

## FAUNAL ANALYSES IN THE NEAR EAST : SCOPE AND LIMITATIONS

Prof. Dr. Arturo Morales Muñiz  
Universidad Autónoma, Madrid

**Abstract :** Faunal studies are an integral part of archaeological research in the Near East. The questions the excavation can address through the use of animal remains is conceptually broad and methodologically varied. In order for those analyses to be of use, however, one needs to build a framework which could serve as a comparative testground for specific results. In this paper we comment briefly on some of the problems of archaeozoological assemblages on the Near East during the transition to sedentary life.

**KEYWORDS :** FAUNA, DOMESTICATION, SEDENTISM, MAMMALS, SUBSISTENCE STRATEGIES, NEAR EAST, MESOLITHIC, NEOLITHIC

### I. Introduction

Traditionally considered the "cradle of civilisation", the Near East saw the sequential emergence of sedentary societies, agriculture, animal husbandry, and urban life. In none of these events did faunas play a neutral role. Much to the contrary, for phenomena such as sedentarism and stockbreeding, they were the main characters. But their role has emerged gradually during the last seventy years of archaeozoological research and then only in not so straightforward ways (*Meadow & Zeder, 1978 ; Buitenhuis & Clason, 1993 ; Buitenhuis & Uerpmann, 1995*). Because of this, a lot of theorizing, based on sound logic but occasionally not that many data, has ensued and , paradoxically, such theorizing has sometimes been to the detriment of a coherent picture emerging from the multitude of faunal reports available (*Tchernov, 1992*).

Obviously, each site is "a world of its own" and a lot of what happens within it, is not easily extrapolable to apparently similar settings. In order to build a general framework of faunal evolution in the Near East, and of its implications for cultural studies, one nevertheless needs to have a clear picture of the conceptual issues "behind the screen".

In the pages that follow, we have tried to succinctly present some of the questions which the faunal analyst should be able to address in the area during the transition from hunter-gathering societies to farming and settled life in general.

It should be stressed that throughout what follows, the term "Near East" has been used in a rather loose, orientative, manner, encompassing what some authors more properly label "Middle East" on top of what could be a "Near East" *sensu stricto*.

### II. The "Bottleneck" of Reference Specimens

Having only been recently incorporated to the study of the Near eastern archaeozoological faunas, I would like to comment briefly, from the host of issues which one could place under the label of "logistics", on the subject of reference collections in connection with faunal analyses in the area (*La Bianca, 1978*).

It seems to me that analysts working outside the realm of biology do not fully grasp the importance of variation in the living world. Archaeozoologists are restricted to a much smaller level of this variability but are still forced to work with an immense amount of variation in mind. For any faunal analysis to be reliable, the analyst needs to make positive identifications of potentially thousands upon thousands of different **categories** of objects (eg., a single fish skull might harbour more than 400 bones in no less than 250-300 different morphologies!). The only way around this is the reference collection.

Reference collections take years to build and, for this reason, faunal analysts rely on those from various institutions. In the Near East, as in other regions outside Europe and North America, the number of institutions with specimens for use in archaeozoological studies is very low and the only operative possibility is to take the specimens "back home". Alternatively one might try to raise a restricted reference collection with the basic stuff for fieldwork!

Fortunately for european archaeozoologists, the Near East belongs, biogeographically speaking, to the Palearctic region which, on top of northern (ie., supra-saharan) Africa and northern/central Asia includes Europe. Because of this, the Near East shares with Europe a rather large number of similar or equivalent (ie., vicariant) species. Such faunal homogeneity, however, is restricted for the most part to medium-large sized mammals (eg., carnivores and ungulates) and birds (in particular migratory species). Since included in these two categories are most of the game animals as well as all the domestic species which we have in Europe (see below), european analysts have not had, for the most part, great difficulties in tackling Near eastern faunal assemblages<sup>1</sup>. This has not always been the case with non-european archaeozoologists.

On the other hand, animals such as microvertebrates or soil arthropods, with restricted mobility, exhibit a far larger degree of endemism and require the build-up of specific collections if one is to make use of them. Normally, these faunas, being more dependent on local conditions, are good bioindicators and, as such, allow one to address a host of paleoenvironmental questions. Occasionally, as in the case of fishes or molluscs, one can also analyze cropping strategies or, even, paleocultural issues (see next section). Despite their importance, this fauna has been neglected for the most part in the Near East sites or, at the most, given a cursory treatment. But even today, when the potential for the systematic retrieval of all these remains can be fully exploited, one is at pains in finding institutions harbouring reliable collections for use by faunal analysts. I, for one, do not yet know of any single institution in the world which harbours a collection of freshwater molluscs or mites for archaeozoological purposes and of very few harbouring amphibians, reptiles and micromammals. The same holds for marine fishes of Indo-Pacific origin (*Desse, 1993*). Such a

---

<sup>1</sup> Most of the skeletons from domestic mammals in european institutions are, obviously, from local breeds which, as far as we have seen, are quite different from their near eastern counterparts (more slender and smaller as is normally the case in animals from arid zones). Such morphological, intraspecific, variation might pose a serious problem for the un-aquainted archaeozoologist when he/she first encounters the near east varieties in the field.

state of affairs constitutes a true "bottleneck" for the development of Near East archaeozoology.

### III. Sedentism : Cause or Effect?

With independence of the causes which forced people to become sedentary<sup>2</sup>. The shift from ephemeral occupation to prolonged habitation had a far reaching impact on the environment (*Tchernov, 1991, 1992, 1993*). Although in most cases such impact did not come overnight, at least two different lines of evidence can be tracked down by the faunal analyst :

1. Resource exploitation within a restricted area implies increasingly restricted subsistence strategies resulting in the "broad spectrum exploitation model" as first defined by Flannery (1972). Both qualitative (i.e., shift from big game to smaller ("lower ranked") prey) and quantitative (i.e., percentages of the various taxa cropped by people) parameters help us define such a model (*Uerpmann, 1989*).

2. Once a more or less constant availability of food and shelter is created by man at a particular place, the stage is set for an array of species to "colonize" that area either as parasites or commensals. Such re-accommodation of biological habits, would allow these faunas to gain ground over their wild counterparts and set the "feedback loop" in motion so that facultative parasites/commensals could eventually become obligate forms (*Cohen, 1989; Morales et al, 1995; Les Groube, 1996*). By doing so, these species become bio-indicators of human sedentism to an extent which far exceeds that of most domestic taxa. Obviously, one of the aims of faunal analysis is to detect such target taxa (*Tchernov, 1991*).

Much more can not be said on archaeozoological grounds. Intensive use of resources has been variously labelled by such ambiguous terms as "specialized hunting", "cultural control", "proto-domestication", "overkill (or anti-overkill!) practices" and the like. Within such framework, any particular pattern, whether preferential retrieval of a cohort, size diminution trends and equivalent events have too often been taken to indicate conscious manipulation of the environment without offering much thought to alternative explanations. In many instances, moreover, the hypotheses seem beyond the realm of refutation and in others there seems to be a somewhat circular type of thinking involved. Thus, if a particular sample belongs to a species which was eventually domesticated, any "hints" of deviation in its putative "normal demographic parameters" or structural features might be taken as evidence of "cultural control" leading to domestication (see below). If, on the other hand, those "deviations" are recorded on samples from species which, like gazelles, did not become domestic, then "deviations" "must be the result of preferential hunting practices" (*Tchernov, 1993 : 12*).

### IV. Domestication Models : Heuristic Tools

<sup>2</sup> In view of the consequences which, in terms of human health and nutrition, sedentism brought about (*Cohen, 1989; Les Groube, 1996*) it seems clear that the phenomenon might have been less of a free "adaptive strategy" and more of an imposed "solution" than many of us would like to admit. On the other hand, hypotheses relying on basically "negative" conditions (eg., limited movement of populations due to social conditions such as the presence of neighbouring groups) do not in any way rule exogenous agents (such as the onset of wetter conditions in the Levant around 10.300-10.000 BP enabling Natufians to expand their knowledge as intensive users- eventually cultivators- of wild cereals) out of the general framework (*Bar Josef & Belfer Cohen, 1989*).

With independence of chronological factors<sup>3</sup>, domestication models rest on the premise that animal domestication has not been a monocentric phenomenon<sup>4</sup> (Bökönyi, 1993). Despite its non-parsimoniousness, polycentric domestication has been proven beyond reasonable doubts in the case of the dog (Clutton-Brock, 1981, 1984; Olsen, 1985) lending support to the idea that both ethological (Uerpmann, 1996) and evolutionary (Budiansky, 1992) forces acted so that *"whenever and wherever man reached a certain level in his cultural ... development, he began domestication"* (Bökönyi, 1993: 4). Although this hypothetical framework has been *"never proved beyond the stage of plausible candidate circumstances"* (Hole, 1996: 263) it nevertheless allows one to address the issue from a wider perspective than a strictly utilitarian one. One should still be reminded that the power of the domestication models is mainly heuristic and, as of this writing, no definitive identification has been made of where and under circumstances were livestock domesticated for the first time (see next section).

Bökönyi's models address the domestication issue on the additional premise that, in a particular area, particular animals happened to occur *"... in such abundance that a succesful domestication ... could develop out of their capture and taming"* (Bökönyi, 1993: 4). Such premise, otherwise logical and parsimonious, does not seem to take into account different "threshold levels" in terms of species densities and seems more appropriate in the case of the domesticated herbivores (eg., no matter how abundant, carnivores never reach densities comparable to prey species). A perhaps more disturbing fact has to do with the second "premise" of Bökönyi's models which requires that, for any particular species to become incorporated into any of them, we need to know that that particular species eventually became domesticated (at one or another place!). This is the same type of circular reasoning which we denounced in the previous section and one that, inevitably, leads us to trouble (eg., why can we argue for domestic goats in Irak as part of its domestication model? because goats eventually got domesticated *somewhere* at some stage!). One way or the other, we still need to stress that Bökönyi's models refer to "animals", never species, since he considered that specific differences were not necessary for the development of the various models proposed. Finally, one should be reminded that we are here referring exclusively to Eurasian models, not taking into consideration other places which, despite geographical proximity (eg. Egypt), do not belong to this author's general "scheme of things". Also, Bökönyi refrains from placing a time scale to them since he believes that doing so would place an extra burden on the heuristic value of these hypotheses. Here are, then, the characteristics of the four Near East domestication models (Figure 1):

1. Anatolian-Mesopotamian: except for the bezoar goat and asiatic mouflon, this model resembles most that which happened in the european subcontinent for, on the top of the european subspecies of aurochs, it also included subspecies of wild boar and wolf quite similar

<sup>3</sup> The onset of animal domestication seems to span over periods 2 (10.300-9.600 BP) and 3 (9.600-8.600 BP) of the chronological scheme proposed by Aurenche et al (1987).

<sup>4</sup> This does not seem to be the case for plant domestication where McCorriston & Hole (1991) provide persuasive argument in favour of *"...a single development in one locale gradually spreading (from the "Levantine corridor") northwards with branches extending both east and west"* (Hole, 1996: 263).



to those found in SE and Central Europe. This was the "domesticated package" later exported to Europe.

2. European : with the exception of the paleolithic/mesolithic finds of dogs (*Degerbøl, 1961; Bökönyi, 1975, 1978; Benecke, 1993*) and some claims of putative domestic pigs (*Bibikova, 1960*), Bökönyi (1993) contends that "a less ostentatious" domestication of the locally available aurochs, wild swine and wolf probably started in Europe after the caprovine-based anatolian stockbreeding, with its accompanying set of domesticates, first set foot in the southern portions of the continent. Such parsimonious postulating of contacts and gradual spreading of imported domesticates, together with the idea to carry on with the domestication of local variants, coexists with a more punctuated type of dispersal in the western mediterranean as exemplified by Zilhão's paradigm of the "enclave" (*Zilhão, 1993*) where claims for local domestication of aurochs and wild swine have been criticised by several authors (*Morales & Martín, 1995; Morales et al, 1995b; Rowley-Conwy, 1995*).

3. Palestinian-Arabian : wild sheep and pig are either extremely rare or altogether missing from this region (**Figure 1**) where bezoar (as well as occasionally ibex) is abundant and auroch is not rare either [wild ass and camel remain two further possibilities (*Morales et al, 1995a*) and the wolf was apparently present everywhere] (*Uerpmann, 1987*). All this resulted in an important goat and lesser cattle domestication in the northern area (cattle and, eventually, ass became the dominant elements in the SE portions thus resembling the Egyptian/East African models where domesticated caprovines arrive only during the late Neolithic (*Gautier, 1984 a,b*). The peculiar feature about this model is that domesticates represent a special, slender, desert type best seen in goat and cattle.

4. Irano-Indian : as in the previous case, this model differs from the first and second at the level of "geographical races" (ie., subspecies). In this way, indian aurochs (*Bos primigenius namadicus*) and urial (*Ovis orientalis*) played the leading role here. Secondary role was played by the local subspecies of wild goat, swine and wolf although in these semi-desert and desert settings the pig was a marginal domesticate. The camel has been also postulated to become domesticated here. Zebu cattle, descendants of the indian aurochs and characterized by bifid neural processes of the thoracic vertebrae as well as by slender metapodials and peculiar skull + horncores, spread from this zone all-over the hot and arid afro-asiatic regions. Much the same thing seems to have happened with the urial's descendants, bred into specimens with characteristic strongly twisted horns which ended up in the horizontal corkscrew types best exemplified by the predynastic sheep of Egypt.

## V. The Caprovines : a Case Study

In the light of their subsequent economic importance, it is quite surprising to discover just how rare bones from wild goat (*Capra aegagrus*) and wild sheep (*Ovis orientalis*) are in pre-neolithic southwest asian sites<sup>5</sup>. Such scarcity seems to be in open conflict with

<sup>5</sup> In his recent review, Legge (1996) mentions "... fewer than 20 late paleolithic and mesolithic sites" and further specifies that "... in only a few instances have both species been identified at the same site. Uerpmann (1987) list six pre-neolithic sites with unquestionable identifications of both sheep and goat, to which list can be added the site of Wadi Judayid (Henry & Turnbull, 1985)" (Op. cit.: 238). On top of this, it should be stressed that, even when found, caprine bones represent a minor resource

Bökönyi's contention that local abundance was a *sine qua non* requirement for the domestication of mammals (Bökönyi, 1993) and places the inferential process on a rather weak basis.

With independence of hypotheses on the role of landscape/environmental triggers, changes in settlement/mobility patterns in human populations at the onset of caprovine domestication, management of wild mammals populations, etc. (see Hole 1996 for a recent and comprehensive review of such matters), none of the criteria on which faunal analysts rely for determining the domestic status of caprovine remains can be considered absolute (Table 1).

To start, the assumption that caprines in a faunal assemblage were wild when scarce and domestic when abundant is, as acknowledged by Legge (1996), "... an oversimplified view of a complex process" (Op. cit. : 238). (As we have previously argued, much of that reasoning relies on circular arguments).

Obviously, a shift in status from wild to domestic does not imply any speciation/subspeciation event and, consequently, anatomical criteria are essentially useless for diagnostic purposes (even in such straightforward instances as hornedness is the evidence weak for one knows that this mutation accounts for some 1 % of cases of hornless individuals in wild populations!) (Clutton-Brock, 1981 : 54).

The remaining criteria do not fare much better than this ; Thus :

(a) Body size changes, in order to be of any use, need data for contrast. This means to have not only recent osteometrical data on both wild and domestic species (preferably from the same area where sheep/goat remains are being excavated!) but also to monitor osteometrical changes through time. Body size depends on a wealth of phenomena, both "natural" (ie., temperature, sexual dimorphism, etc.) and man-caused and one should have at least an idea of what parameters might be important in a particular case.

(b) Population structure. Although, "it is a problematic to argue that a given population structure differs from the wild norm in that none such exists" (Legge, 1996 : 239), this same author later states that "the identification of a high frequency of subadults bones and an adult herd in which females are the majority is evidence for domestication " (Op. cit. : 239) this exemplifies the conceptual mistake of equating taphocenosis with biocenosis. Faunal assemblages from archaeological sites are seldomly (a) catastrophic, localized, events and (b) the strict result of random processes. What one is retrieving is, basically, the remains of what people have been eating (not managing!). By the same token, a strict interpretation of a particular population structure from the exclusive perspective of human interference might, in many instances, be also a gross oversimplification in need of a thorough revision.

(c) Sudden appearance of a new species in the archaeozoological record can be equated with domestication, particularly when (1) the species is one which we know was eventually domesticated (again the old circular argument) and (2) the corology of the agriotype is clearly disjunct. When the agriotypes have been known to exist in the area where a particular

site lies (or in nearby areas!) matters might be more difficult to tackle. This applies to caprovine (wild and domesticated forms) throughout the Middle East (Uerpmann, 1987).

Notwithstanding these facts, we must, nevertheless, stress the heuristic power of the synergesis produced when the faunal analyst can combine several, or all, of those lines of evidence at the same moment on a specific sample. This synergesis is further enhanced when a particular set of data can be coupled on a larger scale of events. Pattern-seeking researches, then, should be the prime aim of all studies.

Mainly for this reason, we have tried to summarize, to the best of our ability, the latest evidence for caprovine domestication by targetting on a series of Near east sites from Periods 2 and 3 ) (Aurenche *et al*, 1987) where the following parameters have been recorded :

1. Presence of sheep (*Ovis sensu lato*) and goat (*Capra sensu lato*) remains (O/C). The logic being that, since both species exhibit different environmental preferences (goats steep and rocky habitats, sheep more undulating terrain) their simultaneous retrieval at a particular site/level, might at least be taken as a hint that "something peculiar" could have been going on.

2. Sheep to goat ratio (O : C). The logic here being that, for synchronic sites from similar settings in a particular region, such ratio could evidence regularities of use (being this dietary or otherwise).

3. Percentage of caprovines over total of fauna ( O/C %). The logic in this case being that significant contributions (ie., 40 % of total number of remains) of the caprovines to the total might indicate a "cropping" intensity well above what seems to be expected in terms of their abundance in preneolithic sites in the area.

4. Size. Simply recorded as "small" or "large" roughly corresponding to what the authors consider domestic or wild.

5. Age and sex peculiarities. The logic here being that skewed distributions of a particular sex or cohort might reflect a preferential use (ie., dietary or otherwise) of sectors of a population despite the previously mentioned drawbacks.

6. Status. This simply reflects the opinion of the researchers about their faunal material. Faunal analysis is about bones and first-hand contact with them normally places the archaeozoologist in a better position to make more reliable educated guesses about the nature of his/her material than most reviewers might like to acknowledge.

Obviously, the diverse nature and scope of all these analyses is far from providing a homogeneous picture of the state of affairs. Still, a casual look at **Table 1** evidences a series of apparent consistencies :

- (a) Of all the places under study, caprovine domestication may have occurred for the

first time in the region where Irak, Iran and Turkey intersect. This would be consistent the borderline between Bökönyi's Anatolian-Mesopotamian and Irano-Indian domestication models.

(b) Few sites feature "domestic" caprovines prior to 9.000 BP although Hole (1996) maintains that this domestication is most likely to have occurred between 11.000 and 10.000 BP. Whether sheep or goat were domesticated simultaneously or not remains an open question.

(c) There seems to exist a pervasive pattern of putative domesticated caprovines correlating with abundance frequencies 50 % of all the fauna or higher. Normally, these two parameters couple with "small" size but, on view of the scarcity of data, no such correlations can be spotted in the case of age and sex groups.

These are, very briefly, the main "facts". Many more things could be said from both the cultural and hypothetical standpoints but this is well beyond the scope of our paper.

## VI. Conclusions

The previous lines are not in any way meant to be an exhaustive review of the major aspects of archaeozoological studies in the Near East but, rather, a series of more or less linked ideas evidencing the range of phenomena (and some of the problems) which any faunal analyst is likely to encounter when studying early Holocene sites in the region.

The questions that can be raised in later (ie., post-Neolithic) stages are different but in no way less interesting or complex. Faunal studies have grown both methodologically, with the incorporation of techniques such as paleo-DNA, trace element and stable isotope analyses, and conceptually. This conceptual growth has much to do with the realisation, on the part of the excavators, that animal remains can be put to uses far beyond the realm of the natural sciences.

At this stage of research, however, one could say that we have hundreds of pieces from a huge jig-saw puzzle whose picture we have been able to decipher but that many of these pieces stand on isolation and, consequently, in many cases we are still unable to place them in their correct position. It is for these reasons that now, more than ever, archaeozoologists need to be incorporated as vital elements of interdisciplinary research teams in the area.

## VII. References :

Aurenche, O., Evin, F. & F. Hours (eds) (1987). Chronologies in the Near East. *British Archaeological Reports (International Series)* 379ii. Oxford.



Bar Josef, O. & A. Belfer-Cohen (1989). The origins of Sedentism and Farming Communities in the Levant. *Journal of World Prehistory*, 3 : 447-498.

Benecke, N. (1993). Zur Kenntnis der mesolithischen Hunde des südlichen Ostseegebietes. *ZfA Z. Archaeol.*, 27 : 39-65.

Bibikova, V.I. (1960). *O Raspostranenii dikogo Kabana v cervecticnom periode Naucnye novosti i Zametki* : 107-112.

Bökönyi, S. (1975). Vlasac : an early site of dog domestication. In : Clason, A.T. (Ed.) : *"Archaeozoological Studies"* : 167-178. North-Holland. Amsterdam.

Bökönyi, S. (1978). The vertebrate fauna of Vlasac. In : Srejovic, D. & Z. Letica (Eds.) *"Vlasac : a mesolithic settlement in the Iron Gate"* : 36-65. Serbian Academy of Sciences and Arts Monograph DXII. Beograd.

Bökönyi, S. (1993). Domestication Models : The Anatolian-Mesopotamian and the Others in Southwest Asia. In : Buitenhuis, H. & A. Clason (Eds.) *"Archaeozoology of the Near East"* : 4-9. Dr. W. Backhuys. Leiden.

Budiansky, S. (1992). *The Covenant of the Wild*. Weidenfeld & Nicholson. London.

Buitenhuis, H. & A. Clason (Eds.) (1993). *Archaeozoology of the Near East*. Dr. W. Backhuys. Leiden.

Buitenhuis, H. & H.P. Uerpmann (Eds.) (1995). *Archaeozoology of the Near East*. II. Dr. W. Backhuys. Leiden.

Clutton-Brock, J. (1981). *Domesticated Animals from Early Times*. William Heinemann. London.

Clutton-Brock, J. (1984). Dog. In : Mason, I.L. (Ed.) *"Evolution of Domesticated Animals"* : 198-210. Longman. London.

Cohen, M.N. (1989). *Health and the Rise of Civilization*. Yale University Press. New Haven.

Degerbøl, M. (1961). On a find of a Preboreal domestic Dog (*Canis familiaris* L.) from Starr Carr, Yorkshire, with remarks on other mesolithic dogs. *Proceedings of the Prehistoric Society* for 1961. vol. VII : 35-55.

Desse, J. (1995). Archéo-ichthyologie du Golfe Arabique et de l'océan Indien. In : Buitenhuis, H. & H.P. Uerpmann (Eds.) : *"Archaeozoology of the Near East, II"* : 72-78. Dr. Backhuys Publishers. Leiden.

- Flannery, K.V. (1972). The Cultural Evolution of Civilizations. *Annual Review of Ecology and Systematics*, 3 : 399-426.
- Gautier, A. (1984a). Quaternary mammals and archaeozoology of Egypt and the Sudan : a survey. In : Krzyzaniak, L. & M. Kubasciewicz (Eds.) "Origin and early development of food-producing cultures in North-eastern Africa" : 43-56. Polish Academy of Sciences. Poznań.
- Gautier, A. (1984b). The fauna of the neolithic site at Kadero. In : Krzyzaniak, L. & M. Kubasciewicz (Eds.) "Origin and early development of food-producing cultures in North-eastern Africa" : 317-319. Polish Academy of Sciences. Poznań.
- Groube, L. (1996). The Impact of Diseases upon the Emergence of Agriculture. In : Harris, , D.R. ( Ed.) "The Origins and Spread of Agriculture and Pastoralism in Eurasia" : 101-129. UCL Press. London.
- Harris, D.R. (Ed.) (1996). The Origins and Spread of Agriculture and Pastoralism in Eurasia. UCL. London.
- Hole, F. (1996). The Context of Caprine Domestication in the Zagros Mountains. In : Harris, , D.R. ( Ed.) "The Origins and Spread of Agriculture and Pastoralism in Eurasia" : 263-281. UCL Press. London.
- La Bianca, Û. S. (1978). The Logistic and Strategic Aspects of Faunal Analyses in Palestine. In : Meadow, R.H. & M.A. Zeder (Eds.) "Approaches to Faunal Analysis in the Middle East" : 3-9. Peabody Museum Bulletin, 2.
- Legge, T. (1996). The Beginning of Caprine Domestication in Southwest Asia. In : Harris, , D.R. ( Ed.) "The Origins and Spread of Agriculture and Pastoralism in Eurasia" : 238-262. UCL Press. London.
- McCorriston, J. & F. Hole (1992). The Ecology of Seasonal Stress and the Origins of Agriculture in the Near East. *American Anthropologist*, 93 : 46-69.
- Meadow, R.H. & M.A. Zeder (Eds.) (1978). "Approaches to Faunal Analysis in the Middle East". Peabody Museum Bulletin, 2.
- Morales, A. & J.M. Martín (1995). Los mamíferos de la Cueva de Nerja : Análisis de las cuadrículas NM 80A, NM80B y NT82. In : Pellicer, M. & A. Morales (Eds.) "Fauna de la Cueva de Nerja I" : 57-159. Patronato de la Cueva de Nerja. Nerja.
- Morales, A., Riquelme, J.A. & C. Liesau (1995a). Dromedaries in Antiquity : Iberia and beyond. *Antiquity*, vol. 69, n° 263 : 368-375.
- Morales, A., Cereijo, M.A., Hernández, F. & C. Liesau (1995b). Of Mice and Sparrows :

Commensal Faunas from the Iberian Iron Age in the Duero Valley (Central Spain). *International Journal of Osteoarchaeology*, 5 (2): 127-138.

Olsen, S.J. (1985). *Origins of the Domestic Dog*. The University of Arizona Press, Tucson.

Rowley-Conwy, P. (1995). Wild or Domestic ? On the Evidence of the earliest domestic cattle and pigs in South Scandinavia and Iberia. *International Journal of Osteoarchaeology*, vol. 5 (2): 115-126.

Tchernov, E. (1991). Of mice and men. Biological Markers for long-term Sedentism ; a reply. *Paleorient*, 17 (1): 1-8.

Tchernov, E. (1992). Evolution of Complexities. *Archaeozoologia*, V (1): 9-42.

Tchernov, E. (1993). The Impact of Sedentism on Animal Exploitation in the Southern Levant. In: Buitenhuis, H. & A. Clason (Eds.) "Archaeozoology of the Near East": 10-26. Dr. W. Backhuys. Leiden.

Uerpmann, H.P. (1979). Probleme der Neolithisierung des Mittelmeerraums. (Beihefte zum Tübinger Atlas des Vorderen Orients, Reihe B (Geisteswissenschaften) 28). DR. L. Reichert. Wiesbaden.

Uerpmann, H.P. (1987). The Ancient Distribution of Ungulate Mammals in the Middle East . (Beihefte zum Tübinger Atlas des Vorderen Orients, Reihe A (Naturwissenschaften) 27). DR. L. Reichert. Wiesbaden.

Uerpmann, H.P. (1989). Annual Exploitation and the Phasing of the transition from the Paleolithic to the Neolithic. In: Clutton-Brock, J. (Eds.) "The Walking Larder": 91-96. Unwin Hyman. London.

Uerpmann, H.P. (1996). Animal Domestication- Accident or Intention ?. In: Harris, D.R. (Ed.) "The Origins and Spread of Agriculture and Pastoralism in Eurasia": 227-237. UCL Press. London.

Zilhão, J. (1993). The Spread of agro-pastoral economies across Mediterranean Europe : a view from the West. *Journal of Mediterranean Archaeology*, 6 (1): 5-63.

FIGURE 1. Territories of the four Domestication models (after Bökönyi, 1993).

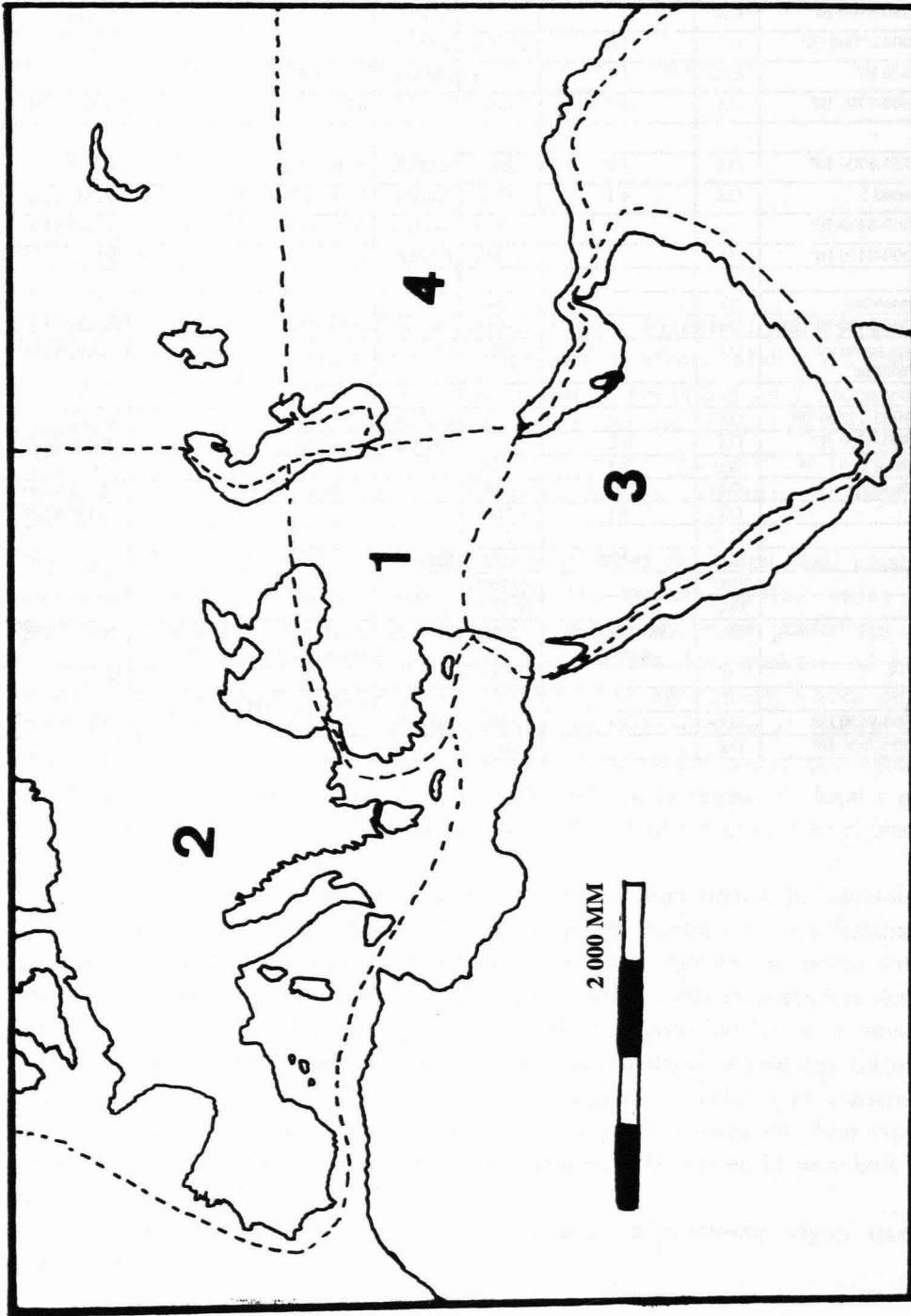


Figura 1. Territories of the four Domestication models (after Bökönyi, 1993).



SITE	DATING	O/C	O:C	% O/C	SIZE	AGE	SEX	STATUS
TURKEY								
Cafer Höyük	8980-8400 BP	O,C	1:8/9	56-63 %	LARGE			WILD
Asikli Höyük	8980-8400 BP	O,C			LARGE			WILD ?
Çayönü Tepesi	10000/9000 BP	O,C	1:4	10-26 %	LARGE			WILD ?
Çayönü Tepesi	9000 BP	O,C	1:1	+ 80 %	SMALL	35 % NAD		DOMESTIC ?
Gritille	8600-7700 BP	O,C	3:1	76%		65 % ( 36 m)		DOMESTIC ?
IRAN/IRAK								
Tepe Asiab	9755-8700 BP	O,C	1:2	36%	LARGE	18 % NAD		WILD
Tepe Asiab	Period 5	O,C	4:1	85%	SMALL	33-40 % NAD		DOMESTIC
Ganj Dareh	9000-8450 BP	C		+ 90 %	SMALL	70 % NAD?	juv. OO	DOMESTIC
Ganj Dareh	9000-8450 BP	O		- 10 %	LARGE	?		WILD
SIRIA								
Abu Hureyra	mesolithic	O		6%				WILD
Abu Hureyra 2A	9700-9400 BP (P3)	O,C		12-14 %	SMALL	65 % NAD	bias OO C	DOMESTIC (C)
Abu Hureyra 2B	later aceramic Neolithic	O,C		75%	SMALL		bias O♀ C	DOMESTIC
LEVANT								
Wadi Judayid	13000-10300 BP	O,C			LARGE			WILD
Tell Aswad	9800-8800 BP	O,C	0 C		SMALL	"peak" 1-2 y	bias OO	DOMESTIC ?
Ghoraifé	(Phase I)	O,C	1:3	+ 50 %				DOMESTIC
Ghoraifé	(Phase II)	O,C	3:1	++ 50 %				DOMESTIC
Tell Ramad		O,C	3:1	+ 70 %				DOMESTIC
Tell-es-Sultan		O,C		5%				?
Tell-es-Sultan		O,C	O/C	60%	SMALL			DOMESTIC
Beisamoun		"O/C"		60-70 %				?
Abu Gosh		"O/C"		60-70 %				?
Ain Ghazal		"O/C"	Only C in early occupation	50%	SMALL	most C immature	bias OO ++	DOMESTIC
Beidha		C		66%				WILD
Beidha		C			SMALL	60% < 24m		DOMESTIC ?
Basta	9600-8600 BP	O,C	2:3	76%	SMALL			DOMESTIC
Jilat 13	7900-7830 BP	O,C		30%				DOMESTIC ?

TABLE 1.