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collected by J. C. Mansel, Esq.,
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*Deuxième Gavial d'Honfleur, Tête à
museau plus court (Steneosaurus
rostro-minor* of Geoffroy St.Hilaire, 1825),
and with Quenstedt's *Dakosaurus***

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Notes

3. *Notes on some FOSSIL REMAINS of a GAVIAL-LIKE SAURIAN from KIMMERIDGE BAY, collected by J. C. MANSEL, Esq., establishing its identity with CUVIER's DEUXIÈME GAVIAL d'HONFLEUR, Tête à museau plus court (STENOSAURUS ROSTRO-MINOR of GEOFFROY St.-HILAIRE, 1825), and with QUENSTEDT's DAKOSAURUS.* By J. W. HULKE, Esq., F.R.S., F.G.S.

[PLATES XVII. & XVIII.]

THE fossils which form the subject of this note consist of part of a lower jaw, with teeth and vertebræ, imbedded in hard pyritic clay-stone, lent me by J. C. Mansel, Esq., and of parts of the upper and lower jaws, with several teeth *in situ* and loose, portions of vertebræ and of ribs, a femur, and some other bones, which, owing to their fragmentary and crushed condition, I have not been able to identify, in the British Museum.

As received from Mr. Mansel, the bones in the British Museum were nearly hidden in large masses of very hard stone containing, as is usual in Kimmeridge fossils, much pyrites, which made it very difficult to extricate them; but this has been successfully accomplished, and the severed pieces have been very skilfully joined by Mr. Davies, to whom I am glad to take this opportunity of expressing my obligation for much valuable assistance.

Description—Upper Jaw.—Of this the British Museum has the extreme end of the snout, comprising the symphysis, with about 4 inches of both intermaxillæ, forming the antero-lateral boundary of an undivided terminal nostril, which has a laterally compressed oval form, and is not swollen at the sides as in the living Gavials and in the extinct Teleosaurs. The oval nostril is indented in front by a slightly overhanging, medial, tubercular production of the symphysis. A thin seam of stone marks the open intermaxillary suture. The outer border of the upper surface of the portions of the intermaxillæ bounding the nostril makes a blunt ridge with the nearly vertical outer surface, from which the upper surface slants inwards and downwards to the inner surface; and this latter slants downwards and outwards, so as to overhang the floor of the nostril, with which it makes an angle of rather more than 45°.

The alveolar border of the right intermaxilla has been laid bare; it contains three alveoli; and the hard palate has been traced to within .9 inch of the symphysis, which shows that the palatine processes of the intermaxillaries subtend the greater part of the nostril, and that the prepalatine foramen is proportionately lessened, a point of resemblance to the living Gavial in which this latter differs from crocodiles proper. The outer surface of the intermaxillæ bends evenly outwards and backwards from the symphysis. There is not any indication of a notch for the passage of the fourth tooth; and, as far as I can judge from this fragment, the snout tapered regularly, ending bluntly.

There is another fragment, 5½ inches long, which belongs, perhaps, to the upper maxilla. It contains five alveoli, four of which include portions of teeth. The outer surface is moderately convex;

the inner surface is less convex transversely than the outer, and bears a deep longitudinal groove. The buccal surface is longitudinally flat, and it rises gently towards its inner border, which makes it slightly hollow transversely. The outer surface of both fragments is smooth; it has a close grain, and a fine longitudinal striation.

Dimensions of the Anterior Extremity of the Upper Maxilla.

	inches.
Antero-posterior diameter of symphysis	1·8
Maximum vertical depth of symphysis	2·3
Length of fragment of intermaxilla	4
Diameter of first and second alveoli in right intermaxilla. .	1·1
Width of nostril at level of its floor at posterior surface of fragment	1·8
Width of nostril at angle where the inner and upper surfaces of intermaxilla meet	1·5
Maximum width of nostril at angle where upper and outer surfaces meet	3·1
Vertical depth of intermaxilla at posterior surface of fragment	1·9
Transverse diameter of intermaxilla at junction of upper and inner surfaces	1·3
Do. do. at floor of nostril	1·65
Max. vert. depth of nostril from its floor to meeting of upper and outer surfaces of intermaxilla	0·95
Breadth of snout just behind symphysis	3

Lower Jaw.—In the British Museum there is now, stripped of its matrix, in continuous fragments, which have been cleverly joined by Mr. Davies, a nearly complete right ramus, including the entire non-tooth-bearing part, measuring 30 inches from its posterior extremity to the hindermost visible tooth*, with 4 inches of the tooth-bearing part. Viewed from above, the dentary part, with 4 inches of the ramus behind it, appears to be nearly straight, and from this point the ramus curves outwards nearly to its posterior extremity, where it becomes slightly inflected. When the straight, toothed part is placed horizontally, the ramus behind it is observed to have a large upward curve. The upper border of the jaw, traced from behind forwards, exhibits first a gently inclined, slightly longitudinally hollowed and transversely flat postarticular surface, 2·7 inches long, separated by a transverse ridge from a longitudinally concave articular surface of nearly equal length, which looks forwards and upwards. From this the border declines gently for about 5 inches,

* The upper surface has been more recently cleared of the matrix behind the tooth, exposing four more alveoli, which, with two, for which there is ample space in an intermediate fragment on which the distal end of the femur lies, make six, or perhaps seven, teeth behind the point where the symphysis probably begins, and lessens the length of the non-tooth-bearing ramus to between 22 and 23 inches.

where, at 7.5 inches from the postarticular ridge, it makes a coronoid eminence, which is less elevated than that of lizards, but which rises more than that of crocodiles. From this onwards the border sinks at first in a rather steep curve, and then runs forwards nearly horizontally to the straight dentary part.

The lower border of the ramus sweeps downwards and forwards from the posterior extremity in a nearly uniform curve to about 6 inches behind the hindermost tooth, from which point onwards it is nearly straight. Six inches from the posterior extremity, and 4 inches behind the coronoid process, the curve is broken by a distinct angle.

The form of the toothed part may be roughly compared to a three-sided prism. The upper surface is nearly flat, and its inner border rises slightly higher than its outer border, which is pierced by the alveoli at short intervals. The inner surface is vertical. It is scored by furrows and striæ, which begin a little distance in front of the angle which the straight part makes with the curved part of the jaw, and which mark, I think, the beginning of the symphysial suture. The outer and under surface, much defaced, is transversely convex. Behind the straight dentary part, the ramus loses in thickness, and at about 6 inches from the last visible tooth it begins to gain in depth, while the inner and outer surfaces becoming parallel, the transverse section has here an oblong figure. From this backwards the depth of the ramus increases till it attains its maximum in the coronoid eminence, behind which it declines to the posterior extremity.

The large vacancy in the outer surface, between the angular, surangular, and dentary bone, present in all living crocodiles, and, as far as I can learn, in all extinct ones of the Tertiary period, is entirely absent from this Kimmeridge jaw, in which the component bones meet closely. For about 16 inches from the posterior extremity, the outer surface is nearly equally shared by the angular bone below, and an upper splint comprising, I suppose, the dentary and surangular, with a small portion of the articular bone. About $1\frac{1}{2}$ inch in front of the postarticular ridge, and therefore just at the front of the articular surface, on the upper border, there is a fissure filled with stone, which may be the suture between the articular and surangular bones; but I cannot trace any suture marking the respective shares of the surangular and dentary bones, unless a fissure running along the bottom of a groove which indents the surface of the jaw, parallel with its upper border, for 7 inches forwards from the coronoid eminence, be part of it, of which I feel very doubtful. This composite surangular and dentary splint, with the articular, forms the upper border and the greatest part of the posterior extremity of the ramus. From this latter to a short distance in front of the articulation, the natural surface of the bone has suffered from chipping, and is quite destroyed here; but it reappears in front of the articulation, and it exhibits, for about 12 inches, a fine longitudinal striation; the striæ spread from a point in the lower border of the splint, below the articulation, in a fan-

like manner, the lower ones coursing parallel to this border, while the upper lines radiate towards the coronoid process. The angular bone forms the lower half of the hindermost 16 inches of the ramus, and completes the posterior extremity. It composes the whole lower border of the ramus for about 25 inches, and it is also visible on the inner surface, below the articular bone, from which in this situation it is marked off by a suture, which, further forwards, a couple of inches in front of the salient anterior internal angle of the articular bone, becomes lost in the matrix. In the outer surface a conspicuous suture, nearly straight for the first 9 inches from the posterior extremity, and then curving downwards for the next 15 inches, separates the angular bone from the dentary and surangular bone above it. The anterior two-thirds of the angular bone are also longitudinally striated; and the uppermost striæ run out obliquely at the upper border of the bone, which helps to increase the distinctness of the suture between it and the surangular. On the inner side, the anterior internal angle of the articular bone projects strongly 3 inches above the lower border of the ramus, and nearly 6 inches from its posterior extremity; its anterior margin descends at first almost vertically, and then curves forwards to the suture with the angular bone. In front of this the inner surface is hidden for nearly 4 inches by large splints of bone lying athwart it, which are, I think, pieces of the upper jaw*; and for 6 inches in front of these it is much defaced; but beyond this, to the dental part, it is smooth, and channelled by a broad, shallow, longitudinal groove. The splenial bone is wanting.

The piece of the lower jaw lent me by J. C. Mansel, Esq., consists of 7 inches of the anterior extremity of the right half. The lower and upper lines meet in rather a blunt point. The outer surface, transversely convex, is beset with a few vascular foramina below the two first alveoli. The inner, vertical surface is scored with marks of the symphysial suture. The upper surface is horizontal and flat, rising slightly towards the inner border; its outer third is pierced by the openings of six sockets, from the four last of which fully grown teeth protrude. The sections which Mr. Mansel has most kindly allowed me to have made†, show clearly the loose implantation of the long tooth-fangs in capacious alveoli, which have a forward and outward inclination that gives a corresponding slant to the teeth. The alveolar apertures in the border of the dentary bone are quite distinct from one another. They are here separated from each other by very evident unbroken partitions, which, however, are less complete in the in-

* These splints have been further exposed since the above account was written; they are portions of both maxillæ crushed and retroverted, so that the front end overhangs the posterior extremity of the ramus of the lower jaw. The nasal bones are absent; but the groove into which they were received reaches forwards for a considerable distance on the upper and inner edge of the maxillary bones.

† For getting these sections made I am under great obligation to Mr. Etheridge.

terior of the jaw-bone, owing to the increasing dimensions of the tooth-roots towards the bottom of the alveoli.

Dimensions of Lower Jaw.

Right ramus.	inches.
Length from posterior extremity to the hindermost visible tooth	30
Length of articular surface measured from its ant. int. angle to the postarticular ridge	2·7
Length of postarticular surface	2·7
Distance of coronoid process from the postarticular ridge	7·5
Horizontal distance between coronoid process and angle	4
Distance of angle from posterior extremity of jaw	5
Depth of jaw at angle	4·5
„ at coronoid eminence	6
„ at articular surface	3·5

Teeth.—Of these several are *in situ*, some have fallen out of their sockets and lie scattered in the matrix, and others are loose. They vary much in size and in length, but they may very properly be called slender and tapering. They are slightly incurved, and curved slightly backwards. In the fully grown teeth, a long root or fang buried in the alveolus, a long, tapering, enamelled crown, and a relatively long intermediate neck without enamel are distinguishable.

The fang is subcylindrical. Some have a slight lateral compression, giving to their cross section an egg-shape—the smaller end turned backwards. They have a remarkably large, conical pulp-cavity, open below, and ascending through the neck a long distance into the crown. Their outer surface is finely striated longitudinally, and it is distinguished by its light brown colour and by its want of polish from the highly polished deep madder-brown crown. This latter is laterally compressed, unequally convex, the outer surface being less swollen than the inner; it is also two-edged, and the edges, which are back and front, are finely notched. In a strong light, the serrature is recognizable by the unaided eye, and it is always distinctly perceptible to the touch.

The posterior edge begins rather earlier than the anterior on the neck of the tooth; and the first two or three lines are unbroken. A shallow marginal depression of the outer surface runs parallel to the notched edges. The highly polished crown is overlaid with very fine, closely-set, longitudinal striæ just visible to the unaided eye in a good light, the striæ scarcely rising above the surface. On the more convex inner surface a few broader, widely set, parallel striæ are prolonged from the lower limit of the enamel for some distance upon the crown, but they do not reach its top. Some of the crowns are marked with faint annular indentations.

Succession of the Teeth.—The presence of the germ of an immature crown in the pulp-cavity of a fully-grown tooth, the occurrence

of an annular fragment of a former fang around the fang of an effective tooth in one of the alveoli, and the protrusion of a small immature tooth from a very wide alveolus demonstrate that, as regards the manner of succession of its teeth, this Kimmeridge crocodile agreed with those of our day.

Minute Structure of the Teeth.—This so agrees substantially with that of living crocodiles that any description of it is superfluous.

Vertebræ.—All the vertebræ which have as yet been brought into view are amphicoelian; both articular faces are moderately but decidedly hollow. The centrum is cylindrical. Its middle is constricted, laterally compressed, and overhung by the expanded articular ends, which have a nearly circular contour. In two of these vertebræ the posterior articular face has a rather longer vertical than transverse diameter, due, I think, to squeezing. The neurapophyses, laterally compressed and thin, are suturally attached to the upper surface of the centrum in nearly its whole length, reaching, however, nearer to the anterior than to the posterior margin. The suture descends slightly on the side of the centrum. The neural canal is indented by a median groove, deepest at its middle, as is common in some crocodiles.

One of the vertebræ, imbedded in the same mass of stone as the ramus of the lower jaw in the British Museum, has a costal facet on the anterior margin of the transverse process (diapophysis), near its root, and none on the centrum, which makes it correspond to the fifth or sixth thoracic vertebra of living crocodiles, from which, however, it differs in the absence of a hypapophysis, as well as in its hollow articular faces. Beyond this costal facet the process has been unfortunately broken off; its section is trihedral; but the right transverse process is 3·5 inches long. The posterior border of the neural spine, the only part of it visible, is ·5 inch thick, and 2·5 inches long, and it ends abruptly as if squarely truncated. The postzygapophyses are very mutilated, they project backwards from the neurapophysis, their lower ends nearly meeting in the level of the crown of the neural canal, and their upper ends diverging. Their surfaces look outwards and downwards. In another vertebral arch with the spine and transverse processes, which, from the great length of these latter, together with the absence of a costal facet from their anterior margin, I presume to be part of a posterior thoracic vertebra, the prezygapophyses project from the front of the neurapophyses just above the plane of the anterior margin of the diapophyses. The size and form of their surface are hidden; but their anterior margin is part of a very wide curve, and it has a more nearly upward direction than in the more anterior vertebra.

Measurements of vertebræ.	In British Museum.					No. 6. Do., lent me by Mr. Mansel.
	No. 1. In block with ramus of lower jaw.	No. 2. In same block.	No. 3. In block with symphysis of upper jaw.	No. 4. Arch with processes and spine, centrum wanting.	No. 5. In block with anterior extremity of lower jaw.	
	inches.	inches.	inches.	inches.	inches.	inches.
Height from lower border of centrum to end of neural spine... Centrum.	5·8					
Posterior articular face.						
Breadth	2·5		2·6			2·5
Height	2·6		2·6			2·9
Anterior articular face.						
Breadth					2·5	2·8
Height					3·1	2·8
Length	3·1		2·8		3·1	2·9
Transverse horizontal diameter midway between neurap. suture and inf. median line ...	1·6					
Neurapophysis.						
Length						
Thickness						
Diapophysis.						
Length	3·5					4·5
Breadth at root.....	2·1			2·3		
Thickness of ant. margin ...	0			3 to 4		
„ post. margin...	·9			·9 to 1		

Ribs.—Imbedded in the same blocks of stone with the vertebræ and jaws are fragments of several ribs. The longest of these, 12 inches long, lies across the outer surface of the lower jaw. For 10 inches it is cylindrical; and it has an average diameter of ·8 inch. Its distal end is flattened; the flatness may have been slightly increased by squeezing, as the texture of the bone shows here signs of crushing. Its vertebral end is forked, and some of the other fragments are also distinctly bifurcated; but in none are the actual articular surfaces preserved.

Limb-bones.—The only limb-bone which I can identify is a long bone, the distal half of which is seen lying across the lower jaw. Its proximal half has been exposed in the reverse side of another block, so that, very unfortunately, the entire bone cannot be viewed at once. The broken ends, however, fit accurately, and there cannot be the slightest doubt of the original continuity of the two pieces. This bone agrees more closely with the femur of the living crocodile than with the humerus of this latter; and on this ground I believe it to be the femur, the left one. In its present state it is 14 inches long. The proximal end is expanded transversely, and it measures 3 inches across. Its under surface bears a subhemi-

spherical articular head, below which is a slight swelling, which I take to be the traces of a crushed and worn trochanter. The shaft has been much squeezed. All the fractures show that the interior consists of cancellous tissue, which, in some situations, has a very open texture, without, however, there being strictly any medullary canal. The axis is very slightly twisted, much less, I think, than in existing crocodiles. The line of the anterior border of the shaft is convex, and that of the posterior border correspondingly hollow. The distal end is much damaged, but traces of one condyle are recognizable.

Dimensions of Femur.

	inches.
Length in its present mutilated state	14
Proximal end. Breadth	3
Transverse diameter of articular surface	2.1
Longitudinal diameter of ditto	1.6
Diameter of shaft at centre	2
" " near distal end	2

These diameters are from back to front; those from upper to under surface are less.

Conclusions.—The conclusions resulting from my examination of the fossil remains of this Kimmeridge Saurian are:—

I. That it is an amphiœlian Gavial-like crocodile.

II. That it is probably identical with Cuvier's 2nd Honfleur Gavial, "*tête à museau plus court*," to which Cuvier assigned vertebræ of his "*système convexe*;" *Steneosaurus rostro-minor* of Geoffroy Saint-Hilaire, 1825; *Metriorhynchus*, Von Meyer, 1830, who reversed Cuvier's disposal of the vertebræ, and gave those of the "*système concave*" to the short snout; *Steneosaurus*, Owen, 1841, who adopted Von Meyer's allotment of the vertebræ; *Streptospondylus*, Von Meyer, 1847, who returned to Cuvier's association of the opisthocœlous vertebræ with the "*tête à museau plus court*;" *Metriorhynchus*, Bronn, 1851.

III. That it is also identical with *Dakosaurus*, Quenstedt.

IV. That *Dakosaurus* is probably Cuvier's second Honfleur Gavial "*tête à museau plus court*."

I now proceed to establish these points *seriatim*:—

I. That this Kimmeridge Saurian is an amphiœlian Gavial-like crocodile is proved beyond doubt by its bifurcated (anterior) ribs, the long transverse processes of the posterior thoracic vertebræ, the sutural attachment of the neurapophysis to the centrum, the concavity of both articular faces of this latter, the nature of the attachment of the teeth and the manner of their succession, the restriction of the teeth to the symphyseal part of the jaw and a very small piece of the adjoining ramus, the relatively long symphyseal, and the single undivided terminal nostril.

II. It is probably identical with Cuvier's second Honfleur Gavial, "*tête à museau plus court*."

In order to make this clear I must first cite briefly those facts relating to the Honfleur Gavials which bear directly on this matter.

They are found in the 'Annales du Muséum d'Histoire Naturelle,' t. xii. article iv. pp. 88-101 (Paris, 1808), and in the 'Ossements Fossiles,' t. v. partie ii. article iv. p. 143 (5th ed., Paris, 1826).

In a collection of fossil bones from the neighbourhood of Honfleur, made by the Abbé Bachelet, and afterwards transferred to the Museum of Natural History, Paris, Cuvier recognized parts of the upper and lower jaws of two species of Gavials, differing from all recent and extinct ones then known, and also vertebræ of two kinds. The least-mutilated lower jaw comprised the entire dentary portion, with the greater part of both rami. The composite character of the jaw, its teeth, and the manner of their implantation and of their succession demonstrated the crocodilian nature of the fossil. In its long symphysis and in the restriction of the teeth to this part of the dentary bone, Cuvier saw resemblances to the Gavial; but he also perceived that the Honfleur Gavial differed from the Gangeitic in the relatively greater length of the ramus, in the smaller angle included by the rami at the symphysis, in the more regularly tapering form of the head, and in the absence of the oval hole present in the outer surface of all known living crocodiles. Cuvier does not give a very detailed account of the teeth; but he mentions that they are conical and striated, and have "deux arêtes tranchantes." (Figs. 1 & 2, pl. viii. Oss. Foss., are upper and side views of this lower jaw.)

To this lower jaw Cuvier confidently allotted the fragment of an upper jaw comprising the symphysis with part of both intermaxillaries containing three alveoli and forming the front of the external nostril. (Figs. 6 & 7, pl. viii., are upper and under views of this fossil.)

Cuvier's lower jaw wants the posterior extremities of the rami, while from the Kimmeridge jaw the middle of the dentary piece is absent. A comparison of its measurements with those of the Honfleur jaw given by Cuvier is therefore not possible; but in all the points in which a comparison can be instituted, the resemblance between the Kimmeridge and the Honfleur jaw is very close.

The Kimmeridge lower jaw, like the Honfleur (*tête à museau plus court*), has also a very long non-tooth-bearing ramus, which includes a larger angle with the straight tooth-bearing symphysis than does the living Gavial's; and this makes a sharper mandibular arch, indicative of a more uniformly tapering head, than the Gavial's. It also has not the oval hole in the outer surface which we find in all living crocodiles, and in all those, I think, of the Tertiary period. Its teeth, too, are conical, (very finely) striated, and they have "deux arêtes tranchantes."

Next, the likeness of Cuvier's upper view of the fragment of the maxilla of the "*tête à museau plus court*" (fig. 6, pl. viii. 'Ossements Foss.') to the corresponding view of the same part of the upper jaw of this Kimmeridge crocodilian is so striking that it is impossible not to recognize it.

This Honfleur fragment is very remarkable from the absence of bulging, and from the lateral compression of its terminal nostril.

The Kimmeridge snout has the same oval, laterally compressed terminal nostril in which the Honfleur "tête à museau plus court", differs from the Gangetic Gavials and the Teleosaurs; and taken by itself, I think its specific identity could scarcely be doubted by any one who compared it with Cuvier's figures 6, 7, pl. viii.; while if, when making the comparison, the strong resemblance of the lower jaw is borne in mind, the conviction that the individuals are specifically identical becomes irresistible.

That Cuvier rightly matched the jaws of his "tête à museau plus court" is now established by the conjunction of the jaws in this Kimmeridge fossil, which affords us another instance of the wonderful sagacity of this master in paleontology. The occurrence of amphicelous vertebræ, and one of these probably the 5th thoracic, together with these Kimmeridge jaws is important, because it removes all doubt which of Cuvier's vertebral systems belongs to the "tête à museau plus court," and makes it evident that it is the "système concave"*.

III. The Kimmeridge crocodilian is identical with *Dakosaurus* of Quenstedt.

Inasmuch as the genus *Dakosaurus* was founded on teeth only, it is with those that the comparison between it and our Kimmeridge Saurian must be made.

Quenstedt's description of the teeth of *Dakosaurus* in 'Der Jura,' Tübingen, 1858, p. 131, was drawn from six teeth in a piece of jaw, probably the lower, 1 foot long; they are two-edged, serrated, unequally convex, subincurved, subretrocurved and implanted. He adds that he had formerly † described these teeth under the provisional name of *Megalosaurus*; and he points out that they differ from genuine Megalosaurian teeth in the greater compression, coarser serrature, and more sickle-like curvature of the latter. Further, Quenstedt identifies with his *Dakosaurus* the large tooth which Prof. Plieninger described in the 'Württemberg. Jahresheft,' 1846, and represented in fig. 2, tab. 3. of this work under the name *Geosaurus maximus*, a name which Plieninger withdrew in 1849, on additional evidence that differentiated his Saurian from Sömmering's acrodont *Geosuar*‡.

Our Kimmeridge teeth agree in every essential particular with those of Plieninger's *Geosaurus maximus*, and with those of Quenstedt's *Dakosaurus*. Plieninger's figures (fig. 2, Taf. 3), which are

* For a précis of the various views which have been entertained by later writers I must refer to Pictet's 'Paléont.' and Brown's 'Lethæa.' In face of the positive facts that "des vertèbres de la deuxième espèce (i. e. système concave) étaient pétrées dans le même morceau que la grande mâchoire inférieure, ce qui pourrait aussi engager à croire qu'elles venoient du même individu" (Ann. du Mus. t. xii.), it is very remarkable that Cuvier should have allowed speculation to prevail, and have assigned to this jaw the "système convexe en avant."

† Cf. "Flötzgebirg. Württemb." p. 493 in Handb. der Petrefakt., tab. 8, fig. 4.

‡ Cf. Württemb. Jahresheft, p. 252, tab. i. f. 7, 1849-50.

much more carefully executed than Quenstedt's, might have been drawn from one of our crowns, so complete is the resemblance.

The teeth of the Kimmeridge Saurian, like those of *Dakosaurus*, are slightly incurved, slightly backward-curved, laterally compressed, and unequally convex. They have a serrated front and back cutting edge, and they are finely striated. They are stouter than the teeth of *Megalosaurus*; their curve is also less sickle-like; and the serrature of their trenchant ridges is less coarse than that of this Dinosaur.

But, because comparison with actual specimens is more satisfactory than that with descriptions, however close to nature these may be, I have compared our teeth with other Dakosaurian teeth in the British Museum, and I have found them to be specifically identical*.

IV. That *Dakosaurus* is probably the same as Cuvier's "deuxième Gavial de Honfleur, tête à museau plus court," follows as the necessary consequence of the II. and III. of these conclusions, because, if this Kimmeridge crocodilian is identical with each of these, they must be identical with each other.

If these conclusions be ultimately proved correct, I would propose to retain Geoffroy St.-Hilaire's original name *Steneosaurus rostrum minor*, to the exclusion of all given subsequently to his Memoir of 1825.

Note.—Since this paper was written, a further examination of the fossils presented to the British Museum has led to the discovery of a considerable part of the skull, with the complete snout, of this Kimmeridge crocodilian. I shall take an early opportunity of communicating a description of it to the Society.—J. W. H., Oct. 17, 1868.

EXPLANATION OF PLATES.

PLATE XVII.

- Fig. 1. Upper view of end of upper jaw of the Kimmeridge Gavial-like Crocodile, showing front half of subterminal nostril.
2. Side view of the same.
 3. Posterior view of the same.
 4. Outer view of right half of lower jaw of the same†. *a*, rib; *b*, part of the femur; *c*, part of the left half of the lower jaw, reversed. (This last I at first conjectured might be a crushed piece of the upper jaw.)

PLATE XVIII.

- Figs. 1 & 2. Side and front views of the neural arch and spine of a vertebra. *a*, prezygapophysis.
3. A trunk-vertebra, showing the anterior articular surface, the neural canal, and the long transverse process.
 4. Side view of an early dorsal vertebra. There is a costal facet on the anterior margin of the transverse process near its root.

* I greatly regret not to have had the advantage of seeing in print Mr. Mason Wood's paper on *Dakosaurus*, read in the early part of this session—the more so that, although present on the evening on which it was communicated to the Society, my mind being preoccupied by another subject, I did not give Mr. Wood's paper the attention it deserved.

† As the portions of this jaw entrusted to me by Mr. Mansel have been found to fit those in the British Museum, the jaw is shown in a single drawing after restoration.

Fig. 1 ($\frac{1}{2}$).

Fig. 2. ($\frac{1}{4}$)

Fig. 3 ($\frac{1}{2}$)

Fig. 4 ($\frac{1}{4}$)

Fig. 1. ($\frac{1}{2}$)

Fig. 2. ($\frac{1}{2}$)

Fig. 3. ($\frac{1}{2}$)

Fig. 4. ($\frac{1}{2}$)

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on July 2, 2012

E. Fielding lith.

M & N Hanhart imp

STENEOSAURUS FROM KIMMERIDGE.

DISCUSSION.

Mr. SEELEY remarked that in the base of the Oxford Clay, there was what he regarded as a peculiar form of *Dakosaurus*, with two serrated ridges close together on one side of the tooth, and one on the other. Vertebræ of similar character to those exhibited occurred in the Kimmeridge Clay at Ely, but the teeth were rarely perfect. The author's conclusions confirmed his own surmises.

4. *On the GEOLOGY of a PORTION of ABYSSINIA* *. By W. T. BLANFORD, Esq., F.G.S., Assoc. Roy. School of Mines, &c., late Geologist Abyssinian Expeditionary Force.

THE geology of Abyssinia has been more or less examined by several eminent French and German travellers—Rüppell†, Roth‡, D'Abbadie§, Rocher d'Héricourt ||, and especially Ferret and Galinier¶; but still there is very much left to be ascertained before the geological structure of the country can be said to be thoroughly known. The peculiar circumstances under which the late expedition was carried out limited the area of observation to the line of march from Annesley Bay to Mágdala; but along that line and, in some instances, in its immediate neighbourhood a very fair opportunity was afforded for judging of the general geological structure of the country, and of the relations of the most important rock-systems to each other. Roughly speaking, after passing the Posttertiary or late Tertiary volcanic rocks and alluvial deposits of the coast, the formations met with presented a regular ascending series as far as Mágdala, where the rocks belong to the highest group, with the exception of recent alluvial deposits, met with on the highlands.

After the departure of the expeditionary force, a few additional observations were made in Northern Abyssinia about Massowa, the Bogos country, and the Anseba valley.

The following are the formations which have been noticed in Abyssinia, in descending order:—

7. Recent.—Soils of the highlands. Alluvial deposits near the coast.
6. Posttertiary?—Aden series of volcanic rocks.
5. Tertiary? or Cretaceous?—Bedded traps, basaltic and trachytic. Mágdala group.
4. Cretaceous? or Jurassic?—Bedded traps, chiefly basaltic. Ashángi group.
3. Jurassic.—Antalo limestones.
2. Infrajurassic (Triassic?).—Adigrat sandstones.
1. ? ————— Metamorphic rocks.

It is unnecessary to dwell on the physical geography, which has been already amply treated by numerous able observers. It is sufficient to remark that the portion of Abyssinia traversed is the dividing ridge between the salt plain to the eastward and the Nile valley

* The present is an abstract of the observations made, which will be published at length elsewhere. † Mus. Senckenberg. i. 286, p. 12.

‡ Münchn. gel. Anz. 1844, &c. § Bull. de la Soc. Géol. vol. x. p. 121.

|| Bull. de la Soc. Géol. 1846, p. 541; Compt. Rend. vol. xii. p. 732.

¶ Voy. en Abyss. vol. iii.