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Contributions from The E. M. Museum, Princeton, N. J., Bull. No. 3, 1883, p. 46, Pl. VIII, Figs. 1–3.

Type: Upper jaws, No. 10166, Princeton Museum Catalogue.

Horizon: Eocene Formation (Bridger Beds).

Locality: Henry's Fork, Wyoming.

Generic Characters: Professor Scott defines the genus as follows: "Lophiodonts closely allied to *Hyrachyus*, having the molar teeth constructed exactly as in that genus, but differing from it in the pattern of the third and fourth upper premolars, which have two internal cusps instead of one. Dental formula: $\frac{?-?}{?-?}$ c. $\frac{1-1}{?-?}$ Pm. $\frac{4-4}{?-?}$ M $\frac{3-3}{?-?}$."

In his specific determination Scott states that the postero-internal cusp of P^4 "is very small and situated somewhat exterior to the antero-internal cusp." His illustration (*l. c.*, Pl. VIII, Fig. 3) also appears to agree with this statement. Both are erroneous and clearly a mistake, since his detailed description of P^4 apparently agrees better with the actual type specimen. Upon the reëxamination of the specimen (See Pl. XLIV, Fig. 6) it is clear that the tetartocone is on a more nearly even antero-posterior line with the deuterocone, and that the cusp represented in Professor Scott's illustration is an enlargement, or an intermediate tubercle located on the posterior cross-crest. The tetartocone is very much ground down by the opposition of the inferior tooth.[111] The true condition is better shown on P^4 of the left side, which is completely preserved, and from which the drawing represented by the present illustration is partly restored.

Scott states (*l. c.*, p. 48) that the true molars of *Desmatotherium* are, with few minor differences, very similar to those in *Hyrachyus*, and the matter here needs no further discussion, except to say that these two genera are indeed very closely related.

COMPARISON AND RELATIONSHIP.

With regard to the taxonomic position of *Desmatotherium* I am strongly impressed with the idea that the genus is not directly ances-

[111] It is possible that this tubercle was broken off and healed over before the death of the animal.

tral to the tapirs, but that it is closer to the Rhinoceroses. Again referring to *l. c.* Pla e XLIV, Fig. 3, it is quite clear that the premolars have unmistakably advanced towards such Oligocene genera as *Leptaceratherium trigonodum*, *Cœnopus mite*, or *C. platycephalum*. This implies a very early origin of the "atypical" premolar structure, to which Professor Osborn calls attention in his work on the Rhinoceroses referred to above. Nor is there any apparent reason for excluding *Hyrachyus agrarius* or *Colonoceras agrestis* as also possibly belonging to the Rhinoceroses, the latter genus to *Diceratherium* as Marsh originally suggested.[112] The *Rhinocerotidæ* had, in the Uinta, the Bridger, or even earlier Tertiary time, most likely made more than the initial start towards their varied specilizations seen in later time. I am inclined to the opinion, that, if we had found in America the true middle Eocene ancestry of the various types of Rhinoceroses, in the later epochs we would have met with even further advancements than are recorded in the Bridger or later Eocene.[113] The Amynodonts of the Uinta are certainally surprisingly advanced along their line. When the dentition of *Desmatotherium* is compared with that of *Isectolophus* and *Parisectolophus* and the earlier genus *Homogalax* the tendency toward the vertical increase of the crowns, or greater development of the cement is clearly observed in *Desmatotherium*. Besides the early origin of the tetartocone of $P^{\frac{4}{}}$, the cross-crests are visibly of greater prominence and the valleys deeper than in the teeth of *Parisectolophus* or even the Uinta genus *Isectolophus*. Altogether the teeth, especially the molars, are more nearly like those in *Hyrachyus*, *Colonoceras*, or *Helaletes*. In *Hyrachyus* there is, however, present a crista which is only faintly or not at all indicated in *Desmatotherium*. In *Colonoceras* the crista is slightly better developed than in *Desmatotherium* and the posterior cross-crests of the superior premolars are also located further foward in *Colonoceras*.[114] Scott's genus *Desmatotherium* should be placed with *Hyrachyus* in a line nearer to the *Rhinocerotidæ*. It certainly appears to be more closely related to that group that to the Tapiroidea, where it has been heretofore placed.

[112] *Amer. Jour. Sci.* (3), Vol. XIV, 1877, p. 362.

[113] Europe during this time was nearer, or perhaps more accessible, to the center of dispersion of the true Rhinoceroses, according to the works of Schlosser, Abel, and others.

[114] If these features in *Colonoceras* are constant they may be regarded as of considerable importance.

Genus HYRACHYUS Leidy.

Proc. Acad. Nat. Sci. Philad., 1871, p. 229.

Hyrachyus is represented by two individuals C. M. Nos. 2908 and 3112. The former consists of a pair of lower jaws minus the angle and the incisor teeth, and was found in the upper portion of horizon A, near White River, Uinta Basin, Utah, while No. 3112 is a fragment

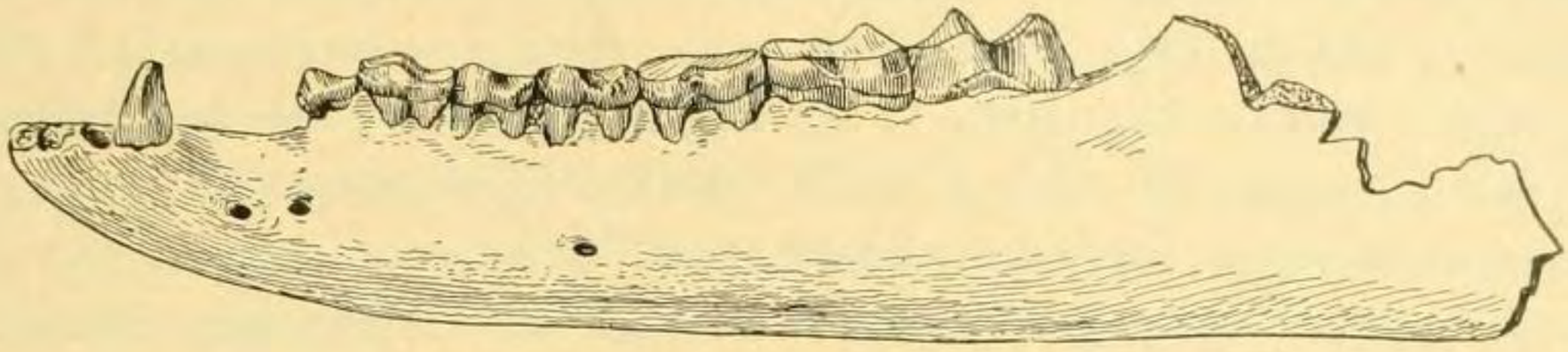


FIG. 18. *Hyrachyus grande* sp. nov. Type Carnegie Museum No. 2908. × 3/10.

of a lower jaw with P_4 and M_1 in place and a fragment of the maxillary with only the roots of the premolars present. The latter was found in horizon B, southeast of Kennedy's Hole, Uinta Basin, Utah. While the lower jaws, No. 2908, represent an animal larger than any pertaining to that genus heretofore found, and may probably belong to a new species, or possibly even a new genus, there are unfortunately no characters present indicating any marked advance over those found in the Bridger genus. As stated above, the incisors are lost,

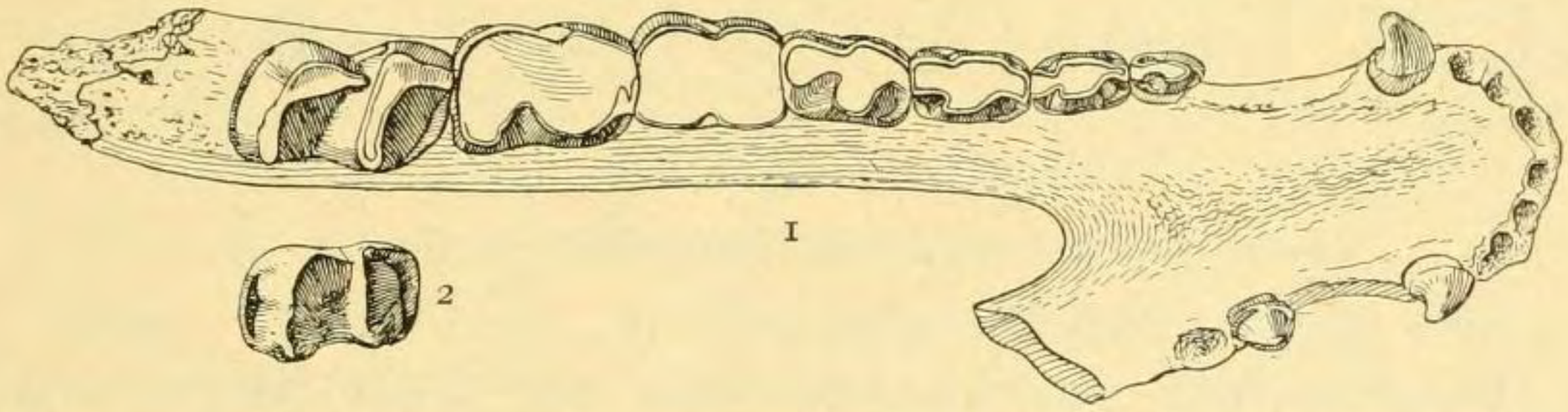


FIG. 19. 1. *Hyrachuys grande* sp. nov. Type. Carnegie Museum No. 2908. × 2/5. 2. *Hyrachyus princeps* Marsh. $M_{\overline{3}}$ of type specimen in Peabody Museum of Natural History. × 2/5.

but from their alveoli it is possible to quite definitely determine that they were all of subequal size, the two intermediates possibly somewhat larger than the laterals. The canine is possibly slightly reduced when compared with *Hyrachyus agrarius*, but this may well be a sexual character and not of specific importance. The premolars are all of the *Hyrachyus* pattern, with practically no indication of a further

step towards the development of a posterior cross-crest, such as is found in *Trigonias osborni* from the base of the Oligocene. Deciduous $P_{\overline{1}}$ is present in the right ramus (see Fig. 19). $M_{\overline{4}}$ and $M_{\overline{2}}$ are much worn, the crowns furnishing no detailed characters, while $M_{\overline{3}}$ practically agrees in all details with the same tooth of the known species of the genus, except in its larger size. The ramus appears to be proportionally slenderer than in *Hyrachyus agrarius*. *Hyrachyus princeps* Marsh, which also is a large form, is smaller than the specimen under description. If the specimen does not belong to the latter species [115] it may be called *Hyrachyus grande* sp. nov. simply to indicate its extraordinarily large size (See Figs. 18 and 19).

The specimen No. 3112 is slightly larger than *Hyrachyus agrarius* Leidy, and appears moreover to differ from the latter by a proportionally greater development of the metaconid and a slight basal elevation indicating the tetartoconid.

MEASUREMENTS.

	No. 2908.	No. 3112.
Length of ramus from anterior point of symphysis to and including $M_{\overline{3}}$		215 mm.
Depth of ramus at $P_{\overline{1}}$		40 "
" " " " $M_{\overline{3}}$		54 "
Antero-posterior diameter of cheek-teeth		161 "
" " " " $P_{\overline{4}}$	21 "	15 mm.
Transverse " " "	15 "	11 "
Antero-posterior " " $M_{\overline{1}}$	26 "	22 "
Transverse " " "	19 "	14 "

Subfamily AMYNODONTINÆ.

Genus **Amynodon** Marsh (Plate XLVII, Figs. 5–7).

Amer. Jour. Sci., Vol. XIV, 1877, pp. 251–252.

This genus is represented by a number of individuals. The material has a considerable range in size and undoubtedly represents two or probably three species. Unfortunately the fragmentary condition of the greater number of the specimens does not admit of an accurate identification. The smaller individuals are therefore provisionally[116]

[115] There is unfortunately no other basis of comparison between these two specimens besides $M_{\overline{3}}$. In *H. princeps* the cingulum of the anterior face is heavier and the anterior extension of the metalophid is somewhat less developed than in the Uinta specimen. These may or may not be valid characters.

[116] All the specimens referred to *A. advenum* are too small when compared with the measurements of the type specimen by Marsh. One specimen in our Collection, No. 3217, is especially small and may represent a new species.

placed in *Amynodon advenum* (Marsh)[117] while the larger are referred to *Amynodon intermedium* Osborn.[118] Of the smaller specimens those which have the upper and lower premolars preserved show three in either jaw, which according to Osborn's reidentification (*l. c.*, 1889, page 507) would, except in size, agree with *Amynodon advenum*. The best preserved specimen representing the larger species, is C. M. No. 3200, the greater portion of a skull of an adult, perfectly symmetrical. Unfortunately, however, the dentition is represented only by the roots of the posterior premolars, the roots of the molars, and a portion of the crown of $M^{\frac{3}{}}$ (Pl. XLVII, Fig. 5). This portion of $M^{\frac{3}{}}$ and the general large size of the teeth agree with *A. intermedium* and an outline drawing of the dentition of the type as figured by Osborn (*l. c.*, Pl. X, Fig. 10) is here added in connection with the palatal view, in order to better aid the student in comparative work (See Pl. XLVII, Fig. 6). A side view of the specimen in the Carnegie Museum is given in Fig. 7 on the same plate, in order to supplement the figures given by Osborn of the dentition and maxillary region, the only portions of the type specimen preserved. The description of the skull, which belongs to the articulated young skeleton exhibited in the American Museum of Natural History, referred to *A. intermedium* by Osborn[119] appears to agree quite well with the present cranium.

Subfamily HYRACODONTINÆ.

Genus PROTHYRACODON Scott and Osborn.

40. **Prothyracodon obliquidens** Scott & Osborn (Plate XLVI, Figs. 1–9).

Proc. Amer. Philos. Soc., Vol. XXIV, Sept. 2, 1887, p. 260.

Generic Characters: $I\frac{3}{3}$, $c\frac{1}{1}$, $P\frac{4-3}{4-3}$, $M\frac{3}{3}$. *Incisors subequal in size; upper canine followed by a short diastema, lower canine close to* $I\frac{}{3}$; *a general advance of the cheek dentition towards the Hyracodonts and Rhinoceroses of the Oligocene; that is, a decided development of the crista, crochet, and anticrochet together with the Rhinocerotic structure of* $M^{\frac{3}{}}$ (*Prothyracodon uintense, vide infra*). *Fore limb proportionally shorter than in Triplopus. Animals larger than Triplopus.*

It is a matter of surprise to find such differences in the proportionate

[117] *Amer. Jour. Sci.*, Vol. IX, 1875, p. 244.

[118] "The Mammalia of the Uinta Formation," *Trans. Amer. Philos. Soc.*, Vol. XVI, 1889, p. 508.

[119] *Bull. Amer. Mus. Nat. Hist.*, Vol. VII, 1895, p. 95.

length of the humerus and radius of Professor Cope's genus of the Washakie Eocene *Triplopus cubitalis* and the recently acquired material of *Prothyracodon* from the Uinta deposits. It is thus seen that the genus from the Uinta has the fore limb much more like that of the Oligocene genus *Hyracodon* than is the case with the genus from the Washakie. The type of the latter was, according to Professor Cope, "cut from a block of calcareous sandstone" and Dr. Matthew of the American Museum of Natural History assures the writer that there is no doubt as to the correct association of the parts of the type specimen upon which Cope founded the genus.[120] A restudy of the type of *Triplopus cubitalis*, compared with the material in the Carnegie Museum, results in definitely placing the form from the Uinta in a separate genus, *Prothyracodon*, as was originally done by Scott and Osborn. The generic rank of the form from the Uinta was called into question by Professor Osborn in a later publication.[121]

Prothyracodon obliquidens is represented in the Carnegie Museum by a number of individuals. These are all more or less fragmentary, but serve to throw further light on the limb-structure of this cursorial Rhinoceros from the Uinta Eocene. C. M. No. 2942 is represented by both fore limbs and is of approximately the same size as the type of *Prothyracodon obliquidens*. A second specimen, C. M. No. 3199, not fully adult, and slightly smaller, is represented by both fore and hind limbs. The former was found by the writer in the lower portion of horizon C, six miles East of Myton, Utah, while the latter was found by Mr. Earl Douglass in horizon C further east in the Uinta Basin. The scapula of No. 2942 is represented only by a fragment of the proximal end (See Pl. XLVI, Fig. 5). It agrees with the description and illustration by Professor Cope.[122] In a specimen, which probably pertains to another species, described on page 134, the scapula is fairly well-preserved. This bone is quite elongated, with a long neck. The spine, however, rises more rapidly than that in *Hyracodon* of the Oligocene and differs further from that genus by having apparently the acromion process situated lower down or nearer the glenoid cavity,[123] and by having a proportionally shorter and broader blade.

[120] Tertiary Vertebrata, p. 684, Pl. LVI*a*.

[121] "The Mammalia of the Uinta Formation," *Trans. Amer. Philos. Soc.*, Vol. XVI, 1889, p. 524.

[122] Tertiary Vertebrata, p. 684, Pl. LVI*a*.

[123] The spine in this region is broken, but what still remains is proportionally higher and differs otherwise from that in *Hyracodon* and is more suggestive of *Mesohippus*.

The humerus is laterally compressed proximally, which is in part due to crushing. The greater tuberosity rises considerably above the head. There is a large deltoid groove and the deltoid ridge is prominent, but does not have the large and rugose tuberosity seen in *Hyracodon*, and the supinator ridge is also less developed. The distal trochlea is relatively slightly narrower than in the latter genus, but resembles it closely in height, its very prominent and narrow intercondylar ridge, and narrow outer condyle (Pl. XLVI, Fig. 4).

The radius is only very slightly longer than the humerus, and in this respect is quite similar to the same bone in *Hyracodon*, though slenderer. Its head is not greatly expanded and the shaft is broad and rather compressed antero-posteriorly, with a considerable bow in the same direction, while distally it is expanded both laterally and antero-posteriorly, with deeply excavated facets for the scaphoid and the lunar. The shaft of the ulna is more reduced than in *Hyracodon* of the Oligocene, but, as in that genus, it is at no place coössified with the radius.

The carpus agrees with the description given by Osborn (*l. c.*, pp. 527, 547) except the trapezium, which according to Osborn is greatly reduced. This is probably a mistake, since the trapezium of one individual (No. 2336) of the Carnegie Museum is of considerable size, and the large facet on the radial palmar angle of the trapezoid of the specimen under description indicates a bone proportionally quite as large as in *Hyracodon*.

The metacarpals are all complete, and plainly show that they are much shorter proportionally than in *Mesohippus*, the genus with which Professor Osborn compared the pes of *Triplopus*. Mc. I is entirely absent, Mc. II and IV are reduced in size, but not quite as much as in *Hyracodon*, while their length in comparison with Mc. III is fully as much or even more reduced than in that genus. Mc. V is reduced to about the same extent as in *Hyracodon* (See Plate XLVI, Fig. 2).

The median phalanx of the proximal row is broad and depressed, while those of the lateral digits are higher. The ungual phalanges are also depressed, somewhat pointed and cleft, suggesting the features of the early horses to a remarkable degree.

With No. 3199, already referred to above, there is unfortunately only preserved a fragment of the pelvis, the femur, and the metatarsals, while the entire length of the tibia, except the epiphysis of the proximal end, and the greater portion of the tarsus is present.

The length of the tibia is very little, if any, greater than the radius. The bone is quite symmetrically formed with a prominent cnemial keel well confined to the proximal end, unlike what occurs in *Hyracodon*, in which it extends somewhat further down. The shaft has a slightly backward curve, while the distal trochlea is deeply excavated and is very oblique, in this respect closely suggesting the *Hyracotheres*.

The astragalus of No. 3199 has received slight lateral crushing, which makes it appear narrow in comparison with the specimen illustrated by Professor Osborn (*l. c.*, Pl. XI, Fig. 9). The pes as a whole is in reality slightly smaller than in the type, which is, no doubt, due to the incomplete maturity of the specimen at hand. The different bones of the tarsus agree quite well with the description of the material in Princeton University furnished us by Osborn (*l. c.*, p. 549), and needs no further description, except to say that the entocuneiform, though quite large, and with the plantar process somewhat like that of *Hyracodon* described and figured by Professor Scott,[124] has not formed an articulating facet with the plantar process of Mt. III, and the process itself has not attained the prominence seen on the entocuneiform of the Oligocene genus (See Plate XLVI, Figs. 7–8).

41. **Prothyracodon uintense** sp. nov. (Plate XXXVI, Fig. 1; Plate XLV; Plate XLVI, Figs. 10–16).

Type: Skull and lower jaws of young individual C. M. No. 3007*a*.[125]

Horizon: Uinta Eocene, horizon C.

Locality: Six miles east of Myton, Utah.

With the type specimen are provisionally associated three other specimens in the Carnegie Museum as probably pertaining to the same species. Of these No. 2990 consists of fragments of the lower jaws, limbs, and foot-bones; No. 3097, portion of vertebral column, scapulæ, and humerus, and No. 3399, fragments of vertebræ. Of these specimens No. 3007 was found together with the type, but is of an adult individual, the others were found in the same general locality and in the same horizon.

Specific Character: Protoloph of molars with a well-marked antecrochet. M^3 with smooth posterior face, no spur of the ectoloph at all indicated. Teeth proportionally large, when compared with P. obliquidens. Animals larger than P. obliquidens.

[124] "Osteology von *Hyracodon* Leidy," Festschrift für Carl Gegenbaur, Leipzig, 1887, p. 377, Pl. I, Fig. 7.

[125] The type specimen was found together with the remains of other individuals of different genera.

In the type, No. 3007*a*, there are three lower incisors, which are procumbent in position, of subequal size, with laterally expanded or fan-shaped crowns (Pl. XXXVI, Fig. 1). The canine is placed close to $I_{\frac{3}{3}}$ and is but very little larger than the incisors in the type, while in an adult specimen No. 2990[126] it is slightly larger in proportion. On the whole the tooth in this species is relatively larger than in the Oligocene genus *Hyracodon* and it is also more oval in cross-section. In the type there are four upper and lower milk-teeth, while in the adult specimen, No. 2990, $P_{\frac{1}{1}}$ is absent.[127] In the Uinta genus there is not developed the strong rib near the median portion of the ectoloph on the lower molars and premolars, nor is the heavy cingulum seen in *Hyracodon* present. There is in the type specimen a decided swelling on the posterior face of the protoloph, representing the antecrochet, and the prefossette is well indicated, but the crista is little or not at all represented, while in *Hyracodon* the crista is much better developed and the antecrochet is prominent. $M^{\frac{3}{3}}$ is just appearing through the alveolar border. This young tooth has the posterior face of the ectoloph perfectly smooth, there being no spur of the ectoloph represented as in *Triplopus cubitalis* or *Prothyracodon obliquidens*. This feature was thought to be due to the immaturity of this tooth in the Carnegie Museum specimen, but it is perhaps more probable that the present well calcified crown would not before its final eruption add the characteristic spur seen in *Hyracodon* of the Oligocene or in the contemporary species of the Uinta deposits. Too much stress, however, should not be laid upon this highly interesting Rhinocerotic feature of $M^{\frac{3}{3}}$ in the specimen at hand, until the discovery of fully adult upper dentitions. If this character is found in $M^{\frac{3}{3}}$ of fully adult specimens, *P. uintense* should be placed in a distinct genus.

The base of the skull appears to be proportionally broader than in *Hyracodon*, which may be due to crushing. Whether or not there is a tympanic bulla cannot be determined. Unfortunately the important region of the external ear is also too much mutilated to determine whether it is like that in *Hyracodon* or whether it is closed inferiorly as in *Triplopus cubitalis*. There is a long and well defined sagittal crest and the supra-orbital ridges are also indicated in this young individual.

[126] No. 2990 is provisionally referred to *P. uintense* on account of its large size, which is taken as an indication that it pertains to the same species.

[127] The first premolar above and below are very rudimentary, and their absence or presence in this genus is perhaps not of great phyletic importance.

The postglenoid process is unusually heavy. In a specimen, No. 3201, referred to *P. obliquidens* the post-tympanic and paroccipital processes are separated, as shown in Plate XLVI, Fig. 1, and answers quite well to Cope's description. Furthermore the actual specimens have been compared, and are found to be quite alike in this respect. There are a number of similarities in the contour of the present specimen and the young specimen on which Cope established his *Triplopus cubitalis*.

These similarities may be regarded as of comparatively little importance since both specimens pertain to young animals.

In comparing *Prothyracodon* with Doctor Koch's *Prohyracodon*[128] as described and illustrated in Doctor O. Abel's work[129] it is at once seen that $M^{\underline{1}}$ and $M^{\underline{2}}$ of *Prohyracodon*, though mutilated, show the proto- and metalophs to be at a more nearly right angle to the ectoloph, the proto- and metalophs are also of more nearly subequal size than in the American genus. Furthermore there is in *Prothyracodon* a better defined antecrochet, a proportionally longer $M^{\underline{2}}$, and $M^{\underline{3}}$ has a more nearly triangular outline, than in the specimen preserved at Budapest.

MEASUREMENTS.

Total length of skull from condyle to and including d. $P^{\underline{1}}$				165 mm.
Antero-posterior diameter of deciduous upper dentition				42 "
"	"	"	" $M^{\underline{1}}$ and $M^{\underline{2}}$	36 "
"	"	"	" "	18 "
Transverse	"	"	" $M^{\underline{1}}$	16 "
"	"	"	" $M^{\underline{2}}$	19 "
Antero-posterior	"	"	" "	22 "
"	"	"	" deciduous lower dentition	42 "
"	"	"	" permanent $M_{\overline{1}}$ and $M_{\overline{2}}$	32 "
"	"	"	" $M_{\overline{1}}$	15 "
Transverse	"	"	" "	10 "
"	"	"	" $M_{\overline{2}}$	10 "
Antero-posterior	"	"	" "	16 "

On comparing the atlas of No. 3007 with that of *Hyracodon*, the similarities are remarkably close. Thus it is seen, that, as in the latter genus, the bone is high[130] and rather short, with a backward

[128] Koch, A., Termeszetrazi Fuzetek, Budapest, XX, 1897, pp. 490–500, Pls. XII–XIII.

[129] *Abhandl. der K. K. Geolog. Reichsanstalt*, Bd. XX, 1910, pp. 24–25, Pl. II, Fig. 1.

[130] The atlas of *Prothyracodon* appears to be proportionally higher than in *Hyracodon*, which is to a certain extent due to crushing.

projecting transverse process, perforated by a canal of considerable size, which again appears on the under surface of the transverse process and forms a deep atlantal groove (not foramen), at the anterior base of the same process. The anterior cotyles are deep and broadly excavated above and below, as in *Hyracodon*, but the accessory facets for the base of the occipital condyle are less developed than in the latter genus. The above description also agrees with that of *Triplopus cubitalis* by Professor Cope.

The axis of No. 3399, a specimen approximately of the same size as No. 3007, is considerably longer than the atlas. The bone again agrees with the description of *Triplopus cubitalis* by Cope,[131] and of *Hyrachyus* by Scott.[132] Thus the bone is relatively longer and slenderer than in the Rhinoceroses and suggests the axis of the horses through its prominent spine and odontoid process, ventral keel, and the oblique and concave posterior face of the centrum.

The remaining cervicals, which are represented in specimen No. 3007, appear to gradually shorten from the axis backward, and agree generally, so far as comparison can be made, with those in contemporaneous Uinta species as well as *Hyracodon*.

MEASUREMENTS.

	No. 3007.	No. 3399.
Transverse diameter of anterior cotyle	39 mm.	
Vertical " " " "	22 "	
Greatest vertical diameter of atlas	33 "	
" length of axis, odontoid process not included		48 mm.
Length of odontoid process		14 "

Besides the specimens described above, there are in the Carnegie Museum a number of individuals from the same locality and horizon, which perhaps pertain to a third species intermediate in size between *Prothyracodon obliquidens* and *P. uintense*. It is thought best to defer adding more species until more complete specimens are obtained. Two species of *Prothyracodon* from the Uinta were originally proposed by Scott and Osborn, which Osborn united in 1889 (*l. c.*, p. 525).

I do not hesitate in expressing my agreement with earlier workers (Scott, Osborn, Wortman, Earl and others), in regard to the phylogeny of *Prothyracodon*. From the evidence at hand there is comparative certainty that some genus closely allied to *Hyrachyus* should

[131] Tertiary Vertebrata, p. 683.

[132] "Die Osteologie von Hyracodon Leidy," *Festschrift für Carl Gegenbaur*, p. 363.

be regarded as the Bridger representative of this line of cursorial Rhinoceroses.[133] The Washakie genus *Triplopus* and the Uinta form *Prothyracodon uintense*[134] obviously represent independent lines, which may or may not be represented in the Oligocene,[135] while *P. obliquidens* is in all the obtainable characters so very closely related to the Oligocene genus *Hyracodon* that one cannot deny the phylogenetic relationship here displayed. It is very unfortunate that we have not in the recently acquired collection from the Uinta a skull sufficiently complete in the region of the tympanum and the external ear to verify Professor Cope's studies of *Triplopus cubitalis*. Considering all the known characters of *Prothyracodon* which are so very suggestive of *Hyracodon*, I believe that the Uinta form did not have the meatus closed inferiorly as in *Triplopus cubitalis*. This would substantiate Cope's position in placing *Triplopus* in a separate systematic position. Together with this equine feature of the external ear in *Triplopus* we now know that the limbs were also proportionally longer than in the Uinta genus. The genus apparently does, in fact, represent a subfamily (*Triplopodinæ*) of the *Hyracodontidæ* which holds an equal rank to the *Prothyracodon-Hyracodon* phylum.

Together with the highly Rhinocerotic feature of $M^{\frac{3}{3}}$ in *Prothyracodon uintense* the first upper and lower premolars are altogether too much reduced in size[136] to be seriously regarded as a forerunner of the rhinoceroses of the Oligocene. Furthermore the lower canine and incisor series are typically those of *Hyracodon*, plainly excluding this species from the true rhinoceroses of the later Tertiary. In my opinion it is altogether possible, that, if this line continued in later epochs, we may find a Hyracodon-like form in the Oligocene with $M^{\frac{3}{3}}$ reduced to the characteristic features of the *Rhinocerotidæ* so strongly suggested in the Uinta genus.

[133] The actual type of *Hyrachyus implicatus* Cope I have not seen, but from the splendid illustrations (Tertiary Vertebrata, Pl. LVIII, Figs. 6, 6*a*, 7) by Professor Cope, it appears to be in this line. Its dentition seems to be advanced in the direction of the Hyracodonts.

[134] With the exception of $M^{\frac{3}{3}}$, *Prothyracodon uintense* bears a closer relation to *Hyracodon nebrascencis* than does *Triplopus cubitalis*.

[135] The different forms of *Hyracodon* of the lower and upper Oligocene are as yet comparatively little known.

[136] Both the upper and lower first premolars may well be absent in fully adult specimens of *P. uintense* as they are, in fact, seen to be in individuals in the Carnegie Museum.

PLATE XXXVI.

FIG. 1. *Prothyracodon uintense*, type. Alveolar border of lower jaw and crowns of dentition.

FIG. 2. *Eomoropus annectens*, type. Palate and crown view of upper teeth.

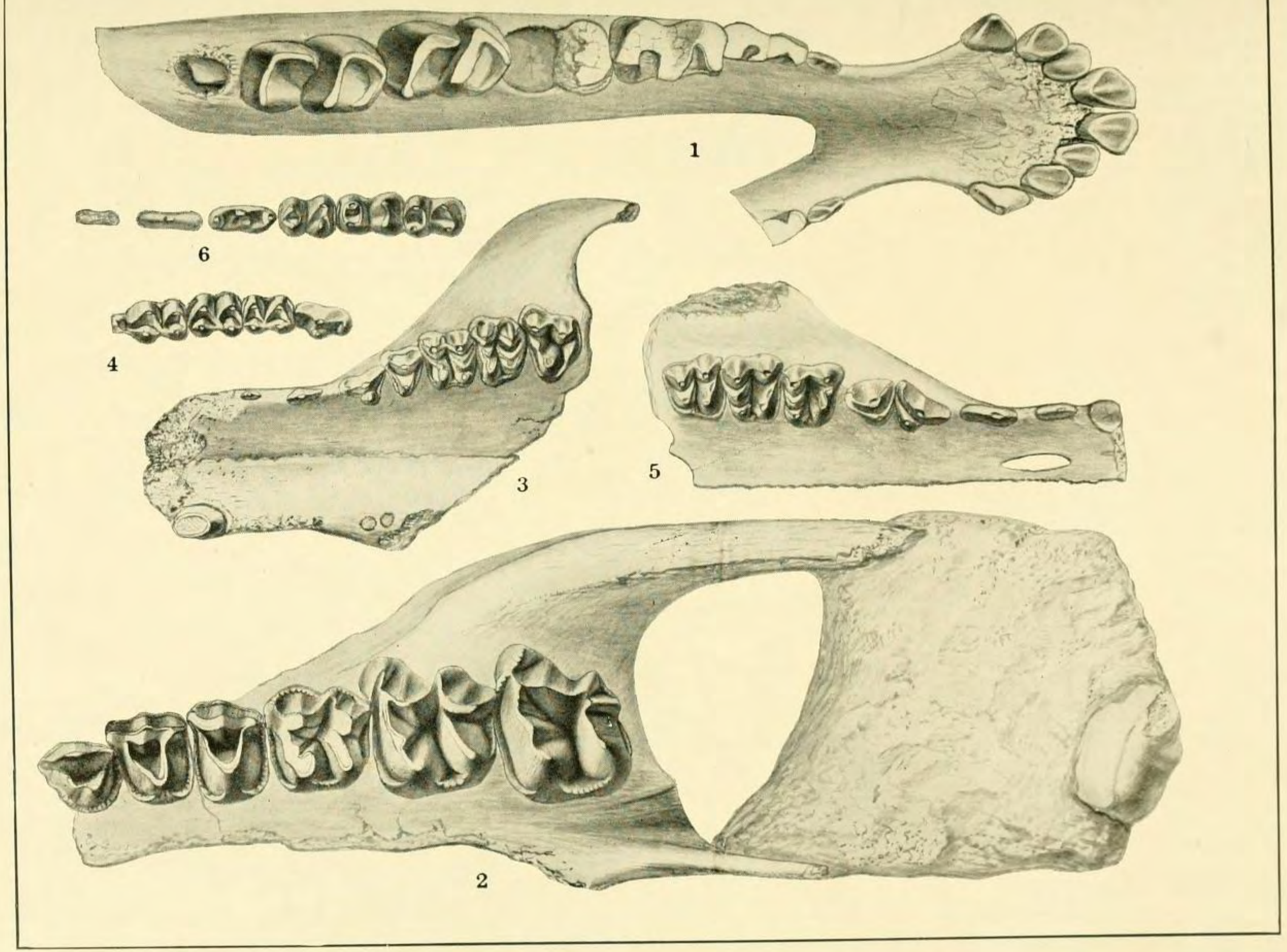
FIG. 3. *Bunomeryx montanus*. Palate and crown view of upper teeth.

FIG. 4. *Bunomeryx montanus*. Crowns of lower teeth.

FIG. 5. *Hylomeryx annectens*, type. Palate and crown view of upper teeth.

FIG. 6. *Hylomeryx annectens*, type. Crowns of lower teeth.

Figs. 1 and 2 natural size. Figs. 3, 4, 5, and 6 are slightly more than one and a third of nature.



Ungulates from the Uinta.
(For explanation see opposite page.)

PLATE XLIV.

FIG. 1. *Isectolophus annectens.* Crowns of upper dentition. C. M. No. 3030.

FIG. 2. *Parisectolophus latidens*, type. Alveolar border of lower jaw and crowns of inferior dentition.

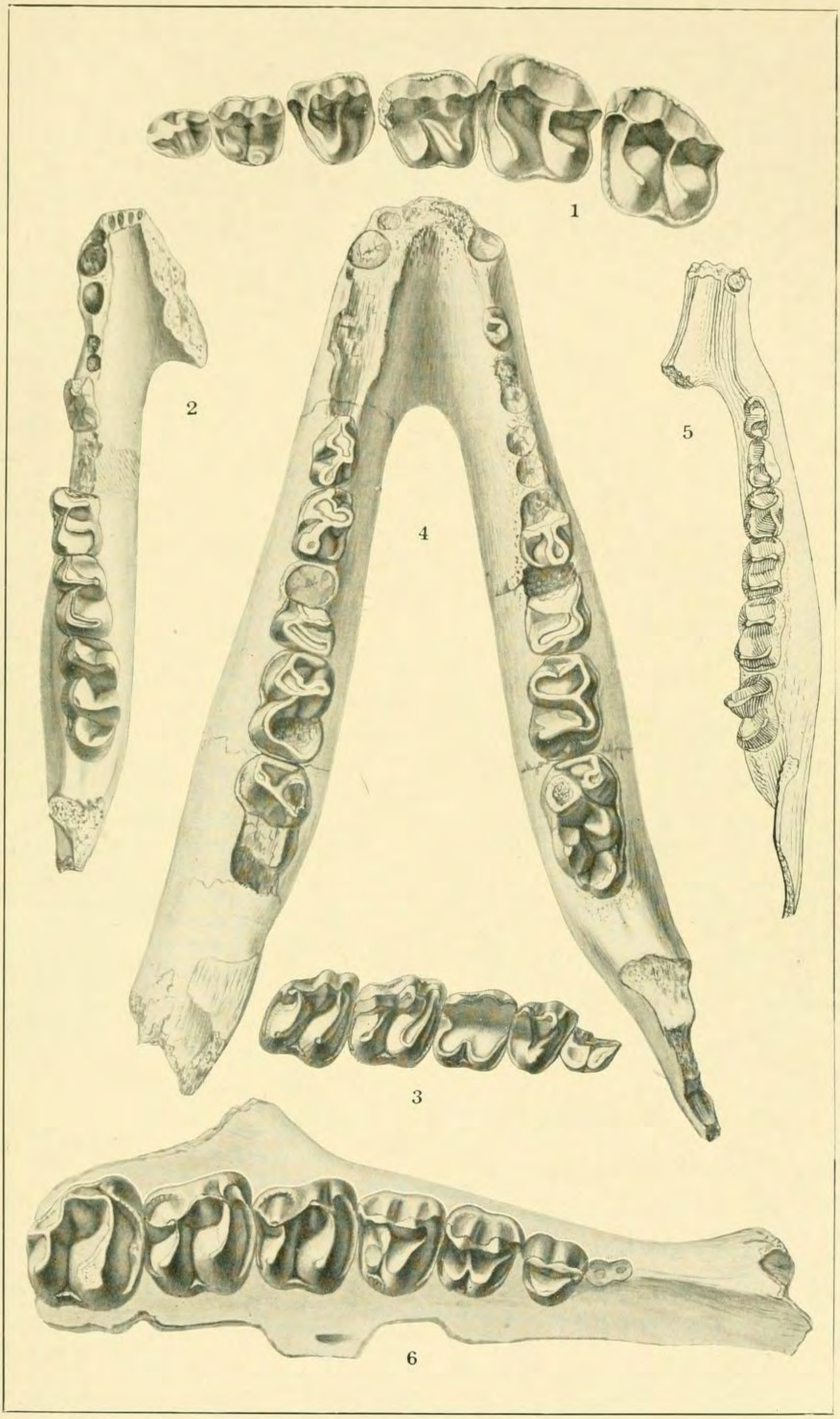
FIG. 3. *Parisectolophus latidens*, type. Crown view of upper dentition.

FIG. 4. *Schizolophodon cuspidens*, type. Lower jaws.

FIG. 5. *Dilophodon minusculus*, type. Alveolar border of lower jaw and crown view of dentition.

FIG. 6. *Desmatotherium guyotii*, type. Palate and crowns of upper dentition.

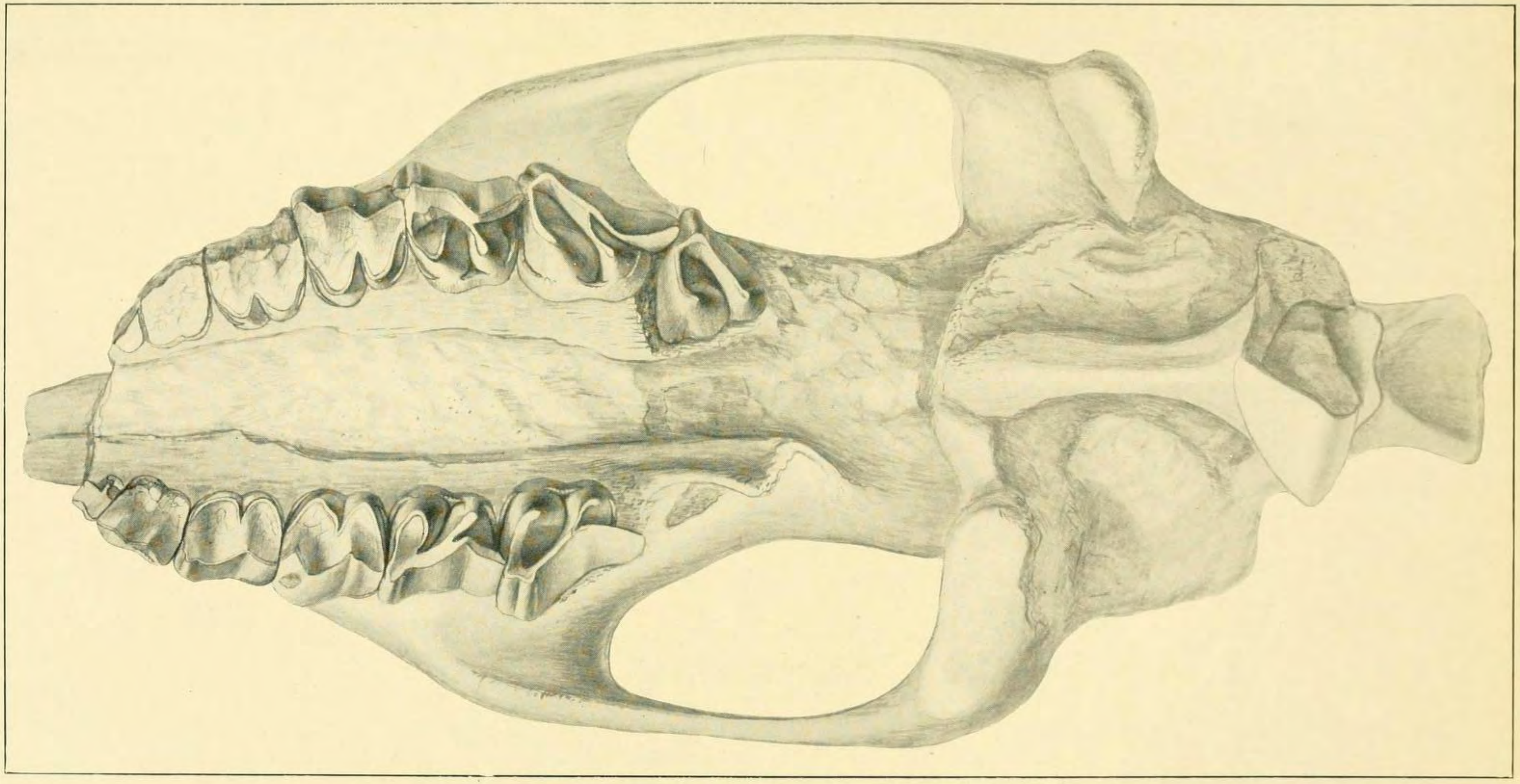
All figures natural size except Figs. 2 and 3 which are × 8/9 of nature.



Perissodactyls from the Uinta.
(For explanation see opposite page.)

PLATE XLV.

Prothyracodon uintense, type. Palatal view, natural size.



Prothyracodon uintense Peterson (type.)

PLATE XLVI.

FIG. 1. *Prothyracodon obliquidens.* Skull and lower jaws, from the side. C. M. No. 3201.

FIG. 2. *Prothyracodon obliquidens.* Manus, dorsal face. C. M. No. 2942.

FIG. 3. *Prothyracodon obliquidens.* Pisiform, dorsal face. C. M. No. 2942.

FIG. 4. *Prothyracodon obliquidens.* Humerus, anterior face. C. M. No. 2942.

FIG. 5. *Prothyracodon obliquidens.* Scapula, proximal end. C. M. No. 2942.

FIG. 6. *Prothyracodon obliquidens.* Metatarsals III & IV, dorsal face. C. M. No. 3199.

FIG. 7. *Prothyracodon obliquidens.* Pes, tibial face. C. M. No. 3199.

FIG. 8. *Prothyracodon obliquidens.* Pes, dorsal face. C. M. No. 3199.

FIG. 9. *Prothyracodon obliquidens.* Radius and ulna, anterior face. C. M. No. 2942.

FIG. 10. *Prothyracodon uintense,* paratype. Radius and ulna, ulnar face. C. M. No. 2990.

FIG. 11. *Prothyracodon uintense.* Tibia, anterior face. C. M. No. 2990.

FIG. 12. *Prothyracodon uintense.* Mc. IV,, dorsal face. C. M. No. 2990.

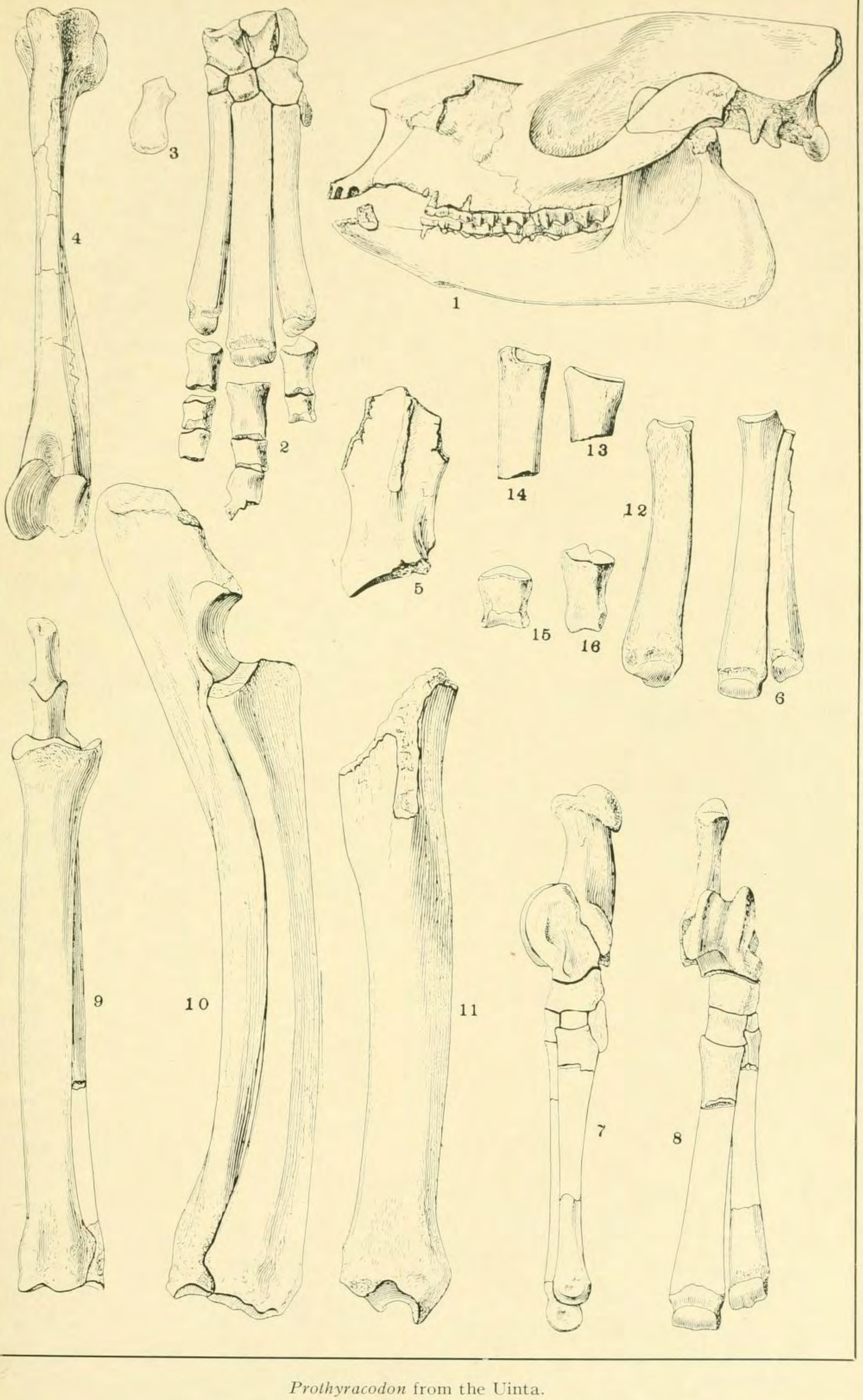
FIG. 13. *Prothyracodon uintense.* Mt. III, dorsal face. C. M. No. 2990.

FIG. 14. *Prothyracodon uintense.* Mt. IV, dorsal face. C. M. No. 2990.

FIG. 15. *Prothyracodon uintense.* Median phalanx, dorsal face. C. M. No. 2990.

FIG. 16. *Prothyracodon uintense.* Proximal phalanx, dorsal face. C. M. No. 2990.

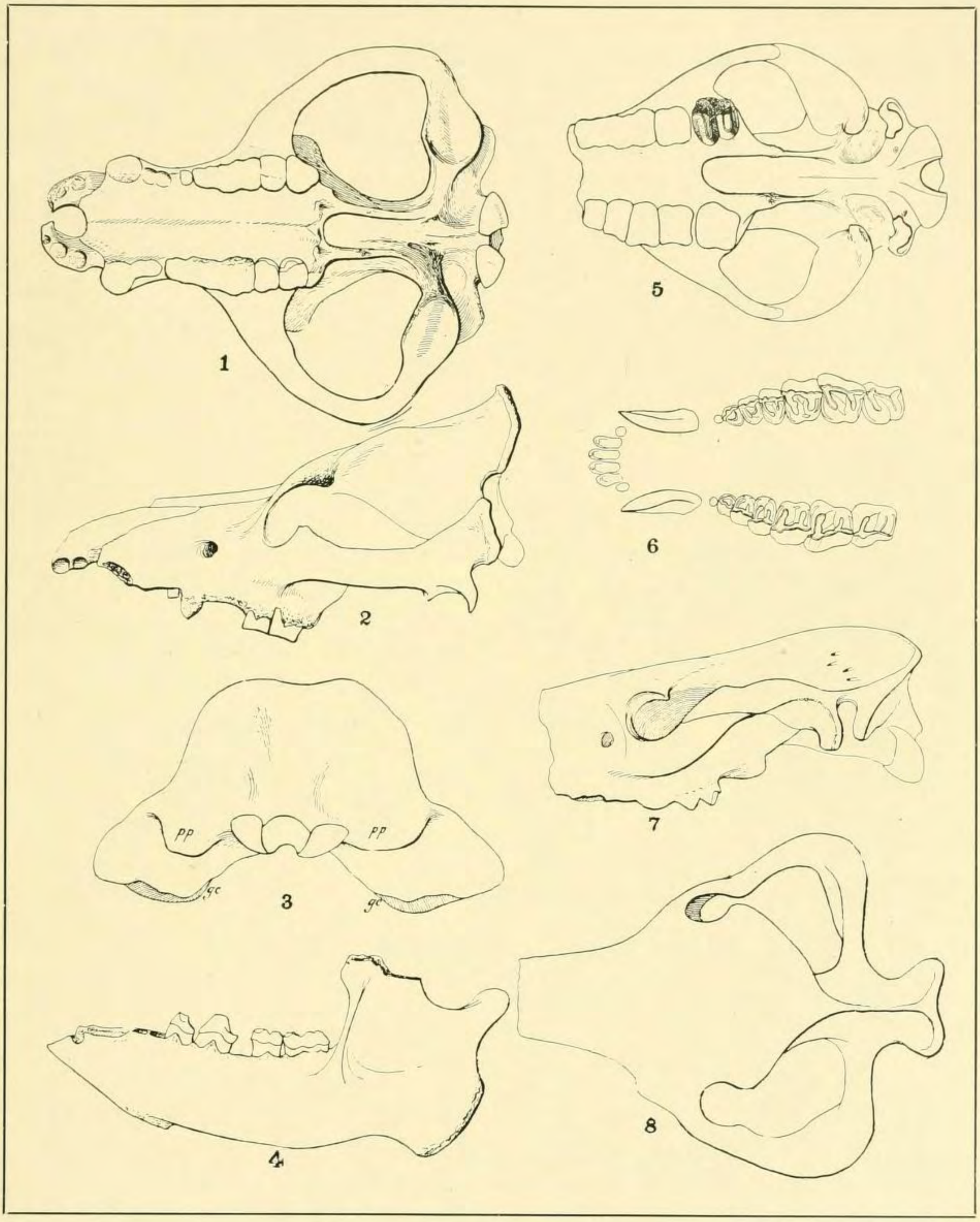
All figures one-half natural size except Fig. 1, which is one-third of nature.



Prothyracodon from the Uinta.
(For explanation see opposite page.)

PLATE XLVII.

FIG. 1. *Achænodon uintense.* Skull, palatal view.
FIG. 2. *Achænodon uintense.* Skull from the side.
FIG. 3. *Achænodon uintense.* Skull from the back.
FIG. 4. *Achænodon uintense.* Lower jaws, outer face.
FIG. 5. *Amynodon intermedium.* Skull, palatal view. C. M. No. 3200.
FIG. 6. *Amynodon intermedium*, type. Crowns of upper dentition.
FIG. 7. *Amynodon intermedium.* Skull, from the side. Same as Fig. 5.
FIG. 8. *Achænodon robustus*, type. Skull, top view.
All figures one-sixth natural size. Fig. 6 is redrawn from Professor Osborn's paper, *Trans. Amer. Philos. Soc.*, XVI, 1889, Part II, Pl. X, Fig. 10.



Artiodactyls from the Uinta.
(For explanation see opposite page.)