

Animal economy at Tell Arbid, north-east Syria, in the third millennium BC

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Abstract: *The main aim of this paper is to reconstruct animal economy at Tell Arbid in the 3rd millennium BC. The examined material consists of post-consumption bone remains retrieved from various contexts dated to the Ninevite 5, Early Dynastic III, Akkadian, and Post-Akkadian periods. Domesticated animals were the dominant species in all of the distinguished periods. Sheep and goat were the main species (~50%) followed by pig (~40%) and cattle (~10%). Starting in the Akkadian period there was a small increase in caprines and a concomitant decrease in pigs. The Arbidian animal economy was marginally supplemented by hunting wild animals (roe deer, gazelle, fallow deer, boar). Equids (onager, horse, donkey), canids (dog, jackal), and felids (domestic and wild cat, caracal) are represented in small numbers. The pattern of animal exploitation observed at Tell Arbid is comparable to the picture obtained for other Upper Khabur sites, although a significant share of pig (40–48%) is noticeable at the site during the 3rd millennium BC.*

Key words: Upper Khabur drainage, animal economy, pigs, cattle, caprines

Introduction

Tell Arbid is located in north-east Syria in the Upper Khabur valley. It has been excavated since 1996 by the Polish–Syrian archaeological expedition led by Piotr Bieliński (University of Warsaw). The site stretches over an area of about 40ha and comprises the main tell (~12ha), the so called lower town and several smaller mounds (**Figure 1**). The mound, which was settled over a few millennia, conceals remnants of occupations dating to the Ninevite 5 (~2900–2500 BC), Early Dynastic III (ED III, ~2500–2350 BC), Akkadian (~2350–2200 BC), Post-Akkadian (~2200–1900 BC), as well as Khabur ware (~1900–1500 BC) and Mitanni (~1500–1300) periods. After the Mitanni period, there was a hiatus that ended in the Neobabylonian period (~600–550 BC). The latest traces of occupation are dated to the Hellenistic period (~300–100 BC).

In the 3rd millennium BC, the neighbours of Tell Arbid—whose ancient name remains unknown—included among others, Nagar (modern Tell Brak), Nabada (modern Tell Beydar) and Urkesh (modern Tell Mozan). The settlement of Tell Arbid reached its greatest extent during the Ninevite 5 period. Residential districts of diverse character, dating to this period, have been discovered in different parts of the site. Apart from residential and household buildings, public or representative structures dated to the 3rd millennium BC have also been uncovered. Unique discoveries include a Ninevite 5 temple with a hearth and a podium at its center (in Area W) and a monumental building of an official character at the top of the tell, which may

have been the seat of local governance and administration in the 2nd half of the 3rd millennium BC (Bieliński 1998, 2002).

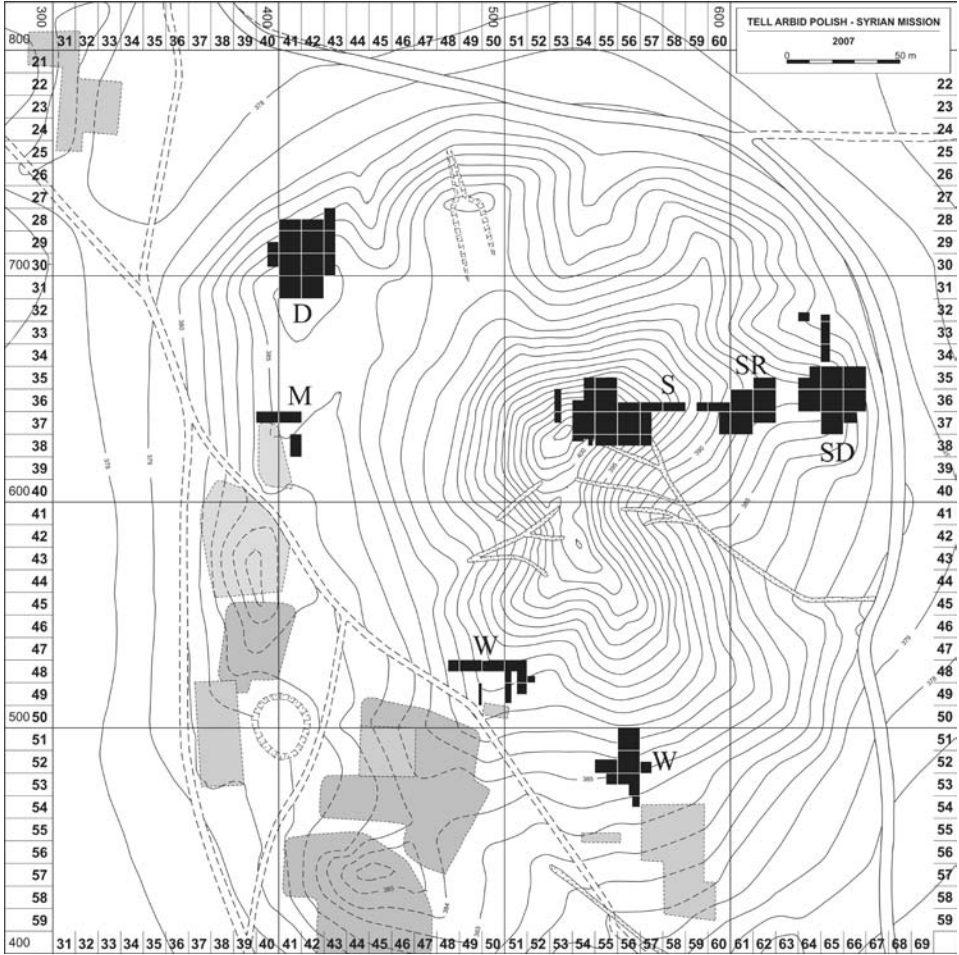


Figure 1. Contour map of Tell Arbid. Drawing by M. Momot.

Tell Arbid is located in the region of rain-fed agriculture. The 250mm rainfall isoheyet which runs to the south of Hassake, is the limit for rain-fed farming (Weiss 1986; Zeder 1995). Farming and animal breeding were the main economic strategies for the inhabitants of Tell Arbid. The majority of the populations in the region were farmers. Extensive areas were under cultivation; high yields were possible but there was also a high risk of loss because of the high inter-annual variability in precipitation (Weiss 1986). Cereals were the main crops on the Khabur plains. Barley was the leading grain crop in the dry-farming zone, followed by wheat and emmer (Weiss 1986; Wetterstrom 2003).

Faunal evidence from Tell Brak, Tell Leilan, and Tell Beydar has contributed to an overall understanding of animal economy in the Upper Khabur region (Weiss et al. 1993; Zeder

1995; Clutton-Brock et al. 2001; van Neer & de Cupere 2001; Dobney et al. 2003). In the 3rd millennium BC animal husbandry was only marginally supplemented with hunting. Caprines were the main domesticated livestock. Pigs were valued and were more important in the Upper Khabur region (15–60%) than in the Middle Khabur area (1–20%) (Zeder 1998b). Cattle rarely contributed more than 10–15% of the faunal remains.

The purpose of this paper is to reconstruct animal economy at Tell Arbid during the 3rd millennium BC, to define the patterns of animal exploitation and to place them within a broader regional context of north-east Syria. Animal bone remains from Tell Arbid offer the opportunity to examine animal economy in the local centre and to compare it to the dominant urban centres in the Upper Khabur area including Tell Brak, Tell Leilan and Tell Beydar. Tell Arbid represents an important source of information especially concerning the organization of animal economies during the Ninevite 5 period.

Material and methods

The examined material consisted of animal bones unearthed at Tell Arbid from the layers dated to the 3rd millennium BC. They were excavated from various contexts during excavations that took place between 1996 and 2006 (**Table 1**, **Figure 2**). The results of zooarchaeological analyses of bones excavated between 1996 and 2002 have been already published (Piątkowska-Matecka & Koliński 2006). The material analysed in the present paper derives from Ninevite 5 (VIIC), Early Dynastic III (VIIB), Akkadian (VIIA), and Post-Akkadian (VI) layers. Some of the bones were found in mixed, uncertain, and broadly dated layers, and these were excluded from the analysis.

Table 1. Number of Identified Specimens (NISP) for recognized taxa in post-consumption bone remains unearthed from the Ninevite 5 layers (VIIC), the Early Dynastic III layers (VIIB), the Akkadian layers (VIIA) and the Post-Akkadian layers (VI).

Zoological identification	VIIC		VIIB		VIIA		VI	
	n	%	n	%	n	%	n	%
Cattle	154	5.9	93	7.2	2	1.6	111	8.5
Pig	1165	44.9	615	47.9	52	41.3	517	39.6
Sheep/goat	1276	49.2	577	44.9	72	57.1	677	51.9
sheep	14		4				10	
goat	15		15				20	
Total	2595	100.0	1285	100.0	126	100.0	1305	100.0
Equids		30		25		12		87+2 donkey
Canids		1		3		7		
Felids						1		18
Wild boar		1				1		2
Large wild ruminant	1 red-deer		2				15 <i>Cervidae</i> ,	
Small wild ruminant	1 gazelle?		7				2 <i>Bovidae</i>	
Micromammal			12				9 gazelle, 4?	
Bird		4		1				
Fish		1						
Mollusc		41		33		3		74
Unidentified		1849		1033		132		1505

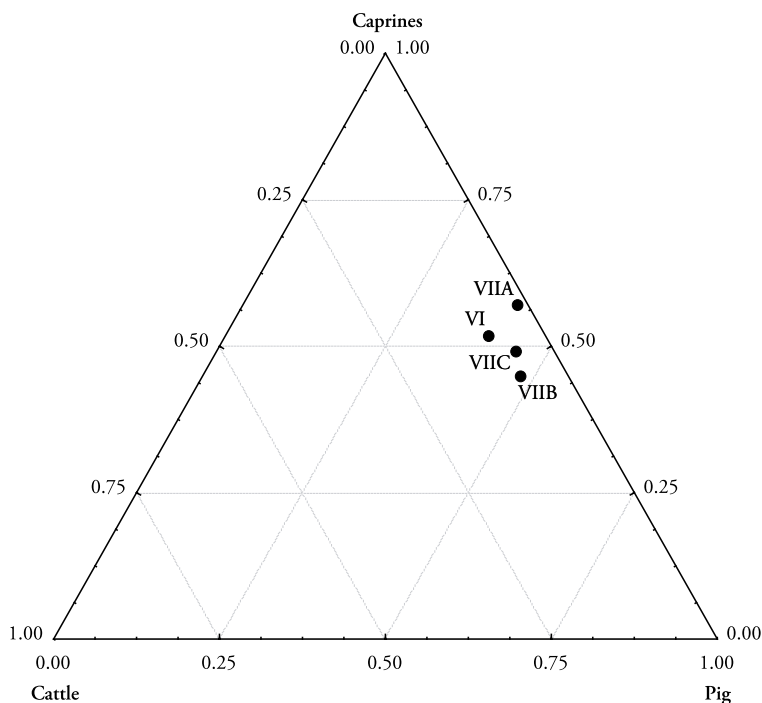


Figure 2. Ternary graph for the distribution of sheep/goat, pig, and cattle bone remains from various periods represented at Tell Arbid during the 3rd millennium BC: Ninevite 5 (VIIC), Early Dynastic III (VIIB), Akkadian (VIIA) and Post-Akkadian (VI).

The bones were generally in very poor condition; there were mainly small fragments. Most probably they were destroyed while the meat was being prepared for consumption and during the consumption itself. Their further deterioration was due to their disposal in unfavourable soil conditions that caused decalcification of the bones and their disintegration into smaller fragments.

The bone material was identified anatomically and according to zoological taxa. The animal assemblage was calculated from the number of individual specimens (NISP) (Klein & Cruz-Urbe 1984). The following groups were identified: domestic mammals—breeding animals, wild animals, equids and canids, and others, including the remains of amphibians, birds, molluscs, and unidentified micromammals. The group comprising equids and canids could contain the remains of various species belonging to these families, both their domesticated and wild forms. As their identification was difficult, more general taxa had to be used. The percentages of different species in the group of animals were calculated and then compared between and within the distinguished chronological periods.

A spatial analysis was carried out to determine how animal species were distributed in different locations within the site during the Ninevite 5, Early Dynastic III, Akkadian, and Post-Akkadian periods. The zoological distribution of the remains from the sector SD, located in the east part of the site, and the sector D, situated in the north-western part of the site, was compared. In the sector SD, the so called Building of the Plastered Platform was distinguished (**Figure 3**). It was most certainly not residential in character (Bieliński 2006). There were also

the so called east and west dwelling districts (**Figure 3**). The integral part of each district was a street that functioned for a long period of time—from the late Ninevite 5 period until the Early Dynastic III period. In the sector D a residential district was unearthed, with buildings clustered around a yard (**Figure 4**). Living quarters were distinguished from the yard, where economic and cooking activities of the dwellers were performed, including—among other things—food processing and the preparation of meals.

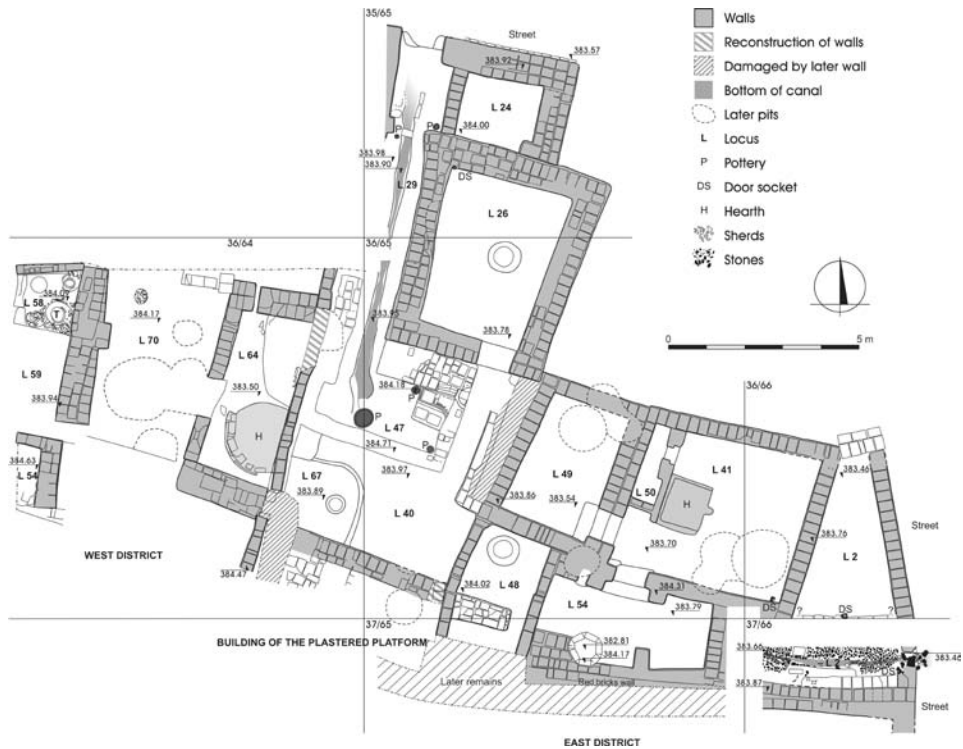


Figure 3. Tell Arbid. Area SD with Building of the Plastered Platform and east and west districts. Drawing by M. Momot.

The anatomical distribution of bone parts was analysed for cattle, pig, and sheep/goat for each chronological phase. The remains were categorised into two groups: less valuable and valuable parts of the carcass. The former consisted of cranial material (cranium and teeth), distal parts of the forelimb (carpal and metacarpal bones), distal parts of the hind limb (tarsal and metatarsal bones), and digital bones, while the latter comprised the trunk (vertebrae and ribs), proximal parts of the forelimb (scapulae, humeri, radii, ulnae) and proximal parts of the hind limb (pelvis, femora, tibiae, fibulae). The percentages of different anatomical fragments were calculated for every species, provided there were 100 or more NISP scores for a given species. The results were compared with the model distribution (Lasota-Moskalewska 2008).

The age of slaughtered breeding animals was reconstructed on the basis of epiphyseal union (Kolda 1936) and dental development (Lutnicki 1972). The percentage of animals killed before reaching morphological maturity was estimated for each chronological phase. The term “young”, as used in this paper, refers to animals under the age of 3.5 years. The sex of the

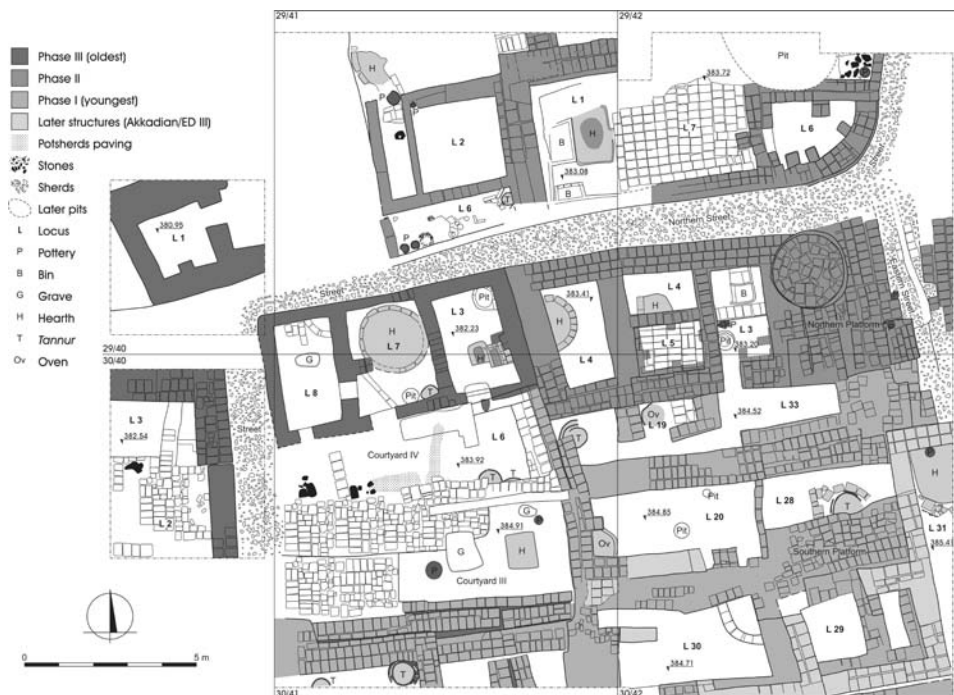


Figure 4. Tell Arbid. Area D, residential quarter. Drawing by M. Momot.

animals was also assessed (Lasota-Moskalewska 2008). The bones of mature individuals were measured according to the unified Driesch's method (Driesch 1976). These measurements helped to reconstruct the animal's morphology. In the case of cattle, pig, sheep/goat, and horse the osteological measurements were converted into points of the point-scale method (Lasota-Moskalewska 1984; Lasota-Moskalewska et al. 1987, 1991). The pig and sheep/goats withers heights were calculated according to Teichert's coefficients (after Driesch & Boessneck 1974). Any visible anomalies on the bones were described (Binford 1981; Lyman 1994).

Results

Ninevite 5 layers (MIIIC)

4483 bone fragments were obtained from the Ninevite 5 layers, 2634 (58.6%) of which were identified, as well as 41 invertebrate shell fragments, mainly belonging to bivalves and—to a lesser extent—to snails (**Table 1**). Single bones belonged to fish, birds, and wild animals (deer, boar and small ruminant, most probably gazelle). A small number of bone remains represented equids and canids. The majority of bones were identified as belonging to breeding animals, mostly sheep and goat (49.2%) followed by pig (44.9%), and cattle (5.9%).

Cattle cranial parts prevailed, followed by the trunk, proximal and distal parts of the forelimb and hind limb, as well as digital bones (**Table 2**). As for sheep and goat, head and trunk parts were most common, followed by proximal parts of the forelimb and hind limb. Fewer

distal parts of the forelimb and hind limb, and digital bones were identified. Among the pig bones, head and tooth fragments were most common, as they constituted over 60% of the material. Bones from the trunk and proximal parts of the forelimb were also recovered frequently. Other skeleton parts were scarcely represented. The comparison of the anatomical distribution of breeding mammal bone remains with the model distribution revealed the insufficient number of trunk fragments in the cattle material.

Table 2. Anatomical distribution of the domesticated animal bone remains from the Ninevite 5 layers (VIIC).

Body part	Cattle		Pig		Sheep/goat	
	n	%	n	%	n	%
Head	59	38.3	650	55.7	382	29.9
Trunk	24	15.6	153	13.2	470	36.8
Proximal forelimb	20	13.0	155	13.4	149	11.8
Distal forelimb	5	3.2	40	3.4	30	2.3
Proximal hind limb	16	10.4	85	7.3	154	12.1
Distal hind limb	14	9.1	48	4.1	58	4.5
Phalanges	16	10.4	34	2.9	33	2.6
Total	154	100	1165	100	1276	100

8.4% of the cattle bone remains belonged to animals that had been slaughtered at a young age. For sheep and goat this percentage was higher—16.4%, whereas in the case of pig it reached 32.2%. As for the sex analysis, one female cattle bone was identified, as well as single bone remains belonging to a male and a female goat. Eight pig bone fragments came from female individuals, and six from males.

Fifteen measurements were taken of the cattle remains and then calculated into points of the point-scale method (see supplementary file). All of them ranged from 36 to 50 points out of 100 which indicates medium-sized cattle of the brachyceros type. 19 measurements were obtained for pig and then converted into points. The results ranged from 0 to 42 points which suggests that the remains belonged to domesticated small and medium-sized pigs. The presence of boar-like pig was not confirmed. Other measurements indicated that the sheep withers height was 68cm and that small goats were present at the site. Also, measurements suggested that the equids were small with withers heights not larger than 120cm.

Early Dynastic III layers (VIIB)

2368 animal bones were removed from layers dating to the Early Dynastic III period, 1335 (56.4%) of which were identified. In addition, 33 bivalve shell fragments were recovered. The majority of the bones belonged to domesticated animals: pig prevailed (47.9%), followed by sheep/goat (44.9%), and cattle (7.2%). One bone fragment belonged to a bird, 12 to unidentified micromammals, and 9 to wild animal species. There were also some remains of equids and canids (25 and 3 fragments, respectively).

An analysis of the anatomical distribution of the cattle bone remains showed that less valuable carcass parts, mainly head parts, prevailed, as they constituted almost 40% of the as-

semblage (**Table 3**). Valuable parts of the carcass, such as the trunk and proximal parts of the forelimb and hind limb, were far less common. Sheep/goat bone remains had a similar distribution—the trunk parts, however, were more numerous followed by cranial skeletal material. The pig assemblage was made up of predominantly head parts and teeth (> 55%) followed by valuable parts of the carcass, such as the trunk and proximal parts of the forelimb and hind limb. Other skeleton elements were rare. The comparison with model distribution indicates a shortage of trunk fragments among the cattle bone remains.

Table 3. Anatomical distribution of domesticated animal bone remains from the Early Dynastic III layers (VIIB).

Body part	Cattle		Pig		Sheep/goat	
	n	%	n	%	n	%
Head	19	20.4	384	62.4	199	34.5
Trunk	12	12.9	73	11.9	144	24.9
Proximal forelimb	14	15.1	79	12.8	89	15.4
Distal forelimb	17	18.3	15	2.4	21	3.6
Proximal hind limb	11	11.8	36	5.9	97	16.8
Distal hind limb	11	11.8	19	3.1	22	3.8
Phalanges	9	9.7	9	1.5	5	1.0
Total	93	100	615	100	577	100

2.2% of the cattle bone remains belonged to animals that had been slaughtered at a young age. Two fragments were identified as belonging to a female. 10.7% of the small ruminant bone fragments belonged to young animals. Single bones represented a male and a female goat. As for pig, bones belonging to animals that had been slaughtered at a young age constituted 28.3% of the assemblage. Six bone fragments were identified as female, and two as male.

Twelve measurements were taken of the cattle remains and were converted into points using the point-scale method (see supplementary file). Almost all of the points suggest that the animals had been medium-sized (from 36 to 66 points); only two results (0, 28) indicate that smaller animals had been present. In the case of pig, 25 measurements were taken and then converted into points using the point-scale method. The results ranged from 0 to 26 points which suggests that the pigs were the fully domesticated variety and that all the animals were small and middle-sized. In three cases, the withers height was measured on the basis of the tarsal bone width, and it equalled 59cm (x2) and 61cm. Equid morphology was reconstructed on the basis of two measurements converted into points using the point-scale method. They both represented small individuals, with the withers height less than 115cm.

Akkadian layers (VIIA)

In the Akkadian layers 279 animal bones were found, 147 (53.2%) of which were identified anatomically and taxonomically. The majority of the bones were identified as belonging to domestic animals. They were dominated by sheep and goat (57.1%), followed by pig (41.3%), and cattle (1.6%). In addition, three bivalve shell fragments were unearthed. Only a few equid and canid bone fragments were identified as well as one boar fragment.

An anatomical analysis was not possible because of small sample size of identified species. Also, there no sex and age data were available. Only pig and sheep/goat morphology was reconstructed (see supplementary file). In the case of pig, two bone fragments were measured that corresponded to 22 and 25 points using the the point-scale method, respectively. The results suggest that the bones belonged to middle-sized fully domesticated animals. Additionally, on the basis of tarsal bone length, pig withers height was measured, which equalled 62.6cm. The withers height of sheep was also measured—the results were 63.5cm and 64.5cm.

Post-Akkadian layers (VI)

2950 mammal bone fragments and 74 shell fragments belonging to molluscs (both bivalves and snails) were excavated from the Post-Akkadian layers. Almost half of the mammal assemblage (49.0%) was identifiable to element and to taxa. The vast majority (90.0%) of the material belonged to domesticated mammals. Fewer fragments were identified as representing equids (6.3%) and wild taxa (2.3%) such as boar, gazelle, cervids and bovids. Only single bones belonged to felids (1.3%) and an unidentified micromammal (0.1%). Domesticated animals were dominated by sheep and goat bone remains (51.9%), followed by pig (39.6%) and cattle (8.5%).

The analysis of the anatomical distribution of the cattle bone remains revealed that head parts were most common (32.5%), followed by more valuable carcass parts and proximal parts of the forelimb and hind limb (**Table 4**). Less valuable carcass parts were discovered less frequently. The goat and sheep bones presented a similar anatomical distribution pattern as the cattle. For pig remains, however, head fragments dominated (70.0%). The comparison with model distribution revealed a shortage of trunk fragments among the cattle bone remains.

Table 4. Anatomical distribution of domesticated animal bone remains from the Post-Akkadian layers (VI)

Body part	Cattle		Pig		Sheep/goat	
	n	%	n	%	n	%
Head	36	32.5	377	73.0	285	42.1
Trunk	16	14.4	31	6.0	100	14.8
Proximal forelimb	16	14.4	55	10.6	87	12.8
Distal forelimb	6	5.4	8	1.5	34	5.0
Proximal hind limb	15	13.5	22	4.2	122	18.0
Distal hind limb	11	9.9	20	3.9	39	5.8
Phalanges	11	9.9	4	0.8	10	1.5
Total	111	100	517	100	677	100

Only 2.7% of the cattle bone remains represented animals slaughtered at a young. The percentage of young slaughtered animals was higher for sheep and goat (10.0%) and pig (18.2%). Single bones belonging to female and male cattle were identified.

Seven measurements were obtained for cattle and then converted into points using the point-scale method (see supplementary file). Four of them represented medium-sized animals, two large individuals, and one a small animal. 15 pig bone fragments were measured and

converted into points, the results ranging from 0 to 25 points. The results suggest that the individuals represented the domesticated variety and were small or medium-sized. The withers height of one individual was also measured and it equalled 55.5cm. The withers heights of two sheep were measured—they were 65.8cm and 68.0cm, respectively. One measurement was obtained for an equid and then converted into points. The measurement suggested that the bone fragment belonged to a small individual with a withers height of about 110cm.

Comparative analysis

The zoological comparison of the domesticated animal bone remains from the distinguished chronological periods in the 3rd millennium BC indicates that there were no significant differences. Sheep and goat (50%) were the dominant species (except for Early Dynastic III period) followed by pig (40%), and cattle (10%). Beginning in the Akkadian period, a higher percentage of both caprine and equid material was observed, whereas the percentage of pig bones diminished. Apart from that time, the percentage of the bone fragments representing the equids, the felids and other wild species, was similar and low.

The spatial analysis of domesticated animal bones in different contexts dating from the late Ninevite 5 period suggests that animals may have been disposed in various proportions across the site over time (**Table 5, Figure 5**). In the sector SD (comprising the east district, the west district, Building of the Plastered Platform, and the street), the east district and the street had the most in common in terms of animal remains. Caprine remains prevailed in these contexts (over 50.0%) followed by pig bone (35.0%), and cattle (10.0%). The Building of the Plastered Platform was dominated by the pig bone fragments while sheep, goat and cattle remains were less common. The west district was anomalous as the vast majority of the bone fragments found there (over 80.0%) belonged to pig.

Table 5. Comparison of the domesticated animal bone remains from various areas of Areas D and SD.

Species	East district (SD)		West district (SD)		Building of the Plastered Platform (SD)		Street (SD)		Residential district (D)		Yard (D)	
	n	%	n	%	n	%	n	%	n	%	n	%
Cattle	44	7.8	1	1.2	15	5.2	22	11.3	39	4.2	14	10.4
Pig	198	35.0	75	83.3	149	52.0	72	37.2	334	35.9	62	46.3
Sheep goat	323	57.2	14	15.5	123	42.8	100	51.5	555	59.9	58	43.3
Total	565	100	90	100	287	100	194	100	928	100	134	100

The comparative analysis of the living quarters and the yard in the residential district in sector D also revealed some differences in animal remains. In the residential area the sheep and goat bone remains prevailed (60.0%), followed by pig (35.9%), and cattle (4.2%). The yard was dominated by the pig bone fragments (46.3%) followed by sheep and goat (43.3%), and cattle (10.4%).

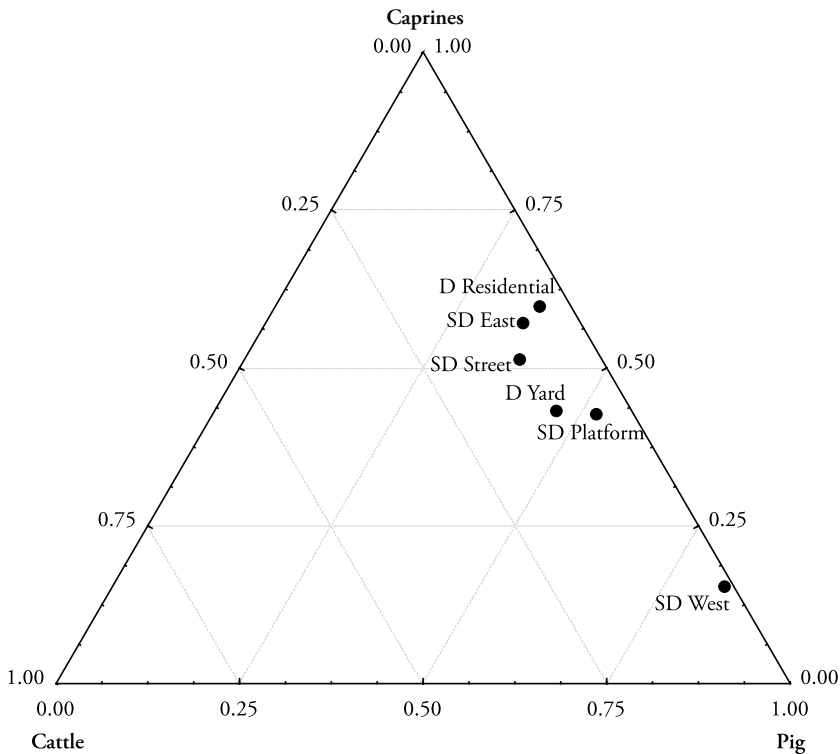


Figure 5. Ternary graph for the distribution of the sheep/goat, pig, and cattle bone remains from various parts of Area D and SD (Ninevite 5 period).

Discussion

Domesticated animals (especially caprines and pigs) played large role in the animal economy at Tell Arbid during the 3rd millennium BC. The percentage of game remains did not exceed one per cent. Only during the Post-Akkadian period was this percentage slightly higher (~2%). Various species of small ruminants were mostly hunted—roe deer, gazelle, and probably fallow deer, rarely boar.

Although pigs and caprines were dominant during the 3rd millennium BC, their numbers did change over the periods. Beginning in the Akkadian period, the role of caprines increased (~50%) and the pig was next in line in importance (~40%). Regardless of the chronological period, cattle were less significant, never exceeding 10%.

Pigs may have gained importance around the time when the site became more densely inhabited—with an increased demand for meat (cf. Lasota-Moskalewska 2008). In such circumstances, pig breeding is an economical solution, since the species is omnivorous and easy to breed close to a settlement. Pigs may have been kept in the settlement of Tell Arbid in individual households or in the site's immediate surroundings. Pig also provides more meat in comparison to other animals. After only one year, a pig can be slaughtered for meat, and two litters of piglets can be acquired annually. The pig was a less attractive species in terms of

the number of products that it provided. Although pigs provide meat, they do not provide hide and other resources such as milk and wool and they cannot be used in agricultural work.

It seems that at the beginning of the 3rd millennium BC in northern Mesopotamia, where Tell Arbid is located, there existed ample park forests, where herds of pigs could have been pastured. According to the estimates, the climatic conditions, especially in the first half of the 3rd millennium BC, were more humid in comparison to the present day (Bryson & Bryson 1997).

Pigs were raised mainly in order to acquire meat. This is confirmed by the fact that the animals were mostly slaughtered at a young age, the share of which in both early periods was around 30%. This fact is also confirmed by the data acquired at other sites in the Upper Khabur region. For example, at Tell Brak during the second half of the 3rd millennium BC, it was observed that in contrast to caprines, the majority of pigs (~40%) were slaughtered at a young age (Dobney et al. 2003). Also, in the Lower Town of Tell Leilan (ED III period), 86% of pig remains were infants and juveniles (Weiss et al. 1993). During the Post-Akkadian period at Tell Arbid when a smaller percentage of the pig remains was observed, the percentage of bones of animals killed at a young age also decreased. At that time, pigs constituted only slightly less than 20% of the assemblage. This suggests a shift in animal raising, aimed not only at the acquisition of meat, but also of fat.

The animal economy in Upper Khabur sites was focused on caprine breeding with a significant, albeit variable, share of pig breeding. In the Akkadian and the Post-Akkadian periods, the animal bone assemblages at Tell Brak were dominated by the remains of sheep and goats (~50–60%) followed by pig (~25%) (Clutton-Brock et al. 2001). However, the archaeological analysis conducted on the materials from excavations of the same site by R. Matthews showed slightly different results in the skeletal material from Ninevite 5 layers and from layers dating to the second half of the 3rd millennium BC. The breeding of sheep and goats played a major role then, and during the second half of the 3rd millennium BC there was an increase in pig consumption (up to 40–50%) (Dobney et al. 2003).

At Tell Beydar, at the end of the 4th millennium BC, pig constituted 15% of consumed domesticated animals. Throughout the entire 3rd millennium BC, there was a constant decrease in pig consumption and an increase in goat and sheep consumption (van Neer & de Cupere 2001). The administrative texts from Tell Beydar reveal the importance of wool production during the ED III period that may be related to the emphasis on caprine breeding (Ismail et al. 1996). Although sheep, equids and oxen are mentioned in texts from Tell Beydar, pigs are never mentioned in the inventories. The pig fat mentioned in the texts was purchased and was used to clean wool and to prepare hides etc. These texts, however, included only the animal inventories under the central administration. Animals kept in individual households, beyond central control, may not have been included in the official registries. Pigs are often interpreted at Near Eastern sites primarily as household-based food resources, the abundance of which can be related to status and degree of political centralization (Collins 2006; Zeder 1991, 1998b).

At Tell Leilan (Weiss et al. 1993; Zeder 1995) pig consumption was compared in various areas of the site. At the acropolis, for example, pig remains comprised of 22% of the faunal assemblage. In the Lower Town, however, pig remains made up a highest percentage (60%) of the faunal material (Weiss et al. 1993). Such disparity between two areas was used to suggest that there were differences between the diet of elites and ordinary inhabitants or workers (Zeder 1998b). Socio-economic differentiation of the diet was also observed in the city of Lagash (Tell al-Hiba), in southern Mesopotamia. It was confirmed there pigs had a greater

significance for the inhabitants of the residential districts (18%), while in the more affluent temple district, mostly goat and sheep meat was consumed, while the pig provided only 8% (Mudar 1982).

There are some differences in animal consumption when comparing the Middle and Upper Khabur regions. In particular, pork consumption seems to have been less common at the Middle Khabur sites than in contemporary Upper Khabur sites. At Middle Khabur sites, less pig was consumed over time (Zeder 1998b). At the beginning of the 3rd millennium BC, pig consumption oscillated between ~10 and 20%, and by the end of the period it had decreased to as low as one per cent. Simultaneously, during the 3rd millennium BC, the importance of goat and sheep increased from 25% to 80% (Zeder 1998a). These changes have been explained in terms of economic choices, rather than as a result of more arid conditions (Zeder 1998b). The decline in pig exploitation and the increasing focus on caprines may be linked to a shift to a more specialized pastoral economy and production of wool (Zeder 1998b).

The pig had a low status in the Near East as a pariah animal (Collins 2002; Zeder 1998b; Lion & Michel 2006). Even though the pig was commonly consumed by the inhabitants of Tell Arbid in the 3rd millennium BC, it was practically absent from the realm of representation, including small art forms and glyptics. Small clay figurines found at Tell Arbid as well as at other sites depict mostly sheep, goats, and equids (**Figures 6 & 7**). The pig was always represented only sporadically, and its significance in the animal economy was not reflected in the art of the ancient Near East (**Figure 8**). Due to the small number of written sources from northern Mesopotamia in the 3rd millennium BC, little is known about the significance of the species in cult and rituals. Later written sources from Mesopotamia inform us that although the pig was commonly eaten, it was treated as an impure animal, and because of this, only extremely rarely was it offered as a sacrifice to the gods in temples (Collins 2002). Rare examples of pig sacrifice can be found in nocturnal or Netherworld contexts. At the site Tell Mozan (ancient Urkesh), the remains of dozens of animals were found (including 60 piglets) inside a stone-lined circular pit, dated to ~2300 BC. This structure, connected with Hurrian rituals, was interpreted as a channel to the Underworld, in which animals were sacrificed (Kelly-Buccellati 2002).

Two species of small ruminants, goat and sheep, played an important role in animal economy of Tell Arbid. Their significance increased gradually over time. Goats and sheep raised at Tell Arbid provided mostly meat, as indicated by the age at death of the animals. Early on, during the Ninevite 5 period, the percentage of young animals was just above 16%, while later, in the ED III period and during the Post-Akkadian period, the proportion of younger animal remains dropped to ~10%. This suggests a shift from a meat producing economy during the first half of the 3rd millennium BC towards a focus of wool, hair, and milk (including dairy product) production. Although not documented in economic and administrative texts, more intensive wool production can be suggested at Tell Arbid during this period.

Cattle were the least significant animals at the site, perhaps bred for milk acquisition, the occasional provision of manure, and its role as a draught animal for fieldwork. This is also confirmed by the small percentage of cattle killed at a young age (3–8%). The assemblage suggests that cattle breeding was an economical process, with a fine balance maintained between the individual animals left and used for their secondary products, and the ones selected for slaughter. In addition, the use of cattle as draught animals is confirmed by mentions in the texts from Tell Beydar, although donkey was a more common animal of burden (Ismail et al.



Figure 6. Ram clay figurine. Tell Arbid, 2nd half of the 3rd millennium BC. Photograph by A. Reiche.



Figure 8. Pig clay figurine. Tell Rad Shaqrah (north-east Syria), ED III period. Photograph by A. Reiche.



Figure 7. Equid clay figurine. Tell Arbid, ED III/Akkadian period. Photograph by A. Reiche.

1996). At Tell Arbid goats may have been used as draught animals, as is indicated by traces of wear on the horn of one goat.

Taxonomical analysis of the bone remains from the late Ninevite 5 period at Tell Arbid revealed differences in animal processing across the site. In the east district and the street (sector SD) goat and sheep remains dominated followed by pig. Conversely, in the Building of the Plastered Platform, pig remains dominated followed by sheep and goat. The west district was distinctly different, with over 80% of the assemblage consisting of pig remains. Although the number of animal remains identified in this area is rather low for statistically significant conclusions (90 fragments), the share of pig remains is exceptionally high compared to the other districts at Tell Arbid. There were also differences between houses and the yard in the residential district in sector D—in the houses sheep and goat remains dominated, while mostly remains of pigs were among the remains uncovered in the yard.

The high percentage of pig remains in the west district of sector SD differentiates this area from other districts of Tell Arbid and because of this deserves particular attention. The dietary preference for one animal species over the other can be explained by economic, cultural (including ethnic) or social factors (Crabtree 1990). It can be suggested that the west district was inhabited by a poorer population of lower social status. The pig, as manifested by the data from Tell Leilan and Lagash, was eaten willingly by the less affluent portions of society. According to some authors (see Zeder 1998b), pig use was confined primarily to lower status contexts, where these animals were likely raised by local households as a means of supplementing existing food resources.

Animal remains can be an important indicator of a population's ethnicity (Hesse 1986). Food and its preparation are the conservative elements in culture, because people do not tend to change their culinary habits eagerly. Preference for particular animal species might have a cultural meaning and because of this allows for the identification of ethnic differences between different human groups. Hacinebi, a site located in south-east Anatolia, might be an example of this phenomenon. At around 3700 BC, the inhabitants of southern Mesopotamia established a commercial outpost among the Anatolian population (Bigelow 2000). Differences between the two societies are visible not only in the material culture, but also in their diets which are connected to their cultural traditions. The newcomers from Mesopotamia that were associated with Uruk culture ate mostly sheep and goat meat, similarly to other inhabitants of Mesopotamia (60–90%). The local inhabitants of Hacinebi, just like other peoples of Anatolia, had a diversified diet—apart from sheep and goat they ate significant quantities of cattle and pigs. In the case of the western district in the sector SD it should be emphasised, however, that apart from a definite preference for pork consumption in this area, no other differences in material culture are visible between the western district and other districts settled during the late Ninevite 5 period.

The analysis of the distribution of specific animal bone parts suggests that the slaughter, the carving, and the consumption took place within the boundaries of the settlement. This conclusion is induced from the presence of all of the elements of the skeleton, including digital bones. In the case of pigs, the discovery of a significant quantity of skulls confirms that meat from the head was also eaten. Although there are no visible cut-marks on the pig skulls, the skulls are preserved in fragments (similar to other post-consumption bone remains) which may suggest that they were consumed. A similar situation was observed at the site Tell Brak, where among pig remains cranial material dominated (Clutton-Brock et al. 2001). In addi-

tion, pig skulls were uncovered in the administrative/temple complex in the sectors SS and FS, which perhaps also has ritualistic meaning (Clutton-Brock et al. 2001).

At Tell Arbid the lack of bones from valuable portions of cattle, i.e., vertebrae and ribs, was noted in all of the chronological phases. These elements are relatively easy to identify and they tend to preserve at the same rate as the vertebrae and ribs of small ruminants (among which no such discrepancy was noted). Because of this, it is possible that these anatomical parts were carried away from the settlement. The presence of valuable meat in some contexts and a lack in others may be a sign of social differentiation between inhabitants at a site (Crabtree 1990). At Tell Arbid, the picture is rather one sided, since it has proven difficult to identify contexts containing the valuable cattle parts at the site.

Among cattle herds, small and medium-sized individuals representing the brachyceros type were found (withers height from 110 to 130cm). Their population was uniform and well-bred. Larger-sized individuals (height ~146cm) were noted only during the Post-Akkadian period. Among the pig herds, small and medium-sized individuals (withers height ranging between 54 and 72cm) were identified. They all belonged to the fully domesticated breed. No transitional forms between a domesticated pig and a boar were found, which might suggest the existence of closed breeding. In terms of sheep, the acquired data confirm the existence of small individuals exclusively, of the mouflon type, and with a withers height between 59 and 68cm. Similarly, among goats, only the existence of the small form was confirmed.

A small number of equid remains was found in the post-consumption deposits at Tell Arbid dating to the 3rd millennium BC. During the first two periods (Ninevite 5 and Early Dynastic III), their share did not exceed 2%, but beginning in the Akkadian period, it rose up to 8%. In this group, there might have been onagers, horses, and perhaps donkeys. Because it is impossible to determine whether they were wild or domesticated, it is impossible to tell whether these animals were bred, tamed, or whether they were used for meat. The onagers were the wild form that was hunted eagerly in the Near East because of their tasty meat. Among the equids, both horses and donkeys were the domesticated forms. It is difficult to ascertain whether of the wild forms may have been present at the site, since their range did not reach the discussed area. Donkeys appear to dominate the smaller animal assemblage, with withers heights not exceeding 120cm. They were kept for a long time because of their role as beasts of burden. Cuneiform texts dated to the Early Dynastic III period mention the use of donkeys and other equids (most likely crossbreeds of horses and donkeys) as work animals (Ismail et al. 1996).

The single remains of canids and felids were unearthed from the layers dated to the 3rd millennium BC at Tell Arbid. The canids were uncovered in all of the layers except for the Post-Akkadian period. Overall, the remains were identified as dog, but it cannot be excluded that some of the remains may have belonged to the golden jackal. The osteological material representing the felids was noted from the Akkadian period onwards and it belonged either to domesticated cat, wild cat, or to caracal.

Conclusion

The faunal evidence from Tell Arbid suggests general continuity between animal economies during the individual periods represented at the site in the 3rd millennium BC. The basis of the animal economy at Tell Arbid during the 3rd millennium BC was animal breeding, augmented to some degree by hunting. Pig breeding was most important followed by sheep and

goat breeding. Over time, however, there was a gradual increase in the significance of caprines. A shift in animal economy is evident starting in the Akkadian period—pigs decline somewhat in importance and caprines increase in importance. The pigs were kept mostly because of the possibility of acquiring large amounts of meat in a short time. Their significance was associated to an increase of settlement size in the area and because the environment was suitable for pig breeding. The pigs at Tell Arbid were fully domesticated and had withers heights between 54cm and 72cm. Head meat was preferred as opposed to other body parts.

In comparison to other districts within the site, a large proportion of pig remains were noted in the west district of sector SD. This predilection may be explained because of either social factors—the habitation of the district by the lower-class individuals, or by cultural and ethnic factors—stemming from a population of different cultural and culinary traditions. In addition, two species of caprines provided the inhabitants with meat for consumption, and also supplied milk and wool. They represented small forms. Cattle were used for their secondary products (e.g., milk, manure, and for labour). The cattle were the brachyceros type and were characterized by withers heights ranging from 110cm to 130cm.

Few bone remains belonged to the equids—wild onagers, domesticated horses, and donkeys. They were morphologically mature animals, of small breed, with a withers height ranging from 110–120cm. Also, bone remains belonging to the canids (dog, jackal) and felids (wild cat, caracal) were noted.

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