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*Merycochoerinae*  
A New Subfamily of Oreodonts

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Article V.—MERYCOCHOERINÆ

A NEW SUBFAMILY OF OREODONTIS<sup>1</sup>

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## INTRODUCTION

The present paper deals with two closely related genera of oreodonts, *Brachycrus* Matthew (= *Pronomotherium* Douglass) and *Merycochoerus* Leidy, which are here included under the new subfamily, Merycochoerinae. The Merycoidodontidae (Thorpe, 1923) [= Oreodontidae (Leidy, 1869)] have been divided by the present writers into five or more subfamilies—the Merycochoerinae, Ticholeptinae, Promerycochoerinae, Eporeodontinae, and Leptaucheninae. Each subfamily is to be treated separately in a series of forthcoming papers,<sup>1</sup> which will be followed by a detailed summary of the phylogeny and stratigraphic distribution of the entire family.

Since 1934 the writers have been engaged in a comprehensive study of the oreodonts as part of the research program of the Frick Laboratory, American Museum of Natural History, and the University of Nebraska State Museum. The large collections of oreodont material in these institutions are being used as a basis for this work. Where previously described material has lacked sufficient stratigraphic data or was not complete enough for definite comparison, field work has been carried on in the type areas. In the case of the Merycochoerinae all of the type localities of the twelve species and three varieties have been investigated. The visits to some of these regions have yielded many choice specimens and also a quantity of much-needed geological data.

A total of nine hundred and twenty-nine numbered skulls, mandibular rami, and skeletal elements is here listed or described under *Brachycrus* and *Merycochoerus*. Forty-nine of these specimens, representing ten species and two varieties of *Brachycrus* (of which two species and two varieties are new) and two species and three<sup>2</sup> varieties of *Merycochoerus* are illustrated in detail in eighteen text-figures. In several cases type material is refigured to supplement existing illustrations. The shaded drawings are reproduced at one-half, and the outline drawings at one-third natural size.

The figures of *Brachycrus* demonstrate specific differences in size, shape, and proportions of the skulls, mandibular rami, and skeletal elements. Noteworthy are the variations in the height of the superior border of the maxillae, the inclination of the nasals, the size of the dental series, and the position of the angle of the mandible. The consistent generic characters shown are: the greatly retracted nasals, the facial cavity above the dental series, and the infraorbital foramina placed within the cavity, instead of on the side of the face as in *Merycochoerus*. Three stages of development of the *Brachycrus* skull are illustrated by one adult and two immature specimens which were found in the same quarry.

The *Merycochoerus* illustrations show specific and individual variation in the size and form of the skulls, mandibular rami, and skeletal elements. The height of the premaxillae and the position of the nasals relative to the infraorbital foramina are useful specific characters.

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<sup>1</sup> Much of the research work concerning the remaining subfamilies has been completed and manuscript partially prepared.

<sup>2</sup> Two geographic varieties are included in this count.

The writers wish to acknowledge their appreciation to: Mr. Childs Frick and Dr. Erwin H. Barbour for the privilege of carrying on the studies and for helpful suggestions in the preparation of the manuscript; Mr. Charles W. Gilmore and Dr. C. Lewis Gazin of the United States National Museum, Mr. J. LeRoy Kay of the Carnegie Museum, and Dr. Walter Granger of the American Museum of Natural History for the loan of specimens of *Brachycrus* and *Merycochoerus*; Dr. William K. Gregory of the American Museum of Natural History for a reading of the manuscript; Mr. Thompson M. Stout of the University of Nebraska for cooperation in stratigraphic studies; Mr. Ralph Mefferd of the Frick Laboratory for the illustrations, which he has carefully drawn under the supervision of Miss Hazel de Berard; Miss Jannette May Lucas of the Osborn Library for aid with references; Mr. Sydney E. Helprin of the Frick Laboratory for assisting in the editing of the manuscript; and Mrs. C. Bertrand Schultz for help in preparing the manuscript.

Thanks are also due: members of the Frick Laboratory, especially Messrs. Floyd Blair, Joseph Rooney, Charles Hoffman, and Frank Miller, for the preparation and care of the oreodont collection; and Messrs. Henry Reider, Frank Bell, and Robert Wolfe for supervising the preparation of the University of Nebraska specimens.

(1) **Merycochoerinae**, new subfamily

DESCRIPTION

Includes two genera, *Brachycrus* and *Merycochoerus*; medium to large size forms; skulls brachycephalic; cranial region foreshortened; nasals considerably retracted; tympanic bullae small; teeth large, and brachyodont to moderately hypsodont.

DISTINCTIVE CHARACTERS OF *Brachycrus* AND *Merycochoerus*

<i>Brachycrus</i> (p. 218)	<i>Merycochoerus</i> (p. 277)
Nasals light and greatly retracted.	Nasals robust and retracted.
Pronounced facial cavity.	No facial cavity.
Infraorbital foramina above region of M <sup>2</sup> .	Infraorbital foramina above region of M <sup>1</sup> .
Supraoccipital wings incorporated in fan-shaped occipital region.	Supraoccipital wings produced beyond fan-shaped occipital region.
Superior border of maxillae with gradual rise to nasals.	Superior border of maxillae with abrupt rise to nasals.
Inferior border of mandibular ramus concave, with great depth of the posterior portion.	Inferior border of mandibular ramus comparatively straight.
Dentition moderately hypsodont.	Dentition brachyodont.
Limbs comparatively light.	Limbs comparatively robust.



## I. BRACHYCRUS MATTHEW

*Merycochoerus (Brachycrus)* MATTHEW, 1901, Mem. Amer. Mus. Nat. Hist., I, Pt. 7, p. 397.  
*Pronomotherium* DOUGLASS, 1907, Ann. Carn. Mus., IV, No. 2, p. 94.

GENOTYPE.—*Brachycrus rusticus* (LEIDY).

## GENERIC CHARACTERS

SKULL.—Medium to large size; mesocephalic to brachycephalic; occiput fan-shaped; brain case moderately inflated, with a great foreshortening of the posterior portion of the skull; deep facial cavity anterior of the orbit and extending to above the median premaxillary region; nasals<sup>1</sup> greatly shortened; infra-orbital foramina above M<sup>2</sup>; premaxillæ united for a long distance and forming a spout-shaped depression which is concave transversely and convex longitudinally; posterior palate moderately extended to pterygoid region; postglenoid process compressed anteroposteriorly and extended downward as in examples of *Merycochoerus*; bullæ small and cylindrical.

MANDIBLE.—Medium to heavy; contour of inferior border descends gradually to a point below either M<sub>2</sub> or M<sub>3</sub> and then sharply downward to a maximum depth at the angle posterior to M<sub>3</sub> (tendency for inferior border outline to be concave); tendency to have a tuberosity on posterior border of symphysis.

DENTITION.<sup>2</sup>—I<sub>1</sub><sup>1</sup>—M<sub>3</sub><sup>3</sup>, P<sub>1</sub> caniniform; tendency to be hypsodont; anterior premolars slightly crowded; M<sup>3</sup> with or without split heel.

LIMBS.—Medium to heavy; great variation in length and width.

MEASUREMENTS.—Tables I and II.

## DISCUSSION

*Brachycrus rusticus* (Leidy), the genotypic species, has long been a questionable form and its affinities to the other oreodonts have not been thoroughly understood, chiefly because of the fragmentary type material and insufficient stratigraphic information. The type specimens are in the United States National Museum and were collected by Dr. F. V. Hayden in the Sweetwater River area near Devil's Gate, Wyoming. These remains, although incomplete, can readily be referred to the same genus as the Carnegie Museum material from Montana upon which Douglass<sup>3</sup> based his description of *Pronomotherium laticeps*. In order to obtain more complete specimens of "*M.*" *rusticus* and definitely establish this synonymy, the Sweetwater River locality was visited in 1937 and 1938 by Frick Laboratory field parties consisting of Nelson J.

<sup>1</sup> The nasal bones, which are rarely preserved in specimens referred to this genus, show some variation as to length, shape, and degree of inclination. The extremely short nasals and the deep facial cavity strongly suggest that animals belonging to this genus possessed a large snout or proboscis, perhaps similar to that of the Recent tapir.

<sup>2</sup> Thorpe (1937, Mem. Peabody Mus., III, Pt. 4, p. 160) questioned the presence of three inferior incisors in this genus. All three incisors, however, are present in various examples in the F.A.M. collection, as illustrated in the figured specimens, 34492, 36195, and 34462, Figures 4, 6, 8.

<sup>3</sup> Douglass, Earl, 1907, op. cit., p. 94.



Vaughan, John Lynch, and Charles H. Falkenbach. The new material secured at this time includes a skull more complete than the holotype, a partial skull of a second individual, and a mandible of a third. These remains definitely demonstrate that the characters of *Brachycrus* and "*Pronomotherium*" are identical.

The name of *Brachycrus* was proposed by Matthew<sup>1</sup> as a subgenus of *Merycochoerus*. "*Merycochoerus rusticus*" of Wyoming was designated as the subgenotype. Matthew<sup>2</sup> provisionally referred certain unrelated specimens<sup>3</sup> from northeastern Colorado to "*M.*" *rusticus*, and based additional characters of the species on this material. Matthew and Cook<sup>4</sup> described material from the "Upper Snake Creek," similar to the Colorado material, under the name of *Merychyus (Metoreodon) profectus*.

Palmer<sup>5</sup> included "*Brachycrus* Matthew, 1901" in his list of genera and subgenera of Agriochoeridae, and accepted "*Merycochoerus rusticus*" as the type species and "Sweetwater River, Wyoming" as the type locality.

Douglass,<sup>6</sup> in describing the genus "*Pronomotherium*," stated:

"The specimen of *Pronomotherium (P. laticeps)* is apparently much more like *Merycochoerus? rusticus* than *Merycochoerus proprius*. The symphysis of the premaxillaries, the concavities of the sides of the face, the way the infraorbital foramen opens, the sudden widening of the skull at the anterior of the zygomatic arches, the reduction in size of the incisors, and the form of the chin and other portions of the mandible are much the same in both, yet there are slight differences in all of these . . . It may be that *Merycochoerus rusticus* belongs to the same genus as *Pronomotherium laticeps*, but it is still very doubtful as the type of the former is so incomplete."

The present writers have compared the genoholotypes of "*P.*" *laticeps* Douglass and *Brachycrus rusticus* (Leidy) with the additional material of *B. rusticus* from the type locality in Wyoming and are convinced that the two forms belong to one genus. Since *Brachycrus* has priority of name over "*Pronomotherium*," according to the "International Rules of Zoological Nomenclature," it should stand as the preferred name. Douglass<sup>7</sup> pointed out the differences between "*Pronomotherium*" *laticeps* and "*Merycochoerus*" *rusticus* but these dissimilarities are considered by the writers as being of specific rather than generic value.

Loomis<sup>8</sup> treated *Brachycrus rusticus* as a species of *Ticholeptus*, apparently basing this conclusion on the characters of some Colorado material which

<sup>1</sup> Matthew, W. D., 1901, op. cit., p. 397.

<sup>2</sup> Matthew, W. D., 1901, op. cit., p. 412.

<sup>3</sup> These specimens (American Museum 9050, 9056, 9115a, and 9049) are distinct from the holotype of "*M.*" *rusticus* and have been identified as belonging to a different genus. No material referable to *Brachycrus* has been reported from northeastern Colorado.

<sup>4</sup> Matthew, W. D., and Cook, Harold J., 1909, Bull. Amer. Mus. Nat. Hist., XXVI, Art. 27, p. 394.

<sup>5</sup> Palmer, T. S., 1904, U. S. Dept. Agr., Div. Biol. Surv., North Amer. Fauna No. 23, p. 911.

<sup>6</sup> Douglass, Earl, 1907, op. cit., p. 96.

<sup>7</sup> Douglass, Earl, 1907, *ibid.*, p. 96.

<sup>8</sup> Loomis, F. B., 1920, Amer. Jour. Sci., (4), L, p. 281, Figs. 1-3.

Matthew<sup>1</sup> had "provisionally" referred to *B. rusticus*. The Colorado specimens, however, definitely do not belong to the genus *Brachycrus* and are included by the present writers under the subfamily Ticholeptinæ. Thorpe<sup>2</sup> accepted the identification of Loomis and also considered *Brachycrus* a synonym of *Ticholeptus*.

#### DISTRIBUTION

Remains of *Brachycrus* are widely distributed in the western United States. Ten species and two varieties are here recognized from the Miocene of California, Montana, Nebraska, New Mexico, and Wyoming.<sup>3</sup> The genus is best represented from the upper deposits ("Sheep Creek" and "Lower Snake Creek") of the Hemingford<sup>4</sup> group in Sioux County, Nebraska. The writers agree with the following statement of Matthew<sup>5</sup> concerning the relationship of the Sheep Creek and "Snake Creek":

"The relations between the 'Snake Creek' and 'Sheep Creek' beds had not been clearly understood. The former appeared when first examined to be a distinct and later formation overlying the eroded surfaces of the latter. A more careful study of the quarry cuts and faunas makes it necessary to modify the conclusion to some extent, the two representing different facies of the same formation or sequence of strata, in part contemporaneous, rather than two distinct formations."

Studies of the mammalian remains by several writers<sup>6</sup> tend to show that two distinct faunal horizons are present within the Sheep Creek formation. The collection of *Brachycrus* material from the Sioux County area verifies this. Although the writers consider the "Lower Snake Creek" as a part of the Sheep Creek formation, the names used by Matthew<sup>7</sup> will be retained for convenience in the present paper. The term "Sheep Creek" is used to designate the quarries of Stonehouse Draw and their equivalents.

<sup>1</sup> Matthew, W. D., 1901, op. cit., p. 412, Figs. 27-28.

<sup>2</sup> Thorpe, M. R., 1937, Mem. Peabody Mus., III, Pt. 4, p. 194, Figs. 142-143; Pl. xxviii, Figs. 1-2; Pl. XLVII, Fig. 1.

<sup>3</sup> Gazin (1932, Carn. Inst. Wash. Publ. No. 418, p. 81, Fig. 15a) reported the occurrence of a mandibular fragment of an oreodont from the Miocene of Malheur County, Oregon, and referred it to "*Ticholeptus* sp." Thorpe (1937, op. cit., p. 170), however, listed this specimen under "*Pronomotherium* species." The present writers agree with the identification of Gazin and therefore the Oregon example is not included under *Brachycrus*.

Simpson (1932, Bull. Fla. State Geol. Surv., No. 10, p. 34) mentioned "an upper canine of a fairly large oreodont, about the size of *Pronomotherium siouense*," from the Miocene of Florida. He did not, however, definitely refer it to this genus. Thorpe (1938, op. cit., p. 170) considered the tooth as belonging to the *Suidæ*.

<sup>4</sup> The existence of the Hemingford group has been recognized by the writers (manuscript) since 1936 [Lugn, 1938, Amer. Jour. Sci., (5), XXXVI, p. 226; 1939, Bull. Geol. Soc. Amer., L, p. 1253]. This division of the Miocene includes both the Marsland [Schultz, 1938, Amer. Jour. Sci., (5), XXXV, p. 443] and the Sheep Creek (Lugn, 1939, op. cit., p. 1254).

<sup>5</sup> Matthew, W. D., 1924, Bull. Amer. Mus. Nat. Hist., L, Art. 2, p. 61.

<sup>6</sup> Matthew, W. D., 1924, *ibid.*, p. 65; Frick, Childs, 1937, Bull. Amer. Mus. Nat. Hist., LXIX, pp. 117, 123, 131, etc.

<sup>7</sup> Matthew, W. D., 1924, op. cit., pp. 61-73.

All of the collecting localities from which *Brachycrus* has been reported have been visited by one or both of the writers, and the geology studied. Additional stratigraphic evidence, as well as an abundance of fossil material, has been gathered since 1926 for the Frick Laboratory by the following party leaders and their associates: Joseph Rak in the Barstow area of California; Joseph Rak and John C. Blick in the Santa Fé area of New Mexico; Jack Wilson in Sioux County, Nebraska; Ted Galusha in Dawes County, Nebraska; and Charles H. Falkenbach in Wyoming and Montana.

The geological history of the Tertiary of Montana is still not thoroughly understood. Four species of *Brachycrus* have been described from a small area in Montana, namely, *B. altiramus*, *B. elrodi*, and *B. madisonius* from the Lower Madison Valley, and *B. laticeps* from east of New Chicago. The type specimens of *B. altiramus* and *B. laticeps* are quite complete and in each case the holotypes consist of a skull and associated lower dentition. The type descriptions of *B. elrodi* and *B. madisonius* were based on fragmentary mandibular rami which have characters that seem specifically distinct from each other and from the more completely known forms. The small heel on  $M_3$  and the point of descent of the angle of the inferior border of the ramus of *B. elrodi*, and the shortened premolar region of *B. madisonius* differ from other described species. The two last-mentioned species, however, will remain questionable until more complete material is available for study.

## SUMMARY OF SPECIES AND TYPES

Ten species and two varieties of *Brachycrus* from eight Miocene localities are here recorded:

From California, one species and one variety:

- (1) *Brachycrus buwaldi* (Merriam), 1919, from the Barstow area, San Bernardino County, California.

HOLOTYPE.—Portions of skull, U.C.21350.<sup>1</sup>

- (1a) *Brachycrus buwaldi barstowensis*, new variety, from the Barstow area, San Bernardino County, California.

HOLOTYPE.—Anterior portion of skull, F:A.M.42402. *Figure 9.*

From Montana, four species:

- (2) *Brachycrus altiramus* (Douglass), 1901, from the lower Madison Valley, Gallatin County, Montana.

HOLOTYPE.—Partial skull, A.M.9746, and right mandibular ramus, C.M.759.<sup>2</sup> *Figure 1* (in part).

- (3) *Brachycrus elrodi* (Douglass), 1901, from the lower Madison Valley, Gallatin County, Montana.

HOLOTYPE.—Posterior portion of mandibular ramus, C.M.818. *Figure 9.*

- (4) *Brachycrus madisonius* (Douglass), 1901, from the lower Madison Valley, Gallatin County, Montana.

HOLOTYPE.—Anterior portion of right mandibular ramus, C.M.800. *Figure 9.*

- (5) *Brachycrus laticeps* (Douglass), 1900, from east of New Chicago, Granite County, Montana.

HOLOTYPE.—Skull and mandible, C.M.796. *Figure 1* (in part).

From Nebraska, two species and one variety:

- (6) *Brachycrus siouense* (Sinclair), 1915, from the Sheep Creek-Snake Creek locality, Sioux County, Nebraska, and referred remains from Dawes County, Nebraska.

HOLOTYPE.—Right mandibular ramus, P.U.12057.

- (7) *Brachycrus wilsoni*, new species, from the Sheep Creek-Snake Creek locality, Sioux County, and referred remains from Dawes County, Nebraska.

HOLOTYPE.—Skull, F:A.M.34202. *Figures 1, 7, 11.*

<sup>1</sup> List of abbreviations of institutions cited: A.N.S.P. = Academy of Natural Sciences of Philadelphia; A.M. = American Museum of Natural History; F:A.M. = Frick Collection; F:B:A.M. = Frick:Barbour Collection; C.M. = Carnegie Museum of Pittsburgh; Col.M. = Colorado Museum of Natural History; K.U. = University of Kansas Museum; N.M. = U.S. National Museum; N.S.M. = University of Nebraska State Museum; P.U. = Princeton University; U.C. = University of California Museum of Paleontology.

<sup>2</sup> The skull and mandibular ramus are of one individual, see *B. altiramus*, page 229.

- (7a) *Brachycrus wilsoni longensis*, new variety, from the Sheep Creek-Snake Creek locality, Sioux County, Nebraska.

HOLOTYPE.—Anterior portion of skull, F:A.M.33574. *Figure 9.*

From Wyoming, three species:

- (8) *Brachycrus rusticus* (Leidy), 1870, genotype, from the Sweetwater River area, near Devil's Gate, and referred remains from Fremont County, Wyoming.

GENOHOLOTYPE.—Anterior portion of skull and partial mandible, N.M.145. *Figure 2.*

- (9) *Brachycrus sweetwaterensis*, new species, from the Sweetwater River area, Natrona County, and referred remains from Fremont County, Wyoming.

HOLOTYPE.—Skull, F:A.M.34498. *Figures 1, 5.*

- (10) *Brachycrus vaughani*, new species, from the Sweetwater River area, Fremont County, and referred remains from Natrona County, Wyoming.

HOLOTYPE.—Skull, mandible, and skeletal parts, F:A.M.34492. *Figures 1, 4, 10.*

From New Mexico:

- (11) *Brachycrus*, species undetermined, from the Skull Ridge area, Santa Fé County, New Mexico.

#### DETAILED LISTS OF TYPES, REFERRED SPECIMENS, AND SYNONYMY

*Brachycrus*, total available specimens, 794

##### (1) *Brachycrus buwaldi* (Merriam)

From the Miocene Deposits, North of Barstow, San Bernardino County, California

*Merycochoerus?* *buwaldi* MERRIAM, 1919, Bull. Dept. Geol. Uni. Calif., XI, No. 5, p. 507, Figs. 84-88.

*Merycochoerus buwaldi* MERRIAM, Thorpe, 1937, Mem. Peabody Mus., III, Pt. 4, p. 152, Fig. 112.

#### SPECIFIC CHARACTERS

SKULL.—Approximately same length as that of *B. laticeps*, but not as wide; about same length and width as that of *B. siouense*, but decidedly more robust; malar heavy, but not exceptionally deep; posterior pillar of orbit massive; point of contact of nasal (known from posterior portion only) and frontal about same position as in *B. siouense*, with nasals also produced upward as in that species; muzzle robust; superior border of the maxilla massive; glenoid surface wide (anteroposteriorly) in comparison with *B. siouense*; occipital condyle extremely light; foramen magnum wide.

MANDIBLE.—Slightly larger and heavier than examples of *B. siouense*.

DENTITION.—Superior and inferior series longer than average series of *B. siouense*.

LIMBS.—Approximate length of *B. siouense*, but definitely heavier.

MEASUREMENTS.—Tables I and II.

#### DISCUSSION

The robust nature of the skull, mandible, and skeletal elements characterizes this species. The occipital condyles are extremely small for the size of the skull. The holotype is indistinguishable from the corresponding portions of the skull, F:A.M.34467, *Figure 8*.

*Brachycrus* remains in the Barstow area are recorded only from the Green Hills horizon or Second Division which underlies the later deposits including the "Hemicyon Stratum" of the First Division.<sup>1</sup>

One hundred and seven specimens are here recorded:

HOLOTYPE.—Portion of skull with I <sup>2</sup> -P <sup>1</sup> rt. <sup>2</sup> and P <sup>2</sup> -M <sup>3</sup> . (w) <sup>3</sup>	U.C. 21350	From U.C. collecting locality 2057, Barstow syncline, San Bernardino County, California. Figured by Merriam, 1919, Fig. 84; Thorpe, 1937, Fig. 112.
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#### REFERRED.—

##### (A) FROM TYPE LOCALITY:

Partial skull with P <sup>4</sup> -M <sup>3</sup> and partial mandible with M <sub>3</sub> .....	(w)	U.C. 21485
Partial mandible with P <sub>2</sub> -P <sub>4</sub> .....	(w)	21345

The holotype and the above referred material were collected by the University of California field parties in 1911 and 1913.

##### (A') FROM TYPE AREA (collected by Joseph Rak, Jack Wilson, Carl Long, Charles H. Falkenbach, and associates, 1926-1937):

From Steepside Quarry:

##### TWO SKULLS

Skull with I <sup>1</sup> -I <sup>2</sup> alv. and I <sup>3</sup> -M <sup>3</sup> , lacking anterior of nasals. <i>Figures 1, 8</i> .....	(w†)	F:A.M. 34467
Skull, crushed, with C/-M <sup>3</sup> (P <sup>1</sup> alv.), lacking nasals and occipital region.....	(w†+)	34466

##### TWO MANDIBULAR SPECIMENS

Two right rami with		
P <sub>3</sub> -M <sub>3</sub> .....	(w+)	42404
P <sub>1</sub> -M <sub>3</sub> .....	(w)	42405

<sup>1</sup> Frick, Childs, 1926, Bull. Amer. Mus. Nat. Hist., LVI, Art. 1, p. 34.

<sup>2</sup> Abbreviations used in descriptions: rt. = root or roots; alv. = alveolus or alveoli; br. = broken; erupt. = erupting.

<sup>3</sup> Stage of wear of teeth: (i) = immature; (m) = mature; (w) = worn.

From Ness Quarry:

## SKULL

Skull, crushed, with I <sup>1</sup> -I <sup>2</sup> alv. and I <sup>3</sup> -M <sup>3</sup> , lacking nasals.....	(w)	F:A.M. 42372
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From Green Hills:

## THREE SKULLS

Skull, crushed, with I <sup>3</sup> -P <sup>1</sup> rt. and P <sup>2</sup> -M <sup>3</sup> .....	(w+)	42373
Partial skull, crushed, with C/-P <sup>1</sup> br. and P <sup>2</sup> -M <sup>3</sup> .....	(w+)	42374
Immature skull, crushed, with I <sup>1</sup> -I <sup>3</sup> rt. and C/(br.)-dP <sup>2</sup> -M <sup>2</sup> , lacking nasals.....	(I)	42375

## TWENTY PARTIAL SKULLS

Twenty anterior portions of skulls with

C/-M <sup>3</sup> (P <sup>1</sup> br.).....	(w+)	34459
C/-M <sup>3</sup> .....	(w+)	34465
P <sup>3</sup> -M <sup>3</sup> .....	(w±)	42376
C/-M <sup>3</sup> (P <sup>1</sup> alv.).....	(w±)	42377
C/-M <sup>3</sup> .....	(w±)	42378
C/-M <sup>3</sup> .....	(w±+)	42379
C/-M <sup>3</sup> (P <sup>1</sup> -P <sup>2</sup> rt.).....	(w+)	42380
I <sup>1</sup> -M <sup>3</sup> .....	(w±+)	42381
I <sup>1</sup> (rt.)-M <sup>3</sup> (I <sup>2</sup> alv.).....	(w±)	42382
I <sup>2</sup> -M <sup>3</sup> .....	(w±+)	42383
I <sup>1</sup> -M <sup>3</sup> (br.).....	(w±)	42384
C/-M <sup>3</sup> .....	(w±+)	42385
P <sup>4</sup> -M <sup>3</sup> .....	(w+)	42386
C/-M <sup>3</sup> (P <sup>1</sup> alv.).....	(w±+)	42387
C/-M <sup>3</sup> .....	(w±)	42388
C/-M <sup>3</sup> .....	(w±)	42389
I <sup>2</sup> -M <sup>3</sup> .....	(w±+)	42390
I <sup>2</sup> -M <sup>3</sup> .....	(w±)	42391
P <sup>2</sup> -M <sup>3</sup> .....	(w±+)	42392
Immature, I <sup>1</sup> -dP <sup>2</sup> -M <sup>2</sup> .....	(I)	42393

## SEVENTEEN MAXILLÆ

Nine right maxillæ with

C/-P <sup>1</sup> rt. and P <sup>2</sup> -P <sup>4</sup> .....	(w)	34463
P <sup>4</sup> -M <sup>3</sup> .....	(w+)	34469
M <sup>1</sup> -M <sup>3</sup> (br.).....	(w±)	34470
M <sup>2</sup> -M <sup>3</sup> .....	(w+)	34471
P <sup>2</sup> -M <sup>3</sup> .....	(w)	42397
P <sup>2</sup> -M <sup>3</sup> (br.).....	(w±)	42398
P <sup>3</sup> -M <sup>3</sup> .....	(w±+)	42399
P <sup>3</sup> -M <sup>3</sup> and left maxilla fragment with P <sup>4</sup> -M <sup>1</sup> .....	(w±+)	42400
I <sup>1</sup> -I <sup>3</sup> alv. and C/-dP <sup>2</sup> -M <sup>1</sup> .....	(I)	42401

		F:A.M.
Eight left maxillæ with		
P <sup>2</sup> (br.)-M <sup>1</sup> .....	(w)	34458
C/(rt.)-M <sup>3</sup> (P <sup>1</sup> alv.).....	(w‡)	34460
P <sup>1</sup> -M <sup>3</sup> .....	(w‡ <sup>+</sup> )	34461
P <sup>3</sup> (br.)-M <sup>3</sup> (M <sup>2</sup> -M <sup>3</sup> br.).....	(w‡)	34468
C/-P <sup>1</sup> rt. and P <sup>2</sup> -M <sup>1</sup> (rt.).....	(w+)	34472
C/-M <sup>3</sup> .....	(w‡)	42394
P <sup>4</sup> -M <sup>3</sup> .....	(w)	42395
P <sup>3</sup> -M <sup>3</sup> (br.).....	(w‡)	42396

## FIFTY-FOUR MANDIBULAR SPECIMENS

Sixteen mandibles with		
I <sub>1</sub> -M <sub>3</sub> . <i>Figure 8</i> .....	(w‡)	34462
I <sub>1</sub> -P <sub>1</sub> rt. and P <sub>2</sub> -M <sub>3</sub> .....	(w‡)	34433
I <sub>1</sub> -M <sub>3</sub> .....	(w‡)	34434
P <sub>1</sub> -M <sub>3</sub> .....	(w‡ <sup>+</sup> )	34435
I <sub>1</sub> (alv.) and I <sub>2</sub> -M <sub>3</sub> (I <sub>3</sub> alv.).....	(w‡ <sup>+</sup> )	34437
P <sub>1</sub> (rt.)-M <sub>2</sub> .....	(w‡)	34444
P <sub>1</sub> -M <sub>3</sub> .....	(w‡ <sup>+</sup> )	34445
P <sub>1</sub> -P <sub>4</sub> .....	(w‡ <sup>+</sup> )	34446
P <sub>3</sub> -M <sub>3</sub> .....	(w‡ <sup>+</sup> )	42340
P <sub>1</sub> -P <sub>2</sub> rt. and P <sub>3</sub> -M <sub>3</sub> .....	(w+)	42341
/C(br.)-M <sub>3</sub> .....	(w‡)	42342
I <sub>1</sub> -I <sub>3</sub> rt. and /C-M <sub>3</sub> (/C-P <sub>1</sub> br.).....	(w‡)	42343
I <sub>1</sub> -M <sub>2</sub> .....	(w+)	42344
P <sub>1</sub> -M <sub>3</sub> .....	(w+)	42345
P <sub>3</sub> -M <sub>3</sub> .....	(w+)	42346
P <sub>1</sub> (rt.)-M <sub>3</sub> .....	(w‡ <sup>+</sup> )	42352
Twenty-one right rami with		
/C(br.)-M <sub>3</sub> (M <sub>1</sub> alv.).....	(w‡ <sup>+</sup> )	34436
P <sub>2</sub> (rt.)-M <sub>3</sub> .....	(w‡)	34440
P <sub>1</sub> -M <sub>3</sub> .....	(w‡ <sup>+</sup> )	34441
P <sub>4</sub> -M <sub>3</sub> .....	(M)	34442
P <sub>3</sub> (br.)-M <sub>3</sub> .....	(w‡)	34448
P <sub>1</sub> -P <sub>2</sub> br. and P <sub>3</sub> -M <sub>3</sub> .....	(w+)	34452
/C-P <sub>2</sub> alv. and P <sub>3</sub> -M <sub>3</sub> .....	(w‡)	34453
P <sub>3</sub> -M <sub>3</sub> .....	(w‡)	34454
P <sub>1</sub> -M <sub>3</sub> (br.).....	(w‡)	34457
I <sub>1</sub> -I <sub>2</sub> rt. and I <sub>3</sub> -M <sub>2</sub> .....	(w‡)	42347
M <sub>1</sub> -M <sub>3</sub> (br.).....	(w‡)	42348
P <sub>3</sub> -M <sub>3</sub> .....	(w‡ <sup>+</sup> )	42349
P <sub>3</sub> -M <sub>3</sub> .....	(w‡)	42350
P <sub>1</sub> -M <sub>3</sub> (P <sub>2</sub> br.).....	(w‡)	42351
P <sub>1</sub> -M <sub>3</sub> (br.).....	(w‡)	42353
/C-M <sub>3</sub> (P <sub>2</sub> alv.).....	(w‡ <sup>+</sup> )	42354
/C(rt.)-M <sub>3</sub> .....	(w‡)	42355
/C-M <sub>3</sub> .....	(w‡ <sup>+</sup> )	42356
Three immature with		
I <sub>1</sub> -P <sub>2</sub> (rt.)-dP <sub>3</sub> -M <sub>2</sub> (br.).....	(I)	42369
I <sub>3</sub> -dP <sub>4</sub> -M <sub>2</sub> (br.).....	(I)	42370
I <sub>1</sub> -dP <sub>3</sub> -M <sub>2</sub> .....	(I)	42371



		F:A.M.
Seventeen left rami with		
P <sub>1</sub> (br.)-M <sub>3</sub> (P <sub>4</sub> -M <sub>1</sub> br.).....	(w††)	34438
P <sub>1</sub> -P <sub>2</sub> rt. and P <sub>4</sub> -M <sub>3</sub> .....	(w†)	34439
M <sub>1</sub> -M <sub>3</sub> .....	(w†)	34443
/C-M <sub>3</sub> .....	(w†)	34449
/C(rt.)-M <sub>3</sub> (br.).....	(w†)	34455
P <sub>1</sub> -M <sub>2</sub> (br.) (P <sub>2</sub> rt.).....	(w+)	42357
P <sub>1</sub> (alv.)-M <sub>3</sub> (br.) (P <sub>2</sub> br.).....	(w+)	42358
P <sub>1</sub> (rt.)-M <sub>3</sub> .....	(w+)	42359
P <sub>3</sub> -M <sub>3</sub> .....	(w†)	42360
P <sub>1</sub> -M <sub>2</sub> (P <sub>4</sub> -M <sub>1</sub> br.).....	(w†)	42361
/C-P <sub>2</sub> rt. and P <sub>3</sub> -M <sub>3</sub> .....	(w††)	42362
P <sub>1</sub> (rt.)-M <sub>3</sub> .....	(w††)	42363
/C(rt.)-M <sub>3</sub> (br.).....	(w††)	42364
P <sub>1</sub> (br.)-M <sub>3</sub> (br.).....	(w+)	42365
I <sub>3</sub> -P <sub>1</sub> br. and P <sub>2</sub> -M <sub>3</sub> .....	(w†)	42366
P <sub>1</sub> -M <sub>3</sub> .....	(w)	42367
P <sub>1</sub> -M <sub>3</sub> .....	(w†)	42368

## FIVE LIMB ELEMENTS

Radius.....	42406
Tibia. <i>Figure 10</i> .....	42333
Partial tibia.....	42407
Metacarpal III. <i>Figure 10</i> .....	42335
Metatarsal III. <i>Figure 10</i> .....	42334

(1a) *Brachycrus buwaldi barstowensis*,<sup>1</sup> new variety

From the Miocene Deposits, North of Barstow, San Bernardino County, California

## VARIETAL DESCRIPTION

SKULL.—Smaller and less robust than *B. buwaldi*. (Known from anterior portion only.)

MANDIBLE.—Lighter construction and smaller than *B. buwaldi*. (Known from referred specimens only.)

DENTITION.—Superior and inferior series shorter and of lighter construction than those of *B. buwaldi*, molar series of about same length, premolar series shorter; premolars smaller and more crowded than those of *B. buwaldi*.

LIMBS.—Unknown.

MEASUREMENTS.—Table I.

## DISCUSSION

The available material of this new variety of *Brachycrus*, although incomplete, definitely demonstrates the existence of a smaller form than the typical *B. buwaldi* of the Barstow area.

<sup>1</sup> Named after the Barstow deposits, near Barstow, California.

The holotype and the referred specimens were collected by Joseph Rak and associates, 1923-1928.

Six specimens are here recorded:

HOLOTYPE.—Anterior portion of skull with I <sup>1</sup> -I <sup>3</sup> rt. and C/(br.)-M <sup>3</sup> . (w+)	F:A.M. 42402	From Green Hills, Barstow area, San Bernardino County, California.
		Figure 9.

REFERRED FROM TYPE LOCALITY.—

		F:A.M.
Anterior portion of skull with C/-M <sup>2</sup> .....	(w+)	42403
Portions of skull with I <sup>1</sup> -P <sup>3</sup> and M <sup>3</sup> (I <sup>3</sup> alv.).....	(w+)	34451
Right mandibular ramus with M <sub>1</sub> (br.)-M <sub>3</sub> .....	(w+)	34450A
Left mandibular ramus with /C-M <sub>3</sub> . Figure 9.....	(w+)	34450
It is possible that specimens F:A.M.34450, 34450A and 34451 are of one individual, since the stage of wear of the teeth and the fossilization are the same.		
Left ramus with /C-P <sub>2</sub> rt. and P <sub>3</sub> -M <sub>3</sub> .....	(w†+)	42362

## (2) *Brachycrus altiramus* (Douglass)

From the Miocene Deposits of the Lower Madison Valley of Montana

*Merycochoerus altiramus* DOUGLASS, 1901, Amer. Jour. Sci., (4), XI, p. 73, Fig. 1.

*Merycochoerus altiramis* (DOUGLASS), TROUSSERT, 1905, Quinquinale Supplementum of 1898, p. 669.

*Pronomotherium altiramum* (DOUGLASS), 1907, Bull. Amer. Mus. Nat. Hist., XXIII, Art. 32, p. 817, Figs. 8-9. THORPE, 1925, Jour. Mamm., VI, No. 2, p. 74, Fig. 5.

*Pronomotherium altiramis* (DOUGLASS), MATTHEW, 1909, Bull. 361, U. S. Geol. Surv., p. 117.

*Pronomotherium altiramus* (DOUGLASS), THORPE, 1937, Mem. Peabody Mus., III, Pt. 4, p. 161, Figs. 4, 114-116.

### SPECIFIC CHARACTERS

SKULL.—Largest known of the genus; decidedly longer, but approximately same width as that of *B. laticeps*; squamosal portion of the zygomatic arch massive; postglenoid process very large; palate slightly narrower than in examples of *B. laticeps*; condyles massive.

MANDIBLE.—Longest and deepest known of the genus; beginning of the descent of the angle of the inferior border more posteriorly located than in *B. laticeps*.

DENTITION.—Largest and longest known series of the genus; small diastema between P<sup>1</sup> and P<sup>2</sup>; P<sub>2</sub> set obliquely in ramus; heel of M<sub>3</sub> like that of *B. laticeps* and larger than in *B. elrodi*.

LIMBS.—Unknown.

MEASUREMENTS.—Table I.

## DISCUSSION

This species is known only from a right ramus, C.M.759, and a skull, A.M. 9746. Although the skull was not found until a year after the jaw was described and the species established, the specimens appear to belong to one individual. Douglass<sup>1</sup> reported that the ramus was found "in a bed or pocket of sand at the base of the Loup Fork beds of the Lower Madison Valley in Montana, in 1895." In 1902, an expedition of the American Museum of Natural History, under the direction of W. D. Matthew, found the skull at the same site. Douglass<sup>2</sup> considered the skull and ramus as of the same individual. The ramus was loaned to the present writers in 1936 and was studied with the skull in the American Museum. The observations of Douglass appear to be correct and both specimens, therefore, are listed below as part of the holotype.

HOLOTYPE.—Skull with C/-M <sup>2</sup> (lacking nasal region and pre-maxillæ), and right ramus with /C-M <sub>3</sub> . (w+)	A.M.9746  C.M.759	From lower Madison Valley, Gallatin County, Montana; skull collected by W. D. Matthew and associates, 1902; ramus collected by Earl Douglass, 1895.  Figured by Douglass, 1901, Fig. 1; 1907, Figs. 8-9; Thorpe, 1925, Fig. 5; 1937, Figs. 4, 114-116. <i>Figure 1</i> (in part).
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(3) *Brachycrus elrodi* (Douglass)

From the Miocene Deposits of the Lower Madison Valley of Montana

*Merycochoerus elrodi* DOUGLASS, 1901, Amer. Jour. Sci., (4), XI, p. 78, Fig. 3.

*Pronomotherium elrodi* (DOUGLASS), THORPE, 1937, Mem. Peabody Mus., III, Pt. 4, p. 164, Fig. 117; Pl. XXIV, Fig. 4.

## SPECIFIC CHARACTERS

SKULL.—Unknown.

MANDIBLE.—Known only from jaw fragment containing M<sub>2</sub> and M<sub>3</sub>; approximate size of *B. laticeps*; descent of the angle of inferior border more posterior than in that species.

DENTITION.—Small heel on M<sub>3</sub>, which results in a small M<sub>3</sub>; M<sub>3</sub> in *B. laticeps* is larger.

LIMBS.—Unknown.

MEASUREMENTS.—Table I.

<sup>1</sup> Douglass, Earl, 1907, op. cit., p. 817.

<sup>2</sup> Idem., p. 817.

## DISCUSSION

Douglass<sup>1</sup> stressed the importance of the depth and the lightness of the inferior border of the ramus. A study of a large collection of mandibular rami of *B. siouense* from one quarry (Echo Quarry, Sioux County, Nebraska) demonstrates considerable individual variation of the inferior border. The position of the angle, however, is quite constant.

Thorpe<sup>2</sup> stated that *B. elrodi* was close to *B. madisonius*. The present writers, however, find that the M<sub>2</sub> and the anterior lobe of M<sub>3</sub>, which are the only corresponding teeth present in the two forms, are decidedly larger in *B. elrodi*. The dentition present in *B. madisonius* is closer to that of *B. siouense*, while *B. elrodi* approaches the size of *B. laticeps*.

HOLOTYPE.—Posterior portion of left ramus with M <sub>2</sub> –M <sub>3</sub> br. (w)	C.M.818	From lower Madison Valley, Gal- latin County, Montana; col- lected by Earl Douglass. Figured by Douglass, 1901, Fig. 3; Thorpe, 1937, Fig. 117; Pl. xxiv, Fig. 4. <i>Figure 9.</i>
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(4) *Brachycrus madisonius* (Douglass)

From the Miocene Deposits of the Lower Madison Valley of Montana

*Merycochoerus madisonius* DOUGLASS, 1901, Amer. Jour. Sci., (4), XI, p. 75, Fig. 2.

*Pronomotherium madisonius* (DOUGLASS), 1907, Bull. Amer. Mus. Nat. Hist., XXIII, Art. 32, p. 821.

*Pronomotherium madisonium* (DOUGLASS), HAY, 1930, Carn. Inst. Wash., Publ. No. 390, II, p. 786. THORPE, 1937, Mem. Peabody Mus., III, Pt. 4, p. 167, Figs. 2, 119; Pl. xxiv, Fig. 5.

## SPECIFIC CHARACTERS

SKULL.—Unknown.

MANDIBLE.—Heavy construction; physysial surface wide.

DENTITION.—Superior dentition known only from referred M<sup>1</sup>–M<sup>3</sup>, which approach those of *B. siouense* in size; inferior series decidedly smaller in length than in *B. elrodi*; length of premolar series compares favorably with some very well-worn examples of *B. siouense*.

LIMBS.—Unknown.

MEASUREMENTS.—Table I.

<sup>1</sup> Douglass, Earl, 1901, op. cit., p. 78.

<sup>2</sup> Thorpe, Malcolm R., 1937, op. cit., p. 164.

## DISCUSSION

Various authors have stressed the importance of the massive inferior ramal border of the holotype. As mentioned on page 230, under *B. elrodi*, the large collection of mandibular rami of *B. siouense* definitely shows that this characteristic is an individual rather than a specific variation.

Two specimens are here recorded:

HOLOTYPE.—Partial right ramus with P <sub>1</sub> –P <sub>4</sub> rt. and M <sub>1</sub> (br.)–M <sub>3</sub> (br.). (w†)	C.M.800	From lower Madison Valley, Gallatin County, Montana; collected by Earl Douglass. Figured by Douglass, 1901, Fig. 2; Thorpe, 1937, Figs. 2, 119; Pl. xxiv, Fig. 5. Figure 9.
REFERRED.—Partial maxilla with M <sup>1</sup> –M <sup>3</sup> . (w† <sup>+</sup> )	C.M.819	Collected by Earl Douglass, 1896. Figure 9.

(5) *Brachycrus laticeps* (Douglass)

From the Miocene Deposits East of New Chicago, Montana

*Merycochoerus laticeps* DOUGLASS, 1900, Amer. Jour. Sci., (4), X, p. 428, Figs. 1–3.

*Pronomotherium laticeps* (DOUGLASS), 1907, Ann. Carn. Mus., IV, No. 2, p. 94. THORPE, 1937, Mem. Peabody Mus., III, Pt. 4, p. 165, Fig. 118; Pl. xxiv, Figs. 1–3.

## SPECIFIC CHARACTERS

SKULL.—Brachycephalic; intermediate in size between those of *B. altiramus* and *B. siouense*; squamosal portion of the zygomatic arch not extended as far forward as in *B. altiramus*; nasals similar to those of *B. siouense*, i.e., short, comparatively heavy, and produced upward; occipital condyles heavy.

MANDIBLE.—Robust; angle of inferior border deep and begins to descend sharply below the posterior portion of M<sub>2</sub>.

DENTITION.—Comparatively light construction; intermediate in length between that of *B. altiramus* and *B. siouense*; heel of M<sub>3</sub> decidedly heavier and larger than the holotype of *B. elrodi*.

LIMBS.—Medium heavy construction (known only from fragments).

MEASUREMENTS.—Table I.

## DISCUSSION

It is fortunate that the holotype of this species (genoholotype of "*Pronomotherium*") consists of a nearly complete skull and lower jaws. This facilitates comparison with the genoholotype of *Brachycrus*.

Two recorded specimens:

- HOLOTYPE.**—Skull with I<sup>1</sup>-M<sup>3</sup> (I<sup>1</sup>-I<sup>3</sup> and P<sup>1</sup> alv. and P<sup>2</sup>-P<sup>3</sup> br.), mandible with /C-P<sub>2</sub> rt. and P<sub>3</sub>-M<sub>3</sub>, and skeletal fragments. (w+)
- C.M.796
- From E. of New Chicago, Granite County, Montana; collected by Earl Douglass, 1899.  
Figured by Douglass, 1900, Figs. 1-3; Thorpe, 1937, Fig. 118; Pl. xxiv, Figs. 1-3.  
*Figure 1* (in part).
- REFERRED.**—Anterior portion of skull with I<sup>3</sup>-C/ br. and P<sup>1</sup>-M<sup>3</sup>, and partial mandible with I<sub>1</sub>-I<sub>3</sub> rt. and /C-M<sub>1</sub> (P<sub>1</sub> br.). (w+)
- F:A.M.34482
- From type area; collected by Charles H. Falkenbach, 1937.

This specimen is somewhat smaller than the holotype, but falls within the range of allowable specific variation. The numerous associated skulls of *B. siouense* from Nebraska demonstrate the wide extent of possible variation.

#### (6) *Brachycrus siouense* (Sinclair)

From the Miocene Deposits ("Lower Snake Creek" Horizon) of Sioux County, Nebraska; Referred Specimens from Nebraska

*Pronomotherium siouense* SINCLAIR, 1915, Proc. Amer. Phil. Soc., LIV, No. 217, p. 86, Fig. 11.  
MATHEW, 1924, Bull. Amer. Mus. Nat. Hist., L, Art. 2, p. 183, Figs. 51-53. THORPE, 1937, Mem. Peabody Mus., III, Pt. 4, p. 168, Figs. 120-123.

#### SPECIFIC CHARACTERS

**SKULL.**—Brachycephalic; larger and slightly heavier than holotype of *B. rusticus* from Wyoming; construction lighter and basal length less than in *B. wilsoni*; nasals short and protruding slightly upward.

**MANDIBLE.**—Larger and more massive than that of *B. rusticus*; smaller and lighter than *B. wilsoni* and *B. sweetwaterensis*.

**DENTITION.**—Series larger and heavier than examples of *B. rusticus*; average series smaller and lighter than *B. wilsoni*.

**LIMBS.**—Approximately same length as examples of *B. rusticus*; average somewhat lighter and shorter than *B. wilsoni*. (The limbs of *B. wilsoni* and *B. siouense* are not well represented in the collections.)

**MEASUREMENTS.**—Tables I and II.

#### DISCUSSION

*B. siouense* is better represented in the collections than any other species of this genus. The large collections from single quarries provide a basis for a better understanding of the individual variation within a species. All material here listed from Sioux County, Nebraska, except where otherwise stated, has been collected by Jack Wilson, Carl Long, and their associates, 1928-1939.

Specimens of *Brachycrus* collected from various levels within the Sheep Creek-Snake Creek section have indicated, interestingly enough, the occurrence of the largest forms in the lowest deposits, an exception to the observed tendency of the oreodonts to increase in size during the Tertiary progression.

Five hundred and sixteen specimens are here recorded:

HOLOTYPE.—Right ramus with I <sub>1</sub> - /C alv. and P <sub>1</sub> -M <sub>3</sub> . (w+)	P.U.12057	From Sinclair Draw, "Lower Snake Creek" deposits, Sioux County, Nebraska; collected by William Sinclair and associ- ates, 1914. Figured by Sinclair, 1915, Fig. 11; Matthew, 1924, Fig. 52; Thorpe, 1937, Fig. 123.
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REFERRED.—

(A) FROM TYPE LOCALITY, SINCLAIR DRAW (collected by Albert Thomson and associates, 1921):

From "B Quarry":

Skull with I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> , lacking nasals; figured by Matthew, 1924, Figs. 51-52; Thorpe, 1937, Figs. 120-122... (w)	A.M.	18333
Mandible with I <sub>1</sub> -/C alv. and P <sub>1</sub> -M <sub>3</sub> (P <sub>2</sub> alv.)..... (w)		18336
Right ramus with /C-M <sub>3</sub> ; figured by Matthew, 1924, Fig. 53.. (w+)		18334

From "Sheep Creek Quarry" of 1921 ("Lower Snake Creek" horizon):

Right maxilla with P <sup>1</sup> (alv.)-M <sup>3</sup> (br.) (P <sup>2</sup> -M <sup>1</sup> br.)..... (w+)		18338
Right ramus with P <sub>2</sub> (rt.)-M <sub>3</sub> ..... (w+)		18335
Left ramus, immature, with dI <sub>2</sub> -/C-dP <sub>3</sub> -M <sub>3</sub> (germ)..... (I)		18337

(A<sup>1</sup>) FROM SINCLAIR DRAW (F:A.M. collections, 1932-1939):

From West Sinclair Draw:

Inferior portion of skull with I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> (P <sup>1</sup> alv. and P <sup>2</sup> -P <sup>3</sup> br.)..... (w+)	F:A.M.	37267
Partial right ramus, immature, with I <sub>1</sub> -P <sub>2</sub> alv. and dP <sub>3</sub> -M <sub>1</sub> (br.) (I)		37293

From East Sinclair Draw:

Partial left maxilla with C/-P <sup>3</sup> (P <sup>1</sup> alv.)..... (w‡)		37294
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From Sinclair Quarry 1:

Mandible, immature, with I <sub>1</sub> -dP <sub>1</sub> -M <sub>3</sub> (erupt.) (I <sub>3</sub> , P <sub>2</sub> -P <sub>3</sub> alv.)... (I)		34270
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From Sinclair Quarry 4:

Anterior portion of skull with P <sup>1</sup> (alv.)-M <sup>3</sup> ..... (w‡)		33576
Partial left maxilla, immature, with C/-dP <sup>2</sup> -M <sup>1</sup> (br.)..... (I)		34341

Two partial right rami with		F:A.M.
I <sub>1</sub> -P <sub>1</sub> alv. and P <sub>2</sub> -M <sub>3</sub> .....	(w±)	33557
P <sub>1</sub> (rt.)-M <sub>3</sub> (br.).....	(w+)	33560
Two partial left rami with		
/C-M <sub>3</sub> (P <sub>1</sub> -P <sub>2</sub> alv.).....	(w+)	33570
M <sub>2</sub> -M <sub>3</sub> .....	(w±)	37134
Two metapodials.....		43004A-B

(B) FROM ECHO QUARRY, ANTELOPE DRAW, "LOWER SNAKE CREEK" DEPOSITS, SIOUX COUNTY, NEBRASKA:

FORTY-FIVE SKULLS

Sixteen skulls with

I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> (P <sup>1</sup> alv.). <i>Figures 1, 6</i> .....	(M+)	36113
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> , lacking nasals and left zygomatic arch...	(w)	33575
I <sup>1</sup> (alv.)-M <sup>3</sup> , partial skull and left ramus, I <sub>1</sub> -P <sub>1</sub> alv. and P <sub>2</sub> -M <sub>3</sub> ..	(w±)	35550
I <sup>1</sup> -I <sup>2</sup> alv. and I <sup>3</sup> -M <sup>3</sup> , lacking nasals.....	(w±)	36109
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sub>3</sub> , lacking nasals.....	(w±)	36110
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> (P <sup>1</sup> alv.), partial skull.....	(w)	36111
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> , lacking nasals and partial frontals.....	(w±+)	36112
I <sup>1</sup> -I <sup>2</sup> alv. and I <sup>3</sup> -M <sup>3</sup> , lacking nasals.....	(w±)	36114
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> (P <sup>2</sup> alv.), lacking nasals and partial frontals.....	(w)	36115
dP <sup>2</sup> (br.)-M <sup>2</sup> (erupt.), lacking nasals, premaxillæ, and left zygomatic arch.....	(i)	36134
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> (P <sup>1</sup> alv.), lacking nasals (occipital region distorted).....	(w±)	37553
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> , lacking nasals, occipital region, and zygomatic arches.....	(w±)	37554
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> (P <sup>1</sup> -M <sup>2</sup> alv.), lacking nasals and right orbit	(w±+)	37555
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> , lacking nasals and frontals.....	(w+)	37556
I <sup>1</sup> -M <sup>3</sup> (I <sup>2</sup> alv., C/ br., and P <sup>1</sup> alv.), lacking nasals.....	(w±+)	37559
I <sup>1</sup> -M <sup>3</sup> , lacking nasals and left zygomatic arch.....	(w±)	42317

Twenty-four anterior portions of skull with

I <sup>1</sup> -P <sup>1</sup> alv. and P <sup>2</sup> -M <sup>3</sup> .....	(w±+)	33554
P <sup>2</sup> -M <sup>3</sup> .....	(w)	33568
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> .....	(w)	33572
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> (P <sup>1</sup> alv.).....	(w±+)	36116
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> (P <sup>1</sup> alv.).....	(w±+)	36117
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> .....	(w±+)	36118
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> (P <sup>1</sup> alv.).....	(w±+)	36119
I <sup>1</sup> (rt.)-M <sup>3</sup> (I <sup>2</sup> -I <sup>3</sup> , P <sup>2</sup> -M <sup>1</sup> alv.).....	(w±±)	36120
I <sup>1</sup> -M <sup>3</sup> .....	(w+)	36122
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> (P <sup>1</sup> alv.).....	(w±+)	36124



		F.A.M.
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> (P <sup>1</sup> alv.).....	(w)	36125
I <sup>1</sup> -I <sup>3</sup> alv. and C/(rt.)-M <sup>3</sup> (br.) (P <sup>1</sup> alv.).....	(w+)	36126
C/-M <sup>3</sup> (P <sup>1</sup> alv.).....	(w†+)	36127
C/-M <sup>3</sup> .....	(w)	36128
P <sup>1</sup> -P <sup>2</sup> alv. and P <sup>3</sup> -M <sup>3</sup> .....	(w†+)	36130
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> (P <sup>1</sup> , M <sup>1</sup> alv.).....	(w‡)	36131
C/-M <sup>3</sup> .....	(w‡)	36132
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> (br.) (P <sup>1</sup> br.).....	(m+)	36133
I <sup>1</sup> -M <sup>3</sup> .....	(w‡)	36185
P <sup>2</sup> -M <sup>3</sup> (M <sup>1</sup> br.).....	(w‡)	37257
P <sup>1</sup> -M <sup>1</sup> alv. and M <sup>2</sup> -M <sup>3</sup> (br.).....	(w+)	37258
I <sup>1</sup> -I <sup>2</sup> alv. and I <sup>3</sup> -M <sup>3</sup> .....	(w‡)	37275
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> (P <sup>1</sup> alv.).....	(w†+)	37552
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> .....	(w)	37558
Five skulls, immature with		
C/(rt.)-dP <sup>2</sup> -M <sup>2</sup> (P <sup>1</sup> alv.).....	(i)	34267
I <sup>1</sup> (alv.)-I <sup>2</sup> (germ)-dP <sup>2</sup> -M <sup>2</sup> (I <sup>3</sup> , P <sup>1</sup> alv.).....	(i)	34268
C/-dP <sup>2</sup> -M <sup>2</sup> .....	(i)	36121
I <sup>1</sup> -I <sup>3</sup> germs and C/-dP <sup>4</sup> -M <sup>3</sup> (germ) (P <sup>2</sup> -P <sup>3</sup> alv.).....	(i)	36123
I <sup>1</sup> -I <sup>3</sup> alv. and C/-dP <sup>3</sup> -M <sup>2</sup> (P <sup>1</sup> -P <sup>2</sup> alv.).....	(i)	36129

ONE HUNDRED AND EIGHT MAXILLÆ

Sixty-four right maxillæ with		
C/-M <sup>3</sup> (P <sup>1</sup> alv.). <i>Figure 9</i> .....	(m+)	36186
This specimen has styles on the inner side of the molars between the hypocone and the protocone, a condition not observed in other specimens of oreodonts. This character is more typical of the bovids and cervids.		
C/(br.)-M <sup>3</sup> (br.) (P <sup>1</sup> alv.).....	(w)	36137
C/-M <sup>3</sup> .....	(w)	36147
P <sup>1</sup> -M <sup>3</sup> (br.).....	(w+)	36190

P <sup>2</sup> -M <sup>3</sup>		P <sup>3</sup> -M <sup>3</sup>		M <sup>2</sup> -M <sup>3</sup>		misc.		misc.		immature	
(w+)	36135	(m+)	34265	(w‡)	34260	(w‡)	33552	(w)	37195	(i)	36144
(w)	36136	(w+)	36150	(w+)	36148	(w+)	34217	(w‡)	37197	(i)	36160
(w+)	36138			(w+)	36149	(w+)	34218	(w+)	37247	(i)	36194
(w+)	36139			(w+)	36159	(w)	34257	(w‡)	37248	(i)	37246
(-m)	36140			(w‡)	36161	(w)	34258	(-m)	37249	(i)	37272
(w+)	36141	P <sup>4</sup> -M <sup>3</sup>		(w+)	36164	(w+)	36143	(w‡‡)	37250		
(w+)	36142	(w)	33553	(w‡)	36165	(w)	36156	(w+)	37251		
(w)	36146	(w+)	36145	(w‡)	36166	(w+)	36157	(w+)	37252		
(w‡)	36152	(w)	36151	(w+)	36167	(w+)	36158	(w‡‡)	37253		
(w‡)	36163	(w)	36154	(w‡+)	36168	(w‡+)	36181	(w‡+)	37254		
(w‡+)	37158	(w)	36155	(w‡‡)	37196	(w)	36184	(w‡+)	37255		
		(w+)	36162	(w‡)	37245	(m)	36192	(w)	37256		

## Forty-four left maxillæ with

C/-M <sup>3</sup>		P <sup>2</sup> -M <sup>3</sup>		M <sup>2</sup> -M <sup>3</sup>		misc.		misc.		immature	
(w+)	36153	(w‡)	33566	(w‡+)	34259	(w‡)	34261	(w‡)	37260	(I)	34269
(w)	36171	(w)	36170	(w‡+)	37198	(w‡)	34262	(w‡)	37262	(I)	37202
		(w‡+)	36173	(w‡)	37200	(w+)	36175	(-M)	37263	(I)	37273
		(w‡+)	36180	(w+)	37201	(w‡)	36177	(w+)	37264	(I)	37274
		(w)	36182	(w)	37261	(M+)	36178	(w+)	37266		
				(w‡+)	37265	(w‡)	36183	(-M)	37267		
						(w‡)	36187	(M)	37268		
						(w‡)	36191	(w‡)	37269		
						(w‡+)	37199	(w‡+)	37270		
						(M+)	37203	(w+)	37271		
						(w+)	37259				

## ONE HUNDRED AND NINETY-EIGHT MANDIBULAR SPECIMENS

## Three mandibles with

I <sub>1</sub> -/C alv. and P <sub>1</sub> -M <sub>3</sub> . <i>Figure 6</i> .....	(w)	36195
I <sub>1</sub> -P <sub>2</sub> alv. and P <sub>3</sub> -M <sub>3</sub> .....	(w‡+)	33669
I <sub>1</sub> -M <sub>3</sub> (I <sub>2</sub> , /C, P <sub>1</sub> alv.).....	(w+)	36219

## Ninety-nine right rami with

I <sub>1</sub> (alv.)-M <sub>3</sub> (/C alv.).....	(w+)	36202
I <sub>1</sub> (alv.)-M <sub>3</sub> .....	(w+)	36239
I <sub>1</sub> -I <sub>3</sub> alv. and /C-M <sub>3</sub> .....	(w‡+)	36252
I <sub>1</sub> -I <sub>3</sub> alv. and /C-M <sub>3</sub> .....	(w‡)	36253

P <sub>1</sub> -M <sub>3</sub> *		P <sub>2</sub> -M <sub>3</sub>		P <sub>3</sub> -M <sub>3</sub>		misc.		misc.		immature	
(-M)	34250	(w‡+)	36200	(M)	36208	(w+)	34209	(w‡)	36254	(I)	36211
(w+)	36196	(w‡+)	36220	(w‡+)	36209	(w‡)	34214	(w+)	36258	(I)	36221
(w)	36197	(w‡+)	36244	(w+)	36248	(w+)	34215	(w+)	36260	(I)	36223
(w+)	36198	(w‡+)	36246	(w+)	36256	(-M)	36203	(w‡+)	36262	(I)	36227
(-M)	36234	(w‡)	36249	(w+)	36263	(w)	36206	(-M)	36264	(I)	36232
(w‡)	36235	(w‡)	36276	(w+)	36267	(w+)	36210	(w‡+)	36269	(I)	36245
(w+)	36236	(w‡)	36277	(w‡)	36268	(w+)	36212	(M)	36272	(I)	36261
(w‡+)	36237			(w‡)	36271	(w+)	36213	(w+)	36275	(I)	36266
(w‡)	36238			(w+)	36274	(w+)	36214	(w‡)	36279	(I)	37121
(w‡)	36240					(-M)	36215	(M+)	36229	(I)	37163
(w‡)	36241					(w‡+)	36217	(w‡)	37193	(I)	37164
(w‡)	36242					(w‡+)	36222	(w‡+)	37278	(I)	37168
(w)	36243					(w‡)	36224	(w+)	37279	(I)	37169
(w‡)	36247							(M)	37280	(I)	37172
(w+)	36255							(w‡)	37281	(I)	37190
(w‡)	36257							(w+)	37557		
(w‡)	36259										
(w‡)	36278										
(M+)	36280										

\* In the following listings the alveoli for the missing teeth may or may not be present.

Ninety-six left rami with

I <sub>1</sub> (alv.)-M <sub>3</sub> (br.).....	(w+)
/C-M <sub>3</sub> .....	(M+)

F:A.M.

34251
36298

P <sub>1</sub> -M <sub>3</sub>	P <sub>2</sub> -M <sub>3</sub>	P <sub>3</sub> -M <sub>3</sub>	misc.	misc.	immature
(w‡) 33556	(w‡+) 36220	(w+) 37127	(w‡) 33559	(w+) 37150	(I) 36295
(w+) 36281	(w‡‡) 36286	(w+) 37136	(w‡+) 33563	(w‡) 37153	(I) 37111
(w‡+) 36283	(w+) 36291	(w) 37137	(M) 33564	(w) 37155	(I) 37117
(w‡) 36284	(w‡) 37110		(w+) 37105	(w‡) 37156	(I) 37118
(w‡) 36292	(w+) 37144	P <sub>4</sub> -M <sub>3</sub>	(w) 37107	(w) 37191	(I) 37119
(w) 36294		(M+) 33571	(w‡‡) 37112	(w+) 37192	(I) 37120
(w‡) 36299	P <sub>3</sub> -M <sub>3</sub>	(M) 34216	(w+) 37115	(-M) 37283	(I) 37123
(w) 36300	(w‡) 33567	(M) 34264	(w) 37122	(w) 37284	(I) 37129
(w+) 37106	(w+) 34211	(w) 36285	(w‡) 37124	(w) 37285	(I) 37132
(w+) 37109	(w) 36282	(w‡) 36287	(w‡‡) 37130	(w) 37286	(I) 37154
(w‡+) 37113	(w‡) 36289	(w‡) 36288	(w) 37131	(w) 37287	(I) 37182
(w+) 37114	(w‡) 36290	(w+) 36296	(w‡) 37133	(w) 37288	(I) 37268
(w‡) 37128	(w‡) 36293	(w‡+) 37102	(w) 37135	(w) 37291	(I) 37282
(w) 37138	(w+) 36297	(w‡) 37116	(w+) 37143		
(w+) 37139	(w‡) 37101	(w‡‡) 37126			
(w+) 37140	(w‡+) 37103	(w‡+) 37151			
(w+) 37141	(w‡) 37104	(w‡) 37152			
(w+) 37149	(w‡+) 37108	(w+) 37289			
(w‡+) 37235	(w+) 37125	(w‡) 37290			
		(w‡) 37292			

FIFTY-ONE SKELETAL ELEMENTS

Five humeri. ( <i>Figure 10, 37296B</i> ).....	37296A-E
Nine radii. ( <i>Figure 10, 37297G</i> ).....	37297A-I
Two ulnae. ( <i>Figure 10, 37298B</i> ).....	37298A-B
Two femora. ( <i>Figure 10, 42332A</i> ).....	42332A-B
Seven tibiae. ( <i>Figure 10, 37295B</i> ).....	37295A-G
Metacarpal III. <i>Figure 10</i> .....	42336
Metatarsal III. <i>Figure 10</i> .....	42337
Fourteen metapodials.....	43003A-N
Five calcanea.....	43001A-E
Five astragali.....	43002A-E

(C) FROM VERSION QUARRY, ANTELOPE DRAW, "LOWER SNAKE CREEK" DEPOSITS, SIOUX COUNTY, NEBRASKA:

SKULL

Skull with I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> , lacking nasals, frontals, and left zygomatic arch.....	(M+)	F:A.M. 34212
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TWO MAXILLÆ

Right maxilla with M <sup>1</sup> (br.)-M <sup>3</sup> .....	(w+)	37188
Left maxilla with P <sup>2</sup> -P <sup>4</sup> alv. and M <sup>1</sup> -M <sup>2</sup> .....	(M)	34255

## FIVE MANDIBULAR SPECIMENS

		F:A.M.
Partial right ramus with /C(alv.)-M <sub>3</sub> (br.).....	(M)	34207
Four partial left rami with		
I <sub>2</sub> -/C alv. and P <sub>1</sub> -M <sub>3</sub> .....	(w+)	34213
M <sub>2</sub> (br.)-M <sub>3</sub> .....	(w+)	34252
M <sub>2</sub> -M <sub>3</sub> .....	(w <sup>+</sup> )	34266
M <sub>1</sub> -M <sub>2</sub> (br.).....	(M)	34344
(D) FROM HUMBURG QUARRY, RANCHHOUSE DRAW, "LOWER SNAKE CREEK" DEPOSITS, SIOUX COUNTY, NEBRASKA:		

## TEN SKULLS

		F:A.M.
Seven skulls with		
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> , lacking nasals and left zygomatic arch..	(w)	42424
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> , lacking nasals.....	(M+)	42425
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> , lacking nasals, orbits, and left zygomatic arch.....	(w)	42426
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> (P <sup>2</sup> alv.), slightly crushed, lacking part of nasals and occipital region.....	(w <sup>++</sup> )	42427
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> , lacking anterior of nasals and right zygomatic arch.....	(M)	42461
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> , lacking nasals and supraoccipital region..	(w+)	42462
C/-dP <sup>2</sup> -M <sup>3</sup> (germ), lacking nasals, supraoccipital region, and most of zygomatic arches.....	(I)	42464
Three anterior portions of skulls with		
I <sup>1</sup> -I <sup>3</sup> alv. and C/-dP <sup>2</sup> -M <sup>2</sup> (br.).....	(I)	42421
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> , nasals present.....	(w <sup>++</sup> )	42463
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> (P <sup>1</sup> , P <sup>2</sup> alv.).....	(w <sup>++</sup> )	42467

## EIGHT MAXILLÆ

Five right maxillæ with		
P <sup>1</sup> -P <sup>2</sup> .....	(w)	42419
P <sup>1</sup> (alv.)-M <sup>2</sup> (br.).....	(w+)	42420
C/-M <sup>3</sup> (br.) (P <sup>1</sup> alv.).....	(w+)	42422
The length of the above dental series is less than the average of this species from Echo Quarry.		
dP <sup>3</sup> -dP <sup>4</sup> .....	(I)	42458
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> (P <sup>2</sup> -P <sup>3</sup> alv., M <sup>1</sup> br.).....	(w <sup>++</sup> )	42460
Three left maxillæ with		
P <sup>4</sup> -M <sup>2</sup> (br.).....	(w+)	42423
C/(rt.)-M <sup>3</sup> (br.) (P <sup>1</sup> alv.).....	(w+)	42457
M <sup>1</sup> (br.)-M <sup>3</sup> .....	(w+)	42459

## FORTY MANDIBULAR SPECIMENS

Mandible with I <sub>1</sub> -/C alv. and P <sub>1</sub> -M <sub>3</sub> .....	(w)	42453
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Four partial mandibles with		F:A.M.
I <sub>1</sub> -P <sub>1</sub> alv. and P <sub>2</sub> -M <sub>2</sub> .....	(w±)	42409
I <sub>1</sub> -C alv. and P <sub>1</sub> -M <sub>3</sub> (P <sub>2</sub> -P <sub>4</sub> alv., M <sub>1</sub> rt.).....	(w±+)	42452
M <sub>3</sub> .....	(w+)	42454
I <sub>1</sub> -P <sub>3</sub> (I <sub>3</sub> -C rt.).....	(w+)	42455
Ten right rami with		
P <sub>1</sub> (rt.)-M <sub>3</sub> .....	(w±)	37538
The P <sub>2</sub> -P <sub>4</sub> of the above specimen are quite large in comparison with the average of this species.		
P <sub>1</sub> (br.)-P <sub>4</sub> .....	(w)	37539
P <sub>1</sub> -M <sub>3</sub> (P <sub>2</sub> alv.).....	(w±)	42412
I <sub>1</sub> -P <sub>1</sub> alv. and P <sub>2</sub> -M <sub>3</sub> .....	(w±)	42413
I <sub>1</sub> -P <sub>4</sub> alv. and M <sub>1</sub> -M <sub>3</sub> .....	(w±+)	42414
P <sub>2</sub> (alv.)-M <sub>3</sub> (M <sub>2</sub> -M <sub>3</sub> br.).....	(w+)	42440
I <sub>1</sub> -C alv. and P <sub>1</sub> -M <sub>3</sub> .....	(w)	42441
M <sub>1</sub> -M <sub>3</sub> (br.).....	(w±)	42442
P <sub>3</sub> (br.)-M <sub>3</sub> .....	(w±)	42443
M <sub>2</sub> -M <sub>3</sub> .....	(w)	42444
Nine right rami, immature, with		
I <sub>1</sub> (alv.)-I <sub>2</sub> (germ)-P <sub>1</sub> -P <sub>2</sub> (germ)-dP <sub>4</sub> -M <sub>2</sub> (I <sub>3</sub> -C, P <sub>3</sub> alv.).....	(i)	42416
I <sub>1</sub> -C alv. and P <sub>1</sub> (erupt.)-dP <sub>4</sub> (alv.)-M <sub>2</sub> .....	(i)	42439
P <sub>1</sub> (erupt.)-dP <sub>3</sub> -M <sub>2</sub> (germ).....	(i)	42445
P <sub>1</sub> (erupt.)-dP <sub>4</sub> -M <sub>1</sub> .....	(i)	42446
I <sub>1</sub> -P <sub>1</sub> alv. and dP <sub>2</sub> -M <sub>1</sub> .....	(i)	42447
I <sub>1</sub> -P <sub>2</sub> alv. and dP <sub>3</sub> -dP <sub>4</sub> .....	(i)	42448
P <sub>3</sub> -dP <sub>4</sub> -M <sub>1</sub> .....	(i)	42449
dP <sub>4</sub> -M <sub>1</sub> .....	(i)	42450
I <sub>1</sub> -I <sub>3</sub> alv. and C/-dP <sub>2</sub> -M <sub>1</sub> (P <sub>1</sub> alv.).....	(i)	42451
Eleven left rami with		
I <sub>1</sub> -C alv. and P <sub>1</sub> -M <sub>3</sub> .....	(w+)	37540
The P <sub>3</sub> of the above specimen is quite large.		
M <sub>1</sub> -M <sub>3</sub> .....	(w±)	42410
I <sub>1</sub> (alv.)-M <sub>3</sub> (I <sub>2</sub> rt., I <sub>3</sub> -P <sub>1</sub> alv.).....	(w±+)	42411
I <sub>1</sub> (alv.)-M <sub>3</sub> (I <sub>2</sub> rt., I <sub>3</sub> -C alv.).....	(w±+)	42415
P <sub>3</sub> (alv.)-M <sub>3</sub> (br.) (P <sub>4</sub> , M <sub>2</sub> br.).....	(w+)	42417
I <sub>2</sub> -I <sub>3</sub> alv. and /C-M <sub>3</sub> .....	(w±±)	42429
I <sub>1</sub> -C alv. and P <sub>1</sub> (br.)-M <sub>3</sub> .....	(w)	42431
I <sub>1</sub> -P <sub>1</sub> alv. and P <sub>2</sub> -M <sub>3</sub> (br.) (P <sub>3</sub> alv.).....	(w±±)	42432
I <sub>1</sub> -C alv. and P <sub>1</sub> -M <sub>3</sub> .....	(w±)	42433
I <sub>1</sub> -C alv. and P <sub>1</sub> -M <sub>3</sub> .....	(w+)	42435
I <sub>1</sub> (alv.)-M <sub>3</sub> (I <sub>3</sub> alv.).....	(w+)	42436
Five left rami, immature, with		
dP <sub>4</sub> -M <sub>2</sub> .....	(i)	42418
I <sub>1</sub> -C alv. and P <sub>1</sub> -dP <sub>3</sub> -P <sub>4</sub> (alv.)-M <sub>2</sub> (erupt.).....	(i)	42434
I <sub>1</sub> -P <sub>1</sub> alv. and dP <sub>2</sub> -dP <sub>3</sub> .....	(i)	42437
I <sub>1</sub> -P <sub>1</sub> alv. and dP <sub>2</sub> -P <sub>4</sub> (alv.)-M <sub>1</sub> (erupt.).....	(i)	42438
dP <sub>4</sub> -M <sub>2</sub> (br.).....	(i)	42465

## SIX SKELETAL ELEMENTS

Two radii	F:A.M.
Radius (equal to Echo Quarry examples).....	42428
Radius (more massive than Echo Quarry examples).....	42456
Femur (equal to Echo Quarry examples).....	42430
Two tibiae	
Tibia (more massive than Echo Quarry examples).....	42466
Tibia (longer and heavier than average Echo Quarry examples)	42468
Metatarsal.....	43015

## STATEMENT

The material from Humbug Quarry, which is represented by sixty-four specimens, shows a different range of variation in size than the four hundred and two specimens from Echo Quarry. The following table gives the comparison of measurements of material from the two quarries. The measurements show that the material from Humbug Quarry has a slightly different range of size from that of Echo Quarry, but not enough to warrant separation into distinct varieties. The two quarries are probably only in part stratigraphically contemporaneous.

*Brachycrus siouense*, referred

	Skulls				Rami	
	Basal length		Width		C/-M <sup>3</sup>	
	min.	max.	min.	max.	min.	max.
Echo Quarry	218.	246.	151.	180.	125.	149.
Humbug Quarry	234.	254.	160.	190.	134.	147.

	Limbs					
	Radii		Femora		Tibiae	
	min.	max.	min.	max.	min.	max.
Echo Quarry	115.	131.	179.	184.	137.	146.
Humbug Quarry	123.	136.	180.		150.	166.

(E) FROM QUARRY 6,  $\frac{1}{4}$  MI. N. OF OLCOTT HILL, "LOWER SNAKE CREEK" DEPOSITS, SIOUX COUNTY, NEBRASKA (collected by Albert Thomson and associates, 1925):

	A.M.
Left maxilla with M <sup>1</sup> (alv.)-M <sup>3</sup> ..... (w+)	21422
Right ramus with I <sub>1</sub> -/C alv. and P <sub>1</sub> (br.)-M <sub>3</sub> (br.) (P <sub>2</sub> rt.)..... (w+)	22049
Two left rami with	
/C-P <sub>2</sub> alv. and P <sub>3</sub> -M <sub>3</sub> ..... (w+)	21423
I <sub>1</sub> -P <sub>2</sub> alv. and P <sub>3</sub> -M <sub>3</sub> (br.)..... (w $\frac{1}{2}$ )	22057

## (F) FROM INDEFINITE LOCALITY, (?) "LOWER SNAKE CREEK" DEPOSITS, SIOUX COUNTY, NEBRASKA:

	F:A.M.
Anterior portion of skull with C/-M <sup>3</sup> (P <sup>1</sup> alv.)..... (w+)	33577

- (G) FROM THE REGION WEST AND SOUTHWEST OF HAY SPRINGS, DAWES COUNTY, NEBRASKA [collected by Ted Galusha, 1935-1938 (F:A.M. and F:B:A.M. numbers) and M. K. Elias, 1933 (K.U. number)]:

From Observation Quarry:

MAXILLA

Left maxilla with C/-P <sup>3</sup> (P <sup>1</sup> alv.).....	(M)	F:A.M. 34287
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MANDIBULAR SPECIMEN

Partial right ramus with I <sub>1</sub> -/C alv. and P <sub>1</sub> (br.)-M <sub>2</sub> (br.).....	(w+)	34286
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EIGHT SKELETAL ELEMENTS

Radius.....		42408
Five metapodials.....		43011A-E
Astragalus.....		43010
Calcaneum.....		43009

From Ginn Quarry:

TWO MAXILLÆ, IMMATURE

Two partial right maxillæ, immature, with		F:B:A.M.
P <sup>1</sup> (erupt.)-dP <sup>3</sup> .....	(i)	33639
dP <sup>4</sup> -M <sup>2</sup> (br.).....	(i)	33650

TWO MANDIBULAR SPECIMENS

Two right rami with		
I <sub>1</sub> -/C alv. and P <sub>1</sub> -M <sub>3</sub> (br.).....	(w‡)	33655
I <sub>1</sub> -/C alv. and P <sub>1</sub> (br.)-M <sub>2</sub> (P <sub>2</sub> -P <sub>4</sub> alv.).....	(w‡+)	33657

From Jorgenson Quarry:

MAXILLA

Partial left maxilla with M <sup>1</sup> (alv.)-M <sup>3</sup> .....	(w‡)	F:B:A.M. 33649
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From Sand Canyon, southwest of Hay Springs:

Mandible with I <sub>1</sub> -M <sub>3</sub> , associated with radius, ulna, femur, and misc. vertebræ.....	(w‡)	37215
Radius, ulna, and manus.....		42497
Occipital region of skull, partial mandible with I <sub>1</sub> (alv.)-M <sub>3</sub> , radius, ulna, and partial manus.....	(w‡)	K.U. 3972

(7) *Brachycrus wilsoni*,<sup>1</sup> new species

From the Miocene Deposits ("Sheep Creek"<sup>2</sup> Horizon) of Sioux County, Nebraska

*Pronomotherium siouense*, variety, MATTHEW, 1924, Bull. Amer. Mus. Nat. Hist., L, Art. 2, p. 184.

## SPECIFIC CHARACTERS

**SKULL.**—Mesocephalic; longer but noticeably narrower than examples of *B. laticeps*; longer and more massive than those of *B. siouense*; malar quite deep and massive; nasals (only incompletely preserved) appear to protrude upward as in *B. siouense*; superior border of the maxilla similar to that of *B. siouense*, in rising very gradually to a point anterior of the nasals, also in the widening of the border surface and the rapid ascent to the nasals; orbits large and oblong.

**MANDIBLE.**—Lighter construction than examples of *B. laticeps*, and more massive than those of *B. siouense*; inferior border of the ramus with gradual descent from below anterior of  $M_2$ , reaching maximum below posterior of  $M_3$ . (The examples of this genus show a great variation of the inferior border and the angle of the rami. All rami of this genus have the concave inferior border characteristic of the genus.)

**DENTITION.**—Dental series approximately equal in length to those of *B. laticeps*; more massive than either *B. laticeps* or *B. siouense*; molar series longer than in the latter species.

**LIMBS.**—Slightly heavier than examples of *B. laticeps*; somewhat heavier and longer than in *B. siouense*.

**MEASUREMENTS.**—Tables I and II.

## DISCUSSION

In 1924 Matthew,<sup>3</sup> referring to numerous specimens belonging to "*Pronomotherium siouense*, variety," stated:

"A number of upper and lower jaws from the Sheep Creek beds at Stonehouse draw (Sheep Creek, Hor. A) are referable to the genus and not positively distinguishable from *P. siouense*. I regard them provisionally as a variant, and specify as type No. 18344, upper jaw. The size is a little larger throughout, the premolars, especially the anterior ones, proportionately larger and more robust but not showing any clearly distinctive construction."

Matthew hesitated to propose a name for the variant, probably because of insufficient material on which to base a differentiation. With the additional specimens now at hand, the writers believe it necessary to consider this variant as a

<sup>1</sup> Named in honor of Jack Wilson who has been conducting extensive field work in the Sheep Creek-Snake Creek area of Nebraska for the Frick Laboratory since 1932.

<sup>2</sup> The limited meaning of the Sheep Creek is here used. Only the deposits below the "Lower Snake Creek" horizon are referred to in this usage.

<sup>3</sup> Matthew, W. D., 1924, op. cit., p. 184.



distinct species, *B. wilsoni*. Specimens referred to this new form are definitely larger and more massive than those of *P. siouense* and the skull proportionately narrower.

Matthew noted that "*Pronomotherium siouense*, variety" occurred in the "Sheep Creek" and "*Pronomotherium siouense*" in the "Lower Snake Creek." Field work carried on in the type area since 1924 confirms Matthew's contention that the two forms are found at different faunal levels in the same area.

F:A.M. collections from Sioux County, Nebraska, have been made by Jack Wilson, Carl Long, and their associates, 1933-1937.

Ninety-six specimens are here recorded:

HOLOTYPE.—Skull with I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> , lacking nasals. (w†)	F:A.M. 34202	From "Sheep Creek" deposits, Greenside Quarry, Ranchhouse Draw, Sioux County, Nebraska.
		- Figures 1, 7, 11.

REFERRED.—

(A) FROM TYPE LOCALITY (GREENSIDE QUARRY):

TWO SKULLS, IMMATURE

Skull with I <sup>1</sup> -I <sup>3</sup> alv. and C/-dP <sup>3</sup> -M <sup>3</sup> (germ) (P <sup>1</sup> -P <sup>2</sup> alv.), lacking nasals. <i>Figure 11</i> .....	(I)	F:A.M. 33551
Partial skull with I <sup>1</sup> -I <sup>3</sup> alv. and C/(germ)-dP <sup>2</sup> -M <sup>1</sup> (P <sup>1</sup> alv.). <i>Figure 11</i> .....	(I)	33573

FIVE MAXILLÆ

Partial right maxilla with P <sup>3</sup> -M <sup>3</sup> .....	(w†)	34204
Immature, partial right maxilla with C/(br.)-dP <sup>2</sup> -M <sup>2</sup> (P <sup>1</sup> alv.)..	(I)	34278
Three partial left maxillæ with		
P <sup>3</sup> -M <sup>3</sup> .....	(w†)	33665
C/-M <sup>3</sup> (br.) (P <sup>1</sup> , M <sup>1</sup> alv.).....	(w)	33666
M <sup>1</sup> -M <sup>2</sup> .....	(w+)	34347

FIFTEEN MANDIBULAR SPECIMENS

Three right rami with		
I <sub>2</sub> /C alv. and P <sub>1</sub> -M <sub>3</sub> (br.).....	(w†)	33579
/C(alv.)-M <sub>3</sub> (br.).....	(w+)	34210
/C-M <sub>3</sub> (P <sub>2</sub> -P <sub>3</sub> alv.).....	(M)	34273
Three right rami, immature, with		
I <sub>3</sub> /C alv. and P <sub>1</sub> -dP <sub>4</sub> -M <sub>2</sub> (P <sub>2</sub> -P <sub>3</sub> alv.).....	(I)	34280
dP <sub>3</sub> -M <sub>1</sub> (rt.).....	(I)	34338
I <sub>1</sub> -I <sub>3</sub> rt. and P <sub>1</sub> -dP <sub>4</sub> -M <sub>2</sub> (/C, P <sub>2</sub> -P <sub>3</sub> alv.).....	(I)	33578

Four left rami with		F:A.M.
I <sub>1</sub> (alv.)-M <sub>3</sub> (br.) (M <sub>2</sub> br.) <i>Figure 7</i> .....	(w)	33670
P <sub>4</sub> -M <sub>3</sub> (P <sub>4</sub> very large).....	(M+)	33558
I <sub>1</sub> -/C alv. and P <sub>1</sub> -M <sub>3</sub> (P <sub>2</sub> alv., M <sub>1</sub> , M <sub>3</sub> br.).....	(w <sup>+</sup> )	33561
I <sub>1</sub> -I <sub>3</sub> alv. and /C(rt.)-M <sub>3</sub> .....	(w)	33672
Five left rami, immature, with		
I <sub>3</sub> -/C alv. and P <sub>1</sub> -dP <sub>3</sub> -M <sub>3</sub> (germ) (P <sub>1</sub> erupt., P <sub>2</sub> alv., M <sub>2</sub> br.)....	(I)	34279
I <sub>3</sub> -/C alv. and P <sub>1</sub> (germ)-dP <sub>2</sub> -M <sub>2</sub> (germ).....	(I)	34281
I <sub>1</sub> -/C alv. and P <sub>1</sub> (germ)-dP <sub>2</sub> -M <sub>2</sub> (erupt.).....	(I)	34282
I <sub>1</sub> -/C alv. and P <sub>1</sub> -dP <sub>3</sub> -M <sub>3</sub> (erupt.)(P <sub>2</sub> alv.).....	(I)	34285
dP <sub>4</sub> -M <sub>1</sub> .....	(I)	34342

## FIFTEEN SKELETAL ELEMENTS

Humerus <i>Figure 10</i> .....	37515
Radius <i>Figure 10</i> .....	37517
Ulna <i>Figure 10</i> .....	37516
Metacarpal III <i>Figure 10</i> .....	42339
Metatarsal III <i>Figure 10</i> .....	42338
Nine metapodials.....	42498A-I
Astragalus.....	42499

(B) FROM HILLTOP QUARRY, ANTELOPE DRAW, "SHEEP CREEK"  
DEPOSITS, SIOUX COUNTY, NEBRASKA:

## THREE MAXILLÆ

Right maxilla with P <sup>4</sup> -M <sup>1</sup> br. and M <sup>1</sup> -M <sup>2</sup> .....	(w+)	36189
Two left maxillæ with		
C/(rt.)-M <sup>3</sup> .....	(w)	36188
P <sup>2</sup> -M <sup>3</sup> .....	(w)	37159

## NINE MANDIBULAR SPECIMENS

Two right rami with		
M <sub>1</sub> -M <sub>2</sub> .....	(w <sup>+</sup> )	37510
P <sub>4</sub> -M <sub>1</sub> .....	(w+)	37513
Two right rami, immature, with		
dP <sub>4</sub> -M <sub>1</sub> (br.).....	(I)	37511
I <sub>1</sub> -P <sub>2</sub> alv. and dP <sub>3</sub> -dP <sub>4</sub> .....	(I)	37512
Five left rami with		
I <sub>2</sub> -/C alv. and P <sub>1</sub> (rt.)-P <sub>4</sub> (P <sub>2</sub> alv.).....	(w)	37142
(P <sub>3</sub> -P <sub>4</sub> rather large)		
P <sub>1</sub> -M <sub>2</sub> (P <sub>2</sub> alv.).....	(w)	37145
P <sub>2</sub> (rt.)-M <sub>1</sub> .....	(w+)	37147
I <sub>2</sub> -M <sub>3</sub> (br.).....	(w)	37157
I <sub>1</sub> (alv.)-M <sub>3</sub> (I <sub>2</sub> -/C rt., M <sub>2</sub> br.).....	(w+)	37514

## SKELETAL ELEMENT

F:A.M.  
43006

Calcaneum.....

(C) FROM LONG QUARRY, ANTELOPE DRAW, "SHEEP-CREEK"  
DEPOSITS, SIOUX COUNTY, NEBRASKA:

## TWO PARTIAL SKULLS

Anterior portion of skull with P<sup>2</sup>-M<sup>3</sup>..... (w±) 34203  
 Immature, partial skull with C/-P<sup>1</sup> erupt. and dP<sup>2</sup>-M<sup>1</sup>..... (i) 34284

## NINE MAXILLÆ

Three right maxillæ with  
 C/-M<sup>1</sup> (P<sup>4</sup> very large)..... (w) 33674  
 M<sup>2</sup>-M<sup>3</sup>..... (w+) 34276  
 M<sup>2</sup>-M<sup>3</sup>..... (w+) 34277

Five left maxillæ with  
 C/-M<sup>1</sup>..... (m) 33673  
 C/-M<sup>3</sup>..... (w±) 34205  
 P<sup>3</sup>-M<sup>2</sup>..... (w±) 34256  
 P<sup>2</sup>-M<sup>3</sup>..... (w+) 34275  
 P<sup>4</sup>-M<sup>3</sup>..... (w±+) 36193

Immature, left maxilla with C/-dP<sup>4</sup>-M<sup>3</sup> (P<sup>2</sup>-P<sup>3</sup> germs)..... (i) 34283

## FIFTEEN MANDIBULAR SPECIMENS

Ten partial right rami with  
 I<sub>3</sub>-/C alv. and P<sub>1</sub>-M<sub>3</sub>..... (w+) 33667  
 /C(alv.)-M<sub>2</sub> (P<sub>3</sub> alv.) (P<sub>3</sub>-P<sub>4</sub> very large)..... (w) 33668  
 P<sub>3</sub>(alv.)-M<sub>3</sub>..... (m+) 33678  
 I<sub>1</sub>-/C alv. and P<sub>1</sub>-M<sub>3</sub>..... (w+) 34206  
 I<sub>1</sub>-/C alv. and P<sub>1</sub>-M<sub>3</sub>(br.)..... (w±+) 34208  
 P<sub>1</sub>-P<sub>4</sub> (P<sub>2</sub>-P<sub>3</sub> quite small)..... (w+) 34263  
 M<sub>1</sub>-M<sub>2</sub>..... (m) 34337  
 M<sub>1</sub>-M<sub>2</sub>(br.)..... (w) 34340  
 I<sub>2</sub>-I<sub>3</sub> alv. and /C-M<sub>3</sub>..... (w+) 36205  
 P<sub>4</sub>-M<sub>1</sub> alv. and M<sub>2</sub>-M<sub>3</sub>..... (w±+) 37146

Five partial left rami with  
 M<sub>1</sub>-M<sub>3</sub>..... (w+) 33562  
 I<sub>1</sub>-/C alv. and P<sub>1</sub>-M<sub>3</sub>..... (m+) 33569  
 M<sub>2</sub>-M<sub>3</sub>..... (w±) 34253  
 I<sub>2</sub>(alv.)-P<sub>4</sub> (I<sub>3</sub> rt., /C alv.)..... (w+) 34254  
 M<sub>1</sub>(br.)-M<sub>3</sub>..... (w±+) 34274

## TWO SKELETAL ELEMENTS

Metapodial..... 43007  
 Astragalus..... 43008

(D) FROM THOMSON QUARRY, STONEHOUSE DRAW, "SHEEP CREEK"  
DEPOSITS, SIOUX COUNTY, NEBRASKA:

SKULL	F:A.M.
Skull with I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> , lacking nasals and occipital region (m)	34201

## FOUR MANDIBULAR SPECIMENS

Two partial right rami with	
P <sub>1</sub> -M <sub>1</sub> (br.) (P <sub>2</sub> alv.).....	(w) 34271
/C-P <sub>4</sub> (P <sub>3</sub> alv.) (P <sub>4</sub> very large).....	(m) 34272
Two partial left rami with	
P <sub>3</sub> (rt.)-M <sub>3</sub> (P <sub>4</sub> large).....	(w) 33565
I <sub>1</sub> -P <sub>1</sub> alv. and P <sub>2</sub> -M <sub>3</sub> .....	(w††) 33671

## FIVE SKELETAL ELEMENTS

Three metapodials.....	42499A-C
Two calcanea.....	42500A-B

(D') FROM STONEHOUSE DRAW (collected by Albert Thomson and  
associates, 1922-1925):

	A.M.
Right maxilla with P <sup>2</sup> (br.)-M <sup>3</sup> .....	(w+) 18953
Left maxilla and fragment of right with P <sup>1</sup> -M <sup>3</sup> .....	(w) 18344
"Type" of " <i>P. siouense</i> , variety" Matthew (op. cit., p. 184).	
Right ramus with I <sub>2</sub> -I <sub>3</sub> alv. and /C-M <sub>3</sub> (P <sub>2</sub> alv.).....	(w) 21421
Left ramus with I <sub>2</sub> -/C alv. and P <sub>1</sub> -M <sub>3</sub> (br.) (P <sub>1</sub> -P <sub>2</sub> rt.).....	(w+) 18345

(E) FROM INDEFINITE LOCALITY, (?) "SHEEP CREEK" DEPOSITS  
SIOUX COUNTY, NEBRASKA (collected by American Museum  
party, 1908):

## TWO PARTIAL MAXILLÆ

Right maxilla with P <sup>4</sup> and M <sup>1</sup> -M <sup>3</sup> br.....	(w†) 14066
Left maxilla with M <sup>3</sup> .....	(w†) 14068

The foregoing two specimens were referred to "*Metoreodon profectus*" by Matthew and Cook (1909, op. cit., p. 394). Specimen A.M.14066 shows evidence of the typical facial cavity of *Brachycrus*.

*M. profectus* has been found in the "upper Snake Creek" (Pliocene) but has not been reported from the earlier "lower Snake Creek" or Sheep Creek deposits (Miocene). The fossilization of the two examples in question more nearly resembles Sheep Creek than "upper Snake Creek" material.

## TENTATIVELY REFERRED.—

(F) FROM SAND CANYON, DAWES COUNTY, NEBRASKA (collected by  
Ted Galusha, 1938):

	F:A.M.
Partial right ramus with M <sub>1</sub> (br.)-M <sub>3</sub> (br.).....	(w+) 42496

(7a) *Brachycrus wilsoni longensis*,<sup>1</sup> new variety

From the Miocene Deposits ("Sheep Creek"<sup>2</sup> Horizon) of Sioux County, Nebraska

## VARIETAL DESCRIPTION

SKULL.—Differs from examples of *B. wilsoni* as follows: not as wide across infraorbital foramina; palate narrower anterior of P<sup>1</sup>; pronounced pinching together of the spout-shaped depression on the premaxillæ, creating a flare above and below the compressed area on either side of the muzzle, and resulting in an inflated region around the canine.

MANDIBLE.—Unknown.

DENTITION.—Superior series somewhat smaller than the type of *B. wilsoni*, but within the variation found in that species; premolar series approximately equal in length to those of *B. wilsoni*, but molar series shorter, due to the small heel of M<sup>3</sup> (the heel, however, varies in the referred material of *B. wilsoni*); inferior series unknown.

LIMBS.—Unknown.

MEASUREMENTS.—Table I.

One listed specimen:

HOLOTYPE.—Anterior portion of skull with I <sup>1</sup> -I <sup>2</sup> alv. and I <sup>3</sup> -M <sup>3</sup> . (w†)	F:A.M.33574	From the Sheep Creek deposits, Long Quarry, Antelope Draw, Sioux County, Nebraska; collected by Jack Wilson and Carl Long, 1934.
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Figure 9.

(8) *Brachycrus rusticus* (Leidy), genotype

From the Miocene Deposits of the Sweetwater River Area of Wyoming

*Merycochoerus rusticus* LEIDY, 1870, Proc. Acad. Nat. Sci. Phila., XXII, p. 109; 1873, Report U. S. Geol. Surv. Territories, I (Hayden), p. 199, Pl. III, Figs. 1-3; Pl. VII, Figs. 1-5; Pl. XX, Figs. 9-11.

*Merycochoerus (Brachycrus) rusticus* (LEIDY), MATTHEW, 1901, Mem. Amer. Mus. Nat. Hist., I, Pt. 7, p. 398.

*Ticholeptus rusticus* (LEIDY), LOOMIS, 1920, Amer. Jour. Sci., (4), L, p. 281. THORPE, 1937, Mem. Peabody Mus., III, Pt. 4, p. 194, Pl. XXVIII, Figs. 1-2.

## SPECIFIC CHARACTERS

SKULL.—Brachycephalic; smallest known of the genus; somewhat lighter than examples of *B. siouense*; nasals greatly shortened and apparently protruding straight forward and not upward as in *B. siouense*.

<sup>1</sup> Name derived from Long Quarry, which in turn had been named after Carl Long of the Frick Laboratory.

<sup>2</sup> The limited meaning of the Sheep Creek is here used. Only the deposits below the "Lower Snake Creek" horizon are referred to in this usage.

MANDIBLE.—Small and light; smaller than in *B. siouense*, the nearest related species.

DENTITION.—Series smallest known of the genus; slightly lighter than in *B. siouense*; P<sup>1</sup> very small.

LIMBS.—Approximate size of examples of *B. siouense*.

MEASUREMENTS.—Table I.

#### DISCUSSION

Peterson,<sup>1</sup> in his discussion of *Merychys medius* Leidy, stated:

“Very careful comparison with the types of *Merychys medius*, *Merychoerus rusticus*, and the specimens in the Carnegie Museum shows that the dentition is so nearly identical as not to warrant separation. Other features of the cranium of the type specimen of *Merychoerus rusticus*, however, differ from the specimens here referred to *Merychys medius* in having the muzzle more produced in front of the nasals, and the infraorbital foramen placed further back as in *Merychoerus proprius*.”

The present writers have also observed that the two forms are similar in many respects, but a close comparison shows that the position of the infraorbital foramina and the type of nasals are distinct enough to warrant generic separation.

Nineteen specimens are here recorded:

GENOHOLOTYPE.—Anterior portion of skull with I <sup>1</sup> (br.)—M <sup>2</sup> (P <sup>4</sup> br.) and partial mandible with I <sub>1</sub> —I <sub>2</sub> alv. and I <sub>3</sub> (rt.)—M <sub>3</sub> (br.) (P <sub>1</sub> br.) (w†)	N.M.145	From near Devil's Gate, Sweet-water River area, Wyoming; collected by F. V. Hayden. Figured by Leidy, 1873, Pl. III, Figs. 1-3; Thorpe, 1937, Pl. XXVIII, Figs. 1-2. <i>Figure 2.</i>
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The genoholotype is usually listed as including the left ramus only, but there is a partial right ramus in the National Museum collection that has the same number (N.M.145). The fossilization, size, and stage of wear of the teeth of this latter specimen are the same as that of the left ramus.

#### REFERRED.—

(A) FIFTEEN ADDITIONAL SPECIMENS FROM THE TYPE AREA (collected by F. V. Hayden):

SIX MAXILLÆ		
Right and left maxillæ with M <sup>1</sup> —M <sup>3</sup> . (w)	N.M.442	Figured by Leidy, 1873, Pl. VII, Fig. 1. <i>Figure 2</i> (in part).
Left maxilla with M <sup>1</sup> . (w)	443	
Left maxilla with P <sup>3</sup> (alv.)—M <sup>1</sup> . (w†)	443	

It is quite possible that the left maxilla, N.M.443, and the right maxilla, N.M.916, may be of the same skull.

<sup>1</sup> Peterson, O. A., 1906, Ann. Carn. Mus., IV, No. 1, pp. 63-67.

Left maxilla with dP <sup>3</sup> -dP <sup>4</sup> . (i)	N.M.536	Pl. VII, Fig. 2.
Left maxilla with P <sup>2</sup> -P <sup>3</sup> . (w)	537	Pl. VII, Figs. 3-4.
Right maxilla with P <sup>4</sup> (br.)-M <sup>1</sup> . (w)	916	

## SEVEN MANDIBULAR SPECIMENS

Partial mandible with M <sub>1</sub> (br.)-M <sub>3</sub> . (w)	444	
Three partial right rami with M <sub>3</sub> (br.). (w)	444	<i>Figure 2.</i>
M <sub>1</sub> (br.)-M <sub>3</sub> (br.). (w)	444	
M <sub>1</sub> -M <sub>2</sub> . (w+)	444	
Left ramus with P <sub>3</sub> (alv.)-M <sub>3</sub> (M <sub>2</sub> , M <sub>3</sub> rt.). (w)	444	
Two symphyses with I <sub>1</sub> -I <sub>3</sub> br. and /C-P <sub>1</sub> (br.). (w)	535	Pl. VII, Fig. 5.
Immature, I <sub>1</sub> -P <sub>3</sub> (germ) (I <sub>3</sub> germ, /C-P <sub>1</sub> br., P <sub>2</sub> germ). (i)	441	

## SKELETAL ELEMENTS

Right calcaneum (very pathological).	532	
Distal end of tibia, calcaneum, and astragalus.	913	Pl. XX, Figs. 9-11.

(B) THREE REFERRED SPECIMENS FROM EXPOSURE 2A, 7 MI. N.E. OF MUDDY GAP, SWEETWATER RIVER AREA,<sup>1</sup> FREMONT COUNTY, WYOMING (collected by Nelson J. Vaughan, John Lynch, and Charles H. Falkenbach, 1937-1938):

## TWO SKULLS

Skull with P <sup>1</sup> -M <sup>3</sup> , lacking nasals, premaxillæ, and occipital region. (M)	F:A.M. 36105	<i>Figures 1, 3.</i>
Partial skull (in two sections, without contact) with I <sup>1</sup> -P <sup>2</sup> and posterior portion with P <sup>4</sup> (br.)-M <sup>3</sup> , and partial right ramus with P <sub>4</sub> -M <sub>3</sub> . (M+)	37587	

The above specimen is larger than the holotype and the referred skull (F:A.M.36105). It was collected from a different horizon than the referred skull and may represent a distinct variety.

## MANDIBLE

Partial mandible with I <sub>1</sub> -M <sub>3</sub> (I <sub>1</sub> , I <sub>3</sub> alv.). (w+)	37588	<i>Figure 3.</i>
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<sup>1</sup> See discussion of Sweetwater River collecting localities, p. 250.

(9) **Brachycrus sweetwaterensis**,<sup>1</sup> new species

From the Miocene Deposits of the Sweetwater River Area of Wyoming

## DESCRIPTION

**SKULL.**—Brachycephalic; exceptionally high above the molar region; average length, slightly longer than *B. laticeps*; longer and wider than *B. vaughani*; nasals long, posterior edge more or less circular, with a rounded superior surface (in *B. laticeps* the nasals are more triangular in outline); the superior border of the maxillæ rises sharply to the nasals without a noticeable break (in *B. vaughani* there is a definite break before the abrupt rise of the border to the nasals); orbits oblong in shape; condyles slightly lighter than *B. laticeps*.

**MANDIBLE.**—Inferior border of ramus descends abruptly below  $M_3$ , reaching maximum depth posterior to  $M_3$ ; having less depth below  $M_3$  (anterior) than shown in example of *B. laticeps*; angle of ramus more like holotype of *B. elrodi*.

**DENTITION.**—Superior and inferior series approximately same length as in *B. laticeps*, but somewhat heavier; heel of  $M_3$  about size of that of *B. laticeps*, decidedly larger than *B. elrodi*.

**LIMBS.**—Moderately heavy; considerable variation in length and robustness, probably due to sexual variation.

**MEASUREMENTS.**—Tables I and II.

## DISCUSSION

The heights of the skull and the superior border of the maxillæ definitely separate this species from *B. vaughani*. The limbs apparently are about the same size in both species.

Material listed under this species was collected by Nelson J. Vaughan, John Lynch, and Charles H. Falkenbach, 1937–1938.

## SWEETWATER RIVER COLLECTING LOCALITIES

The Miocene exposures in the Sweetwater River area, Wyoming, are small and scattered. The various collecting localities have been divided and numbered, in order to facilitate the recording of field data.

Exposure No. 1 is located about eleven miles west of Devil's Gate, Natrona County. The holotype of *B. sweetwaterensis* and the majority of specimens referred to the same species were collected at this locality. Exposure No. 1a, located a few hundred yards to the southwest of No. 1, produced several examples of *B. vaughani*. The fossil material from No. 1 is stained yellow, while that from No. 1a is dark gray to black. Although these two exposures are very closely associated, there is no proof that they are of exactly the same geological age. Since the area is largely grass covered and there are no large and extensive

<sup>1</sup> Named after the Sweetwater River, Wyoming, the collecting area of the holotype of this species as well as the holotypes of *B. rusticus* and *B. vaughani*.



outcrops, it is difficult definitely to correlate the various exposures or to determine the extent of faulting.

Exposure No. 2, located approximately seven miles west of Muddy Gap, Fremont County, is divided into three small localities, namely, a, b, and c. These three outcrops extend consecutively from northeast to southwest for nearly a mile and are separated from each other by grass-covered areas. Exposures 2a and 2b have produced examples of *B. vaughani*, and No. 2c, *B. sweetwaterensis*. Here again no definite association of these two species has been established. Referred material of *B. rusticus* comes from exposure No. 2a, but apparently at a lower level than the specimens of *B. vaughani* from the same location.

Sixteen specimens are here recorded:

HOLOTYPE.—Complete skull with I <sup>1</sup> -M <sup>3</sup> . (w)	F:A.M.34498	From exposure No. 1, 11 mi. W. of Devil's Gate, S. of Sweetwater River, Natrona County, Wy- oming. <sup>1</sup> <i>Figures 1, 5.</i>
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REFERRED.—

- (A) FROM TYPE AREA, EXPOSURE NO. 1, 11 MI. W. OF DEVIL'S GATE,  
S. OF SWEETWATER RIVER, NATRONA COUNTY, WYOMING:

SEVEN SKULLS AND ASSOCIATED MATERIAL

Skull with P <sup>1</sup> -M <sup>3</sup> (lacking nasals and premaxillæ), mandible with I <sub>1</sub> -M <sub>3</sub> , 2 humeri, 2 radii, 2 ulnæ, left and right fore feet. <i>Figures</i> <i>5, 10</i> (in part)..... (w)	F:A.M.	34494
Skull with I <sup>2</sup> -M <sup>3</sup> (lacking supraoccipital region), mandible with /C- M <sub>3</sub> , scapula, 2 humeri, and partial pelvis..... (w)		34493
Skull with I <sup>2</sup> -M <sup>3</sup> (lacking nasals), partial mandible with /C-M <sub>3</sub> , tibia, distal end of fibula, partial pes, distal end of humerus, and vertebræ (w+)		34495
Anterior portion of skull with I <sup>1</sup> -M <sup>2</sup> , associated with partial skeleton (w+)		34496
Right side of skull with C/-P <sup>1</sup> br. and P <sup>2</sup> -M <sup>3</sup> , and partial right ramus with P <sub>1</sub> (br.)-M <sub>3</sub> , associated with nearly complete skeleton..... (w+)		34500
Skull with I <sup>1</sup> -M <sup>3</sup> (lacking posterior portion of left maxilla and left zygomatic arch), and attached mandible with /C-M <sub>3</sub> ..... (w+)		36104
Skull fragments with M <sup>1</sup> -M <sup>3</sup> , partial mandible with I <sub>1</sub> -M <sub>1</sub> (br.), and vertebræ..... (w+)		37503

FOUR MANDIBULAR SPECIMENS AND ASSOCIATED MATERIAL

Three partial mandibles with I <sub>2</sub> -M <sub>3</sub> ..... (w+)		34497
I <sub>2</sub> -M <sub>1</sub> (br.)..... (w†)		36103
P <sub>1</sub> -M <sub>3</sub> , humerus, partial ulna, femur, tibia, calcaneum, and skeletal fragments..... (w†+)		36107
Two partial rami Left with P <sub>3</sub> -M <sub>1</sub> ..... (w)		37506
Immature right with dP <sub>3</sub> (rt.)-M <sub>1</sub> (br.)..... (i)		37507

<sup>1</sup> See page 250 for discussion of Sweetwater River collecting localities.

## LIMBS

F:A.M.

Tibia, radius, ulna, 2 partial humeri, partial manus, and partial pes. .

37504

(B) FROM EXPOSURE NO. 2c, 7 MI. W. OF MUDDY GAP, SWEETWATER RIVER AREA, FREMONT COUNTY, WYOMING:

## TWO MANDIBULAR SPECIMENS

Mandible with $P_2$ - $M_3$ .....	(M+)	37591
Mandible with $I_2$ - $M_3$ and partial pes.....	(W†)	37597

(10) *Brachycrus vaughani*,<sup>1</sup> new species

From the Miocene Deposits of the Sweetwater River Area of Wyoming

## DESCRIPTION

SKULL.—Moderately high; length less than in examples of *B. sweetwaterensis*, close to *B. laticeps*; narrower than in either of the latter two species; nasals long, posterior edge rounded, anterior surface somewhat flattened in comparison with *B. sweetwaterensis*; superior border of the maxillæ rises gradually to a point just anterior of the tip of the nasals, where it rises abruptly; orbits oval.

MANDIBLE.—Larger than those of *B. siouense*; smaller than in *B. laticeps* and *B. sweetwaterensis*; inferior border of ramus descends abruptly below anterior of  $M_3$ , reaching maximum depth posterior to  $M_3$ .

DENTITION.—Superior and inferior series intermediate in length between *B. laticeps* and *B. siouense*; teeth heavier than in both latter species.

LIMBS.—Approximately equal to those of *B. sweetwaterensis*.

MEASUREMENTS.—Tables I and II.

## DISCUSSION

The material listed under this species was collected by Nelson J. Vaughan, John Lynch, and Charles H. Falkenbach, 1937–1938.

Twenty-one specimens are here recorded:

HOLOTYPE.—Skull and mandible with $I_1^1$ - $M_3^3$ , 2 partial humeri, 2 ulnæ, 2 radii, femur, tibia, pel- vis, and vertebrae. (W†)	F:A.M.34492	From exposure No. 2a, 7 mi. W. of Muddy Gap, Sweetwater River area, Fremont County, Wyoming. <sup>2</sup> <i>Figures 1, 4, 10.</i>
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<sup>1</sup> Named in honor of Nelson J. Vaughan, collector, Frick Laboratory.

<sup>2</sup> See page 250 for discussion of Sweetwater River collecting localities.

## REFERRED.—

(A) FROM TYPE AREA, EXPOSURE No. 2A, 7 MI. W. OF MUDDY GAP,  
SWEETWATER RIVER AREA, FREMONT COUNTY, WYOMING:

## NINE SKULLS AND ASSOCIATED MATERIAL

Anterior portion of skull with P <sup>2</sup> -M <sup>3</sup> (br.), partial mandible with I <sub>1</sub> -M <sub>3</sub> , and partial pes. <i>Figure 10</i> (in part).....	(w+)	F:A.M. 36102
This specimen is smaller than the average of this species.		
Skull with I <sup>1</sup> -I <sup>2</sup> alv. and I <sup>3</sup> (br.)-M <sup>3</sup> (M <sup>1</sup> br.), and mandible with I <sub>2</sub> - I <sub>3</sub> br. and /C-M <sub>3</sub> .....	(w±)	36101
Skull and mandible with I <sub>1</sub> -M <sub>3</sub> <sup>3</sup> (/C alv.).....	(w+)	37583
Anterior portion of skull with I <sup>1</sup> -M <sup>3</sup> (P <sup>1</sup> br.).....	(w)	37584
Posterior portion of skull with M <sup>1</sup> (br.)-M <sup>3</sup> (br.), right ramus with I <sub>2</sub> - M <sub>3</sub> (M <sub>2</sub> br.), and skeletal fragments.....	(w±)	37585
Anterior portion of skull with C/-M <sup>3</sup> .....	(m)	37586
Skull with P <sup>1</sup> -M <sup>3</sup> (lacking supraoccipital region, left zygomatic arch and premaxillæ) and mandible with P <sub>1</sub> (br.)-M <sub>3</sub> , associated with partial skeleton.....	(w+)	37589
Skull with I <sup>2</sup> -M <sup>3</sup> , associated with partial skeleton.....	(w+)	37590
Partial skull with I <sup>1</sup> -M <sup>3</sup> (I <sup>3</sup> alv.), right ramus with /C-M <sub>2</sub> , associated with partial skeleton.....	(w+)	42305

## THREE SKULLS AND ASSOCIATED MATERIAL, IMMATURE

Partial skull with C/(germ)-dP <sup>2</sup> -M <sup>1</sup> and mandible with I <sub>1</sub> -/C rt. and P <sub>1</sub> (erupt.)-dP <sub>3</sub> -M <sub>2</sub> (germ).....	(i)	37592
Partial skull with I <sup>1</sup> -I <sup>3</sup> alv. and dC/-M <sup>1</sup> , and partial femur.....	(i)	37593
Partial skull with I <sup>1</sup> -I <sup>3</sup> -dC/-P <sup>1</sup> (erupt.)-dP <sup>2</sup> -M <sup>1</sup> and mandible with I <sub>2</sub> -I <sub>3</sub> -/dC-P <sub>1</sub> (erupt.)-dP <sub>3</sub> -M <sub>1</sub> .....	(i)	37596

## FOUR MANDIBULAR SPECIMENS AND ASSOCIATED MATERIAL

Mandible with I <sub>1</sub> -I <sub>2</sub> alv. and I <sub>3</sub> -M <sub>3</sub> (/C alv.), 2 humeri, 2 ulnae, 2 radii, femur, and vertebrae.....	(w+)	36108
Anterior portion of mandible with I <sub>1</sub> -M <sub>2</sub> (br.).....	(w±)	37508
Anterior portion of mandible with I <sub>1</sub> -M <sub>1</sub> (br.).....	(w±+)	37509
Immature partial mandible with I <sub>1</sub> -dP <sub>3</sub> -M <sub>2</sub> (erupt.).....	(i)	37594

## SKELETAL ELEMENTS

Tibia, calcaneum, and astragalus.....		37505
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(B) FROM EXPOSURE No. 1A, 11 MI. W. OF DEVIL'S GATE, SWEET-  
WATER RIVER AREA, NATRONA COUNTY, WYOMING:

## TWO SKULLS AND ASSOCIATED MATERIAL

Skull with I <sup>1</sup> -M <sup>3</sup> , lacking nasals and posterior portion of left zygomatic arch.....	(w+)	34499
Anterior portion of skull with I <sup>1</sup> -M <sup>3</sup> , partial ulna, and metapodial... .	(w+)	36106

## MAXILLA AND ASSOCIATED MATERIAL

Partial right maxilla with P <sup>1</sup> -P <sup>4</sup> , femur, and tibia.....	(w‡)	F:A.M. 37595
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The above three specimens are of a black color and differ in fossilization from material collected from exposure No. 1. (See page 250 for discussion of localities.)

(11) *Brachycrus*, species undetermined

- (A) FROM THE LOWER PART OF THE "SANTA FÉ BEDS," EAST OF ESPANOLA, SANTA FÉ COUNTY, NEW MEXICO (collected by Joseph Rak, John C. Blick, and Charles H. Falkenbach, 1926, 1927, and 1930):

## FIVE MANDIBULAR RAMI

From southeast of White Operation:		F:A.M.
Mandible with I <sub>1</sub> -P <sub>1</sub> rt. and P <sub>2</sub> -M <sub>3</sub> .....	(w+)	33688
From Skull Ridge:		
Partial mandible with P <sub>1</sub> -P <sub>4</sub> (br.).....	(w+)	34388
Left ramus with P <sub>1</sub> (rt.)-M <sub>3</sub> (br.).....	(w‡+)	33690
Left ramus with P <sub>2</sub> -M <sub>3</sub> (P <sub>3</sub> alv.).....	(w‡+)	37543
This ramus has an exceptionally large M <sub>3</sub> .		
From East Skull Ridge:		
Partial right ramus with I <sub>1</sub> -C alv. and P <sub>1</sub> -M <sub>1</sub> .....	(w‡)	33641

## STATEMENT

The above material from New Mexico is represented only by five mandibular rami. The mandibles of the various species of *Brachycrus* are not so readily distinguished as the skulls. Although the specimens from New Mexico compare favorably with *B. siouense*, more material is needed in order definitely to establish the validity of this reference.

TABLE I.—*Brachycterus* MATTHEW. COMPARATIVE MEASUREMENTS<sup>1</sup> OF SKULLS AND RAMI

	<i>B. buwaldi</i> (Merriam)		<i>B. buwaldi</i> <i>barszewiczi</i> , n. var.		<i>B. altiramus</i> (Douglass)		<i>B. elrodi</i> (Douglass)		<i>B. madisonius</i> (Douglass)		<i>B. laticeps</i> (Douglass)	
	HOLOTYPE U.C. 21350 (w)	REFERRED F.A.M. 34467 (w+) (280.)	HOLOTYPE F.A.M. 42402 (w+)	HOLOTYPE F.A.M. 42402 (w+)	HOLOTYPE C.M. 9746 (w+) (340.)	HOLOTYPE C.M. 818 (w)	HOLOTYPE C.M. 819 (w+)	HOLOTYPE C.M. 800 (w+)	HOLOTYPE C.M. 796 (w+) (285.)	HOLOTYPE C.M. 796 (w+) (285.)	HOLOTYPE C.M. 796 (w+) (285.)	HOLOTYPE C.M. 796 (w+) (285.)
SKULL												
Stage of wear of teeth.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Length (including supraorbital crest and incisors).....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Basal length (from anterior notch of foramen magnum to posterior base of I).....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Width (max.).....	.....	246	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Width of brain case (max.).....	.....	(190.)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Width, interorbital (min.).....	.....	88	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Distance from anterior rim of orbit to anterior base of canine.....	.....	83.5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Distance from anterior rim of orbit to supraorbital crest.....	.....	137.5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Width of muzzle at infraorbital foramina.....	.....	((162.))	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Width across canines (max.).....	.....	108	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Width of palate between fourth premolars.....	.....	55	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Width of palate between canines.....	.....	46	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Length, C/M <sup>3</sup> incl.....	.....	23	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Length, P <sub>1</sub> -M <sup>3</sup> incl.....	.....	146.5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Length, P <sub>1</sub> -P <sup>4</sup> incl.....	.....	129	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Length, M <sup>1</sup> -M <sup>3</sup> incl.....	.....	57	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Length, M <sup>1</sup> -M <sup>3</sup> incl.....	.....	74	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Width of M <sup>3</sup> (max.).....	.....	24	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Depth of malar below orbit.....	.....	40	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
RAMUS												
Stage of wear of teeth.....	.....	F.A.M. 34462 (w+)	REFERRED F.A.M. 34450 (w+)	.....	.....	.....	.....	.....	.....	.....	.....	.....
Depth below anterior edge of M <sub>2</sub> .....	.....	49	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Length, C-M <sub>2</sub> incl.....	.....	134	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Length, P <sub>1</sub> -M <sub>2</sub> incl.....	.....	125	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Length, P <sub>1</sub> -P <sub>4</sub> incl.....	.....	50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Length, M <sub>1</sub> -M <sub>2</sub> incl.....	.....	76	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

1 ( ) = approximate; ( ( ) ) = estimated. All measurements in millimeters.

TABLE I (continued)

	<i>B. siouense</i> (Sinclair)		<i>B. wilsoni</i> , n.sp.		<i>B. wilsoni</i> <i>tongensis</i> , n.var.		<i>B. rusticus</i> (Leidy) (Genotype)		<i>B. suetwater-</i> <i>ensis</i> , n.sp.		<i>B. vaughani</i> , n.sp.		
	REFERRED F.A.M. 36113 (w+) 270.	HOLOTYPE F.A.M. 34202 (w+) (300.)	HOLOTYPE F.A.M. 33574 (w+)	HOLOTYPE F.A.M. 270. 190. 83. 101. 157. (167.) (120.) 52. 49. 25. 145. 127. 56. 74. 25. ..	HOLOTYPE F.A.M. 33574 (w+)	HOLOTYPE F.A.M. 270. 190. 83. 101. 157. (167.) (120.) 52. 49. 25. 145. 127. 56. 74. 25. ..	GENEHOLOTYPE N.M. 145 (w+)	GENEHOLOTYPE F.A.M. 36105 (w) (234.)	HOLOTYPE F.A.M. 34498 (w) 304.	HOLOTYPE F.A.M. 251. 206.5 76.5 96. 153. 170.5 136. 129. 52.5 39. 39. 24.5 157. 141. 54.5 88. 29. 47.	HOLOTYPE F.A.M. 34491 (w+) (270.)	HOLOTYPE F.A.M. 34491 (w) 304.	HOLOTYPE F.A.M. 246. 191. 76. 91. 125.5 (169.) 129. 52.5 39. 39. 24.5 145.5 127.5 51.5 78. 27.5 38.
<b>SKULL</b>													
Stage of wear of teeth.....	234.5	270.	..	..	..	..	..	..	251.	246.	..	251.	246.
Length (including supraoccipital crest and incisors).....	161.	190.	..	..	..	..	151.5	..	206.5	191.	..	206.5	191.
Basal length (from anterior notch of foramen magnum to posterior base of I <sub>1</sub> ).....	75.	83.	..	..	..	..	71.	..	76.5	76.	..	76.5	76.
Width of brain case (max.).....	78.5	101.	..	..	..	..	((68.))	..	96.	91.	..	96.	91.
Width, interorbital (min.).....	125.5	157.	..	..	..	..	(108.)	..	153.	125.5	..	153.	125.5
Distance from anterior rim of orbit to anterior base of canine.....	144.5	(167.)	..	..	..	..	(121.)	..	170.5	169.	..	170.5	169.
Distance from anterior rim of orbit to supraoccipital crest.....	112.5	(120.)	..	..	..	..	..	..	136.	129.	..	136.	129.
Width of muzzle at infraorbital foramina.....	47.	52.	(128.)	..	..	..	95.	..	49.	52.5	..	49.	52.5
Width across canines (max.).....	37.5	49.	54.	..	..	..	45.	..	36.	39.	..	36.	39.
Width of palate between fourth premolars.....	22.	25.5	39.	..	..	..	30.	..	40.	39.	..	40.	39.
Width of palate between canines.....	136.5	157.	25.	..	..	..	24.	..	24.5	22.	..	24.5	22.
Length, C/-M <sub>3</sub> incl.....	(119.)	139.	145.	..	..	..	(22.)	..	157.	145.5	..	157.	145.5
Length, P <sub>1</sub> -M <sub>3</sub> incl.....	74.	86.	127.	..	..	..	(120.)	..	141.	127.5	..	141.	127.5
Length, P <sub>1</sub> -P <sub>4</sub> incl.....	49.	54.	56.	..	..	..	(105.)	..	54.5	51.5	..	54.5	51.5
Length, M <sub>1</sub> -M <sub>3</sub> incl.....	23.	31.5	74.	..	..	..	46.	..	78.	78.	..	78.	78.
Width of M <sub>3</sub> (max.).....	40.	43.	25.	..	..	..	(59.)	..	88.	88.	..	88.	88.
Depth of malar below orbit.....	..	..	..	..	..	..	..	..	29.	27.5	..	29.	27.5
..	..	..	..	..	..	..	..	..	47.	38.	..	47.	38.
<b>RAMUS</b>													
Stage of wear of teeth.....	12057	33670	..	..	..	..	..	..	37588	49.	..	37588	49.
Depth below anterior edge of M <sub>3</sub> .....	54.	60.	..	..	..	..	46.5	..	58.5	145.	..	58.5	145.
Length, /C-M <sub>3</sub> incl.....	123.	(156.)	..	..	..	..	(118.)	..	152.	145.	..	152.	145.
Length, P <sub>1</sub> -M <sub>3</sub> incl.....	70.	(147.)	..	..	..	..	(111.)	..	143.5	135.5	..	143.5	135.5
Length, P <sub>1</sub> -P <sub>4</sub> incl.....	53.	57.	..	..	..	..	47.	..	57.5	55.	..	57.5	55.
Length, M <sub>1</sub> -M <sub>3</sub> incl.....	73.	(90.)	..	..	..	..	(65.)	..	86.	81.	..	86.	81.

<sup>1</sup> See Table II, page 257, for measurements of skeletal elements of this specimen.

TABLE II.—*Brachycrus* MATTHEW. COMPARATIVE MEASUREMENTS OF SKELETAL ELEMENTS

	<i>B. buwaldi</i> (Merriam)	<i>B. siouense</i> (Sinclair)	<i>B. wilsoni</i> , n.sp.	<i>B. sweet-</i> <i>waterensis</i> , n.sp.	<i>B. vaughani</i> , n.sp.
	REFERRED	REFERRED	REFERRED	REFERRED	REFERRED
	F.A.M.	F.A.M.	F.A.M.	F.A.M.	F.A.M.
Length of humerus (articular).....	..	156. 37296B	((183.)) 37515	162. ....	..
Length of radius (articular).....	..	132. 37297G	131. 37517	140.5 ....	..
Length of ulna (max.).....	..	((186.)) 37298B	206. 37516	((190.)) ....	..
Length of metacarpal III (max.).....	61.	42355	62. 42339	63. ....	..
Length of femur (articular).....	..	185. 42332A	.. 195.	.. 195.	..
Length of tibia (articular).....	147.	42333	.. 37295B	.. 161.	..
Length of metatarsal III (max.).....	61.	42334	62.5 42337	.. 65.	62.

<sup>1</sup> See Table I, page 256, for measurements of skull and ramus of this specimen.

TABLE III.—*Merycochoerus* LEIDY. COMPARATIVE MEASUREMENTS OF SKELETAL ELEMENTS

	<i>M. proprius</i> <i>magnus</i> (Loomis)	<i>M. matthewi</i> Loomis	<i>M. proprius</i> Leidy	<i>M. proprius</i> <i>magnus</i> (Loomis)	<i>M. matthewi</i> Loomis
	HOLOTYPE	HOLOTYPE	REFERRED	REFERRED	REFERRED
	A.M.	A.M.	Min. Max.	Min. Max.	Min. Max.
Length of humerus (articular).....	14242	12970	189. 228.	179. 202.	185. 192.
Length of radius (articular).....	202.	..	130. 166.	129. 151.	144. 164.
Length of ulna (max.).....	151.5	144.	186. 224.	189. 224.	200. 211.
Length of metacarpal III (max.).....	224.5	200.	54. 75.	60. 73.	73. 81.
Length of femur (articular).....	68.5	73.	197. (244.)	216. 236.	211. 232.
Length of tibia (articular).....	236.	..	132. 176.	149. 178.	170. 192.
Length of metatarsal III (max.).....	178.	..	53. 68.	48. 65.	74.
Length of metatarsal III (max.).....	65.5	..	..	..	..

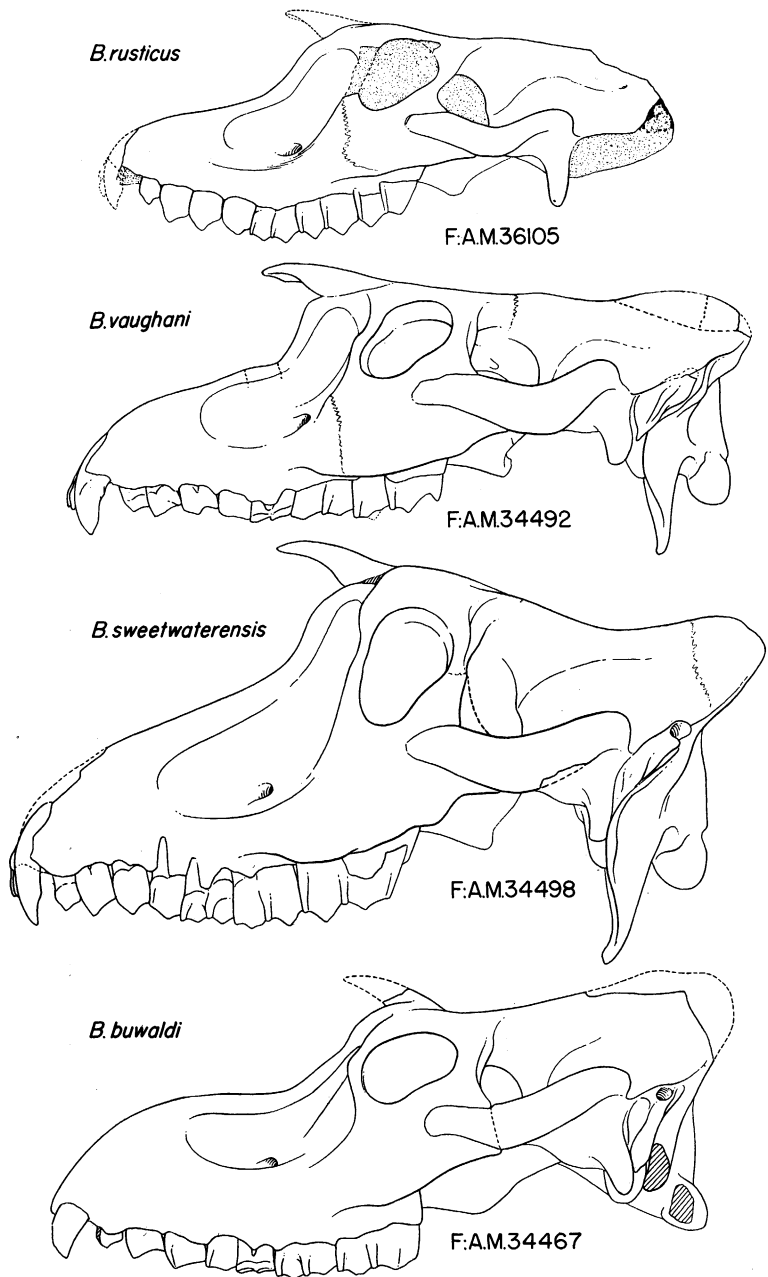
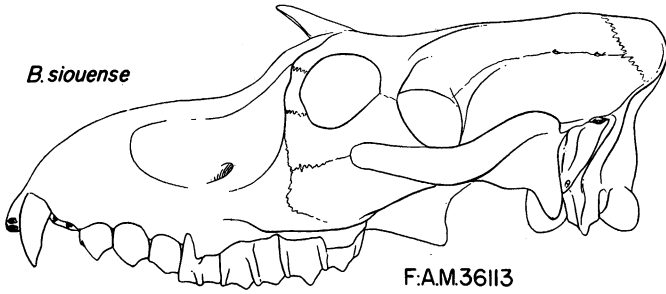


Fig. 1. Outlines of skulls representing eight species of *Brachycrus* (*B. laticeps*, after Peterson). (See opposite page.)  $\times \frac{1}{3}$ . (Compare *Merycochoerus*, Fig. 12.)

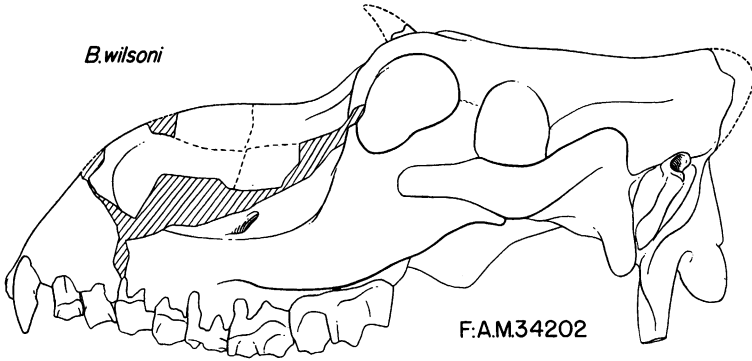


*B. siouense*



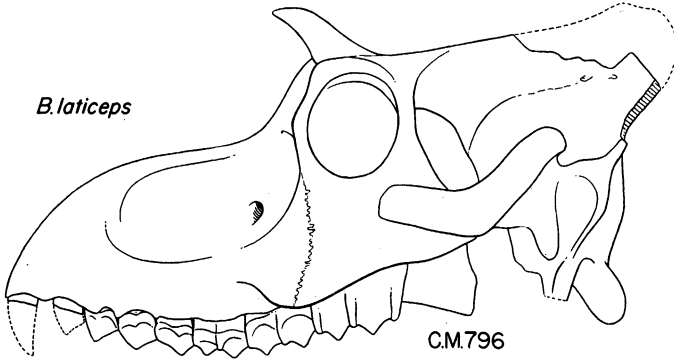
F.AM.36113

*B. wilsoni*



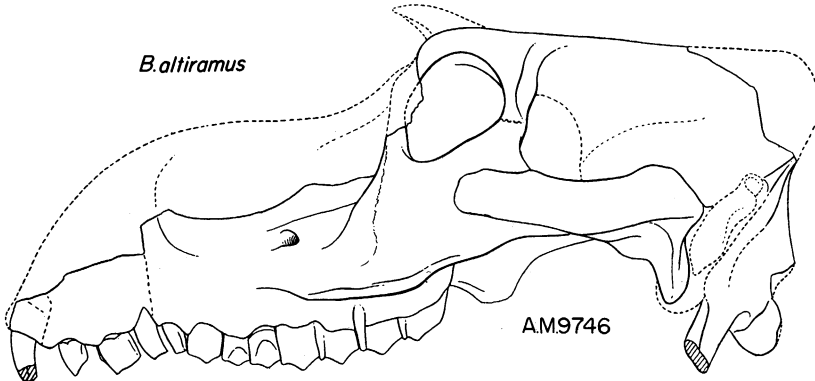
F.AM.34202

*B. laticeps*



CM.796

*B. altiramus*



AM9746

Fig. 1 (cont.). See legend, opposite.

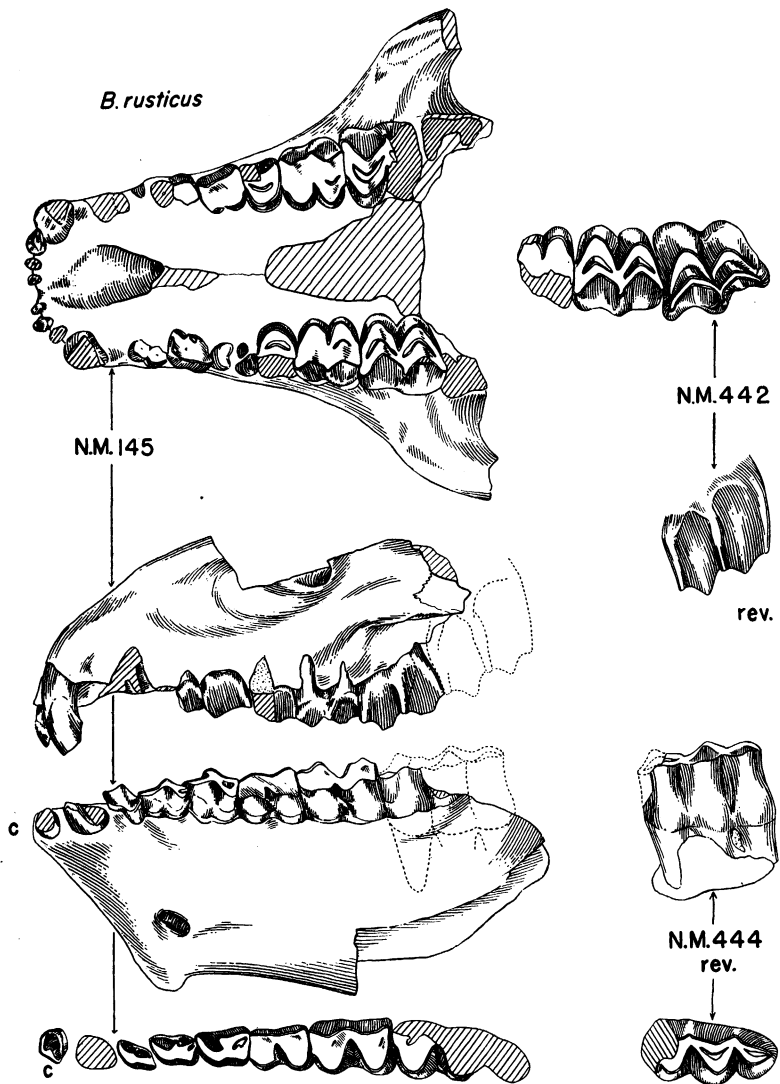


Fig. 2. *Brachycrus rusticus* (Leidy), GENOHOLOTYPE, N.M.145, partial skull and ramus (/C from opposite side), and REFERRED, N.M.442, maxilla, and N.M.444, M<sub>3</sub>, from the Sweetwater River area, Wyoming. (See Fig. 3 for comparison.)  $\times \frac{1}{2}$ .

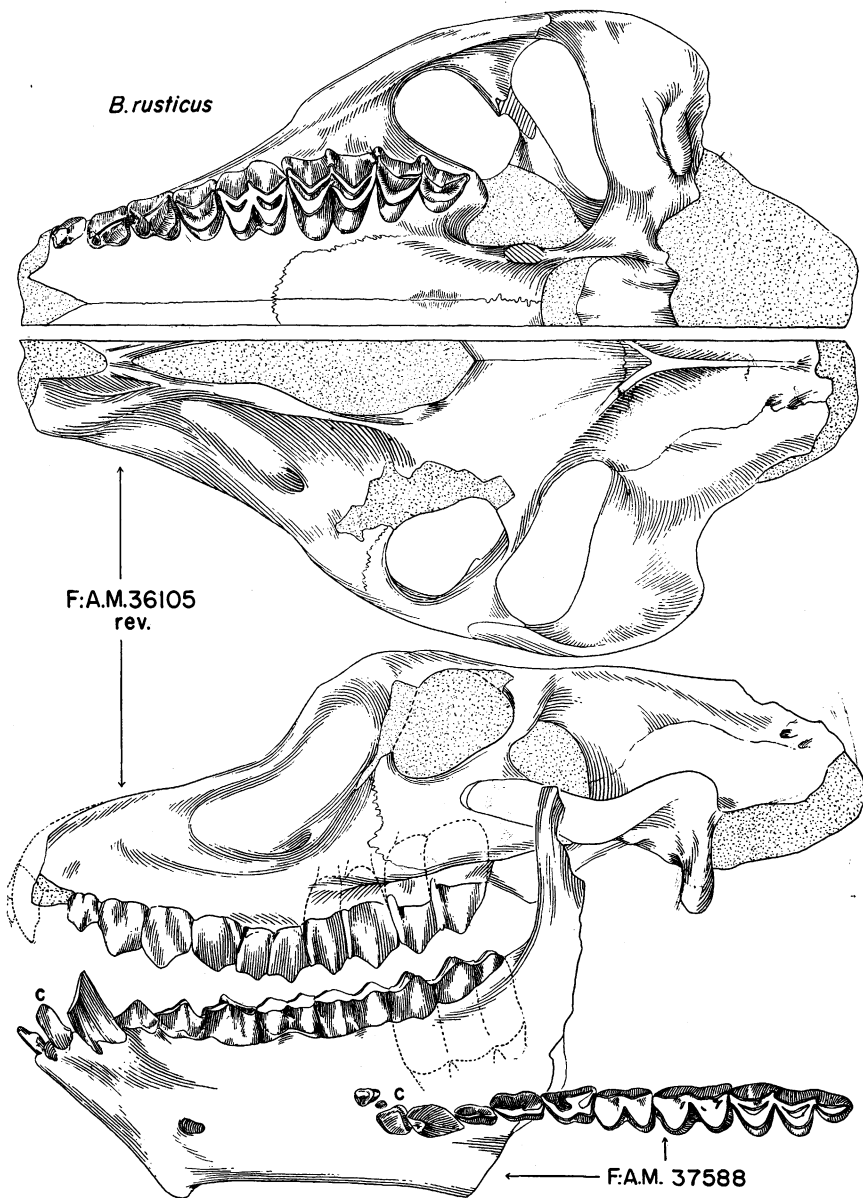
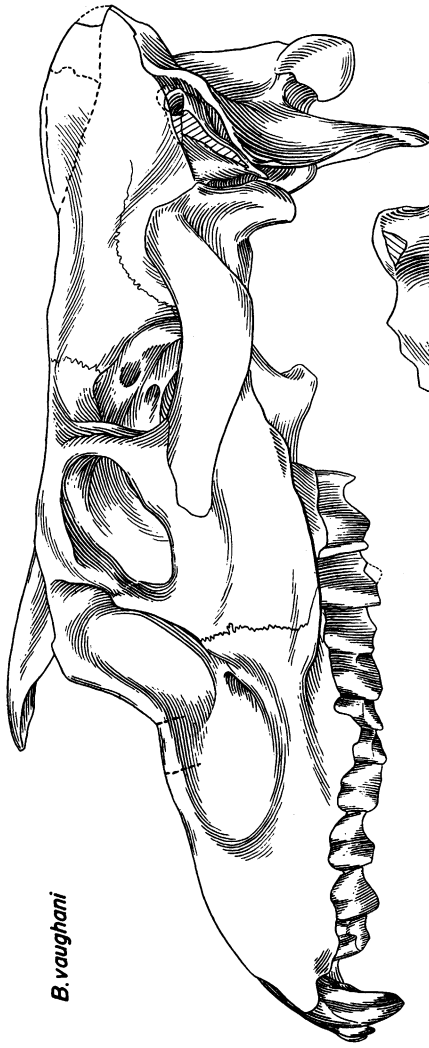
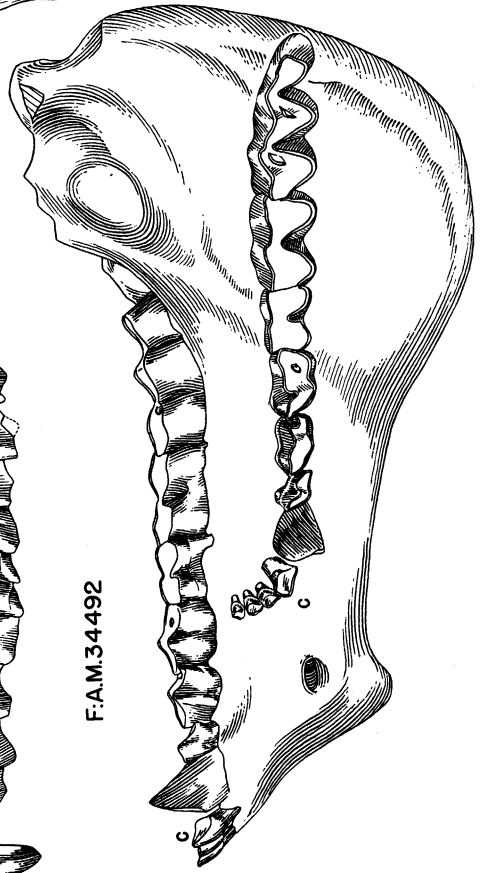


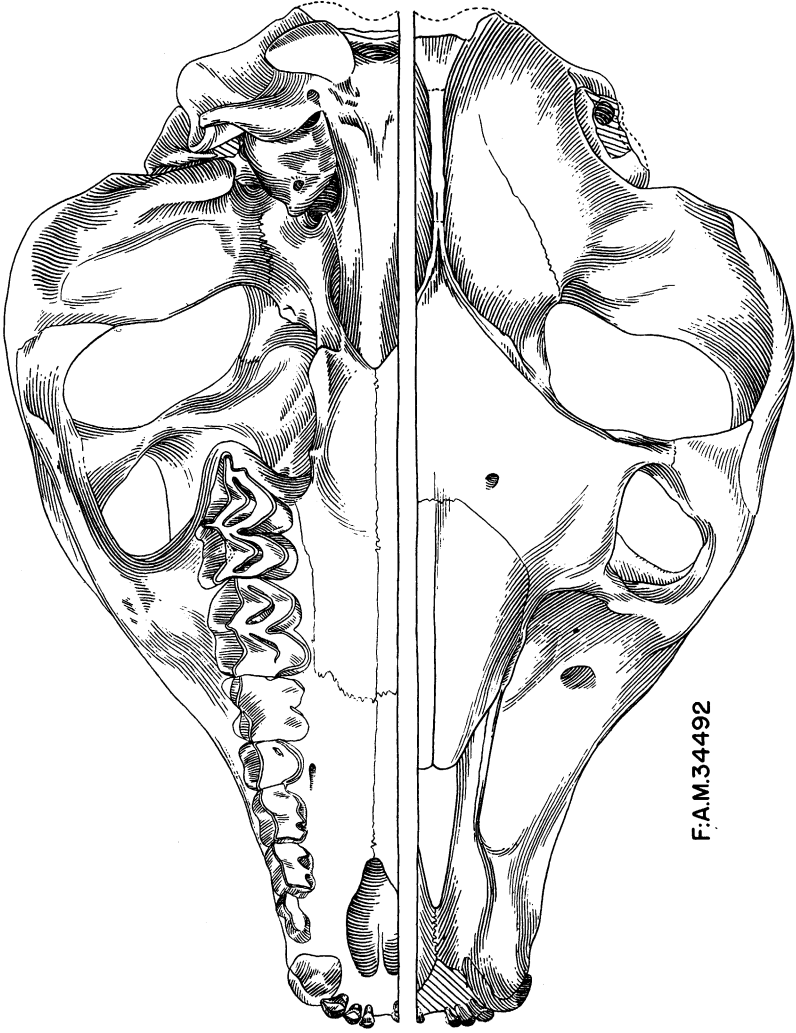
Fig. 3. *Brachycrus rusticus* (Leidy), REFERRED, F:A.M.36105, skull, and F:A.M.37588, ramus, from type area, Sweetwater River area, Wyoming. (See Fig. 2 for comparison.)  $\times \frac{1}{2}$ .



*B. vaughani*

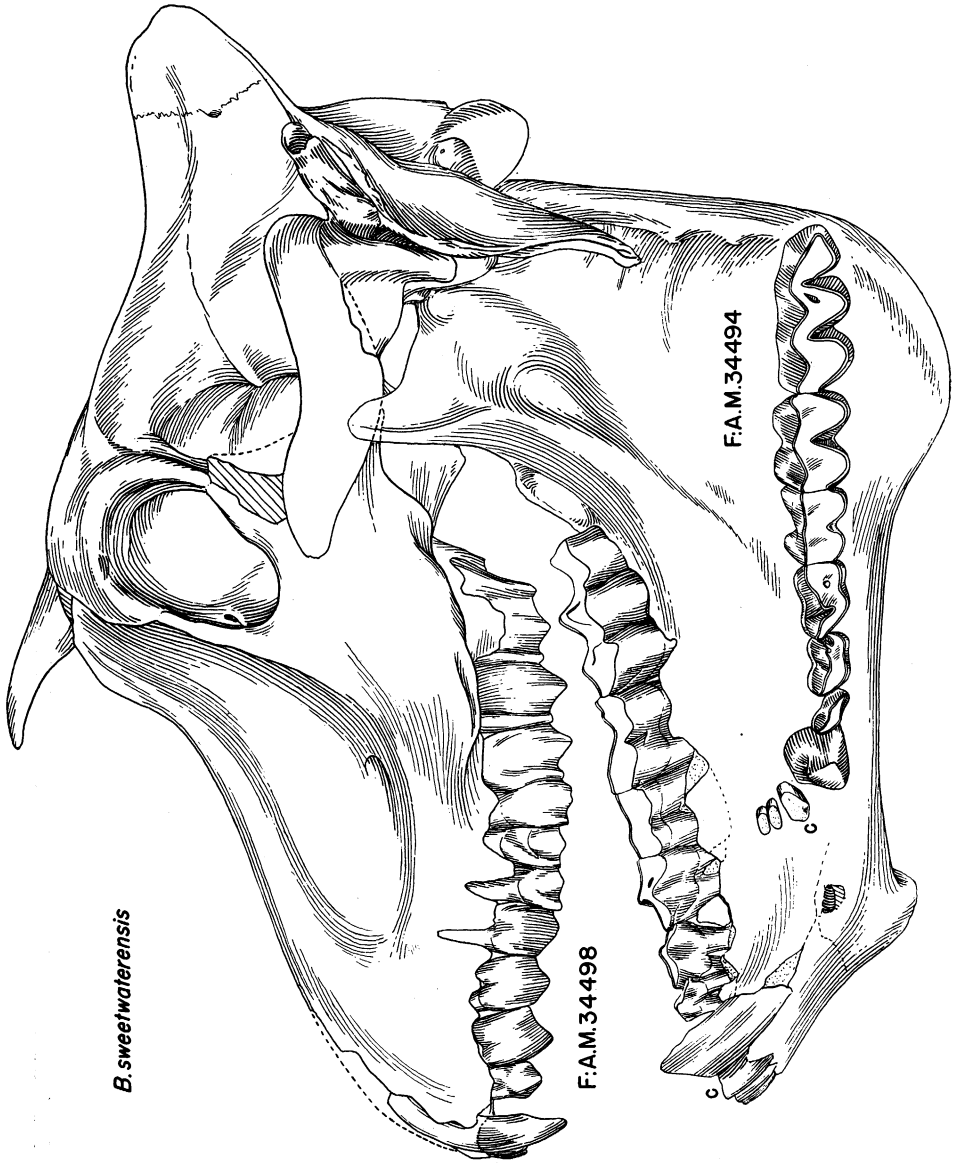


F.A.M.34492



F.A.M.34492

Fig. 4. *Brachycrus vaughani*, new species, Holotype, F.A.M.34492, skull and ramus, from the Sweetwater River area, Wyoming.  $\times 1$ .



*B. sweetwaterensis*

F.A.M. 34498

F.A.M. 34494

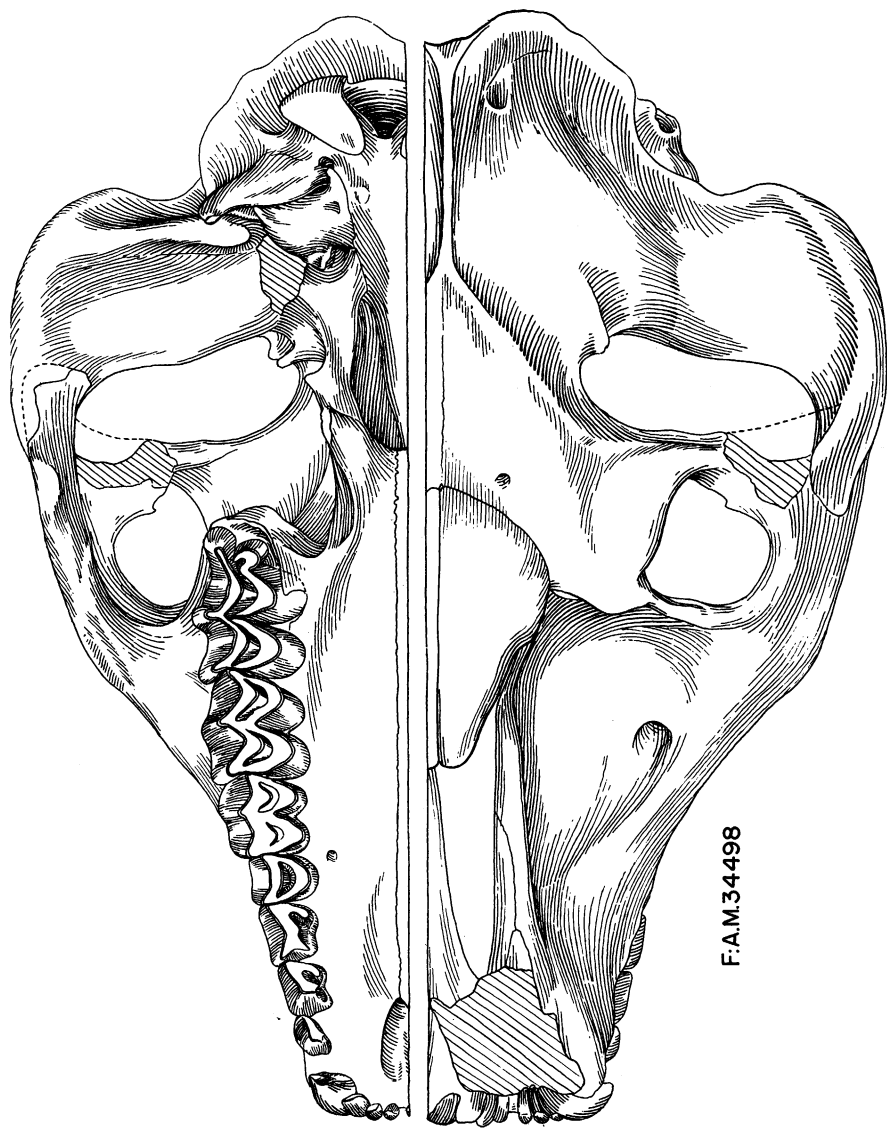
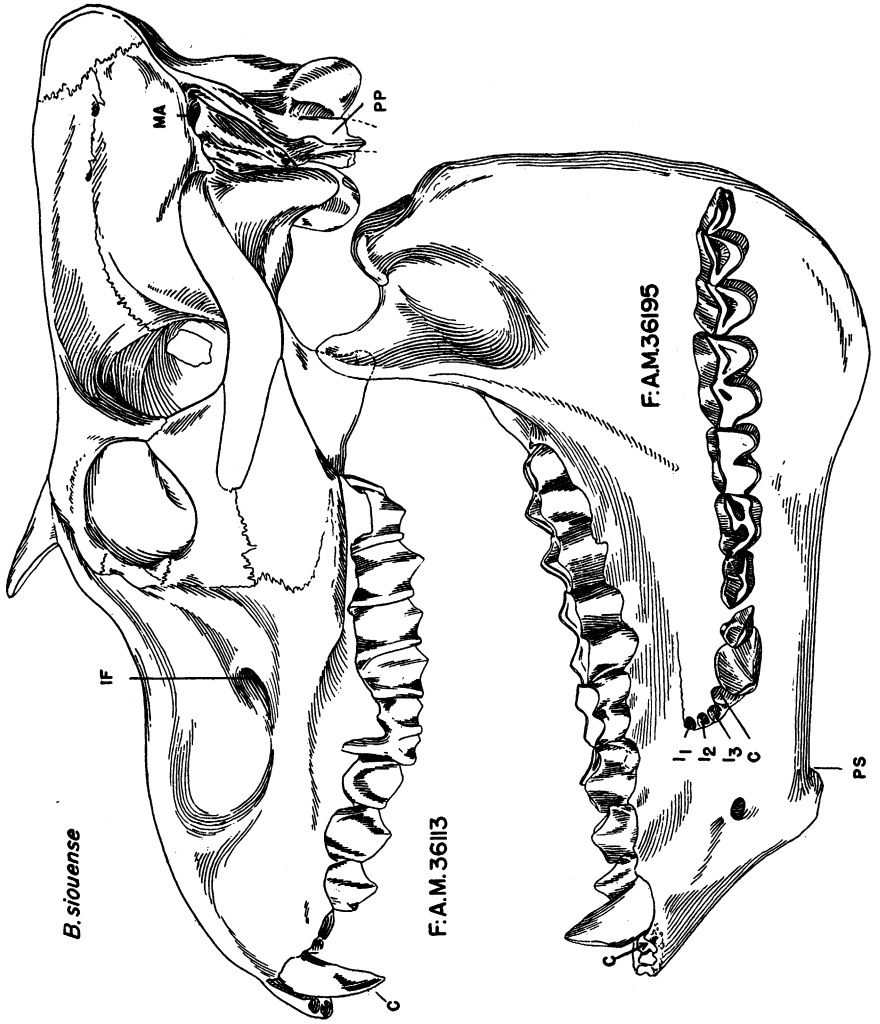
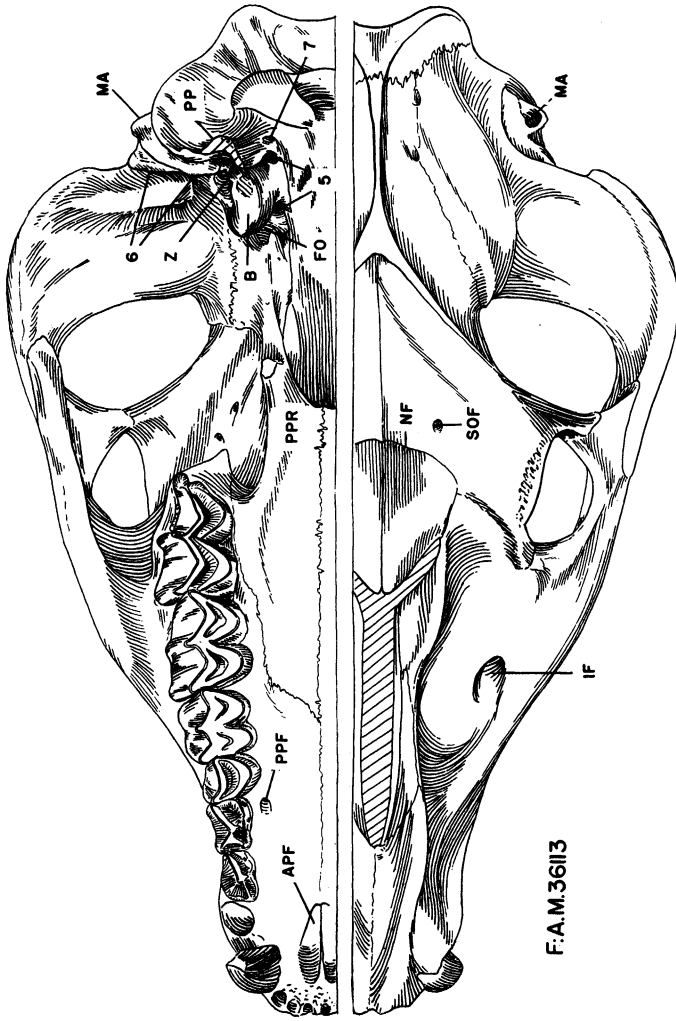


Fig. 5. *Brachycrus sweetwaterensis*, new species, HOLOTYPE, F.A.M.34498, skull, and REFERRED, F.A.M.34494, ramus, from the Sweetwater River area, Wyoming.  $\times \frac{1}{3}$ .



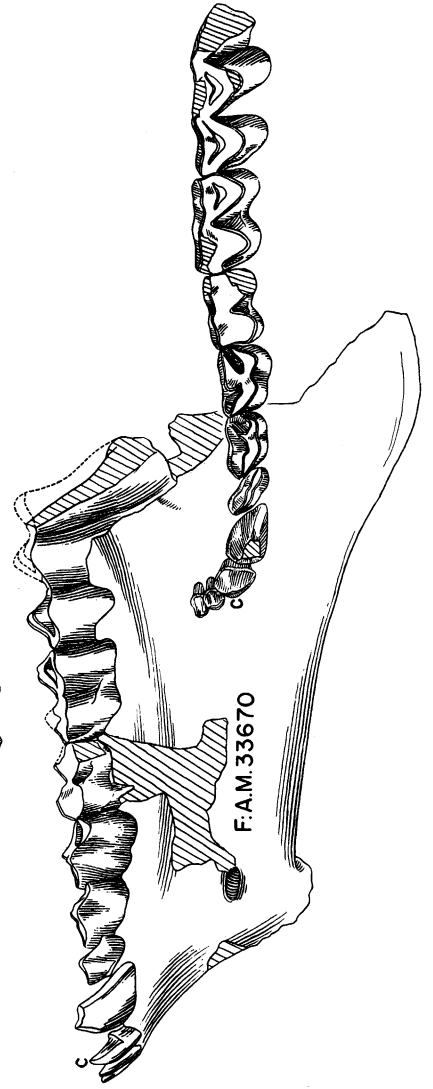
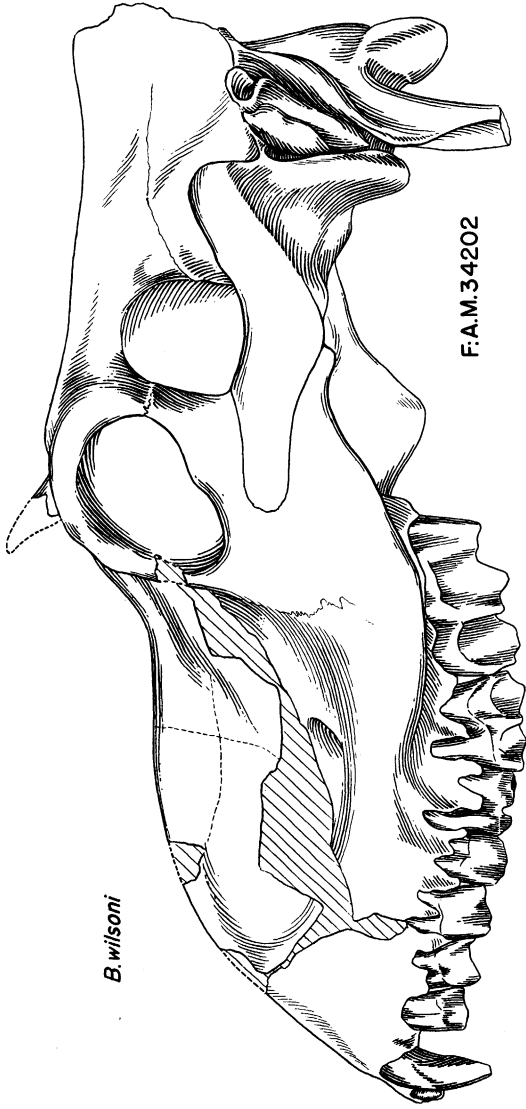


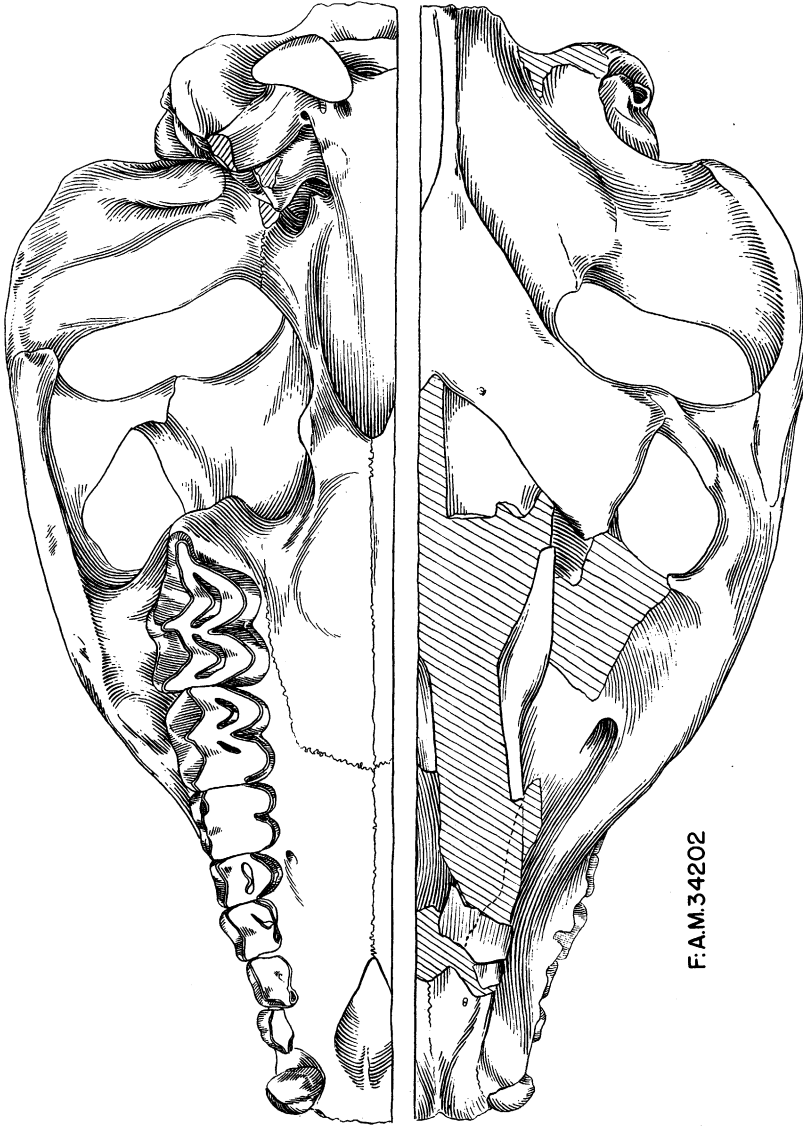


F.A.M.36113

Fig. 6. *Brachyercus siouense* (Sinclair), REFERRED, F.A.M.36113, skull, and F.A.M.36195, ramus, from "Lower Snake Creek" deposits, Sioux County, Nebraska. X  $\frac{1}{4}$ .

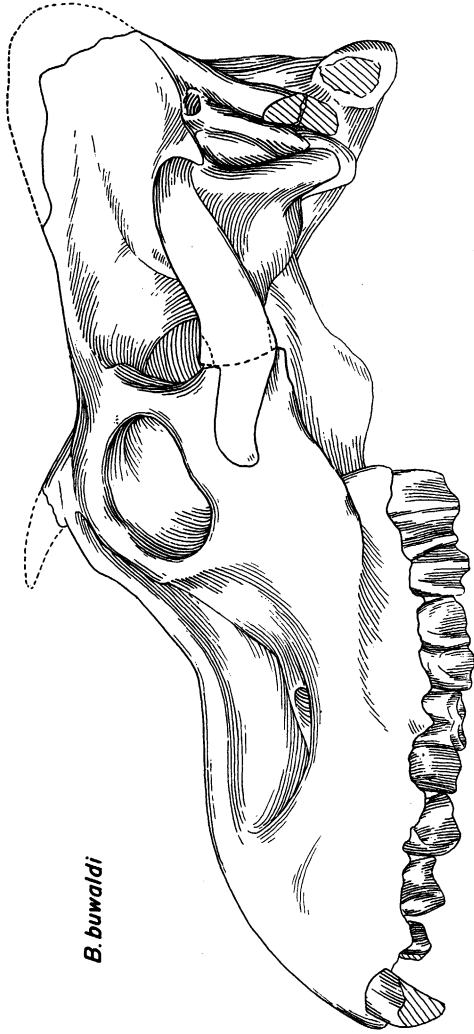
APF = anterior palatine foramen; B = auditory bulla; FO = foramen ovale; IF = infraorbital foramen; MA = external auditory meatus; NF = nasal frontal contact; PP = paroccipital process; PPF = posterior palatine foramen; PPR = posterior palatine projection; PS = posterior border of symphysis; SOF = supraorbital foramen; Z = depression for tympanohyal; 5 = lacerated foramina; 6 = lacerated foramina; 7 = condylar foramen.





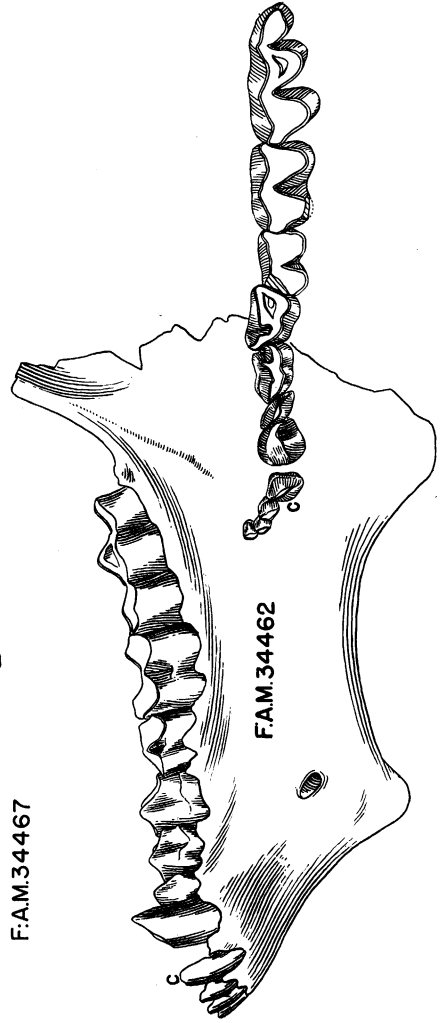
F.A.M.34202

Fig. 7. *Brachycerus wilsoni*, new species, Holotype, F.A.M.34202, skull (some restoration from right side), and REFERRED, F.A.M.33670, ramus, from "Sheep Creek" deposits, Sioux County, Nebraska.  $\times \frac{1}{4}$ .



*B. buwaldi*

F.A.M.34467



F.A.M.34462

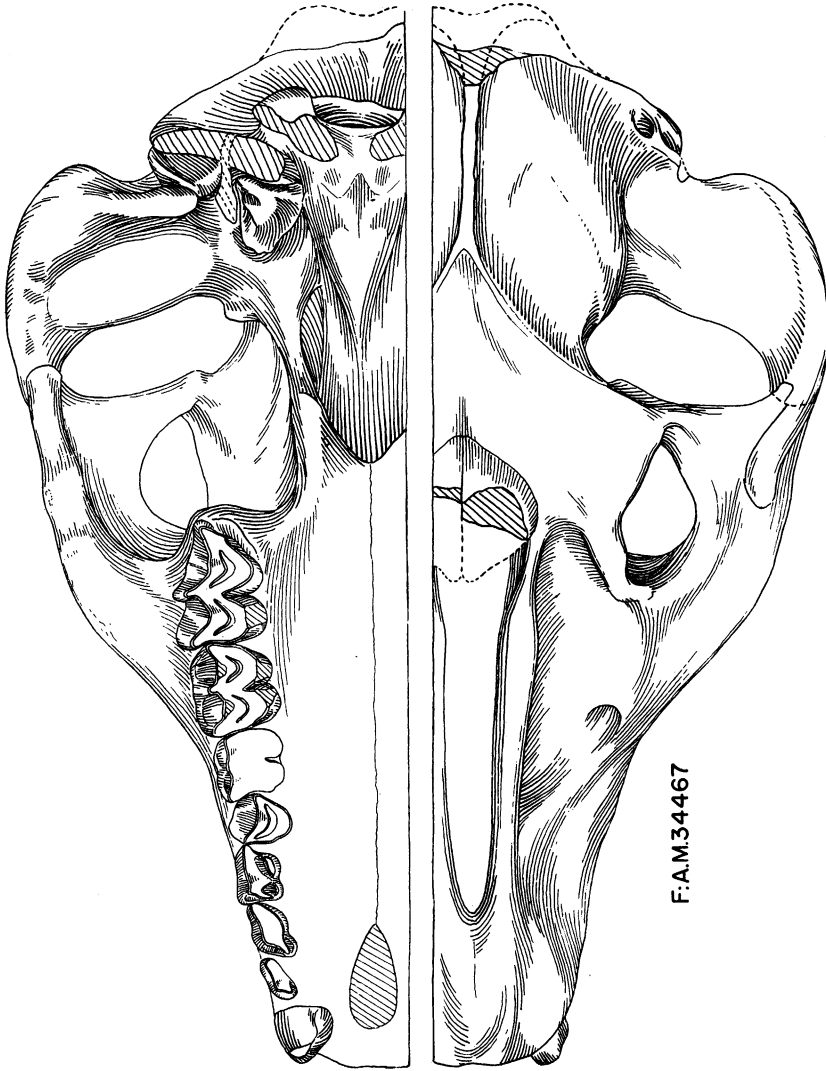
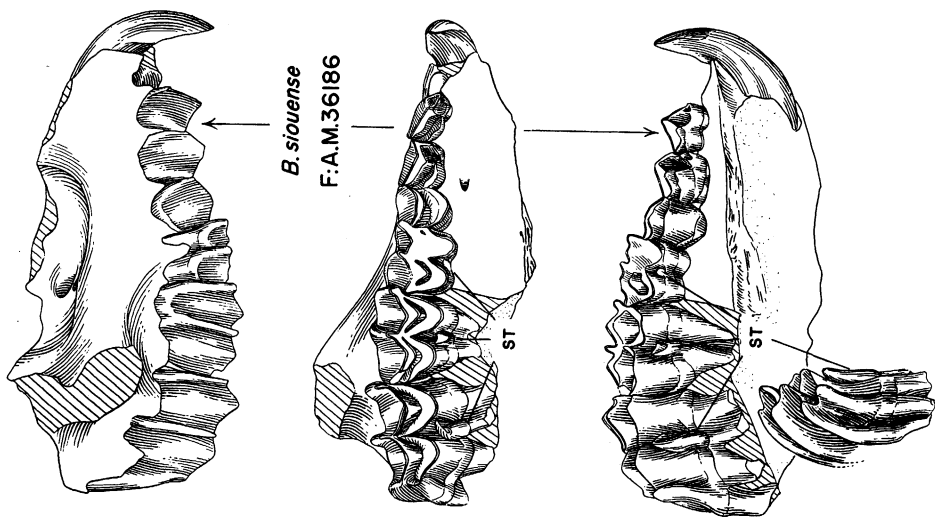
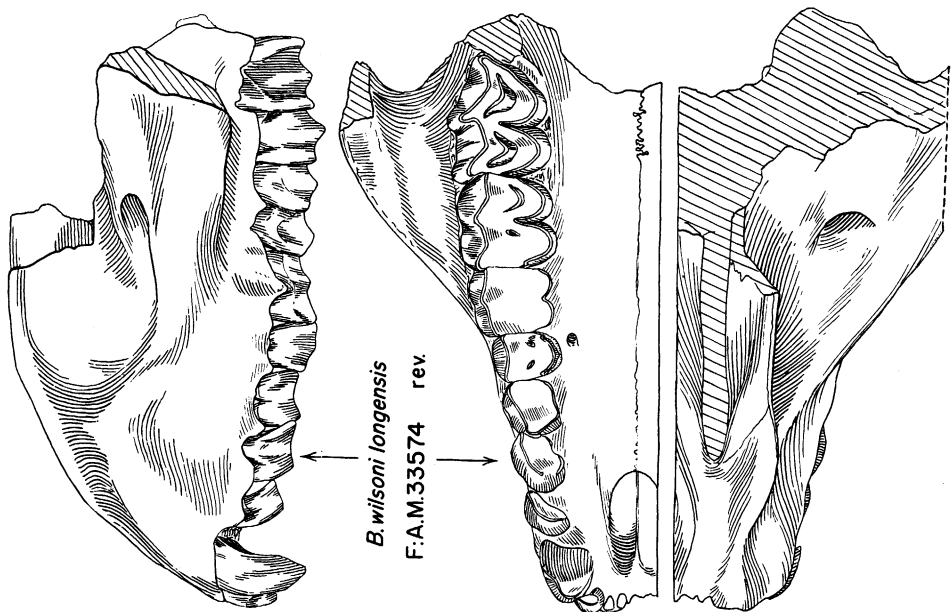


Fig. 8. *Brachyurus buwaldi* (Merriam), REFERRED, F:A.M.34467, skull, and F:A.M.34462, ramus, from Green Hills, Barstow, San Bernardino County, California.  $\times \frac{1}{2}$ .



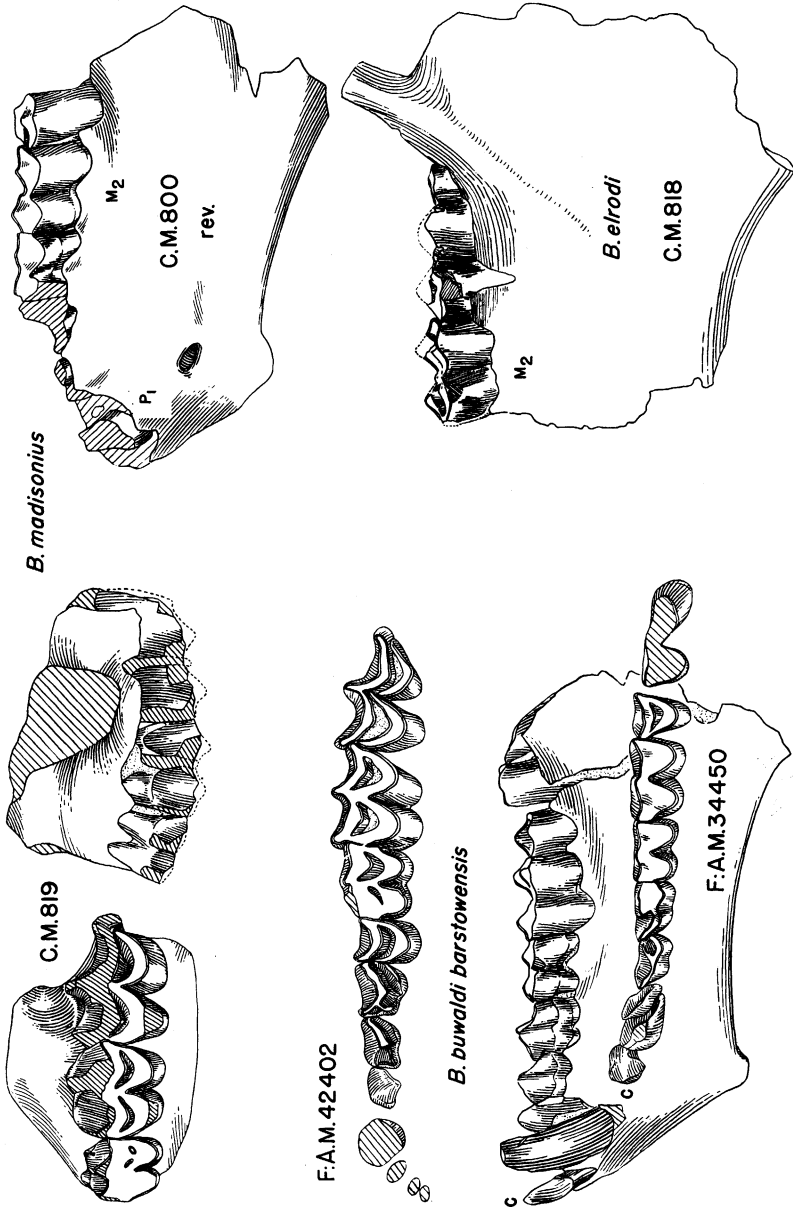
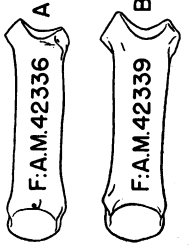
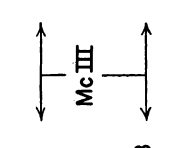
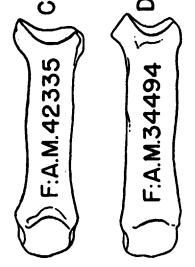
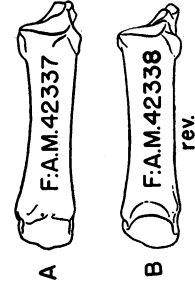
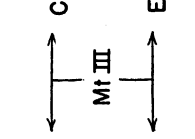
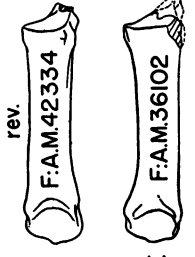
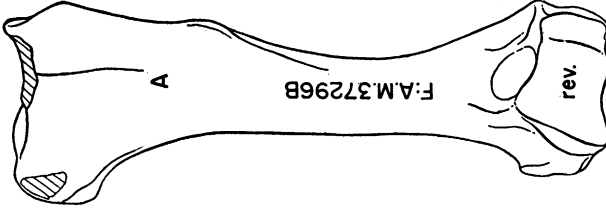
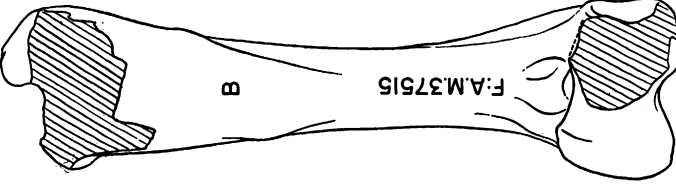
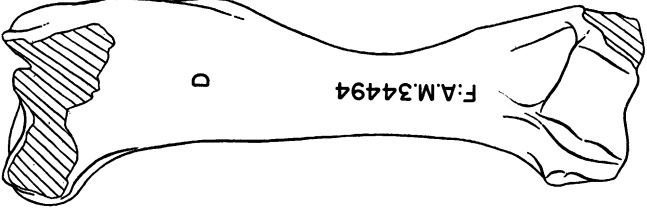
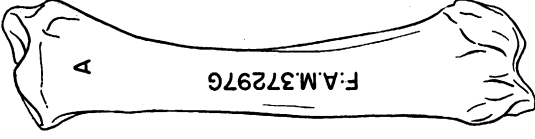
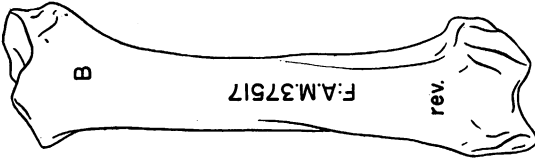
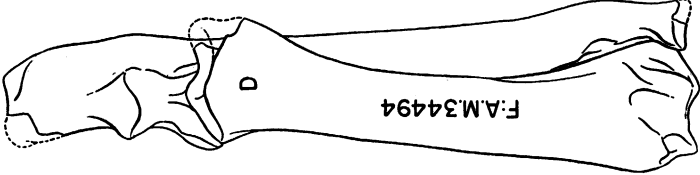
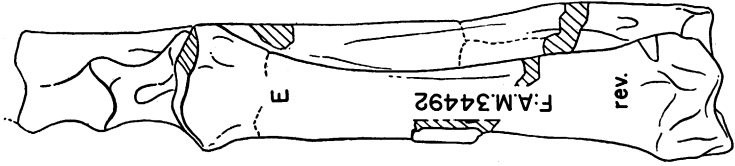


Fig. 9. *Brachycrus siouense* (Sinclair), REFERRED, F.A.M. 36186, maxilla, from Sioux County, Nebraska (ST = style); *B. wilsoni longensis*, new variety, HOLOTYPE, F.A.M. 35574, anterior of skull, from Sioux County, Nebraska; *B. madisonius* (Douglass), HOLOTYPE, C.M. 800, ramus, and REFERRED, C.M. 819, partial maxilla, from Gallatin County, Montana; *B. elrodi* (Douglass), HOLOTYPE, C.M. 818, ramus, from Gallatin County, Montana; *B. buwaldi barstowensis*, new variety, HOLOTYPE, F.A.M. 42402, superior dental series, and REFERRED, F.A.M. 34450, ramus, from Barstow area, San Bernardino County, California.  $\times \frac{1}{2}$ .





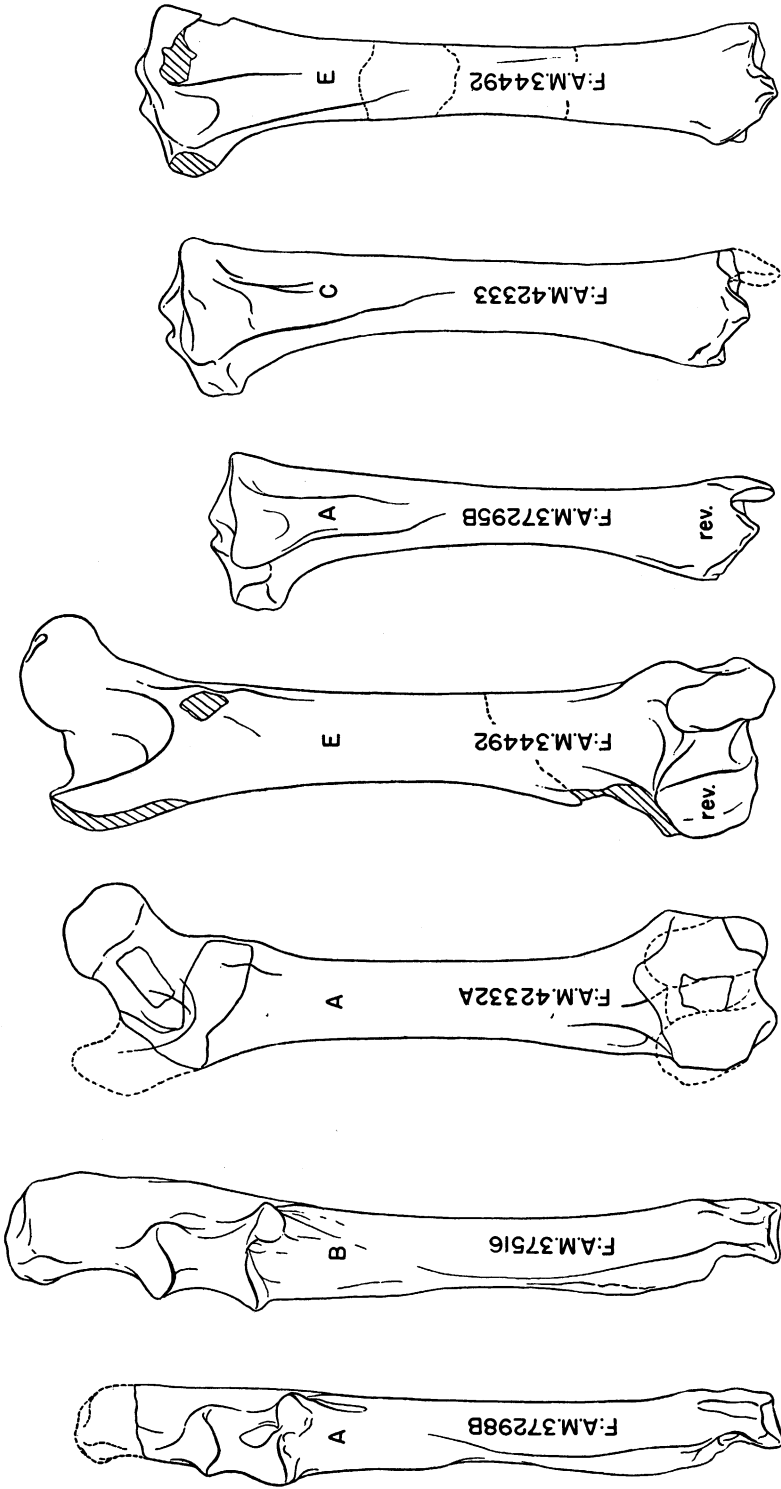


Fig. 10. *Brachycerus* Matthew, comparison of skeletal elements. A = *B. siouense* (Sinclair), from Nebraska; B = *B. wilsoni*, new species, from Nebraska; C = *B. buvadii* (Merriam), from California; D = *B. sweetwaterensis*, new species, from Wyoming; E = *B. vaughani*, new species, from Wyoming. X  $\frac{1}{2}$ .

*B. wilsoni*

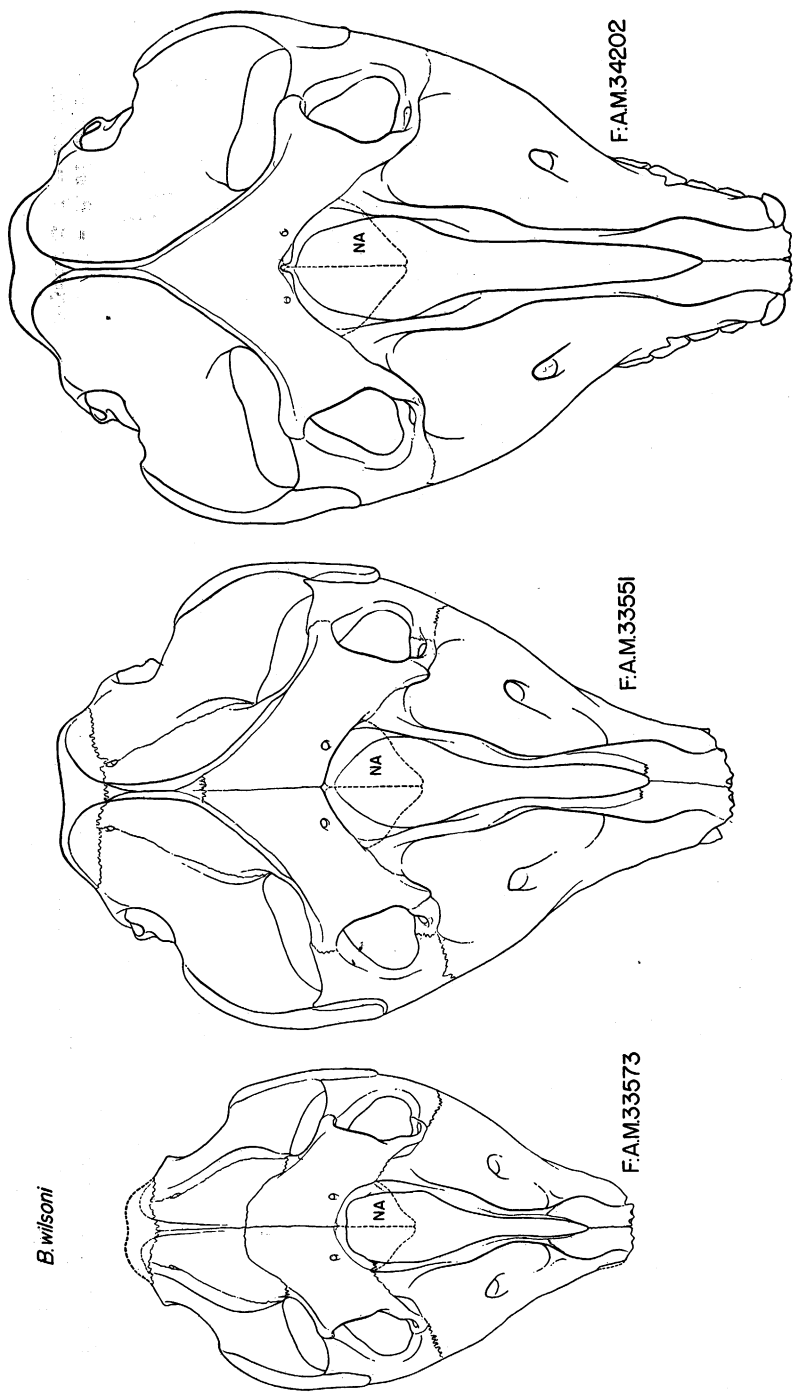


Fig. 11. *Brachycterus wilsoni*, new species, HOLOTYPE, F.A.M.34202, adult skull, REFERRED, F.A.M.33551, young skull, and F.A.M.33573, very young skull, showing age variation, from "Sheep Creek" deposits, Sioux County, Nebraska.  $\times \frac{1}{3}$ .

NA = nasals.

## II. MERYCOCHOERUS LEIDY

*Merycochoerus* LEIDY, 1858, Proc. Acad. Nat. Sci. Phila., X, p. 24. 1869, Jour. Acad. Nat. Sci. Phila., (2), VII, p. 110, Pl. x.

GENOTYPE.—*Merycochoerus proprius* LEIDY.

### GENERIC CHARACTERS

SKULL.—Medium to very large size; brachycephalic; occipital region fan-shaped with supraoccipital crests protruding posteriorly; cranial region foreshortened; brain case laterally expanded; frontals wide and moderately convex; zygomatic arches of medium to heavy construction; malars under orbits deep; nasals much reduced; infraorbital foramina above region of M<sup>1</sup>; muzzle moderately to extremely deep; maxillæ form a curve along the upper contour in advance of the anterior narial opening; pronounced extension of the posterior palate to the pterygoid region; bullæ inflated but small for size of skull.

MANDIBLE.—Medium to large; long symphysis, with tuberosity on the posterior border.

DENTITION.—Brachyodont.

LIMBS.—Moderately heavy to robust; feet vary from long and light to short and heavy.

MEASUREMENTS.—Tables III and IV.

### DISCUSSION

*Merycochoerus proprius* Leidy, the genotypic species, was established on material collected "from the Miocene red-grit bed near Fort Laramie, Wyoming."<sup>1</sup> The type locality is commonly considered to be near Fort Laramie in Wyoming because of Leidy's statement, but F. V. Hayden<sup>2</sup> definitely placed the collecting locality of the holotype in Nebraska along the Niobrara River, not far from the present site of Dunlap in the Hemingford area. Hayden reported, concerning the Nebraska location,

"August 2nd. . . . From the head of the Loup Fork we pursued a north-west course to the Niobrara River. . . .

"August 10th. On reaching the Niobrara we observed some of the upper Miocene beds. . . . As we pass up the Niobrara the gray sandstone bed assumes a variety of characters. . . . About fifty miles up the Niobrara from the point where we struck it (Aug. 10th) the Pliocene beds cease to appear, and the whole country is occupied by the Miocene formation D and E of the general section.

"August 14th. . . . Fifty miles above our camp of August 10th, a new bed arises above the water level of the river, composed of a flesh-colored calcareous grit with a reddish tinge. Sometimes it is a light yellow calcareous marl, and the eroded material gives a reddish yellow tint to the whole surface of the country. It seems to pass up quite gradually into the

<sup>1</sup> Leidy, Joseph, 1858, op. cit., p. 24.

<sup>2</sup> Hayden, F. V., 1863, Trans. Amer. Philos. Soc. (N. S.), XII, p. 13.

sandstone above. The remains of an animal allied to the *Oreodon*, named by Dr. Leidy, *Merycochoerus proprius*, were collected from this bed at this locality."

Hayden plotted the various "camps" of the survey party on his map<sup>1</sup> of Nebraska and Dakota. The location given for August 14th (the day that the holotype of *M. proprius* was collected) indicates that the camp was near the present site of Dunlap, northeast of Hemingford, Nebraska. This information agrees with that given in the 1863 report.<sup>2</sup> The examples of *Merycochoerus* recently collected from this same area are referable to *M. proprius*.

*Merycochoerus* remains are very restricted in distribution and have been found only in Colorado, Nebraska, South Dakota, and Wyoming. This is due to the scarcity of deposits of lower Hemingford age in North America.

Considerable individual variation within a species is noted in the genus. This is very much in evidence in *M. proprius* as illustrated by the seven associated skulls, mandibles, and limbs, F:A.M.42469A to 42471, from Dawes County, Nebraska. The outlines of four of these skulls are shown in *Figure 16* in order to demonstrate the differences in size and shape. The following table contains measurements for all seven skulls as well as the remaining associated material.

*Merycochoerus proprius*, referred

F:A.M.	Wear	SKULLS					MANDIBLES	
		Length (max.)	Width (max.)	Height of pre-maxillæ (max.)	C/- Maxillary notch <sup>3</sup> (min.)	C/-M <sup>3</sup>	Length	/C-M <sub>3</sub>
42469A	(w+)	341.	276.5	120.5	133.	178.	255.	170.5
42469B	(w+)	(297.)	225.	93.	113.5	168.	(241.)	(163.5)
42469C	(w)	(316.)	203.	(90.)	116.5	168.5	((249.))	(168.5)
42469D	(w)	(297.)	197.	97.	105.	164.	....	....
42469E	(r)	234.5	154.	78.	83.	...	192.5	....
42470	(w+)	319.	...	94.	105.	162.	....	....
42471	(w+)	...	...	...	...	156.	245.5	158.5

ASSOCIATED LIMBS (F:A.M.42469A to 42471)				
Humerus (articular)	Radius (articular)	Ulnæ (max.)	Femora (articular)	Tibiæ (articular)
((196.))	130.5	206.5	225.5	150.5
		187.	219.	136.5
		185.	195.5	

<sup>1</sup> Hayden, F. V., 1869, Jour. Acad. Nat. Sci. Phila., (2), VII, accompanied by a map.

<sup>2</sup> Hayden, F. V., 1863, op. cit., p. 13.

<sup>3</sup> Measured from anterior base of canine to maxillary notch of sigmoid curve, below nasals.

## SUMMARY OF SPECIES AND TYPES

Two species<sup>1</sup> and three<sup>2</sup> varieties of *Merycochoerus* from six Miocene localities are here recorded:

- (1) *Merycochoerus proprius* Leidy, 1858, genotype, from Hemingford area, Nebraska.

GENOHOLOTYPE.—Right maxilla, right ramus, A.N.S.P.10868; left maxilla, A.N.S.P.10867; and left ramus, N.M.156 (all from one individual).

- (1a) *Merycochoerus proprius magnus* (Loomis), 1924, from near Agate, Sioux County, Nebraska, and referred remains from Dawes County, Nebraska, and Logan County, Colorado.

HOLOTYPE.—Skull, mandible, and skeletal elements, A.M.14242. *Figures 12, 14, 17, 18.*

- (2) *Merycochoerus matthewi* Loomis, 1924, from near Porcupine Butte, Shannon County, South Dakota, and geographic varieties (2a) from Goshen and Niobrara Counties, Wyoming, and (2b) from Sioux County, Nebraska.

HOLOTYPE.—Skull, mandible, and skeletal elements, A.M.12970. *Figures 12, 15, 17, 18.*

- (3) *Merycochoerus* species undetermined, from Hemingford area, Dawes County, Nebraska.

<sup>1</sup> Scott, W. B., 1890, *Morpholog. Jahrb.*, XVI, Figs. 33-34.

In this paper Scott named a new species of oreodont, "*Merycochoerus coenopus*," based on a distal end of an ulna and elements of manus and pes. The present writers have compared the holotype of this species with skeletal elements of *Merycochoerus* and they feel certain that this form should be referred to a different genus. "*M. coenopus*" will be considered in a later paper under the subfamily Ticholeptinae.

<sup>2</sup> Two geographic varieties are included in this count.

## DETAILED LISTS OF TYPES, REFERRED SPECIMENS, AND SYNONYMY

*Merycochoerus*, total available specimens, 135(1) *Merycochoerus proprius* Leidy, genotype

From the Upper Part of the Marsland Formation, Hemingford Area, Nebraska

*Merycochoerus proprius* LEIDY, 1858, Proc. Acad. Nat. Sci. Phila., X, p. 24. 1869, Jour. Acad. Nat. Sci. Phila., (2), VII, p. 110, Pl. x. THORPE, 1937, Mem. Peabody Mus., III, Pt. 4, p. 157, Pl. xxiii, Figs. 1-3.

## SPECIFIC CHARACTERS

SKULL.—Average larger and more massive than *M. proprius magnus* or *M. matthewi*; very high muzzle and maxillæ; maxillary notch of sigmoid curve, below nasals, retracted to a point above M<sup>1</sup>-M<sup>2</sup>; nasals retracted more than in *M. proprius magnus* or *M. matthewi*; tendency for nasals to protrude upward anteriorly; brain case with a pronounced ridge.

MANDIBLE.—More robust than examples of *M. matthewi*.

DENTITIONS.—Slightly heavier than those of *M. matthewi*, but overlapping in size range with that species.

LIMBS.—Definitely heavier than examples of *M. matthewi*; feet shorter and more robust than those of *M. matthewi*.

MEASUREMENTS.—Tables III and IV.

## DISCUSSION

*M. proprius* is readily recognized by a more massive appearance of the muzzle and a greater amount of retraction of the nasals than is found in the other two described forms. The average skull is definitely larger than that of *M. proprius magnus*, although the latter name suggests a more massive form. Loomis,<sup>1</sup> in naming "*M. magnus*," pointed out the larger size of his new species compared with examples of *M. proprius*. He apparently used the specimens from Colorado, which Matthew<sup>2</sup> had referred to *M. proprius*, for the comparison. The present writers include the Colorado specimens under *M. proprius magnus* and consider the size difference mentioned by Loomis as an individual rather than a specific variation (see discussion of variation, p. 278).

*M. proprius* appears at higher levels in the Marsland formation than *M. matthewi* and has not been reported in association with this latter species, which comes from the lower part of the Marsland. A detailed discussion of the type area of *M. proprius* will be found on p. 277.

The University of Nebraska State Museum specimens referred to this species were collected by E. L. Blue, Thompson M. Stout, Grayson E. Meade, Guy Johnson, Loren Toohey, C. Bertrand Schultz, and associates, 1935-1939.

<sup>1</sup> Loomis, F. B., 1924, Bull. Amer. Mus. Nat. Hist., LI, Art. 1, p. 28.

<sup>2</sup> Matthew, W. D., 1901, Mem. Amer. Mus. Nat. Hist., I, Pt. 7, p. 401.

Ninety-three specimens are here recorded:

GENOHOLOTYPE.—Right maxilla with I <sup>3</sup> -M <sup>3</sup> . (w $\dagger$ )	A.N.S.P.10868	From the Marsland formation of the Hemingford group, near Dunlap, Hemingford area, Nebraska; collected by F. V. Hayden, 1857.
Left maxilla with C/-M <sup>3</sup> (P <sup>1</sup> , M <sup>1</sup> missing) and right ramus with I <sub>1</sub> -M <sub>3</sub> (P <sub>2</sub> , P <sub>4</sub> alv.). (w $\dagger$ )	A.N.S.P.10867	
Left ramus with P <sub>1</sub> -M <sub>3</sub> (br.) (w $\dagger$ )	N.M.156	Figured by Leidy, 1869, Pl. x; Thorpe, 1937, Pl. xxiii, Figs. 1-3.

The above specimens listed as the holotype appear to have been from the same individual. Douglass<sup>1</sup> considered that the holotype of *M. proprius* included a portion of a maxilla and a mandible in the Academy of Natural Sciences of Philadelphia, while Thorpe<sup>2</sup> stated that it consisted of "upper and lower jaws containing nearly complete dentition... U.S.N.M.156." The specimens, however, are divided so that the right and left maxillæ as well as the right ramus are in the Academy of Natural Sciences of Philadelphia and the left ramus is in the United States National Museum.

REFERRED.—

(A) FROM TYPE LOCALITY, HEMINGFORD AREA (collected by F. V. Hayden, 1857):

M <sup>3</sup> .....	(w+)	N.M. 445
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(A') FROM TYPE AREA, NEAR DUNLAP, HEMINGFORD AREA, DAWES COUNTY, NEBRASKA (collected by Ted Galusha and associates):

From Pebble Creek, 1938:

SEVEN ASSOCIATED SKULLS, ETC.

Skull with I <sup>1</sup> -M <sup>3</sup> and mandible with I <sub>1</sub> -M <sub>3</sub> . Figures 12, 13, 16	(w)	F:A.M. 42469A
Accessory tooth between I <sub>3</sub> and /C on left side, alveolus on right.		
Skull with I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> and mandible with I <sub>1</sub> (rt.)-M <sub>3</sub> (I <sub>2</sub> -I <sub>3</sub> alv., /C br.). Figure 16 (in part).....	(w $\dagger$ )	42469B
Skull with C/-M <sup>3</sup> and partial mandible with I <sub>1</sub> -I <sub>2</sub> alv. and I <sub>3</sub> (rt.)-M <sub>3</sub> (C/ rt.).....	(w)	42469C
Skull with I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> . Figure 16 (in part).....	(M)	42469D
Skull with I <sup>1</sup> -I <sup>2</sup> alv. and I <sup>3</sup> (rt.)-dP <sup>2</sup> -M <sup>2</sup> and left ramus with I <sub>1</sub> -dP <sub>3</sub> -M <sub>2</sub> . Figure 16 (in part).....	(I)	42469E
Partial skull with I <sup>1</sup> (alv.)-M <sup>3</sup> (P <sup>2</sup> -M <sup>1</sup> br.) and partial mandible with /C-P <sub>2</sub> rt. and P <sub>3</sub> (br.)-M <sub>3</sub> .....	(w+)	42470
Skull with I <sup>1</sup> -M <sup>3</sup> (lacking nasals, and premaxillæ badly eroded) and mandible with I <sub>2</sub> -M <sub>3</sub> .....	(w+)	42471
Ramus with I <sub>3</sub> -dP <sub>3</sub> -M <sub>3</sub> (germ).....	(I)	42470A

<sup>1</sup> Douglass, Earl, 1906, Science, N.S., XXIV, No. 618, p. 565.

<sup>2</sup> Thorpe, Malcolm R., 1937, op. cit., p. 157.

## SKELETAL ELEMENTS

2 scapulae (1 partial), 3 humeri (1 partial), 5 radii (2 partial), 5 ulnae (1 partial), 5 femora (1 partial), 5 tibiae (3 partial), 2 calcanea, 3 astragali, manus and pes elements, pelvis, and vertebrae.  
*Figures 17, 18* (in part).....  
 3 partial humeri, 2 radii, 4 ulnae (2 partial), and skeletal fragments

F:A.M.  
 42469A-E  
 42470-1

The foregoing seven skulls, mandibles, and skeletal elements were found associated. They illustrate very well the large amount of individual variation to be expected within a single species. The length and width of the skulls as well as the lengths of the superior and inferior dental series vary considerably. The length of the muzzle and the distance from the anterior base of the canine to the posterior notch of the sigmoid curve of the maxilla, however, are very constant in all examples including the immature (see p. 278 for discussion).

From various localities on Pebble Creek, 1937-1938:

## FOUR PARTIAL SKULLS AND ASSOCIATED MATERIAL

Inferior portion of skull with I <sup>1</sup> -M <sup>3</sup> (P <sup>1</sup> absent), partial mandible with C/-M <sup>3</sup> , partial radius, and partial ulnae. (w <sup>+</sup> )	F:A.M.37523
Left posterior portion of skull with P <sup>4</sup> -M <sup>3</sup> . (M)	42492A
Anterior portion of skull with C/(rt.)-M <sub>2</sub> (br.). (M)	42492B
Proximal end of radius, 2 partial ulnae, and 2 distal ends of tibiae.	42492A-B

The above limb elements and the two partial skulls (42492A and 42492B) were found associated.

Partial skull (crushed) with I <sup>1</sup> (alv.)-M <sup>3</sup> (br.) (I <sup>2</sup> -C/alv., M <sup>1</sup> -M <sup>2</sup> br.), left ramus with I <sub>1</sub> -P <sub>1</sub> alv. and P <sub>2</sub> (rt.)-M <sub>3</sub> , humerus, and skeletal fragments. (w <sup>+</sup> )	42493
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## TWO PARTIAL MANDIBULAR SPECIMENS

Fragment of right ramus with M <sub>3</sub> (br.). (w+)	43026
Partial right ramus with P <sub>4</sub> -M <sub>3</sub> . (w+)	43027



From Cottonwood Creek, 1937:

THREE SKULLS AND ASSOCIATED MATERIAL

Skull with I <sup>1</sup> -I <sup>2</sup> alv. and I <sup>3</sup> -M <sup>3</sup> (P <sup>4</sup> alv., M <sup>1</sup> br.), lacking occipital region, and left dentition. (w <sup>+</sup> )	F:A.M.37236
Skull with P <sup>2</sup> -M <sup>3</sup> (lacking premaxillæ). (w)	37237
Skull with I <sup>1</sup> -M <sup>3</sup> (lacking nasals and zygomatic arches), mandible with I <sub>1</sub> -M <sub>3</sub> , and skeletal frag- ments. (w <sup>+</sup> )	37522

TWO MANDIBULAR SPECIMENS

Partial mandible with I <sub>1</sub> - M <sub>3</sub> . (w+)	37524
Partial left ramus with /C- M <sub>2</sub> (br.) (P <sub>4</sub> -M <sub>1</sub> br.). (w+)	37224

LIMB

Humerus.	43024
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From N.E. of Dunlap, 1933-1937:

SKULL

Skull with P <sup>3</sup> -M <sup>3</sup> (lacking premaxillæ). (w)	F:B:A.M.34490
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LIMB

Femur.	F:A.M.43025
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From Dunlap Camel Quarry, 1937-1939:

TEN SKULLS

Nine skulls with		F:A.M.
P <sup>2</sup> -M <sup>3</sup> , lacking premaxillæ.....	(w)	37240
P <sup>3</sup> -M <sup>3</sup> , lacking premaxillæ and occipital region.....	(w+)	37241
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> and partial mandible with P <sub>1</sub> -M <sub>3</sub> .....	(w+)	37518
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> .....	(w <sup>+</sup> )	42475
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> , lacking anterior of nasals.....	(w+)	42476
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> .....	(w+)	42477
P <sup>1</sup> -M <sup>3</sup> , lacking premaxillæ.....	(w)	42478
I <sup>1</sup> -C/ alv. and P <sup>1</sup> -M <sup>3</sup> .....	(w+)	42479
C/-dP <sup>3</sup> -M <sup>3</sup> (germ) (P <sup>2</sup> alv.), lacking nasals and premaxillæ..	(i)	42481

## PARTIAL SKULL

Superior portion of skull with nasals (without dentition).....	F:A.M.	42483
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## FOUR PARTIAL MAXILLAE

Right maxilla with P <sup>3</sup> -M <sup>3</sup> .....	(w)	42473
Three left maxillæ with		
dP <sup>2</sup> -M <sup>1</sup> .....	(i)	37214
P <sup>2</sup> -M <sup>3</sup> (M <sup>1</sup> -alv.).....	(M+)	37238
P <sup>3</sup> -M <sup>3</sup> .....	(w+)	42474

## FOUR MANDIBULAR SPECIMENS

Two partial right rami with		
P <sub>2</sub> -M <sub>2</sub> (br.).....	(w+)	37221
P <sub>1</sub> -M <sub>3</sub> (P <sub>3</sub> alv., M <sub>1</sub> -M <sub>2</sub> br.).....	(w‡)	42482
Two left rami with		
I <sub>1</sub> -/C alv. and P <sub>1</sub> -M <sub>3</sub> .....	(w+)	37239
I <sub>1</sub> -/C alv. and P <sub>1</sub> -M <sub>3</sub> .....	(w‡)	42480

## TWENTY-FOUR SKELETAL ELEMENTS

Two radii.....	42487A-B
Two ulnæ.....	42486A-B
Femur.....	42484
Tibia.....	42485
3 astragali.....	43012A-C
15 metapodials.....	43013A-O

(A") FROM HEMINGFORD AREA, DAWES AND BOX BUTTE COUNTIES, NEBRASKA (collected by E. L. Blue, Thompson M. Stout, Grayson E. Meade, Guy Johnson, Loren Toohey, C. Bertrand Schultz, and associates, 1935-1939):

## EIGHT SKULLS AND ASSOCIATED MATERIAL

Six skulls with	N.S.M.	
I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> , brain case and zygomatic arches damaged. (w+)	1-28-6-35S.P.	From N. of Hemingford, Box Butte County.
P <sup>2</sup> -M <sup>3</sup> (lacking premaxillæ and supraoccipital region) and partial mandible with P <sub>2</sub> -M <sub>3</sub> . (w‡‡)	2-27-8-35S.P.	From N.E. of Dunlap, Dawes County.
I <sup>1</sup> -M <sup>3</sup> (lacking occipital region) and mandible with I <sub>1</sub> -I <sub>2</sub> rt. and I <sub>3</sub> -M <sub>3</sub> . (w‡)	1-20-6-36N.P.	From N.E. of Marsland, Dawes County.
I <sup>1</sup> -M <sup>3</sup> (lacking zygomatic arches and most of anterior right side) and mandible with I <sub>1</sub> -M <sub>3</sub> . (w+)	1-10-8-36N.P.	From N.E. of Marsland, Dawes County.

	N.S.M.	
C/-M <sup>3</sup> (P <sup>1</sup> br.) (lacking condyles) and mandible with I <sub>1</sub> -/C alv. and P <sub>1</sub> -M <sub>3</sub> , associated with 2 scapulæ (1 partial), 4 humeri (1 partial), 3 radii, 3 ulnæ (1 partial), distal end of femur, and fragment of pelvis (limbs from several individuals). (w†+)	1-12-8-36N.P.	From Hemingford Quarry 24, Dawes County. <i>Figure 17</i> (in part).
P <sup>1</sup> -M <sup>3</sup> (lacking premaxillæ and partial mandible with P <sub>1</sub> -M <sub>3</sub> . (w+)	3-10-9-36N.P.	From N.E. of Marsland, Dawes County.
Two skulls, immature, with I <sup>1</sup> (alv.) - dP <sup>2</sup> - M <sup>3</sup> (germ), lacking occipital region and zygomatic arches. (i)	5-17-10-38N.S.M.	From Hemingford Quarry 12 B, Box Butte County.
C/(alv.)-M <sup>3</sup> (germ) (P <sup>2</sup> -P <sup>4</sup> germs), lacking premaxillæ and condyles. (i)	1-10-9-39	From N. of Hemingford, Box Butte County.

## MAXILLA

Partial right maxilla with P <sup>2</sup> -M <sup>2</sup> (br.) (M <sup>1</sup> br.). (w)	2-10-9-39	From Hemingford Quarry 7 B, Box Butte County.
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Various individual teeth of *Merycochoerus* have also been found in Hemingford Quarry 7B.

## TWO MANDIBULAR SPECIMENS

Partial mandible with P <sub>4</sub> -M <sub>3</sub> . (w+)	2-3-8-37S.P.	From N.W. of Hemingford, Box Butte County.
Partial left ramus with I <sub>2</sub> -/C alv. and P <sub>1</sub> (br.)-M <sub>1</sub> (br.). (w)	2-14-8-35N.W.P.	From N.W. of Marsland, Dawes County.

## MISC. ASSOCIATED SKELETONS

Large block, containing skulls, jaws, and associated skeletal elements of <i>Merycochoerus proprius</i> . (Block collected in sections, total weight approximately 3,800 lbs., only partially prepared at present time.)	1-8-8-35N.W.P.	From Hemingford Quarry 25 Dawes County.
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(A''') FROM NEAR MARSLAND, HEMINGFORD AREA, DAWES COUNTY, NEBRASKA (collected by Frank Figgins and Nelson J. Vaughan, 1927):

## TWO SKELETONS

Two mounted skeletons and skeletal elements of several immature individuals..... Col.M. 1264

From near Marsland:

## SKULL AND MANDIBLE

Skull with P<sup>1</sup>-M<sup>3</sup> (lacking premaxillæ) and mandible with I<sub>1</sub>-M<sub>3</sub>.. (w‡) F:A.M. 43014

## FOUR SUPERIOR DENTITIONS

Posterior portion of skull with M<sup>3</sup>..... (w+) 43016A

Left maxilla with C/-M<sup>2</sup>(br.)..... (w+) 43016B

Right half of skull with I<sup>2</sup>-C/(br.) and P<sup>1</sup>-M<sup>3</sup>..... (w) 43016C

The above three specimens were found associated.

Right maxilla with P<sup>2</sup>-M<sup>3</sup>..... (w‡) 43017

## SIX MANDIBULAR SPECIMENS

Two partial mandibles with

I<sub>1</sub>-P<sub>1</sub> br. and P<sub>2</sub>-M<sub>3</sub>(br.)..... (w+) 43018

I<sub>1</sub>-P<sub>3</sub>..... (w) 43022

Two partial right rami with

P<sub>1</sub>-M<sub>2</sub>..... (M) 43019

M<sub>3</sub>..... (w+) 43020A

Associated with left ramus 43020B.

Two partial left rami with

M<sub>2</sub>-M<sub>3</sub>..... (w+) 43020B

M<sub>1</sub>(br.)-M<sub>3</sub>..... (w‡) 43021

(1a) *Merycochoerus proprius magnus*<sup>1</sup> (Loomis)

From the Marsland Formation, Nebraska, and Referred Specimens from Colorado

*Merycochoerus magnus* LOOMIS, 1924, Bull. Amer. Mus. Nat. Hist., LI, Art. 1, p. 28, Figs. 16 (in part)-17. THORPE, 1937, Mem. Peabody Mus., III, Pt. 4, p. 154, Fig. 113 (in part), Pl. XXI.

## VARIETAL CHARACTERS

SKULL.—Differs from *M. proprius* in having less height to muzzle and maxillæ as well as less retraction of the nasals; maxillary notch of sigmoid curve, below nasals, retracted to a point above M<sup>1</sup> (usually anterior of M<sup>1</sup>); nasals nearly horizontal.

<sup>1</sup> It is unfortunate that the name *magnus* was applied to this form since it is now established that skulls of *M. proprius* develop to a larger size.

MANDIBLE.—Similar to examples of *M. proprius*.

DENTITIONS.—Inseparable from *M. proprius*.

LIMBS.—Approximately equal to those of *M. proprius* and heavier than in *M. matthewi*; metapodials like examples of *M. proprius* but shorter and heavier than in *M. matthewi*.

MEASUREMENTS.—Tables III and IV.

#### DISCUSSION

Loomis<sup>1</sup> pointed out the close relationship of *M. proprius* and *M. magnus* when he described the latter form:

“This species is nearer to *M. proprius*, in that the sagittal crest ends some distance in front of the lambdoidal region. . . The zygomatic arches are heavy and wide, but not as wide proportionally as those of *M. proprius*, being heavy and stocky, with feet extremely short and stubby.”

The sagittal crest in the holotype of *M. magnus* is broken but in complete specimens the crest continues to the lambdoidal region. This character is typical of the genus. The differences in the zygomatic arches to which Loomis referred are not of specific value, but are to be considered as individual variations (see discussion of variations, p. 278).

Thorpe<sup>2</sup> stated that “the skull (of *M. magnus*) is about a sixth longer and a seventh wider than that of *proprius*.” This conclusion apparently was based on material from Colorado referred to *M. proprius* by Matthew (see specimen list, p. 288), which the writers consider as belonging to *M. proprius magnus*. The Colorado specimens, although smaller than the holotype of *M. proprius magnus*, are well within the range of variation of this variety.

More information concerning the stratigraphic occurrence of this variety is necessary. The degree of development of the skull and skeletal elements would strongly suggest that this form represents a stage more advanced than *M. matthewi* and less advanced than *M. proprius*. Remains of *M. proprius magnus*, therefore, should be found in Marsland deposits of intermediate age between those containing the remains of *M. matthewi* and *M. proprius*, but somewhat nearer the level of the latter.

Eighteen specimens are here recorded:

<p>HOLOTYPE.—Skull with I<sup>1</sup>-M<sup>3</sup>, mandible with I<sub>1</sub>-I<sub>2</sub> alv. and I<sub>3</sub>-M<sub>3</sub> (/C, P<sub>2</sub>-P<sub>4</sub> alv.), partial scapula, humerus, 2 radii, 2 ulnæ, manus, femur, tibia, calcanea, astragalus, pes, pelvis, vertebræ and ribs. (w††)</p>	<p>A.M.14242</p>	<p>From Marsland formation of Hemingford group, 7 mi. N.E. of Agate, Sioux County, Nebraska; collected by R. L. Moodie, 1908. Figured by Loomis, 1924, Figs. 16-17 (in part); Thorpe, 1937, Fig. 113, Pl. XXI (in part). Figures 12, 14, 17, 18.</p>
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<sup>1</sup> Loomis, F. B., 1924, op. cit., p. 28.

<sup>2</sup> Thorpe Malcolm R., 1937, op. cit., p. 154.

## REFERRED.—

- (A) FROM COTTONWOOD CREEK, HEMINGFORD AREA, DAWES COUNTY, NEBRASKA (collected by Ted Galusha and associates, 1937):

## SKULL AND ASSOCIATED MATERIAL

Partial crushed skull with I <sup>1</sup> (alv.)-M <sup>3</sup> (P <sup>2</sup> alv.), right ramus with I <sub>3</sub> -M <sub>3</sub> (/C, M <sub>3</sub> erupt., P <sub>3</sub> alv.) and skeletal fragments.....	(-M)	F:A.M. 42491
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## SKULL

Skull with I <sup>1</sup> -M <sup>3</sup> .....	(-M)	37520
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## FOUR MANDIBULAR SPECIMENS

Partial mandible with P <sub>1</sub> (rt.)-M <sub>3</sub> .....	(w)	37520A
Right ramus with I <sub>1</sub> -M <sub>3</sub> .....	(w+)	37521
Left ramus with I <sub>1</sub> -I <sub>2</sub> alv. and I <sub>3</sub> -M <sub>3</sub> .....	(m)	37521A
Right ramus with I <sub>2</sub> -/C rt. and P <sub>1</sub> -M <sub>3</sub> .....	(w)	37223

## SKELETAL ELEMENTS

Femur, partial tibia, and metapodial.....	37520 to 37521A
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F:A.M.37520, 37520A, 37521, and 37521A were found associated.

- (B) FROM HEMINGFORD AREA, DAWES COUNTY, NEBRASKA (collected by University of Nebraska State Museum field parties, 1935-1937):

## FOUR SKULLS, ETC.

Skull with I <sup>1</sup> -M <sup>3</sup> , partial mandible with I <sub>1</sub> -P <sub>2</sub> alv. and P <sub>3</sub> -M <sub>3</sub> (M <sub>2</sub> br.), and skeleton (mounted). (w+)	N.S.M.1-10-6-36N.P.	From N.E. of Marsland.
Skull with I <sup>2</sup> -M <sup>3</sup> (lacking zygomatic arches and occipital region) and mandible with I <sub>1</sub> -M <sub>3</sub> . (w‡)	1-10-8-35N.W.P.	From N.W. of Marsland.
Skull with I <sup>1</sup> -I <sup>2</sup> alv. and I <sup>3</sup> -M <sup>3</sup> (zygomatic arches damaged). (w)	2-31-5-37N.P.	From Willow Creek, N.E. of Marsland.
Skull with I <sup>1</sup> -M <sup>3</sup> . (w‡)	3-10-7-37N.P.	From N. of Dunlap.

- (C) FROM MARTIN CANYON, EASTWARD HEAD OF CEDAR CREEK, LOGAN COUNTY, COLORADO (collected by W. D. Matthew and H. T. Martin, 1898):

## FIVE SKULLS AND ASSOCIATED MATERIAL

Group of five individuals, skull with I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> (w‡), 3 immature skulls, 4 immature mandibles, and skeletal elements. (Figured by Matthew, <sup>1</sup> 1901, Figs. 18, 20, 23, 24, 25, and 26).....	A.M. 8968
Skull with I <sup>1</sup> -M <sup>3</sup> (I <sup>2</sup> -I <sup>3</sup> alv.) (supraoccipital region restored). (Figured by Matthew, 1901, Fig. 21.).....	(w+) 9052

<sup>1</sup> Matthew, W. D., 1901, Mem. Amer. Mus. Nat. Hist., I, Pt. 7.

The following fragmentary upper and lower dentitions from Martin Canyon were also referred to *M. proprius* by Matthew<sup>1</sup>: A.M. Nos. 9051, 9053, 9055, 9057, 9058, 9062, and 9064 (9062 has since been discarded).

## (2) *Merycochoerus matthewi* Loomis

From the Lower Part of the Marsland Formation, South Dakota; and Geographic Varieties (2a) from Wyoming and (2b) from Nebraska

*Merycochoerus matthewi* LOOMIS, 1924, Bull. Amer. Mus. Nat. Hist., LI, Art. 1, p. 27, Figs. 14-15. THORPE, 1937, Mem. Peabody Mus., III, Pt. 4, p. 156, Pl. XXIII, Figs. 4-5.

### SPECIFIC CHARACTERS

**SKULL.**—Smaller and somewhat lighter construction than in *M. proprius*; muzzle low in comparison with that of *M. proprius* and nasals not as retracted; maxillary notch of sigmoid curve, below nasals, retracted to a point above P<sup>3</sup>-P<sup>4</sup>; nasals nearly horizontal; brain case more rounded than in *M. proprius*.

**MANDIBLE.**—Lighter construction than average of *M. proprius*.

**DENTITIONS.**—Tendency to be lighter in construction than *M. proprius*; length of upper and lower series equal in length to smaller examples of *M. proprius*.

**LIMBS.**—Equal in length to those of *M. proprius*, but lighter; metapodials longer and lighter than examples of *M. proprius*.

**MEASUREMENTS.**—Tables III and IV.

### DISCUSSION

The muzzle region of the skull of *M. matthewi* is much lower than in *M. proprius* and the premaxillæ do not extend as high at the anterior surface of the muzzle as in that species. The height of the muzzle and the amount of upward extension of the premaxillæ are important diagnostic characters of the genus *Merycochoerus*. These characters appear to remain constant within a species, in both immature and adult specimens.

Loomis<sup>2</sup> used as a specific character of *M. matthewi*, "the fact that the sagittal crest extends to the rear of the skull and unites with the lambdoidal crests in making the projection behind." This character is not of specific value since he was referring especially to the holotype of *M. proprius magnus*, in which specimen the sagittal crest is broken (see discussion, p. 287).

It is interesting to note the contrast in the shape of the various skulls referred to *M. matthewi*. Much of this apparent variation is due to the crushing of the specimens by pressure from the overlying sediments.

This species seems to occur only in the lower part of the Marsland formation and so far it has not been found associated with *M. proprius*.

<sup>1</sup> Matthew, W. D., 1901, *ibid.*, p. 401.

<sup>2</sup> Loomis, F. B., 1924, *op. cit.*, p. 27.

The F:A.M. specimens here referred were collected by Nelson J. Vaughan, John Lynch, Everett DeGroot, and Charles H. Falkenbach, 1931-1939.

Nineteen specimens are here recorded:

HOLOTYPE.—Skull with I <sup>1</sup> (rt.)-M <sup>3</sup> (lacking supraoccipital region), mandible with I <sub>1</sub> (br.)-M <sub>3</sub> , radius, ulna, manus, and skeletal fragments. (w‡)	A.M.12970	From Marsland formation (= "Upper Rosebud," in part), 3 mi. N.E. of Porcupine Butte, Shannon County, South Da- kota; collected by W. K. Gregory and Albert Thomson, 1906. Figured by Loomis, 1924, Figs. 14-15 (in part); Thorpe, 1937, Pl. xxiii, Figs. 4-5 (in part). <i>Figures 12, 15, 17, 18.</i>
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REFERRED.—

(2a) VARIETY FROM GOSHEN AND NIobrARA COUNTIES, WYOMING.—

- (A) FROM JAY EM AREA, GOSHEN COUNTY, WYOMING (the Jay Em area includes the exposures on the east side of United States highway No. 85, from 2 mi. S. to 5 mi. N. of Jay Em), 1931-1937:

FIVE SKULLS AND ASSOCIATED MATERIAL

	F:A.M.
Skull with I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> , lacking anterior of nasals..... (w)	33317
Skull with I <sup>1</sup> -M <sup>3</sup> (br.) (crushed, lacking occipital region) and partial right ramus with /C(alv.)-M <sub>2</sub> (br.)..... (w)	37526
The above specimen was collected from a higher level than the balance of the referred material from the Jay Em area. The depth of the muzzle and the distance from the anterior base of the canine to the posterior notch of the sigmoid curve of the muzzle are somewhat greater than in the other referred remains. The size and characters of this specimen approach <i>Merycochoerus proprius</i> , which possesses a very deep muzzle.	
Skull with I <sup>1</sup> (alv.)-M <sup>3</sup> (I <sup>3</sup> alv.), lacking anterior of nasals..... (w)	37527
Anterior portion of skull with I <sup>1</sup> -M <sup>3</sup> (nasals present), partial mandible, with I <sub>1</sub> -M <sub>3</sub> , distal end of humerus, partial radius, and partial manus..... (w)	37528
Anterior portion of skull with I <sup>1</sup> -P <sup>3</sup> ..... (w‡)	42472

SKELETAL ELEMENTS

Radius, partial ulna, and partial manus.....	43028
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- (A') FROM EXPOSURES ON EAST SIDE OF UNITED STATES HIGHWAY  
No. 85, 16 MI. S. OF LUSK, GOSHEN COUNTY, WYOMING, 1938:

THREE ASSOCIATED SKULLS, ETC.

Skull with I <sup>1</sup> -I <sup>2</sup> alv. and I <sup>3</sup> -M <sup>3</sup> and mandible with I <sub>1</sub> -M <sub>3</sub> (I <sub>3</sub> alv.) (w‡)	F:A.M. 42490A
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Partial skull with I <sup>1</sup> -M <sup>3</sup> and mandible with I <sub>1</sub> -M <sub>3</sub> .....	(w†)	42490C
Skull with I <sup>1</sup> -I <sup>3</sup> alv. and C/-M <sup>3</sup> (erupt.) (P <sup>2</sup> -P <sup>4</sup> erupt., dP <sup>2</sup> -dP <sup>4</sup> present on left side) and mandible with I <sub>1</sub> -dP <sub>3</sub> -M <sub>3</sub> (erupt.).....	(i)	42490B
Mandible with I <sub>1</sub> -M <sub>3</sub> .....	(w)	42490D
3 scapulae, 3 humeri, 4 radii, 4 ulnae, manus elements, 4 femora (1 partial), 4 tibiae, 2 fibulae, 4 calcanea, 2 astragali, pes elements, 2 pelvi (1 partial), and vertebrae. <i>Figures 17, 18 (in part)</i> .....		42490A-D

(A\*) FROM EXPOSURES 16 MI. S. AND 9 MI. E. OF LUSK, GOSHEN COUNTY, WYOMING, 1936:

MANDIBULAR RAMUS, ETC.

Right ramus with I <sub>2</sub> -I <sub>3</sub> br. and /C-M <sub>3</sub> and skeletal elements....	(w)	F:A.M. 43029
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(B) FROM ROYAL VALLEY, 8 MI. S. OF LUSK, NIOBRARA COUNTY, WYOMING, 1933:

PARTIAL SKULL AND MANDIBLE

Posterior portion of skull with I <sup>1</sup> -M <sup>3</sup> and partial mandible with I <sub>2</sub> -M <sub>3</sub> (P <sub>2</sub> alv.) (badly weathered).....	(w†+)	F:A.M. 42489
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(2b) VARIETY FROM SIOUX COUNTY, NEBRASKA.—

(C) FROM 10 MI. S.W. OF HARRISON, SIOUX COUNTY, NEBRASKA, 1937:

SKULL, ETC.

Skull with I <sup>1</sup> -M <sup>3</sup> (I <sup>2</sup> alv.), mandible with I <sub>1</sub> -M <sub>3</sub> , and skeletal elements.....	(w)	F:A.M. 42494
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(D) FROM NEAR AGATE, SIOUX COUNTY, NEBRASKA (collected by O. A. Peterson and Earl Douglass, 1901):

TWO SKULLS AND ASSOCIATED MATERIAL

Left side of skull with I <sup>1</sup> -M <sup>3</sup> , mandible with I <sub>1</sub> -M <sub>3</sub> , vertebrae, ribs, and skeletal fragments.....	(w)	C.M. 1306
Skull with I <sup>1</sup> -M <sup>3</sup> (I <sup>2</sup> alv., P <sup>1</sup> br.), mandible with I <sub>1</sub> -C alv. and P <sub>1</sub> -M <sub>3</sub> , and vertebrae.....	(w+)	1399 <sup>1</sup>

Peterson<sup>2</sup> suggested that the above two specimens were distinct from *Merycochoerus proprius* but hesitated to base a new species on the material at hand. He questionably placed

<sup>1</sup> The tray card of specimen No. 1399 shows that this example came from the base of the "Nebraska beds," which would indicate its derivation from the base of the Marsland. This agrees with the age of other referred material of *M. matthewi*.

<sup>2</sup> Peterson, O. A., 1906, Ann. Carn. Mus., IV, No. 1, p. 63.

them in *M. proprius*, using Matthew's<sup>1</sup> referred material from Colorado for comparison. The present writers consider the Colorado specimens as belonging to *M. proprius magnus*, which appears to be a more primitive form than *M. proprius*. Loomis<sup>2</sup> later named a new species, *M. matthewi*, basing his descriptions on a specimen similar to Peterson's two examples, to which, however, he did not refer. Thorpe,<sup>3</sup> on the other hand, allocated C.M.1306 and 1399 to *M. magnus*.

## TENTATIVELY REFERRED.—

## (E) FROM NEAR AGATE, SIOUX COUNTY, NEBRASKA:

From 5 mi. N.E. of Agate; collected by Albert Thomson, 1908:

## TWO SKULLS AND ASSOCIATED MATERIAL

Skull with C/-M <sup>2</sup> (lacking premaxillæ and supraoccipital region), mandible with I <sub>1</sub> -M <sub>3</sub> , partial radius, partial ulna, and partial fibula. [Figured by Loomis, 1924, Fig. 16 (in part); Thorpe, 1937, Fig. 113 (in part) <sup>4</sup> ].....	(M)	A.M. 14238
Skull with mandible attached, humerus, radius, and skeletal parts	(I)	14239

From 6 mi. N.E. of Agate; collected by Harold J. Cook, 1908:

## MANDIBLE

Partial mandible with I <sub>1</sub> -M <sub>3</sub> .....	(w)	14241
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(3) *Merycochoerus*, species undetermined

Four additional sites in the Hemingford area, Dawes County, are here recorded:

From Hank's Locality, 1935:

Anterior portion of skull with I <sup>1</sup> -M <sup>1</sup> and anterior of right ramus with I <sub>1</sub> -P <sub>4</sub> .....	(w)	F:B:A.M. 33651
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From B Quarry, 1935:

## TWO MANDIBULAR SPECIMENS

Partial right ramus with M <sub>2</sub> -M <sub>3</sub> .....	(w±)	F:B:A.M. 33656
Left ramus with I <sub>1</sub> -C alv. and P <sub>1</sub> -M <sub>3</sub> .....	(w+)	33648

<sup>1</sup> Matthew, W. D., 1901, Mem. Amer. Mus. Nat. Hist., I, Pt. 7, p. 401.

<sup>2</sup> Loomis, F. B., 1924, op. cit., p. 28.

<sup>3</sup> Thorpe, Malcolm R., 1937, op. cit., p. 155.

<sup>4</sup> Loomis and Thorpe referred this specimen to *M. magnus*. The present writers, however, consider that it more nearly approaches *M. matthewi* because of the position of the nasals. The Marsland section northeast of Agate is very thick and it is possible that this, as well as the other two A.M. specimens listed here, was collected at a lower level than the type of *M. magnus*, which also came from the same locality.

From Wood's Canyon, 1935:

Posterior portion of skull with $M^3$ , occipital region of second skull, partial left maxilla with $M^1$ - $M^3$ , partial mandible with $M_1$ - $M_3$ , anterior portion of right ramus with $I_1$ (alv.)- $P_2$ ( $I_2$ br.), distal end of scapula, radius, ulna, partial manus, distal end of femur, proxi- mal end of tibia, and fragments of pes.....	(w+)	F:B:A.M. 33647
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From Sand Canyon,<sup>1</sup> 1938:

Fragment of right ramus with $M_2$ - $M_3$ (erupt.).....	(i)	F:A.M. 42495
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#### STATEMENT

The above specimens collected by Ted Galusha are not complete enough for definite specific identification but are worth listing since no other material has been reported from these sites. The geologic age of several of the sites has been questioned by some field observers, but the appearance of *Merycochoerus* seems to indicate that the deposits are Marsland.

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<sup>1</sup> Deposits of both lower and upper Hemingford age occur in Sand Canyon. *Brachycrus* remains are found in the upper part of the section in this canyon.

TABLE IV.—*Merycochoerus* LEIDY. COMPARATIVE MEASUREMENTS OF SKULLS AND RAMI

	<i>M. proprius</i> Leidy (Genotype)		<i>M. proprius magnus</i> (Loomis)	<i>M. matthewi</i> Loomis
	GENO- HOLOTYPE A.N.S.P. 10867-8 (w†)	REFERRED F:A.M. 42469A (w)	HOLOTYPE A.M. 14242 <sup>1</sup> (w†)	HOLOTYPE A.M. 12970 <sup>1</sup> (w†)
SKULL				
Stage of wear of teeth.....				
Length (including supraoccipital crest and incisors).....	...	341.	353.	(298.)
Basal length (from anterior notch of fora- men magnum to posterior base of I <sup>1</sup> )..	...	279.	306.	257.
Width (max.).....	...	276.5	278.	215.
Width of brain case (max.).....	...	140.	138.	112.
Width, interorbital (min.).....	...	(104.)	102.	100.
Distance from anterior rim of orbit to anterior base of canine.....	...	173.5	170.	136.
Distance from anterior rim of orbit to supraoccipital crest.....	...	168.	178.	(162.)
Width of muzzle at infraorbital foramina	...	94.	112.	93.
Height of premaxillæ (max.).....	...	120.5	78.5	35.
Distance from anterior base of canine to maxillary notch of sigmoid curve of muzzle (min.).....	...	133.	105.	67.
(max., along upper contour).....	...	152.	115.	72.
Width across canines (max.).....	...	86.	107.	71.
Width of palate between fourth pre- molars.....	...	54.	59.	39.
Width of palate between canines.....	...	51.	48.	42.
Length, C/-M <sup>3</sup> incl.....	179.	178.	192.	165.
Length, P <sup>1</sup> -M <sup>3</sup> incl.....	158.	154.	161.	147.
Length, P <sup>1</sup> -P <sup>4</sup> incl.....	69.	65.	67.	65.
Length, M <sup>1</sup> -M <sup>3</sup> incl.....	90.	88.	95.	85.
Width of M <sup>3</sup> (max.).....	35.5	32.	34.5	33.
Depth of malar below orbit.....	...	57.	53.	35.
RAMUS				
Length (max.).....	...	255.	288.	248.
Depth below anterior edge of M <sub>3</sub> .....	57.5	53.	67.	44.
Length, /C-M <sub>3</sub> incl.....	175.	170.5	(181.)	167.
Length, P <sub>1</sub> -M <sub>3</sub> incl.....	160.	156.5	173.	154.5
Length, P <sub>1</sub> -P <sub>4</sub> incl.....	66.	67.5	73.	67.5
Length, M <sub>1</sub> -M <sub>3</sub> incl.....	94.5.	93.5	101.	86.5

<sup>1</sup> See Table III, page 257, for measurements of skeletal elements of this specimen.

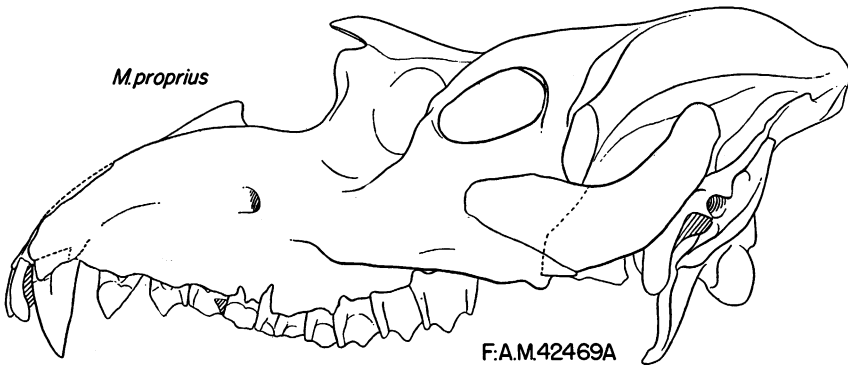
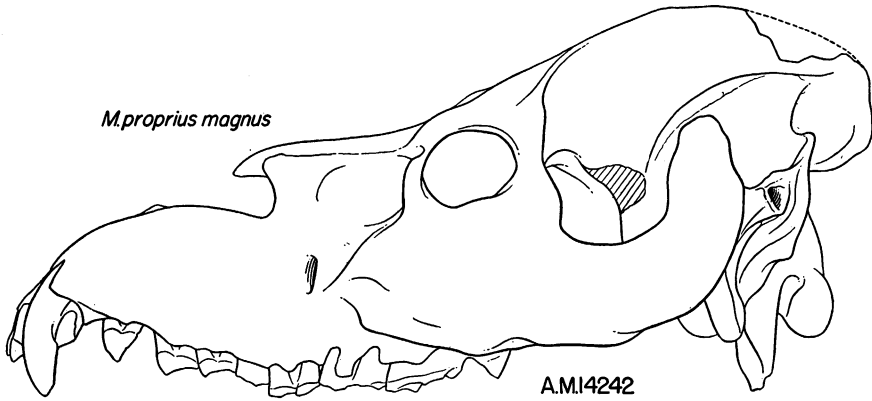
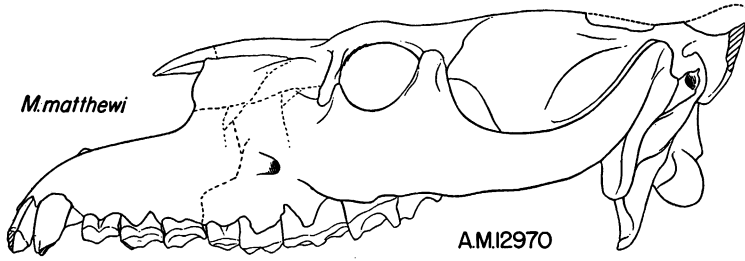
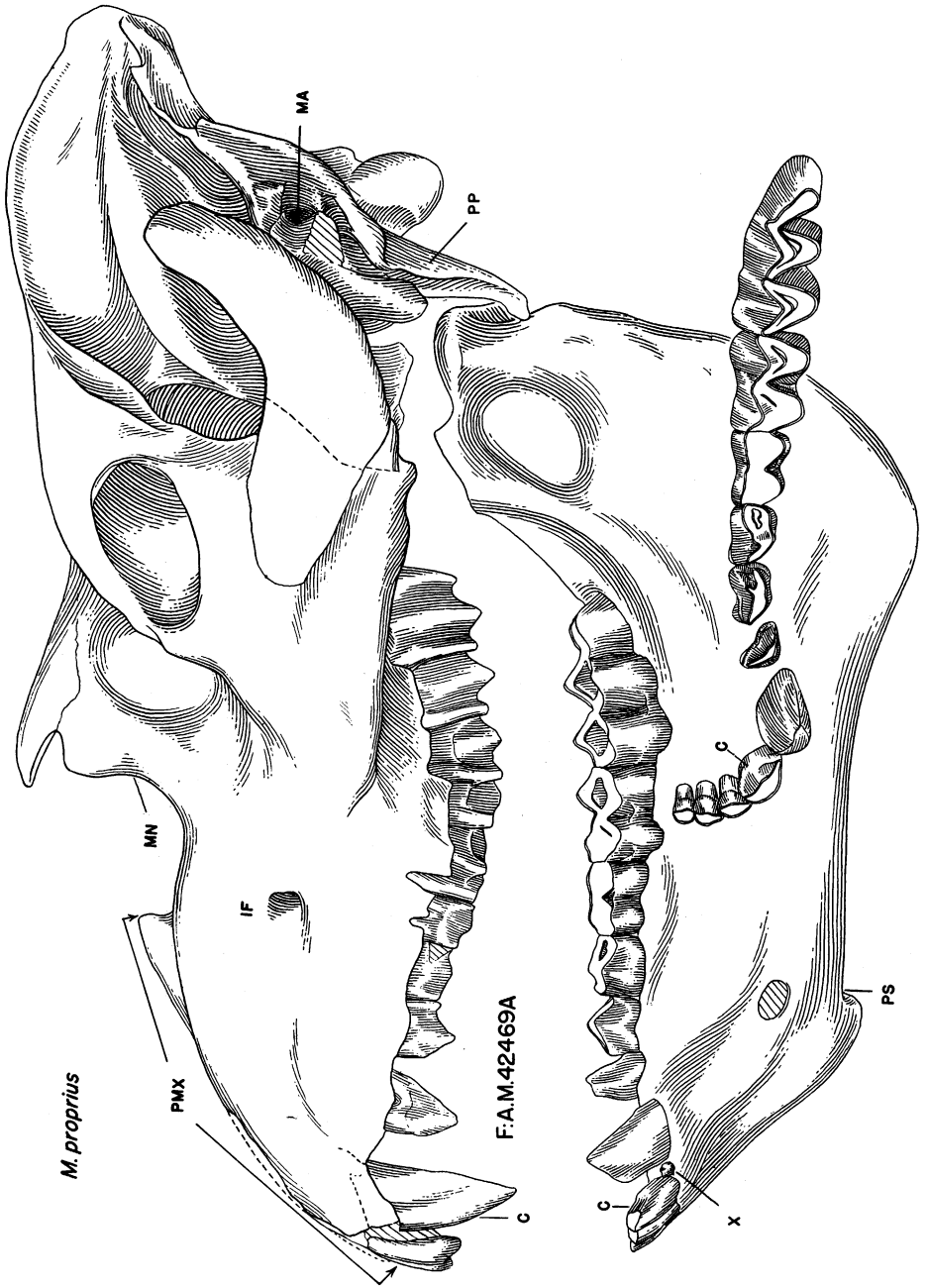


Fig. 12. Comparison of skulls representing the two species and one variety of *Merycochoerus*.  $\times \frac{1}{3}$ . (Compare *Brachycrus*, Fig. 1.)



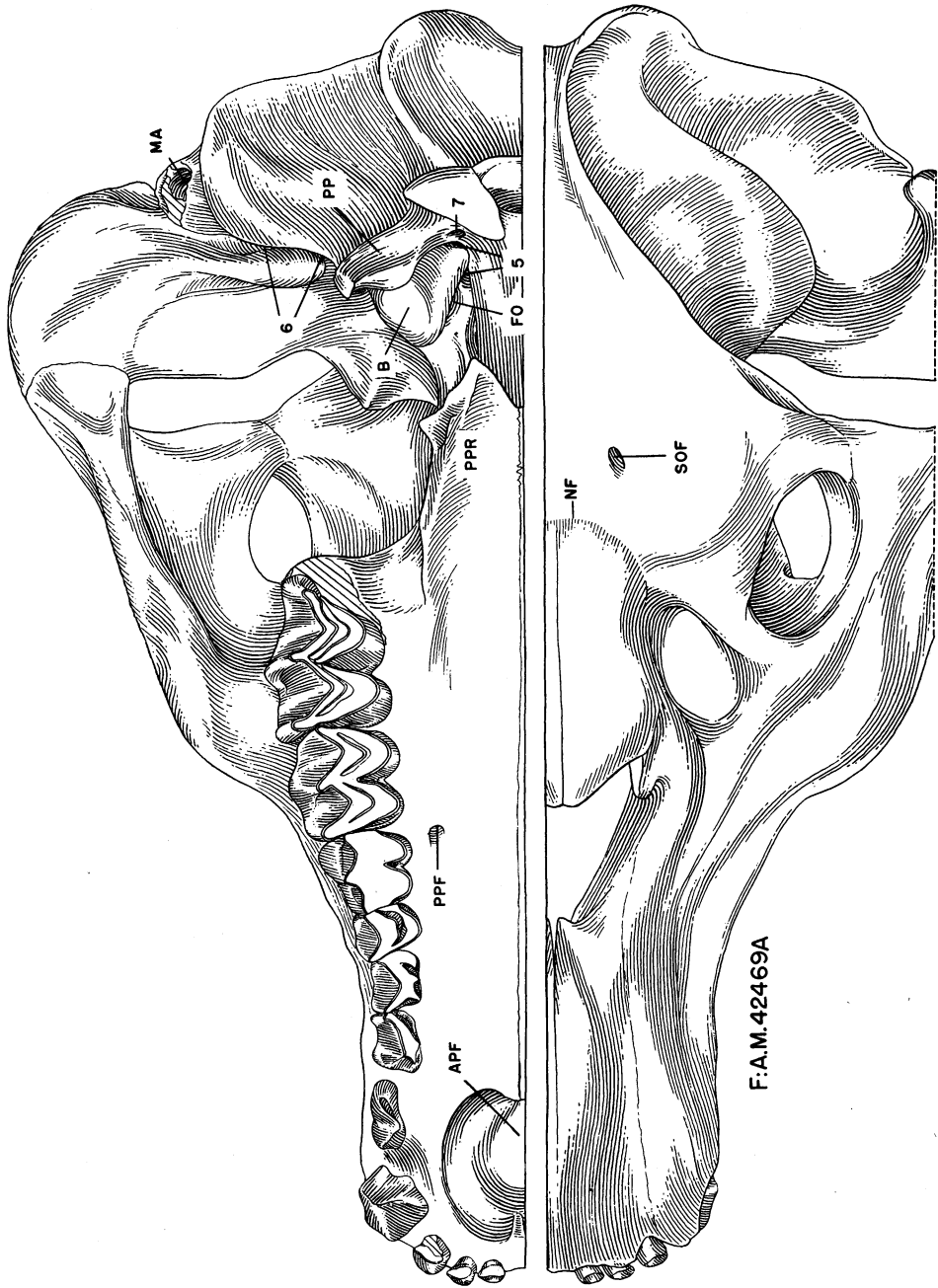
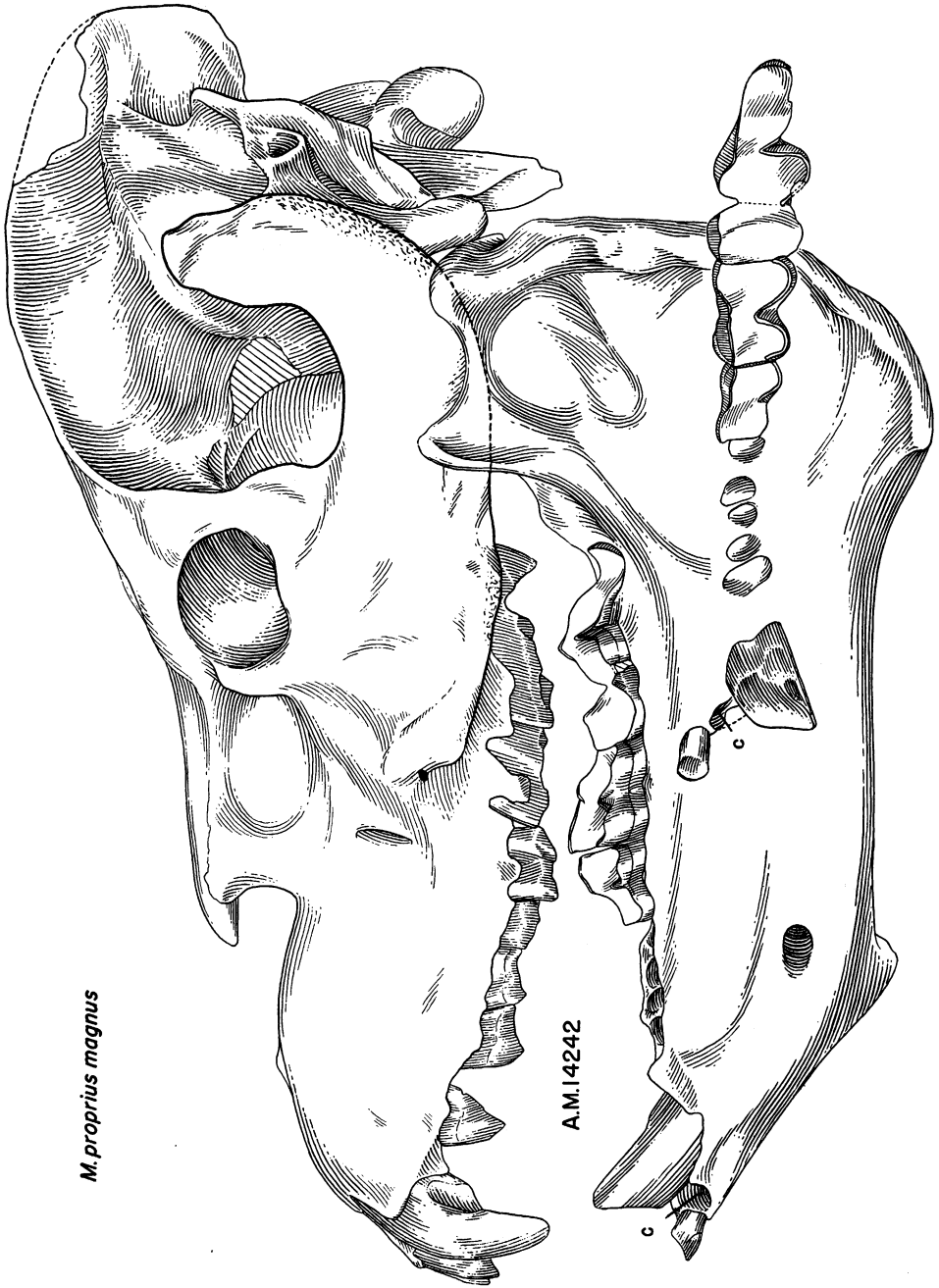


Fig. 13. *Merycochoerus proprius* Leidy, REFERRED, F.A.M. 42469A, skull and ramus, from Marsland deposits, Dawes County, Nebraska.  $\times \frac{1}{2}$ .

MN = maxillary notch; PMX = premaxillae; X = accessory tooth. See legend, Fig. 6.



*M. proprius magnus*

A.M.14242



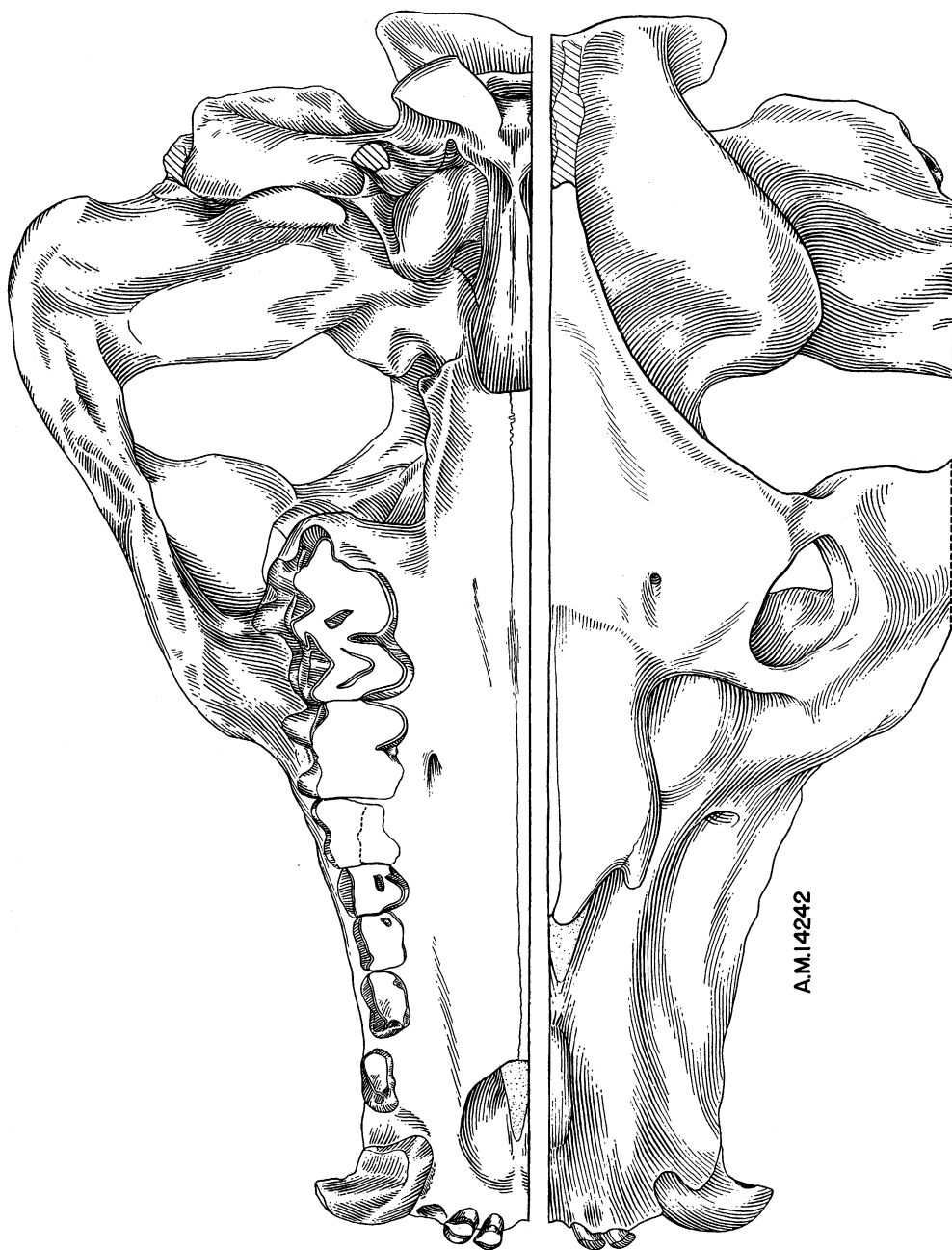
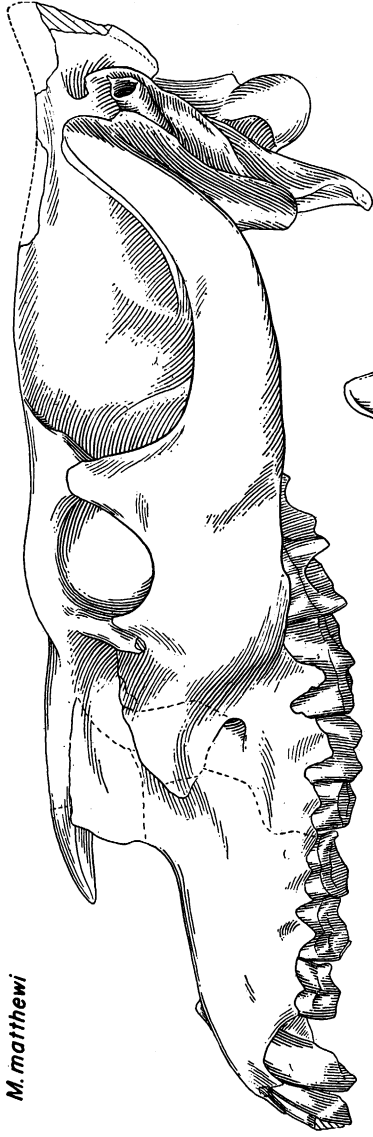
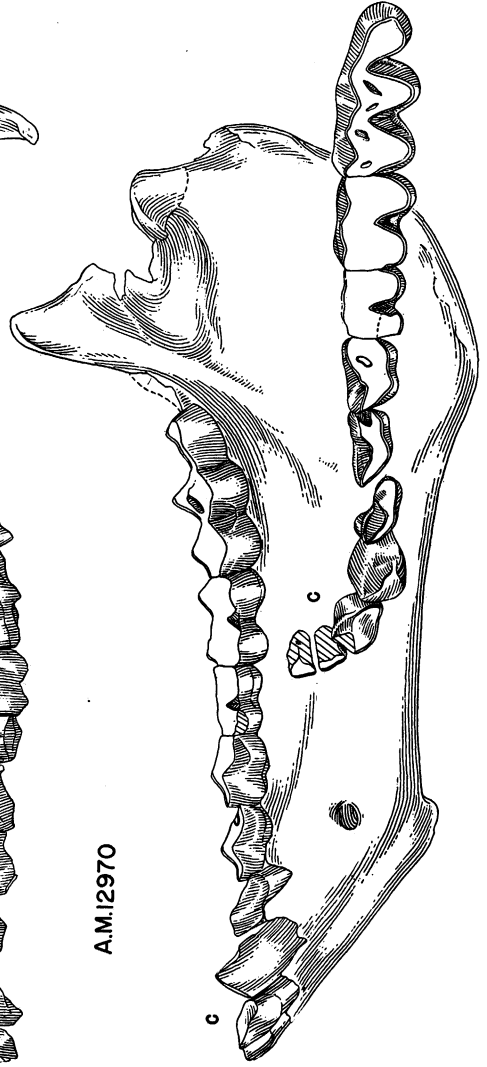


Fig. 14. *Merycochoerus proprius magnus* (Loomis), HOLOTYPE, A.M.14242, skull and ramus, from Marsland deposits, Sioux County, Nebraska.  $\times \frac{1}{2}$ .



*M. matthewi*



A.M.12970

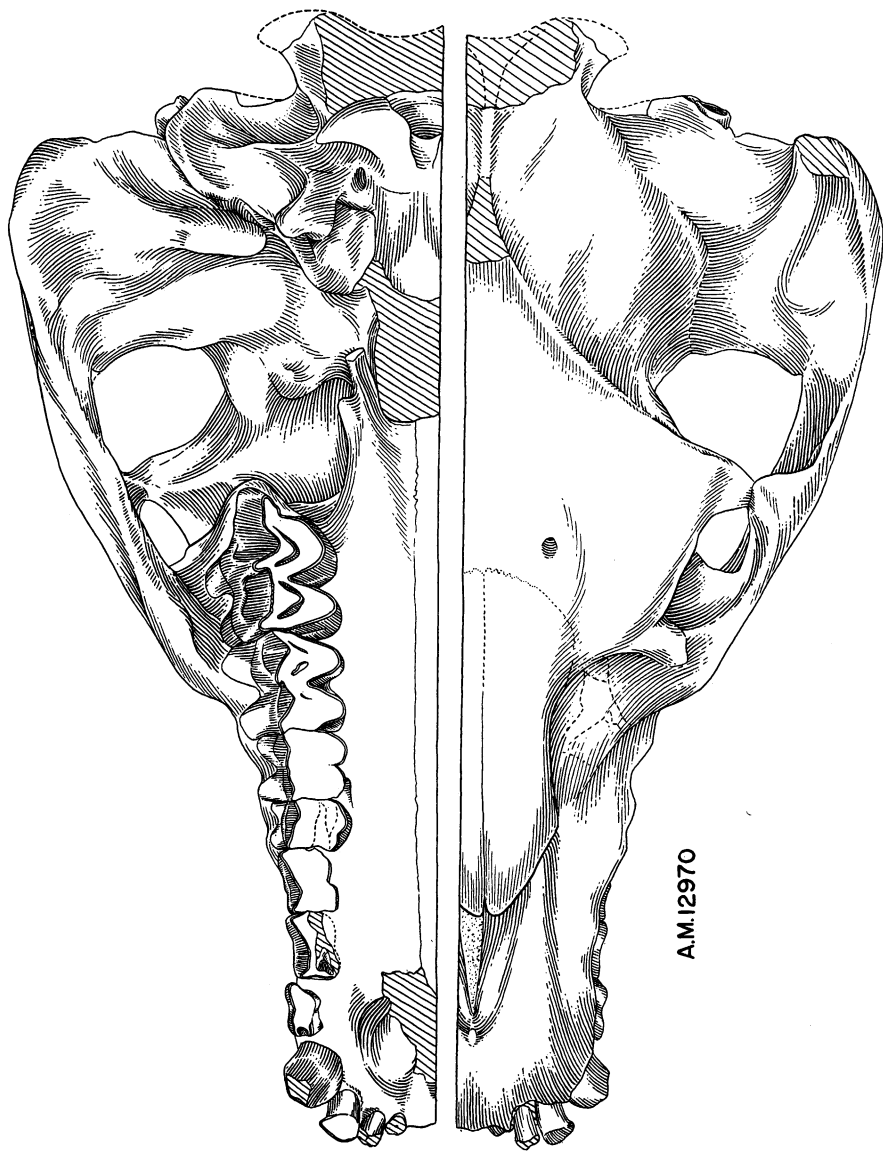
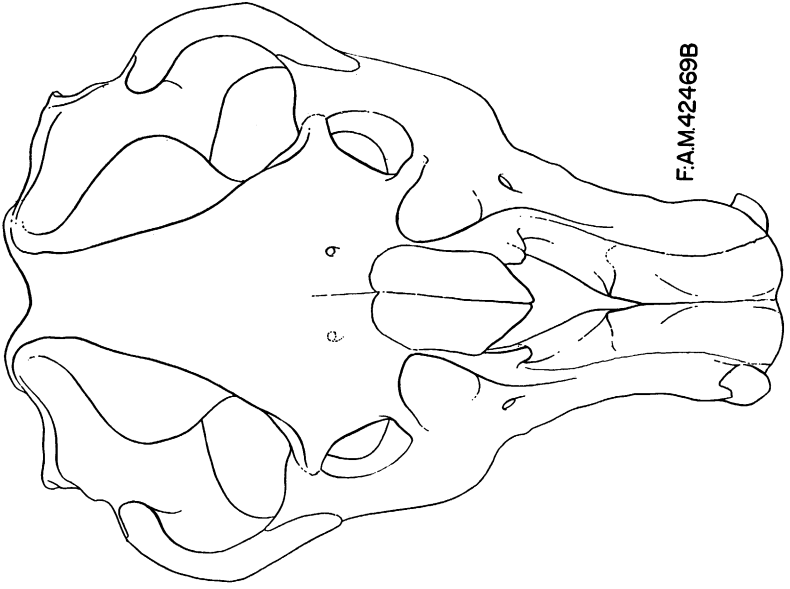
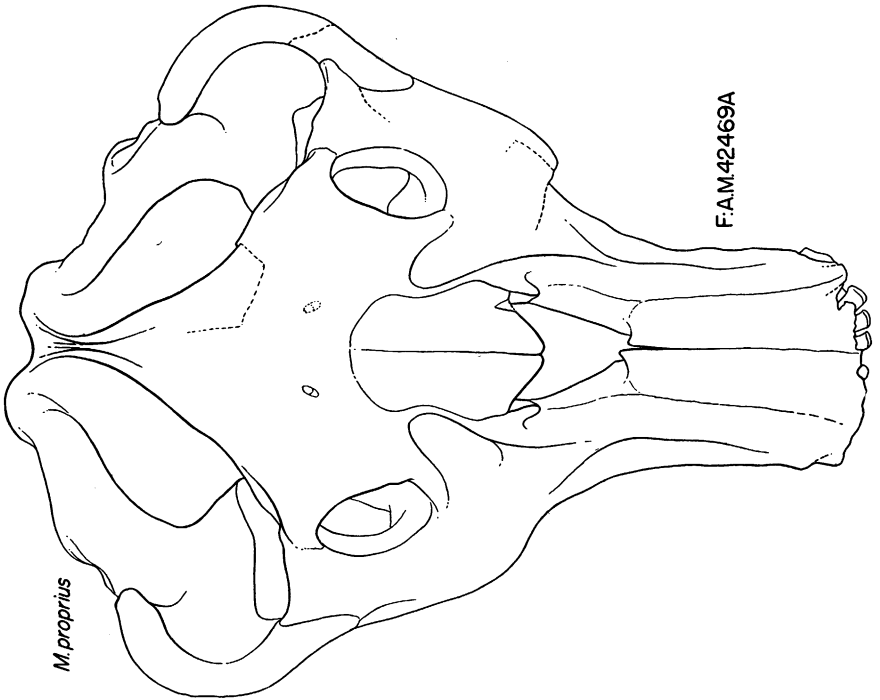


Fig. 15. *Merycochoerus matthewi* Loomis, HOLOTYPE, A.M.12970, skull and ramus (dentition of ramus a combination of both sides of mandible), from Shannon County, South Dakota  $\times \frac{1}{2}$ .



F.A.M.42469B



*M. propius*

F.A.M.42469A

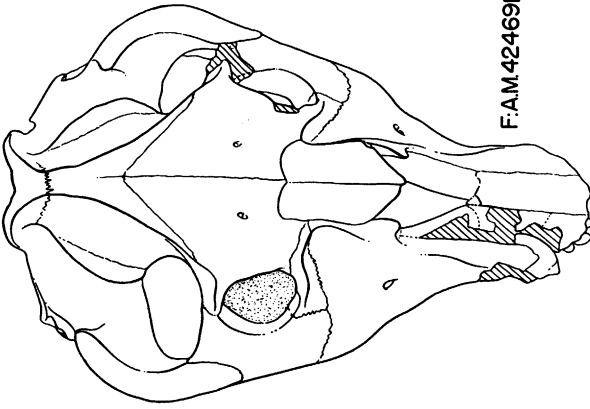
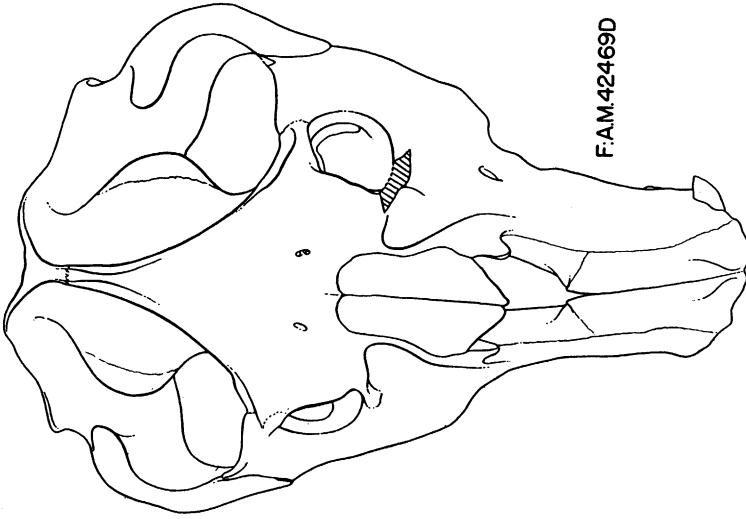
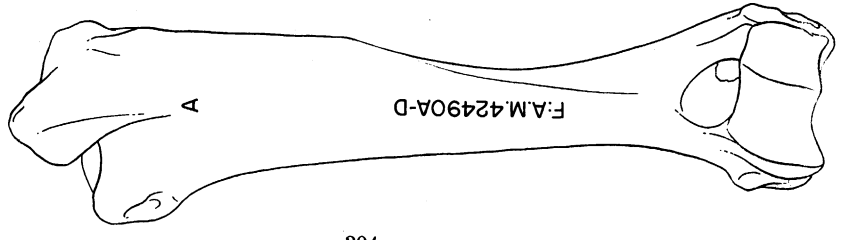
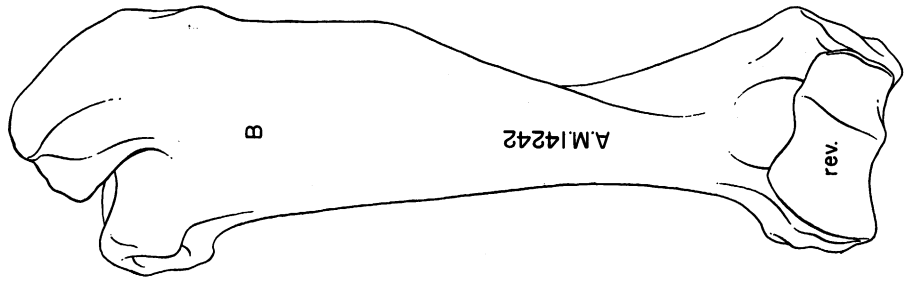
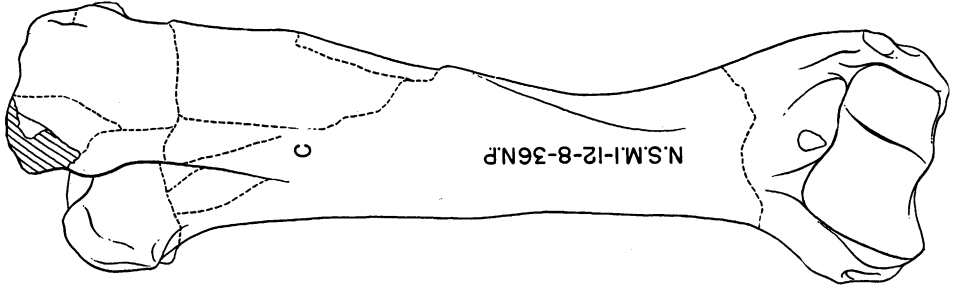
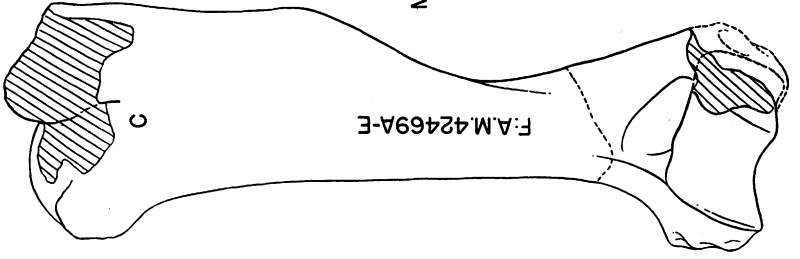
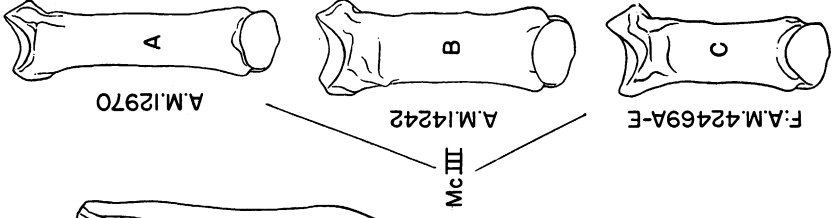


Fig. 16. *Merycochoerus proprius* Leidy, REFERRED, four associated skulls, F.A.M.42469A, 42469B, 42469D (adults), and 42469E (young), showing individual and age variation, from Dawes County, Nebraska.  $\times \frac{1}{3}$ .



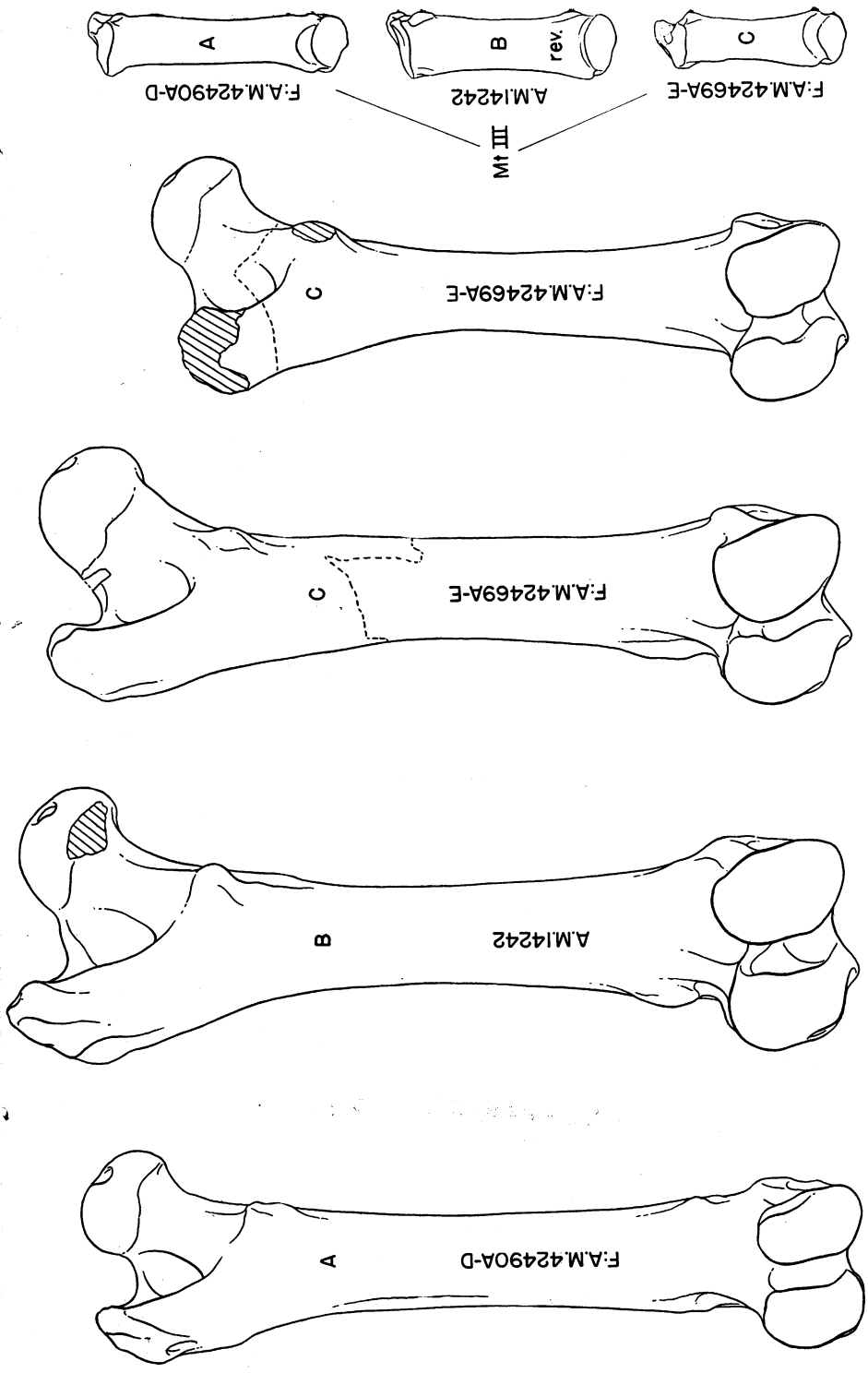


Fig. 17. *Merycochoerus leidy*, comparison of skeletal elements. A = *M. matthewi* Loomis, from South Dakota and Wyoming; B = *M. proprius magnus*, from Nebraska; C = *M. proprius*, from Nebraska.  $\times \frac{1}{2}$ .

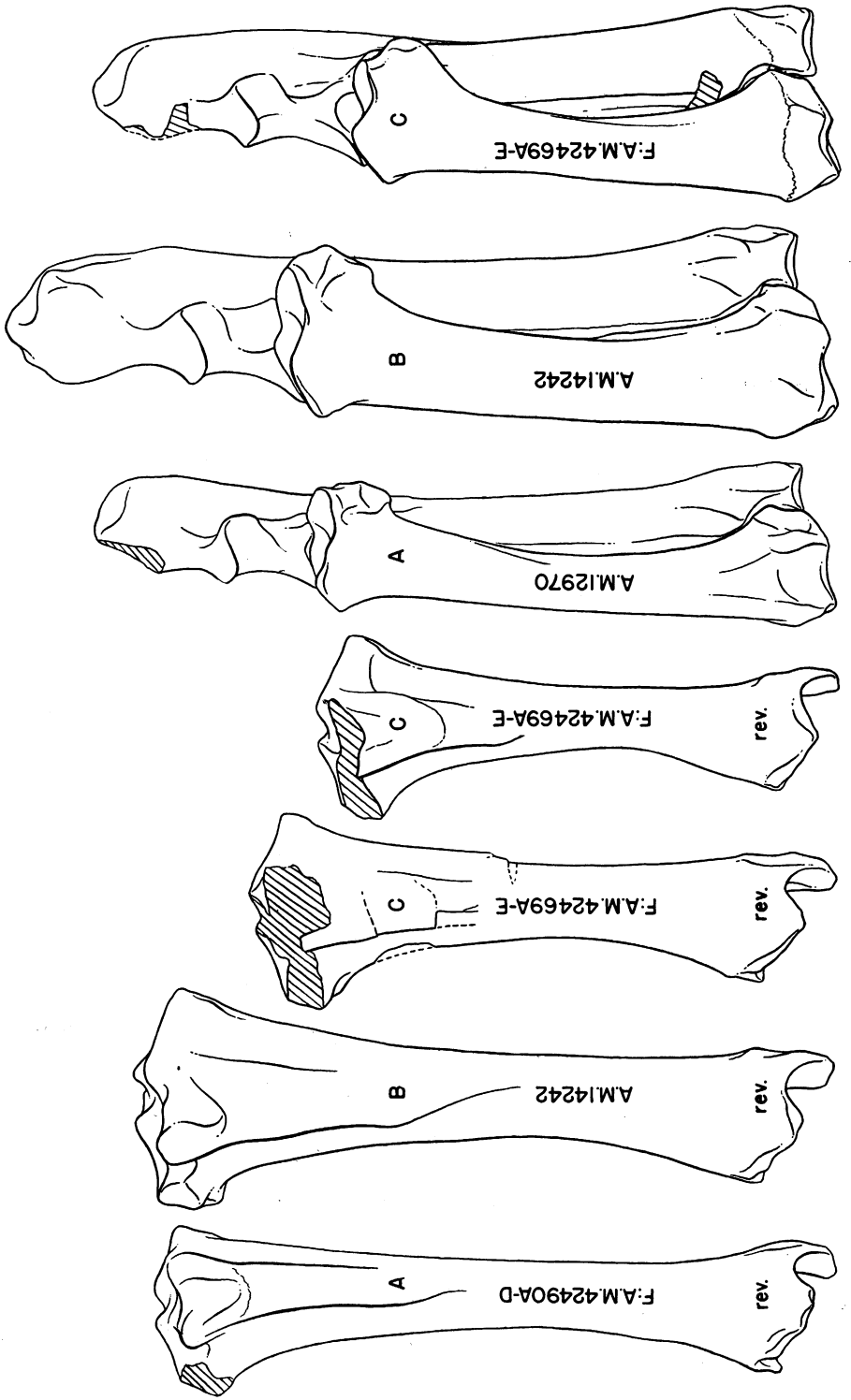


Fig. 18. *Merycochoerus leidy*, comparison of skeletal elements. (See legend, Fig. 17.)  $\times \frac{1}{2}$ .





