21.8	18.3
2008	G III:4	#97	32.5	19.2	

Metatarsal

Context	Period	Code	GL	Bp	Dp	Bd	Dd	Sd	Sd ap	3M	4M	3L	4L
3046	IA III	#83	113.5	20.1	18.7	23.4	14.9	10.9	11.0	10.8	8.8	10.4	9.1

Talus

Context	Period	Code	GLl	GLM	DLm	DLl	GB
4028	IA III	#72	26.1	24.7	14.4	14.1	17.0
2008	G III:4	#98	24.4	23.4	14.4	13.1	15.2
2008	G III:4	#99	25.4	24.2	14.2	13.5	16.2
2012	G III:4	#147	28.9	27.5	16.6	16.7	19.6
2014	G III:4	#158	25.8	25.1	14.9	13.5	16.5
2020	G III:5	#14	27.4	26.4	19.2	15.7	19.1
2020	G III:5	#15	26.9	26.7	17.1	15.1	19.6
2035	G III:6	#27	28.5	27.6	17.2	16.2	18.7

Phalanx 1

Context	Period	Code	GL	Bp	Dp	Bd	Dd	Sd	Sd ap
3043	IA III	#110	35.7	11.3	14.2	10.9	10.4	8.40	7.8
3049	G III	#154*	38.6	12.5	15.1	10.7	10.0	9.7	10.2
2014	G III:4	#156				12.8	11.0	11.5	8.7
2020	G III:5	#17*	35.5	11.8	13.6	11.7	10.1	10.5	9.3
2020	G III:5	#18*	35.2	13.0	13.4	12.4	10.6	11.4	9.6
2035	G III:6	#31*	35.1	12.3	13.5	12.3	10.5	10.7	10.0
2035	G III:6	#32	34.7	11.1	14.0	10.2	9.4	8.5	9.4
2035	G III:6	#33	36.7	11.4	15.0	10.4	8.9	8.9	9.9

Phalanx 2

Context	Period	Code	GL	Bp	Dp	Bd	Dd	Sd	Sd ap
3043	IA III	#111	21.8	11.4	12.5	8.8	10.6	8.1	8.2
3043	IA III	#112	26.6	13.6	12.5	10.7	12.1	9.3	9.8
2020	G III:5	#19	24.9	13.1	12.8	9.8	11.6	9.9	9.4
2024	G III:5	#151	26.4	15.0	13.4	11.4	12.1	11.3	10.4

Phalanx 3

Context	Period	Code	DLS	MBS	LD
2031	G III:6	#161	30.6	6.1	19.5
2035	G III:6	#36	34.4	6.1	

(b) Sheep *(Ovis)*

Scapula

Context	Period	Code	SLC	LCG	GLP	LG	BG
3013	IA III	#1	18.6	17.5	29.4	23.6	19.9
3024	IA III	#133	18.7				
4017	IA III	#51*		20.1			22.5
2029	G III:6	#11	17.9	17.8		24.0	19.9
2038	G III:6	#93	19.8	18.6	32.8	25.5	20.1
2041	G IV	#57	19.5	17.7	32.3	25.3	19.7
2051	G IV	#149	22.5	23.7		25.2	24.2

Humerus

Context	Period	Code	Bd	Dd	Sd	Sd ap	Bt	Ht	Ad
3002	IA III	#150	27.5	22.5	12.6	16.9	25.3	16.3	13.3
2010	G III:4	#78	31.4	25.0			28.1	17.7	13.3

Radius/Ulna

Context	Period	Code	GL	Bp	Dp	Bd	Dd	Sd	Sd ap	SDO	DPA
5005	IA III	#60	150.9	29.3	14.6	27.6	18.3	17.4	9.7		
4013	IA III	#80		33.7	17.6			18.5	10.1	23.2	27.6
2047	G IV	#104		34.5	18.5						

Metacarpal

Context	Period	Code	GL	Bp	Dp	Bd	Dd	Sd	Sd ap	3M	4M	3L	4L	3	4
3043	IA III	#107				25.3	17.5			11.7	11.7	11.6	11.5		
3043	IA III	#108				22.0	14.6			10.2	10.2	9.6	9.7		
4008	IA III	#116	119.5	23.0	15.6	23.8	15.6	13.6	10.2	11.1	11.2	10.7	10.5		
2015	G III:5	#89						13.5	11.8					12.2	12.5
2028	G III:6	#102	140.1		17.9									11.8	11.4

Talus

Context	Period	Code	GLl	GLM	DLm	DLl	GB
4009	IA III	#128	28.8	27.6	16.9	15.5	18.6
2007	G III:4	#25	26.7	26.1	14.8	14.5	16.8
2010	G III:4	#79	26.9	25.8	15.3	14.5	17.3
2020	G III:5	#12	31.4	30.8	19.2	16.9	20.5
2020	G III:5	#13	30.3	29.4	18.4	16.8	19.3
2035	G III:6	#26		26.9	16.1	15.4	
2044	G IV	#9	26.9	26.2	16.4	15.5	17.2

Metatarsal

Context	Period	Code	Bd	Dd	3M	4M	3L	4L
4012	IA III	#126	22.3	16.3	10.7	11.4	9.6	10.0
2047	G IV	#105	22.7	15.6				
2047	G IV	#115	24.1	16.5	11.6	12.0	10.4	10.8

Metapodial

Context	Period	Code	Bd	Dd	3M	4M	3L	4L	3	4
3018	IA III	#147	23.3	15.7	11.4	11.0	10.7	10.3		
2035	G III:6	#44							11.4	11.1

Phalanx 1

Context	Period	Code	GL	Bp	Dp	Bd	Dd	Sd	Sd ap
3013	IA III	#8	33.2	10.5	12.9	10.4	9.6	9.2	8.7
3020	IA III	#122				11.4	10.7		
2008	G III:4	#100	35.0	11.8	14.4	11.4	10.8	9.9	10.1
2035	G III:6	#28	35.0	11.9	14.8	11.5	9.4	10.2	8.9
2035	G III:6	#29	34.7	12.1	15.1	11.7	10.7	10.3	9.3
2035	G III:6	#30	36.8	11.4	14.6	10.1	9.1	8.7	9.1

Phalanx 2

Context	Period	Code	GL	Bp	Dp	Bd	Dd	Sd	Sd ap
2035	G III:6	#34	22.8	11.2	12.4	9	9.9	8.3	7.7

Phalanx 3

Context	Period	Code	DLS	MBS	LD
2035	G III:6	#35	27.9	6.80	21.9
2041	G IV	#58	31.9	7.5	22.6

(c) Cattle *(Bos)*

Humerus

Context	Period	Code	Bp	Bd	Dd	Bt	Ht	Ad
4013	IA III	#81				47.0		36.7
5005	IA III	#64						34.6
5005	IA III	#65*		84.2	72.8	76.7	40.5	29.9
5005	IA III	#66	89.0					

Radius

Context	Period	Code	Bp
2016	G III	#145	29.5

Metacarpal

Context	Period	Code	Bp	Dp	Sd	Sd ap	3	4
3004	IA III	#75	48.0	26.9	25.2	18.8		
4008	IA III	#118					27.0	25.7

Femur

Context	Period	Code	Bp	Dc
3046	IA III	#85		35.5
5005	IA III	#67	111.1	40.3

Patella

Context	Period	Code	GB
2020	G III	#22	50.6

Tibia

Context	Period	Code	Dp	Bd	Dd
3030	IA III	#160	41.7		
4028	IA III	#70		48.7	38.4

Talus

Context	Period	Code	GLl	GLM	DLm	DLl	GB
3024	IA III	#132	62.2			32.9	
4028	IA III	#73					36.3
5005	IA III	#61	69.0	66.2	38.7	38.6	41.8
5005	IA III	#62		57.8	34.5	34.3	

Metatarsal

Context	Period	Code	Bp	Dp	Bd	Dd	3M	4M	3L	4L	3	4
4006	IA III	#54				35.1					29.0	24.8
4010	IA III	#142	35.5	34.0								
3047	G III	#94			59.2	32.8	28.6	25.0	26.8	23.3		

Phalanx 1

Context	Period	Code	GL	Bp	Dp	Bd	Dd	Sd	Sd ap
4017	IA III	#50	61.5	33.9	33.9	31.5	23.0	28.4	25.6
2038	G III	#92	64.2	29.2	33.7	28.4	20.3	22.8	17.9

Phalanx 2

Context	Period	Code	GL	Bp	Dp	Bd	Dd	Sd	Sd ap
3046	IA III	#86	41.6	28.1	31.2	23.0	28.6	21.7	21.1
4009	IA III	#129	41.0	29.2	30.2	24.9	29.3	24.8	22.0
2020	G III	#20	34.0	26.6	29.9	22.2	24.7	21.6	19.7
2042	G IV	#114				23.9	26.3	25.9	

Phalanx 3

Context	Period	Code	MBS
2003	G III	#162	25.8

(d) Chicken *(Gallus gallus)*

Humerus

Context	Period	Code	GL	BP	Bd	SC
3046	IA III	#3	42.5	15.8	9.8	4.4
2002	G III	#7			10.0	4.5

Appendix 2.4.2. Student *t* test for the comparison of Gūnespān LSIs and other population in the Zagros: (a) goat(*Capra*), (b) sheep (*Ovis*), (c) cattle (*Bos*) populations at Gūnespān and other assemblages from the fourth to the first millennium BC in the Zagros using Log-Size Index. In bold the P values < 0,001. Neo = Neolithic; LN = Late Neolithic; E&MC = Early and Middle Chalcolithic; LC = Late Chalcolithic; EBA = Early Bronze Age; MBA = Middle Bonze Age; LBA = Late Bronze Age; IA = Iron Age.

Appendix 2.4.2a

Capra	**Asiab (Neo)**	**Sarab (LN)**	**Qela Gap (LN)**	**Siahbid (E&MC)**	**Qela Gap (E&MC)**	**Dehsavar (LC)**	**Qela Gap (LC)**	**Qela Gap (MBA)**	**Gūnespān (MBA)**	**Qela Gap (LBA)**	**Gūnespān (IAIII)**
Asiab (Neo)		**0.000**	**0.000**	**0.000**	**0.001**	**0.000**	0.182	**0.000**	**0.000**	**0.000**	**0.000**
Sarab (LN)			0.003	0.963	0.338	*0.021*	**0.000**	**0.001**	0.270	**0.000**	**0.001**
Qela Gap (LN)				*0.031*	0.365	0.709	**0.000**	0.903	*0.037*	*0.032*	0.753
Siahbid (E&MC)					0.466	0.117	*0.031*	0.102	0.637	*0.012*	0.048
Qela Gap (E&MC)						0.666	0.061	0.689	0.418	0.085	0.481
Dehsavar (LC)							0.003	0.893	0.101	0.080	0.604
Qela Gap (LC)								0.004	0.137	0.004	**0.001**
Qela Gap (MBA)									0.047	0.227	0.724
Gūnespān (MBA)										0.028	*0.036*
Qela Gap (LBA)											0.272
Gūnespān (IAIII)											

Appendix 2.4.2b

Ovis	Asiab (Neo)	Sarab (LN)	Qela Gap (LN)	Siahbid (E&MC)	Dehsavar (LC)	Qela Gap (LC)	Gūnespān (EBA)	Qela Gap (MBA)	Gūnespān (MBA)	Gūnespān (IAIII)
Asiab (Neo)		**0.000**	**0.001**	**0.000**	0.000	**0.009**	**0.001**	**0.000**	**0.000**	**0.000**
Sarab (LN)			0.004	*0.023*	*0.032*	**0.001**	0.234	*0.021*	0.674	0.765
Qela Gap (LN)				0.456	0.144	0.479	0.316	0.469	*0.014*	*0.033*
Siahbid (E&MC)					0.548	0.144	0.615	0.946	0.059	0.120
Dehsavar (LC)						*0.025*	0.866	0.509	*0.092*	0.161
Qela Gap (LC)							0.128	0.230	0.002	*0.018*
Gūnespān (EBA)								0.606	0.365	0.466
Qela Gap (MBA)									0.067	0.094
Gūnespān (MBA)										0.970
Gūnespān (IAIII)										

Appendix 2.4.2c

Bos	Qela Gap (MBA)	Sagzabad (IA)	Zendane Suleiman (7th c. BC)	Qalaichi (5th c. BC)	Gūnespān (MBA)	Gūnespān (IAIII)
Qela Gap (MBA)		0.394	0.127	0.439	0.879	0.629
Sagzabad (IA)			**0.000**	**0.000**	0.798	0.099
Zendane Suleiman (7th c. BC)				*0.033*	0.233	0.719
Qalaichi (5th c. BC)					0.504	0.700
Gūnespān (MBA)						0.639
Gūnespān (IAIII)						