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Morphological and Morphometrical Features of Sardinian Wild Cat *(Felis silvestris lybica var. sarda)*

A. Mura[1], S. Gadau[1], M. Zedda*[1]

[1] Department of Animal Biology, University of Sassari, Sassari, Italy, Via Vienna 2, 07100 Sassari, Italy.
* E-mail: mzedda@uniss.it

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Abstract

Wildcats (*Felis silvestris*) spread over Europe ranging from Spanish to Eastern woodlands. In Northern Africa, the wildcat belongs to a different subspecies (*Felis silvestris libyca*) which diffused in Sardinia giving rise to a novel taxon there (*Felis silvestris libyca sarda*).

The morphological features of the Sardinian wildcat taxon are not well-known yet. In our work its morphological and morphometrical features have been studied on 19 stuffed models. Numerous morphometrical parameters were taken, and the distribution of spots and stripes of the coat was studied. A low variability in the morphometrical parameters was detected, confirming that the Sardinian wildcat can be considered a well-defined taxon. Since one of the most severe problems in the safeguard of pure Sardinian wildcats is their crossbreeding with domestic cats, the comprehensive knowledge of the anatomical features of these animals could be useful in making a distinction between these two taxa.

Introduction

The wild cat (*Felis silvestris* Schreber, 1775) is one of the most widely distributed small felid in the world. Despite this vast distribution area, this animal is a dying species and among Mammals it is still poorly investigated. For many years there has been confusion in wildcat taxonomy because this species shows different phenotypes with different geographical distribution [1-3]. In recent years, there have been several studies attempting to establish and evaluate the current intraspecific wild cat taxonomy using biochemical and biomolecular approaches [4]. On the other hand, genetic studies found very little differences in the frequency of allelic loci between wild, feral and domestic cats [5]. Indeed, the differences based on genetic studies are often smaller than morphological aspects [6]. Genetically, the cats show a remarkably low degree of interspecific variation since all the Old World cats have identical karyotypes and morphology of their chromosomes [7]. Recently, a definitive classification of the wild cats has been proposed on the study of the microsatellite and mitochondrial DNA [8,9].

In agreement with these Authors, the wildcat is one single species (*Felis silvestris*) with five main morphological types, considering interfertile subspecies: *F. s. silvestris*, *F. s. ornata*, *F. s. bieti*, *F. s. cafra* and *F. s. lybica*. The first type is present in the Continental Europe including the Italian peninsula and Sicily. The type belonging to *Felis s. ornata* lives in Asian woods and *F. s. bieti* is present in Chinese desert mountains. In Southern Africa *F. s. cafra* is typical while in Northern Africa the wild cat belongs to a local subspecies, *Felis silvestris lybica* (Fig. 1).

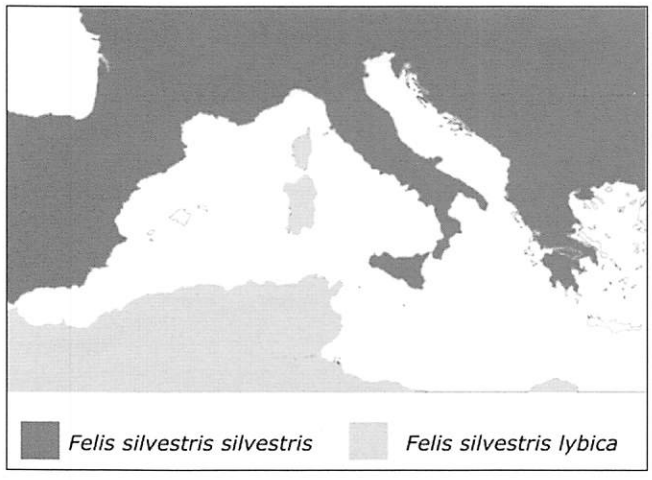

Figure 1. *Distribution of the wildcat in Mediterranean area.*

This last type diffused in Sardinia giving rise to a novel taxon there, *Felis silvestris lybica sarda*. The morphological features of Sardinian wildcat taxon are not well-known yet. These considerations justify the great importance of morphometrical and morphological studies in order to recognize differences among wild, feral and domestic cat populations. Aim of our study was to better clarify the morphological features of Sardinian wildcats in order to make a useful distinction from the domestic cat, since one of the most severe problems in the safeguard of pure Sardinian wildcats is their crossbreeding with domestic cats [10-12].

Materials and Methods

Morphological and morphometrical analyses were carried out on 17 stuffed and 2 frozen wildcats. The stuffed Sardinian wild cats came from the Zoological Collections of the Universities of Sassari and Cagliari, and Museums of Natural History of the following Sardinian villages: Cala Gonone, Belvì, Neoneli, Nughedu S.Vittoria, Siddi and Arbus (Fig. 2). Wildcats underwent evaluation of the following morphometrical parameters: i) length of the body (from nose to tail tip), ii) length of the head (from nose to external occipital protuberance), iii) interzygomatic distance, iv) height of auricles, v) length of hair tufts, vi) neck circumference, vii) length of tail. As regards this last parameter, the relative tail length index (RTLI) was calculated as ratio between length of the tail and length of the body without the tail. To compare these data measurements have been also taken in a colony of 30 tabby domestic cats (*Felis catus*). In addition, as comparative model to European wild cat, a stuffed cat exposed in the Zoological Collection of the University of Cagliari was taken (cat R).

In order to evaluate the maculation pattern, images of the coat were photographed with a Nikon D-60 digital camera. The spots and the stripes located near to the median plane were turned into colorimetric plots (Fig. 3) by the Scion Image software (*Scion Corporation*, Frederick, MD, USA).

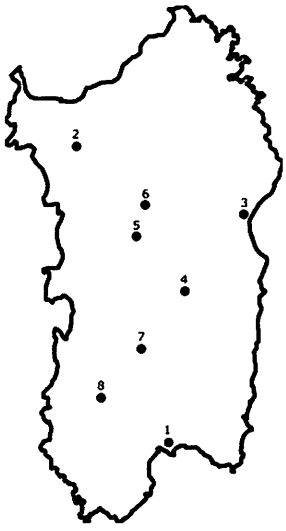

Figure 2. Geographical distribution of cats examined in Sardinia. 1: Zoological collection of the University of Cagliari (cats R, S, T); 2: Department of Animal Biology (cat A) and Department of Zoology and evoluzionistic genetics (cats B, C, D) of the University of Sassari. 3: Bue Marino Museum of Cala Gonone, Nuoro (cats E, F). 4: Natural History Museum of Belvì, Nuoro (cats G, H). 5: Natural History Museum of Assai-Neoneli, Nuoro (cats I, L). 6: Natural History Museum of Assai-Nughedu S. Vittoria, Nuoro (cat M). 7: Ornithologic Museum of Siddi, Oristano (cat N). 8: Zoological collection of Montevecchio-Arbus, Medio Campidano (cats O, P, Q).

Results and Discussion

The comparative study of all cats examined, revealed that all the animals were characterized by similar morphological features, with some small variations as regard the coat. Morphological observations showed that one of characteristic features of these animals, not detectable in

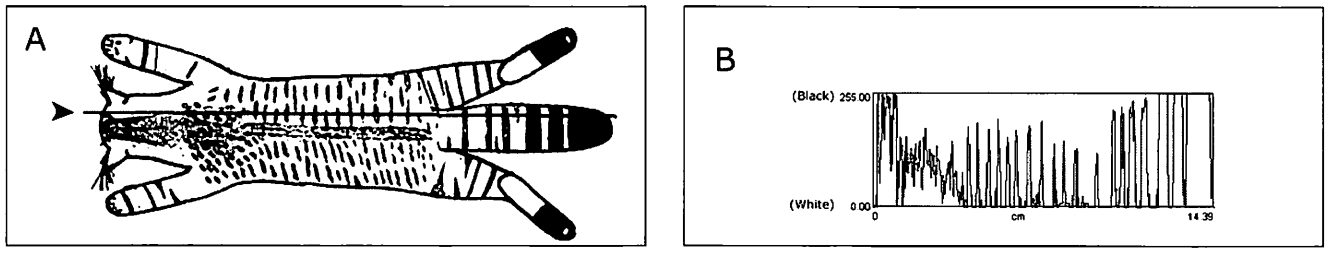

Figure 3. Schematic drawn of colorimetric plot method. A, typical Sardinian wildcat coat, the arrowhead indicates the black straight line corresponding to the scanning paramedian plane; B, diagram representing the spots and stripes turned in colorimetric plot.

cat	body (lenght)	neck (circumf)	thorax (circumf)	auricles (height)	hair tufts (lenght)	bizigomatic distance	Head (lenght)	canines (lenght) sup/inf	Tail (lenght)
A	950	-	-	51		66	64	-	340
B	960	260	360	46	11	81	100	-	340
C	860	210	270	33	13	64	80	-	300
D	770	220	290	41	9	72	79	-	250
E	950	260	380	50	12	75	108	15/12	350
F	930	260	390	38	9	76	85	9/11	370
G	880	230	360	35	4	65	99	11/11	290
H	830	220	340	26	4	58	86	8/8	230
I	870	220	325	35	12	79	89	12/9	310
L	870	240	300	37	7	77	92	11/10	320
M	770	220	300	37	6	71	89	-	250
N	910	240	330	73	5	72	99	-	360
O	900	230	330	30	13	74	92	-	320
P	680	190	330	39	4	72	93	-	320
Q	920	230	320	51	14	73	89	13/9	360
R	890	260	380	38	-	77	104	-	280
S	-	-	-	-	-	-	-	-	-
T	-	-	-	-	-	-	-	-	-
U	1009	-	-	54	5	60	94	12/10	375
V	944	-	-	48	6	64	110	11/9	350
average	894,1	234,0	333,7	42,3	8,4	72,0	91,8	39444,4	317,5
SD	62,4	23,2	35,3	11,0	3,7	7,4	11,1	270,8	43,5

Table 1. Measurements of biometrical parameters of Sardinian wildcats and one European wild cat (R). All data are expressed in mm.

domestic and European wild cats, is the presence of hair tufts in auricles, which mean length is 8.4 mm (± 3.7). A long tail represents another morphological feature of these animals, as it is longer than half body. Sardinian wild cats showed a total length of the body of 894 mm in average, with variations between 770 mm and 1009 mm depending on the length of the tail. In contrast, the European wild cat (subject R) shows a length of 890 mm, similarly to the average of Sardinian wild cats, but it is mainly due to the length of the trunk. Morphometrical data from wild cats are reported in Table 1.

A low variability in the morphometrical parameters was detected, confirming that the Sardinian wildcat can be considered a well-defined taxon.

Regarding the study of coats, we observed that the fur is spotted, with a colour varying from brown to tawny. Seasonal variations are also evident since in summer the fur is more reddish with shorter hair and bristles, whereas in winter it tends to gray-brown and fawn. In the trunk, more than one median black streak and scattered black marks are also present. As regards the limbs, only streaks are evident and localized especially at the forearm and leg. In addition, the coat of domestic cats displays a continuous streak in the median plane ending at the tip of the tail. The wild cat tail is large and bush and with a constant diameter and 5-7 complete black rings showing variable width. Tail tip is black and rounded in shape in all subject examined. One of the most interesting features of Sardinian wild cat coat is the complete absence of white spots, the possible presence of which could suggest a loss of purity due to genetic crosses with domestic cats.

Our study pointed out that Sardinian wild cat could be considered a defined taxon. Indeed some morphological features displayed low variability and oneness. In particular the spots and stripes distribution of the coat and the tail, the absence of white spots, the length of the tail and the hair tufts represents a peculiarity of pure Sardinian wild cat. Pure Sardinian wildcats often crossbreed with domestic cats leading to a genetic pollution, that represents a overriding problem for its safeguard. The comprehensive knowledge of the anatomical features of these animals could be useful in making a distinction between these two taxa.

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