

## **UC Merced**

### **Biogeographia - The Journal of Integrative Biogeography**

#### **Title**

Nineteenth century wild ungulates (Mammalia, Artiodactyla) of the island of Lampedusa (Pelagian archipelago, Italy)

#### **Permalink**

<https://escholarship.org/uc/item/5qb721tq>

#### **Journal**

Biogeographia - The Journal of Integrative Biogeography, 23(1)

#### **ISSN**

1594-7629

#### **Authors**

Masseti, Marco  
Zava, Bruno

#### **Publication Date**

2002

#### **DOI**

10.21426/B6110098

Peer reviewed

# Nineteenth century wild ungulates (Mammalia, Artiodactyla) of the island of Lampedusa (Pelagian archipelago, Italy)

MARCO MASSETI\*, BRUNO ZAVA\*\*

\**Dipartimento di Biologia Animale e Genetica dell'Università di Firenze,  
Laboratori di Antropologia, Via del Proconsolo, 12, I-50122 Firenze (Italy)*  
*e-mail: marco.masseti@unifi.it*

\*\**Wilderness-Studi ambientali, Via Cruillas, 27, I-90146 Palermo (Italy)*  
*e-mail: wildbz@gestelnet.it*

Key words: Lampedusa, Pelagian islands, Mediterranean islands, red deer, *Cervus elaphus corsicanus*, wild goat, *Capra aegagrus*, zoogeography, palaeozoogeography, *Syncerus caffer*, Ippotraginae, Palaearctic Region, Ethiopian Region

## SUMMARY

The occurrence of wild ungulates, such as red deer, *Cervus elaphus* L., 1758, and wild goats, *Capra aegagrus* Erxleben, 1777, is reported from the island of Lampedusa (Pelagian archipelago, Italy) in the course of the nineteenth century, and is supported by written and/or osteological evidence. However, as far as is presently known, the origin of these ungulates on Lampedusa, and when and how they appeared on the island is still obscure and veiled in mystery. Effectively, late Pleistocene-early Holocene fossils from Lampedusa reveal no remains of Palaearctic continental mammals but only endemic taxa of African origin. The introduction of red deer and wild goats onto the island seems to be directly related to human intervention.

## INTRODUCTION

The island of Lampedusa (35°30'N-12°31'E) lies in the Sicilian Channel only some 113 km off the North-African coast, and about 205 km from Sicily. It is the main island of the Pelagian archipelago, which also includes the isles of Linosa and Lampione. Lampedusa is 20.2 km<sup>2</sup> in area and reaches an altitude of 133 m above sea level. The island has little water, and during the summer has to be supplied by tankers. Its vegetation today is composed of scanty, low and thorny Mediterranean scrub. But, according to several authors (Gussone, 1832; Calcara,

1846, 1947; Sanvisente, 1849; Avogadro di Vigliano, 1880; Sommier 1908; Riggio, 1976; Fragapane, 1993), the original luxuriant Mediterranean woodland was burnt out over a few years in the nineteenth century for the production of charcoal to be exported to the mainland and to other islands, including Sicily, Malta and Pantelleria. This coincided with the definitive human colonisation brought about by the King of Naples, between 1840 and 1850. The present vegetation shows only relics of a degraded maquis. Rare botanical species are *Centaurea acaulis* L., and *Caralluma europaea* (Gussone, 1832).

An examination of medieval documents written prior to the fifteenth century yield no information concerning the presence of wild ungulates on Lampedusa. For example, in his geographical treatise “The Book of Roger”, written for Roger II, the first Norman king of Sicily, the Arab scholar Edrisi (c. 1100-64 A.D.) referred to Lampedusa as a small island “completely bare of fruit trees and animals” (cf. Amari and Schapparelli, 1883; Rizzitano, 1994). And, despite the great abundance of land tortoises, rabbits and migratory birds, in the course of the fifteenth century wild ungulates were still not reported on the island as is clear from the *Relazione sopra l'isola di Lampedusa* drawn up in 1436 for Giovanni de Charo, Baron of Montechiaro, when he purchased Lampedusa from King Alfonso V of Aragon (cf. Fragapane, 1993). Shortly afterwards, however, in his epic poem *Orlando Furioso*, Ludovico Ariosto (1474-1533) chose the tiny, remote island of Lipadusa as the theatre for the bloody, final battle between the Christians and the Moors. He described the island as follows:

“D’abitazioni è l’isoletta vota  
 Piena d’umil mortelle e di ginepri,  
 Gioconda solitudine e remota  
 A cervi, a daini, a capriuoli, e lepri;  
 E fuor che ai pescatori è poco nota  
 Ove sovente a rimondati vepri  
 Suspendon, per seccar, l’umide reti;  
 Dormono intanto i pesci in mar quieti”

(*Orlando Furioso*, canto XL, stanza 45)<sup>1</sup>

Different scholars commenting on Ariosto’s work have identified this island as Lampedusa. Ariosto described it as a remote sea-bound world in the middle of nowhere, cloaked in a dense Mediterranean vegetation (“Piena d’umil mortelle e di ginepri” = With humble myrtle and juniper clad), completely void of human life. In some ways, the image of Lampedusa evoked by Ariosto recalls Homer’s island of the goats “perpetually empty of men” (*The Odissey*, IX, 39-132), where Ulysses and his companions landed to hunt before the Polyphemus episode. But, instead of the homeland of bleating wild goats, Ariosto described Lampedusa like

a wild game reserve, where hares (“lepri”) and several species of cervids, including red deer (“cervi”), fallow deer (“daini”), and roe deer (“capriuoli”), roamed quite untroubled by man. It is almost impossible to say where Ariosto got his information about the presence of all these herbivores on the island. The various texts that he probably consulted, in his search for sources and historical and geographical data to provide a context for his stories, must have included the works of famous classical geographers and historians, such as Pliny the Elder, Strabo, Ptolemy, Pomponius Mela, Marco Polo, and Fazio degli Uberti. Ariosto may have also consulted the many geographical and topographical maps, and the reports of journeys and explorations held at the time in the Biblioteca Estense of Ferrara (cf. Fragapane, 1993). Since it is impossible to verify the quality of the sources utilized by Ariosto in the sixteenth century, we have to consign the existence of deer on Lampedusa in the Middle Ages to the sphere of literary invention.

#### CORSICAN RED DEER *CERVUS ELAPHUS CORSICANUS* (ERXLEBEN, 1777) ON LAMPEDUSA

Effectively, the former existence of a population of red deer, *Cervus elaphus* L., 1758, on Lampedusa was noted by many writers, such as Calcara (1846, 1847 and 1848), Sanvisente (1849), Avogadro di Vigliano (1880), Sommier (1908), Giglioli (1912), Kohlmeyer (1959), Zavattari (1960), Riggio (1976), Gibilaro (1991) and Fragapane (1993). Furthermore, towards the end of the nineteenth century, in the course of his scientific journey on board the steamer Washington in 1882, the zoologist Enrico Hillier Giglioli collected some deer osteological material which he presented to the Royal Zoological Museum of Florence (Italy) – now the Zoological Museum “La Specola” of the University of Florence (MZUF). According to Giglioli (1912), these red deer had survived on Lampedusa until about 1850, thirty years before his visit to the island. Part of this material is still preserved at the MZUF, where it represents the only surviving remains of the red deer which inhabited Lampedusa. However, in view of Giglioli’s scientific authority, this material confirms without any doubt the nineteenth century occurrence of red deer on Lampedusa. In the inventory of the *Collezione degli Animali Vertebrati Italiani del R. Museo di Fisica e Storia Naturale di Firenze*, vol. 1, *Mammiferi (1875-1900)* there were two separate specimens attributed to the deer of Lampedusa, respectively registered under catalogue numbers 5. 1709. 1. S. and 58. 1700. 1. S. The first consisted of a complete skull with mandible and antlers, which was found on Lampedusa around 1850. Giglioli obtained it thirty years later from the “Museo del R. Liceo di Girgenti” (Giglioli, 1912). Now, all that remains is the catalogue card entry written by Giglioli himself, while the specimen has unfortunately been lost. The other specimen is still held in the Florentine mammal collection under the new catalogue number MZUF C 11937 (Fig. 1). Giglioli himself confirmed its origin from Lampedusa,



Fig. 1 - Incomplete left antler of *Cervus elaphus* L., 1758, collected by E. H. Giglioli on Lampedusa, 10th August 1882, and still kept at the Zoological Museum of the University of Florence (n. cat. MZUF C 11937) (photograph by Saulo Bambi, courtesy of the Zoological Museum "La Specola" of the University of Florence)

where he collected it on the 10 August 1882 (Giglioli, 1912). This specimen consists of the distal portion of a left antler missing the proximal part which appears to have been cut off just above the trez tine. Consequently, it is not possible to ascertain whether this antler was characterised by the presence of the latter tine, together with that of the bez or second tine. The antler is distinguished by the absence of the crown and by a simplified architecture. The three points of the distal portion are not greatly developed. It is also possible that the beam was cut close to the brow tine. In this case the surviving ramifications could be respectively the trez tine shifted upwards and a distal point characterised by a slight bifurcation. This hypothesis would be supported by the angle between the trez tine, the main stem of the beam and the bifurcated distal point (Masetti and Zava, 2002). The section of the beam is elliptic, not circular, and tends to flatten out towards the top. The total length of the antler portion is 416 mm. Unfortunately, the loss of the proximal portion makes it impossible to determine the age category of this specimen through evaluation of the development of the coronet, and the shape and dimensions of the brow tine. The dimension of the mid-section of the beam is 33.25 mm x 28.96 mm. The simplicity of the antler architecture is typical to adaptation to environments of low trophic production. It seems likely that the trophic, environmental and genetic conditions of the Lampedusa population were such this type of antler architecture that may have been characteristic of adult males (over five years old) (Masetti and Zava, 2002).

A similar development of the antlers has been observed in the red deer population of the Mesola Wood in the Po delta (Ferrara, Italy) (Mattioli, 1990, 1991, 1993). The Mesola deer, isolated for centuries in a restricted area of low trophic production, has probably been at length represented by “maintenance phenotypes”, with animals of reduced stature and where the architecture of the stag antlers is very simplified, in the old males (about 15 years old) scarcely exceeding the trophy of eight points (Mattioli, 1991, 1993; Lorenzini et al., 1998; Geist, 1999; Fico et al., in press). Analogous phenotypic patterns were also observed in the relic population of red deer which possibly still survives in the peninsula of Sithonia (Chalkidiki, Greece) (cf. Poirazidis, 1987).

Giglioli (1912), apparently on the basis of an evaluation of the morphological characteristics of the bone material collected, suggested referring the Lampedusa red deer to the taxonomy of the “...piccolo Cervo (*Cervus corsicanus*) che trovasi tutt'ora allo stato libero in Corsica e Sardegna”, now identified as the subspecies of the Corsican red deer, *Cervus elaphus corsicanus* (Erxleben, 1777). This has been described as the smallest subspecies of existing red deer, the males standing from 85 to 100 cm at the withers, while the medium-sized Central European form, *Cervus elaphus hippelaphus* Erxleben, 1777, ranges from 120 to 125 cm (cf. Krumbiegel, 1982; Dolan, 1988; Beccu, 1989). The taxonomic attribution made by Giglioli could lead to the assumption that, beyond the evidence resulting from a direct analysis of the finds, he may also have had access to more circumstantial



Fig. 2 - Stag of Corsican red deer, *Cervus elaphus corsicanus* (Erxleben, 1777) in the Mediterranean scrub of south-western Sardinia (photograph by Roberto Meloni)

information about the origin of the Lampedusa deer, which has not come down to us (Masseti and Zava, 2002). The Corsican red deer is still dispersed in a few areas of southern Sardinia (Murgia and Monni, 1991; Beccu, 1993), where it may be regarded as the oldest established red deer stock still surviving on the Mediterranean islands (cf. Masseti, 1998) (Fig. 2). In the course of the last 15 years, the subspecies has been reintroduced onto Corsica where it became extinct in about 1970 (Saint-Girons, 1973; Conchon, 1979; Krumbiegel, 1982; Dolan, 1988; Beccu, 1989, 1993). The modest antlers of the Sardinian stags rarely reach the typical development of the species and reveal a reduced total length (< 70 cm), with the bez tine generally developed in a very low percentage (Cetti, 1774; Dolan, 1988; Vigne and Marinval-Vigne, 1988), which according to Beccu (1989) does not exceed nine per cent. In most cases, the antlers of this subspecies are characterised by the absence of the crown, often displaying a tendency to palmation below the fork (Vigne and Marinval-Vigne, 1988; Beccu, 1989, 1993). Similar morphological patterns are characteristic of another Mediterranean subspecies of red deer, the Barbary stag, *C. e. barbarus* Bennett, 1833, originally dispersed along the mountainous and forested territories of north-eastern Algeria and north-western Tunisia, which appears today to survive only in the area of the El Feidja National Park (Ghardimaou, Jendouba, Tunisia) (Kock and Schomber, 1961; Salez, 1959) (Fig. 3). This subspecies is bigger than the Corsican form, standing approximately 112 cm at the withers in the case of the stags (Meyer,

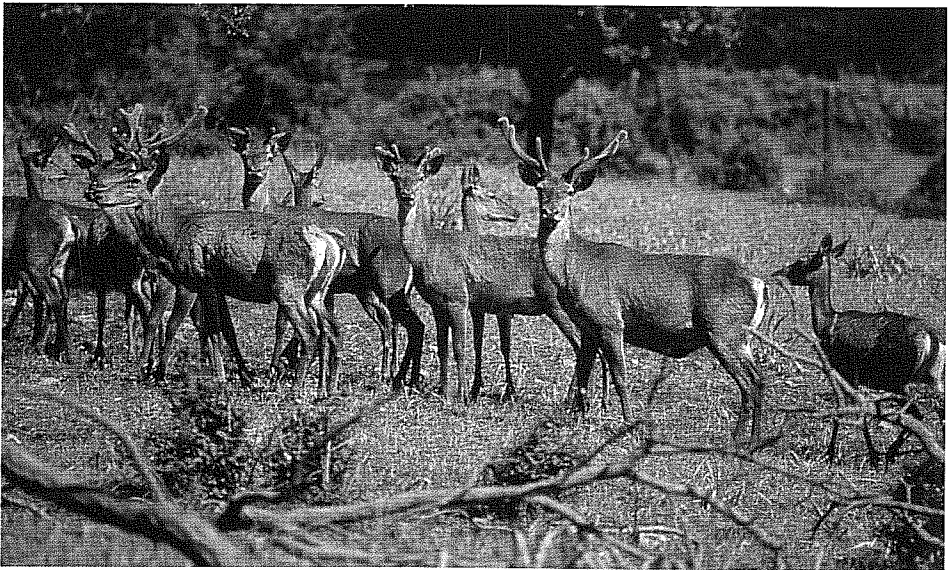


Fig. 3 - Herd of Barbary red deer, *Cervus elaphus barbarus* Bennett, 1833, in the oak forest of the National Park of El Fedjia (north western Tunisia). As for the Corsican deer, the absence of the bez tine in the growing antlers of the stags can be observed (photograph by Marco Masseti)

1972; Dolan, 1989). The antlers also lack the bez tine and the crown, often displaying a tendency to palmation (Gervais, 1854; Joleaud, 1913, 1925; Lavauden, 1924; Salez, 1959; Meyer, 1972). In Tunisia, studies done on antlers indicate that only about five per cent of the population develop a bez tine, and this may often appear only as a bump or slight projection on the beam of the antler (Dolan, 1988). The similarity of African red deer to the representatives of the Sardinia subspecies has been underlined by various authors, including Gervais (1848), Lataste (1885), Corbet (1978), and Kowalski and Rzebik-Kowalska (1991). In *C. elaphus*, the reduction of size and the simplified antler architecture has often been interpreted as a consequence of prolonged isolation in restricted areas of low trophic production, combined with the effects of genetic bottlenecks and of a serious and continuous consanguinity (cf. Kaji et al., 1988; Mattioli, 1991, 1993). In several cases, among the deer of Sardinia and Mesola, considerable simplification in the antler architecture has been recorded, characterised by the upward shifting of the bez tine (Mattioli, *in litteris*). Despite the fact that the available evidence of the Lampedusa red deer is limited to a single specimen, it seems likely that the deer lived in very low trophic conditions, and probably were under stress caused by excessive interbreeding and the restricted size of the island (Masseti and Zava, 2002). The bone evidence collected by Giglioli, confirming earlier literary references and reports, undermines any hypothesis that the remains were imported onto the island.

#### THE “WILD” GOATS OF LAMPEDUSA

When the nineteenth century botanist Giovanni Gussone landed on Lampedusa in 1828, in the course of the first scientific mission launched by the Kingdom of Naples, he did not report the occurrence of any red deer. Large-sized ungulates were only represented by a few feral pigs, and several wild goats (“caprii selvaggi”). Gussone (1832) estimated the occurrence of about 200 wild goats on the island. These goats used to live in herds, coming down to the sea at night to quench their thirst. They greedily ate the fruits of *Phillyrea* and the leaves of *Pistacia*. Several other authors, such as Calcara (1846, 1847, 1848), and Sanvisente (1849), who observed the goats, although they did not describe their morphology, indicated that these were truly wild goats rather than feral. Effectively, scientific literature and official reports recorded the occurrence of populations of wild goats on several of the central Mediterranean islets from at least the eighteenth century (Fig. 4). The Sardinian naturalist Francesco Cetti, as far back as 1774, described the islet of Tavolara, off the north-eastern shores of Sardinia, as inhabited by herds of wild goats. “These are neither chamois nor ibexes; they are independent goats; they are fugitive goats, wild, but of the same species as the domestic; they are effectively the primitive goats from which, according to Varro, the domestic species is derived. They are, therefore,



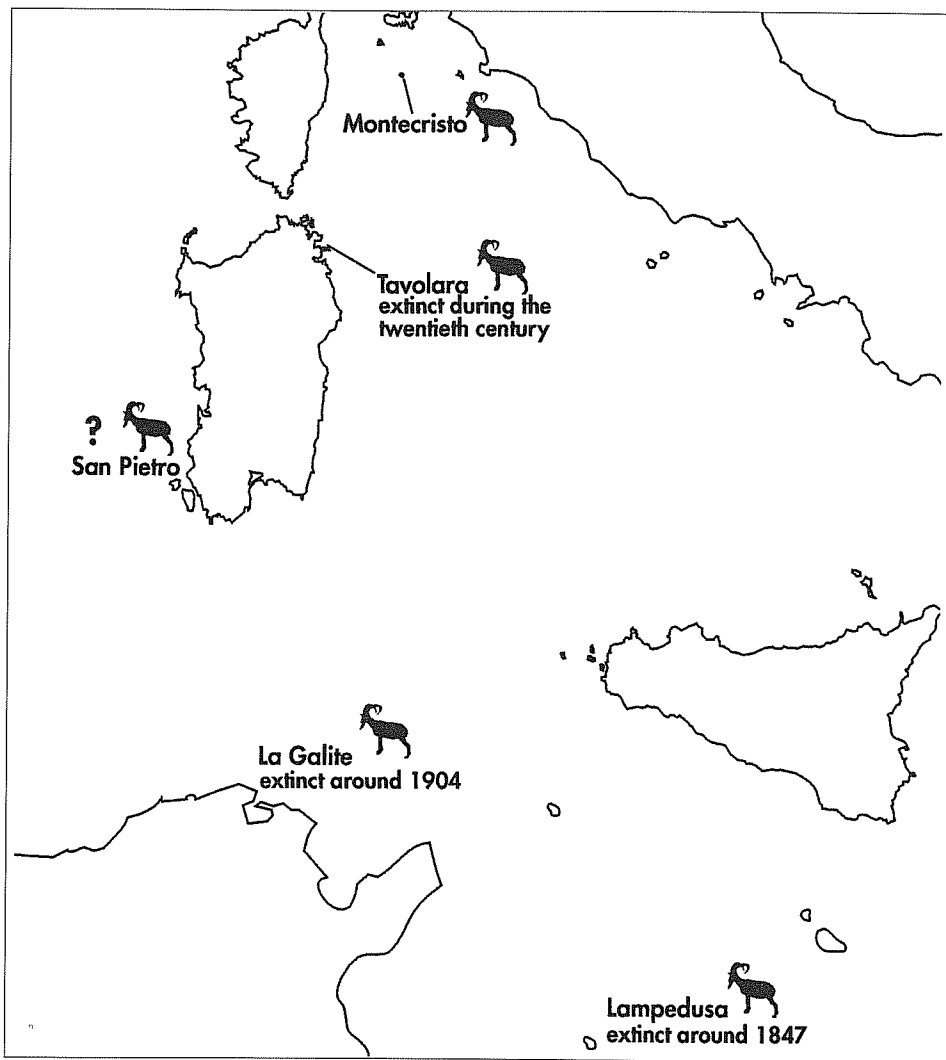


Fig. 4 - Wild goat populations of the *Capra aegagrus* phenotype in the south-central Mediterranean islands during the nineteenth and twentieth centuries, with the geographical location of the island of Lampedusa in the Sicilian Channel (Italy) (drawing by Sandro Sacchetti)

bearded and horned [...] with shorter fur, but of a much greater size..." (Cetti, 1774). Their existence on Tavolara was continuously disturbed by the hunters who reached the islet from the surrounding islands and the mainland. "All day long the hunters would stalk the goats over the crags, where they roamed by day, but even better in the morning or evening they would lie in wait until the goats came down to the shore to drink, and then they would ambush and attack them; in a single expedition they slaughtered as many as five hundred". (Cetti, 1774). The wild goats

of Tavolara featured the same morphological patterns of the Bezoar goat or wild goat, *Capra aegagrus* Erxleben, 1777, still found wild in western Asia (Harrison, 1968; Harrison and Bates, 1991), and on several islands of the Mediterranean basin. In fact, these ungulates are still reported from Crete (*C. a. cretica* Schinz, 1838) (Fig. 5), the isle of Antimilos five marine miles off the north-western coast of Milos (Cyclades) (*C. a. pictus* Erhard, 1858), and Youra in Northern Sporades (*C. a. dorcas* Reichenow, 1888 (Schultze-Westrum, 1963; Sfougaris, 1990; Ciani and Masseti,

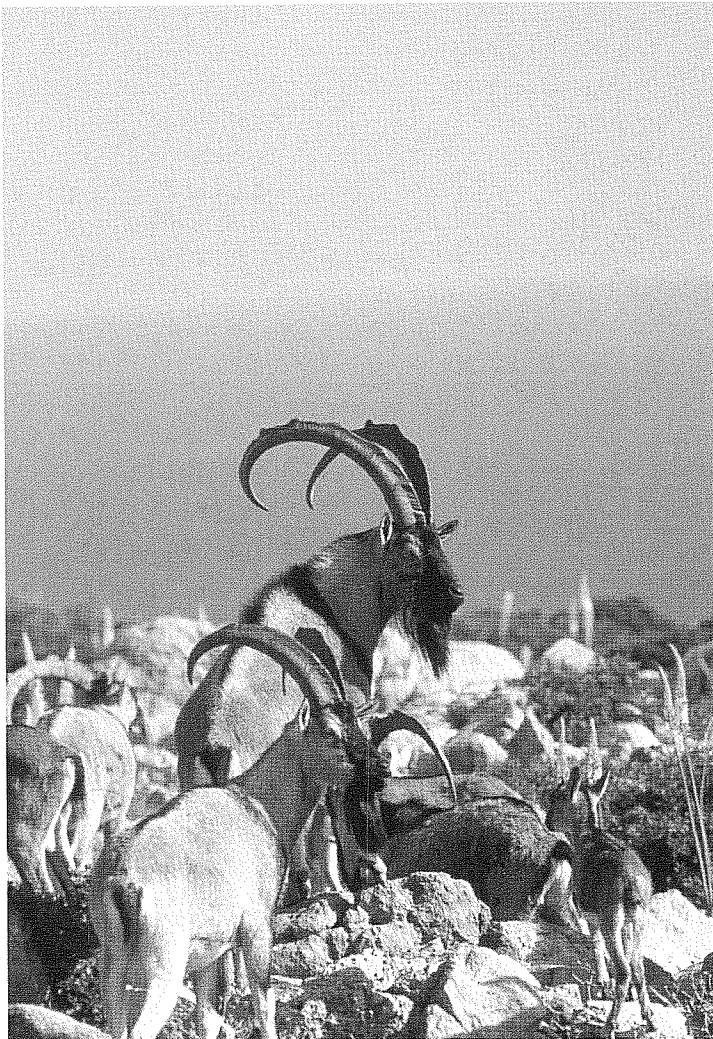


Fig. 5 - The Cretan wild goat, *Capra aegagrus cretica* Schinz, 1838, is still dispersed on the White Mountains (Lefka Ori) and on several small islets off the northern Cretan coast (photograph by Marco Masseti)

1991; Sfougaris, 1994 and 1995). The wild goat of the island of Samothrace, in the Northern Aegean sea, has also been described as *C. a. pictus* (Schultze-Westrum, 1963), and seems to have become extinct in the wild before the end of the 1980s (Sfougaris, 1990, 1995). In the Central Mediterranean basin, a population of wild goats, which has been described taxonomically as *C. aegagrus hircus* L., 1758 (Spagnesi et al., 1986) is still present on the island of Montecristo (Tuscan archipelago, Northern Tyrrhenian sea), although on the basis of morphological and phenotypical observations, Ciani and Masseti (1991) suggest that it might be included in the nomenclature of the wild goats of the Aegean islands (Fig. 6). Again, on the islet of La Galite off the northern Tunisian shore, a population of wild goats survived until the beginning of the twentieth century (Lavauden, 1924), displaying phenotypical patterns identical to those of the Montecristo goat. Earlier authors often classified these Mediterranean insular goats as specific or subspecific geographic forms, almost entirely on the basis of arbitrary criteria and of the examination of scattered materials. Further investigations are now called for to provide a more specific definition of their taxonomic and genetic position. It used to be thought that the wild goats of the Mediterranean islands were autochthonous forms. But it is now realised, considering the lack of fossil evidence for these ungulates on the islands, that these caprines are ancient breeds which can be related to anthropical importations (Payne, 1968; Masseti, 1981; Davis, 1984, 1987; Clutton-Brock,



Fig. 6 - The straight-horned wild goat of Montecristo is the last survivor of an ancient breed imported onto the central Mediterranean islands (photograph by Marco Masseti)

1989; Ciani and Masseti, 1991; Helmer, 1992). Current evidence suggests that domestic caprines originated in the Near East (Clutton Brock, 1981; Davis, 1993), and that the ancestors of the domestic goat can be identified in the Bezoar goat (Clutton-Brock, 1981, 1989; Davis, 1987). It is possible that, since early Neolithic times, some of the goats that were imported as tamed and/or semi-domestic livestock onto the Mediterranean islands escaped from their guardians' control, giving origin to the "wild" population, the descendants of which have persisted up to today. Back in the wild, they maintained the morphological patterns of their Near-Eastern ancestors. In fact, as observed by Ryder (1983), recognition of the origins of domestication is complicated by the fact that the first domestic animals were no different from their wild counterparts. Recent morphologic and genetic analyses of the Cretan wild goat, for example, indicate that it had very likely experienced some cultural control in prehistorical times before it colonised the mountains of Crete (Logan et al., 1994; Masseti, 1998). The Bezoar goat is completely absent from the original Quaternary faunistic scenario of Southern Europe (Schultze-Westrum, 1963; Azzaroli, 1983). Along the Mediterranean shores, the substantial evidence for wild caprines is referable to ibexes (*C. ibex ibex* L., 1758, *C. ibex nubiana* F. Couvier, 1825, and *C. pyrenaica* Schinz, 1838), Barbary sheep (*Ammotragus lervia* Pallas, 1777), and chamois (*Rupicapra rupicapra* L., 1758, and *R. pyrenaica* Bonaparte, 1845), all species which were never domesticated anywhere in Europe, North Africa, or the Near East in the early Holocene. The lack of fossil evidence for wild goats from the western Mediterranean region reveals that *C. aegagrus* definitely had a Near-Eastern continental anthropochorous origin (Masetti and Vianello, 1991; Masseti, 1993, 1997, 1998). It is therefore certain that domestic goats were first introduced in Europe from western Asia, where their earliest remains have been found in archaeological sites dating to around the 9th-8th millennium BC (Masetti, 1997, 1998).

According to Gussone (1832), Calcara (1846, 1851), and Sommier (1908), wild goats were introduced on the Pelagian islands either by the English or the Maltese, around the end of the first decade of the nineteenth century. On Lampedusa, these were confined to the western ridge of the island. Effectively, up to the end of the first half of the nineteenth century, the island was divided into two parts by a dry stone wall protecting the cultivated eastern areas from the wild game (Smith, 1824). As already noted, Gussone (1832) observed that no more than 200 of these animals roamed the remote cliffs of the island, but shortly afterwards Calcara (1846, 1851) reported how they had been drastically reduced to less than one hundred. Later, by the time Sommier (1908) landed on Lampedusa, there remained no trace of their former occurrence. In his report on the Pelagian islands, drawn up in 1847 but published in 1849, Bernardo Sanvisente, first governor of Lampedusa for the King of Naples, between 1843 and 1848, recorded that he had given the order for the eradication of all the wild

goats from the island, to preserve the habitat of the last red deer and to prevent damage to the olive groves (Sanvisente, 1849). Current knowledge indicates that most of the wild goat populations of the central Mediterranean islets became extinct between the first half of the nineteenth century and the twentieth century. The wild goats of Tavolara are thought to have become extinct in the course of the nineteenth century (Ciani et al., 1999), and are now replaced by feral animals originating from the Sardinian domestic race, whereas the caprines of La Galite vanished around 1904, at the time of the construction of the Galitone rock lighthouse (Lavauden, 1924). During the nineteenth century, or even earlier, a few specimens of the latter goat were imported by fishermen onto the island of San Pietro, off the south-western Sardinian coast, to improve local breeds, and there is evidence of their survival up to the 1970s. Even today, it is in fact not so unusual to find some specimens of wild goat bred within domestic flocks on Mediterranean islands. The wild goats of Youra, for example, are quite commonly bred on several Aegean islands, such as Alonissos and Tilos, and up to the 1960s it was common practice to release domestic livestock on Antimilos or in the Cretan White Mountains to let them interbreed with the local wild goats.

#### CONCLUDING REMARKS

As far as is presently known, while the origin of the wild goats of Lampedusa is documented in nineteenth century literature, the origin of the red deer population, and when and how they appeared on the island is still obscure and veiled in mystery. Effectively, late Pleistocene-early Holocene fossils from Lampedusa reveal no cervid remains but only endemic mammals of African origin (Burgio and Catalisano, 1994; Burgio et al., 1997). These Ethiopian elements include several osteological fragments which show affinities with the species *Syncerus caffer* (Sparrmann, 1779), and possibly with one representative of the Hippotraginae family (Fig. 7). One has to wait, however, until the appearance of the Neolithic culture on Lampedusa to find the earliest evidence for the presence of Palaearctic mammals, such as domestic caprines (*Ovis vel Capra*), and boars, *Sus scrofa* L., 1758 (cf. Radi, 1972) of anthropochorous origin. Attributed to the Stentinello style, a cultural *facies* also documented from south-eastern Sicily, these remains also yielded one incomplete canine of red fox, *Vulpes vulpes* (L., 1758), certainly imported onto the island for decorative purposes.

Sommier (1908) reported that the introduction of deer on Lampedusa was perhaps perpetrated by “the ancient masters of the island”. And, as far as is presently known, this introduction could have been carried out by the Anglo-Maltese gentleman Fernandes, who tried to convert the unproductive soils of Lampedusa into an agricultural estate at the beginning of the nineteenth century (cf. Fragapane, 1993). It is not immediately apparent, however, why people should have wanted

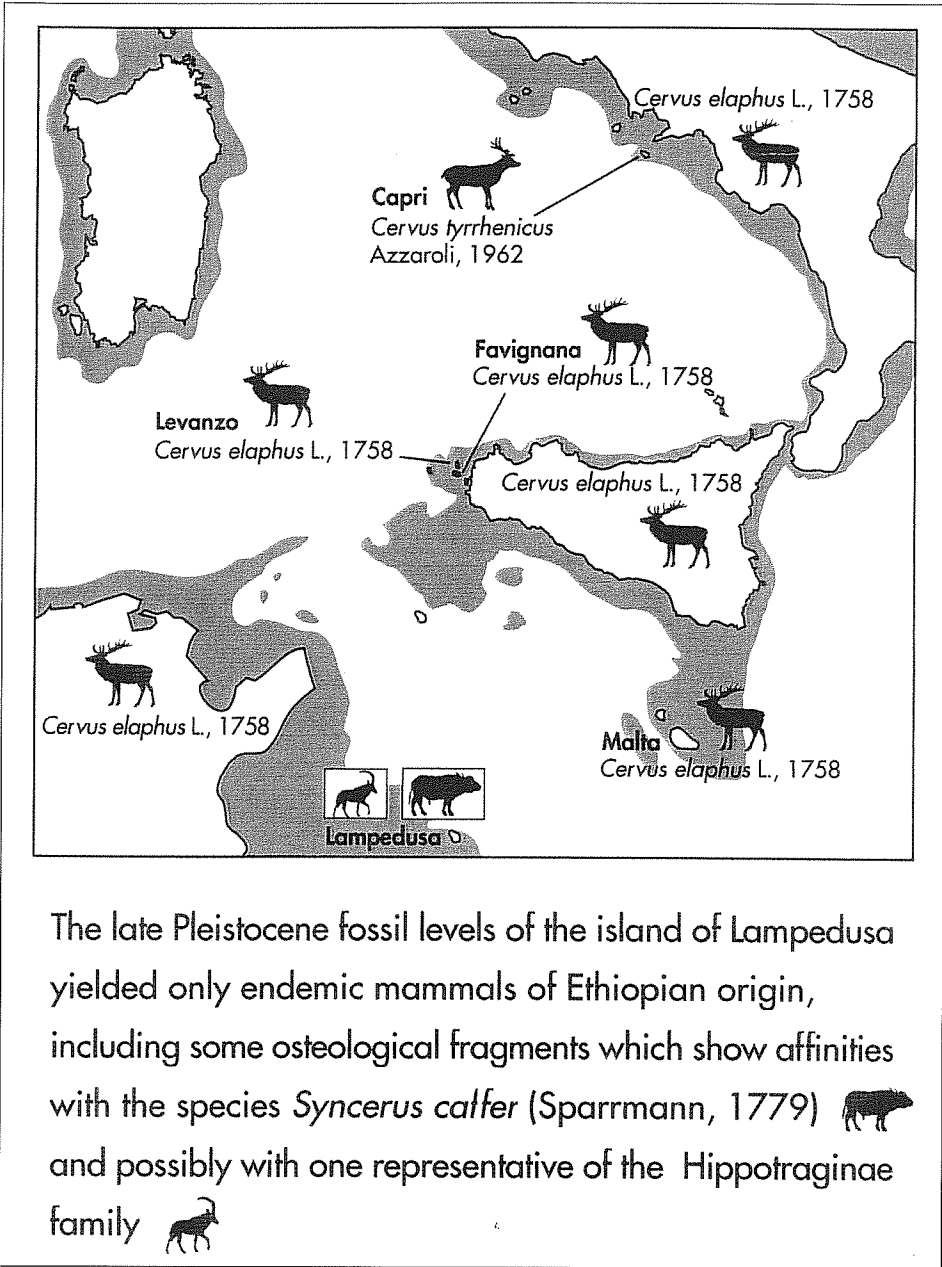


Fig. 7 - Late Pleistocene fossil remains of deer of the south-central Mediterranean basin, with the endemic ungulates of the island of Lampedusa. The grey area represents lands lost during Holocene sea-level rises. Data from Graziosi (1950), Malatesta (1957), Azzaroli (1962, 1971, 1977), Cassoli and Tagliacozzo (1982), Kowalski and Rzebik-Kowalska (1991), Burgio et al. (1997) (drawing by Sandro Sacchetti)

to introduce deer on Lampedusa. It cannot be excluded that deer could have been released in a free-ranging state, while man exerted a control on the number of the animals through justified hunting, as occasion demanded. This could have been one way of simplifying management problems, considering Lampedusa as a natural enclosure and allowing the deer herds to derive their food supply directly from the carrying capacity of the environment. One cannot overestimate the importance of islands inhabited by free-ranging populations of herbivores, which represented living depositories of animal proteins available at any time along the marine routes of the Mediterranean sea. Indeed, some of the ungulates most adaptable to peculiar environmental conditions even of small islands, were brought by sailors and let loose on islands so that they could breed and provide a store of fresh meat that would be readily available for the passengers of ships (Masseti, 1998). This is the probable explanation for the periodic releasing of wild goats on several Mediterranean islands since antiquity and even in prehistory. Beyond this peculiar use of islands as natural reservoirs of fresh meat, in the past centuries the European nobility often regarded the islands, especially those located near the mainland coasts, simply as game preserves. Regarding the circum-Sicilian islands, literary sources report the occurrence of herds of deer on Favignana, in the Egadi archipelago, from at least as far back as the beginning of the 18th century (Amico, 1757-1759), whereas gazelles were probably present on Marettimo even earlier, since the 12th century (cf. Amari and Schapparelli, 1883; Rizzitano, 1994). Even islands at quite a distance from the mainland coast sometimes became attractive game parks. Between the end of the nineteenth century and the beginning of the twentieth, for example, the Florentine count Carlo Ginori and the king of Italy, Emanuele III of Savoy, used to organise regular hunting parties on the rocky and inhospitable islet of Montecristo. As already observed, this island was – and still is – inhabited by wild goats featuring the same phenotypes as the Bezoar goats of the Aegean islands and southern Anatolia. Before the island became a protected nature reserve in 1971, the hunting of the Montecristo wild goat had traditionally provided sport for the Italian leisured classes.

#### ACKNOWLEDGEMENTS

This research was made possible by the financial support of the Assessorato Beni Culturali, Ambientali e Pubblica Istruzione della Regione Siciliana, Soprintendenza di Agrigento, and by the logistic assistance provided within the context of the official twining project involving the El Feidja National Park (Tunisia) and the Riserva Naturale WWF of Monte Arcosu-Monte Lattias (Italy), and by the Gestione Ex Azienda di Stato per le Foreste Demaniali (A.S.F.D., Italy). We would like to express our appreciation and gratitude to the following friends and colleagues for their suggestions and assistance: Ferdinando Ciani, National Focal Point FAO-

ConSDABI, Circello (Benevento, Italy); Maria Gabriella di Palma, Soprintendenza Beni Culturali ed Ambientali, Sezione Beni Naturali e Naturalistici, Palermo; Ahmed Ridha Fekih Salem, Ministry of Agriculture of Tunisia; Pedro Regato, WWF Mediterranean Program, Rome (Italy). Special thanks are due to Paolo Agnelli, for having allowed us to study the bone material held at the Museum of Natural History of the University of Florence, Zoological Section, and to Stefano Mattioli, Dipartimento di Biologia Evolutiva of the University of Siena for the critical reading of the manuscript and for his suggestions.

## NOTE

1) "The little isle, of habitation bare, / With humble myrtle and juniper clad, / Offered the red deer, the fallow deer, the roebuck, and the hare / A solitude remote, secure and glad, / Unknown except for fishermen; and there / They hung their nets on branches which they had / For this same purpose of their foliage stripped, / While fishes in the tranquil waters slept" (translation by B. Reynolds, 1977, revised).

## REFERENCES

- AMARI M., SCHAPPARELLI C. 1883 - L'Italia nel "Libro di Ruggero". Compilato da Edrisi. Tipografia Salviucci, Roma, 155 pp.
- AMICO V.M., 1757-1759 - Lexicon topographicum Siculum. In quo Siciliae, Urbes, Opida, cum diruta, tum extantia, Montes, Flumina, Portus, adjacentes Insulae, ac singula Loca describuntur, illustrantur. Catania; traduzione di G. Di Marzo. Palermo, 1855-1856. Rist. anastatica Forni, Bologna.
- AVOGADRO DI VIGLIANO E. 1880 - Lampedusa. Appunti di un Comandante di Distaccamento. Tipografia nel R. Albergo dei Poveri, Napoli.
- AZZAROLI A. 1962 - Il nanismo dei cervi insulari. Paleont. It., 26: 1-31.
- AZZAROLI A. 1971 - Il significato delle faune insulari quaternarie. Le Scienze, 30: 84-93.
- AZZAROLI A. 1977 - Considerazioni sui mammiferi fossili delle isole mediterranee. Boll. Zool., 44: 201-211.
- AZZAROLI A. 1983 - Biogeografia dei mammiferi della Sardegna. Lavori della Società italiana di Biogeografia, 8: 35-52.
- BECCU E. 1989 - Il cervo sardo. Carlo Delfino editore, Sassari: 167 pp.
- BECCU E. 1993 - Consistenza e prospettive di salvaguardia della popolazione di *Cervus elaphus corsicanus* presente in Sardegna. Suppl. Ric. Biol. Selvag., 21: 277-287.
- BURGIO E., CATALISANO A. 1994 - *Mus lopadusae* (Mudirae Rodentia), nuova specie fossile dell'isola di Lampedusa (Agrigento, Sicilia). Il Quaternario, 7 (1): 119-122.
- BURGIO E., CATALISANO A., SALVO G., ZAVA B. 1997 - Primo ritrovamento di vertebrati fossili nell'isola di Lampedusa (Sicilia). Naturalista sicil., S. 4, 21 (3-4): 229-236.
- CALCARA P. 1846 - Rapporto del viaggio scientifico eseguito nelle isole di Lampedusa, Linosa e Pantelleria ed altri appunti della Sicilia. "Il Contemporaneo", Stamperia Raffaele Pagano, Palermo: 13-14, 32 pp.
- CALCARA P. 1847 - Descrizione dell'isola di Lampedusa. Stamperia Raffaele Pagano, Palermo.
- CALCARA P. 1848 - Sui boschi della Sicilia. Mem. di P. Calcara letta nelle sedute del 16 apr. e 4 giug. nell'Ist. di Incoraggiamento. Tip. Solli, Palermo.
- CALCARA P. 1851 - Descrizione dell'Isola di Linosa. Stamperia P. Morvillo, Palermo, 31 pp.
- CASSOLI P.F., TAGLIACCOZZO A. 1982 - La fauna della Grotta di Cala dei Genovesi a Levanzo. Riv. Sc. Preist., 37: 48-58.
- CETTI F., 1774 - I quadrupedi della Sardegna. G. Piattoli, Sassari, XIX-218 pp.
- CIANI F., MASSETI M. 1991 - Considerazioni preliminari sull'origine della popolazione ircina dell'isola di Montecristo, nel Mar Tirreno settentrionale. Elementi per un confronto cronologico-culturale con l'antica diffusione dell'egagro (*Capra aegagrus* Erxleben, 1777) nelle isole del Mediterraneo orientale. In: E. Randi, M. Spagnesi (eds.), Atti del Convegno "Genetica e Conservazione della fauna". Suppl. Ric. Biol. Selvag., 18: 123-133.
- CIANI F., MASSETI M., PALAZZO M., CAPPUCCIO A., MATASSINO D. 1999 - Genetic variations in the Mediterranean wild goat (*Capra aegagrus* Erxleben, 1777). Contrib. Zoogeogr. Ecol. Eastern Mediter. Reg., 1: 69-74.
- CLUTTON-BROCK J. 1981 - Domesticated animals from early times. Heinemann and British Museum (Natural History), London, 208 pp.
- CLUTTON-BROCK J. 1989 - Five thousand years of livestock in Britain. In: S. Harris (ed.), British Mammals: Past, Present and Future. The Linnean Society of London and Academic Press, London, pp. 31-37.



- CONCHON O. 1979 - Les animaux disparus. Courrier du Parc de la Corse, Automne-Hiver 1979: 1-44.
- CORBET G.B. 1978 The mammals of the Palaearctic Region: a taxonomic review. British Museum (Natural History), Cornell University Press, London and Ithaca, 314 pp.
- DAVIS S.J.M. 1984 - Khirokitia and its mammal remains. A Neolithic Noah's ark. In: A. Le Brun (ed.), Fouilles récentes à Khirokitia (Chypre), 1977-1981. Editions Recherche sur les Civilisations, Paris, pp. 189-162.
- DAVIS S.J.M. 1987 - The archaeology of animals. B.T. Batsford Ltd, London, 224 pp.
- DAVIS S.J.M. 1993 - The zoo-archaeology of sheep and goat in Mesopotamia. Bull. Sumer. Agricult. (1993): 1-7.
- DOLAN J.M. 1988 - A deer of many lands. A guide to the subspecies of the red deer *Cervus elaphus* L. Zoonooz, 10: 1-36.
- FICO R., MATTIOLI S., LORENZINI R., NOBILI G. (in press) - Preliminary results of the conservation of red deer from Mesola Wood. Hystrix.
- FRAGAPANE P. 1993 - Lampedusa. Sellerio editore, Palermo, 550 pp.
- GEIST V. 1999 - Deer of the world. Swan-Hill Press, Shrewsbury (England), 421 pp.
- GERVAIS P. 1848 - Sur les animaux vertébrés de l'Algérie, envisagés sous le double rapport de la géographie zoologique et de la domestication. Annls. Sci. nat. Zool., 10: 202-208.
- GERVAIS P. 1854 - Zoologie et Paléontologie française: Nouvelles recherches sur les animaux vertébrés dont on trouve les ossements enfouis dans le sol de la France. A. Bertrand, Paris, 544 pp.
- GIBILARO G. 1991 - Lampedusa e Linosa. Da Colonia a Comune 1843-1878. Istituto Siciliano di Studi Politici ed Economici, Palermo, 362 pp.
- GIGLIOLI E.H. 1912 - Studii laltassografici. Annali di Agricoltura 1912. Ministero di Agricoltura, Industria e Commercio. Ufficio della pesca, Roma: 1-339.
- GRAZIOSI P. 1950 - Le pitture e i graffiti preistorici dell'Isola di Levanzo nell'Arcipelago delle Egadi (Sicilia). Riv. Sc. Preist., 5: 1-43.
- GUSSONE D.G. 1832 - Notizie sulle isole Linosa, Lampione e Lampedusa e descrizione di una nuova specie di *Stapelia* che trovasi in quest'ultima. Atti R. Accad. Sc. Napoli, 4: 74-97.
- HARRISON D.L. 1968 - The mammals of Arabia. Volume III. Carnivora-Artiodactyla-Hyracoidea. Ernest Benn Ltd. London, 381 pp.
- HARRISON D.L., BATES P.J.J. 1991 - The mammals of Arabia. Harrison Zoological Museum, Sevenoaks (England), 354 pp.
- HELMER D. 1992 - La domestication des animaux par les hommes préhistoriques. Masson, Paris, 184 pp.
- JOLEAUD L. 1913 - Études de Géographie zoologique sur la Berbérie, I: Les Cervidés. Rev. Afric., 287: 471-499.
- JOLEAUD L. 1925 - Études de Géographie zoologique sur la Berbérie, I: Les Ruminants cervicornes. Volume jubilaire de Gornjanovic-Krambergera. Zagreb, 61 pp.
- KAJI K., KOIZUMI T., OHTAISHI N. 1988 - Effects of resources limitation on the physical and reproductive condition of sika deer on Nakanoshima Island, Hokkaido. Acta Theriol., 33: 187-208.
- KOCK D., SCHOMBER H.W. 1961 - Beitrag zur Kenntnis der Verbreitung und des Bestandes des Atlashirsches (*Cervus elaphus barbarus*) sowie eine Bemerkung zu seiner Geweihbildung. Säugetierkundl. Mitteil., 9: 51-54.
- KOHLMEYER J. 1959 - Lampedusa Biologische wanderung auf einer der Pelagischen Inseln. Natur und Volk, 89: 214-223.
- KOWALSKI K., RZEBIK-KOWALSKA B. 1991 - The mammals of Algeria. Ossolineum, Warszawa, 371 pp.
- KRUMBIEGEL I. 1982 - Der Korsika-Rothirsch (*Cervus elaphus corsicanus* Erxleben, 1777) und sein Biotop. Säugetierk. Mitt., 30: 281-286.
- LATASTE L. 1885 - Etude de la faune des vertébrés de Barbarie (Algérie, Tunis et Maroc). I. Catalogue provisoire des mammifères apélagiques sauvages. Actes Soc. linn. Bordeaux, 39: 129-289.
- LAUDAUDEN L. 1924 - La chasse et la faune cynégetiques en Tunisie. Imprimerie Guénard and Franchi, Tunis, 50 pp.
- LOGAN G.T., BROWN J.H., HUSBAND T.P., NICHOLSON M.C. 1994 - Conservation biology of the Cretan agrimi. Biol. Gallo-hellen., 22: 241-246.
- LORENZINI R., MATTIOLI S., FICO R. 1998 - Allozyme variation in native red deer *Cervus elaphus* of Mesola Wood, northern Italy: implications for conservation. Acta Theriol., Suppl. 5: 63-74.
- MALATESTA A. 1957 - Terreni, faune e industria quaternaria nell'Arcipelago delle Egadi. Quaternaria, 4: 1-26.
- MASSETI M. 1981 - La capra selvatica nel Mediterraneo. L'Universo, 2: 177-218.
- MASSETI M. 1993 - Post-Pleistocene variations of the non-flying terrestrial mammals on some Italian islands. Supplemento alle Ricerche di Biologia della Selvaggina, 21: 209-217.
- MASSETI M. 1997 - The prehistoric diffusion of the Asiatic mouflon, *Ovis gmelini* Blyth 1841, and the Bezoar goat, *Capra aegagrus* Erxleben, 1777, in the Mediterranean area beyond their natural distributions. In: E. Hadjisterkotis (ed.): Proceedings of the Second International Symposium on Mediterranean Mouflon "The Mediterranean mouflon: management and conservation". Game Fund of Cyprus/IUCN Species Survival Commission, Caprinae Specialist Group, Nicosia, pp. 1-19.
- MASSETI M. 1998 - Holocene and anthropochorous wild mammals of the Mediterranean islands. Anthropozoologica, 28: 3-20.
- MASSETI M., VIANELLO F. 1991 - Importazioni preistoriche di mammiferi alloctoni nelle isole del Mar Tirreno centro-settentrionale. Rivista di Scienze Preistoriche, XLIII, 1-2: 275-292.
- MASSETI M., ZAVA B. 2002 - The deer of the island of Lampedusa (Pelagian archipelago, Italy): literary references and osteological evidence. Archiv. Nat. Hist., 28: 51-66.

- MATTIOLI S. 1990 - Red deer in the Italian peninsula, with particular reference to the Po delta population. *Deer*, 8, 2: 95-98.
- MATTIOLI S. 1991 - Antler morphology in an Italian red deer population. 20th Congress of the International Union for Game Biologists. Gödöllő, Hungary, August 21-26, 1991, pp. 467-470.
- MATTIOLI S., 1993 - Antler conformation in red deer (*Cervus elaphus*) of the Mesola Wood, Northern Italy. *Acta Theriologica*, 38: 443-450.
- MEYER P. 1972 - Zur Biologie und Oekologie des Atlashirsches. *Zeitschr. Säugetierkunde*, 37: 101-116.
- MURGIA C., MONNI A. 1991 - Distribuzione e popolazione del cervo sardo (*Cervus elaphus corsicanus*). *Suppl. Ric. Biol. Selvaggina*, 16: 595-598.
- PAYNE S. 1968: The origins of domestic sheep and goats; a reconsideration in the light of fossil evidence. *Proc. Prehist. Soc.*, 34: 368-384.
- POIRAZIDIS K. 1987 - The physical environment of the Sithonia peninsula (in Greek). *I Phisis*, 37: 12-14.
- RADI G. 1972 - Tracce di un insediamento neolitico nell'isola di Lampedusa. *Atti Soc. Tosc. Sci. Nat., Mem., Serie A*, 79: 197-205.
- RIGGIO S. 1986 - Degradazione dell'ambiente ed estinzione della fauna vertebrata in Sicilia. *Atti del I Convegno Siciliano di Ecologia*. Società Editrice Delphinus, Noto, pp. 67-93.
- RIZZITANO U. 1994 - Idrisi. Il Libro di Ruggero. Il diletto di chi è appassionato per le peregrinazioni attraverso il mondo. Flaccovio Editore, Palermo, 123 pp.
- RYDER M.L. 1983 - Sheep and Man. Gerald Duckworth & Co. Ltd, London, 846 pp.
- SAINT-GIRONS 1973 - Les Mammifères de France et Bénélux. Doin, Paris, 481 pp.
- SALEZ M. 1959 - Note sur la distribution et la biologie du cerf de Barberie (*Cervus elaphus barbarus*). *Mammalia*, 23: 133-138.
- SANVISENTE B. 1849 - L'isola di Lampedusa eretta a Colonia dal Munificentissimo Nostro Sovrano Ferdinando II, descritta dal Cav. B. Sanvisente Capitano di Fregata e Governatore della medesima con un cenno sulle minori isole di Linosa e Lampione. R. Tipografia Militare, Napoli.
- SCHULTZE-WESTRUM T. 1963 - Die Wildziegen der ägäischen Inseln. *Säugetierk. Mitt.*, 11: 145-182.
- SFOUGARIS A.I. 1990 - Wild Goats (*Capra aegagrus*) in Greece: distribution and status. Laboratory of Wildlife Management and Fisheries, Department of Forestry and Natural Environment, Aristotelio University of Thessaloniki. Poster presentation at 5th International Congress "Zoogeography and Ecology of Greece and Adjacent Regions. Heraklion (Crete), 16-20 April 1990.
- SFOUGARIS A.I. 1994 - Wild goats (*Capra aegagrus*) in Greece: distribution and status. *Biol. Gallo-hellenica*, 22: 233-240.
- SFOUGARIS A.I. 1995 - The distribution, ecology and management of goats *Capra aegagrus* in Greece. An outline. *Caprinae Specialist Group of the Species Survival Commission of I.U.C.N.*, 8/9: 5-9.
- SMITH W.H. 1824 - Memoir descriptive of the resources, inhabitants and hydrography of Sicily and its islands, interspersed with antiquarian and other notices. J. Murray, London.
- SPAGNESI M., CAGNOLARO L., PERCO F., SCALA C. 1986 - La capra di Montecristo (*Capra aegagrus hircus* Linnaeus, 1758). *Ric. Biol. Selvaggina*, 76: 147 pp.
- SOMMIER S. 1908 - Le Isole Pelagie. Lampedusa, Linosa e Lampione e la loro flora con un elenco completo delle piante di Pantelleria. Stabilimento Pella, Luigi Chiti successore, Firenze.
- VIGNE J.-D., MARINVAL-VIGNE M.-C. 1988 - Contribution a la connaissance du cerf de Corse *Cervus elaphus*, *Artiodactyla*, *Mammalia*) et de son histoire. *Bull. Ecol.*, 19, 2-3: 177-187.
- ZAVATTARI E. 1960 - Biogeografia delle isole Pelagie. *Accad. Naz., XI, Rendiconti*, Roma, 11: 1-471.