46. *On* NEW SPECIES *of* PROCOLOPHON *from the* CAPE COLONY *preserved in* DR. GRIERSON'S MUSEUM, THORNHILL, DUMFRIESSHIRE; *with some* REMARKS *on the* AFFINITIES *of the* GENUS. By HARRY GOVIER SEELEY, Esq., F.L.S., F.G.S. &c., Professor of Geography in King's College, London. (Read June 5, 1878.)

[PLATE XXXII.]

DR. THOMAS BOYLE GRIERSON transmitted to me for description three more or less perfect small skulls, which all belong to the genus *Procolophon*, instituted by Professor Owen for some small reptiles from the Tafelberg. Dr. Grierson's specimens were collected by Mr. Donald White from Donnybrook, Queenstown District, Cape Colony. They are contained in a hard red ironstone matrix, often crystalline, which is apparently concretionary, and invested one skull much in the same manner as the clay-ironstone of our own country often invests Carboniferous fossils. The matrix can be removed only in part, because the bones and the cavities between them are frequently filled with brittle and crystalline carbonate of lime. Hence the thin film of external bone is often broken away in the endeavour to develop the specimens.

PROCOLOPHON GRIERSONI, Seeley. (Pl. XXXII. figs. 1–3.)

Of this species but one example has been found. The skull is of subtriangular outline, as in many lizards; and, as in lizards, it is rather depressed and flattened above. The occipital region appears to be vertical; the eyes are a large oval, placed nearer to the back of the skull than is usual in lizards, and look outward and upward. The nostrils are nearly terminal, but look laterally, being divided from each other by the narrow ascending process of the premaxillary bones.

In the median line, from the premaxillaries to the supraoccipital region, the specimen measures $1\frac{6}{10}$ inch. The occipital region, which is slightly compressed on the left side, measures from the median line outward $\frac{6}{10}$ inch, so that the region was probably $1\frac{2}{10}$ inch wide. The greatest width of the skull was attained nearly at the back of the orbit, in a line passing through the foramen parietale, and results from the convex bulging of the malar bones, where the width may have been $1\frac{4}{10}$ inch. At the anterior corner of the orbit the transverse measurement is $\frac{6}{10}$ inch; while the width of the upward bars of the two premaxillary bones which divide the nares is $\frac{1}{10}$ inch. The upper jaw extends beyond the lower, and the upper termination of the premaxillaries and the adjacent part of the nasal bones are compressed so as to form a short anterior region, which looks obliquely upward and forward.

All the roof-bones of the cranium appear to be double. The foramen parietale is large, rounded, and slightly elongated longitu-

dinally, but less than $\frac{1}{5}$ inch in length. Its hinder margin is distant $\frac{7}{20}$ inch from the transverse occipital margin, and its anterior border is about $1\frac{1}{10}$ inch from the extremity of the snout. Behind the foramen the parietal, postfrontal, and squamosal bones are expanded as in the marine Chelonia; but in *Procolophon* the occipital region is closed posteriorly, as in Dinosaurs and Dicynodonts, which is not the case in the Chelonia; and the roof of the skull is encroached upon by the backward position, obliquity, and large size of the orbits. The orbits are elongated ovals, the hinder margins of which are in a line with the back of the foramen parietale, $\frac{7}{10}$ inch in length and $\frac{5}{10}$ inch in depth from the frontal to the malar. The anterior margin of the orbit appears to be pierced with a large lachrymal duct. The orbits appear to be margined by the maxillary and malar bones below; the postfrontal, which is very large, by its expansion seems to have filled in the vacuity between the parietal and squamosal; it forms the back of the orbit. The frontal divides the orbits; where narrowest it is about $\frac{3}{10}$ inch wide; from the foramen parietale to its transverse junction with the nasal bones it measures $\frac{6}{10}$ inch. The prefrontals appear to be moderate, to form the upper anterior borders of the orbits, and to extend forward to the nasal bones; but as the substance of the bone is broken away and only obscure sutural lines remain to indicate its limits, this statement is made with some reserve. There are some indications that the orbits were parted by a septum, and probably they were conditioned much as are the orbital cavities of *Hatteria*. I have evidence that the base of the orbit in this genus was formed by a palatal plate, and that the eye must have reached back to the front wall of the somewhat large brain-cavity. The chief difference of the external orbital region from that of such a lizard as *Plestiodon* consists in the large size and backward prolongation of the orbit. The interspace between the orbit and narine is $\frac{1}{20}$ inch. The portion of the skull anterior to the orbit has an aspect as of side-to-side compression. The nares are small, oval, and vertical, and lie between the premaxillaries in front, the maxillaries behind, and the nasals above. The narrow premaxillaries extend up so as to be embraced by the nasal bones, and only form a narrow band anterior to the nares. The teeth in each of the premaxillaries are four in number, two prehensile teeth close together in front of the nares (one in each bone) and three behind. In the maxillary bone of the right side are six teeth. These teeth are subcylindrical, and terminate in sharp conical points; they are placed close together, so that the expanded bases are almost conical. The hindermost tooth is $\frac{8}{10}$ inch from the extremity of the snout. The teeth have a central pulp-cavity which extends high up into the crown. At the base of each maxillary tooth appear to be many germs of successional teeth, which extend backward obliquely from the bases of each. Behind the teeth the maxillary bone appears to terminate in a downward process. The malar bone is about $\frac{1}{10}$ inch deep in front, but widens behind by rising so as to narrow the orbit posteriorly, and looks obliquely outward and upward. At the back of the

malar bone the vertical narrow quadrate bone is attached; it is nearly $\frac{4}{10}$ inch in length, and sends inward and forward a large thin process similar to that of *Hatteria* and of Dinosaurs. Upon the quadrate bone appears to be a plate of bone (regarded by Prof. Owen as the squamosal), which I am inclined to regard as the quadrato-jugal; it extends chiefly behind the quadrate bone. Posterior to the quadrate bone the cranium is contracted a little, and probably excavated in the auditory region. The rami of the lower jaw are loosely adherent, and have a narrow union; they are straight, and diverge at a considerable angle. There are ten teeth in each ramus; the teeth in front are longer and more slender than those behind, as in many lizards. Immediately behind the teeth is a moderate coronoid process, and behind this the jaw thickens considerably from side to side, so as to extend outward somewhat after the manner of the lower jaw in some rodents. In the articular region the lower jaw is inflected a little, so as to widen the articulation. The extreme length of the lower jaw is $1\frac{4}{10}$ inch, but it extends a little behind the quadrate bone and terminates in a rounded and contracted heel. The depth of the jaw increases slowly from before backward, but where deepest is not more than $\frac{3}{10}$ inch at the coronoid eminence. The cervical vertebræ remain attached to the specimen, and are partly exposed by a fracture, so as to show indications of four or five. The centrums are rather short; the articular surface of the last is concavely or conically cupped with a central notochordal depression or perforation similar to that figured by Prof. Owen as Dinosaurian in Quart. Journ. Geol. Soc. vol. xxxii. pl. v., but which is paralleled in *Hatteria*, as well as in Amphibians and fishes. The neural spine of the first vertebra exposed is expanded from front to back, and the neural spines of the succeeding vertebræ are strong and directed backward as in *Hatteria*; short transverse processes are given off on a level with the base of the neural canal. To these processes slender cervical ribs were attached; but there is no evidence as to whether the articulation was single or double. The vertebræ are bent at a right angle with the roof of the skull, as in many mammals, ornithosaurs, and other animals. Below the vertebræ, and behind the lower jaw, is a portion of a thin expanded plate of bone, which is probably part of the sternum, in front of which are fragments of long bones, too imperfect for determination. As compared with *Procolophon trigoniceps* of Prof. Owen, which is of similar size, this species has the head much more compressed from side to side, more elongated in front of the orbits, has the parietal foramen smaller, and shows various minor differences which are more easily gathered from a figure than from description.

PROCOLOPHON CUNEICEPS, Seeley. (Pl. XXXII. figs. 7, 8.)

The second skull is somewhat larger and deeper, and the modification of the malar arch is so different from that seen in the first specimen, and in those figured by Professor Owen, as to leave no reasonable doubt that the animal is specifically distinct; and so,

especially as it throws light on the palatal characters of the genus, the specimen may be deserving of description, although it is less perfectly preserved than the other. It was almost hidden in an ironstone nodule, from which I have, by the permission of Dr. Grierson, extracted it.

Like all the other crania of *Procolophon*, this skull is flattened above and of triangular outline; but in the median line it is rounded from the nasal region above down to the anterior termination of the palate, and in front of the orbits appears to taper rapidly, though this may result partly from accidental lateral compression. The bone-tissue is entirely removed from the front part of the skull; and on the left side the circular narine, $\frac{2}{10}$ inch in diameter, is seen to have looked downward and outward; the nares extend to the extremity of the skull, much as in *Uromastix*, and, though separated by the premaxillaries, do not appear to have been divided by a vertical bony septum. There is a slight compression behind the nares, and then succeeds the region of the lateral preorbital inflation, bounded above, on the cast, by two ridges which converge forward. These ridges terminate backward in a line with the narrowest part of the frontal bone, which is between the orbits, and they are prolonged forward to the anterior termination of the skull. From the front of the ovate foramen parietale to the end of the snout measures $1\frac{5}{10}$ inch. The least width of the frontal bone is $\frac{4}{10}$ inch. The posterior borders of the orbits are in a line with the hinder limit of the parietal foramen. The length of the orbit is $\frac{8}{10}$ inch; from above downward it measures $\frac{5}{10}$ inch. The upper surface of the skull is an inch wide behind the orbits; but the malar arch bulges outward and the skull reaches its greatest width at the articular portion of the quadrate bone. The malar bone originates at the anterior border of the orbit, and is a flat thin bone less than $\frac{2}{10}$ inch deep. At the middle of the orbit it bends, and widens in a triangular form, extending above and below so as to reach along the entire height, $\frac{8}{10}$ inch, of the quadrate bone. The length of the malar is rather more than its height; it is concave from above downward in its expanded hinder part, where it joins the quadrate bone, which in side view was vertical, though directed somewhat outward. The malar bone shows no certain sign of division, or evidence that it included a quadrato-jugal element. Many lizards with a complete orbit, such as *Calotes*, have the malar bone expanded and reaching far back, and joined by ligament to a thin wing of the quadrate bone, which curves outward and forward towards it, approximating towards the condition seen in these fossils. Resting upon the hinder part of the malar bone, and resting upon it superiorly so as to form the oblique hinder and inferior border of the orbit, is a thin bone $\frac{1}{10}$ inch deep and from $\frac{6}{10}$ to $\frac{7}{10}$ inch long, which occupies the usual position of the postfrontal bone in lizards, and appears to underlap the outer wing of the frontal bone at the hinder and upper limit of the orbit, on the lizard plan, but is in the position of the quadrato-jugal in *Hatteria*. The broad flattened superior surface of the skull behind the orbits ($1\frac{2}{10}$ inch wide), with-

out trace of a temporal fossa, and formed by the frontal bones which partly overlap the parietals, is an important difference from the character of that region among lizards, which is always marked by a more or less conspicuous temporal fossa; but the variable condition of this region in the Chelonia warns us that the expanded forms of the parietal and frontal bones roofing-in the head need not be more than a generic difference in the Lacertilian order. Probably owing to the condition of preservation of the specimen, there are no indications of teeth in the premaxillary bone; but indications of the posterior seven teeth are preserved: they are large, long, cylindrical, tapering to a conical point, which is slightly recurved; each has a large pulp-cavity, prolonged into a short canal, which appears to pierce the crown of the tooth. The teeth are ankylosed to the jaw without trace of fangs or sockets. A fracture through the middle of the specimen shows the palate in the region beneath the orbits to be closed in the median line. The middle region is occupied by rows of teeth, short and conical, which converge forward in a V-shape. Seven teeth in a row on one side in the inner and hinder series on this part of the palate are visible in the space exposed. External and anterior to these teeth there are indications of another parallel series, of which three crowns can be detected. These teeth must be placed on the pterygoid bones. On each side of the teeth the palate is broadly channelled, and the transverse process of the pterygoid which forms the channel is broad and prolonged outward and downward, being homologous with the outer and downward processes of the pterygoid bones of the crocodile. Coupled with the fact that the pterygoid in the specimen previously described must have reached the quadrate bone, this condition of the palate is essentially Lacertian. Below the palate is a mass of bone, which seems too thick to be the central element of the hyoid; but at the posterior end of the skull, in a corresponding position, are two slender, parallel, cylindrical bones, which would lend support to such a view.

PROCOLOPHON LATICEPS, Seeley. (Pl. XXXII. figs. 4–6.)

The third skull of *Procolophon* is larger and relatively much broader. All the hinder part is invested in matrix. It is fractured obliquely behind the foramen parietale, so as to give some indication of the transverse outline of the brain-cavity and of the position of the pterygoid bones. The skull extends markedly beyond the lower jaw both anteriorly and laterally, and the teeth in the maxillary bone are directed inward just as those in the lower jaw are directed upward and outward to meet them. There would seem to have been a very slight displacement of the rami at the symphysis; but this is probably more the result of crystallization going on in the matrix than of pressure, since the specimen shows no evidence of deformation. This species, in common with the others, has a flattened upper surface, cranial bones in pairs, a rounded snout terminated by a pair of narrow premaxillaries, nares similarly placed and looking downward laterally, large oblique orbits, similar inflation of the lachrymal or preorbital region, and subcylindrical teeth ending in conical

points; so that it is distinguished chiefly by its form and measurements from the species already described. From the anterior border of the pear-shaped foramen parietale to the anterior limit of the premaxillaries is fully $1\frac{2}{10}$ inch. Between the orbits the frontal bones measure, where narrowest, $\frac{4}{10}$ inch. The antero-posterior extent of the orbit is $\frac{7}{10}$ inch. The snout is rather blunt, and the ridges on the cast, which are prolonged from the upper corners of the orbits to the anterior nares, are parallel to each other, and diverge slightly outward as they terminate forward, instead of converging. The nares are rather small ($\frac{1}{10}$ inch), and look outward and downward, without any forward tendency. The front of the premaxillary bones is covered by matrix; but laterally on the right side the bone is separated from the maxillary by a somewhat oblique suture, which descends with a backward inclination from the hinder border of the nostril to the palate, and contains on its lateral aspect three large long teeth with pulp-cavities. In the maxillary bone are seven similar teeth, further apart behind than in front, but never separated by interspaces so wide as the teeth. The length of jaw occupied by the ten teeth and their interspaces is $\frac{7}{10}$ inch. The bases of the fangs are invested by bone, so as to have the aspect of being in sockets. In the corresponding part of the lower jaw, extending for $\frac{4}{10}$ inch, are six cylindrical teeth, which decrease in length backward; the front ones are fully $\frac{3}{10}$ inch long. The teeth are smooth, without a trace of striations. The maxillary bone is convex from above downward; it is pierced by a large oval foramen, which is above and behind the second maxillary tooth. Above the maxillary bone, and extending under it so as to form the anterior corner of the orbit, is the large lachrymal or prefrontal bone, which covered the preorbital inflation and joined the nasal bone. The width of the skull at the outward bend of the malar bone, which is much sharper than in other species, is about $1\frac{8}{10}$ inch. The height of the skull, including the lower jaw, is $1\frac{2}{10}$ inch. The lower jaw is strong and deep, and increases in depth from before backward; it is flattened, compressed from side to side, and straight; but beneath the quadrate bone it becomes wider than deep, and is subquadrate in section where it is fractured through; it extends for a short distance behind the quadrate bone, and is rounded and compressed from above downward. The dentary bone is large, and on its inner side the splenial bone extends to the anterior extremity. The quadrate bone is vertical, overlapped in front by the quadrato-jugal, which curves round, much as in chelonians, so as to cover its lateral aspect, except at the articulation. Above and in front of the quadrato-jugal is the malar, which forms the lower and hinder border of the orbit. Both these bones extend upward almost to the roof of the skull to meet a squamous bone, apparently the squamosal, which overlaps the parietal, reaches forward to the hinder margin of the orbit, becomes massive behind, and extends over the strong transverse element at the back of the skull, which can only be one of the otic bones, probably that called paroccipital by Professor Owen. The upper part of the quadrate bone is wedged into a ver-

tical bone, which extends inward and forward so as to form the back wall of the orbit, but does not visibly enter into the wall of the brain-case. This bone is evidently a downward fold of the parietal, and in meeting the quadrate offers a modification which is paralleled to some extent among Lizards and Rhynchocephalians. The quadrate bone is also developed outward into a large, vertical, cellular mass, which extends outward for $\frac{3}{10}$ inch beyond the articulation for the lower jaw, is behind the quadrato-jugal, and increases the transverse width of the skull to $2\frac{2}{10}$ inches, which is considerably more than its length. The pterygoid process of the quadrate is thin, is directed inward, upward, and forward, and is given off at more than $\frac{2}{10}$ inch above the articular surface of the quadrate bone; it may extend inward for about the same distance. The pterygoid bones meet in the middle line, and are prolonged backward and obliquely downward to a level with the articular pedicles of the quadrate bones; they are not in contact with the base of the brain-case.

The vertical fracture through the brain-case is somewhat oblique. This cavity appears to have been $\frac{4}{10}$ inch deep in the sphenoidal region, and slightly narrower; and, as in most reptiles, it is like a box contained within the skull *. The basisphenoid is thick and channelled on its ventral aspect, two strong compressed hypapophyses being prolonged downward and backward towards the pterygoid bones. The alisphenoid is thick and directed upward and outward; there is a large perforation placed between it and the bone above; and, since the perforation opens into the back of the orbit, it probably gave passage to the optic nerve, so that the bone would be the frontal. It is uncertain whether the brain-case was closed in above by bone, no bone being visible in the upper median part of the cerebral region. The fracture in the specimen gives no evidence concerning the existence of a columella.

## *The Systematic Position of* Procolophon.

Such being the more important structures of the skull of the genus *Procolophon*, it remains to determine the place of the type in the Reptilian series. Professor Owen placed the genus in the family Mononarialia of his order Theriodontia, the family being defined as having "the external nostril single or undivided," and with more than three incisor teeth in each premaxillary bone. The more perfect preservation of the nasal region in the specimens described, by

* The specimen figured by Professor Owen in his South-African Reptile Catalogue, pl. xx. fig. 2, as the brain-cavity of *Nythosaurus larvatus* may be seen, by comparison with the lateral view of the same specimen (pl. xx. fig. 1), to represent the whole interior cavity of the skull from the brain forward to the nares. There is no evidence that the cavity for the cerebrum extended forward between the orbits, as indicated in the figures and text (p. 24). This apparently mammalian character would also result from a modification of the Chelonian plan of a median prolongation forward of the chamber for the envelope of the brain.

exhibiting divided external nostrils, demonstrates that the genus cannot be located in the Mononarialia. The only definition of the order Theriodontia is that given by its illustrious founder in these words*:—"Dentition of the carnivorous type; incisors defined by position, and divided from the molars by a large laniariform canine on each side of both upper and lower jaws, the lower canine crossing in front of the upper as in Mammalia." But since *Procolophon* possesses no canine, and exhibits no modification in the dental series of any importance from front to back of the jaw, it is obvious that the genus does not conform to the dental definition of the Theriodontia, even if an ordinal group could be founded on such characters as have been cited. Before inquiring whether the Theriodontia can be defined so as to include *Procolophon*, I would remark on the very small value which can be attached to modified form of teeth as an ordinal character. It is extremely rare to find that the teeth do not change their form and proportions with position in the jaw. In Lizards and Crocodiles these modifications so far parallel those of the supposed Theriodonts as to be worth some consideration in searching for the classificatory value of the mammalian type of teeth found in the South-African fossils. In *Hatteria* and in a large number of lizard types there are teeth which are more or less well defined by position and altered form as incisors, premolars, and molars; but the canine attains no development, and sometimes the character is more strongly marked in the lower than in the upper jaw. Yet it would be altogether unjustifiable, in the present state of science, to see more than an analogy between these lizards and corresponding ordinal types of dentition among Mammalia; for it would presuppose that the teeth remained comparatively unchanged, while the remainder of the organism scarcely retained a semblance of lizard characteristics; whereas it is known, from the evolution of all the orders of Mammalia during Tertiary ages†, that the axial skeleton alters with extreme slowness, while the rapid modifications of the mammalian teeth are even more striking than the changes seen in bones of the limbs. But, among the Crocodiles, I recognize in the well-known wavy outline of the jaws a demarcation of teeth into regions which have a fair right to be named incisors, canines, premolars, and molars, and constitute a dentition as Theriodont in principle, but not so specialized, as is seen in the South-African fossil group. In the crocodile the regions are easily recognized by the form, size, and characters of the tooth-sockets, when all the teeth are drawn, especially in the lower jaw. The incisors occupy a flat or slightly concave region, corresponding to the premaxillary bone. Then at the head of the crest is the large canine placed between the premaxillary and maxillary bones. Next succeeds a portion of jaw with concave outline occupied by small teeth, which sometimes become larger from before backward: these are the premolars. And, lastly, there are teeth in another concave region which have the position of molars; these may, in the young animal, all be con-

* 'Fossil Reptilia of South Africa,' 4to, 1876, p. 15.

† See Gaudry, 'Mammifères Tertiaires,' 8vo, 1878.

tained in a groove with sockets scarcely better indicated than among Ichthyosaurs.

Fig. 1.—*View of Lower Jaw of a Crocodile, from above, showing the formula* I. 3, C. 1, Pm. 6, M. 9.

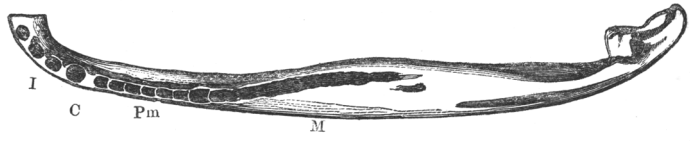
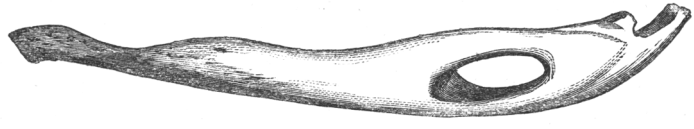



Fig. 2.—*Lateral View of the same Jaw, showing how these Regions are indicated by Curves.*



Nor are Crocodiles the only animals in which this sort of dental character is met with; for it may be detected more or less well marked, though with different divisions, in certain Plesiosaurians, some of the Ornithosauria, and Teleosaurs *. It is true that no other types, of reptilian affinities, have the canines so much developed as in the so-called Theriodonts of South Africa; but when we remember the wide range of variation in dental characters that exists among marsupial mammals, coupled with the variation of size in the canines of Carnivora, there seems to be a *primâ facie* objection to the institution of an ordinal group for reptiles with canine teeth, even though they may sometimes be as well developed as in *Machairodus*. If the order is well founded, it will show cranial and other characters which are more important. The South-African genera classed as Theriodont by Prof. Owen are largely founded on snouts, which give no indication of the structures of the skull which are useful in comparison: among such genera are *Tigrisuchus*, *Cynodraco*, *Cynochampsa*, *Cynosuchus*. The genera founded on more or less useful crania are:—*Lycosaurus*, which is too imperfect for comparison; *Procolophon* and *Scaloposaurus*, neither of which fall within the definition of Theriodonts, since they have no canine teeth; and, lastly, *Galesaurus* and *Gorgonops*, genera which differ a good deal, of which the former shows the limits of the bones on the upper surface of the skull, and the latter gives imperfect indications of the structure of the palate (which, though figured, has not been described). These palatal structures are similar to those figured in *Ptychognathus boopis*, and appear to be such as

* Continental naturalists have long used the mammalian formula for teeth in describing Teleosauria (see Pictet, 'Traité de Paléontologie,' vol. i. p. 484, *et seq.*).

might well be included under the Dicynodont type. The typical forms of this group, such as *Dicynodon testudiceps*, have the anterior nares almost as far forward as in the Theriodonts; and there is a sufficiently close resemblance between the lateral aspect of the skull in *Gorgonops* and that of such a species as *Dicynodon lacerticeps* to show that there is no character of importance, beyond the single premaxillary bone in *Dicynodon* and the divided premaxillary in *Gorgonops*, to place the genera in different groups. Nor is the skull of *Galesaurus* so unlike that of the *Dicynodon pardiceps* in form and position of the bony elements as to necessitate their location in different orders. In fact the Theriodonts differ from the Dicynodonts much as these differ from Oudenodonts. If the Theriodonts are taken as the typical form, with all the teeth developed, then the Dicynodonts are those genera in which the incisor and postcarnassial teeth disappear; and the Oudenodonts are the genera in which all the teeth disappear, or are but slightly developed. A fourth family may perhaps be indicated by *Endothiodon*, in which the palate is covered with palatal teeth closely placed and irregularly grouped. Professor Owen long ago characterized the first three families just referred to under the excellent names Cynodontia, Dicynodontia, and Cryptodontia, which he regarded as making up the order Anomodontia*. I cannot find any evidence that the characters by which the Cynodontia differ from the other families are such as would justify the institution of an ordinal group for them; and therefore urge that the name Theriodontia must rank as a synonym of the family name Cynodontia. *Procolophon* can only be placed among the Cynodontia on the hypothesis that it is a modification of that type in which the canine teeth have not become separable from the others; but I should prefer to regard it as belonging to a parent type from which the dental modifications of the Anomodontia have been derived. And in that view there seem to me to be no sufficient reasons for regarding the genus as other than an extinct family of the Rhynchocephala. Professor Owen fully recognized the affinity of the Dicynodonts in this direction when they were first described; and therefore this suggestion of affinities only raises the question whether the Anomodontia and the South-African animals described as Dinosauria perhaps might not be united with the Rhynchocephala into a subclass of Reptilia. Of the affinity of *Procolophon* with the Anomodonts there can be no great doubt, though there is no conclusive demonstration; but, in common with the Rhynchocephala, it has (1) a fixed vertical quadrate bone, which (2) sends a process inward and forward to articulate with the pterygoid, and (3) develops a strong process which extends outward transversely to the main column of the bone and above the articulation; (4) both have teeth on the bones of the palate, though apparently not on the same bones, and the pterygoid bones are more closely united in the fossil than in the living type; (5) in both there are large, long, palatal vacuities beneath the anterior nares, such as also occur in Lizards; (6) both types have the skull of

* See Owen's 'Palæontology,' 2nd ed. p. 256 *t seq.*

the same general form, and the median roof-bones double, with orbits, nares, and foramen parietale similarly placed. The chief differences are that (1) in the fossil the region of the temporal fossa is covered by expansions of the frontal, parietal, and postfrontal bones; but since in *Podocnemys* this is only a generic variation from the Emydian type, there is no reason for attributing more than generic importance to it in the fossil; (2) the malar bone in the fossil is expanded so as to cover most of the vacuity which exists in the living type between that bone and the squamosal; (3) in the fossil the posterior outline of the skull is straight. There are many important points upon which further information must be obtained before the position in the series of *Procolophon* can be finally settled; but, in the present state of knowledge, I see no reason to hesitate, on the evidence detailed, in regarding it as a fossil Rhynchocephalian. As such, it adds another link to the evidence that the Rhynchocephala constituted one of the most widely diffused types of terrestrial life in the Triassic period.

## EXPLANATION OF PLATE XXXII.

*Procolophon Griersoni.*

Fig. 1. Skull, seen from above.
Fig. 2. Lateral view of same skull with lower jaw.
Fig. 3. Anterior view of skull, showing divided nares.

*Procolophon laticeps.*

Fig. 4. Anterior part of skull, seen from above.
Fig. 5. Lateral view of same skull.
Fig. 6. Vertical section of same skull through quadrate bone, lower jaw, brain-cavity, basisphenoid and pterygoid bones.

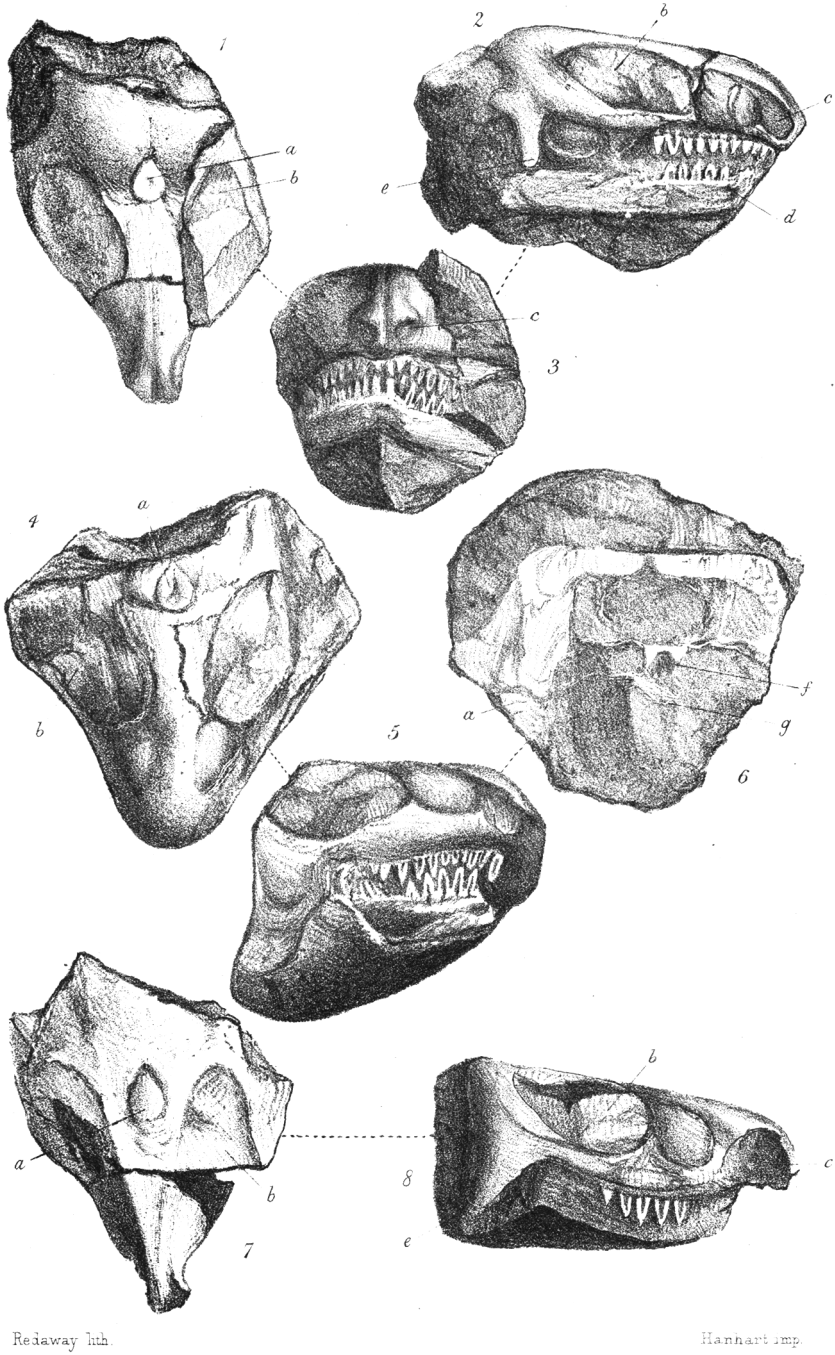
*Procolophon cuneiceps.*

Fig. 7. Skull, seen from above.
Fig. 8. Lateral view of same skull.

(*a*, parietal foramen; *b*, orbit; *c*, nostril; *d*, lower jaw; *e*, quadrate bone; *f*, basisphenoid; *g*, pterygoid bone.)

## Discussion.

Mr. Hulke accepted Prof. Seeley's views on the structure of the skull of *Procolophon*, and agreed with him as to the difficulty of regarding the Theriodontia as forming a distinct Order of the Reptilia.




Redaway lith. Hannart imp.

PROCOLOPHON.