CAT TAMING IN THE WESTERN MEDITERRANEAN. ISSUES, PROBLEMATICS AND UNPREDICTABILITY IN THE LIGHT OF BIO-ARCHAEOLOGICAL APPROACHES TO A MUSEUM SPECIMEN

Roberto Micciché, Pietro Valenti, Andrea D. Messina, Luca Sìneo*
Dipartimento STEBICEF, LabHOMO, Università di Palermo, Italy

Noboyuki Yamaguchi
Department of Biological & Environmental Sciences, Qatar University, Doha

Giulio Catalano
Department of Cultural Heritage (DBC), Università di Bologna, Ravenna, Italy

Stefano Reale, Mario Cosenza
Istituto Zooprofilattico Sperimentale di Sicilia, Palermo, Italy

Keywords: Felis silvestris Felis silvestris catus, animal domestication, Sicily, cat taming

1. Introduction

Applying a technological approach to "cultural heritage conservation" today envisages physical, philosophical and managerial sustainability aimed at preserving, protecting and caring for the sites and signs that have distinguished humans during their evolution and recent history. This is a multidisciplinary approach, which includes the skills and technology of historians, engineers, archaeologists, physicists, chemists, biologists, and anthropologists, in collaboration with trained conservators. A well-preserved and accurately conserved material is a fertile and fruitful field of investigation full of unexpected results. A network of cultural heritage conservation consequently provides not only a modern approach to preservation and conservation but is a necessary step in the scientific exploitation of cultural heritage.

A substantial range of significant questions in understanding our past finds answers in bioarchaeological studies. These include issues ranging from genetic relatedness to palaeodiet, ecology and health, or archaeozoological questions on hunter-gatherer subsistence, or times and mode of domestication. Several fundamental answers come to archaeology and to the global Cultural Heritage Network from new genetic approaches to museum collections of extinct animals and plants, or humans [1-3]. Nevertheless, new approaches in the study of morphologies can be of extreme importance for the taxonomy of museum collections.

One of the most recent issues in archaeology and in related sciences such as physical anthropology is: what was the contribution of anthropochorus fauna to human evolution across time?

In the light of the Neolithic Transition to a productive economy, with storage of foodstuffs and opportunistic animals and pests, humans soon appreciated having a small tamable predator like the cat around them. Indeed, it has long been debated whether

* Corresponding author: luca.sineo@unipa.it

humans domesticated the cat or whether it was the cat that domesticated humans. Nevertheless, this companionable situation certainly led to the development of an important relationship between humans and cats [4].

The housecat is the most common pet in the world. Despite its prevalence among humans, debates on the origin of the intimate feline-human bond are still inconclusive and there are many open questions about the cat's role in the broad process of animal domestication. As every cat owner knows, it is an elusive and unpredictable animal. Their housecat's mercurial behavior is likewise mirrored in the difficulties in tracing the history of their domestication. For zoo-archaeological researchers, the low incidence of cat remains in archaeological records, and the minor morphological differences between domestic cats and wildcats, constitute the two main obstacles in determining their developmental history. Such conditions make it necessary to employ a broad empirical approach and to examine multiple lines of evidence. After briefly reviewing the current understanding of the cat's history of domestication, as an example, this paper will present preliminary data from the study of an authentic archaeological specimen. This study, still in progress, especially as regards molecular methods, is a case-report on a multidisciplinary approach to museum sample analysis. The contribution focuses on a cat skull found at a prehistoric Sicilian site. The analyses were based on examination of the morphometric features of the skull and biomolecular analysis of DNA extracted from the bone.

2. Brief history of an "atypical" domestication process

In examining the origins and dynamics of the domestication of plants and animals, cat taming has remained one of the main issues still to be resolved within the field of prehistoric archaeology. Despite this, questions arose long ago within the theoretical framework of the Neolithic Revolution proposed by Child [5]; the argument is still strongly debated among scholars, testified by the absence of a shared definition of domestication. This is due to the extremely complex nature of the process of animal domestication that avoids a univocal and generalized notion. It is impossible here to examine in detail the multiple definitions of animal domestication, however, it is possible to find shared assumptions that may be useful in locating the cat within the history of animal domestication.

Most definitions of animal domestication focus on an analysis of the relationship between biological and cultural components [6-8]. However, despite the fact these two components are present in virtually every scholarly description of animal domestication, there is a wide discrepancy in reference to the role played by each element [9].

Many scenarios emphasize the predominance of human intervention and characterize it as exerting full control over animals, managing reproduction, movement, sustenance, and shelter [10, 11]. Furthermore, since many theories point out the crucial position of animal domestication in shaping the developing social organization of ancient human societies, the place assigned to animals within these communities is one that sees them as mere objects of possession [12].

In opposition to this "utilitarian" view of domestication, other researchers claim a more active role played by animals in the process of domestication. They reject the conceptualization of humans as the unique beneficiaries in the relationship and point out that the animals also benefit, notably in terms of improved reproductive fitness, food supplies and shelter [13].

Bökönyi [14] theorizes the dynamics of animal domestication in two phases: a first phase provides for keeping an animal in captivity for utilitarian purposes, and a second, which is a conscious action, is the control over reproduction intended to select only those individuals that exhibit certain biological and behavioral characteristics. It is important to note that the cat, for a large part of its history, was confined to the first phase. This is because, as expressed by the currently large number of phenotypic variations, complete domestication only took place in the last two hundred years. Following this model in relation to the cat, it would seem more appropriate to speak about taming rather than domestication [15].

The latter assumption introduces another shared factor present in almost all definitions of domestication. This common denominator is that the relationship, between human and non-human animals usually entails both morphological and behavioral modifications in the animal population [10, 14, 16-18]. These modifications are guided by the selective pressure of humans and have occured over several generations. For many years, this particular aspect of domestication has guided researchers, and still guides them today, in their attribution of a domesticated form and its wild predecessor, in zoo-archaeological research. Due to the absence of strong morphological differences between wild and domestic cat types, the hypothesis was put forward of a partial domestication or an "interested" tolerance by humans to semi-wild animals whose presence was useful in limiting the number of rodents. However, this is still a "utilitarian" point of view which highlights the dominant role of human agency. In the case of the cat, this dominant role of human agency seems out of place.

As Diamond [19] stated, when we attempt to determine why certain animals were domesticated, we not only consider human agency, we also need to examine all behavioral and biological features of the animals. Simply put, animals must give their permission before being domesticated. In referring to the cat, Budiansky [20] goes further in his definition and ironically proposes a type of "reverse domestication" process instigated by cats against humans. Thus the cat, in most of its biological and behavioral aspects, is not a species that falls into a "canonical" definition of domestication. A favorable candidate for domestication generally comes from species in which social structures are organized in large gregarious groups with a clear hierarchy, are easily managed and non-aggressive and follow a generally herbivorous or omnivorous diet. But in examining the cat, we note that it is lacking in all these characteristics. Wildcats are territorial and solitary, hyper-carnivorous and not easily tamed, even when young. These conditions are in clear contrast with the enormous success of cats as a domestic species. Looking beyond the lack of qualifications displayed by cats we can refer to a different theoretical model that instead empathizes aspects of cooperative patterns played by both human and non-human animals in the domestication process.

O'Connor [13] points out that instead of researching the goals of humans in controlling animals, we should attempt to answer the question of why humans were particularly attractive to some animals. In regard to the cat's biological and behavioral characteristics, a model principally based on the expression of a mutual, co-dependent relationship between humans and animals appears better suited than models which take the "economical" utilitarian use of animals by humans as its main theoretical basis. Such symbiotic theories balance human agency and put the role of animals' opportunistic strategies into the equation. Thus, we can place the phenomenon of cat domestication into a more suitable theoretical framework, both in accordance with the intrinsic characteristics of this small animal and the historic evidence from the beginning of radical change in the structure of the earliest human societies during the Neolithic.

Animal domestication processes took place over different times and in at least ten focal areas of the world [9]. The beginning of a domestication process for most principal domesticated animals finds its earliest archaeological traces in the Near East, and can be dated to the middle of the 11th millennium B.P. [21]. This evidence constitutes one of the fundamental elements of the Neolithic Transition, and highlights human adoption of new subsistence strategies. As a consequence, the growth of the human population and the improved control of the evolutionary process through the artificial selection of plants and animals, profoundly shaped almost every natural ecosystem of the planet. However, the Neolithic Transition was not only limited to the human control of plants and animals as a source of food, but involved a totally new conception of the world, where human groups organized in new and diverse ways and the occupation of space took on new social dynamics through cognitive symbolic systems [22]. Therefore, it is difficult to understand the Neolithic Transition without taking into account the symbolic values from an emerging new relationship between humans and animals. This latter assertion is even more true if we take as an example the cat and its strong influence in different branches of human culture as testified by the history of art, literature and religion.

It is generally accepted, on the basis of vast and well-defined artistic production, that the Egyptians were the first to adopt cats as pets, consequently identifying Egypt as the "cradle" of the domestic cat during the 2nd millennium B.C.. But in the last few years, riding the wave of new archaeological discoveries and molecular studies, a new scenario has emerged that positions the Near East during the Early Neolithic period as showing the earliest evidence of cat taming.

The house cat derives from the polytypic wild species *Felis silvetris*, which is present in three inter-fertile subspecies, covering wide geographical areas. They are respectively: the subspecies *F.s. ornata* inhabiting Central Asia and the Middle East; *F.s. lybica* in the Near East and North Africa; and the subspecies *F.s. silvestris* found across the whole of Europe. In the last ten years, thanks to advances in biomolecular techniques, numerous studies have focused on the genetic analysis of the cat. Even if the majority of these studies focus on wildcat conservation problems caused by high levels of hybridization between local wildcat populations and free-ranging domestic cats [23-26], recent molecular studies, specifically conducted to reconstruct the phylogeny of the cat [27, 28], have shed new light on the topic of cat domestication. The research suggests that current house cats seem to derive from the wild subspecies *Felis silvestris lybica,* which was probably domesticated in the area of the Near East during the Early Neolithic.

This ancient DNA data also supports the archaeological evidence that identifies these regions as the center of cat domestication in the early phases of the Neolithic. This is highlighted by evidence from the Cyprus burial site of Shillourokambos [21]. Despite Cyprus being in the Mediterranean basin, its proximity to the Anatolian coast and the nature of its material culture, which highlights the presence of clear contacts with, and influences from, the Levant cultures, accord with Cyprus' inclusion in the macro-geography of the Near East. During the excavation of the Neolithic village of Shillourokambos, a complete cat's skeleton was found in close association with a human grave. Contextual dating attributed the finds to the Pre-Pottery Neolithic period (9500 BP). In this case it was not necessary to carry out detailed morphometric or molecular analyses of the specimen, because in Cyprus there is no evidence of a pre-existent endemic form of wildcat. Therefore, the simple occurrence of the cat allows

for allegations that the animal was introduced by humans. Furthermore, this skeleton is the oldest known archaeological evidence of cat domestication and should be interpreted as the pet of the buried person rather than a simple food offering. Thus, it provides information regarding the highly symbolic and sentimental value conferred on the cat in early Levant societies. The discovery of the Cypriot cat could constitute the starting point for a survey oriented towards finding evidence of an early introduction of the cat to other Mediterranean Islands possibly in connection with ancient trade routes.

3. Evidence for the early introduction of the domestic cat in Sicily

Due to its close proximity to the Italian peninsula, Sicily is a "continental" island sporadically connected to Italy during glacial peaks, as shown by its continental mammal fauna [29]. Unlike Cyprus, where the only *Felis* form still living on the island is the domestic *Felis s. catus*, currently, both the domestic *Felis s. catus* and the European wild subspecies *Felis s. silvestris* can be found in Sicily. The coexistence of these two subspecies constitute a further obstacle to identifying when the domestic cat was introduced to Sicily. The presence of a single "generic" form of cat in Sicilian archaeological records does not provide enough evidence to claim when humans actually introduced the domestic cat. Therefore, it is necessary to understand whether the oldest osteological cat specimens recovered belong to a particular subspecies of *Felis silvestris* or not. To approach this problem, it is evident then, that different methodologies such as ancient DNA and morphometric analysis need to be employed.

Current literature reports the presence of the European wildcat in Sicily from the Upper Pleistocene – Holocene Transition [30]. This data comes from the faunal analysis at a key site of the Mesolithic-Neolithic Transition in Italy: the Uzzo cave near the city of Trapani [31]. This site is fundamental in understanding the emergence of the domestication process in Sicily, since some of the earliest domesticated species introduced to the island were recorded here [32]. The first occurrence of cat-related osteological finds came from the Early Neolithic (7000 – 6500 B.P.) layers of the cave, where almost 85 fragments belonging to several cats were found. These remains were interpreted as the result of hunting and assigned to the wild form *Felis s. silvestris* [33], though no specific morphometric or molecular analyses were undertaken.

Apart from the Uzzo cave, there is only one other Sicilian prehistoric context with the presence of cat remains. This evidence consists of the fragmentary skull of a cat. During the recent redesigning of the museum where this find was on display, we had the opportunity to study the skull, applying both craniometric and biomolecular approaches to determine its phylogenetic position as belonging to a specific *Felis silvestris* subspecies.

4. Materials and methods

The specimen examined in this research comes from the excavation of a system of natural caves in the archaeological area of Stretto Partanna (Trapani). The specimen was exhibited at the Museum of Partanna (TP).

Archaeological operations conducted in 2000 by the Regional Heritage office of Trapani (Soprintendendenza BB.CC.AA.), discovered a *polysome* burial dated, on the basis of the grave-site items, to the Eneolithic period (late 3rd millennium B.C.). In close proximity to the burial ground, in another small cave situated at a lower level with respect to the grave, a different stratigraphic horizon was investigated. The deposit,

attributed to the Early Bronze Age (22nd century BCE – 16th century BCE) on the basis of the archaeological materials recovered, revealed a great many interesting finds such as obsidian blades, lithic axes and dipper cups, among which a large bell-shaped vase (60 cm high) (Figure 1) stands out as exceptional. Archaeologists interpreted the context as an expression of religious activities related to a cult of water. Inside the large bell-shaped vase, a cat skull was found with other faunal remains (Figure 2). The aim of the survey was to assign this sample to a subspecies of *Felis silvestris* and, consequently, understand whether it was introduced by humans or if it was the feral form *Felis s. silvestris*.

The morphometric analysis of the skull was set up following current cranial biometrics standards [34]. The specimen was highly fragmented and before craniometric analysis began, it was necessary to proceed with complete restoration of the specimen. To ensure the reversibility of the operation a cellulose nitrate adhesive, soluble in acetone, was used to assemble the fragments. After conservation operations, it was possible to take twenty linear (Figure 3) measurements of the skull through the use of a digital caliper. Ten measurements were used to conduct a discriminant statistical analysis by comparing our specimen to a worldwide database of over 220 items that includes the varieties *silvestris*, *lybica*, *ornata* and *catus*. Statistical analysis was performed using the software package Statistica (StatSoft, Tulsa, USA). Taking into account the preservation (conditions) of our specimen, only the shared variables were considered. The data was processed in an Exploratory Statistical Analysis (EDA). Multivariate techniques such as principal component analysis, discriminant analysis and single linkage cluster analysis were performed.

To investigate the relationship of our specimen with domestic cats and wild progenitors, we selected mtDNA polymorphisms that were known to be variable and informative [27]. A skull fragment was prepared using appropriate ancient DNA techniques (Golden criteria) [35], and DNA was extracted using a Charge Switch Forensic DNA Purification Kit (Invitrogen). The extracted DNA was analyzed by polymerase chain reaction (PCR), and PCR amplifications were performed with three sets of mitochondrial primers. Multiple negative extraction and amplification controls were included in each PCR reaction to detect eventual contamination. The primers used were: cytb1: Fw 5'-TCGAAAATCACACCCCCTTA-3',Rv 5'-CCTAGAAGGGAGCCGAAGTT-3' cytb2: Fw 5'-CGGCTCCCTTCTAGGAGTCT-3',Rv5'-GCGACAGATGTGGGTAACTG-3'; ND5:Fw 5'-ACTCAAACGCATGGGACTTC-3', Rv5'-AATTGGGCGGATTTACCTGT-3'. All PCR reactions were performed using AmpliTaqGold (Applied Biosystems). The initial steps were: denaturation at 94°C for 10 minutes followed by 50 cycles of 45 seconds at 94°C, 60 seconds annealing at 50-53°C and 60 seconds elongation at 72°C with final extension of 10 minutes at 72°C. The double stranded PCR products were run on 2 % low melting agarose gels to determine whether PCR was successful. Positive bands were purified using Gel Band Purification Kit (illustra) and sequenced using the Big Dye Terminator system (Applied Biosystems Inc.). Extension products were purified and resolved on an ABI 3700 sequencer. Gene identity was established by comparison to homology in GenBank using BLAST 2.2.

Figure 1. The large bell-shaped vase and highlighted in the large square, the cat's skull.

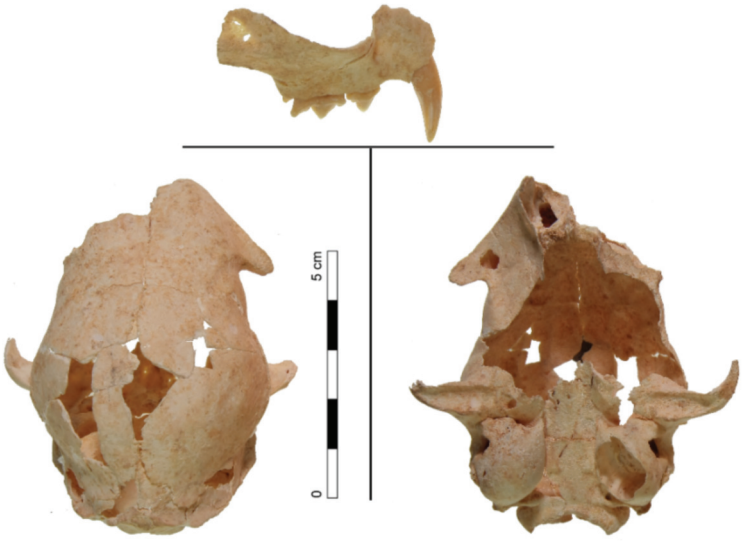

Figure 2. The Stretto Partanna specimen after conservation.

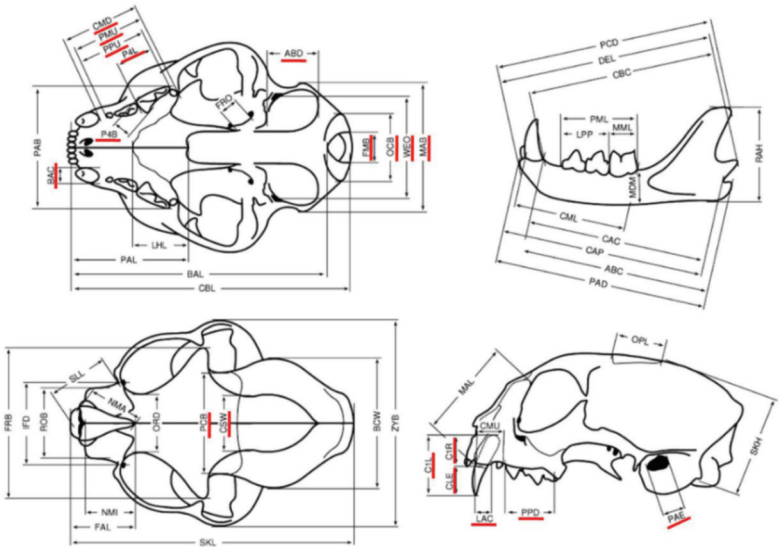

Figure 3. Morphometric skull characters, measured skull variables are underscored in red (modified from Yamaguchi [34]; Platz et al. [37]).

5. Results and discussion

Measurements resulting from morphometric examination were previously submitted to standardization Q-mode in order to express only morphological information. We calculated D^2 distances with an unbiased estimator to correct biased results and misinterpretations [36]. We then used discriminant analysis to compare the Stretto Partanna cat with four groups: *silvestris*, *lybica*, *ornata* and *catus*. The scatter plot (Figure 4) showed the first two components as 93.2% of the variance (63.74% and 29.50%), highlighting along the positive side of the first component a clear similarity of the Stretto Partanna cat to *Felis silvestris silvestris*. This result allowed us to classify our sample as the local wild form of cat and to exclude the possibility of introduction by humans. However, the craniometrics data are in sharp contrast with the results of the biomolecular analysis detailed below.

Despite the impossibility of obtaining sequences for the mitocondrial polimorphic locus ND5, we successfully sequenced two *cytocrome b* fragments. The finding of haplotype 15082T- 15164T, not present in European wildcats, seems to indicate, in contrast to what the morphometric analysis showed that our specimen is not a wildcat of European origin. Hence, we might hypothesize that it was a tamed animal brought to Sicily perhaps from the Levant. From the beginning of the 2nd millennium B.C. Sicily was fully incorporated into Mediterranean trade routes, as testified by the presence of Aegean, Levantine and Cypriot pottery in many Sicilian Bronze Age sites.

The discrepancies shown by the craniometrics data which designated our sample as a European wild cat could be biased, not only due to the well-known morphological similarity among cat subspecies, but also because of the coexistence of two inter-

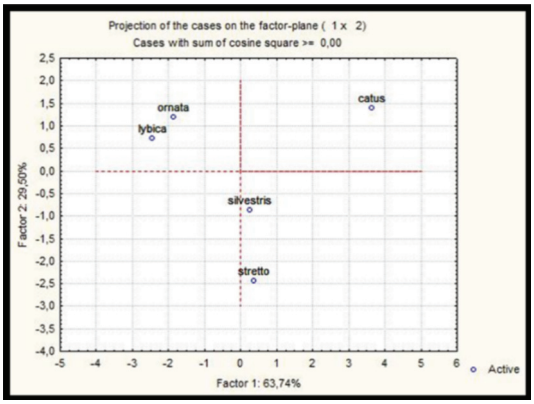

Figure 4. The scatter plot of the first two components as 93.2% of the variance (63.74% and 29.50%) highlight similarity of the Stretto Partanna cat to Felis silvestris silvestris.

fertile forms in Sicily, that could have produced a high level of introgression resulting in hybrid forms. In this case, it would be improbable to expect a clear morphometric distinction between the wild and domestic form of cat [39].

Once again the cat has displayed its elusive attributes. However, despite the fact that these preliminary analyses leave the debate on the early introduction of the domestic cat in Sicily inconclusive, these are promising results that encourage us to continue with further studies, and with the aim to investigate a chronology and approach to cat domestication in prehistoric Sicily and in the Western Mediterranean Basin. Furthermore, these preliminary results highlight the necessity to proceed with systematic revisions and radiometric dating of all Sicilian faunal assemblages where the presence of cat remains is recorded.

Acknowledgements

Authors are particularly grateful to Lee Ambrozy for proofreading the English text and for her valuable suggestions which greatly improved the paper. Thanks go to Franco Palla and Sebastiano Tusa for advice and suggestions and to Andrew C. Kitchener for sharing the craniometric data of the *Felis silvestris silvestris*.

RM is supported by Research Grant PON It@ca Project: “Metodi innovativo sperimentali su base interdisciplinare (biologica – chimica fisica) per la valutazione del sistema: bene culturale – ambiente – biota”, Università di Palermo.

References

[1] Brown, T.A., (1999) How ancient DNA may help in understanding the origin and spread of agriculture, *Phil. Trans. R. Soc. Lond. B*, **354**, pp. 89-98.

[2] Beja-Pereira, A., Caramelli, D., Lalueza-Fox, C., Vernesi, C., Ferrand, N., Casoli, A., Goyache, F., Royo, L.R., Conti, S., Lari, M., Martini, A., Ouragh, L., Magid, A., Atash, A., Zsolnai, A., Boscato, P., Triantaphylidis, C., Ploumi, K., Sineo, L., Mallegni, F., Taberlet, P., Erhardt, G., Sampietro, L., Bertranpetit, J., Barbujani, G., Luikart, G., Bertorelle, G., (2006) The origin of European cattle: Evidence from modern and ancient DNA, *PNAS*, **103(21)**, pp. 8113-8118.

[3] Hofreiter, M., (2011) Drafting Human Ancestry: What Does the Neanderthal Genome Tell Us about Hominid Evolution? Commentary on Green et al. (2010), *Human Biology*, **83(1)**, pp. 1-11.
[4] Hu, Y., Hu, S., Wang, W., Wu, X., Marshall, F.B., Chen, X., Hou, L., Wang, C., (2014) Earliest evidence for commensal processes of cat domestication*, PNAS*, **111(1)**, p. 117.
[5] Childe, V.G., (1928) The Most Ancient East: The Oriental Prelude to European Prehistory*,* Kegan Paul, London.
[6] Clutton-Brock, J., (1992) The process of domestication, *Mammal Review*, **22**, 79-85.
[7] Crabtree, P.J., (1993) Early animal domestication in the Middle East and Europe. In: Schiffer M.B. (ed.), *Archaeological method and theory*, Vol. 5. University of Arizona Press, pp. 201-245.
[8] Meadow, R.H., (1989) Osteological evidence for the process of animal domestication. In: Clutton-Brock J. (ed.), *The walking larder: Patterns of domestication, pastoralism, and predation.* London: Unwin Hyman, pp. 80-90.
[9] Zeder, M.A., (2006) Central Questions in the Domestication of Plants and Animals, *Evolutionary Anthropology*, **15(3)**, pp. 105-117.
[10] Clutton-Brock, J., (1994) The unnatural world: Behavioural aspects of humans and animals in the process of domestication. In: Manning A., Serpell J.A. (eds.), *Animals and human society: Changing perspectives*. London: Routledge, pp. 23-35.
[11] Bökönyi, S., (1989) Definitions of domestication. In: Clutton-Brock J. (ed.), *The walking larder: patterns of domestication, pastoralism, and predation*. Cambridge: Unwin, pp. 1-4.
[12] Ducos, P., (1978) Domestication defined and methodological approaches to its recognition in faunal assemblages. In: Meadow RH, Zeder MA, (eds.), *Approaches to faunal analysis in the Middle East. Peabody Museum Bulletin 2*. MA: Harvard University, Cambridge, pp. 49-52.
[13] O'Connor, T.P., (1997) Working at relationships: Another look at animal domestication, *Antiquity*, **71**, pp. 149-156.
[14] Bökönyi, S., (1969) Archaeological problems and methods of recognizing animal domestication. In: Ucko P.J., Dimbleby G.W. (eds.), *The domestication and exploitation of plants and animals*. Chicago: Aldine Publishing, pp. 219-229.
[15] Driscoll, C.A., Clutton-Brock, J., Kitchener, A.C., O'Brien, S.J., (2009) The Taming of the Cat, Genetic and archaeological findings hint that wildcats became housecats earlier-and in a different place--than previously thought, *Scientific American*, **300(6)**, pp. 68-75.
[16] Harris, D.R., (1996) Domesticatory relationships of people, plants and animals. In: Ellen R.F., Fukui K. (eds.), *Redefining nature: Ecology, culture and domestication*. Oxford: Berg, pp. 437-463.
[17] Hesse, B.C., (1984) These are our goats: The origins of herding in west central Iran. In: Clutton-Brock J., Grigson C. (eds.), *Animals and archaeology: 3. Early herders and their flocks*, *British Archaeological Reports,* International Series 202. Oxford: British Archaeological Reports, pp. 243-264.
[18] Ingold, T., (1980) *Hunters, pastoralists, and ranchers: Reindeer economies and their transformations.* Cambridge: Cambridge University Press.
[19] Diamond, J., (2002) Evolution, consequences and future of plant and animal domestication, *Nature*, **418**, pp. 700-707.
[20] Budiansky, S., (1992) *The Covenant of the wild: Why animals chose domestication*. New York: William Morrow & Co.

[21] Vigne, J.D., Carrère, I., Briois, F., Guilaine, J., (2011) The Early Process of Mammal Domestication in the Near East, *Current Anthropology*, **52(S4)**, pp. S255-S271.
[22] Helmer, D., Gourichon, L., Stordeur, D., (2004) À L'aube de La Domestication Animale. Imaginaire et Symbolisme Animal Dans Les Premières Sociétés Néolithiques Du Nord Du Proche-Orient, *Anthropozoologica*, **39(1)**, pp. 143-163.
[23] Daniels, M.J., Beaumont, M.A., Johnson, P.J., Balharry, D., Macdonald, D.W., Barratt, E., (2001) Ecology and genetics of wild-living cats in the north-east of Scotland and the implications for the conservation of the wildcat, *Journal of Applied Ecology*, **38**, pp. 146-161.
[24] Reig, S., Daniels, M.J., Macdonald, D.W., (2001), Craniometric Differentiation Within Wild-Living Cats in Scotland Using 3D Morphometrics, *Journal of Zoology*, **253**, pp. 121-133.
[25] Randi, E., Pierpaoli, M., Beaumont, M., Ragni, B., Sforzi, A., (2001) Genetic Identification of Wild and Domestic Cats (Felis Silvestris) and Their Hybrids Using Bayesian Clustering Methods, *Molecular Biology and Evolution*, **18(9)**, pp. 1679-1693.
[26] Pierpaoli, M., Biro, Z.S., Herrmann, M., Hupe, K., Fernandes, M., Ragni, B., Szemethy, L., Randi, E., (2003) Genetic Distinction of Wildcat (Felis Silvestris) Populations in Europe, and Hybridization with Domestic Cats in Hungary, *Molecular Ecology*, **12(10)**, pp. 2585–2598.
[27] Driscoll, C.A., Menotti-Raymond, M., Roca, A.L., Hupe, K., Johnson, W.E., Geffen, E., Harley, E.H., Delibes, M., Pontier, D., Kitchener, A.C., Yamaguchi, N., O'Brien, S.J., Macdonald, D.W. (2007) The Near Eastern Origin of Cat Domestication, *Science*, **317(5837)**, pp. 519-523.
[28] O'Brien, S.J., Stephen, J., Warren, J., Driscoll, C.A., Pontius, J., Pecon-Slattery, J., Menotti-Raymond, M., (2008) State of Cat Genomics, *Trends in Genetics : TIG*, **24(6)**, pp. 268-79.
[29] Bonfiglio, L., Mangano, G., Marra, A.C., Masini, F., Pavia, M., Petruso, D., (2002) Pleistocene Calabrian and Sicilian bioprovinces, *Geobios Special Memoires*, **24**, pp. 29-39.
[30] Sommer, R.S., Benecke, N., (2006) Late Pleistocene and Holocene Development of the Felid Fauna (Felidae) of Europe: a Review, *Journal of Zoology*, **269(1)**, pp. 7-19.
[31] Piperno, M., Scali, S., Tagliacozzo, A., (1980) Mesolitico e neolitico alla Grotta dell'Uzzo (Trapani). Primi dati per un'interpretazione paleoeconomica, *Quaternaria*, **22**, 275-300.
[32] Malone, C., (2003) The Italian Neolithic: A Synthesis of Research, *Journal of World Prehistory*, **17(3)**, pp. 235-312.
[33] Tagliacozzo, A., (2005) Animal Exploitation in the Early Neolithic in Central-Southern Italy, Munibe, *Antropologia-Arkeologia*, **57**, pp. 429-439.
[34] Yamaguchi, N., Driscoll, C.A., (2004) Craniological Differentiation Between European Wildcats (Felis Silvestris Silvestris), African Wildcats (F. S. Lybica) and Asian Wildcats (F. S. Ornata): Implications for Their Evolution and Conservation, *Biological Journal of the Linnean Society*, **83**, pp. 47-63.
[35] Cooper, A., Poinar, H.N., (2000) Ancient DNA: Do it right or not at all, *Science*, **289**, p. 1139.
[36] van Vark, G.N., Schaafsma, W., (1992) Advances in the quantitative analysis of skeletal morphology. In: Saunders S.R., Katzenberg M.A. (eds.), *Skeletal Biology of Past Peoples: Research Methods*. New York: Wiley-Liss, pp. 225-257.

[37] Platz, S.S., Hertwig, T., Jetschke, G., Krüger, M., Fischer, M.S., (2011) Comparative Morphometric Study of the Slovakian Wildcat Population (Felis Silvestris Silvestris): Evidence for a Low Rate of Introgression?, *Mammalian Biology – Zeitschrift Für Säugetierkunde*, **76(2)**, pp. 222-233.

[38] Driscoll, C.A., Macdonald, D.W., O'Brien, S.J., (2009) *From wild animals to domestic pets, an evolutionary view of domestication*. In: Proceedings of the National Academy of Sciences of the United States of America, **106**, pp. 9971-9978.

[39] O'Connor, T., (2007) Wild or domestic? Biometric variation in the cat Felis silvestris Schreber, *International Journal of Osteoarchaeology*, **595**, pp. 581-595.

Biographical notes

Roberto Micciché, Osteoarchaeologist, Honorary Fellow of Anthropology at the University of Palermo.

Pietro Valenti, Zooarchaeologist and Speleologist, Honorary Fellow of Anthropology at the University of Palermo.

Andrea D. Messina, PhD in Animal Biology at the University of Palermo.

Giulio Catalano, PhD in Anthropology at the University of Bologna, Ravenna.

Luca Sìneo, Full Professor of Anthropology at the University of Palermo.

Noboyuki Yamaguchi, Associate Professor of Animal Ecology in the Department of Biological and Environmental Sciences at the College of Arts & Sciences at the University of Doha in Qatar.

Stefano Reale, Senior researcher at the molecular biology unit, Istituto Zooprofilattico Sperimentale di Sicilia.

Mario Cosenza, Biologist at the molecular biology unit, Istituto Zooprofilattico Sperimentale di Sicilia.

Summary

The vast wealth of cultural artifacts and ancient biological samples can today be investigated using a great variety of methods and technologies. The result is a growing diffusion of studies on DNA, isotopes and morphometrics, and the exponential growth of publications and bio-archaeological discoveries of inestimable value for different areas of interpretation, such as phylogeny, history and archaeology. This paper describes the morphological and molecular study of a rare specimen of *Felis* from an Early Bronze Age horizon. The report offers the opportunity for a brief discussion on cat taming, on the origin of this practice and on the archaeological importance of this specimen for the reconstruction of taming practices in the Western Mediterranean Basin.

Riassunto

Il vasto patrimonio culturale di manufatti e di reperti biologici antichi può attualmente essere investigato con molte metodologie e tecnologie. Ne deriva una crescente diffusione di studi sul aDNA, isotopici e morfogeometrici e una crescita esponenziale delle pubblicazioni e dei risultati bio-archeologici di inestimabile valore per ambiti interpretativi diversi, filogenetici, storici, archeologici. Il presente lavoro descrive uno studio morfologico e molecolare di un raro reperto di *Felis* proveniente da un orizzonte del Bronzo Antico. Il report offre per altro l'occasione per una breve disamina sull'addomesticamento del gatto, la provenienza di tale pratica e sull'importanza zooarcheologica della relazione con *Homo* nel Mediterraneo occidentale.