

Short report on Pleistocene fauna from Grotta Lina (Marina di Maratea, Southern Italy): palaeoecological and geochronological implications

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ABSTRACT – A faunal assemblage from the continental deposit of Grotta Lina, Marina di Maratea (Potenza, Southern Italy) referable to a time span from late Middle Pleistocene (isotopic stage 9) to Late Pleistocene (isotopic stage 3/2) has been described. The biostratigraphical analysis allow us to refer the bedrock of the cave (a biocalcarenite with Cladocora) to the isotopic stage 7, the fossiliferous continental deposit to the stage 6, while a Tyrrhenian shoreline with Lithodomus holes affects the continental deposit at 8-9 m a.s.l. (stage 5 e). The mammal fauna studied may be referred to the late Middle Pleistocene, Vitinia Faunal Unit, Aurelian Mammal Age (AIQUA Working Group Inqua Berlin, 1995). The occurrence of *Microtus ex gr. agrestis-arvalis*, *Capra ibex*, rhino and a very big red deer suggest a palaeoenvironment with a partially wooded grassland with rocky areas and a temperate-cold climate.

RIASSUNTO – [Breve nota sulla fauna Pleistocenica di Grotta Lina (Marina di Maratea, Sud Italia): implicazioni paleoecologiche e geocronologiche] – L'associazione faunistica studiata e rinvenuta nel deposito continentale della Grotta Lina di Marina di Maratea (Potenza), può essere riferita ad un intervallo temporale che va dal Pleistocene medio superiore (stadio 9 delle paleotemperature) al Pleistocene superiore (stadio 3/2 delle paleotemperature). Per una maggiore precisione cronologica sono stati analizzati perciò i rapporti stratigrafici fra questo deposito e la biocalcarenite inferiore. Attraverso una serie di considerazioni stratigrafiche si è ritenuto possibile correlare il livello inferiore a Cladocora della grotta allo stadio isotopico 7; il successivo deposito continentale risulta strettamente correlato con lo stadio 6 in quanto depresso durante una fase di basso stazionamento del livello marino posteriore allo stadio 7; la fascia di fori di litodomi a 8-9 m slm che perfora il deposito continentale, risulta corrispondere ad una linea di riva Tirreniana (stadio 5e). I resti faunistici di Grotta Lina rientrano perciò nell'Unità faunistica di Vitinia della Età a Mammiferi Aureliano (AIQUA Working Group Inqua Berlin, 1995) e confermano con la presenza di *Microtus gr. agrestis-arvalis*, *Capra ibex*, del rinoceronte e di un cervo particolarmente robusto, un paleoambiente di prateria di boschi con ampi spazi aperti con zone a luoghi particolarmente scoscese, a clima temperato con puntate fredde.

INTRODUCTION

Grotta Lina is a coast cave near Marina di Maratea (Potenza, Southern Italy) (Text-fig. 1), already referred to in a previous work (Barbera *et al.*, 1988); it opens in an ancient fault or fracture on a series of stromatolithic dolomite bedrock of Noric age appearing in the area.

The cave, at about 35 m a.s.l., consists nowadays in three different sections: the lowest one, thoroughly without any sediment; the second one, partially excavated by the sea, contains the fossil remains referred in the present work; the third one, and latest one, formed by a funnel opening in the present country surface.

A first cycle of *Lithodomus* holes is developed directly on the bedrock and pierces the cave walls as far 35 m a.s.l.; it is covered, together with holes themselves by a thin layer of biocalcarenite bearing *Cladocora coespitosa*, Algae and *Spondylus gaederopus* and developing itself along the cave walls as far 35 m a.s.l..

A second cycle of *Lithodomus* holes affects the biocalcarenite.

A well developed continental deposit overlaps the biocalcarenite which is constituted (Text-fig. 2) from the bottom to the top by:

a) dolomite blocks at the basis (4.80 m thick) collapsed from the vault constituting the floor for the later sedimentation;

b) stratified levels of debris in a micro-conglomerate-sandy matrix (b1), interiorly eteropic with sandy levels (b2) (0.60 m thick); becoming thinly laminated in the inner part of the cave and containing continental mollusks (b3) (2.40 m thick); more internally, a thin yellow silty-sandy layer (b4) (0.20 m thick) is present;

c) breccias containing layers of red soils yielding vertebrate remains.

Finally, the deposit, especially the breccia b1, is pierced by an another belt of *Lithodomus* holes developed until 8-9 m a.s.l.

In the present work, two aspects will be focused: the first one concerns the chronostratigraphical relationships among the continental sediment, the marine-biocalcarenite and the different shorelines, testified by the *Lithodomus* holes; the second one concerns the comparative analysis between the



Text-fig. 1 - Anterior view of Grotta Lina, Marina di Maratea (Potenza, Southern Italy).

faunal remains found in the cave and those from the most important neighbouring sites. This analysis will allow to hypothesize palaeoecological reconstructions.

THE FAUNA REMAINS

Ursidae Gray, 1825

Ursus Linnaeus, 1758

Ursus arctos Linnaeus, 1758

Two metatarsals (fourth and fifth), one scapular and one first fragmentary phalanx (Text-fig. 3) are referred to this species.

According to Torres (1988), the fourth metatar-

sal, in *norma lateralis*, shows a remarkable bending from the diaphysis to the distal epiphysis; in *norma verticalis*, the proximal articular surface is flat with a subtriangular border; in *norma medialis*, there are three very distinct articular facets.

The fifth metatarsal, in *norma caudalis*, has a low proximal articular surface; in *norma medialis*, the distal epiphysis shows a tuberosity which is typical of the brown-bear; the proximal articular surface with the fourth metatarsal is joined.

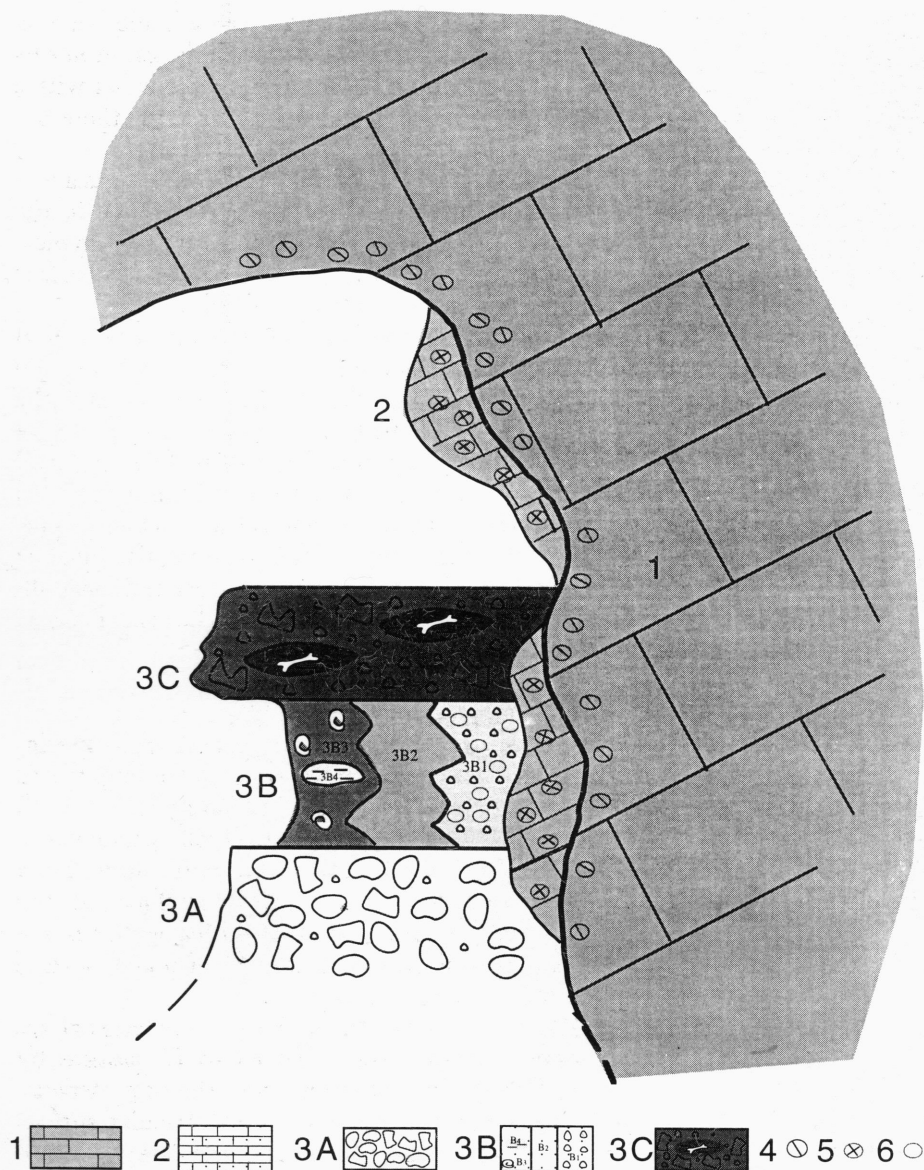
The relationships between the distal transversal diameter and the length of the fourth metatarsal, and between the medium transversal diameter and the same length of the fifth metatarsal well fit perfectly in the range of Pleistocene *Ursus arctos* (Torres, 1988) and they denote extremely thin and more extended metapodials. In *norma verticalis*, the articular surface of the scapular shows a subquadrangular outline; in *norma ventralis*, the articular surface is divided into three portions and the border of the central *doccia* is typically V shaped.

Ursus spelaeus Rosenmueller, 1794

All the metapodials referable to this species (Text-fig. 3) show proportions between lengths and different diameters which are comparable with biometrical data given by Torres (1988); particularly, the fourth metatarsal, in *norma lateralis*, shows a not bending outline; the articular surface of the proximal epiphysis is joined; in *norma verticalis*, the same metatarsal shows a convex articular surface with subrectangular border.

Also the proportion of the first metacarpal are comparable with those referred to *U. spelaeus* by Torres (1988). On the other hand, the first metacarpal is characterized by a proximal articular surface laterally lengthened; the medial and lateral profile show a bending which is peculiar of this species.

The relationships among lengths and diameters of two radii-ulna are comparable with the values given by Torres (1988). Some other morphological features can be considered: the ellipsoidal outline of the proximal articular surface, very developed subarticular tuberosities of the proximal epiphysis and straight diaphysis.



Text-fig. 2 - Stratigraphy of Grotta Lina, Marina di Maratea (Potenza, Southern Italy);

1) stromatolitic dolomite bedrock with *Lithodomus* holes;

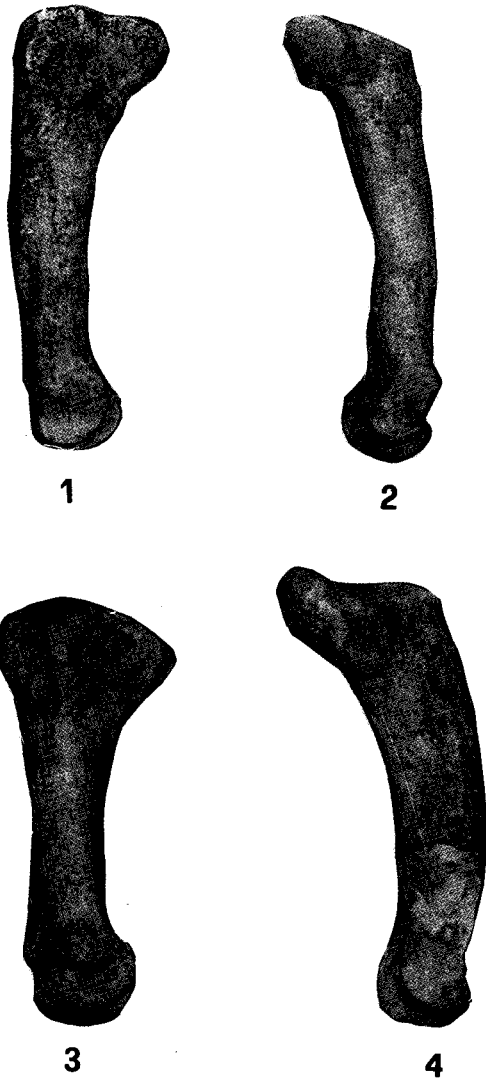
2) biocalcarenite with *Lithodomus* holes, *Cladocora coespitosa*, *Spondylus gaederopus* and Algae;

3) a, dolomite blocks; b, continental debris (b1: micro-conglomerate and sand; b2: reddened sands; b3: sandy layers thinly laminated with continental mollusks; b4: silty-sandy layers); c, breccias with vertebrate remains;

4) 1st cycle *Lithodomus* holes;

5) 2nd cycle *Lithodomus* holes;

6) 3rd cycle *Lithodomus* holes.



molars are very brachyodont; the ectoloph of the premolars, which are much less brachyodont than the molars, bend strongly towards the inner side of the tooth in mesial position.

Stephanorhinus sp.

Some fragmentary remains, of uncertain systematic significance, are ascribed to this *genus*.

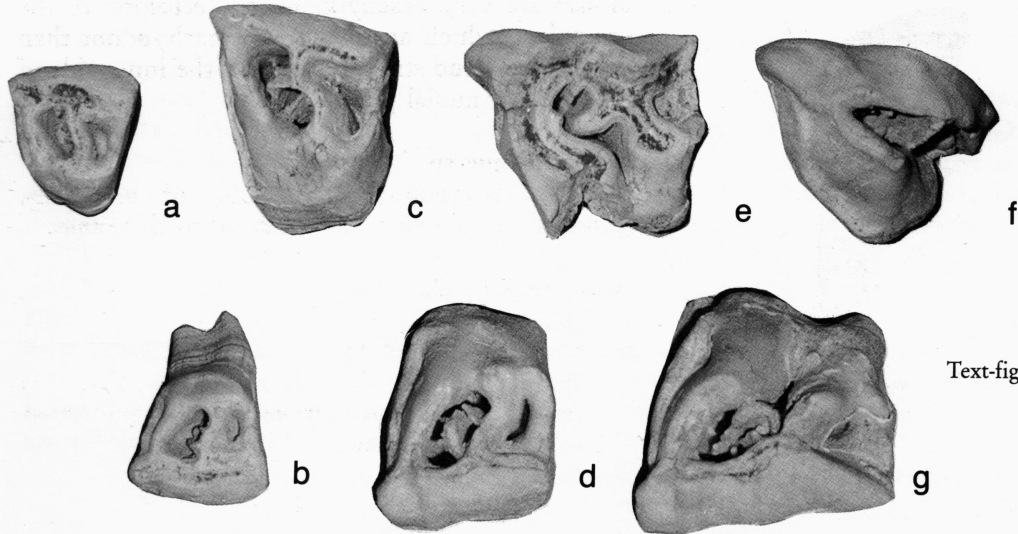
Text-fig. 3 - (above) *Ursus arctos* Linnaeus, Grotta Lina, Marina di Maratea (Potenza, Southern Italy), late Middle Pleistocene: IV (1) and V (2) metatarsal; (below) *Ursus spelaeus* Rosenmueller: IV (3) and V (4) metatarsal.

Rhinocerotidae Owen, 1875

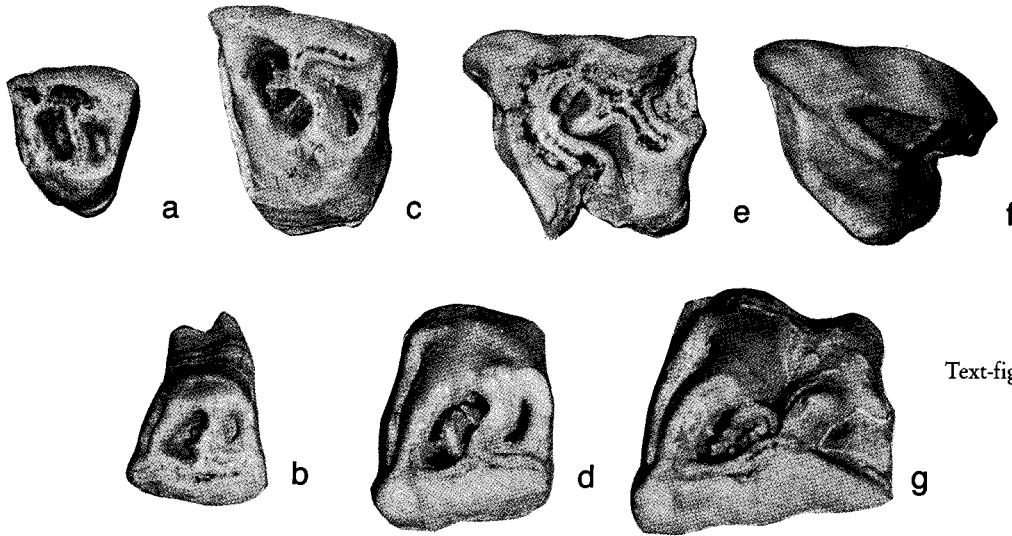
Stephanorhinus Kretzoi, 1942

Stephanorhinus cf. *kirchbergensis* (Jaeger, 1839)

Two incomplete dental upper rows (Text-fig. 5), some skull fragments and one third metacarpal, belonging to same individual, are ascribed to this species. The teeth have large size, remarkably much higher buccally than lingually, with *cingula* and with many styles in the mesial and distal valleys. The



Text-fig. 5 - *Stephanorhinus* cf. *kirchbergensis* (Jaeger), Grotta Lina, Marina di Maratea (Potenza, Southern Italy), late Middle Pleistocene: a, b, c, d) upper premolars and e, f, g) molars, occlusal view.



Text-fig. 5 - *Stephanorbinus cf. kirchbergensis* (Jaeger), Grotta Lina, Marina di Maratea (Potenza, Southern Italy), late Middle Pleistocene: a, b, c, d) upper premolars and e, f, g) molars, occlusal view.

DISCUSSION

The faunal association referred, does not contain any element with an high biochronological significance: in fact, these elements are diffused in a long time span from the late Middle Pleistocene (isothopic stage 9) to Late Pleistocene (isothopic stage 3/2). It stands to reason, in order to obtain more chronological information, to analyze the stratigraphical relationships between the continental deposit and the lower biocalcarenite.

It seems evident that the biocalcarenitic layers with *Cladocora* and *Spondylus* are the same recognized by Carobene & Dai Pra (1991) a little towards south at Marina di Maratea Nord (Potenza, Southern Italy) at 10.50 m a.s.l. and at Marina di Maratea Sud at 9.30 m a.s.l. and dated at about 0.208 My.

Moreover, at Marina di Maratea Nord the same Authors recognize at 4.50-5.50 m a.s.l. some breakers furrows, small caves, *Lithodomus* holes and narrow abrasion platforms whose stratigraphic correlation is not reported; these features however should represent the shoreline Z1, correlated with the stage 5a/5c.

At Marina di Maratea Sud, on the other hand, the biocalcarenite is cut by an abrasion platform at 9.30 m a.s.l., which appears covered by a silty-sandy deposit with numerous fossil remains; the *Astraliium* and *Spondylus* fillings of some small caves can be associated with this deposit.

The absolute age obtained by molluscs have

given a correlation with the aminozone E and it can be referred to the isothopic stage 5e (= Tyrrhenian or late interglacial stage).

The whole data allows therefore to correlate the *Cladocora* layer of the Grotta Lina (Marina di Maratea) with the isothopic stage 7, the subsequent continental deposit is strictly correlated with stage 6, as it was deposited during a regression later than the stage 7 and as the *Lithodomus* holes band at 8/9 m a.s.l. piercing it, correspond to a Tyrrhenian shoreline (= stage 5e).

Actually, if the correlation seems to be convincing, some attention on the Carobene & Dai Pra (1991) study must be done. The opinion of the mentioned Authors is that along the Tyrrhenian coast considered, the biocalcarene layers with *Cladocora* form only two shorelines (Y and Y1), the first one at 14-19 m a.s.l. and the second one at 12 m a.s.l., defining all higher deposits, 55 m (terrace W) and 20-25 m a.s.l. (terrace X), as marine «Pre-*Cladocora*» levels.

However, the presence of biocalcarene with *Cladocora* in the Grotta Lina at 35 m a.s.l., that is a protected cave from every possible later erosion, invalidates this reconstruction.

Besides, already Carboni *et al.* (1992) suggested the possibility of a correspondance of the deposit with a 30 m a.s.l. higher shoreline, for a biocalcarene with *Cladocora* emerging at 8-10 m a.s.l. in the area of Praia a Mare (Potenza, Southern Italy) because of considerations about the ecology of *Cladocora coespitosa*. This hypothesis have been rejected by Carobene & Dai Pra (1991), because of morphological considerations; besides the same Authors (1990) had already defined «unreliable» without any scientific discussion the work of Carboni *et al.* (1992).

On the basis of what above mentioned, after the attribution of continental layers with vertebrate remains to a regression later than the stage 7, also pierced by *Lithodomus* holes of Tyrrhenian age and therefore correlable with the stage 6, it is possible to correlate this bed with other late Middle and Late Pleistocene sites of South-Western Italy.

Among these localities, the oldest appear to be Cala d'Arconte, Capogrosso and Calabianca, near Marina di Camerota (Salerno, Southern Italy) (stage 10 with middle Acheulean industry: Gambassini, 1984), Santo Stefano (Praia a Mare, Cosenza, Southern Italy) situated at 70-130 m a.s.l., possibly correlated with the stage 8 (Caloi & Palombo, 1989) and coeval with the site of Rosaneto (same locality) (Biddittu *et al.*, 1984), where many advanced Acheulean tools have been found.

Most of the other localities in this area can be

referred to the Late Pleistocene: Grotta del Poggio near Marina di Camerota (Salerno, Southern Italy) (stage 4/5a) (Palma di Cesnola, 1975; Bartolomei *et al.*, 1976; Sala, 1979), Grotta Tina near Marina di Camerota (layer R, stage 4/3) (Martini *et al.*, 1972; Bartolomei *et al.*, 1976), Grotta di Castel Civita (Salerno, Southern Italy) (stage 3, Cioni *et al.*, 1979), Grotta della Cala near Marina di Camerota (stage 3, Palma di Cesnola, 1971; Bartolomei *et al.*, 1976), Cala delle Ossa (Salerno, Southern Italy) (stage 3/2, Mirigliano, 1946) and lastly Grotta della Madonna near Praia a Mare (Cosenza, Southern Italy) with Holocene fauna.

After the ones with Acheulean industry (Marina di Camerota, Rosaneto and Santo Stefano), Grotta Lina is the oldest site of the area.

CONCLUSIVE NOTES

The faunal remains from Grotta Lina, which can be correlated with the stage 6, belong to the Vitinia Faunal Unit (Roma) of Aurelian Mammal Age (Working Group AIQUA Berlin, 1995) the presence of *Microtus* gr. *arvalis-agrestis*, *Capra ibex*, rhino and large sized deer, confirm a palaeoenvironment with grassland, wide opened spaces particularly abrupt areas in a temperate climate with cold peaks.

OBSERVED MATERIAL (measurement in mm)

Stephanorbinus cf. *kirchbergensis* (Jaeger, 1839)

GL 205/1	P ²	(bl 38, ll 25, mw 41, dw 39) P ²
GL 205/2	P ³	(bl 46, ll 39, mw 61, dw 59) P ³
GL 205/3	P ⁴	(bl 46, ll 38, mw 62, dw 57) P ⁴
GL 205/4	M ¹	(bl 59, ll 43, mw 61, dw 62) M ¹
GL 205/5	M ²	(bl 69, ll 52, mw 70, dw 58) M ²
GL 205/6	M ³	(bl 67, ll 64, mw 55) M ³
GL 205/7	P ²	(bl 38, ll 25, mw 41, dw 39) P ²
GL 205/8	P ³	(bl 46, ll 39, mw 61, dw 59) P ³
GL 205/9	P ⁴	(bl 46, ll 38, mw 62, dw 57) P ⁴
GL 205/10	M ¹	(bl 59, ll 43, mw 61, dw 62) M ¹
GL 205/11	M ²	(bl 69, ll 52, mw 70, dw 58) M ²
GL 206	third metacarpus proximal epiphysis	(appd 51, tpd 60, apdsh 22, tdsh 54)
GL 217/1	skull fragment	
GL 217/2	skull fragment	
GL 217/3	skull fragment	
GL 217/4	skull fragment	
GL 217/5	skull fragment	
GL 217/6	skull fragment	
GL 217/7	skull fragment	
GL 217/8	skull fragment	
GL 217/9	skull fragment	
GL 217/10	skull fragment	
GL 217/11	skull fragment	

Stephanorbinus sp.

GL 207	anterior medial third phalanx	
GL 208	anterior lateral third phalanx	
GL 209	pisiform	(l 62.5, gh 37, ha 33)
GL 210	third cuneiform	(appd 40, tpd 47, apdd 39.2, tdd 47.5, gh 23.5)
GL 211	anterior first phalanx	
GL 212	medial first phalanx	

- GL 213 medial first phalanx
fragment
GL 214 anterior first phalanx
GL 215 femur fragment
GL 216 second metacarpus
distal epiphysis

LEGENDA

l	length
tpd	trasversal proximal diameter
appd	antero-posterior proximal diameter
tmd	trasversal medial diameter
tdd	trasversal distal diameter
apdd	antero-posterior distal diameter
lh	lateral height
mh	medial height
apld	antero-posterior lateral diameter
apmd	antero-posterior medial diameter
Mapd	maximum anterior-posterior diameter
atd	articular trasversal diameter
tds	trasversal diameter at the sustentaculum tali
apdt	antero-posterior diameter of the tuberosity summit
tdt	trasversal diameter of the tuberosity summit
lcf	length of the caput femuris
w	width
bl	buccal length
ll	lingual length
mw	mesial width
dw	distal width
apdsh	antero-posterior diameter of the shaft
tdsh	trasversal diameter of the shaft
gh	greatest length
ha	height articular surface

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