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Bears (Ursidae) from the Late Cenozoic of Nebraska





Frontispiece—Photograph showing Allen Graffham and Alex Keith (left to right) at U.N.S.M. Coll. Loc. Ft-40, Frontier County, Nebraska. Mr. Keith discovered the Kimballian fossil locality in 1927 when he uncovered the holotype of *Amebelodon fricki* Barbour, a shovel-tusked mastodont, at approximately the spot where the two men are standing. Mr. Graffham was the field leader in 1947, when the following holotypes were discovered: *Indarctos keithi* Schultz and Martin, new species; *Prosthennops (Macrogens) graffhami* Schultz and Martin (described in Pt. 3 of this Bulletin); *Teleoceras schultzi* Tanner (described in Pt. 2 of this Bulletin); *Aphelops kimballensis* Tanner; *?Tapirus simpsoni* Schultz, Martin, and Corner (described in Pt. 1 of this Bulletin); *Barbourofelis fricki* Schultz, Schultz, and Martin; and *Proagriocharis kimballensis* Martin and Tate. Photograph by Schultz, 1947.

C. Bertrand Schultz

Larry D. Martin

CENOZOIC MAMMALS FROM THE CENTRAL GREAT PLAINS

Part 4

Bears (Ursidae) from the
Late Cenozoic of Nebraska

ABSTRACT

Part 4. Bears (Ursidae) from the Late Cenozoic of Nebraska

C. Bertrand Schultz Larry D. Martin

A ramus and partial premaxilla establish the presence of a new subspecies of *Indarctos* in the upper Pliocene (Kimball Formation, Ogallala Group) of Frontier County, Nebraska. An extremely large species of *Agriotherium* is represented by fragmentary remains from the middle Pliocene (middle part of Ash Hollow Formation, Ogallala Group) of Sherman County, Nebraska.

CONTRIBUTION OF The Department of Geology, College of Arts and Sciences, and the Division of Vertebrate Paleontology of the Museum.

Bears (Ursidae)

from the Late Cenozoic of Nebraska

INTRODUCTION

This study is part of a series of papers dealing primarily with the fauna of the Kimball formation in Nebraska (Barbour 1927, 1929; Barbour and Schultz, 1941; Schultz and Stout, 1948, 1961; Kent 1963, 1967; Tanner, 1967; Short, 1969; Martin and Tate, 1970; Schultz, Schultz, and Martin, 1970). The Kimballian fauna from Nebraska differs from the Hemphillian fauna in that most of the known forms are markedly more advanced, but definitely pre-Blancan (Early Pleistocene).

A large bear, *Indarctos oregonensis keithi*, new subspecies, from U.N.S.M. Coll. Loc. Ft-40 is included in the Kimballian fauna from Nebraska. An edentulous ramus and a radius of *Agriotherium* brought in by Frank Garvel of Ashton, Nebraska, from near U.N.S.M. Coll. Loc. Sm-101 in Sherman County, Nebraska, is also reported. This latter locality is Hemphillian in age (Ash Hollow Formation) and has produced *Machairodus* as well as some rhinoceros material (personal communication from Lloyd Tanner).

SYSTEMATIC DESCRIPTIONS

Class: MAMMALIA
 Order: CARNIVORA
 Family: URSIDAE

Indarctos oregonensis keithi, new subspecies

Holotype.—Left ramus with I₁-I₃ alv., /C, P₁, P₂-P₃ alv., P₄-M₂, M₃ (alv.), U.N.S.M. 76009 (Figs. 1-2).

Referred Specimen from the Type Locality.—Left premaxilla with I¹-I³ alv., C/, U.N.S.M. 76010 (Fig. 2) This specimen appears to be from the same individual as the holotype, and therefore should be considered to be part of the holotype.

Type Locality.—U.N.S.M. Coll. Loc. Ft-40 (= "Amebelodon fricki Quarry"), E. ½, SW. ¼, SE. ¼, sec. 15, T. 5N., R. 26W., 8 miles North and 5 miles West of Cambridge, Frontier County, Nebraska.

Stratigraphic Occurrence.—Upper Pliocene (Kimballian),³ Ogallala Group, Kimball Formation, from channel deposits which rest on the upper part of the Ash Hollow Formation.

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³In the present paper "Pliocene" includes the Valentinian, Clarendonian, Hemphillian, and Kimballian Provincial ages, although the writers realize that the Kimballian may be equivalent to the latest Miocene of Europe. See Part 1, p. 2 of the present Bulletin for further remarks on this subject.

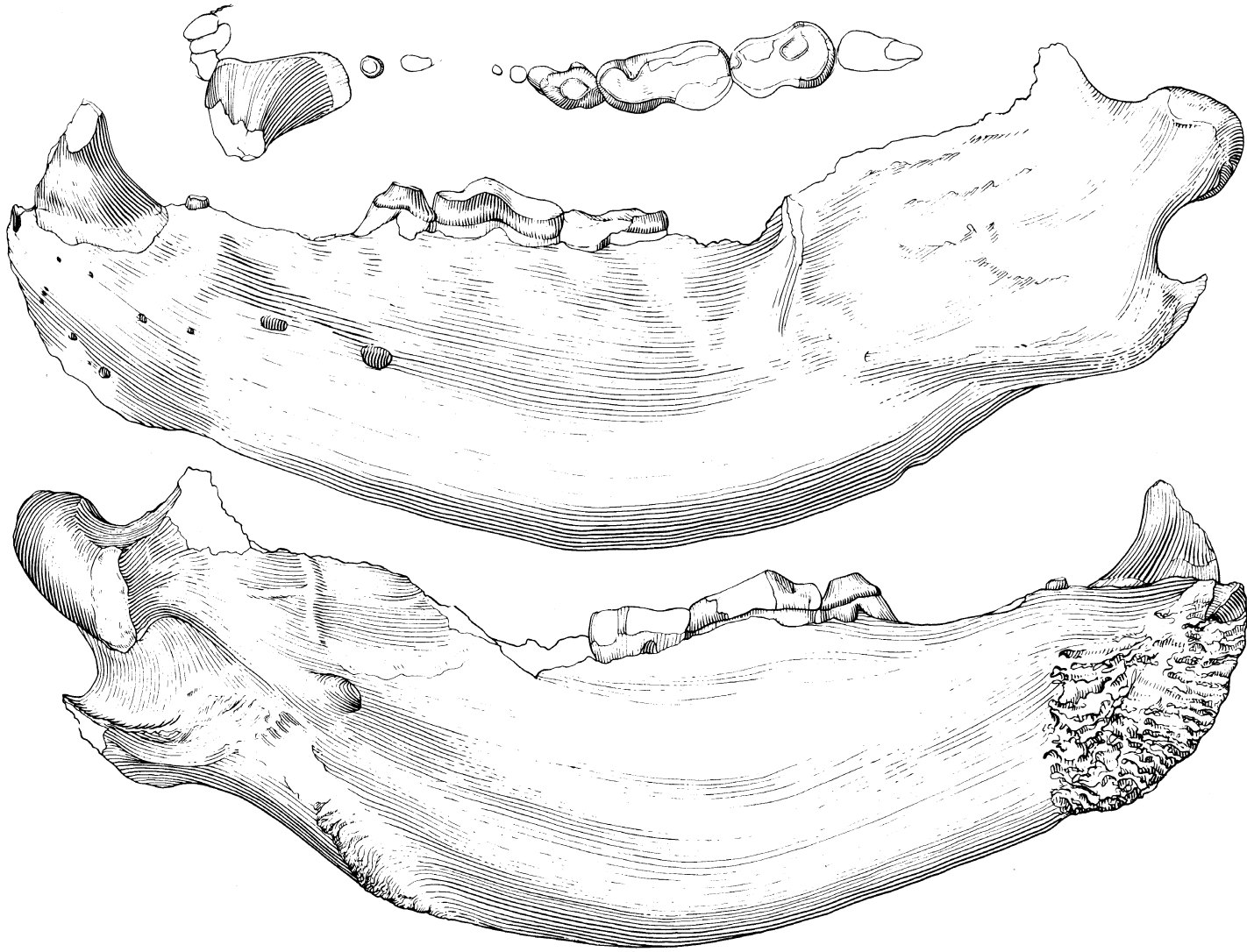


Fig. 1—*Indarctos oregonensis keithi*, new subspecies, holotype, U.N. S.M. 76009, left ramus (occlusal, labial, and lingual views), from the lower part of the Kimball Formation, Frontier County, Nebraska. X 1/2.



Fig. 2—*Indarctos oregonensis keithi*, new subspecies, referred, U.N.S.M. 76009, left canine, from same quarry as holotype. X 1/2.

Diagnosis.—Mandible very large and elongate; premasseteric fossa absent; mandibular condyle large and close to the angular process; dental formula I_{1-3} , $/C$, P_{1-4} , M_{1-3} ; incisors crowded with I_2 largest and posterior to I_1 and I_3 ; $/C$ large and robust; P_{1-2} small and single rooted; P_{3-4} double rooted; M_1 large, narrow, and elongate; trigonid of M_1 narrower than talonid; trigonid and talonid about equal on M_2 . Premaxilla massive with crowded I_{1-3} and a large robust $C/$; I^1 and I^2 approximately same size; I^3 very large.

Description.—Dentition worn; alveoli indicating small laterally flattened incisors; canine short and heavy with a wear facet on the anterolingual margin; P_1 peg-like (worn down to the root); single alveolus for P_2 ; short diastema (18.6 mm.) between P_2 and P_3 ; double alveolus for P_3 ; P_4 inclined posteriorly against M_1 ; accessory cusps on P_4 not noticeably developed; cingulum barely evident on cheek teeth; M_1 large and elongate, with trigonid narrow, talonid wide and rounded, paraconid fairly large; M_2 elongate with trigonid and talonid about equal in size; M_3 large and single rooted (based on alveolus); two large mental foramina (under diastema between P_2 and P_3 and under P_4) posterior to two small mental foramina (under $/C$); masseteric fossa large and posteriorly situated; interior of mas-

seteric fossa roughened and ridged; angular process large and continuing as a strongly rugose masseteric line under masseteric fossa; coronoid process large (upper portion broken off), and mandibular condyle enormous.

Discussion.—*Indarctos oregonensis keithi* is the first record of this genus from Nebraska. It differs from *Agriotherium* in the shape of the M_2 , as the talonid and trigonid are about equal in size. In *Agriotherium* the trigonid is usually larger than the talonid. This tooth is also more elongate than the M_2 of *Agriotherium*. The M_3 is represented by a broken alveolus which indicates that the tooth was single rooted. The shape of the ramus is different from that found in *Agriotherium* and is tapered in its forward portion, making it similar to the shape of the ramus in *Ursus*. There is no premasseteric fossa, which is often present in *Agriotherium*.

The Nebraska species of *Indarctos* resembles *I. arctoides* from the upper Pliocene of Europe, but it is much larger in size. *I. o. keithi* has marked similarities to *I. maraghanus* from the Pliocene sediments of the Maragha in Persia, differing from that species in the shape of the M_1 and having slightly smaller dentition. *Indarctos oregonensis keithi* differs from *I. nevadensis* from the Hemphillian of Nevada and from *I. atticus* from the upper Pliocene (Pontian) of the Island of Pikermi (in the Aegean Sea), both in its large size and the presence of a double-rooted P_3 (see Thenius, 1959). It might be noted here that *I. nevadensis* and *I. atticus* are very similar in most respects. It is unfortunate that the $C/$, $/C$, and M_2 's are too worn and mutilated to have much diagnostic value in the new subspecies. These teeth do agree quite closely in size and proportions with *I. oregonensis*, but the upper canine of the Nebraska specimen is definitely larger and more robust. The measurements of the left $C/$ of the holotype of *I. o. oregonensis*, U.C. 22362, are as follows: anteroposterior diameter at base of enamel, approximately 29.8 mm.; and the transverse diameter at base of enamel, 20.2 mm. (Merriam, Stock, and Moody, 1916, p. 582). The corresponding measurements of the $C/$ of *I. o. keithi* are approximately 39 mm. and 28 mm.

The specimens from the Hemphillian Coffee

Ranch Local Fauna reported by Dalquest (1969, pp. 9–10) as *Indarctos oregonensis*⁴ include a M₂ with the trigonid much wider than the talonid. The carnassial Dalquest (1969, Fig. 4) illustrates is very similar in size and configuration to the one illustrated as *Hyaenarctos*, species, by Frick (1926, Fig. 29). *Hyaenarctos* is a junior synonym of *Agriotherium*, and it is probably to the latter genus that the Coffee Ranch specimens should be referred. They would belong to one of the largest species of *Agriotherium* and are possibly conspecific with the undescribed form from near Sm-101 reported in this paper.

Agriotherium sp.

Material.—Right ramus with I₂ (alv.), I₃ (rt.), /C (rt.), P₃-P₄ alv., M₁ (rt.), M₂-M₃ alv., U.N.S.M. 76011 (Fig. 3B); and right radius, U.N.S.M. 76013 (Fig. 3A), which is probably from the same individual.

Locality.—From the same drainage as U.N.S.M. Coll. Loc. Sm-101, 7 mi. north and 1 mi. east of Ashton, Sherman County, Nebraska.

Stratigraphic Occurrence.—Middle Pliocene (?Hemphillian), Ogallala Group, Ash Hollow Formation (probably middle).

Description.—The right ramus of this large ursid has a dental formula of /I?, /C, P₃₋₄, M₁₋₃; incisors probably reduced in number with only a trace of alveolus and root for very small I₂, and no signs alveolus for I₃; I₁ moderate in size; canine very large with oval base; P₃ very small and peg-like with a single root; P₄ unusually large, double rooted and inclined posteriorly; M₁ and M₂ large; M₃ small and apparently single rooted; M₂ and M₃ placed high on ascending ramus (alveolar measurements are given for the teeth, and except for P₄, are all probably somewhat smaller than actual measurements of the teeth would have been); interalveolar border strongly roughened symphyseal surface large and squarish in outline; three prominent mental foramina present and posterior one (under P₄)

unusually large; strong rugosity for muscle attachment along inner side of ventral border of jaw; anterior portion of premasseteric fossa lies beneath M₃; right radius U.N.S.M. 26202 is large and massive; bicipital tuberosity well developed, as is styloid process—general configuration of radius very similar to *Ursus* (concavity above facet which articulates with ulna much larger, and all of ridges for muscle attachments strongly developed); about 10% larger than radius of *Arctotherium simum* from Potter Creek Cave (Merriam and Stock, 1925).

Discussion.—This material is notable for its large size, and the relative shortness of the ramus. It contrasts sharply with the elongate, more dog-like ramus of *Indarctos* (Fig. 1) in this respect. The ramus resembles most closely that of *Agriotherium schneideri* Sellards, but differs from that species in the lack of P₁, the presence of P₃, and the largeness of the ramus. *Agriotherium sivalensis* is also similar, but is not so large, and has a P₁ as well as a P₂. *Agriotherium gregoryi* was also slightly smaller. The Nebraska material probably represents an undescribed form, but no name is proposed because of the fragmentary nature of the material.

SUMMARY AND CONCLUSION

Although *Agriotherium* has been designated an index fossil for the Hemphillian age (Wood, et al, 1941, p. 12), both it and *Indarctos* are extremely rare fossil mammals. Because of this it seems worth while to report the ramus of *Agriotherium* from Sherman County, Nebraska, although it is badly damaged. It differs from other described species of *Agriotherium* in being somewhat larger and more massive. A premasseteric fossa comparable to the one in *Arctotherium* and even better developed than the premasseteric fossa of *Agriotherium gregoryi* (Frick) (Frick, 1926, Fig. 36) may have been present. *Agriotherium* and *Arctotherium* are both short-faced bears with massive limbs (Merriam and Stock, 1925). Most species of *Agriotherium* however have lost too many of the anterior premolars to be regarded as ancestral to *Arctotherium*. The development of a premasseteric fossa might be related to the development of a short and deep skull and relatively

⁴Apparently the reference of this material to *Indarctos nevadensis* in table 7 (Dalquest, 1969) is a *lapsus*, although on page 10 of the same paper he seems to suggest identity with *I. nevadensis*.

deep jaws. It is found in *Agriotherium*, *Arctodus* and *Tremarctos*. However, it is also found in the rather dog-like genus *Hemicyon*.

Both *Indarctos* and *Agriotherium* probably originated in Eurasia and migrated to North America during the Hemphillian or perhaps as early as the Clarendonian. The large Middle Miocene carnivores were primarily amphicyonids in North America. The diversity of these amphicyonids was very reduced before the appearance of these giant bears. *Indarctos* and *Agriotherium* achieved an essentially holarctic distribution during the Ogallala Pliocene, essentially similar to that of *Machairodus*.

The presence of *Indarctos* in the Kimballian of Nebraska is interesting as *I. keithi* is one of the largest and most advanced known species of the genus. *Indarctos nevadensis* Macdonald has teeth almost as large but has a much smaller ramus, and as described by Macdonald (1959, p.

879) is much closer to the Asian forms than is *I. keithi*. The exact relationship of *I. oregonensis keithi* to *I. oregonensis oregonensis* cannot be determined until additional material of both subspecies is discovered and described.

ACKNOWLEDGMENTS

The two Sherman County *Indarctos* specimens, U.N.S.M. 76011 and 76013, were collected in 1950 and donated by Mr. Frank Garvel of Ashton, Nebraska. The holotype of *Indarctos oregonensis keithi*, U.N.S.M. 76009 and 76010, were collected in 1947 by the University of Nebraska State Museum field party (see Acknowledgments in Part 1 of this Bulletin for names of the collectors). Figs. 1 and 3 were illustrated by Mrs. Mary Tanner, and Fig. 2 by Mr. Jerry Tanner. Mr. George Corner and Mrs. Mary Tanner were very helpful in the preparation of the manuscript.

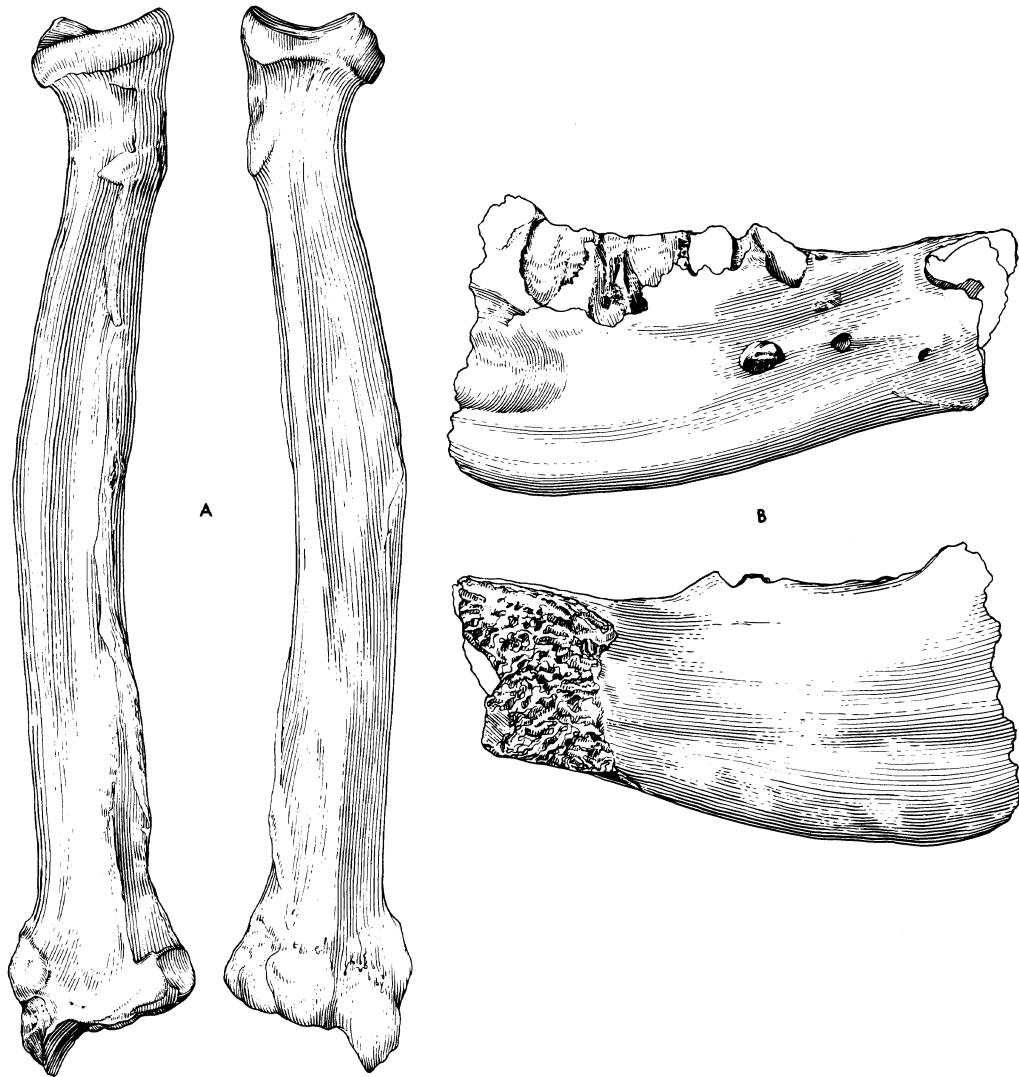


Fig. 3—*Agriotherium* sp., A, U.N.S.M. 76013, right radius (medial and lateral views), B, U.N.S.M. 76011, edentulous right ramus (labial and lingual views), from the Ash Hollow Formation (?middle), Sherman County, Nebraska. X 1/3.

TABLE 1
Indarctos
COMPARATIVE MEASUREMENTS OF MANDIBULAR RAMI

MANDIBULAR RAMI	<i>I oreogonensis keithi</i>			
	n. subsp. Holotype U.N.S.M. 76009	<i>I. nevadensis</i> (Macdonald) U.C. Mus. Pal. 38629	<i>I. arctoides</i> (Deperet) ¹	<i>I. atticus</i> (Dames) ¹
Total length of the ramus	369	(253) ²	---	(248)
Depth of ramus behind canine	70	(52)	---	---
Depth of ramus posterior to M ₁	92	(64)	49.5	61
/C anteroposterior	35	26.5	18.4	---
/C transverse	24	20.5	13.8	---
P ₁ anteroposterior	7	12.1	8.5	(7.0)
P ₁ transverse	7	7.5	6.8	(6.8)
P ₂ anteroposterior	(7.5)	11.9	9.7	(7.0)
P ₂ transverse	6	8.1	6.1	(6.4)
P ₃ anteroposterior	(11.2)	12.7	11.0	(6.8)
P ₃ transverse	6	9.1	5.5	(6.4)
P ₄ anteroposterior	19.5	23.5	15.8	21.0
P ₄ transverse	12.4	14.7	9.6	13.2
M ₁ anteroposterior	39.8	40.5	30.8	39.3
M ₁ transverse	(21)	20.6	15.8	20.4
M ₂ anteroposterior	30.4	31.4	24.1	28.7
M ₂ transverse	20.7	---	16.5	20.8
M ₃ anteroposterior	?	---	---	17.0
M ₃ transverse	?	---	---	16.4

¹Measurements from Macdonald, 1959.

²() = alveolar or approximate measurement.

TABLE 2
Agriotherium sp.
COMPARATIVE MEASUREMENTS¹ OF MANDIBULAR RAMUS AND RADIUS

MANDIBULAR RAMUS	U.N.S.M. 76011
Depth of ramus at posterior margin of the canine	69
Depth of ramus at posterior margin of M ₁	100
/C greatest anteroposterior diameter	(39) ²
/C greatest transverse diameter	(23)
P ₃ greatest anteroposterior diameter	(3.5)
P ₃ greatest transverse diameter	(4)
P ₄ greatest anteroposterior diameter	(27)
P ₄ greatest transverse diameter	(14)
M ₁ greatest anteroposterior diameter	(45)
M ₁ greatest transverse diameter	(15)
M ₂ greatest anteroposterior diameter	(36)
M ₂ greatest transverse diameter	(11)
M ₃ greatest anteroposterior diameter	(11)
RADIUS	U.N.S.M. 76013
Greatest length	421
Greatest diameter of proximal extremity	80
Width of shaft at middle	43
Thickness of shaft at middle	33
Greatest diameter of distal extremity	58

¹The measurements are taken to the nearest millimeter except on dentition where they are measured to the nearest one-tenth of a millimeter.

²() = alveolar.

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