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# CATALOGUE OF THE LATE PLEISTOCENE FOSSIL MAMMALIAN COLLECTION FROM "GROTTA PARIGNANA" (NATURAL HISTORY MUSEUM, UNIVERSITY OF PISA)

**Abstract** - *Catalogue of the Late Pleistocene fossil mammalian collection from "Grotta Parignana" (Natural History Museum, University of Pisa).* The upgraded catalogue of the paleontological collection of "Grotta Parignana" (Monte Pisano, Italy) is presented. The recovery of the material and the discovery of isolated tags referred to the old Canavari inventory permitted to re-associate some tags to the corresponding specimens. The catalogue includes all the determined species stored at the Natural History Museum and the description of the specimens stored at the Department of Archaeological Sciences of the University of Pisa. For each taxon, the collection number, the description of the specimen and the number of specimens (in parentheses) are reported.

**Key words** - Mammals, Late Pleistocene, catalogue, collections, Grotta Parignana, Monte Pisano, Italy.

**Riassunto** - *Catalogo della collezione a mammiferi fossili del Pleistocene Superiore della "Grotta Parignana" (Museo di Storia Naturale dell'Università di Pisa).* Viene presentato il catalogo aggiornato relativo alla collezione paleontologica della Grotta di Parignana (Monte Pisano, Italia). Il recupero del materiale e il ritrovamento di cartellini isolati riferibili al vecchio catalogo Canavari ha permesso di riassociare dei cartellini agli esemplari corrispondenti. Il catalogo comprende le specie determinate che si trovano presso il Museo di Storia Naturale e la descrizione degli esemplari conservati presso il Dipartimento di Scienze Archeologiche dell'Università di Pisa. Per ogni taxon, viene riportato il numero di inventario, la descrizione dell'esemplare ed il numero di esemplari (tra parentesi).

**Parole chiave -** Mammiferi, Pleistocene Superiore, Catalogo, Collezioni, Grotta Parignana, Monte Pisano, Italia.

#### INTRODUCTION

This report is the second of a set of catalogues dedicated to the collections of the Late Pleistocene mammals hosted at the Natural History Museum of the University of Pisa. In particular, both the former and the present catalogue are devoted to the most important mammal associations of the Monte Pisano, the Cucigliana (Farina, 2011; 2013) and the Parignana (Farina, 2012) caves.

Grotta Parignana (also named "Buca delle Fate" or "Grotta delle Molina"; Caterini, 1921a) (North Latitude 43°47'58.5" – East Longitude 10°26'04,5") is located at 230 m a.s.l., near San Giuliano Terme (Pisa). The cave was discovered in 1866 by Carlo Regnoli who collected abundant mammal remains. Later, other specimens were recovered by Prof. M. Canavari, Forsyth Major, Prof. Stoppani and Mr De Bosniaski (Caterini, 1921).

The fauna was preliminarily examined by Regnoli and subsequently determined by Forsyth Major, who provided the first list of the species (Caterini, 1921). In later times, Caterini (1921a) revised the mammal association and Del Campana (1925) studied the birds. The first inventory of the Grotta Parignana paleontological collection (mammals and birds) of the "Geologic Museum of the University of Pisa" was realized by Prof. Mario Canavari in 1921 (Fig. 1).

The recent systematic review of the mammal association (Farina, 2012) assessed the occurrence of *Felis silvestris* and *Cricetus* sp. in addition to the species determined by Caterini (1921a). Moreover, the collection review allowed to upgrade the scientific classification and provided updated information about the scientific value of the fossil material.

The present work aims i) to determine the current consistency of the collection after the many displacements occurred after the Second World War and ii) to provide a description of the material including the two new determined taxa.

## MATERIAL AND FORMAT

The main part of the paleontological collection of Grotta Parignana is currently housed at the Natural History Museum of the University of Pisa, whereas a smaller part is stored at the Department of Archaeological Sciences of the University of Pisa. The birds fossil material is housed at the Museum of Geology and Paleontology of the University of Florence.

The mammals collection consists of 1244 specimens, including 28 only anatomically determined specimens and 105 completely undetermined specimens (Farina, 2012).

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Fig. 1 - First two pages of the Canavari inventory.

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The catalogue includes all the determined species stored at the Natural History Museum of the University of Pisa and the description of the specimens stored at the Department of Archaeological Sciences of the University of Pisa (1111 specimens).

DEL MUSEO Nº 9 Ursus arctos Linn. A. nº 4 Mol2 sup. dextr. B. nº 2 Mol2 sup. sin. Parignana UNIVERSITA DI PISA	GEOLOCICO
DEL MUSEO ZODE Cervus elaphus L. Humerus dexter Parignana UNIVERSITA DI PISA	GEOLOGICO

Fig. 2 - Two isolated tag of the old Canavari inventory.

The fossil material stored at the Department of Archaeological Sciences consists in *Marmota marmota* (386 specimens), *Canis lupus* (4 specimens), *Ursus arctos* (2 specimens) and *Cervus elaphus* (43 specimens). A large part of this material does not have an inventory number.

For each taxon described, the inventory number (if present), the description of the specimen and the number of specimens (in parentheses) are reported.

Furthermore, as for the Cucigliana cave catalogue (Farina, 2013), many isolated tags belonging to the Canavari inventory were found (Fig. 2). The cross-comparison between the tags, the Canavari inventory and the fossil material often allowed to match the tags with the corresponding specimens, in order to rebuild the historical collection.

CATALOGUE

Order INSECTIVORA

Family ERINACEIDAE

Erinaceus europaeus L.

I14229 - incomplete right femur (young specimen) (the proximal epiphysis and 3/4 of the diaphysis is preserved).

Order RODENTIA Family MURIDAE

Arvicola amphibius (L.)

I15297 - incomplete cranium. The jaws retain the right M<sup>1</sup> and M<sup>2</sup> and the left M<sup>1</sup> and M<sup>2</sup>; I15298 - incomplete incisor tooth; I15299 - fragment of cranium; I15300 incomplete right mandible (M2 and M3 are preserved); I15301 - incomplete right mandible (incisor tooth and M1 and are preserved); I15302 - fragment of right mandible (2 specimens); I15303 - incomplete left mandible (2 specimens); I15304 - fragment of mandible (7 specimens); I15305 - incomplete incisor tooth (5 specimens); I15306 - complete molar tooth (7 specimens); I15307 - incomplete left mandible ( $M_1$  and  $M_2$  are preserved) (2 specimens); I15308 - incomplete right mandible ( $M_1$  and  $M_2$  are preserved) (2 specimens); I15309 - incomplete left mandible; I15310 - fragment of right mandible; I15311 - incomplete incisor tooth (5 specimens); I15312 - complete molar tooth (5 specimens); I15313 - complete right M<sub>1</sub>; I15314 - complete left  $M_1$  (2 specimens).

Apodemus gr. sylvaticus (L.) - flavicollis (Melchior, 1834)

I15294 - incomplete left mandible (the incisor tooth,  $M_1$  and  $M_2$  are preserved); I15295 - incomplete right jaw (M<sup>1</sup>, M<sup>2</sup> and M<sup>3</sup> are preserved); I15296 - incomplete left jaw (M<sup>1</sup>, M<sup>2</sup> and M<sup>3</sup> are preserved).

*Microtus* gr. *arvalis* (Pallas, 1778)-*agrestis* (Linnaeus, 1761)

I15318 - fragment of cranium. The jaws retain the right  $M^1$  and  $M^2$  and the left  $M^1$  and  $M^2$ ; I15319 - incomplete left mandible (incisor tooth,  $M_1$  and  $M_2$  are preserved); I15322 - incomplete right mandible (incisor tooth,  $M_1$  and  $M_2$  are preserved);

Clethrionomys glareolus (Schreber, 1780)

I15315 - incomplete right mandible (incisor tooth,  $M_1$ ,  $M_2$  and  $M_3$  are preserved).

Chionomys nivalis (Martins 1842)

I15317 - incomplete right mandible (M<sub>1</sub> is preserved). *Cricetus cricetus* (L.)

I15333 - incomplete left mandible  $(M_1, M_2 \text{ and } M_3 \text{ are preserved})$ ; I15334 - incomplete right mandible  $(M_2 \text{ and } M_3 \text{ are preserved})$ .

Family SCIURIDAE

*Marmota marmota* (L.)

I15287 - complete atlas (3 specimens); I15291 - complete metapodial bone (4 specimens); I15292 - incomplete left femur (the proximal epiphysis and 3/4 of the diaphysis is preserved).

The fossil material stored at the Department of Archeological Science of the University of Pisa (there is no inventory number):

Cranium - fragment of cranium (7 specimens); fragment of cranium; fragment of cranium (7 specimens) (tympanic bone); fragment of cranium (13 specimens); fragment of cranium (3 specimens) (occipital bone); fragment of cranium; fragment of occipital bone;

Jaws - incomplete right jaw ( $P^3$  and  $P^4$  are preserved); incomplete right jaw ( $P^4$ ,  $M^1$  and  $M^2$  are preserved); incomplete left jaw (M<sup>1</sup> and M<sup>2</sup> are preserved); incomplete left jaw (M<sup>1</sup>, M<sup>2</sup> and M<sup>3</sup> are preserved); incomplete left jaw (P<sup>3</sup>, M<sup>1</sup>, M<sup>2</sup> and M<sup>3</sup> are preserved); incomplete left jaw (M<sup>3</sup> is preserved); incomplete right jaw (M<sup>1</sup> is preserved); incomplete right jaw (M<sup>1</sup> and M<sup>2</sup> are preserved);

Upper teeth - complete left M<sup>1</sup>; complete right M<sup>3</sup> (3 specimens); complete right M<sup>2</sup>; complete left M<sup>3</sup>; complete left M<sup>2</sup>;

Mandibles - fragment of right mandible (2 specimens); fragment of right mandible (M2 and M3 are preserved); fragment of left mandible with incisor tooth; fragment of right mandible with incisor tooth; incomplete right mandible; incomplete left mandible with incisor teeth (2 specimens); incomplete right mandible (incisor tooth and M<sup>2</sup> are preserved); fragment of right mandible (incisor tooth); fragment of right mandible; incomplete right mandible (the incisor tooth is preserved); fragment of mandible; fragment of left mandible; fragment of right mandible (4 specimens); incomplete left mandible (M<sub>1</sub> and M<sub>3</sub> are preserved); fragment of right mandible (M<sub>1</sub> is preserved); incomplete right mandible (M<sub>1</sub> are preserved); incomplete right mandible (M<sub>1</sub> are preserved); incomplete right mandible (P<sub>4</sub> and M<sub>4</sub> are preserved);

plete right mandible ( $P_4$  and  $M_1$  are preserved); Lower teeth - complete left  $M_2$  (3 specimens); complete left  $M_1$  (2 specimens); fragment of two indeterminate teeth; complete right  $M_3$ ; complete left  $P_4$  (?); complete left  $M_3$ ; complete right  $M_2$  (2 specimens); complete right  $M_1$ ; complete right  $M_3$  (3 specimens); complete right  $M_2$  (3 specimens); complete right  $M_1$ ; Indeterminate teeth – incomplete incisor tooth; incomplete incisor tooth (8 specimens); incomplete incisor tooth (14 specimens); incomplete incisor tooth (13 specimens); incomplete incisor tooth (10 specimens);

Vertebrae – incomplete cervical vertebra (5 specimens); incomplete cervical vertebra (11 specimens); incomplete cervical vertebra (9 specimens); incomplete vertebra (17 specimens); fragment of vertebra (12 specimens); complete sacral vertebra (3 specimens);

Clavicles – incomplete left and right clavicle (?) (6 specimens);

Scapulae – incomplete right scapula (5 specimens); incomplete left scapula (4 specimens);

Humeri – fragment of humerus (the proximal epiphysis is preserved); complete left humerus; fragment of left humerus (3 specimens) (the distal epiphysis is preserved); fragment of left humerus (the proximal epiphysis is preserved); incomplete left humerus (3/4 of the diahysis is preserved); incomplete left humerus (2 specimens) (the distal epiphysis and 1/2 of the diaphysis is preserved); incomplete left humerus (the distal epiphysis and 3/4 of the diaphysis is preserved); incomplete right humerus (2 specimens) (the distal epiphysis and 1/4 of the diaphysis is preserved); incomplete right humerus (2 specimens) (the distal epiphysis and 1/4 of the diaphysis is preserved); incomplete right humerus (2 specimens) (the distal epiphysis and 1/2 of the diaphysis is preserved); fragment of right humerus (the distal epiphysis is preserved); incomplete right humerus (2 specimens) (1/4 of the diaphysis is preserved);

Radii – incomplete right radius (5 specimens) (the proximal epiphysis and 3/4 of the diaphysis is preserved); – incomplete left radius (5 specimens) (the proximal epiphysis and 3/4 of the diaphysis is preserved); fragment of radius (5 specimens);

Ulnae - fragment of ulna (?) (2 specimens); incomplete right ulna (5 specimens); incomplete left ulna (5 specimens); fragment of ulna;

Coxal bones – incomplete right coxal bone (11 specimens); incomplete left coxal bone (11 specimens); fragment of coxal bone; fragment of coxal bone;

Femora- fragment of femur (2 specimens); fragment of femur (the distal epiphysis is preserved); incomplete right femur (2 specimens) (the proximal epiphysis and 1/4 of the diaphysis is preserved); incomplete left femur (the proximal epiphysis and 1/4 of the diaphysis is preserved); incomplete right femur (2 specimens) (the proximal epiphysis and 3/4 of the diaphysis is preserved); incomplete right femur (3 specimens) (1/2 of the diaphysis is preserved); fragment of right femur (the distal epiphysis is preserved); incomplete left femur (the proximal epiphysis and 3/4 of the diaphysis is preserved); incomplete left femur (3 specimens) (the proximal epiphysis and 1/2 of the diaphysis is preserved); fragment of left femur (proximal epiphysis); incomplete right femur (the proximal epiphysis and 1/2 of the diaphysis is preserved);

Tibiae – fragment of left tibia (the proximal epiphysis is preserved); incomplete left tibia (3 specimens) (1/4 of the diaphysis is preserved); fragment of left tibia (the proximal epiphysis is preserved) (4 specimens); incomplete left tibia (11 specimens) (the distal epiphysis and part of the diaphysis is preserved); complete left tibia; incomplete left tibia (the distal epiphysis and 1/2 of the diaphysis is preserved); fragment of tibia (proximal epiphysis); complete right tibia; incomplete right tibia (8 specimens) (1/2 of the diaphysis is preserved); incomplete right tibia (2 specimens) (the distal epiphysis and 3/4 of the diaphysis is preserved); incomplete right tibia (10 specimens) (the distal epiphysis and 1/2 of the diaphysis is preserved); incomplete

Metapodial bones – complete and incomplete metapodial bone (28 specimens); fragment of metapodial bone (4 specimens);

Calcanei – complete left calcaneus; complete right calcaneus;

Astragali – complete left astragalus; complete right astragalus;

Phalanges – complete phalanx (13 specimens); Family GLIRIDAE

Glis glis (Linnaeus, 1766)

I15288 – complete lower tooth (4 specimens); I15289 – incomplete right mandible (the incisor tooth is pre-

served); I15290 – incomplete right mandible; Order LAGOMORPHA Family LEPORIDAE

Lepus timidus L.

I15187 – fragment of left femur (the distal epiphysis is preserved); I15188 – complete right tibia; I15191 – incomplete left ulna; I15192 – incomplete left radius (the proximal epiphysis and 1/2 of the diaphysis is preserved); I15193 – incomplete right radius (the distal epiphysis and 1/2 of the diaphysis is preserved); I15199 – incomplete right femur (the distal epiphysis and 1/2 of the diaphysis is preserved); I15200 - incomplete left femur (the distal epiphysis and 1/2 of the diaphysis is preserved); I15201 – incomplete left femur (the distal epiphysis and 1/2 of the diaphysis is preserved); I15204 – incomplete right ulna (2 specimens); I15205 – incomplete right ulna (2 specimens); I15211 - incomplete left tibia (the proximal epiphysis and 3/4 of the diaphysis is preserved); I15226 – incomplete left mandible (P<sub>3</sub>, P<sub>4</sub>, M<sub>1</sub> and M<sub>2</sub> are preserved) (Fig. 3); I15227 – incomplete right radius (6 specimens) (the proximal epiphysis and 1/2 of the diaphysis is preserved); I15228 – incomplete left radius (2 specimens) (the proximal epiphysis and 1/2 of the diaphysis is preserved).



Fig. 3 - Lepus timidus I15226 - incomplete left mandible ( $P_3$ ,  $P_4$ ,  $M_1$ ,  $M_2$ ). Lateral view. The scale is 3 cm.

## Lepus europaeus Pallas, 1778

115184 – incomplete left coxal bone; 115185 - incomplete right coxal bone; 115186 – incomplete left femur (the proximal epiphysis and 3/4 of the diaphysis is preserved); 115189 – incomplete left scapula; 115190 – incomplete left humerus (the distal epiphysis and 3/4 of the diaphysis is preserved); 115194 – complete left calcaneus; 115195 – fragment of right humerus (the proximal epiphysis is preserved); 115196 – fragment of left femur (the proximal epiphysis is preserved); 115196 – fragment of left femur (the proximal epiphysis is preserved); 115197 – incomplete right femur (1/2 of the diaphysis is preserved); 115198 – incomplete right femur (1/2 of the diaphysis is preserved); 115202 – incomplete left humerus (3 specimens) (the distal epiphysis and 1/2 of the diaphysis is preserved); 115203 - incomplete right

humerus (the distal epiphysis and 1/2 of the diaphysis is preserved); I15206 – complete left calcaneus (2 specimens); I15207 - complete right calcaneus (2 specimens); I15208 – fragment of right tibia (1/4 of the diaphysis is preserved); I15209 – incomplete right tibia (1/2 of the diaphysis is preserved); I15210 - incomplete right tibia (3 specimens) (1/2 of the diaph-)ysis is preserved); I15212 – incomplete left tibia (the distal epiphysis and 1/4 of the diaphysis is preserved); I15213 - incomplete left tibia (2 specimens) (1/2 of the diaphysis is preserved); I15214 - fragment of right tibia (1/4 of the diaphysis is preserved); I15215 – incomplete left femur (2 specimens) (1/2 of the diaphysis is preserved); I15217 – incomplete right tibia (the distal epiphysis and 1/2 of the diaphysis is preserved); I15218 – incomplete right jaw  $(P^2, P^3, P^4, M^1, M^2)$  and M<sup>3</sup> are preserved); I15219 – fragment of right jaw; I15220 – incomplete mandible ( $P_4$  and  $M_1$  are preserved); I15221 – incomplete left mandible (P<sub>3</sub>, P<sub>4</sub>, M<sub>1</sub> and M<sub>2</sub> are preserved); I15222 – incomplete mandible (I and  $P_4$  are preserved); I15223 – incomplete incisor tooth (4 specimens); I15224 – incomplete right incisor tooth and indeterminate tooth; I15225 – incomplete molar tooth (4 specimens); I15229 - complete right II metatarsal; I15230 - complete left V metatarsal; I15231 – complete IV metatarsal; I15233 – complete right III metatarsal (2 specimens); I15234 – complete left IV metatarsal; I15235 – incomplete right scapula; I15236 – fragment of left tibia (the proximal epiphysis and 1/4 of the diaphysis is preserved); I15237 – incomplete right humerus (the distal epiphysis and 1/2 of the diaphysis is preserved); I15238 – complete right calcaneus; I15239 - incomplete right ulna; I15240 incomplete left coxal bone; I15241 – complete left II metatarsal; I15242 – complete right II metatarsal; I15244 – incomplete left III metatarsal (the proximal epiphysis and 1/2 of the diaphysis is preserved); I15245 - incomplete right III metatarsal (the proximal epiphysis and 3/4 of the diaphysis is preserved); I15247 – incomplete left scapula; I15248 – incomplete right scapula; I15249 – fragment of left femur (1/4 of the diaphysis is preserved); I15250 – fragment of left V metatarsal (the proximal epiphysis is preserved); I15258 – complete left calcaneus; I15259 – incomplete left coxal bone; I15260 - incomplete left II metatarsal (the proximal epiphysis and 1/2 of the diaphysis is preserved); I15262 – fragment of right femur (the distal epiphysis is preserved); I15263 – incomplete right tibia (the distal epiphysis and 1/4 of the diaphysis is preserved); I15264 – incomplete left radius (the proximal epiphysis and 1/2 of the diaphysis is preserved); I15265 – incomplete right radius (the distal epiphysis and 1/2 of the diaphysis is preserved); I15266 – incomplete right scapula (2 specimens); I15267 – incomplete cervical vertebra (2 specimens); I15269 – complete right II metatarsal; I15270 – incomplete left II metatarsal (the proximal epiphysis and 1/2 of the diaphysis is preserved); I15271 – incomplete and complete right V metatarsal (5 specimens) (the incomplete specimens are represented by the proximal epiphysis and 1/2 of the diaphysis); I15272 – incomplete and complete left V metatarsal (2 specimens); I15273 – incomplete left IV metatarsal (the proximal epiphysis and 3/4 of the diaphysis is preserved); I15274 – incomplete right IV metatarsal (the proximal epiphysis and 3/4 of the diaphysis is preserved); I15275 – incomplete and complete right III metatarsal (6 specimens).

Order CARNIVORA

Family MUSTELIDAE

Mustela putorius L.

I15277 – incomplete right mandible (C, P<sub>4</sub>, M<sub>1</sub> and M<sub>2</sub> are preserved); I15278 – incomplete left mandible (P<sub>2</sub>, P<sub>3</sub>, P<sub>4</sub> and M<sub>1</sub> are preserved); I15279 – incomplete left mandible (C, P<sub>2</sub>, P<sub>3</sub>, P<sub>4</sub>, M<sub>1</sub> and M<sub>2</sub> are preserved); I15280 – incomplete left mandible (P<sub>3</sub>, P<sub>4</sub>, M<sub>1</sub> and M<sub>2</sub> are preserved); I15280 – incomplete left mandible (P<sub>3</sub>, P<sub>4</sub>, M<sub>1</sub> and M<sub>2</sub> are preserved); I15281 – fragment of right jaw (P<sup>3</sup> and incomplete P<sup>4</sup> are preserved); I15282 – complete canine tooth.

Mustela sp.

I15283 – incomplete left mandible ( $P_2$ ,  $P_3$ ,  $P_4$  and  $M_1$  are preserved); I15284 – incomplete right mandible ( $P_2$ ,  $P_3$ ,  $P_4$ ,  $M_1$  and  $M_2$  are preserved); I15285 – complete canine tooth.

Family CANIDAE

Canis lupus L.

I12873 – incomplete atlas; I12874 – complete axis; I12875A – complete III cervical vertebra; I12875B – incomplete V cervical vertebra; I12875C – complete cervical vertebra; I12876A - incomplete thoracic vertebra; I12876B – incomplete thoracic vertebra; I12876C – incomplete thoracic vertebra; I12876D – incomplete thoracic vertebra; I12876E – incomplete thoracic vertebra; I12877A - incomplete first lumbar vertebra; I12877B - incomplete II lumbar vertebra; I12877C – incomplete III lumbar vertebra; I12877D - incomplete IV(?) lumbar vertebra; I12878 - incomplete sacral vertebra; I12879 – fragment of right scapula; I12880 - fragment of left scapula; I12881- complete right humerus; I12882 – incomplete left humerus (the proximal epiphysis and 3/4 of the diaphysis are preserved); I12883 – incomplete left ulna (the proximal epiphysis and 1/2 of the diaphysis are preserved); I12884 - incomplete right ulna (the proximal epiphysis and 1/2 of the diaphysis are preserved); I12885 - incomplete right radius (the distal epiphysis and 1/2 of the diaphysis are preserved); I12886 - complete left radius; I12887 – complete right scapho-lunate bone; I12888 – complete right capitate bone; I12889 – complete right cuneiform bone; I12890 - incomplete right femur (1/2 of the diaphysis is preserved); I12891 – incomplete left femur (distal and proximal epiphysis and 3/4 of the diaphysis are preserved); I12892 - in-

complete right tibia (the distal epiphysis and 3/4 of the diaphysis are preserved); I12893 – incomplete left tibia (the distal epiphysis and 1/2 of the diaphysis are preserved); I12894 – complete left astragalus; I12895 – incomplete left calcaneus; I12896 – complete sesamoid bone (2 specimens); I12897 – complete left cuboid bone; I12898 - complete right carpal bone (scaphoid?); I12899 – complete left IV metacarpal; I12900 – incomplete left III metacarpal (the proximal epiphysis and 3/4 of the diaphysis are preserved); I12901 – complete right III metatarsal; I12902 – complete right II metatarsal; I12903 – complete right V metatarsal; I12904 – incomplete right IV metacarpal (the distal epiphysis and 3/4 of the diaphysis are preserved); I12905 – fragment of left III metacarpal (the distal epiphysis is preserved); I12906 - fragment of metapodial bone (2 specimens); I12907 – complete I phalanx; I12908 - complete I phalanx; I12909 - complete I phalanx; I12910 - complete I phalanx; I12911 - incomplete I phalanx (the distal epiphysis and 3/4 of the diaphysis are preserved); I12912 – complete II phalanx; I15182 – complete first phalanx.

Specimens of *Canis lupus* stored at the Department of Archaeological Sciences of the University of Pisa: Inventory Number: 1756

 incomplete left II metatarsal (the proximal epiphysis and 3/4 of the diaphysis are preserved);

– complete left III metatarsal

– complete left IV metatarsal

– complete left V metatarsal

*Canis* sp.

I12918 – fragments of cranium (47 specimens) Vulpes vulpes (L.)

I12913 – incomplete right mandible ( $P_4$  and  $M_1$  are preserved); I12914 – complete right M<sub>1</sub>; I12915 – complete left P4; I12916 – complete left M1; I12917 – incomplete lower incisor tooth; I12919 - fragment of axis; I12920 - complete right tibia; I12921 - incomplete right humerus (the distal epiphysis and 1/2 of the diaphysis are preserved); I12922 – complete left calcaneus; I12923 – incomplete left femur (the proximal epiphysis and 1/2 of the diaphysis are preserved); I12924 – fragment of left femur (the distal epiphysis is preserved); I12925 - incomplete right femur (the proximal epiphysis and 1/4 of the diaphysis are preserved); I12926 – incomplete left tibia (the distal epiphysis and 1/4 of the diaphysis are preserved); I12927 – fragment of left tibia (the distal epiphysis is preserved); I12928 - incomplete thoracic vertebra; I12929 - incomplete lumbar vertebra; I12930 - complete right II metacarpal; I12931 – complete left II metacarpal; I15051 - incomplete left radius (the distal epiphysis and 1/2 of the diaphysis are preserved); I15052 - fragment of femur (a part of the distal epiphysis is preserved); I15053 – incomplete metapodial bone (3 specimens); I15054 – incomplete III metatarsal; I15055 – fragment

of left coxal bone; I15056 - fragment of left coxal bone; I15057 – fragment of right coxal bone; I15232 – complete V metatarsal; I15246 – incomplete and complete first phalanx (5 specimens).

Family URSIDAE

Ursus arctos L.

I12780 – incomplete left mandible (P<sub>4</sub>, M<sub>1</sub> and M<sub>3</sub> are preserved); I12781 – incomplete left mandible  $(M_1, M_2)$ M<sub>2</sub> and M<sub>3</sub> are preserved); I12782 – incomplete left  $M_{2}$ ; I12783 – incomplete left  $P_{4}$ ; I12784 – incomplete right mandible; I12785 – incomplete right M<sub>3</sub>; I12786 - incomplete right lower canine tooth; I12787 - incomplete right mandible (M2 and M3 are preserved); I12788 – fragment of left jaw (M<sup>1</sup> and M<sup>2</sup> are preserved); I12789A – incomplete left M<sup>1</sup>; I12789B – incomplete right M<sup>1</sup>; I12790 – incomplete left P<sup>4</sup>; I12791 – complete right dP<sup>4</sup>; I12792 – incomplete left lower tooth; I12793A – incomplete right upper canine tooth; I12793B – complete left upper canine tooth; I12793C - complete right upper canine tooth; I12794 - complete right humerus; I12795 – complete right humerus; I12796 – complete left humerus; I12797 – incomplete right humerus (the distal epiphysis and 1/2 of the diaphysis are preserved); I12798 - incomplete right humerus (the distal epiphysis and 1/4 of the diaphysis are preserved); I12799 - incomplete right ulna (the proximal epiphysis and 3/4 of the diaphysis are preserved); I12800 – complete right ulna; I12801 – incomplete left ulna (the proximal epiphysis and 3/4 of the diaphysis are preserved); I12802 - complete right radius; I12803 incomplete right radius (the proximal epiphysis and 1/2 of the diaphysis are preserved); I12804 – complete left radius; I12805 - incomplete left radius (the proximal and the distal epiphysis and 3/4 of the diaphysis are preserved); I12806 – incomplete left humerus (the distal epiphysis and 3/4 of the diaphysis are preserved); I12807 – complete right femur; I12808 – complete left femur; I12809 – complete left femur (Fig. 4); I12810 – incomplete right femur (the distal epiphysis and 3/4 of the diaphysis are preserved); I12811 – incomplete left femur (the distal epiphysis and 3/4 of the diaphysis are preserved); I12812 - incomplete right tibia (the distal epiphysis and 3/4 of the diaphysis are preserved); I12813 – complete right tibia; I12814 – complete right tibia; I12815 – complete right tibia; I12816 – complete left tibia; I12817 – complete right calcaneus; I12818 - complete right calcaneus; I12819 - complete left calcaneus; I12820 - complete left calcaneus; I12821 - incomplete right calcaneus (the proximal epiphysis and 3/4 of the diaphysis are preserved); I12822 - incomplete left calcaneus (the distal epiphysis and 3/4 of the diaphysis are preserved); I12823 – complete right astragalus; I12824 - complete right astragalus; I12825 – complete left astragalus; I12826 – complete left astragalus; I12827 – incomplete left astragalus; I12828 – incomplete right astragalus; I12829 – com-

plete right schapo-lunate bone; I12830 – complete left schapo-lunate bone; I12831 – complete left schapo-lunate bone; I12832 complete left schapo-lunate bone; I12833 – complete left cuboid bone; I12834 - complete right cuboid bone; I12835 – incomplete right scaphoid bone; I12836 – complete right scaphoid bone; I12837A complete right scaphoid bone; I12837B – complete left scaphoid bone; I12838incomplete right scaphoid bone; I12839 – complete right pisiform bone; I12840 - complete right pisiform bone; I12841 – complete right pisiform bone; I12842 – complete left pisiform bone; I12843 – complete left pisiform bone; I12844 incomplete left navicular bone (?); I12845 – complete right navicular bone (?); I12846 – complete tarsal or carpal bone; I12847 complete right pyramidal bone (?); I12848 – complete left pyramidal bone (?); I12849A – complete right capitate bone; I12849B complete left capitate



Fig. 4 - Ursus arctos I12809 - complete left femur. Anterior view. The scale is 10 cm.

bone; I12850 - fragments of metatarsals and metacarpals; I12851 - complete patella (4 specimens); I12852 – incomplete sternum; I12853 – incomplete sternum; I12854 – incomplete sternum; I12855 – fragment of right coxal bone (2 specimens); I12856 - incomplete baculum; I12857 - fragment of right scapula; I12858 - incomplete atlas; I12859 – incomplete cervical vertebra; I12860 – incomplete cervical vertebra; I12861 - incomplete thoracic vertebra; I12862 – incomplete thoracic vertebra; I12863 – incomplete thoracic vertebra; I12864 - incomplete thoracic vertebra; I12865 - incomplete thoracic vertebra; I12866 - incomplete thoracic vertebra; I12867 - incomplete thoracic vertebra; I12868 - incomplete thoracic vertebra; I12869 - incomplete thoracic vertebra; I12870 - incomplete thoracic vertebra; I12871 - incomplete thoracic vertebra; I12872 – fragment of sacral vertebra; I15359 – incomplete left fibula (the proximal epiphysis and 1/4 of the diaphysis is preserved); I15360 – incomplete right fibula (2 specimens) (the proximal epiphysis and 1/4 of the diaphysis is preserved); I15361 – incomplete left fibula (the distal epiphysis and 1/4 of the diaphysis is preserved); I15362 – incomplete right fibula (the distal epiphysis and 1/4 of the diaphysis is preserved).

Specimens of *Ursus arctos* stored at the Department of Archaeological Sciences of the University of Pisa (there is no inventory number):

– complete III phalanx

– incomplete left M3

Family FELIDAE

Felis silvestris Schreber, 1777

I15179A – incomplete left mandible (dP<sub>3</sub> and dP<sub>4</sub> are preserved); I15179B – complete right dP<sub>4</sub>; I15180 – complete left III metatarsal.

Order PERISSODACTYLA

Family RHINOCERONTIDAE

Stephanorhinus hemitoechus (Falconer, 1868)

I12757 – incomplete right jaw (the  $M^1$  is preserved); I12758 – fragment of right P4; I12759 – complete right  $P^2$ ; I12760 – complete right  $M^3$  (the specimen is the cast of I12770); I12761 – incomplete left jaw (P<sup>2</sup>, P<sup>3</sup>) and  $P^4$  are preserved); I12762 – complete left  $M^1$ ; I12763 – fragment of right P<sup>3</sup>; I12764 – incomplete right P<sup>2</sup>; I12765 – incomplete right P<sup>2</sup>; I12766 – incomplete left P<sup>3</sup>; I12767 – complete right M<sup>1</sup>; I12768 – complete left M<sup>1</sup>; I12769 – complete left M<sup>2</sup>; I12770 - complete right M<sup>3</sup>; I12771 - incomplete right molar tooth ( $M^{1}$ ?); I12772 – fragment of right  $M^{1}$ ; I12773 – incomplete right mandible; I12774 - incomplete left mandible; I12775 – fragment of temporal bone (?); I12776 – incomplete right humerus (1/2 of the distal)epiphysis is preserved); I12777 – incomplete left humerus (3/4 of the distal epiphysis is preserved); I12778 - incomplete left ulna (3/4 of the distal epiphysis is preserved); I12779 – complete II (?) phalanx.

ORDER ARTIODACTYLA

Family CERVIDAE

*Capreolus capreolus* (L.)

I15139 – complete right calcaneus (2 specimens); I15140 – complete right incisor tooth; I15141A – complete right M<sup>1</sup>; I15141B – complete right M<sub>1</sub>; I15141C – complete left M<sub>1</sub>; I15142 – complete left P<sup>2</sup>; I15143 - incomplete right radius (the proximal epiphysis and 1/2 of the diaphysis is preserved); I15144 – incomplete left tibia (the distal epiphysis and 1/2 of the diaphysis is preserved); I15145 – fragment of right tibia (the distal epiphysis is preserved); I15146 - incomplete right tibia (the distal epiphysis and 3/4 of the diaphysis is preserved); I15147 - incomplete left metatarsal (the proximal epiphysis and 3/4 of the diaphysis is preserved); I15163 – complete left navicular-cuboid bone; I15164 – complete right navicular-cuboid bone; I15165A - complete right astragalus; I15165B - complete left astragalus; I15165C - complete left astragalus; I15165D – complete left astragalus.

*Cervus elaphus* L.

I12753 – incomplete cranium (a fragment of antler is preserved); I12754 - incomplete cranium; I12755 incomplete cranium; I12756 – incomplete left jaw  $(P^3, P^4, M^1, M^2 \text{ and } M^3 \text{ are preserved}); I15060 - frag$ ment of cranium; I15061 – fragment of antler; I15062 - fragment of antler; I15063 - fragment of right jaw  $(dP^3, dP^4 \text{ and } M^1 \text{ are preserved})$ ; I15064A – incomplete left jaw  $(P^4, M^1, M^2 \text{ and } M^3 \text{ are preserved})$ ; I15064B - incomplete left jaw (dP3, dP4 and M1 are preserved); I15064C - fragment of left jaw (dP4 and  $M^1$  are preserved); I15065 – incomplete left jaw (dP<sup>3</sup>, dP<sup>4</sup> and M<sup>1</sup> are preserved); I15066Å – incomplete left M<sup>1</sup> or M<sup>2</sup> (4 specimens); I15066B – incomplete right  $M^1$  or  $M^2$  (7 specimens); I15067 – complete right  $P^4$ ; I15068A – complete right P<sup>4</sup>; I15068B – complete left P<sup>3</sup>; I15068C - incomplete left P<sup>3</sup>; I15069A – complete right incisor tooth; I15069B - complete left incisor tooth; I15069C – complete left incisor tooth; I15070A - incomplete right mandible (P2, P3, P4, M1, M2 and M<sub>3</sub> are preserved); I15070B – incomplete left mandible (M<sub>1</sub>, M<sub>2</sub> and M<sub>3</sub> are preserved); I15071A – incomplete right mandible ( $dP_4$  and  $M_1$  are preserved); I15071B – incomplete left mandible ( $dP_4$  and  $M_1$  are preserved); I15072A – fragment of right mandible ( $M_3$ is preserved); I15072B – incomplete left mandible ( $M_1$ and M<sub>2</sub> are preserved); I15073A – incomplete right  $M_3$ ; I15073B – complete right  $M_3$ ; I15073C – complete left M<sub>3</sub>; I15074A – complete left M<sub>2</sub>; I15074B – complete léft  $M_1$  (2 specimens); I15074Ć – complete right M<sub>1</sub> (4 specimens); I15075 – incomplete right mandible ( $P_3$  and  $P_4$  are preserved); I15076Å – incomplete right mandible  $(P_2, P_3, P_4, M_1, M_2 \text{ and } M_3 \text{ are preserved})$ (Fig. 5); I15076B – incomplete right mandible ( $M_1$ and  $M_2$  are preserved); I15076C – complete left  $M_1$ ; I15076D – complete right M<sub>2</sub>; I15077 – incomplete left mandible ( $P_3$ ,  $P_4$ ,  $M_1$ ,  $M_2$  and  $M_3$  are preserved); I15078A – complete right  $P_3$ ; I15078B – complete left  $P_4$ ; I15079 – complete right  $P_3$ ; I15080A – complete left  $P_2$ ; I15080B – complete right  $P_2$ ; I15081 – incomplete left dP<sub>4</sub>; I15082 – complete right M<sub>1</sub>; I15083 – incomplete left mandible ( $P_3$  and  $P_4$  are preserved); I15084 – fragment of right jaw ( $P^2$  and  $P^3$  are preserved);



Fig. 5 - *Cervus elaphus* I15076A - incomplete right mandible ( $P_2$ ,  $P_3$ ,  $P_4$ ,  $M_1$ ,  $M_2$ ,  $M_3$ ). Lateral view. The scale is 5 cm.

I15085 – incomplete molar tooth; I15086 – incomplete right humerus (the distal epiphysis and 3/4 of the diaphysis is preserved); I15087 – complete right humerus; I15088 - complete left radius; I15089 - complete right radius; I15090 – incomplete left metacarpal (the distal epiphysis and 3/4 of the diaphysis is preserved); I15091 – incomplete left metacarpal (young specimen) (the proximal epiphysis and 3/4 of the diaphysis is preserved); I15092 – complete left metacarpal; I15093 – incomplete left metacarpal (young specimen) (the proximal epiphysis and 3/4 of the diaphysis is preserved); I15094 – complete left metacarpal; I15095 - incomplete right metacarpal (young specimen) (the proximal epiphysis and 3/4 of the diaphysis is preserved); I15096 - incomplete right metacarpal (the proximal epiphysis and 1/2 of the diaphysis is preserved); I15097 – incomplete right metacarpal (the distal epiphysis and 3/4 of the diaphysis is preserved); I15098 – incomplete right metacarpal (the proximal epiphysis and 1/2 of the diaphysis is preserved); I15099 – incomplete right metacarpal (young specimen) (the proximal epiphysis and 3/4 of the diaphysis is preserved); I15100 – complete left navicular-cuboid bone; I15101 – complete right navicular-cuboid bone; I15102 – complete left navicular bone (3 specimens); I15103 – complete right navicular bone; I15104 – complete left carpal bone (lunate bone?); I15105 - complete right carpal bone (lunate bone?); I15106 – complete carpal bone; I15107 - complete carpal bone; I15108 –complete left femur; I15109 – incomplete left tibia (the distal epiphysis and 1/2 of the diaphysis is preserved); I15110 – incomplete left tibia (the distal epiphysis and 3/4 of the diaphysis is preserved); I15111 - incomplete left metatarsal (the proximal epiphysis and 3/4 of the diaphysis is preserved); I15112 – incomplete left metatarsal (the proximal epiphysis and 3/4 of the diaphysis is preserved); I15113 – incomplete left metatarsal (the proximal epiphysis and 1/2 of the diaphysis is preserved); I15114 - incomplete right metatarsal (the proximal epiphysis and 1/2 of the diaphysis is preserved); I15115 – incomplete right metatarsal (young specimen) (the proximal epiphysis and 3/4 of the diaphysis is preserved); I15116 – incomplete right metatarsal (the proximal epiphysis and 3/4 of the diaphysis is preserved); I15117 – complete right metatarsal; I15118 – complete right metatarsal; I15119 – incomplete right metatarsal (the distal epiphysis and 1/2of the diaphysis is preserved); I15120 - incomplete left calcaneus; I15121 - complete left calcaneus; I15122 incomplete right calcaneus; I15123 - complete tarsal bone; I15124 – complete tarsal bone (2 specimens); I15125A – complete left III phalanx; I15125B – complete right III phalanx; I15126 - incomplete left scapula; I15127 - complete I phalanx; I15128 - complete II phalanx; I15130 – incomplete right ulna; I15131 – incomplete right metatarsal (the proximal epiphysis

and 1/2 of the diaphysis is preserved); I15132 – incomplete left metatarsal (1/2 of the diaphysis is preserved); I15133 – incomplete left metacarpal (the distal epiphysis and 1/2 of the diaphysis is preserved); I15134 incomplete left metacarpal (the distal epiphysis and 1/2 of the diaphysis is preserved); I15135 – incomplete right metacarpal (the distal epiphysis and 1/2 of the diaphysis is preserved); I15136 – complete sesamoid bone (6 specimens); I15138 – complete carpal bone (?); I15167 – complete left I phalanx; I15168 – complete right III phalanx; I15169 – fragment of metapodial bone (the distal epiphysis is preserved); I15170 – complete right I phalanx (3 specimens); I15171 - incomplete left I phalanx (5 specimens); I15172 – complete right II phalanx; I15173 – complete II phalanx (6 specimens); I15174 – fragment of metapodial bone (10) specimens) (the distal epiphysis is preserved).

Specimens of *Cervus elaphus* stored at the Department of Archaeological Sciences of the University of Pisa: Inventory Number: 796

– complete left astragalus (4 specimens)

– complete right astragalus (4 specimens)

– incomplete right tibia (the distal epiphysis and 1/2 of the diaphysis is preserved)

 incomplete right tibia (the distal epiphysis and 3/4 of the diaphysis is preserved)

– incomplete right tibia (the distal epiphysis and 1/2 of the diaphysis is preserved)

– incomplete left tibia (the distal epiphysis and 1/2 of the diaphysis is preserved)

- incomplete left tibia (3/4 of the diaphysis is preserved)

– incomplete right tibia (1/2 of the diaphysis is preserved)

– incomplete right tibia (1/2 of the diaphysis is preserved)

 incomplete left humerus (the proximal epiphysis and 1/2 of the diaphysis is preserved)

 incomplete left humerus (the distal epiphysis and 3/4 of the diaphysis is preserved)

incomplete right humerus (the distal epiphysis and 1/2 of the diaphysis is preserved)

 incomplete right humerus (the distal epiphysis and 1/2 of the diaphysis is preserved)

- incomplete right scapula
- incomplete right scapula
- incomplete left scapula
- incomplete left scapula
- incomplete rib
- complete left radius
- incomplete right radius (the proximal epiphysis and

3/4 of the diaphysis is preserved)

– complete right radius

- incomplete right radius (the proximal epiphysis and

1/2 of the diaphysis is preserved)

- incomplete right femur (the distal epiphysis and 1/4

of the diaphysis is preserved)

 incomplete right femur (the distal epiphysis and 1/4 of the diaphysis is preserved)

– incomplete left femur (the distal epiphysis and 1/4 of the diaphysis is preserved)

- incomplete left femur (3/4 of the diaphysis is preserved)

- fragment of right femur (1/4 of the diaphysis is preserved)

- fragment of antler

- complete III phalanx (2 specimens)
- complete I phalanx

 incomplete I phalanx (the proximal epiphysis and 1/2 of the diaphysis is preserved)

– complete II phalanx (2 specimens)

– incomplete II phalanx (2 specimens)

– incomplete M2

Family **BOVIDAE** 

*Rupicapra rupicapra* (L.)

I15148 – incomplete left dP<sup>4</sup>; I15149A – complete right M<sub>2</sub> (2 specimens); I15149B – complete left M<sub>1</sub>; I15150A – incomplete right mandible (dP<sub>3</sub>, dP<sub>4</sub> and M<sub>1</sub> are preserved); I15150B – fragment of right mandible (dP<sub>3</sub> is preserved); I15151 – incomplete left humerus (the distal epiphysis and 1/2 of the diaphysis is preserved); I15152 – incomplete left humerus (the distal epiphysis and 1/2 of the diaphysis is preserved); I15153 – fragment of right humerus (1/4 of the diaphysis is preserved); I15154 – fragment of left radius (the proximal epiphysis is preserved); I15155 – incomplete left metacarpal (the proximal epiphysis and 1/2 of the diaphysis is preserved); I1516 – incomplete left metacarpal (the proximal epiphysis and 1/2 of the diaphysis is preserved); I15157 – incomplete right metacarpal (the proximal epiphysis and 3/4 of the diaphysis is preserved); I15158 – incomplete right metacarpal (the proximal epiphysis and 3/4 of the diaphysis is preserved); I15159 – incomplete left metacarpal (the proximal epiphysis and 1/2 of the diaphysis is preserved); I15160 – incomplete right metatarsal (the proximal epiphysis and 1/2 of the diaphysis is preserved); I15161 – incomplete left metatarsal (the proximal epiphysis and 1/2 of the diaphysis is preserved); I15161 – incomplete left metatarsal (the proximal epiphysis and 1/4 of the diaphysis is preserved); I15162 – fragment of metapodial bones (10 specimens).

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