W. P. Blake with the respects of the author Joseph Leidy

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DESCRIPTION OF REMAINS OF FISHES

FROM THE CARBONIFEROUS LIMESTONE OF ILLINOIS AND MISSOURI.

REMARKS ON SAUROCEPHALUS AND ITS ALLIES.

OBSERVATIONS ON

THE EXTINCT PECCARY OF NORTH AMERICA;

REMARKS ON

THE STRUCTURE OF THE FEET OF MEGALONYX.

BY JOSEPH LEIDY, M. D.,

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NOTICE OF REMAINS OF THE WALRUS

DISCOVERED ON THE

COAST OF THE UNITED STATES.

BY JOSEPH LEIDY, M. D.

[*From the Transactions of the American Philosophical Society, Volume XI., p.* 83. *Read June* 20, 1856.]

Well-authenticated remains of the Walrus appear never to have been discovered in any other than the most recent geological formations.

In a report presented to the Lyceum of Natural History of New York, Messrs. Mitchell, J. A. Smith, and Cooper, give notice of the discovery of a specimen, consisting of the anterior portion of a Walrus skull, from the sea beach of Accomac Co. Virginia.* These gentlemen observe that the fragment bears the greatest resemblance to the corresponding portion of the skull of the existing species of Walrus, as compared with the figures given by Cuvier in the "Ossemens Fossiles." The specimen now preserved in the cabinet of the New York Lyceum, is represented in two outline figures by De Kay, who under the impression that it indicates an extinct species, has given for this the name of *Trichecus Virginianus*.†

In the summer of 1853, Professor J. F. Frazer of this city discovered the skull of a Walrus on the sea beach at Long Branch, Monmouth County, New Jersey. The specimen which has lately been presented to the Academy of Natural Sciences, has lost a portion of the cranium proper, and the exserted portion of one tusk, but otherwise, except being a little water worn, is in a good state of preservation. It is unchanged in texture, and nearly so in colour; and it belonged to an old individual, as all the sutures are completely obliterated. (Plate IV., fig. 1; V., fig. 1.)

* Annals of the Lyceum of Natural History, II. 271.

† Natural History of New York, Part I. Zoology, p. 56; pl. XIX. figs. 1 a, b.

The form of the facial portion of this specimen corresponds with that of the specimen from Virginia, above mentioned; and the entire skull closely resembles that of the recent Walrus, *Trichecus rosmarus*, as represented in the figures of Daubenton, Cuvier, and De Blainville; and its measurements also are sufficiently near those given by the first named author to recognise it as the same species.*

The tusks in the fossil curved downwardly in a diverging manner, and were about four inches distant from each other at their emergence from the alveoli, and ten inches at their tips. The remaining tusk in the specimen, is thirteen inches long from its alveolar border, and in this latter position it is three inches in diameter antero-posteriorly and one and three-quarter inches transversely.

The second incisor, and the succeeding three molar teeth, contained in the specimen, occupy an extent antero-posteriorly of four and a quarter inches. These teeth are quadrately rounded at their alveolar orifices, and are worn away at their triturating surfaces in an irregularly oblique manner. The first molar tooth is the smallest of the series; and the incisor and the other molars are of nearly equal size.

Quite recently Professor Geo. H. Cook, of New Brunswick, New Jersey, sent for my inspection, the facial portion of a Walrus skull, which also was discovered on the sea beach of Long Branch, New Jersey. The specimen was kindly loaned to Professor Cook by the Rev. Mr. Finch, of Shrewsbury, to whom it now belongs. It is unchanged from its original texture, but is brown from the infiltration of oxide of iron. It also belonged to an old individual, as all the sutures are obliterated, and the third molars together with the greater extent of their alveoli are gone. (Pl. IV., fig. 2.) In its anatomical details the specimen agrees with the corresponding portion of Professor Frazer's specimen, except that it is an inch and a half broader in the position of the canine alveoli, and the antero-posterior diameter of the tusks is rather less.

An important question now arises in relation to the age or geological period to which the three Walrus skulls, thus discovered on the coasts of New Jersey and Virginia, belong. As they appear to be of the same species as the recent *Trichecus rosmarus*, which once lived in great numbers in the Gulf of St. Lawrence, they are most probably the remains of individuals that were once floated upon fields of ice southerly, and left on the present United States coast. Or, perhaps they may be the remains of the same species which probably during the glacial period extended its habitation very far south of the latitude in which it has been found in the historic age.

* Histoire Naturelle, etc. T. XIII. 423.

MEASUREMENTS OF THE FOSSIL WALRUS SKULLS.

	Prof. Frazer's specimen.	Mr. Finch's specimen.
Greatest length of skull estimated,	15 inches.	
Length from mastoid ridge to front of canine alveolus,	12 "	
Greatest length of tempero-orbital fossa,	8½ "	
Length of skull from summit of tempero-occipital ridge to end of nose,	10½ "	
Breadth of narrowest portion of cranium,	3 "	
Breadth of cranium at mastoid processes,	11 "	
Breadth of face at canine alveoli,	8 "	9½ inches.
Height from palatal border to end of nose,	5¼ "	5 "
Height of anterior nasal orifice,	2 "	2 "
Breadth " " "	2¼ "	2¾ "
Length of exserted portion of tusks,	13 "	
Antero-posterior diameter of tusks at alveoli,	3 "	2¾ "
Transverse " " "	1¾ "	1¾ "
Distance of tusks from each other at alveoli,	4 "	3¾ "
Distance " " " tips,	10 "	
Length of inciso-molar series,	4¼ "	4¼ "
Distance apart of third molars,	2¾ "	2½ "
Distance apart of incisors,	11 lines.	14 lines.
Antero-posterior diameter of incisors,	14 "	14 "
Transverse, " "	11 "	11 "
Antero-posterior diameter of first molar,	9 "	8½ "
Transverse, " " "	10 "	10 "
Antero-posterior diameter of succeeding molars,	12 "	13 "
Transverse, " " "	12 "	14 "

In the course of the preceding investigations I was led to examine a specimen, in the cabinet of the Academy of Natural Sciences, consisting of the stuffed skin of a portion of the head enveloping the jaws of a species of Walrus apparently differing from the true *Trichecus rosmarus*, of which, as characteristic, I have viewed the figures of the skull and skeletons as given by Daubenton, Cuvier, and De Blainville. The specimen was presented by Sandwith Drinker, Esq., of Canton, China, and was probably derived from the Asiatic shore of the Arctic Ocean. From the worn condition of the upper incisors and molars, it appears to have belonged to an old individual; and in the case of the lower jaw, the teeth appear to have been entirely worn out. The tusks are very much longer and are narrower than in the *T. rosmarus*, and they curve downward, outward, and inward, instead of continually diverging, as in this species. At their emergence from the alveoli the tusks are two and three-quarter inches apart, near their middle five and a quarter inches, and at their tips only one inch. Their length is twenty-two inches and their diameter

at the alveolar border antero-posteriorly two and a quarter inches, and transversely one and a half inches. Towards their lower part they are twisted from within, forwards and outwardly.

Pennant, in speaking of the Walrus of Nova Zembla and the Frozen Sea, observes, "I entertain doubts whether these animals are of the same species with those of the Gulf of St. Lawrence. The tusks of those of the Frozen Sea are much longer, more slender, and have a twist and inward curvature."*

The superior incisor and molar teeth also are very much smaller than in the fossils of *T. rosmarus*, as may be seen by comparing the following measurements with those already given.

Diameter of the upper second incisor,	5½ lines.
Diameter of the upper first molar,	4½ "
Diameter of the upper second molar,	8 "
Diameter of the upper third molar,	7 "

The hairs of the upper lip of the *T. rosmarus* are stated by Shaw, to be about three inches long, and almost equal to a straw in diameter.† In the specimen under consideration, the hairs of the moustache are stiff-pointed spines, not more than one line long at the upper part of the lip, and they gradually increase in size, until at the lower and outer part of the lip they are about one inch in length.

[Dec. 22, 1856. Since presenting the above communication to the Society, the Academy has received from Mr. Drinker, of Canton, an entire specimen of the Walrus of Northern Asia. In this individual, which measures in a straight line eight feet from the nose to the tail, the tusks are ten inches long, and diverge from their alveoli to the tips, where they are five and a half inches apart, but they are slender, as in the stuffed head above mentioned, and appear as if they would ultimately have obtained the same length and direction. Perhaps the peculiarities noticed may prove to be of a sexual character.]

Plate IV., Fig. 1. Side view of the fossil skull, of the Walrus discovered by Professor Frazer, one-half the diameter of nature. Fig. 2. Inferior view of the specimen discovered by Mr. Finch, also reduced one-half.

Plate V., Fig. 1. Inferior view of Prof. Frazer's specimen.

* Arctic Zoology, I. 170.

† Shaw's Zoology, vol. I. Pt. I. p. 234.

DESCRIPTIONS OF THE REMAINS OF FISHES

FROM THE

CARBONIFEROUS LIMESTONE OF ILLINOIS AND MISSOURI.

BY JOSEPH LEIDY, M. D.

[*From the Transactions of the American Philosophical Society, Volume XI., p. 87. Read July* 18, 1856.]

The present communication consists of short descriptions of remains of Cestraciont fishes, principally discovered by Dr. Benjamin Shumard of St. Louis, in the Carboniferous Limestone of Illinois.

From the variety in form of the teeth in different positions of the jaws of *Cestracion Phillippii*, the only surviving member of its family, we may infer that in the determination of extinct species from isolated teeth, which form the usual condition of the remains of Cestraciontes, we may consider as characteristic of several genera and species what may really belong to a single species. Under the circumstances the error is perhaps unavoidable; and it must be left to subsequent discovery, in which entire series of teeth in their original relationship may be found, to correct the error.

COCHLIODUS AG.

1. COCHLIODUS NITIDUS, Leidy.

This species is proposed on the specimen of a tooth, apparently from the left side of the lower jaw. The tooth is trilateral in outline, with the inner border convex, the anterior thick and straight, and that postero-externally straight and oblique in its direction. The triturating surface is transversely convex, with an anterior narrower and a posterior broad groove dividing three ridges crossing the tooth obliquely. Structure finely porous. Length from the posterior to the anterior angle seven lines; breadth of anterior border four and a half lines; breadth of inner border six lines.

Locality.—Carboniferous limestone of Chester, Illinois. Plate V., Fig. 2. Tooth of *Cochliodus nitidus.*

2. COCHLIODUS OCCIDENTALIS, Leidy.

This species is proposed on eight more or less imperfect specimens of teeth. In their perfect condition, the teeth have a trilateral outline; are strongly curved transversely; and have the outer extremity narrow, the inner border convex, the anterior part recurved, and the posterior border thick and slightly concave. The posterior two-thirds of the triturating surface are prominently convex and smooth, or wrinkled transversely or longitudinally. Structure coarsely porous. Antero-posterior diameter from eight lines to nearly an inch; transverse diameter from eight lines to one and a quarter inches.

Locality.—Carboniferous limestone of Warsaw, Illinois. Besides the preceding specimens there were discovered in the same locality fragments of six larger teeth, which are too imperfect to judge of their form. Possessing the same structure as those just described, they may probably be the middle teeth of the series in the jaws. The largest of the specimens is three lines thick, and all appear as if they might be the greater portion of trilateral plates. Their triturating surface is moderately convex and smooth, or slightly wrinkled. At one broken border it appears as if it were recurved, and at the opposite border it turns downwards at right angles, and what is probably the inner border is thick and convex.

Plate V., Figs. 3—10. Teeth of *Cochliodus occidentalis.* Figs. 11—16. Six fragments of teeth last referred to in the above description, and probably belonging to *C. occidentalis.*

3. COCHLIODUS LATUS, Leidy.

This species is proposed on a fragment of a large tooth, apparently a second of the series in the jaw. In its perfect condition the tooth has been over two inches in length, and more than one and a half in breadth. The triturating surface presents two oblique convexities separated by a shallow depression, and there may have been a third ridge at the anterior border. The postero-internal angle of the specimen is abruptly bevelled off, apparently as the result of wearing. The structure is coarsely porous.

Locality.—With the preceding species.

Plate V., Fig. 17. Tooth of *Cochliodus latus;* the margins of the specimen being broken.

HELODUS AG.

4. HELODUS GIBBUS, Leidy.

This species is proposed on a single and imperfect specimen of a tooth, which in the fragment exhibits a prominent gibbosity obscurely divided into two. Surface coarsely porous. Height of crown three lines; probable length when perfect one and a quarter inches; probable breadth in the same condition seven and a half lines.

Locality.—The Carboniferous limestone of Warsaw, Illinois. Plate V., Fig. 18.

CHOMATODUS, AG.

5. CHOMATODUS VENUSTUS, Leidy.

This species is founded on the specimen of a tooth, the crown of which forms a narrow, oblong, quadrilateral plate elevated on the outer side, into an obtuse ridge. The latter rises towards its middle into a mammillary eminence with a truncated apex, centrally impressed and punctured at the margin. Along the summit of the ridge, to one side of the principal eminence, there are five other similar but comparatively minute ones, and on the opposite side there are several others nearly obsolete. The internal side of the crown is depressed, and is bordered by four or five delicate folds of ganoine, which are likewise in a much enfeebled condition, extended on the outer side of the crown. The root of the tooth is a narrow, thin, flat plate extending in the direction of the crown. Length of the specimen seven lines; breadth at middle two lines; depth at middle one and a half lines.

Locality.—From the Carboniferous limestone of Warsaw, Illinois. Plate V. Fig. 19. Triturating surface of the tooth of *Chomatodus venustus*, magnified three diameters. Fig. 20. Profile section of the same tooth at the middle; three diameters. Fig. 21. Profile section at one side.

6. CHOMATODUS OBSCURUS, Leidy.

This species is proposed on a fragment of a tooth, the crown of which in its perfect condition appears to have been an oblique, oblong, quadrilateral plate, with an obtuse, compressed hemi-elliptical ridge extending along the outer part of the triturating surface. The latter is bordered by a basal ridge apparently worn smooth in the specimen, except in one position, where it exhibits five folds of ganoine. The root is hemi-elliptical, extended in the length of the crown, and is twice the depth externally that it is internally. Height of the specimen four and a quarter lines; antero-posterior diameter of the crown, when perfect, about four and a quarter lines; probable transverse diameter twice its present extent, which is seven lines; depth of root internally two lines, externally four lines.

Locality.—The Carboniferous limestone of Warsaw, Illinois. Plate V. Fig. 22. Triturating surface of the tooth of *Chomatodus obscurus*. Fig. 23. Profile section of the tooth.

PALAEOBATIS, Leidy.

7. PALAEOBATIS INSIGNIS, Leidy.

This species is proposed on a fragment of a remarkable tooth, recalling to mind one of the dental plates of *Myliobates*, of which plates the specimen apparently corresponds to the half of one. The upper surface of the crown is a linear plane, and its posterior side presents a single row of deep pits, of which about four may be counted in each line of extent; and below the row of pits a band-like basal ridge without folds, separates the crown,

from the root of the tooth. The anterior side of the crown has developed from it a scroll-like ridge, the edge of which is nearly on a level with the triturating surface, and includes between it and the latter a wide sulcus. The root posteriorly forms a nearly vertical plane, but anteriorly is subdivided into a series of demi-cylindrical fangs, confluent at their back part. The bottoms of these fangs exhibit the orifices of coarse nutritive canals; and the crown of the tooth is a very little more dense in structure than the root. The transverse diameter of the specimen in its present condition is eight lines, but in its perfect condition has probably been twice this extent. The antero-posterior breadth of the crown is one and a quarter lines, and the height one and three quarter lines.

Locality.—The Carboniferous limestone of Warsaw, Illinois.

The specimen upon which this species is founded appears to resemble the figure 9, of table 12, in volume iii., of Agassiz' Poissons Fossiles, representing the tooth of *Chomatodus linearis*, but the figure is so obscure that I can make nothing of its details.

Plate V. Fig. 24. Posterior view of the tooth of *Palaeobatis insignis;* magnified two diameters. Fig. 25. Anterior view of the same tooth; magnified to the same extent. Fig. 26. Profile section of the same tooth; magnified four diameters.

Ctenoptychius, Ag.

8. Ctenoptychius digitatus, Leidy.

The species is proposed on a fine specimen of a remarkable-looking tooth discovered by Mr. Koch, the celebrated explorer of extinct animal remains, and presented by him to Dr. Shumard of St. Louis.

The crown is palmate in form, with the sides vertical, excepting that the outer one slopes inferiorly to the basal ridge. The summit is divided into four unequal, thick, obtuse, digitate processes, of which the median pair are confluent. The basal ridge descends much lower externally than internally, and in the former position is acute, in the latter thick, and presenting only the faintest trace of folding. The root slopes inwardly from the basal ridge on the outer side, and its inner side presents an extensive shallow excavation. Length of the specimen nine lines; breadth nine lines; length of the crown externally six lines; internally three and a half lines; depth of the root externally three and a half lines; internally five lines.

Locality.—Carboniferous limestone, near St. Louis, Missouri. Plate V. Fig. 27. Internal view of the tooth. Fig. 28. External view. Fig. 29. Profile section.

REMARKS ON SAUROCEPHALUS

AND

ITS ALLIES.

BY JOSEPH LEIDY, M. D.

[*From the Transactions of the American Philosophical Society, Volume XI., p. 91. Read November 21, 1856.*]

THE genus *Saurocephalus* was founded by Dr. Harlan on a specimen consisting of the greater portion of the right upper maxillary bone with teeth of a sphyrænoid fish, discovered in a cavern on the Missouri River, and which probably belonged to the cretaceous period. The animal was supposed by Dr. Harlan to have been a saurian, and to the species he gave the name of *S. lanciformis.*

A second and much smaller species was subsequently described by Dr. Hays under the name of *Saurodon Leanus*, from a specimen consisting of the upper and lower jaws, obtained from the green sand of New Jersey, and now in the possession of Dr. Isaac Lea, who has kindly loaned it to me for inspection. Dr. Hays was aware that the animal indicated by this specimen belonged to the same genus as the species described by Dr. Harlan with the name of *Saurocephalus lanciformis*, but conceiving the generic name not appropriate, changed it to that of *Saurodon.*

In both species the superior maxillary bone is a trapezoidal plate a little convex externally and concave internally. Its two longer borders are the dental border, and the upper one, which is directed backward and downward, and externally is jagged as if for sutural connexion with other bones. The posterior border is also jagged, yet it is too imperfect in the specimens to judge accurately of its natural condition. The anterior border is longer than that just indicated, and in the specimen of *Saurocephalus Leanus* is united by suture with the premaxillary bone. (Pl. VI. fig. 8, 12 a.)

The number of teeth occupying the maxillary bone of *S. Leanus* (fig. 12 a,) appears to be thirty-six, but in *S. lanciformis*, (fig. 8,) so far as can be judged from the imperfect specimen under consideration, the number appears to have been eight or ten less.

The teeth in the corresponding bone of both species are very nearly alike in form; and they have the same mode of insertion and order of succession as in the existing *Sphyræna*. The crown or exserted portion of the tooth, with a thin enameloid investment, is compressed conical, with trenchant borders and an acute summit. The transverse section near the base is carinated at the poles, convex externally, and trilateral internally. In *S. lanciformis* the crown is straight; its breadth equal to its length, and the thickness half the extent of the breadth; and the trenchant borders are finely denticulate. In *S. Leanus* the crown is slightly curved inwardly; its length is a third greater than the breadth; and the trenchant borders are entire, and extend more upon the fang than in the former. The fang is from two to three times the length of the crown, and tapers towards its free extremity. Internally it is convex, and externally trilateral with the intermediate face grooved, which condition often extends upon the corresponding face of the crown as represented in the enlarged figure 15.

The surface of the crown is striate, but so very minutely that the elevation of the striæ is hardly perceptible. This condition is distinct from the more visible structural folding in the enameloid substance.

In the maxilla of *S. lanciformis* a layer of coarsely granular ossific substance, which invested its outer surface, accumulates at the dental border and envelopes the base of the teeth, and on the inner side of the jaw is defined by a groove containing a series of foramina communicating with the cavities of the successional teeth. In *S. Leanus* a similar layer invests the outer face of the jaw, but does not accumulate at the dental border, where it ceases abruptly. In this species on the inner side of the dental border, vertical notches exist opposite the teeth, terminating below in foramina communicating with the reserved cavities for the successional teeth, as seen in fig. 13.

In the specimen of *S. Leanus* the premaxillary is a quadrate curved bone united by suture with the anterior border of the maxillary, and turned inward at the border where it joins the corresponding bone of the opposite side. Its dental border appears to have supported ten teeth, of which those posterior are of the same size and form as those of the maxillary bones, and the anterior ones, though broken away, judging from the remains of their alveoli, appear also to have been of the same size. The contiguous parts of the premaxillary and maxillary bones at their upper part support a tubercle with a smooth surface, as in fishes ordinarily. (Fig. 12, a, b.)

In the shortness of the premaxillary, its union and continuity with the maxillary, and the support of teeth by the latter, we have an extraordinary variation from the condition of things as existing in the living *Sphyræna;* and indeed the two bones in their form, relative position, union, and continuity of the dental borders, exhibit a striking resemblance to the same parts in the lacertian reptiles.

The lower jaw of *Saurocephalus*, as indicated in the specimen of *S. Leanus*, preserves much more the form and general appearance of that of *Sphyræna* than the upper one. The dental bone has nearly the same outline of form as in the latter, but it is deeper in relation with its length, and is less convex externally. Its symphysis presents very much the appearance of that of *Sphyræna*, though I am not satisfied that the comparatively feeble tubercle antero-internal to the dental border supported a large tooth as in this genus, and of which I can detect no trace. The articular bone holds the same relative position as in *Sphyræna*, as does also its articular process, which is however much more vertical in its direction. (Fig. 14.)

The dental border of the lower jaw appears to have supported about forty-two teeth, which have nearly the same size and form as those of the upper jaw, in which respect this genus further strikingly differs from *Sphyræna*. The inner side of the dental border with its notches presents the same appearance as in the upper jaw.

The more uniform size of the teeth in both jaws of *Saurocephalus* approaches the genus more closely to another extinct allied genus, *Sphyrænodus*, than to *Sphyræna*, and indeed I have a suspicion that a careful comparison of the specimens upon which the two former genera were founded may prove them to be identical.

Professor Agassiz has described and represented a number of isolated teeth (Pois. Fos. V. 102, pl. 25, c. figs. 21—29,) of a large sphyrænoid fish, from the chalk of Lewes, England, which he erroneously refers to the *Saurocephalus lanciformis*, Harlan. Although teeth of the size of those in the fragment of an upper jaw, described by Dr. Harlan, might be inferred from the examination of the *Sphyræna barricuda*, to be accompanied with teeth in the lower jaw, as large as those attributed to *S. lanciformis* by Agassiz, yet the jaws of *Saurocephalus Leanus*, prove this not to be the case.

The crowns of the teeth of *S. lanciformis*, Harlan, are almost as broad as they are long, and do not measure more than 2½ lines, whereas the corresponding portions of the teeth referred by Agassiz to this species, as represented in his figures, measure from 5 to 15 lines long, and from 2½ to 6 lines broad.

Dixon, in his Geology of Sussex, following Agassiz, refers portions of the lower jaw and teeth of a large sphyrænoid fish (pl. xxx. fig. 21; xxxi. figs. 12; xxxiv. fig. 11,) apparently the same as that indicated by the figures of Agassiz above noticed, also erroneously to the *Saurocephalus lanciformis*. In a note to page 375 of the same work, he further attributes the rostrum of a Xiphioid fish (pl. xxxii.* figs. 1) to *S. lanciformis*, to which it certainly does not belong.

Professor Owen's sectional view of the structure of the teeth of *Saurocephalus* (Odonto-

graphy, pl. 55,) was taken from a specimen obtained from Dr. Harlan, and is therefore correct as regards the genus to which it is referred.

Count Münster has described and figured remains, which he refers to three different species of *Saurocephalus* (Giebel, Fauna der Vorwelt, 88,) but to his work I have not had access, and cannot therefore know whether he is correct or not.

Reuss (Verst. d. Böhm. Kreideform. 13, pl. iv. fig. 67) has described an isolated tooth of a fish, which he attributes to the *Saurocephalus lanciformis,* but it does not belong to this, and I think it doubtful even whether it belongs to the same fish supposed to be that species by Agassiz.

Gervais (Zool. e. Palæont. Franc. pl. 70, figs. 5—7,) has represented several large teeth which he attributes to the *Saurocephalus* of Harlan, but these belong to the fish supposed to be of that genus by Agassiz.

To *Saurodon Leanus* Hays, Agassiz has erroneously referred the fragment of a palate bone with teeth (Pois. Foss. v. 102, pl. 25 c. figs. 30, 31) of another large sphyrænoid fish from the chalk of Lewes, England. Though the true *Saurocephalus* may have had semi-barbed teeth to the palate bone, like those just referred to in the fragment described by Agassiz, yet this could not fairly be inferred from the condition of the living *Sphyræna.*

Dixon has noticed and represented (Geol. Sussex, 373, pl. xxx. figs. 28, 29; xxxii.* fig. 10) several large, isolated, semi-barbed teeth, and a lower jaw and palate bone with teeth, which following Agassiz, have been referred to *Saurodon Leanus,* Hays, to which they certainly cannot belong. The teeth in the lower jaw just mentioned, resemble in form and size those attributed to *Saurocephalus striatus* (Agassiz, Pois. Foss. v. 102, pl. 25 c. figs. 17, 20; Dixon, Geol. Sussex, 375, pl. xxxv. figs. 5,) and a careful examination of the specimens may prove the remains referred by Agassiz and Dixon to the latter and to *Saurodon Leanus* to belong to the same species of fish, though not the *Saurodon Leanus* described by Dr. Hays.

In concluding the above remarks, I have prepared the following corrected list of the fishes which have been attributed to the *Saurocephalus* of Harlan.

1. SAUROCEPHALUS LANCIFORMIS, HARLAN.

Jour. Acad. Nat. Sci. iii. 337, pl. xii. figs. 1—5; Med. a. Phys. Res. 362, pl. figs. 1—5; Trans. Geol. Soc. i. 87; Owen: Odontography, 130, pl. 55.

Saurodon lanciformis Hays: Trans. Phil. Soc. iii. 476, pl. xvi. fig. 11.

2. SAUROCEPHALUS LEANUS, HARLAN.

Saurodon Leanus Hays: Trans. Am. Phil. Soc. iii. 477, pl. xvi. figs. 1—10.
Saurocephalus Leanus Harlan: Trans. Geol. Soc. i. 87.

3. PROTOSPHYRAENA FEROX, LEIDY.

Saurocephalus lanciformis Harlan, Agassiz: Pois. Fos. v. 102, pl. 25 c. figs. 21—29; Dixon: Geol. Sussex, 374, pl. xxx. fig. 21, xxxi. 12, xxxiv. 11; Pictet: Traité d. Palæont. pl. xxxii. figs. 7; Giebel: Odontog. pl. xliii. fig. 7; Reuss: Verst. Böhm. Kreidef. 13, pl. iv. fig. 67?

Tooth of an unknown fish, and tooth of a species of Squalus, Mantell: Geol. Sussex, 227, 228, pl. xxxiii. figs. 7, 9.

Saurocephalus Harlan, Gervais: Pal. Franc. pl. 70, figs. 5—7?

4. PROTOSPHYRAENA STRIATA, LEIDY.

Saurocephalus striatus Agassiz: Pois. Fos. v. 102, pl. 25 c. figs. 17—20; Dixon: Geol. Sussex, 375, pl. xxxv. figs. 5.

5. CIMOLICHTHYS LEVESIENSIS, LEIDY.

Saurodon Leanus Hays, Agassiz: Pois. Fos. v. 102, pl. 25 c. figs. 30, 31; Dixon: Geol. Sussex, 373, pl. xxx. figs. 28, 29, xxxii.* fig. 10; Pictet: Tr. d. Pal. pl. xxxii. fig. 6.

(?) *Saurocephalus striatus* Agassiz.

6. XIPHIAS DIXONI, LEIDY.

Saurocephalus lanciformis Harlan, Dixon: Geol. Sussex, note to p. 375, pl. xxxii.* figs. 1.

Plate VI. fig. 8. Greater portion of the left superior maxilla of *Saurocephalus lanciformis* Harlan, natural size.

Fig. 9. One of the teeth, magnified three diameters.

Fig. 10. Section of the crown at base, magnified three diameters.

Fig. 11. Section of the fang, magnified.

Fig. 12. Left maxillary (a,) and pre-maxillary (b,) of *Saurocephalus Leanus* Harlan, natural size.

Fig. 13. Internal view of the same specimen.

Fig. 14. Left ramus of the lower jaw of *S. Leanus*.

Fig. 15. Upper tooth, magnified four diameters.

OBSERVATIONS ON

THE EXTINCT PECCARY OF NORTH AMERICA;

BEING A

SEQUEL TO "A MEMOIR ON THE EXTINCT DICOTYLINÆ OF AMERICA."

BY JOSEPH LEIDY, M. D.

[*From the Transactions of the American Philosophical Society, Vol. XI. Read November* 21, 1856]

In attempting to determine extinct animals from a few remains, we are frequently perplexed to know whether one or more species of a genus or of several genera are indicated. Were specific characters unvarying, which perhaps could not be the case, the difficulty though lessened would not be removed, for recent animals exhibit the fact, that while many species are well characterized by external marks, they are not so by the dentition and skeleton.

At the period of publishing "A Memoir on the Extinct Dicotylinæ of America," in the Transactions of this society, (Vol. X., p. 323,) feeling dissatisfied with the results, I determined to reinvestigate the subject, which having done, with the aid of additional material both recent and fossil, I have come to the conclusion that all the Dicotyline animals supposed to be indicated by the fossil remains, described in the memoir just mentioned, really belong to one species of Peccary.

In comparing a considerable number of skulls of the recent *Dicotyles torquatus*, I find that variations occur equal in value to the characters upon which the different Dicotyline genera and species have been proposed by Dr. Le Conte and myself.

Notice of variations in the skull of the recent Dicotyles torquatus.—The skull of *Dicotyles torquatus* varies considerably in size; the smallest and largest adult specimens observed differing more than an inch in length. It also varies in the breadth and convexity of the forehead; in the length and thickness of the parietal crest; in the width and prolongation of the face; in the degree of extension forward of the malar ridge; in the concavity of the malar bones; in the extent of inversion of the angle of the lower jaw; the breadth of the

symphysis; and indeed hardly an anatomical feature can be mentioned which does not present considerable variation among a large number of skulls.

In examining the dentition, all the teeth will be found to vary considerably in size, though generally only in proportion with a variation in the size of the skull. The crowns of the first and second lower incisors indicate more or less tendency to become bilobed; sometimes the appearance is quite strong, at others feeble. The crowns of the upper incisors, vary in the degree of development and irregularity of their basal ridge, and in the degree of concavity of their interior surface. The canines vary in robustness and in the degree of divergence. Those below differ in the extent of development of the exterior ridge, which is sometimes very prominent, and occasionally is nearly obsolete. Usually the upper ones have an even surface, but sometimes present a longitudinal groove on one or both sides. As the crowns of the canines are worn down, their fangs become thickened by a deposit of cementum.

Of the inferior molars, the last true one varies considerably in its exact form and proportions. It is oblong ovoid, trilateral, or oblong square. It sometimes presents five, nearly uncomplicated, mammillary tubercles; at others the unsymmetrical tubercle is more or less subdivided, and the crown generally presents a more complex appearance by the introduction of offsets from the principal tubercles; and sometimes the fifth lobe degenerates into a thick basal ridge. The anterior true molars vary in the extent of corrugation of their lobes. The inferior premolars vary considerably in form. Their crown generally is ovoid, and usually presents in succession a small anterior tubercle, a transverse pair of large mammillary tubercles, and a broad tubercular heel. The anterior tubercle is sometimes nearly obsolete, especially in the first premolar, and occasionally in the last one. Not unfrequently the last premolar assumes the appearance more or less complete of a true molar.

The superior molars vary in corresponding characters with the lower ones. The last of the series has a more or less square, or ovoidal crown, is variably corrugated, and has a posterior basal ridge varying in extent of development. The last premolar varies in form from that of the teeth preceding it to that of the succeeding true molars. The second premolar resembles the one below, except that it is more square; and sometimes, it also assumes the appearance of a true molar. The crown of the first premolar varies in the degree of development of its tubercles and basal ridge.

The value of sexual differences in the skull of *Dicotyles torquatus*, I have not been able to ascertain for want of authentic specimens of the two sexes, but perhaps the smaller skulls with less robust teeth, above indicated, belong to the female, while the others belong to the male.

Remarks on the discovery of remains, and distinctive characters of the extinct Peccary.—Remains of the Peccary have been discovered in Illinois, Kentucky, Iowa, Missouri, and Virginia. The most important specimen yet obtained of these remains, is a nearly perfect skull, completely unchanged in original texture, which was found in a saltpetre cave in Kentucky, and was presented by Dr. Samuel Brown, in 1805, to the American Philosophical Society, in the cabinet of which it remained for nearly half a century with the impression of all who examined it, that it was the skull of a recent Peccary. More accurate information of the exact locality in which the specimen was found I have not obtained.

The first remains of the extinct Peccary of North America were described by Dr. John L. Le Conte, from specimens obtained by Mr. Snyder, of Galena, Illinois, in the vicinity of that city. These remains consisted of a number of bones and teeth, with fragments of others, and were found in association with remains of an extinct species of *Procyon* and a tooth of an extinct genus to which Dr. Le Conte gave the name of *Anomodon*.

In a recent visit to Galena, Illinois, through the aid of Dr. E. D. Kittoe, and Dr. Hempstead, of that city, I had an opportunity of examining the localities in which fossil remains of the Peccary are found; and Dr. Kittoe gave me a number of additional specimens. The localities referred to, occur in the cliff limestone,* which is widely extended through Wisconsin and portions of Illinois and Iowa, is full of irregular fissures containing lead ore, and is remarkable for the singular weather-worn and castellated appearance it presents in exposed situations. Within the lead-bearing crevices, in the vicinity of Galena, bones have frequently been found, and they may also have been discovered even more frequently in similar positions in Wisconsin, but as yet, I have seen no evidence of such discovery. The bones are generally exceedingly friable, often chalk white and resembling recent ones calcined; and they are enveloped in a loose or more or less compact matrix of brown ferruginous sand. Occasionally, the remains are found in abundance, and in one instance a miner informed Dr. Kittoe that for several days together he had been engaged in removing bones from a lead crevice, but not knowing they were of any value, they were thrown among other rubbish removed from the mine, where from their very great friability, they were soon destroyed through the action of the weather. At my instigation, Dr. Kittoe employed two miners to enter a deserted lead crevice, in which it was stated bones had been found; and after some trouble in removing rubbish that had fallen in from above, they obtained about a quarter of a peck of bones and fragments of the extinct peccary, together with a few fragments of bones and numerous incisor and a few molar teeth of four rodents. These latter may, on subsequent investigation, prove to be extinct species,

* An appropriate name given to it by Dr. D. D. Owen, who says this rock is a subdivision of the mountain limestone group.

but the remains are not distinguishable in anatomical character from the corresponding parts of the recent *Arctomys monax*, *Pseudostoma bursarius*, *Lepus sylvaticus* and *Arvicola*.

A list of the Dicotyline remains which have been obtained at Galena, is given in the concluding portion of this paper.

Of other remains of the Peccary, Dr. R. W. Gibbes obtained a small fragment of the lower jaw with a canine tooth, described by Dr. Le Conte, from Benton Co., Missouri, where it was discovered in association with the remains of the *Mastodon*.

Recently, Dr. Le Conte presented to the Academy of Natural Sciences, a small fragment of the lower jaw containing the last temporary molar tooth, of the extinct peccary, from Augusta County, Virginia.

Through the kindness of Professor Wyman, I have lately had the opportunity of examining a number of remains of the extinct peccary, discovered in Iowa, by Dr. Foster. The remains consist of one half of the lower jaw with the canine and molar teeth, the upper jaw with the molars, and a malar bone of an adult animal, together with fragments of the skull of a very young animal.

Upon the observed varieties of structure in the first collection of remains of the extinct peccary, obtained through Mr. Snyder of Galena, and described by Dr. Le Conte, were proposed the names of *Platygonus compressus*, *Hyops depressifrons*, *Dicotyles depressifrons*, *Protochoerus prismaticus*. Upon a small fragment of the lower jaw with one canine tooth of the same extinct species of peccary, from Benton Co., Missouri, also described by Dr. Le Conte, the name of *Dicotyles costatus* was proposed, and upon the cave head from Kentucky, described by myself, the name of *Euchoerus* (*Protochoerus macrops*) was proposed. All these I am now inclined to believe belong to a single extinct species of peccary, and must be included under the name of *Dicotyles compressus*, unless the anatomical characteristics, which have been given in detail in my former memoir on the Extinct Dicotylinæ of America, should be considered subgeneric, when the original name of *Platygonus compressus* must represent the whole of those which have been employed. All the points of variation in the different specimens described in the memoir just referred to, find their corresponding equivalents in different individuals of the recent *Dicotyles torquatus*, and therefore cannot be allowed to retain the value that we too hastily had given them.

The extinct *Dicotyles compressus*, was a little larger than the existing *Dicotyles labiatus*, and its other most important differences from this and the more common species, *D. torquatus*, chiefly observable in the skull, are briefly as follows. The face is more prolonged and narrower, the upper outline of the head is less inclined from the horizon, the forehead is much broader, the cheeks deeper, the orbits have a more supero-posterior position, the sides of the inion are less oblique, the technical angle of the lower jaw is strongly everted and the

symphysis is narrow and keeled, the incisor teeth are smaller, and the principal lobes of the molar teeth possess a greater proportionate degree of development.

Comparison in the varieties of dentition observed in Dicotyles compressus.—In figures 5, 6, plate 37 of volume X. of these Transactions, is given a representation of the right upper series of molar teeth, of the cave head, formerly viewed as characteristic of *Euchoerus macrops*. The teeth may be observed to be constructed on the same plan as those of the recent peccaries, but strikingly to differ in the greater degree of development of their primary lobes.

In figure 2, plate 6, accompanying this communication, is represented the corresponding series of teeth, from the Iowa fossil in possession of Dr. Wyman. These teeth have slightly more robust proportions than those in the cave head; and they also belong to an adult individual, whereas in the latter, the permanent premolars and last true molar, had not yet protruded from the gums. The crown of the last true molar in the Iowa fossil, is less narrowed posteriorly than in that of the cave head, its postero-external lobe is proportionately with its fellow much better developed, and the basal ridge does not extend exterior to the latter, as it does so conspicuously in the cave head. In the preceding true molars, the lateral offsets of the inner lobes are rather better developed than in the cave head. The crowns of the premolars have rather different outlines in the two fossils; and in the case of the first of the series, it is trilateral in the Iowa specimen, and quadrilateral in the cave head. In the last two premolars the thick basal ridge continues around the inner side in the former, as in the first premolar, but does not do so in the cave head.

In the imperfect series of isolated upper molars, represented in figs. 12, 13, plate 37, volume X., formerly referred to *Platygonus compressus*, a condition is observable in the last two true molars, so different from that in the teeth just disposed of, that if they had been discovered unassociated with congeneric remains, almost any naturalist would have supposed they belonged to a taperoid, rather than to a dicotyline animal. The crown of the last true molar, has its unsymmetrical lobe in a most rudimental condition; and it has a quadrilateral oval outline instead of being trilaterally ovoidal. In this and the preceding tooth trituration has advanced more in clearing out the transverse valleys, than in wearing away the summits of the lobes, so that the teeth have assumed an appearance resembling that of the inferior molars of the Tapir, whereas in the recent peccaries ordinarily, and as is also observable in the corresponding teeth of the Iowa fossil, fig. 2, plate 6, the summits of the lobes are worn away without clearing out the transverse valleys. These facts would lead to the supposition that we really had before us the remains of two distinct genera of animals in which the trituration of the teeth proceeded on a different plan, but an inspection of the first and second true molars in the cave head, and the inferior true molars of *Dicotyles compressus* led me to view the difference as only another individual peculiarity

of the fossil species just named. The premolars of the series under examination, fig. 12, pl. 37, resemble more closely those of the cave head than of the Iowa fossil, except the first tooth, which differs from the corresponding one of both these fossils in being smaller and in possessing but a single large conical lobe.

Figures 14, 15, pl. 37, vol. X., represent another imperfect series of isolated upper molars, formerly referred to *Platygonus compressus*, and these teeth nearly resemble the corresponding ones indicated in the former figures and those of the cave head.

Figure 11, pl. 37, further represents a series of unworn premolars contained in a fragment of a skull, formerly also referred to *P. compressus*, and these resemble the isolated ones of fig. 12, pl. 37, but unworn.

In figures 7, 8, plate 37, is given a representation of the inferior right series of molars of the cave head above referred to, in which the same striking increase in development of the principal lobes is observable, in comparison with their condition in the recent peccaries, as in the case of the upper molars.

In figure 3, pl. 6, we have a representation of a corresponding series of teeth, to that just indicated, from one of the Iowa fossils, in possession of Prof. Wyman. The teeth of this fossil are slightly more robust than those of the cave head, and the premolars are less square or are more laterally compressed, a variation which is frequent in different individuals of the recent *Dicotyles torquatus*. In the last true molar, the contiguous sides of the anterior pair of lobes are much less concave than in the cave head, and the unsymmetrical lobe is almost simple, while it is subdivided in the latter.

In an inferior series of molars, contained in a fossil fragment, from Galena, presented by Dr. Edward Kittoe, the teeth are considerably smaller than in either of the corresponding series just dispensed with, and the transverse valleys of the true molars appear rather more open in consequence of a less proportionate degree of development of the lateral offsets of the inner lobes. In the last molar the unsymmetrical lobe forms a single large conical tubercle.

Figure 10, plate 37, represents two inferior back molars, contained in the fragment of a lower jaw, formerly attributed to *Platygonus compressus*. The teeth pretty closely resemble the corresponding ones of the series last indicated in a more worn condition; and in the open transverse valleys, they bear much likeness to the opposing upper teeth of fig. 13, which accompanied them.

We further possess two isolated, slightly worn, back inferior molars, from Galena, one of which presents a variation from the more common condition in having its unsymmetrical lobe diminished in size and enclosed by a thick basal ridge.

Figure 18, plate 37, represents the fragment of a back inferior molar, formerly viewed

as characterizing *Protochoerus prismaticus*. In comparison with the last molars of *Dicotyles torquatus*, represented in figures 1 and 3, plate 37, it would be considered to belong to the lower jaw, but in comparison with the corresponding teeth in the cave head, figures 5 and 7, it would certainly be viewed as belonging to the upper jaw.

As indicative of the smaller size of the incisors of *Dicotyles compressus*, in comparison with those of the recent peccaries; representations of the following specimens, presented by Dr. Kittoe, are given in plate 6, accompanying this communication. Figure 4, an anterior view of the first superior incisor of the left side; figure 5, a view of the upper right lateral incisor; and figures 6, 7, lateral views of the first and second inferior incisors. The third inferior incisor, of the cave head, of *D. compressus* is represented in figure 19, plate 37, vol. X. of these Transactions.

List of remains of the extinct Peccary, (DICOTYLES COMPRESSUS,) *observed by the author.*—1. An almost perfect skull accompanied with the lower jaw, entirely unchanged in texture. It was discovered in a saltpetre cave in Kentucky, and was presented to the American Philosophical Society, in 1805, by Dr. Samuel Brown; and is now deposited in the cabinet of the Academy of Natural Sciences. It has lost a portion of the nasal bones, the incisors of both jaws, and one upper canine. On both sides it contains all the permanent molars, of which the premolars and the last true molar were just ready to be protruded. On one side in the upper jaw, three temporary molars are retained, but all the other series are lost, though they had not yet been shed. Trans. Am. Phil. Soc. 10, 342, plates 35, 36, 37, figs. 5—8. Referred to *Euchoerus* (*Protochoerus*) *macrops*.

2. Fragment of the right side of the lower jaw, of an adult individual, containing the last two molar teeth. Trans. Am. Acad. Arts and Sci. III., pl. 3, fig. 7; Trans. Am. Phil. Soc. X., pl. 38, fig. 3; pl. 37, figs. 9, 10. Referred to *Platygonus compressus*.

3. Fragment of the face, of a young animal, containing three premolars and portions of both canines. Trans. Am. Ac. Arts, III., pl. 1, 2, fig. 5 a.; Trans. Am. Phil. Soc. X., pl. 38, fig 2; pl. 37, fig. 11. Referred to *Platygonus compressus* and *Hyops depressifrons*.

4. Upper portion of the cranium. Tr. Am. Phil. Soc. X., pl. 38, fig. 1. Referred to *Hyops depressifrons*, and *Dicotyles depressifrons*.

5. Three imperfect series of upper molars, from two individuals. Tr. Am. Acad. III., pl. 3, figs. 12, 13, 13; Tr. Am. Phil. Soc. X., pl. 37, 12—15. Referred to *Platygonus compressus*, *Dicotyles depressifrons*, *Hyops depressifrons*.

6. An upper canine. Tr. Am. Acad. III., pl. 3, figs. 9—11; Tr. Am. Phil. Soc. X., pl. 37, fig. 16. Referred to *Platygonus compressus*.

7. Fragments of a frontal and malar bone, a dorsal and lumbar vertebra, the lower portion of a humerus, the left fore-arm bones, and a cuboid and metatarsal bone. Tr. Am. Acad. III., pl. 2, figs. 4, 5, b., 6; pl. 3, fig. 14; pl. 4. *Platygonus compressus*.

8. The fragment of a last molar tooth. Tr. Am. Phil. Soc. X., pl. 37, fig. 18. Referred to *Protochoerus prismaticus.*

9. Three inferior canines and a much worn lower molar tooth.

10. Small fragments of an upper and a lower jaw, of an atlas and of several ribs; three mutilated lower extremities of the humerus; fragment of a radius; two thirds of a hip bone and fragments of a second; an entire femur seven inches long and two and one third inches in circumference at the middle of the shaft; fragments of another femur, fragments of two tibiæ; three calcanea; two astragali; fragments of two metacarpals; two first phalanges, and one second phalanx. All these specimens appear to have been derived from three individuals, and the same to which the fragments belonged which were supposed to characterize *Platygonus compressus* and *Hyops s. Dicotyles depressifrons.*

The specimens of the list from number 2 to 10 inclusive, were obtained by Mr. Snyder of Galena, from the vicinity of that city, and have been presented by Dr. Le Conte, to the Academy of Natural Sciences, where they are now preserved.

11. The incisive portion of the lower jaw, with the right canine tooth. Referred to *Dicotyles costatus.* Obtained through Dr. R. W. Gibbes, from Benton Co., Missouri, where it was found in association with bones of the Mastodon, and presented to the Academy of Natural Sciences by Dr. Le Conte.

12. Two much worn upper and two lower canines; fragments of a lower jaw, with an entire series of molars of one side, and four molars of the opposite side; three last lower molars of as many other different individuals; fragments of the lower jaw of a young individual containing the last temporary and the first permanent true molar; three upper and two lower incisors. Also, besides a quart measure full of small fragments of vertebræ, and of bones of the extremities, the following:—fifteen mutilated vertebræ; part of a scapula; two humeri embedded in ferruginous sand, and measuring seven inches in length; lower extremity of another humerus, one inch and a half in transverse diameter; two olecranon processes; several carpal bones; a pair of co-ossified metacarpals, three inches long and one inch wide at the base; several isolated metacarpals, and halves of metatarsals; four first phalanges, two second, and two last ones; portions of two hip bones; extremities of four femora; one patella; two heads of tibiæ, measuring one inch and three quarters in transverse diameter; distal end of another tibia; two calcanea, two and three quarter inches long; one astragalus, and several other tarsal bones. All these specimens were obtained by Dr. Edward Kittoe, from the lead crevices of the cliff limestone rocks of Galena, Illinois, and have been presented to the Academy of Natural Sciences.

13. A fragment of the lower jaw, of a young animal, containing the last temporary molar unworn. The first permanent true molar had not yet commenced to protrude. The specimen was from Augusta Co., Virginia.

14. The half of a lower jaw, the upper jaw with the molar teeth, and other fragments, belonging to several individuals; found by Dr. Foster, in Iowa, and now in possession of Prof. Wyman, who proposes shortly to give a more complete account of them, together with some other interesting fossils discovered in association.

REFERENCES TO PLATE 6.

Figure 2. Series of upper molars of the extinct peccary, *Dicotyles compressus*. From a specimen discovered in Iowa. Fig. 3. Series of lower molars from the same individual. Figs. 4, 5. Upper incisors of *D. compressus*. Figs. 6, 7. Inferior incisors of *D. compressus*.

REMARKS ON

THE STRUCTURE OF THE FEET OF MEGALONYX.

BY JOSEPH LEIDY, M. D.

[*From the Transactions of the American Philosophical Society, Vol. XI. Read Dec.* 19, 1856.]

In the Smithsonian Contributions to Knowledge entitled "A Memoir on the Extinct Sloth Tribe of North America," I attributed five toes to the hinder-feet, as well as to the fore-feet of the *Megalonyx*:—a greater number than is known to belong to any other genus of the Gravigrada. At the time of writing the memoir, I had only had the opportunity of seeing the second, fourth, and fifth metatarsal bones of the *Megalonyx*. Prof. M. Tuomey recently presented to the Academy of Natural Sciences, a collection of bones of the Megalonyx, discovered in a cave in the northern part of Alabama. In this collection there is a complete series of metatarsals, as represented in fig. 1, plate 6, except the first one, or that belonging to the inner side of the foot.

The middle metatarsal bone is the shortest of the outer four, but it is much more robust in its proportions transversely and vertically, in accordance with the great size and strength of the middle toe. Its shaft is quadrate, but is so short as to appear to be formed simply by the conjunction of the carpal and phalangial extremities. The latter extremity is composed of three vertically convex lobes of which the median one is three and a quarter inches in depth. The carpal articular surface extends the entire depth of the corresponding extremity, and is quadrate and moderately concave. The articulation for the base of the second metatarsal bone, is a convex, oval surface, supported at the upper angle upon a prominent tuberosity. In a corresponding position, externally there is a rounded concave surface for articulation with the base of the third metatarsal bone.

The last metatarsal bone of the left foot presents a remarkable variation from that of the one figured; the interval between the shaft and long basal process being filled up, so that the bone is, in this specimen, a thick triangular plate with the carpal and fourth metatarsal articular surfaces placed on each side of its inner angle.

The measurement in length of the four metatarsals represented, is 3 inches for the second, 2½ for the third, 4½ for the fourth, and 5 for the fifth.

Besides the bones mentioned, the collection of Prof. Tuomey contains an atlas, axis, and three other cervical vertebræ; fragments of ribs and dorsal and lumbar vertebræ; six caudal vertebræ; one calcaneum, one astragalus, one cuneiform, and two cuboid bones; a first and second median phalanx of the hind foot, co-ossified as described in the memoir above mentioned, and a first median phalanx isolated; a first and second phalanx of the fourth toe; two median mecatarpals, one fifth metacarpal, and the first and second phalanges of the median and fourth toes of the fore foot.

Mingled with these remains of the *Megalonyx*, there was a humerus of a large wolf, and the same bone of a species of deer.

REFERENCE TO PLATE 6.

Fig. 1. The second to the fifth metatarsal bone inclusive of the right hind foot of *Megalonyx Jeffersonii*, commencing from the right d, b, c, a. One half the size of nature.

REFERENCE TO PLATES IV, V, VI.

Plate IV. Fig. 1. Skull of *Trichecus rosmarus fossilis*, from the coast of New Jersey; reduced one half. Fig. 2. Under view of a facial fragment of the skull of *Trichecus rosmarus fossilis*, also found on the coast of New Jersey; reduced one half.

Plate V. Fig. 1. Under view of the same specimen represented in plate IV, figure 1; reduced one half.

Fig. 2. Tooth of *Cochliodus nitidus;* natural size. Figs. 3—16. Teeth of *Cochliodus occidentalis.* Fig. 17. Tooth of *Cochliodus latus.*

Fig. 18. Tooth of *Helodus gibbus.*

Fig. 19. Tooth of *Chomatodus venustus*, upper view; enlarged three diameters. Fig. 20. Profile section of the tooth at the middle; three diameters. Fig. 21. Profile section at one side; three diameters. Fig. 22. Tooth of *Chomatodus obscurus;* natural size. Fig. 23. Profile section of the same tooth.

Figs. 24 and 25. Posterior and anterior view of the portion of a tooth of *Palæobatis insignis;* enlarged two diameters. Fig. 26. Profile section of the same tooth; enlarged four diameters.

Figs. 27 and 28. Internal and external view of the tooth of *Ctenoptychius digitatus;* natural size. Fig. 29. Profile section of the same tooth.

Fig 30. A flat pointed bone (?), found in company with the preceding teeth; in the carboniferous limestone of Illinois.

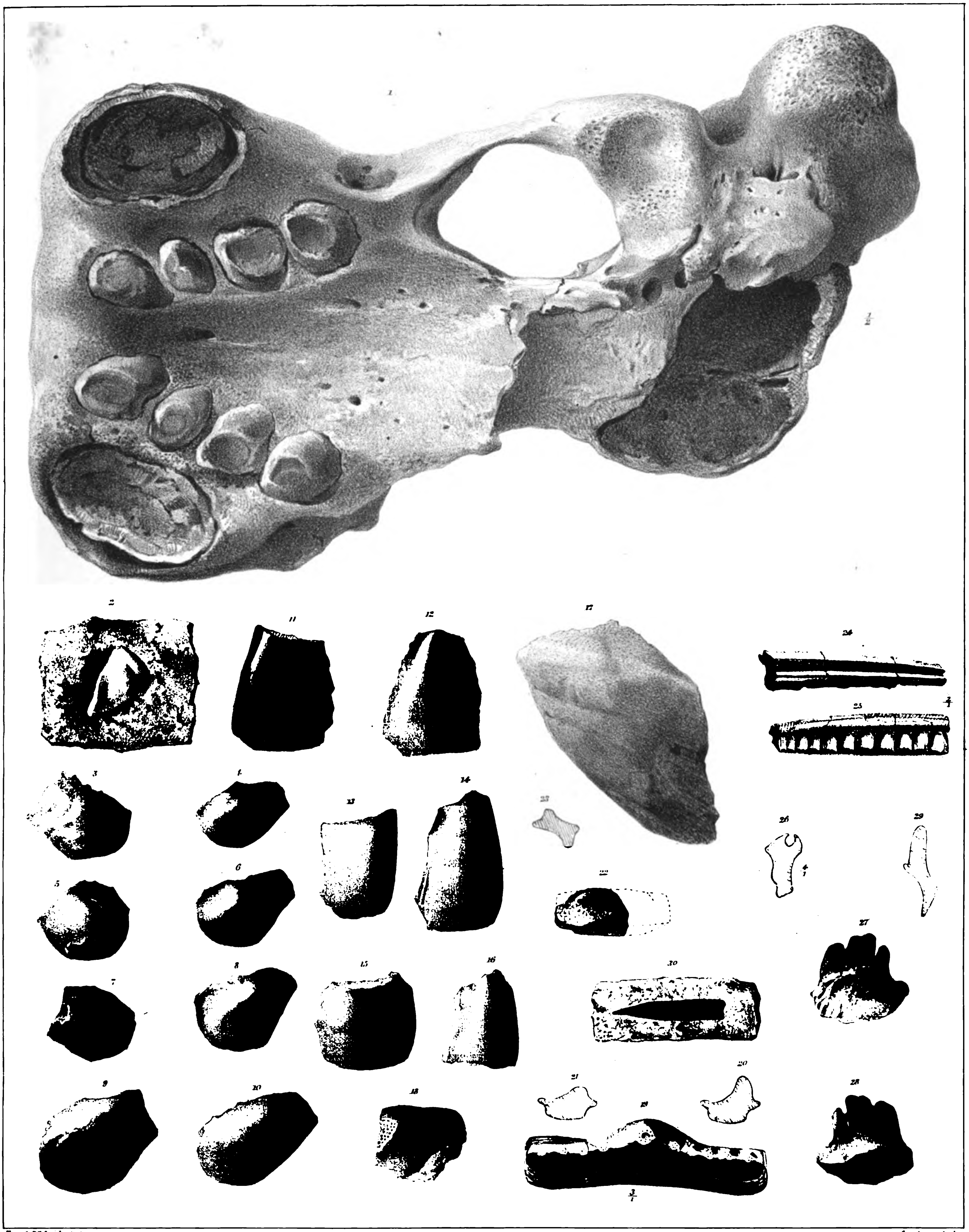
Plate VI. Fig. 1, d, c, b, a. The second to the fifth metatarsals, of the right hind foot of *Megalonyx Jeffersonii;* reduced one half.

Figs. 2, 3. Superior and inferior molar teeth of the right side, of *Dicotyles compressus.* Figs. 4 and 5, superior first and second incisors. Figs. 6 and 7, inferior first and second incisors.

Fig. 8. Left upper maxillary bone of *Saurocephalus lanciformis.* Fig. 9. Tooth of do.; magnified three diameters. Figs. 10, 11. Transverse sectional outlines of the crown and fang; three diameters. Fig. 12. Left maxillary (a,) and premaxillary (b,) of *S. Leanus.* Fig. 13. Inner view of the same specimen. Fig. 14. Left dental bone of *S. Leanus.* Fig. 15. Outline of a superior tooth of do.; magnified four diameters.

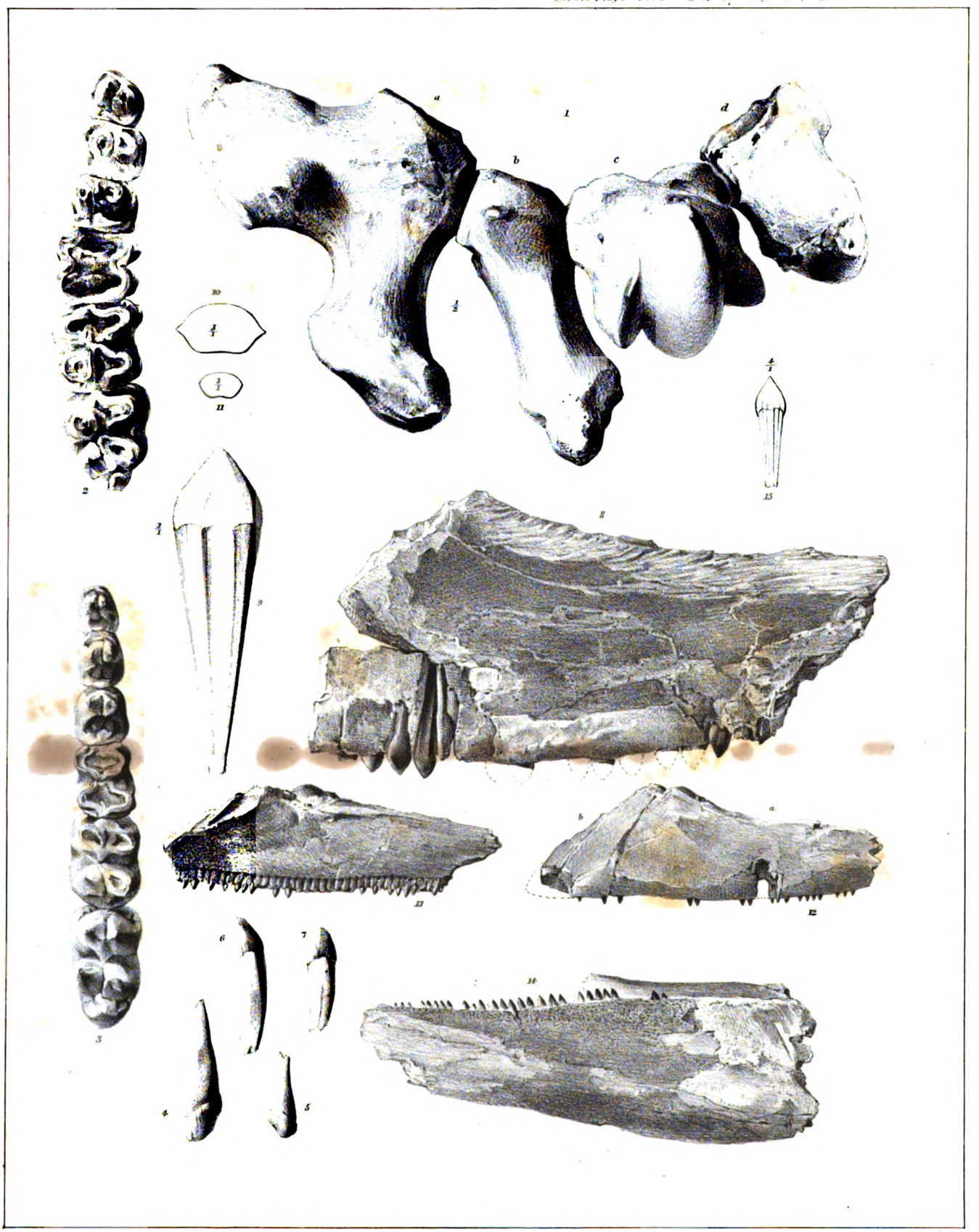
Trichecus rosmarus fossilis

Sinclairs lith



Prev & Dr. Leidy. Del. Sinclairs lith

1. Trichecus rosmarus fossilis. 2. Cochliodus nitidus, Leidy. 3-16 C. occidentalis, Leidy. 17. C. latus, Leidy.
18. Helodus gibbus, Leidy. 19-21. Chomatodus venustus Leidy. 22-23 C. obscurus, Leidy.
24-26 Palaeobatis insignis, Leidy. 27-29. Ctenoptychius digitatus, Leidy.



T. Sinclairs lith

1. Megalonyx Jeffersonii, Harlan. 2-7, Dicotyles compressus, Leidy.
8-11 Saurocephalus lanciformis Harlan. 12-15, S. Leanus, Harlan