

**Article IX.—REMOUNTED SKELETON OF PHENACODUS PRIMÆVUS. COMPARISON WITH EUPROTOGONIA.**

By HENRY FAIRFIELD OSBORN.

PLATE XII AND FOUR TEXT FIGURES.

This unique skeleton was transferred to the American Museum with the remainder of the Cope Collection in 1893. It had been mounted<sup>1</sup> as found (Fig. 1), laterally crushed, a large portion of the vertebræ and ribs concealed so that their number could not

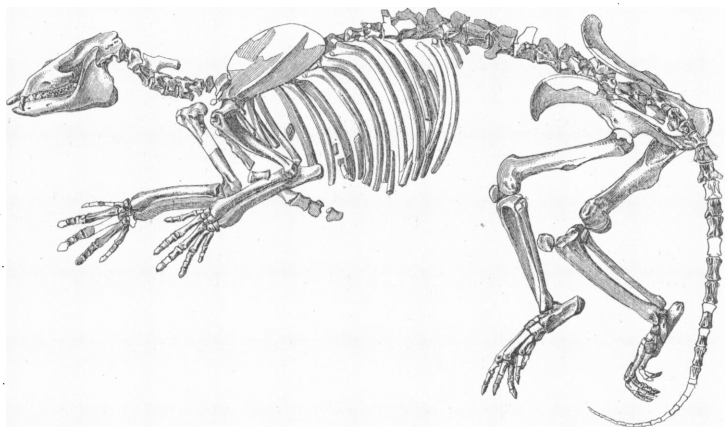


Fig. 1. Skeleton of *Phenacodus primævus* as originally mounted and cast under the direction of Professor Cope.

be definitely ascertained, and in such position as to convey a false impression both of the proportions and mode of location of this remarkably primitive Ungulate.

After very careful deliberation we decided to remove the skeleton entirely from the matrix, and remount it as nearly as possible in the natural position. This removal cost many months of labor

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<sup>1</sup> See Cope, 'Tertiary Vertebrata,' Plate LVII E.

and two months more were occupied by Mr. Hermann, Preparator, in mounting the animal as represented in Plate XII. This mount is now a model of its kind, since it not only displays the real characters of the animal, but every bone upon one side of the body or the other can be removed for purposes of detailed study. Moreover, in course of removal of the stone and plaster matrix, the two missing cervical vertebræ were found inserted in the tail, and the number of ribs was definitely ascertained to be fifteen on each side, thus positively determining the dorsal vertebral formula, a matter of very great importance. These results alone justify the labor involved.

As photographed in Plate XII, *Phenacodus primævus* strikes us as a rather slenderly built, straight-limbed animal, digitigrade like the Tapir, five-toed, but almost exclusively supported on three toes both upon the fore and hind feet, with the median toe considerably enlarged, well hoofed, and extended beyond the others; therefore functionally of the tridactyl type. Flower's restoration, in his volume upon the Horse, is very nearly correct. The upwardly-arched back, powerful lumbar vertebræ, the long hind-quarters (measuring 635 mm.), the long powerful tail, when contrasted with the much shorter fore-quarters (measuring 460 mm.), the rather low withers and small head, are reminiscent of Creodont ancestry.

*Phenacodus* was, in fact, a swift-footed, cursorial, small-brained, microcephalic type (in distinction from *Coryphodon*). It was largely propelled by its powerful hind limbs. The skeleton is, however, straight limbed at the elbow in contrast with the early Amblypods, such as *Pantolambda* and *Coryphodon*.<sup>1</sup> In this respect it approaches that of the Perissodactyla. The terminal phalanges of the three median toes are broad and spreading, while the lateral phalanges have rather the narrow compressed type seen in *Euprotogonia*.

The most striking features of the skull are the small size and separation of the basicranial foramina, the simple primitive structure of the whole region around the ear at the base of the skull (the auditory meatus being bounded posteriorly by the mastoid),

<sup>1</sup> See Osborn, 'A Complete Skeleton of *Coryphodon*,' Bull. Am. Mus. Nat. Hist., Vol. X, April 5, 1898, pp. 81-91.

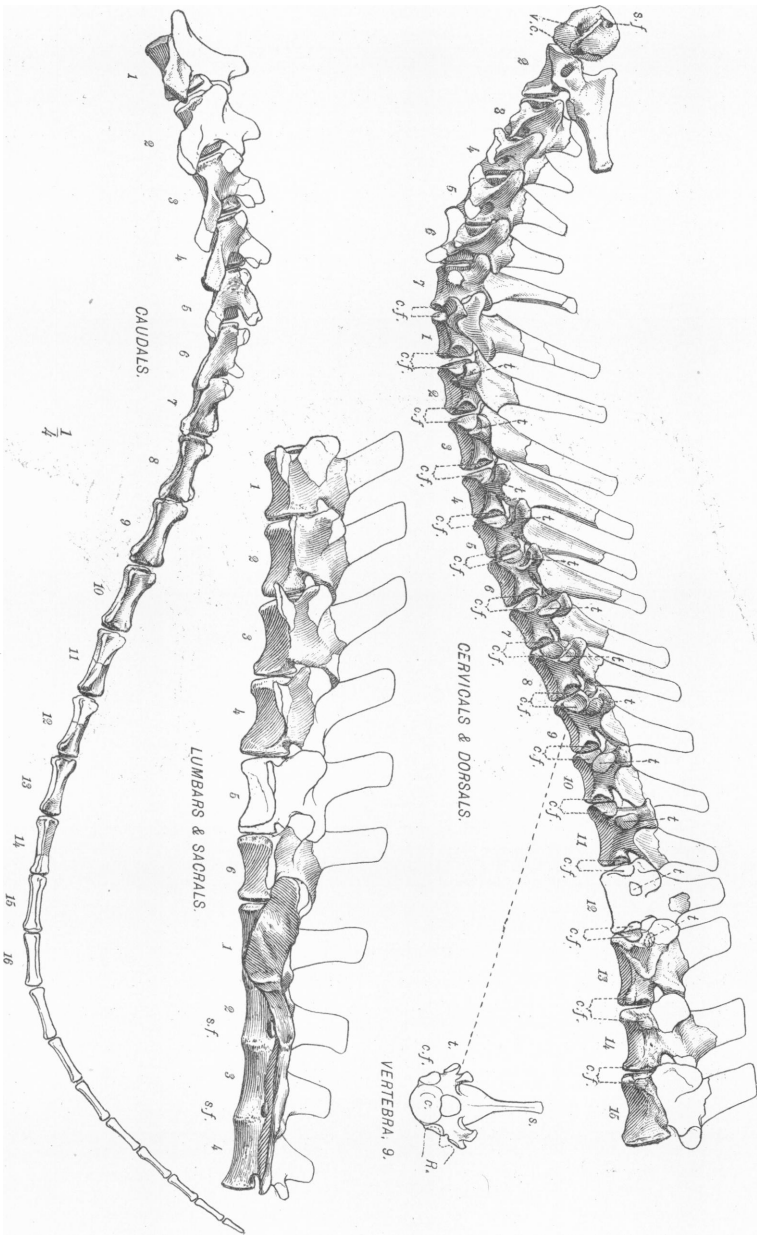


Fig. 2. Vertebral Column of *Phenacodus primævus*. s.f., spinous foramen; v.c., vertebrarterial canal; c.f., capitular facets; t, tubercular facets. Spines, fifth lumbar vertebra and posterior caudal vertebrae restored. One-fourth natural size.

and the longitudinal grooves upon the superior intranareal surfaces of the maxillaries (also observed in *Coryphodon*). The proportions and characters of the skull (exclusive of the teeth) are identical with those in the ancient Amblypoda, such as *Peripitychus* and *Pantolambda*.

The distinctive feature of the vertebral column is the small number of dorsal vertebræ, namely 15, exactly as in *Coryphodon* and *Titanotherium*, giving a dorso-lumbar formula of 20-21. In

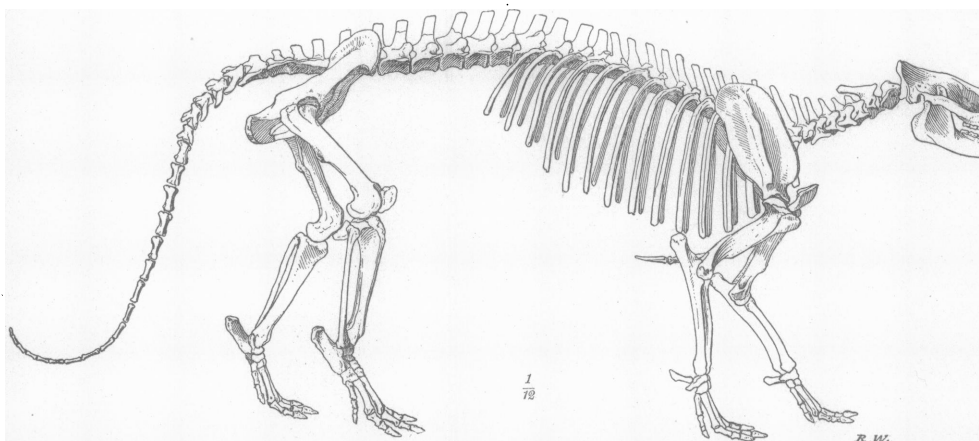


Fig. 3. Skeleton of *Phenacodus primævus* placed in the standing position to show elevation of the withers. One-twelfth natural size.

the writer's opinion this number is characteristic of the primitive Condylarthra or Protungulata. Marsh,<sup>1</sup> on the other hand, has assigned to the Holodactyla (Condylarthra) 23 dorso-lumbars, and to the Protungulata 30 dorso-lumbars or more. The second distinctive feature is found in the splitting of the transverse processes on the posterior dorsals for articulation with the tubercles of the ribs and for the support of the zygapophyses respectively, as shown in Fig. 2, these processes being sharply separate.

<sup>1</sup> 'Dinocerata,' pp. 171, 172.

TABLE OF MEASUREMENTS.

	<i>Phenacodus.</i>		<i>Euprotogonia.</i>	
	Feet.	In.	Metres.	Metres.
Length, chin to perpendicular line of tail....	4	4¾	1.340	
Length, chin to ischiac symphysis .....			1.220	.590
Length skull, condyles to symphysis of pre-maxillæ .....			.235	
Height, dorsal spines at withers.....			.550	.270
Height, dorsal spines at hips.....			.585	
Limbs, total length of hind-limb, outside measurement.....	2	1	.635	.310
Limbs, total length of fore-limb, outside measurement.....	1	6	.460	

*Euprotogonia puercensis* thus appears to be about one-half the size of *Phenacodus primævus* in all its measurements. As shown in Fig. 4, the lateral digits are considerably longer, reaching the ground.

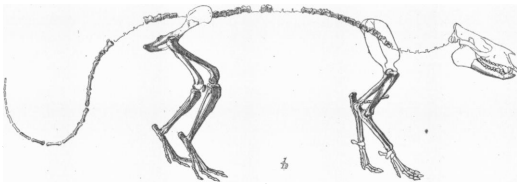


Fig. 4. Skeleton of *Euprotogonia puercensis* as now mounted, with missing parts restored in outline from *Phenacodus*. One-twelfth natural size. Same scale as *P. primævus*.

COMPARISON WITH EUPROTOGONIA.

<i>Euprotogonia.</i> [TORREJON.]	<i>Phenacodus.</i> [WASATCH.]
(1) Caudals 18 preserved, neural arches complete in C 1-8. D. L. formula unknown.	Caudal formula indeterminate. Neural arches complete anteriorly. D. L. = 20-21.
(2) Fore-limb. Posterior face of ulna convex. (C.)	The same, concave.
(3) Ectepicondylar ridge prominent. (C.)	The same.
(4) Magnum very small. (C.)	Magnum somewhat enlarged.
(5) ? Os centrale. (C.)	The same wanting.
(6) Trapezoid very short. (C.)	The same somewhat enlarged.
(7) Terminal phalanges laterally compressed, intermediate between hoofs and claws.	Hoofs fully formed in <i>P. primævus</i> . More compressed in <i>P. (Trispondylus) wortmani</i> .
(8) Hind-limb. Femur with sharp and prominent patellar trochlea.	The same.

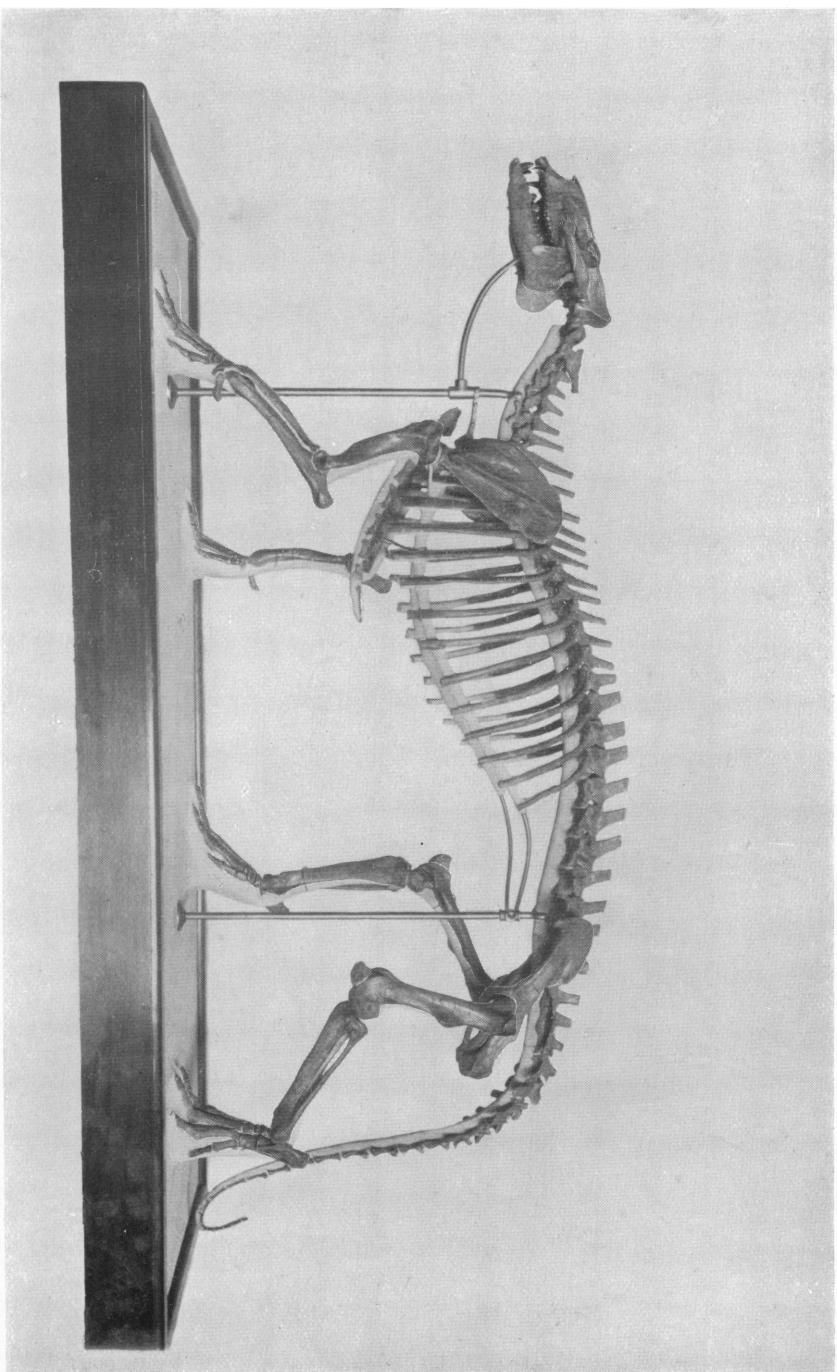
COMPARISON WITH EUPROTOGONIA.—*Continued.*

<i>Euprotogonia.</i>	<i>Phenacodus.</i>
[TORREJON.]	[WASATCH.]
(9) Tibial spines sharp and prominent ; cnemial crest very prominent and elongate. (C.)	The same. Cnemial crest less prominent, and shorter.
(10) No fibulo-calcaneal facet.	The same.
(11) Astragalo-cuboidal facet depressed.	The same.
(12) An astragalar foramen ; tibial trochlea in front of foramen, <i>i.e.</i> , sub- digitigrade. (C.)	No astragalar foramen. Tibial trochlea extended further back, <i>i.e.</i> , fully digitigrade.
(13) Meso-cuneiform very short. (C.)	The same.
(14) Lateral digital reduction advanced : ratio of Mts.V : Mts.III : 23 mm. 37 mm., or as 2 : 3.	Lateral digital reduction still more advanced : ratio of Mts.V : Mts. III : 35 mm. : 73 mm., or as 1 : 2,
(15) Metatarsals and phalanges slightly curved. (C.)	The same nearly straight.

This strengthens the observation of Matthew,<sup>1</sup> in his recent comparison of these types, that the features in which *Phenacodus* differs from *Euprotogonia* are progressions from the Creodont type, as indicated in the above column by the letter C.

A far larger proportion of Creodont characters are, however, found in the Amblypod contemporary of *Euprotogonia*, namely, *Pantolambda*, which will be fully described by the writer in a forthcoming paper.

<sup>1</sup> 'Revision of the Puerco Fauna,' Bull. Am. Mus. Nat. Hist., Vol. IX, 1897, pp. 305-308.



MOUNTED SKELETON OF *Platanocodus primævus*.

One-twelfth natural size.

