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Article XXV.— NEW OR LITTLE KNOWN FORMS OF CARBONIFEROUS AMPHIBIA IN THE AMERICAN MUSEUM OF NATURAL HISTORY.

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Plates LVIII–LXV.

There have been, up to the present time, about eighty species of Amphibia recognized in the Carboniferous of North America. The known forms represent a fauna of extreme diversity of appearance and structure.

The genus *Tuditanus* was among the first to be characterized by Professor Cope[1] in his studies of the Carboniferous forms. He based his description of the genus on the two species, *T. punctulatus* and *T. brevirostris*. He later referred to the same genus such forms as *T. huxleyi*, *T. radiatus*, *T. tabulatus*, *T. obtusus*, etc., and on account of the more striking form of the latter species the genus *Tuditanus* is usually thought of as pertaining to the larger species. The form *T. huxleyi* has already been separated by the writer into a distinct genus, *Macrerpeton*.[2]

The forms *T. radiatus* and *T. tabulatus* show characters which are so diverse from those exhibited by the species designated by Cope as the types of the genus *Tuditanus* that in the hopes of gaining a more consistent view of these forms the new genus *Erpetosaurus* is proposed to include them as well as other members of the genus *Tuditanus* which are aberrant to the type forms. I will designate *T. radiatus*, Plate LXII, Fig. 1 (American Museum No. 8600 G), as the type of the new genus and with this species are to be associated the two new forms described below and also: *Erpetosaurus* (*Tuditanus*) *tabulatus* (Cope), Plate LXII, Fig. 2, *Erpetosaurus* (*Tuditanus*) *sculptilis* (Moodie), *Erpetosaurus minutus* Moodie, *Erpetosaurus* (*Dendrerpeton*, *Tuditanus*) *obtusus* (Cope), There will thus be established two definite morphological groups which have distinctive characters. The genus *Tuditanus* will contain the following species: *T. punctulatus* Cope, *T. brevirostris* Cope, *T. longipes* Cope, *T. minimus* Moodie, *T. walcotti* Moodie.

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[1] Cope, E. D. Trans. Amer. Philos. Soc., Vol. XV, p. 271.

[2] Moodie, Roy L. Journal of Geology, Vol. XVII, No. 1, p. 72.

Erpetosaurus, new genus.

The characters on which this new genus is based are the large size of the individuals, the coarse sculpture of the cranial elements, the arrangement of the cranial elements, the larger size and relatively more anterior position of the orbits, and the presence on the skull of a distinctive type of lateral line system (Fig. 1). The position as to family is a little uncertain since family characters are not yet well understood among the Carboniferous forms on account of the lack of information as to the structure of the animals. If we take the absence of ventral scutellæ as a family character then the present genus will find its place in the Tuditanidæ; but the evidence on this point is negative so that for the present we may place the species of *Erpetosaurus* only provisionally among the Tuditanidæ. This arrangement will undoubtedly require revision when additional material will allow a closer definition of the genus.

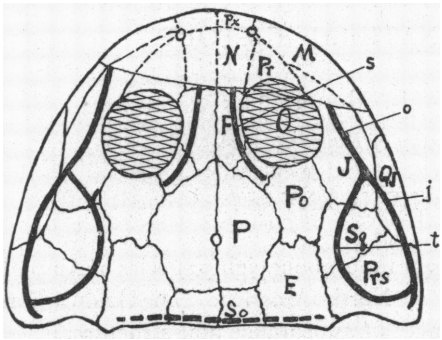

Fig. 1. Outline of the skull and cranial elements of *Erpetosaurus tabulatus* (Cope), showing the arrangement of the lateral line canals. × 1.5.

E = epiotic; *F* = frontal; *J* — jugal; *M* = maxilla; *N* = nasal; *O* = orbit; *P* = parietal; *Po* = postorbital; *Pr* = prefrontal; *Prs* = supratemporal; *Px* = premaxilla; *Qj* = quadratojugal; *Sq* = squamosal; *So* = supraoccipital; *s* = supraorbital lateral line; *o* = suborbital lateral line; *j* = jugal canal; *t* = temporal canal. The row of elongate dots across the base of the skull represents the occipital cross commissure.

The new genus may be defined as follows: —

Skull stout, elements sculptured with radiating grooves and ridges or pits; orbits large and usually placed far forward; base of skull sometimes provided with a posterior table; skull more or less rounded; lateral line canals consisting of supraorbitals, *s*, suborbitals, *o*, jugals *j*, and temporal, *t* (Fig. 1), canals with the last two uniting to form a circular canal in one species (E.). Type, No. 8600 G, Amer. Mus.

Our knowledge of the genus is confined exclusively to the skull.

Erpetosaurus tuberculatus n. sp.

Plate LVIII.

The present species is based on a fragmentary cranium consisting of the posterior part of the right side of the skull. Its association in the genus is solely on the character of the sculpturing of the cranial elements. It is

most closely related, in the characters which are preserved, to the form described by Cope as *Tuditanus radiatus* from which it differs especially in the character of the sculpture and in the position of the orbits, as well as the arrangement and size of the various cranial elements, so far as this arrangement can be determined in the present specimen. In *Erpetosaurus radiatus* (Cope) the skull is sculptured by radiating grooves and ridges (Plate LXII, Fig. 1), which do not rise from any definite center. In *E. tuberculatus* this center of radiation is marked by an elevation or tubercle on each cranial element exposed, from which the grooves and ridges radiate outward. These tubercles have an elevation of four millimeters above the cranial element proper. The orbit (Plate LVIII, *O*), is located near the median line of the skull so far as can be determined. In *E. radiatus* the orbits are located well forward. In that species also the supraoccipital is smaller than in the present species and the squamosal is longer and more slender.

The fragment of the skull on which the above comparison has been made consists of the left supraoccipital plate, a portion of an epiotic, the parietal, the frontal and a portion of the squamosal. The jugal and supratemporal elements have been lost. The elements in the median line are elongated as in *E. radiatus*. The pineal foramen is located well back on the median line and lies posterior to two-thirds of the length of the parietals. The sutures separating the frontal and parietal elements from each other in the median line are of the zigzag form so characteristic of the higher labyrinthodonts.

Measurements of the type of *Erpetosaurus tuberculatus* Moodie.

	mm.
Length of portion of skull preserved	52
Width across epiotics (estimated)	60
Length of parietal	12
Width of parietal, maximum	11
Length of frontal	25
Width of frontal	12

A single specimen with its counterpart, Nos. 8603 G and 8610 G, is in the Newberry Collection of the American Museum.

Erpetosaurus acutirostris n. sp.

Plate LXI, Fig. 1.

The present species adds another form to the diversity of structure presented by the Carboniferous Microsauria. It is closely allied to *Erpetosaurus* (*Tuditanus*) *obtusus* (Cope), Fig. 2 and Plate LX, Fig. 2, from the same beds but differs from it especially in the position and shape of the

orbits and the acute form of the skull. Other characters, which amount almost to generic significance, are found in the posterior prolongation of the frontal and in the triangular form of the skull. Only the skull of the animal is preserved and this is shown in Plate LXI, Fig. 1, where the various elements of the cranium are indicated by letters. The character which is common to all members of the genus *Erpetosaurus*, the cranial rugosity, is present in this species on the squamosal and supratemporal. This character alone would not, however, suffice to separate the form generically, but the general morphology and arrangement of the cranial elements is such that reference to any other genus save *Erpetosaurus* would not be legitimate.

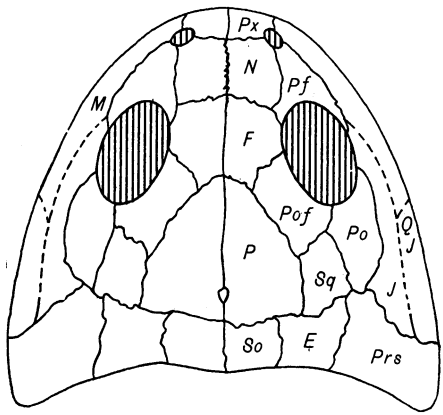

Fig. 2. Outline of the skull and cranial elements of *Erpetosaurus obtusus* (Cope). × 1. Legends for the cranial elements as in Figure 1.

The skull of *Erpetosaurus acutirostris* takes the form of a rounded triangle. Its base is some 50 millimeters in extent and this width gradually narrows to 31 millimeters across the orbits and still more towards the snout. The form of the skull is not widely different from that of the type species, *E. radiatus* (Cope), but the differences are sufficiently apparent. (Compare Plate LXI, Fig. 1, and Plate LXII, Fig. 1.)

Nearly all the elements of the cranium can be detected and by careful study of the figure (Plate LXI, Fig. 1) the outlines of the cranial elements will become apparent to the reader. The bony portion of the cranium has nearly all been lost leaving only the impression; and the matrix in which the skull was imbedded has been forced up into the sutures between the cranial elements, thus forming ragged ridges where the bones of the skull were joined.

The position of the nostrils cannot be determined accurately. The orbits are placed well forward, a character common to several species of the genus. The interorbital space is equal to the long diameter of the eye. The orbits are separated by narrow prolongations of the postfrontals and by the anterior portions of the frontals. The frontals are remarkable in their great backward extension. In *E. obtusus* (Cope) the frontals are nearly confined to the interorbital space. The parietals, which, on the median

suture, enclose the parietal foramen, lie well posterior, and the supraoccipitals and epiotics are small. A portion of the sculpturing of these elements has been preserved and it is seen to be made up of pits and elevations much as we find in the skull of *Saurerpeton latithorax* (Cope). The left squamosal also shows sculpturing which here tends to take the form of grooves and ridges and also pits and elevations. It is quite probable that the anterior portion of the skull was ornamented with grooves and ridges and undoubtedly the lateral line canals were well developed. The postfrontals and the postorbitals are both large and elongated. The postorbital is especially large. The squamosal apparently separates the epiotic and the supratemporal in their posterior extremities but of this I am not sure. The supratemporal, *u*, projects posteriorly to the epiotic and apparently even goes beyond the limits of the exoccipitals, *x*. The region of the quadratojugal is indicated at *i*. Its presence is, however, not definitely determined. The outlines of the jugal, *j*, are fairly definite as are also the limits of the maxilla, *m*.

Measurements of the type of the skull of *Erpetosaurus acutirostris* Moodie. (No. 8598 G, American Museum).

	mm.
Length of skull	50
Interorbital space	9
Width of orbit	7
Length of orbit	10
Width across orbits	31
Posterior width of skull	50
Diameter of pineal eye	1
Length from tip of snout to posterior angle of the skull	65

Mandible provisionally associated with **Erpetosaurus tabulatus** (Cope).

Plate LX, Fig. 2, and Plate XIV, Fig. 3.

The present specimen is preserved almost completely on a small slab of soft coal. It is impossible to determine with positiveness to what species of the Microsauria it pertains but it may, for the present, be associated with *Erpetosaurus tabulatus* (Cope), Plate LXII, Fig. 2, on account of its size and the character of its sculpture. It is a rare treat to have such an excellent opportunity to study the mandible of a microsaurian and, so far as I am aware, this is the first and most complete example we have of the mandible in the North American Microsauria. The form of the jaw is perfectly preserved although the exact structure of the articular surface cannot be determined. An enlarged photograph is given in Plate LX, Fig. 2, and the

mandible is shown natural size in Plate LXIV, Fig. 3. A glance at either will suffice to give the essential characters.

The proportions of the mandible, as may be judged from the table of measurements, are rather stout and the teeth are strong and numerous since there are evidences of nineteen preserved. The sutures separating the articular, *a*, angular, *n*, surangular, *s*, coronoid, *c*, and the dentary, *d*, are clear for at least the greater part of their length and they may be easily restored for the remainder of their course. The surangular is thus seen to rival the dentary in size and on it occurs the peculiar sculpturing which approximates so closely that on the skull of *Erpetosaurus tabulatus* (Cope). The presence of the long anterior tooth is strikingly characteristic of the early microsaurians. It is well developed, for instance, in *Sauropleura longidentata* Moodie. It is also present in well developed form in several species of the later labyrinthodonts. The teeth are all, with the exception of the fourth from the anterior end, rather short, curved and sharply pointed with an indication of longitudinal fluting. The arrangement of the mandibular elements recalls in a striking way the mandible of *Eryops* as figured by Branson.[1]

Measurements of the mandible provisionally associated with *Erpetosaurus tabulatus* (Cope).

	mm.
Length of mandible	32
Posterior width across surangular	6
Width of dentary	3
Width of jaw at tip	1.5
Length of one of the posterior teeth	.1.25
Width at base of same tooth	.50
Length of long anterior tooth	2
Width of do. at base	.75

This specimen is in the Newberry Collection of the American Museum of Natural History, No. 8542 G.

Palate of **Erpetosaurus** sp.

Plate LX, Fig. 2.

The form designated above is represented by half of a cranium with its impression. Its reference to the genus *Erpetosaurus* is based on the character of the sculpturing of the mandible and on the form of the posterior table of the skull. On the surangular there is seen the rugosity which is common to other members of the genus. The sculpture is similar to that exhibited

[1] Branson, E. B. Journal of Geology, Vol. XIII, No. 7, p. 603.

by the mandible described above as pertaining to *Erpetosaurus tabulatus* (Cope), and the posterior table of the skull is strikingly as in that species (Plate LXII, Fig. 2). Its reference to that species was, however, uncertain on account of the greater size of the present specimen.

The portion of the skull herewith described may represent a new form but I hesitate to name it since the characters on which all of the other members of the genus are based have been confined to the dorsal region of the skull. The present specimen and its counterpart are especially interesting and unique in showing, very clearly, so far as the specimen is preserved, the structure of the elements of the palate, the only instance in which this structure has been possible of observation among several score specimens. Jaekel has figured, very completely, the palate of *Diceratosaurus punctolineatus* Cope. The morphology of the present palate differs from that of *Diceratosaurus* only in the enlarged ectopterygoid which in the present instance lies well down on the side and along the pterygoid. The palatine is smaller.

The parasphenoid (vomer of Broom) in the present form does not differ, so far as I can determine, from the parasphenoid exhibited by other Palæozoic Amphibia. Its form was slender, arising from an enlarged base and separating the pterygoids by its own width. The exoccipitals are probably represented in the present skull and I have indicated them at x in Plate LXI, Fig. 2. The exoccipitals are rather large and extended some distance under the base of the skull to unite anteriorly with the pterygoids, a very unusual arrangement. The pterygoids are elongate elements, p, with the usual relations, being bounded anteriorly by the vomer (prevomer of Broom) and laterally by the ectopterygoid. The vomer shows no evidence of being toothed although it may have been so in its anterior portions, which are partially obscured. The same may be said for the palatine which is indicated at l. The relations of the ectopterygoid are rather unusual for the Amphibia in the posterior extension of the element. It lies all along the side of the pterygoid and anteriorly projects forward between the pterygoid and the palatine. In this unusual posterior projection the ectopterygoid has almost obliterated the infratemporal foramen which possibly may be still represented by the triangular space between the bases of the pterygoid and the ectopterygoid. The anterior palatine foramen (internal nares) lies between the anterior ends of the palatine and the vomer, its usual relations in the Labyrinthodontia. The foramen may be recognized as the rounded depression slightly anterior to the palatine.

The mandible, M, is rather heavy and is coarsely sculptured with radiating grooves and ridges. The character of the teeth cannot be determined save to say that they were present. The posterior end of the mandible projects somewhat beyond the quadrate angle of the skull.

The interest in the present specimen is heightened by the light it throws on the characters for the separation of the Amphibia from the Reptilia. If we take as one of the chief characters of the Amphibia the wide separation of the pterygoids by the parasphenoid the present form, and undoubtedly all of the Microsauria, fall well within the Amphibia. Of course when we find forms showing other amphibian characters and with a reduced parasphenoid, then this character will no longer be of significance. One character which, thus far, seems to be restricted entirely to the Amphibia is the lateral line canals which are present on the skull as grooves and pits and on the bodies of some forms as specialized scales.

Measurements of the skull of *Erpetosaurus* sp.
(No. 8607 G, American Museum.)

	mm.
Length of skull in median line	45
Posterior width of skull (estimated)	50
Width of parasphenoid (estimated)	6
Width of pterygoid	5
Length of ectopterygoid	17
Width of mandible (posterior)	12

MACRERPETIDÆ, new family.

Plate LXI, Fig. 1.

It seems necessary to propose a new family for the reception of the single species *Macrerpeton* (*Tuditanus*) *huxleyi* (Cope). The characters exhibited by this species are so different from those offered by other members of the Carboniferous Microsauria that it is clearly distinct. In its cranial characters and the position of the orbits it approaches most nearly to *Eryops megacephalus* Cope from the Permian of Texas. In some of its characters the present form shows a similarity to *Dasyceps bucklandi* Lloyd, from the Permian of Kenilworth, England; more especially is this similarity found in the form of the skull, the size and shape of the teeth and the posterior position of the orbits and their wide removal from the border of the skull. Only a fragment of the skull is known but repeated study of this fragment has disclosed the wide diversity of its characters.

The new family may be defined as follows:—Skull larger than in any other known Carboniferous microsaurian; cranial elements sculptured with pits and coarse grooves; lachrymal element present; teeth large, curved outward and fluted; mandible heavy; orbits located far back on the skull and near the median line so that the interorbital space is about half the space from the outer edge of the orbit to the border of the skull, thus approaching the condition known in *Eryops*; the ribs (?) are strong and heavy with an incipient tubercle.

Sauropleura sp.

Plate LIX, Fig. 2.

The present specimen is figured here on account of a portion of the skin of the animal which is preserved as a smooth mold over the ribs and ventral scutellæ. The skin was undoubtedly that of the back since the creature is preserved on its belly and is interesting in not showing the slightest trace of scales or other hard plates. The ventral scutellæ are characteristic of the species of the genus *Sauropleura*. With one species of this genus, *Sauropleura scutellata* Newberry, the writer has found associated scutes of some size and the same fact was noted by Cope. The scutes are more fully described elsewhere and it will suffice here to say that they are quite large measuring in some cases more than 25 mm. in length by 12–14 mm. in diameter.

Eoserpeton tenuicorne (*Cope*).

Plate LXIII, Fig. 1.

Ceraterpeton tenuicorne COPE, Proc. Amer. Philos. Soc., XXII, p. 407.
Eoserpeton tenuicorne (COPE), Journal Geology, XVII, p. 76.

The type of the new genus already proposed for the species *Ceraterpeton tenuicorne* Cope is figured here for the first time. Its characters have already been given in the restoration of the entire skeleton.[1] The distinctive generic character is the wide expansion of the horned supratemporal element. The position of the orbits and the pineal foramen as well as the sutures separating the cranial elements can be readily determined from the photograph which is slightly larger than natural size. Further discussion will be reserved for the writer's forthcoming memoir.

Diceratosaurus robustus *Moodie.*

Plate LXIII, Fig. 2.

A photograph of the type of this species is given here for the first time. In the original description of the species [2] an outline drawing with a restoration of the skull was published. The characters are clearly apparent in the photograph. Especial attention is called to the distinct separation of the squamosal which in the type species of the genus Jaekel defined as being united into his "perisquamosal." [3]

[1] Moodie, Roy L. Journ. Geol., XVII, No. 1, fig. 20.
[2] Moodie, Roy L. Journ. Geol., XVII, No. 1, fig. 15.
[3] Jaekel, O. Neues Jahrbuch für Mineralogie, Bd. 1, 1903, p. 116

Ptyonius mummifer *Cope.*

Plate LXIII, Fig. 3.

The present figure is given to indicate the close affinity between the true Microsauria and the Aistopoda as defined by Professor Cope. The present form was associated by him with the species *P. pectinatus* Cope which is utterly limbless. The limb bone shown at *a*, and the pectoral plates just below, either indicate the microsaurian origin of the Aistopoda or else indicate the generic separation of the present species from others placed in the Ptyoniidæ. The generic separation is doubtful on account of the characters of the vertebræ and it seems best to turn to the other alternative and say that some of the Aistopoda possess very diminutive limbs. The body in the present species is very long and slender and I have been unable so far to detect hind limbs. It was considered as possible that the elements figured at *a* (Plate LXIII, Fig. 3) might be a hyoid element but, save in *Cocytinus gyrinoides* Cope, hyoids are unknown among the Carboniferous Holospondyli, and on account of the presence of the large interclavicle the safest conclusion seemed to be to regard the element as a humerus. It is very small and slender and indicates a very weak limb which may possibly have had the appearance presented by the limbs of *Amphiuma.*

The *footprint* figured in Plate LXIV, Fig. 1, may pertain to some member of the Microsauria or a branchiosaurian but I suspect the former. It is preserved in hard shale from Phoenix Tunnel, Pennsylvania, and is represented in the figure three times the natural size. There are five toes and the first digit had an enlarged tubercle at the base. The other digits were short and stumpy and without claws.

The *plates* described by Professor Cope as *Tuditanus mordax*, and which he later located in the species *Diceratosaurus* (*Ceraterpeton*) *punctolineatus* Cope, is shown in Plate LXIV, Fig. 2. A comparison of the figure with the plates shown in Plate LXV will suffice to convince one that Cope's later reference was correct.

An idea of the size and proportions of the type of the genus *Tuditanus*, *T. brevirostris* Cope, may be had from an examination of Plate LXIV, Fig. 4. The skull is almost perfectly smooth.

Diceratosaurus punctolineatus (*Cope*).

Plate LXV.

Cope described the present form as pertaining to Huxley's genus *Ceraterpeton.* Jaekel has, however, clearly shown that the species does not

belong where Cope placed it and he erected the new genus *Diceratosaurus* for the species. He defines the genus thus: "Die wichtigsten Unterscheide gegenüber *Ceraterpeton* scheinen mir zu liegen in der vorgerückten Lage und geringen Grösse der Augenhöhlen, dem Zurücktreten der Quadratecken, der oberen Ausbreitung der Dornfortsätze." [1]

In his discussion of the type of the species Cope referred to a peculiar element which he could not determine, which resembled a lacertilian pubis. This is undoubtedly the peculiar scapula of the creature, as may be judged by reference to Woodward's figure of *Ceraterpeton galvani* Huxley.[2] The character of the scapula together with other characters combine to locate the genus *Diceratosaurus* in the family Urocordylidæ as defined by Lydekker.

I am totally unable to find anything in the type specimen which might correspond with the peculiar elements figured by Jaekel on Tafel V.[3] Nor has a study of other microsaurian pectoral girdles furnished any evidence on this point. I have never found more than the five elements in the pectoral girdle — two clavicles, two scapulæ and a single interclavicle. Other new points in regard to the species are the ventral scutellæ at *v* and the hand with the cartilaginous carpus at *h*, Plate LXV.

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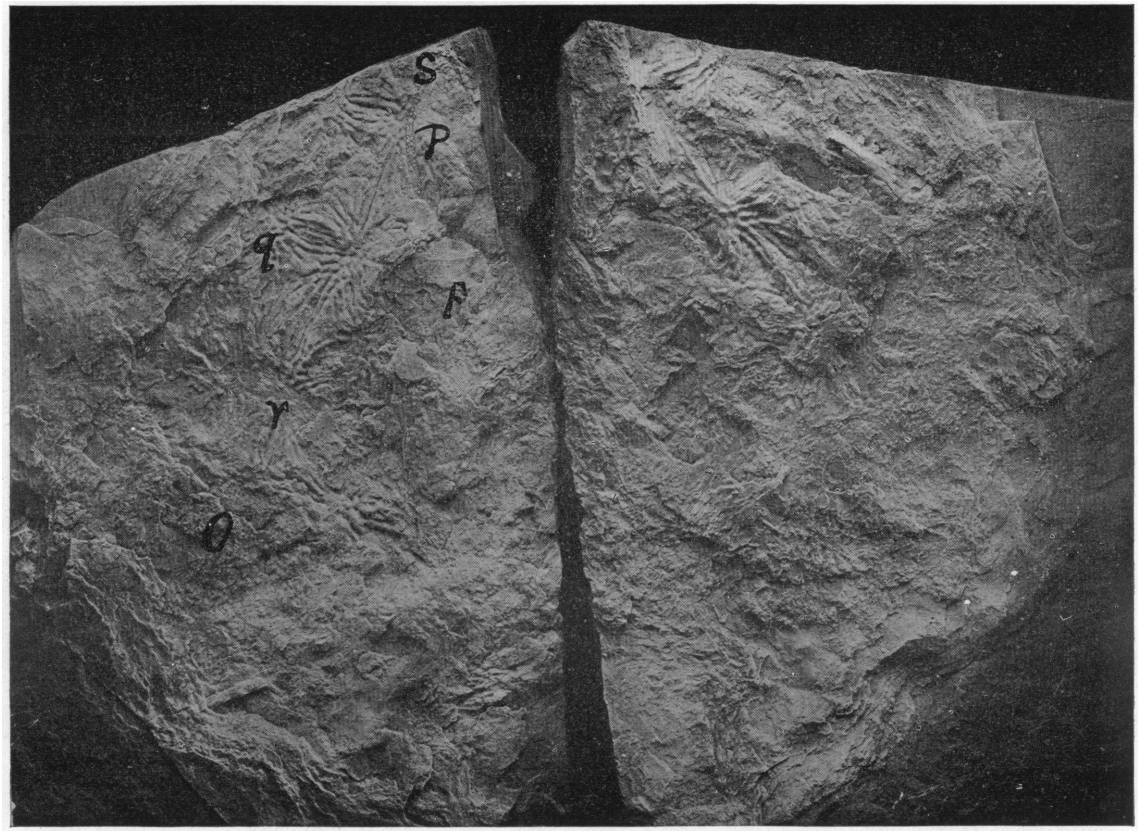
[1] Jaekel, O. Neues Jahrbuch für Mineralogie, Bd. I, 1903, p. 112.
[2] Geological Magazine, 1897, p. 293.
[3] Neues Jahrb. für Mineralogie, 1903.



Type, and its obverse, *Erpetosaurus tuberculatus* Moodie. × 1.25.
F = frontal; *O* = orbit; *P* = parietal; *Q* = squamosal; *r* = postfrontal; *S* = supraoccipital.

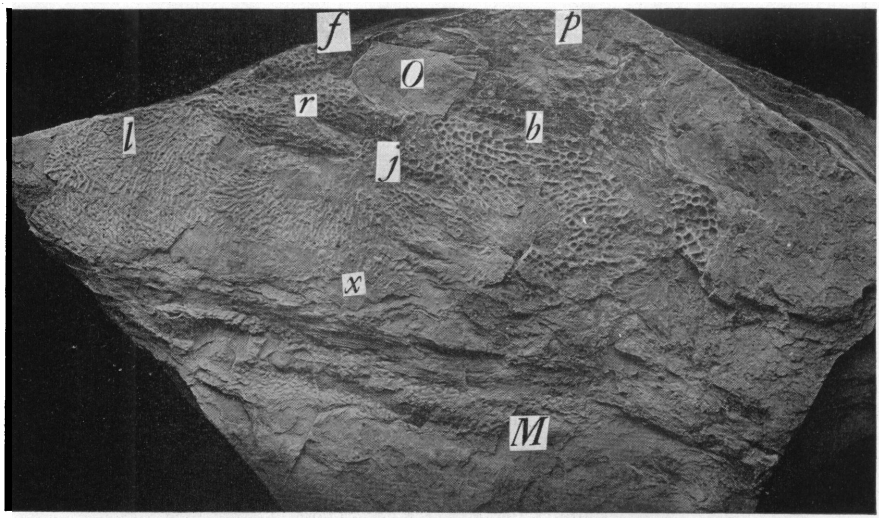


Fig. 1. Type of the genus and species *Macrerpeton huxleyi* (Cope) and the new family Macrerpetidæ. × .75. *M* = mandible; *O* = orbit; *b* = postorbital; *f* = frontal; *j* = jugal; *l* = lachrymal; *p* = parietal; *r* = prefrontal; *x* = maxilla.

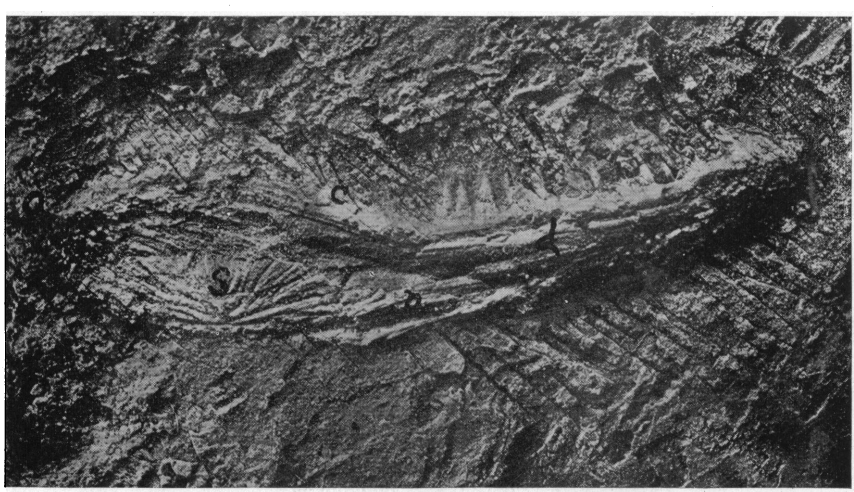


Fig. 2. Mandible of *Erpetosaurus tabulatus* (Cope). × 3.33. *a* = angular; *c* = coronoid; *s* = surangular; *n* = angular; *d* = dentary.

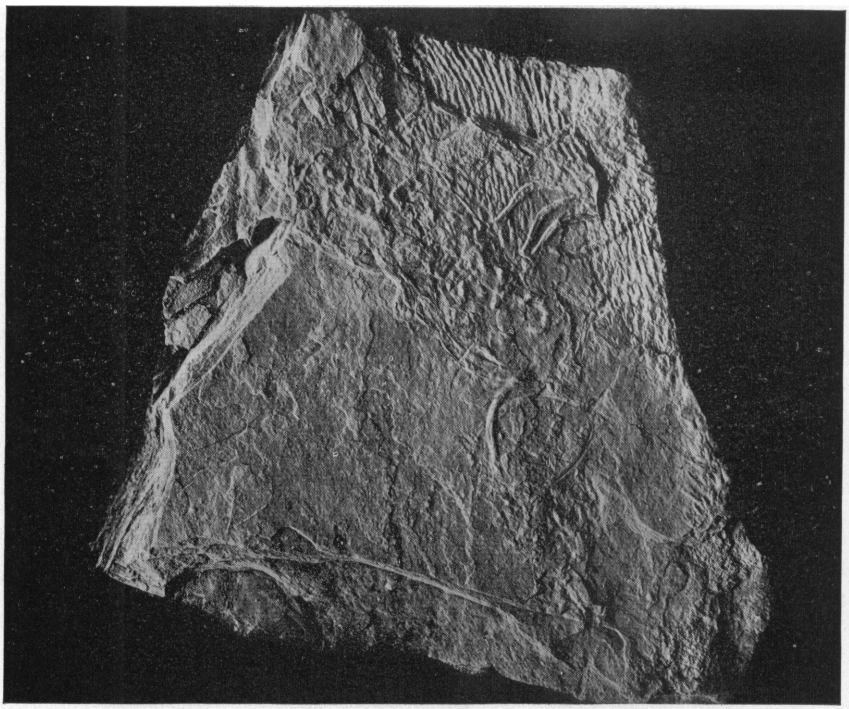


Fig. 1. Photograph of the block of coal on which is preserved the remains of the skin of *Sauropleura* sp. × 1.25.

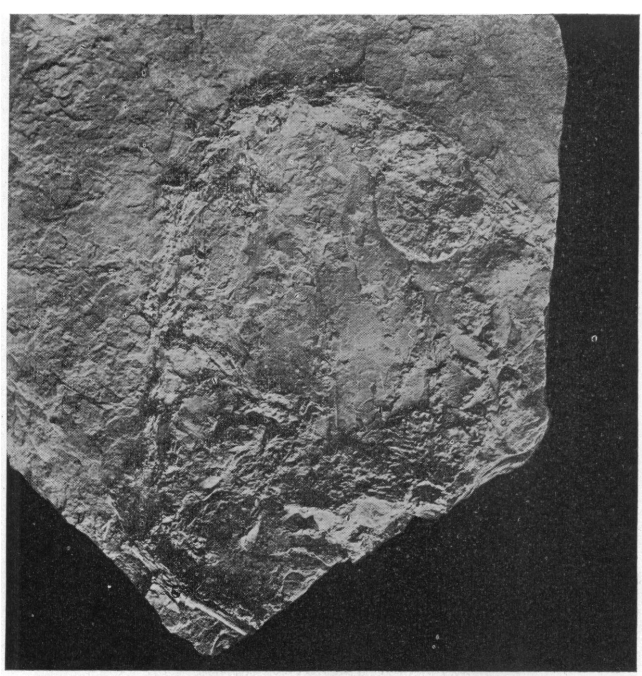


Fig. 2. Type of *Erpetosaurus obtusus* (Cope). × 1.

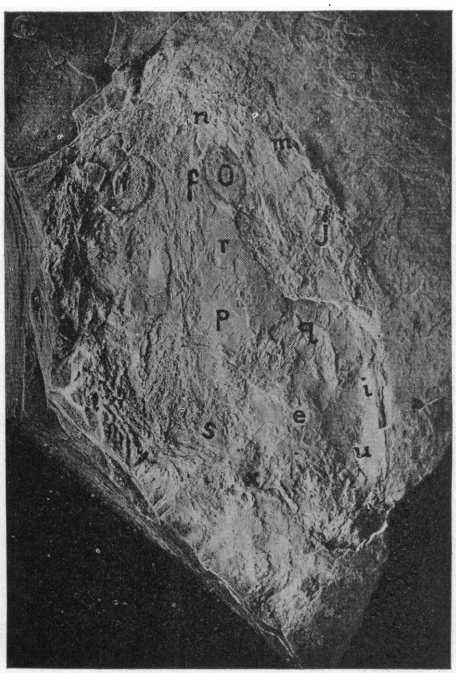


Fig. 1.

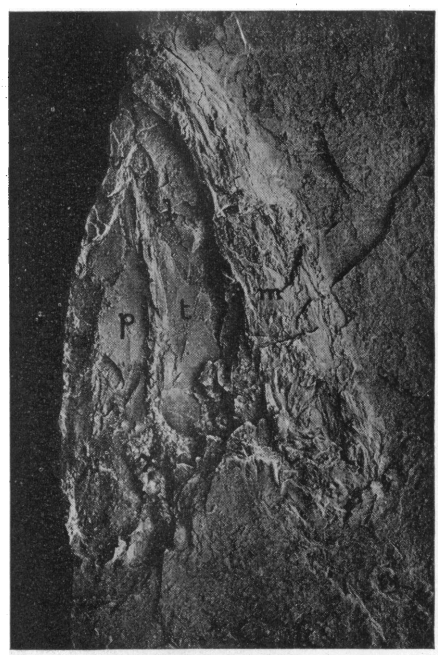


Fig. 2.

Fig. 1. Type of *Erpetosaurus acutirostris* Moodie. × 1.
Legend for the cranial elements as in Text Figure 1.
Fig. 2. Palate of *Erpetosaurus* sp. × 1.75.
a = vomer; *v* = prevomer; *p* = pterygoid; *t* = ectopterygoid; *l* = palatine; *m* = mandible.

Fig. 1. Type of the genus *Erpetosaurus* (*E. radiatus* (Cope). × 1.

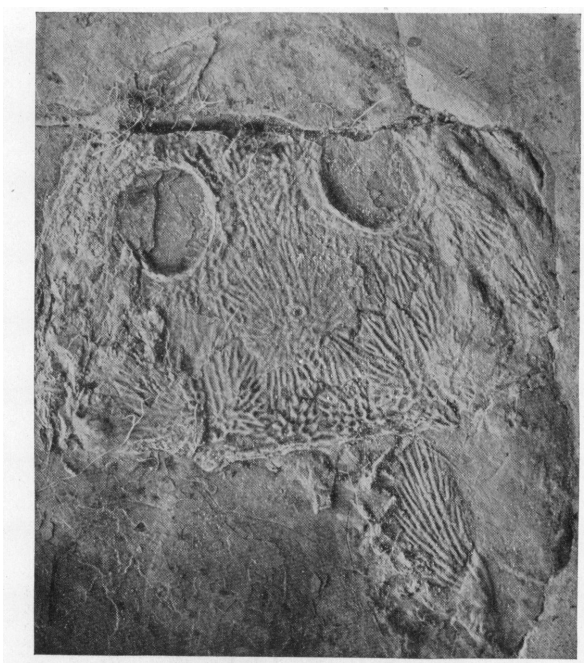


Fig. 2. Type of *Erpetosaurus tabulatus* (Cope), on which is preserved the lateral line system illustrated in Text Figure 1. × 2.

Fig. 1. Type of *Eoserpeton tenuicorne* (Cope). × 2.33.

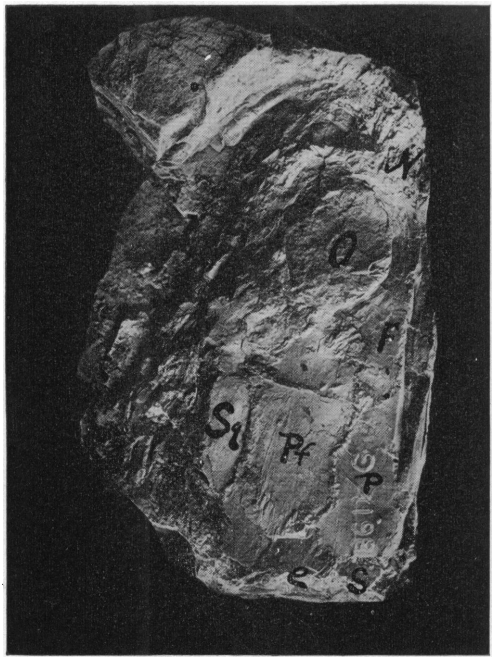


Fig. 2.

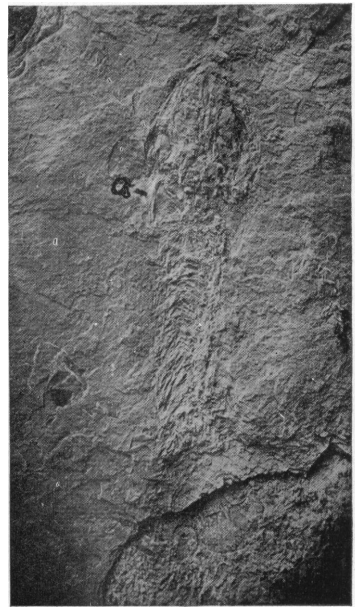


Fig. 3.

Fig. 2. Type of *Diceratosaurus robustus* Moodie. × 1. *e* = epiotic; *f* = frontal; *N* = nasal; *O* = orbit; *P* = parietal; *Pf* = post-frontal; *S* = supraoccipital; *Sq* = squamosal.

Fig. 3. Type of *Ptyonius nummifer* Cope. × 1. Limb bone at "*a*" (humerus).

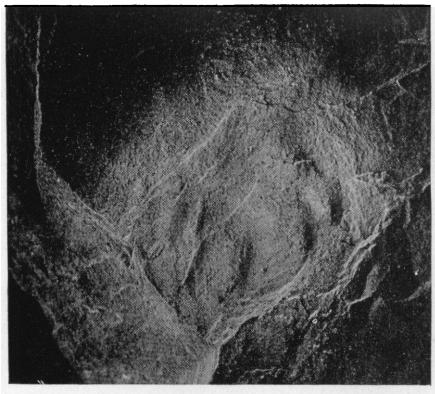


Fig. 1.

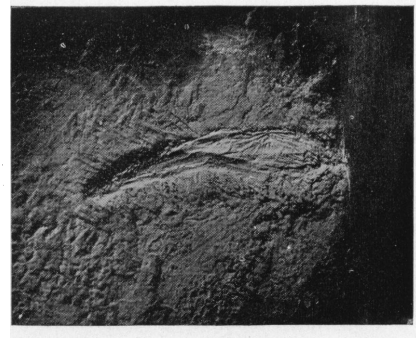


Fig. 3.

Fig. 1. Amphibian Footprint from Pennsylvania. × 3.
Fig. 3. Mandible of *Erpetosaurus tabulatus* (Cope). × 1.

Fig. 2.

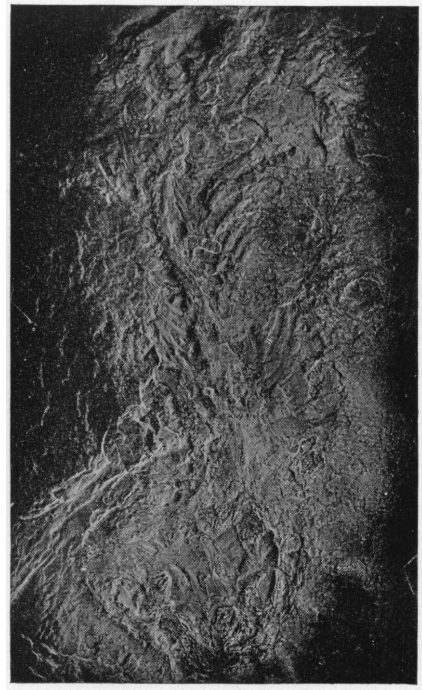
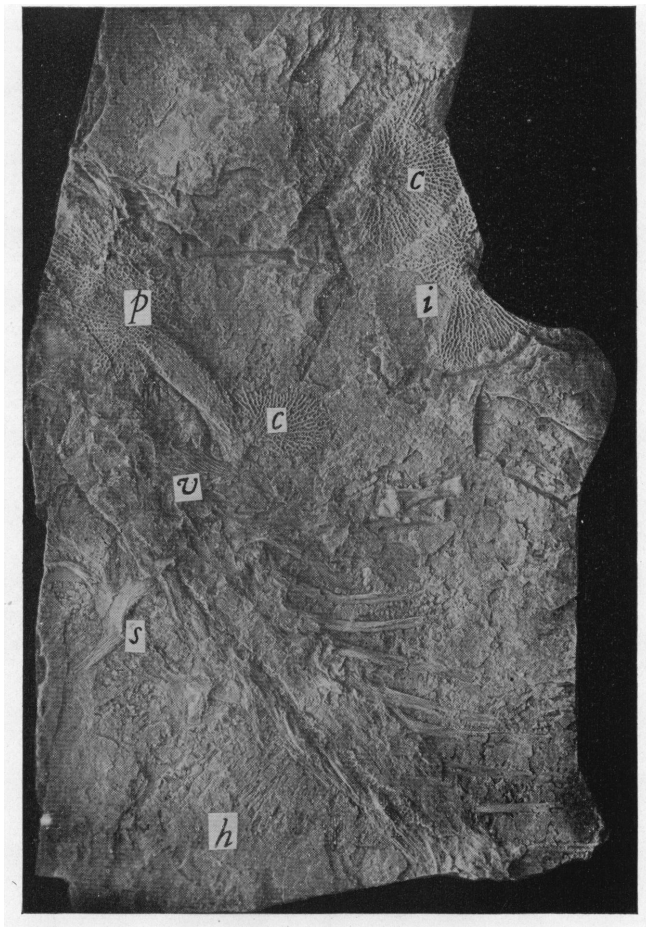


Fig. 4.

Fig. 2. Plates described by Cope as *Tuditanus mordax*. × 1.
Fig. 4. Type specimen of *Tuditanus brevirostris* Cope. × 1.33.



Type of Jaekel's genus *Diceratosaurus* (*D. punctolineatus* (Cope)). × 1.5.
c = clavicle; *h* = hand; *i* = interclavicle; *p* = supratemporal element of the skull; *s* = scapula; *v* = ventral scutellæ.