

ART. IX.—*The Camels of the Harrison Beds, with Three New Species*; by F. B. LOOMIS.

DURING the deposition of the Upper and Lower Harrison beds of Lower Miocene age there was probably no more abundant or varied group of vertebrates in that region than the camels. Already six species belonging to two genera have been described, and in this paper three more will be added to the number; but even then the collectors in that region, judging from the varied toe bones, etc., are confident that there are yet several species to be added. The deposits are typically those of an upland country, those of the Lower Harrison being fluvial, and those of the Upper Harrison, in a considerable proportion at least, eolian. The fauna points in the same direction, being entirely composed of plains types and river-frequenting animals, like the rhinoceroses, *Diceratherium* and *Aceratherium*.

In 1908 both Yale University and Amherst College had parties working together along Muddy Creek and in the "breaks" to the south of the Raw Hide Buttes in Converse Co., Wyo.; and it is the camel material of these two expeditions which is the basis of this paper, the authorities of the Yale Museum having generously loaned all of theirs for this purpose.

In the Lower Harrison beds the camels which are most abundant belong to the genus *Stenomylus*, forms characterized by their very hypsodont dentition and slender build. Of these there are three species as differentiated further on. Then one species of *Oxydactylus* has been described by Mr. Cook from these beds, making four known species. It is in these horizons that there are doubtless several more species. In the Upper Harrison beds two species of *Oxydactylus* have been described by Peterson, the genus being characterized by a brachyodont complete dentition and elongated limbs. To these will be added two more species of *Oxydactylus* and one of *Protomeryx*, which differs from the foregoing by not having the excessive development of limbs and still retaining the brachyodont dentition. In both divisions of the Harrison it will be seen that the camels are specialized and further that they are of the open country or plains types. The more generalized genus *Protomeryx* is strikingly scarce, being only represented by the one species, which in its turn is the slenderest representative of the genus.

The genus *Oxydactylus* is the dominant one, containing five different species, the representatives of which are also among

the most frequently found. It is characterized by i. 3/3 c. 1/1 pm. 4/4 m. 3/3 brachyodont teeth, the upper incisors being but little reduced, the third incisor being caniniform and often of considerable size, occasionally larger than the canine. The first premolar in both upper and lower jaw is double-rooted. Limbs are long and metacarpals free, metatarsals also separate except at the palmar process. The skull is usually small and specific variations are perhaps best seen in the relative development of the snout as shown by the spacing either side of the canine and first premolar. The relative size of the canine and third incisor are also characteristic. *O. longipes* is the largest of the known species and most fully described so that it can conveniently be used as a standard for comparisons.

Oxydactylus longipes Peterson

Ann. Carnegie Museum, vol. ii, pp. 435-468, 1904.

This largest species of the genus is also comparatively abundant in the Upper Harrison beds; and is characterized by a moderately short snout, and by the third incisor being equal to or slightly larger than the canine.

Oxydactylus brachyodontus Peterson

Ann. Carnegie Museum, vol. ii, pp. 469-471, 1904.

This species is the most abundant of the Upper Harrison camels, is slightly smaller than *O. longipes*, and has a much more elongated and narrower snout, the third incisor being smaller than the canine.

Oxydactylus lulli sp. nov.

The type of this species is number 10327 of the Yale Museum, found by Prof. R. S. Lull in the "breaks," about five miles south of the Raw Hide Buttes, Converse Co., Wyo. The type consists of a skull complete as to the jaws and dentition, but lacking the major part of the brain case and being considerably crushed laterally, and also of incomplete limb and foot bones. Beside the type there are three other specimens, all from the Upper Harrison beds, but none showing the brain case. This species is nearest to *O. brachyodontus* but is smaller and of very different proportions. The facial portion of the skull is as long as that of *O. brachyodontus* but much lower throughout. The back part of the skull, especially in the region of the premolar and molar series of teeth, is considerably shorter than the foregoing. The third upper incisor is much smaller than the canine, though caniniform in shape. In the upper jaw the diastema between incisor 3 and the canine is only 12^{mm}, which makes the canine seem very far forward. Similarly in the lower jaw the first premolar is placed

well forward, being but 15^{mm} from the canine. This first premolar is unusually stocky and two-rooted. Premolars 2-4 in the lower jaw are entirely simple and do not resemble the molars.

FIG. 1.

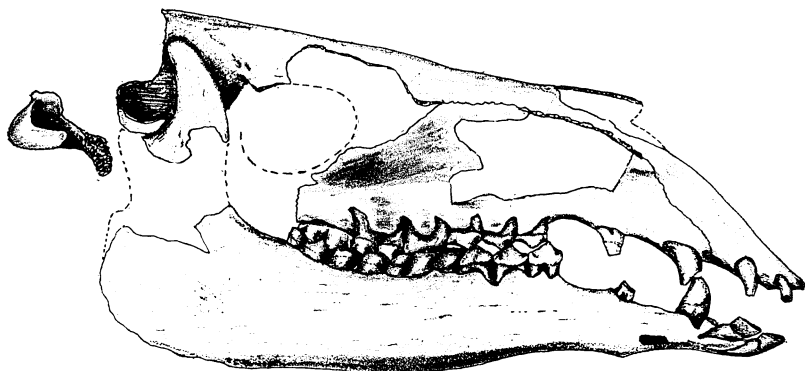


FIG. 1. Type of *Oxydactylus tulli*. Dotted outlines are put in from a second specimen. Nat. size.

Oxydactylus gibbi sp. nov.

The type of this species is number 10328 in the Yale Museum, found by Mr. Hugh Gibb on Muddy Creek, about opposite the spring associated with the "Spanish diggings." The type consists of the palate and lower jaws with complete dentition, except that the third molar is lacking in each jaw. In the measurements given it is estimated as being of the same

FIG. 2.

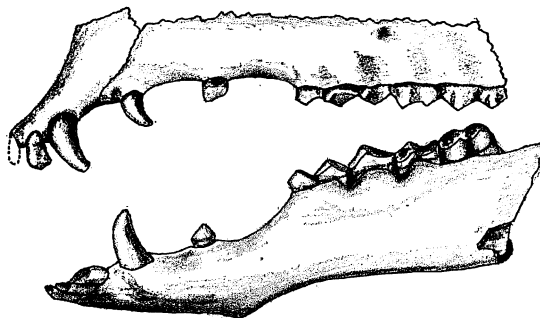


FIG. 2. Upper and lower jaws used as type of *Oxydactylus gibbi*. Half nat. size.

proportions as that of the other members of the genus. Beside the type there are two other specimens from the same general

region, all from the Upper Harrison beds. One of the two accompanying specimens consists of the major portion of the skull and some limb bones, but the individual is so young as to still be using the milk dentition although molars 1 and 2 are up in the jaw.

This species is smaller than the preceding one, in fact is the smallest *Oxydactylus* yet described. Its snout is moderately long and the species is easily distinguished by the great size of upper incisor 3, which is nearly twice the size of the reduced canine. The first premolar is also a large, strong tooth, and less reduced than in other species. The lower jaw is stocky, the canine being much enlarged. The first premolar stands considerably nearer to the canine than to the second premolar. The skull of the young individual shows wide projecting arches over the orbits and a rather wide but short brain case. The limb material is only complete enough to show that the form had long limbs typical of the genus.

Oxydactylus campestris H. J. Cook

Amer. Naturalist, xliii, p. 188, 1909.

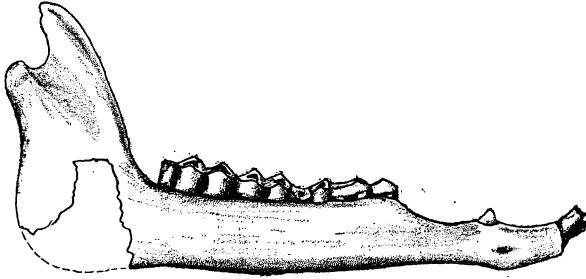
This species occurs in the Lower Harrison beds, is intermediate in size between *O. brachyodontus* and *O. lulli*, and clearly distinguished by the very short snout, and by the large size of upper incisor 3, which is larger than the canine. The short snout would indicate a less advanced type than those in the Upper Harrison beds.

Protomeryx leonardi sp. nov.

The type of this species is number 2004 in the Amherst College Museum, and was found in the Upper Harrison beds on Muddy Creek, about three miles below the "Spanish Diggings" spring, by Mr. E. N. Leonard. Part of the skull of a very young individual was also found in the same beds some five miles further up the Muddy Creek and is 10326 of the Yale Museum. Heretofore this genus has not been reported from the Harrison beds. This species is characterized by the slender proportions of the lower jaw, which is all that was found of the adult animal. The full set of teeth is present in the lower jaw, the teeth being rather high crowned, but not enough so to be designated hypsodont. In the lower jaw there is a short diastema behind the third incisor (as shown by the young jaw). The canine is a slender, compressed tooth which rises to an unusual height and projects somewhat forward. The first premolar is reduced, being but $4\frac{1}{2}$ mm wide, the diastema between it and the canine being 15 mm, while the interval behind it, i. e. between premolar 1 and premolar 2, is very

considerable, 17^{mm}. The premolar series is simple, there being no crescent on any of the teeth, and premolars 2-4 measuring 23^{mm}. The three molars are those typical of the genus, but rather high crowned, and together extending 45^{mm}. The jaw is very slender and with a short coronoid process. It measures but 12½^{mm} in depth under the first premolar, and 17^{mm} under the second molar.

FIG. 3.

FIG. 3. Lower jaw used as type of *Protomeryx leonardi*. Nat. size.

The following table is arranged to show the relative size of the different species of *Oxydactylus*, and especially to show the variations in the proportions of the snout and in the positions of the canine and first premolar teeth:

		Length of skull	Diastema i ³ - c	Diastema c - p ¹	Diastema p ¹ - p ²	Length p ² - m ³	Diastema c - p ¹	Diastema p ¹ - p ²	Length p ² - m ³
<i>O. longipes</i>	U. Harrison	340	13	14	18	102	17	17	104
<i>O. brachyodontus</i>	U. Harrison	---	14*	18*	19*	93	17*	22*	100
<i>O. lulli</i>	U. Harrison	275	12	19	19	85	15	20	91
<i>O. gibbi</i>	U. Harrison	---	10	16	18	72†	12	24	77†
<i>O. campestris</i> ...	L. Harrison	290	--	--	--	70	--	--	--

The genus *Stenomylus* contains the other Harrison camels and is distinguished by having a complete dentition of very hypsodont teeth, by the upper canines being partly and the lower wholly incisiform, and by the slender build. Three

* These measurements are taken from the figure.

† The last molar being absent, it is estimated as being normal to the genus.

species are described, of which *S. hitchcocki* is commonest and known by the most complete material, so may be used for a standard for comparisons.

Stenomylus hitchcocki Loomis

This Journal, vol. xxix, 298-318, 1910.

This species, known by several complete skeletons, has so far been found only at one point, in a quarry near Agate, Neb., in the Lower Harrison beds. It is characterized by the small size, narrow molars, lower canine completely incisiform, lower jaw deep, metacarpals separated the entire length.

Stenomylus gracilis Peterson

Ann. Carnegie Museum, vol. iv, p. 41, 1906, and p. 286, 1906.

A larger species, rather rare, with narrow upper molars, lower canine less incisiform, lower jaw slenderer, and metacarpals coössified a part of their length. Occurs in the Lower Harrison beds.

Stenomylus crassipes Loomis

This Journal, vol. xxix, p. 319, 1910.

About the size of the preceding, but with lower canine completely incisiform, and the limbs much shorter and the skeleton throughout much heavier. This form occurs in the uppermost beds of the Lower Harrison.