

A new element of the Late Villafranchian (Tasso Unit) faunas of Italy: occurrence of *Ovibovini* (Bovidae, Artiodactyla, Mammalia) in the fauna of Casa Frata (Upper Valdarno, Tuscany)

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(manuscript received July 14, 1983
accepted July 26, 1983)

KEY WORDS — *Ovibovini*; Taxonomy; Villafranchian; Pleistocene; Upper Valdarno; Italy.

SUMMARY — The occurrence of *Ovibovini* cf. *Praeovibos* in a Late Villafranchian fauna of Tuscany has been recognized. This taxon was not known in any Villafranchian fauna of Europe. Taxonomic characters of European *Ovibovini* are shortly discussed.

RIASSUNTO — [Un nuovo elemento delle faune italiane del Villafranchiano superiore (Unità Tasso): la presenza di *Ovibovini* (Bovidae, Artiodactyla, Mammalia) nella fauna di Casa Frata (Valdarno superiore, Toscana)] — Viene riconosciuta la presenza di *Ovibovini* cf. *Praeovibos* in una fauna del Villafranchiano superiore della Toscana. Si tratta anche della prima segnalazione di questo taxon in una fauna villafranchiana europea. Vengono discussi brevemente i caratteri tassonomici degli *Ovibovini* europei.

PREFACE

The Casa Frata fauna has been communicated in a previous paper (Borselli *et. al.*, 1980), where detailed informations about this site and the occurrence of the fossil material were given. The faunal association is typical of the Late Villafranchian Tasso mammal unit (Azzaroli, 1977) and consists of the following taxa: *Canis etruscus*, *Canis falconeri*, *Vulpes* sp., *Ursus etruscus*, *Martes* sp., *Pachycrocuta brevirostris*, *Lynx issiodorensis*, *Acinonyx pardinensis*, *Homotherium crenatidens*, *Archidiskodon meridionalis*, *Dama nestii*, *Eucladoceros* sp., *Leptobos vallisarni*, *Equus steblini*, *Dicerorhinus etruscus*, *Lepus valdarnensis*, and a bovid provisionally identified as *Megalovis*, and which will be discussed here.

A metacarpal bone, with its massive proportions and its size, witnessed the occurrence in a Villafranchian fauna of Italy of a bovid which is different from *Gallogoral* occurring at Olivola as well as from the almost ubiquitous *Leptobos*. With some doubts that specimen was referred to *Megalovis*, a form which occurs in Senèze, a locality of doubtful stratigraphic

homogeneity but possibly synchronous in part to Casa Frata. Although the metacarpal is the best preserved specimen, a more accurate analysis has shown that other specimens can be referred to the same taxon.

The investigation of this new bovid in a Villafranchian fauna of Italy led us to extend comparisons also to the chronologically closest faunas of the Lower Middle Pleistocene. *Bison* is the best represented bovid in these faunas in Italy. The large bovids of the Italian Villafranchian and Lower Middle Pleistocene consist thus of *Gazellospira*, the rupicaprine *Gallogoral* and the bovine *Leptobos* and *Bison*.

Different forms referred to *Ovibovini* as well as some sporadic Caprini are also widespread in Eurasia, although they are uncommon.

Literature supplies a rich information about *Leptobos* and *Bison* (e.g. Merla, 1949; Sokolov, 1979; McDonald, 1981). Size and proportion of limb bones of *Gallogoral*, of the known Caprini (*Ovis*, *Hemitragus*) and those supposed for *Gazellospira* are quite different from those of the fossils of Casa Frata and cannot be taken into consideration.

THE EUROPEAN OVIBOVINI

The European fossils, since Lower Villafranchian, which can be referred to Ovibovini are: *Hesperoceras*, *Deperetia*, *Megalovis*, *Soergelia*, *Praeovibos* and *Ovibos*.

Hesperoceras, De Villalta & Crusafont, 1953, is represented by a skull from the Lower Villafranchian site of Villaroya (Spain). A metacarpus (tab. 1; pl. 1, fig. 1) in the collections of the Paleontological Museum of Sabadell, can be referred to this form according to its metric and morphologic features. *Hesperoceras* has been distinguished from *Deperetia* mainly for the different curvature of its horn cores and for the longer pre-molar row.

Deperetia, Schaub, 1923, was collected at Etouaires (France, Lower Villafranchian) and at Senèze (France, Late Villafranchian). The limb bones of this form are poorly known. Some skeletal remains referred to this genus by Schaub, 1943, are larger but more slender than those referred to *Megalovis* by the same author. Schaub, 1923, referred these specimens to *Megalovis* as well. Bolomey, 1965, refers to *Deperetia* some fossil material found in three Late Villafranchian localities of Oltenie (Rumania). Following the short description of the limb bone remains referred to *Deperetia* by this author, we get the image of an animal larger and more slender than previously hypothesized by Schaub, 1943.

Megalovis, Schaub, 1923, is defined on a skull and a mandible from Senèze. Schaub, 1943, refers to this genus a metacarpal (tab. 1; pl. 1, fig. 2) and a humerus from the same locality and considers that also the Ovibovinae indet. from Nihowan (Teilhard & Piveteau, 1930) belongs to *Megalovis* as well as some specimens from Honan (Schaub, 1937). Measurements and outline of these metacarpals are in tab. 1 and pl. 1, figs. 4,5. Schaub, 1943 considers that this genus occurred in the Villafranchian of whole Eurasia. Radulescu & Samson, 1962, ascribed to *Megalovis* a metacarpal (tab. 1; pl. 1, fig. 3) found at Fintina lui Mitilan (Oltenie) and considered that locality of Late Villanfran-

chian age, just owing to the occurrence of this genus. We believe that also a left metacarpal (tab. 1; pl. 1, fig. 6; pl. 2, fig. 2) preserved in the Frick Collection of the American Museum of Natural History should be referred to *Megalovis* because of its morphology and size, which are very similar to those of the metacarpal of Senèze. This specimen was collected by Buchshot and Lin at Chao Chuang (Yu She District, China), a locality referred to a generic Villafranchian age.

Soergelia, Schaub, 1951, was described on a skull from Süssenborn to which a somewhat smaller metacarpal than the *Megalovis* ones was referred. Kahlke, 1969, refers to *Soergelia* a metacarpal (tab. 1; pl. 1, fig. 15) quite different from the one of Schaub and refers the latter to *Ovibos* female (tab. 1; pl. 1, fig. 10).

Praeovibos, Staudinger, 1908, is defined on a Bad Frankenhausean skull. A damaged metacarpal (tab. 1; pl. 1, fig. 7) from the same locality is referred by Kahlke, 1963, to this genus. *Praeovibos* is present in the Cromerian s.l. localities of central Europe and England and occurs also in Spain at Venta Micena (Moyà-Solà *et al.*, 1981). The presence of *Allophaiomys pliocaenicus* proves that this locality is older than Bad Frankenhausean and Süssenborn, but it is not as old as previously hypothesized (De Giuli & Torre, in press). More or less of the same age is the fauna with *Allophaiomys pliocaenicus* from the Kolyma River (Eastern Siberia) in which Sher, 1971, found cranial remains of *Praeovibos* to which he ascribed several limb bone remains. In a more recent paper Sher & Kaplina, 1979, put forth some doubts concerning the smallest limb bones suggesting that they could well belong to *Soergelia*.

Ovibos, Blainville, 1816, is a typical form of the cold faunas in holartic Upper Pleistocene. Kahlke, 1963, reports the occurrence of two skulls of this genus in the Middle Pleistocene faunas of Süssenborn and Obergünzberg. He refers to *Ovibos* a right metacarpal Süss. 5876 (1965/2598) as the left metacarpal Süss. 5651 (1965/2531) previously referred to *Soergelia* by Schaub, 1951. Measurements and outline of these metacarpals are in tab. 1 and in pl. 1, figs 9-10. Kahlke, 1963, considers the musk ox of Süssenborn

Tab. 1 - Measurements and indexes of the metacarpals of Ovibovini considered in this paper and of some *Bison* specimens.

(1): Casa Frata (this paper). (2): Senèze, from a mould of the specimen Mus. Basel. Se. 1731. (3): Oltenie, from Radulescu & Samson, 1962. (4): Nihowan, from Teilhard & Piveteau 1930. (5): Honan, from Schaub 1937. (6): Chao Chuang (this paper). (7): Villaroya, from photographic material. (8): Süssenborn, from Kahlke 1969a. (9): Bad Frankenhausean, from Kahlke 1963. (10): a, Chukoch'ya River; b, Malyy Anyuy; from Sher 1971. (11): Süssenborn; a, specimen Süss. 5876, from Kahlke 1969; b, specimen Süss. 5651, from Schaub 1951. (12): a, Bolschoi Liakowsky; b, Mjedgevica Cave; from Sher 1971. (13): Mauer, Mosbach, from Schertz 1936a. (14): Bielorusia, from Sokolov 1979; a, males (n=26); b, females (n=10). (15): North America, from Mc Donald 1981; a, males (n=116); b, females (n=160). (^): inferred values.

MEASUREMENTS & INDEXES	<i>Cf. Praeov.</i> (1)	<i>Megalovis</i> (2)	<i>Megalovis</i> (3)	<i>Megalovis</i> (4)	<i>Megalovis</i> (5)	<i>Megalovis</i> (6)	<i>Hesperoc.</i> (7)	<i>Soergelia</i> (8)	
1. Total lenght	188	200	192	192	204	185	200.2	190(^)	180.6
2. Transverse diameter proximal end	61.7	56.5	56.0	51.0	57.0	52	58.7	47(^)	49.8
3. Antero posterior diam. prox. end	36.4	36.8	-	-	-	-	39.2	-	32.1
4. Transverse diameter shaft	42.9	36.9	35.7	33 (^)	-	32.7(^)	38.9	32(^)	29.3
5. Antero posterior diam. shaft	27.2	24.8	-	-	-	-	24.3	-	21.6
6. Transverse diameter distal end	66	61 (^)	64.0	54.0	61	57	60.3	49(^)	56.6
7. Antero posterior diam. distal end	37	33.4	32.5	-	-	-	34.4	-	29.3
a. Enlargement prox. end (2x100/1)	32.8	28.2	29.1	26.5	27.9	28.1	29.4	24.7	27.5
b. Slenderness index (4x100/1)	22.8	18.4	18.5	17.1	-	17.6	19.2	16.8	16.2
c. Enlargement distal end (6x100/1)	35.5	30.0	33.3	28.1	29.9	30.8	30.0	25.7	31.3

	<i>Praeovibos</i> (9)	<i>Praeovibos</i> (10a)		(10b)	<i>Ovibos moschatus</i> süss. (11a) (11b)		<i>Ovibos pallantis</i> (12a) (12b)			
							mean	range	mean	range
1	194.5	185.5	172	184.5	188.8	180	166.6	157-175	155.8	152-160
2	-	49	53.0	58.5	61.9	(48)	57.6	51.5-63.0	50.2	48.0-53.4
3	-	33	34.5	38.5	36.7	-	34.6	29.0-38.0	33.0	31.0-35
4	46	38.7	35.3	37.4	44.0	35	39.8	31.4-46.7	34.8	32.0-36.7
5	-	23.6	22.8	23.8	22.3	-	22.2	19.3-25.4	20.4	19.0-21.7
6	-	65.5	62.0	67.4	69.9	(51.5)	68.2	60.0-74.0	61.2	58.2-65.0
7	-	37.0	33.0	35.4	35.2	-	33.5	29.0-37.0	31.0	29.5-32.0
a	-	26.4	30.8	31.7	32.6	-	34.5	32.3-36.4	32.2	31.4-33.8
b	23.6	20.8	20.5	20.2	23.3	19.4	23.8	20.0-26.7	22.3	20.9-23.5
c	-	35.3	36.5	36.5	37.0	-	40.8	37.2-43.0	39.3	31.8-40.5

	<i>Bison schoetensacki</i>		<i>Bison bonasus</i>		<i>Bison bison</i>		<i>Bison bison</i>		<i>Bison bison</i>	
	(13)		(14a)		(14b)		(15a)		(15b)	
	mean	range	mean	range	mean	range	mean	range	mean	range
1	246.6	241-255	215	202-225	205	201-209	206.3	192-227	198.9	182-219
2	74.4	71.8-80.9	74	70-79	67	62-72	-	-	-	-
3	46.4	44.3-49.0	-	-	-	-	-	-	-	-
4	44.8	43.8-47.8	44	41-49	35	32-38	45.4	38-53	36.6	36-44
5	31.4	29.0-34.7	-	-	-	-	27.2	22-31	24.0	19-28
6	73.0	70.7-74.7	70	66-75	63	60-67	-	-	-	-
7	41.3	38.8-43.3	-	-	-	-	-	-	-	-
a	30.0	28.6-31.7	34.4	-	32.6	-	-	-	-	-
b	18.1	17.5-18.7	20.4	-	17.0	-	22.0	-	18.4	-
c	29.4	28.2-30.3	32.5	-	30.7	-	-	-	-	-

a subspecies of the living *Ovibos moschatus*, from which it differs essentially for morphologic details of the horn cores and dentition and for the more slender and longer metapodials which recall those of *Praeovibos*. Sher, 1971, therefore suggests that the metacarpals of Süssenborn could well belong to *Praeovibos*.

Taxonomy and phylogeny of the Villafranchian and Middle Pleistocene Ovibovini is still unclear. Gentry, 1970, considered *Hesperoceras*, *Deperetia*, *Megalovis* and *Soergelia* closely related forms, perhaps synonymous. The inclusion of *Soergelia* within Ovibovini is doubtful, and some authors (Sher, 1971; Schaub, 1951) consider this form a representative of Caprini.

As may be seen, if many doubts subsist regarding the taxonomy based on skull remains, the attribution of post-cranial elements is even more uncertain and often only hypothetical. Anyway all the specimens cited above show a great resemblance, most of all the metacarpals, which have been object of a closer investigation by many authors and by ourselves as well. In particular the characters of metacarpal allow a clear discrimination between all these specimens and those belonging to Bovini.

THE OVIBOVINI OF CASA FRATA

The remains referred to cf. *Praeovibos* are: a right metacarpal (IGF 572V); a distal extremity of left humerus (IGF 574V); a left calcaneus (IGF 573V); a left cubonavicularis (IGF 725V); a distal end of left tibia (IGF 575V); the proximal extremity of a left metatarsal (IGF 582V).

The massive structure is the most evident feature of metacarpal (pl. 2, fig. 1). The measurements are compared with those of the chronologically or morphologically closest bovid metacarpals in tab. 1. The morphological details are however the best characters for its taxonomical assessment and allow clearly to separate our specimen from the Bovini *Leptobos* and *Bison* and to recognize its Ovibovini affinity.

The borders of the shaft are sub-parallel in the proximal third, then diverge toward the distal end. The distal extremity shows a larger transverse diameter than the proximal extremity. The dorsal longitudinal groove is reduced to a faint mesial deepening of the bony surface near the proximal end, and the feebly convex dorsal surface of the shaft sharply distinguishes our specimen from *Leptobos*. The palmar notch of the proximal extremity (pl. 2, fig. 3) is shallow, volarly narrowed and closed by the median palmar tuberosity. The articular facet for the fused 2nd and 3rd carpals is slightly concave, with the centre of deepening placed near its palmaro-mesial angle. The palmar edge of this facet is lightly rised mesially; its transverse diameter is almost as large as the one for the 4th carpal facet. The articular facet for the 5th metacarpal is absent.

All these features differentiate our specimen from *Bos*, *Leptobos* and *Bison* and are found in Ovibovini. Like in Ovibovini, the distal articular surface of the metacarpal has well developed and sharp sagittal ridges, and abaxial condyles are smaller, as compared to axial ones, than in *Leptobos* and *Bison*. The intertrochlear incision is wide, most of all in its palmar opening. Like in *Bison*, but unlike *Leptobos*, the medial and lateral tuberosities are well developed.

We referred the other specimens listed above to the same form as they show different size or different morphologic details from *Leptobos*. Unfortunately we were unable to make a comparative morphologic description relatively to these specimens owing to the scanty data available in the literature and to the poor preservation of some of our remains.

The distal part of humerus (pl. 3, fig. 1) is more massive than in *Leptobos*. It shows a more blunt and symmetric ridge between the articular surfaces of the trochlea and the capitulum and a more extended lateral epicondylus.

The distal fragment of tibia (pl. 3, fig. 3) is square shaped in distal view and not trapezoidal as in *Leptobos*. It is characterized by the great development

EXPLANATION OF PLATE 1

Outline of the known metacarpals of Eurasian Ovibovini and related forms.

- Fig. 1 - *Hesperoceras*, Villaroya (from photographic material).
 Figs. 2-6 - *Megalovis*. 2) Senèze (from a mould of the specimen Mus. Basel Se. 1731). 3) Oltenie (from Radulescu & Samson 1962). 4) Nihowan (from Teilhard & Piveteau 1930). 5) Honan (from Schaub 1937). 6) Chao Chuang (this paper).
 Fig. 7 - *Praeovibos*, Bad Frankenhausen (from Kahlke 1963).
 Fig. 8 - cf. *Praeovibos*, Casa Frata (this paper).
 Figs. 9, 10 - *Ovibos moschatus süssenbornensis*. 9) Specimen Süss. 5876 (from Kahlke 1963). 10) Specimen Süss 5651 (from Kahlke 1963).
 Figs. 11-13 - *Praeovibos*, Kolyma (from Sher 1971).
 Fig. 14 - *Ovibos pallantis*, Eastern Siberia (from Sher 1971).
 Fig. 15 - *Soergelia*, Süssenborn (from Kahlke 1969a).
 All figures 1/3 nat. size.



of the extra-articular structures. Also the tibial articular surface is more squared than in *Leptobos* and the ratio between the length of lateral and medial articular grooves is greater than in *Leptobos*. The development of extra articular surfaces is particularly evident in the malleolar process which is larger than in Bovini. The poorly developed anterior malleolar facet is placed more proximally respect to the posterior one than in *Leptobos*. These characters are not the ones of the living *Ovibos* according to Sher, 1971, and could fit the morphology of *Praeovibos* with the exception of the square shape which seems to be a typical feature of our specimen. The medial malleolar process poorly developed distally resembles that of Bovini and is not found in *Ovibos* and *Praeovibos*.

The calcaneum (pl. 3, fig. 2) differs from *Leptobos* for its massive proportions, particularly those of the sustentaculum tali, for the more antero-posteriorly developed malleolar facet and for the larger flat surface of the proximal part of the dorsal edge.

The cubonavicularis (pl. 3, fig. 4) shows a stocky morphology which differentiates it from *Leptobos* and shows a partial fusion with the magnum cuneiform.

The badly damaged fragment of metatarsal (pl. 3, fig. 5) seems to fit the cubonavicularis.

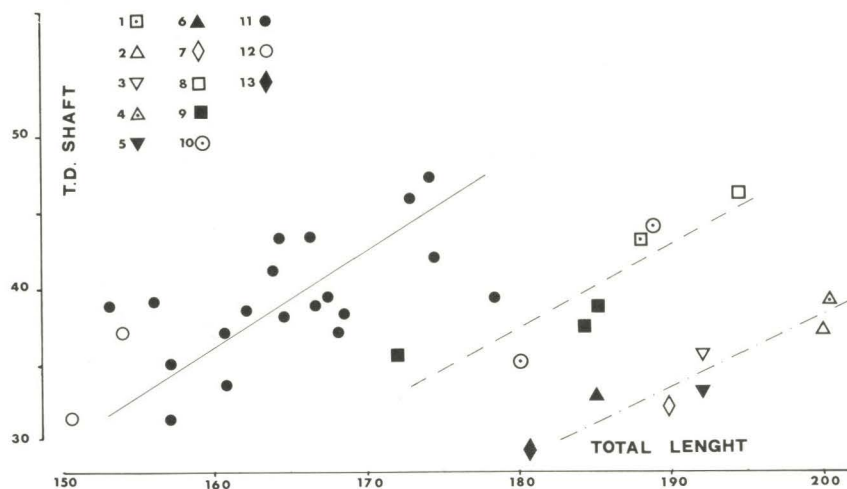
All these skeletal remains possibly belong to a single individual.

DISCUSSION

The only metacarpal is sufficient, in our opinion, to prove that our fossil cannot be confused with the known Villafranchian and Middle Pleistocene Bovini of Italy. All the features considered, which distinguish our specimens from both *Leptobos* and *Bison*, are shared by the Ovibovini previously cited. There is therefore little doubt in the attribution of the fossils of Casa Frata to the tribe Ovibovini.

The determination of these specimens at a generic level is a more difficult problem. From the diagram of text-fig. 1 it is evident that the metacarpals of Villafranchian and Pleistocene Ovibovini may be divided into three main groups. A first group consists of the specimens referred to *Megalovis* (or *Megalovis* like forms) and to *Soergelia*. These metacarpals are characterized by the relatively slender proportions and larger size, and are mainly from Villafranchian localities. The intermediate group includes Middle Pleistocene remains ascribed to *Praeovibos* and to *Ovibos moschatus süssenbornensis*. The more massive forms belong to the Upper Pleistocene or living representatives of *Ovibos*. The Casa Frata specimen conforms to the intermediate group.

The attribution of the Süssenborns metacarpals to *Ovibos* or to *Praeovibos* is thus the main problem.



Text-fig. 1 - Scatter diagram of the ratio of the transverse diameter of the shaft against the total length of the metacarpal. To Kahlke's 1964 fig. 8 were added new data.

1: Cf. *Praeovibos*, Casa Frata; 2: *Megalovis*, Senèze; 3: *Megalovis*, Oltenie; 4: *Megalovis*, Chao Chuang; 5: *Megalovis*, Nihowan; 6: *Megalovis*, Honan; 7: *Hesperoceras*, Villaroya; 8: *Praeovibos*, Bad Frankenhausen; 9: *Praeovibos*, Kolyima; 10: *Ovibos moschatus süssenbornensis*, Süssenborn; 11: *Ovibos pallantis*, Eastern Sibiria; 12: *Ovibos moschatus*, Greenland; 13: *Soergelia*, Süssenborn.

EXPLANATION OF PLATE 2

Fig. 1 - Ovibovini cf. *Praeovibos* of Casa Frata, metacarpal: a) dorsal view, b) palmar view, c) medial view, d) proximal view, e) distal view.

Fig. 2 - *Megalovis* of Chao Chuang, metacarpal: a) dorsal view, b) palmar view, c) medial view, d) proximal view, e) distal view.

Fig. 3 - Scheme of the nomenclature used in describing the proximal end of the metacarpal (mainly after Sisson & Grossman, 1975).

Figures 1 & 2, 1/2 nat. size.



The trend toward a reduction of the length of extremities is a feature which seems to characterize the evolution of the eurasian Ovibovini during the Pleistocene. Therefore we can likely put forth the hypothesis that the marked massiveness of post-cranial skeleton of the Upper Pleistocene and living *Ovibos* should be regarded as a derivative character. It is probably related to the extreme specialization of this genus which is now confined in circum-polar habitat. If this is true, the more slender proportions and larger dimensions which characterize *Praeovibos* limb bones should be expected also in the ancient representatives of *Ovibos*. Therefore the hypothesis of Sher, 1971, that the metacarpals of Süsssenborn belong to *Praeovibos* according to their proportions could not exclude that of Kahlke, 1963, which was strengthened by the statement of Kahlke, 1964, that the *Ovibos* of Süsssenborn was older than any known *Praeovibos*.

At present, we know that *Praeovibos* occurs in at least two faunas with *Allophaiomys pliocaenicus* (Venta Micena and Kolyma) thus older than Süsssenborn. There is therefore no problem in giving confidence to the morphology of the metacarpals and refer them to *Praeovibos*. It should be noted also that the stratigraphic difficulty envisaged by Kahlke, 1964 for a *Praeovibos* ancestry to *Ovibos* does not exist any more.

The Casa Frata metacarpal, can be clearly distinguished from *Megalovis* and *Soergelia* and shows almost the same proportions and measurements of the metacarpal Süss. 5876. It is therefore referred to Ovibovini cf. *Praeovibos*.

It is the first time that a form belonging to the *Praeovibos-Ovibos* group is found in a typically and completely Villafranchian faunistic context.

ACKNOWLEDGEMENTS

Dr. B. Engesser and the Naturhistorisches Museum Basel provided the molds of the type material of *Megalovis latifrons*; Dr. R. Tedford and the American Museum Natural History kindly supplied the Chao Chuang specimen; Dr. J.V. Santafè received us in the Museo de Paleontologia de Sabadell; Dr. S. Moyà-Solà showed us the Venta Micena material; drawings and the table composition were made by Mrs. C. Andreani and the photographs were taken by Mr. F. Cozzini.

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EXPLANATION OF PLATE 3

Figs. 1-5 - Ovibovini cf. *Praeovibos* of Casa Frata. 1) Humerus, a: frontal view, b: lateral view. 2) Calcaneum, a: plantar view, b: medial view, c: dorsal view. 3) Tibia, a: frontal view, b: caudal view, c: medial view, d: lateral view, e: distal view. 4) Cubonavicularis, a: medial view, b: frontal view, c: proximal view. 5) Metatarsal, medial view. All figures 1/2 nat. size.



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