SMITHSONIAN MISCELLANEOUS COLLECTIONS
VOLUME 101, NUMBER 13

A NEW TITANOTHERE FROM THE EOCENE OF MISSISSIPPI, WITH NOTES ON THE CORRELATION BETWEEN THE MARINE EOCENE OF THE GULF COASTAL PLAIN AND CONTINENTAL EOCENE OF THE ROCKY MOUNTAIN REGION

(With Three Plates)

BY
C. LEWIS GAZIN
U. S. National Museum
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(Publication 3679)

CITY OF WASHINGTON
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During the summer of 1940 a laborer, while fishing, discovered portions of a fossil jaw in the bank of a small stream on the Covington Farm south of Quitman, Miss. Fortunately, through the kindness of V. G. Clifford, of Quitman, the material was brought to the attention of Professor Sullivan at Millsaps College. Recognizing the remains as titanothere and realizing their significance, Professor Sullivan immediately investigated the occurrence with the result that the skull was also recovered. No other skeletal portions were found. Later, Professor Sullivan communicated with Dr. Remington Kellogg and C. W. Gilmore, and arrangement was made for preparation in the laboratory of vertebrate paleontology at the United States National Museum. The specimen has been deposited with the National Museum.

The remains were found about 2½ miles south of Quitman, Clarke County, on a small branch of a tributary to the Chickasawhay River. On the Geologic Map of Mississippi compiled by Dr. L. W. Stephenson[1] the place of its occurrence is seen to be well within the area mapped as immediately underlain by the Lisbon formation. Dr. Julia Gardner of the United States Geological Survey has made collections from the vicinity of the find and informs us that the distribution of Lisbon beds certainly includes the area in question. The Lisbon is a part of the Claiborne group, and is the equivalent of the Cook Mountain formation farther west. These beds are currently regarded as of about middle Eocene age.

[1] Accompanying U. S. Geol. Surv. Water Supply Paper 576, 1928.

For the identification of the beds as Lisbon, we are indebted to F. Stearns MacNeil, of the United States Geological Survey, who has recently examined the site. MacNeil reports that the rock from which the titanothere came contains an abundance of invertebrate remains, including *Ostrea sellaeformis,* which is characteristic of the Lisbon. Further substantiating evidence is to be found in the work of Dr. R. E. Grim,[2] of the University of Mississippi.

The mollusks collected by MacNeil from the margin of the excavation made for the skull were submitted to Dr. Julia Gardner for identification. Her report is as follows:

> The following species were recognized in the material associated with the skull collected 2½ miles south of Quitman, Clarke County, Mississippi:
>
> *Nucula* sp.
> *Chlamys* sp. cf. *C. wahtubbeanus* Dall
> *Pseudamussium corncoides* Harris
> *Nemocardium* sp.
>
> *Ostrea sellaeformis* Conrad was reported from a level not more than a foot below the skull horizon. The character of the material and of the fauna closely resembles that of Bed No. 17 of the Little Stave Creek section in Clarke County, Alabama. On Little Stave Creek, Bed No. 17 occurs about 25 feet below the top of the Lisbon.

The foraminifera included with the above samples taken from the margin of the excavation were prepared by Lloyd G. Henbest and submitted for identification to Dr. Joseph A. Cushman. His report is as follows:

> The specimens you [Henbest] sent from the Eocene 2½ miles south of Quitman, Clarke County, Miss., have been examined and they contain numerous species which seem to place the material definitely in the Claiborne. Two of these, *Siphonina claibornensis* Cushman and *Nonion planatum* Cushman and Thomas, are abundant.
>
> In addition there are numerous species described by Howe from the Cook Mountain Eocene of Louisiana: *Pseudobulimina glaessneri* Howe and Roberts, *Nonionella winniana* Howe, *Triloculina natchitochensis* Howe, etc., that give enough evidence, I believe, to place the sample definitely in this part of the Claiborne.

The titanothere find is particularly significant in two respects: first, in permitting a tie-in between the continental sequence of the Rocky Mountain and Great Plains areas and the marine Eocene of the Gulf Coastal Plain; and second, in the discovery of a new member of the Brontotheriidae and at a place in the southern States remote from the recorded distribution of titanotheres, either Eocene or Oligocene.

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[2] Mississippi State Geol. Surv. Bull. 30, p. 130, 1936.

The evidence for correlation is presented by the stage of evolution exhibited by the skull and dentition of the Mississippi titanothere, comparisons being greatly facilitated by the tremendous amount of change that took place in the titanothere family during the period from lower Eocene to lower Oligocene time. The Mississippi form seems most nearly comparable to the stage of development reached in the late Uintan titanotheres, currently regarded as upper Eocene, or possibly the Duchesnean forms usually considered as late Eocene or early Oligocene in age. It is distinctly more advanced than any of the wealth of forms known from the Bridger formation, or even most of those known from the Uinta beds. The dentition is very progressive and approaches the Chadron forms in the reduction of the incisors and in the molarization of the premolars, but does not show the facial shortening and the crowding of the incisors and premolars usually characterizing the Oligocene genera.

From this it is evident that either a titanothere having a more advanced type of dentition existed in Mississippi contemporaneously with a number of less progressive types, as known from the Bridger beds of Wyoming and currently regarded as middle Eocene, or the age assignments made to portions of the two stratigraphic sequences are not in harmony. It seems more probable that the age assignment made to one or the other sequence is in error and that the Uintan, or possibly the Duchesnean, is to be correlated with the Lisbon portion of the Claiborne.

As to the part of the Eocene represented by the correlated portions of the two sequences, the evidence to be derived from the land mammals themselves is not particularly satisfactory inasmuch as no direct correlation is permitted between North America and Europe during middle and upper Eocene time. As Osborn has shown, after Sparnacian or possibly Ypresian time, and until the Sannoisian of Europe, the terrestrial mammalian faunas are very distinct. The Sparnacian or lower Eocene of Europe has a fauna comparable to that of the Wasatch of North America, and the lower Oligocene Sannoisian is about equivalent to our Chadron. However, as a limiting factor in the foregoing consideration we know that the Jackson formation, stratigraphically younger than the Lisbon, has been shown by Kellogg[3] on the evidence of the archaeocete fauna to be Bartonian upper Eocene in age and is correlated in part directly with the Barton Clays of England, and in part with the Qasr-el-Sagha stage of the Fayum, Egypt. The Lisbon formation might conceivably

[3] Kellogg, Remington, Carnegie Inst. Washington Publ. 482, p. 272, 1936.

be included also in the upper Eocene, but representing a lower stage than the Jackson; however, Dr. Gardner informs us that the Lisbon appears most closely associated in time with the Lutetian middle Eocene of the Paris Basin. In any case the Uintan stage should on the basis of the foregoing evidence apparently be regarded as not younger than lowermost Bartonian and possibly as old as Lutetian. Moreover, the possibility that a more direct correlation is to be made between the Lisbon and Duchesne River beds rather than between Lisbon and Uinta cannot be disregarded, but unfortunately our knowledge of Duchesnean titanotheres is far from complete and is limited at present to a few forms allocated to the genus *Teleodus*.

NOTIOTITANOPS,[4] new genus

Generic characters.—Facial portion of skull elongate. Teeth uncrowded. Incisors with noncingulate, globular crown, reduced to two pairs, transversely arranged, and with a marked cleft between median pair. Canines rounded. Marked diastema between canines and premolars. Premolars very progressive. P^1 with prominent deuterocone portion. Lingual cingulum weak or incomplete on upper premolars and not present on molars. Metaconid of P_3 elevated and lingual as in P_4. Lower molars and preserved premolars with well-developed metacristid.

Genotype.—*Notiotitanops mississippiensis,* new species.

NOTIOTITANOPS MISSISSIPPIENSIS,[5] new species

Type.—Basal portion of skull with complete dentition, except for three incisors, and portions of both rami of the mandible with P_3 to M_3 represented, U.S.N.M. No. 16646.

Horizon and locality.—Lisbon formation, about $2\frac{1}{2}$ miles south of Quitman, Clarke County, Miss.

Specific characters.—Size of skull and length of dental series comparable to that of *Diplacodon progressum* Peterson. Specific characters not otherwise distinguished from generic.

Description of skull.—The skull of *Notiotitanops mississippiensis* is about the size of that of *Diplacodon progressum* Peterson[6] from the upper part of Uinta "C," larger than that of *Teleodus uintensis* Peterson[7] from the Duchesne River beds, as indicated by the para-

[4] νότιος, southern; τιτάν, titan; ὄψ, aspect.

[5] From the State of Mississippi.

[6] Peterson, O. A., Ann. Carnegie Mus., vol. 22, pp. 351-355, 1934.

[7] Peterson, O. A., ibid., vol. 20, pp. 307-312, 1931.

type, and apparently smaller than material representing species of *Protitanotherium*. The facial portion of the skull is moderately long as in such forms as *Diplacodon, Eotitanotherium,* and *Protitanotherium,* but not nearly so prolonged as in *Dolichorhinus*. Unfortunately, the top of the skull was eroded away so that no evidence remains of the presence or absence of horns. The palate exhibits a long diastema between the canine and P^1, and the incisive border of the premaxillae is directed transversely between the canines, not rounded or projecting forward as in the known Uinta titanotheres. In this respect *Notiotitanops* more nearly resembles *Teleodus*. The notch between the nasal and premaxilla extends posteriorly to a point near the infraorbital foramen and approximately above the posterior margin of P^2. The anterior opening of the infraorbital foramen is above most of P^3 and possibly the anterior portion of P^4. The anterior margin of the orbit is not complete, but it apparently extended forward to a position about over the middle or anterior portion of M^1. The lowest point of the orbital margin of the jugal is over the anterior portion of M^2.

Basicranium.—The basicranial portion of the skull is rather well preserved, and as is the case with most of the skull, as far as complete, appears to be entirely uncrushed. The squamosal on the right side is lacking but the basal portion of the cranium is nearly entire on the left side, except for a part of the zygomatic process of the squamosal. The cranial portion of the skull, as is the case with the facial portion, shows no significant shortening. In fact, the distance between the last molar and the postglenoid process is actually as great as in a much larger Chadron skull identified as *Brontotherium curtum*. The elongate posterior narial opening has nearly parallel sides, and has preserved the septum dividing it beyond the entire length and most of the depth of this opening. The posterior margin of the pterygoid forms a crest with the alisphenoid which originates with the posterior and ventral margin of the foramen ovale. In *Notiotitanops* this crest descends more abruptly from the region of the foramen ovale than in such forms as *Brontotherium,* somewhat as indicated in Peterson's [8] illustration of the type of *Diplacodon progressum*. However, the foramen ovale and the posterior opening of the alisphenoid canal are much more widely separated than indicated in Peterson's illustration. The foramina penetrating the alisphenoid bones are relatively large and rather well spaced as compared with these structures in either the earlier Bridger forms or

[8] Peterson, O. A., ibid., vol. 22, pl. 27, 1934.

the later Chadron types. The alisphenoid canal is directed more anteroposteriorly than in *Brontotherium,* where the foramen rotundum with the anterior opening of the alisphenoid canal is more dorsally placed with respect to the posterior opening of the canal. The posterior opening of the alisphenoid canal faces laterally, rather than ventrally as in the Chadron material.

The basioccipital and basisphenoidal portion is nearly triangular in section, dorsally broad and noticeably deep through the median portion as compared with such forms as *Palaeosyops.* The postglenoid process is broad, very elongate, and with a noticeable excavation on its anterolateral face for the entire length. The paroccipital process extends downward to an even greater extent than the postglenoid process. A conspicuous opening, apparently the mastoid foramen, is seen just above the outer margin of the paroccipital process, presumably about at the contact between the periotic and exoccipital bones, and appears to have conducted a part of the venous system of the occipital region, tied in with that which emerged from the postglenoid foramen.

The false external auditory meatus is deeply recessed above the basicranial surface as compared with the more shallow and open groove that represents this structure in the Bridger titanotheres. The rather long canal appears to be embedded entirely in the squamosal, but the extent to which the mastoid portion of the periotic is excluded from a position adjacent to the postglenoid process below cannot be certainly determined. The massive structure nearly or quite closing the canal ventrally is at least for the most part the posttympanic process of the squamosal. The closure is completed medially by a long, flat, wedgelike extension of the tympanic, occupying the rather deep and very narrow cleft between the postglenoid process and the posttympanic as far laterally as the postglenoid foramen. In the Chadron forms the posttympanic process is usually better developed ventrally, and possibly laterally, and appears to make a broader, deeper union with the postglenoid process.

Tympanic.—The tympanic is not completely preserved, but as far as represented it is securely attached to the periotic in the two positions about corresponding to the legs of the annulus, and by a lateral flange or portion of the audital tube to the squamosal. The posterior pedicle joins the periotic anterior to the lateral extremity of the facial canal, just posterior to the position of the tympanic membrane. The anterior pedicle joins approximately above the origin of the styliform process of the tympanic, just anterior to the position of the tympanic membrane. It is uncertain just how far medially the tympanic was

ossified, as the margin of the bone is damaged. It may not have been complete across the entire width of the petrosal. A prominent flange of the tympanic, however, extends laterally in the narrow cleft between the postglenoid and posttympanic processes completing the closure of the false external auditory meatus below. Medially this lateral flange of the tympanic also covers a small part of the posterior wall of the audital canal, and a lip of it extends a very short distance up the anterior wall close to the medial margin of the root of the postglenoid process. The osseous audital tube is open anteriorly for a short space medial to the inner margin of the postglenoid process.

A rather large but incomplete tympanohyal is preserved in a recess of the posterolateral portion of the tympanic, anterolateral to the inner margin of the paroccipital process, probably adjacent to both the exoccipital and the mastoid. The stylomastoid foramen occurs between the posteroexternal portion of the tympanohyal and the mastoid portion of the periotic. A short distance medial to this position and still adjacent to the tympanohyal a second foramen is visible in the ventral view. This, however, converges with the stylomastoid foramen dorsally and may join it.

Petrosal.—The petrous portion of the periotic is complete except for a small segment of the very thin ventromedial margin. This element is a rather large wedgelike mass tapering ventromedially and with its thick base merging dorsolaterally with the spongy mastoid portion. In the dorsomedial view the rather large internal auditory meatus is seen to open on the medial margin of the bone much as in the Chadron forms, but with the dorsal margin forming a much more compressed anteroposterior ridge than in the larger petrosals of *Brontotherium* and *Menodus*. Also, as in the Chadron forms, the medial margin exhibits a channel about the width of the foramen extending posteriorly from the meatus; this, however, is not so broad dorsoventrally as in *Menodus*, but appears fully as long anteroposteriorly. In *Palaeosyops* the internal auditory meatus is distinctly removed from the somewhat thickened ventromedial margin of the petrosal. The posterior margin of the opening is complete and the shallow channel issuing from the opening is directed anteromedially.

The surface above the internal auditory meatus, regarded as the floccular fossa, is moderately extensive but not deeply excavated. Anterior to this the angle which is interpreted as marking the separation between the cerebral and cerebellar portions of the brain is not particularly acute, and there is no indication of the bony ridge that in more modern mammals rises to join the tentorial plate. In *Palaeosyops* the petrosal shows no indication of a juncture of the cerebrum and cerebellum.

Posterior to the floccular fossa the exact position of the aquaeductus vestibuli and the aquaeductus cochleae cannot be certainly determined because of the spongy character of the bone at the transition to the mastoid portion, but the aquaeductus vestibuli appears to be just beyond the posterodorsal extent of the floccular fossa, and the aquaeductus cochleae at the posteroventral margin of the fossa.

In the ventral aspect the petrosal exhibits a marked promontorium, much more prominent and inflated than in *Palaeosyops* but not so massive and anteroposteriorly expanded as in the Chadron material observed. The facial canal at its lateral extremity rises from the stylomastoid foramen to the petrosal at a position posterolateral to the fenestra rotunda, forms a relatively deep impression in the petrosal lateral to the fenestra rotunda, passes forward somewhat shallower lateral to the fenestra ovalis, and then extends anteromedially to the anterior margin, at which point it joins a foramen that connects with the internal auditory meatus. At this position the unclosed hiatus facialis coincides with the geniculum of the facial nerve. At no place in the course of the facial canal or sulcus is it completely enclosed by bone between the position of the geniculum and its ventrolateral extremity in the petrosal. A marked approach toward closure, however, is made at the positions where the tympanic is attached to the petrosal, namely at its stylomastoid extremity, where bone nearly crosses the sulcus lateral to the fenestra rotunda, and at the forward extremity, anterior to the fenestra ovalis. In *Palaeosyops* it is interesting to note that the facial sulcus is much shallower, and the fenestra ovalis, which in life is covered by the stapes, faces much more ventrally, possibly suggesting a more nearly horizontal tympanic annulus. In the Chadron material examined the facial canal appears to be closed completely in the positions at which an approach to closure is made in *Notiotitanops;* however, as in that form, the canal is open entirely across the aperture lateral to the fenestra ovalis.

The tensor tympani muscle in *Notiotitanops* presumably originated in a moderately large, much recurved fossa lateral to the extended crista facialis, somewhat lateral and anterodorsal to the fenestra ovalis. The stapedial muscle may have originated in some part of the same fossa. A very small pit just posterior to the fossa may have been the position occupied by the crus breve of the incus. The fossa believed to be that of the tensor tympani is appreciably larger in a specimen of *Menodus*. I am unable to delineate it in *Palaeosyops,* unless it be a very shallow depression on the side of the promontorium posteromedial to the facial sulcus.

Upper dentition.—The dentition of *Notiotitanops mississippiensis* is very progressive for Eocene titanotheres. The incisors are reduced to two pairs, uncrowded, and the preserved lateral incisor is not of the piercing type but exhibits a globular crown without evidence of a ridge or shelflike cingulum so characteristic of the Eocene forms having teeth otherwise in an equivalent stage of wear. This type of incisor is noted in the Duchesne River and Sespe *Teleodus* and in most of the Chadron titanotheres.

The canine is moderately large, rounded, and markedly curved in the crown portion. The anterior surface of the canine is forward of the anterior margin of the premaxilla, a position not occurring in such forms as *Dolichorhinus, Eotitanotherium* or *Diplacodon,* but observed in *Teleodus* and many Chadron specimens.

The premolars are advanced in the degree to which they have become molariform, about equivalent in this respect to those in *Diplacodon* and *Eotitanotherium,* and certainly much advanced over the development reached in *Dolichorhinus, Metarhinus,* etc. P^1 is an anteroposteriorly elongate tooth but exhibits a rather well-developed, posteriorly placed deuterocone. Also, the tritocone is distinct and about as well developed as the primary cusp. This tooth appears to be in as advanced a stage of development as that reached in the most progressive Uintan titanotheres and as that in some of the Chadron material, but without the anteroposterior compression characterizing the later dentitions. P^2 and P^3 have a full, nearly molariform outline. The lingual portion of P^2 is anteroposteriorly broad, with but little indication of a cingulum, and the elongate deuterocone crest shows a slight indication of a separate tetartocone. The cingulum is weak internally on P^3 and slightly better developed and more nearly continuous on P^4, although it is absent from the molars. The lingual crest on P^3 and P^4 is more clearly divided into a deuterocone and lesser tetartocone, but this portion of these teeth, though somewhat worn, appears much inflated and the separation of the tetartocone is not sharp and deep in contrast to the separation of the hypocone in the molars. The mesostyle is fairly well developed on P^4, much weaker or slight on P^3, and not seen on P^2. This style shows a nearly uniform increase in prominence from P^3 to M^3.

The upper molars are essentially like those of the Uintan or even Chadron titanotheres, but certain structural differences were noted. In comparison with those of *Diplacodon* they are distinctly wider transversely; also, M^3, which is larger and transversely wider than M^2, has a well-developed hypocone, and the buccal and lingual walls of this tooth do not converge posteriorly so markedly as in *Dipla-*

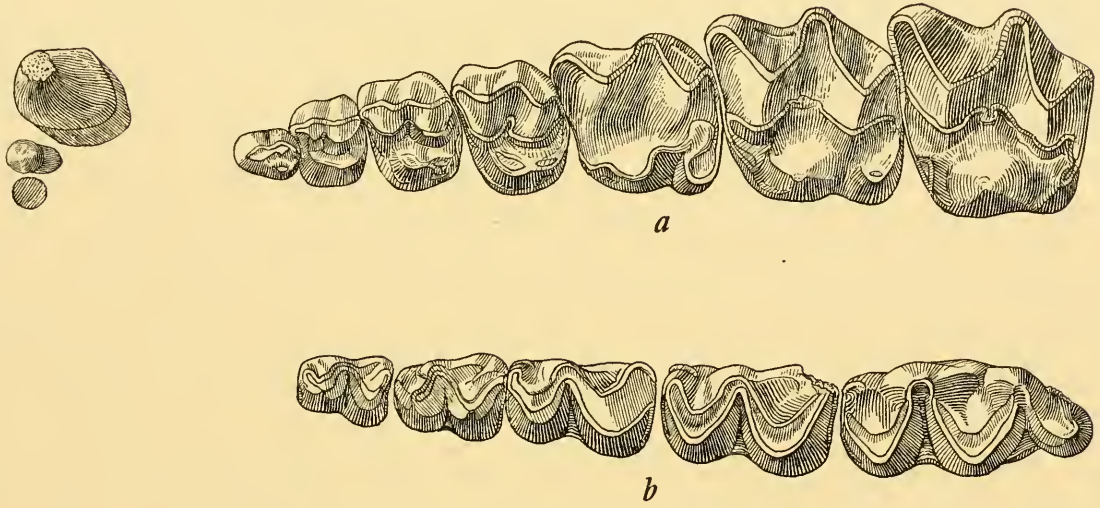


FIG. 1.—*Notiotitanops mississippiensis,* new genus and species. Left upper and lower dentitions, U.S.N.M. No. 16646, type specimen, occlusal views. $\times \frac{1}{2}$. *a,* I, C., and P^1 to M^3; *b,* P_3 to M_3. Lisbon Eocene, Mississippi. Drawing by Sydney Prentice.

codon. The hypocone is smaller than the protocone in the various molars but is distinctly more lingual in position than in *Diplacodon.* The appearance of the molars in the region of the hypocone is suggestive of some of the much larger Chadron brontotheres.

Mandible and lower dentition.—The lower jaws of *Notiotitanops mississippiensis* are rather incomplete but appear relatively robust, and the symphysis is seen to extend posteriorly to a point below P_4. On the right ramus a mental foramen is situated below the posterior root of P_3 and an anterior branch of this canal appears below a position which would be occupied by the posterior root of P_2 if this tooth were present. On the left ramus a mental foramen is seen below the anterior root of P_3. Both rami are incomplete anterior to the third premolar, and only P_3 to M_3 are known. M_3 is missing from the right ramus.

The lower cheek teeth increase in size uniformly from P_3 to M_3 and the two premolars appear to be markedly molariform, but with a somewhat less distinct notch between the paraconid and metaconid than in the molars. The paraconid and entoconid on P_3 and P_4 approach the development seen in the molars, a distinct advance over *Dolichorhinus,* etc. In P_3 the metaconid is elevated and set lingually much as in P_4 and the molars, *Notiotitanops* being more progressive in this respect than *Protitanotherium.* The preserved premolars and molars show a rather well-developed metacristid extending posteriorly to a notch which is very near the entoconid, a significantly advanced condition.

Comparisons.—*Notiotitanops mississippiensis* is seen to be most nearly comparable to *Diplacodon* and related *Protitanotherium* and *Eotitanotherium* of the Uinta in certain respects and to *Teleodus* of the Duchesne River stage in others. It resembles *Diplacodon* in size and facial length, including the diastema between the canine and cheek teeth of the upper dentition, and in the progressiveness of the premolars. It differs from *Diplacodon* most noticeably in the reduction of the incisors and in the globular, noncingulate character of these as indicated by the one that is preserved. Moreover, the molars are broader transversely, not so convergent posteriorly, and with a more lingually placed hypocone. The form resembles *Teleodus* in the reduction and form of the incisors, in the abbreviation of the premaxillae anterior to the canines, as well as in the progressiveness of the premolars. It differs from *Teleodus* in the greater length of the facial portion, including the presence as well as the marked length of the postcanine diastema. Moreover, *Notiotitanops* almost certainly

did not have the reduced number of lower premolars indicated for *Teleodus*.

It is important to note that the tympanic and petrosal as well as the dentition show a very marked advance over these elements, as known or interpreted, of the Bridger titanotheres, heretofore regarded as middle Eocene.

It is further observed that in a comparison with titanothere remains as described from the Pacific Coast region, *Notiotitanops* shows a development more advanced than that indicated by the *Metarhinus* material[9] from the Poway conglomerate, which in turn has been correlated with the marine Tejon formation.[10] This would suggest that the Tejon stage as represented by the Poway conglomerate is not younger and possibly is older than the horizon in the Lisbon that produced *Notiotitanops*.

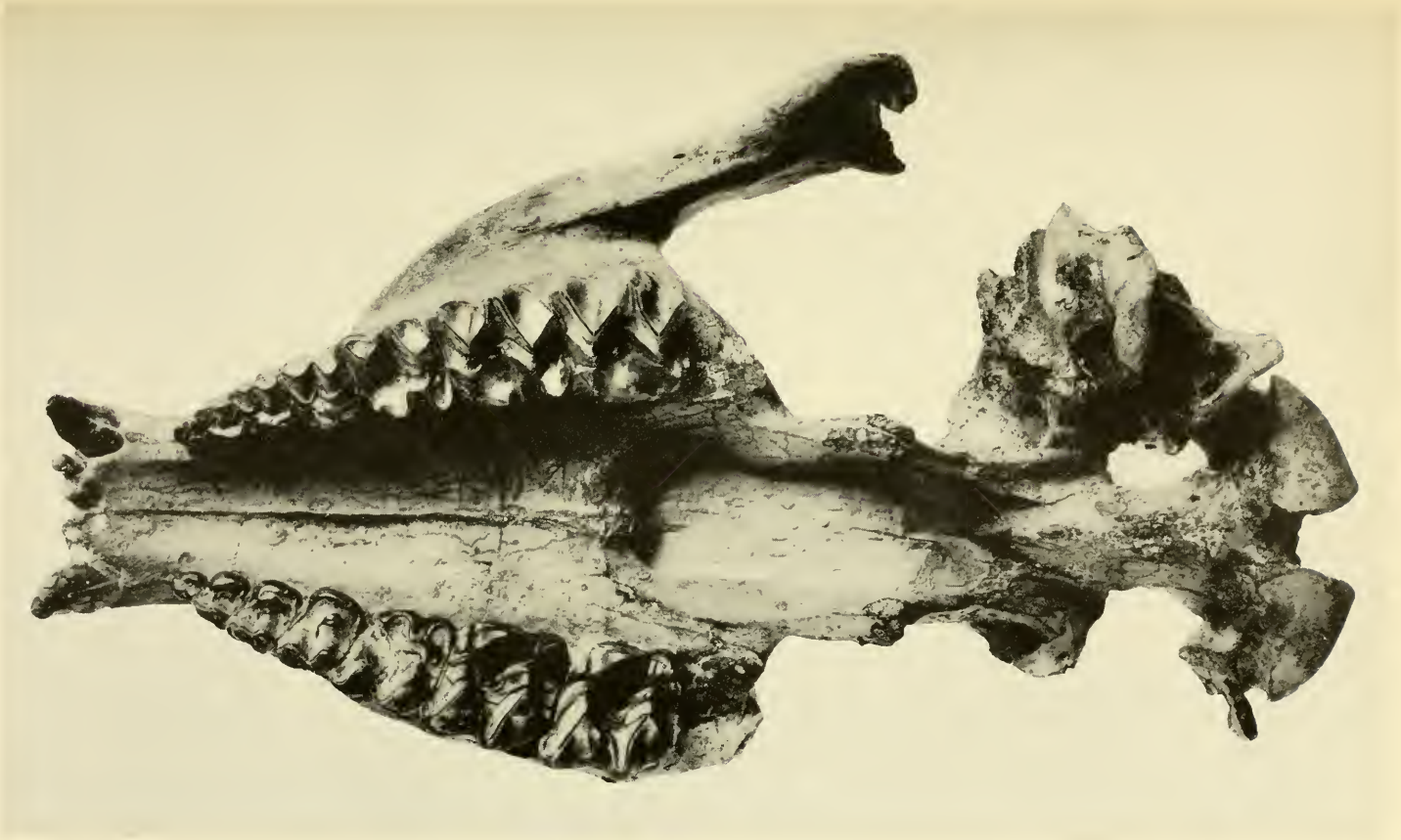
Measurements (in millimeters) of skull, mandible, and dentition of Notiotitanops mississippiensis, *U.S.N.M. No. 16646*

Greatest length from anterior margin of premaxillae to posterior margin of occipital condyles	560
Distance from anterior margin of premaxillae to posterior narial aperture	252
Distance from anterior margin of posterior narial aperture to posterior margin of pterygoids above the hamular processes	120
Distance between M^3 and the apex of the postglenoid process	191
Distance between median incisor alveoli	12.1
Distance across alveoli of two incisors on one side	16.2
Greatest width across canines at cingula	91.6
Width between canines at alveoli	42.7
Least width at constriction posterior to canines	82.5
Width of palate between anterointernal portions of second premolars	50.5
Width of palate between anterointernal portions of second molars	84.8
Width of posterior narial opening ventrally and anterior to the pterygoids	47
Distance from median plane to outer margin of postglenoid process	133
Distance across paroccipital processes near apices	167
Width across occipital condyles	143
Length of upper dentition from anterior margin of canine at cingulum to posteroexternal angle of M^3	288
Distance between alveoli of canine and P^1	28
Length of cheek tooth series, P^1 to posteroexternal angle of M^3	229
Length of premolar series, P^1 to P^4 inclusive	90.7
Length of molar series, M^1 to M^3 inclusive and externally	147
Lateral incisor—anteroposterior diameter: transverse diameter	10.5: 8.8
Canine—anteroposterior diameter at cingulum: transverse diameter	27 : 24

[9] Stock, Chester, Proc. Acad. Nat. Sci., vol. 23, No. 2, pp. 48-53, 1937.

[10] Hanna, M. A., Univ. California Publ., Bull. Dep. Geol. Sci., vol. 16, pp. 256-263, 1927.

P^1—anteroposterior diameter: greatest transverse diameter..... 17.2 : 13.2
P^3—anteroposterior diameter including parastyle: transverse diameter. 26.2 : 30.9
M^1—anteroposterior diameter including parastyle: transverse diameter across mesostyle and protocone..... 43.5 : 42
M^3—anteroposterior diameter externally including parastyle: transverse diameter across mesostyle and protocone..... 58.0 : 56.5
Depth of lower jaw below point between P_4 and M_1 on lingual side..... 90
Depth of lower jaw below occlusal surface of M_2 measured from valley immediately lingual to hypoconid..... 112
Length of preserved lower dentition, P_3 to M_3 inclusive..... 210
Length of lower molar series, M_1 to M_3 inclusive..... 155
P_3—anteroposterior diameter: transverse diameter..... 25.6 : 19.2
M_1—anteroposterior diameter: transverse diameter..... 39.0 : 26.7
M_3—anteroposterior diameter: transverse diameter..... 69.2 : 31



NOTIOTITANOPS MISSISSIPPIENSIS NEW GENUS AND SPECIES

Ventral view of skull, U.S.N.M. No. 16646, type specimen approximately one-third natural size. Lisbon Eocene, Mississippi.

NOTIOTITANOPS MISSISSIPPIENSIS, NEW GENUS AND SPECIES

Lateral view of skull and left ramus of mandible, U.S.N.M. No. 16646, type specimen, approximately one-third natural size. Lisbon Eocene, Mississippi.

NOTIOTITANOPS MISSISSIPPIENSIS. NEW GENUS AND SPECIES

Dorsal view of both rami of the mandible, U.S.N.M. No. 16646, type specimen, approximately one-third natural size. Lisbon Eocene, Mississippi.