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The origins of animal domestication and husbandry: A major change in the history of humanity and the biosphere

Les origines de la domestication des animaux et de l'élevage : un changement majeur dans l'histoire de l'humanité et de la biosphère

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ABSTRACT

This article aims to summarize the present archaeo(zoo)logical knowledge and reflections on the origins of Neolithic animal domestication. It targets the main characteristics of early Neolithic animal domestication set against a backdrop of two complementary scales, namely the global and macro-regional scales (the latter using the example of the Near East). It discusses the conceptual and methodological issues, arguing in favor of an anthropozoological approach taking into account the intentions and the dynamics of human societies and critically analyzes the reductionist neo-Darwinian concepts of co-evolution and human niche construction. It also provides a brief discussion on the birth of ungulate domestication and its roots, as well as appropriate bibliographic references to enlighten the current status of domestication research.

Mots clés :
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« Human niche construction »

RÉSUMÉ

Cet article résume l'état présent des connaissances et des réflexions archéo(zoo)logiques concernant les débuts néolithiques de l'élevage des animaux. Il cherche à dégager les principales caractéristiques des premières domestications animales néolithiques en considérant ce phénomène à deux échelles complémentaires, mondiale et macro-régionale, la seconde étant illustrée par l'exemple du Proche-Orient. Il argumente en faveur d'une approche anthropozoologique de la domestication, prenant pleinement en compte l'intentionnalité et les dynamiques propres des sociétés humaines, et critique les concepts néo-darwiniens réductionnistes de coévolution et de construction de la niche humaine. En conclusion, il discute brièvement les raisons de la naissance de la domestication néolithique des ongulés. De nombreuses références bibliographiques sont données afin de préciser l'état des recherches sur la domestication des espèces.

1. Introduction

Wolves (*Canis lupus*) are the first species known to have been domesticated during the Late Glacial by both European and Asian hunter-gatherers. This occurred somewhere around 17–15 kyrs BP [1–6] or perhaps earlier, around 20–30 kyrs BP [7]. However, this did not bring about major modifications in the way of life for humans, except perhaps small changes in hunting strategies, tactics or techniques. This suggests that at least during the Upper Palaeolithic *Homo sapiens* were already able to

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domesticate, but only utilized this behavior sporadically for a restricted number of species in particular circumstances. From ca. 12 kyrs BP several other species of animals and plants began to be domesticated in other parts of the world [8–11]. Though only a tiny fraction of all biodiversity has actually been domesticated [12], domestication of new species continued throughout the next millennia until the present day, where it is still active primarily with fish. Contrary to dog domestication, these domestications were part of a major change in the way of life of an increasing number of human societies throughout the world, in a process called Neolithisation. This process is not only characterized by a slow but drastic techno-economic shift from hunting-gathering to food production, based on cultivation and husbandry of domesticates, but also by a strong demographic transition [13] combined with deep social and spiritual change [14].

This paper aims to summarize the current state of knowledge accumulated by archaeology and archaeozoology during 50 years of studying Neolithic animal domestication. It will briefly present the archaeozoological methods, whilst attempting to emphasize the main trends of this phenomenon against two different scales, namely the continental and regional (Near East) scales to discuss the conceptual issues and the reasons behind the birth of domestication. Many bibliographic references are provided to help readers getting a deeper insight into this fascinating topic of domestication.

2. Archaeological approaches to early animal domestication: concepts and techniques

Archaeological evidence of domestication, such as representations of scenes of husbandry or remains of objects linked with husbandry (e.g. yokes, fessels) are rare and often ambiguous. Thus, the best way to investigate early domestication consists of studying archaeological skeletal remains (archaeozoology [15–19]). These remains provide substantial and important evidence that deserves attention:

- if they come from well-dated and characterized archaeological contexts they can often be dated with relative precision (± some decades to 2–3 centuries) and as this date can normally be corroborated by direct radiocarbon dating of the collagen from the bones themselves it is therefore possible to analyze the domestication processes with high temporal resolution, even for early period's ca. 12-10 kyrs BP;
- contrary to paleontological or even Pleistocene collections they often constitute a large series allowing quantitative approaches and statistical appreciation of the observations;
- as Late Glacial and Holocene archaeological bones are not fossils, histological structures, associated unicellular or helminthic parasites and organic matters are often well preserved, allowing for a large panel of biological analyses, including paleomolecular or isotopic approaches [20];
- in addition to multiscale and refined analyses of size and shape (e.g. using geometric morphometrics [21,22]), which provide information on size and shape evolutions and on age and sex at death, they constitute a large and very informative panel of pre-mortem (or intrinsic) biological signatures;
- the archaeological context of discovery (food refuse deposits, human burial, cultural sites) as well as the post-mortem marks on the bones (cut marks, cooking burns) give indications as to the relationship of the species with humans.

Conversely archaeological approaches are limited by:

- archaeozoological discoveries coming from limited regions or periods, being badly documented or not yet studied;
- the low rhythm of archaeological analyses, often five to ten yearly excavation sessions are required before the refined chronological or contextual information is available, without which animal bones cannot be used;
- the loss of most of the biological information with only the skeleton being preserved;
- the extreme fragmentation of the bones, due to the systematic consumption of marrow and the post-depositional attrition of the collections, which reduces the quality and quantity of archaeozoological information.

Consequently, to fully analyze the preserved archaeological faunal collections, including paleomolecular or isotopic analyses, it is of utmost importance to have an in-depth knowledge of both the archaeological contexts and the taphonomic processes that have degraded the information [23]. This cannot be achieved without a tight and well-balanced collaboration between the excavator, whose scientific approach is as important and difficult as that of the analysts, the osteo-archaeologist, in charge of the general study of the faunal assemblages, and the specialists who undertake the molecular, geo-morphometric or isotopic investigations.

Studying early Neolithic domestication naturally requires a clear theoretical view of precisely what domestication is. Archaeologists generally agree that domestication can be defined as the process whereby the reproduction of a deme (i.e. local sub-population) of animals or plants is appropriated and controlled by human society for material, social or symbolic profit. Domestication, within this definition, is clearly differentiated from the pet-keeping of some Amazonian [24], New Guinean or Japanese Ainu hunters-gatherers, which consists of capturing a young wild animal, for a particular household rather than for a whole society, raising it (and even breast-feeding it) then later releasing or killing it without any offspring as a symbolic offering to nature to guarantee their future subsistence.

As a process dependent on the animal/plant species and on the multiplicity of human behavior domestication takes various forms. These can be arranged on a gradient of eco-anthropological mutualistic relationships between animal and human societies [25,26]; from anthropophily, to commensalisms or control in the wild, the management of captive animals, expansive or intensive breeding, and finally to pets (Fig. 1). As the process depends solely on the dynamic equilibrium between animals and humans, it is