

ART. XXVII.—*Leptauchenia* Leidy and *Cyclopidius* (*Pithecistes*) Cope, with descriptions of new and little known forms in the Marsh Collection; by MALCOLM RUTHERFORD THORPE.

[Contributions from the Othniel Charles Marsh Publication Fund, Peabody Museum, Yale University, New Haven, Conn.]

TABLE OF CONTENTS.

Introduction.

Description of species.

Leptauchenia decora Leidy.

L. cf. decora.

L. major Leidy.

L. nitida Leidy.

Cyclopidius Cope.

Pithecistes Cope.

C. hullianus, sp. nov.

Chelonocephalus schucherti, subgen. et sp. nov.

References.

INTRODUCTION.

The genera *Leptauchenia* and *Cyclopidius* are the most peculiar of all the Oreodontidæ. *Pithecistes* Cope is considered identical with *Cyclopidius*. The first genus is fairly well known, the whole skeleton of *L. decora* having been mounted, but not as yet fully described. *Cyclopidius* is known only from skulls and jaws.

Leptauchenia decora was apparently the most numerous, judging from the number of individuals represented in the Marsh and other collections.

The taxonomy of these genera will be discussed in a later paper where the Oreodontidæ as a family are considered. It is sufficient to remark here that they represent the climax of at least a part of this family, which began in the Eocene, reached its greatest development in the Oligocene, and became extinct through these and other highly specialized and peculiar forms in the Miocene or early Pliocene. *Leptauchenia* represents an earlier geologic epoch than does *Cyclopidius* (*Pithecistes*), the latter also showing more marked peculiarities.

The material in the Yale Museum serves admirably to amplify our knowledge of these genera, both in the description of referred specimens and of new species. The excellent illustrations were made by R. Weber.

DESCRIPTION OF SPECIES.

Leptauchenia decora Leidy 1856.

This species is represented in the Marsh Collection by more than forty individuals. Apparently the elements of the skull which were most resistant to destruction were the rami and maxillæ with molars. Specimens of this species have been found on the North Platte River, at Crow Buttes, Fort Mitchell, Lawrence's Fork, Court House Rock, Scott's Bluff, Omaha Creek, Rattlesnake Butte (near Chadron), and many from Pumpkin Creek—all in Nebraska; and one specimen from Spring Creek, near Camp Baker, Montana, collected by Edward S. Dana and George Bird Grinnell. The description is taken from various individuals, but especially from Cat. Nos. 10119 and 10121.

Specific Characters.—The skull is somewhat smaller than that of *Oreodon gracilis*, and broader, shorter, and lower. The lacrymal fossa is small and shallow, and the infra-orbital foramen is above the middle of P^3 . The malar is remarkably robust. The bullæ are much inflated and oval in outline. The palate is nearly flat, while the palatonarial border is opposite the posterior margin of M^3 . The orbits are large, oval-shaped antero-posteriorly, and look chiefly outward; the facial vacuities are large and extend somewhat posterior to the anterior orbital border; the ramus is similar to that of *Oreodon*, except that the posterior area is of greater proportionate width and depth; the masseteric fossa is large and relatively deep; the inferior border is straight; the auditory meatus is large, situated a little in advance of and well above the line of the occipital condyles; the paramastoids are plate-like, are in contact with the bullæ, and extend downward but slightly below the inferior border of the bullæ. The dentition shows the full number of teeth common to *Oreodon*, that is, forty-four. Both molar-premolar series are crowded and the latter somewhat reduced. The molars are more nearly uniform in size reduction from M^3 to M^1 . These teeth are very hypsodont and the external styles are very well developed.

Measurements.

(Cat. No. 10121, Y. P. M., unless otherwise indicated.)

	mm.
Skull, length, occip. condyle to canine inc., approx.	107
Bizygomatic diam., approx.	74
Diam. of postorbital constriction	20.5
Max. width of brain-case	34.5
Width above P ²	27
Width between middle of orbits	38
Ant.-post. diam. of facial vacuity, approx.	30
Ant.-post. diam. of bulla (Cat. No. 10120)	21
Transverse diam. of bulla (Cat. No. 10120)	18.5
Depth of malar below middle of orbit	14
Depth of paramastoids below inferior border of auditory meatus	26
Ramus, depth, coronoid to angle	55
Depth below M ₂	18
Total length, approx.	90
Superior molar series, length	28.5
Superior premolar series, length (Cat. No. 10120)	17-20
Inferior molar series, length (Cat. No. 12668)	32
Inferior premolar series, with P ₁ , length (Cat. No. 12668)	20.5

Leptauchenia cf. decora Leidy.

A skull with jaws attached, not readily identifiable with any of the three described species of this genus, was collected in 1914 by John T. Doneghy, Jr., at Rattlesnake Butte, about 6 miles southwest of Chadron, Nebraska. This skull is that of an immature individual, in which neither superior nor inferior third molar is erupted. It was found in the Lower Miocene beds, and I believe represents a form intermediate in size between *L. decora* and *L. major*.

This specimen, Cat. No. 12221, Y. P. M., is exceedingly well preserved, with the exception of the superior part of the muzzle in advance of the orbits, including the superior incisor border. The chief characters may be set forth briefly. The total length of the skull is approximately that of *L. decora*, but in the fully adult form it must have been somewhat longer. The sagittal crest is short and has a nearly straight contour. From the junction of the temporal ridges, the upper contour descends steeply to the tip of the nasals, giving an anthropoid appearance from a lateral view. The orbits are small and look chiefly upward and outward, in which

respect it is more like *L. major*, although this feature is more pronounced than in the latter species. The bregma, the junction of the sagittal and coronal sutures, is situated considerably farther in advance of the junction of the temporal ridges than in *L. decora* and holds more nearly the position seen in *L. nitida*. In *L. major* the bregma is located at the junction of the temporal ridges. The malar below the orbit is more robust and deeper in this submature specimen than in a fully adult *L. decora*. The infra-orbital foramen is above the interval between P^2 and P^3 . The bullæ are of different shape than in any other species of the genus, but whether this is due to adolescence or not I have no way of determining at present. In outline, they are roughly circular and much inflated. They are proportionally as large as in *L. nitida*, and absolutely larger than in *L. decora*. They are farther apart, however, than in *L. nitida*, and their internal faces do not parallel each other vertically as in the latter species. The paramastoids are broad above and extend downward and considerably outward below the inferior edge of the bullæ, with which they are in contact for a part of their course. I fail to find this outward direction in the Yale specimens of the three species, in all of which they extend nearly directly downward. The outline of the facial vacuities is partially destroyed, but they were evidently relatively large.

The ramus is quite robust for a submature animal. The inferior border is very gently curved as in *L. decora*, and does not turn downward at the angle as in *L. major*. The coronoid process extends but slightly above the condyle, more as in *L. major*, and its superior edge does not curve backward, so pronounced a feature in *L. decora*, but not in *L. major*. I can not determine this character in *L. nitida*. The masseteric fossa is unusually deep, and the ramus very robust below the molar series. With respect to the occipital condyles, the external auditory meatus is situated much farther back than in *L. nitida*, but approximately as in *L. major* and *L. decora*, although relatively a little higher.

Measurements.

	mm.
Skull, length, occip. condyles to canine inc.	103
Bizygomatic diam.	82
Diam. of postorbital constriction	22.5

Max. width of brain-case	41
Width above P ²	31
Width between middle of orbits	37
Depth of malar below middle of orbits	15
Depth of paramastoid below inferior border of auditory meatus	29
Ant.-post. diam. of bulla	23.5
Transverse diam. of bulla	22.1
Ramus, depth, coronoid to angle	60
Depth below M ₂	23
Total length from incisor border	92
M ¹ plus M ² , length	24
Superior premolar series, length	28
M ₁ plus M ₂ , length	23
Inferior premolar series, with P ₁ , length	27

Leptauchenia major Leidy 1856.

This species is represented in the Marsh Collection at Yale by a very well preserved skull with jaws, Cat. No. 10118, Y. P. M., as well as by other more or less fragmentary material, yielding data which have heretofore been undescribed.

Specific Characters.—The skull is intermediate in size between that of *Oreodon culbertsonii* and *O. gracilis*. The upper skull contour shows a steep forward declivity from the junction of the temporal ridges to the tip of the nasal bones, which lies above the line of the canines. The infra-orbital foramen is above the posterior part of P³. The nasals are very narrow; the forehead is slightly elevated in the median plane and somewhat concave between that and the supra-orbital margins. The skull is depressed, especially in advance of the orbits. The temporal ridges diverge much more rapidly and widely than in *Oreodon*. The facial vacuities are large and extend posteriorly nearly to a line through the middle of the orbits. The muzzle is marked by a prominent ridge from the infra-orbital arch to the anterior end of the nasals. The palate is nearly flat. The bullæ are very much inflated and extend somewhat forward of the glenoid articular surface. The paroccipitals are broad, but tapering posteriorly and ending slightly below the inferior border of the bullæ. The latter are rather more roughly triangular, than oval, in outline, with the base posteriorly located.

The rami resemble those of *Oreodon* more closely than

do those of either *L. decora* or *L. nitida*. They are robust, nearly straight below the dental series, with a distinct downward trend at the angle. They are wide and moderately heavy below the coronoid and condyle.

The molar teeth are characterized by very heavy external styles, heavier than in any other of the species of this genus, and likewise heavier than in *Merychys*.

Measurements.

(Cat. No. 10118, Y. P. M.)

	mm.
Skull, length, occip. condyles to canines, inc., approx.	139
Bizygomatic diam., approx.	100
Diam. of postorbital constriction	22.3
Max. diam. of brain-case	44
Width above P ²	31
Width between middle of orbits	46
Ant.-post. diam. of facial vacuity	34
Depth of malar below middle of orbits	23
Depth of paramastoid below inferior border of auditory meatus	28
Ant.-post. diam. of bulla	27
Transverse diam. of bulla	18.5
Ramus, depth, coronoid to angle	60
Depth below M ₂	25
Total length from incisor border	113
Superior molar series, length	40
Superior premolar series, length	35
Inferior molar series, length	44
Inferior premolar series, with P ₁ , length	34

Leptauchenia nitida Leidy 1869.

This comparatively rare and little known species is represented in the Marsh Collection by several specimens collected on Pumpkin Creek, along White River, at Scott's Bluff, and near Fort Mitchell—all in Nebraska. Two skulls represent immature individuals, one of which is extremely delicate and fragile, with even the lower incisors preserved. Another skull, Cat. No. 10122, is that of a fully mature individual, and is remarkably well preserved. It lacks both rami and the incisor border, together with part of the zygomata.

Specific Characters.—This species is the smallest known in the genus. The muzzle is short and pointed; facial vacuities are smaller absolutely than in *L. decora*,

their posterior termination being but slightly back of the line of the anterior orbital margins; the forehead is slightly elevated along the sagittal plane and more prominently at the supra-orbital borders; the infra-orbital foramen is above the posterior edge of P^3 ; the face in advance of the orbits is quite narrow; the bullæ are very much inflated; the palate is nearly flat; the glenoid articular surface is much more convex downward than in *Oreodon*; there is a marked fossa at the anterior base of the postglenoid tubercle; this latter process is small and is composed apparently half of the squamosal and half of the tympanic bone, the dividing line in No. 10122 being a transverse vertical plane; the superior skull contour is a nearly straight gentle slope from the summit of theinion to the tip of the nasals; the bullæ are so greatly inflated that they are separated by an interval only 2 mm. in diameter; the frontals are produced between the nasal bones, which end in a wedge in the frontals.

The superior molars differ from those of the other species in that the size reduction from M^3 to M^1 is much greater, the antero-posterior diameter of M^1 being less than one half that of M^3 . The hypocone of M^3 is quite small, while the metastyle is relatively large and prominent. The metacone is rotated inward more strongly than in *L. decora* or *L. major*. The premolars have a decided backward slope from root to crown, which does not occur in the Yale specimens of either of the other species.

Although No. 10122 is a robust specimen, I am inclined to believe that Leidy did not accurately estimate the length of the superior molars. He stated it to be 20 mm., and yet the length of M^1 plus M^2 in the type specimen is 13 mm. M^3 is lacking in the type. In all of the Yale specimens, the antero-posterior diameter of M^3 is more than 10 mm.

Measurements.

(Cat. No. 10122, Y. P. M.)

	mm.
Skull, length from occip. condyles to canines, inc.	95
Bizygomatic diam.	65
Diam. of postorbital constriction	21
Max. width of brain-case	36

	mm.
Width above P ²	24
Width between middle of orbits	30
Ant.-post. diam. of facial vacuity, approx.	21
Ant.-post. diam. of bulla	25
Transverse diam. of bulla	19
Depth of malar below middle of orbit	12.5
Superior dental series with canine, length	51
Superior molar series, length	25
Superior premolar series, length	20

Cyclopidius Cope 1878.

The generic distinctions between *Leptauchenia* and *Cyclopidius* are by no means clearly marked. Cope defined *Cyclopidius* as being "*Leptauchenia* without superior incisor teeth." As we now know the genus, this is an inconstant character. Some of the species had one or two superior incisors, and it is not unlikely that all of them possessed two. These, however, may have been, and probably were, in many cases very small and perhaps vestigial, so that they were easily lost or destroyed during the process of fossilization. The inferior incisors were likewise two in number. If we assume for the present at least that *Cyclopidius* had but two incisors in each tooth row, then we have the most marked generic distinction between this genus and *Leptauchenia*, which has the full complement of forty-four teeth.

Cyclopidius is found in a higher horizon than *Leptauchenia*, the latter being Upper Oligocene to Lower Miocene and the former being restricted to the Middle Miocene.

In general, it seems that *Cyclopidius* possesses, in an exaggerated form, the various peculiarities of *Leptauchenia*. The nasal vacuities are larger; the frontals are narrower and form but very little of the cranial roof; the zygomata are much heavier and more widespread; the cranium is very much narrower and smaller; the nasals are narrow bands which expand slightly at their junction with the premaxillaries; the external styles of the superior molars are more prominent; the inferior caniniform premolar is somewhat reduced, and, in size, more nearly approximates that of the true canine; the external auditory meatus is somewhat more posteriorly placed; the rami have become more robust and much heavier posteriorly, and the whole skull foreshortened and much more brachycephalic.

Pithecistes was established by Cope on a lower jaw in which, he said, P_1 and all of the incisors except I_3 had been lost. Likewise the true canine was no longer incisiform, but had again become caniniform. These characters were shown only in the type species, *P. brevifacies*, which was a very old individual. In 1899 Matthew showed that this genus was not valid. He wrote (p. 73):

"Careful comparison and more complete removal of the matrix show that: (1) the alveoli of two small incisors are present on each side; (2) the canine, mistaken by Cope for an incisor, is present and worn to a stump; (3) the first premolar, mistaken for canine by Cope, is present and caniniform; (4) there are no distinctions whatsoever from *Cyclopidius simus* except those due to age of the individual. *Pithecistes decedens* is the permanent and *P. heterodon* probably the milk dentition of a smaller species of *Cyclopidius*; both are founded on upper teeth."

I do not think it possible that in this family any form will be found in which P_1 has been lost and the true inferior canine become caniniform. This caniniform premolar has developed far in excess of the other premolars, and at the expense of the true canine, in all of the preceding genera of the Oreodontidæ. It is possible, however, that a form may be found without any incisors, either superior or inferior, a condition which has occurred in other groups.

Cyclopidius lullianus, sp. nov.

(Figs. 1-3.)

Holotype, Cat. No. 10117, Y. P. M. Spanish Mines, Wyoming. Lower Miocene (lower Harrison beds).

The type material consists of a skull and jaws, excellently preserved with the exception of the left zygoma and a portion of the left side of the cranium. It was collected in 1908 by Professor Richard S. Lull, after whom the species is named.

Specific Characters.—This is the largest species of the genus, and shows remarkably well the generic characters. Its specific peculiarities are very marked. The skull length is approximately that of a small *Oreodon culbertsonii*. The muzzle is short, and the zygomata much expanded. The nasal bones are very narrow, expanding anteriorly at the junction with the premaxillaries, which are small. The facial vacuities are very large. A shallow forward-facing depression represents the lacry-



Fig. 1.—*Cyclopidius lullianus*, sp. nov. Holotype. Lateral view of skull and jaw. Two-thirds nat. size.

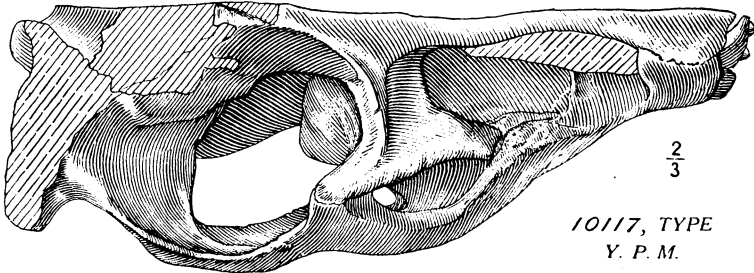


Fig. 2.—*Cyclopidius lullianus*, sp. nov. Holotype. One half superior view of skull. Two-thirds nat. size.



10117, TYPE
Y. P. M.

Fig. 3.—*Cyclopidius lullianus*, sp. nov. Holotype. Anterior view of muzzle. Two-thirds nat. size.

mal fossa. The infra-orbital foramen is single and located above the middle of P³. The frontals are much reduced and very narrow. A rather shallow but well marked depression separates the median sagittal ridge from the slightly elevated supra-orbital borders. The malar part of the zygoma is exceedingly thick and deep, while the squamosal portion is comparatively weak, except for the great expansion above the glenoid articular surface. The brain-case is relatively very small.

The rami are massive, deep, and heavy. The inferior border is much thickened and, below the anterior molar series, there is an osseous tubercle on each ramus. The position of this small tubercle is suggestive of that in the entelodonts, except that in the latter the size is very much greater. There are but two incisors in both dental series. This species is nearest to *C. brevifacies* Cope, but larger, and shows marked differences.

Measurements of Holotype.

	mm.
Skull. length, occip. condyles to prosthion, inc.	143.5
Bizygomatic diam.	104.5
Diam. of postorbital constriction	24
Max. width of brain-case	46
Width above P ²	40
Width between middle of orbits	60
Depth of malar below middle of orbits	28
Ant.-post. diam. of facial vacuities	47
Ramus, total length	131
Depth, coronoid to angle	88
Depth below M ₂	35.5
Width below M ₂	16.2
Superior dental series, with canine, length	78.2
Superior molar series, length	44.2
Superior premolar series, length	30.5
Inferior dental series, with P ₁ , length	70.5
Inferior molar series, length	40.5
Inferior premolar series, with P ₁ , length	27.5

Chelonocephalus schucherti, subgen. et sp. nov.

(Figs. 4-6.)

Holotype, Cat. No. 10123, Y. P. M. Middle Miocene, Badlands, near Hermosa, South Dakota.

The type material, which was collected in 1894 by H. F. Wells, consists of a well preserved skull, lacking the

occipital condyles and the incisor border. The individual is fully adult. The specific name is given in honor of Professor Charles Schuchert as a token of appreciation of his generosity to the Division of Vertebrate Paleontology, in the apportionment of funds.

This species resembles *Cyclopidius decedens* (*C. heterodon*) in two characters. Both species are smaller than *C. simus*, and both have the same antero-posterior diameter of P^4 , but not the same transverse diameter. All the species of *Cyclopidius* are considerably larger than this and smaller than *Cyclopidius lullianus*, sp. nov. From other dimensions of *C. decedens*, it is apparent that this

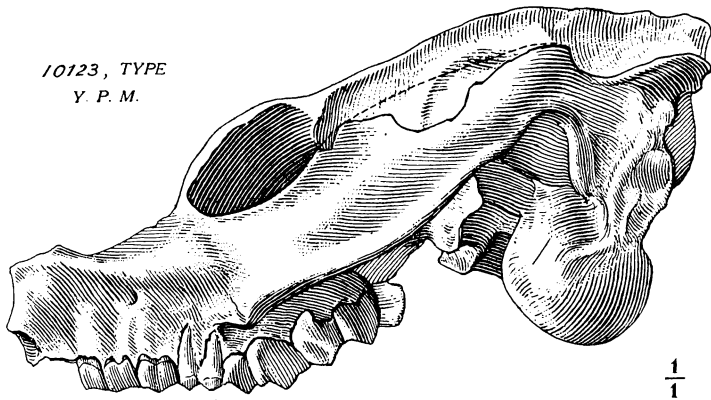


Fig. 4.—*Chelonocephalus schucherti*, subgen. et sp. nov. Holotype. Lateral view of skull. Nat. size.

new species is not only smaller, but differently proportioned.

Distinctive Characters.—Great relative bizygomatic diameter, giving the skull a strong brachycephalic appearance. In fact, it is roughly circular in outline, superficially resembling that of the *Chelonia*. The zygomata are relatively heavy, although not very thick except near and at their origin above M^2 and the anterior part of M^3 . The orbits look outward and upward. The sagittal crest is long and high, while the brain-case is relatively large. The sagittal crest is marked by a foramen produced by a spreading of the parietal bones, about on a line above the paramastoids. The frontals are narrow and the facial vacuities large. The basicranial area is foreshortened,

so that the much inflated bullæ lie below a part of the glenoid articular surface, and their anterior border is in advance of the glenoid surface. The small postglenoid

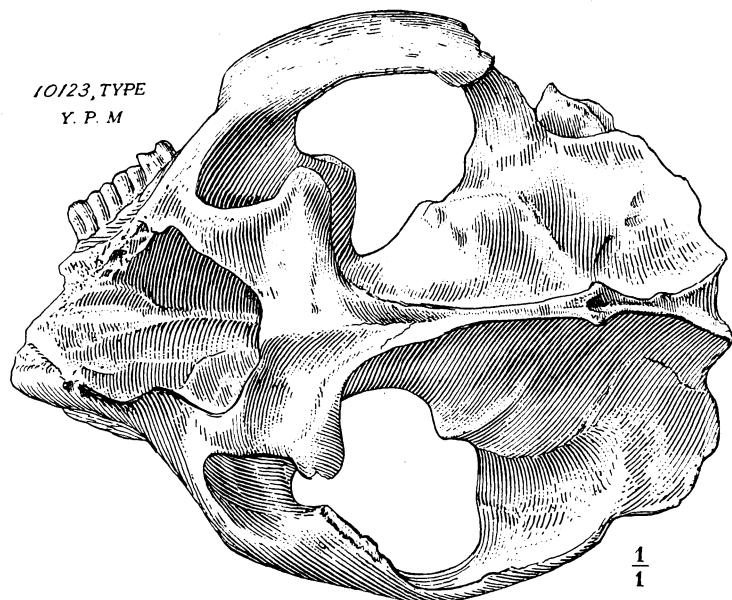


Fig. 5.—*Chelonocephalus schucherti*, subgen. et sp. nov. Holotype. Superior view. Nat. size.

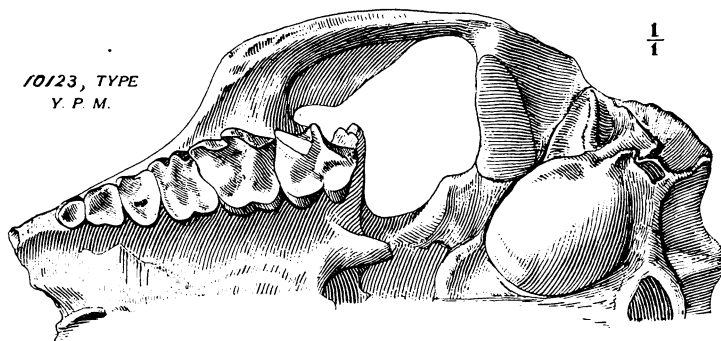


Fig. 6.—*Chelonocephalus schucherti*, subgen. et sp. nov. Holotype. One half palatal view. Nat. size.

processes are thin and plate-like, situated almost directly above the posterior margin of the bullæ. The bullæ are oval in outline, with their long diameter directed forward and inward at a slight angle. This foreshortening of the

basicranial area is not known to me to occur so distinctly in any species of *Cyclopidius* where the skull characters have been described. The palatonarial border is opposite the posterior lobe of M^3 . In *Cyclopidius emydinus* it is nearly halfway between the glenoid articular surface and M^3 . The palate is slightly concave.

The transverse diameter of the posterior lobe of M^3 is but a trifle greater than that of P^3 . The tooth rows are not parallel, as in *Oreodon* and most of the genera of this family, but converge anteriorly. The canine is situated inwardly of the line of the tooth row and is nearly circular in section, being of somewhat greater diameter at the internal face. As stated above, the incisor border is missing, but the amount of space available for incisors was not more than would accommodate two unless they were extremely small. However, I am inclined to believe that it had but two of these teeth.

The infra-orbital foramen is single and above the interval between P^3 and P^4 . The external auditory meatus is directed more posteriorly than outwardly, and situated posterior to a line above the paramastoid process.

Measurements of Holotype.

	mm.
Skull, length, occip. condyles to canine inc., approx.	93
Bizygomatic diam.	82
Diam. of postorbital constriction	17
Max. width of brain-case	39.5
Width above P^2	26
Width between middle of orbits	33
Depth of malar below middle of orbits	14.7
Ant.-post. diam. of bulla	22
Transverse diam. of bulla	19.5
Dental series, with canine, length	53
Molar series, length	28.5
Premolar series, length	20

References.

- Cope, E. D. 1878A. New artiodactyles of the upper Tertiary. *Amer. Nat.*, 12, 58.
 — 1878B. Descriptions of new Vertebrata from the upper Tertiary formations of the West. *Proc. Amer. Philos. Soc.*, 17, 219-231.
 1884. Synopsis of the species of *Oreodontidæ*. *Ibid.*, 21, 503-572.
 Leidy, J. 1856A. Notices of remains of extinct Mammalia, discovered by Dr. F. V. Hayden in Nebraska Territory. *Proc. Acad. Nat. Sci. Phila.*, 8, 88-90.
 — 1856B. Notice of some remains of extinct vertebrated animals. *Ibid.*, 8, 163-165.

- Leidy, J. 1858. Notice of remains of extinct Vertebrata, from the valley of the Niobrara River. *Ibid.*, 10, 20-29.
- 1869. The extinct mammalian fauna of Dakota and Nebraska. *Jour. Acad. Nat. Sci. Phila.* (2), 7, 1-472.
- Loomis, F. B. 1920. On *Ticholeptus rusticus* and the genera of Oreodontidæ. *This Journal* (4), 50, 281-292.
- Matthew, W. D. 1899. A provisional classification of the fresh-water Tertiary of the West. *Bull. Amer. Mus. Nat. Hist.*, vol. 12, 19-75.
- 1909. Faunal lists of the Tertiary Mammalia of the West. *U. S. Geol. Survey, Bull.* 361, 91-120.
- Scott, W. B. 1890. Beiträge zur Kenntniss der Oreodontidæ. *Morpholog. Jahrbuch*, 16, 319-395.
- 1893. The mammals of the Deep River beds. *Amer. Nat.*, 27, 659-662.
- 1895. The Mammalia of the Deep River beds. *Trans. Amer. Philos. Soc.*, 18, 55-185.
- 1899. The selenodont artiodactyls of the Uinta Eocene. *Trans. Wagner Free Inst. Sci., Phila.*, 6, 1-121.
- Sinclair, W. J. 1910. The restored skeleton of *Lepiauchenia decora*. *Proc. Amer. Philos. Soc.*, 49, 196-199.