

XLVIII.—*Notes on a Deep-sea Dredging-Expedition round the Island of Anticosti, in the Gulf of St. Lawrence.* By J. F. WHITEAVES, F.G.S. &c.

UNTIL last summer (1871), so far as I am aware, no dredging-operations have ever been conducted in the deepest parts of the River and Gulf of St. Lawrence. In 1867 and 1869 I dredged in upwards of fifty different localities north of the Bay of Chaleurs, but never in deeper water than 50 fathoms. The researches of Dr. Packard and others on the coast of Labrador, those of Principal Dawson, Prof. Bell, &c. in the Gaspé district, together with those of Mr. Willis on the Nova-Scotian coast, were all conducted in comparatively shallow water. On several occasions I have called the attention of the Natural-History Society of Montreal to the importance, from a scientific point of view, of a careful investigation into the nature of the animal and vegetable life of the greater depths of the gulf, which seemed to me to promise a rich harvest of new facts.

A committee was appointed to petition the Dominion Government to allow qualified observers facilities for deep-sea dredging on board government vessels. Principal Dawson also, as President of the Society, represented to the Honourable the Minister of Marine and Fisheries the practical value of, and the useful results that might accrue from, such inquiries, and met with the most liberal response. The desired facilities on board government cruisers were at once promised, the necessary rope was provided, and no efforts were spared to make the cruises successful. I was deputed by the Natural-History Society to undertake the management of the expedition, and left Montreal early in July 1871. My friend Mr. G. T. Kennedy, M.A., of Montreal, an ardent zoologist, started with me, but returned after he had been a few days at sea.

The first cruise was on board the government schooner 'La Canadienne,' and lasted three weeks. The ground examined on this vessel was from Point des Monts (on the north shore of the St. Lawrence) to the Mingan Islands, then round the west point of Anticosti, and from there, in a diagonal line, to Gaspé Bay. Next, embarking on board the 'Stella Maris' at Gaspé Basin, we made an entire circuit of the island of Anticosti, sailing as far to the north-west as Sawhill Point, on the north shore, and to the south-east as the Magdalen Islands. We were driven to Bryon Island, one of the Magdalen group, by a "nor'-wester," which of course prevented our dredging there. As these investigations were entirely subordinate to the special duties upon which the two schooners

were engaged, dredging could only be carried on at intervals, and in several cases the same ground was gone over twice or more.

On 'La Canadienne' we had sixteen successful hauls of the dredge. Of these, four were in 50 fathoms of water or less, seven in between 50 and 100 fathoms, and five in from 100 to 200 fathoms.

On the 'Stella Maris' we had nine successful hauls. One of these was in less than 50 fathoms, two were between 50 and 100, and six between 100 and 250 fathoms.

The deep-sea mud, in the places examined, is dotted over with (for the most part rounded) masses of rock, usually of Laurentian gneiss, varying in size from that of a pea to considerably larger than a man's head. By a modification of the usual sieving process every organism, piece of rock, &c. larger than $\frac{1}{16}$ of an inch in diameter was first picked out from the mud. A large bagful of the mud thus sifted, from each locality examined, was preserved for subsequent microscopic examination. Three fourths of this mud was found to be a silt so impalpable as, when wet, to pass readily through fine cambric; the remaining fourth consisted half of organic, and half of inorganic matter. The organic matter comprised a few diatoms, multitudes of Foraminifera, some Polycystina, many sponge-spicules, and fragments of other organisms. The inorganic débris was a more or less coarse kind of sand, made up of fragments of quartz, bits of felspathic rocks, and small flakes of mica.

Attempts were made to endeavour to ascertain the approximate temperature of the deep-sea mud. When the dredge was hauled up, its contents were emptied as quickly as possible into a large shallow tub; and this was covered with a tarpaulin and placed in the shade. An ordinary thermometer, with a metal case and perforated base, was then plunged into the mud, and the whole was kept carefully shaded for some time. With one exception, the temperature of the mud was found to be from 37° to 38° Fahr., and this not alone in deep water; for sand brought up from 25 fathoms, on the north shore of the St. Lawrence, also made the mercury sink to 38° or 37° Fahr. In the centre of the river, between the island of Anticosti and the south shore of the St. Lawrence, mud brought up from 200 fathoms only made the mercury sink to from 43° to 45° Fahr. Either a warm current affects the temperature of the bottom at this point, or else my observations were inaccurate or defective, which latter assumption is by no means unlikely.

On one occasion a somewhat curious phenomenon occurred.

We had been dredging in the afternoon in 212 fathoms, between the east point of Anticosti and the Bird-rocks. About 600 fathoms of rope (made of cocoanut-fibre) had been paid out, which when hauled in was, of course, wet. About ten o'clock the same evening we threw the dredge over in 250 fathoms water, and again all the coils were paid out. As the line went over the side it was luminous throughout its entire length with electric sparks! The closest examination with a triplet lens failed to disclose any trace of animal life entangled in the strands.

With a view of trying to get some information as to the nature of the food of some of the surface-feeding fishes, and especially of the herring and mackerel, towing-nets were frequently used; but scarcely any thing was taken in these. I attribute these failures to the circumstance that the towing-nets were only used in the *daytime*; had they been employed at night the results might have been different. Hempen tangles, similar to those devised by Captain Calver, were employed with some success; but the mistake was made of placing these some 20 fathoms or so *in front* of the dredge, instead of behind and on each side of it.

The following is a brief sketch of some of the most interesting forms of animal life obtained during the expedition. During the autumn of 1871, Mr. J. Gwyn Jeffreys, F.R.S., visited Montreal, and went over the whole of the testaceous Mollusca with me. I am also indebted to Professors A. Agassiz, A. E. Verrill, and S. J. Smith for the identification of several critical species.

FORAMINIFERA.

Large quantities of these beautiful organisms were collected, especially from very deep water, but at present only a portion of these have been carefully examined. In Mr. G. M. Dawson's paper on the "Foraminifera of the River and Gulf of the St. Lawrence," published in the 'Annals' for February 1871, a list is given of fifty-five subspecies or varietal forms. Among the specimens collected last year in deep water are a number of large specimens to which it is difficult to attach any name, but which form a series connecting the subgenera *Nodosaria*, *Dentalina*, *Marginulina*, and *Cristellaria*. One of the most remarkable of these is a *Marginulina* fully one eighth of an inch long, from the first chamber of which long spines proceed (at various angles), which, when perfect, must have been as long as the shell itself; these long spines vary in number from one to three; and besides these there are others which are either rudimentary or imperfect. *Cristellaria crepidula* and *Tro-*

chammina incerta were collected in comparatively shallow water (30 to 40 fathoms); and *Bolivina punctata*, *Nonionina umbilicatula*, *Vulvulina austriaca*, and gigantic examples of the true *Triloculina tricarinata* (remining one of miniature beech-nut seeds carved in ivory) were dredged in from 200 to 250 fathoms. By far the greater number of the St.-Lawrence Foraminifera seem to have a wide range in depth. I have examined large bagfuls of dredgings from more than fifty localities in the northern part of the gulf, and out of fifty or sixty species or varietal forms, only four or five seem peculiar to deep water. *Virgulina squamosa*, *Bolivina costata* and *squamosa*, *Nonionina umbilicatula*, and the typical *Triloculina tricarinata* are only met with in apparently from 200 to 300 fathoms water. In the St. Lawrence, *Lagena distoma* (typical), *Bulimina pyrula* and *marginata*, and *Vulvulina austriaca* are characteristic of deep water, but are very rarely met with in lesser depths. *Globigerina bulloides*, though small, is not unfrequent at all depths; but, curiously enough, *Orbulina universa* has not yet been found living in Canada. Although many of the Foraminifera from the deep water are small and delicate, by far the largest specimens yet collected were taken in from 200 to 250 fathoms. This agrees with the result of Dr. Carpenter's observations on board the 'Porcupine.' The *Rhabdopleura* figured by Mr. Dawson I believe to be an annelid-tube, having examined the animal in a living state.

POLYCYSTINA.

Dictyocha aculeata and a species of *Ceratospyrus* have been previously catalogued from the Gulf of St. Lawrence by Principal Dawson. Three additional species were dredged in upwards of 200 fathoms; but these are at present undetermined. In Canada, Polycystina are not peculiar to deep water; for I have taken fine specimens from the interior of a species of *Halichondria*, also from the stomach of *Echinus dröbachiensis*, both collected from a little below low-water mark.

SPONGES.

Several examples of the *Grantia ciliata* of O. Fabricius were dredged from 96 fathoms in Trinity Bay, on the north shore of the St. Lawrence. It is the first sponge with calcareous spicules recorded from the Gulf. The straight spicules of the terminating cone and the triradiate ones of the body of the sponge, make beautiful polariscope objects. A fine species of *Polymastia* was abundant in many places in deep water. In 38 fathoms off Cap-Rosier lighthouse a massive *Halichondria* was dredged, which, besides the ordinary smooth,

curved, fusiform spicules, has small retentive *bihamate* ones, apparently resembling those of Dr. Bowerbank's *H. falcata* in all but size. The other sponges collected are as yet undetermined.

HYDROZOA.

Thuiaria thuja and *articulata* and *Campanularia verticillata* have been noticed among the specimens collected, which, however, have yet to be examined.

ACTINOZOA.

The two common sea-anemones of the New-England coast, viz. *Metridium marginatum*, Say (which is probably a variety of the European *Actinoloba dianthus*), and *Urticina crassicornis*, Ehr., were found as abundantly living in the greatest depths examined as in very shallow water. Prof A. E. Verrill recognizes a species of *Zoanthus* in some specimens which I sent him, which were dredged in 212 fathoms, between Anticosti and the Bird-rocks. Among the same specimens he has also detected examples of his *Eunephthya glomerata*, an Alcyonoid previously known only from Greenland and the banks of Newfoundland; also a new species, and perhaps genus, near to *Cornularia*. A large number (50 or 60) of living specimens of a *Pennatula*, which I believe to be new to science, was dredged in from 160 to 200 fathoms, between the island of Anticosti and the south shore of the St. Lawrence. In the largest specimens collected there are 40 pinnules on each side of the upper portion of the cœnosarc; but in average full-grown examples the number is less, and ranges from 30 to 35. On the back of the rachis there is a central groove, on each side of which are numerous but unequal, spinose, undeveloped polyps. The average number of polyp-bearing cells on each pinnule seems to be about 11, but varies from 9 to 16. The polyp-bearing cells are entirely separate, and are margined with bundles of spines. The 8 mesenteries and somatic chambers, as well as the 8 tentacles of the polyps, can be well made out in the specimens collected. In one specimen examined by Mr. G. T. Kennedy the basal portion of the pinnules is filled with spheres of granular matter. The spicules of the lower half of the stem are elliptical or oblong, and decidedly constricted in the middle. The calcareous internal axis is somewhat longer than the cœnosarc itself, and is recurved at the base. Large examples measure about 8 inches; but some are only 6 inches long, or even less. These latter specimens have as few as 21 pinnules on each side of the stem. The St.-Lawrence *Pennatula*, although re-

sembling in some respects some of the varieties of *P. phosphorea* as described by Kölliker, seems nevertheless a distinct species, for which I venture to propose the name of *Pennatula canadensis*. On this point Prof. A. E. Verrill, to whom I sent specimens, writes to me as follows:—"I have spent considerable time on the *Pennatula*. It is *very near P. phosphorea*, and for a time I thought it would prove identical. So far as the figures and descriptions of the latter go it agrees very well, allowing that all the varieties and subvarieties recognized by Kölliker really belong to one species; but on comparison with Norwegian specimens, received from Copenhagen, it seems to be sufficiently distinct. The most evident differences are to be found in the more numerous, crowded, and unequal rudimentary or asexual polyps along the back of the stalk in your species, and in the greater smoothness of the peduncle, due to the much smaller size of the spicula of the integument in the American species." For many of the details respecting this species I am indebted to my friend Mr. G. T. Kennedy, M.A., of Montreal, who has kindly helped me in the dissection of specimens.

ECHINODERMATA.

Two fine living examples of *Schizaster fragilis* (the *Brissus fragilis* of Düben & Koren) were dredged, one off Cap-Rosier lighthouse, in 125 fathoms, the other from 200 fathoms, in the centre of the river, between Ellis Bay, Anticosti, and the south shore. Off Sawhill Point, on the north shore, the dredge brought up, from 69 fathoms, a curious Asterid covered with long and slender spines. Prof. Agassiz, to whom I sent the only specimen collected, informs me that it is identical with a species dredged on the 'Porcupine' expedition, and subsequently named by Prof. Wyville Thomson *Calveria hystrix*. Prof. A. Agassiz thinks that this Asterid may be the *Solaster furcifer* of Düben & Koren. Unfortunately two widely different Echinoderms are called *Calveria hystrix* in the 'Proceedings of the Royal Society.' The St.-Lawrence starfish is the "singular Asterid allied to *Pteraster*," but *not* the Echinoderm "belonging to the *Diadema* family," to both of which the same name is given. *Ctenodiscus crispatus*, Düben & Koren, was abundant in every haul at depths greater than 100 fathoms. *Amphiura Holbölli*, Lütken, and *Ophiacantha spinulosa*, Müll., were also frequent in deep water. Large living examples of *Ophioglypha Sarsii*, Lütken, were dredged in 125 fathoms off Cap-Rosier lighthouse, and a few fine specimens of *Astrophyton Agassizii* were taken, from 60 fathoms mud, off Thunder River.

ANNELIDA.

By far the most numerous of the denizens of the deep-sea mud in the St. Lawrence are marine worms. Apparently about 20 or 30 species were collected; but none of them has as yet been studied or determined.

CRUSTACEA.

Hempen "tangles" used in 212 fathoms water, to the south-east of the east point of Anticosti, brought up several living examples of a *Pycnogonum*, which is Dr. Stimpson's *P. pelagicum*, but which does not seem to differ from the *P. littorale*, Ström, of European seas. A fine specimen of *Nymphon giganteum*, Goodsir, was dredged in 125 fathoms off Cap-Rosier lighthouse. On the authority of the Rev. A. M. Norman's 'List of the Crustacea of the Shetlands,' I had quoted this (in a report printed by the Department of Marine and Fisheries for the Dominion) as Johnston's species; but Prof. S. J. Smith informs me that it was Goodsir who first described it. Several examples of *Munnopsis typica*, M. Sars, were taken in 125 fathoms off Cap-Rosier lighthouse. Several curious Amphipods were taken, among the more conspicuous of which were fine specimens of an *Epimeria*, which Mr. Smith refers doubtfully to *E. coniger* of Boeck. No large Decapods were dredged from deep water; the only specimens observed were a few shrimps. Mr. Smith recognizes the following critical forms of *Macrura* in a small series which I sent to him for identification:—

Pandalus annulicornis, Leach. 96 fathoms, Trinity Bay, and 125 fathoms off Cap-Rosier lighthouse.

Hippolyte Phippsii, Kröyer, with the preceding species.

Hippolyte Fabricii, Kröyer. 125 fathoms, off Cap-Rosier lighthouse.

Hippolyte polaris, Kröyer. 38 fathoms, off Cap-Rosier lighthouse.

POLYZOA.

Good specimens of the following species have been determined, from depths of from 90 to 250 fathoms; but many interesting forms are at present unnamed:—

Crisia eburnea, Linn.

Idmonea atlantica, Forbes.

Defrancia lucernaria?, Sars.

Alcyonidium gelatinosum, Pallas.

Scrupocellaria scruposa, Linn.

Gemellaria loricata, Linn.

Caberea Ellisii, Flem.

Bicellaria ciliata, Linn.

Acamarchis plumosa, Pallas.

Flustra Barleei, Busk.

Retepora cellulosa, var.

— *elongata*, Smitt.

TUNICATA.

The following is a list of the few species of this order at present identified by Prof. A. E. Verrill:—

- Asciidiopsis complanatus* (= *Ascidia complanata*, Fabr.). In 212 fathoms to the south-east of the east point of Anticosti.
- Eugyra pilularis*, Verrill. In 50 fathoms off the St. John's River, Mingan.
- Botryllus*, a purple species, distinct from *B. Gouldii*, Verrill. Attached to *Flustra Barleei*?, Busk, from 96 fathoms in Trinity Bay.

Several examples of *Amouroucium glabrum*, Verrill, were collected in and just outside of Gaspé Bay, where I had previously dredged it in 1869.

MOLLUSCA.

In the 'Canadian Naturalist' for 1869, I published a catalogue of 114 species of marine Mollusca inhabiting the Gulf of St. Lawrence, to the north of the Bay of Chaleurs. We now know localities for 150 species which inhabit the region in question. The shells collected last summer have been carefully studied; and the following is a list of some of the most interesting among them*.

- Terebratula septentrionalis*, Couth. In 112 fathoms, stones, off Charleton Point, Anticosti, and in 212 fathoms to the S.S.E. of the east end of that island.
- Terebratella spitzbergensis*, Davidson. 38 fathoms, stones, off Cap-Rosier lighthouse, alive, adult, and frequent; 96 fathoms, in Trinity Bay, one young, but living example; 112 fathoms, off Charleton Point, Anticosti, one dead, adult. Most abundant in somewhat shallow water.
- Pecten grænelandicus*, Chemn. Taken alive in several localities in from 160 to 250 fathoms, mud.
- Lima sulculus*, Leach. Fine specimens in 38 fathoms, off Cap-Rosier lighthouse.
- Arca pectunculoides*, Scacchi (= *A. raridentata*, Searles Wood). Dredged on the north shore of the St. Lawrence, also between Anticosti and the south shore, in 160 to 170 fathoms. The specimens were often living, and of large size for the species. New to the western side of the Atlantic.
- Arca glacialis*, Gray (= *A. raridentata*, var. *major*, Sars). A few dead examples of this shell were taken with the preceding one.

* I am indebted to Mr. J. Gwyn Jeffreys, F.R.S., for the determination of those species to which an asterisk is affixed.

Yoldia (? *Portlandia*) *thraciæformis*, Storer. One living specimen occurred in 212 fathoms, S.S.E. of the east point of Anticosti, and a dead, but perfect one, in 125 fathoms, off Cap Rosier.

Yoldia (*Portlandia*) *lucida*, Lovén. Living in seven of the localities examined, its range in depth being apparently from 150 to 250 fathoms.

**Yoldia* (*Portlandia*) *frigida*, Torell. Frequent, living with the preceding.

Dacrydium vitreum, Möll. In 212 fathoms, mud, to the S.S.E. of the east point of Anticosti, living. This and the preceding are new to America.

Cryptodon Gouldii, Philippi. Common, living, at all depths; it ranges from 10 to 250 fathoms.

Astarte lactea, Brod. & Sow. Fine in several localities. Off Sawhill Point in 30 fathoms; off Moisie village in 70 fathoms; mouth of St. John's River, Mingan, in 50 fathoms; Gaspé Bay. The young is *Astarte Richardsonii*, Reeve.

ASTARTE. Two species of *Astarte*, both of the *A. sulcata* group, were collected in deep water. One, of which two specimens only were dredged (off Bear Point, Anticosti, in 112 fathoms), I at first thought to be *A. crebricostata*; the other is by far the most abundant mollusk of the greater depths of the northern part of the river and gulf of the St. Lawrence. Mr. Jeffreys says that this latter shell is *Astarte sulcata*, var. *minor*. No specimens that I have seen, from American or European localities, exactly resemble either of these shells; and, in my judgment, both are new and good species.

Tellina (*Macoma*) *inflata*, Stimpson, MSS. Perhaps *M. fragilis* of Leach. Fine living specimens of a shell which the late lamented Dr. Stimpson gave to the writer some years ago, with the label "*Macoma fragilis*, St. MSS.," were dredged in 70 fathoms, sand, off Moisie village and at various depths in other localities.

**Neera arctica*, Sars. Several living specimens of this species (the largest of which measures upwards of an inch and a quarter in its greatest breadth) were taken in 125 fathoms, off Cap-Rosier lighthouse; also in 200 fathoms, mud, Ellis Bay, Anticosti, bearing S.S.W. 27 miles distant.

**Neera obesa*, Lovén (= *N. pellucida*, Stimpson). Off Caribou Island, on the north shore of the St. Lawrence, nearly opposite Cape Chatte, living, in 170 fathoms, mud. I regard both *N. arctica* and *N. obesa* as varieties of the European *N. cuspidata*, *N. arctica* being adults of unusual size, and *N. obesa* the young of the same species. In deference to Mr.

Jeffreys's greater experience, however, I keep the two forms separate. *N. arctica* has not previously been found on the American coast.

**Utriculus pertenuis*, Mighels. In 25 fathoms, sand, off Trinity River, also in Gaspé Bay; abundant at both localities. (Probably = *U. turritus*, Möller.)

Utriculus hyalinus?, Turton (= *Diaphana debilis*, Gould). With the preceding, but rare in both places.

**Philine quadrata*, Wood. Alive, from 212 fathoms, mud, to the S.S.W. of the east point of Anticosti.

Philine lineolata, Couth. Gaspé Bay, and off the St. John's River, Mingan, in 50 fathoms.

Dentalium abyssorum, Sars. Dead but good specimens of this species were dredged in three localities:—in 164 fathoms, mud, off Seven Island Bay; also in 160 and 200 fathoms to the S.W. and S.S.W. of Ellis Bay, Anticosti. New to America.

Siphonodentalium vitreum, Sars. Deep water, in several localities, fine and living. Most frequent in 200 to 250 fathoms; also new to the American side of the Atlantic.

Margarita argentata, Gould (= *M. glauca*, Möll.). Off the mouth of the St. John's River, Mingan, in 50 fathoms, and sparingly in other localities. Gaspé Bay.

Margarita striata?, Brod. & Sow. A remarkable variety of this species, with three unusually prominent revolving ribs (so much so as to remind one of some of the Australian Trochocochleas), occurred in 70 fathoms, sand, off Moisie village. The type is abundant and large almost everywhere in the St. Lawrence in shallow water.

Rissoa carinata, Mighels. Frequent, alive, from 96 fathoms in Trinity Bay.

Rissoa castanea, Möll. With the above, and elsewhere not unfrequent.

Rissoa scrobiculata, Möll. Collected in three localities, in from 125 to 250 fathoms, where it is large and fine. It occurs living, but of small size, in Gaspé Bay, at depths of from 20 to 30 fathoms.

Rissoella eburnea, Stimpson. One living and adult example, in 70 fathoms, off Moisie village.

Lacuna glacialis, Möller. A living adult specimen of this species was dredged from 96 fathoms in Trinity Bay. The shell is not a true *Lacuna*, and belongs, in my judgment, to a new genus.

Aporrhais occidentalis, Beck. A remarkable thin and inflated variety of this species was taken in 120 fathoms off Bear Head, Anticosti. The type is not uncommon throughout the gulf in from 20 to 50 fathoms.

- Eulima stenostoma*, Jeffreys. A single living adult was taken from 160 fathoms, to the south-west of Ellis Bay, Anticosti. New to America.
- Astyris Holbölli*, Möll. (= *Columbella rosacea*, Gld.). Trinity Bay, 96 fathoms, also other localities. Ranges from 20 to 100 fathoms.
- Buccinum ciliatum*, O. Fabr. Alive, in 112 fathoms, off Charleton Point, Anticosti.
- Buccinum cyaneum*?, Brug. From 250 fathoms, mud, between the east point of Anticosti and the Bird-rocks.
- Sipho islandicus*, Chemn. Only one living example of this mollusk was collected, from 112 fathoms, off Charleton Point, Anticosti.
- Sipho Sarsii*, Jeffreys. With the above, but much more frequent; also off Egg Island, in 70 to 80 fathoms. The epidermis is very different in these two species; but it is difficult to separate them when the specimens are water-worn.
- Trophon craticulatus*, O. Fabr. Off Cap-Rosier lighthouse, in 38 fathoms, stones, fine and living; also near the mouth of the St. John's River, Mingan, in 50 fathoms, sand, but dead.
- Fasciolaria ligata*, Mighels. Two living examples were taken in Gaspé Bay, near Cape Gaspé, on a stony bottom, in 20 or 30 fathoms.

Twenty-five species of shells not previously known to inhabit the seas of the Province of Quebec were collected during the two cruises; of these, twelve are new to the American side of the Atlantic.

FISHES.

The only fishes brought up in the dredge were a young specimen of each of the following species:—

- Sebastes norvegicus*. The Norway haddock. 96 fathoms, Trinity Bay.
- Anarrhichas lupus*. The wolf fish. 112 fathoms, off Charleton Point, Anticosti.
- Agonus hexagonus*?, Schneid. With the preceding.

It is estimated that, when the whole of the material collected has been examined with care and all the specimens are determined, upwards of 100 species of marine invertebrates new to the Gulf of the St. Lawrence can be added to its previously recorded fauna. Of these, from 30 to 40 species are new to the western side of the Atlantic, and a few are undescribed. When it is considered that only five weeks were spent at sea, that during this time the ordinary duties upon which the schooners were engaged (and sometimes unfavourable weather)

often made dredging quite impracticable, also that I was alone (so far as scientific help was concerned) nearly the whole time, I may be pardoned for thinking that the results of these investigations, so far as they go; are very encouraging, and such as should stimulate to renewed exertions in so promising a field of inquiry.

I have previously shown (in the 'Canadian Naturalist' for 1869) that a large proportion of the Greenland invertebrates, probably three fourths of the whole, range as far south as the northern part of the Gulf of St. Lawrence down to Gaspé Bay. In Canada many marine animals (such as, for example, the oyster and the two species of *Crepidula* which are found attached to it) occur off the southern coast of the Bay of Chaleurs, but not in the northern part of the same bay. A number of characteristic New-England species inhabit the coasts of Nova Scotia and New Brunswick, which do not apparently range further north than the Bay of Chaleurs.

On the Admiralty Charts of the Gulf of St. Lawrence, an irregular line of shallow soundings may be seen to extend from a little above the northern extremity of the Island of Cape Breton, round the Magdalen group, and thence, in a westerly direction, to Bonaventure Island. To the south and south-west of this line the water is uniformly somewhat shallow, and never exceeds 50 fathoms in depth. To the north, north-west, and north-east of the same line the water deepens rapidly, and perhaps even precipitously. Principal Dawson suggests that the Subcarboniferous rocks of which the Magdalen Islands are composed, and which appear again on the mainland, in Bonaventure County, may possibly crop up under the sea in the area between the north-west side of Cape Breton and the mainland of New Brunswick, as well as that of the counties of Bonaventure and Gaspé, in the Province of Quebec. This would account, possibly, for the shallowness of the water in the area in question. Whether this is the case or not, it seems not improbable that this extended line of shallow soundings may form a natural barrier to those arctic currents, if any such there are, which sweep down the Straits of Belle Isle in a south-westerly direction, and may tend to deflect their course in a bold curve into and up the river St. Lawrence.

In the centre of this river, opposite Murray Bay, about 80 miles below Quebec, Principal Dawson has dredged quite a large series of Labrador marine invertebrates; but how much further up the stream these salt-water denizens extend, we have yet to learn.

North of the Bay of Chaleurs the fauna of the Gulf of St. Lawrence has a purely arctic character. The species of which

it is composed are remarkable alike for their geological antiquity and for their wide range of geographical distribution. In time, a few of them date back to as ancient periods as the Coralline and Red Crags, and a much larger number occur in the Postpliocene deposits of both Europe and North America. It is curious to observe that species which are found both living on the American coast to-day and fossil in the European Pliocene and Postpliocene, had a different geographical range in former times from that which they are known to have now. Many of these arctic marine invertebrates are circumpolar in their distribution, and not only inhabit both sides of the Atlantic, but are also found in the Northern Pacific. The preceding generalizations refer almost exclusively to the assemblage of marine animals characteristic of comparatively shallow water, the members of which range in depth from low-water mark up to about 50 fathoms.

The deep-water fauna, at least that of the localities examined, is also decidedly arctic, but it has at the same time a much more Scandinavian aspect. Nearly all of the species which are now for the first time recorded as inhabitants of the Atlantic coast of America occur also in the seas of the north of Scotland, of Norway, and Spitzbergen. There is a striking similarity between the series of fossils from the Quaternary deposits of Norway (as catalogued by Sars) and the marine invertebrates of the deepest parts of the St. Lawrence. *Pennatule*, *Ctenodiscus*, *Tripylus* (*Schizaster*) *fragilis*, *Ophioglypha Sarsii*, together with many species of mollusks, are common to both. Still it must be borne in mind that in the Quaternary deposits of Norway a number of characteristic European invertebrates occur, which, so far as we know, do not live on the western side of the Atlantic.

In the River and Gulf of St. Lawrence, generally speaking, the number of species of marine animals which may be collected at or above low-water mark is very small; few specimens, apparently, are washed ashore by storms. But there is a constant tendency in the opposite direction; littoral and shallow-water forms are constantly being drifted down to lower levels, particularly shells (which are usually dead and empty) and the larger calcareous Polyzoa, such as *Celleporaria incrassata* and *Myriozoum subgracile*. Sometimes the Mollusca are living: on one occasion I dredged an example of *Littorina rudis*, apparently alive, but certainly with the operculum fitting tightly into the aperture, from upwards of 100 fathoms water. When such is the case, it is often difficult to separate the true denizens of the deep sea from those which are washed down from shallower water.

The Government of Canada (to whom I had the honour of presenting a report on this preliminary deep-sea dredging-expedition, with special reference to facts collected bearing on the fisheries) has decided that the prosecution of these inquiries shall be continued. A vote of a small sum of money has been passed, which will, it is hoped, defray the necessary expenses of the expedition. I propose to devote the months of July and August of the present year to endeavouring to dredge in the greatest depths of the River and Gulf of St. Lawrence, particularly in the deepest place to the west of Newfoundland. Between the east point of Anticosti and the Magdalen Islands, about halfway, and in an easterly direction towards Newfoundland, is the deepest part of the gulf. The bottom, at this locality, for several miles (nearly two meridians) has a depth of 313 fathoms. Last year we were unfortunate; for as soon as we were fairly on the ground, and had got every thing in readiness, a stiff north-west gale sprung up, which lasted sixty hours, and made dredging quite impracticable. It is hoped that in this respect our efforts will be more successful during the present season.

Montreal, July 12, 1872.

XLIX.—*Descriptions of new Myriopoda of the Family Glomeridæ*. By ARTHUR GARDINER BUTLER, F.L.S., F.Z.S., &c.

[Plate XVIII.]

THE millipedes treated of in the present paper are all in the collection of the British Museum.

CHILOGNATHA.

Family *Glomeridæ**, Gervais.

Genus *ZEPHRONIA*, Gray.

1. *Zephronia chitonoides*, n. sp. Pl. XVIII. figs. 2, 2 a.

Brownish testaceous, inclining to castaneous; head and nuchal plate darker.

Head shining, external area coarsely rugose, central area coarsely punctured, inner margin bearing about fourteen minute teeth; dorsal segments highly polished, covered with exceedingly indistinct, almost obsolete, granulations; external margin of first segment rugose; last segment very oblique; segmental lateral wings much incurved in dried specimens, very oblique.

* Variously designated *Zephroniidae*, *Spherotheridae*, and *Polyzoniidae*! (Wood, Proc. Acad. Nat. Sci. Philad. 1865, p. 172). In his 'Aptères,' M. Gervais restricts this family to the three genera *Polyzonium*, *Siphonotus*, and *Siphonophora*.