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The Middle Pleistocene rhinoceros remains from Cesi (Colfiorito Basin, Macerata, Central Italy)

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ABSTRACT – *Rhinoceros remains from Cesi (Colfiorito Basin, Umbro-Marchean Apennines) are analyzed. On the basis of the results of detailed morphological and morphometrical analyses, the specimens are referred to a large-sized representative of Stephanorhinus hundsheimensis (Toula, 1902).*

RIASSUNTO – [Resti di rinoceronti medio-pleistocenici da Cesi (bacino di Colfiorito, Macerata, Italia centrale)] – *Vengono qui esaminati i resti di rinoceronte provenienti da Cesi (bacino di Colfiorito, Appennino Umbro-Marchigiano). Sulla base di dettagliate analisi morfologiche e morfometriche e di accurati confronti, gli esemplari sono attribuiti ad un rappresentante di grande taglia di Stephanorhinus hundsheimensis (Toula, 1902).*

L'esemplare di Cesi contribuisce sensibilmente alla conoscenza di questo particolare rinoceronte del Pleistocene medio europeo, noto in letteratura con diversi nomi, quali, ad esempio, Rhinoceros etruscus heidelbergensis, Dicerorhinus etruscus brachycephalus, D. hemitoechus intermedius.

Sulla base delle sue caratteristiche dentarie e scheletriche e delle associazioni faunistiche con le quali è generalmente rinvenuto, Stephanorhinus hundsheimensis probabilmente viveva in ambienti piuttosto aperti, quali steppe boschive o savane ed era forse un equivalente ecologico del rinoceronte nero attuale.

INTRODUCTION

In the course of 1994 University of Florence excavations near Cesi, Colfiorito Basin (Macerata), a rich collection of Middle Pleistocene mammal remains was unearthed (Ficcarelli *et al.*, in press), among which those of a rhinoceros, subject of the present note. The bones were mostly found in articulation.

DESCRIPTION OF THE MATERIAL

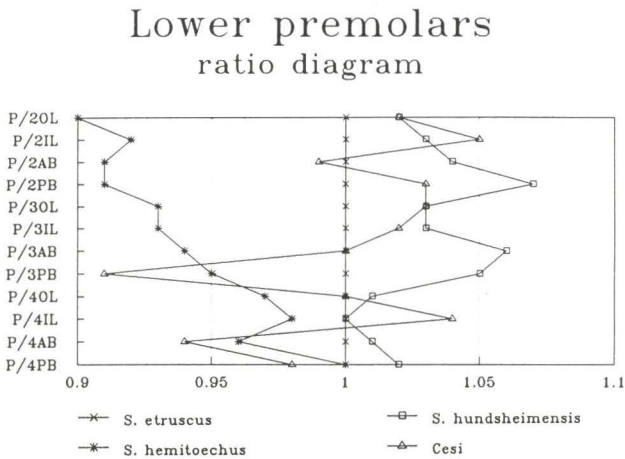
At the moment, the rhinoceros material from Cesi is represented by few badly preserved specimens of a single individual, a mandible, a right second metacarpal bone, a right femur and a right tibia. The bones were mostly found in articulation. All the specimens appear extensively covered by iron and manganese crusts.

The mandible (Tab. 2; pl. 1, fig. 1) is fractured at the symphysis. The left hemimandible is more complete than the right one. Both lack most of the incisive portion. The coronoid process and the condyle of the right hemimandible are not preserved, while only the coronoid process is missing on the left hemimandible. Both hemimandibles consist in a mosaic of fragments, identified by longitudinal, transversal and oblique fractures. The horizontal rami

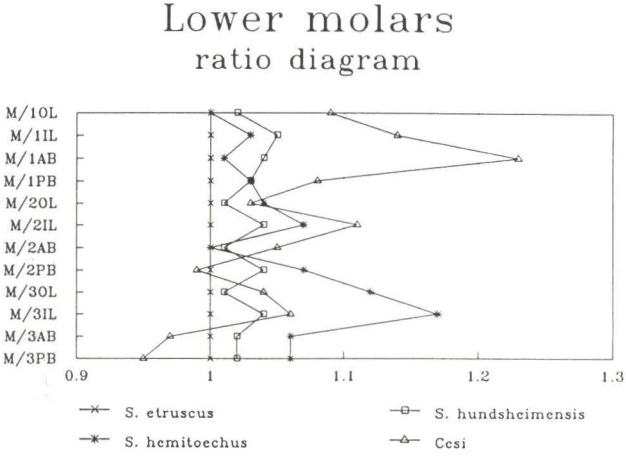
are slender and have a fairly constant height along their length. The ascending rami are considerably

Lower cheek teeth	
LPM	243.9
LP	100.8
LM	143.4
P/2OL	30
P/2IL	28.8
P/2AB	17.1
P/2PB	20.4
P/3OL	35.8
P/3IL	33.7
P/3AB	22.9
P/3PB	23
P/4OL	37.9
P/4IL	37.9
P/4AB	24.8
P/4PB	27.8
M/1OL	46
M/1IL	45
M/1AB	35
M/1PB	32
M/2OL	45.8
M/2IL	48.2
M/2AB	31.8
M/2PB	28.9
M/3OL	45.9
M/3IL	48
M/3AB	28.2
M/3PB	26.6

Tab. 1 - Measurements of the cheek teeth.



Text-fig. 1 - Ratio diagram of the lower premolars. Reference: *Stephanorhinus etruscus*.



Text-fig. 2 - Ratio diagram of the lower molars. Reference: *Stephanorhinus etruscus*.

salient and gently inclined backwards. The cheek tooththrow preserved on the left hemimandible is complete, including P₂, P₃, P₄, M₁, M₂ and M₃, while the right hemimandible still preserves P₄, M₁, M₂ and M₃. The teeth are brachyodont and considerably worn. There is a fairly sharp dimensional increase passing from the premolars to the molars (Tab. 1; text-figs. 1, 2). The rear valley of M₂ is V-shaped, while both the mesial and distal valleys of M₃ are U-shaped. The enamel is fairly rough and traces of thin cement can be observed on the molars. No lingual or buccal cingula occur; all the teeth bear only weak mesial and distal cingula. Only few parts of the left hemimandible could be measured (Tab. 2). Longitudinal fissures and the fibrous texture of the bone due to fairly long exposure can be observed on both specimens (Behrensmeyer's, 1978, weathering stage 3). Teeth are fractured by vertical cracks and fissures. The mandible from Cesi resembles those of *S. etruscus* and *S. hundsheimensis* more closely than it does those of *S. hemitoechus*, which are generally more massive and have horizontal rami which increase progressively in height in aboral direction. The ratio diagrams shown in Text-figs. 1 and 2 illustrate the comparison of the cheek teeth of the rhinoceros from Cesi with those of *S. etruscus* (used as reference), *S. hundsheimensis* and *S. hemitoechus*.

Mandible	
HP4	83.8
HM3	96.1
Hvcn	258
Lcm	221
α	105°

Tab. 2 - Measurements of the mandible.

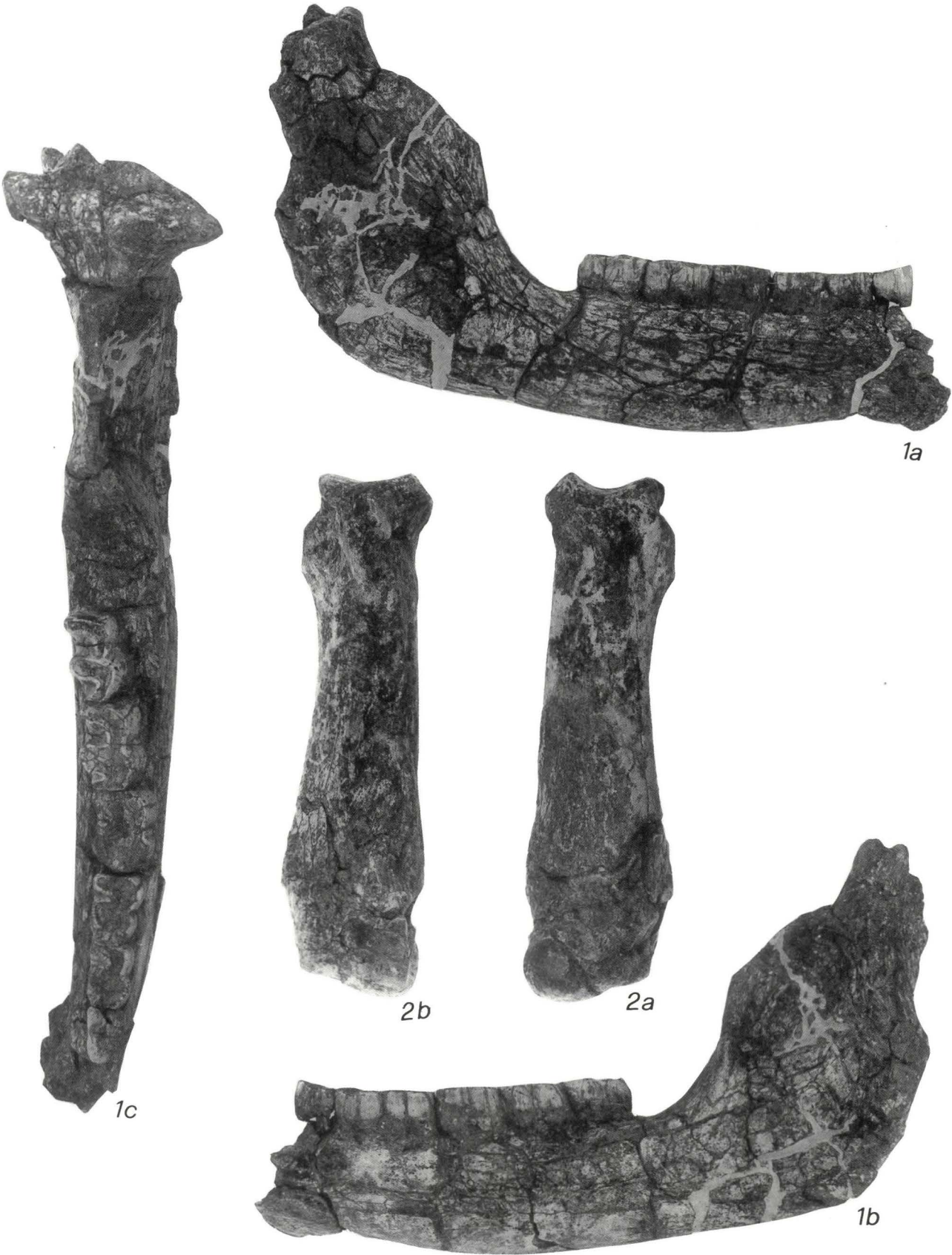
These diagrams clearly show that the cheek teeth of the specimen from Cesi are unusually narrow, more than they are in *S. etruscus* and *S. hundsheimensis* and sometimes even more than in *S. hemitoechus*. Furthermore, the rhinoceros from Cesi is shown to have a particularly large first lower molar (Text-fig. 2).

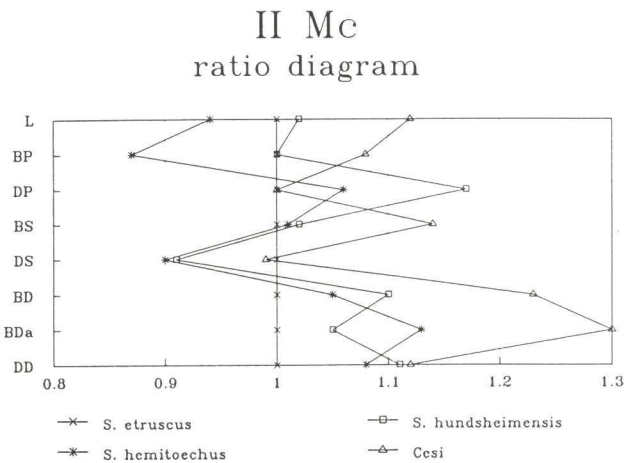
Second metacarpal bone	
L	189.9
BP	47.2
DP	37.1
BS	38
DS	23.5
BD	48.6
DD	41.4
BDa	41.6

Tab. 3 - Measurements of the second metacarpal bone.

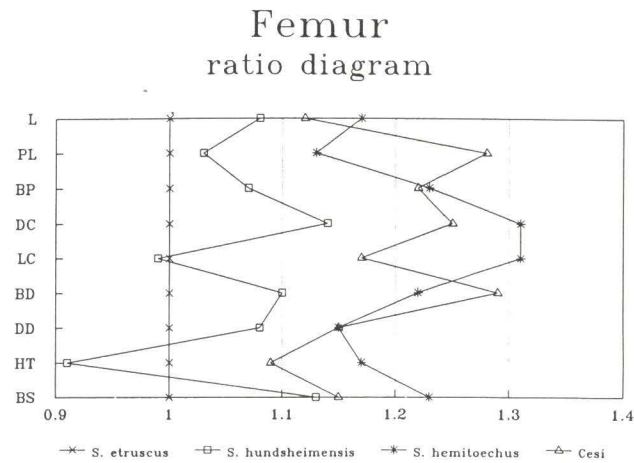
EXPLANATION OF PLATE 1

- Fig. 1 - *Stephanorhinus hundsheimensis*. Fragmental left hemimandible, uncatalogued.
1a) lingual view; 1b lateral view; 1c) occlusal view. All figures about 1/4 nat. size.
Fig. 2 - *Stephanorhinus hundsheimensis*. Right second metacarpal bone, uncatalogued.
2) dorsal view; 2b) palmar view. All figures about 1/2 nat. size.





Text-fig. 3 - Ratio diagram of the second metacarpal bone. Reference: *Stephanorhinus etruscus*.



Text-fig. 4 - Ratio diagram of the femur. Reference: *Stephanorhinus etruscus*.

The right second metacarpal bone (Tab. 3; pl. 1, fig. 2) is well preserved and slender. As compared with the second metacarpal bones of *Stephanorhinus etruscus*, the specimen from Cesi is proportionally more elongate, has a straighter and flatter diaphysis and a broader and thicker distal epiphysis. The specimen bears evidence of slight exposure (Behren-

smeier's, 1978, weathering stages 1 or 2) represented by several longitudinal fissures. The ratio diagram (Text-fig. 3) shows that the specimen is somewhat more elongate and has a comparatively more dorsopalmarly compressed proximal epiphysis than *S. hundsheimensis* and *S. hemitoechus*. The rest of the bone shows the same proportions of the second metacarpals of *S. hemitoechus*, although it is quite larger-sized.

Femur	
L	477
PL	573
BP	194
DC	88
LC	88
BSoT	94.2
DSoT	44
HT	66
DT	47
BS	69.8
DS	52
BD	153.9
Lltr	89
Lmtr	107
DDl	134.2
DDm	151.3
Ltrr	60
Btr	90
Bcon	144.4

Tab. 4 - Measurements of the femur.

The femur (Tab. 4; pl. 2, fig. 2) is thoroughly dissected by deep transversal and longitudinal cracks, mostly, or entirely, due to the load of sediments. Only few slabs of the original outer bone surface are preserved (Behrensmeyer's, 1978, weathering stage 4). The bone is massive, with a very broad, roundish head, a short, sturdy neck, a prominent greater trochanter and a well developed lesser trochanter. The difference in height between the caput and the greater trochanter is enhanced with respect to the femurs of *S. etruscus*. The third trochanter is powerful; it was found near the bone, detached from its base, but could not be remounted since part of the base is not preserved. The third trochanter is placed more distally than it is in the femurs of *S. etruscus*. The distal epiphysis is massive, more than in *S. etruscus*. The distal condyles are more robust than in *S. etruscus*, and the intercon-

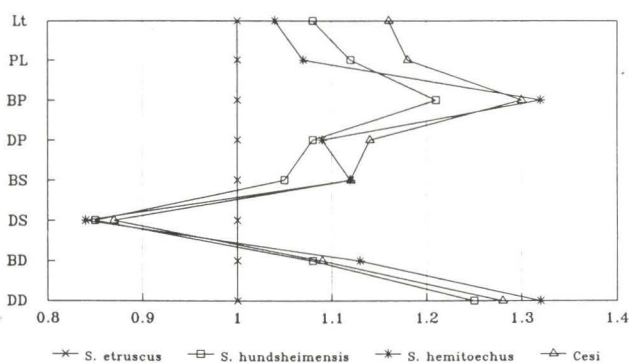
EXPLANATION OF PLATE 2

- Fig. 1 *Stephanorhinus hundsheimensis*. Right femur, uncatalogued.
1a) cranial view; 1b) caudal view; 1c) distal view. Figures 1a, b about 1/4 nat. size; figure 1c about 1/2 nat. size.
Fig. 2 *Stephanorhinus hundsheimensis*. Right tibia, uncatalogued.
2) dorsal view; 2b) plantar view; 2c) proximal view; 2d) distal view. Figures 2a, b about 1/4 nat. size; figures 2c, d about 1/2 nat. size.



dyloid fossa is quite more open. The femur is a highly diagnostic bone for recognizing Pleistocene European representatives. The ratio diagram illustrated in text-fig. 4 shows that the femur has approximately the same proportions of the femurs of *S. hundsheimensis*, the only significant difference being the stronger difference in height of the Caput with respect to the greater trochanter. The femurs of *S. hemitoechus* are shown to be quite shorter and more massive than those of the other rhinoceroses considered here.

Tibia ratio diagram



Text-fig. 5 - Ratio diagram of the tibia. Reference: *Stephanorhinus etruscus*.

The right tibia (Tab. 5; pl. 2, fig. 3) is complete, but it is dissected by a considerable number of fractures, likely due to the load of sediments. As compared with the *S. etruscus* tibiae from Upper Valdarno, the bone is more elongate, the epiphyses are broader and the diaphysis is flatter dorso-plantarly. The bone is in a fairly advanced phase of weathering (Behrensmeyer's, 1978, weathering stage 3). The ratio diagram (Text-fig. 5) shows a remarkable coincidence between the tibia from Cesi and the average of the tibiae of *S. hundsheimensis*. *S. hemitoechus*, on

the other hand, has short and massive tibiae, with broad, expanded epiphyses.

CONCLUSIONS

On the basis of the analytical results reported above, the rhinoceros from Cesi is referable to one of the largest-sized representatives of *S. hundsheimensis* Toulou. The slight disproportions which distinguish it from other representatives of the species may thus be interpreted as allometric differences. The find from Cesi is very significant in that it contributes substantial new knowledge on this peculiar rhinoceros of the Pleistocene of Europe.

Stephanorhinus hundsheimensis is the typical Middle Pleistocene rhinoceros indicated in the past literature with several names, such as the massive or large-sized etruscan rhinoceros, *Rhinoceros etruscus heidelbergensis* (Freudenberg, 1914), *Dicerorhinus etruscus brachycephalus* (Guérin, 1980), *D. hemitoechus intermedius* (Cigala-Fulgosi, 1976) or simply *D. etruscus* (H.D. Kahlke, 1965, 1969). The most ancient representatives of this species, such as those from Pietrafitta, characterize late Villafranchian communities; the species therefore made its appearance in the course of the Early Pleistocene. *S. hundsheimensis* shares a number of dental and postcranial features with *S. etruscus*, which attests to a possible descent from the latter species. Nevertheless, the true ascendance of the species is still unresolved. *S. hundsheimensis* was larger-sized and more massively built than *S. etruscus*, but had cursorially structured limbs. It apparently disappeared during the Middle Pleistocene, since the last ascertained occurrence of *S. hundsheimensis* is from Mosbach-2 (*sensu* Koenigswald & Tobien, 1987) (Fortelius *et al.*, 1993).

Judging by its dental and skeletal characteristics and by the faunal contexts in which its remains are commonly found, *Stephanorhinus hundsheimensis* probably inhabited fairly open territories (Mazza, 1993) such as wooded steppes or savannahs; it may have been an ecological equivalent of the living black rhinoceros, *Diceros bicornis*.

Tibia	
Lt	403
PL	353
BP	125.6?
DP	124.9
BS	58.2
DS	53
BD	97
DD	70.8

Tab. 5 - Measurements of the tibia.

LEGEND OF THE RATIO DIAGRAMS

LOWER CHEEK TEETH

- P/3OL - outer length of the third lower premolar
- P/3IL - inner length of the third lower premolar
- P/3AB - anterior breadth of the third lower premolar
- P/3PB - posterior breadth of the third lower premolar
- P/4OL - outer length of the fourth lower premolar
- P/4IL - inner length of the fourth lower premolar

P/4AB	- anterior breadth of the fourth lower premolar
P/4PB	- posterior breadth of the fourth lower premolar
M/1OL	- outer length of the first lower molar
M/1IL	- inner length of the first lower molar
M/1AB	- anterior breadth of the first lower molar
M/1PB	- posterior breadth of the first lower molar
M/2OL	- outer length of the second lower molar
M/2IL	- inner length of the second lower molar
M/2AB	- anterior breadth of the second lower molar
M/2PB	- posterior breadth of the second lower molar
M/3OL	- outer length of the third lower molar
M/3IL	- inner length of the third lower molar
M/3AB	- anterior breadth of the third lower molar
M/3PB	- posterior breadth of the third lower molar

MANDIBLE

HP4	- height of the horizontal ramus between P ₄ and M ₁
HM3	- height of the horizontal ramus behind M ₃
Hvcn	- gonion ventrale-condyle height
Lcm	- length from the gonion caudale to the aboral border of the alveolus of M ₃
α	- angle between horizontal and ascending ramus

METACARPAL BONE

L	- greatest length
BP	- proximal breadth
DP	- proximal depth
BS	- breadth of the shaft
DS	- depth of the shaft
BD	- distal breadth
DD	- distal depth
BDA	- breadth of the distal articular surface

FEMUR

L	- lateral length
PL	- physiologic length
BP	- proximal breadth
DC	- depth of the caput femoris
LC	- length of the caput femoris
BSoT	- breadth of the shaft over the third trochanter
DSOT	- depth of the shaft over the third trochanter
HT	- height of the third trochanter
DT	- depth of the shaft at the third trochanter
BS	- smallest breadth of the shaft
DS	- smallest depth of the shaft
BD	- distal breadth
Lltr	- length of the lateral lip of the trochlea
Lmtr	- length of the medial lip of the trochlea
DDI	- greatest depth of the lateral portion of the distal epiphysis
DDm	- greatest depth of the medial portion of the distal epiphysis
Lttr	- length of the trochlear trough
Btr	- breadth of the trochlea
Bcon	- breadth across the condyles

TIBIA

Lt	- greatest length
PL	- physiologic length

BP	- proximal breadth
DP	- proximal depth
BS	- breadth of the shaft
DS	- depth of the shaft
BD	- distal breadth
DD	- distal depth

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