LIV.—*Notes on Deep-sea Dredging.* By Edw. Perceval Wright, M.D., F.L.S., Professor of Zoology, Trinity College, Dublin.

Professor Edward Forbes refers, in his 'History of the European Seas,' to "an abyss where life is either extinguished or exhibits but a few sparks to mark its lingering presence." "Its confines," he writes, "are yet undetermined, and it is in its exploration that the finest field for marine discovery yet remains." One sees here, as it were, the hope of some just possible brilliant discovery contending in the author's mind with a dark despair at finding anything beyond a mere spark of life in the great ocean depths, in the so-called azoic regions. Had the amiable author lived even until now, he would have known that many sparks of life are to be met with at depths undreamt of by him, and that the creatures which reside there are not so very much modified as he seemed to anticipate.

The researches of Dr. Wallich, and the publication of the first part of his work on the North-Atlantic sea-bed, have thrown a great deal of light on this subject; a considerable number of deep-sea soundings are recorded or alluded to by him in his interesting volume. But, however valuable they may be, as affording us some slight knowledge of the formation of the sea-bottom at great depths, yet they have not given, nor are they likely to give us any indications of the animals, higher than the Rhizopods, living at these depths: I purposely pass over the occurrence of *Ophiocoma nigra*, O. F. Müll., as recorded by Wallich, as the bringing up of this species from the depth of 1260 fathoms was the result of accident. To afford us any certain knowledge of higher forms, recourse must be had, not to the sounding-line, but to the dredge; and even with it, it will only be after many a tedious and careful exploration that we can expect to arrive at any satisfactory results. It should not be forgotten how very small a surface is scraped by even the largest dredge; and as the deep-sea valleys lie at a considerable distance from the land, the examination of them, except with the assistance of a steamer, is only possible under very favourable circumstances.

In the third or coralline zone of Professor Forbes, though animal life is abundant, yet plants become scarce; and in the fourth or deep coral zone, and at a depth of about 100 fathoms, the only vegetation met with consists of the lowly Nullipores. This latter zone, however, reaches to a depth that I am inclined to place in our seas at about 150 fathoms, increasing another hundred fathoms at the Equator; and it is only below it that we come to a zone of which Professor Forbes knew

nothing—a zone commencing at 300-fathoms mark down to a depth at present quite unknown—a zone in which we now find a very peculiar fauna—one into which some of the fourth-zone animals may wander, but which is still wonderfully well characterized by its own corals and echinoderms, its vitreous sponges, and even its own peculiar fishes. Up to the present I know of no published account of dredging in this zone, except the very interesting paper of Mr. L. F. de Pourtales, Assistant to the United States Coast Survey (for a copy of which I am indebted to the author). The field selected for the researches of Capt. Platt, of the Coast-Survey steamer 'Corwin,' was in a section between Key West and Havana, and the casts of the dredge were made at depths of 270 and 350 fathoms. At these depths many species of Echinoderms, Cœlenterates, and Sponges were met with; and, most interesting fact of all, not only were the long spicules of *Hyalonema* dredged up, but there was also found a fragment of the siliceous skeleton of a sponge, forming a regular network, somewhat like that of *Euplectella*, but lacking the spines. Mr. Pourtales alludes also to a number of sponges (at least a dozen species) which are not yet determined, and says that some of the detached spicules are remarkable for their great size, one of the slender rectangulated sexradiate type of Bowerbank [and doubtless belonging to a sponge of Wyville Thomson's order Vitrea] was found measuring more than half an inch.

We may hope for more information when Professor Wyville Thomson and Dr. Carpenter publish an account of their expedition to the deep-sea valleys off the west coast of Scotland, and when the results of the fourth Swedish expedition shall be known. In the meanwhile I venture to give the following brief notes of a deep-sea dredging-expedition off the Portuguese coast near Setubal.

I had been asked by the Council of the Royal Irish Academy to draw up a report on the present state of our knowledge of that strange organism *Hyalonema mirabile* of Gray, and was naturally anxious to procure living or well preserved specimens of this species.

Professor J. V. Barboza du Bocage, of Lisbon, kindly invited me to pay him a visit at the season for the shark-fishing (in September), promising to place all the specimens of the *Hyalonema* in the museum at Lisbon at my disposal, and to give me every assistance in his power to enable me to go out to the ground where the specimens of *Hyalonema lusitanicum*, Bocage, had been found. Accordingly, after the meeting of the British Association * in August last, at Norwich, I pro-

* A committee was appointed by the British Association, with the

ceeded by Madrid to Lisbon. Having spent some time in examining the very beautiful series of specimens of *Hyalonema* which the energy and zeal of Professor Bocage have collected in the excellent Royal Museum of Lisbon, I went on to Setubal. I had brought out with me a medium-sized naturalist's dredge, for which, I may remark, I had to pay duty while passing through Spain. It is not necessary here to allude to the difficulty of procuring a boat to bring me to the ground, which lies about thirty miles to the south-west of Setubal, which latter is a fishing-village now connected with Lisbon by rail; suffice it to say that, by the kind assistance of Professor Bocage, and of the Deputy Inspector of Fisheries at Setubal, I was at last enabled to procure an open sail-boat and a crew of eight men: we also took on board about 600 fathoms of rope, the dredge, lots of hooks and bait, and provisions for a couple of days. Leaving the port of Setubal a little before 5 o'clock in the evening, we, after a fair night's sailing, reached what the fishermen signed to me to be the edge of the deep-sea valley, where they were in the habit of fishing for sharks, and where, while thus engaged, they had found the *Hyalonema*. It was now about 5 o'clock in the morning; and the men, having had their breakfast, put the boat up to the wind, and let down the dredge; before it reached the bottom, about 480 fathoms of rope was run out, some 30 more was allowed for slack, and then we gently drew it (by hoisting a small foresail) for the distance of about a mile along the bottom. It required the united efforts of six men, hauling the line hand over hand, with the assistance of a double-pulley block to pull in the dredge; and the time this occupied was just an hour. The dredge was nearly full of a tenacious yellowish mud, through which sparkled innumerable long spicules of the *Hyalonema*; indeed, if you drew your fingers slowly through the mud, you would thereby gather a handful of these spicules. One specimen of *Hyalonema*, with the long spicules inserted into the mud, and crowned with its expanded sponge-like portion, rewarded my first attempt at dredging at such a depth. As I purpose presenting to the Academy (as a portion of my report on *Hyalonema*) a detailed account of this

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sum of £20 at their disposal, to assist me in this matter, and I had intended applying the money to one day's hire of a steam-tug; but the General Committee having passed a resolution having for its object to make all the specimens of natural history collected by means of its grants the property of the Association, to be disposed of as they should direct, and as I wanted the specimens that I might collect to dissect and cut up for the benefit of science, I thought it better respectfully to refuse the grant, and to decline to serve on the committee.—E. P. W.

and other specimens, I only allude to the discovery of this species here as adding a species to the fauna of the deep-sea zone.

I understood from the men that they had discovered most of the specimens of *Hyalonema* when shark-fishing; but I was not prepared to find sharks at a depth like this; so I was somewhat surprised when the padrone of the boat asked for leave to throw out the fishing-lines, just over the place where we had drawn up the dredge. Some 600 fathoms of rope was let out, the first 30 or 40 fathoms of which had fastened to it, at intervals of a fathom, a series of smaller ropes, on each of which was fastened a large hook, baited with a codling. This fishing-tackle remained below for about two hours, when they commenced to haul it in; when it arrived at the last few fathoms, they pulled in, one after the other, five or six specimens of a shark, each specimen from three to four feet long; the species was the *Centroscymnus cœlolepis*, Boc. & Cap. These sharks, as they were hauled into the boat, fell down into it like so many dead pigs; there was not the smallest motion of their bodies, no switching of their tails, not even a wink of their eyes; and I think there can be no reasonable doubt that they were inhabitants of the same great depth as the *Hyalonema*, and that, on being dragged up through such a weight of water, they were completely asphyxiated. It will not be forgotten how violent all the members of the shark tribe are on being caught. I have watched the boats arriving at daybreak at Setubal after a night's fishing for the surface-living sharks, and, as each boat was emptied of its gory freight, never, in a single instance, did I see any of the hundreds of sharks thrown on shore that had not huge gashes on its head and caudal regions; and these had been inflicted to keep them quiet.

Thus I was enabled to add to the fauna of this deep-sea valley a shark and a sponge; and on the authority of the fishermen I am able to add, still further, a coral and a very remarkable fish. A small hook, baited with a smaller-sized fish than usual, happened accidentally to be fastened to the tackle for catching the sharks, and on the line being drawn up it was found that a small fish (*Chiasmodon niger*, Johnson) had swallowed the bait and hook and a considerable portion of the line. This specimen is now in the Museum of Lisbon, and is, perhaps, the most perfect specimen in any museum. I see no reason to doubt that, if fished for, plenty of specimens of this *Chiasmodon* will be found at these depths; but though, as Dr. Carte has shown *, this fish is very voracious, and

* Proceedings Zoological Society, 1866, p. 35, plate 2.

capable of swallowing a fish twice as large as itself, still it would not attempt to swallow the large fish and enormous hooks that are used in the shark-fishing. I need not say that this fact corroborates Dr. Günther's opinion as to this fish being a deep-sea species.

I am further indebted to Professor Bocage for a specimen of a coral dredged in this same valley. It probably belongs to the family Isidæ, and appears to me to belong to a new genus, which I have described as *Keratoisis Grayii*.

Is it not to these deep-sea valleys that we must look not only for new and strange forms, but even for some of the supposed recently extinct forms, which may be yet found lingering in these abysses, safely there outliving the ravages of time? Professor Sars calls attention to one fact that would seem to point in this direction; for, in a memoir* on the fossil animal remains of the quaternary formation in Norway, he calls attention to the fact that certain remains of marine animals, found in a semifossil condition in these formations, are found living when looked for at certain depths below the existing level of the sea. Professor Sars mentions that the bottom of the Gulf of Christiania, in the neighbourhood of Dröbak, for the space of some three-fourths of a Norwegian square mile, and in an abyss of some 70 or 80 up to some 7 or 8 fathoms in depth, is strewed with *Oculina prolifera*, Linn., occurring in great masses of from one to two feet in diameter: nevertheless not a single living polyp is ever found on these masses; but at the same time they have the appearance of having been comparatively recently torn away from the place where they originally grew. Off the Norwegian coast, however, this very same *Oculina prolifera*, Linn., is found living in great quantities at the depth of 300 fathoms and lower.

LV.—*On the Genera* Cortesia *and* Rhabdia.

By John Miers, F.R.S., F.L.S., &c.

Cortesia.

This genus was established by Cavanilles, in 1797, upon a plant collected by Louis Née in his overland journey from Chile to Buenos Ayres. His account of this little-known plant is upon the whole correct; but, as there are some points of structure unnoticed by him, I will here add the results of

* I only know Prof. Sars's paper from the abstract given in the 'Correspondenz-Blatt des zoologisch-mineralogischen Vereines in Regensburg, 21. Jahrgang, 1867, pp. 72–74.