Gen. MEGHYPENA Grt., 1873.

65. *edictalis* Walk. Canada to Middle States.
    ♂ *vellifera* Grt.
    ♀ *lentiginosa* Grt.

Gen. LOMANALTES Grt., 1873.*
Type : *L. lætulus.*

66. *eductalis* Walk. Nova Scotia to Texas.
    lætulus Grt.

Gen. HYPENA Schrank, 1802
Type : *H. rostralis.*

67. *californica* Behr. Calif.; Vancouver ; Brit. Col.
68. *modesta* Sm. Los Angeles, Calif.
69. *decorata* Sm. California ; Vancouver.
70. *germanalis* Walk.
    evanidalis Rob.
    humuli Fitch nec Harris.
    var. *olivacea* Grt. (pale form).
    var. *albopunctata* Tep. (dark form).

Gen. PLATHYPENA Grt., 1873.

71. *scabra* Fabr.
    humuli Harris.
    erectalis Guen.
    var. *subrufalis* Grt. (rufous form).

The Reptilian Order Cotylosauria.

By E. D. Cope.

(*Read before the American Philosophical Society, November 15, 1895.*)

The characters of this order are as follows:

Quadrate bone united by suture with the adjacent elements. Temporal fossa overroofed by the following elements: Postfrontal, postorbital, jugal, supramastoid, supratemporal, quadratojugal. Tabular bone present. Vertebræ amphicœlous ; ribs one-headed. Episternum present. Pelvis without obturator foramen.

This order is of great importance to the phylogeny of the amniote

*In the *Bull. Brook. Ent. Soc.*, Vol. vii, 4, Mr. Smith says of his new Bomolocha that "it is nearest to the *lætulus* variety of *deceptalis.*" Nowhere in the *Revision* can I find mention of this remarkable variety of *deceptaiis*, pr. syn. or pr. var. I do not know what to make of the omission. Now, in the *Revision*, Mr. Smith adopts Lomanaltes and says that the insect "does convey a somewhat distinctive impression." As in *Agrotis opipara* and *Oncocnemis riparia*, etc. Mr. Smith's synonymy is here not full ; the omitted references tell against me and here cover up a remarkable error of judgment on his part.

Vertebrata. The structure of its temporal roof is essentially that of the stegocephalous Batrachia, while the various postorbital bars of the amniote Vertebrata are explained by reference to the same part of its structure.

The relations of the opisthotic and paroccipital bones in the later orders are apparently explained by their structure in the Cotylosauria. I have identified the element which intervenes between the exoccipital and the supratemporal in the Lacertilia with the distal part of the opisthotico-paroccipital element in the Testudinata, retaining for it the name of paroccipital. Thinking that I have confounded this element with the opisthotic, Baur differs with me,* and calls the element in question the squamosal. My belief in the position taken was based on the character of this region in the Pythonomorpha, where the paroccipital extends proximad to the petrosal, and nearly or quite to the opisthotic, which it does not do in the Lacertilia, a fact not sufficiently regarded by authors generally. I assumed, in consequence of this structure in the Pythonomorpha, that the single element in the Testudinata which extends from the supraoccipital to the quadrate, really includes two elements, the opisthotic proximally and the paroccipital distally. This view is confirmed by the fact that the two elements in the Cotylosauria are distinct. I have been able to locate the semicircular canals definitely in the genera Empedias† and Chilonyx, and to fix the position of the opisthotic, petrosal and epiotic bones. In adults these elements are coössified, but they appear to be separated by suture from the exoccipital and from the paroccipital. The latter is a long bone and supports the quadrate exclusively, the exoccipital being separated by a considerable interval. The form of the quadrate is that characteristic of theromorous Reptilia and Batrachia. It is distal in position and short, not reaching the cranial box by its proximal extremity, with which it is connected by the paroccipital, and by the elements of the temporal roof.

The palatal elements in this order are more or less in contact on the middle line, and the pterygoids diverge abruptly from this point, and return to the quadrate. The occipital condyle is single, and does not include exoccipital elements (unknown in Elginia).

Intercentra are present in Pariasauridæ, Diadectidæ and Pariotichidæ, and they are wanting in Elginiidæ. The hyposphen-hypantrum articulation is present in the Diadectidæ, but is wanting in the Elginiidæ and Pariasauridæ.

The scapular arch is best known in Pariotichidæ, Pariasauridæ‡ and Diadectidæ. In the two former there is a T-shaped sternum, over which are applied the median extremities of the clavicles ; and there are a well-developed coracoid and præcoracoid. In Diadectidæ ‖ (probably genus Empedias) the episternum is articulated by suture with the clavicles.

* *American Naturalist*, 1895, p. 998.

† *Proceeds. Amer. Philos. Soc.*, 1885, p. 234.

‡ Seeley, *Philos. Trans. Roy. Soc. London*, 1888, p. 89 ; 1892, p. 331.

‖ Cope, *Proceeds. Amer. Philos. Soc.*, 1883, p. 635.

In the *Proceedings* of this Society, 1892, p. 279, in a paper on "The Phylogeny of the Vertebrata," I wrote as follows: "Moreover, the Pelycosauria and the Procolophonina have the interclavicle, which is an element of membranous origin, while in the Prototheria we have the corresponding cartilage bone, the episternum. This element is present in the Permian order of the Cotylosauria, which is nearly related to the Pelycosauria." The examination of the sternal region in Pariotichus has led me to the conclusion that the episternum and interclavicle are present and fused together in that genus, and also to the belief that the episternum is present in the genus Procolophon. The structure is generally similar in the two genera, and I think that Seeley is in error in determining the element in question in Procalophon as the interclavicle only.* Gegenbaur pointed out in his *Comparative Anatomy* the different, *i. e.*, membranous origin of the interclavicle of the Lacertilia, but he included it with the episternum under the same name. The true episternum is not present in the Lacertilia. It is present in the Sauropterygia and Testudinata and probably in all the orders with one postorbital bar, or Synaptosauria, while it is wanting in most or all of the Archosaurian series, and in the Squamata. Whether the element I have referred to in the genus Naosaurus as interclavicle, is that element or the episternum, must remain uncertain until I can see it in place. Its edges are thin, as in the interclavicle of the Lacertilia. Of course the reptilian order which is in the line of ancestry of the Mammalia will have an episternum, and not an interclavicle only. The Stegocephalia among Batrachia possess an episternum, with, perhaps, an adherent interclavicular layer as in the Testudniata.

Seeley describes four sacral vertebræ in Pariasaurus. In Empedias there are but two. The pelvis is without obturator foramen. The humerus has an entepicondylar foramen. The tarsal and carpal elements are incompletely known.

There are palatine teeth in Empedias and Pariasaurus, but none in Elginia.

The inferior surface of the cranium is known in Elginia, Pariasaurus, Empedias and Pariotichus, and has been described as to the first three genera by Newton, Seeley and myself. Pariotichus displays generally similar characters. There is a pair of posterior nares, and a pair of zygomatic foramina, but there is no palatine foramen. The palatine elements meet on the middle line, but gape behind. The vomers (prepalatines) are distinct, and are well developed anterior to the palatines. The ectopterygoid is large and has a prominent posterior border. I have stated that in Empedias there are teeth on the vomer. Better preserved specimens of Pariotichus show that the teeth are really borne on the edges of the palatines, which are appressed on the median line in the former genus. Similar palatine teeth are present in Pariasaurus, but are wanting in Elginia. Teeth are also present on the posterior edge of the ectoptergoids in

* *Philos. Transac. Royal Society*, 1889, p. 275, Plate ix, Fig. 9.

Pariasaurus and Pariotichus, but not in Elginia or Empedias. A character of the American genera is the weakness of the attachment of the basioccipital to the sphenoid. The basioccipital is lost from the only known specimen of Elginia, and the sphenoid projects freely below it in Pariasaurus. The roof of the mouth in this order is a good deal like that of the Lacertilia, lacking the palatine foramen.

The order Cotylosauria was defined by me in the *American Naturalist* for 1880, p. 304, and in 1889 (October). In 1889 (*Transac. of the Roy. Soc. London*, p. 292), Prof. Seeley gave it the name of Pariasauria. In my *Syllabus of Lectures on Vertebrate Paleontology* (1891, p. 38), I arranged the group as a suborder of the Theromora. In 1892 (*Trans. Amer. Philos. Soc.*, p. 13, Pl. i), I again regarded the Cotylosauria as an order, and desciibed the characters of the skull in three of the genera, and gave figures of them.

Seeley has objected to the reference of the genera Pariasaurus and Empedias to the same order, on the ground that the elements connecting the supraoccipital and the quadrate rest on the occipital elements in the latter, while they are elevated above them in the former. This character would not, however, define orders, as both conditions are found in the Lacertilia; but might distinguish families within an order. However, Seeley's description and figure of the occipital region in *Pariasaurus bainii** show that the structure only differs from that of the Diadectidæ in the presence of a large foramen between the supraoccipital and exoccipital bones on each side.

Seeley has also proposed to include Eryops in this order. But Eryops is a true batrachian with two occipital condyles, and a large parasphenoid bone. The dental structure is like that of Actinodon, and the vertebræ are of the rhachitomous type, which is unknown among Reptilia.

The known species of the Cotylosauria range in dimensions from that of the South American Caimans (Chilonyx, Pariasaurus sp.) to that of the smaller Lacertilia, *e. g.*, *Eumeces quinquelineatus* (Isodectes and Pariotichus sp.). They range from the Permian to the Trias, inclusive, and have been found in South Africa, North America and Scotland.

This order embraces at present four families, which are distinguished as follows:

I. Teeth in a single series.

Teeth not transversely expanded; vertebral centra with surfaces only ossified; no hyposphen.................................*Elginiidæ*.

Teeth not transversely expanded; vertebral centra ossified; no hyposphen...................................*Pariasauridæ*.

Teeth with the crowns transverse to the axis of the jaws; vertebræ ossified and with a hyposphen-hypantrum articulation.......*Diadectidæ*.

II. Teeth in more than one series in (one or) both jaws.

Teeth with cylindric roots; vertebræ ossified ....*Pariotichidæ*.

* *Philos. Trans. Roy. Soc.*, 1892, p. 326, Pl. 18, Fig. 2.

These families embrace the following genera.

ELGINIIDÆ.

This family includes but one genus, Elginia Newton.

Elginia Newton.

Philos. Trans. Roy. Soc. London, 1893, p. 489.

Supraoccipital and tabular bones well developed on the superior surface of the cranium, the latter produced into a horn. Teeth pleurodont, crowns distinct from shafts, compressed, serrate. Posterior nares anterior. Pterygoids divergent (Newton).

The above characters are derived from Prof. Newton's description and figures. His epiotic bone is my tabular, and his squamosal is my supramastoid. It is probable that the superior border of the orbit is formed by the frontal bone, which separates the postfrontals from the prefrontals. The skeleton is unknown. Newton refers this genus to the "Pariasauria."

Elginia mirabilis Newton, *loc. cit.*, p. 473, Pl. 37–40.

Elgin sandstones (Lower Trias?), Scotland.

PARIASAURIDÆ.

Three genera are probably referable to this family, which differ as follows:

Teeth on the vomer and palatine bones; vertebræ shallowly biconcave. *Pariasaurus* Seeley.

Vertebræ deeply biconcave.............................*Anthodon* Owen.

Palate toothless; ? vertebræ.......................*Tapinocephalus* Seeley.

The above characters I derive chiefly from Seeley.

Pariasaurus Seeley.

Philos. Trans. Roy. Soc. London, 1888, p. 95. Owen, Nomen Nudum; *Foss. Rept. S. Africa, Brit. Mus.* 1876, p. 6.

Pariasaurus serridens Owen, *Foss. Reptilia South Africa Brit. Mus.*, 1876, p. 6, Pls. vi, vii, viii, Figs. 1, 2. Seeley, *Trans. Roy. Soc. London*, 1888, p. 75, Pl. xvi.

Permo-Trias of South Africa.

Pariasaurus bombidens Owen, *l. c.*, p. 9, Pl. viii, Fig. 3, Pls. ix, x, xii. Seeley, *Philos. Trans. Roy. Soc.*, 1888, p. 59, Pls. xii, xiii, xiv, xv; *l. c.*, 1892, p. 315, Pl. xx.

Permo-Trias of South Africa.

Pariasaurus bainii Seeley, *Philos. Trans. Roy. Soc. London*, 1892, p. 322, Pls. xvii, xviii, xix.

Permo-Trias of South Africa.

PARIASAURUS RUSSOUVII Seeley, *loc. cit.*, 1892, p. 333, Pl. xix, Figs. 3, 4.

Permo-Trias of South Africa.

PARIASAURUS MINOR Seeley, *loc. cit.*, p. 354, 1892, Figs. 10, 11. *Propappus minor* Seeley.

Permo-Trias of South Africa.

ANTHODON Owen.

Catal. Foss. Reptiles South Africa Brit. Mus., 1876, p. 14. Seeley, *Philos. Trans. Roy. Soc.*, 1888, p. 95.

ANTHODON SERRARIUS Owen, *loc. cit.*, p. 14, Pl. xiii.

Permo-Trias of South Africa.

TAPINOCEPHALUS Seeley.

Philos. Trans. Roy. Soc., 1888, p. 95 ; Owen, *Catal. Foss. Reptilia South Africa Brit. Mus.*, 1876, p. 1, Nomen Nudum.

TAPINOCEPHALUS ATHERSTONII Owen, *loc. cit.* Pls. i, ii, Figs 1–3.

Permo-Trias of South Africa.

DIADECTIDÆ.

Cope, *Proceeds. Amer. Philos. Soc.*, 1880, p. 8 ; *l. c.*, 1882, p. 448.

There are three genera of this family known, as follows :

Teeth much compressed ; a canine .... *Diadectes* Cope.

Teeth less compressed, robust ; no canine ; os tabulare not produced ; top of head without dermal scuta...................... *Empedias* Cope.

Teeth compressed, with an apex ; no canine ; os tabulare produced into a tuberosity or horn ; top of head scutate .... *Chilonyx* Cope.

The species of this family are of robust character, and have stout limbs with strong claws. The spines of the vertebræ are short and robust, and the peculiar hyposphen-hypantrum articulation, elsewhere known only in the Camarasauridæ of the Jura, is present. Intercentra present so far as known.

DIADECTES Cope.

Proceeds. Amer. Philos. Soc., 1878, p. 505, 1880, p. 8.

DIADECTES SIDEROPELICUS Cope, *l. c.*

Permian of Texas.

EMPEDIAS Cope.

Proceeds. Amer. Philos. Soc., 1883, p. 634. *Empedocles*, *l. c.*, 1878, p. 516 ; *American Naturalist*, 1878, April ; *l. c.* April, 1880 (preoccupied).

Empedias molaris, *l. c.*, 1883, p. 634. *Empedocles molaris, l. c.*, 1880, p. 10. *Diadectes molaris* Cope, *American Naturalist*, 1878, p. 565.

Permian of Texas.

Empedias fissus Cope, *Proceeds. Amer. Philos. Soc.*, 1883, p. 634.

Permian of Texas.

Empedias phaseolinus Cope, *l. c.*, 1883, p. 635. *Diadectes phaseolinus* Cope, *loc. cit.*, 1879, p. 9.

Permian of Texas.

Empedias latibuccatus Cope, *loc. cit.*, 1883, p. 634. *Diadectes latibuccatus* Cope, *loc. cit.*, 1878, p. 505.

Permian of Texas.

Chilonyx Cope.

Proceeds. Amer. Philos. Soc., 1883, p. 631 ; *Trans. Amer. Philos. Soc.*, 1892, p. 13.

Chilonyx rapidens Cope, *l. c.; l. c.*, Pl. i, Fig. 2 ; Pl. viii, Fig. 6.

Permian of Texas.

PARIOTICHIDÆ.

This family was proposed by me in the *Proceeds. Amer. Philos. Soc.*, 1883, p. 631. I there enumerated three genera, one of which must be canceled. To the two remaining, I now add three others. They are defined as follows:

I. External nostrils lateral.

a. Palatal and splenial teeth with compressed crowns.

Teeth equal, acute .... *Isodectes* Cope.
Teeth increasing gradually in length anteriorly....... *Captorhinus* Cope.
Teeth enlarged on the middle of the maxillary and anterior part of the incisive series .... *Pariotichus* Cope.

aa. Palatal and splenial teeth obtuse, forming a grinding pavement.

Median maxillary and anterior incisor teeth enlarged .....*Pantylus* Cope.

II. External nostrils inferior.

Mouth posterior in position, mandible short, and with a few acute teeth. *Hypopnous* Cope.

It is probable that Helodectes Cope pertains to this family.

Isodectes Cope, gen. nov.

Isodectes megalops Cope. *Pariotichus megalops* Cope, *Proceeds. Amer. Philos. Soc.*, 1883, p. 630 ; *Trans. Amer. Philos. Soc.*, 1892, p. 25, Pl. i, Fig. 3.

Permian formation of Texas.

Captorhinus Cope, gen. nov.

Captorhinus angusticeps, sp. nov.

This species is represented by an imperfect skull with both rami of the lower jaw in place. The superior osseous walls have been mostly lost, leaving a cast of this region ; the walls of the maxillary and mandible, and one side of the temporal region, with the border of one orbit remain. Almost the entire dental series of both sides is displayed, the teeth being split through their centres.

The head is wedge-shaped, with an acuminate and rather elongate muzzle. The orbits are round and very large, the diameter being double the interorbital width, and equal to the length of the muzzle to the middle of the nostril. The teeth increase in length gradually from behind forwards, and the anterior mandibular teeth are inclined forwards at an angle of 45°. The premaxillary teeth have lost their crowns, but from the direction of the alveolæ, it appears that they were not directed posteriorly to any conspicuous degree. The posterior teeth of both jaws have obtuse crowns, and the crowns become more and more conic to the front. Nothing can be said of the character of the sculpture, as the surface of the bone, where present, is injured. The characters which distinguish the species as compared with other Pariotichidæ, besides those of the teeth, are the following: The interorbital width is less; the orbit large, entering the temporal length 1.5 times; and the skull is narrowed posteriorly, the width being three-quarters of the length, as in the *Pariotichus aguti*.

Measurements.	MM.
Total length of skull	62
Width of skull posteriorly	41
Interorbital width	10
Diameter of orbit	16
Elevation of crown of a posterior superior tooth	2.5
" " " an anterior " "	4
Length of posterior inferior tooth	2
" " anterior " "	5
Depth of cranium at occiput	14
" " mandibular ramus below temporal roof	10

From the Permian formation of Texas.

Pariotichus Cope.

Proceeds. Amer. Philos. Soc., 1878, p. 508; *l. c.*, 1883, p. 631. *Ectocynodon* Cope, *l. c.*, 1878, p. 509.

This genus was established on the smallest known species, the *P. brachyops* Cope, in which the premaxillary teeth are unknown. The maxillary teeth display the enlarged median tooth characteristic of the species referred to Ectocynodon, although it is less prominent than in some of the latter, and it is probable that the premaxillaries display corresponding enlargement. The type of Ectocynodon (*E. ordinatus* Cope) is in the same condition as regards teeth of the premaxillary series, but a long tooth is present near the mandibular symphysis, so that the characters are so far those of the other species referred here. The elongation of the maxillary tooth is more conspicuous than in the *P. brachyops*. In general this tooth is not absolutely very large, but the teeth anterior and posterior to it are small or very small.

Besides the usual series of teeth on the maxillary bone, there are two or more series adjacent. In like manner on the mandible, besides the dentary series, there are two or three series, perhaps on the splenial bone, standing on a ledge in the same horizontal plane as the tooth-bearing edge of the dentary.

In this genus, and probably in all the members of the family, the palate is roofed over posteriorly by the palatine bones. The pterygoids diverge early from the presphenoid region towards the zygomatic border, as in Batrachia generally. The mandibular articular surface consists of two cotyli placed transversely. The os tabulare is small, and is situated, as in other genera of the family, near the posterior junction of the supramastoid and supratemporal. The supraoccipital forms a narrow strip at the posterior border of the superior plane of the skull. The arrangement of the cranial bones is as I have described in the genera Isodectes and Pantylus,* except that the prefrontal and postfrontal bones scarcely meet over the orbit, instead of separating the orbital border from the frontal. The occipital condyle, as in Empedias, is prominent, and has a median fossa.

In *Pariotichus aguti* the vomers are elongate posteriorly and the palatines send an acute anterior process between them. The palatines are separated by a fissure which is narrow anteriorly and becomes wider posteriorly. Each interior border bears on its posterior two-thirds a row of small teeth. In this respect this genus differs from Empedias, where the palatines are closely appressed on the middle line. The suture between the palatines and the ectopterygoid is not easily made out, but this region descends below the maxillaries to opposite the middle of the inside of the mandible as in many Lacertilia. Just anterior to the oblique angle which marks this descent a ridge of the palatines extends forwards and outwards, and for a short distance bears a row of teeth. These teeth, like those of the internal palatine series, are in a single row, differing in this respect from the species of Pariasaurus as described by Seeley, where they are in two rows. The positions of the rows are the same in the two genera. The posterior border of the (?) ectopterygoid supports a patch of teeth in several rows. They are much less developed in Pariasaurus.

The pterygoids are slender and diverge from the interior part of the palatines outward, backward and upward, to the inner side of the quadrate. They bear no teeth. The sphenoid is deeply grooved on the middle line as in Elginia. Its lateral inferior keels project below the plane

Trans. Amer. Philos. Soc., 1892, p. 14, Pl. i.

of the short basioccipital. There is no evidence that any of the rows of teeth of the upper jaw rise from the palatine bone; they appear to be maxillary in attachment.

The specimen of *Pariotichus aguti* on which the above observations are made, possesses, attached to the skull in nearly normal relation, seven vertebræ, a good deal of the scapular arch, and the right humerus. The fifth and sixth vertebræ have slender cervical ribs. The bodies of these with that of the seventh are the only ones whose inferior surfaces are exposed. I observe narrow spaces for intercentra between them. Of the scapular arch the clavicle and a median element are preserved. The former has a narrow subvertical portion which rests on the anterior edge of the scapula, and a horizontal portion which is considerably expanded, contracting gradually to the middle line. The median element is T shaped, with the median portion or stem rather slender. It is broken off posteriorly so that its apex cannot be described. It underruns the expanded clavicles, and may be therefore supposed to be a cartilage bone and a true sternum, and not an interclavicle. A superficial layer of the exposed part of this element is roughened by sculpture, and probably represents the interclavicle. The inferior layer of the expanded part of the clavicle is similarly sculptured. The humerus has greatly expanded extremities and a slender shaft of moderate length. The form is similar to that of Pariasaurus. There is an angulation of the distal extremity, which represents a condyle. Entepicondylar foramen well developed; no ectepicondylar foramen.

The species differ as follows:

I. The long maxillary tooth below the anterior border of the orbit.

Head short, wide; orbit small, half interorbital width; length of skull about 25 mm .... *P. brachyops*.

II. The long maxillary tooth nearer the nostril than the orbit.

a. Sculpture reticulate.

Interorbital and parietal sculpture reticulate; interorbital width 20 mm.; interior jaw teeth with round crowns..................... *P. incisivus*.

aa. Sculpture more or less in longitudinal ridges.

Interorbital sculpture in longitudinal ridges; interorbital width 9 mm., equal orbit; maxillary tusk abruptly longer............. *P. ordinatus*.

Cranial sculpture in longitudinal ridges; orbit about equal interorbital width; skull equilateral, straight posteriorly; length 72 mm. Inner jaw teeth compressed................................ *P. isolomus*.

Cranial sculpture partly reticulate, especially medially; orbit about equal interorbital width; width of skull three-quarters length; outline emarginate posteriorly, length 80 mm. .... *P. aguti*.

Orbit oval; cranium 162 mm. long, and nearly as wide; posterior border emarginate; muzzle much contracted, entirely overhanging symphysis mandibuli.. *P. hamatus*

Pariotichus brachyops Cope, *Proceeds. Amer. Philos. Soc.*, 1878, p. 508.

The typical specimen is the only one that has come under my observation. Permian bed of Texas.

Pariotichus incisivus Cope. *Ectocynodon incisivus* Cope, *Trans. Amer. Philos. Soc.*, 1886, p. 290, Pl. ii, Figs. 4, 5.

But one specimen has come under my observation ; it was found in the Permian of Texas.

Pariotichus ordinatus Cope. *Ectocynodon ordinatus* Cope, *Proceeds. Amer. Philos. Soc.*, 1878, p. 509.

The original specimen from the Permian of Texas is the only one that I have seen.

Pariotichus isolomus Cope, sp. nov.

Three nearly complete skulls represent this species in my collection. In the most damaged of these the frontal and parietal bones are wanting ; in another the skull is fractured so as to separate the maxillary and mandibular bones on one side so as to display the crowns of the teeth.

As may be seen by the comparative key, this species is most nearly allied to the *P. aguti.* The form of the skull is different and also the sculpture. The skull is equilateral, and the posterior superior border is nearly straight. The muzzle projects beyond the mouth border, so that the incisor teeth are directed backwards at an angle of 45°. The nares are separated by a space equal to their long diameter. The orbit is of moderate size. Its anteroposterior diameter enters the lengths of the skull anterior and posterior to it 1.75 times, being midway of the total length. It exceeds by a little the interorbital width. The mandibular ramus is robust, being a little deeper than wide, and the angle is small and pinched, projecting behind the articulation and in line with the rising inferior border. The parietal foramen is well developed.

In the sculpture of the superior surface of the skull the longitudinal striæ are more prominent than the transverse ones which connect them, except on the muzzle, where they are about equally conspicuous. The sculpture is finer and reticulate on the jugal and quadratojugal regions. About a dozen longitudinal ridges between the orbits. Sculpture of mandible tubercular reticulate.

Three teeth on each premaxillary bone, of graded lengths, the anterior being much the larger. Posterior to these one or even two smaller teeth may stand on the premaxillary. The large tooth of the maxillary is the third from the premaxillary suture. At the fifth tooth the second longitudinal row appears, and at the eighth tooth, the third. There are ten teeth in line with the row which is external anteriorly, but posteriorly a short row appears external to this one, which includes five teeth. The crowns of the teeth of the two internal rows are low and compressed so as to have a longitudinal edge. In the lower jaw there are three rows with compressed crowns, besides the external row. Posteriorly the marginal, and the third row (from without) disappear, and the second and fourth approximate, and end in a single tooth in line with the second row.

In one of the specimens the cranial roof posterior to the orbits can be lifted off. Above the sphenoid region, viewed from above, there are four subround tuberosities, which look like the casts of cavities. On the inferior side of the roof in the corresponding positions are four flat tuberosities, of somewhat different form from the inferior ones, and an obtuse median prominence, which fits into the space between the four inferior tuberosities. These superior tuberosities resemble the casts of cavities left by the dissolution of two hemispheres, and two transversely expanded larger, mesencephalic lobes, with a hypophysis between them. This interpretation is, however, very uncertain, especially as the structure does not resemble the cast of the cranial cavity which I have previously described in Empedias.

Measurements.		MM.
Length of cranium on middle line		76
Width of cranium posteriorly		63
Anteroposterior diameter of orbit		16
Interorbital width		13
Width between nares at front of muzzle		9
Diameter of largest maxillary tooth		2.5
Length of long premaxillary tooth		7
Diameters mandibular ramus at fourth tooth	vertical	10.5
	transverse	9

From the Permian of Texas.

PARIOTICHUS AGUTI. *Ectocynodon aguti* Cope, *Proceeds. Amer. Philos. Soc.*, 1882, p. 451., Pl. vii.

Since this species was described, I have received six crania from the same horizon. These include some specimens of smaller dimensions than the type, while others are intermediate, and one is a little longer. They all agree in their wedge-shaped form with less posterior width than the *P. isolomus*, since it is only three-fourths the length. The posterior border is openly emarginate posteriorly, while it is nearly straight in the *P. isolomus*. The cranium has a less depressed form, especially posteriorly. In one specimen, which is much flattened by pressure, the proportion of width to length remains unchanged. In the sculpture, the longitudinal lines are not relatively so conspicuous. The reticulation is conspicuous on the middle parts of the superior surface throughout, and on the sides posteriorly. The sculpture is very fine on the jugal bone and the sides of the muzzle. There are four teeth on the premaxillary, and fifteen in the external series of the maxillary, of which in some specimens the third from the front is the largest, in others the fourth. The crowns of the teeth of the internal series are compressed so as to be anteroposterior. The proportions of the premaxillaries and of the internal and external rows of those of the jaws are as in the *P. isolomus*.

The protrusion of the muzzle, and position of the nostrils ; also the size of the orbits and interorbital width are as in *P. isolomus*. The length of the largest specimen is 90 mm., of the smallest 70 mm.

The vomers are decurved anteriorly. The posterior border of the posterior nares is opposite the anterior border of the orbits. The point of divergence of the posterior or ectopterygoid wings of the palatines is opposite the posterior border of the orbit. I count fifteen teeth on each internal palatine border, and five on the external palatine series. The posterior or (?) ectopterygoid patch contains about twenty teeth. All the palatal teeth have circular cross sections.

The clavicles do not meet on the middle line, but show a portion of the sternum between them. The sternum posterior to the clavicles is quite narrow. The distal extremity of the humerus is in a plane which has an angle of nearly 90° to that of the head. The plane of its narrow inner face is nearly at right angles with the general plane, and it projects beyond the latter distad. Condylar border concave ; entepicondylar ala large.

Measurements.	MM.
Length of sixth cervical centrum	5.5
Elevation of neural spine of cervical centrum	10.2
Length of clavicle, vertical portion	15
" " horizontal portion	13
Width of sternum, at clavicles	24
" " posteriorly	5
Length of humerus	33
Width of head of humerus	12
" of distal extremity of humerus	16
Diameter of shaft of humerus	3.5

PARIOTICHUS HAMATUS, sp. nov., Pl. viii, Figs, 1, 2.

Represented by a cranium with lower jaw in pretty good preservation, and a second smaller cranium with lower jaw, from which the end of the muzzle is wanting. Besides exceeding in size the other species, this one is characterized by the elongation and compression of the muzzle, and by the extent of the projection of the premaxillary region beyond and below the mandibular rami.

The length of the skull a little exceeds its posterior width. The lateral outlines expand rapidly from the anterior borders of the orbits, posteriorly, while from this point anteriorly the lateral outlines of the muzzle converge very gradually. The transverse section of the muzzle is subrectangular, and not a segment of a circle as in other species, the superior face being nearly flat, and the maxillary borders somewhat contracted. This form may however be due to pressure. Opposite the posterior border of the nostril the premaxillary border is steeply decurved, forming a concavity which receives the extremity of the mandible. The deflected portion of the premaxillary forms a lobe which projects as far as the continuation of the line of the inferior border of the ramus mandibuli. An open emargination of the border separates it from the corresponding lobe of the opposite side. This may be due to accident. The mandible is narrower than the muzzle at the symphysis ; it is a little wider than the cranium at the front of the orbit, but is narrower than the cranium posterior to it.

The orbit has an oval outline, with the long axis anteroposterior, which enters the length of the cranium posterior to it twice, and one and three-quarters times the length anterior to it, and a little exceeds the interorbital width. The latter is flat. The posterior outline of the skull forms a wide open emargination. The surface of the skull and jaws is so much injured in both specimens as to render it impossible to state the character of the sculpture, if any existed.

The teeth are not well preserved, although where preserved their length can be determined in the limestone matrix. The elongate maxillary tooth is placed exactly half way between the borders of the orbit and nostril, which is posterior to its position in the *P. aguti.* The other maxillary teeth are small in comparison with the size of the skull. The enlarged anterior premaxillary teeth are not well preserved, and their size is uncertain. In some other specimens of similar size with rounded cross-section of muzzle, these teeth are enlarged as in *P. aguti.*.

Measurements.

	MM.
Length of cranium from line connecting posterior borders of quadrates	162
Length of cranium from middle of posterior border	145
Interorbital width	32
Diameters of orbit { anteroposterior	36
Diameters of orbit { vertical	22
Width of muzzle at posterior border of nares	29
Depth " " " "	21
" of cranium at middle of orbit	35
Length of crown of large maxillary tooth	6
Depth of mandible at middle of orbit	20
Length of mandible on ramus	170

The decurved premaxillary region and the posterior expansion of the skull give this species a certain resemblance to the alligator snapping tortoise, *Macrochelys temminckii.*

Pantylus Cope.

Bulletin of the U. S. Geol. Survey Terrs., 1881, p. 79; *Transac. Amer. Philos. Soc.*, 1892, p. 14.

Pantylus cordatus Cope, *l. c.; l. c.*, Pl. i, Figs. 4–4a.

Permian formation of Texas; two incomplete crania.

PANTYLUS COÏCODUS, sp. nov.

An injured anterior half of a cranium represents this species. The right dental series is tolerably well preserved, so that the forms of the dental crowns can be determined. The left dental series is partially preserved. The superior surface of the muzzle has been destroyed, so that the forms and positions of the orbits and nares cannot be distinguished.

The right dental series includes eleven teeth, which are of subequal dimensions. The crowns are robust and somewhat swollen at the middle, and with a small median subacute apex. The matrix covering the palate is rather hard, and in removing it only three internal teeth were detected. Two of these are near the maxillaries, and just within the last and the penultimate respectively. The third is opposite the antepenultimate maxillary and is as far interior to it as the length of the last three maxillaries. This and the posterior palatine teeth are as large as the maxillaries, the other is smaller. The crowns have the same form as those of the maxillary series.

This species is of about the dimensions of the *P. cordatus*, but the palatine teeth are less numerous, and less closely placed. The inequality in size of the maxillary teeth characteristic of the *P. cordatus* is not seen in the *P. coïcodus*, and the form of the crown, in the two species is distinct. Those of the *P. cordatus* are obtuse, and without the little apex of the new species. In the latter the dental crowns have nearly the form of the seeds of the grass, *Coix lachryma*.

Accompanying the specimen above described is a fragment of apparently a dentary bone, which supports eight teeth and parts of teeth. The crowns stand on shanks which rise above the external parapet of the jaw, but have a deeper attachment on the inner side, being thus partially pleurodont. The crowns are swollen at the base as in the maxillary teeth, but the apices are more produced, being regularly conic. The apices are all lost. These teeth belong to a rather larger animal than the one above described, and perhaps to another species.

Measurements.

		MM.
Length of a series of eleven maxillary teeth		37
Diameters of the crown of a maxillary tooth	longitudinal	4
	transverse	3
Distance from ninth tooth to anterior palatine		6

HYPOPNOUS Cope, gen. nov.

Nostrils on the inferior aspect of the muzzle. Mouth posterior. Teeth few, with compressed crowns. Cranial bones sculptured. Frontal bone bounding the orbit above.

This genus displays in this family the character found in Lepidosternum and other genera among the Amphisbænidæ. The large superiorly placed orbits and inferior posterior mouth indicate that the animal lived in some locality where upward vision was important, while its food was below it.

Hypopnous squaliceps, sp. nov., Pl. viii, Figs. 3–5.

Based on a skull, which is somewhat crushed by pressure. The bony roof of the anterior part of the muzzle has been lost. The suspicion that physical causes could have produced the extraordinary form of the muzzle is dispelled by the symmetry of all the parts, and the preservation of the much abbreviated right mandibular ramus, which is perfect except the angle, with its teeth.

The cranium is moderately elongate, is truncate posteriorly, and has a rather broadly rounded muzzle. The orbits are posterior to the middle transverse line of the skull, and have the axis directed at an angle of 45° to the horizontal plane of the skull. The anterior border of the mouth is below the anterior border of the orbit. The nares are large ; their anterior border coincides with the border of the muzzle, and they are about as wide as long, the width equaling that of the premaxillary space between them. The mouth border is 1.33 times their long diameter posterior to them. The diameter of the orbit is one half the long diameter of the muzzle, and enters its width one and one-half times ; it equals the length of the cranium posterior to it, and is twice the interorbital width. Both ossa quadrata are preserved ; they are directed outwards at an angle of about 45°. Their articular surfaces are concave transversely and plane anteroposteriorly ; the anterior border is concave, the posterior convex.

At the anterior extremity of the mandible there is a series of three teeth, which are relatively large, since their length exceeds the depth of the ramus. Their shanks are cylindric, and the apices conic. The last two are opposed by two teeth of the upper jaw, and behind these is a third. These are well under the border of the skull, and it is likely that they belong to the palatine bone, although this is not demonstrable. Posterior to the three mandibular teeth are two others, but it is uncertain whether they are mandibular or palatine teeth. The crowns of the last two anterior palatine teeth are compressed, as in the species of Pariotichus.

The surface of the cranial bones is sculptured in a shallow honeycomb pattern, the longitudinal ridges predominating on the median regions posteriorly. These bones with those of the mandible are rather abundantly marked with deeply impressed puncta, which may be in some instances pores. These are larger and more numerous on the malar bone, where the sculpture is wanting. They are more sparse on the mandible, and become larger anteriorly. The surface of the ramus is marked also with shallow, generally longitudinal grooves, which sometimes inosculate, and sometimes terminate in the punctiform pits. The inferior bones of the muzzle are sculptured like those of the interorbital region.

A series of five crushed vertebræ lie along the inner side the left mandibular ramus, displaying only their neural arches. They are about as wide as long, excepting the anterior one, which is longer. The zygapophyses are well developed, and there extends from about the middle of the side of the neurapophysis, an aliform crest downwards and forwards to the side of the anterior articular face of the centrum below the prezygapophysis. The neural arch forms a low roof, and judging from the base, the neural spine is not large. The small size of the vertebræ renders it highly probable that they belong to another individual which the animal had taken into its mouth.

Measurements.	MM.
Total length cranium above	55
Width cranium posteriorly	34
" " at middle of muzzle	23
" interorbital space	9
Length from end of muzzle to mouth border	21
" " mouth border to quadrate cotylus	30
Depth of mandibular ramus at symphysis	2
" " " middle	3.5
Anteroposterior diameter of nostril	8
Width of internarial space	5
Length of basis of three mandibular teeth	4
Length of crown of second mandibular tooth	3
" three anterior vertebræ	7
" anterior vertebra	2.5
Width of " "	2.5

From the Permian bed of Texas.

SUPPLEMENT.

Some New Batrachia from the Permian Bed of Texas.

Zatrachys microphthalmus, sp. nov.

Represented by an entire skull covered with a thin layer of bean ore, and a second and larger skull without lower jaw and with the extremity of the muzzle broken off. The second specimen displays the characters of the base of the skull, and in other respects better displays the specific characters.

The attenuation of the bones of the skull exhibited by the *Z. serratus* is present in this species also. The interorbital and preinterorbital regions are strongly concave, and there are strong preorbital fossæ. The tabular angles are very prominent, forming rudimentary horns, and there is a prominent angle projecting from the posterior quadrate region. What especially characterizes this species is the small size of the orbits. These are about half the diameter of those of a *Z. serratus* of the same size, and are half the diameter of the space between their posterior border and that of the cranium at the middle line, and enter the interorbital width 2.5 times. The posterior border of the orbit marks the fourth fifth of the length from the end of the muzzle to the middle supraoccipital border. The muzzle narrows rapidly anteriorly, presenting an elliptic outline, and is much depressed.

The parasphenoid bone widens anteriorly so that the pterygoid foramina are triangular with the base posterior and the apex anterior. At the extremities of the transverse processes of the parasphenoid the pterygoids send a prominent border downwards; they then curve rather abruptly outwards to the quadrates. The teeth have not been fully exposed, but on the middle of the length of the maxillary bones they are small and widely spaced.

Dimensions.

No. 1.	MM.
Total length on middle line	100
Width at orbits	84
No. 2.	
Width at orbits	96
" between extremities of quadrates	130
" " tabular horns	21
" " orbits	27
Length from orbit to extremity of tabulare	40

It is uncertain whether there is a process at the inner side of the tabulare as in *Z. serratus*. The region of the occipital condyle is without projection and is like that of other species of the genus.

ZATRACHYS CONCHIGERUS, sp. nov.

This ganocephalous batrachian is known to me from the posterior part of the cranium of an individual of about the size of the smaller specimen of the species just described. It differs from this and from the *Z. serratus* in two conspicuous characters. First, the tabular processes are smaller and more widely separated from each other; second, the border of the quadratojugal element projects freely from the distal part of the quadrate, and is separated from it by an open emargination. The orbits are not so small as in *Z. microphthalmus*, have a raised border, and are posteriorly placed. Their diameter is about equal to the space between their posterior border and the tabuloquadrate notch, and is about half the interorbital width. The tabular processes are quite small, and the border connecting them is depressed in the center. The surface is strongly rugose.

The occipital condyles are represented by two shallow cotyli, which are confluent on the middle line. The posterior part of the pterygoid forms a sharp curve inwards before reaching the quadrate, and presents a thin edge inferiorly. The free edge of the quadratojugal is serrate. The muzzle of this specimen is broken off a short distance anterior to the orbits.

Dimensions.	MM.
Width at quadrates	56
" quadratojugals	74
" between orbits	20
" " tabular processes	25
Diameter of orbit	10

TRIMERORHACHIS MESOPS, sp. nov.

The greater part of the skull and vertebral column with ribs and thoracic plates represent this species. The vertebral column and ribs rest in a sheet of matrix whose upturned edges suggest that it contains as a support a ventral armature. It also looks like a cast of a cavity left in the matrix by the dissolution of the inferior body wall. The only part of the vertebræ discernible without further cleaning are the neural arches. Limbs not detected. The posterior border of the skull is damaged, but one angle is preserved, and all of the other but the apex. The remainder is in good preservation on one side or the other, and the surface has been cleaned by weathering. The lower jaw is tightly closed on the upper.

The skull does not expand posteriorly as in the *T. insignis*. The posterior border of the orbit is 4.5 times the diameter of the latter in front of the angle of the mandible, and four times posterior to the line of the end of the muzzle. It is thus nearly in the middle of the length of the skull, and posterior to the position it holds in the *T. insignis*. The interorbital space is nearly twice as wide as the diameter of the orbit, while in *T. insignis* it equals that diameter. The muzzle is therefore relatively elongate, and it projects an eye diameter beyond the line connecting the anterior borders of the nostrils. The latter are large and look upwards; and the long or anteroposterior diameter equals the transverse diameter of the orbit. There are no preorbital or interorbital depressions. The sculpture is strongly marked. On the jaws it is generally longitudinal; on the supratemporal, radiating; on the top of the front and muzzle, reticulate with some predominance of the longitudinal ridges. The sensory grooves are very obscure, but are traceable on the internal border of the nostrils, but scarcely posterior to them. The groove on the internal side of the inferior border of the mandibular ramus is distinct. The rami are more transversely expanded than in the specimens of *T. insignis*, but some of this may be distortion due to pressure. The parasphenoid is narrow for the greater part of the length.

The *T. bilobatus* is known from the angles of mandibles of two individuals, and probably by associated remains. The corresponding parts of the *T. mesops* are much more expanded transversely inwards, are horizontal in fact, where the inner wall is in the *T. bilobatus*, vertical. The strong internal keel of the latter, if represented at all in the *T. mesops*, has an external position.

The neurapophyses of the vertebræ are more elevated and more delicate than in the *T. insignis*, and have the usual median longitudinal groove between them on the middle line above.

The thoracic shield is represented by a coarsely sculptured plate which is but partially exposed, so that its form is as yet uncertain.

The species is smaller than the *T. insignis*.

Measurements.	MM.
Length of skull to line of mandibular angles	136
Width " at " " "	100

Measurements.	MM.
Length from orbit to end of muzzle (axial)	47
Interorbital width	25
Internareal width	29
Diameter of orbit	12
Width of mandible at quadrate	25
Length of four vertebræ over arches	30

From the Permian of Texas.

DIPLOCAULUS MAGNICORNIS Cope, *Proceeds. Amer. Philos. Soc.*, 1882, p. 453.

This is an abundant species in the Permian beds in Texas. I take advantage of a specimen in which the skull is better preserved than in the type, to describe its segmentation, and also the disposition of the teeth.

In the typical specimen the posterior border of the skull was not preserved. The present specimen shows that it is continuous from the extremity of one horn to that of the other, and regularly concave without angles, and that it overhangs the occipital condyles a little. The posterior parts of the horns consist of the tabular bones, and the anterior portion consists of the supratemporals. The inferior part of the base of the horn externally consists of the element which articulates with the quadrate, or quadratojugal. It is distinguished from the supratemporal by a horizontal suture. A considerable part of its surface presents inferiorly. The supramastoid lies between the supratemporal and the postfrontoörbital.

The supraoccipitals extend well forwards on the superior face of the cranium, the median suture equaling the length of the parietal bone. They have an extraordinary transverse extent. The median suture of the parietals is rather longer, and it is separated by the small parietal foramen at a point one-third its length from the frontal suture. The posterior width of the frontal is equal to three-fifths its length, and is a little greater than the interorbital width. It extends as far anterior as posterior to the orbits. The posterior suture is trilobate. The postfrontals are suboval with the long diameter at 45° to the median line, and the anterointernal border excavated by the orbit. They do not advance on the internal border of the latter, resembling the prefrontals in this respect. The supramastoids are necessarily well produced forwards to meet the short postfrontals, advancing far anterior to the posterior border of the jugals.

The premaxillaries are short and wide, and are widely truncate by the frontal posteriorly. The prefrontals do not extend posteriorly to the inner border of the orbit, but they join the jugal by a considerable suture. The nasals occupy their usual position, and are rather small; one of them is fused with the premaxillary in the specimen. The maxillaries are small, especially the facial part, which does not reach the orbit. The jugal is a relatively large bone, and has an irregular posterior outline, where it joins the quadratojugal and the supratemporal.

The great expansion of the roof-bones posterior to the quadrates, is associated with a considerable expansion of the pterygoids in the same region. The palatopterygoid arch has the relations prevalent in the Stegocephalia, but what is novel so far, its anterior and chiefly palatine portion carries a single series of teeth on the external and anterior border, which is concentric with the premaxillo-maxillary series, as in Cryptobranchus. Posterior to this is a pair of straight series of teeth, probably on the vomers, which form an anteriorly directed right-angle at the middle line. They do not extend so far posteriorly as do the maxillary teeth, and the latter do not extend so far posteriorly as the pterygopalatines, which terminate at a straight line drawn through the posterior borders of the orbits. The posterior nostrils are situated between the two series of palatal teeth. The external nostrils open forwards and outwards. Maxillary and premaxillary teeth twenty-three on each side. Palatines, twenty-four; vomerines, ten.

The composition of the huge horns is thus the result of the fusion of the three posterolateral roof-elements into one, thus obliterating the notch which separates the tabular from the quadratojugal bones in most other Stegocephalia.

DIPLOCAULUS LIMBATUS, sp. nov.

This species is represented by a number of fragmentary skeletons and skulls. One of these I describe as the type since it displays more of the characters than any other, but it is nevertheless damaged anterior to the orbits, so that the form of the muzzle is not accurately determinable.

The character of the species is seen in the horns. These are much less produced relatively to other regions than in the *D. magnicornis*, and the postquadrate (quadratojugal) element is more distinct, and terminates in a separate apex below the principal horn. This tract, which is fused with the principal bone in the *D. magnicornis*, is separated from it by a groove in the *D limbatus*, and the large fossa which it encloses with the inferior side of the principal horn looks inwards at an angle of 45°, while it looks downwards in the *D. magnicornis*. The terminal angle of the quadratojugal (postquadrate) body forms a prominent compressed offset, rather than a free apex. In one specimen of large size it is infero-lateral; in the type, entirely inferior. The principal horn is shorter and narrower than in the *D. magnicornis*, and less divaricate.

As the mandibular rami are in place and their extremities are entire, the length of the muzzle can be inferred. It is relatively longer and less broadly rounded than in the *D. magnicornis*. The surfaces of the skull are sculptured in honeycomb pattern, as in the type species.

Measurements.	MM.
Length of skull on median line	92
" " to extremity of horn	220
Width of skull at posterior border	160
" base of horn	51
Length from angle of mandible to end of horn	115
" " " postquadrate process	65

Measurements.	MM.
Length of mandibular ramus	82
Interorbital width (approximate)	20

From the Permian bed of Texas.

EXPLANATION OF PLATES.

Plate VII.

Pariotichus aguti Cope ; nat. size.

Fig. 1. Skull, from side.

Fig. 2. Skull, with angular parts of mandible adherent, cervical vertebræ and scapular arch, from below.

Fig. 3. Skull, from above, with cervical vertebræ.

Fig. 4. Anterior two-thirds of mandibular arch, with adherent premaxillary bones, from above.

Fig. 5. Humerus.

Plate VIII.

Fig. 1. *Pariotichus hamatus* Cope ; two-fifths nat. size ; from above.

Fig. 2. Do. from the side.

Fig. 3–5. *Hypopnous squaliceps* Cope ; skull nat. size ; 3, from side ; 4, from above ; 5, from below.

Fig. 6. *Chilonyx rapidens* Cope ; left side of skull from behind and below ; one-half nat. size.

Plate IX.

Diplocaulus magnicornis Cope ; 4-7ths nat. size.

Fig 1. Cranium, from above.

Fig. 2. Anterior part of palate.

Fig. 3. Postquadrate region, from below.

Fig. 4. Occipital condyles, from below.

Lettering.

N., Nasal bone : *F.*, Frontal ; *Pef.*, Prefrontal ; *Pof.*, Postfrontal ; *P.*, Parietal ; *Pmx.*, Premaxillary ; *Mx.*, Maxillary ; *J.*, Jugal ; *Qj.*, Quadratojugal ; *St.*, Supratemporal ; *Sm.*, Supramastoid ; *T.*, Tabulare ; *So.*, Supraoccipital ; *V.*, Vomer ; *Pa.*, Palatine ; *Par.*, Paroccipital ; *Ecp.*, Ectopterygoid ; *Ot*, Otic bones ; *Asc*, Anterior semicircular canal ; *Pg.*, Pterygoid ; *Q.*, Quadrate ; *C.*, Clavicle ; *Ep.*, Episternum ; *H.*, Humerus ; *Co.*, Coracoid ; *Ic.*, Intercentrum.