Order. Crocodilia.

Family. Cœlospondilia.*

Genus—Poikilopleuron. Eudes-Deslongchamps.† (‘Crocodilia,’ Plate 39.)

This genus was established on fossils discovered in the Oolitic building-stone at Caen, Normandy, and the characters which have led to the recognition of evidences of the genus in our own Wealden deposits are the shape and texture of the vertebrae, and more especially the latter. By these were determined a caudal vertebra from the Wealden of Tilgate, in the Mantellian collection, now in the British Museum: which vertebra differed from the type-specimens on which the genus was founded, only by a slight inferiority of size.

M. Deslongchamps assigns the length of a ‘décimètre,’ or thereabouts, to his vertebrae, say 3 inches, 10 lines. The Wealden specimen, which has been fractured across the middle of the centrum, gives a length of that element of 3 inches, 8 lines; or about 9 centimeters. The vertical diameter of the articular end is 2 inches, 3 lines (55 mm.), the transverse diameter is 2 inches, 2 lines (55 mm.); the transverse diameter of the middle, contracted part of the centrum is 1 inch, 4 lines (36 mm.).

The external free surface of the vertebra is marked with faint striæ, otherwise it is almost smooth. Both terminal surfaces are of a full elliptical form, with the long diameter vertical; they deviate from flatness by a slight concavity. The centrum gradually contracts from the two extremities toward the middle: a diapophysis extends from the upper and hinder part of the side, below which there is a shallow groove, slightly bent with the convexity downward. The neural arch has coalesced with the centrum, and the base of the diapophysis extends from the hinder upper half of the centrum upon the base of the arch. A longitudinal sulcus traverses the anterior half of the under surface of the centrum. The hypapophysial surface is a single obliquely bevelled plane indicative of the confluent bases of the hæmapophyses, and this is the character of the hæmal arch preserved in the Caen specimen.

In my ‘Report on British Fossil Reptiles’‡ I did not recognise grounds for specifically differentiating the Wealden Poikilopleuron from the Poik. Bucklandi of the

* This term refers to the large vacuity in the centre of each vertebral body, simulating a medullary cavity; ossification is here arrested at the middle, not, as in the Amphicoelial, at the two ends of the centrum.

† ‘Mémoires de la Société Linnéenne de Normandie,’ vol. vi, 1838, p. 37.

‡ ‘Reports of the British Association,’ 1841, p. 84.
Caen Oolite. Besides the Tilgate locality I was able to note, after examination of a series of fossils belonging to S. H. Christie, Esq., from the submerged Wealden Beds, Isle of Wight, the "half of a dorsal vertebra from Brook Bay, which agrees in size, in the form of the articular extremity, in the degree of median constriction, and especially in the large size of the medullary" (chondrosal) "cavity at the middle of the bone, with the vertebral characters of Poikilopleuron."

Species. Poikilopleuron pusillus, Ow. ('Crocodilia,' Plate 39.)

This species is, to me at present, represented by eight vertebrae, an ungual phalanx of the rapacious type, and part of a medial symmetrical bone to which are articulated portions of a pair of rib-like bones, as to the nature of which the nearest guess I can make is that they represent part of the series of abdominal ribs with their sternum.

All these bones show a compact osseous texture with a smooth or polished exterior, and a section of one of the dorsal centrums exposed, what a fractured caudal one indicated, viz. a large central chondrosal vacuity, such as characterises the centrum of the Oolitic crocodilian genus Poikilopleuron of Eudes-Delongchamps.

The reptile, of which the present are fossilised remains, was discovered by the Rev. W. Fox, M.A., in the south-west Wealden of the Isle of Wight; it is much smaller than the type of the genus Poikilopleuron from the Caen Oolite, or the Wealden vertebrae above referred to Poik. Bucklandi. It may be objected that the present specimens are from a young individual of the same species; but they show no signs of immaturity, and the caudal hypapophyses indicate the bases of the piers of the haemal arch not to have been confluent as in the Poikilopleuron Bucklandi, and as in Iguanodon.

The vertebral centrums are long in proportion to their breadth and depth, and the non-articular surface is so concave lengthwise as to give the appearance of the centrum being constricted between the terminal articular surfaces. These are almost flat.

In one trunk-vertebra, the sides of the centrum converge to a carinate inferior surface. In another (Plate 39, figs. 1—3) that surface is less narrow (ib., fig. 2). In both the suture of the neural arch is traceable, but the arch has remained attached: it shows a small facet (fig. 1, p) for the head of the rib at the fore part of the base of the neurapophysis. A horizontal (diapophysial) ridge (ib. a) extends from the prezygapophysis to the upper surface of the postzygapophysis, broadening as it recedes. The neural spine is compressed, but rises from nearly the entire length of the neural arch. The outer surface of the centrum is compact, smooth, and glistening; and on making a vertical longitudinal section the more definite generic character of the large chondrosal vacuity was exposed, as in fig. 3, ch, 3.

* 'Reports of the British Association,' 1841, p. 84.
WEALDEN CROCODILES.

In the series of five vertebrae, including the three hinder lumbar and the sacrum (ib., fig. 4), the costal surface has been transferred to the diapophysial ridge, \(d\), which now extends outward from a contracted base midway between the zygapophyses, the terminal articular surface being supported by a lower buttress-like ridge, \(f\). The under surface of the centrum is here broader than in the preceding vertebra, and is transversely rounded: the carinate character in the dorsal vertebrae, giving space to the abdominal cavity, has here disappeared. In some of the present series the deeply concave side of the centrum has yielded to pressure, and the compact outer wall has been fractured and pressed in upon the chondrosal or quasi medullary cavity. In the last lumbar vertebra the diapophysis, depressed and subelongate, shows a narrow costal surface, \(d'\), for a small or short 'false rib.'

The two hindmost vertebrae in this series of five are sacral (s 1, s 2). They have the crocodilian character of limited number, and the non-dinosaurian character of retaining their neural arch in normal junction with the centrum. The doubt expressed as to the ordinal affinities of Poikilopleuron* in my 'Report' is here dispelled. The diapophysis, short, but broad and deep (s 1, \(d\)), terminates in a large flattened semi-oval surface for the sacral rib. The corresponding surface upon an equally large diapophysic in the second sacral has rather less vertical extent (s 2, \(d\)). The centra appear to have coalesced, but the primitive line of separation of the terminal expanded surfaces is traceable.

The neural spines are broken away in all this series of vertebrae, but their narrow elongate bases indicate the same character as in the detached more anterior vertebra from a smaller individual (figs. 1 and 3, ns).

The two caudal vertebrae (figs. 5—8) are from the terminal part of the tail where both transverse and spinous processes have disappeared. The low neural arch has coalesced with the centrum, and this, retaining its length, as in the sacral and lumbar region has diminished by loss of transverse and vertical extent. The under surface is canaliculate (fig. 7), and both the anterior and posterior expanded ends of the boundary ridges of the lower groove have articular surfaces, \(h\), \(h\), for a hæmal arch.

In Plate 39, fig. 9, the compressed subtriangular portion of an abdominal sternum (?) is marked \(hs\); the pair of abdominal ribs which articulate by expanded thinned-off ends to the sides of \(hs\) are marked \(k\), \(k\).

The ungual phalanx (ib., figs. 12, 13) is remarkable for its degree of curvature, its strong lever-process, and the deep lateral grooves.

The value of this little specimen and fruit of Mr. Fox's persevering researches in the Wealden deposits of his vicinity is its demonstration of the limited crocodilian number of trunk-vertebrae deprived of reciprocal motion upon each other, and with transverse processes thickened and terminally expanded for junction with the pelvis.

* "Subsequent discoveries may prove it to belong, like the Megalosaurus, to the Dinosaurian order; but, as the Poikilopleuron is, at present, known, it seems to have most claim to be received into the cælor spondylian family of the Crocodilian order," 'Rep. Brit. Assoc.,' 1841, p. 85.
I repeat, with some stress, this character because the experienced and accomplished palæontologist of the United States, Joseph Leidy, M.D., while rightly recognising the "half of a vertebral body" from a Cretaceous formation at Middle Park, Colorado, as of a Poikilopleuron, remarks:—"Poikilopleuron was probably a semi-aquatic Dinosaurian, an animal equally capable of living on land or in water, and perhaps spending most of its time on shores or in marshes."*

But the cited capacity is enjoyed by Crocodilia equally with Dinosauria; and Poikilopleuron may well have spent, like its neighbour and contemporary the Teleosaurus, least of its time on shores or in marshes, if the latter were accessible to it in its Oolitic or Cretaceous localities.

The fossil described and figured by Leidy adds nothing to the evidence previously extant of the affinities of Poikilopleuron; and if I plead for the retention of the orthography of the estimable discoverer of the genus, I more strongly protest against the addition of a new generic term for which Leidy’s fossil yields not a single character.†

The geological conditions under which Deslongchamps discovered his Poikilopleuron led him to remark: "aussi dut-il passer une grande partie de sa vie dans les eaux et probablement dans les eaux marines; puisque ses os sont restés dans un calcaire qui doit évidemment sa formation à des débris marins."‡

Amongst the rounded pebbles discovered in a position suggestive of their having been in the stomach of the Poikilopleuron, as such pebbles are commonly found in the stomach of a Crocodile or Alligator, Deslongchamps detected the tooth of a Cestracient Fish,§ very significant of the element whence the Poikilopleuron derived its food.

Our actual knowledge of the skeleton of Poikilopleuron is sufficiently complete to give the answer to the question, "Whether the cavernous structure of its skeleton was related to pneumatic functions, as in Birds, flying Reptiles, and some others?"¶ The central cavity is completely closed; no pneumatic orifice or canal penetrates thereto: it had no communication with pulmonary or other air-cells. Nor is the alternative limited to marrow.¶¶ Primitive "chondrine," to which ossification had not extended, most probably filled the vacuity in the vertebral body shown at a, fig. 2, plate ii, of the 'Mémoires de la Société Linnéenne de Normandie,' sixième volume, 4to, 1838; as in figures of Plate 39, and in fig. 16 of Leidy’s plate xv, op. cit.

* 'Contributions to the Extinct Vertebrate Fauna of the Western Territories,' p. 268, 4to, 1873.
† Ibid., pl. xv, figs. 16—18, "Antrodemus."
§ Mem. cit., p. 65, "elle provient très-probablement d’une des derniers proies qu’il avait avalées."
¶ Id., p. 279.
¶¶ "Dans les deux séries, le corps des vertèbres est creusé d’une grande cavité médullaire (fig. 2 a, et v. b); le tissu spongieux n’existe qu’aux deux bouts; il y a de chaque coté, dans la gouttière latérale un trou pour le passage des vaisseaux nourriciers," p. 78; "ces vertèbres présentent à l’intérieur une grande cavité médullaire analogue à celle des os longs." Mem. cit., p. 83.
FAMILY.—STEREOSPONDILIA.

Genus—Goniopholis.

Species—Goniopholis simus, Ow. Crocodilia, Pl. 40.

This species is founded upon the entire skull, minus the lower jaw, imbedded in the limestone of the Swanage quarry, of which skull a reduced view of the upper surface is given in Pl. 40, fig. 1; and of so much of the under surface (ib., fig. 2) as could be brought to light by exploratory operation on that part of the imbedding slab.

The skull in its general shape corresponds with the broad-faced species of the Procoelian Crocodiles;¹ and in the festooned contour of the alveolar borders, with those having teeth of unequal size, and with a crown of mainly the proportions of the teeth in the present Amphicoelian genus.

The conclusion conveyed by the latter expression is not, indeed, based upon the discovery of vertebrae in such contiguity with the present skull as to support an inference as to their having formed part of the same skeleton; but it is a probable one from the association of such vertebrae with the nearly allied species Goniopholis crassidens (ante, p. 427); and such probability is strengthened by the nature of the cranial modifications by which the skull under review differs from those of the Procoelian species most nearly resembling it in shape.

The temporal vacuities (ib., fig. 1, e) are relatively larger than in Crocodilus proper, or other broad-faced Procoelians, and are subquadrate in form. The palatonaris (ib., fig. 2, n) is not only larger, but is more advanced in position, so as to come wholly into view on the bony palate, and on the same plane therewith; and here, moreover, they receive, for completion of their anterior contour, the hinder ends of the proper palatine bones (ib., ib. 20), three fourths only of the border being contributed by the pterygoids (ib., ib. 24). The Eustachian aperture (ib., ib., e) is likewise on the palatal, not the occipital, plane.²

In these characters is manifested the nearer affinity of the Purbeck Crocodilian to the Amphicoelian Teleosaurus³ than any Tertiary or modern genus presents.

The following are amongst the modifications of minor import in the skull of the present species of Goniopholis. The external nostril (Pl. 40, fig. 1, n), horizontal in position, is more nearly terminal than in modern Crocodiles, or than in Goniopholis crassidens (Pl. 11, fig. 1). It is formed by the premaxillaries exclusively; the nasal bones terminating about an inch behind the nostril. In Procoelian Crocodiles a graduated series of developments of the nasal bones can be traced. They may be short,

¹ Cuvier, 'Ossem. Foss.', tom. v, part ii, pl. i, figs. 4 and 5.
² See 'Phil. Trans.,' modcol., pl. xi, fig. 1 e.
³ Ib., p. 522.
as in Gavialis gongeticus, or extend to near the nostril, as in Crocodilus cataphractus, rather nearer in Crocodilus intermedius, still nearer in Crocodilus Hastingsia, be produced close to the aperture as in Crocodilus champsoides, penetrate a short way into the aperture, as in Crocodilus suchus, or, by continuous ossification of the septum in old individuals of Crocodilus niger and Alligator lucius, extend seemingly across the nostril. These characters, barely of specific value, have been used in the fabrication of genera of existing Crocodiles and Alligators, in all of which the orbits are larger than the upper temporal apertures. In Goniopholis simus the orbits (Pl. 40, fig. 1, o) are rather smaller than those apertures (ib. ib. t).

When p. 536 of the description of the Wealdon Hylæochamps was printed off I had not materials for studying the palatal characters of Goniopholis. By excavating the under surface of the block of Purbeck stone on the opposite side of which the subject of Plate 40, fig. 1, was exposed, the characters in question were brought to light. A narrow medial tract, ib. fig. 2, n, contributed by both pterygoids and palatines divided the vacuity answering to Cuvier's 'Fosse nasal postérieure' in Teleosaurus cadomensis. An increase in the breadth of this pterygo-palatine septum gives the character of the 'palatonares' (Dinosauria, Pl. 60, fig. 25, s, s) in Hylæochamps, and removes any doubt as to the homology of those vacuities with the palatonares in Goniopholis. The pterygo-maxillary vacuities (Pl. 40, y, y) are relatively larger than in Hylæochamps.

Each pterygoid (fig. 2, 24), articulating by a crenate suture with the narrow hind end of the palate (ib. 20), which diverges from its fellow to form the fore part of the palatonas, loses vertical thickness and gains in breadth as it extends backward. It there articulates by a tract of an inch in length with the basisphenoid. The Eustachian canal (ib., e) at the midspace between the basisphenoid and basisoicipital. The latter arches down in advance of the condyle, and the venus foramen is conspicuous on this tract.

As the pterygoids are relatively less than in the Procoelians, so the palatines are relatively larger, especially in anterior breadth. After contributing their share to the palatonas they come into contact, and the medial suture is continued forward to an extent of 3 inches 5 lines. The anterior breadth of the pair is 3 inches 4 lines. The medial suture of the palatal plates of the maxillaries was traced forward two inches or more in advance of the palatines, and laterally the plates were exposed to the same breadth as the palatines proper. The palato-maxillary suture, 20'—21', is strongly sigmoid, describing as it leaves the midline a convexity forward and then a concavity. It was not thought expedient to endanger the unique specimen by further excavation in reference to the comparatively unimportant premaxillo-maxillary palatal suture.

The bony palate, as far as it was exposed, is smooth; the upper surface of the skull is rugose and pitted. The pits are circular or subcircular, from 1 to 2½ lines in diameter, situated chiefly on the swollen sides of the maxillaries and on the cranial part of the skull, including the expanded upper and outer surface of the squamosals; and

the tympanic pedicles are smooth, and terminate in the usual transversely extended concavo-convex articular surface.

The tooth called "anterior canine" (ib., fig. 3, c) is preserved, somewhat mutilated, in each premaxillary. Sockets of smaller premaxillary teeth are faintly traceable. The tooth termed "posterior canine" (ib., m, c) projects from the anterior part of the outswollen and convex border of the maxillary. From portions or traces of the other teeth or sockets I estimate that there were from sixteen to eighteen teeth on each side of the upper jaw. In the largest and least mutilated crowns of these teeth the dental characters of the genus *Goniopholis* are shown.

In the 'Catalogue of the Osteological Series, Mus. Coll. Surgeons,' 4to, 1853, p. 164, is described the specimen No. 752, as "The skull of a Crocodile from Bengal wanting the lower jaw, of a species (Crocodilus palustris?) which is frequently found inhabiting the larger ponds. It differs from the *Cr. biporcatus* of the Ganges in having shorter maxillary and premaxillary bones in proportion to its length, and in having much less developed prefrontal ridges; the palatal suture between the maxillary and premaxillary bones is transverse, not curved. The anterior extremities of the palatine bones are narrower and more pointed. The number of alveoli is—premaxillary 5–5, maxillary 14–14."

The doubt indicated (?) arose from the inadequate characterisation by Lesson, of the species described by him in the 'Zoologie' of the 'Voyage aux Indes Orientales de Bélanger;' but there is no reference of the specimen, No. 752, to the *Crocodilus rhombifer*, as is affirmed by the author of the "Synopsis of the Species of Recent Crocodiles," 'Trans. Zool. Soc.,' vol. vi, p. 140. I did not regard my doubt as justifying the sinking of Lesson's "*palustris*" into a synonym, and of imposing a new specific, much less generic name. But the osteological character of the palatal region of the skull, pointed out in my 'Catalogue,' appears to be the chief of those relied upon by the author of that 'Synopsis' for his genus *Bombifrons*, of which the first character is: "The premaxillary suture straight, or rather convex forwards" (loc. cit., p. 139). The other characters are not of specific value.

The sutures of the premaxillary bones, I may remark, are of three kinds; one is medial and unites the pair; it is the "interpremaxillary suture:" the second is lateral, uniting the outer or dental plate of the premaxillary with that of the maxillary; it is the "premaxillo-maxillary suture:" the third is transverse, more or less, and unites the palatal plate of the premaxillary with that of the maxillary; it is the "premaxillo-maxillary palatal suture." Its modifications, added to other differences, when determined to be constant, may aid in differentiating the species of *Crocodilus* proper, of *Alligator*, and of *Gavialis.*

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1 Prof. Marsh, in his 'Introduction and Succession of Vertebrate Life in America,' 8vo, 1877, writes (p. 21):

"The beds of the Rocky-Mountain Wealden have just furnished us with a genuine "missing link," a
The convenience of these three genera of Procoelian *Crocodilia*, although they agree in palatobarial and vertebral characters, will probably ensure their retention; but *Tomistoma, Oopholis, Halerosia, Palæosuchus, Rhynchosuchus, Ramphostoma, Mecistops, Bombifrons, Palinia, Molinia, Caiman, Jacare, &c.,* into which they have been subdivided, exemplify the evil of "encumbering the science with a multitude of names" (loc. cit., p. 128),—an evil which, if the "names" do not represent "generic distinctions," cannot be laid to the charge of the "Palæontologist."

At least, the "small fragments of the fossil skeleton" (ib., p. 128) on which the genus *Goniopholis* was originally founded have subsequently been proved, by acquisition of other parts, to have indicated accurately that well-marked and interesting addition to the recorded modifications of the Crocodilian type. Those of the vertebral and cranial structures have, indeed, proved to be not only of generic, but of family value.

*Genus—Petrosuchus, Owen.*

*Species—Petrosuchus levidens. Crocodilia, Plate 41.*

This genus and species of Crocodile is founded on the portion of skull and mandible, figured in Plate 41. The skull is imbedded in the same limestone of the Middle Purbecks, now quarried at Swanage. It was discovered in a block with the upper surface (ib., fig. 1) exposed. This surface is partially weathered, but shows here and there a faintly wrinkled natural sculpturing. The upper temporal apertures are larger than the orbits. In front of these the skull contracts more rapidly than in *Goniopholis,* and presents, as far as it is preserved, a slender form of face approaching to the proportions of that in the modern *Crocodilus cataphractus,* and in the Tertiary *Crocodilus champsoïdes* (p. 115); but the more rapid contraction in front of the orbits is gavial-like, and there are other characters indicative of a nearer affinity than in *Goniopholis* to the Teleosaurian group. This affinity is decisively marked by the larger relative size and more advanced position of the palatobaria (ib., fig. 2, b), into the formation of which the diverging hind ends of the palatines (ib., fig. 2, 20) enter in a larger proportion than in *Goniopholis.* The basisphenoid (ib., ib., 5) is more produced, and the pterygoid (ib., ib., 24) contracts Saurian (*Diplosaurus*) with essentially the skull and teeth of a modern Crocodile, and the vertebrae of its predecessor from the Trias."

When the cranial characters of this Crocodilian are made known it will be of moment to compare the temporal apertures on the upper surface and the palato-barial apertures on the under surface of the skull. When the dental characters of the same fossil are described and figured we may be able to determine whether they are those of the broad-faced procoelian Crocodiles and Alligators or those of *Goniopholis.*

1 Gr. 'πέτρος, rock, and Σωκρατος, an Egyptian name of the Crocodile.

2 Cuvier, 'Ossem. Foss.,' 4to, tom. v, part ii, pl. v, figs. 1 and 2; Gray, 'Trans. Zool. Soc.,' vol. vi, pl. xxxii, fig. 2.
a more extensive sutural union therewith. Each palatine bone \(ib., \) where they diverge at the palatovarianis, shows a protuberance on its under surface. The Eustachian outlet is seen at \(e.\)

The portion of the left mandibular ramus \((Pl. \, 41, \) fig. 3) includes the dentary element \((32),\) nine inches in length, with portions of the angular \((30)\) and surangular \((29)\); that of the angular including six inches of its extent. Of this element two inches extend forward in advance of the hiudmost point of the dentary; and, guided by the proportions of the \(Crocodilus \) chamsoids, I estimate the total length of the mandible of \(Petrosuchus \) levidens to be 16 inches, or thereabouts, indicating that from four to five inches are wanting at the fore part of the upper jaw, the subject of fig. 1.

The vertical extent of the ramus behind the mandibular vacuity \(ib., \) fig. 3, \(v)\) is 1 inch 9 lines; the vacuity itself is 1 inch 6 lines in long diameter, 6 lines in short diameter; its long axis is nearly parallel with that of the ramus. The lower, like the upper jaw, appears to have been long exposed on its imbedding block of stone. Little of the outer layer of the bone is preserved, and this is limited to parts of the angular and surangular. It here shows a more decided reticulate sculpture, the meshes being in the form of subcircular pits of from 1 to 2 lines in diameter.

The vertical breadth of the dentary at the terminal point of the angular is 1 inch 3 lines; it loses, as usual, in this diameter as it advances, but irregularly, owing to a gentle undulation of the alveolar border. This is convex where it supports the anterior group of teeth opposed to the premaxillary and foremost upper canine teeth; it is then slightly concave to the mid-third part, where the border is more feebly convex; beyond this, after a feeble concavity, it gradually rises to the surangular piece \((29).\)

Of the foremost group of teeth seven are preserved; the third counting from the foremost being the longest and broadest, with the crown curving upward and a little backward; the length of this tooth is 1 inch 4 lines, its extreme breadth is 3 lines, about half of the total length forms the exserted crown, but the point is not entire. The first and fifth of this series are the next in size, but do not exceed an inch in length, the intermediate teeth are smaller; two or three sockets of still smaller teeth may be traced in the concave part of the border. In the following convex part, seven teeth are preserved, with shorter and relatively thicker crowns than in the foremost group; but none of them showing the robust proportions of the teeth of \(Goniopholis.\) Behind this group the indications of teeth and sockets are faint. I estimate the number of teeth in the present ramus at about twenty; which is the number in the mandibular ramus of \(Crocodilus \) chamsoids: a margin of two or three more or less being allowed for a perpetually changing set of teeth.

The inequality of the size of the teeth and concomitant festooned course of their alveolar series is Crocodilian, as contrasted with the Gavialian and Teleosaurian types. But the temporal and palatonarial openings indicate the generic distinction of \(Petrosuchus,\) with its transitional character between the Teleosaurian and Tertiary Crocodiles.
Portions of dermal scutes, with the pitting as on the mandible, but with wider intervals, are preserved on the slab in which the above-described fossil is imbedded.

A few Wealden vertebrae, not associated with characteristic parts of any of the foregoing (pp. 431, 631, 634) Crocodilia, differ from those in Plate 10 by the carinate under surface of the centrum. They are figured in Crocodilia, Plate 14, under the provisional name of Goniopholis carinatus.

Of the known species of mesozoic Crocodiles, including the Purbeck and Wealden kinds now added, the following are common characters. A greater development, than in Tertiary Crocodiles, of the dermal bony armour, which consists, without exception, of both dorsal and ventral scutes, the scutes in each series well connected with each other, and in Goniopholis exceptionally so. A less development of the osseous surface for the origin of the muscles of the mandible indicated at the upper surface of the cranium by the larger ‘temporal vacuities,’ and at the under surface by the smaller pterygoid plates. The horizontal plane, larger size, advanced position and palato-pterygoid formation of the palatonares. Relatively small fore-limbs; Amphicoelian vertebrae in most, in none Procoelian.

These common characters of mesozoic Crocodilia suggest considerations of their relation to the prey of such Crocodilia and also to the coexistent marine reptiles of which those Crocodilia themselves became the prey.

Similarly, if the common characters of the tertiary and existing Crocodilia be summed up they become suggestive of analogous considerations. They are:—cup-and-ball vertebrae, the cup in front; fewer dermal scutes, not co-articulated sutureally or by peg-and-socket joints; posterior aspect and position of small and exclusively pterygoid ‘palatonares;’ upper temporal apertures, when present, less than the orbits; fore-limbs relatively larger than in Amphicoelians; with one exception jaws stronger with larger and more varied teeth.

The Procoelian articulation of the trunk-vertebrae better adapts that part of the body to be sustained and moved in air than the Amphicoelian articulation which characterises the vertebral column of the more aquatic and probably marine Crocodiles of the Mesozoic period.

The presence of prey not in existence at those periods, but which in later, tertiary and modern times, might tempt a Crocodile to rush on shore in pursuit of a Mammalian quadruped, is a phenomenon contemporary at least with the acquisition of the Procoelian structure in the axial skeleton of such Crocodile.

The extent, the density, the closer fitting articulation of the bony scutal armature of the Mesozoic Crocodilians, suggests its use and need in waters tenanted at the same epoch by larger carnivorous marine reptiles, as, for example, the Ichthyosaurs, Plesio-
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saurs, Polyptychodonts, and Mosasours. The oolitic species of Crocodile (‘Crocodile de Caen.’) is signalized by Cuvier as “l'espèce la mieux cuirassée de tout le genre.”

But the Goniopholis of the Wealden and Purbeck formations surpassed even the Teleosaurus Cadomensis and its congener in this part of its organization.

The great quadrangular dorsal scutes of Goniopholis are distinguished by the presence of a conical obtuse process continued from one of the angles transversely to the long axis of the scute, like the peg or tooth of a tile, which fits into a depression on the under surface of the opposite angle of the adjoining scute, thus serving to bind together the plates of the imbricated bony armour and repeating a structure which is characteristic of the large bony and enamelled scales of many extinct ganoid fishes. The hexagonal ventral scutes of Goniopholis were firmly joined together by broad sutural borders. No knight of old was encased in jointed mail of better proof than these Crocodiles of an older world.

But the imimical contemporaries of those Crocodiles have passed away. No representative of Mosasaurian, Plesiosaurian, or Ichthyosaurian families lived after the secondary epoch. Crocodiles alone of the larger aquatic saurians continued on to the present times more fortunate than their predecessors in respect to possible hostile fellow denizens of the deep.

Certain it is that the defensive armour of Procoelian Crocodiles has degenerated. Bony ventral scutes are exceptional in them, and the dorsal ones are fewer, thinner, less closely arranged and less firmly connected with one another. And if this change can be connected with the disappearance of Reptilia against the attacks of which a better coat of mail may have advantaged the contemporary Mesozoic Crocodilia, it may further be remarked that diminution of weight would favour Crocodilian movements in air, and that a loosely-jointed armour would less impede the evolutions required to catch a prey on land.

In this relation, also, arising out of the introduction in tertiary times of many species of warm-blooded Mammals frequenting the banks of lakes and rivers tenanted by carnivorous Alligators and Crocodiles, I have been led to ponder upon the well-marked difference in the relative position of the palantonares (internal or posterior nostrils) which exists between the secondary and tertiary Crocodiles.

The physiologist discerns in the palatal and gular structures concomitant with the backward position and small size of the palantonares in the existing Crocodiles and Alligators of Asia, Africa, and America, the power of holding submerged a powerful Mammiferous quadruped without the streams of water traversing the great cavity of the mouth during the struggle getting access to the posterior nostrils and windpipe of the amphibious assailant. The valvular mechanism applicable to, or, I may say, possible with, the

1 Cuv., Teleosaurus cadomensis, Geoffr.
2 "Report on British Fossil Reptiles," 'Reports of British Association,' Svo, 1841, p. 70.
peculiar position of the posterior nostrils of Procoelian Crocodiles, opening vertically behind the bony palate, not horizontally upon that plane, could hardly be adjusted to the relatively larger post-palatine apertures, upon a horizontal plane at some distance from the occiput, with the inner nostrils opening at a more advanced position in the mouth, an arrangement which characterises all Amphicoelians.

No doubt there were sphincteric structures which would exclude water from the glottis in all the aquatic air-breathing reptiles, but the peculiar and well-developed valvular contrivances to that end in existing Crocodiles are conditions of the relative size and position of the posterior nostrils in them; and the repetition of that character in the palatonares of all known tertiary Crocodiles justifies an inference as to the concomitant valvular structures of the soft parts in those extinct Procoelian species, and their conformity with those in existing Crocodiles. These considerations stimulated or augmented the desire to determine the palatal characters of the fossil skulls of those Crocodilia of the newer Mesozoic formations which, in the massive proportions of their jaws, made the nearest approach to the tertiary and modern kinds. Such demonstration of the structure of the bony palate is accordingly given in the specimens of the Purbeck Crocodiles in the British Museum, described at pp. 632, 634, and figured in Plates 40 and 41.

Although the jaws of Goniopholis crassidens and Goniopholis simus have proportions adapted to grapple with large and active Mammals, the evidence of any such warm-blooded air-breathers co-existent with those Crocodilia is not yet acquired. And the probability of such co-existence is, in my opinion, very small, from the circumstance of the palatonares being relatively larger and more advanced than in the Crocodiles contemporary with great Mammals. The palatonares in Goniopholis open likewise upon a horizontal plane, look directly downward, not obliquely backward, and, moreover, have a different conformation. With this anatomical character, which I am disposed to associate with a fish diet, are combined in both Goniopholis and Petrosuchus upper temporal apertures larger than the orbits, and Amphicoelian or Amphiplatyan vertebrae. Now all known tertiary and existing Crocodilia combine with small, posterior, pterygoid palatonares, upper temporal apertures less than the orbits, and in some broad-faced kinds, the upper temporal apertures are almost obliterated by the progressive increase of the osseous roof of the temporal vacuities. These vacuities in the recent reptile are occupied by the temporal muscles, and the power of these biting and holding muscles is in the ratio of the extent of their bony origins.

In the Amphicoelian fish-eating Crocodilia, the upper temporal apertures are larger and usually much larger than the orbits; and they are, for the most part, associated with slender jaws and with numerous small uniformly-sized teeth.

With the palatine modifications, which relate to the drowning of air-breathing prey, and with the cranial developments which relate to the grip of such prey, we find, as a rule, in Procoelian Crocodiles, concomitant modifications in the breadth and strength of the jaws, and in the size of the teeth. There is also inequality of size, favouring hold-
fast, as in Mammalian Carnivora, and certain teeth of the dental series have accordingly received the name of canines in the Crocodiles with such analogous dentition. Partial developments of the alveolar borders concomitant with the modified dentition give a festooned course or contour to those borders.

In Mesozoic Crocodiles this character is exceptional and begins to appear at the Wealden period. The oolitic and older Amphicoelians have more numerous, smaller, and sharper teeth, occupying straight, or nearly straight, alveolar borders of the jaws. One genus, Gavialis, still exists, which exceptionally exemplifies the old dental fish-catching character.

Finally, in reference to the limb-character as distinguishing the Amphicoelia from the Procælia. This character, at least, is exemplified in all the Mesozoic Crocodilia, of which the skeleton of the same individual has been sufficiently restored. It is then manifested by the shorter and smaller proportions of the fore pair of limbs as compared with the hind pair than we find in existing Crocodiles, and in the similarly restored skeletons of extinct Neozoic species (Crocodilia, Pl. 11).

The difference in question I take to relate to the more strictly or uniformly aquatic life of the Teleosauroids.

When the nilotic Crocodile darts under water after a prey, or swims off swiftly to escape a danger, the fore-limbs take no part in the action, but are closely applied prone to the trunk. The same motionless and unobstructive disposition of the fore-limbs has been observed in the still-surviving marine lizards of the genus Amblyrhythynchus.

But the resistance to rapid swimming of fore-limbs so disposed is calculable according to the degree in which they break the uniformity of the curve and project beyond the surface of the fore part of the body to which they may be applied. The smaller, therefore, such limbs may be and the less will they obstruct the forward course of the Crocodile.

Thus, the Mesozoic Amphicoelians in their rush after fishes, or retreat from attacking larger Reptilia, would be favoured by their limb-character. On the other hand, their progress on dry land would be more difficult, unless, as has been suggested in regard to some kinds of Dinosaur with similarly stunted fore-limbs, the Teleosauras were able to run upright on their hind-legs.

But dismissing such interpretation of the dwarfed fore-limbs of Mesozoic Crocodilia, to what conditions, it may be asked, do the augmented size and strength of these limbs in Neozoic Crocodiles relate?

The advent in tertiary times of large Mammalian quadrupeds browsing or prowling along the banks of estuaries and rivers haunted by such Crocodiles might, and does, tempt them to make a rush on the dry land to seize such passing prey. In such rushes the fore-limbs come into strenuous action.

A Lamarckian might say that this temptation to terrestrial locomotion would, by the repeated increased exertion and exercise of the fore-limbs lead, in the course of genera-
tions, to their augmentation of size, and he would set it down as one of the factors in the progressive transmutation of a Teleosaur into an Alligator.

His opponent would ask, of course, for the transitional forms. The subjects of the foregoing pages (631—636) in some degree represent such.

Those which I next proceed to describe also suggest relations of adjustment of characters to associated, probable, prey. Before entering on the descriptive details I may revert to the topic last discussed.

A large and powerful modern Crocodile having seized and submerged a tiger or buffalo, admits the water of the river it haunts into its wide lipless mouth by the spaces to which the thickness of the part of the prey gripped keeps asunder the upper and the lower jaws. Thus, the part of the mouth not occupied by the prey is filled with the fluid in which the mammal is being dragged and drowned. "The closure of the exterior nostrils"¹ would not prevent the water entering the 'glottis.' A special arrangement is requisite for this purpose, and such arrangement, as it exists in Neozoic Crocodiles, is incompatible with the relative position of "the posterior nares" and the glottis in the Mesozoic Crocodiles. The question is, with a closure of the external nostrils and the exclusion of water admitted by the mouth into the nasal passage, how is the water to be prevented from getting into the windpipe? We know how this is effected in the Cetaceans; and modern Crocodiles have as efficient a mechanism to the same end though on a different plan, but requiring a size and position of the palatonares which, as shown in previous pages, constitutes one of the best marked cranial characters differentiating the Mesozoic and Neozoic Crocodilia.

In all the Crocodiles contemporary with "large and active mammals"² there is a double valvular structure at the back of the mouth, which prevents the water having access to the mouth, from entering either the hinder nostril or the glottis. A membranous and fleshy fold hangs, like a curtain, from the hind border of the roof of the mouth, and answers to our 'velum palati:' the other valve is peculiarly crocodilian; it is a broad, gristly plate, which rises from the root of the tongue, carrying with it a covering of the lingual integument; and, when the palatal valve is applied to it, they form together a complete partition wall, closing the back of the mouth, between which and "the posterior nares" it is situated, shutting off both the latter aperture and the glottis from the mouth.

To make this mechanism available, the hind nostril is reduced in size, and such reduction is shown in the skull. The palatonaris is also placed far back, and its plane instead of being horizontal is tilted up at the angle which makes the operation of the two parts or folding doors of the partition most effective in closing the oral chamber posteriorly.³ If the submergence of the Crocodile, with its large mammalian prey,

² Loc. cit., p. 425.
should last so long as to render it needful for the reptile to take a fresh breath, it can protrude its prominent snout from the surface of the river, and inhale a current of air which will traverse the long meatus and enter the glottis by the chamber common to nose and windpipe, which is shut off from the mouth by the above-described structures. We have no ground for inferring this faculty and mechanism of soft parts from the bony palate in amphicoelian Crocodiles; the difference in its size and position are such as to have deceived both Bronn and De Blainville as to the position and homology of the palatounares in Teleosaurus.¹

The subjects of the following sections bear unexpectedly, and in an interesting degree, on another objection, raised during the discussion at the Geological Society of London, on the topics treated of in pp. 636—640. The objection was, that “warm-blooded animals did actually exist contemporaneously with the Mesosuchian Crocodiles.”² As the only examples of the Mammalian class of which I was cognisant were the subjects of the undercited Monograph,³ and a few other species of like diminutive size, it did not seem to me to affect a question exclusively bearing upon large Mammalian quadrupeds. It seems, however, that the Crocodiles which most abounded, if we may judge from the proportion of their fossil remains in the fresh-water deposits of the ‘feather-bed’ subdivision of the Purbeck series, were related in size to their contemporary diminutive Mammals. The Spalacotheres, Peralistes, Stylodons, Triconodons, &c., may well have been the prey of the dwarf Crocodiles of the locality. For these were reduced to dimensions which forbade them to disdain such succulent morsels, and at the same time they were suitably armed and limbed for the capture of the little Marsupials.

At the first aspect, detecting in the scattered groups of scutes in the Purbeck shales submitted to my inspection, specimens showing the peg (Pl. 45, fig. 3, a) and groove (ib., fig. 4, b), it seemed as if remains of some young specimens of Goniopholis were so exposed. The condition, however, of two of the skulls (Pl. 44, figs. 1 and 3) enabled a comparison to be made which determined their specific and, by their dentition, generic distinctions from both Goniopholis and Petrosuchus. The number of maxillary and mandibular specimens, of which several are figured in Pl. 44, exemplified a degree of constancy in size which begat a conviction that such was a character of the species; and, diminutive as were the Reptilia which have supplied the subjects of both plates, their characters were indisputably those of the Order Crocodilia.

One of them, by the size and shape of certain teeth, came nearer to Goniopholis, another by the same character resembled Petrosuchus, but the differential characters were such as could not have been obliterated by growth or age.

A third form of Crocodilian made a nearer approach in one of the species (Pl. 42, fig. 2) to the average size of the broad-faced genera. A fourth (ib., fig. 1)
corresponded in size with the subject of fig. 2, but offered no character by which it could be legitimately removed from the genus *Goniopholis*. I commence with the description of this small but well-marked species.

**Genus—Goniopholis, Owen.**

Species—*Goniopholis tenuidens*, Ow. *Crocodilia, Plate 42, fig. 1.*

The dental character of the Amphicellean genus *Goniopholis* consists of the numerous close-set, fine, longitudinal ridges of the enamel, two of which, larger and sharper than the rest, traverse opposite sides of the tooth from the base to the apex of the crown, midway between the convex and concave lines of the curvature of the tooth, that is, at the fore and back parts of the crown.

The general shape and proportions of the tooth-crowns indicate distinctions of species of *Goniopholis*. The type of the genus is characterised by the thickness and subcircular section of the crown, and the obtuseness of that in the posterior teeth.

In *Goniopholis simus* the proportion of breadth to length of crown is less than in *G. crassidens*, and this difference is more marked in the specimen from the Feather-bed of Purbeck which forms the subject of fig. 1, Pl. 42.

This specimen consists of the chief part of the dentary and co-articulated splenial elements of both rami of the same mandible, partially dislocated at the symphysis. The alveolar tract includes the incisive (i) and molary (m) convexities, without an intervening laniary rising. The incisive convexity includes five sockets, a tooth being retained in the first, third, and fourth on the right, and in the first and third sockets on the left dentary. The foremost tooth has a crown of 6 mm. length and barely 2 mm. of basal breath; each has partially emerged from a socket larger than itself, and exhibits a portion of a tooth in succession to one which has been lost or shed. The socket is separated by an interval of 2 mm. from the second. This shows a subcircular aperture of 5 mm. in diameter. The third socket opens at 2 mm. distance from the second. The tooth (b) in the right dentary shows the inner, longitudinally concave side of the crown, with a basal breadth of 6 mm. and a total length of 16 mm. One may count about a dozen fine longitudinal linear ridges between the fore and hind stronger ones (ib., fig. 1 b and b', magn.). The corresponding tooth (ib., fig. 1 a, magn.) in the left dentary shows the outer longitudinally convex side of the crown, with about sixteen fine ridges. These teeth answer to, or interlock with, the premaxillary or anterior canines of the upper jaw. The fourth tooth (ib. c) is less than the third; its crown projects 10 mm. from the right dentary; the fractured base of

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2 Loc. cit., pp. 69, 70.
3 Ib. ib., p. 7, pl. v.
the corresponding tooth in the left dentary is 4 mm. in diameter. Seven close-set sockets follow along the feebly concave part of the alveolar tract. The tooth of the twelfth socket at the beginning of the second convexity is preserved in both rami; its crown is 8 mm. in length, 4 mm. in basal breadth, with an obtuse summit, showing the feeblest indication of an apical point. This point is rather better seen in the crown of the next tooth, which has not wholly emerged.

The total number of teeth is sixteen in each of the dentary elements here preserved, and by analogy to the Goniopholis simus, the whole, or nearly the whole, of the dental series or sockets, in one dentary element is here exhibited.

The outer surface of the dentary is pitted by small subcircular, not close-set, impressions, except on the outer alveolar plate of the molary rising, where a few longitudinal pits indent the otherwise smooth surface of the bone.

The length of the symphysis is 25 mm., the depth 10 mm. The extreme breadth of the incisive part of the mandible is 32 mm.

The length of the preserved alveolar part of the dentary is 85 mm. (3 inches, 3 lines); the length of the entire mandible might have been between 5 and 6 inches.

Fragmentary evidences of the Goniopholis tenuidens in other slabs of matrix do not indicate any individual of a larger size than is exemplified by the above-described portion of lower jaw.

The mandible of Goniopholis crassidens, with an extreme depth of 4 inches, attained the length of 2 feet. Of this length the alveolar part of the dentary element occupied, as in most broad-faced Crocodiles, one half. The length of the alveolar part of the mandible of Goniopholis tenuidens being 3 inches, the total length of the jaw may be set down at one fourth of that of the type species of the genus.

**Genus—Brachypectes, Owen.**

Species—Brachypectes major, Ow. Crocodilia, Plate 42, fig. 2.

In this genus and species a left mandibular ramus, 9 inches 6 lines in length, shows an alveolar tract of but 3 inches 9 lines in length. In the proportion of the jaw, therefore, appropriated to the lodgment of the teeth this Crocodile differs from the rest of the family. The ramus has a less relative depth than in *Brachypectes minor*, fig. 3; it measures in extreme vertical extent, taken at about one fourth of the length from the angle, 1 inch 9 lines, or little more than one sixth the entire length of the ramus, whilst in *Br. minor* the extreme depth of the mandible, which is about midway between the two ends, is nearly one fifth of the entire length of the ramus. This proportion might, however, be deemed an immature character of the smaller specimen, but there are

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1 Gr. *βραχύς*, short; *δερθής*, biter.
other differences in the jaw of *Brachydectes major* not attributable to age and consequent growth. There is no longitudinal ridge on the angular element. The angle itself is more produced. This process repeats, indeed, the low position characteristic of the genus *Brachydectes*, but the line descending thereto from the articular element is straight, not concave, as in *Br. minor*, and the curve from the angle to the convex border of the angular element (fig. 1, 30) is deeply concave. Moreover, the outer surface of the deep hinder part of the ramus is sculptured with close-set deep pits, giving a strongly reticular character to that part of the bone.

The alveolar tract shows, as in *Brachydectes minor*, a laniary convexity (l) as well as an incisive one (i); both, however, are slight. In the latter the crown of the third or fourth incisor is preserved; it is 20 mm. in length, 6 mm. in basal breadth. The enamel of the exposed outer side is smooth; the fore part of the crown is obtuse, the hind part trenchant, with a faint appearance of minute denticulation. This is the only tooth preserved in the present jaw. There are faint indications of ten or twelve alveoli behind the tooth; two of these in the laniary curve (l) indicate teeth proportionally as large as the canine in *Brachydectes minor*. The outer surface of the laniary convexity is smooth. The rugged irregularly and minutely pitted character is continued to the alveolar border of the incisive convexity. The sutures between the dentary and hinder elements of the mandible are not clearly definable. Certain parts of the outer surface which were wanting made it doubtful whether any vacuity between the surangular, angular, and dentary elements existed; and the condition of the jaw of the smaller species weighs in favour of assigning an uninterrupted outer wall of the mandible as an additional differential character of the genus.

The proportion of the incisor tooth approaches that of the third in *Petrosuchus*,¹ but the latter is longer in proportion to the basal breadth. The dental series, and consequently the dentary element, are relatively longer in *Petrosuchus* than in *Brachydectes*.

A second specimen of the left dentary bone repeats closely the same size and characters of the corresponding part of the mandibular ramus above described. The teeth are wanting. Behind the alveolus of the 'anterior canine' are indications of seven or eight following alveoli, not more. The better preserved outer plate of the bone demonstrates the absence of the vacuity which is present in *Petrosuchus*, *Goniopholis*, and *Crocodilia* generally.

Species—*Brachydectes minor*, Ow. *Crocodilia*, Plate 42, fig. 3.

This species first indicated the genus in the exploratory operations; it is represented by the left mandibular ramus (Plate 42, fig. 3), which is remarkable, as in the larger species, for the small proportion which the alveolar tract bears to the entire length of the

¹ P. 634, Pl. 41, fig. 3.
bone, and for the entireness of the outer wall. The alveolar tract is undulated, showing an incisive and a laniary convexity with intervening and hinder concavities.

The incisive convexity holds five teeth, close set, the two hindmost rather larger than the rest; but no single tooth is so much larger as to suggest the name of ‘canine.’ The laniary convexity shows one large canine with a broad, straight, laterally compressed crown. It is preceded by a smaller tooth, rather less than the hindmost incisor, and separated therefrom by a space which may have held two or three small teeth. The alveolar tract behind the canine seems to have lodged three or four teeth, the crowns of which are lost.

The whole length of the alveolar tract is 23 mm. (1 inch); that of the entire ramus is 85 mm. (3 inches 2 lines). The dentary element bifurcates behind as usual; the upper prong joining the surangular, the lower and longer one the angular, but without defining or leaving any vacuity; the union where such vacuity would have been left in ordinary Crocodiles is situated well within the anterior half of the ramus. The posterior elements are correspondingly of unusual length; their breadth is also proportionally greater than in previously known Crocodilian mandibles. The length of the surangular element (29') is 48 mm. (1 inch 10 lines); its depth (vertical breadth) is 13 mm. (6 lines). The upper border describes a feeble convexity; beneath the articular surface of 29 the surangular curves downward and backward, meeting the lower border at a point wedged between the articular and angular elements.

The articular exposes the outer antero-posterior concave border of the joint. From this it descends obliquely backward and joins the angular in forming the process (30'), which here projects directly backward, its termination being much below the joint, and nearly on the level of the lowest part of the lower border of the jaw. The angular element extends forward from the angle, with its lower border at first straight or feebly concave, and then moderately convex to its junction with the dentary; a ridge projects along the greater part of this course a little way above the lower border. A portion of the splenial element shows above the fore part of the surangular, and supplements the inner alveolar wall at the hind part of the dentary.

From the lower jaw of Theriosuchus (Plate 44, figs. 5, 14, 16) the present differs in the shortness of the dentary element and alveolar series, in the greater depth and verticality of the outer surface of the ramus, and the narrower inferior border. It also offers a generic distinction in the number and shape of the teeth.

The proportional length and slenderness of the dentary and the absence of any laniary convexity succeeding the incisive one, together with greater number and the shape of the teeth of Nannosuchus (Pl. 43, figs. 8 and 9) offer a more striking contrast with the mandible and teeth of Brachydects.

No specimens have been brought to light which show characters of Brachydectes minor on a larger scale than is represented by the mandibular ramus above described.
Genus—Nannosuchus, 1 Owen.

Species—Nannosuchus gracilidens, Ow. Crocodilia, Plate 43, figs. 1—10; Plate 44, figs. 1 and 2.

In this genus the teeth have long, slender, sharp-pointed crowns, slightly recurved, mostly sub-circular in transverse section, impressed by a few linear or narrow and shallow grooves. The dental series is pretty uniform as to size and shape of crown, but less so than in the Teleosaur and Gavial; the teeth are also less numerous and wider apart.

The claim to generic distinction indicated by the armature of both upper and lower jaws was established by an additional dental character revealed in the following specimen.

The fore part of the mandible (Plate 43, fig. 1) exhibited a tooth in situ (fig. 1 e and fig. 2 enlarged), answering to that termed the 'anterior canine' in Crocodilia, but presenting characters which I had not before observed in those or other Reptilia.

The crown is long in proportion to the basal breadth, conical, recurved, and pointed. It is traversed along the middle of the outer surface by a ridge, or rather a low angle of the enamel, simulating a ridge; between this and the trenchant hind border is included one third of the outer surface of the crown. This tract is smooth, and, transversely, is feebly depressed or concave, giving a trenchant character to the hinder longitudinally concave edge of the crown. The two thirds of the outer, transversely convex, surface of the crown is traversed by close-set linear grooves; and intervening ridges, which mostly subside at the apical half of the crown, leaving about one third of the apex smooth. This tooth appears to be the fourth counting backward; the length of the crown is 10 mm., the basal breadth 3 mm. An enlarged view is given of the outer side of the crown in fig. 2.

The foremost tooth, also preserved (fig. 1, i), shows a coronal length of 5 mm., a basal breadth of 1 mm.

The crown of a fifth tooth rises close behind that of the fourth, with a basal breadth of 2 mm., and a length of 5 mm.; it is conical, but is straight. The outer side, uniformly convex, is traversed along the basal half by fine ridges and intervening grooves; it may be that the whole of this crown has not emerged.

The portions of mandible, the subject of fig. 1, consist of the right and left dentary elements, of which the major part is preserved, the rest indicated by impressions on the matrix. The preserved parts include the symphysial expansion, the joint being slightly dislocated through pressure, which has acted obliquely. The right dentary shows its outer side, the left dentary its lower border, and beyond the symphysis a small proportion of the outer surface, while the inner one is partly covered by the smooth splenial element (31).

1 ἄννος, dwarf, Σαουξ, an Egyptian name of the Crocodile.
The breadth of the symphysial part of the right dentary is 15 mm.; the length of the under part of the symphisis is 18 mm. At 33 mm. from the fore end the (vertical) breadth of the ramus diminishes to 10 mm., beyond which it gradually increases to 15 mm., where the bifurcation of the bone begins. The entire length of the part preserved is 114 mm. (nearly 4 1/2 inches).

The exterior of the symphysial part of the dentary is pitted by numerous minute subcircular depressions. As the bone contracts the depressions enlarge and elongate, then take the form of longitudinal grooves of irregular depth; but these become limited to the lower half of the outer side of the dentary, the part above, which forms the outer alveolar plate, being smooth, with a few faint, short, longitudinal linear impressions.

The symphysial expanse of the right dentary shows five sockets, of which, as above stated, the first, fourth, and fifth retain their teeth. The implantation of these teeth in complete sockets confirms the indication by the sculpturing of the bone that the jaw has belonged to a member of the Crocodilian order.

The first tooth was the smallest; the second and third, judging from the sockets, gained in size; the fourth is the largest, and represents, as above remarked, the tooth opposing or interlocking with the premaxillary canine above; the fifth abruptly loses size. Of the succeeding teeth little more can be divined from the present specimen than that they were small or, at least, slender. The convex curve, lengthwise, of the outer alveolar border is very feeble, and seems to have helped to lodge the hinder teeth; it is divided by a long feeble concavity from the symphysial or incisive convexity. There is no laniary rising.

Two smooth bones (31, x) contribute to the inner wall of the ramus, as exposed on the left side. If the lower one (x) represents the splenial, the upper one (31) would be an unusually developed inner plate of the dentary. If this, however, should be, as its posterior expansion indicates, according to the analogy of the modern Crocodiles, the splenial element (31), then the lower bone (x), would represent an angular element unusually produced forward. The longitudinal line of demarcation between these smooth inner questionable elements is not an accidental crack.

The Crocodilian character of the present jaw is supported by the scutes (Pl. 43, fig. 4) and impressions (fig. 5) of scutes, by a vertebra (fig. 3), by portions of ribs with a bifurcate proximal end, and by a metacarpal bone, all on the same slab of matrix.

The vertebra is Amphicoelian; the neurapophysial suture is unobliterated; it is from the part of the trunk where the rib articulation has risen wholly above the centrum. This element is 13 mm. in length; the non-articular surface is smooth and entire, gradually and slightly expanding to the articular ends; the one exposed being subcircular, 10 mm. in diameter.

Of the scutes preserved the largest are oblong, quadrangular, with a tooth-like process from the anterior and outer angle, from the base of which is continued a raised
smooth tract along the anterior border, from 4 to 3 mm. in breadth. The breadth of the entire scute is 17 mm.; the length is 35 mm. Some smaller scutes are pentagonal.

We have here, therefore, evidence of an Amphicoelian Crocodile, with the dermal armour after the type of that of Goniopholis, but generically distinct by the characters of the mandibular dentition. If the dentary bone constituted three fourths the length of the mandible this may be reckoned to have been about 6 inches in length, and the entire Crocodile may have been 6 feet in length.

The portion of mandible of which the under surface of the dentary and splenial elements are exposed, forming the subject of fig. 6, Plate 43, is shown by certain teeth in place and others scattered near in the same slab, to belong to the same genus and species as that represented by fig. 1, and to have come from an individual of similar size. Both are the largest evidences of Nannosuchus shown in the numerous series of Reptilian fossils from the portions of the ‘Feather-bed’ formation now under review.

The symphysis, 21 mm. in longitudinal extent, forms a fifth part of the preserved extent of the dentary; the breadth of this part of the jaw is 30 mm.; that behind the symphysis is 27 mm. The rami, as far as they are preserved, diverge to a breadth of 70 mm.

The alveolar part of the symphysis describes an incisive convexity, and the sockets indicate one or two teeth of larger size and thicker proportions than those of the rest of the dental series. The crowns of two of these teeth, which had become detached, are fortunately preserved, near the fore part of the jaw. The largest (fig. 7, magn.) represents the ‘anterior canine,’ and is the homologue of fig. 1 c and fig. 2, magn. It shows the well-marked characteristics of that tooth in Nannosuchus, and, besides the difference of sculpturing, the crown is more strongly curved than in Goniopholis or Petrosuchus. The second detached tooth near the incisive alveoli shows both root and crown. The latter is but half the length of that of the ‘canine;’ more of the convex side is exposed than in fig. 2; it is traversed by fine longitudinal ridges. The teeth which are in place show a smaller size and more slender pointed crown. There is no evidence of any tooth equaling in size the largest of the symphysial or incisive series.

The numerous minute circular pits sculpturing the symphysial expansion change, as in the specimen (fig. 1), to coarser and larger longitudinal impressions as the rami recede and pass backward; and the surface near the alveolar border showing the feeble molary convex curve is smooth.

The dental character of Nannosuchus is more fully exemplified by smaller specimens, of which two, forming parts of the lower jaw, will be first noticed.

The subject of fig. 8, Pl. 43, includes the dentary and angular elements, partially dislocated, of the right mandibular ramus. Two of the molary series of teeth are in situ, showing long, slender, feebly recurved crowns, each 5 mm. in length; other teeth of similar shape and with finely striate enamel are on the same slab.

In a smaller dentary (Pl. 43, fig. 9) the sockets of eighteen teeth are visible. The proportions and outer markings agree with those of the larger specimen.
The humerus (fig. 10), preserved near the jaw, shows the usual Crocodilian characters, with more slender proportions than in *Crocodilus niger*; it rather resembles that of the Gavial.¹

The characters of *Nannosuchus* yielded by the foregoing specimens are supplemented by those of the skull represented of the natural size in Pl. 44, fig. 1. The teeth preserved *in situ* and detached, but in contiguity with the alveolar border, are generically those to which they would be opposed assuming the skull to be that of a *Nannosuchus*. The inferiority of size is not shown by any other distinctive character to indicate a species other than that founded on the lower jaws above described.

As in those, the teeth of the upper jaw are divided by intervals usually greater than their basal breadth. Each premaxillary (fig. 1, 22) had four teeth at least; the maxillary had not fewer than ten teeth.

The characters of length and slenderness of crown in the teeth of this small Crocodile suggested a comparison of its skull with that of *Petrosuchus*, but the differential characters exceed in importance those of size. The upper jaw of *Nannosuchus* does not contract so rapidly, or in so great a degree in advance of the orbits, as in *Petrosuchus* (Pl. 41); it is also shorter as well as broader; no amount of growth could have converted it into the slender elongate shape which approximates *Petrosuchus* to the gavial-like *Crocodilus cataphractus*.

The hind border of the parieto-mastoid platform is undulate; gently convex at the middle, where it is formed by the parietal (ib., 7), concave on each side, where it is carried out by the mastoids (ib., 8).

In *Crocodilus niger* this border is straight; in *Croc. palustris* it is undulate, but the middle parietal convexity is much less than the lateral, concave, mastoidean curves, owing to the relatively narrower extent of the parietal bone. The lateral borders of the supra-cranial platform, due to the mastoids (ib., 8) and post-frontals (ib., 12), present, in *Nannosuchus*, a gentle sigmoid curve. In most modern Crocodilia these borders are straight, running parallel in *Croc. niger*, slightly convergent forwards in *Croc. cataphractus* and *Croc. intermedius*.

The breadth of the platform is to that of the skull, taken across and including the zygomatic arches, as 8 to 10 in *Nannosuchus*; in *Croc. niger* the platform is little more than half the breadth of the skull taken across the hind part of the parieto-mastoid or upper temporal apertures; in *Croc. palustris* the platform occupies half the breadth of the skull taken at the same part.

The upper temporal apertures (τ) have the same relative size as in *Petrosuchus*, but they differ in shape, being less circular, the longer diameter being longitudinal, or in the skull's axis. As far as the orbits are preserved these do not exceed in size the upper temporal apertures. This character of the Mesozoic Crocodile is retained in the present dwarf species. A super-orbital bone strengthened the upper eyelid; it retains

its connections with the frontal (11), post-frontal (12), and pre-frontal (14) in the left orbit (o); but has become slightly detached in the right orbit (o'). The nasal bones (15) terminate in a point distant from the external nostril by rather more than the diameter of that aperture, which accordingly is single and exclusively bounded by the premaxillaries. In this character Crocodylus cataphractus and Croc. intermedius resemble Nannosuchus; but the upper jaw is longer and more slender in proportion in both these existing Crocodiles than in the Purbeck species; in both, also, the upper temporal apertures are relatively smaller than in Nannosuchus.

In the character of the nasal bones and conformation of the external nostril Nannosuchus resembles Goniopholis (Pl. 40), but the supra-temporal apertures are more oblong and the maxillaries are not so out-swollen as they approach the premaxillaries. The facial part of the skull, from the front border of the orbit forwards, equals the extent of the skull from the same part to the occiput in Nannosuchus; in Goniopholis the facial part of the skull, so defined, is one third longer than the extent behind. The mutilated state of the unique skull of Petrosuchus prevents a similar comparison being made.

The sculpturing of the upper surfaces of the exposed parts of the skull in Nannosuchus presents the common Crocodilian character of minute subcircular pits, leaving a reticulate disposition of the intervening bone.

**Genus—Theriosuchus,¹ Owen.**

Species—**Theriosuchus pusillus**, Ow. Crocodilia, Plate 44, figs. 3—18; Plate 45.

This Crocodile, somewhat smaller in size than the preceding species, approaches nearer to the type of the broad-faced Alligators in the proportion of the antorbital part of the skull.

The dentition is more modified than in any other known Crocodile, recent or extinct, and approaches that which characterises the Theriodont order of Triassic Reptilia.

The premaxillary teeth are five in number in each bone; the three middle ones subequal, the first and fifth smaller. The maxillary teeth are divisible into laniaries and carnassials or trenchant molars. The first maxillary tooth is small (Pl. 44, fig. 5); the second and third gain quickly in size, the latter (a) assuming the character of a canine; the fourth tooth (b) is a still larger canine; the fifth (c) and sixth (d) decrease in size somewhat suddenly, but in length rather than breadth of crown, and terminate the series projecting from the convex part of the alveolar border of the maxillary. The tooth c or d may be said to terminate the laniary series. Beyond d the teeth lose length and slightly gain in breadth; the crown assumes a triangular, laterally com-

¹ Gr. ὄφις, wild beast; σαῦχος, crocodile.
pressed, or lamellate form, and the enamel is transversely on the outside by fine but distinct lines (ib., fig. 6, e). Of these sectorial or carnassial molars some of the detached specimens of maxillary (figs. 7 and 11) indicate as many as eight or nine. The broad base or root of each tooth is not inserted into a separate and complete socket, but is lodged in a recess of the outer alveolar wall; moreover, the partitions between these recesses are low or partial, and the teeth appear to have been applied thereto, without being so completely confluent therewith, as in the pleurodont mode of fixation of the teeth in certain Lizards. Hence, in some of the specimens of the maxillary bone the incisors and canines only are retained, being rooted each in its own complete socket; while the molars have fallen out, and their partially separated recesses are shown, as in figures 7 and 11.

In the lower jaw the foremost tooth is rather larger than those which interlock with the middle premaxillary or 'incisor' teeth above; but not any of the succeeding laniary teeth attain the size of the upper canines. The twelfth tooth, counting backwards, assumes the lamellate, triangular shape of striate crown characteristic of the superior sectorials; and the inferior ones were lodged, like those above, in a common depression of an outer alveolar wall, developing the ridges dividing such depression into the dental recesses, as shown in fig. 16, Pl. 44. This approximation to a Lacertian dental character might seem ground for something more than a family section of the order Crocodilia; but the quasi-pleurodont attachment of the hinder teeth in Theriosuchus is only an extension of the character affecting some of the teeth in existing species of Crocodile.1

In the cranial platform of Theriosuchus the medial parietal part of the hind border is less convex and the two outer parts are more concave by reason of the further backward production of the mastoids than in Nannosuchus. The lateral borders of the sculptured part of the platform are more convex than in that genus. This is owing to the greater proportion of the outer and posterior angles of the platform which is abruptly depressed below the level of the sculptured surface of the mastoid, and which becomes smooth like the contiguous and lower-placed tympanic. This character, shown in the subject of fig. 3, Pl. 44, usefully indicated fragmentary parts of the skull of other individuals of the species, such as are figured in fig. 1, 12', Pl. 45. The supra-temporal vacuities are relatively larger than in Nannosuchus. The intervening tract of the parietal, rather more canaliculate than in Nannosuchus, is divided by a mid ridge in two of the cranial specimens, and partially so in the more complete skull.

No palpebral ossicle is preserved in the orbit (o). The pointed ends of the nasals are produced so as to divide the outer nostril into two, as in some specimens of Crocodilus

1 It is noted in the Alligator niger. "No. 765. The right ramus of the lower jaw, from which the posterior part of the inner alveolar wall has been removed, showing the five posterior teeth lodged in a common alveolar groove." 'Osteological Catalogue, Museum of the Royal College of Surgeons," 4to, vol. i, p. 167 (1853).
were this a character of generic value, it might unite Theriosuchus with Halcrosia, Gray.¹

The alveolar part of the maxillary in which the canines are developed make a corresponding convex extension of its outer border, as in Goniopholis.

The extent of the ‘symphysis mandibulæ’ and the angle of divarication of the rami are shown in fig. 4, Pl. 44.

The matrix was removed as far as practicable from the palatal surface of the skull (fig. 4) and exposed a portion of the basisphenoid (5), of the pterygoids (24), of the palatines (20), and palatal plates of the maxillary (21); the pterygo-maxillary vacuities (9) and the hind portion of the palatones (20) were brought into view. What seems to be a portion of the hind part of a mandibular ramus was so wedged down upon a part of the palatal surface that, in regard to the fragile character of this unique skull, it was deemed unadvisable to attempt its removal.

In Pl. 45 a portion of the skeleton of Theriosuchus pusillus is figured. It is of one individual. In the slab of matrix in which it is imbedded the fore part, marked A, A, is continued on from the hind part with an interval of the extent marked B. At this interval the slab has been broken across, but the parts appear to have been naturally readjusted before the specimen was fixed in its present frame. The position in which the two portions of the skeleton are figured relates to the convenience of size of the Plate.

The skull has been displaced and fractured, but the contiguity of the preserved portion with the vertebral column supports the conclusion that it formed part of the skeleton of the same individual. It thus serves to determine the species to which the subject of Plate 45 belonged.

The part of the skull includes the parieto-mastoid platform (7, 12') with the tympanic (28) and the squamosal (27). The articular surface of the tympanic for the mandible shows the Crocodilian character. The median or sagittal ridge of the parietal is well marked, and is continued along the mid-frontal. This character is partially effaced by mutilation in the more entire skull (Pl. 44, fig. 3). It is well shown in the frontal bone indicating the largest of the specimens of Theriosuchus (ib., fig. 8).

The vertebral centrum of the trunk show the shallow Amphicoelian character of those of the Goniopholis and Teleosaurians. The smooth under or dermal surface of part of the two median rows of the dorsal scutes are shown in the fore half of the skeleton. In the hind half the upper or epidermal surface of the scutes is exposed, showing in most the submedial longitudinal ridge. This is wanting in certain, probably lateral, scutes, of which a group is exposed at the fore part of the anterior portion of the skeleton. One of these unridged, but toothed, scutes is figured at fig. 3, Pl. 45.

Of the limb-bones preserved may be recognised the right scapula (51) and humerus (53), the left humerus (53) with the radius (54) and ulna (55), followed by some dislocated

metacarpals and phalanges of the fore-foot. In the hind portion of the skeleton (fig. 2) the right femur (65), tibia (66), fibula (67), with the four metatarsals and scattered phalanges, are preserved.

All the limb-bones show the ordinal Crocodilian characters, but the proportion of the fore to the hind limb is that of the Proccælian division, not that of the Teleosaurus. In this respect, as in the proportions of the maxillary bones and teeth, the advance to Tertiary types of Crocodilia is manifested. As in these the Theriosuchus was better adapted for locomotion on dry land than were the Teleosaurus.

In Theriosuchus the breadth and shortness of the antorbital part of the skull in proportion to the part behind exceeds that in any modern broad-snouted Crocodile. Even in the young ‘Crocodile à deux arrêtes,’ figured in Pl. I of Cuvier’s ‘Ossemens Fossiles,’ a transverse line across the fore part of the orbits equally bisects the skull, omitting the mandible. In Theriosuchus the same line leaves in advance six thirteenth parts of the length of the skull.

This proportion suggested at first view the immature state of the individual to which the subject of fig. 3, Pl. 44, had belonged; but of the numerous evidences of Theriosuchus pusillus none were larger than those figured in Pl. 45, and in figs. 3, 4, 8, 14, 16, of Pl. 44: several other fragmentary evidences had come from smaller individuals.

I conclude, therefore, that, as in the case of most species notable for their diminutive size, immature characters of the larger species of the genus are associated with such dwarfishness of the adults. The only known mammals of the Purbeck period characteristic, moreover, like the dwarf Crocodiles, of the fresh-water ‘Feather-bed’ deposits, are of diminutive size, and the carnivorous Saurians seem to have been thus adapted in dimensions and force to their prey.

I estimate the average length of a mature Theriosuchus at 18 inches. The length of the skull, taken as that of the mandible, is 3 inches 6 lines. In the articulated skeleton of a modern Crocodile the angle of the lower jaw extends to the third cervical vertebra. In Alligator lucius the trunk from the third cervical to the last sacral vertebra inclusive is nearly equal to two lengths of the skull; the length of the tail is 2½ lengths of the skull. The trunk of Theriosuchus so defined includes two lengths of the skull. The tail, as indicated by fig. 2, Pl. 45, equalled 2½ lengths of the skull.

In the long-jawed Gavials and Teleosaurus the trunk includes about 1½ length of the skull; but the tail is proportionally longer than in the short- and thick-jawed Crocodiles.

1 Crocodilia, Pl. 11.
2 Quarto, tom. v, 2de partie.
Crocodilian Vertebrae. Plate 42, figs. 4—12.

Of the numerous scattered vertebrae in the different slabs of the Purbeck matrix those specimens have been selected for figuring which exemplify the Crocodilian characters of different portions of the vertebral column.

The subject of fig. 4, Pl. 42, is from the neck or fore part of the trunk, in which the hypapophysis (h_y) has not subsided on the under surface of the centrum; the processes for the head ('parapophysis,' p) and tubercle ('diapophysis,' d) of the proximally bifurcate rib are well developed. The pre- (z) and post- (z') zygapophyses, together with the neural spine (n.s.), complete the series of developments of this complex type of Crocodilian vertebrae.¹

Figs. 5 and 6 are two consecutive, but slightly dislocated, vertebrae from the hinder part of the trunk. The long and broad diapophyses show the notch (d) where the simple and short hinder ribs were articulated, each by a single joint, with the rest of their osseous 'segment' or vertebra.²

Figs. 7 and 8 are side views of mutilated hinder trunk vertebrae.

Fig. 9 gives a back view of one of the sacral vertebrae, showing the robust processes represented by coalesced pleurapophyses. The suture is traceable by which the latter articulate with both centrum and neural arch.³

Fig. 10 is a caudal vertebra, with the haemal arch and spine (a); a front view of the latter is given in fig. 11; the vertebra is from that part of the tail where the pleurapophyses cease to be developed.⁴

Fig. 12 shows the completely ossified substance in a section of a dorsal centrum.

Fig. 13 probably belonged to Brachydectes minor.

All these and other detached vertebrae indicate the dwarfed proportions of the Crocodilia characteristic of the fresh-water deposits of the 'Feather-bed.' Many correspond in size and shape with those shown in situ in Theriosuchus, Pl. 45. The subjects of figures 4—10 I am disposed to refer to Nannosuchus.

Crocodilian Scutes. Pl. 43, figs. 4, 5, 11, 12.

In almost every slab containing Crocodilian remains are scutes, or portions or impressions of scutes. They include the 'peg-and-groove' type, the hexagonal with

¹ No. 687, 'Catalogue of Osteology,' 4to. ut supra.
² No. 689, op. cit., p. 153.
³ It accords with the character of the sixth cervical vertebra in Gavialis gangeticus ('Catal. of Osteology, Mus. Coll. Chir.,' 4to, vol. i, p. 152, No. 684), save in the minor development of the hypapophysis, which indicates a position in the vertebral column somewhat further back.
⁴ See No. 686 of the same series and 'Catalogue.'
sutural margins, and the ordinary quadrate with bevelled edges, either plain or single-ridged. All show the Crocodilian pitted or reticular sculpturing on one side, the smooth surface on the opposite.

The scutes exemplified in Plate 43, figs. 4 and 5, partly by portions, partly by impressions, may be referred both by contiguity and proportional size to the larger examples of Nannosuchus gracilidens. Some scutes of this type, of rather larger size, and with the smooth, overlapped, anterior border relatively broader and more elevated than in Goniopholis crassidens,¹ may belong to the smaller species of Goniopholis (G. tenuidens) or to the larger kind of Brachydectes. A smaller-sized peg-and-groove scute would fit Brachydectes minor; the smallest and most numerous of all are commonly associated with evidences of Theriosuchus pusillus.

The most instructive scutal fossils are those which exemplify the relative position and mode of interlocking of the articular mechanism. Of these are figured two groups, one showing the outer (ib., fig. 11), the other the inner (ib., fig. 12) surfaces.

These specimens afford grounds for additions to the original description of the peg- and-groove modification of Crocodilian armature.

To the “process continued from one of the angles vertically to the long axis of the scute”² may be added “from the anterior and external angle;” and for “the depression on the opposite angle of the adjoining scute” may be written “on the under surface of the posterior and external angle of the scute in advance.”

When the medial dorsal series of scutes are seen in natural connection from the outer surface the articulating peg is concealed, as in the two hinder pairs of the three shown in fig. 11, Pl. 43. When the inner surface of a similar series is exposed, as in fig. 12, the mode of application of the pegs and grooves comes into view.

The scutes of the two medial rows along the back of these Purbeck Crocodiles join each other at the medial line by a close contact of the inner borders—a kind of ‘harmonia’ or toothless suture. Ventral scutes usually show thicker, more sutural, margins. The dorsal scutes upon the tail lose the peg and groove, are longest in longitudinal diameter, and mostly support a longitudinal submedial ridge on the outer surface; at least in Theriosuchus pusillus (Pl. 45, fig. 2).

Genus—Nuthetes, Owen.

Species—Nuthetes destructor, Ow. Pl. 43, figs. 13—16 and 17—23?

In a former ‘Monograph on the Fossil Lacertian Reptiles of the Purbeck Limestones’ the above genus and species were founded on portions of jaw and teeth, kindly transmitted to me by Charles Wilcox, Esq., of Swanage, Dorsetshire.

¹ Pls. 7 and 8.
² ‘Report on British Fossil Reptiles,’ 1841, p. 70.
In Mr. Beckles' collection further evidence of *Nuthetes destructor* is afforded by the portions of jaw (Pl. 43, figs. 13 and 14) and by numerous detached teeth, ranging in size from a length of enamelled crown of 5 mm. to 20 mm. (fig. 15, c), and with variations in the proportion of length to basal breadth (comp. fig. 15, a, e, with a, b).

The teeth in the mandibular fragment accord in size and shape with those of the original or type specimen;¹ they are laterally compressed, strongly recurved, and combine a basal fore-and-aft breadth of 3 mm. with the length of 5 mm. (straight). They likewise show the "excavation or longitudinal depression on the side of the base." The coronal enamel does not extend over this depression, but is continued along its margins, and to a greater extent on that next the convex border of the crown than on the opposite side. In the portion of jaw, originally figured, with seven more or less perfect tooth-crowns, two of these indicate a longer and more slender shape than the rest. Several detached teeth of this type have been exposed in portions of the 'Feather-bed Marl' in the Becklesian series. Some of these, exemplifying difference of size, are figured in Plate 43, fig. 14.

In all these tooth-crowns the characteristic fore and hind finely denticulate ridges are discernible, as shown in the magnified view (fig. 16); the rest of the enamel is smooth and even, as in the type of *Nuthetes destructor*. Of this species I am disposed to regard the specimens above described as indicative of the range of size according to growth of individuals rather than as exemplifying specific modifications of the genus.

**Dermal Bones ('granicones').**

In many portions of the matrix of the 'Feather-bed' are ossicles of a conical shape, the cone showing various degrees of elevation, with a granulate surface, the base being flat and smooth, or faintly and minutely pitted. These 'granicones' I regard as dermal bones.

In Pl. 43, fig. 18, is represented a 'granicone' with a basal breadth of 8 mm. and a length or height of cone of 14 mm. In fig. 19 the base is oblique, reducing the shortest side of the cone to a height of 8 mm. In this, as in some of the similarly shaped 'granicones,' part of the basal margin is raised or prominent, sometimes formed by a single series of close-set granules, as in fig. 20. Those on the surface of the cone are less regularly disposed, but at some parts affect a longitudinal arrangement (fig. 21.) The apex shows various degrees of obtuseness, which finally reduces the granulate or exterior surface of the cone to a moderate convexity, but the conical shape is the rule. The smallest of such 'granicones' has a basal breadth of 3 mm., a length of 5 mm.

Slices of these enigmatical fossils prepared for the microscope (figs. 22, 23) demonstrated the absence of the structures characteristic of piscine dermal bony cones and spines.

¹ 'Quarterly Journal of the Geological Society,' 1854, p. 120.
Moreover, the geological deposit (a subdivision of the Purbeck series) containing the granicones is a fresh-water one, and their structure was equally distinct from the ganoid dermal defences of the Sturionidae or other fishes habitually frequenting lakes or rivers. The dermal scutes of Theriosuchus are notable for the greater number of the canaliculi, and the more regular 'lay,' or disposition, of the 'lacunæ' or bone cells, than in Lacertians; also by the wider 'sinuses' or unossified tracts. In the dimensions, size, shape, and number of the 'canaliculi;' in the minor regularity of the 'lay' of the lacunæ, and in the less proportion in both number and dimensions of the sinuses, the bony tissue of the granicones resembled that in Lacertians; and in this conclusion from microscopical characters,¹ combined with the evidence of the association, and the contiguity of the granicones, with the unquestionable fossil remains of Nuthetes destructor, I derive the grounds for referring them to that extinct genus and species.

Among modern Lizards the singular 'Moloch horridus' of Australia exemplifies dermal scutes most nearly resembling these 'granicones' in shape; but the horny exterior is supported by dense fibrous tissue, not bone. It may be that we have in them a formal exemplification of the dermal armour of Nuthetes destructor. If so, the association of a Lizard of such forbidding physiognomy with small Marsupials having their nearest of kin in Australia would be worthy of note.

¹ See 'Journal of the Royal Microscopical Society,' vol. i, No. 5, p. 233, pls. xii and xiii.