

a surface of four square inches, and the webs of all the feet together about twelve square inches. As the extremities of the toes have dilated discs for adhesion, showing the creature to be a true tree-frog, it is difficult to imagine that this immense membrane of the toes can be for the purpose of swimming only, and the account of the Chinaman that it flew down from the tree becomes more credible."

The great group of Frogs and Toads, rich as it is in genera and species, and widely as it is diffused over the earth's surface, is one of singular uniformity of structure. The forms most aberrant from our type, the common frog, have now been noticed, except that perhaps the maximum respectively of obesity and slenderness may be referred to. In the former respect the Indian Toad *Glyphoglossus* may serve as an example, and for the latter may be selected *Hylorana jerboa*.

ST. GEORGE MIVART

(To be continued.)

A FOSSIL SIRENIAN FROM THE RED CRAG OF SUFFOLK

AT the opening meeting of the Geological Society, Prof. Flower communicated a description of a fine fragment of a skull of an animal of the order *Sirenia*, which is of great interest as affording the first recorded evidence of the former existence of animals of this remarkable group in Britain. The specimen forms part of the very rich collection of Crag fossils formed by the Rev. H. Canham, of Waldringfield, near Woodbridge. It was found in the so-called "coprolite" or bone-bed at the base of the Red Crag, and presents the usual aspect of the mammalian remains from that bed, being heavily mineralised, of a rich dark brown colour, almost black in some parts, with the surface much worn and polished, and marked here and there with the characteristic round or oval shallow pits, the supposed *Pholas* boring.

The fragment consists of the anterior or facial portion of the cranium which has separated, probably before fossilisation, from the posterior part at the fronto-parietal suture, and in a line descending vertically therefrom. This portion has then been subjected to severe attrition, by which the greater part of the pre-maxillary rostrum, the orbital processes of the maxillaries, and other projecting parts have been removed. In consequence of this, what may be called the external features of the skull, which are especially necessary to determine its closer affinities, are greatly marred, though enough remains of its essential structure to pronounce with confidence as to its general relationship to known forms. Fortunately, the whole of the portion of the maxillæ in which the molar series of teeth are implanted is preserved; and though the teeth have fallen from the alveoli in the front part of the series, and in the posterior part are ground down to mere stumps, so that the form of the crowns cannot be ascertained in any, many important dental characters may still be deduced from the number, form, size and position of the sockets and roots that remain.

As the intensely hard, ivory-like rostra of the ziphioid Cetaceans, the tympanic bones of the Balænidæ, and the teeth of terrestrial mammals almost alone remain in these deposits to attest the former existence of their owners; it is, doubtless, to the extreme massiveness and density of the cranial bones, as characteristic of the order *Sirenia*, that we owe the preservation of so large a portion of the skull under the very unfavourable conditions to which it, in common with the other fossils of the formation, must have been exposed.

After a comparison of the characters of the cranium with those of the several existing and extinct members of the order, Prof. Flower referred it to the genus *Halitherium*, and showed its relationship to *H. Schinzi* of Kaup from

the miocene of the Rhine basin, a formation, it will be remembered, in which several of the animals of the Red Crag bone-bed occur. It is, however, of larger size than that species, the teeth are larger, both absolutely and relatively to the cranium, and certain other differences occur, though the imperfect nature of the materials makes exact comparison of fossils only known from fragments not altogether easy or satisfactory. Believing, however, that it does not belong to either the above-mentioned, or any other of the hitherto described species of *Halitherium*, the specific name of *H. canhami* was proposed. It should be mentioned that there are six teeth in the maxillary or molar series on each side, all present at the same time, the first two with single roots, the third with two roots, and the last three with three roots, precisely resembling in form those of the molar teeth in the existing Manati.

ON THE STICK-FISH (*Osteocella septentrionalis*) AND ON THE HABITS OF SEA-PENS

MR. COOTE M. CHAMBERS has most kindly presented to the British Museum a specimen of the Stick-fish, from English Bay, Burrard's Inlet, British America. The specimen was placed alive, immediately it was caught, into a tin tube, filled with a solution of arsenic and salt.

Mr. Chambers observes that the Stick-fish are only to be found in Burrard's Inlet, English Bay, British Columbia. "It has only one bone in it, and appears to live on suction, and is a great prey to dogfish." Further: "I would mention that in summer only can they be caught. They are found to the least depth of from 30 to 40 fathoms, they move about rapidly in the water, and when brought to the surface, move for a few seconds like a snake, then make a dart as swift as lightning, and disappear."—July 23, 1873.

Unfortunately the specimen did not arrive in a good state for exhibition. The greater part of the animal portion had been washed off, probably by the motion of the solution during the transit; only about a foot of the flesh, which was loose on the axis, and the thick, swollen, naked, club-shaped base without polypes remained; but it was in a sufficiently good state to afford the means of determining its zoological situation and of examining its microscopical and other zoological characters.

Mr. Chambers' specimen is the animal of the axis, or stick, that I described as *Osteocella septentrionalis* (Ann. and Mag. Nat. Hist. 1872, ix. p. 406), and it proves that the axis belongs to a kind of *Pennatula*, or Sea-pen, nearly allied to the long Sea-rushes named *Pavonarius quadrangularis*, found on the West Coast of Scotland, and is evidently the same animal as *Pavonaria blakei*, described by R. E. C. Stearns. The idea of its being a fish, which seems so generally entertained by the people of British Columbia, is clearly a mistake, though one of the observers sent a figure of the Sea-pen, with mouth and eyes like an eel (!), which is copied in NATURE, vol. vi. p. 436.

Osteocella.—The complete polype-mass very closely resembles *Pavonaria quadrangularis*, as figured by Johnston ("British Zoophytes," t. xxxi.), from Prof. Edward Forbes' drawings; but the animal is entirely destitute of calcareous spicules, and the axis is cylindrical, hard, and polished.

Two days after I received this specimen, I received by post Mr. Stearn's description of the Stick-fish (*Pavonaria Blakei*), from the San Francisco *Mining and Scientific Press*, August 9, 1873.

The description of Mr. Stearn, made from a fresh animal, need not be repeated; but as he does not mention the microscopic structure, I sent a fragment of Mr. Chambers' specimen to Mr. Carter to be examined, who kindly writes:—"The fragment arrived safely, although

the Post-office tried to crush the box to the thickness of silver-paper. The bit contains no spicules, nothing but a mass of contorted tubes filled with small nuclei like ova. "The nuclei are about 1-600th of an inch in diameter, and I suppose they are in tubes. The part you sent was boiled in *Liquor potassæ*; that is how the structure alone came out, but there were no spicules in it, examined in this way or in water alone, but many fat globules, and a few sheaf-shaped calcareous concretions, common in all preparations of animal matter."—September 5, 1873.

The habits of *Pennatulidæ* are very imperfectly known and not at all understood. Dr. Johnston observes in the "British Zoophytes," vol. i. p. 160, that the fishermen believe that the common Sea Pens, which they call Coxcombs, "are fixed to the bottom with their ends immersed in the mud." The *Virgularia mirabilis* are believed by the fishermen to have one end erect in the mud, and *Pavonaria quadrangularis*, according to Profesor Forbes, "lives erect, its lower extremity, as it were, rooted in the slimy mud at a depth of from twelve to fifteen fathoms." Mr. Darwin, who observed a species on the coast of Patagonia, which he called *Virgularia patagonica*, says: "At low water hundreds of these zoophytes may be seen projecting like stubble, with the truncate end upwards a few inches above the surface of the muddy sand. When touched or pulled they suddenly drew themselves in with force so as nearly or quite to disappear. By this action the highly elastic axis must be bent at the lower extremity, where it is naturally slightly curved, and I imagine it is by this elasticity alone that the zoophyte is enabled to rise again through the mud."

Bohadsch, as quoted by Johnston, says that the *Pennatulæ* swim by means of their *pinnae*, which they use in the same manner that fishes do their fins. Ellis says: "It is an animal that swims freely about in the sea, many of them having a muscular motion as they swim along." And in another place he tells us, that "these motions are effected by means of the pinnules or feather-like fins, these are evidently designed by nature to move the animal backwards and forwards in the sea, consequently to do the office of fins." Mr. Clifton describes the Australian species as swimming rapidly in shallow water; and the American naturalists all seem to agree that the Stick Fish, *Osteocella septentrionalis* of Burrard Inlet, which has only a slight crest of polyps, and not *pinnae*, or fins, as Ellis calls them, swims about like a fish, and is eaten by the dog-fish.

There seems to be no doubt that the Sea-Pens and Sea-Rushes do live in groups together, erect, and sunk in the mud, and that they are sometimes found swimming free in the sea, but the question is, are the free specimens those that have been disturbed by the waves and currents, and do they afterwards affix themselves in the mud, or are they vagrant specimens that live for a time and then die or are eaten by fish, their struggling being mistaken for swimming? Dr. Johnston observes, that when the Sea-Pens are placed in a basin or plate of water, he never observed a change of position, but they remain in the same place and lie with the same side up or down just as they have been put in. That is my own experience even when they are placed in a deeper vessel, but this may arise from the animal having lost part of its vitality before it was taken.

It may be useful to give the synonyma of these animals. *Osteocella*, Gray, Cat. Pennatulidæ, 1870, p. 40. Ann. and Mag. Nat. Hist. 1872, ix. p. 405.

Pavonaria, sp. Stearns, *Mining and Scientific Press*. San Francisco, Aug. 9, 1873.

Verrillia, Stearns, Californian Acad. Sci., Aug. 18, 1873. 1. *Osteocella cliftoni*, Gray, Cat. Pennatulidæ, 1870, p. 40; Ann. and Mag. Nat. Hist. 1872, ix. p. 406.

Hab., Western Australia (G. Clifton, Esq.), B.M.

2. *Osteocella septentrionalis*, Gray, Ann. and Mag. Nat. Hist. 1873, ix. p. 406 (style only).

"New Marine Animal," Sclater, Brit. Assoc., Aug. 20

1872; NATURE, vol. vi. p. 436 (with figure of fish, of which it is said to be the notochord).

"Axis of Pennatulid," H. N. Moseley, NATURE, Sept. 26, 1872, vol. vi. p. 432.

"Pennatulid," Dawson, NATURE, Oct. 24, 1872, vol. vi. p. 516; Whiteaves, Nat. Hist. Soc. Montreal, 1872.

"New Alcyonoid," Stearns, Proc. Cal. Acad. Sci., Feb. 1873, v. part 1, p. 7.

Pavonaria blakei, Stearns, *Mining and Scientific Press*, San Francisco, Aug. 9, 1873.

Verrillia blakei, Stearns, Proc. Acad. Cal. Acad. Sci., Aug. 18, 1873.

Hab., Gulf of Georgia, Barraud's Creek, near New Westminster, Washington Territory: Herd, Claudet, Doane, Stearns, Chambers. Fraser's River: Dick and Nelson. B.M.

Mr. Stearns's paper in the Proceedings of the Californian Academy of Sciences is a reprint of the paper in the San Francisco *Mining and Scientific Press*, with a few additions, and the addition of a new sub-genus, *Verrillia*, although he quotes *Osteocella*.

Since I have seen the proof of this paper, the Hon. Justice Crease has informed me that he has forwarded to me a series of the animals of *Osteocella*, and also an account of the animal from an examination of fresh examples by Dr. Moss; the latter has arrived, and I communicated it on September 25 to the Zoological Society; it is illustrated by figures. J. E. GRAY

THE RELATION OF MAN TO THE ICE-SHEET IN THE NORTH OF ENGLAND

IN the interesting review of Sir Charles Lyell's "Antiquity of Man," communicated to NATURE of Oct. 2, Mr. A. R. Wallace mentions the fact that "there is as yet no clear evidence that man lived in Europe before the Glacial Epoch, and even if he did so, the action of the ice-sheet would probably have obliterated all records of his existence." The fact was true when it appeared, but both the fact and the remark which follows it, may now have to undergo considerable modification. The Committee for the Exploration of the Victoria Cave, near Settle, Yorkshire, assisted by a grant from the British Association, have just made a discovery which may prove to be of the greatest importance not only to the geologists of Europe, but to all those who take an interest in the origin and early history of man.

In May 1872 the Committee were exploring a bone bed in the cave, which occurred at a considerable depth beneath other deposits. It was full of hyæna-dung, broken bones, and teeth. A quantity of these were sent to Mr. Busk for determination, and he kindly returned the following list:—

<i>Elephas primigenius</i>	<i>Rhinoceros tickorinus</i>
<i>Ursus spelæus</i>	<i>Bison</i>
<i>Ursus prisæus</i>	<i>Cervus elaphus</i>
<i>Hyæna spelæa</i>	

These are well known to represent the fauna of the river gravels in the south of England. Among them was a bone which puzzled even Mr. Busk, and he has only now given his mature and definite opinion on the subject. He writes: "The bone is, I have now no doubt, human; a portion of an unusually clumsy fibula, and in that respect not unlike the same bone in the Mentone skeleton." When Mr. Busk has taken some time to consider the question there are few scientific men who will dispute his verdict. The occurrence of the bones of man with this group of animals is a new fact for this part of the kingdom, but one that might be expected from a similar co-existence in the south of England, in Kent's Cavern, Wookey Hole, and elsewhere.

But at Settle this discovery possesses a far greater