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were dredged up near each other, there is probably a deposit of bones at the spot whence they were obtained, similar to that of the east coast. Their discovery is of very great interest, and I am only sorry that I can add so little to their elucidation.

"J. Gwyn Jeffreys, Esq.
25 Devonshire Place."

"I am, my dear Sir,

Yours truly,

"W. BOYD DAWKINS."

P.S. I may add that, before I left Shetland, Dr. Saxby kindly undertook, at my suggestion, to ascertain whether mammalian bones deposited in the sea would be eroded, and by what means.

Preliminary Report on the Crustacea, Molluscoida, Echinodermata, and Cœlenterata, procured by the Shetland Dredging Committee in 1867. By the Rev. ALFRED MERLE NORMAN, M.A.

THE further investigation is carried on in the Shetland seas, the more deeply interesting does the study of the fauna of that portion of our country become. Dredging in the depths of those northern waters, in which there is almost invariably a heavy sea,—at one time sweeping across the Atlantic, at another rolling away from Greenland, at another (as was the case for many weeks together during the present summer) running from Spitzbergen and the ice-floes of the Arctic Ocean, accompanied by a keen, cutting north-east wind,—is not altogether pleasant work for the naturalist. Yet, trying and difficult though the dredging may be, there is none to be compared with it in the British Islands; and every fresh summer your Dredging Committee have spent in investigating the marine fauna of Shetland, they have returned home only the more convinced of the greatness of the field of research which remains to be explored. Every square mile of the sea seems to have treasures to give up unknown to us before; and the extent of the riches which lie there, one, two, three, four hundred fathoms deep, will perhaps never be known in our day. The extreme interest which attaches to the Shetland sea is the circumstance that it is the trysting place of the northern and southern faunas: the warm influence of the Gulf-stream impinging on the western coast coaxes on many a species of sunnier climes to extend its migration northwards, while the cold winds and waves which issue from the Pole and come drifting round the North Cape and Loffoden Isles, account for the many Arctic forms which, stunted in size and numerically scarce, are yet able in the equable temperature of the abyss of the Shetland waters to hold out against those southern influences so detrimental to their constitutions. The product of the dredging of the present year promises a rich harvest of additions to the British fauna; and in those classes of which I more especially undertake the examination I have already found most important results; at the same time the few notes which at this time are given must be only regarded in the light of a preliminary report. The passing of every specimen under the microscope, as must be done in the determining of all the smaller Crustacea, Hydrozoa, &c., and the dissection and mounting of every specimen of the former not at once recognized, is necessarily a work of time; and very much remains to be examined, especially among the Copepoda, Ostracoda, &c.

1868

Norman

CRUSTACEA.

First we will take the Crustacea. In my Report of Hebridean Dredging last year, I traced the genus *Xantho* northwards as far as the Isle of Mull; and I have now to record the occurrence of a young specimen of *X. rivulosa* some 350 miles further north, off the Island of Balta. A fine undescribed *Pagurus* is perhaps nearest allied to *P. cuanensis*. The hand is remarkably broad, the finger especially so, and is furnished with three much elevated ribs, one at each margin, and the third central; the margins are denticulately spined, and the wrist and upper edge of the second and third legs are also spinous; the species may be named *Pagurus tricarinatus*. Among the Mysidea are two genera not yet recorded as British. *Nematopus serratus*, G. O. Sars, differs from *Mysis* chiefly in the structure of the abdominal feet and of the central tail-plate; the species, when alive, is a beautiful little thing, having its white body prettily painted with red, and the eyes, which are large and kidney-shaped, of a brilliant ruby colour. The other genus is one which I would establish (*Gastrosaccus*) for the reception of the *Mysis sancta* of Van Beneden (= *M. spinifera*, Gües); the marsupial pouch, instead of being an appendage, as in *Mysis*, of the last two thoracic legs, is attached to the last thoracic and first abdominal feet; and the first abdominal feet in the female, instead of being the smallest, are the most fully developed, and consist of an elongated basal joint and two short branches; while in the male the third abdominal foot is the more especially developed sexual organ. *Gastrosaccus sanctus*, though now first recorded, has been for many years in my collection, and was first sent to me by Mr. Edward, of Banff, who procured it in the Moray Firth. *Mysis flexuosa*, *Spiritus, vulgaris*, *Griffithsiae* and *Didelphys*; *Diastylis lamellata*, *Iphithoë serrata*, and *Lamprops rosea* were the remaining Stomapods.

Among the Amphipoda the difficult family Lysianassidæ is well represented by *Callisoma creata*, *Anonyx longicornis*, *longipes*, *minutus*, *obesus*, and *Hollællii* (= *denticulatus*, Bate), and by three additions to our fauna,—*Anonyx nanoides* of Lilljeborg, procured among Laminariæ at Lerwick and at Hillswick, *Anonyx tumidus* of Kroyer, found in a sponge dredged thirty-five miles N.N.W. of Unst in 170 fathoms, and *Stegocephalus ampulla*, Phipps. This last truly arctic species was dredged in 60–70 fathoms in St. Magnus Bay; the single specimen procured is, as compared with Spitzbergen examples, for which I am indebted to Professor Lovén, as a pigmy to giants, bearing about the same proportionate size to its northern brethren as do the *Leda pectinata*, taken in the same spot, to their Greenland relatives. Indeed, as a rule, those arctic Amphipods, which occur also on the British coast—for example, *Gammarus locusta* and *Amathilla Sabini*—attain a much greater development within the Arctic circle. The *Anonyx tumidus*, however, of Shetland, shows no difference of size from Spitzbergen specimens. It may be questioned, however, whether this is a truly arctic species; for although long known in the north, it has recently been recorded by Professor Heller from the Adriatic Sea; and its discovery this year in Shetland gives an intermediate locality. The fact that it is an essentially parasitic species, which is never found except either in the branchial sac of Tunicata or in sponges, and that it is also an inhabitant of very deep water, may have led to its having been hitherto overlooked.

Passing over all other Amphipoda hitherto known to our fauna, I have to announce the following important additions:—a species allied apparently to

Calliopius, having subequal ovate gnathopods; but the peduncles of the antennæ are longer and the flagella shorter than is usual in that genus, and the meros of the pereopods is not produced backwards and downwards; a *Pleustes* (?), with smooth body, and hands somewhat resembling in structure those of the second pair in *Amphilochus manudens*, Bate, with the palm similarly crenated, but much more oblique; a new genus allied in general characters of eyes, of gnathopods, and pereopods, especially in the broadly flattened meros and carpus of the last pair, to *Haploops*, but having the antennæ furnished with an appendage; an *Atylus*, remarkable on account of the extraordinary length and slenderness of the legs, and having the hinder margin of all the abdominal segments serrate across the back with a larger central spine; a *Cyrtophium*, having the segments of the body furnished with spine-formed tubercles, which are much larger than those of *C. tubercularis*, Bruzelius, from which it also differs in having the hand of the second gnathopods shorter and broader, and the spine of the meros large and strong; and a *Corophium*, with longer posterior uropods and less strongly developed antennæ than the species hitherto described.

Of Isopoda the very rare species *Paratanais rigidus*, B. & W., *Phryxus abdominalis*, parasitical in *Hippolyte pusiola*, *Leptaspidia brevipes*, B. & W., and *Cirolana spinipes*, B. & W., were found, together with what appears to be a new species of the last genus. The form comes nearest to the *Ægu crenulata* of Lütken, agreeing with it in having the telson truncated and denticulate at the extremity; the general outline of the telson, however, differs from Lütken's figure, and the uropods are of different form.

My attention was especially directed during the expedition to the Entomostraca, and an enormous stock of material has been accumulated for examination. It has as yet scarcely been touched, but the following new things have already been observed. First and foremost is *Cypridina Norvegica* of Baird—the largest of all European Ostracoda; next is a very fine arctic Cythereis, *Cythereis costata* of Brady, only known previously from the Hunde Islands; *Pontocypris hispida*, *Cythereis crenulata*, and *Cythereis abyssicola* are species recently described by G. O. Sars from the Norwegian seas; and besides these there are four species of *Cythere*, one *Cytheridea*, two *Cytherura* (including by far the finest species of the genus yet known), and a species allied perhaps to *Argillaecia cylindrica* of Sars, which appear to be new to science. There are also several members of the families *Alteuthidæ* and *Harpacticidæ*, together with a curious form, parasitic in *Didemnum gelatinosum*, which I am unable as yet to determine, and believe to be undescribed.

The very rare and curious burrowing barnacle, *Alcippe lampas*, Hancock, was inhabiting shells of *Fusus antiquus*, dredged five miles off Balta.

TUNICATA.

The Tunicata dredged were very few, but included *Ascidia rudis*, Alder, a large species discovered in 1861, and this year procured between the Islands of Whalscy and Balta. In a cave in St. Magnus Bay, *Thylacium Normani*, Alder, was living in great numbers; it was only previously known in the Channel Islands, where it covers a large portion of the side of the famous Gouliot Cave. *Salpa runcinata* was met with in some numbers in the open sea thirty miles N.N.W. of Burrafirth Lighthouse, but was not observed nearer shore.

POLYZOA.

Two or three fragments of the beautiful coral *Hornera violacea* of Sars were dredged between Balta and Whalsey in 40–50 fathoms. A fine specimen procured by Mr. Barlee has long been in my collection. I found it among his Polyzoa bequeathed to me marked "Shetland." The confirmation of the discovery is, however, of importance, and this fine addition to our fauna is now for the first time made public. A very remarkable *Lepralia*, found between tidemarks at Balta, differs widely from all known species. The mouth of the hyaline, punctate, ovate cells, instead of being sessile, is elevated to the extremity of a long tube which rises from the polyzoary; immediately below the origin of this tube is an ovate avicularium. A small patch of this species, consisting of a few cells only, in a very imperfect state, which I had met with among the things procured in Shetland by Mr. Barlee, was sent by me some years ago to Professor Busk, who attached to them the manuscript name *Lepralia tubulosa*, a title which the species may most appropriately bear. There is also a new *Eschara*, and a few other species were found which are additions to the very long list of Shetland Polyzoa previously known to me.

ECHINODERMATA.

Among the Echinodermata the fact of *Cidaris papillata* and *Spatangus meridionalis* having been dredged in considerable numbers, living in 100–110 fathoms, about thirty miles N.N.W. of Unst, is extremely interesting. The *Cidaris* has never before been dredged in our seas, the few specimens known having been obtained from fishermen's lines. We kept it alive for some time, and found it to be remarkably sluggish in its movements. The *Spatangus* was not known anywhere north of the Mediterranean until 1864, when two specimens were obtained near the same spot in which it has this year been met with in greater profusion. A second British specimen of *Archaster Porellii* was found near the same spot as the species just referred to. An *Echinocardium* was dredged by Mr. M'Andrew many years ago on the south side of Bressay Island, Shetland, and described and figured in the 'Annals of Natural History' for 1857, under the name of *Amphidotus gibbosus* of Agassiz. The species was dredged this year in St. Magnus Bay, and I have seen a second specimen procured by Mr. D. Robertson in the Clyde district, and a third found by Mr. Hodge on the Durham coast. It is most certainly not the *Amphidetes gibbosus* of Agassiz, and I would propose to call it *Echinocardium pennatifidum*, on account of the character of the pedicellariæ, which are very different from the same organs in *E. ovatum*, its nearest ally, and remind us strongly of the form of fern leaves.

CELENTERATA.

Lastly, in briefly noticing the Cœlenterata, it is worthy of mention that *Stomphia Churchii*, *Bulocera Tuedii*, and *Pennatula phosphorea*, the last in most extraordinary profusion, were found in St. Magnus Bay, and that *Rhizocline areolata*, *Merona cornucopiae*, and *Dicoryne conferta*, live in about 50 fathoms, five to seven miles off Balta. In company with these last were thousands of a *Zoanthus*, which sometimes lives entirely free, at others coats the shells of small univalve mollusca and then destroys their substance. This *Zoanthus* is, I believe, the *Z. incrustatus* of Scandinavian writers, and I am now perfectly satisfied that it is distinct from the *Zoanthus Couchii*, and from a form, perhaps also distinct from *Z. Couchii*, which was found on this

and on previous occasions in Shetland inhabiting very deep water and living parasitic upon sponges, thus being of similar habit to that species which has excited so much controversy lately, which lives upon *Hyalonema mirabilis*. In the open sea to the north of Unst I had the delight of seeing in profusion two lovely oceanic Hydrozoa belonging to the genera *Diphyes* and *Physophora*. Unfortunately having no works upon the subject with me I was unable to determine the species, but I believe the former to have been *D. appendiculata*. *Diphyes* has only once before been observed in British waters, and *Physophora* was not known to inhabit them. The rapidity of growth in *Diphyes* is extraordinary, the coenosarc of a specimen kept alive was developed nearly three inches in a single night.

These notes are necessarily brief, and I fear may have proved dry and uninteresting to the majority of the members in consequence of that very brevity. My excuse must be that it is much more easy to draw up a report of general interest when little has been done, and the habits and life-history of some particular animals can be dilated upon, than it is so to summarize the discoveries of a successful expedition as to make them in their necessarily condensed form interesting to others than purely scientific naturalists.

Report on the Foraminifera obtained in the Shetland Seas.

By EDWARD WALLER.

In making a report of the Foraminifera obtained in the several dredging expeditions to the Shetland Islands, undertaken by Mr. Jeffreys and his companions from 1861 to the present year (in all of which, except that of 1863, I was a party), it was a matter of immediate importance to consider some of the works recently published on the British Foraminifera, for the purpose of deciding upon the mode of classification, the nomenclature, and the enumeration to be adopted in presenting the results of our explorations.

Mr. Williamson's recent 'Foraminifera of Great Britain,' published by the Ray Society in 1858, illustrated with admirable plates, and containing generally very lucid descriptions, will necessarily be in the hands of all studying the British Foraminifera, and may be taken, without much change, as affording a fair representation of the then known forms which were sufficiently distinct to be named and figured.

The beauty of the objects and the information in the book will, doubtless, soon stimulate explorers elsewhere, as they have done on the Scottish and Durham coasts, to make additions to our species.

The subsequent work of Dr. Carpenter on the study of the Foraminifera, published by the Ray Society in 1862, was based on very extended inquiries into both recent and fossil Foraminifera by himself and Messrs. Parker and Jones, and opened up views of classification which differed very much from previous modes, including Mr. Williamson's.

Dr. Carpenter's system has regard more to the construction of the animal inhabitant than to the outline of the shelly covering, and seems at once to have a more natural foundation, and, from certain characters of the shell, suited to the animal construction, to afford a more obvious and accurate division of the objects. The new arrangement requires a considerable change in the names of species, &c.

I propose, therefore, in the appended list to follow the classification and nearly the nomenclature of Dr. Carpenter and his colleagues, and to take Mr.