

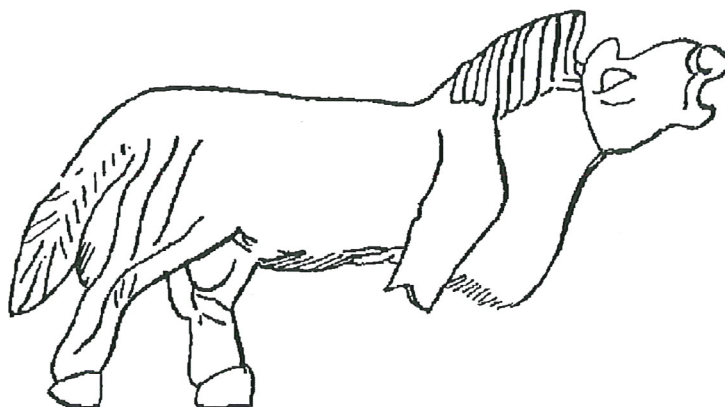


ARCHAEOZOOLOGY OF THE NEAR EAST IV A

Proceedings of the fourth international symposium on the
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ANIMAL RESOURCE MANAGEMENT AND THE PROCESS OF ANIMAL DOMESTICATION AT TELL HALULA (EUPHRATES VALLEY-SYRIA) FROM 8800 BP TO 7800 BP

Maria Saña Seguí¹

Abstract

The dynamics of the process of animal domestication documented on the site of Tell Halula (Euphrates Valley in Syria, 8,800 – 7,000 BP) shows that this phenomenon is neither linear nor the consequence of environmental changes or “waves of diffusion”. The various human communities of Tell Halula domesticated or adopted already domestic animals according to their own needs. The stabilization of the subsistence base and the accumulation of resources were a necessity in addition to the immediate requirements of consumption.

Résumé

La dynamique du processus de domestication animale qu'on a pu documenter sur le site de Tell Halula (vallée de l'Euphrate, Syrie) (8800-7000 BP) montre que ce phénomène n'est pas linéaire et qu'il n'est pas une conséquence des changements environnementaux ou de "vagues de diffusion". Les diverses communautés de Tell Halula ont domestiqué ou ont adopté des animaux domestiqués en fonction de leurs besoins propres. Ces besoins se rapportent à la stabilisation des bases de subsistance et à l'accumulation des ressources, en plus des besoins immédiats de la consommation.

Key Words: Syria, Tell Halula, PPNB, Domestication

Mots Clés: Syrie, Tell Halula, PPNB, Domestication

Introduction

The data presented in this article is the result of the archeozoological analysis on the set of faunal remains recovered from the tell Halula site during field work carried out in the 1993-94 seasons. The documented continuous temporal sequence (8800 BP-7000 BP) has been divided into a total of 37 occupation phases (Table1), each one of which is defined by the grouping together of several levels that represent one episode of human installation that takes concrete shape in the construction and use of a dwelling structure and the associated domestic structures located in the exterior spaces.

The quantification units used are the number of remains per species (Table 2) and the quantity of biomass potentially supplied by each species. The minimum number of individuals has not been directly employed as the exact duration of each of the occupations analysed was not known. The osteometric analysis of the material, after dispersion and multivariate analyses, has enabled us to describe and compare the animal populations represented, to establish the internal variability of these populations and, in some cases, the taxonomic distinction (Figs. 1ab, 2ab, 3 and 4). The qualitative analysis of the material was centered on studying the modifications/alterations caused both by natural agents (sedimentary matrix, atmospheric phenomena, chemical and biological agents and social agents (during the acquisition, processing, preparation for consumption and preservation of food products, as well as the distribution and consumption of food).

The characteristics of the animal resource management modalities practiced in each occupation phase were established after an integrated analysis in which the following variables were considered: documented skeletal variability for each animal species represented, spatial and specific dynamics of

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Table 1. Archaeological sequences registered for Tell Halula, divided according to the documented occupation phases (PO): RC= relative chronology, AC = absolute chronology, PPNBm = PPNB middle, PPNBr = PPNB recent, HL =Halaf, OB = Ob-
eid.

RC	PO	PO	AC
PPNBm	PO-1		8570+ 60 BP
PPNBm	PO-2		
PPNBm	PO-3		
PPNBm	PO-4		
PPNBm	PO-5		8810+ 80 BP
PPNBm	PO-6		
PPNBm	PO-7		
PPNBm	PO-8		
PPNBm	PO-9		
PPNBr	PO-10		
PPNBr	PO-11		
PPNBr	PO-12		8350+ 210 BP
PPNBr	PO-13		
PPNBr	PO-14		
PPNBr	PO-15		
PPNBr	PO-16		
PPNBr	PO-17/BC	PO-17/S1I	8300+ 60 BP
PPNBr	PO-18		
PPNBr	PO-19/BC	PO-19/S1e	7990+ 70 BP
Pre-HL	PO-20		
Pre-HL	PO-21		
Pre-HL	PO-22		
Pre-HL	PO-23		7880+ 120 BP
Pre-HL	PO-24		
Pre-HL	PO-25		7710+ 70 BP
Pre-HL	PO-26/S7	PO-26/S1i	
Pre-HL	PO-27		7440+ 80 BP
Pre-HL	PO-28		
Pre-HL	PO-29		
Pre-HL	PO-30		
Pre-HL	PO-31/S7	PO-31/S14	7690+ 130 BP
Pre-HL	PO-32		
Pre-HL	PO-33		7530+ 60 BP
Pre-HL	PO-34		
HL	PO-35		6780+ 90 BP
HL	PO-36/S1i	PO-36/S1e	
HL-OB	PO-37		

documented. This degree of diversification increases in occupation phase 5 and a significant presence of dog, *Canis familiaris*, and tortoise, together with the specific presence of wolves, foxes, felines, leporids and poultry can be considered.

the anatomical connections, dynamics of the thermoalterations in relation to skeletal and specific variability, analysis of traces linked to the processing of animal resources, dynamics of specific variability, structure of slaughtered animal populations and the quantity of biomass potentially supplied by each species in each occupation phase.

The hypothetical intervals for the beginning of reproduction in artificial conditions for swine, bovines and ovicaprines were established from this evaluation (Fig. 5). These data have made it possible to discern the characteristics of the management modalities practiced in each of the occupation phases, documenting the changes made in the mode of acquisition, processing and distribution of animal resources in each one. The final diachronic analysis of the sequence has made it possible to document the existence of a series of inflexion points that represent significant changes in the way animal resources were managed.

I. Diversified hunting in the initial period of the animal domestication process (occupation phases 1-8)

With the exception of dog and possibly the domestic goat (whose reproduction rate in artificial conditions could in no way be contrasted for the first two occupations) the remainder of the animal resources exploited up until occupation phase 8 were obtained by hunting. However, bearing in mind that biometric criteria has provided evidence of the presence of *Capra hircus* from occupation phase 3, we must consider that goat husbandry might have commenced at an earlier time period as the effects of artificial selection are already registered on the animal skeleton for this occupation phase.

The hunting strategy practiced is characterised by the simultaneous exploitation of differentiated biotopes located close by the settlement. Whereas from the quantity of potential biomass there is evidence for the greater relative importance of bovines, the relative frequencies of representation indicate a balanced diversified exploitation of gazelle, cervids, equids, swine and bovine, although from occupation phase 3 a greater emphasis on gazelle is

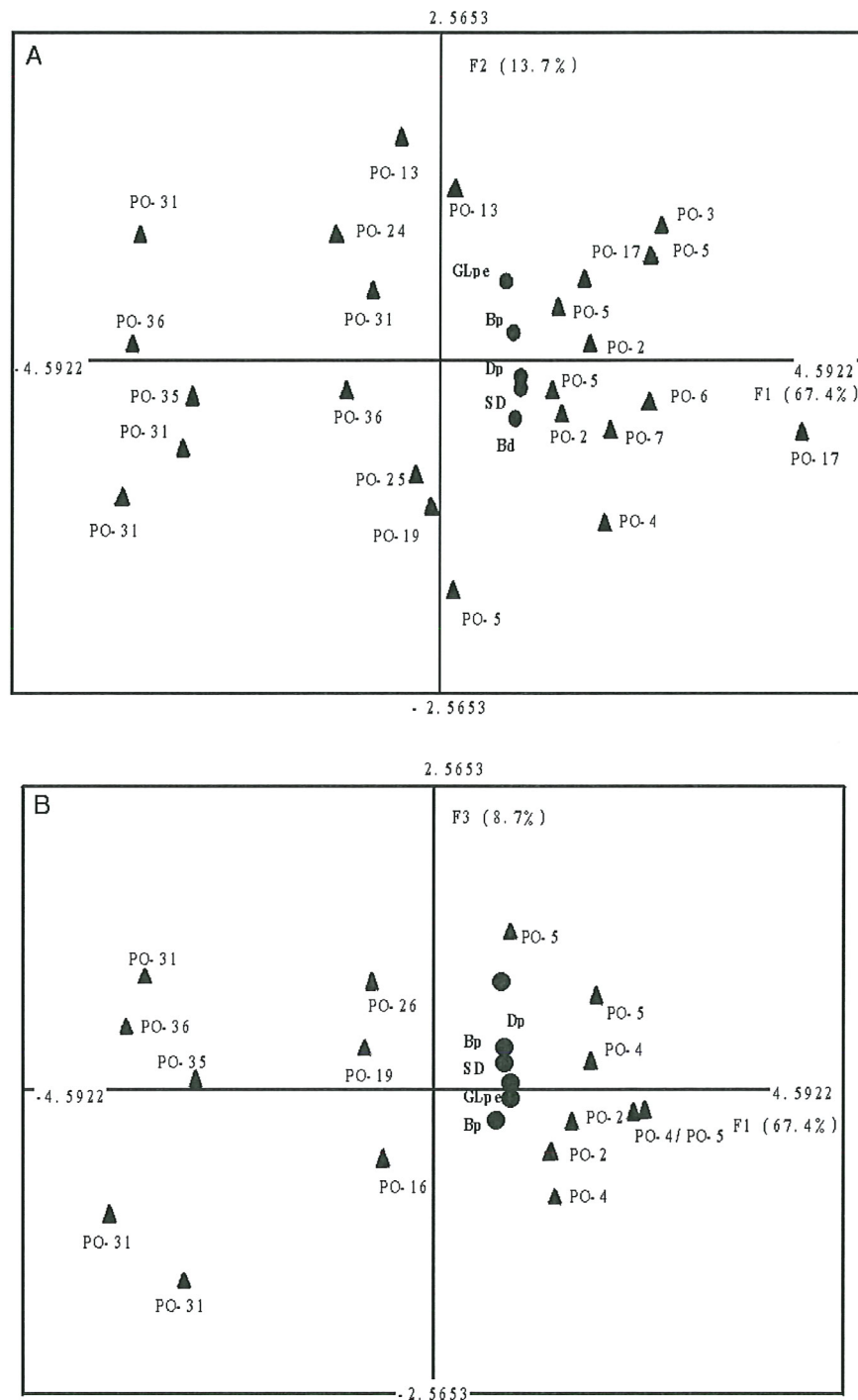


Fig. 2. Graphic representation of the PCA (F1, F2 and F3) with the measurements of the first phalanx of the caprines (GLpe, Dp, Bp, SD and Bd), where the relative reduction in size of the specimens of this species throughout the sequence at the tell is shown, the presence of a larger relative size in the oldest occupations (PO-2/PO-5) and a smaller relative size in the most recent occupations (PO-31/PO-36) being documented.

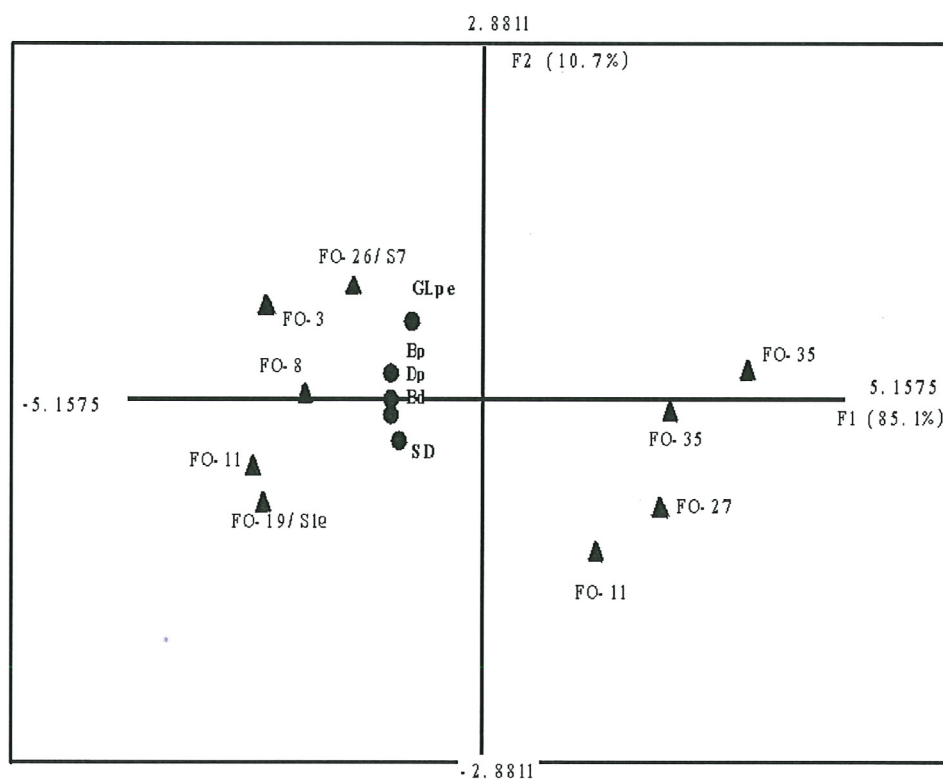


Fig. 3. Graphic representation of the PCA (F1 and F2) with the measurements of the second phalanx of swine (GLpe, Dp, Bp, SD, Bd), where the presence of two populations, differentiated on the basis of the size of the specimens represented, is shown

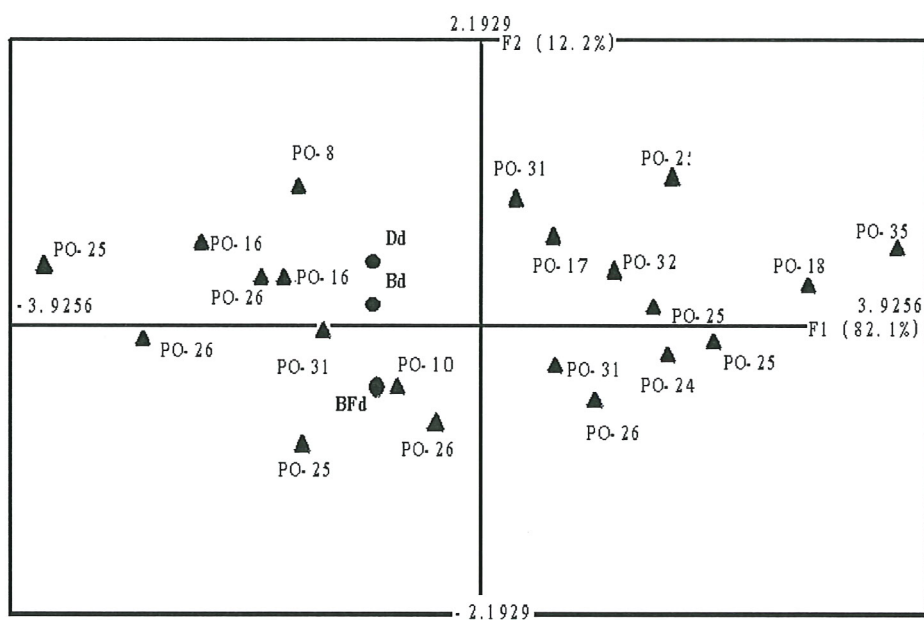


Fig. 4. Graphic representation of the PCA (F1 and F2) with the measurements of the tibia of *Ovis* (BFd, Bd, Dd), where the presence of specimens of different sizes is shown. There is, however, no correspondence with the chronological order of the different occupation phases (OP)

Table 2. Percentages of animal species and definitions of the categories documented

PO	BOS	C-D	CVsp.	EA-H	GZ	SUS	OCND	OVIS	CP	CF	CLU	CNsp.	VU	FEL	LP	ME	RD	MG	MM	MP	PR	GR	RDA	ND
1	13.1	14.4	-	3.2	13.8	15.7	26.3	0.2	3.9	6.5	-	-	1.9	-	-	-	41.1	39.6	57.4	-	2.8	-	47.9	10.8
2	10.5	5.2	-	2.6	13.1	5.2	44.7	-	18.4	-	-	-	-	-	-	-	90.5	-	-	-	-	-	9.4	-
3	11.4	3.6	-	-	26	8.3	39.5	-	10.9	-	-	-	-	-	-	-	27.9	27.8	54.5	-	17.5	-	23.8	48.1
4	21.8	7.4	-	0.3	20.3	4.2	37.8	0.1	7	-	-	-	0.3	-	-	-	45.3	36.1	48.9	-	14.9	-	41.9	12.7
5	20.4	5.1	-	0.3	16	5.8	33.5	0.2	4.1	10.7	0.07	-	2.8	0.07	-	-	65.8	50.1	30.8	1.1	17.7	-	30.8	3.3
6	38.7	9.9	-	1.7	32	2.2	9.1	0.1	0.7	3.2	0.2	-	1.2	0.4	-	-	84.8	33.9	47.1	3.7	15	-	14.1	0.9
7	44	10.2	-	2.4	28.8	3.7	4.9	-	1.2	2.8	-	-	1.6	-	-	-	97.8	-	28.5	-	-	71.4	2.1	-
8	16.4	10.4	-	0.4	21	5.9	29.8	2.7	10.9	0.6	-	-	1	0.1	0.3	-	93.5	26	73.9	-	-	-	6.4	-
9	17.9	1.4	-	4.4	27.3	5.9	27.3	5.9	7.4	0.9	-	-	0.9	-	-	-	87.5	31	68.9	-	-	-	12.4	-
10	18.6	3.1	-	13.1	20.9	8.5	17.8	9.3	5.4	-	-	-	1.5	-	1.5	-	75.5	70.4	29.5	-	-	-	24.4	-
11	8.9	1.9	-	2.4	19.1	8.5	45.6	4.5	3.6	3.7	-	-	0.9	-	-	0.1	57.4	14.3	72.2	6.3	6.5	0.5	38.6	3.8
12	11	0.5	-	4	21.9	8.5	40	5.2	4.5	3.5	-	0.2	0.2	-	-	-	62.5	33.2	43.1	-	23.6	-	37.4	-
13	8.4	3.2	0.6	5.8	11.7	5.5	36.4	16.2	10.4	-	-	-	1.3	-	-	-	86	-	44.4	-	55.5	-	13.9	-
14-15	2	0.5	-	2.3	7.5	13.6	-	52.6	15	1.6	-	-	-	-	-	-	100	-	-	-	-	-	-	-
16	18	-	-	1	6	3	44	12	15	1	-	-	-	-	-	-	47.8	23.8	76.1	-	-	-	52.1	-
17-BC	2.1	-	-	-	4.3	-	50	19.5	22.8	-	-	-	1	-	-	-	51.1	7.9	92	-	-	-	48.8	-
17-Sli	3.1	-	-	-	6.3	1.5	68.2	12.6	7.9	-	-	-	-	-	-	-	47.7	24.6	57.9	-	17.3	-	52.2	-
18	12.1	-	-	6	1.5	2.2	64.3	6	6	0.7	-	-	0.7	-	-	-	54.5	32.7	47.2	-	12.7	7.2	45.4	-
19-Sle	5.2	-	-	0.7	14.2	3	44.3	15	17.2	-	-	-	-	-	-	-	53.4	36.2	53.4	-	10.3	-	46.5	-
19-BC	2.8	-	-	8.5	5.7	5.7	45.7	22.8	5.7	2.8	-	-	-	-	-	-	60.3	-	100	-	-	-	39.6	-
24	6.6	-	-	-	10	-	46.6	23.3	10	-	-	-	3.3	-	-	-	18.9	20.3	79.6	-	-	-	81.0	-
25	16.8	1.3	-	2.1	4.9	0.8	51	13.2	9	0.2	-	-	0.2	-	-	-	53.8	23.3	67.5	0.5	7.7	0.8	44.4	1.6
26-S7	25.9	1.5	-	0.2	3.4	1.3	56	7.4	3.4	0.4	-	-	0.2	-	-	0.05	76.7	29.7	56.2	3.9	6.4	3.5	21.1	2.1
26-Sli	11.7	1.1	-	9.4	4.7	12.9	47	5.8	7	-	-	-	0.2	-	-	-	81.7	-	100	-	-	-	18.2	-
27	19.8	0.7	-	0.3	4.3	1.9	57.1	9.1	5.9	-	-	-	0.3	-	-	-	86.1	-	-	-	100	-	13.8	-
29	7.9	1.1	-	-	5.6	-	70.4	6.8	7.9	-	-	-	-	-	-	-	83.9	-	-	-	94.1	5.8	16	-
30	27.7	-	-	-	22.2	5.5	38.8	-	5.5	-	-	-	-	-	-	-	45	-	100	-	-	-	55	-
31-S7	19.3	2.2	-	2.2	6.6	2.2	54.2	7	3.3	2.2	-	-	-	-	0.3	-	89.3	-	-	-	100	-	10.6	-
31-S14	17.3	0.2	-	2.2	9.3	0.6	48.9	11.4	9.3	-	-	-	0.2	-	-	-	77.8	4	96	-	-	-	22.1	-
32	16.1	-	-	9.6	16.1	3.2	33.3	13.9	7.5	-	-	-	-	-	-	-	56.7	21.1	77.4	-	1.4	-	43.2	-
34	12.7	3.4	-	5.8	15.1	2.3	43	8.1	6.9	2.3	-	-	-	-	-	-	55.4	31.8	47.8	-	20.2	-	44.5	-
35	14.2	-	-	7.9	3.1	5.5	53.1	7.9	7.9	-	-	-	-	-	-	-	68.1	37.2	50.8	-	-	11.8	31.8	-
36-Sle	12	0.5	-	1.1	1.1	5.1	57.7	5.1	14.2	1.1	-	-	0.5	-	1.1	-	62.7	26.9	54.8	-	18.2	-	37.2	-
36-Sli	8.3	-	-	2.3	3.5	4.7	53.5	10.7	15.4	-	-	-	1.1	-	-	-	65.6	36.3	63.6	-	-	-	34.3	-

PO= phase of occupation; RD=determined remains; RDA=anatomically RD; ND=undetermined remains; BOS=Bos primigenius; C-D=Cervus/Dama; EA-H=Equus asinus/hemionus; GZ=gazelle; SUS=Sus scrofa/ domesticus; CP=Capra; Ovis=Ovis; OCND=ovicaprine; CNsp=Canis p.; CF=Canis familiaris; VU=Vulpes vulpes; CLU=Canis lupus; Fel=felins; LP=leporids; ME=meles meles; MG=large size ND mammal; MM=medium size ND mammal; MP=small size ND mammal; PR=small ruminant; GR=small ruminant.

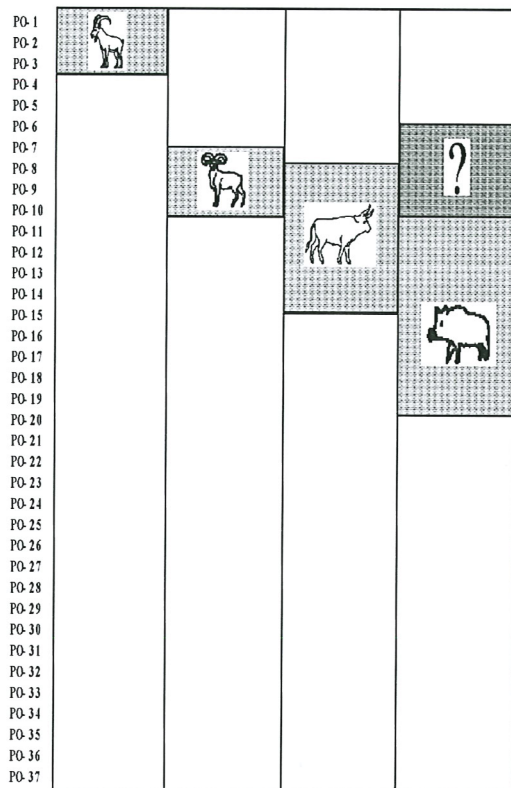


Fig. 5. Hypothetical time intervals in which the probable domestication in Tell Halula of goats, sheep, cattle and pig are registered. These were established from an analysis of the skeletal variability documented for each animal species, the dynamics of species variability, the structure of the animal populations slaughtered and the quantity of biomass potentially supplied by each species in each occupation phase.

strategy practiced was based on acquiring animal resources exclusively through hunting. Although a complementarity of the hunting and husbandry activities can be considered, the above-mentioned phenomenon suggests the possibility of this complementarity not being strictly simultaneous but involving a hierarchy in time. If we consider that the programming of agricultural-husbandry activity must consider the sequencing of the productive and nonproductive cycles, and, closely related to the same thing, the availability of food for the domestic animal herds, the variability observed could be conditioned by these seasonal rhythms themselves. This way, during periods of low husbandry productivity, hunting was used in order to avoid having to change the composition of the domestic herds thus ensuring the next reproductive cycle.

Therefore, the mode of acquisition practiced during this specific time interval involves a mixed strategy centered around goat husbandry with a greater relative importance of hunting in relation to the quantity of food potentially supplied. The type of husbandry practiced would have focused on the breeding of goat herds, since an exploitation mode aimed at obtaining meat and potentially also milk has already been documented. The wide diversity of the species exploited through hunting could be conditioned by an interest in maintaining a certain stability in the reproductive periodicity of the goat herds in accordance with seasonal variations and needs and what was available in the community. In this way, the high degree of eclecticism would enable an increase in production and therefore a profitable form of exploitation. We must, in this sense, also consider the potential use of species such as the dog for purposes of food.

There is no direct evidence for the consumption of dogs and foxes, although the patterns of fracturing registered and the presence of traces of disjuncting-meat removal in some of their remains may be an indication of their potential use as food.

The lack of homogeneity in the selection patterns of the sex and age of the individuals slaughtered is also proof of the flexible and nonspecialized use of local resources, although it must be mentioned that among the slaughtered individuals there were more males above two years of age for bovine, young specimens and adult females for gazelles, young individuals in the case of swine and adult cervids. On the basis of these data, it can be said that the hunting strategy followed was not totally opportunistic but that, at least for bovine and swine, the strategy was aimed mainly at obtaining young individuals. The dominance of young and female specimens for gazelle might be an indication of the seasonal nature of this activity in herds made up of females and young individuals.

In this sense, for example, it must be mentioned that the alternative predominance in occupation phase 5 of the *Capra/Sus* and bovine/gazelle/cervids/equids associations is documented. This fact proves the different exploitation in temporal terms of these two species groupings. Whereas during certain specific intervals (the duration of which it is impossible to establish for the time being) there was a predominance of slaughtering animals that came from husbandry activity, complemented by the occasional hunting of swine, at other times the

From the data presented and by including in this evaluation the spatial articulation of the faunal remains (according to species and skeletal parts) on the basis of the different categories of space (interiors/exterior), we can consider the possibility of the animal resource management mode practiced during the most ancient occupation phases in settlements characterised by collective strategies for acquiring, processing and consuming of animals and animal products. This "collectiveness" would include, at the very least, the different social units that shared the same external space. In this sense, the presence of dwellings constructed with nonperishable materials can be proof of a certain permanence and stability in these social units. The potential presence of resources reproduced in artificial conditions would not be an obstacle to this collectivization. The fact that the product consumed comes mainly from hunting activity could in fact favour the maintenance of this collective structure. The community would then be divided into a series of basic independent production and consumption units within which the work processes involved in acquiring the subsistence resources would be organised. The data available so far does not enable us to make any inferences on the specificity of the internal relations established between these basic social units and the relations of the latter with the community as a whole.

II. The problems considered in relation to the domestication of *Capra* (occupation phases 1-3)

Although the relative percentages of *Capra* remains (in the first occupations at the tell) oscillate around 30% of the total identified, it must be said that the biomass quantity potentially supplied is evidence that its contribution to food would be inferior to that of bovine, *Sus* and cervids and equivalent to that of equids. It must however be considered that the minimum number of specimens of this species slaughtered is higher than that of the rest of the species.

Considering that there is only scarce biometric data available for *Capra* during the first two occupation phases analysed, we must contemplate the possibility that the specimens slaughtered can correspond to both the wild and the domesticated forms or could be representative of both simultaneously. However, based on the analysis of the kill-off structure of the animal population, it can be observed that there are significant patterns that involve a high degree of selection (predominant slaughter of males of less than 6 months of age). We can relate this degree of control exercised on the *Capra* herds with:

1. the practice of selective hunting aimed mainly at the infantile and juvenile specimens in herds made up of the females/infantile-juveniles of this species,
2. the presence of herds reproducing under artificial conditions, with the slaughter aimed at obtaining meat and potentially also milk,
3. the complementary practice of both the above-mentioned strategies.

In all three cases the practice of an exploitation strategy aimed at maintaining herd reproduction with a minimum sacrifice of females of reproductive age is documented. Bearing in mind the diversity of the resources exploited and the relative contribution of *Capra* to subsistence, the control over reproduction in the *Capra* population could be the result of both a circumstantial situation in which the seasonal exploitation of the resource is considered as well as a need to reproduce this species for its initial domestication. On the basis of available data, we cannot *a priori* exclude any of the situations mentioned. What is clearly established is that the mode of acquisition practiced for *Capra* is different from that which is documented for the remainder of the animal species exploited.

Considering the fact that no significant changes in the patterns of *Capra* slaughter are recorded during occupation phase 3 (with respect to what is documented for the preceding occupations) and bearing in mind that the presence of the domestic form of this species is documented for this occupation phase, we must consider the possibility that goat husbandry was already practiced from the first occupation phase, although the criteria mentioned also do not exclude the possibility that the domestication process of this species began at the tell Halula settlement itself. In the latter case, the selection criteria applied to the natural population would continue to be applied to the herds bred under artificial conditions and the time interval between occupation phases 1 and 3 would be superior to 100-300 years, the interval proposed for the reduction in size to take effect (Helmer 1992). Thus, available

evidence points to the practice of a close control of the *Capra* populations from the first occupations of the tell. This would probably correspond to the beginning of its husbandry.

Why goat and not any of the other species? The technical means available are sufficient for exploiting different mediums and a wide diversity of animal species with behavioural mechanisms and requirements that are also very diverse, achieving in this way a balanced exploitation of the environment with a high degree of profitability (immediate benefits, hunting mainly of large animals). In the long term, however, this strategy could have been limited by the natural reproductive rhythms of the animal species. This is precisely what could have given rise to the interest in artificially controlling the reproductive rhythms. Of the species exploited, goat and gazelle are those that have the highest reproductive capacities. But only *Capra* presents a behavioural structure that favours being subjected to artificial breeding conditions. Therefore, one of the main factors that may have influenced its domestication could be precisely its reproductive capacity. With the intensification of its exploitation, its reproduction in artificial breeding conditions would enable productivity to be increased in the strategy as there would be direct control over the product. All of these observations enable us to characterise the type of husbandry practiced so far as an initial form of husbandry, a situation where despite the fact that the techniques of husbandry were already known, a large part of the supply is still obtained from hunting. The latter is in accordance with, and therefore conditioned by, the reproductive rhythms and the availability of domestic animals. Hunting is not a supplement but a complement to husbandry activity, with a specific role that continues to be important. We cannot forget the fact that the work invested in hunting provides an immediate reward as opposed to the different reward from husbandry. The level of development of husbandry techniques are therefore in a phase in which, given specific production demands, it is not feasible to achieve an increase in productivity from intensification or specialized husbandry practice. In this way, although husbandry centers on the breeding of a single animal species it cannot be considered as a specialized husbandry but as the beginnings of husbandry. In this situation, the main objective of the exploitation of domestic animals is for food.

III. A break in the initial period of the husbandry activity? (Occupation phases 6-7)

Although the mode of acquisition of animal resources for the first five occupation phases analysed is relatively homogeneous, it varies significantly for occupation phases 6 and 7. The considerable increase of resources obtained from hunting introduces a point of inflection in the progressive increase of the percentages registered for *Capra*. Although the species acquired from hunting continued to be the same (with the exception of leporids and birds), significant variations in their representation is documented, above all the increase in the exploitation of bovine, gazelle and cervids in detriment to the resources obtained from husbandry. Nonetheless, there is a continuity in the selection criteria with respect to age and sex of the individuals slaughtered (for bovine, gazelle and cervids). On the other hand, the fall registered in the number of goats slaughtered corresponds to a qualitative widening of the animal population kill-off structure observed for this species, which now includes the slaughter of adult animals.

Does this point of inflection mean a reversal in husbandry practices at a time when the breeding of goats under artificial conditions was already developed? In this sense, we must consider that the number of goats slaughtered does not directly imply a reduction in the number of animals comprising the herds. The change in the patterns of culling and the intensification of the hunting of other species could be the result of a greater emphasis being placed on keeping the animals alive, exploitation of derived products and exchange). This situation would entail an abrupt change (bearing in mind that a continuous sequence is being analysed) in the type and mode of exploitation practiced for this species. Such a change could only result from a decision made in a situation where the availability of wild resources is optimal and in which the work invested in maintaining the herds is recovered through alternatives to direct consumption. There is, however, no evidence that would enable us to defend a change in the material conditions that imply a decision of this kind. We might also consider that the husbandry practiced so far by the community or communities settled at tell Halula is based exclusively on a single animal species.

We must, therefore, consider another explanation for the fall registered in the number of slaughtered goats. In this sense we should consider the fact that a situation may have been reached in which

the numbers comprising the herds was "drastically" reduced or that there was no further increase possible. The solution adopted would have consisted in this supply being met through an increase in food obtained from hunting. Unlike the earlier explanation, the option of change is determined here by a modification in the material base: a reduction in the available number of animal resources obtained by breeding or the impossibility of increasing them (when faced with a specific demand in animal production). If we bear in mind that one of the fundamental concerns was the control exercised on the reproduction of the goat herds and that in so far as the management of these resources is concerned the tendency towards an improvement in the breeding conditions of this species is documented, its stabilized exploitation, we might well wonder about the conditions that could destabilise this situation.

In this sense and disregarding a change in environmental conditions (lack of pastures, adverse climate), we believe that only an internal problem could produce such a result. This would have affected the management mode of this resource, as the number of specimens that could be used for reproduction would be reduced. Linked to this we could consider the overexploitation of the herd, the overexploitation or bad management of the pastures. This change, which could be the consequence of a certain type of management, would lead to a situation of uncertainty that would endanger the very reproduction of the herd. Faced with this situation, the community opted in favour of ensuring the subsistence base by intensifying the hunting of bovine, gazelle and cervids, a situation confirmed by the strong positive correlation documented for these three taxa.

The mode of acquisition practiced during occupation phases 6 and 7 would thus have varied substantially with respect to the practice in preceding occupations. From a strategy organized around husbandry that includes diversified hunting which includes the exploitation of birds, small carnivores and leporids as well as the potential use of dog, *Canis familiaris*, for food purposes, there is a shift to a strategy in which special emphasis falls on the hunting of bovine, gazelle and cervids, with fewer specimens reproduced under artificial conditions being slaughtered.

IV. The adoption of the domestic sheep (occupation phase 8)

During occupation phase 8 a new point of inflection is documented in relation to the dynamics described for occupation phases 6 and 7. This is characterised by a significant fall in the hunting of bovines, an increase in the exploitation of goats and the beginning of sheep husbandry.

The return to patterns documented for occupation phase 5 enables us to reaffirm the hypothesis considered regarding the causes that led to the dynamics of the inflection described for occupation phases 6 and 7. Faced with a "crisis" in goat husbandry, it was decided to give preference to the reproduction of this resource by reducing the number of specimens slaughtered of this species and increasing the hunting activity. To complement this, and certainly with a view to long term provision strategies, a decision was made to widen the spectrum of animals bred under artificial conditions by adopting sheep, *Ovis aries*. Nonetheless, it must be mentioned that we do not have sufficient data to *a priori* discard the practice of the initial hunting of wild sheep, *Ovis orientalis*, given that some of the remains classified in the general category of ovicaprids could potentially belong to this species. However, it must be clarified that in the event of its exploitation, the latter would only have taken place occasionally.

On the other hand, we can consider that the adoption of *Ovis*, already in domestic form, would not be the result of "diffusion currents" generally proposed for the geographical area analysed, but that it would be the consequence of the solution adopted by a tell Halula community that was faced with internal problems which could curtail the practice of husbandry centered on a single animal species. All the same, the increase registered in the exploitation of *Capra* in occupation phase 8 as compared to occupation phase 7 indicates that it recovered parallel to the adoption of the sheep.

The acquisition mode practiced in the time interval for which there is documented evidence of the adoption of the domestic sheep is based on a combination of husbandry activities and hunting, with a diversified exploitation of the resources available around the settlement. There is, nonetheless, a greater emphasis on the slaughter of gazelle. The hunting strategy was aimed mainly at young specimens of gazelle, swine and cervids and above all adult individuals in the case of bovines. Small prey (foxes, felines, leporids, birds and tortoise) continued to be exploited, albeit occasionally. A signifi-

cant fact to be highlighted is the fall registered in the quantity of food potentially supplied by wild resources and, specifically, by bovines.

The type of husbandry practiced is essentially ovine and the mode of exploitation in husbandry is oriented mainly at obtaining meat products. We can suppose, therefore, that the central factor around which the animal resource management strategies are articulated comprises husbandry activity, despite the fact that the quantity of biomass potentially supplied by sheep and goats reproduced under artificial conditions does not exceed 15% of the food product potentially obtained from the exploitation of animal resources.

From the results presented so far, it can be deduced that the objective of the mode of exploitation practiced was to satisfy production demands by increasing the stock of domestic animals. The latter, unlike the wild animal resources, could be a stable reserve to be used in unproductive periods or to counter bad harvests or other adversities deriving from agricultural activity. However, as expressed for occupation phases 6 and 7, the non-specialized husbandry practiced with one single species was not necessarily an efficient strategy to overcome certain situations of scarcity, in much the same way as a diversification of hunting activity centred on local resources. Although the exploitation of wild resources at a given moment can be more efficient than the slaughter of domestic animals, it is not a long term solution given that reproduction capacity is not directly controlled by the community. In this sense, the introduction of sheep signifies an attempt to stabilize the subsistence base in the long term as a provision for future imbalances or simply to satisfy demand during the unproductive seasons.

We can, at this point, ask ourselves why sheep was chosen and not another species. With respect to the context being analysed the following are possibilities that can be considered, although it should be mentioned that one does not exclude others as they are not formulated on the same level:

1. due to the high reproductive potential of sheep (comparable with goat), in relation to other species domesticated at a later date.
2. due to an interest in exploiting the derived products, because the knowledge and technical means relating to goat husbandry favoured the adoption of a species with similar characteristics (with the exception of food requirements).
3. due to the fact that the different food requirements of each species would mean a more efficient exploitation of pasture lands, excluding the possibility of competition and maximising the exploitation of the different ecosystems available around the settlement.
4. bearing in mind the previous adoption of domestic sheep, we can also consider the role of exchange networks and the relations established between the different communities.

Considering that the mode of exploitation practiced in occupation phase 8 is aimed mainly at obtaining meat, the second possibility could be a long term objective rather than an immediate one. The exploitation of milk or wool is more efficient than the exploitation of meat as the former include the possibility of the latter. We can consider that the slaughter of the domestic goat is supplemented in occupation phases 6 and 7 with the exploitation of wild resources, one of the priority objectives, therefore, being the obtaining of meat. In this way, the reproductive capacity of *Ovis* may have had a lot to do with when the decision to adopt it was made.

V. The consolidation of caprine husbandry and the potential domestication of pig and cattle (occupation phases 9-13).

Although we can consider that bovines are subjected to artificial breeding, from occupation phase 9 onwards on the basis of biometric criteria, there is not sufficient evidence to confirm this hypothesis. We must bear in mind, in this sense, that documentation of the greater number of adult females sacrificed in this time interval may be influenced by the greater degree of variability registered in the cull population. Nonetheless, the significant reduction in its exploitation and the change registered in the distribution patterns may be an indication of changes in the management mode of this species.

The incipient decline in the hunting of bovines in occupation phase 8 is evident in occupation phase 11, with a relative percentage of 8.9% and with a substantial reduction in the potentially supplied biomass (from 64% to 35%). Although we can consider that one of the factors that may have

contributed to this situation could be the more intensive exploitation of a biotope that does not favour the presence of bovines, such as the preferred biotope of the sheep (from occupation phase 8 onwards), we must also bear in mind other factors that may have conditioned the documented change in strategy practiced. On the one hand, we have to consider the possibility of a reduction in the number of specimens of this species in the area normally exploited from the settlement, and on the other, the beginning of its reproduction under artificial conditions.

Among the factors that may have contributed to the fall in the natural population of bovines, we can consider the hunting of this resource until occupation phase 7 and also the potential reduction of pasture lands with the increase of ovicaprine husbandry. "Competition" for the pasture lands could have had an influence on the quantitative reduction of the wild herds or on their moving on to other areas that were not directly controlled by human groups. Similarly, we can also consider the agricultural strategies practiced (although there is no information in this respect). A greater concern for the maintenance of the pasture and cultivated lands could have parallelly led to a greater interest in controlling the natural bovine populations. We must consider that the extension of agricultural and husbandry activities may have contributed not only to the reduction of bovines but also to the reduction of all the wild animals and plants in general. As the basic strategy for obtaining food centers on the production of the said food, there may have been a steady fall in the alternative food resources.

The acquisition mode documented for this time interval is based on a mixed strategy that combines husbandry activity with hunting, with a confirmed significant emphasis of *Ovis* over *Capra*. The relatively higher percentages registered for *Ovis* from occupation phase 9 were probably a consequence of the stabilization of this resource through husbandry. The husbandry mode of exploitation is aimed primarily at the reproduction of the herds (there is no slaughter of individuals in the reproductive age) and the obtaining of meat products (more slaughter of males between 1 and 2 years of age), although the occasional presence of adult specimens above 6 years of age is documented. Parallel to this, the potential presence of domestic pig, *Sus domesticus*, is also considered during this time interval.

The hunting strategy practiced also focuses on the exploitation of the resources available around the settlement, with a slight increase in the exploitation of the binomial swine/equids at the expense of cervids, bovine and gazelle. The kil-off patterns suggests a greater interest in obtaining young individuals, although the presence of adult individuals can be observed for all the species, particularly in the case of equids. Although the wide range of species diversity does not permit us to characterise this strategy as a specialized one, the relative emphasis on the sacrifice of young individuals may be linked to the practice of selective strategies on the basis of the age criterion. The only small sized species exploited, albeit occasionally, are the dog, fox, leporids and tortoise, though we must add that the spectrum of species exploited widens during this time interval to include roe deer (0.2%) and badger (0.1%), species that were not registered until this time. Also documented for occupation phase 11 is the presence of dog remains (3.7%) with traces of processing. With respect to the quantity of biomass potentially supplied it must be pointed out that there is an increase in the contribution made by equids, together with caprine, a significant decline in the quantity of biomass potentially supplied by bovines.

Can we then consider the practice of an already consolidated husbandry? It is difficult to respond to this question without evidence for the breeding of cattle and pig. The progressive increase in the slaughter of caprines, the potential exploitation of the derived products and the stabilization of the percentages of *Ovis* in relation to *Capra* is proof of an efficient exploitation of these resources. However, we cannot ignore the large number of wild resources (particularly gazelle) in the strategy practiced. If by consolidated husbandry we understand that situation in which the development in the required mediums permits a constant increase in production and consumption, limiting recession in the event of any fluctuation that might endanger it, we can say that the husbandry strategy followed by the settled community in tell Halula was in the process of being consolidated (all the same, we must leave open the question of a greater or lesser degree of consolidation in the different modes of cattle and pig keeping). Thus, the "early husbandry" characterization proposed for the husbandry strategy documented in the oldest occupation phases (1-7) is again reconfirmed. It is only in occupation phases 9-11 that the first stages of this process of consolidation are documented.

VI. Consolidation of the husbandry activity (occupation phases 16-19)

From occupation phase 16 onwards, the main role of ovicaprine husbandry in the acquisition strategy is clear. The hunting resources exploited continue to progressively decline, until they practically disappear. The hunting of equids, swine and gazelle becomes an activity practiced occasionally, one that does not include the exploitation of cervids. The reduction of the spectrum of animal species is equally clear from the absence of small carnivores, leporids, felines, birds and tortoise. In addition to this fact, from occupation phase 19 onwards, the presence of domestic cattle, *Bos taurus*, is documented on the basis of biometric criteria, although there is a continued parallel exploitation of aurochs, *Bos primigenius*.

Despite the fact that the type of husbandry practiced is essentially bovine oriented, since cattle are the main suppliers of meat, the emphasis on the slaughter of caprines, especially sheep, is evidence of the relative importance of sheep and goat herds in the framework of the general strategy. In this sense, we must point out the low relative contribution made by swine to the biomass supply. Although the type of exploitation continues to emphasize meat, the high degree of variability in the age group documented for caprine (from 6 months to 6 years, with the slaughter of males most often from 2 to 4 years and also of those above 6 years) is evidence of the potential exploitation of secondary products.

What does the incorporation of cattle in the production strategy signify? In terms of potentially exploitable biomass, cattle husbandry can be considered more profitable than that of caprines as a greater quantity of food is obtained from each individual. Bearing in mind that for the initial stage in the process of domestication the practice of exploitation aimed mainly at obtaining meat is documented we may well wonder why its domestication took place after that of caprines. There are different viable responses:

1. their reproductive capacity is inferior to that of caprines.
2. the high rate of exploitation of the wild form permits us to presume that it was abundantly available close to the settlement. Their size, larger than caprines, and food requirements would entail a greater investment in work as compared to caprines, so that their exploitation through hunting was considered more efficient.
3. the level of technical knowledge implied in husbandry practices makes the adoption of a species with a specific behavioural structure more feasible, such as that of *Capra*.
4. the priority objective of the domestication of cattle by the community settled in tell Halula is not exclusively the exploitation of the meat, but also secondary products.
5. the exchange relations established favour the adoption of a species different from cattle.
6. the natural populations of *Capra* and *Ovis* pose a greater problem for the development of agricultural practices than cattle.
7. the size of the cattle favours continuity in collective ownership.

Bearing in mind that the basic objective pursued in the domestication of animals is to have direct control over the reproductive periodicity and production of natural populations, it seems logical to think that the reproductive capacity of each species would be precisely one of the most critical characteristics of this decision. The different communities know the reproductive rhythms of each species as well as their reproductive capacity under artificial conditions. We do not, however, want to suggest that this characteristic was the only causal factor. The potential practice of a selective hunting of *Capra* and not of bovines could also have facilitated its premature domestication. All the same, it must be pointed out that widely utilised criteria such as the practice of selective hunting and the abundance of this resource close to the settlement to explain the domestication of a specific species does not sufficiently justify the beginning of reproduction under artificial conditions. One of the indispensable conditions for domestication is that the social structure of a community incorporates the possibilities and the mechanisms of adopting one or certain specific animal species.

The set of social relations that determine the production process based on animal husbandry was already fully established in tell Halula so as to facilitate the beginning of bovine husbandry there. However, its adoption in this case is not a response to the need to overcome a moment of negative inflection but rather to complement a process begun during the first occupation phases of the tell. Once the possibilities of using animals as a means of production were known, the consolidation of the

process could not be limited to two species. In this way, the incorporation of cattle and pig within the basic production strategy constitutes a widening and diversification of these means.

There is thus a substantial change in the mode of managing animal resources. From now on the acquisition strategy practiced followed much more homogenous patterns in relation to the species exploited, focusing primarily on an integrated and complementary management of the herds of sheep, goats, cattle and pigs. The reproduction under artificial conditions of species with different reproductive rhythms enabled the seasonal fluctuations in the number of births and culls to be overcome, thus becoming an alternative to hunting. Parallel to this, the complementary breeding of polyvalent animal species enabled a widening and diversification of the range of obtainable products, adapting the management of each species to the production or utilization that yields a higher level of productivity. In this way, breeding cattle can constitute a crucial element for increasing agricultural performance while at the same time sheep and goats can become a complementary binomial that cover the basic production needs of milk and wool. On the other hand, the meat product, obtained partly from pig combines several sources of supply. The variability registered in the representation of each species does not essentially alter the modes of management. This may be a response to far more localized fluctuations which could be countered without substantially varying the general strategy.

If we can then talk of a certain degree of specialization in husbandry activity, there is still no good evidence for a specialized husbandry during these chronological periods. The management practiced from occupation phase 16 represents thus the culmination of the tendency begun in occupation phase 8. Once husbandry activity was consolidated, a far more specialized management would be feasible both for the animals and their products. The balance achieved between production and reproduction could then tilt towards one extreme or the other.

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