ON A SOUTH AFRICAN MAMMAL-LIKE REPTILE, *BAURIA CYNOPS.*

By

LIEUWE D. BOONSTRA
(South African Museum, Capetown).

With 8 textfigures.

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In the spring of 1929, I had the privilege of acting as guide to Professor and Frau ABEL on a short collecting trip in the Great Karroo. When the opportunity was offered me of contributing to the number of Palaeobiologica which is to be issued in honor of Professor ABEL's sixtieth birthday, I recalled with pleasure the time we had spent together. When Professor ABEL reads this account of a very interesting reptile from the Karroo, I hope that he may have equally pleasant recollections of our donkey-cart excursions in the Great Karroo of South Africa.

On working through the collection of Karroo reptiles which had been sold to the American Museum of Natural History by Dr. R. BROOM in 1913, I came across some interesting remains of a Bauriamorph. Under the number Amer. Mus. 5622, there is catalogued a good skull, a hind-foot and some limb-bones from the *Cynognathus* zone at Winnaarsbaken. The skull was first described and figured by BROOM in 1911. In 1913, and again in 1915, the lateral view was republished. In 1914, sections through the sphenethmoidal and proötic regions were published by the same author.

When the skull first came under my notice, it had a mass of matrix, containing some limb-bones, attached to the preorbital surface of the snout; the teeth of the left side were partly exposed; parts of the basicranium were cleaned; the matrix on the dorsal surface had been removed in a rough manner, so that part of the bone was stripped; the skull had been broken across in two places and the resultant fractures ground down in the median line, with the result that when put together again the bones of the anterior part of the palate were no longer in contact; that part, showing the posterior limits of the prevomers, is thus irretrievably lost.

The whole condition of the skull once again showed that it is impossible to develope a skull in the morning and describe it in the afternoon, as Dr. Broom undoubtedly attempted to do; the result has been the ruination of what would otherwise have been a perfect skull.

As it was apparent that the matrix left the surface of the bone very cleanly, I removed the mass of matrix adhering to the snout and was thus able to expose the lateral and dorsal surfaces; the occiput was then cleaned; in order to expose the whole palate, I sacrificed the left dentary, which was already damaged; the outer surface of the hind part of the brain-case was then exposed on the left side; finally, in attempting to expose the limb-bones in the mass of matrix adhering to the skull, I revealed a practically complete hind-foot.

In general appearance this skull is more mammal-like than that of any other reptile from the Karroo Beds; the narrow snout, followed by a remarkable bulging of the jugal, the medially directed maxillary surface antero-ventral of the jugal "cheek", the incomplete postorbital bar, the large curved dentary, the terminal nostrils and the foramen for the maxillary branch of the fifth nerve under the jugal are the main characters, which contribute to its remarkably mammalian appearance.

In dorsal view (Fig. 1), the skull is pear-shaped. The important features to be noted are: the laterally protruding anterior end of the jugal; the incomplete postorbital bar; the absence of a pineal foramen; the terminal position of the nostrils; the slightly anteriorly directed orbits; the narrow parietal crest; the absence of a post-frontal; the large temporal openings; a large facial exposure of the septomaxilla; the nasals, medially constricted, expanded anteriorly and even more so posteriorly; large prefrontals, which form a swelling above the antero-dorsal orbital border; the formation of an unsymmetrical cruciform figure by the frontals, which have a large entry in the supraorbital border; the wing-shaped postorbital; bayed squamosals, with a large surface for insertion of the temporal

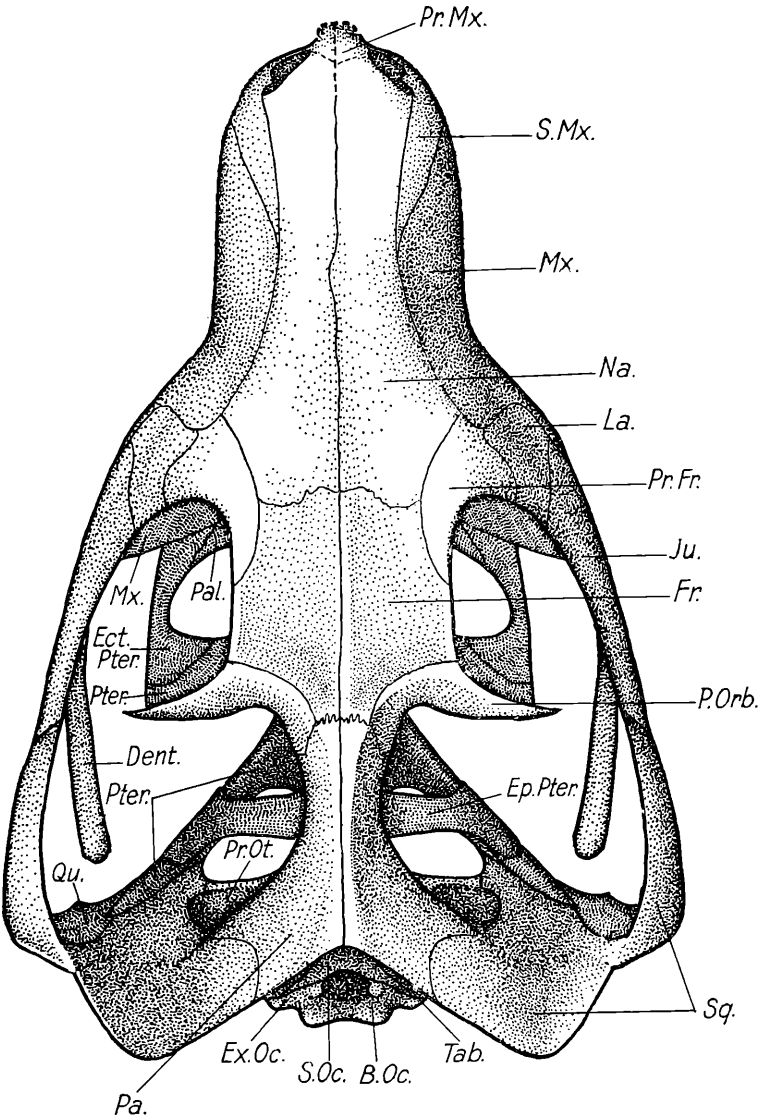

Fig. 1.

Bauria cynops. Amer. Mus. No. 5622. Dorsal view of skull. Nat. size. B. Oc. = basioccipital. Dent. = dentary. Ect. Pter. = ectopterygoid. Ep. Pter. = epipterygoid. Ex. Oc. = exoccipital. Fr. = frontal. Ju. = jugal. La. = lacrymal. Mx. = maxilla. Na. = nasal. Pa. = parietal. Pal. = palatine. P. Orb. = postorbital. Pr. Fr. = prefrontal. Pr. Mx. = premaxilla. Pr. Ot. = proötic. Pter = pterygoid. Qu. = quadrate. S. Mx. = septomaxilla. S. Oc. = supraoccipital. Sq. = squamosal. Tab. = tabular. (Esmé BOONSTRA del.)

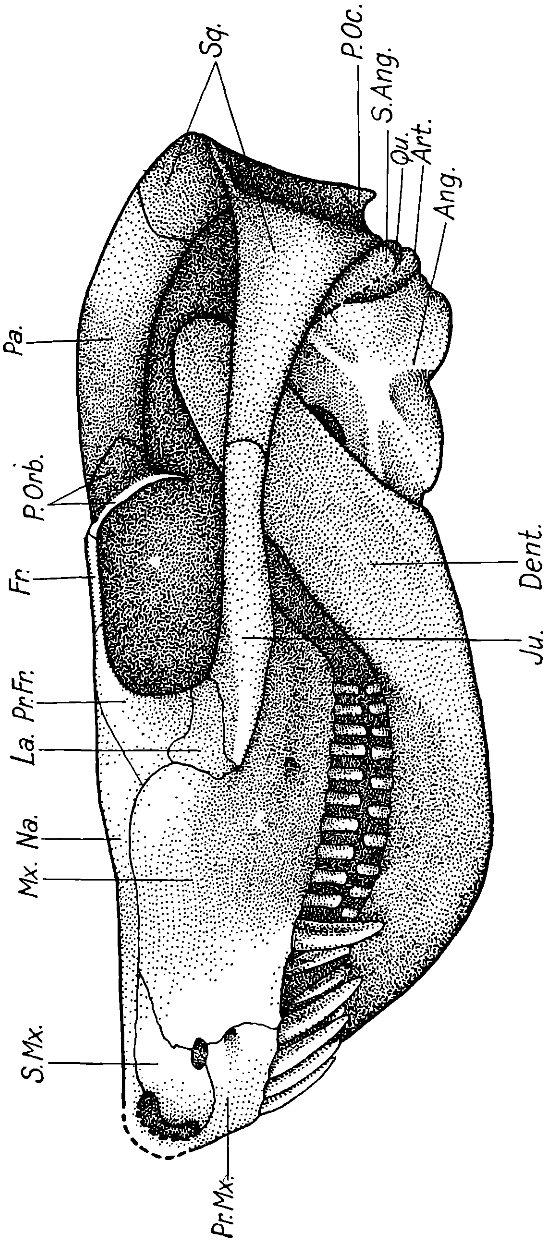

Fig. 2. *Bauria cynops*. Amer. Mus. No. 5622. Lateral view of the left side of the skull. Nat. size. Ang. = angular. Art. = articular. P. Oc. = paroccipital. S. Ang. = surangular. Other lettering as in Fig. 1. (Esmé BOONSTRA del.)

muscle. In contradistinction to the condition in the Gorgonopsians, the Scaloposaurid Therocephalians and in *Ericiolacerta,* the narrow parietal region allows one to see the proötics, epipterygoids and pterygoids in dorsal view.

In lateral view (Fig. 2), it is seen that the skull is relatively low and long and the dentary large. The important features are: the laterally protruding anterior end of the jugal; under the overhanging shelf of the jugal, the maxillaries curve inwards towards the median line; here the foramen for the maxillary branch of the fifth nerve opens on to the outer surface of the maxilla; the septomaxilla and its foramen are large; as in *Ericiolacerta,* there is another foramen, apparently for a branch of the fifth nerve, under the septomaxillary foramen; as in *Ericiolacerta,* a number of very small foramina pierce the outer maxillary surface; the jugal bar lies in a plane considerably above the dentigerous maxillary border; the maxilla stretches far in dorsal direction; the lacrymal is small and no foramen or tubercle has been observed; the orbit is relatively smaller and the temporal opening larger than in *Ericiolacerta* and *Scaloposaurus.*

In the lower jaw, the dentary is large; the coronoid process is strong, whereas in *Ericiolacerta* and *Scaloposaurus* it is weak; as in the upper jaw, the dentigerous borders of the two dentaries are approximated, with the result that the dentary is peculiarly curved; in the Whaitsid Therocephalians I have noticed a similar curvature of the dentary, but in no Gorgonopsian have I seen anything approaching this condition; the symphysis is long and slopes backwards as in the Therocephalians; the angular, though the largest bone in the posterior part of the jaw, is relatively small, its outer surface bearing a number of ridges, which form a distinctive pattern, which I have hitherto noticed only in the Therocephalians; this pattern is not found in the Gorgonopsians, *Ericiolacerta* or *Scaloposaurus;* the prearticular has an inwardly directed shelf, as noticed by WATSON in *Ericiolacerta* and *Scaloposaurus;* the other bones of the lower jaw are not sufficiently exposed to warrant description.

In occipital view (Fig. 3), it is seen that the occipital plate is low and wide; it is concave in both dorso-ventral and in lateral direction; the posttemporal fenestrae are small. The condyle is single and is formed mainly by the basioccipital, although the exoccipitals form part of the dorso-lateral corners. The paroccipital is a massive bone forming the ventral border of the posttemporal fossa; it is pierced by the large jugular foramen; laterally, it abuts against the squamosal, which here forms the auditory groove; there is no development of a process on the paroccipital equivalent to the "mastoid process" described by WATSON in *Scaloposaurus* and *Ericiolacerta*; the paroccipital is here as in the Pristerognathid and Whaitsid Therocephalians. The interparietal is a small element forming the upper median part of the occiput. The tabulars are large, but are thin plates supporting the posterior surface of the parietals and squamosals. The supraoccipitals are large. The exoccipitals are triangular in shape, with bosses developed on the corners; they form the lateral borders of the foramen magnum and encroach on the condylar part of the basioccipital.

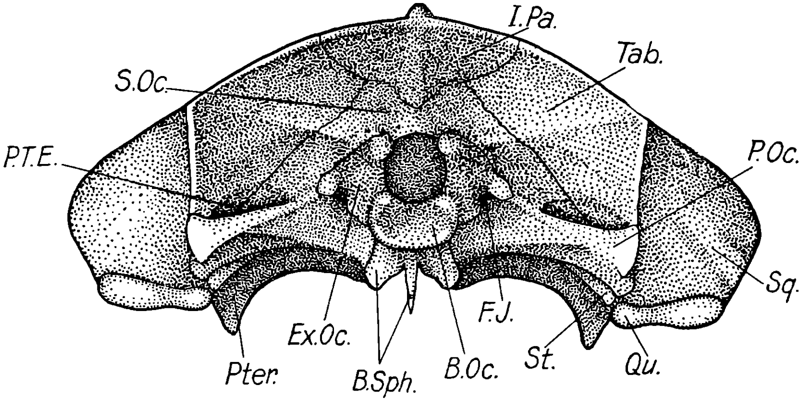

Fig. 3. *Bauria cynops*. Amer. Mus. No. 5622. Cccipital view of the skull. Nat. size. B. Sph. = basisphenoid. F. J. = foramen jugulare. I. Pa. = interparietal. P. T. F. (in figure erroneusly P. T. E.) = posttemporal fenestra. St. = stapes. Other lettering as in previous figures. (Esmé BOONSTRA del.)

In ventral view, (Fig. 4), the pear-shape is again in evidence; this appearance is produced by the preorbital bulging of the maxilla. The most important features are: the inward curvature of the lower half of the maxillaries, which results in an approximation of the dentigerous maxillary borders; the presence of a secondary palate in the anterior third of the skull. The secondary palate is formed by plates from the premaxillaries and maxillaries only, the palatines not contributing as they do in the Cynodonts and in *Ericiolacerta* (WATSON 1931); the secondary palate is a continuous sheet of bone not perforated by any fenestrae or foramina, whereas in the Cynodonts the premaxillaries are separated from each other by the development of a fenestra in the median line, through which the prevomers are visible; anterior to the canines the premaxillaries have a deep depression or fenestra for the reception of the lower canines; medial to the maxillary teeth, there is a rounded ridge for the insertion of the soft palate; the anterior half of this ridge is formed solely by the maxilla; in its posterior half, the palatine, flanking the maxilla, just enters the ventral border of the ridge. In the median line, an exceedingly deep thin keel on the prevomers descends to below the level of the secondary palate; the anterior part of this keel, as seen, is wedged in between the posterior ends of the maxillaries; the prevomerine keel continues in posterior direction to meet a similar, though shallower, keel on the pterygoids; the posterior half of the visible prevomerine keel springs from the spatulate posterior end of the prevomer, which lies in the primary palate at a level considerably higher than the plane of the secondary palate; owing to this part being ground away by Broom, the posterior limits of the prevomers are not preserved; from the portion preserved, it is, however, evident that the posterior ends of the prevomers were expanded and underlie the palatines as they do typically in the Therocephalians. From the above description and the figure it is thus clear that the prevomers are radically different from the condition in *Ericiolacerta*; here Watson figured the prevomer as having an anterior plate entering the secondary palate and a posterior base underlying, not the palatines, but the anterior pterygoidal rami. The palatine is unlike that of the Cynodonts (Broom, Watson and Haughton), *Ericiolacerta* (Watson) or *Aelurosuchus* (Haughton) in that it does not contribute to the formation of the secondary palate, but retains its position in the primary palate; its relations are as in the Therocephalians; it forms the greater part of the middle portion of the primary palate, overlying the spatulate posterior end of the prevomer, forming the anterior border of the large suborbital vacuity, and supporting the mesial surface of the maxilla; the roof of the naso-pharyngeal duct is thus formed by the palatine and prevomer, and its floor, as far as the choanae, by the secondary plates of the premaxilla and maxilla. The ectopterygoid is a slender beam-like bone, which forms the whole of the lateral border of the suborbital foramen; anteriorly, it is wedged in between the palatine and maxilla; posteriorly, it is applied to the anterior face of the lateral pterygoidal ramus, descending nearly to its ventro-lateral corner. The ventral surface of the basicranium has, in part, been described and figured for *Bauria* by WATSON from a specimen which has been renamed,

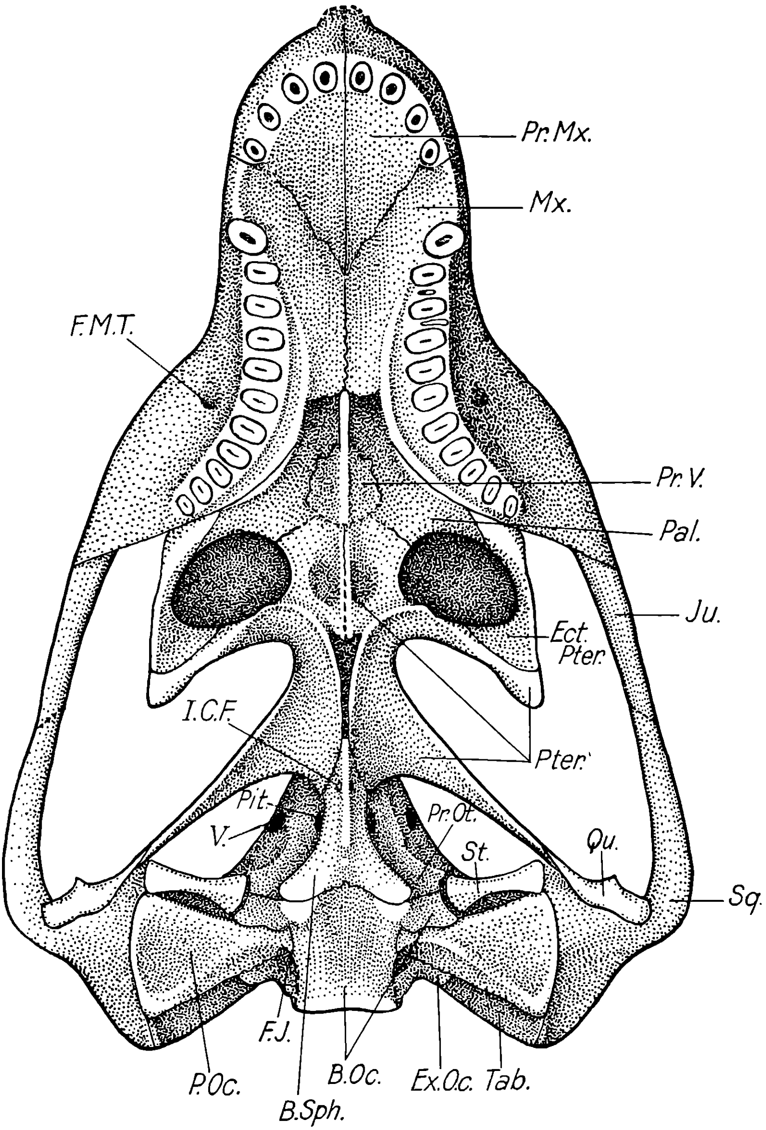

Fig. 4. *Bauria cynops*. Amer. Mus. No. 5622. Ventral view of the skull. Nat. size. F. M. T. = foramen for the exit of the maxillary branch of the fifth nerve. I. C. F. = internal carotid foramen. Pit. = pituitary fossa. Pr. V. = prevomer. V. = foramen for the fifth nerve. Other lettering as in previous figures. (Esmé BOONSTRA del.)

Bauroides, by BROOM; in all essential points WATSON's specimen agrees with the skull under consideration. The pterygoid is a triradiate bone, which is of the same nature as in *Bauroides* and the Scaloposaurids — *Scaloposaurus* and *Icticephalus*; in its anterior half, the pterygoid meets its fellow in a straight suture in the median line; posteriorly, the two pterygoids are separated by a long interpterygoid vacuity; a long interpterygoid vacuity is also present in *Scaloposaurus*, *Icticephalus*, *Ericiolacerta* (WATSON) and, according to BROOM, in *Microgomphodon*; the web of bone between the quadrate and lateral rami of the pterygoid is not so distinctly demarcated as in the Scaloposaurids and in *Ericiolacerta*; the lateral ramus is directed more posteriorly than in *Bauroides*, *Ericiolacerta* or the Scaloposaurids; the quadrate ramus reaches the quadrate; in the median line, the pterygoids clasp the anterior process of the basisphenoid. The basisphenoid is basically as in the Therocephalians and identical in shape with that of *Bauroides* (WATSON 1931), but differs from that of *Ericiolacerta* and *Scaloposaurus* (WATSON 1931); posteriorly, the bone carries two divergent tubera, which underlie two ventrally directed processes on the basioccipital; the tubera are separated by a groove; anterior to this groove, there is a sharp spur; anterior to this spur, the keel proper (parasphenoidal rostrum) extends in anterior direction, as a thin, very deep plate of bone, and projects into the posterior part of the inter-pterygoid vacuity; clasping the anterior part of the basisphenoidal keel, the pterygoids descend a little along its lateral surfaces; lateral to the anterior half of the keel, there is a pair of foramina identified by WATSON in *Bauroides* as the internal carotid foramina; in *Ericiolacerta*, WATSON found that the interpterygoid vacuity extended further posteriorly, with the result that, anteriorly, the basisphenoid was split, and two lateral strips of bone met the pterygoids; the basisphenoid of *Scaloposaurus* differs from that of *Bauria* in the absence of a keel (parasphenoidal rostrum) and in the remarkable lateral extension of the posterior half of the bone. The basioccipital is a large element and, as shown in the figures, different in shape to that figured by BROOM (1911); the ventro-posterior border is not notched, but forms a continuous ridge; laterally, it is supported by the exoccipitals, which enter the condylar surface on the dorso-lateral corners of the condyle; anteriorly, the basioccipital carries two ventrally directed processes, which support the basisphenoidal tubera; antero-laterally, the basioccipital has developed a mass of bony tissue, which forms the postero-ventral borders of the foramen ovale; in *Ericiolacerta* and in *Scaloposaurus*, the basioccipital is too poorly preserved to warrant a comparison. The paroccipital is of the same nature as in the Pristerognathid and Whaitsid Therocephalians, but differs markedly from the condition in *Ericiolacerta* and *Scaloposaurus*; it is a stout bone, whose distal end is considerably widened; it forms a shelf underneath the posttemporal fossa; proximally, its postero-ventral surface is pierced by the large jugular foramen, and here it abuts against the basioccipital and forms the posterior border of the foramen ovale; its postero-distal corner projects considerably and, with the squamosal applied to its distal end, produces a deep auditory groove; there is no indication, whatsoever, of the development of a process on its posterior border, as found by WATSON in *Scaloposaurus* and called the "mastoid process"; although stating that the paroccipital is not well preserved in *Ericiolacerta*, WATSON figured a similar process. The stapes are in position on both sides, though

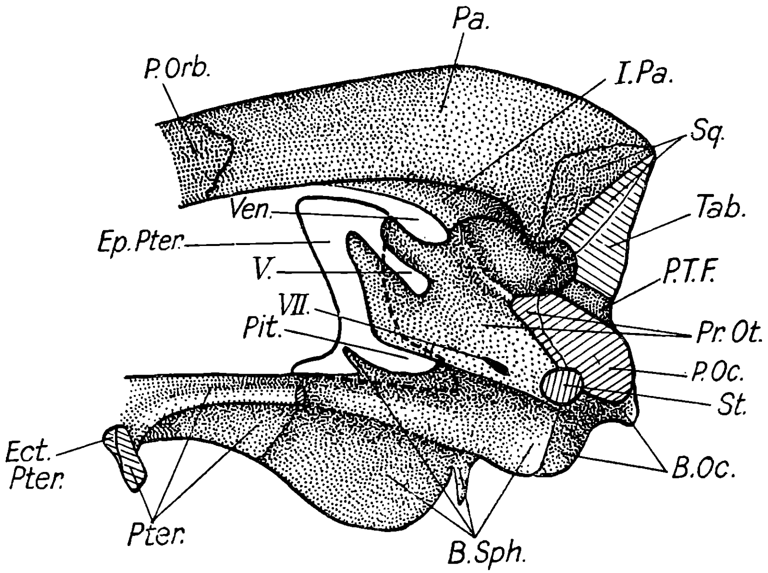

Fig. 5. *Bauria cynops*. Amer. Mus. No. 5622. True lateral view of the left side of the posterior part of the brain-case. The occipital plate is seen in section. The quadrate ramus of the pterygoid is cut off and the epipterygoid only shown in outline in order to show the proötic. About 3×2. Ven. = the large venous foramen found in all Therapsids. VII. = foramen for the seventh nerve. Other lettering as in previous figures. (Esmé BOONSTRA del.)

slightly disturbed; there is no perforating foramen. The quadrate is very firmly supported by the squamosal. I have not been able to identify a distinct quadrato-jugal.

The brain-case (Figs. 5, 6 and 7) has its lateral surface exposed on the left side; the epipterygoid has been removed in order to determine the anterior extension of the proötic; in addition there is one section through the sphenethmoidal region and one through the anterior part of the proötic. In general shape and in the arrangement of the constituent bones the brain-case of *Bauria* approaches very closely to the condition in the Gorgonopsians (BOONSTRA 1934), and the primitive Pristerognathid Therocephalians, which have a slender epipterygoid; it differs from the other Therocephalians (BOONSTRA 1934) and the Cynodonts (BROOM, HAUGHTON and WATSON) in which the epipterygoid is widened and where the cavum epiptericum is reduced; there is no indication of the peculiar widening of the basisphenoid and proötic, which WATSON found in *Scaloposaurus*; anteriorly, the proötics do not approach each other as they do in the Gorgonopsians (e. g. "*Lycaenodon*"); in the Thero-

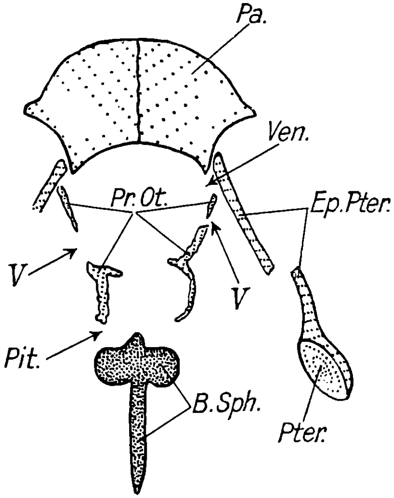

Fig. 6. *Bauria cynops*. Amer. Mus. No. 5622. A cross-section passing through the anterior part of the proötic. 4×3. Between the parietal and the proötic the section passes through the venous foramen; the gap between the two parts of the proötic indicates the position of the large foramen for the fifth nerve; the space between the proötic and the basisphenoid is the lateral opening into the pituitary fossa. The section shows very clearly that the epipterygoid lies lateral to the proötic and that the cavum epiptericum is thus large. (Esmé BOONSTRA del.)

cephalians the anterior proötic margins are also widely separated. As is shown in the figure, the proötic is a fair-sized bone, which forms nearly the whole of the lateral wall of the hind-brain; anteriorly, the two proötic processes form the borders of two notches — the dorsal one is the large venous fossa found in all Therapsids and the lower one is the large notch for the fifth nerve; the antero-ventral border of the proötic forms the upper border of the pituitary fossa, whose lower edge is formed by the basisphenoid and which is anteriorly limited by a spur of the basisphenoid (parasphenoid); midway between the pituitary fossa and the foramen ovale lies a slit through which the seventh nerve emerged; in the figure, the stapes is shown in section as it fits in the foramen ovale; the foramen ovale is surrounded by the basioccipital, basisphenoid, paroccipital and proötic; on the outer surface a high ridge divides the proötic surface into a lateral part and a dorsal part; the dorsal part meets processes of the supraoccipital and tabular and is overhung by the posttemporal bar; in the Therocephalians the last two characters, though present, are less pronounced; the large jugular foramen, piercing the paroccipital has already been mentioned. The epipterygoid is as in the

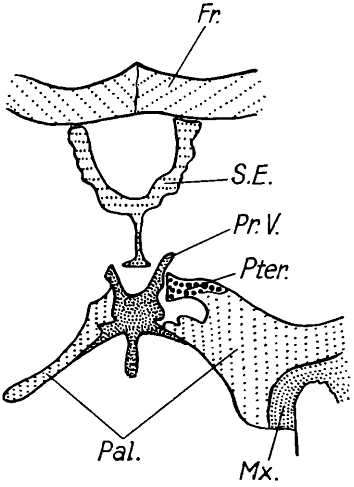

Fig. 7. *Bauria cynops.* Amer. Mus. No. 5622. A cross-section at the plane of the posterior end of the prevomer. 4×3. S. E. = sphenethmoid. Other lettering as in previous figures. The section shows that the sphenethmoid is of the nature of a „os en ceinture“, supported by a median septum; the palatine is seen descending along the mesial face of the maxilla, posterior to the secondary palate; the posterior end of the prevomer is spatulate as in the Therocephalians and carries a deep keel. (Esmé BOONSTRA del.)

Gorgonopsians and the more primitive Therocephalians (e. g. *Scylacosaurus*), where it is a slender sheet of bone lying considerably lateral to the proötic; the c a v u m e p i p t e r i c u m is thus large; there is no indication that the epipterygoid is being incorporated into the lateral wall of the brain-case as has happened in some of the more advanced Therocephalians (e. g. *Trochosaurus* and all the Whaitsids) and as in general in the Cynodonts. Unfortunately, the epipterygoid is as yet unknown in the Scaloposaurids, and in *Ericiolacerta*.

The teeth are fairly well preserved; the dental formula is as in the type specimen in the South African Museum — $\frac{\text{i—4, c—1, m—10;}}{\text{i—4, c—1, m—10;}}$ the upper incisors are long, slender and curved, but the tips are somewhat truncated; the canine is of moderate size, being oval in section, and its point not sharp; between the last incisor and the canine there is a diastema of 9 mm.; anterior to the canine, the maxillary edge is excavated to receive the lower canine, the maxilla being here so thin that the lower canine is apparently developing towards the condition where it passes external to the maxilla as it does in *Sesamodon* (BROOM); there is no diastema between the lower incisors and the lower canine; the molars also follow the canine without a diastema; these teeth are very remarkable; they are high pegs, nearly rectangular in cross-section, unserrated and have a flattened grinding surface, similar to the molars of *Sesamodon*; the grinding surfaces of the molars are not preserved well enough to enable one to study them in detail; as preserved, there are no indications of cusps of the nature of those in *Ericiolacerta* (WATSON). In grinding through the left dentary, a set of replacing teeth was encountered; they showed that the replacement was lateral and not vertical as WATSON found in *Ericiolacerta;* the same condition is shown in the maxilla.

Within both orbits there are thin plates of bone apparently circularly disposed; these sclerotic plates are, however, so fragile and the matrix so hard that I have not been able to expose them sufficiently to warrant a detailed description. As far as I am aware, this is the first time sclerotic plates have been found in the Therapsids.

In contact with the exoccipitals, there is a pair of rhomboidal elements, which shows that the proatlas is of the same nature as in the Therapsids generally.

The mass of matrix attached to the skull contained a nearly perfect left hind-foot (Fig. 8). Only the distal ends of the tibia and fibula are preserved; the former is expanded and forms a good articulation with the large rounded proximal surface of the intermedium (astragalus); the distal end of the fibula is not appreciably expanded, but it has a good articulation with the beautifully modelled proximal end of the fibulare (calcaneum). The proximal row of tarsals consists of three elements — fibulare, intermedium and tibiale. The intermedium is the largest element and is of very irregular shape; on its proximo-palmar end a fairly strong tuber calcis forms a moderately strong heel; on its proximo-dorsal surface a well-modelled, rounded and raised face affords an excellent articulation for the fibula; its disto-preaxial corner is notched for the reception

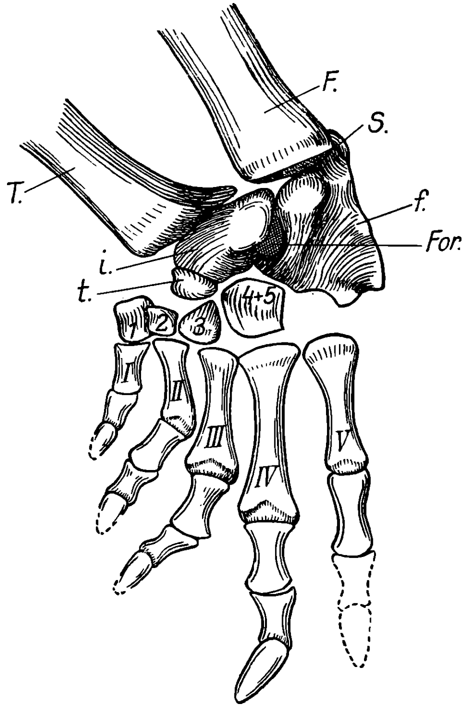

Fig. 8. *Bauria cynops.* Amer. Mus. No. 5622. Dorsal view of the left hind-foot. Nearly nat size. The distal row of tarsals and the foot have been displaced in relation to the proximal tarsals; if the former are shifted towards the right so that the large composite fourth distal fits in the notch of the fibulare, the natural position will be restored. F. = fibula. f. = fibulare. For. = arterial foramen. i. = intermedium. s. = sesamoid? T. = tibia. t. = tibiale. 1—5 = distal tarsalia. I—V = metatarsals. (Esmé BOONSTRA del.)

of the large fourth distal tarsal element; its preaxial border is notched to form a perforation for the artery; on its postaxial border there is a high tubercle for the insertion of a muscle. The intermedium is a large, roughly oval, bone with a rounded surface for the tibial articulation and a notch facing the arterial notch of the fibulare. The tibiale is closely pressed against the disto-preaxial corner of the intermedium; it is a small, rounded bone situated more in the position of a centrale. Postaxially of the tuber calcis of the fibulare, there lies a fair-sized sesamoid.

In the distal row there are four tarsal elements; in dorsal view, they present flat and roughly four-sided surfaces; the fourth is the largest and probably represents a fusion of the fourth and fifth distals.

All five metatarsals are preserved. The fourth is the longest; it has expanded ends and a long slender shaft; its distal end is beautifully modelled, having mammalian-like rounded epiphysial articulatory surfaces, as in some Gorgonopsians and Therocephalians (Boonstra 1934). The fifth is shorter and smaller with the distal end not so well-finished. From the third to the first the metatarsals progressively decrease in length, the shaft becomes lost and the distal end undifferentiated, so that the first is a short, squat bone with hardly any constriction of the shaft. All the digits, except the fifth, are nearly completely preserved. The digital formula is 2, 3, 3, 3, 3?; the fourth digit is the longest; the terminal phalanges carried nail-like claws. The great difference in length between the first and the fourth digit clearly indicates a mode of locomotion similar to that of some of the modern lizards. The limb-bones mentioned by Broom (1915) appear to be a radius and ulna; they are long and slender bones, but somewhat shorter and relatively stouter than those of *Ericiolacerta* (Watson).

The Chief Cranial Measurements are:

Premaxilla to basioccipital condyle	=	130 mm.
Premaxilla to anterior orbital border	=	60
Length of lower jaw	=	106
Length of dentary (direct)	=	103
Width across the squamosals	=	90
Interorbital width	=	27
Intertemporal width	=	12
Width of the snout (over canines)	=	31
Height of snout (at canines)	=	20

Height of occiput (basisphenoid tubera to parietal crest)	=	38 mm.
Width across lateral pterygoid rami	=	51
Length of molar series	=	36
Precanine diastema	=	9
Length of incisor series	=	18
Premaxilla to posterior edge of secondary palate	=	50

Discussion.

From the above description it has become clear that *Bauria* possesses a large number of characters in common with the more primitive Pristerognathid Therocephalians. These can be summarized as follows: narrow parietal crest; large temporal openings; long narrow snout; large facial exposure of the septomaxilla; large prefrontal; postorbital with short posterior limb, not meeting the squamosal; peculiar pattern of ridges on the angular; deep maxilla; stout paroccipital, of similar shape; spatulate widening of the posterior prevomer end, underlying the palatines; large suborbital vacuities, bounded by a beamshaped ectopterygoid; interpterygoid vacuity; straight outer edge of the quadrate ramus of the pterygoid, which meets the quadrate; reduced width across the lateral pterygoidal rami; deep keel on the basisphenoid; slender epipterygoid, with a roomy cavum epiptericum between it and the proötic; similar relations of the proötic; sloping mandibular symphysis; a digital formula of 2, 3, 3, 3, 3.

The advanced characters in which *Bauria* differs from the primitive Pristerognathid Therocephalians can be listed as follows: the preorbital bulging of the jugal and maxilla; the loss of the postfrontals; the incomplete postorbital bar; the closing of the pineal foramen; the approximation of the alveolar borders of the maxillaries (cf. *Whaitsidae*); two foramina for the maxillary branch of the fifth nerve; the inward curvature of the dentary (cf. *Whaitsidae*); larger dentary; apparent absence of a distinct quadratojugal; presence of a secondary palate formed by the premaxillaries and maxillaries; mesial flange on the prearticular; absence of teeth on the pterygoids; the unpointed, blunt molars.

Bauria agrees with the Scaloposaurid Therocephalians in the following points: incomplete postorbital bar (except *Icticephalus*, *Akidnognathus* and *Simorhinella?*); absence of pineal foramen (except *Icticephalus* (Watson), *Simorhinella* and *Choerosaurus*); absence of the postfrontal; large interpterygoid vacuity; flange on the prearticular; web of bone connecting the lateral and quadrate rami of the pterygoid; bulbous swelling of the snout; the absence of a preparietal; straight outer edge of the quadrate ramus of the pterygoid.

Bauria differs from the Scalaposaurid Therocephalia in the following characters: the preorbital bulging of the jugal and maxilla; the approximation of the alveolar borders of the maxillaries; the concomitant curvature of the dentary; the larger dentary; presence of a secondary palate formed by the maxilla and premaxilla; absence of teeth on the pterygoid (but also absent in *Scaloposaurus*); narrow parietal crest; deep basisphenoidal keel; absence of „mastoid process" on the paroccipital; there is no lateral expansion of the basisphenoid equivalent to the remarkable condition in *Scaloposaurus;* loss of a distinct quadratojugal.

The characters in which *Bauria* agrees with the Gorgonopsians are those which the latter have in common with the Therocephalians. *Bauria* differs from the Gorgonopsians on the following points: the narrow parietal crest; the postorbital does not meet the squamosal; the absence of a postfrontal; the absence of a pineal foramen; the bulging of the jugal and maxilla; the bulbous snout; the approximation of the alveolar borders of the maxillaries and the concomitant curvature of the dentary; the larger dentary; the pattern on the angular; the presence of a secondary palate; the spatulate posterior end of the prevomer; the presence of a large suborbital vacuity; the reduced width of the lateral pterygoid rami; the absence of teeth on the palatines and pterygoids; absence of a preparietal; deep basisphenoidal keel; the straight outer edge of the quadrate ramus of the pterygoid; the digital formula is. 2, 3, 3, 3, 3, whereas in the Gorgonopsians it is, 2, 3, 4, 4, 3.

Although *Bauria* agrees with the Cynodonts in having a narrow parietal crest, it differs from them in a large number of characters. viz.: large facial exposure of the septomaxilla; large entry of the frontal on to the orbital border; smaller prefrontal; incomplete postorbital bar; absence of a pineal foramen; the primitive nature of the squamosal; presence of a large suborbital vacuity and a large interpterygoid vacuity; pterygoids reach the quadrates; deep basisphenoidal keel; uncusped molars; the digital formula is 2, 3, 3, 3, 3, whereas in the Cynodonts it is, 2, 3, 4, 5, 3; the slender epipterygoid, flanking a roomy c a v u m e p i p t e r i c u m, not incorporated in the sidewall of the brain-case. A critical study of the characters enumerated here will show that *Bauria* differs from the Cynodonts in retaining a number of Therocephalian characters, which the latter have lost, but in a number of points *Bauria* has advanced further along the mammalian line than have the Cynodonts.

The above series of comparative facts do, I believe, show that: a) *Bauria* has no close relationship to the Gorgonopsians, the characters in which they agree being simply basic characters common to all the Therapsids; b) the Scaloposaurids, although showing some similar advances, differ from *Bauria* in a number of features of fundamental importance, which definitely precludes the thesis that *Bauria* can be derived from the Scaloposaurids; c) the Cynodonts are derived from the Pristerognathid Therocephalians and not from the Gorgonopsians, and the points in which they resemble *Bauria* are simply cases of parallelism.

It will now serve a useful purpose to institute a comparison between *Bauria* and *Ericiolacerta*. These two forms have the following characters in common: general shape; incomplete postorbital bar; loss of the postfrontal; large entry of frontal in the orbital border; deep maxilla; foramen for a branch of the fifth nerve ventral to the septomaxillary foramen; large suborbital vacuities; large interpterygoidal vacuity.

They differ, however, in a number of characters, some of which are of fundamental importance, viz. in *Ericiolacerta* WATSON found that the palatines contributed to the formation of the secondary palate, whereas I find that in *Bauria* only the premaxilla and maxilla form the secondary palate; WATSON also found that the postero-median part of the secondary palate was formed by a plate of the prevomer, whereas I find that there is only a minor intercalation of the prevomerine keel between the maxillaries; according to WATSON, the interpterygoid vacuity extended in posterior direction, so that the anterior end of the basisphenoid is split to form two anteriorly directed prongs; I find, on the other hand, that in *Bauria* the basisphenoidal keel (parasphenoid) projects into this vacuity at a plane in advance of the basisphenoid-pterygoid junction; in *Ericiolacerta*, WATSON has figured a "mastoid process" on the paroccipital similar to that of *Scaloposaurus;* in *Bauria*, the paroccipital is of normal shape; the parietal crest in *Ericiolacerta* is wide, whereas in *Bauria* it is narrow, as was known since BROOM's original account appeared; in *Bauria*, there is a large facial exposure of the septomaxilla; in *Ericiolacerta*, WATSON figured it as being situated largely within the nostril; in *Ericiolacerta*, the bulging of the jugal and maxilla is feeble, whereas, in *Bauria*, it is a characteristic feature; there is no approximation of the alveolar borders of the maxillaries with the concomitant curvature of the dentary in *Ericiolacerta*; in *Bauria*, the outer surface of the angular carries a pattern of ridges as is typical of Therocephalians, but in *Ericiolacerta*, there is no such pattern; the foramen for the exit of a branch of the fifth nerve on to the maxilla has not been described in *Ericiolacerta*.

A number of the above characters appear to show the real relationships of these two forms, and, it is not without interest to note that some of the characters in which *Ericiolacerta* differs from *Bauria* are precisely those which it shares with *Scaloposaurus*. I am convinced that WATSON is correct in maintaining that *Ericiolacerta* must be derived from the Scaloposaurid group of Therocephalians, but the evidence is all against *Bauria* being derived from the Scaloposaurids. The mass of evidence advanced in the beginning of this discussion points very strongly to the unspecialized Pristerognathid Therocephalians, and I can find no arguments to invalidate this view. *Ericiolacerta* cannot be considered as a form intermediate between *Scaloposaurus* and *Bauria*, because, if it be assumed that *Scaloposaurus* was derived from a primitive Therocephalian, where the parietal crest was presumably narrow, the parietal region became wide in *Scaloposaurus*, continued so in *Ericiolacerta* and then again became narrow in *Bauria*. Similarly, the basisphenoid was narrow in the primitive Therocephalian, became enormously widened in *Scaloposaurus* and presumably also in *Ericiolacerta* and then returned to the normal Therocephalian condition in *Bauria*. The same reasoning applies to the "mastoid process"

As I interpret the facts, the relations of the Therocephalians, Cynodonts and Bauriamorphs are as follows:

a) from the primitive Therocephalians, here considered to be represented by the Pristerognathids, the various Therocephalian families (Alopecopsids, Ictidosuchids, Lycideopsids, Euchambersids, Whaitsids and Scaloposaurids) arose; b) from this same group of primitive Pristerognathids another line of development led on to the Cynodonts; c) *Bauria* must have its roots in this stem-group of Pristerognathids; d) the Scaloposaurids, themselves derived from these primitive Therocephalians, continued their evolutionary tendency to produce *Ericiolacerta*.

If this interpretation be correct, then it is obvious that *Bauria* and *Ericiolacerta* cannot both be included in the suborder *Bauriamorpha*. As this suborder was instituted primarily for the reception of *Bauria*, where the parietal region is narrow, it may be convenient to exclude from it any form with a wide parietal region. Although *Ericiolacerta* is manifestly a much more advanced form than *Scaloposaurus*, and cannot legitimately be included in the Therocephalian family *Scaloposauridae*, I propose to regard it provisionally as an advanced Scaloposaurid and therefore do not create a new family or suborder for its reception until my interpretation has been corroborated.

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