

XV. FOSSIL HORSES FROM NORTH DAKOTA AND MONTANA.

BY EARL DOUGLASS.

Until recently, there has been no opportunity to study the fossil horses which have been obtained in Montana and North Dakota for the Carnegie Museum. At the request of Dr. W. J. Holland, the director of the museum, a preliminary account of some of the more interesting of these remains has been prepared. When all the material from these regions has been thoroughly studied and compared with that from other localities, much will be added to our knowledge of the history of the fossil horses.

In 1905, the expeditions from the Carnegie Museum which had previously confined their operations to western Montana, extended them into parts of Minnesota, Idaho, and North Dakota. In the last mentioned state, the deposits which probably were visited by Professor E. D. Cope,¹ in 1883, were searched for fossil mammals. In the "Little Bad Lands" southwest of Dickinson, another area of Oligocene deposits was discovered. In both localities the three divisions of the White River (lower, middle, and upper) are exposed, and from the middle and upper horizons many fossil mammals were obtained.

The White River beds of North Dakota and their mammalian faunæ are much like those of South Dakota, though there are some local differences. On the other hand the various Tertiary deposits of western Montana do not exactly agree in character with those of the plains. As one by one the families of fossil mammals from the Tertiary horizons of Montana have been studied, it has been found that most of the species and part of the genera are different from those which have been obtained elsewhere. It might have been suspected that the camels and horses were more cosmopolitan than some of the other animals, and that identical species would be found in beds which were supposed to be nearly or quite contemporaneous in the mountains and on the plains. In the present paper, I have included provisionally under old names, some species which I believe will eventually

¹ *Proc. Amer. Philos. Soc.*, Vol. XXI, p. 216.

prove to be new. The horses, then will probably not form an exception to the general rule. A preliminary study has also been made of the camels and they tell the same story.

It seems, then, from the evidence thus far obtained, that the two regions (that of Montana and of the plains) all through Oligocene and Miocene times (at least the portions of them represented by fossil-bearing deposits) have been faunally distinct; or else the preservation of mammalian remains seldom, if ever, exactly coincided in time in the two localities.

Mesohippus portentus sp. nov.

(PLATE LXV, FIGURES 1-4.)

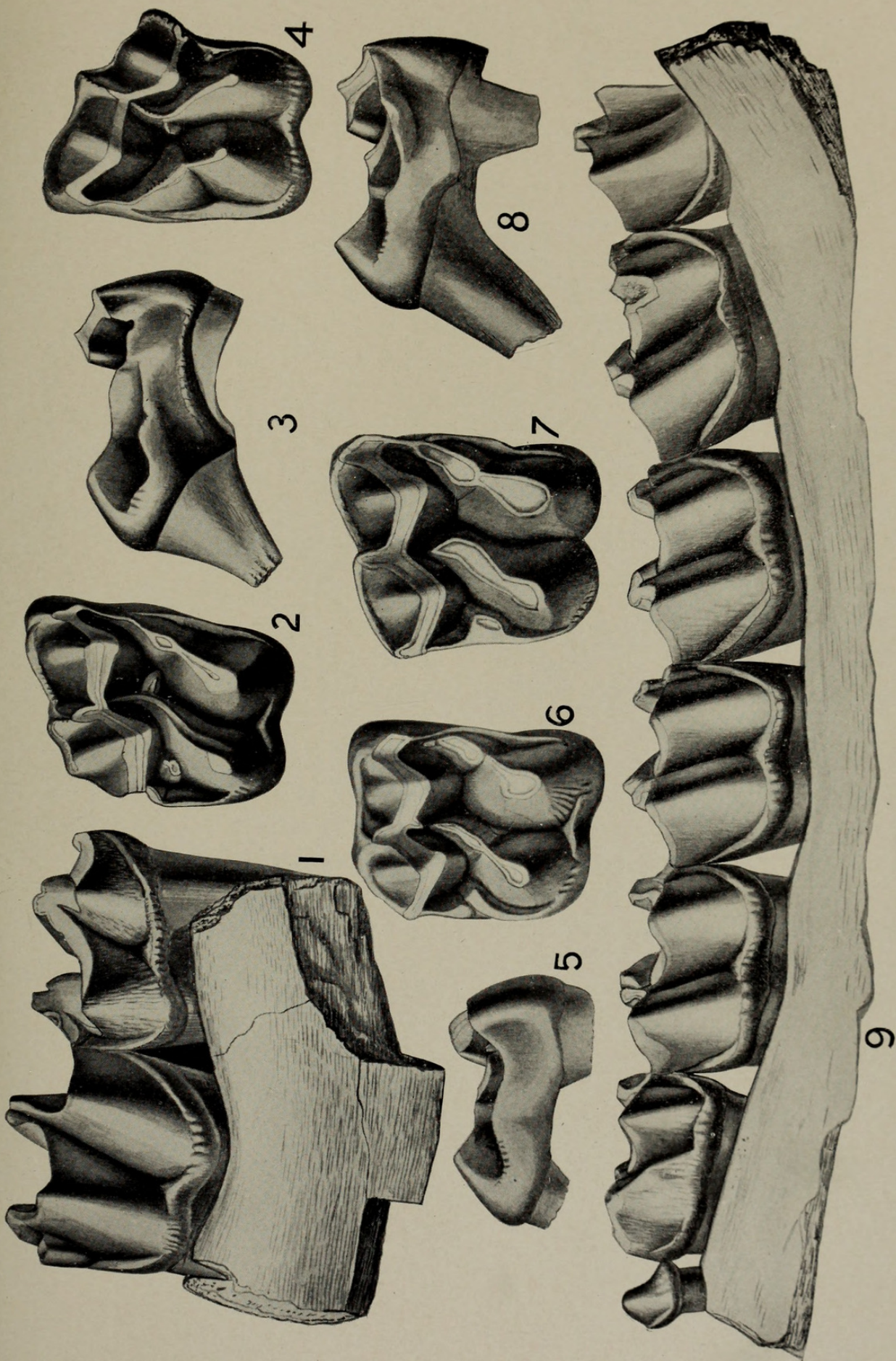
(Type No. 1622, Carnegie Museum Catalogue of Vertebrate Fossils; Pl. LXV, figs. 2 and 3.)

The type is a second right upper molar tooth from the Lower White River ("Titanotherium") beds near Pipestone Creek in Montana. The specimens which I have associated with the type are No. 1624, a left upper premolar; No. 1623, a last left upper molar; No. 1633, two lower molars; and No. 1634, one lower molar. All are from the same region and formation as the type.

DESCRIPTION OF TYPE.

(1) Size large and (2) crests of molars high for a horse from this horizon, (3) ectoloph very oblique, (4) protoloph and metaloph nearly equal in length, (5) protoloph large and connected with the parastyle, (6) metaloph narrow and nearly connected with ectoloph, (7) protoconule easily distinguishable, but (8) metaconule absent, (9) a crotchet present on the metaloph, and (10) a small conule in the posterior valley of the tooth, (11) a rudiment of a cingulum between protocone and hypocone, (12) parastyle and (13) hypostyle small.

The metaloph, external to the metacone, is thin and has a sharp crest. The crotchet extends forward and slightly outward from the metaloph where the latter bends outward toward the ectoloph. It extends nearly across the valley to the posterior base of the protoconule. If the crotchet were higher and united with the protoconule it would produce an "enamel-lake" like those which occur in some Upper Miocene horses. There is a minute conule in the posterior



Teeth of Fossil Horses from North Dakota and Montana.

valley of the tooth between the metaloph and the hypostyle. The hypostyle is simply a thickening of the posterior cingulum.

Measurements. — Antero-posterior diameter of crown 13.3 mm., transverse diameter 18 mm., length of protoloph 12.2 mm., length of metaloph 12 mm., height of hypocone 8.1 mm.

Specimen No. 1623 (Plate LXV, fig. 4) probably belongs to this species. It is a third upper molar, therefore its transverse diameter is not so great as that of the type. The crotchet in the present specimen is not so large and there is no conule in the posterior valley.

No. 1633 (Plate LXV, fig. 1) is a portion of a mandible with two teeth in position. On account of the size and height of these teeth it is assumed that the specimen belongs to the species now under consideration. The antero-posterior diameter of the two teeth is 26 mm. The height is 9 mm. The cingula on the outer faces of the teeth are continuous but not heavy. The metaconid and metastylid are beginning to separate. Another lower tooth (No. 1634) has the same characters as the teeth just described.

Mesohippus hypostylus ? Osborn.

(PLATE LXV, FIGS. 7-9.)

Bulletin of the American Museum of Natural History, Vol. XX (1904), Art. XIII, p. 170, fig. 2.

I include provisionally in this species three upper teeth, Nos. 1625, 1630, and 1631, also a portion of a mandible with nearly complete molar-premolar series (No. 1635 Carn. Mus. Cat. Vert. Fossils) from the Lower White River beds on Pipestone Creek in Montana. All the teeth are considerably larger than those of the type of *Mesohippus hypostylus* and it is doubtful if they belong to the same species.

No. 1625 (Plate LXV, figs. 7 and 8) is a right upper molar. Its antero-posterior diameter is 14.5 mm., its transverse diameter 17 mm., and the height of the protocone, though worn, 8 mm. The ectoloph and cross-crests are moderately oblique. The protoloph is connected, apparently in part by the cingulum, with the parastyle. The protoconule is large and is plainly distinguished from the protocone. The metaloph is much narrower than the protoloph, and there is only a slight constriction to distinguish the metaconule from the metacone. The metaconule or the outer portion of the metaloph is broad and not connected with the ectoloph at the top. There is no internal cingulum on the tooth. The hypostyle is small.

No. 1631 is a second upper premolar. The antero-external style is not large. The antero-external cusp is quite large but there is no outer tubercle on the protoloph. The posterior external tubercle on the metaloph is well developed. There is a large hypostyle and it is connected by wear with the postero-internal cusp. The antero-posterior diameter is 15 mm. and the transverse diameter 15 mm.

No. 1635 (Plate LXV, fig. 9) is a portion of a mandible with all the cheek-teeth except part of the last molar. Because of the size and height of the teeth it is provisionally associated with the upper teeth described above. The length of the molar-premolar series, exclusive of $M_{\frac{3}{2}}$, is 70 mm. The length of $M_{\frac{2}{2}}$ is 15 mm. and the height of the protoconid is 9 mm. The teeth are high for a species from the Lower White River horizon. P_1 is small. There are prominent external cingula on all the teeth except the first premolar. There is a tendency toward a separation of the metastylid from the metaconid but this is not shown by an inner groove. The entostylid is quite well developed.

Meshippus bairdi (Leidy).

Palæotherium bairdi Leidy. Proceedings of the Academy of Natural Sciences, Philadelphia, Vol. V, 1850, p. 122.

The anterior portion of a skull containing the molar-premolar series of both sides, was found below the middle of the nodular beds (Middle White River) on White Butte in Billings County, North Dakota. The specimen is No. 1644 of the Carnegie Museum Collection of Vertebrate Fossils. The teeth are extremely brachyodont for a horse from this horizon — more so than any specimens I have seen from the Lower White River beds of Montana. By the pattern of the teeth they could hardly be distinguished from those usually considered as belonging to *Meshippus bairdi*, though I have not access to the type of that species. The preorbital fossa is quite large and deep, making the top of the muzzle narrow.

UPPER WHITE RIVER BEDS.

Meshippus brachystylus? Osborn.

(PLATE LXV, FIGURES 5 AND 6.)

Bulletin of the American Museum of Natural History, Vol. XX, 1904, Art. XIII, p. 175, fig. 6.

I include provisionally in this species Nos. 1639, 1641, and 1643 (Carn. Mus. Cat. Vert. Foss.). They consist of teeth which were

found by the writer in the Upper White River beds of White Butte in North Dakota. Though they differ somewhat from the type of *Mesohippus brachystylus* as described by Osborn, I refer them with doubt to this species. No. 1639*a* and 1639*b* are two upper molars, 1641 an upper molar, and 1643 a last lower molar.

Measurements. — Specimen No. 1639*a*, apparently a first molar (Plate LXV, figs. 5 and 6), has the antero-posterior diameter of crown 13 mm., transverse diameter 16.5 mm., height of protocone (slightly worn) 5 mm., height of paracone 6 mm.

The most prominent characteristics of these teeth are the following : (1) crowns low, cross-crests especially so ; (2) parastyle fairly large and connected with the anterior cingulum, but not with the outer angle or point of the protoconule ; (3) protoconule and metaconule well developed and of nearly equal form and size ; (4) hypostyle well developed, tending near apex to separate from the portion of the cingulum external to it ; (5) inner cingulum rudimentary ; (6) outer median ribs on crescents not prominent ; (7) form of tooth nearly quadrate.

No. 1641 is an upper molar. The antero-posterior diameter of the crown is 13 mm. and the transverse diameter 16 mm. It differs from the teeth just described in having a shorter inner antero-posterior diameter, making the tooth less quadrate.

No. 1643 is a last left lower molar. The antero-posterior diameter is 20 mm. and the transverse diameter 10 mm. The metastylid is not separated from the metaconid, but a faint external groove indicates a beginning of this separation.

MIOCENE DEPOSITS.

Altippus taxus gen. et sp. nov.

(PLATE LXVII, FIGS. 3 AND 4 ; PLATE LXVIII, FIGS. 6-8.)

(Type No. 836, Carnegie Museum Catalogue of Vertebrate Fossils.)

The type, which was found by the writer near the little railroad station of Woodin on Divide Creek, about six miles south of the continental divide, in Silver Bow County, Montana, consists of parts of a skull, the greater portion of a mandible, a radius, portions of two femora, a tibia, a nearly complete hind foot, other bones of toes, and numerous fragments. The only associated fossils were part of a skull of *Entoptychus* Cope and parts of upper and lower jaws which are not

very different, except in size, from the corresponding parts of the type of *Ticholeptus breviceps*, which was found about a mile farther south, apparently at a little lower level.

Generic Characters. — (1) *Deciduous teeth brachyodont*; (2) *permanent teeth somewhat hypsodont*; (3) *both permanent and temporary teeth without cement on crowns*; (4) *metaloph on the upper permanent teeth not united with ectoloph*; (5) *protoconule small*; (6) *metaconule faintly indicated on the metaloph*; (7) *hypostyle moderately large triangular and having a central pit*; (8) *limbs long*; (9) *metapodials unusually long and slender*; (10) *ungual phalanges long and narrow*; (11) *metatarsals nearly the length of the radius*.

The zygomatic arch is slender and the orbit large. The infraorbital foramen is over the third temporary molar. The first temporary molar is one half of the width and a little over one half of the length of the second temporary molar. The latter tooth has a small median internal pillar between the two internal cusps. The third and fourth temporary molars are nearly equal in size and their antero-posterior and transverse diameters are nearly equal. The protoloph and metaloph are connected with the ectoloph. The hypostyle is large. The first and second permanent molars are nearly equal in size. Their ectolophs are oblique, the anterior portion of the tooth being broader than the posterior portion, and the protoloph being larger than the ectoloph. The cross-crests are not connected with the external crest except at the bases. The parastyle is small and its inner portion is a sharp vertical ridge. The mesostyle is low and thin and there are faint median external ridges on the paracone and metacone. The protoconule is small but well defined, but the metaconule is only faintly indicated by a minute protuberance on the top of the metaloph.

The first lower deciduous molar is a little more than one-third the length of the second. It had one simple cusp and a low heel. The second temporary molar is the longest tooth in the mandible. There are cingula on the outsides of the third and fourth deciduous molars. The first permanent lower molar retains the pattern of the teeth of Oligocene horses, but it is higher than the more brachyodont forms. The proportion of the height to the antero-posterior diameter is only about six per cent. greater than in *Mesohippus portentus* from the lower White River beds.

The radius, like all the other bones of the limbs, is long and slender. Its shaft is transversely concave on the posterior surface. The trans-

verse diameter at its narrowest part is one-twentieth its length. The tibia is nearly a fourth longer than the radius. Its length is fourteen times its narrowest transverse diameter. The shaft of the outer lateral metatarsal is considerably more reduced than that of the inner metatarsal. The lateral phalanges are considerably shorter than the median phalanges, therefore the tips of the unguals were evidently free from the ground when the animal was standing. The lateral unguals, like the median, are slender.

A remarkable characteristic of this horse is the extreme length and slenderness of the limbs combined with the primitive pattern of the teeth, which, with the exception of the somewhat greater height of the different elements and the partial separation of the metaconid and metastylid, are scarcely more progressive in the direction of the modern horse than are the teeth of some of the horses of the Lower Oligocene; though apparently the horse here described is not older than Middle Miocene.

MEASUREMENTS.

	mm.
Length of Upper Molar-premolar series except M^3	88
Length of Upper Premolar series.....	58
Length of M^1	15
Width of M^1	18
Height of M^1	13
Length of M^2	15
Width of M^2	18
Length of first lower temporary molar.....	6.5
Width of first lower temporary molar.....	4
Length of second lower temporary molar.....	18
Length of third lower temporary molar.....	16
Length of fourth lower temporary molar.....	15.5
Length of $M_{\bar{1}}$	15
Width of $M_{\bar{1}}$	10
Height of $M_{\bar{1}}$	13
Length of radius.....	173
Width of shaft of radius, least..	14.5
Length of tibia.....	225
Width of shaft of tibia, least.....	16
Length of median metatarsal, not less than.....	167
Length of median metatarsal, estimated.....	180
Width of shaft of median metatarsal.....	12.5
Length of median ungual phalanx.....	28
Width of median ungual phalanx.....	19
Length of lateral ungual phalanx.....	19
Width of lateral ungual phalanx.....	7

Merychippus? missouriensis sp. nov.

(PLATE LXVI; LXVII, FIGURE 5; PLATE LXVIII, FIGURES 1 AND 2.)

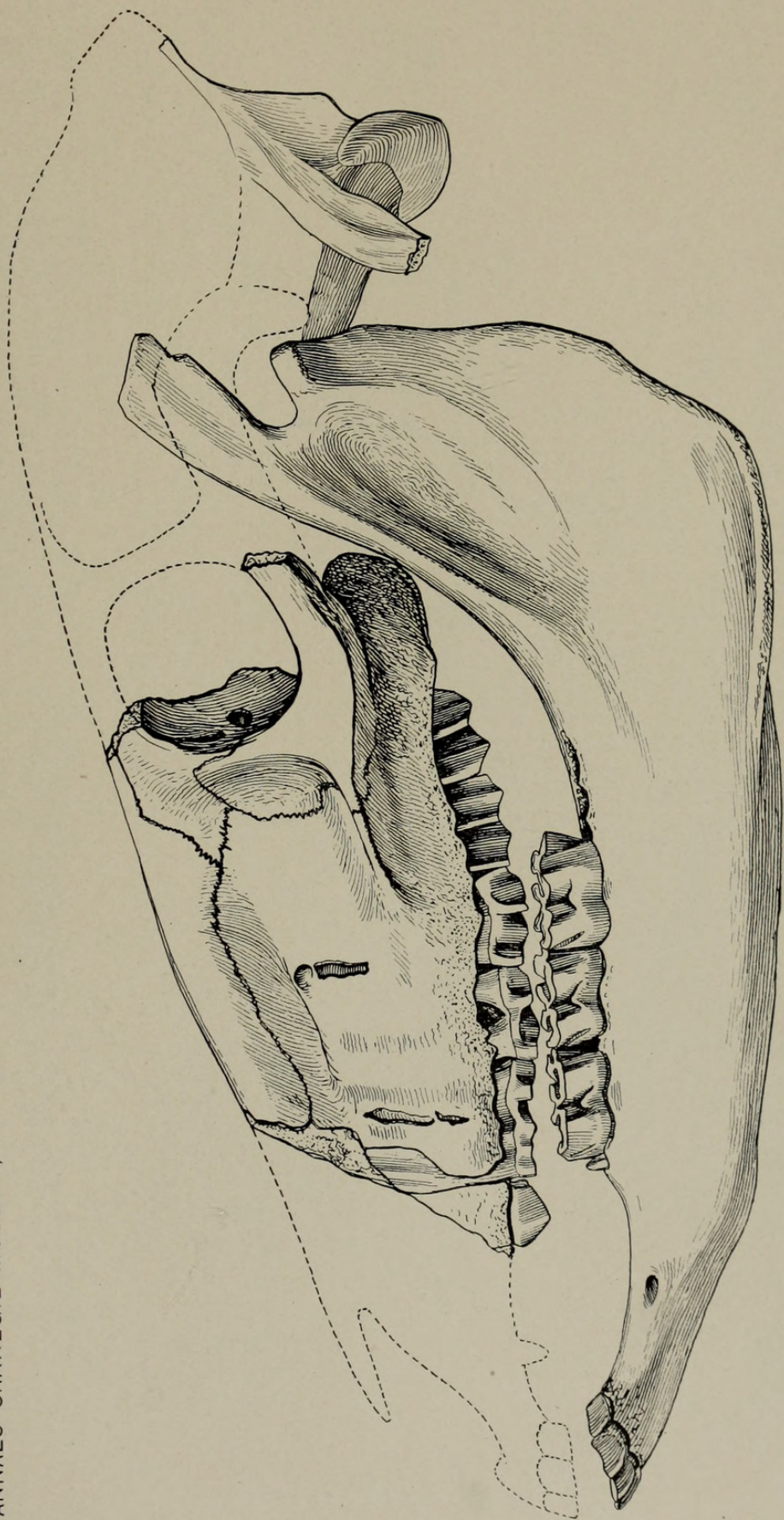
(Type No. 905, Carnegie Museum Catalogue of Vertebrate Fossils.)

The type of this species is a portion of a skull, a mandible, a radius, two femora, two complete and two incomplete metapodials, also numerous fragments. These bones represent a young individual, which was found in the upper Miocene formation (Loup Fork). These beds form a part of the bluffs along the eastern side of the Missouri River north of Confederate Creek and east of Winston in Montana. The type was collected by Earl Douglass and Ray Roberts in 1902. From the same locality, only a few feet away, a nearly complete hind foot (No. 858) was obtained. This undoubtedly belongs to the same species as the type, and the age of the two individuals was nearly the same, as shown by corresponding portions of mandibles with teeth.

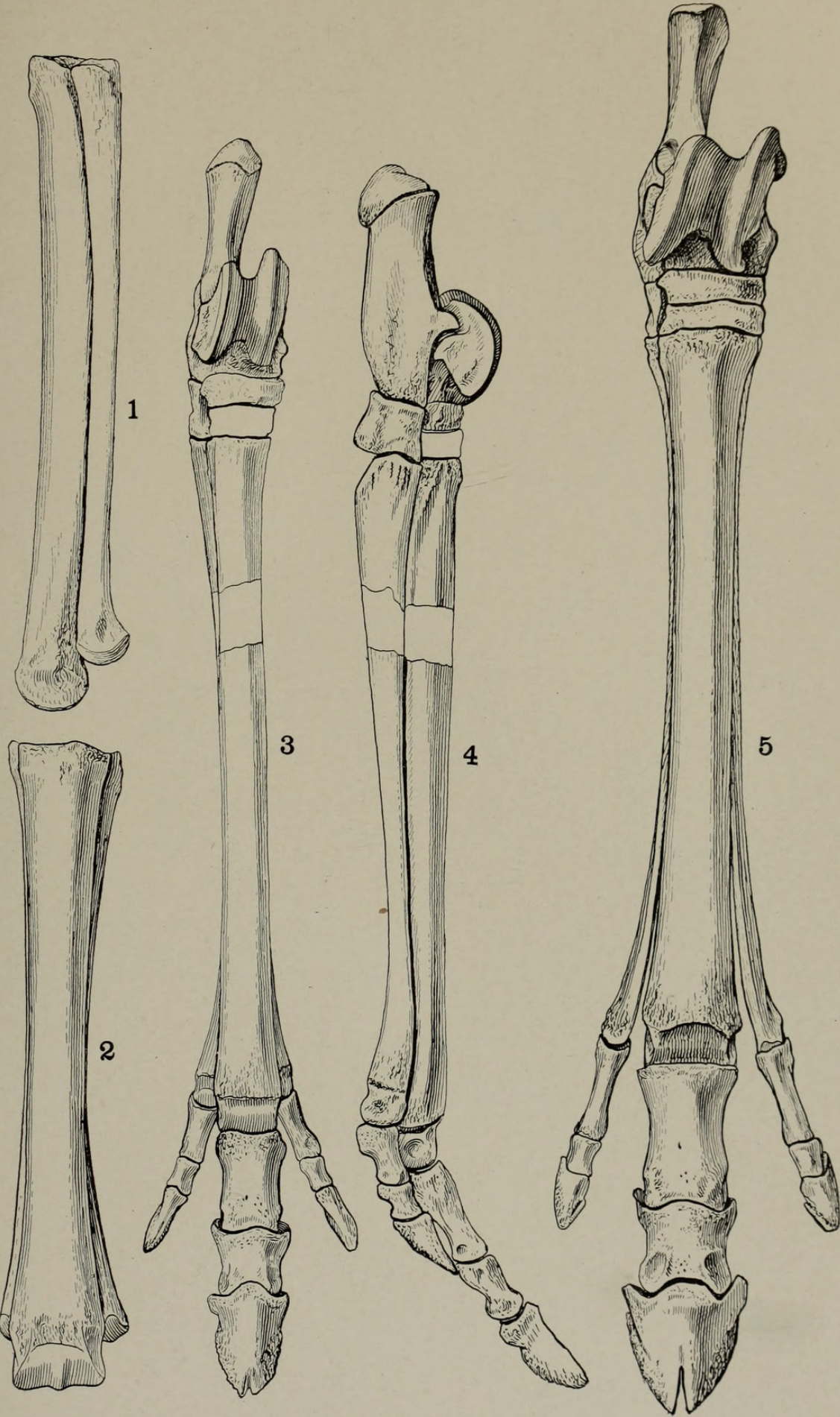
Distinguishing Characters of the Type. — (1) Lachrymal fossa long and moderately deep, (2) malar pit with steep posterior side, bounded below by a thin shelf-like malo-maxillary ridge, (3) temporary molars brachyodont or brachy-hypsodont, (4) permanent molars curved and strongly hypsodont, (5) both series of teeth with a coating of cement which is not very thick, (6) enamel-lakes simple with only one or two simple enamel-folds on each, (7) protocone and hypocone laterally compressed, the former separate from the protoconule but having an angular projection toward the latter, (8) first temporary lower molar minute, (9) intermediate external conule on lower temporary molars concave on the inside, more or less flattened on the outside, (10) metapodial nearly ninety per cent. of the length of the radius and eighty-four per cent. of the length of the femur exclusive of the proximal epiphysis.

MEASUREMENTS.

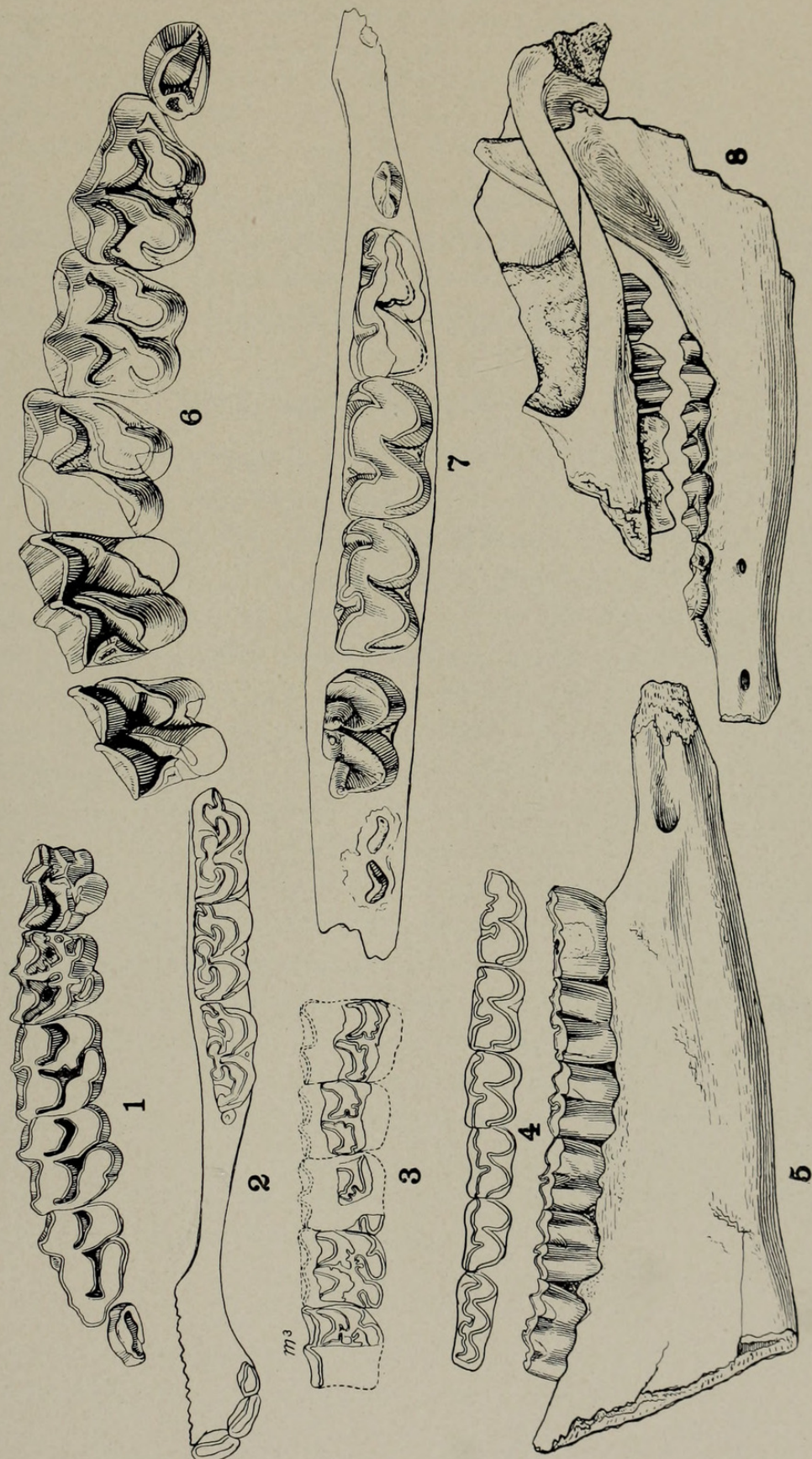
	mm.
Length of upper temporary molar series.....	84.2
Length of DM ¹	13.7
Length of DM ²	28
Length of DM ³	22
Width of DM ³	21.5
Length of DM ⁴	21.5
Length of M ¹	22
Width of M ¹	21
Length of M ²	21
Length of mandible.....	260



Skull of *Merychippus missouriensis* Douglass. $\frac{1}{2}$.



Miocene Horses from Montana.



Miocene Horses from Montana. (Figs. 6 and 7 natural size; all other figures one-half natural size.)

Length of symphysis of mandible.....	49
Length of femur exclusive of proximal symphysis.....	233
Length of radius.....	218
Least antero-posterior diameter of femur.....	30
Length of median metapodial.....	194
Transverse width of shaft of median metapodial.....	17.5
Length of ungual phalanx.....	32.5
Width of ungual phalanx.....	19

Of the paratype (No. 858) there is, besides other bones, a nearly complete hind foot. The specimen was of nearly the same age as the type and the bones so far as shown have the same sizes and proportions. A figure of the foot of the paratype is given on Plate LXVII, fig. 5.

Merychippus insignis Leidy.

(PLATE LXVII, FIGURES 1 AND 2; PLATE LXVIII, FIGURES 3-5.)

Proc. Acad. Nat. Sci. Phila., Vol. VIII, 1856, p. 311.

This specimen, No. 1377, Carnegie Museum Catalogue of Vertebrate Fossils, consists of a portion of a maxillary with incomplete upper teeth, the horizontal rami of a mandible with the molar-premolar series of both sides, three metapodials of one foot, a femur and portions of other limb and foot bones. This specimen was found in the Miocene deposits on Deep Creek, southeast of Townsend in Broadwater County, Montana. As no other fossils were found in these deposits at this place the exact horizon cannot be determined. The specimen was collected by Earl Douglass in 1898.

Distinguishing Characters. — (1) Upper cheek-teeth transversely narrow, (2) enamel lakes comparatively simple, each having from one to three enamel-folds which are usually small, (3) protocone and hypocone of nearly equal size and connected respectively with the protoconule and metaconule, (4) symphysis of mandible shallow, but horizontal rami increasing quite rapidly in depth posteriorly, (5) P_1 absent, (6) teeth of molar-premolar series decreasing in size from P_3 to M_3 , and decreasing in length from P_2 to M_2 , (7) metapodials comparatively short, (8) lateral digits small, (9) femur long, being one and one half times the length of the metapodials.

MEASUREMENTS.

	mm.
Length of lower-premolar series.....	109.5
Length of P_2	21

Length of $P_{\frac{3}{4}}$	18.5
Length of $P_{\frac{1}{4}}$	17.5
Length of $M_{\frac{1}{2}}$	15.5
Length of $M_{\frac{2}{3}}$	16
Length of $M_{\frac{3}{4}}$	21
Length of femur	247
Transverse diameter of femur.....	21
Antero-posterior diameter of femur.....	31
Length of median metapodial	165
Width of median metapodial.....	18

Proportion of transverse diameter to length of femur = 8.5 : 100. Transverse diameter to length of median metapodial 10.9 : 100.

EXPLANATION OF PLATE LXV.

Fossil Horses from the Oligocene Deposits of North Dakota and Montana.

All figures twice natural size.

Fig. 1. *Mesohippus portentus*? No. 1633. Two lower teeth in portion of a mandible.

Fig. 2. *Mesohippus portentus* sp. nov. Type. No. 1622. A right upper molar. Crown view.

Fig. 3. *Mesohippus portentus* sp. nov. Type. No. 1622. The same as Fig. 2. Anterior view of tooth.

Fig. 4. *Mesohippus portentus*? No. 1623. A fourth left upper molar. Crown view.

Fig. 5. *Mesohippus brachystylus*? Osborn. No. 1639. Anterior view of crown of tooth.

Fig. 6. *Mesohippus brachystylus*? Osborn. No. 1639. Crown view.

Fig. 7. *Mesohippus hypostylus*? Osborn. No. 1625. Right upper molar. Crown view.

Fig. 8. *Mesohippus hypostylus*? Osborn. No. 1625. Anterior view.

Fig. 9. *Mesohippus hypostylus*? Osborn. No. 1635. Lower teeth. External view.

EXPLANATION OF PLATE LXVI.

Skull of Merychippus missouriensis sp. nov.

Type. No. 905. From Upper Miocene deposits. From Missouri Valley, east of Winston, Montana.

One-half natural size.

EXPLANATION OF PLATE LXVII.

Miocene Horses from Montana.

All figures are one half natural size.

Fig. 1. *Merychippus insignis*? Leidy. No. 1377. From Deep Creek southeast of Townsend, Montana. Lateral view of metacarpals.

Fig. 2. *Merychippus insignis*? Leidy. No. 1377. Front view of metacarpals.

Fig. 3. *Altippus taxus* sp. nov. Type. No. 836. From Divide Creek, near Woodin, Montana. Anterior view of hind foot.

Fig. 4. *Altippus taxus* sp. nov. Type. No. 836. Lateral view of foot.

Fig. 5. *Merychippus missouriensis*. Paratype. No. 858. From Missouri Valley, east of Winston, Montana. Anterior view of hind foot.

EXPLANATION OF PLATE LXVIII.

Miocene Horses from Montana.

All figures except 6 and 7 one half natural size. Figures 6 and 7 natural size.

Fig. 1. *Merychippus missouriensis* sp. nov. Type. No. 905. From Missouri Valley, east of Winston, Montana. Left upper cheek teeth. The milk molars and the first two permanent molars.

Fig. 2. *Merychippus missouriensis* sp. nov. Type. No. 905. Inferior milk dentition.

Fig. 3. *Merychippus insignis*? Leidy. No. 1377. From Deep Creek, southeast of Townsend, Montana. Fragmentary superior dentition.

Fig. 4. *Merychippus insignis*? Leidy. No. 1377. Lower cheek teeth. Top view.

Fig. 5. *Merychippus insignis*? Leidy. No. 1377. Right ramus of mandible with cheek teeth.

Fig. 6. *Altippus taxus* sp. nov. Type. No. 836. From Divide Creek, Montana. Four temporary upper molars and first two molars of right side. Natural size.

Fig. 7. *Altippus taxus* sp. nov. No. 836. Lower temporary molars and first two permanent molars of right mandible. Natural size.

Fig. 8. *Altippus taxus* sp. nov. No. 836. Portions of skull and mandible.



Douglass, Earl. 1908. "Fossil horses from North Dakota and Montana." *Annals of the Carnegie Museum* 4(3-4), 267-277. <https://doi.org/10.5962/p.328728>.

View This Item Online: <https://www.biodiversitylibrary.org/item/122993>

DOI: <https://doi.org/10.5962/p.328728>

Permalink: <https://www.biodiversitylibrary.org/partpdf/328728>

Holding Institution

California Academy of Sciences

Sponsored by

California Academy of Sciences Library

Copyright & Reuse

Copyright Status: Public domain. The BHL considers that this work is no longer under copyright protection.

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.