VI.—ON THE STRATIGRAPHICAL DISTRIBUTION OF THE INFERIOR-OOLITE VERTEBRATES OF THE COTTESWOLD HILLS AND THE BATH-DOULTING DISTRICT.

By L. RICHARDSON, F.R.S.E., F.G.S.

VERTEBRATE-REMAINS are by no means abundant in the Inferior-Oolite rocks of the Cotteswold Hills and Bath-Doultling District. Mr. H. B. Woodward, F.R.S., has written—

“The Inferior Oolite Series has yielded a rich and varied Invertebrate fauna, but the remains of Saurians and Fishes are very rare.

“The Reptilia that have been found include *Megalosaurus* and *Steneosaurus*, and the Fishes are represented by *Hybodus*, *Strophodus*, etc.”

At the end of the work from which the above quotation is taken is a list of the vertebrate-remains which had been collected up to that year, namely, 1894.¹

In 1904 I gave a list of the vertebrate-remains which had been recorded from the Cheltenham district,² and, except for the record for vertebræ and bones of ? *Ichthyosaurus* from Leckhampton and Sudeley Hills (on the authority of James Buckman & H. E. Strickland, and the more precise stratigraphical location of certain of the other recorded remains), my list was the same as that given in the Geological Survey Memoir mentioned above.

The following list is by no means a lengthy one, but as it embodies the results of quite ten years' collecting on my own part, and considerably longer on Mr. Charles Upton's part, it will be at once understood that vertebrate-remains are by no means common in the Inferior-Oolite rocks.

LIST OF VERTEBRATE-REMAINS FROM THE INFERIOR-OOLITE OF THE COTTESWOLD HILLS AND BATH-DOULTING DISTRICT.

(Those distinguished by an asterisk are in the Author's collection.)

REPTILIA.

Dinosauria.

Megalosaurus Bucklandi, von Meyer. Lower Freestone (Hemera *Murchisonæ*). Aalenian.

CROCODILIA.

Steneosaurus megistorhynchus (Deslongchamps). “Fragment of maxillary rostrum, showing three dental alveoli.” “Gryphite-Grit” (*Sonniniæ*). Bajocian.

(Vide R. Lydekker, *Cat. Fossil Reptilia in the Brit. Mus.*, pt. i, 1888, p. 116.)

*? *Steneosaurus* sp. Reptilian jaw probably of *Steneosaurus*. *Witchellia*-Grit (*Witchellia*). Bajocian. Cold Comfort, near Cheltenham.

ICHTHYOPTERYGIA.

Ichthyosauria.

? *Ichthyosaurus* sp. Vertebræ, etc. ? Bajocian. Leckhampton and Sudeley Hills.

(Vide James Buckman & H. E. Strickland, 2nd ed. of *Murchison's Outline of the Geology of the Neighbourhood of Cheltenham*, p. 80.)

¹ “The Jurassic Rocks of Britain—The Lower Oolitic Rocks of England (Yorkshire excepted)” : *Mem. Geol. Surv.*, vol. iv (1894), pp. 519–22.

² *A Handbook of the Geology of Cheltenham* (1904), p. 230.

SAUROPTERYGIA.

Plesiosauria.

- *? *Plesiosaurus* sp. Tooth. Lower *Trigonia*-Grit (*discitæ*). Bajocian. Frith Quarry, near Stroud.

Professor S. H. Reynolds and Dr. C. W. Andrews both state that this tooth is "Plesiosaurian in type".

- *? *Plesiosaurus* sp. Two teeth. Top of Lower *Trigonia*-Grit or bottom of *Buckmani*-Grit (*discitæ*). Bajocian.

Professor S. H. Reynolds states that these teeth "are exactly like Plesiosaurian teeth in the British Museum"—an identification confirmed by Dr. C. W. Andrews.

A piece of bone 6 inches long was obtained from the Gryphite-Grit of the west side of the Slad Valley, Stroud, by Mr. C. Upton.

PISCES.

ELASMOBRANCHII.

Selachii.

Asteracanthus. See *Strophodus*.

Strophodus. General Note.—The teeth called *Strophodus* include two species: one in which the crown is flat (*S. magnus*, Ag.), and the other in which it is considerably elevated, and the tooth itself long and narrow (*S. tenuis*, Ag.). Satisfactory figures of these species will be found in the *Catalogue of the Fossil Fishes in the British Museum*, pt. i (1889), pl. xv, figs. 2, 3, and 4–8. The teeth which have been named *S. reticulatus* are now definitely known to belong to *Asteracanthus ornatissimus*, Ag., and are very differently ornamented and keeled.

S. magnus, Agassiz. Teeth. Aalenian, Bajocian, and Bathonian.

RECORDS: *Clypeus*-Grit or Doultling Beds. — *Harford Bridge (near Bourton-on-the-Water); *Birdlip Hill; *Slad Valley (near Stroud); *Rodborough Hill; *Soundborough Farm (near Andoversford); Quarry seven-eighths of a mile east of Paulton Church (near Radstock, Somerset); and *Doultling.

Upper *Trigonia*-Grit.—*Holwell (near Frome: "*Acanthothispis spinosa*-Bed"); and *Maes Knoll, Dundry (near Bristol: "Conglomerate-Bed").

Notgrove Freestone.—*Belas Knap, near Winchcombe.

Buckmani-Grit.—*Tuffley's Quarry, near the Air-Balloon Inn, between Cheltenham and Birdlip.

Base of Pea-Grit or top of Lower Limestone.—*Huddingknoll Hill, near Painswick.

S. tenuis, Agassiz. Teeth. Bajocian and Bathonian.

RECORDS: *Clypeus*-Grit or Doultling Beds. — *Doultling; *Foss-Way Quarry, near Radstock.

Upper *Trigonia*-Grit.—*Wellow, near Radstock ("Conglomerate-Bed").

Gryphite-Grit.—*Kimsbury Castle (teste C. Upton).

HOLOCEPHALI.

Myriacanthus sp. Fragments of palatine teeth. Identified by Dr. A. Smith Woodward. Inferior-Oolite. Cleeve Hill, near Cheltenham.

Remains of this genus of Chimæroid fish have not been recorded before from the Middle Jurassic: only from the Lias and Kimmeridgian (vide Dr. A. Smith Woodward, Quart. Journ. Geol. Soc., vol. lxii, 1906, pp. 1–4, and pl. i; Brit. Mus. Cat. Fossil Fishes, pt. ii, 1891, p. 43). Unfortunately the fragments from Cleeve Hill were not found *in situ*.

? *Fish-teeth*.—Mr. Charles Upton found amongst the micro-organisms of the Upper Coral-Bed (*Truellei-hemera*) a number of minute teeth not unlike those from the Rhætic which are generally called "*Saurichthys acuminatus*", only much smaller. Also he obtained a minute round *Lepidotus*-like tooth.

? *Fish-remains in the Scissum-Beds*.—Brodie, writing of the beds at Leckhampton Hill (Quart. Journ. Geol. Soc., vol. vii, 1851, pp. 208-12), which are now called the *Scissum-Beds*, observes: "Bones, scales, Coprolites and teeth of Fish are dispersed throughout the mass, and may be most readily distinguished on the surface." At Crickley Hill the *Scissum-Beds* reveal on their weathered surfaces, mixed up with the sand-grains and shell-debris, innumerable black particles, which prove to be minute phosphatic bodies. These may be the objects to which Brodie refers, but it is impossible to identify them.

THE INFERIOR-OOLITE VERTEBRATES OF NO VALUE FOR THE PURPOSES OF MINUTE ZONING.

From the above list it will be observed that the fish-teeth called *Strophodus* are commonest in the Top-Beds (and especially in the *Clypeus-Grit*); the Reptilian remains in the "Intervening-Beds"; while the Freestone Series (except at Huddingknoll, near Painswick, where *Strophodus* teeth are very common) contains very few vertebrate-remains indeed. The Upper Coral-Bed has yielded a few, but unfortunately indeterminate, teeth, although probably piscine.

Except, then, that the flat *Strophodus* teeth predominate in the Top-Beds, the little acuminate ? fish-teeth in the Upper Coral-Bed, and the reptilian remains in the Intervening-Beds, the Inferior-Oolite vertebrates afford little assistance in subdividing the series and are useless for minute zoning purposes.

VII.—NOTE ON A FURTHER EXTENSION OF THE 'TRANSITION-BED' AND CRINOIDAL LIMESTONE BAND IN THE MIDDLE LIAS OF LEICESTERSHIRE.

By A. R. HORWOOD, Leicester Museum.

ALLUSION has been made in a previous paper¹ to the crinoidal limestone band and Transition-bed at Billesdon Coplow, and to the existence of the former at Tilton Hill near Lowesby Station. At the latter place, though the Transition-bed is not exposed in situ, the position of the crinoidal limestone bed (after making full allowance for Drift deposits), is low enough, with beds normally horizontal or with a slight easterly dip, to adduce without any doubt the extension of the Transition-bed above it at this point. Thus the crinoidal limestone band had been traced at three points—Tilton (*vide* Wilson, *ibid.*),² Billesdon Coplow, Tilton Hill—in the southern portion of the exposed area of the Rock-bed in Leicestershire, up to the time when the second paper, contributed by the author dealing with this bed in Leicestershire, was written. That is to say, it had only been found in the southern series of bold escarpments or spurs into which the district is divided. For the Twyford brook, running more or less west and east, divides the two series to which reference is directly made into a northern and a southern series, or if we include the Belvoir, Stathern, Eastwell, Holwell, and Waltham tract still more to the north, into three, with a central tract north of the Twyford brook.

¹ Geol. Mag., 1910, p. 177; 1907, p. 462.

² Op. cit., 1886, p. 296 et seqq.