

V. DESCRIPTION OF A NEW SPECIES OF PROCAMELUS
FROM THE UPPER MIOCENE OF MONTANA WITH
NOTES UPON PROCAMELUS MADISONIUS
DOUGLASS.

BY EARL DOUGLASS.

Procamelus elrodi sp. nov.

(Type No. 777, Carnegie Museum Catalogue of Vertebrate Fossils.)

(PLATES IX TO XI.)

The type of this species is a nearly complete skull and mandible with the greater portion of the neck. It was found by the writer in a pinkish, fine-grained stratum beneath river deposits of conglomerate and sand, which are exposed in the bluffs on the east side of the lower Madison Valley in Montana nearly east of Hyde Post-office.

The species is distinguished by its large size, the pit into which the infraorbital foramen opens and the much larger pit above it, the heavy but not deep mandible, the prominence of the postero-superior portion of the angle and the relative proportions of the cervicals which decrease in the length of the centra from the axis backwards.

Dentition. — All the teeth are more or less worn, indicating that the animal was fully mature. The teeth anterior to the molars are preserved, but are all somewhat worn, especially the last three premolars. The molars on the left side are gone and the first two on the right side are nearly destroyed.

Upper Teeth. — About 7 mm. anterior to the third incisor on the right side there is a small rudiment of a second incisor in an alveolus 2 mm. in diameter. The tooth does not appear to possess any enamel and does not project below the alveolar border.

I³ is a heavy caniniform tooth, nearly circular in section. The canine is a little narrower transversely and a little longer antero-posteriorly than I² and is elliptical in section. It curves slightly forward like the canines of many of the carnivora. P¹ is smaller than the canine but has nearly the same form. P² is narrow transversely, but is attached by two heavy roots. P³ is larger and has three roots.

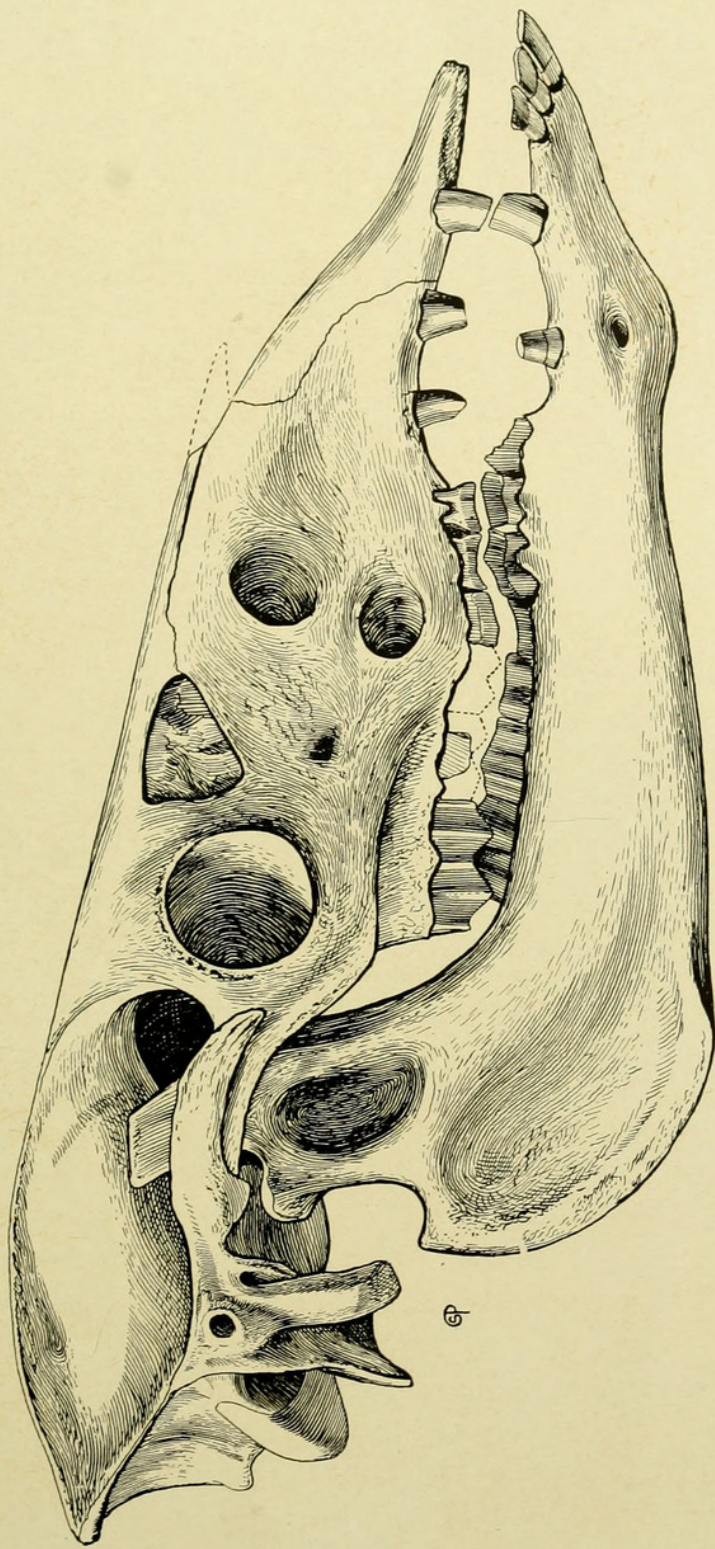
The length of P^4 is nearly the same as that of P^3 but it is much broader. These teeth are so worn that the exact original form of the crown cannot be made out. The last molar is longer and broader than those preceding it.

Lower Teeth. — The incisors are all large, the anterior being the largest and the posterior the smallest. I_1 though somewhat worn has a crown 25 mm. in height, and it is more nearly symmetrical than the other incisors. It is semiprocumbent. I_3 is slightly less procumbent. The canine is large, curved, and oval in horizontal section. The anterior premolar is smaller than the canine and is conical in form. Premolars two and three have each two large roots. The teeth are narrow transversely, but the three posterior premolars increase in length and width from the second to the fourth. Of the molars only the last on the right side is completely preserved. This is long antero-posteriorly.

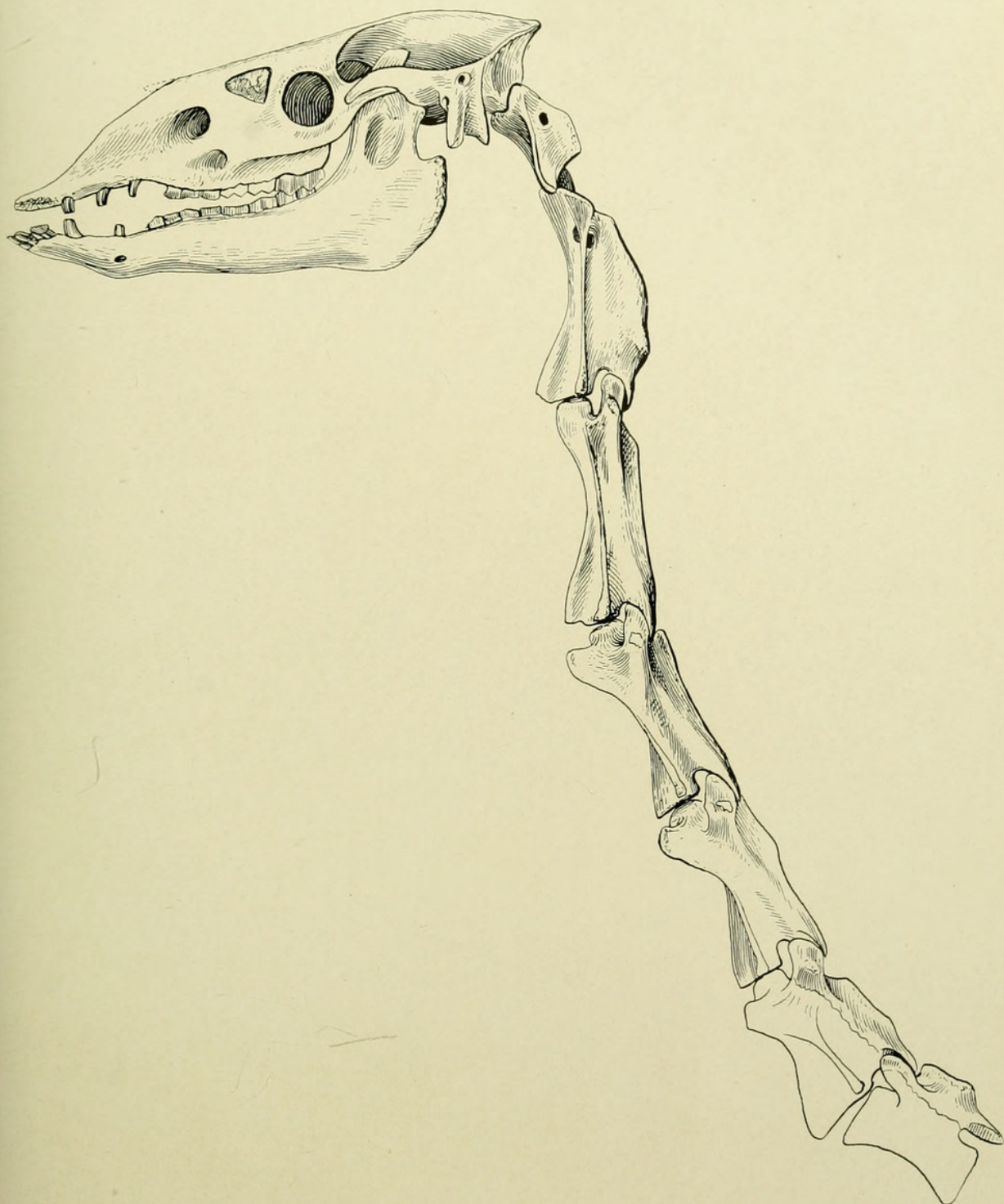
The Skull. — The skull is long and proportionally low, the frontal plane broad, the brain-case quite large and full, the sagittal crest low and long, and the posterior portion of the zygomatic arch slender and arching upward. The lachrymal vacuities are large and oval in form. The facial pits are large.

Palate View. — The alveolar borders of the premaxillaries are thick transversely and are roughened in front of I^3 . The anterior tips arch upward and approach each other but are not in contact in the present specimen. The incisive alveoli are long and narrow. The palate gradually widens from before backward to the canine and then gradually narrows to P^2 , but the last incisors, the canines, and the first premolar of the opposite sides are nearly the same distance apart. The lower border of the pterygoid curves downward and ends in a rounded point. The posterior border ascends steeply. The lower surfaces of the basioccipital and basisphenoid are broad, and broadly convex transversely.

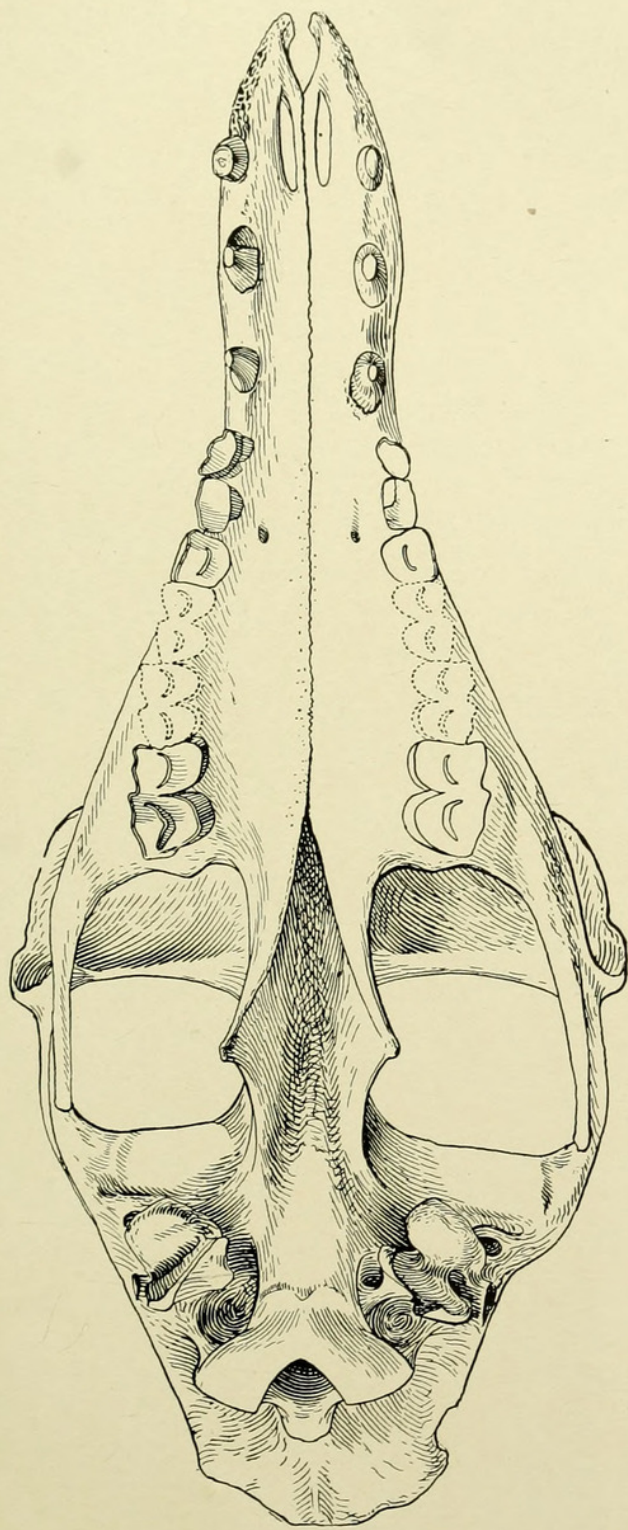
Lateral View. — The infraorbital foramen opens into a fossa or depression above the anterior portion of M^1 . Above this is a large concavity. The lachrymal vacuity is large and oval. The anterior border of the orbit is above the middle of the last molar. The zygomatic arch is rather slender behind the orbit and is arched upward. The postglenoid process is weak and thin antero-posteriorly, but rests against the high tympanic, from which it is partially separated on the outer side by the postglenoid foramen. The tympanic bulla is high. The inner portion is destroyed in the type specimen, but the outer



Skull of *Procamelus elrodii* Douglass, (One third natural size.)



Skull and Neck of *Procamelus elrodi* Douglass. (One eighth natural size.)



Palatal View of Skull of *Procamelus elrodi* Douglass. (A little less than one third natural size.)

portion is prismatic in form. The opening of the external auditory meatus is a short sessile tube located at the upper extremity of the tympanic, fusing behind with the mastoid process. The paroccipital processes are flattened below and are oblique being directed antero-internally and postero-externally. The outer portion terminates in a small triangular process. The paroccipital processes extend forward so that their anterior portions are partly internal to the tympanics.

Top View. — The anterior portions of the nasals are gone. The anterior processes of the frontal form a wedge between the posterior rounded lobes of the nasals. The forehead between the orbits is broad and is slightly convex transversely with a small median anterior concave area. The supraorbital foramina are about two centimeters external to the median line of the skull. The anterior margin of the temporal foramen is nearly perpendicular to the longer axis of the skull, but internally trends backward in a rapidly developing curve continuous with that of the supratemporal ridges, which unite to form the sagittal crest at a point a little less than one third of the distance from the supraorbital foramina to the occiput. The supratemporal ridges are low and obscure. The sagittal crest is long, thin, low in front and quite high behind. The lateral wings of the occiput are quite broad.

The Mandible. — The horizontal portion of the mandible is quite heavy, especially in front, but not deep, though it gradually increases in depth from $P_{\frac{2}{2}}$ to the ascending ramus. The angle of the mandible is broadly rounded, ending behind in a hook-like process. The ascending ramus is narrow antero-posteriorly with heavy rounded anterior and posterior ridges, which bound the masseteric fossa before and behind. This fossa has the form of an inverted oval. The coronoid process is high and inclines backward.

The Neck. — The atlas is broader than long. Beginning with the axis, and including its process, each succeeding cervical is shorter than the preceding or equals it in length. In *Oxydactylus* the third cervical is the longest and the cervicals posterior to it decrease in length to the last. In *Alticamelus altus* (Marsh), according to Matthew,¹ the cervicals vary in length from the longest to the shortest in the following order: C. 3, C. 4, C. 5, axis, C. 6, C. 7, atlas.

The spine on the axis is low, thin and rounded anteriorly, but is

¹ "Fossil Mammals from Colorado," *Mem. Amer. Mus. Nat. Hist.*, Vol. I, Part VII, p. 431. See measurements.

higher and thicker posteriorly where there is a thickened heavy tubercle. The spine of the second cervical is low anteriorly and soon divides into two sessile ridges which diverge and then converge, sending backward parallel branches. The fourth and fifth cervicals resemble the third in general form, but there is a quite prominent tubercle on the fifth.

The skull of *Procamelus elrodi* is nearly as large as that of *Alticamelus altus* described by Matthew, while the neck is much shorter. The separate measurements of the vertebræ in *Procamelus elrodi* give a total of 1036 mm. while that of *Alticamelus altus* gives 1560 mm.

This species is named in honor of my friend Professor Merton J. Elrod who has done so much for scientific research in Montana, and to whom I owe a debt of gratitude.

MEASUREMENTS OF *Procamelus elrodi*.

	Mm.
Length of skull, basal	429
" " " including sagittal crest	503
Width " " at canines	60
Length " " at diastema between P ¹ and P ²	48
Width " " " posterior orbits	165
" " " " tympansics	111
Height " " " M ³	123
" " " " and including tympanic bullæ	118
" " occiput	90
Length of mandible including incisors	380
Depth of " " at canine	19
" " " " P _I	33
" " " " P ₂	40
" " " " M _I	50
" " " " M ₃ , posterior part	65
Anteroposterior diameter of ascending ramus of mandible at posterior angle	85
Length of upper dental series from I ³	223
" " molar-premolar series	163
" " premolar series	81
" " molar series	82
" " I ³	15
Width " " 	13
Length " space between I ³ and canine	19
" " canine	15
Width " " 	14
Length of space between canine and P ¹	15
" " P ¹	14
Width of P ¹	10

	Mm.
Length of space between P^1 and P^2	19
“ “ P^2	15
Width of P^2	8
Length of P^3	18
Width of P^3	11
Length of P^4	20
Width of P^4	17
Length of M^1 and M^2	48
“ “ M^3	38
Width of M^3	25
Length of lower dental series.....	267
“ “ “ molar-premolar series.....	175
“ “ “ molar series.....	96
“ “ I_1 greatest.....	12
Width of I_1	9.5
Length of I_3	15
Width “ I_3	8
Length of space between I_3 and canine.....	11
“ “ canine.....	19
Width “ “.....	13
Length of space between canine and P_1	20
“ “ P_1	15.5
Width of P_1	11.5
Length of space between P_1 and P_2	20
“ “ P_2	12
Width of P_2	7.5
Length of P_3	16.5
Width of P_3	7
Length of M_3	43
Width of M_3	19
Length of atlas, greatest.....	101
Width of atlas.....	120
Length of centrum of axis including odontoid process.....	190
Width of axis, posterior.....	84
Height of axis, greatest.....	100
Length of C 3, centrum.....	176
“ “ C 3.....	118
Height of C 3.....	77
Length of C 4.....	171
Width of C 4.....	110
Length of C 5.....	161
Width of C 5, about.....	105
Height of C 5.....	82.5
Length of C 6, about.....	140
“ “ C 7.....	97
Whole length of neck articulated.....	1000

Procamelus madisonius Douglass.

("The Miocene Lake Beds of Western Montana." Published by the University of Montana, 1899, p. 15.)

In my first paper on the Tertiary deposits of Montana I described a skull and two portions of mandibular rami with teeth under the above name. The portions of the lower jaws were figured in outline

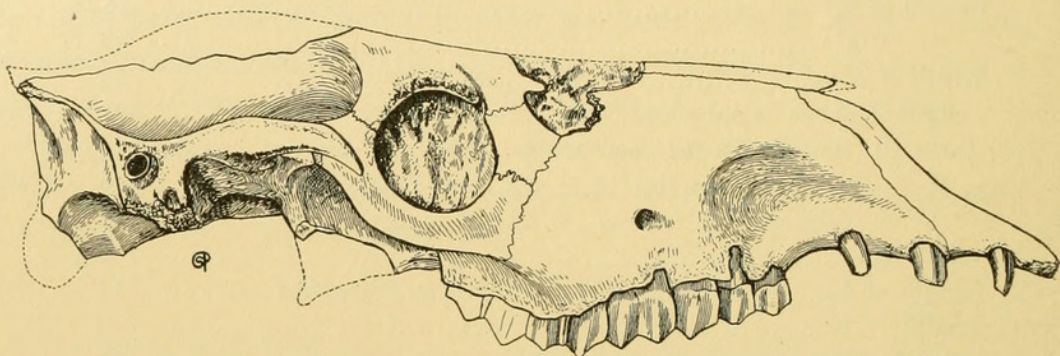


FIG. 1. Lateral view of skull of *Procamelus madisonius* Douglass. (One third natural size.)

in that paper. The skull which is the type of the species has never been figured; figures of the cranium are therefore given in this paper. A detailed description appeared in the original paper, but, as skulls of fossil camels were very rare at that time, its characteristic features could not well be pointed out. The statement there made that the

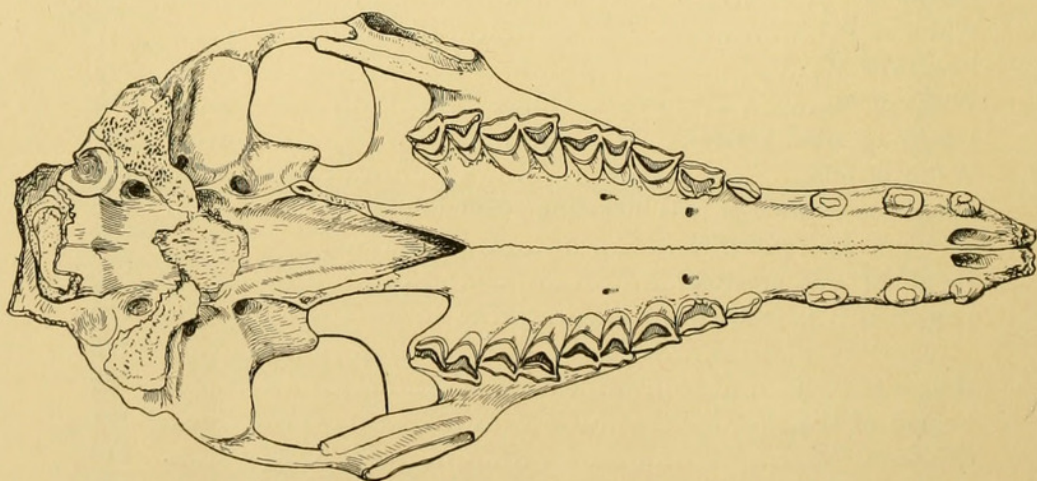


FIG. 2. Palatal view of skull of *P. madisonius* Douglass. (Considerably less than one third natural size.)

skull was about one fifth larger than that of *Camelus dromedarius* is misleading, as the only skull then available for comparison was that

of a small dromedary. Many skulls of the living species are very much larger than that of *Procamelus madisonius*. The characters which now seem most striking in the skull and dentition of this species are the following :

The posterior portion of the skull is broad in proportion to the length. The posterior border of the orbit is about one third the distance from the occiput above the occipital condyles to the anterior margin of the premaxillaries ; thus making the brain-case and the face shorter in proportion to the total length of the skull than is the case in *Procamelus occidentalis* as figured by Cope on Plate LXXVII of Vol. IV of the "U. S. Geological Survey of the 100th Meridian." The brain-case is still larger in *Procamelus elrodi*. The first and second incisors in the type of *P. madisonius* are gone, but none of the other teeth are greatly reduced. In P^3 the inner crescent is incomplete. The length of the molar series is a little greater than that of the premolar series. The three diastemata between I^3 and P^2 increase in length backward.



Douglass, Earl. 1909. "Description of a new Species of Procamelus from the Upper Miocene of Montana, with notes upon Procamelus madisonius Douglass." *Annals of the Carnegie Museum* 5(2-3), 159–165.

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