

ground is but little above the level of the river and at the foot of slight slope down from the jail. The beds seemed to me to be blue clay with traces of rootlets, with the upper surface decomposed to a bright yellow and 5 to 6 feet thick. In places the Coal-measure rocks showed beneath the clay. The Hippopotamus remains, Mr. Denny said, were found deeper down (10 to 12 feet) in a more sludgy and peaty matter. They were solid and dark-coloured and entire. The elephant and ox remains were rather higher up, more broken and worn. . . . The remains of the Hippopotamus are the finest I have seen: there is nearly an entire skeleton.

[See H. Denny, Proc. Geol. and Polyt. Soc., W. Riding, for 1853, 1854, p. 325; and T. P. Teale, Rep. Brit. Assoc. for 1858, Sections, p. 111.]

March 4, 1859.—Newcastle. Approaching Shields the Boulder-clay seems to become thinner. It is in fact deposited on a lower [level], for at Jarrow dock it passes under¹ the bed of the river and is overlaid by 50 feet + of silt, the upper part of which contains thin seams of gravel, and the whole of which abounds in perfect and double estuarine shells such as now inhabit the river; also with traces of wood and a few trunks of trees, and hard lumpy nodules of grey angular limestone enclosing recent shells and beautiful impressions of recent leaves, looking altogether more like nodules and fossils of far older date. Pieces of branches of trees are also found fossilized, more or less in the centre. In one specimen of birch stem the outer bark or peel alone remains unaltered, the inner bark was quite petrified and seemed to possess structure. Crystals of Gay-Lussite [hydrated carbonate of lime and soda] occur commonly in the centre of the nodules.² Altogether it is a very curious and interesting recent deposit.

Bones and entire skeletons of the red deer have been found at the base of the deposit near its edge and on top of the Boulder-clay. The nodules are found low down in the silt and up to within 5 feet of surface. Mr. Howse thinks the chemical works may have had something to do with them. He said some of the blocks were as large as a large stool.

[See also Richard Howse, Trans. Tyneside Nat. Field Club, vol. v, pp. 117, 118, and Trans. N. Eng. Inst. Engineers, vol. xiii, p. 169.]

NOTICES OF MEMOIRS.

THE PELICAN AS AN INDIGENOUS BRITISH BIRD. ON SOME BONES OF A PELICAN FROM THE CAMBRIDGESHIRE FENS.³ By SIDNEY F. HARMER, M.A., B.Sc.

IN February, 1897, some bones from the Fens were brought to the University Museum of Zoology at Cambridge. Most of these specimens belonged to the Beaver, Pig, Swan, Goose, and

¹ In a later note the writer says: "It seemed to me almost to pass under it."

² [A mineral described under the name of 'Jarrowite' by E. J. J. Browell was obtained from Jarrow Slake. It consists of carbonate of lime with nearly 4 per cent. of carbonate of magnesia.—Trans. Tyneside Nat. Field Club, vol. v, p. 103.]

³ Reprinted from the Transactions of the Norfolk and Norwich Naturalists' Society, vol. vi (1897).

Pike; but three of them proved, on examination, to have belonged to a Pelican, a bird which has been recorded on two previous occasions from the same part of the country.

The first account was given by Professor Newton (Proc. Zool. Soc., 1868, p. 2), and refers to a left humerus, in the Woodwardian Museum at Cambridge. This specimen was described by Professor Alphonse Milne Edwards in the *Annales des Sciences Naturelles* (5^e sér., Zool., vol. viii, 1867, p. 285); and a translation of this paper appeared in *The Ibis* (n.s., vol. iv, 1868, p. 363). Milne Edwards described in detail the characters by which the humerus of a Pelican can be distinguished, the great size of the bone being alone an almost certain indication of the genus. He further pointed out that the ossification of the specimen submitted to him was incomplete at the articular extremities; and that the bird was therefore a young one, which was probably native to the Fens, and not an accidental immigrant.

A second left humerus from Feltwell Fen, in Norfolk, was presented in 1871 to the University Museum of Zoology by Mr. J. H. Gurney, jun., to whom it was given by Mr. John Baker, the well-known Cambridge birdstuffer. In exhibiting it to the Zoological Society, Professor Newton called attention (Proc. Zool. Soc., 1871, p. 702) to its correspondence in size with the humerus of a recent specimen believed to belong to *Pelecanus crispus*.

The bones which have recently been acquired by the University Museum of Zoology were found at Littleport, near Ely. They were formerly in the possession of James L. Luddington, Esq., who has been kind enough to inform me that they were found on his farm in Burnt Fen, Littleport, some seven or eight years ago. They consist of the lower end of a humerus and the upper ends of a radius and ulna, all of the left side, and appearing to belong to the same individual. The conclusion that these are the associated bones of a single specimen is quite in accordance with previous experience of the way in which the bones of various animals are found in the peat of the Fens.

The humerus of the Littleport specimen agrees closely with the Feltwell bone, and the three Littleport bones have the closest resemblance, in form and size, to the corresponding bones of the recent *P. crispus*, to which reference has already been made. The ulna is, however, abnormal at a distance of 11 or 12 cm. from its upper or proximal end, and it has the appearance of having been broken, although the fracture was repaired during the life of the bird. The part of the ulna which is preserved measures only 15 cm., so that the whole of the injured region of the bone is not visible. The resemblance, in other respects, between the Littleport bones and those of the recent *P. crispus* certainly lends support to the view hinted at by Professor Newton in 1871, and repeated on page 703 of his "Dictionary of Birds" (part iii, 1894), that the Fen specimens belonged to that species.

It is worthy of remark that a left humerus has been found on each of the three occasions on which the remains of a Pelican have

been recorded from the Fens. The evidence thus afforded of the occurrence of three individuals goes far in support of the view that the Pelican was really native to this part of England.

R E V I E W S.

I.—WACHSMUTH AND SPRINGER'S MONOGRAPH ON CRINOIDS.¹

THIRD NOTICE.

THE fundamental plates in a crinoid cup are the five *radialia*. Oddly enough they are the last of the calycal plates to appear in the development of *Antedon*, and yet they are the very elements in whose constancy and regularity lies the difference between the Crinoidea and their Cystidean ancestors. Intimately correlated as they are with those characteristic crinoid structures, the *brachia* or arms, they are the sole permanent elements of the cup. Other parts may be added to or taken away from, but the radialia, or 'radials' *par excellence*, always remain.

The radials, I have said, are five; that is, one in each ray. In old days other plates that happened in some genera to be incorporated in the cup along the lines of the radii were called radials; but such plates are now understood to have been primitively arm-ossicles, and are therefore known as fixed brachials. The recognition of these facts, due to Wachsmuth & Springer and P. H. Carpenter, has enormously simplified the task of description, and has for ever closed the wearisome discussions as to where the arms began in the various genera.

It must not, however, be supposed that the facts are quite so simple as might appear from the above statement. As our authors express it: "In the earlier Inadunata and Articulata—not in the Camerata so far as observed—the radials are frequently compound, i.e. constructed of two segments or parts, which are closely united by a horizontal suture, and in the organization of the Crinoid count as one plate." For the two halves of such a compound radial Wachsmuth and Springer adopt the terms *superradial* and *infer-radial*, proposed by me in January, 1892. The latter term is certainly superior to 'sub-radial,' used by Jaekel in 1895 for the same element, since not only does sub-radial mean a plate below the radial, but it was actually applied to such plates, viz., the basals, for many years by some authors.

The mutual relations of inferradials and radials, and the varying number of compound radials in the several genera of Inadunate Crinoids, lead our authors, by steps which I do not follow, to the conclusion "that there was a time in the early history of the Crinoids when the arm-bearing section [the superradial] was altogether unrepresented. This was apparently the case in

¹ The North American Crinoidea Camerata. By C. Wachsmuth and F. Springer. Mem. Mus. Comp. Zool. Harvard, vols. xx and xxi, containing 838 pp. and 83 plates. (Cambridge, U.S.A., May, 1897.) For First and Second Notices, see June and July Numbers.