J. jaculus gordoni, Thos.—Larger, browner. Egyptian Soudan.
J. jaculus jaculus, Linn.—Smaller, paler. Lower Egypt.
J. jaculus favonicus, Thos.—Smaller, more ochraceous. S.W. Mauritania.
J. jaculus vulturnus, Thos.—Smaller, browner. Somali.

Brief diagnosis of the last-named :—

Jaculus jaculus vulturnus, subsp. n.

Jaculus, Drake-Brockman, Mammals of Somaliland, p. 141 (1910).

Size about as in true *J. jaculus* of Lower Egypt. Ears rather longer. Colour comparatively brown, matching that of the Soudanese *gordoni*. Postauricular white patches large. Dark dorsal colour somewhat narrowed on posterior back.

Skull practically indistinguishable from that of *jaculus*.

Dimensions of the type (measured in the flesh) :—

Head and body 110 mm.; tail 170; hind foot 60; ear 23.

Skull: greatest length in middle line 30·7; condylo-incisive length 29; back of bulla to front of incisors 32·5; interorbital breadth 12·2; tympanic breadth 23; diameter of bulla 13·8; upper molar series 5·2.

Hab. Somaliland. Type from Berbera.

Type. Adult male. B.M. no. 5. 8. 7. 4. Original number 28. Collected 17th May, 1905, and presented by Dr. R. E. Drake-Brockman.

LVIII.—*On the Skull and Part of the Skeleton of a Crocodile from the Middle Purbeck of Swanage, with a Description of a new Species* (Pholidosaurus lævis), *and a Note on the Skull of* Hylæochampsa. By C. W. Andrews, D.Sc., F.R.S. (British Museum, Natural History).

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[Plate VIII.]

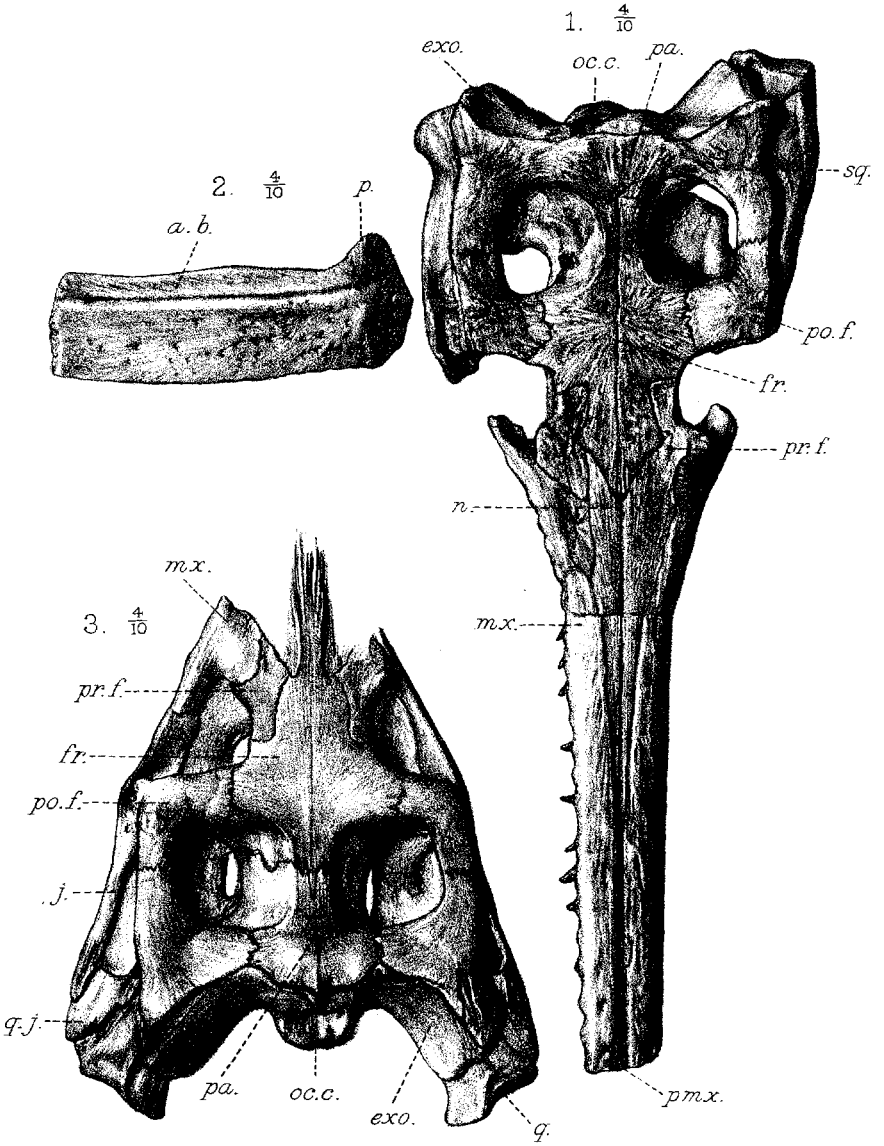
The following paper consists mainly of an account of an imperfect skull and skeleton of a crocodile preserved on a slab of Middle Purbeck limestone from Swanage. The specimen was discovered in Keat's Quarry, and was obtained for the British Museum by the late F. Hovenden, Esq., F.L.S., F.G.S.

The bones are much scattered, and in many cases overlie one another; the parts preserved are:—the skull, wanting

the extremity of the snout; the anterior part of the mandible; the atlas and axis and four other cervical vertebræ, with their ribs, behind which are two more cervical ribs in their natural position in the series, the vertebræ being wanting; two or three dorsal vertebræ; dorsal and sternal ribs; interclavicle; both coracoids; the left scapula; both humeri and ulnæ; left ilium; an ischium; right tibia; left fibula; numerous dorsal and ventral scutes, some of the latter still united with one another.

The skull (Pl. VIII. fig. 1) has been much crushed from above downwards, the palatal bones being especially badly broken. About 3–4 cm. of the end of the snout are wanting. In its general outline the skull is gavial-like, the snout being relatively long and slender. The supratemporal fossæ, though a little larger than the orbits, are much smaller than in the Teleosauridæ. Their upper rim is roughly quadrate in outline, but below this level they are rounded off at the anterior and posterior angles by projections of the frontal and parietal. The bony platform surrounding these openings is wide posteriorly and externally, and the upper surface of the bar between them is also of considerable width. The orbits, which looked upwards, outwards, and forwards, are oval in outline, being somewhat narrowed in front by an overhanging prominence on the prefrontal.

In front of the temporal fossæ the frontal (*fr.*) sends out broad lateral branches to join the postfrontals. Anteriorly they form the hinder part of the orbital border; in front of this the frontal first joins the prefrontal, then terminates anteriorly in a broad wedge-like point, thrust in between the hinder ends of the nasals and extending forward to about 2 cm. in front of the orbit. The prefrontals (*pr.f.*) are separated from the frontals posteriorly by a short suture running inwards from the orbital border nearly at right angles to the long axis of the skull, while their inner border is nearly parallel with it; anteriorly they widen out a little and bear a prominence which projects over the front of the orbit. In this region they overlap the lachrymal, which unites below with the maxilla and forms the actual anterior angle of the orbit. The nasals (*n.*) terminate posteriorly in points which are thrust in between the frontal and postfrontals to a little behind the level of the anterior angle of the orbit. Anteriorly they diminish in width very gradually, and their anterior ends probably just reach the facial processes of the premaxillæ (*p.mx.*), which were long and slender, though, owing to the loss of the anterior part of the snout, the form of the premaxillæ as a whole cannot be determined. The



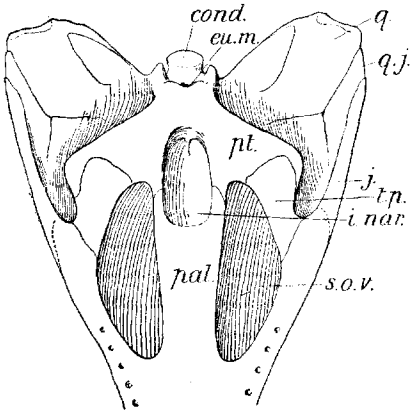
G.M.Woodward del.et lith. West, Newman imp.

Figs. 1-2. Pholidosaurus decipiens *Watson*.
„ 3 „ laevis, *sp. n.*

maxillæ (*mx.*) bear numerous teeth, the edges of the sockets for which form slight prominences on the alveolar border. The teeth themselves have sharp, pointed, slightly curved crowns, which are circular in section; the enamel is raised into numerous well-defined vertical ridges, but there seems to have been no carina. About nine teeth occur in a length of 10 cm. of the alveolar border.

The palate (text-fig. 1) is badly preserved. It can be seen that the pterygoids (*pt.*) united beneath the basisphenoid and send forwards and outwards broad wings which unite externally with the transpalatine (*t.p.*), an L-shaped bone,

Fig. 1.



Pholidosaurus decipiens, Watson. Diagram of the palate. About ⅓ nat. size.

cond., occipital condyle; *eu.m.*, median Eustachian opening; *i.nar.*, internal nares; *j.*, jugal; *pal.*, palatine; *pt.*, pterygoid; *s.o.v.*, suborbital vacuity; *t.p.*, transpalatine.

the outer end of which joins the maxilla and probably the jugal (*j.*). Anteriorly the pterygoids appear to unite with the palatines (*pal.*) at about the level of the anterior angle of the internal nares (*i.nar.*). These openings seem to be bounded below by the palatines only, though the pterygoids must form most of their roof; their anterior angle is about as far forward as the anterior border of the temporal fossa. The suborbital vacuities (*s.o.v.*) are large, their posterior angle extending some distance behind the anterior border of the narial opening. The median Eustachian opening (*eu.m.*)

is immediately in front of the ventral prominence of the basi-occipital. The bones of the back of the skull are much crushed, but it can be seen that the paroccipital process of the exoccipital is very large, widening towards its outer end, where it terminates in a thickened rounded border; the quadrate region does not seem to present any peculiarities. The bones of the skull-roof show a feeble sculpturing of pits, for the most part irregularly arranged, but on the frontal radiating from the middle of the bone. On the snout the pits are replaced by short, irregular, but for the most part longitudinal, grooves.

The skull just noticed agrees very closely with that described by Owen (Foss. Rept. Weald. and Purbeck Form. Suppl. viii. (1878) p. 10, pl. vi. figs. 1, 2) under the name *Petrosuchus lævidens*. Mr. D. M. S. Watson (Mem. and Proc. Manchester Lit. and Phil. Soc. vol. lv. (1910–11), Mem. xviii. p. 9) has, however, pointed out that this specific name can only apply to the mandible of a short-snouted crocodile which Owen wrongly regarded as associated with the skull, so that it is this mandible which must be regarded as the type of *Petrosuchus lævidens*. The skull agrees very closely with that of *Macrorhynchus schaumbergensis* as described by Koken (Palæont. Abhandl. vol. iii. (1887) p. 334), and may no doubt be referred to the same genus, the name for which should be *Pholidosaurus* (von Meyer), which antedated *Macrorhynchus* by some years. The name *Pholidosaurus decipiens* has been suggested by Mr. Watson (*loc. cit.*) for the skull described by Owen, and that name is here adopted for the specimen under discussion.

The mandible had a very long symphysis into which the splenial seems to have entered for a short distance only, a circumstance which distinguishes it from *Pholidosaurus schaumbergensis*, H. v. Meyer, in which, according to Koken, the splenial extends nearly half the whole length of the symphysis. Anteriorly there is a slight expansion, showing that a premaxillary expansion was also present.

The atlas is all preserved, but the parts composing it are scattered. The odontoid remains attached to the centrum of the axis; its postero-inferior angles bear facets which probably helped to support the large first rib, which is a flattened bar of bone, pointed posteriorly and showing no trace of a tubercular process. The first subvertebral wedge-bone (hypocentrum of atlas) is closely similar to that found in the young alligator; it is notched posteriorly and bore a pair of facets which helped to form the surface for the support of the first rib. The two halves of the neural arch are

massive, the thickened ventral portion bearing two facets, one for union with the odontoid, the other forming the supero-lateral part of the cup for the occipital condyle; the base of the neural arch is deeply notched in front; this element is likewise very similar to that seen in the young alligator.

The axis is a moderately elongated vertebra fused anteriorly with the odontoid; the neural spine is long and low, rising somewhat towards its hinder end; the rib articulated mainly by its capitulum, but has a small tubercular process, which was no doubt connected with a diapophysis on the centrum; this second rib seems to have been almost entirely concealed beneath the first. The remaining cervical vertebræ present no peculiarities; their centra were slightly concave at each end; the neural spines are broad and rather low, the upper end being rounded; they increase a little in height and decrease in breadth as they are followed back on the series. The cervical ribs are of the normal Crocodilian form. The last two cervicals are represented by the ribs only which lie in their natural position with regard to one another and the rest of the series.

The dorsal vertebræ are represented by two or three incomplete specimens. One of these shows that the ends of the centrum were circular in outline and slightly concave in the middle, the edges being gently rounded. The neural arch and zygapophyses were proportionately large and the neural spine moderately high.

A number of dorsal ribs are preserved, but present no striking peculiarities. In addition to these there are several elongated flattened elements which do not appear to consist of true bone, but of calcified cartilage: these are sternal ribs. Some of these have their opposite sides parallel and are about three times as long as broad, others have one of the long sides straight, the other convex. So far as I am aware, the presence of calcified sternal ribs in a fossil crocodile has not been previously noted.

The shoulder-girdle is represented by the scapula, coracoid, and a well-preserved interclavicle. The upper end of the coracoid is similar to that seen in *Tomistoma*, but the bone is shorter and broader, particularly in the neck. The scapula is of modern type. The interclavicle is a long straight bar of bone terminating anteriorly in a blunt lance-shaped head; behind this it first narrows and becomes thicker from above downwards, then flattens out and widens to a point about 7 cm. from its anterior end; the expansion marks the point near which the lower ends of the coracoids were attached. Behind this the bone again narrows, and probably terminates

posteriorly in a thickened point; but this region is hidden by overlying bones. An interclavicle of somewhat similar shape, though probably having a shorter extension in front of the coracoids, has been described (as sternum) in *Mystriosaurus* by d'Alton and Burmeister *, but I am not aware that it has been noticed in later Mesozoic forms.

The humerus is closely similar to that of modern crocodiles, except that the distal condyles are more nearly equal in size. In this respect the present species also differs widely from *Steneosaurus* and *Metriorhynchus*, in which the ulnar condyle tends to undergo extreme reduction. The ulnæ are not well enough preserved to show any characters.

Of the pelvis an ilium and an ischium are preserved. The ilium, of which the upper part of the inner face is exposed, does not seem to differ from the modern type. The ischium is nearly concealed by other bones.

Of the hind limb only a right tibia and a left fibula are preserved. The tibia is somewhat incomplete distally and is crushed at its upper end. So far as can be seen it is like that of recent crocodiles, and the same may be said of the uncrushed and perfect fibula, except that the distal facets for the astragalus and calcaneum seem to be more sharply marked off from one another.

Both dorsal (Pl. VIII. fig. 2) and ventral scutes are preserved. Of the former there were no doubt two rows meeting in the middle line. Each dorsal scute (Pl. VIII. fig. 2) is much broader transversely than longitudinally, the ratio being about 11 to 4. The anterior border (*a.b.*) is smooth and separated from the posterior portion by a groove; this smooth portion is overlapped by the hinder border of the scute in front; the outer anterior angle is produced into a blunt process (*p.*), which also underlies the scute in front. The greater portion of the surface is covered with an irregular sculpture of scattered pits, which become most numerous and deepest towards the outer border, near which there is a blunt longitudinal keel. The posterior border of the under surface is bevelled off to fit against the corresponding facet or the scute behind.

The ventral scutes united to form a plastron; they are polygonal, those in the middle of the plastron having six irregular sides. The sculpture of pits is much more strongly developed than on the dorsal scutes.

* 'Der Fossile Gavial von Boll' (1854), p. 55, pl. ix. (in the lettering of the plate this bone is wrongly marked "coracoid"). Also probably the bone marked *c* in pl. vii.

Some dimensions of this specimen are:—

	cm.
Skull (Pl. VIII. fig. 1):	
Length ..... (approx.)	37
Width between orbits	4·0
„ at postfrontals	10·4
„ of the middle of the snout ....(approx.)	3·0
Mandible:	
Length..... (approx.)	42·5
„ of symphysis	20·5
Length of the fused centra of atlas and axis	4·2
Dorsal vertebra:	
Width of centrum	2·5
Height of centrum	2·5
„ to top of neural spine	7·0
Length of humerus.....	12·5
„ ulna	8·3
„ tibia	11·1
„ fibula	10·9
Width of a dorsal scute (Pl. VIII. fig. 2)	11·7
Length of a dorsal scute	4·1

The collection also includes the posterior portion of a skull (Pl. VIII. fig. 3) of a *Pholidosaurus* apparently specifically different from *P. decipiens*. The chief points of difference are: (1) the complete absence of sculpture, and (2) the form of the anterior region of the frontal (*fr.*), which, instead of forming a broad wedge thrust between the hinder ends of the nasals, seems to have extended as a narrow strip between these bones, which furthermore ran a little further back than in *P. decipiens*. This species, which is from the same horizon and locality, may be called *Pholidosaurus lævis*, sp. n.

The form of the skull and position of the sutures will be best understood from the figure of the type specimen (Pl. VIII. fig. 3).

Some dimensions (in centimetres) of this specimen are:—

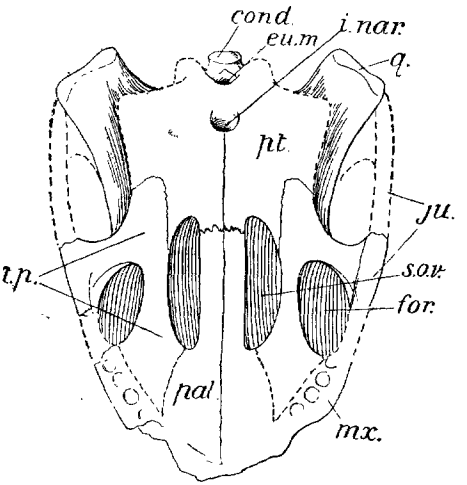
Length from supraoccipital to top of frontal	15·4
„ of temporal fossa	3·9
Width at postfrontals	11·2
Least width between orbits	4·0

From the above account it will be seen that *Pholidosaurus* is distinguished by the relatively small size of the supratemporal fossa, which are little larger than the orbits, the long narrow snout on which the nasals meet the facial processes of the premaxillæ, the internal nares far back, but still closed below by the palatines only. The vertebræ are amphicœlous. The fore limb is relatively large, and was

no doubt ambulatory. This genus has been rightly referred to a distinct family—the Macrorhynchidæ—by various writers; but since the name *Macrorhynchus* is merely a synonym of *Pholidosaurus*, it seems preferable to call the family the Pholidosauridæ. It is distinguished from the Teleosauridæ by the relatively small size of the temporal fossæ, the extension forwards of the nasals to meet the premaxillæ, the more posterior position of the internal nares, and the relatively larger size of the fore limb.

The remarkable and little-known crocodile *Hylæochampsa vectiana* of Owen * has also been referred to this family, but

Fig. 2.



Hylæochampsa vectiana, Owen. Diagram of the palate of the type skull (R. 177). About ½ nat. size.

cond., occipital condyle; *eu.m.*, median Eustachian opening; *for.*, foramen in transpalatine; *i.nar.*, internal nares; *ju.*, jugal; *mx.*, maxilla; *pal.*, palatine; *pt.*, pterygoid; *q.*, quadrate; *s.o.v.*, suborbital vacuity; *t.p.*, transpalatine.

the structure of the palate is so remarkable, and differs so widely from that found in the other Mesozoic crocodiles, and in some respects from the typical Eusuchia also, that it should certainly be placed in a distinct family, the Hylæochampsidæ. Owen's description of the upper and occipital surfaces of the skull is accurate and should be referred to,

* Foss. Rept. Wealden and Purbeck Form. Suppl. vi. (Mon. Pal. Soc. 1874). Figured in Suppl. v. pl. ii. figs. 23–25.

but his account of the palatal surface is obscure. The most remarkable point about the palate (text-fig. 2) is that the pterygoids (*pt.*) meet beneath the nasal passage and carry back the internal narial opening (*i.nar.*) exactly as in modern crocodiles; the median Eustachian opening (*eu.m.*) is only separated from the nares by a ridge of bone, probably mainly formed by the basisphenoid. The palatal (suborbital) vacuities (*s.o.v.*) are very narrow and are separated, as usual, by the nasal tube formed by the palatines. Externally to these openings the palate is perforated by another pair of vacuities (*for.*), not seen in other crocodiles. They are large oval apertures, which Owen was inclined to take for the true suborbital vacuities, regarding the median pair as the internal nares. This, however, is clearly not the case, the nares (*i.nar.*), as already noted, being situate as in the Eusuchia. It becomes necessary, therefore, to account for the outer pair of openings, and a careful examination of the specimen shows that they are the result of the bifurcation of the outer portion of the very large transverse bone (*t.p.*), the posterior branch running outwards and forwards to join the jugal, the anterior nearly directly forwards to the maxilla (*mx.*); the opening included between the branches of the transverse line was no doubt closed externally by the union of the maxilla and jugal, but the specimen is unfortunately incomplete at this point. This opening has not been observed in any other crocodile; but it is significant that in the transverse bone of all modern forms there is, about opposite the point of union of the maxilla and jugal, a small foramen, which completely perforates the bone and is probably not a nutritive opening. It may be suggested that this small opening is a remnant of the vacuity now described on *Hylœochampsa*.

Another remarkable point about the skull is that the series of dental alveoli, of which two or three are preserved in each maxilla, converge very rapidly towards one another in front, as if the skull were very short; but from the large size of the nasals, so far as preserved, and from the peculiar pinching-in of the skull in front of the orbits, it seems more probable that this convergence of the alveolar borders is merely a rapid narrowing to pass into a slender rostrum of unknown length.

Of the remainder of the skeleton nothing is definitely known; but it is very probable that a series of procœlous Crocodilian vertebræ described by Seeley (Quart. Journ. Geol. Soc. xliii. (1887) p. 212, pl. xii. figs. 7–8), under the name *Heterosuchus valdensis*, actually belong to *Hylœochampsa*. If this is so, it adds another striking feature of resemblance to the Eusuchia.

The occurrence in Wealden deposits of a crocodile which in many respects, notably in the position of its internal nares, and probably in the possession of procœlous vertebræ, is quite similar to the recent forms, while at the same time its transverse bone differs widely from that of the earlier Mesosuchia at present known, seems to make it doubtful whether any of the latter are ancestral to the Eusuchia. No doubt the condition of the internal nares found in them represents a stage passed through by the ancestors of the Eusuchia; but it seems quite likely that those ancestors were forms still unknown which lived in rivers and swamps. *Goniopholis* and *Bernissartia*, contemporaries of *Hylæochampsa*, possessed amphicœlous vertebræ, and I am informed by Professor Dollo their transverse bones are not bifurcated or perforated by any foramen. These genera therefore may represent fresh-water or swamp-haunting types derived from the earlier amphicœlous Mesosuchia, but not ancestral to the modern crocodiles. The same may also apply to *Pholidosaurus*. The discovery in the Jurassic of remains of crocodiles other than the more or less pelagic types, such as *Metriorhynchus* and *Steneosaurus*, is necessary before the question can be settled.

EXPLANATION OF PLATE VIII.

Fig. 1. *Pholidosaurus decipiens*, Watson. Skull from above. (R. 3956.) About $\frac{1}{10}$ nat. size.

Fig. 2. Ditto. Dorsal scute from above. (R. 3956.) About $\frac{1}{10}$ nat. size.

Fig. 3. *Pholidosaurus lævis*, sp. n. Skull from above. (Type specimen, R. 3414.) About $\frac{1}{10}$ nat. size.

a.b. Anterior border of scute.
ex.o. Exoccipital.
fr. Frontal.
j. Jugal.
l. Lachrymal.
mx. Maxilla.
n. Nasal.
oc.c. Occipital condyle.
p. Process on antero-external angle of scute.
pa. Parietal.
pmx. Premaxilla.
po.f. Postfrontal.
pr.f. Prefrontal.
q. Quadrate.
q.j. Quadrato-jugal.
sq. Squamosal.

LIX.—*New African Antelopes of the Waterbuck Group.* By Ernst Schwarz.

Further study of the Ungulata brought home by the Duke of Mecklenburg's expedition has resulted in the discovery of the following new forms:—

Kobus defassa annectens, subsp. n.

Type locality. Badingua, Upper Shari River.