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OBSERVATIONS
ON THE
GENUS SALAMANDRA;
AND
DESCRIPTION
OF A
NEW GENUS OF QUADRUPEDS,
OF THE
ORDER EDENTATA.

By RICHARD HARLAN, M. D.

MEMBER OF THE AMERICAN PHILOSOPHICAL SOCIETY; PROFESSOR
OF COMPARATIVE ANATOMY; ETC. ETC.

1824

(41)

[From the Annals of the New-York Lyceum of Natural History, Vol. I.]

OBSERVATIONS *on the* GENUS SALAMANDRA, *with the anatomy of the* SALAMANDRA GIGANTEA (*Barton*) or S. ALLEGHANIENSIS (*Michaux*) and two new genera proposed. By R. HARLAN, M. D. Read Dec. 27, 1824.

DURING my researches into the Linnean Lacerta, I found myself very much embarrassed by the confusion which exists in the present classification and arrangement of this department of zoology; the *Salamandra* have not unfrequently been confounded with the *Proteus* and *Siren*, and these latter described as the former; and in a few instances including individuals generically distinct from either. This confusion has been not a little increased by the late discovery of several individuals of this family, which cannot without violence be referred to any existing genera.

It will be readily presumed, that it was only after considerable attention, and minute anatomical investigation extended to a variety of these animals, that I have ventured to give publicity to the following observations.

The *Siren*, the *Proteus*, the *Amphiuma*, the *Triton lateralis* (Say) the *Salamandra gigantea* (Barton) or *Alleghaniensis* (Michaux) must form a family of reptiles distinct from all others, and these will again be naturally separated into such as have branchiæ, and such as have none; all being furnished with nostrils and spiracula. Those which are provided with *persistent* branchiæ having the skull composed of many separate bones, as the *Proteus* and *Siren*—those which have spiracula, without branchiæ or gills, having the skull composed of a solid piece, as the *Amphiuma* and *Salamandra gigantea*.

The *Triton lateralis* must not be confounded with the Tritons* of Laurenti, or water-newts, (the *Salamandra aquatica* of Cuvier) as, in the first place, these animals are furnished with five toes to the posterior extremities and four to the anterior: the *Triton lateralis* having only four toes to each extremity. 2d. The *T. lateralis* is furnished with persistent gills—in the *Salamandræ* these organs are deciduous. 3d. The *T. lateralis* has one rib less than the Tritons of Laurenti, and the *Salamandræ* proper.

This difficulty could not escape the minute observation of Mr. Say, who, in his paper on the *Triton lateralis*, (in the first Vol. Major Long's Expedition) expressly states: "These four or five species [viz. the *Axolotl* or *Siren pisciformis* (Shaw) the *tetradactyla* (Lacepede) the *Sirène operculée* (Beauvois) and the *Proteus Neo-Cæsariensis* (Green)] might with propriety be separated from the genus to which they are referrible

* *Triton*, as a generic term, should be discarded, it having been originally established by Laurenti, who mistook the larvæ of *Salamandræ* for perfect animals, as was remarked by Cuvier, in his essay "Sur le Protée." (Voyage de MM. Humboldt et Bonpland.)

in the present state of the system, and placed in a separate genus, the external characters of which will be the same as those of *Triton*, with the exception of the persistent branchiæ.* Its proper station will doubtless be intermediate between *Triton* and *Proteus*, but far more closely allied to the former."†

The animal described as the *Sirène operculée* by M. P. de Beauvois, (in the 4th Vol. of the American Philosophical Transactions,) is furnished with four legs, and five toes to the posterior feet—it is merely the larva of a *Salamandra*, similar to that described by Professor Green, in Vol. I. of the Journal of the Acad. Nat. Sciences of Philadelphia, as the *Proteus Neo-Cæsariensis*.

But the animal described by Lacepede, (in the 10th Vol. of the Ann. du Mus.) is worthy of particular notice. He named it "Un Protée, ou Salamandre tetradactyle;" and states that the place of its habitation is unknown, and the internal structure was not examined. It is furnished with four legs, and four toes to each foot, with persistent branchiæ; the form of the tail, and general external appearance, to judge from the plate, resembles the *Triton lateralis*; but both jaws possessed a double row of teeth, and a collar formed by a fold of the skin partially surrounds the superior portion of the neck, immediately anterior to the branchiæ. I have little

* To this exception he should have added, that all the species he has mentioned, excepting the second, have *five* toes to the posterior extremities.

† I am happy in having it in my power thus early to correct an error I have made in detailing the anatomy of the *T. lateralis*, in the paper above alluded to, wherein I have stated that "the olfactory apparatus is similar to that of fishes, having no posterior nares, &c." This is incorrect. In examining lately a specimen of this animal, I observed these openings, which are situated in the space between the two rows of teeth at their posterior termination; they are covered over by a valvular production or duplicature of the lining membrane of the mouth, which circumstance misled me.

doubt of its being a distinct species of the same genus described by Mr. Say as the *T. lateralis*.

The *Salamandra tridactyla* (Lacepede) is furnished with scales, and possesses other characteristics of the lacerta (Vid. Dict. d'Hist. Nat. Art *Sal.*) The animal from the North American Lakes, which Dr. Mitchill has described (in the 4th Vol. of Silliman's Journal, and more at large in the 7th Vol. of the same) as a *Proteus*, and which he has strangely confounded with the *Salamandra Alleghaniensis* (Michaux) or that vulgarly termed "Hell-bender," and "Tweeg," in Dr. Barton's description of the same, (Vid. Barton's Tracts, Vol. II.) has in reality no affinity either to the *Proteus* or "Hell-bender," but is simply a variety of the *T. lateralis*, with which also the animal from Lake Champlain, described by Schneider (in his *Historia Amphibiorum*, Fasc. 1st, p. 50.) as early as 1799, specifically corresponds,* notwithstanding Daudin erroneously supposed it to be the larva of the *Triton Alleghaniensis*, and Mr. Say has since supposed it to be the larva of the *Salamandra Alleghaniensis*. (Latreille, Vid. Vol. I. Acad. Nat. Sciences, notes on Professor Green's paper on the Amphibiæ by Mr. Say.)

The *Salamandra Alleghaniensis* is, I think, improperly placed among the *Salamandræ*. It differs in general form and proportion; it wants that remarkable characteristic of the *Salamandræ*, viz. "Anum habent vulvæ muliebri simillimum." Cuvier, after describing the Mexican *Axolotl*, remarks, "from all of which I conclude, that the *Axolotl* of the Mexicans, or *Siren pisciformis* of Shaw, is nothing more than the larva of some gigantic *Salamandra*, probably precisely the same as the *Salamandra Alleghaniensis* of Michaux." But in this he was mistaken; the *Axolotl* possesses every characteristic of the larva of a *Salamandra*, though probably of a different species

* See page 57 of this Volume.

from any existing in our waters, as it differs in the number of its vertebræ and ribs; and notwithstanding it has not yet been observed in a perfect state, or without branchiæ, (both specimens examined by Cuvier were young animals.*) Whereas, the *Salamandra Alleghaniensis* has never been observed possessing gills, although examined when quite young; they exist in great numbers in the Alleghany river; and I possess a specimen, a few months old, in which there does not exist the least remnant of branchiæ, and as the *Salamandræ* are supposed to carry their branchiæ at least for the term of one year, it is certainly fair to conclude that these appendages do not constitute a part of the organization of this animal; which alone is sufficient to separate it from the genus *Salamandra*. But a comparison of the anatomical structure of these animals, places the subject beyond a doubt; and as no history of the internal fabric of the *Salamandra Alleghaniensis* has ever appeared, the following detail cannot be devoid of interest.

I received, through the politeness of Mr. Poe of Pittsburgh, whose zeal has in more than one instance advanced the cause of science, two specimens of this animal: one very young, the other of a middle size, which was brought alive as far as Baltimore, when it was killed by placing it in slightly brackish river water. They are sometimes observed to have attained two feet in length.

Total length of the present specimen, twelve inches. From the vent to the end of the tail four inches; *vent*, a small longitudinal rima, rather depressed; girth, four and a half inches; width of the head, one and a half inches.

* In a late notice of the *Axolotl*, by Sir E. Home, it is stated that this animal is proved to be a perfect animal, and no larva, as *the organs of generation are developed*. The same argument would prove the tadpoles to be perfect animals, the organs of generation being equally developed in them all—as was demonstrated by Cuvier, in the year 1800. (Vid. Obs. sur les Tetards, in Humb. Voy.)

Organs of Sense. The eye is smaller proportionally than in the common Salamanders, in which respect it resembles the *Axolotl*; the ear, like that organ in the Salamanders, does not appear externally.

Organs of Digestion. Lower jaw furnished with a single row of teeth; upper, with two concentric rows, the interior semicircular, at the posterior terminations of which are the patulous openings of the posterior nares. Tongue free at the anterior portion; the operculum half way between the fore-leg and the posterior termination of the rictus of the mouth; opercular cartilages, three in number, the opening between the two inferior;* their posterior extremities, unlike the Salamanders, are free, or not united to the vertebræ; anteriorly they are united by synchondrosis to the inferior cornua of the os hyoides; the bones of the tongue differ widely from the same in the *Salamandræ* and *Proteus*, which will be comprehended by reference to the plate, and comparing them with the figures in the elaborate works of the Italian naturalists: "Descrizione Anatomica delle Salamandra aquatiche," by Dr. Rusconi, and "Del Proteo anguino, monografia da Configliachi," much better than from description; the parts were sketched, in situ, immediately after dissection, by Mr. T. R. Peale, to whom I am also indebted for two spirited drawings taken from life: one of this animal, the other of the *Triton lateralis*.

The œsophagus is short, and folded longitudinally; the stomach is large, and for the most part membranous, but becomes muscular near the pylorus; it contained two pebbles about the size of the finger-end, and two others much smaller, also the claw of a fresh-water lobster, which the animal had

* In this respect the *Salamandra Alleghaniensis* agrees with the *Amphiuma*—in both, the operculi exist through life. In the *Salamandræ*, and other batracians, on the contrary, these openings do not exist in the adult state.

swallowed without comminuting. The intestinal canal is large, and thrown into numerous folds, and terminates finally in an unusually large cloaca. The liver is oblong, and divided into two lobes, between which is situated the gall-bladder, of a large size, whose duct opens into the intestine two inches from the stomach. The spleen is of a reddish yellow colour, and situated in the centre of the mesentery.

Organs of Respiration. Glottis opens one inch and a half from the extremity of the snout, (it is a mere rima.) Trachea membranous, one inch in length, dividing beneath the clavicles to form two lungs, three inches in length. Lungs vesicular, elastic, vascular: in structure resembling those of the *Testudo*; they lay posterior to the other viscera.

Organs of Circulation. The vena cava inferior, traverses the liver, and enlarges previous to emptying into the auricle, which is single, and very large; this empties immediately into the ventricle, which is also single, and whence a large fleshy artery goes off, as in fish and the larvæ of Salamanders, but the distribution of this artery differs from the above-mentioned animals; after running three tenths of an inch, it forms a sac, which gives off three branches, viz. one to each lung, and a larger one which continues down the spine to nourish the whole body.

Remaining viscera. The urinary bladder, testicles, and kidneys, resemble very much those organs in the *Amphiuma*.

Osteology. Skull composed of a solid piece of bone, articulated by two condyles to the atlas. From the head to the pelvis there are nineteen vertebræ, and eighteen ribs on either side, (or rather moveable rudiments of ribs, similar to the other individuals of this family,) the atlas only, as in the Salamanders, being deprived of this appendage. Having compared this part of the osseous structure with the analogous genera, I shall give the result in a tabular form.

From the head to the pelvis there exists in the	Vertebræ.	Ribs on each side.
<i>Salamandra Alleghaniensis</i> (Michaux), gigantea (Barton) - - - - -	19	18
<i>Salamandra rubra</i> (Daudin)* - - - - -	19	18
<i>Triton lateralis</i> (Say) - - - - -	19	17
<i>Axolotl</i> or <i>Siren pisciformis</i> (Shaw)† - - -	17	13
<i>Proteus anguinus</i> - - - - -	30	7
<i>Siren lacertina</i> - - - - -		7

The rudiments of ribs in the skeleton of the *Proteus anguinus* figured by Cuvier, (in Humboldt's Voyage) are represented as immoveable, or continuous with the transverse process, whereas they are represented as moveable rudiments in the figures of the skeletons given in the works of Configliachi and

* The skeleton of the *Salamandre terrestre*, figured in Sonnini's edition of Buffon, and which is said to have been taken from Latreille, (Histoire Nat. des Salamandres de France,) is represented with only fifteen vertebræ from the head to the pelvis, and fourteen ribs on each side. In a large aquatic *Salamandra*, (*Lacert. lacustris* of Lin.) whose skeleton I possess, there are sixteen vertebræ from the head to the pelvis, and fifteen ribs. In this animal there are thirty-two vertebræ to the tail, including the sacral, making in all forty-eight; though the extreme end of the tail appeared to be lost.

† The figure of the skeleton of the *Axolotl* (in Humboldt's Voyage, &c.) is represented with sixteen vertebræ from the head to the pelvis, and fifteen ribs on each side; thus making the figure to disagree with his description, which is, as expressed in the table—"The *Siren*," according to the same author, "has ninety vertebræ from the head to the pelvis, the anus being opposite to the forty-fifth. The *Salamandre terrestre* has thirty-eight, the aquatic nearly forty vertebræ in all; the pelvis is supported sometimes at the sixteenth, sometimes at the fifteenth, in the *terrestre*; and at the fourteenth or fifteenth in the aquatic. In the *Siren*, eight vertebræ (from the second to the ninth) are furnished with false ribs. In the *Salamandra terrestre* there are twelve or thirteen ribs; in the *Salamandra aquatica* only eleven. In the *Proteus*, there are fifty-six vertebræ in all, the pelvis is attached to the thirty-first; only six vertebræ, counting from the second, have ribs." The number of vertebræ and ribs in the aquatic *Salamandræ* appears to differ in different species.

Rusconi ; the latter author reckons seven ribs from the third to the ninth vertebræ—the former, six, counting from the second to the seventh vertebræ. I am disposed to think Configliachi is correct, and that the errors noted above in Cuvier's figure of the *Protean* skeleton, arose from its having been badly cleaned, as in the view he has given of a separate vertebra enlarged, he has represented the rib as distinct from the transverse process, and bifid at its articular extremity, nearly similar to that of the *Salamandræ*.

The pelvis of the *Salamandra Alleghaniensis* is somewhat or nearly similar to the *Salamandræ* ; a small process is given off laterally from the transverse process of the twentieth vertebra, which may represent the os ilium ; from which another process (the ischium) descends to unite with the pubis ; at the junction of the two last, the os femoris is articulated.

There are twenty-four vertebræ to the tail, including the pelvic or sacral, which makes in all forty-three for the *Salamandra Alleghaniensis* ; both surfaces of the bodies of the vertebræ are remarkably concave, which in the recent animal are filled with a ligamento-cartilaginous ball. The articulating surface of the transverse process is very oblong vertically, the head or articulating surface of the rib is consequently very broad ; this structure differs from those *Salamandræ* with which I have compared it, (viz. *Salamandra rubra* and *aquatica*) in them the head of the rib is bifid and articulated by two separate surfaces to the transverse process, which is also bifid, but approaches the manner in which the ribs are articulated in the *Siren*. Nothing remarkable or characteristic was observed in the remaining portions of the skeleton.

It follows from the above detail that the *Salamandra Alleghaniensis* differs widely from the *Salamandræ* in the respiratory organs—in the circulating system—in the digestive apparatus—and, finally, in its osteological construction. I may here remark, that I was not surprised to observe the internal fabric of the *Alleghaniensis* so characteristically distinct from

all the other animals of this family—it only confirms us in the opinion that anatomy alone can teach us the true affinities and relations of organized beings.

Naturalists are familiar with the dispute between the French and Italian zootomists concerning the *Siren lacertina*: the latter declaring it as their full conviction that this animal is the larva of some reptile, the genus of which is as yet unknown, and which will differ from its larva in not possessing gills, &c. Whilst Cuvier maintains that the *Siren* is a perfect animal, permanently amphibious.

I must refer to the works of these respective naturalists, as above quoted, where this subject is treated of in detail; and shall briefly remark, that the arguments of the Italian naturalists tending to prove the *Siren* a larva, from its anatomical structure, are shown to be groundless by a comparison of the internal fabric of that animal with the anatomy of the *Salamandra Alleghaniensis*, as above detailed.

With all due deference and respect for those very able anatomists above quoted, I may be permitted to correct an important error into which they have both fallen in the anatomical descriptions of the larvæ of the *Salamandra* and of the *Siren*.

I quote the words of the Italian naturalists:—"All zoologists, including Mr. Cuvier, now admit that frogs first receive air into the mouth through the nostrils only, and from thence force it into the lungs by an action resembling deglutition. But neither the *Proteus* nor the *Siren* are able to respire in this manner; for the nostrils in the former do not open into the mouth, but beneath the upper lip; and in the *Siren*, M. Cuvier observes, 'les narines, simplement creusées sur les côtés du museau, ne pénètrent point dans la bouche.' Neither do these animals respire in the manner of serpents, as they are destitute of (true) ribs." And further on, the authors continue—"Between the *Siren* and these larvæ (*Salamandra*) there is the greatest resemblance, not only in regard to the branchial

arches, but also to the nostrils ; for in the *Siren*, as well as in these larvæ, *the nostrils do not communicate with the mouth.*"

I present to the Society a specimen of the larva of the *Salamandra rubra*, (Daud.) in which I have passed a slender probe through the nose into the mouth by the posterior nares, on one side, and have allowed the opposite side to remain untouched, in order that the committee who are to examine this essay, may at once convince themselves of the accuracy of this statement, which I hope they will look into with more than usual scrutiny. It was indeed with some difficulty I found the posterior nares in this larva, as they open in the form of a small slit, which was closed by the lining membrane of the mouth ; they are situate rather external to the posterior termination of the interior row of teeth.

I next proceeded to examine this structure in the *Siren*, two specimens of which are in the Philadelphia Museum ; the smaller of the two being very young, it was not easy to pass a probe through the nostrils, though the posterior nares are visible ; but in the other, which is about one foot in length, I passed a probe of considerable size through the nostril, into the mouth, down the throat, where I allowed it to remain, for the convenience of those who may wish to examine the same.

I experience the less hesitation in making these strictures, and corrections, as the error is one into which I was myself betrayed, in my description of the anatomy of the *Triton lateralis*. These openings in the *Siren* are situate on the outer side of the teeth.*

The *Amphiuma*, the *Siren*, the *Proteus*, and the *Salamandra*, will be acknowledged by all to constitute separate genera.

* In the Dict. d'Histoire Nat. Article *Siren*, by Professor Bosc, it is stated that "the *Siren* is clothed with scales, and furnished with claws." It is only necessary to notice these errors, inasmuch as they may confuse the student.

The *lateralis* and *Alleghaniensis* not belonging to any of these, will require appropriate generic names, in order to introduce them to that independent station in the systems, to which they possess every claim. As the most prominent feature distinguishing the *T. lateralis* from the *Salamandra* is its persistent branchiæ, we have preferred a name significative of the same.

The *Alleghaniensis*, on the contrary, being characterized by the negation of branchiæ, the most appropriate name will be one expressive of that circumstance ; the specific appellations being sufficiently discriminative, must remain.

GENUS I. MENOBRANCHUS.

Generic characters.—Persistent branchiæ ; two rows of teeth in the upper, and one row in the lower jaw ; four-footed, four toes to each foot ; clawless.

Menobranchns lateralis.—A black vitta from the nostrils passing through the eyes, and dilated on the sides, becoming obsolete on the tail.

Menobranchns tetradactylus.—Two rows of teeth in each jaw ; duplicature of skin, forming a collar on the superior part of the neck, immediately anterior to the branchiæ.

GENUS II. ABRANCHUS.

Generic characters.—Destitute of branchiæ at all periods of its existence ; four strong legs ; five toes to the posterior, four to the anterior extremities ; the outer edge of the feet fimbriated ; two outer toes of the hind feet palmated ; clawless.

Abranchus Alleghaniensis.

Explanation of the Plates.

- MENOBANCHUS *lateralis* - - - - Plate XVI.
 ABRANCHUS *Alleghaniensis* - - - - Plate XVII.
 Details of organization of *A. Alleghaniensis* - Plate XVIII.
 Os hyoides and spiracular cartilages, Fig. 1.
 Vertebrae, Fig. 2.
 Upper and side views of the head, Fig. 3, 4.
 Hind foot, Fig. 5.

DESCRIPTION of a new Genus of Mammiferous Quadrupeds, of the Order EDENTATA. By RICHARD HARLAN, M. D. Professor of Comparative Anatomy to the Philadelphia Museum, Member of the Am. Phil. Soc. &c. &c.

Read January 24, 1825.

ON the 18th December, 1824, Mr. William Colesberry of Philadelphia, presented to the Philadelphia Museum of Natural History the interesting animal which forms the subject of the following pages. Mr. C. gave the following statement to Mr. Franklin Peale :—" The animal is a native of *Mendoza*, and in the Indian language is named ' Pichiciago.' Mendoza is situate in the interior of Chili, on the east of the Cordilleras, in lat. $33^{\circ} 25'$ and long. $69^{\circ} 47'$, in the province of Cuyo. It had been obtained on the spot, in a living state, but it continued to live in confinement only a few days. Its habits resemble those of the mole, living for the most part under ground ; and is reputed to carry its young beneath the scaly cloak with which it is covered ; and that the tail possessed little or no motion."

It is to be regretted that the viscera and the greater portion of the skeleton of this animal had been removed before it came into my possession ; and the gentleman who presented the same, having left the city, precludes the possibility of receiving, at present, any further particulars relative to its habits ; but the observations which I have been able to make from the examination of its exterior, together with the skull and teeth, all of which are in nearly a perfect state of preservation, establish the characters of the animal on the most solid foundation.

Cuvier, that justly celebrated naturalist, remarks : " In zoology, when the teeth and jaws of an animal are given, the remaining structure may be readily determined ; at least as far as relates to essential characters." The form of the tooth,

determines that of the condyle; the form of the scapula, that of the nails; just as the equation of a curve indicates all its properties; as in taking each property separately, for the basis of a particular equation, we might arrive, not only at the *ordinary* equation, but at all the other properties. so the nail, the scapula, the maxillary condyle, the femur, and and all the other bones, taken separately, would indicate each other reciprocally; and beginning with either separately, we might, according to the rational laws of the organic economy, construct the whole animal."

It is thus, by a perfect knowledge of the laws of co-existence, to which the combinations of animals are subjected, the skull alone of the animal under consideration would have enabled us to determine that it belonged to a new, and non-descript genus.

The varied, magnificent, and multiplied collection of natural objects, in the Philadelphia Museum, drawn from every department of nature, displays in the strongest light the wonderful results to be obtained by the talent, industry, perseverance, and zeal, of an individual. The venerable octogenarian *founder* still lives, to contemplate with sentiments of pride and delight the colossal monument which has risen at his command; which will perpetuate the fame, and hand down the name of *Charles Wilson Peale* to the latest posterity.

On the present occasion, as on many others, I have been indebted to the Philadelphia Museum for the opportunity of making the clearest illustration of the subject of investigation. I have also to congratulate myself in the acquaintance of Mr. William W. Wood, a young but zealous naturalist, whose talents as a faithful delineator of nature, have only to be known, to be duly estimated.

The order EDENTATA includes quadrupeds destitute of incisor teeth, forming the last order of Cuvier's clawed animals. Although united only by a negative character, there exists some positive relations between them, particularly the large

nails which embrace the extremity of the fingers, and resemble more or less the nature of hoofs.

CHLAMYPHORUS TRUNCATUS.

Corpore, supra testâ coriacea, postice truncata, squamis rhomboideis, lineis transversis dispositis, conflata, subtus capillis albis, sericeis, oblecto; capite supra squamis testa dorsali continuis, adoperto; palmis, plantisque pentadactylis; unguibus anterioribus longissimis, compressis; marginibus externis, mucronibusque acutis; cauda rigida, sub abdomine inflexa.

DIMENSIONS.

	Inch.
Total length - - - - -	5.2
Length of the head - - - - -	1.6
Breadth between the eyes - - - - -	.8
Depth of the posterior truncated portion of the shell -	1.3
Greatest breadth of the same - - - - -	1.8
Girth posterior to the shoulders - - - - -	4.
Length of the sole of the foot, including the nails -	1.2
Breadth of the foot - - - - -	.3
Length of the nails - - - - -	.2
Length of the hand - - - - -	1.4
Breadth of ditto - - - - -	.4
Length of the longest nail - - - - -	7 $\frac{1}{2}$
Length of that portion of the tail which is free, and curved beneath the body - - - - -	1.2

The shell which covers the body, is of a consistence somewhat more dense and inflexible than sole leather of equal thickness. It is composed of a series of plates of a square, rhomboidal, or cubical form; each row separated by an epidermal or membranous production, which is reflected above and beneath, over the plates; the rows include from fifteen to twenty-two plates; the shell being broadest at its posterior

half, extending about one half round the body ; this covering is loose throughout, excepting along the spine of the back and top of the head ; being attached to the back immediately above the spine, by a loose cuticular production, and by two remarkable bony processes (to be described hereafter) on the top of the os frontis, by means of two large plates, which are nearly incorporated with the bone beneath ; but for this attachment, and the tail being firmly curved beneath the belly, the covering would be very easily detached. The number of rows of plates on the back, counting from the vertex, (where they commence) is twenty-four ; at the twenty-fourth the shell curves suddenly downwards, so as to form a right angle with the body ; this truncated surface is composed of plates nearly similar to those of the back ; they are disposed in semicircular rows, five in number : the lower margin, somewhat elliptical, presents a notch in its centre, in which is attached the free portion of tail, which makes an abrupt curvature, and runs beneath the belly parallel to the axis of the body ; the free portion of tail consists of fourteen caudal vertebræ, surrounded by as many plates, similar to those of the body ; the extremity of the tail being depressed, so as to form a paddle ; the rest of the tail compressed. The caudal vertebræ extend up to the top of the back, beneath the truncated surface, where the sacrum is bent to meet the tail. The superior semicircular margin of the truncated surface, together with the lateral margins of the shell, are beautifully fringed with silky hair.

Head : posterior half, broad, anterior half, before the eyes, tapering ; the occiput is covered by the five first rows of the *back plates*, with which they are continuous ; the occiput not distinguishable externally. The anterior half of the top of the head, is covered, first, by a row of large plates, five in number, which are firmly attached to the bone beneath ; particularly the two outer ;—secondly, by a smaller row, six in number, anterior to which, that is to say, the top of the snout, is covered with smaller plates irregularly disposed.

External ear, consists of a circular, somewhat patulous opening, directly posterior to the eye, surrounded with an elevated margin; and communicating with a bony canal, to be more fully described hereafter. *Eye*, minute, totally black; and, like the ear, nearly hidden by long silky hair. *Mouth*, the rictus small. *Nose*, the extremity of the snout is furnished with an enlarged cartilage, as in the hog; the anterior nares opening downwards, at the inferior border.

The whole surface of the body covered with fine silk-like hair, longer and finer than that of the mole, but not so thick set. The anterior of the chest is large, full, and strong; the anterior extremities, short, clumsy, and powerful; the hair is continued for some distance on the palm—the phalanges of the hand united; five powerful nails rising gradually one above the other; the external shortest and broadest; the whole so arranged as to form a sharp cutting instrument, somewhat scooped; very convenient for progression under ground; and such as must very much impede motion on the surface. Hind legs weak and short—feet, long and narrow; the sole resembles considerably the human foot, having a well defined heel, which rests flat upon the ground, and being arched in the middle; toes separate, nails flattened horizontally.

Skull. At first view, the bones of the cranium and face would appear to constitute one solid case, the remnants of sutures are indistinctly visible in some parts only. The cavity of the cranium is capacious; the greatest breadth, which is from ear to ear, is one inch; greatest depth five tenths; length of the cavity, seven tenths. One of the most remarkable peculiarities of this skull, consists in the two processes of bone, above alluded to, which project obliquely, forward, upward, and outward; from the os frontis, anterior to the cavity of the cranium, and directly above the malar bone; giving to the front of the skull an aspect totally unique; these prominences are hollow, communicating with the frontal sinuses, and must contribute in a great measure to enlarge the organ of smell;

there exists a considerable concavity between them, which, in the recent state, was filled with an adipose, gristly mass, which served to unite the skull to the plates above. The snout commences anteriorly to these processes, and is rapidly attenuated and depressed. The ossa nasi are broad and strong, slightly arched transversely, extending anteriorly beyond the os incisivum, as does likewise the osseous septum narium. The zygomatic processes are laterally arched; a small pointed process, descending near the malar bone, (somewhat like that in the sloth); the zygomatic fossæ are large.

The labyrinth is protuberant, and occupies the usual situation at the base of the skull; joined to which is the tympanum;—to the last is attached a bony cylinder, stretching first upwards behind the zygomatic process of the temporal bone, around which it makes a sudden curve, and runs forward and upwards to terminate at the external ear. This structure, which I believe is peculiar to the animal before us, will be better understood by referring to the plate.

Lower jaw. Anterior portion shaped like that of the elephant, much elongated; the general form and proportion resembles very closely the lower jaw of the sheep, the base being considerably arched, and the curve at the posterior part, forming with the base nearly a right angle, projecting obliquely outwards: the base is marked by eight slightly elevated protuberances, occasioned by the roots of the teeth; the condyloid process is longer than the coronoid; in the sheep, this is reversed: the articulation at the glenoid cavity is such as to admit of great freedom of motion. Length of the base of the lower jaw one inch; length of the angle five tenths; greatest width two and a half tenths; width of the angle three tenths.

Teeth. Incisors, none in either jaw; molars, eight in number, on either side of the upper and lower jaws, all approximate; disposed in separate alveoli; the crowns of the two first only, approach to a point, and thus much resemble canine teeth; the six remaining are all nearly flat on the crowns;

their structure is simple ; a cylinder of enamel, of equal thickness throughout, surrounds a central pillar of bone, there being no division into body and root ; the lower half is hollow, the cavity representing an elongated cone. In the lower jaw, the teeth penetrate its whole depth ;—length of the teeth, about three tenths of an inch : two tenths of which are buried in the sockets—diameter, about one tenth. They are somewhat flattened on the sides, and in a slight degree curved externally, to be adapted to the shape of the jaw. The teeth of the inferior maxilla are directed forwards and upwards ; those of the superior maxilla are directly reversed in their direction, so that the crowns meet each other obliquely ; and the posterior margin of the lower teeth, and the anterior margin of the upper, present their angles to the object of mastication. (This structure is exemplified in Plate XXI. fig. 7.)

The remainder of the skeleton, with the viscera, having been removed previous to my obtaining a view of the animal, I am unable to give any further detail of the internal organization. It is fortunate that I have been enabled to make so complete a preparation of the skull ; this, with the external organization, which is well preserved, will enable me to establish its generic characters on the firmest foundation. To such as have made comparative anatomy the subject of their investigation, the above minute detail of this very extraordinary individual will enable them in some measure to anticipate the observations which follow ; they will perceive, at first view, that the animal before us unites in its external configuration traits peculiar to the genera *Dasypus*, *Talpa*, and *Bradypus* ; yet a very superficial observation will unfold characters generically distinct from either. It will be observed, that though this singular being is clothed with a coat (or rather cloak) of mail, in a slight degree resembling the armadillo, yet it differs remarkably in its texture, form, situation, arrangement, and mode of attachment to the body. In the armadillo, the body is covered with a hard, scaly shell, and consists,—1st. In a

plate upon the forehead. 2d. A vast shield, situate upon the shoulders, and formed of small rectangular compartments, disposed in transverse bands. 3d. In bands of similar plates, but moveable, and varying in number, from three to twelve more or less, according to the species. 4th. In a shield upon the rump, very similar to that on the shoulders. 5th. In rings more or less numerous on the tail; five toes behind; before sometimes five, at others four; hairs sparse. The whole shell is covered by a thin, transparent epidermis, *which is joined to the skin of the belly*, which gives to the shell a shining aspect, as if it were varnished; the extremities are entirely covered with strong scales. The armadillo burrows in the earth; is sufficiently quick in its motions; is capable of rolling its body into the form of a ball; and is omnivorous. The external ear is sometimes large, and always very apparent.

From this statement, we are convinced that there exists only the most distant analogy in the external covering of the *Dasypus* with that of the *new genus*; other analogies, which are found in the comparison of the skulls, will be referred to hereafter.

The lower portions of our animal, as well as that beneath the scales, will bear a pretty close comparison with the same parts of the mole, (*Talpa Europea*, (Lin.) white variety.) The hair is finer and longer than in the mole, and at a distance resembles long staple cotton in appearance. The eye is small; the neck, breast, and shoulders, are very powerful; the posterior extremities are short and weak; the anterior, short and strong, and furnished with large claws, as in the mole; but in the form of the head, in the structure and form of the claws, in the external ear, which is apparent when the hair is separated, our animal is totally dissimilar to the mole. The claws bear some analogy to the sloth, (*Bradypus*, Lin.) but are articulated to the last phalanx, as in the mole. Like the last named animal, the organs of generation must have open-

ed anterior to the pubis, and at a great distance from the sacrum, viz. before the inferior margin of the truncated portion of the shell, near the middle of the caudal vertebræ, which, as I have remarked above, are continued, within the truncated plate, to near the top of the back. Thus far, like the mole, our animal is eminently constructed for subterranean progression; and here, in all probability, any strict analogy with that animal ceases.

In the examination of the skull, we are struck with its many peculiarities, and great dissimilarity to that of the mole, to which it is so nearly allied in its subterranean habits. The skull of the latter animal is long and narrow, flattened vertically; the jaws are furnished with four large canine teeth, separated from each other; having between them six incisors above and eight below, seven molars on each side of the upper jaw, six on each side below, the crowns of which are furnished with sharp points; in all of which our animal differs entirely. Like the mole, the extremity of the snout is furnished with a sort of button, but of much firmer consistence; in the form of the snout, and posterior part of the skull, as well as in the effaced appearance of the sutures, some slight resemblance is visible. The palm of the hand is directed rather inwards, in our new genus; whereas in the mole it is directed outwards, and the nails are destitute of the cutting edge, so remarkable in the former. On comparing the skull of our animal with that of the armadillo, (*Dasypus sexcinctus*, Lin.) a few traits of similarity of typification are visible: both these animals being equally destitute of incisor and canine teeth in either jaw; in both, a considerable space intervenes between the anterior margin of the os intermaxillare and the commencement of the teeth; and in both the number of molar teeth is the same, viz. eight on each side of both jaws—thirty-two in all. Here all further analogy with the *Dasypus* is at an end.

In the last named animal, the crowns of the teeth terminate in two points, and, together with the bodies, are completely enveloped in enamel; they are so far separated from each other, that when the jaws are closed, those of the lower jaw pass between those of the upper; furthermore, the teeth are proportionally much shorter, neither sinking so deep into the jaw, nor rising so high above the alveoli. The whole form of the head, and of the jaws, particularly the inferior, will admit of no comparison in the two animals; lateral motion being almost entirely forbidden in the armadillo, and the greatest freedom in this respect existing in the *new genus*: in which, the *condyloid* extends above the *coronoid* process.

The teeth in structure are most nearly allied to those of the sloth, (*Bradypus tridactylus*, Lin.) that is to say, they consist of a simple cylinder of bone, surrounded with enamel, except the crowns, which are destitute of enamel in the centre; the roots, (or rather that portion buried in the jaw) of both these animals, are hollow. In these particulars, together with the short process descending from the zygomatic arch, which has been alluded to before, as well as in the form of the fore-claws, there is considerable analogy; but in all other points of organization, these two genera are most widely separated.

As far as the nature of the subject will admit, I have now gone through with the detail of the organization of this most singular quadruped. During the investigation, I have had frequent occasion to admire those laws of co-existence which regulate the structure of organized beings; Nature, true to herself in this as in all other instances, has pursued an undeviating course. We have been presented in the subject before us with a *new form*: an animal combining in its external configuration a mechanical arrangement of parts which characterises, respectively, the armadillo, the sloth, and the mole; constituting in themselves, individually and separately, of all other quadrupeds, those which offer the most remarkable anatomical characters. Pursuing the investigation step by step,

with the skeletons of the above-named animals before me, it was not until after I had completely finished every point of observation, that I perceived in the skull alone, of the new animal, a reunion, more or less complete, of all those remarkable traits that an external view of the animal had offered for contemplation ; which, taken collectively, furnishes us with an example of *organic structure*, if not unparalleled, at least not surpassed in the history of animals.

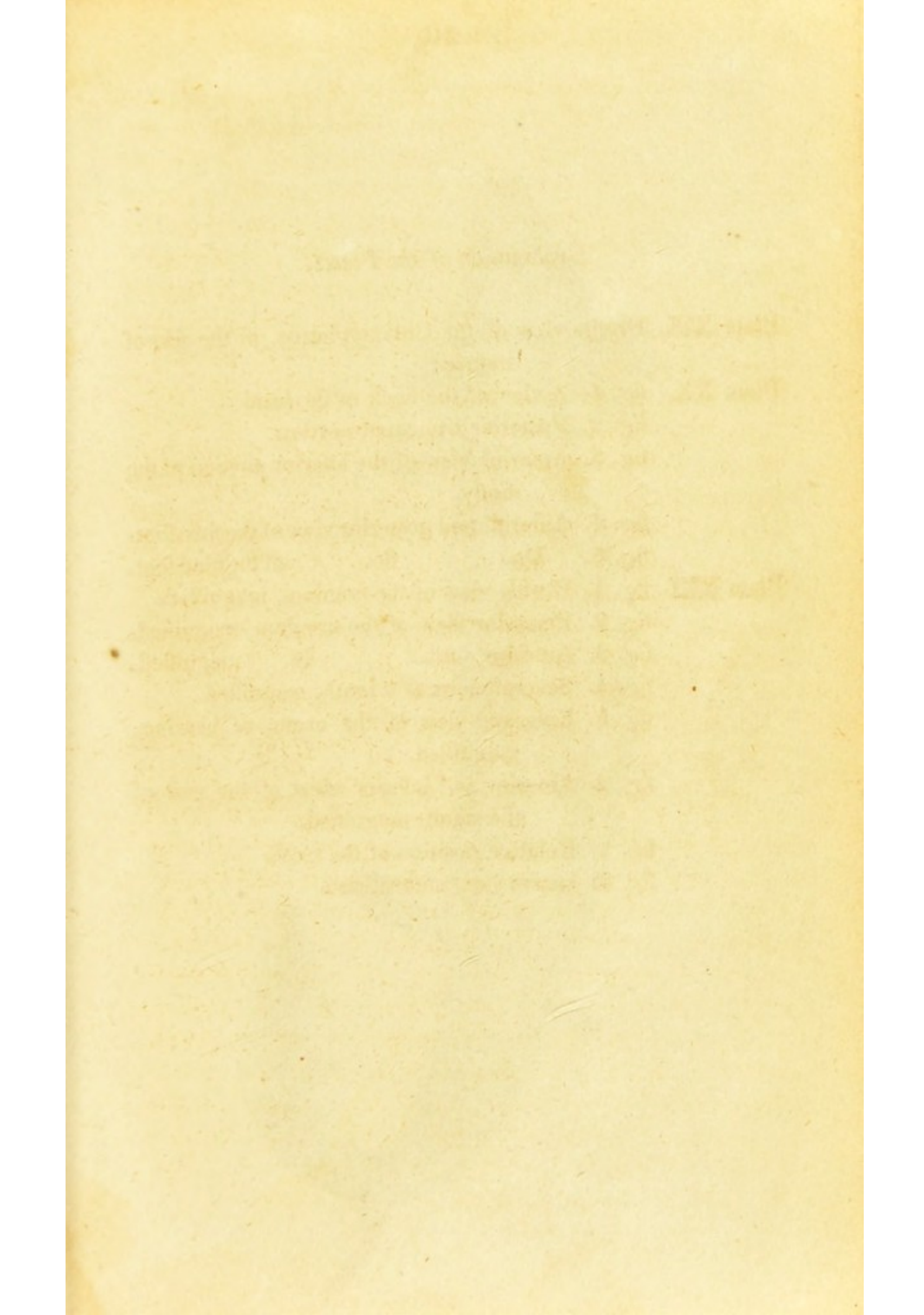
The most peculiar and unique characters consist—First, In the general contour of the animal. Second,—In the form, texture, and disposition of its scaly cloak, which would very much confine the power of flexion and extension of the body, and nearly altogether impede lateral motion ; the greatest freedom of motion would consist in the extension of the head on the body. Thirdly,—in the position of the organs of generation. Fourthly,—In the form, structure, position, and use of the tail. Fifthly,—In the peculiar and complicated structure of the feet and claws. Sixthly,—In the structure of the organ of hearing. Seventh,—In the bony protuberances on the os frontis. Eighth,—In the disposition of the teeth ; and Ninth,—In the form of the lower jaw, which separates the animal, in this respect, from the order *Edentata*, and approximates it to the *Ruminantia* and *Pachydermata*.

Explanation of the Plates.

Plate XIX. Profile view of the Chlamyphorus, of the size of nature.

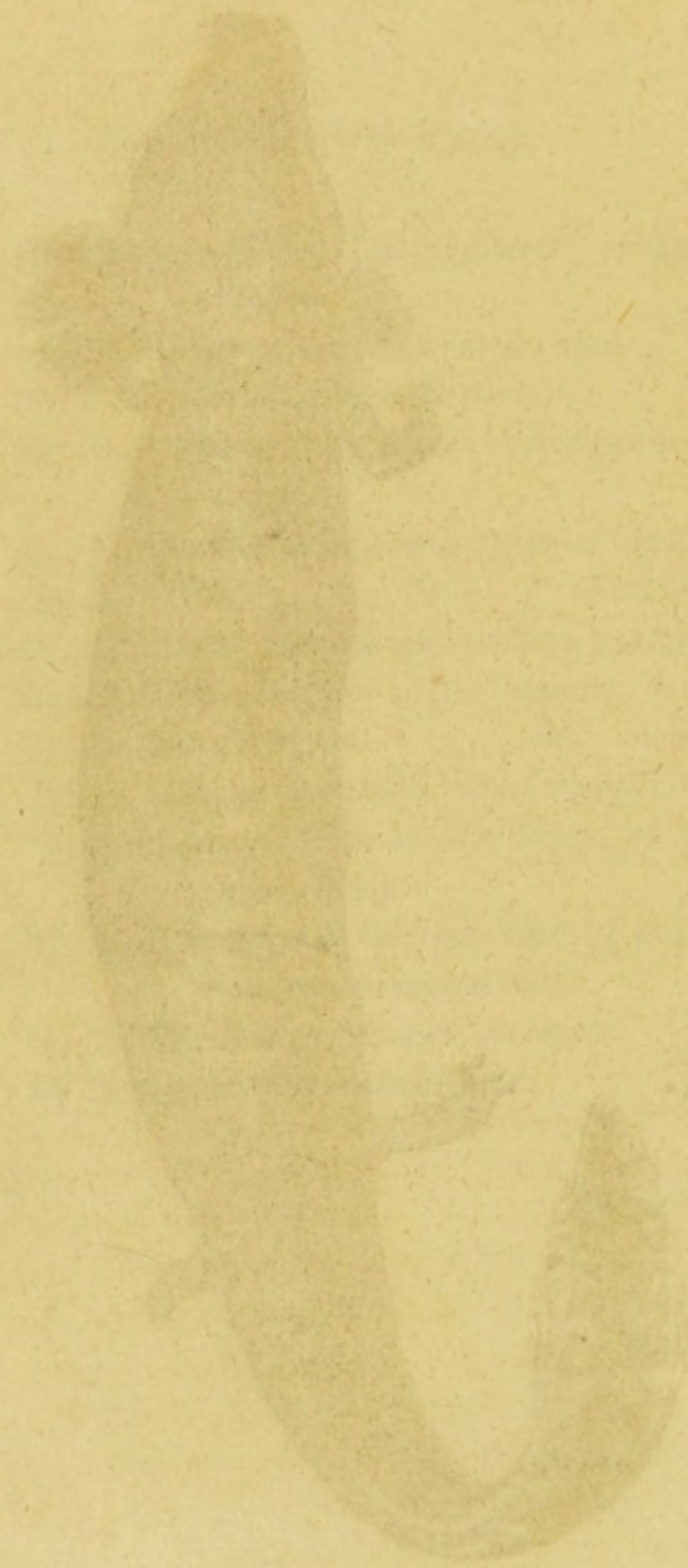
Plate XX. fig. 1. A view of the back of the head.
 fig. 2. Posterior truncated portion.
 fig. 3. Anterior view of the inferior portion of the body.
 fig. 4. Anterior and posterior view of the fore foot.
 fig. 5. Do. do. of the hind foot.

Plate XXI. fig. 1. Profile view of the cranium, magnified.
 fig. 2. Posterior view of the cranium, magnified.
 fig. 3. Anterior do. do. magnified.
 fig. 4. Several views of a tooth, magnified.
 fig. 5. Enlarged view of the organ of hearing, magnified.
 fig. 6. Anterior and inferior view of the end of the snout, magnified.
 fig. 7. Relative position of the teeth.
 fig. 8. Lower jaw, natural size.



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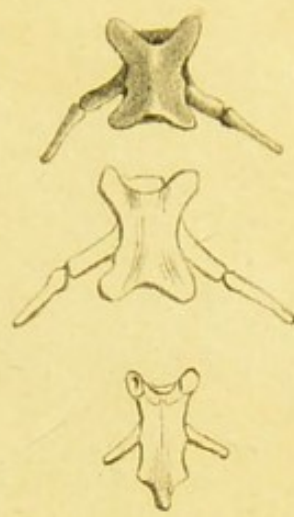
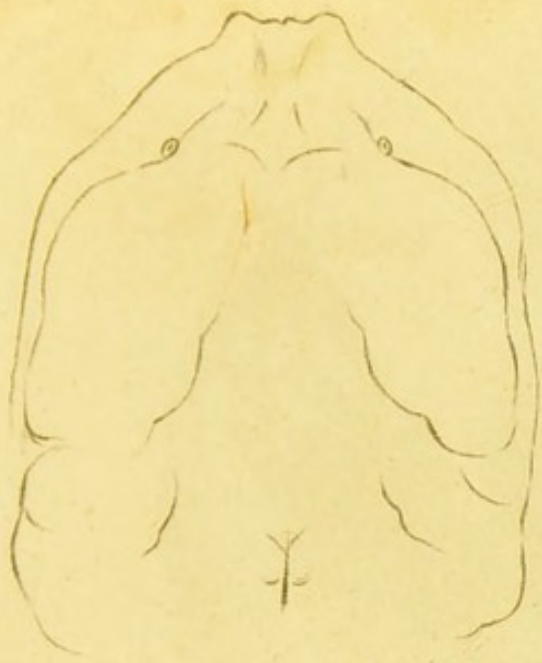




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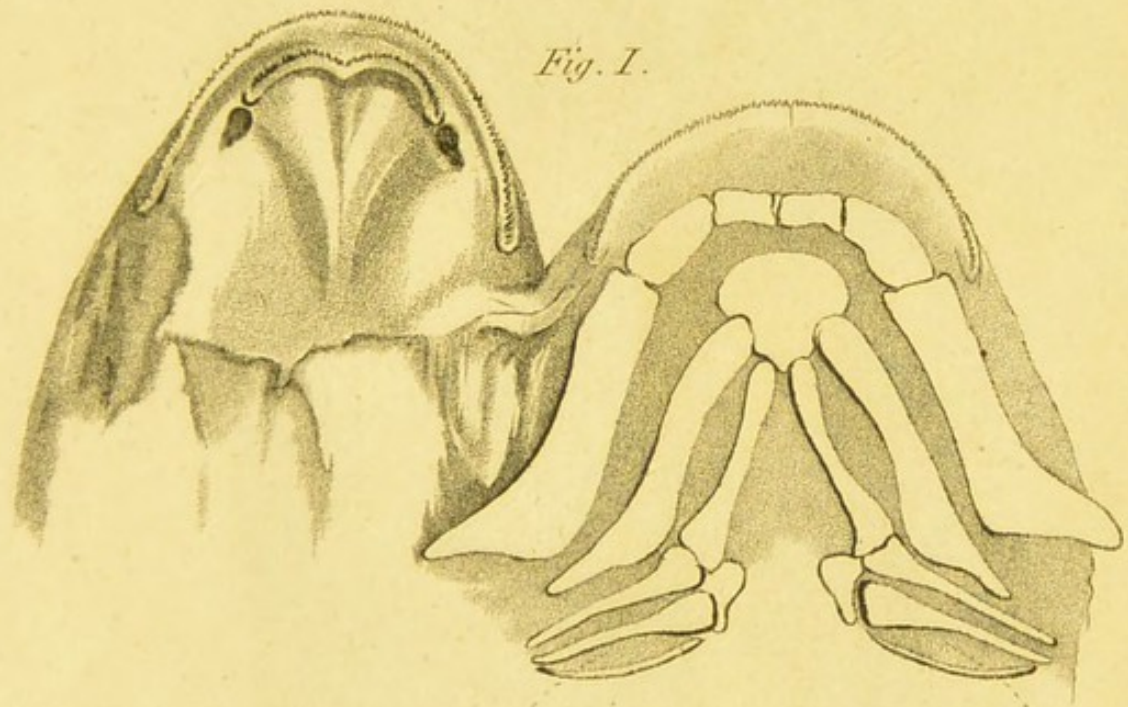




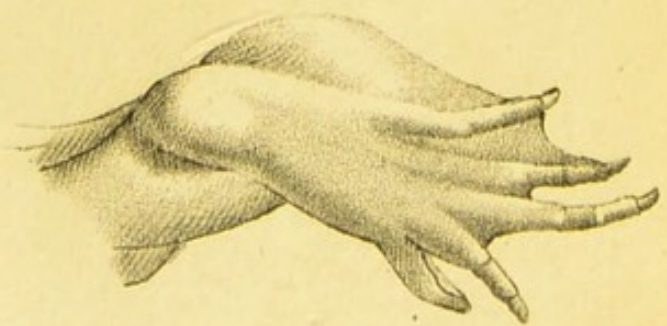
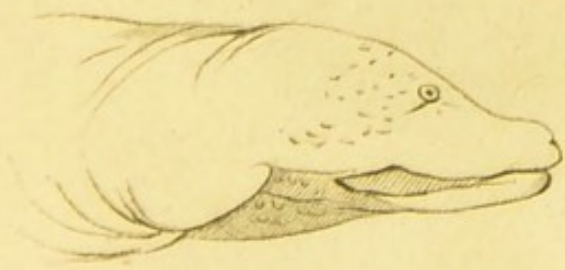


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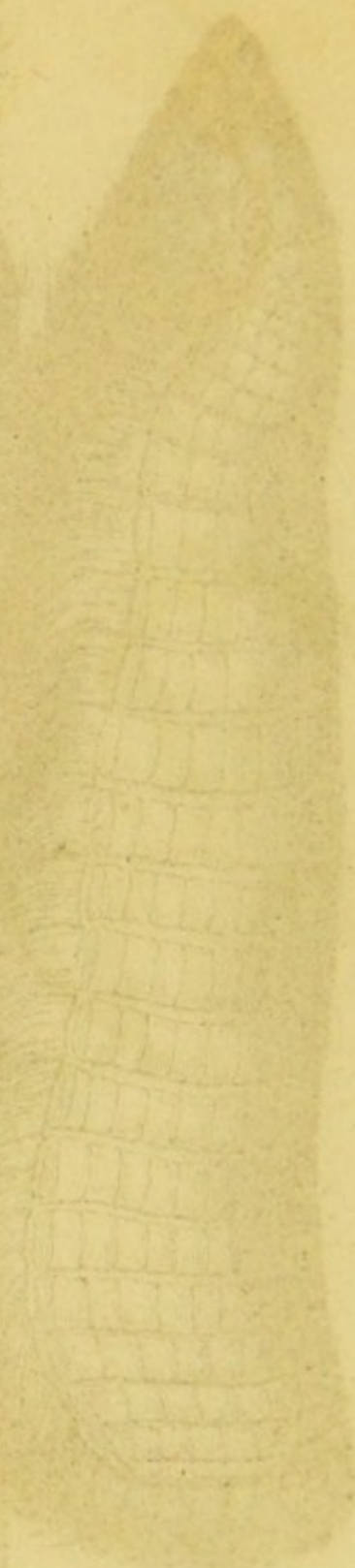
Fig. I.



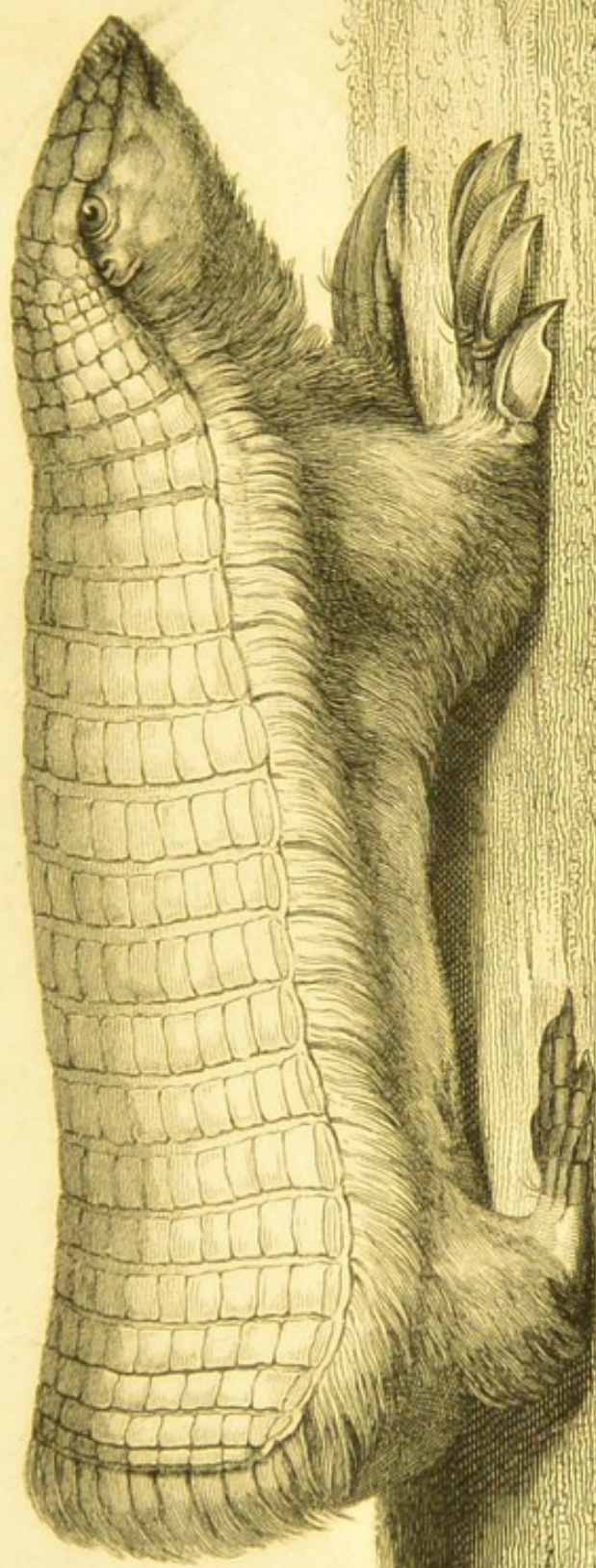
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REPORT OF THE COMMISSIONER



CHLAMYPHORUS TRUNCATUS.



W. W. Wood del.

Peter Mauerich sc.



1.

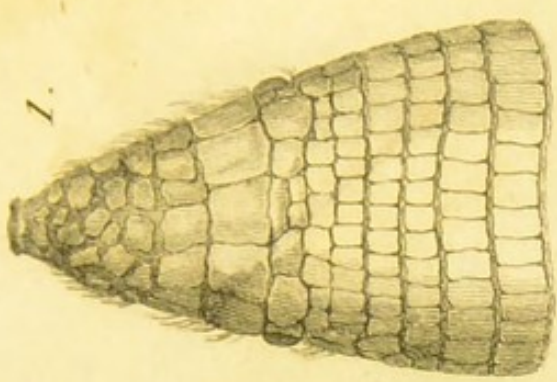
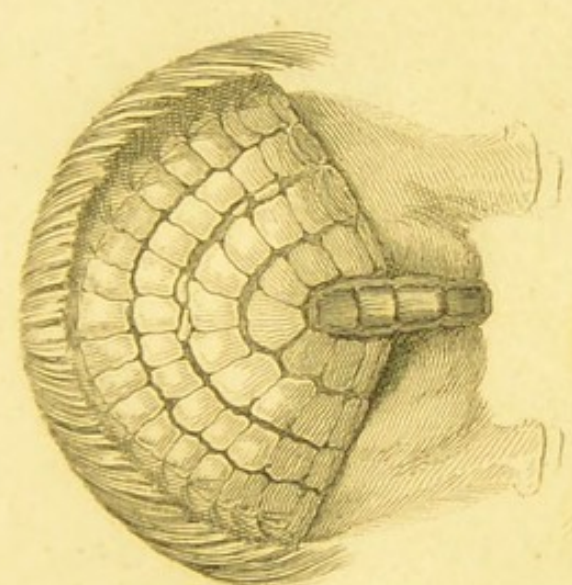
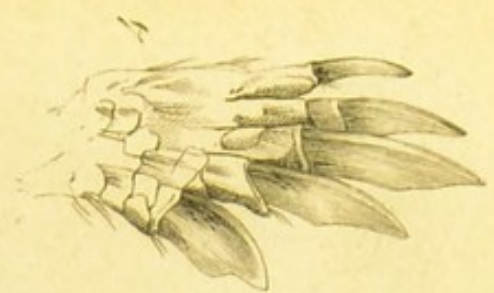
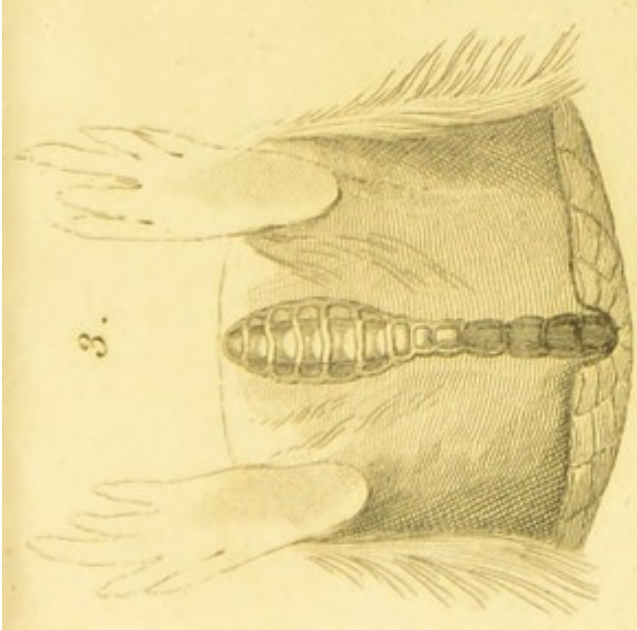


Fig. 2.



3.



Peter-Maverick sc.

W. W. Wood del.

