

*Teleoceras* sp.

The best specimen is No. 13874, a lower jaw from the Snake Creek beds, 23 miles south of Agate, Neb. It is smaller than *T. medicornutus*, with decidedly smaller tusk;  $p_1$  present, although very small. The teeth are well worn, the molars large and hypsodont, premolars reduced, symphysis short, lower tusk upward curving; these characters place it in *Teleoceras* but it is much smaller and more primitive than *T. fossiger*. A number of teeth, and skull and skeleton parts are referable to this genus and probably to the same species. One shows the characteristic nasal with its rudimentary horn; various foot bones also show the generic characters, but all of them indicate a smaller and less specialized species than *T. fossiger*.

**Equidæ**

Six genera are represented: *Parahippus*, *Hypohippus*, *Merychippus*, *Hipparion*, *Protohippus*, and *Pliohippus*. The first two are scarce; the third occurs in overwhelming abundance in most of the pockets; the fourth is almost as abundant in certain pockets; the last two are also common in certain pockets. Thus far, no skulls or skeletons have been obtained except one of *Pliohippus* found by H. J. Cook, but numerous upper or lower jaws and vast numbers of separate teeth.

*Parahippus*

There is evidence of but one species, which is not separable from *P. cognatus* Leidy. The permanent upper and lower teeth show a medium-sized, moderately progressive species with a little cement in the valleys and slopes of the cusps, but not enough to fill them until the teeth are nearly worn down. The foot bones have not been identified.

*Hypohippus*

This genus is even scarcer than *Parahippus* but apparently two species are present, one of which may be *H. affinis* Leidy; the other, *H. pertinax*, is of smaller size, approximately equal to *P. cognatus*.

*Hypohippus pertinax*, new species

Type No. 17232, lower jaw with  $p_1$ - $m_3$ . Size of *H. equinus*;  $p_1$  minute, vestigial;  $p_2$  broader, heel of  $m_3$  smaller than in Scott's species.

*Merychippus*

Numerous upper and lower jaws, pieces of jaws and thousands of isolated teeth are found, this being by far the most abundant genus in the fauna. The majority fall into a group representing either one species very variable in size and somewhat variable in length of crown, pattern etc., or else a number of closely allied species not separable by the teeth alone. This species or group approaches *Hipparion* in the separation of the protocone nearly to the base, but the teeth are shorter-crowned, and the milk teeth are the characteristic wide, brachyodont, imperfectly cemented type of *Merychippus*. The protocone is rounded but with the characteristic crest on its buccal side reaching out toward the protoconule crescent and joining it near the base. The parastyle is not so broad as in *Hipparion*; the mesostyle, broad at the base, narrows rapidly to a thin crest, while in *Hipparion*, *Protohippus* and *Pliohippus* it holds its width further up on the crown — up to the top in *Equus*. The caballine fold is present; the two primary folds projecting into the anterior lake and the one primary fold projecting into the posterior lake are present, with a few minor folds which disappear towards the top and bottom of the crescents.<sup>1</sup>

The *Merychippus calamarius* group

I refer this very abundant group to Cope's species from the Santa Fe beds of New Mexico, although most of the material is smaller and somewhat shorter crowned.

The *Merychippus insignis* group

Another common form has smaller, decidedly shorter-crowned teeth with somewhat more simple construction, but is otherwise nearly related to *M. calamarius*. The milk teeth agree closely with those of *M. insignis*; the permanent teeth are not easily separable from *M. severus* and other ill-defined species of the Middle Miocene.

*Merychippus patruus* Osborn *obliquus*, new variety

Many teeth in the collection belong to the *M. sejunctus* group which is allied to *Protohippus* and *Pliohippus* and distinguished by closer union of

<sup>1</sup> I state this construction in terms of the enamel surface of the tooth, as observed in preformed teeth that have not yet received their coating of cement. The customary method of comparing equine teeth by the pattern of the wearing surfaces of the crowns, although necessary when material is scanty, gives a very imperfect notion of the real construction and is a principal cause of the confusion in their affinities and phylogeny.

the protoconule crescent with the protocone and imperfect union of protoconule with metaloph, amounting sometimes to complete separation. (*M. insignis* displays this also in some degree.) These pass insensibly through numerous intermediate stages into these more progressive genera. Whether these stages represent primitive survivals, hybridism, or individual variation, I am not able to determine. No other collections afford such quantities of material for comparison, and it may be that the apparent distinctness of equine species elsewhere is due to insufficient material for examination. But it is also possible that the Snake Creek pockets represent a considerable lapse of time, and, until the pockets have been separately exploited and carefully compared, we may suppose that we have to do with successive stages in the evolution of a phylum, tangled up with variation and hybridism.

#### The *Protohippus perditus* group

Jaw fragments and teeth agreeing fairly well with Leidy's type are not rare but no good specimens have yet been secured.

#### The *Protohippus placidus* group

Incomplete jaws and rather numerous teeth of the type represented by Leidy's *placidus*, but many of smaller size, more hypsodont. Better material is necessary to clear up their precise relations.

#### The *Hipparion gratum* group

Jaw fragments and teeth, of which some agree well with *H. gratum*, while others are in varying degree smaller and longer crowned, some molars as hypsodont as *Equus*, but the area of the crown at the base scarcely exceeding that in *Mesohippus bairdii*. These teeth are parallel to the series referred to *Protohippus placidus* and are nearly related, if one may judge from the similarity in details of construction; but the two series do not grade into each other. Certain species from the Pliocene of Mexico and Florida belong to this group, but none are so extreme as some of our Snake Creek teeth. *H. lenticulare* of Texas also belongs here.

#### The *Hipparion occidentale* group

Larger species with a marked tendency to flattening of the protocone heavy mesostyle, usually much complexity in the infoldings of the enamel borders of the fossettes.

Very numerous teeth and a few jaw fragments represent this group, most of them belonging to a form smaller than *H. occidentale* proper, but not agreeing with any of the later described "species." The protocone is frequently round-oval towards the top of the crown although flattened-oval towards the base; complexity of enamel foldings extremely variable.

#### The *Pliohippus mirabilis* group

Jaws and jaw fragments and numerous teeth agree with *P. mirabilis* Leidy or with the doubtfully separable variants *P. supremus*, *pernix*, *robustus*, etc. All lie on the boundary between *Protohippus* and *Pliohippus*, and are rather nearly related to the *Protohippus perditus* group, but not to the *P. placidus* group. Larger size, somewhat shorter and more curved upper molars, fossettes broader with simpler enamel borders, are the chief distinctions from the *perditus* group.

#### The *Pliohippus spectans* group

These are not as common as the small Pliohippi but fortunately a complete skeleton has been discovered so that the characters can be fully understood.

*P. spectans*, *interpolatus*, *lillianus*, etc., are probably all monodactyl, the skull large and elongate, limbs and feet of moderately slender proportions; teeth large and decidedly more hypsodont with less curvature in upper molars than in the smaller group. Protocone more or less flattened, union with crescent less complete than in *P. mirabilis* group, mesostyle heavy, enamel borders simple.

### ARTIODACTYLA

#### Dicotylidæ (= Tagassuidæ)

There are two distinct species of peccary in the Snake Creek. One is very close to Cope's *Prosthennops serus*; it has more bunodont teeth and  $p_4$  fully molariform. In the other, the teeth are somewhat lophodont and  $p_{3-4}$  imperfectly molariform. The latter is very close to the modern *Dicotyles* in teeth; it may, however, be *P. crassigenis* Gidley, which is quite distinct from *Dicotyles* in the skull. Until better material is available, both species are referred to *Prosthennops*.

*Prosthennops serus* Cope

No. 17310, lower jaw with unworn  $p_4$ - $m_3$  is referred here. Various teeth in the 1908 collection belong to this and the following.

? *Prosthennops* cf. *crassigenis* Gidley

A lower jaw in the 1908 collection, No. 14052, is provisionally referable.

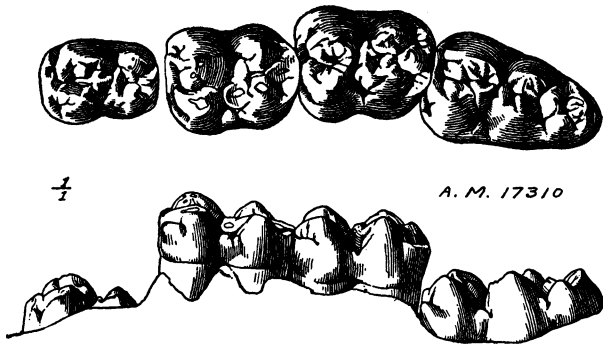


Fig. 15. *Prosthennops serus* Cope. Unworn lower teeth  $p_4$ - $m_3$  in fragment of jaw from Snake Creek beds referred to this species. Natural size; crown and external views.

**Oreodontidæ<sup>1</sup>***Metoreodon* Matthew and Cook

This genus is most readily distinguished from *Merychyus* by the characters of the premolars. The skull is not known in either genus,<sup>2</sup> for the skulls referred to *Merychyus* from the Lower Miocene, *M. arenarius*, *minimus*, etc., are probably not of this genus; they differ very considerably from the Middle Miocene (Pawnee Creek) skulls which have been referred to *M. elegans* but are also of doubtful reference even generically; and no skulls of *Merychyus* from the *Hipparion* zone, to which the types of the genus belong, have yet been found.

The teeth differ in the following features.

Upper premolars  $p^1$ ,  $p^2$ , and  $p^3$  broader and more crowded than in *Mery-*

<sup>1</sup> = Agriocheridæ or Merycoidodontidæ.

<sup>2</sup> Since these lines were written, Barbour and Cook have published a description and figure of a skull of *Metoreodon*.

*chylus*; with a distinct isolated anterointernal tubercle, absent in *Merychylus*; the transverse crests of  $p^1$  more developed, but the median transverse crest of  $p^2$  and  $p^3$  more rudimentary. Lower premolars,  $p_2$ ,  $p_3$ , and  $p_4$ , with an anterior transverse crest extending towards the inner side, absent in *Merychylus*. External valleys of lower premolars more distinct. Molars very similar in the two genera.

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*Metoreodon relictus*

No. 17311, a palate and lower jaws is referred here.

**Camelidæ**

Next to Equidæ, Camelidæ are the most abundant fossils in the Snake Creek fauna. The following genera are represented.

*Protolabis* Cope. Three upper incisors, the first two usually small. Cheek teeth moderately hypsodont; cheek premolars  $\frac{2}{3}$ , moderately reduced.

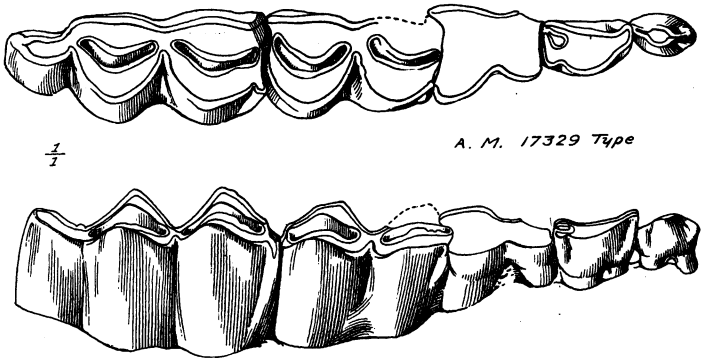


Fig. 16. *Planchenia singularis*, new species. Teeth of type lower jaw, crown and external views; natural size. Snake Creek beds, expedition of 1916.

Limb bones relatively small, rather short, metacarpals separate or imperfectly united.

*Procamelus* Leidy. One upper incisor. Cheek teeth more hypsodont; cheek premolars  $\frac{2}{3}$ , considerably reduced. Limb bones relatively small, moderately long, metapodials fully united.

*Alticamelus* Matthew. One upper incisor. Cheek teeth more or less hypsodont; cheek premolars  $\frac{2}{3}$ , unreduced. Limbs and feet relatively large, much elongate, metapodials fully united.

*Pliauchenia* Cope. One upper incisor. Cheek teeth subbrachyodont to hypsodont; cheek premolars  $\frac{3}{2}$ , reduced much as in *Procamelus*. Skeleton unknown.

*Megatylopus* Matthew and Cook (subgenus of *Pliauchenia*). One upper incisor. Cheek teeth more or less hypsodont; cheek premolars  $\frac{3}{2}$ , much reduced. Limbs moderately large, very massive. All gigantic species. Phalanges short, broad; unguals reduced as in *Camelus*.

The most abundant species in the present collection is *A. procerus*. The material is all fragmentary and it appears better to reserve description until better specimens are at hand.

### Cervidæ

#### *Dromomeryx* Douglass<sup>1</sup>

The affinities of *Dromomeryx* and its allies appear to be closer to the Tertiary Giraffidæ than to the Cervidæ with which they are usually ranked. Pending a revision of the American later Tertiary ruminants I nevertheless retain this group as customarily arranged.

#### *Dromomeryx whitfordi* Sinclair

A number of lower jaws and upper teeth, Nos. 17331-17335, are referred to this species, as they agree with Sinclair's paratype.<sup>1</sup> The teeth show considerable variation in size and some variability in pattern, but always the crowns are very low, the surface strongly rugose; the lower molars always show the "*Palæomeryx* fold"; the metaconid of  $p_4$  is expanded anteriorly and posteriorly into a wide plate; the heel of  $m_3$  has its inner cusp opposite the posterior end of the hypoconid crescent.

#### *Cervavus* Schlosser<sup>2</sup>

Schlosser uses this name to designate a stage intermediate between the *Palæomeryx* stage of cervid evolution and the more specialized cervid genera.

I cannot find any very clear generic distinctions from *Amphimoschus* Bourgeois, 1873,<sup>3</sup> as described and figured by Mayet, 1908<sup>4</sup>; but this genus is from an older geological horizon.

<sup>1</sup> Ann. Carn. Mus., V, 1909, p. 461.

<sup>2</sup> 'Fossilien Säugethiere Chinas,' Abh. bay. Akad. Wiss., XXII, 1903, p. 116. Type, *Palæomeryx Oweni* Koken.

<sup>3</sup> Bourgeois. Journal de Zoologie, II, 1873, p. 65, Pl. x.

<sup>4</sup> Mayet. 'Mam. Mioc. de l'Orléanais, etc.,' Ann. Univ. Lyon, N. S., Sci., Med., 1908, Fasc. 24, p. 285, Pl. x and text figs.

*Cervavus sinclairi*, new species

Types: three lower jaws, Nos. 17338, 17337, 17336.

Size of *D. whitfordi* and very like it in construction but distinguished by higher crowned and less rugose molars with no trace of palæomeryx fold, metaconid of  $p_4$  smaller, less extended anteriorly, heel of  $m_3$  with its inner cusp wholly or almost wholly behind the posterior wing of the hypoconid crescent.

In addition to the two species above cited, a larger and a smaller species of *Dromomeryx* and two other species of *Cervavus*, one smaller than *C. sinclairi*, are indicated by single teeth.

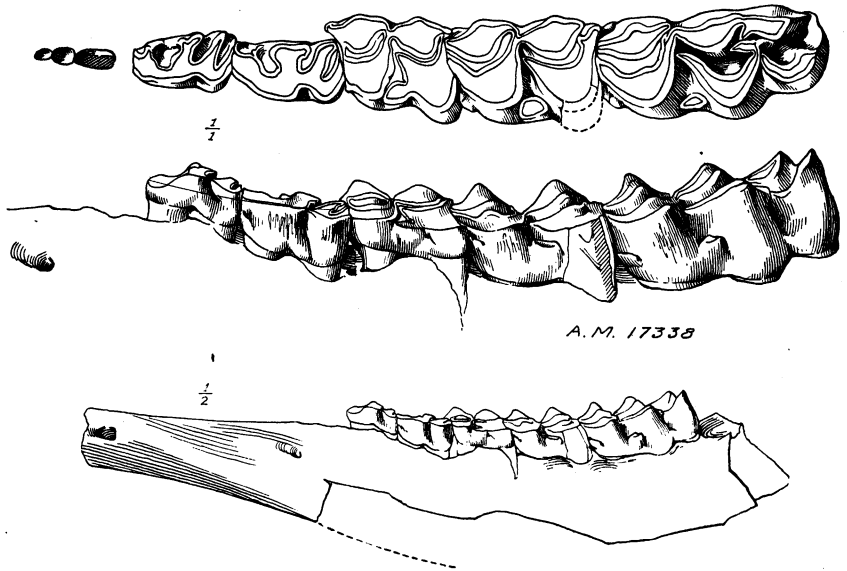


Fig. 17. *Cervavus sinclairi*, new species. Lower jaw, type specimen, half natural size; with crown and external views of teeth, natural size. Snake Creek beds, expedition of 1916.

*Blastomeryx elegans* Matthew and Cook

This species is represented by a number of jaws which add nothing to the known characters.

The relationships of the above species of "Cervidæ" are not clear. *Dromomeryx* is undoubtedly allied by its teeth to the European *Palæomeryx*; its "horns" are of the giraffid type, distinct from the deciduous antlers of cervids and merycodonts and from the true horns of the Bovidæ.



*Cervavus sinclairi* and other nearly related species of the Lower Pliocene are close to *Odocoileus* in dentition but, until the character of their antlers is known, it is not safe to refer them to that genus for they equally resemble various other modern cervid genera, especially the South American *Blastocerus* and *Hippocamelus*. *Blastomeryx* is probably a primitive survival but possibly has relations to the Central American brockets.

### Antilocapridæ

#### *Merycodus* Leidy

The reference of *Merycodus* to the Antilocapridæ is now well warranted. The genera *Sphenophalos* and *Ilingoceras* from the Pliocene of Thousand Creek and skull material of *Capromeryx* from the La Brea beds show intermediate conditions in one way or another. *Merycodus* is very common in the Snake Creek beds, by far the most abundant of the smaller forms. Three species are represented, but only one is well known and this appears to be indistinguishable from *M. necatus* Leidy.

#### *Merycodus necatus* Leidy

Two incomplete skulls, Nos. 17339 and 17340, and a large series of upper and lower jaws afford some interesting data concerning this species.

In the first place, comparison of this series with a large series (unpublished) of *M. necatus* jaws from Valentine, Neb., in the University of Nebraska Museum, which I was permitted to examine through the courtesy of Professor Barbour, shows that there are no constant differences of size between the Valentine jaws and the Snake Creek material described in 1908 as *M. necatus sabulonis*. No other valid characters have been detected. The type of *M. necatus* is from Bijou Hills and is in the American Museum but, in absence of topotypes, it affords no good specific characters except size. The Valentine series are topotypes of Leidy's subsequently figured specimens (1869).

One of the skulls from Snake Creek has the molars well worn; in the other, they are comparatively little worn. The teeth are smaller than in *M. osborni*, the premolars more reduced, the molars more hypsodont. A rudimentary third lobe sometimes occurs on  $m^3$ ; also a rudimentary inner pillar. The antlers in both skulls are two-tined; they branch rather high up on the beam, and the tines are rather small. The burr is single on the younger, double and partly triple on the older individual. Four separate

antlers of the same type were found. It appears, therefore, that in this species there were only two tines in the mature individuals, whereas in *M. osborni* there are three, the antlers being much larger.

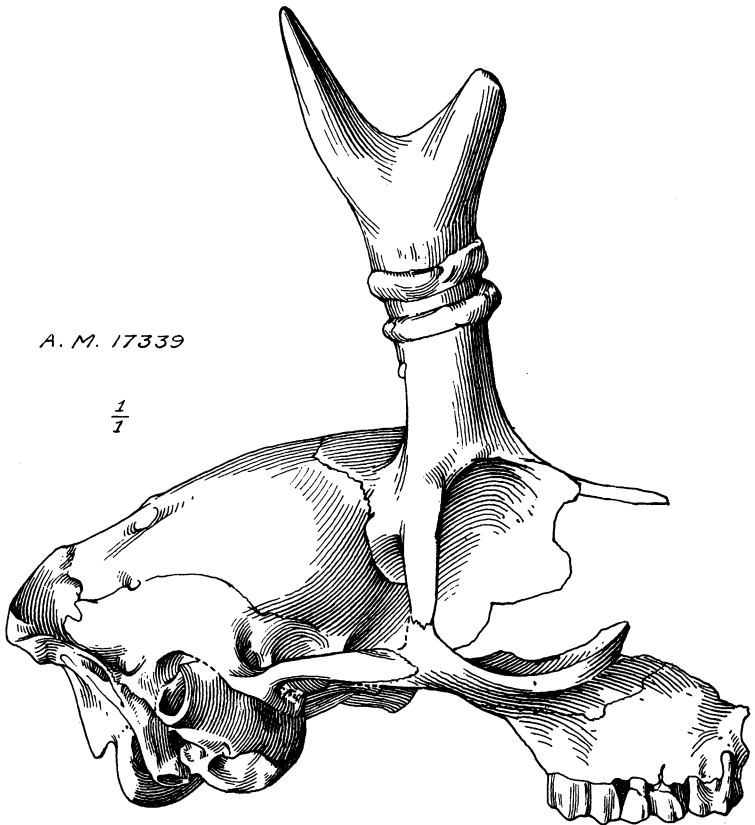


Fig. 18. *Merycodus necatus* Leidy. Incomplete skull; natural size. Note the supra-orbital position of the antlers and the sharp bend of the basifacial upon the basicranial axis. The molar teeth are heavily worn, showing that the skull is of an old individual, but the antler has only two tines. Two complete burrs and traces of a third are preserved, indicating repeated shedding of the antlers, probably annual. Sinclair quarry, Snake Creek beds.

#### *Affinities of Merycodus*

Winge<sup>1</sup> regards this genus as a true deer and not related to *Antilocapra* which he places in the Bovidae. Following is a translation of his remarks.

<sup>1</sup>Winge. 1906. Jordfundne og nulevende Hovdyr (Ungulata) fra Lagoa Santa etc. E Museo Lundii, III, part 1, p. 221.

A peculiar group of American deer is represented by the Tertiary North American *Merycodus* (syn. *Cosoryx* auct. Cope and Matthew) and its Tertiary North American relatives, the more primitive *Blastomeryx* and the less primitive *Capromeryx*. . . . *Merycodus* is known from the nearly complete skeleton, the others only from small parts. *Merycodus* is a deer with two or more tined horns certainly shed annually, with burr, and in all respects standing close to the other Cervidæ except in the form of the posterior cheek teeth, which are high crowned as in the highest Bovidæ. Matthew sets forth a number of other peculiarities by which it should resemble Bovinæ especially *Dicranoceras* ("*Antilocapra*") and he makes it the type of a special family Merycodontidæ which he, in spite of the horns [antlers], places beside the Antilocapridæ among *Boöidea typica*, which he has set in opposition to *Boöidea cerviformia*, quite in sympathy with Cope's presentation; yet he admits that nearer affinities with the deer are possible although not probable.

But not a single one of the peculiarities, excepting the height of the cheek teeth, which Matthew sets forth as resemblances to the Bovidæ is, in truth, decisive; not one of them is strange for Cervinæ; on the contrary, *Merycodus* has, in the form of the 3rd and 4th united metacarpals and likewise the metatarsus, a distinct deer peculiarity, the back side of the bone is excavated channel-fashion (according to Matthew's description). There cannot be the least doubt that *Merycodus* is a deer that has acquired high-crowned back teeth like the highest, not the more primitive, Bovidæ; it is not a bovine that has developed deer-antlers. Another question is whether the *Merycodus* group had its origin in the older deer-forms which are known from North America referred to *Palæomeryx* [i. e. from *Dromomeryx*] or from the deer allied to *Cervulus*, or whether it came from the same stem as the *Subulo* group [*Odocoileus* and its allies]; hereupon one cannot be certain. The condition of the vomer in *Merycodus* and its relatives, a point which would have weight in this respect, is not shown in the drawings. As against the *Subulo* group, *Merycodus* (but not *Blastomeryx*) differs not alone in the high crowned cheek teeth but in the complete lack of 2nd and 5th metacarpals.

Winge reckons *Antilocapra* among the Bovidæ and therefore does not allow that it has anything to do with *Merycodus*. The channelling of the back of the metapodials, which he regards as a cervid peculiarity, is a primitive character; it is retained in most of the Cervidæ, in *Antilocapra*, and in some primitive true Antelopes, e. g. *Cephalophus*, but it is present in all the Miocene pecora that I have examined, as well as in *Merycodus* and *Blastomeryx*. Its disappearance in most modern Bovidæ is an incident of specialization. The bending down of the basifacial axis is also a specialization and it undoubtedly occurs to a varying extent in some modern Cervidæ; perhaps Winge is right in attaching no great weight to it. The forward position of the antlers I have not seen matched in any Cervidæ, and it does constitute a marked approach to the supra-orbital position of the horns in *Antilocapra*. The peculiar character of these last and the intermediate types in *Capromeryx* and *Hingoceras*, indicating derivation from a deciduous branching antler, confirm the affinity to *Merycodus* for which the principal weight of evidence is in the teeth. The height and construc-

tion of the molars and the construction of the premolars in *Merycodus*, *Capromeryx*, and *Antilocapra* can hardly be studied in detail without concluding that they are rather nearly related and should be set apart from either Cervidæ or Bovidæ. *Merycodus* and *Capromeryx* retain a distinctly more primitive stage in premolar construction, which might be derived from the *Blastomeryx* type, not from the later *Odocoileus* group, and certainly not from *Dromomeryx* (which is not older than *Merycodus*, as Winge states, but a contemporary).

Without entering into the problem of the exact phyletic relations, it may be said that to disassociate *Merycodus* and *Antilocapra*, throwing the one into the Cervidæ and the other into the Bovidæ as Dr. Winge would arrange them, appears to be a quite untenable arrangement, in spite of his very positive statements; but whether the affinities of the Antilocapridæ, including *Merycodus*, etc., are closer to the deer or the true antelopes is, in my opinion, an open question. The whole matter must be viewed in the light of the relative geological age of the various genera to be considered (a point to which Dr. Winge gives very little attention; here or elsewhere), of their present distribution, and of the centers of dispersal of the ruminant groups. *Merycodus* of the middle Miocene had already acquired complex antlers, hypsodont teeth, and other highly progressive characters which do not appear in the true Cervidæ until later; per contra, its premolar construction is archaic.

Schlosser<sup>1</sup> has attempted to derive *Merycodus* from the Oligocene *Hypisodus*, but, aside from the precocious hypsodontism of this genus, there is nothing to support his view. On the contrary, the first lower premolar of *Hypisodus*, as Cope observed in 1874, has become incisiform, as well as the canine, so that there are ten incisiform teeth in the lower jaw; and the outer crescents of the upper molars are of quite different construction from any of the true pecora. Either of these features would serve to exclude it from the ancestry of *Merycodus*. The premolars are also much more reduced, aside from their simple hypertragulid pattern.

### ? Bovidæ

Whether the genera provisionally referred here are really more nearly related to the antelopes than to the giraffes may well be doubted.

#### *Neotragocerus improvisus* Matthew and Cook

The type of this genus and species is a short straight horn-core, showing, especially towards the tip, the soft coarsely cancellous structure of the

<sup>1</sup> See Zittel's 'Grundzüge der Palaeontologie,' Revised Edition, 1911, p. 496.

bovid type of horn-core. The upper molars, provisionally referred to it, may not belong to this genus, but they are nearer to the antelope type than to any other. The lower jaw, provisionally referred by Dr. Sinclair<sup>1</sup> to this form, appears to me more probably a camel, perhaps *Protolabis*,<sup>2</sup> p<sub>4</sub> being too narrow for a bovid or cervid.

*Cranioceras unicornis*, new genus and species

*Type*: Amer. Mus. No. 17343, fragment of back of skull with base of horn from Snake Creek beds (Lower Pliocene) of Sioux Co., Neb., Amer. Mus. Exped. 1916.

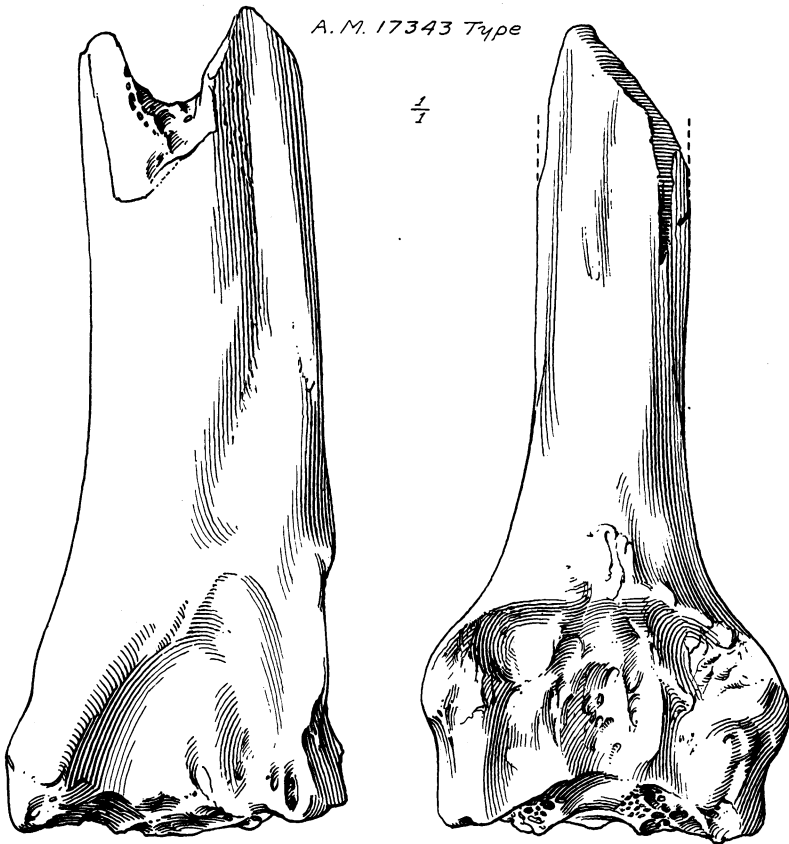


Fig. 19. *Cranioceras unicornis*, new genus, new species. Type specimen; part of occipital horn with adjoining portions of skull. Left side and posterior views; natural size. Snake Creek beds, expedition of 1916.

<sup>1</sup> Sinclair, 1915, *loc. cit.*, p. 93, fig. 16.

A median horn upon the posterior part of the parietal, long, slender, laterally compressed, projecting upward in line with occiput, but with a slight forward curvature.

This is a very extraordinary type of animal. Unfortunately, the type is very incomplete. It is about as large as the larger antelopes, but the median horn, situate on the parietal and projecting upward above the occiput, is wholly different from any described mammal, living or extinct. I suppose it to be more probably an antelope than anything else, but it might be cervid, dicotylid or even perissodactyl. The specific name is based upon the suggestion made by a number of friends — not of course seriously — that it represents the legendary unicorn.

Assuming its ruminant affinities, it is to be noted that five very distinct types of horned ruminants are known from the Snake Creek beds, only two of which, *Merycodus* and *Dromomeryx*, can be correlated with the dentition. The other three are *Cranioceras*, *Neotragoceras* Matthew and Cook, and *Drepanomeryx* Sinclair. Two types of "antelope" dentitions, with moderately long crowned molars, somewhat rugose enamel, one with premolars much reduced, the other with premolars little reduced, have been distinguished. These may correspond to two out of the three horn-types, *Neotragoceras*, *Cranioceras*, and *Drepanomeryx*. The third is perhaps a palæomerycine with short crowned molars like *Dromomeryx* — there are at least two types of 'palæomerycine' dentitions distinct from *Dromomeryx* — but, until the discovery of skulls of these various ruminant genera serves to correlate definitely their teeth and horns, it will be impossible to determine their association.

I have referred tentatively to this animal a remarkable lower jaw, No. 17344, indicated as a bovid by the breadth and pattern of the premolars, the moderate height and width and smooth surface of the molar crowns, and the character of the heel of  $m_3$ , as well as by the form of the front of the jaw and arrangement of the front teeth and entire lack of caniniform teeth. It is distinguished by the great reduction of the premolars. I can find no near relative or parallel among existing Bovidae or the known extinct forms, and the aberrant character of the jaw may well have been correlated with the aberrant skull characters of the type of *Cranioceras*.

#### REPTILIA

##### *Alligator* sp.

A right dentary, lacking the teeth, shows the presence of this genus, not previously recorded from the Tertiary so far as I can discover.

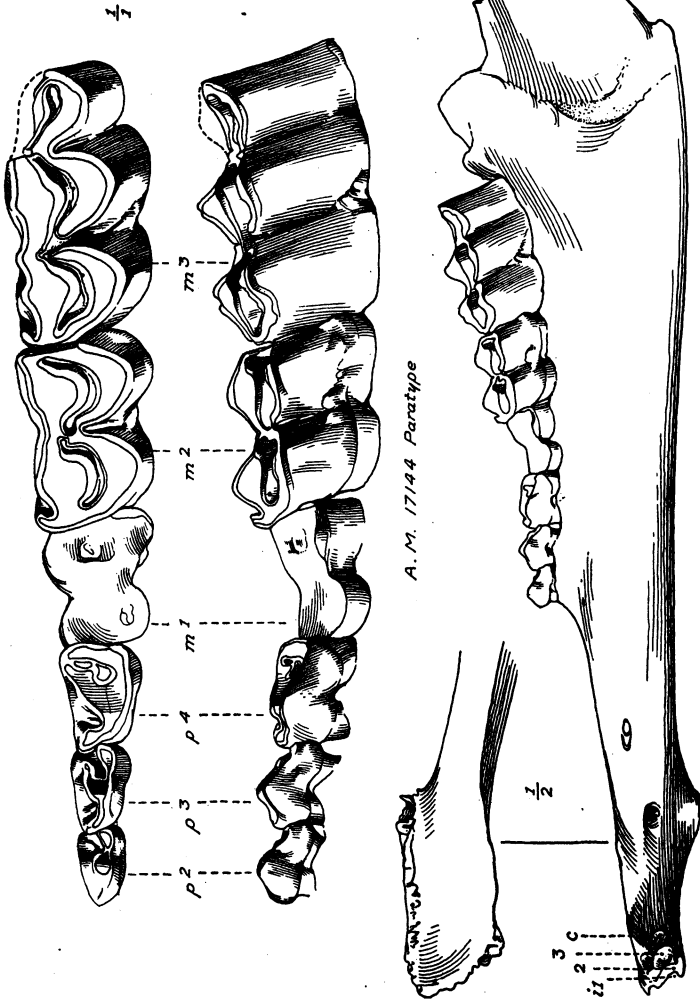


Fig. 20. *Cranioceerus unicornis*. Lower jaw provisionally referred to this genus and species; above, crown and external views of cheek teeth, natural size; below, external view of symphysis, one-half natural size. Amer. Mus. No. 17144, Snake Creek beds, expedition of 1916.

## AMPHIBIA

*Plicagnathus matthewi* Cook

A large amphibian nearly related to the giant salamander of Japan and to the American *Cryptobranchus* has been recently described by Mr. Harold J. Cook from part of a lower jaw found by him in the Snake Creek beds.

## PISCES

? *Ameiurus* sp.

A lower jaw and other fragments of a large catfish are identified by Mr. J. T. Nichols as probably *Ameiurus*, agreeing in size with *A. lacustris*, whose present range is from the Saskatchewan and the Great Lakes in the north to Texas in the south.

## NOTES UPON THE PLEISTOCENE OF WESTERN NEBRASKA

## SHERIDAN AND LOUP RIVER BEDS

The older Pleistocene "Equus beds" are widely spread in western Nebraska, and are readily recognized by the bones of *Equus* which are the most abundant fossils in them. In western Nebraska the most productive locality is the "Hay Springs quarry," south of the Niobrara River in Sheridan Co. In 1902 I published a list of this fauna<sup>1</sup>; since then the Equidæ have been revised by Dr. O. P. Hay, and some changes in nomenclature or identification now appear advisable in other groups. A few additions have been made.

**Canidæ**

<i>Canis</i> cf. <i>occidentalis</i>	jaw fragments, etc.
"    " <i>latrans</i> Say	jaws, etc.

**Ursidæ**

<i>Arctotherium</i> sp.	astragalus; metacarpal
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**Felidæ**

<i>Smilodon nebrascensis</i> , new species	lower jaw
Felidæ div. indet.	limb and foot bones

<sup>1</sup> Pleistocene Fauna from Hay Springs, Nebraska. Bull. Amer. Mus. Nat. Hist., XVI, 1902, pp. 317-322.



<b>Sciuridæ</b>	
<i>Cynomys</i> cf. <i>ludovicianus</i>	palate
<b>Muridæ</b>	
<i>Fiber nebracensis</i> Hollister	skull; jaws
<i>Microtus</i> sp.	jaws
<b>Castoridæ</b>	
<i>Castoroides</i> sp.	teeth, humerus, astragalus
<b>Geomyidæ</b>	
<i>Thomomys</i> sp.	jaws and fragments
<b>Megalonychidæ</b>	
<i>Mylodon nebrascensis</i> (Brown) ? = <i>M. harlani</i>	skull, jaws, parts of skeleton
<i>Megalonyx</i> sp. ( <i>vide infra</i> )	foot bones
<b>Equidæ</b>	
<i>Equus niobrarensis</i> Hay	skull, numerous jaws, and all parts of skeleton
“ <i>excelsus</i> Leidy	jaws, ? foot bones, etc.
<b>Elephantidæ</b>	
<i>Elephas columbi</i> Falconer	skull; tusks, teeth, etc.
<b>Dicotylidæ</b>	
<i>Platygonus</i>	palate, parts of jaws, etc.
<b>Camelidæ</b>	
<i>Camelops kansanus</i> Leidy	jaw fragments and bones of skeleton
“ cf. <i>vitakerianus</i> Cope	jaws, etc.
“ <i>americanus</i> (Wortman)	lower jaw
<b>Antilocapridæ</b>	
<i>Antilocapra</i> cf. <i>americana</i> Ord	teeth, foot bones, etc.
<i>Capromeryx furcifer</i> Matthew	lower jaw

The identity of this fauna with the Aftonian interglacial fauna of Iowa has been fully demonstrated by Calvin<sup>1</sup> and confirmed by Hay.<sup>2</sup>

The “original Loup River” formation, described by Hayden in 1858 and from which Leidy described the species *Elephas imperator*, *Equus excelsus* and ?*Hipparion* sp., appears to have been the beds exposed along

<sup>1</sup> Calvin, 1909. Bull. Geol. Soc. Amer., XX, pp. 341-356, Pl. xvi-xxvii.

<sup>2</sup> Hay, 1914. Iowa Geol. Sur. Ann. Rep. for 1912, XXIII.

the Middle Loup west of Seneca, underlying the sandhill deposits and distinguished by a more earthy consistency, pale yellowish gray color with a slightly greenish tinge, and slightly consolidated, in distinction from the yellower and completely unconsolidated sandhill material.

A small fauna was secured from these beds in 1916, as follows.

<i>Equus</i> sp., cf. <i>niobrarensis</i>	teeth and foot bones
Camelid cf. <i>Camelops</i> , 2 species	foot bones
<i>Platygonus</i> , 2 species	jaw fragments
Megalonychid indet.	part of scapula
<i>Thomomys</i> sp.	several lower jaws
<i>Cynomys</i> sp.	lower jaw
<i>Scalops</i> sp.	"
<i>Lutra</i>	jaw fragments, no teeth

No proboscidean bones were observed.

The westward route of Hayden's party as shown on Leidy's map in the 'Extinct Mammalian Fauna of Dakota and Nebraska,' 1869 (Lieut. Warren's Exped.), was up the Middle Fork of the Loup River, but side trips appear to have been made to the Dismal and North Loup River. The whole region is sandhill country with very few exposures and these only along the river valleys. On the Middle Loup, the only exposures found were these beds west of Seneca; on the Dismal, a little Tertiary (Pliocene) is exposed in places underlying similar Aftonian beds; and possibly it was from these that the *Hipparion* was obtained. But, it appears evident that the typical Loup River horizon, long confused with the Tertiary exposures along the Niobrara (from which came most of the fauna which Leidy and Hayden referred to the formation), is in fact identical with the Sheridan or *Equus* beds of Nebraska and of early Pleistocene age. Osborn, in 1909, showed that it was distinct from the great series of later Tertiary faunas that had been referred to it by Leidy, Cope, and others, but retained it provisionally as a possible late Pliocene horizon. It is now clear that it is early Pleistocene and correlates with the Sheridan and Aftonian. The name has been so generally misapplied that it seems better to avoid using it in any typical sense and to retain it only for the local deposits.

#### *Smilodon nebrascensis*, new species

*Type:* No. 17351, lower jaw from the Hay Springs quarry, Sheridan Co., Nebraska.

The postcanine diastema is decidedly shorter than *S. californicus* jaws with which I have compared it, the cheek teeth about the same size, canine and incisors more

robust. The specimen is not comparable with *S. floridanus* (type a skull with alveoli of upper teeth) although it accords in size. It is incommensurable save as to size with *S. fatalis* of Texas. *Dinobastis* and *Smilodontopsis* appear to be more specialized types of dentition, the cheek teeth more compressed and extended. *Machærodus?* *merceri* and *gracilis* and all other species of *Machærodus* are separated by the presence of  $p_3$ , deeper flange, etc.

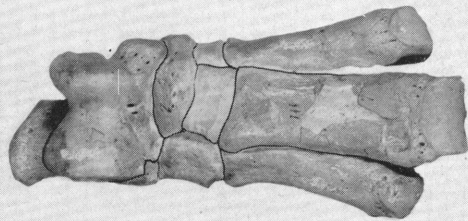
I cite this as a new species but much doubt whether it is more than a geographic variant of the *californicus-floridanus-fatalis* group. Its interest is in its occurrence in the typical Hay Springs Pleistocene, correlated with the Aftonian of Iowa, and representing the Lower Pleistocene fauna of the Plains. True cats have been known but sabre-tooth tigers have not hitherto been recorded from this fauna.

? *Arctotherium* sp.

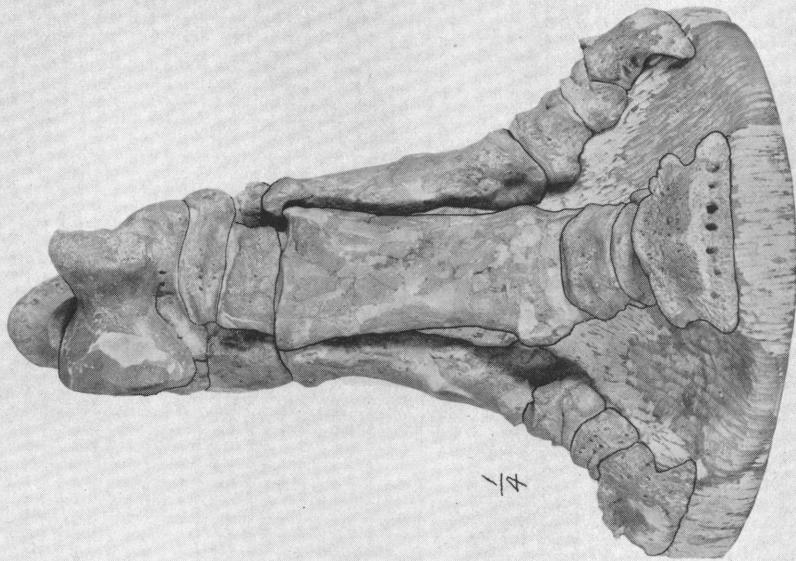
A very large ursid, provisionally referred to this genus, is represented by an astragalus from Box Butte Creek, near the Niobrara River.

*Megalonyx*, cf. *leidyi* Lindahl

Two or three skeleton bones of *Megalonyx* are identifiable, of which the most characteristic is a metatarsal III, No. 17352 from the mouth of Box Butte Creek. It accords in size with *M. jeffersoni* but is referred to Lindahl's species on ground of geographic propinquity. The genus has been recorded from western Kansas and from eastern Nebraska, not hitherto from the northwestern part of the state.



A. M. 5293

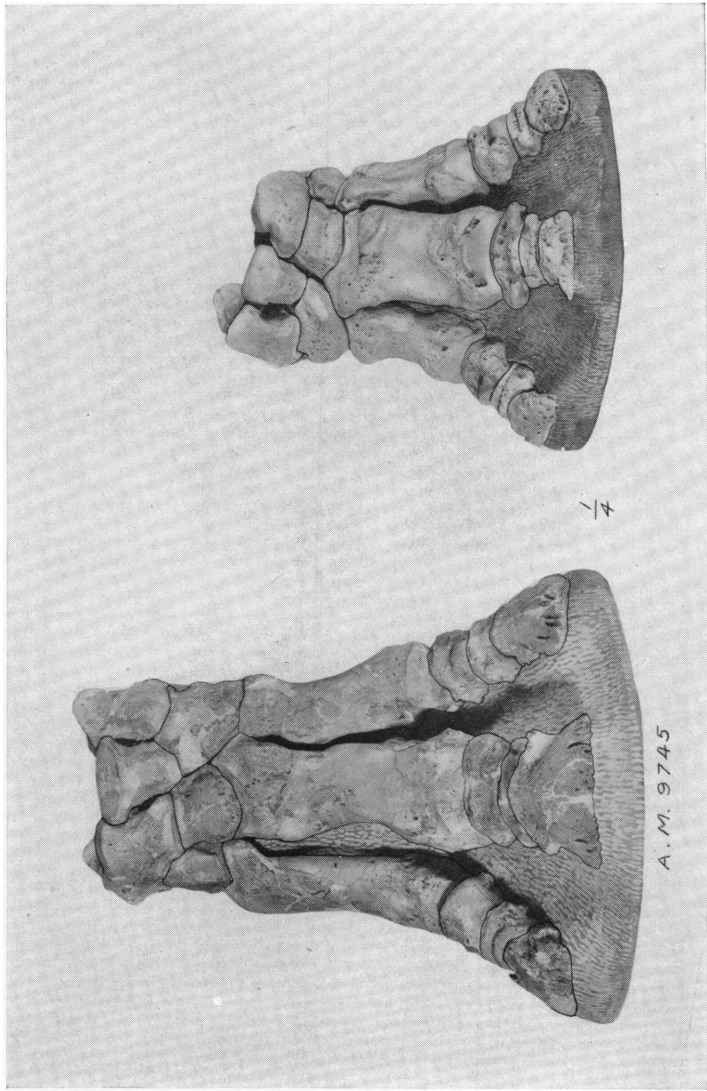


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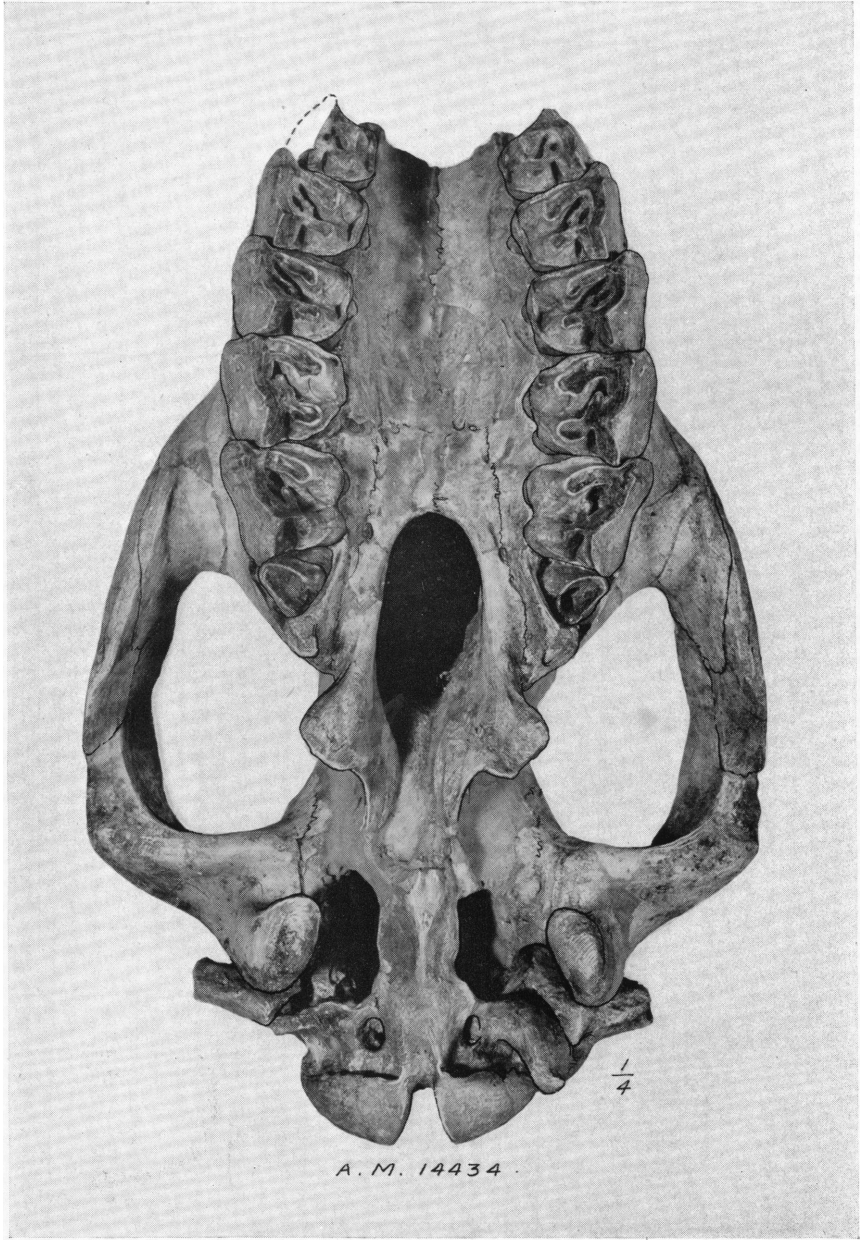
A. M. 9745



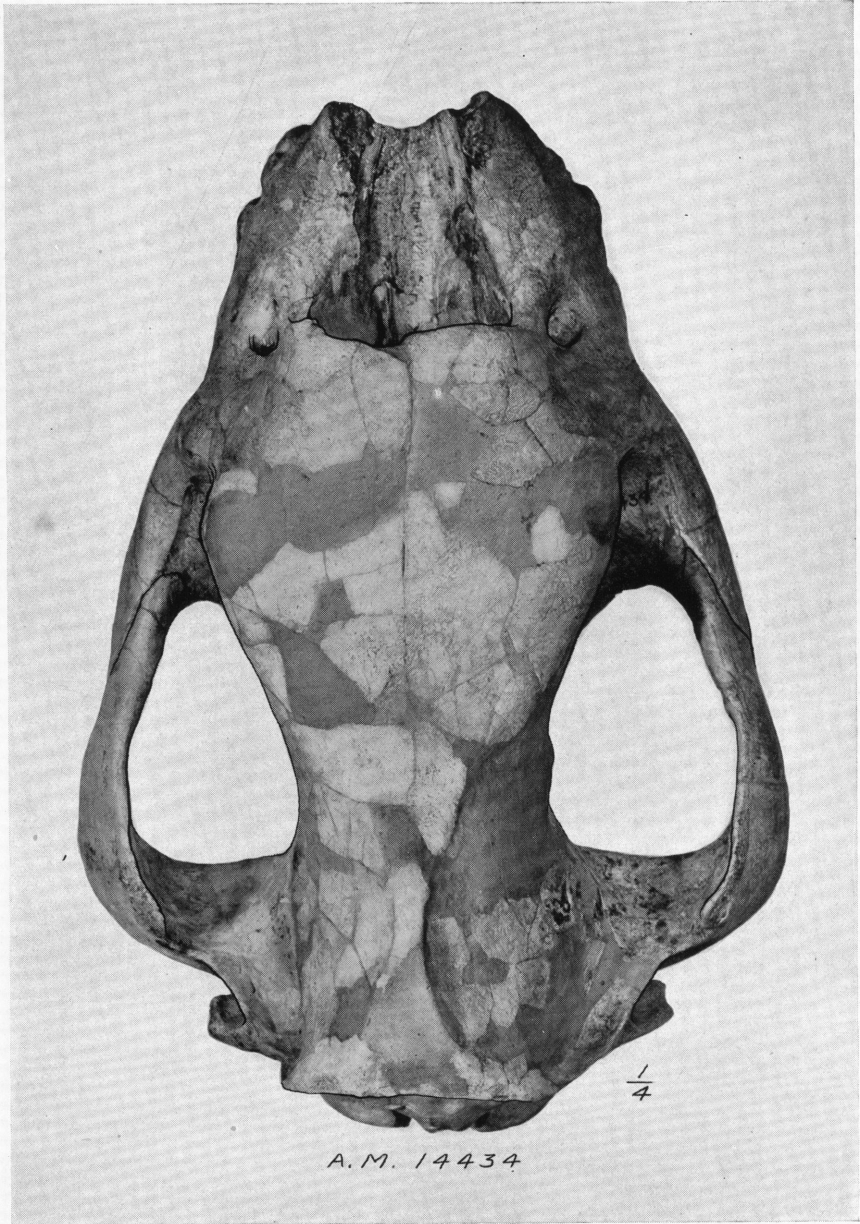
Left hind feet of *Aphelops* and *Teleoceras*. No. 8293, *A. megalodus* Cope, Pawnee Creek beds, late Miocene, of Colorado; No. 9745, *A. ceratotherium*, Madison Valley beds, Lower Pliocene, of Montana; No. 2650, Republican River beds, Lower Pliocene, composite specimen from the Long Island



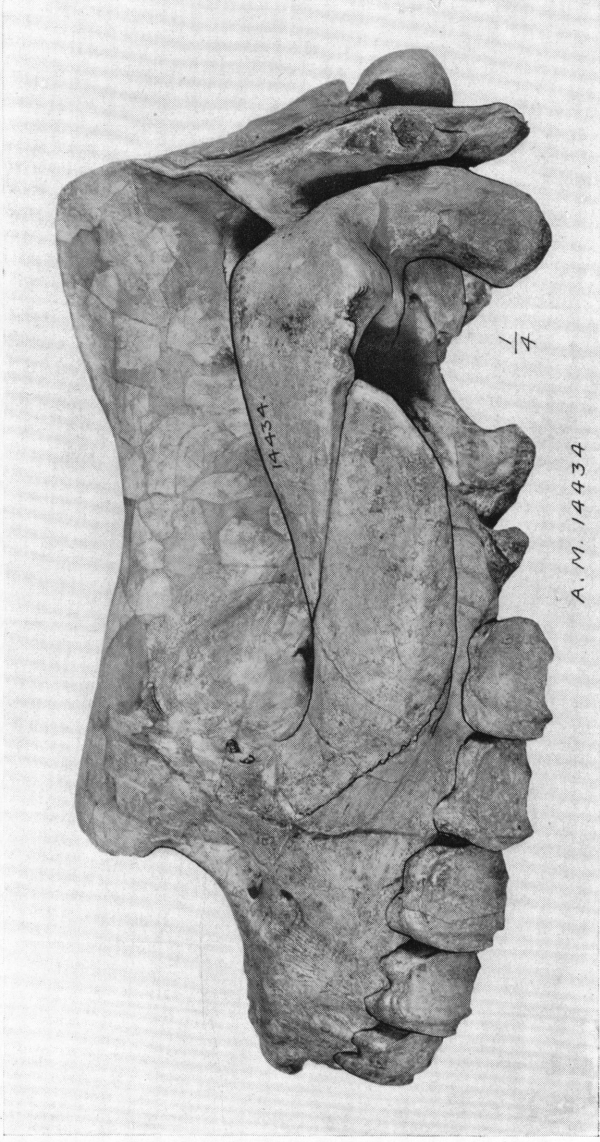
Fore feet of *Aphelops* and *Teleoceras*. No. 9745, *A. ceratorhinus*, Madison Valley beds of Montana; No. 2650, Republican River beds, composite from Long Island quarry, Phillips Co., Kansas. Both topotype specimens and of Lower Pliocene age.



*Peraceras troxelli*, new species; type skull, palatal view.

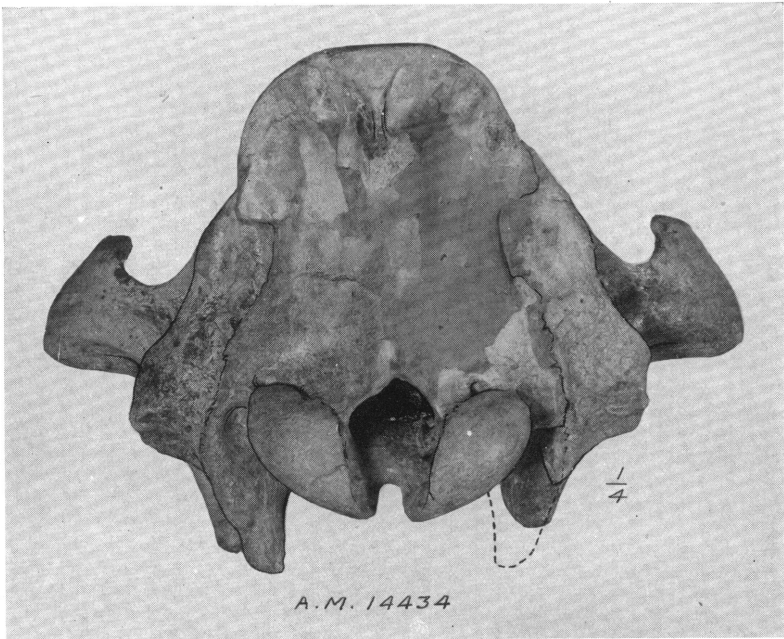


*Peraceras troxelli*, new species; type skull, top view.

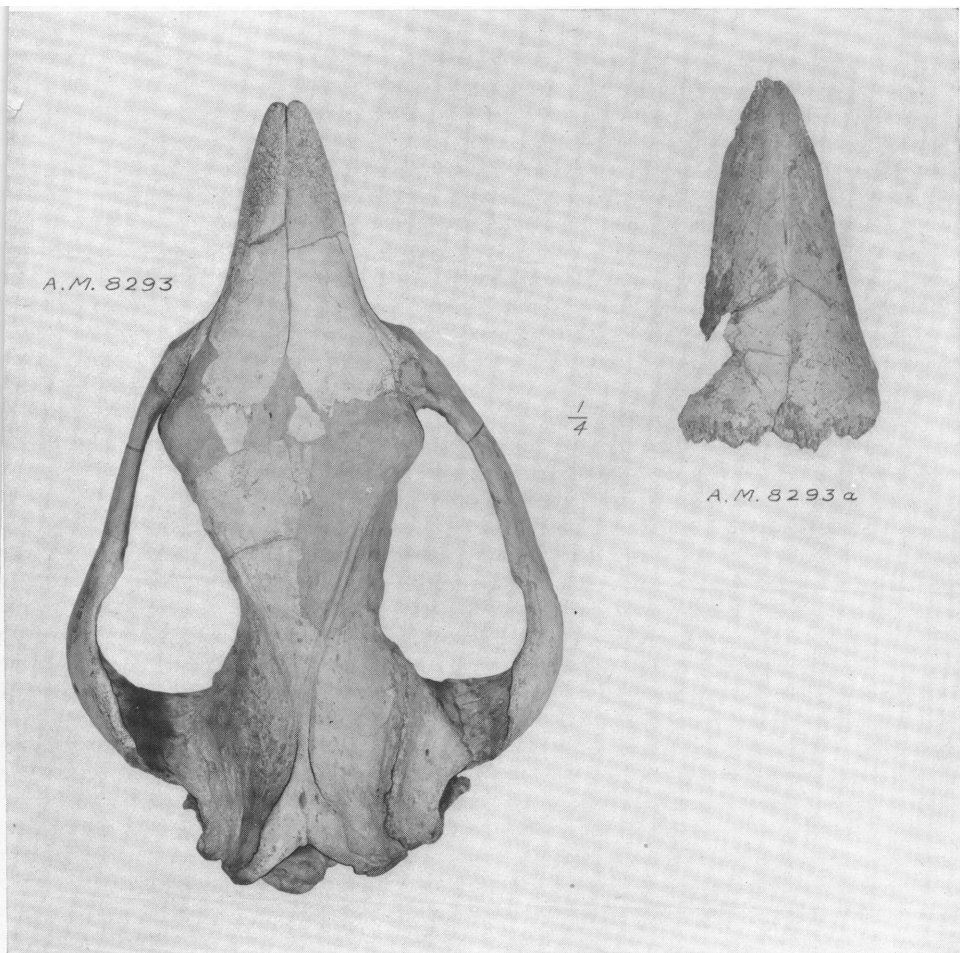


*Peraceras troxelli*, new species; type skull, side.





*Peraceras trozelli*, new species; type skull, occipital view. Lower Pliocene, Springview, Keyapaha Co., Nebraska.



*Aphelops megalodus*, No. 8293, top view of skull; and *Teleoceras medicornutus*, nasals. Pawnee Creek beds, late Miocene, N. E. Colorado. Cope Collection. Both topotypes. The *Teleoceras* is part of a specimen referred by Cope to '*Rhinoceros crassus* Leidy.'