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Economies in Transformation: A Zooarchaeological Perspective from Early Iron Age Arslantepe (Southeastern Türkiye)

FEDERICO MANUELLI – GIOVANNI SIRACUSANO*

Abstract

The transition from the Late Bronze to the Iron Age is considered a period of great turmoil and profound changes in the whole eastern Mediterranean. Large political and cultural transformations are attested as well as mobility and interrelations of human groups. But how these affected the subsistence economy of the societies involved is a topic that has not yet been precisely discussed in the literature. Recent excavations carried out at the site of Arslantepe have generated interesting new data that can shed fresh light on this question. This article presents the main characteristics of the Early Iron Age zooarchaeological remains unearthed at Arslantepe. A diachronic analysis of the Late Bronze Age material and comparisons with other sites and regions will help to highlight wider potential transformations in agropastoral habits and associated craft productions during the last centuries of the second millennium BC. The contribution improves our understanding of the changes that occurred in the agro-production patterns of a site that was

Öz

Geç Tunç Çağı'ndan Demir Çağı'na geçiş, tüm Doğu Akdeniz Havzasında büyük kargaşa ve köklü değişimlerin olduğu bir dönem olarak kabul edilir. Büyük siyasi ve kültürel dönüşümler, insan gruplarının yoğun hareketliliği ve aralarındaki ilişkilerle doğrulanmaktadır, ancak bunların ilgili toplumların geçim ekonomisini nasıl etkilediği literatürde henüz tam olarak tartışılmamış bir konudur. Arslantepe Höyüğü'nde yapılan son kazılar, bu soruya ışık tutabilecek ilginç yeni veriler ortaya çıkardı. Bu makale, Arslantepe'de ortaya çıkarılan Erken Demir Çağı zooarkeolojik kalıntılarının temel özelliklerini ortaya koymaktadır. Böylelikle, Geç Tunç Çağı materyalinin diakronik analizi, diğer alanlar ve bölgelerle yapılan karşılaştırmalar, MÖ 2. binyılın son yüzyıllarında gerçekleşen tarım ve hayvancılık biçimleri ve ilişkili zanaat üretimlerinde daha geniş potansiyel dönüşümleri anlamaya yardımcı olacaktır. Ayrıca, Erken Hitit etki alanının sınırında ve daha sonra etkin, bağımsız Demir Çağı krallıklarından birinin başkenti olan bir yerleşimin,

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first at the margin of the Hittite sphere of influence and later the capital of one of the most influential independent Iron Age kingdoms.

Keywords: Euphrates, Arslantepe, Iron Age, Hittite, zooarchaeology, continuity and change

tarımsal üretim kalıplarında meydana gelen değişiklikleri anlamamıza katkı sağlayacaktır.

Anahtar Kelimeler: Fırat, Arslantepe, Demir Çağı, Hitit, zooarkeoloji, süreklilik ve değişim

Transformations in the Subsistence Economy at the End of the Second Millennium BC in the Syro-Anatolian Region

The beginning of the Iron Age in the eastern Mediterranean region is a period characterized by widespread transformations. The breakdown of the Late Bronze Age palace economies and the establishment of the new independent local powers, which occurred during the last centuries of the second millennium BC, have been analyzed by scholars from many perspectives and with different aims.¹ Archaeological and philological evidence coming from the Syro-Anatolian territory, i.e., the area including southeastern Türkiye and northern Syria, show that the emerging Iron Age societies arose by combining enduring aspects of the Bronze Age cultures with completely innovative elements. This is particularly evident when we consider the Euphrates region. Indeed, during the Late Bronze Age, this area was deeply influenced by the expansion of the Hittite civilization, while later became the core region where some of the main local Iron Age polities (the so-called Neo-Hittite Kingdoms) originated and developed, thereby inheriting the cultural legacy of the empire.²

This intertwining of continuity and change, derived from the blend of local and foreign agencies, also affected the political economy of the communities involved in this process. In this context, the diachronic analysis of zooarchaeological remains represents an essential instrument for understanding the social and economic status of the Syro-Anatolian societies during the tumultuous last centuries of the second millennium BC. Indeed, the analysis of animal bones represents the most tangible evidence of changes in human-animal interaction, since they are directly interrelated with the reconstruction of pastoral patterns.³ Moreover, identifying processes of transformations in animal husbandry and exploitation at the Late Bronze Age-Iron Age transition can provide significant information on how the staple economy developed in a moment of political change and turmoil, as well as offer answers to questions such as: What visible traces might political changes leave on our archaeological records? What do these data tell us about the relationships between political and economic systems? Was the primary economy used by the ruling classes as a possible means of control and power?

These topics have usually been investigated in terms of various categories of remains. Pottery is certainly the class of material that, due to its nature, abundance and long-lasting tradition of study, is mostly used to provide answers related to the socio-economic conditions of ancient societies.⁴ However, the analysis of subsistence strategies largely drawing on faunal, archaeobotanical and paleo-environmental remains is gradually contributing to improving our knowledge of the economic, political and climatic changes in the Syro-Anatolian region during these crucial centuries.

¹ Knapp and Manning 2016.

² Hawkins and Weeden 2016; Brown and Wilkinson 2017.

³ Greenfield 2005.

⁴ Mielke 2016.

The combination of archaeological investigations, philological studies, and natural science has allowed over the years to reconstruct the ecological and economic background of the Hittite civilization.⁵ The existence of large-scale storage facilities brought to light at many of the Hittite sites within the Anatolian plateau certainly implies the existence of a centralized system based on the accumulation and redistribution of staple products.⁶ At the same time, the geographical features of the region, which is divided by mountain ranges into small topographic units, and the clear limitation of long-distance commodities trading suggest that the subsistence economy of the Hittite cities was mostly organized on a regional scale.⁷ The situation is rather more difficult to trace when we move outside of the main urban centers of the central Anatolian plateau. Indeed, the subsistence strategies of rural settlements and sites located at marginal areas under the Hittite influence could strictly be affected by local differences and aspects of regionalism.⁸ Because of the above-mentioned geographic conditions and the increasing necessity of “feeding” large cities, the Hittite economic system has been always considered very fragile.⁹ It is nowadays evident that this instability, gradually worsened by climatic, political, demographic, and ideological difficulties, was one of the stress factors that brought about the abrupt collapse of the Hittite civilization at the turn of the 12th century BC.¹⁰

The political vacuum created by the disappearance of the Hittite power had the consequence of pushing some of its former peripheries, especially those in south and southeastern Anatolia as well as western Syria, to move towards local autonomy and prosperity. Indeed, the Late Bronze Age crisis only marginally affected these decentralized regions, giving their ruling classes an opportunity to take advantage of the lack of a central authority.¹¹

To some extent the economic dimension of the new Iron Age independent kingdoms was certainly rooted into the previous Hittite tradition, as is shown by the partial survival of practices of centralization of staple products.¹² Nonetheless, the fragmented political framework of the Iron Age realms unquestionably suggests the presence of spatial variations and small-scale organizations.¹³ Indeed, analyses of animal exploitation and crop cultivation from sites in southern Anatolia and northern Levant show a situation mostly marked by regional and local traits.¹⁴ Unfortunately, to date a chronic lack of published data and the many chronological issues related to the discrepancies when matching the sequences of ongoing projects with the results of old excavations have rarely allowed the research to go beyond intra-site scales of analysis and to properly compare and define the various aspects of Late Bronze Age continuity and the imposition of new patterns.

The situation of the Euphrates territory is emblematic in this regard. Investigations on the Late Bronze and Iron Age levels at the main sites of the region were mostly conducted during the first decades of the 20th century AD, generally focusing on their abundant artistic

⁵ Dörfler et al. 2011; Dörfler 2018; Corti 2020.

⁶ Mielke 2011, 176-78; Diffey et al. 2017; Seheer 2018, 66-73, 85-87.

⁷ Schachner 2017, 42-43.

⁸ Berthon 2017.

⁹ Schachner 2020, 391-97.

¹⁰ De Martino 2018.

¹¹ Manuelli and Mori 2016, 229-34.

¹² Castellano 2018.

¹³ Kabatlar 2019-2020.

¹⁴ Karakaya and Riehl 2019-2020, 137-41; Riehl and Nesbitt 2003; Ikram 2003.

heritage.¹⁵ The recent resumption of excavations and the establishment of new projects and lines of research are gradually allowing the scholarship to shift focus towards a comprehensive understanding of the manifold aspects of development that affected these societies during the late second and early first millennium BC.¹⁶

This article presents the main characteristics of the Early Iron Age zooarchaeological remains recently brought to light at the site of Arslantepe. A diachronic analysis of the Late Bronze Age material and comparisons with other sites and regions will also offer the possibility to better comprehend the changes that occurred in the agro-production patterns of a site that was first at the margin of the Hittite sphere of influence and later the capital of one of the most influential independent Iron Age kingdoms.

The Early Iron Age at Arslantepe: A Sketch of its History and Excavations

The mound of Arslantepe is located in eastern Anatolia (Malatya, Türkiye), a few kilometers from the Euphrates river. The site lies between the Taurus and the Anti-Taurus chains at 912 meters above sea level at the southern margin of the fertile Malatya plain (fig. 1). The first round of excavations was conducted at the site during the 1930s by a French team directed by Louis Delaporte, which brought attention to the importance and monumentality of the Iron Age settlement.¹⁷ The Italian Archaeological Expedition in Eastern Anatolia (MAIAO) began working at Arslantepe in 1961, continuing and deepening the investigations on the northern slopes of the mound started by the French and reaching the Late Bronze Age phases.¹⁸ In 1971 the activities switched to the southern slopes of the site where a long-lasting project of excavations was able to unearth over the years a sequence stretching from the end of the fifth millennium BC to the Byzantine era, including the astonishing and unique remains of the renowned Late Chalcolithic palace that recently led to the site's inclusion in the UNESCO Heritage List.¹⁹ This provoked a gradual decrease of interest in the historical phases of the site, which have been investigated only sporadically.

In 2008 a new project of excavation and study of the Late Bronze and Iron Age levels started with the intent of shedding fresh light on the development of the site during these crucial centuries.²⁰ As a matter of fact, the historical relevance of Arslantepe during the late second and early first millennia BC was almost exclusively recognized by scholarship because of the remains of the “Lions Gate” discovered by Delaporte and its extraordinary set of figurative bas-reliefs as well as contemporaneous inscriptions distributed in the countryside west of the site.²¹ The in-depth study of the Luwian hieroglyphic inscriptions carved on many of these monuments has allowed scholars to assign to Arslantepe and its territory a very significant role within the formation of the Neo-Hittite realms.

In summary, during the Late Bronze Age the site was attested only sporadically in the Hittite cuneiform texts with the name of Maldiya/Malitya (14th-13th century BC).²² On the

¹⁵ Bryce 2012, 83-121; Blanchard 2019.

¹⁶ Osborne 2021, 19-29.

¹⁷ Delaporte 1940.

¹⁸ Pecorella 1975.

¹⁹ Frangipane 2019a, 2019b.

²⁰ Liverani 2012; Frangipane and Liverani 2013.

²¹ Hawkins 2000, 282-329.

²² De Martino 2012; Manuelli 2013, 413-18.

other hand, the local Early Iron Age sources often reference the powerful kingdom of Malizi and its namesake capital, i.e., Arslantepe (12th-10th century BC), whose domain extended to the vast valleys surrounding the Malatya plain.²³ The relevance of Arslantepe to the Late Bronze-Iron Age transition is further underlined by the fact that the first Iron Age rulers at the site were genealogically related to the sovereigns of Karkemiš, whose bloodline was the same as the last kings of the Hittite Empire.²⁴ During the first centuries of the first millennium BC, the site gradually acquired more relevance, finding its own independence from Karkemiš and being internationally acknowledged with the name of Melid (ninth-seventh century BC), as is known from Assyrian and Urartian sources.²⁵

The recent results of the new project of excavations have, on the one hand, confirmed the reconstruction of the historical events established through the study of the above-mentioned sources and, on the other hand, produced detailed new data for the creation of a more comprehensive picture of the history of the site. The excavation - carried out from 2008 to 2010 and again in 2015 and 2016 in the F-G sector, which adjoins and partially overlaps the old trenches investigated by the French and the first Italian expeditions - identified three main Early Iron Age archaeological levels.²⁶ This allowed some of the old discoveries to be integrated into the new excavation sequence. The latter has been also recently provided with a quite large set of radiocarbon dates that have been used to establish an accurate absolute chronology of the beginning of the Iron Age, stretching from 1250 to 850 BC (fig. 2).²⁷

Level IIIA.1 (ca. 1250-1200 BC) represents a proper intermediate and transitional phase between the advanced Late Bronze Age and the beginning of the Iron Age. It is characterized by the presence of two large rooms with thick walls made of greenish-colored mud bricks (the so-called “green buildings”).²⁸ No traces of a final destruction by fire have been recognized, and the rooms were intentionally filled, probably following their collapse. Underneath the rooms, traces of a round structure filled with mud-brick pieces, probably the remains of a tower related to a fortification system, have been discovered. Despite the fact that the exact relationship between the two rooms and the tower is not completely clear yet, the use in all structures of green-colored bricks and the absence of any burnt traces suggest the existence of one single level characterized by several phases of construction.

The “green buildings” have been found sealed by a mud-plastered floor associated with an imposing fortification wall of mud-bricks and stone foundations, which represents the main structure of level IIIA.2 (ca. 1200-1000 BC).²⁹ The wall was four meters wide and has been preserved for a length of 40 meters and a height of up to four meters including the foundation. The downfall of the fortification was particularly catastrophic, as a thick layer of heavily burnt debris stemming from its collapse has been found over a large area. A monumental gate was probably to be found in the vicinity of the excavated portion of the wall, as is corroborated by the discovery of two figurative bas-reliefs on the floor surface associated with the fortification.

²³ Hawkins 2000, 282-88; Bryce 2012, 98-106.

²⁴ Hawkins and Weeden 2016, 9-13; Manuelli and Mori 2016, 212-16; Simon 2020, 152-56.

²⁵ Hawkins 2000, 284-86; Di Filippo and Mori 2018, 46-47.

²⁶ Frangipane et al. 2020, 77-86.

²⁷ Manuelli et al. 2021.

²⁸ Frangipane et al. 2020, 77-78; Manuelli 2020, 115-17.

²⁹ Frangipane et al. 2020, 79-80. Manuelli and Mori 2016, 216-22.

During the following IIIB level (ca. 1000-850 BC), the fortification wall was reused after destruction, but a complete new set-up of this part of the settlement appears.³⁰ A series of large silos and pits, cutting the collapse layer of the fortification wall, has been discovered. The silos had circular or roughly elliptical shapes and were up to four meters in diameter. Their inner surface shows traces of a thick chaff plaster and of internal partitions and installations, indicating a probable use for storing cereals and suggesting that the entire area close to the city wall was devoted in this period to storage activities. However, silos and pits have both been found filled with earth and debris, which means that the area was later used as dump.

From 2008 onwards the field activity was also accompanied by an intensive study and reappraisal of materials and architectures from old excavations. This led firstly to the reconstruction of an even longer occupation of this part of the site and a better understanding of the earlier Late Bronze Age phases.³¹ Indeed, level IIIA.1 directly overlaps the final destruction of the so-called Hittite imperial gate and related fortification wall of the 14th and early 13th centuries BC (level IV), marking the existence of an unbroken sequence and implying that the citadel of Arslantepe was continuously fortified for at least 500 years. Moreover, the analysis allowed a more detailed comprehension of the development of the material belonging to these phases.³² The material culture and especially the pottery production from level IV testify to a clear connection with the typical Hittite central Anatolian sphere of influence. Aspects of continuity of this tradition as well as the introduction of completely new cultural features are visible in material from level IIIA.1 and IIIA.2. A new set of pottery shapes, especially trefoil jugs, handled jars, small squat body cooking-pots and neckless pithoi, as well as the conspicuous appearance of clay spool-shaped loom weights, reflect remarkable connections with material dated from the end of the Late Bronze Age to the Iron Age I in the Levantine region. Connections with the Levant increase in level IIIB, as is especially shown by the introduction and subsequent spread of red-slip wares.

The results of the archaeozoological remains brought to light from the above-mentioned Early Iron Age levels excavated in the F-G sector at Arslantepe will be presented in the following pages. A set of contemporary material coming from the old Italian excavations at the site, selected because of their reliability and the fact that they can be unequivocally associated with the new excavated levels, has been also integrated into the analysis. Moreover, the already published Late Bronze Age zoological material will be used to highlight wider transformations in agropastoral habits during the last centuries of the second millennium BC.³³

A couple of important remarks should be stressed before entering into the details of the analysis. First of all, the Iron Age sequence at Arslantepe is longer than the section taken into consideration for this study. Indeed, on top of the structures belonging to level IIIB, important remains of the Middle and Late Iron Age (ca. 850-650 BC) have been discovered.³⁴ Moreover, from 2016 a new excavation sector (H-I) has been opened towards the inner citadel to investigate the Iron Age sequence in the innermost area of the site.³⁵ Here during the 2019 campaign the monumental remains of structures likely dated to the late 11th and the 10th century BC,

³⁰ Frangipane et al. 2020, 81-86.

³¹ Manuelli 2013.

³² Manuelli 2018.

³³ Bartosiewicz et al. 2013.

³⁴ Liverani 2012; Frangipane et al. 2020, 86-92; Manuelli 2020, 113-18.

³⁵ Frangipane et al. 2019, 27-30; 2020, 72-92.

which are coeval to the final-level IIIA.2 and to level IIIB of the F-G sector, have been brought to light. Despite their relevance for the development of the site during these centuries, the remains coming from these layers have not been included in this analysis and will be the focus of future contributions.

The Archaeozoological Analysis

Assemblage and Methods

A total amount of 5,415 bone fragments, belonging to levels IIIA.1, IIIA.2, and IIIB excavated in the F-G sector, have been analyzed. Each fragment has been hand-collected directly from the field, labelled and classified taxonomically and anatomically as well as tabulated in an Excel worksheet. Those bones, whose provenance was archaeologically or stratigraphically unreliable, were discarded. The collection was also enriched by the integration of the data from the old excavations processed in the past by Sándor Bökönyi. This allowed us to reach a total amount of 6,880 specimens (table 1). Inter-observer bias was already appraised in Early Bronze Age and Late Bronze Age animal remains from Arslantepe. Differences in previously unrecorded patterns of fragmentation as well as varying levels of taxonomic resolution have been noted, but always yielded to comparable and reliable results.³⁶

The method chosen to reconstruct the amount of different animal taxa is based on the Number of Identifiable Specimens (NISP), which provides a more direct and reliable approximation of the original data.³⁷ When the bones clearly constitute a substantial portion of the same skeleton, they were counted as a single unit in the NISP. In case of concrete difficulties in distinguishing closely related species, samples have been considered within the same taxonomic unit as sub-family (e.g., Caprines for Capra vs. Ovis) or family (e.g., Cervids or Equids).³⁸

Standard criteria have been applied for bone measurements and epiphyseal fusion determinations,³⁹ while age estimation was done using the eruption and wear stage from the lower and upper teeth of sheep, goats, pigs and cattle.⁴⁰ Age groups have been distinguished by means of two different graphic systems: First, the kill-off pattern, based on the mandibular tooth eruption and the reduction of tooth crown heights, which allows us to highlight the size of the killed individual or population of a flock or herd;⁴¹ second, the survival curve derived from the analysis of the fusion of the epiphyses for caprines, which shows the effects of selective eliminations by analyzing the surviving individuals that are *in vivo* on a given animal population.⁴²

In order to obtain greater details on food preferences and edibility, body parts have been grouped in different sets of anatomical portions. Finally, sex ratio has been, first of all, determined for those bones which allowed morphological evaluation and then were integrated with the bimodal distribution of portions of fused bones. This allows us to show sexual dimorphism, with smaller individuals representing the females and the larger ones the

³⁶ Bartosiewicz 1998, 228-29; Bartosiewicz et al. 2013, 275-76.

³⁷ Grayson 1984, 202; Lyman 2008, 348.

³⁸ Boessneck 1969; Payne 1985; Halstead et al. 2002.

³⁹ von den Driesch 1976, 148; Eisenmann 1986; Bullock and Rackham 1982.

⁴⁰ Payne 1973; Deniz and Payne 1982; Vigne and Helmer 2007, 17, table 1; Grant 1982; Bull and Payne 1982.

⁴¹ Cribb 1984, 161; Payne 1973; Ducos 1968, 233-37; Vigne and Helmer 2007, 20-21, fig. 2.

⁴² Zeder 2001, 2006.

males.⁴³ The overlaps have been controlled by taking into consideration those measurements that formed clearly separate sets of data.⁴⁴

Animal Husbandry

Subsistence livestock in ancient Anatolia and throughout the history of Arslantepe was always dominated by flocks, mostly represented by sheep. The impact of the Hittite expansion on the territories of the upper Euphrates had clear effects on the animal husbandry.⁴⁵ The contact with the Hittite culture, which began during the second quarter of the second millennium BC, is manifested at Arslantepe (level IV), especially with the increase of cattle breeding.⁴⁶ Although there are no relevant variations suggesting radical changes in the pastoral economy, one interesting find is the increase of pigs, previously rare, which reach 9% of herds in this period.⁴⁷ Another important point is the appearance during the Late Bronze Age of horses and donkeys.⁴⁸ Despite the fact that it was probably not linked to the consumption of meat, their presence represents a revolutionary novelty in the pastoral economy of the territories of the upper Euphrates during the period of Hittite expansion.

The transition to the Iron Age (Arslantepe IIIA.1) as well as to the Early Iron I and II levels (Arslantepe IIIA.2 and IIIB) show in general a strong continuity with what has been just described, and no major variations are detectable in the pastoral and subsistence economy of Arslantepe between the Late Bronze and the Early Iron Age assemblages (fig. 3). Compared to the Late Bronze Age II, the clearest changes are the progressive decrease of pigs and a fluctuation in the ratio of cattle to caprines. Indeed, in level IIIA.1 an increase of the flocks, mainly due to a rise of sheep over goats (ratio 4:1), is noticeable. In level IIIA.2 there is instead a return to the proportions between cattle and goats observed at the end of the Late Bronze Age, while in level IIIB a return to the conditions of the transitional period has been seen. In addition, the ratio of sheep to goats progressively halves over time, reaching about 2:1. As for equids, while in level IIIA.1 there is a substantial numerical balance between horses and donkeys, in levels IIIA.2 and IIIB the number of donkeys clearly exceeds that of horses.

Mortality Rates and Survivorship

The analysis of the age classes of caprines, identified by dental growth and wear as well as by epiphyseal fusion, shows rather interesting results (table 2).⁴⁹ In order to integrate into the analysis the data elaborated in the past by S. Bököny so as to provide a greater numerical consistency in the sample used, it was decided to consider the ages of individual bones by assigning them to four general age classes: J (infant-juvenile, <12 months), Sb (subadult-immature, one-two years), A (adult, two-six years), and M (mature-senile, >six years).⁵⁰

⁴³ Makarewicz 2009.

⁴⁴ O'Connor 2006.

⁴⁵ Bartosiewicz et al. 2013.

⁴⁶ Bartosiewicz et al. 2013, 276-80, fig. 6.1.

⁴⁷ Bartosiewicz et al. 2013, 276-78, fig. 6.1.

⁴⁸ Bartosiewicz et al. 2013, 276-80, fig. 6.1.

⁴⁹ As far as dental wear is concerned, we applied Payne's method (1973) for the mandibular teeth integrated with Vigne and Helmer's approach (2007, table 1) for the crown height of the cheek teeth, and Ducos (1968) for the upper teeth. The data on epiphyseal fusion from post-cranial elements of sheep and goats have been calculated following Redding's "fusion score" (1981, 248) per skeletal element multiplied by 100 according to Zeder (1991, 91).

⁵⁰ Greenfield and Arnold 2008, 838.

It is first of all interesting to point out that during the Late Bronze Age mortality profiles based on dental analysis showed a wide range of use of caprine products. In this period and in continuity with the earlier phases at the site, a culling of lambs between three and 12 months has been acknowledged, as well as a growth exploitation of the secondary products.⁵¹ The kill-off patterns of levels IIIA.1 and IIIA.2 show a consistent selection of animals in adulthood, roughly corresponding to the time when, for females, milk production tends to decline (fig. 4). In level IIIB, on the other hand, an early increase in the culling between one and two years is observed, with relative shifting of the production interest towards the consumption of younger and more tender meat.

These data emphasize, first of all, a strong continuity with what has already been observed during the Late Bronze Age and confirm how the breeding practices during the second half of the second millennium BC at Arslantepe were not only addressed to the exploitation of meat and milk but also to the production of wool. This is demonstrated by the constant persistence in the flock of a high number of adult individuals. It is also noted that, despite the fact that in level IIIB this trend partially changes because of considerable growth in the quantity of eliminations of juveniles, the culling of adults always remains high. Furthermore, when we compare the mortality trend of each of the three examined phases with the average of the entire period using the Size Log Index (SLI),⁵² the evolution of cull management becomes even more evident (fig. 5). In levels IIIA.1 and IIIA.2, in fact, a situation of continuity with what was observed during the Late Bronze Age emerges and might be associated with a predominant interest in wool exploitation.⁵³ The logarithm changes instead significantly in level IIIB, when the interest of caprine production seems to shift more towards meat consumption.

Body-Size and Sex Ratio

As far as sheep are concerned, an average size between 60 and 65 cm at withers height has been found and falls within the standard of these species in the region and the earlier periods of Arslantepe.⁵⁴ On the other hand, the height at withers of cattle is between 120 and 130 cm.⁵⁵ In this case the measurements are slightly lower than those already noted at Arslantepe during the Early Bronze Age but similar to those of the Middle Bronze Age. This testifies once again to the uniformity of cattle breeding and pastoral practices during the second millennium BC.⁵⁶

The age at slaughter shows that the vast majority of animals were males (table 3). According to the morphological characteristics and the sexual dimorphism visible in the measurements of both cattle and goats (Bd/Bt humerus and Bd/Dd metapodius above all),⁵⁷ some change can be observed between levels IIIA and IIIB. As far as cattle are concerned, there is an increase in the number of females compared to males, which goes from 33% in level IIIA.1 to 43% in level IIIB. In the case of caprines, it is interesting to observe a difference between goats and sheep. In fact, for the former there is a predominance of males throughout the examined periods, while for the latter a drastic increase of females can be observed over time. However, it

⁵¹ Bartosiewicz et al. 2013, 282, fig. 6.5.

⁵² Meadow 1999.

⁵³ Payne 1973; Cribb 1984.

⁵⁴ Zeder 2008; Siracusano 2020, 593; forthcoming.

⁵⁵ The height at withers has been calculated following the coefficients of Matolcsi (1970) for cattle and Teichert (1975) for sheep.

⁵⁶ Bökönyi 1983, 585; Siracusano 2020, 593.

⁵⁷ Ruscillo 2014, 8003-6; Davis 2000, 374.

should be noted that for those samples from level IIIB where an association between sex and age was possible, young and sub-adult caprines were represented only by males, while adults were both male and female.

Body Portions

Skeletal body categories have been identified by assigning three values of meat production (A, B, and C) to each portion of the carcass.⁵⁸ The grouped bones have been placed in logarithmic relationship with anatomical proportions of a whole skeleton; the positive value indicates a greater presence of the skeletal structure (fig. 6).⁵⁹ The analysis shows some similarity between the distribution of these categories in levels IIIA.1 and IIIA.2. In fact, the bone remains reveal a prevalence of the most nutritionally important portions, while the portions with less edible value, such as the autopods (phalanx, carpal and tarsal bones), have a low incidence. It is certainly not unusual to assume that the smaller bones (autopods) of small ungulates (almost exclusively O/C) might have been easily dispersed by multiple taphonomic factors and be less represented compared to those of larger animals. However, the lower incidence of small bones is also detectable among large ungulates, suggesting that the analyzed bones belonged mostly to meal remains. This appears even clearer when we observe what happens in level IIIB, where a flattening of the histograms is observable. Indeed, the bone portions from this level correspond almost perfectly to those belonging to intact skeletons. Taking into consideration a more detailed subdivision in which the most delicious body portions consisting of forequarters and hindquarters are highlighted (fig. 7), it clearly appears that we are dealing with proper food waste. In fact, these remains represent the discards of whole carcasses, including both eaten and previously discarded portions, as if they had been slaughtered and consumed on site and then their remains all collected and dumped.

The Wild Taxa

The presence of wild animals at Arslantepe has always been sporadic. In general, wild taxa, mostly high-quality game such as deer, aurochs and wild caprines, do not exceed 3% of the total of NISP. However, it should be stressed that deer hunting has always been attested at the site.⁶⁰ The percentage of deer remains in levels IIIA.1 and IIIA.2 is in fact 60-70% of the wild animals (table 1). In level IIIB there is instead a decrease of deer to 40% with an increase of hares, aurochs, and wolves.

Big game hunting has been always marked at Arslantepe by the presence of exotic animals acknowledged for their value and rarity, such as bears (*Ursus arctos* L., 1758), lions (*Panthera leo* L., 1758), leopards (*Panthera pardus* L., 1758), elephants (*Elephas maximus* L., 1758) and even cheetahs (*Acinonyx jubatus cf. venaticus* Schreber, 1775), together with many other species of mammals and exotic birds. This has often suggested the presence at the site of elite hunting activity,⁶¹ a phenomenon motivated not by food needs, but by the acquisition of prestige in the social sphere.

⁵⁸ Uerpmann 1973. Category A consists of the most valuable parts, like humerus and femur (stylopodium), vertebrae, pelvic and scapular girdle. Category B consists of the skull bones (neurocranium), jaws, ribs, and zeugopodium (radius, ulna, tibia, fibula). Category C consists of the less valuable parts, like splanchnocranium (without mandibles), loose teeth and autopodium (carpal and metacarpal, tarsal and metatarsal bones, phalanges), as well as horn cores.

⁵⁹ Meadow 1999.

⁶⁰ Bökönyi 1993; Bartosiewicz 2010; Bartosiewicz et al. 2013.

⁶¹ Bökönyi 1985; Bartosiewicz 1998, 225; Siracusano 2012.

At the beginning of the Iron Age, besides the already mentioned presence of deer, we should also note the relatively large number of bears in level IIIA.1 and of wolves in level IIIB. It seems therefore that elite hunting mostly concerned deer during the Iron Age and probably aimed as well at the elimination of dangerous predators that could be a threat to domestic livestock. The increasing presence in level IIIB of hares - animals typical of cereal steppes - might confirm the greater intensity and extension of agricultural activities.

Agropastoral Economy at the Late Bronze-Iron Age Transition

In Hittite Anatolia the pastoral economy was based on the breeding of flocks.⁶² Their composition shows the strong prevalence of sheep over goats and marks a well-determined orientation towards the exploitation of primary and secondary products that supply well-being and prestige through the production of rams, milk and wool. Cattle are in general less represented but still comprised around 30% of domestic animals. The ratio of cattle to caprines is overall less than 1:2.⁶³

Outside the central Anatolian plateau the situation is much more variable. At Kilise Tepe, for instance, goats and sheep represent the vast majority of domestic animals, but goats predominate over sheep.⁶⁴ At Arslantepe the ratio between cattle and caprines is less than 1:2. But the contribution of the former is still quite consistent, suggesting that beef must have made up well over half of the meat consumed.⁶⁵ The fact that along the Euphrates cattle breeding was a more consolidated practice is also confirmed at Lidar Höyük, where their incidence ranges from 22 to 30% of domesticated animals.⁶⁶ On the other hand, cattle are generally much less attested in the western and southern territories, as confirmed at Gordion, Kilise Tepe and also at Tell Afis where they only account for about 10%.⁶⁷

Pig can be considered a sensitive cultural indicator, probably even more than cattle and caprines. Pigs were actually not popular in the Hittite world, as shown by the data from Boğazköy where in the Lower Town they had an incidence of 7%⁶⁸ and Kuşaklı where they did not reach 5%.⁶⁹ However, their presence had a certain relevance at Kaman-Kalehöyük, where they constituted 23% of the domestic animals⁷⁰ and also at Çadır Höyük where they reached 20%.⁷¹ In the southern, eastern and western Anatolian regions, pigs rarely reached 10%, as is shown at Kinet Höyük, Lidar Höyük, Korucutepe, Gordion, as well as at Tell Afis.⁷² This is also confirmed at Late Bronze Age Arslantepe where pigs range between 7 and 9%.

⁶² von den Driesch and Pöllath 2004, 22-23.

⁶³ von den Driesch and Boessneck 1981, 77; von den Driesch and Pöllath 2004, 79; Hollenstein and Middea 2016; Berthon 2017.

⁶⁴ Baker 2008.

⁶⁵ Bartosiewicz et al. 2013.

⁶⁶ Kussinger 1988.

⁶⁷ Zeder and Arter 1994; Baker 2008; Wilkens 1998, 443, table 1.

⁶⁸ Boessneck and von den Driesch 1975.

⁶⁹ von den Driesch and Vagedes 1997.

⁷⁰ Hongo 1993.

⁷¹ Arbuckle 2014; Steadman et al. 2019, 109-12; Ross et al. 2019.

⁷² Kabatlar 2017, 314-19; Kussinger 1988; Boessneck and von den Driesch 1975; Zeder and Arter 1994; Wilkens 1998, 443, table 1.

As mentioned, one of the main novelties observed among the bone collection of Arslantepe is the presence of equids. Although their incidence as meal remains does not exceed 1.5% within the Hittite sites, it seems well-established that the demand for horses, mules and donkeys must have been quite high both as mounts and beasts of burden.⁷³ Moreover, as the burials of horses and donkeys at Osmerkayası show, these animals must certainly have had some sort of special consideration within the Hittite world.⁷⁴

It is also interesting to note that mortality rate and survivorship analysis shows at Late Bronze Age Arslantepe a widespread maintenance of adult caprines. This probably pertains mostly to the production of wool. Stocking many males after their economically favorable age for meat production is actually a practice already attested in Anatolia during the Middle Bronze Age at Acemhöyük, where it was interpreted as a sign of intensive wool production.⁷⁵ Moreover, it is well-known that wool and woolen textiles were an essential component of the Old Assyrian Colony period.⁷⁶ A similar pattern also continues during the Hittite era, as can be seen in the Lower Town of Boğazköy where caprines in their second to fourth year predominate.⁷⁷ Similarly, at Kinet Höyük the major kill-off occurred in the two to three year-old group with a secondary kill-off seen for animals four to eight years age.⁷⁸

The geopolitical changes that followed the end of Hittite rule in Anatolia also testify to a rearrangement of the socioeconomic situation. From the point of view of subsistence, greater heterogeneity can be observed, especially in the most peripheral sites that had previously been only marginally touched by Hittite influence. At Arslantepe, the general structure of the livestock during the transitional IIIA.1 level does not show many changes compared to the Late Bronze Age II phase and is characterized by the scarcity of pigs and the abundance of cattle. Moreover, during the whole IIIA period the delay in caprine slaughter seems to emphasize, even more than in the Late Bronze Age, the exploitation of wool, which follows a trend that is similar to other Iron Age sites (table 4).

Unfortunately, there are limited comparisons available for the transitional period between the Late Bronze and Iron Age. At Arslantepe the ratio of cattle to caprines is the highest of the contemporaneous sites and comparable to Kinet Höyük and Kilise Tepe.⁷⁹ These animals therefore played a substantial role in the economy of these sites, and agriculture had a prominent importance. At Tell Sheikh Hamad, the ratio of cattle to caprines turns completely in favor of the second group.⁸⁰ But this may obviously stem from the fact that the site is located in the Syrian Jezirah region that is not only very distant from the other compared settlements but also lies within a different environmental system. In any case, it is interesting to note that all the available information led to the conclusion that the structure of the flocks everywhere clearly favored sheep. Besides being important for its direct meat consumption, this animal was indeed a valuable source of exchange for both its primary and secondary products. In fact, sheep seem to have less difficulty in moving along the numerous hydrographic basins and streams

⁷³ Dörfler et al. 2011.

⁷⁴ von den Driesch and Vagedes 1997, 131.

⁷⁵ Arbuckle 2006.

⁷⁶ Michel and Veenhof 2010.

⁷⁷ von den Driesch and Boessneck 1981, 35.

⁷⁸ Kabatlar 2017.

⁷⁹ Kabatlar 2017; Baker 2008.

⁸⁰ Becker 2008.

that characterize the Anatolian plateaus compared to goats. As a consequence, they offer greater chances of trade. Despite the fact that they only occasionally represent a food remain, the presence of equids is also significant in most of the above-mentioned sites.⁸¹ At Arslantepe, 80% of the equid remains have been identified as belonging to horses or donkeys. During the Late Bronze Age II, horses and donkeys were attested in about the same quantity (ratio 0.94:1), while in Arslantepe IIIA.1 a prevalence of the latter is noted (ratio 0.82:1). This could indicate, together with the presence of cattle, the importance of the rural context at the site.

Comparisons with the Early Iron Age are much more abundant than for the transitional phase. At Arslantepe IIIA.2 a strengthening of the above-mentioned pastoral practices is in general noticeable. Interesting affinities in the ratio between cattle and caprines are visible at Büyükkaya, while Gordion contrarily turns out to be the site where flocks have absolute dominance, representing over 90% of the livestock.⁸² At Karkemiš cattle are represented at 60%, but we must also consider that the numerical shortage of the sample is not sufficient for the result to be entirely comparable.⁸³ Once again, at Arslantepe as well as in the contemporaneous sites, flocks consist mainly of sheep (in a ratio of 3:1 to goats), with the exception of Tell Tayinat where goats prevail.⁸⁴ As far as equids are concerned, Arslantepe IIIA.2 still shows a clear predominance of donkeys, while at Karkemiš and Büyükkaya horses are in the majority.⁸⁵

The affinity in the amount of cattle previously outlined with Büyükkaya is still visible during Arslantepe IIIB. In general, caprines continue to be abundant and predominant everywhere, especially at Gordion, which shows again the lowest number of cattle.⁸⁶ The ratio of sheep to goats across all the contemporaneous sites favors sheep, to the extent of about 2-3:1, but with a clear increase in the number of goats compared to the previous periods. An exception is represented by Ziyaret Tepe, where goats are represented at about 75%. But it must be considered that the available data are rather limited.⁸⁷ Moreover, it is also interesting to note that at Arslantepe the ratio between horses and donkeys continues to be definitively in favor of the latter (ratio 1:4).

The development in caprine culling indicates that at Arslantepe IIIB the slaughter of sub-adult males mostly took place between the age of one and two years, while data from contemporaneous sites show an older age (table 4). However, considering that subadult males were already capable of producing a sufficient amount of wool,⁸⁸ their kill-off could testify to an attempt of optimizing the exploitation of fiber production before culling.⁸⁹ Moreover, the situation of Arslantepe IIIB does not show a distinct demographic profile dominated by adult rams and ewes, further suggesting an optimization towards wool production.⁹⁰

⁸¹ Kabatlar 2019-2020; Baker 2008; Becker 2008.

⁸² von den Driesch and Pöllath 2004, 79; Zeder and Arter 1994.

⁸³ Maini et al. 2018.

⁸⁴ Welton et al. 2019.

⁸⁵ Maini et al. 2018, 373-83; von den Driesch and Pöllath 2004, 79.

⁸⁶ Zeder and Arter 1994.

⁸⁷ Greenfield-Jongsma and Greenfield 2013.

⁸⁸ Halstead 1998.

⁸⁹ Payne 1973.

⁹⁰ Helmer et al. 2007.

Concluding Remarks

Despite the significant political transformations that occurred at the site towards the end of the second millennium BC, the agro-pastoral economy of Arslantepe does not show substantial changes during the centuries that encompass the end of the Bronze Age and the beginning of the Iron Age. The analyzed data indeed displays a strong continuity in the ratio of cattle to caprines and in the main characteristics of the herds, i.e., mortality, sex, and size, despite some obvious fluctuations between the phases under consideration. The few detectable variations in the presence of wild animals also seem to indicate that the territory surrounding the site was not affected by substantial changes.

However, when compared to the cases of other Anatolian sites and regions, some significant variability emerges. During the Late Bronze Age the Euphrates area shows that cattle breeding was well-established, partially differing from what is known from other regions of the Anatolian world. The relevance of equids at Arslantepe is also worth noting, which contrasts to the lower numbers of the Hittite core. However, on the other hand, pigs are interestingly attested in all the Anatolian territories taken into consideration. During the Early Iron Age there is more heterogeneity between the areas previously under the Hittite domain. In any case, it is remarkable to note that the general structure of the flocks tends to prefer the exploitation of sheep and that the presence of equids is attested at all the sites considered. At Arslantepe the low number of pigs continues over time. It is especially very significant to note the stability that characterizes cattle numbers and their culling profile throughout the examined period. In this regard, an important affinity with Büyükkaya is emphasized by the high amount of cattle remains. In more detail, body portions analysis shows at Arslantepe a perfect continuity between the end of the Late Bronze and the Early Iron Age. In levels IIIA.1 and IIIA.2, animal bones are predominantly characterized by the presence of the most edible portions. Therefore, it seems that the food remains can be attributed mainly to daily consumption, as is also supported by their contexts, which are almost exclusively fillings. On the other hand, in level IIIB the remains seem to represent almost entirely whole skeletons, i.e., entire carcasses of slaughtered animals and food remains accumulated over time. This is again further confirmed by the stratigraphy since, as mentioned, the silos of level IIIB were found filled with waste. This confirms that the entire area was used, in its final phase, as a proper dump. Yet these results might also reflect a progressive tendency at the site towards better use and organization of animal exploitation.

However, the most interesting result is certainly related to the mortality curve. In general, between the end of the Late Bronze and the Early Iron Age, great importance given to secondary products of livestock exploitation can be seen throughout the Anatolian world.

In Arslantepe IIIA.1 and IIIA.2 an important quantitative elimination of mature caprines can be observed. This corresponds to the time when milk production in females tends to decrease, following a pattern already attested at the end of the Late Bronze Age and also shared with other Early Iron Age sites. It testifies to the fact that, in addition to the interest in meat and milk, the production must have been strongly oriented towards a conspicuous use of wool. In Arslantepe IIIB, on the other hand, an early culling of caprines between one and two years of age shows an interest in the consumption of tender meat. However, the general trend of adult elimination continues.

In this respect, it is remarkable that starting with Arslantepe IIIA.1 and throughout the Early Iron Age levels at the site, there is a massive spread of tools for textile production. As

mentioned above, these are the so-called clay spool-shaped objects traditionally interpreted as loom weights for warp-weighted looms,⁹¹ although their multifunctional employment for many practices related to the use of the thread is plausible.⁹² Notably, these objects see an exponential increase throughout the whole eastern Mediterranean region during the Iron Age.⁹³ The simultaneous increase in the production of wool and weaving tools obviously cannot be a mere coincidence, but rather represents an important socio-economic aspect of Iron Age Arslantepe. The topic will be the focus of future research, but some interesting parallels and considerations already deserve to be introduced here.

The importance of textile activities and products, and especially the link between an increasing exploitation of animal fibers and the use of warp-weighted looms, has been seen in Iron Age Levant as a form of political and economic centralization and wealth construction as well as the proliferation of production and possible change in techniques.⁹⁴ From an historical viewpoint, it has been mostly interpreted in terms of satisfying the demands of Assyrian kings, whose appreciation for textiles produced by Levantine local industries was well-known.⁹⁵ A fascinating comparison with the case discussed here can be also noted with Early Chalcolithic Tell Sabi Abyad (ca. 5500-5000 BC) in northern Syria, where an increase in the age of slaughter of sheep and goats is accompanied by an abundance of spindle whorls.⁹⁶ Albeit very far in the past, it suggests a relationship between a caprine management that targets the fiber of adult animals and the development of spinning and weaving technologies.⁹⁷

Further implications for this topic can also be pursued at Arslantepe by looking at the change over time in the ratio between sheep and goats, with the latter becoming more prevalent towards the end of the Early Iron Age. That flocks in general were mainly composed of sheep is probably due to the gentle and gregarious nature of these animals, which made movement and exchange easier compared to goats. Indeed, the prominent role of goats in nomadic herds or small household contexts has usually been related to the possible exploitation of some specific products, such as milk or fleece for weaving tents and tarps.⁹⁸ However, it should be considered that the wool from goats could also be employed for high-quality products such as carpets, curtains, bags and other furnishings. Indeed, despite the fact that goat wool is thought to be coarser than that from sheep, the quality mostly depends on the age, sex, condition, and health of the animals instead of the species. And goat wool can also be very fine.⁹⁹ Moreover, the finest wool is not necessarily the best, since different types of wool can be associated with different types of fabric.¹⁰⁰ In this framework, it is very important to recall that the analysis of a textile fragment coming from the so-called “Royal Tomb” at Arslantepe dated to 3100-3000 BC demonstrated that the raw material was goat wool produced with an extremely fine fiber diameter and used in a very symbolic and highly prestigious context.¹⁰¹ Therefore, it is

⁹¹ Cecchini 2011.

⁹² Siennicka and Ulanowska 2016; Laurito and Manuelli 2020.

⁹³ Ramhstorf 2011.

⁹⁴ Nelson 2020.

⁹⁵ Boertien 2013, 27-31; Lumb 2014, 147-49.

⁹⁶ Arbuckle and Hammer 2019, 411.

⁹⁷ Russel 2010.

⁹⁸ Ryder 1993.

⁹⁹ Spinazzi Lucchesi 2018, 19; Andersson Strand 2014, 43-45; Schier and Pollock 2020.

¹⁰⁰ Andersson Strand 2012, 31.

¹⁰¹ Frangipane et al. 2009, 19-20.

probably not surprising that in a situation such as the final Early Iron Age at Arslantepe, in which there was an increase in the textile industry within a political context that facilitated exchanges and movements not only on an extra-local but also an extra-regional scale, there was an optimization in the use of wool as well as the exploitation of sheep and goats.

In conclusion, this study has shed new light on the still partially obscure ecological and economic background of the Syro-Anatolian society of the late second millennium BC. The analysis of the archaeozoological remains from Early Iron Age Arslantepe shows the importance of the accuracy and detail of taxonomic studies on faunal remains and the value of associating analyzed assemblages with contemporaneous craft artifacts in order to reconstruct more exact historical situations. On the one side, some significant transformation involved life in Iron Age Arslantepe, whose inhabitants were breeding more sheep and producing more wool, presumably for textile and carpets as well as acquiring more equids. This may also be related to the transport of these goods. On the other side, it should be noted that the subsistence economy of the site shows a general pattern of stability and firm continuity with the past. Indeed, the results obtained do not seem to evidence any drastic changes from the period when the site was under the political and cultural sphere of the Hittites to when it became the capital of the independent reign of Malizi/Melid. Rather, the analysis confirms the complex and multifaceted nature of this transitional phase in which agro-pastoral habits and human-animal interactions were marked by strong elements of continuity with the past. At the same time, it was affected by significant aspects of economic and behavioral transformations that characterized the whole eastern Mediterranean region at the turn of the first millennium BC.

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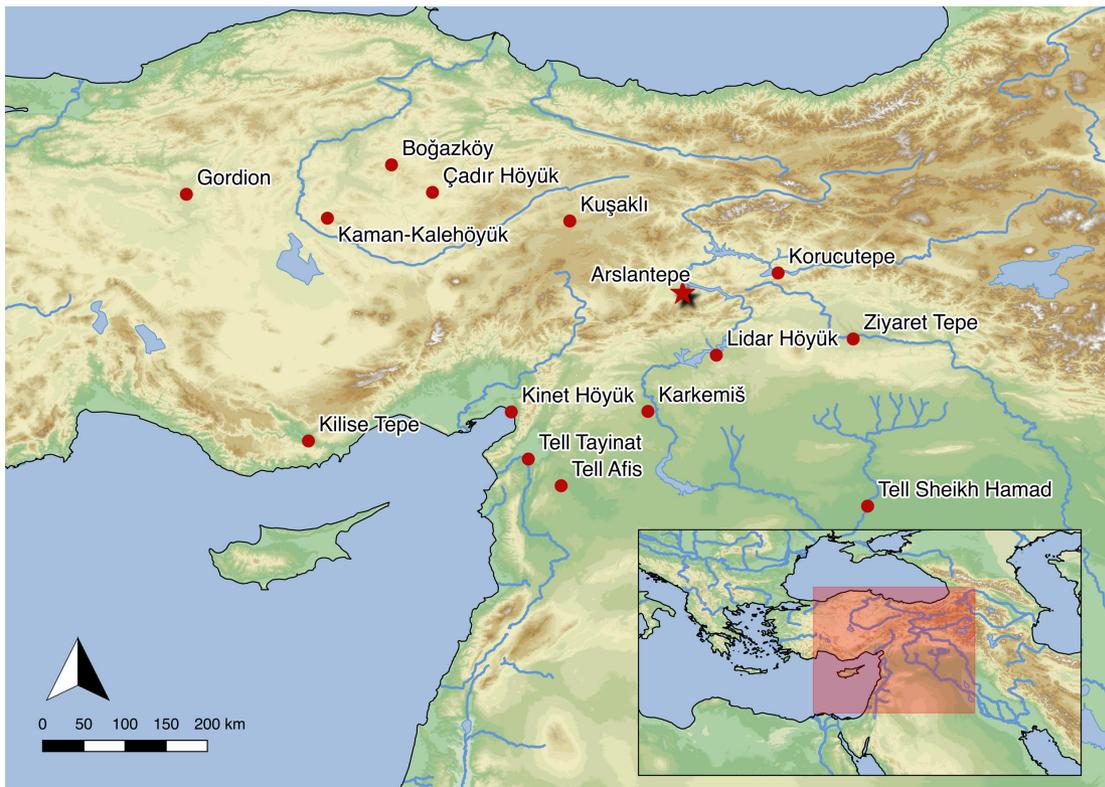


FIG. 1 Map of Anatolia and northern Syria with the main sites mentioned in the text (modified data courtesy of National Centers for Environmental Information – ETOPO1: doi:10.7289/V5C8276M, Natural Earth and Geo Network opensource).

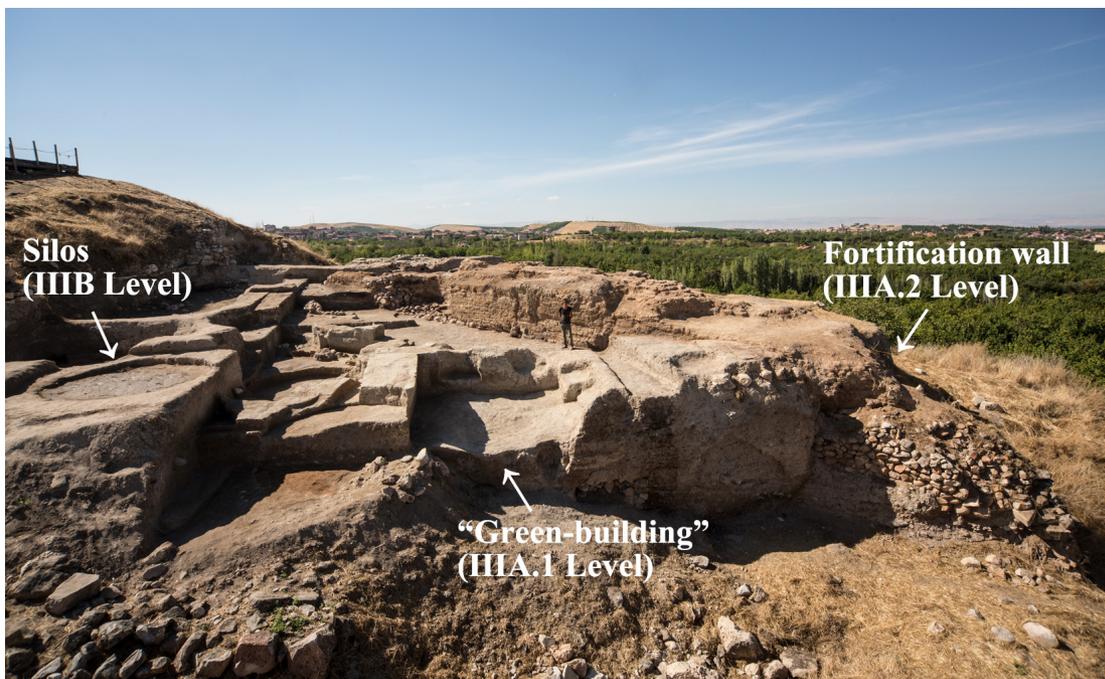


FIG. 2 Arslantepe, Early Iron Age monumental sequence (Photo: R. Ceccacci, ©MAIAO).

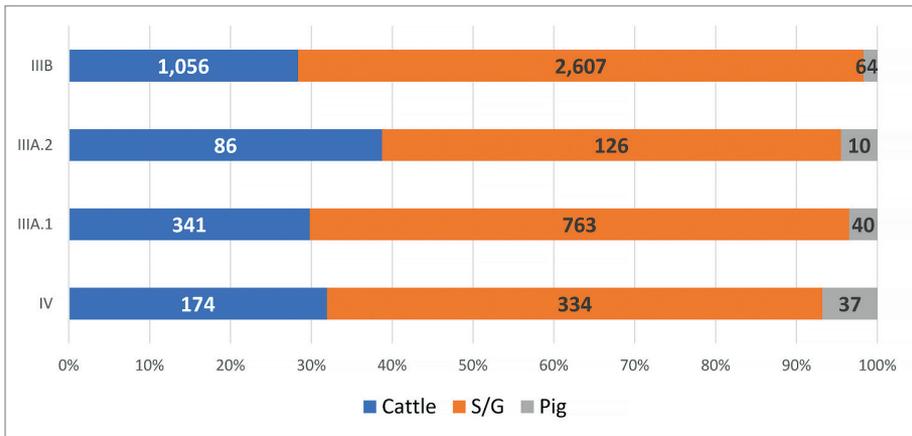


FIG. 3 Arslantepe, percentages of domestic ungulates (NISP) from Late Bronze Age II (Arslantepe IV) to Early Iron Age II (Arslantepe IIIB).

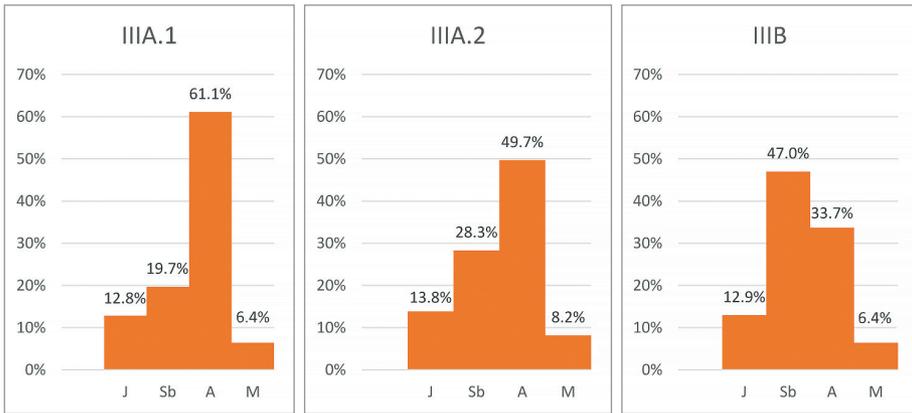
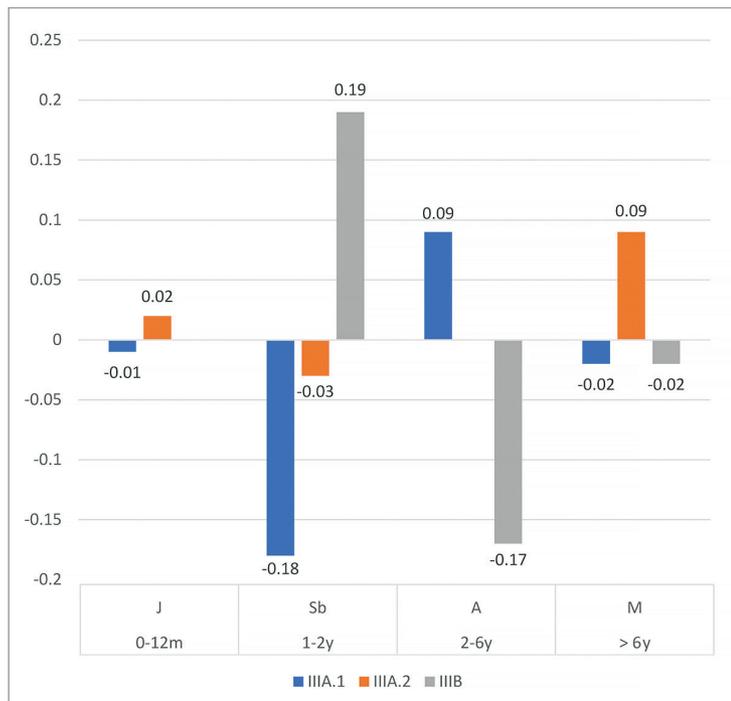


FIG. 4 Arslantepe, kill-off pattern histogram of caprines according to four general age classes: J (infant-juvenile <12 months), Sb (subadult-immature one-two years), A (adult two-six years), M (mature-senile > six years) distributed over the three analyzed levels (IIIA.1 = 203 specimens; IIIA.2 = 159 specimens; IIIB = 551 specimens).

FIG. 5 Arslantepe, logarithm comparing the mortality trend of each of the three examined phases with the average of the entire period using the Size Log Index (Meadow 1999). The x-coordinate 0 references the whole examined period.



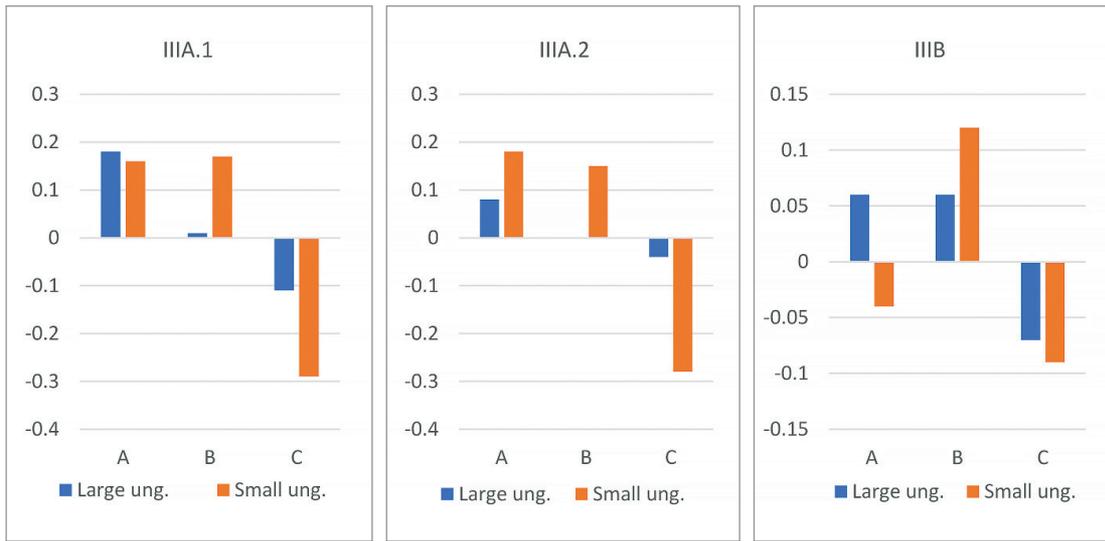


FIG. 6 Arslantepe, logarithm of the incidence of each meat category (A, B, C) in respect of an intact skeleton distributed over the three analyzed Early Iron Age levels.

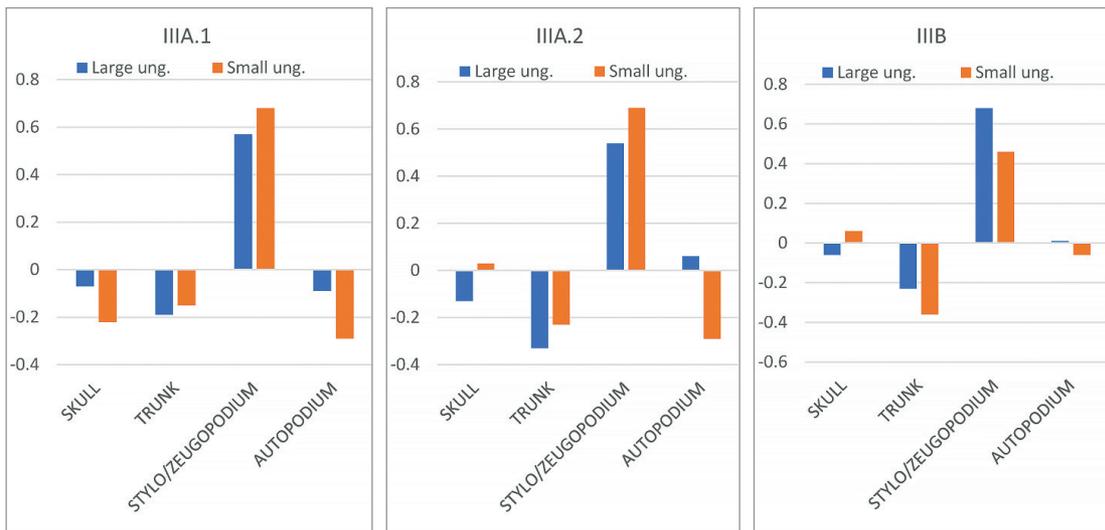


FIG. 7 Arslantepe, logarithm of body portion incidence distributed over the three analyzed Early Iron Age levels.

TAXA	ARSLANTEPE IIIA.1			ARSLANTEPE IIIA.2			ARSLANTEPE IIIB		
	NUM	%IIIA.1	%DOM	NUM	%IIIA.2	%DOM	NUM	%IIIB	%DOM
Horse (<i>Equus caballus</i>)	19	1.3%	1.5%	1	0.1%	0.1%	1	0.0%	0.0%
Donkey (<i>Equus asinus</i>)	22	1.5%	1.7%	23	2.1%	2.4%	4	0.1%	0.1%
Equids	8	0.5%	0.6%	6	0.6%	0.6%	15	0.3%	0.4%
Cattle (<i>Bos taurus</i>)	382	25.3%	30.2%	343	31.9%	35.7%	1,056	24.6%	28.1%
Sheep (<i>Ovis aries</i>)	131	8.7%	10.4%	88	8.2%	9.1%	330	7.7%	8.8%
Goat (<i>Capra hircus</i>)	35	2.3%	2.8%	29	2.7%	3.0%	154	3.6%	4.1%
S/G unid.	591	39.1%	46.8%	445	41.4%	46.3%	2,123	49.5%	56.5%
Pig (<i>Sus scrofa domestica</i>)	55	3.6%	4.4%	23	2.1%	2.4%	64	1.5%	1.7%
Dog (<i>Canis lupus familiaris</i>)	20	1.3%	1.6%	4	0.4%	0.4%	13	0.3%	0.3%
TOTAL DOMESTIC	1,263		DOM/WILD 92.0%	962		DOM/WILD 93.1%	3,760		DOM/WILD 98.3%
			%WILD			%WILD			%WILD
Aurochs (<i>Bos Primigenius</i>)	2	0.1%	1.8%	1	0.1%	1.4%	4	0.1%	6.2%
Wild caprine	4	0.3%	3.6%	10	0.9%	14.1%	4	0.1%	6.2%
Red deer (<i>Cervus elaphus</i>)	75	5.0%	68.2%	43	4.0%	60.6%	23	0.5%	35.4%
Roe deer (<i>Capreolus capreolus</i>)	1	0.1%	0.9%	0	0.0%	0.0%	2	0.0%	3.1%
Fallow deer (<i>Dama dama</i>)	7	0.5%	6.4%	8	0.7%	11.3%	1	0.0%	1.5%
Cervids	0	0.0%	0.0%	2	0.2%	2.8%	1	0.0%	1.5%
Wild boar (<i>Sus scrofa</i>)	5	0.3%	4.5%	1	0.1%	1.4%	2	0.0%	3.1%
Hare (<i>Lepus capensis</i>)	1	0.1%	0.9%	6	0.6%	8.5%	11	0.3%	16.9%
Brown bear (<i>Ursus arctos</i>)	13	0.9%	11.8%	0	0.0%	0.0%	8	0.2%	12.3%
Wolf (<i>Canis lupus</i>)	2	0.1%	1.8%	0	0.0%	0.0%	9	0.2%	13.8%
TOTAL BIG GAME	110			71			65		
Rodents	0	0.0%		0	0.0%		7	0.2%	
Aves sp.	2	0.1%		0	0.0%		9	0.2%	
Pisces sp.	0	0.0%		0	0.0%		10	0.2%	
Turtle (<i>Testudo graeca</i>)	3	0.2%		0	0.0%		7	0.2%	
TOTAL SMALL WILD	5			0			33		
TOTAL IDENTIFIED	1,378			1,033			3,858		
Large mammals	107	7.1%		29	2.7%		279	6.5%	
Large/medium mammals	31	2.1%		14	1.3%		144	3.4%	
Small mammals	1	0.1%		0	0.0%		44	1.0%	
TOTAL BONES	1,512			1,076			4,292		

TABLE 1 Arslantepe, Early Iron Age number of identifiable specimens (NISP) and their relative percentages. The specimens are grouped by levels (IIIA.1, IIIA.2, and IIIB) and sub-totals of taxa sets (domestic animals, big game hunting, small wild animals, and undefined mammals).

Age Category	Age Class	IIIA.1	%	IIIA.2	%	IIIB	%
A	0-2m	6	6%	0	0%	0	0%
B	2-6m	3.6	4%	0	0%	3.3	1%
C	6-12m	9.6	9%	8	12%	67.4	17%
D	1-2y	17.4	17%	11	16%	136.4	34%
E	2-3y	31.6	31%	22	32%	121.5	30%
F	3-4y	21.3	21%	22	32%	38.1	9%
G	4-6y	9.1	9%	4.4	6%	21.9	5%
H	6-8y	2.25	2%	1.35	2%	10.8	3%
I	8-10y	0.25	0%	0.75	1%	3.5	1%

TABLE 2 Arslantepe, caprine tooth wear and eruption following Payne (1973) and Vigne and Helmer (2007).

Period	Sex	Cattle	%	Sheep	%	Goat	%
IIIA	♂	24	66.7%	32	86.5%	15	71.4%
	♀	12	33.3%	5	13.5%	6	28.6%
TOT	RATIO ♂/♀	36	2.00	37	6.40	21	2.50
IIIB	♂	54	57.4%	39	55.7%	17	65.4%
	♀	40	42.6%	31	44.3%	9	34.6%
TOT	RATIO ♂/♀	94	1.35	70	1.26	26	1.89

TABLE 3 Arslantepe, sex ratio based on morphological features and sexual dimorphism.

Age Category	Age Class	Arslantepe IV	Lidar Höyük LBA	Arslantepe IIIA.1	Kinet Höyük 14-13	Kilise Tepe IId	Arslantepe IIIA.2	Arslantepe IIIB	Kinet Höyük 12	Kilise Tepe IIe	Kaman IId	Büyükkaya Eisenzeit	Cadır Höyük EIA
J	0-12m	14.5%	23.0%	13.0%	19.0%	42.0%	14.0%	13.0%	7.7%	38.0%	5.0%	17.3%	22.0%
Sb	1-2y	30.4%	21.0%	20.0%	19.9%	12.0%	28.0%	47.0%	13.8%	10.0%	15.0%	33.2%	18.0%
A	2-6y	49.3%	57.0%	61.0%	52.0%	38.0%	50.0%	34.0%	73.5%	50.0%	73.0%	45.7%	47.0%
M	> 6y	5.8%	0.0%	6.0%	9.2%	8.0%	8.0%	6.0%	5.1%	2.0%	8.0%	3.8%	13.0%

TABLE 4 Age classes grouped by period and compared to other sites quoted in the texts (data from Kussinger 1988; Kabatlar 2019-2020; Baker 2008; Hongo 1993; von den Driesch and Pöllath 2004; Ross et al. 2019).

