







Miss May Rathbone
with the Author's compliments

NOTES

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ON THE

NATURAL HISTORY OF EAST FINMARK.

BY

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Notes on the Natural History of East Finmark. By Canon
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I HAD spent three summer holidays in dredging-excursions in South and West Norway, and in 1890 I resolved to go to the extreme north-eastern district of Norway, in order to obtain the more arctic fauna.

East Finmark is a portion of that country which was formerly called Lapland, and commences a little to the east of the North Cape at the Porsanger Fiord. It extends thence to the Russian frontier as its eastern boundary, while to its south lies the northern frontier of Finland.

It is generally known that the extent of the Norwegian seaboard is very great, and is about 2000 miles from Christiania to the Varanger Fiord; but it is not usually realized how greatly the Norwegian coast all the way up trends eastwards, and, of course, directly east after the North Cape has been rounded: so that Vadsö on the Varanger Fiord is not only as far north as Disco in Baffin's Bay and as Icy Cape in Alaska, far within Behring Strait, but also nearly two degrees further east than Constantinople.

The following is the itinerary of my excursion :—

- June* 17.—Left Newcastle by steamer.
 19.—Arrived at Bergen, and left by steamer for north
 the same evening.
 25.—Arrived at Tromsö.
 28.—Left Tromsö.
- July* 2.—Arrived at Vadsö.
 10.—Crossed Varanger Fiord to Kirchenes in Sydva-
 ranger.
 28.—Returned to Vadsö.
 31.—Left Vadsö.
- Aug.* 6.—Arrived at Svolveær in Lofoten.
 11.—Left Svolveær.
 18.—Home.

I dredged a little whilst waiting at Tromsö, and on the homeward journey worked for a few days at Svolveær in the Lofoten Islands.

At Tromsö I was joined by Herr J. Sparre Schneider, the friend who was to be my companion and who added so much to the interest and pleasure of my trip. Herr Schneider is the Curator of the Tromsö Museum, and his knowledge of the fauna of arctic Norway, on which he has written so many papers, is unequalled. It was indeed surprising to find at Tromsö, far within the Arctic Circle, a museum in which all departments of the arctic fauna were so fully illustrated and so admirably arranged. At my request Herr Schneider had engaged as my head dredger a young farmer who had a taste for natural history and had sometimes accompanied him in his work at Tromsö. Herr Bersvend Bjerking was a very fine fellow physically, and his invariable good humour, his energy and heartiness in his work, and his never-ceasing attention to myself remain as most pleasant reminiscences.

We left Tromsö, and Herr Schneider thought it well to carry with us in the steamer his small boat fitted for shallow-water work over the 500 (?) miles we had to go, in case there should be any difficulty about boats at our destination. We fortunately, however, had no difficulty in hiring a larger boat at Vadsö and in Sydvaranger. At the latter place our crew was certainly a curiously mixed one, consisting of one Englishman (myself), two Norwegians (Schneider and Bjerking), a Lapp, a Finn, and a Russian.

In the voyage between the North Cape and Vadsö we passed two very famous breeding-places of sea-birds—Svær-

holtklubben and Syltefjordklubben. The high cliffs were perfectly white with *Larus tridactylus*, and when a gun was fired from the steamer to arouse them, the clouds upon clouds of these gulls and other sea-fowl which filled the air were simply astonishing. Two islands at Vardö are also great breeding-places.

Vadsö is an excellent dredging-station, and the fauna, whether of tide-marks, of shallow depths, or of deep water in the middle of the Varanger Fiord, is most interesting. Nevertheless, we were glad to leave it. The inn was miserable, the place horrid to a degree. The cod brought in here in vast quantity are disembowelled and their heads cut off, and while the fish are hung up on lines to dry the refuse is left rotting on the ground, until it is gathered up in carts and carried to the fish guano manufactory to be boiled down. The stench from the chimney of that manufactory was unbearable. Herr Schneider suggested that we should cross the Varanger Fiord to Sydvaranger, in the hope of being able to find quarters with a landowner at whose house he had previously stayed when on an entomological expedition. This we did, and in the hospitable and commodious house of Herr H. Figenschou found ourselves in the lap of luxury for so outlandish a place. Here was every comfort and kind attention from our good host and his wife, with excellent food—though, of course, fresh meat was not to be expected every day, where it must of necessity be home-killed. “Kirchenes” with its owner’s family and its guests—for there were several others besides ourselves—can never be forgotten.

Here at Sydvaranger we were within 7 miles of Russia. All fellow voyagers had been left behind, and among these had been some most interesting companions. During the short summer months many of the government officials appear to go to the furthest north to carry out their inspections. Thus, before coming to Sydvaranger we had met the Harbour Director, the Inspector of Fisheries of Norway, the Inspector of Inland Fisheries of Finland, the head of the Geological Survey, the Professor of Chemistry, Herr Svend Foyu (the great whale-hunter), and others of interest, besides English salmon-fishers, for the rivers of East Finmark are famous for their salmon.

Sydvaranger is, however, beyond the range of ordinary or almost any travellers. Ornithologists have been there; entomologists, especially my friend Herr Schneider, have done excellent work in the district; botanists have added species to the Norwegian flora and worked well there; but the only

marine zoologists* who had previously collected in the fiords, as I was informed by Herr Schneider, were Nylander and Gadd, who, in 1855, gave what they had found to the Helsingfors Museum, but did not publish anything on the subject.

The sun never set while we were in East Finmark. Schneider was often entomologizing and I botanizing until near midnight.

I may here add that when dredging we always landed at some spot which had not previously been visited, to have a midday meal and to give our men an hour or an hour and a half's rest. While they were resting Herr Schneider was busy with his net after insects, and more especially Bombyces, which were very abundant and especially affected *Vicia cracca*, a very common vetch of the district, and which there grows with a luxuriance which I have not seen equalled in our own islands. While Schneider was collecting insects I was intent on the botany of the spot.

Geography and Geology.

Norway is divided into Stifts, Amts, and Fogderier. A Stift is a Diocese, and the whole of Norway north of lat. 65° 15' N. is comprised in the Stift of Tromsö. This great Diocese contains three Amts—Nordland, Tromsö, and Finmark. Of these, Finmark is divided into five Fogderier—Altens, Hammerfest, Tana, Vardö, and Varanger. The first two of these Fogderier belong to West Finmark and the last three constitute East Finmark. East Finmark, as has been already stated, extends from the Porsanger Fiord, which is the next large fiord to the east of the North Cape, to the Russian frontier. Beyond Vardö, the most eastern point, the coast-line trends southward and then westward, forming the large Varanger Fiord, the entrance of which thus faces eastward. The northern shore of the Varanger Fiord is known as Nordvaranger, and here is situated the famous whale-fishing station Vadsö. The territory on the southern side of the Varanger Fiord is Sydvaranger. Running inland to the south from Varanger Fiord is Bog Fiord, which ultimately becomes forked, the western fork being Lang Fiord and the eastern Klosterelv Fiord. On the projecting land which forms these last-named fiords is situated Kirchenes, where we had our quarters. At the head of Klosterelv Fiord is Elvenes, at the mouth of the Pasvik River, which river throughout the greater part of its

* Except M. de Guerne, for whose expedition see observations in succeeding part of this paper.

length from Lake Enara is the boundary between Norway and Russia. A mile or so above Elvenes, however, the Russian boundary crosses the Pasvik, in order to take in a very ancient and highly prized chapel of Boris Gleb, which Russia insisted on possessing. By the kind invitation of Madame Prebensen, the wife of the Amtmand (= a sort of Lord Lieutenant, but with much more extended powers), who was staying at Elvenes, I accompanied her to Boris Gleb, where we were most hospitably entertained by the Russian priest. The little old chapel, now no longer used, with the ancient vestments preserved in it, is very interesting. The inhabitants of the little village are Lapps, who belong to the old Greek Church *, and retain many curious old customs. They do not smoke; they will not eat or drink out of any vessel which has been used by those not of their peculiar faith. Formerly there were castrati among them for the Kingdom of God's sake; but this rite is no longer practised, unless secretly, since it has been forbidden by the government. The priest does not, of course, share these old superstitions and views.

The population of East Finmark embraces a mixture of Norwegians, Fins, and Lapps.

The Fins or Quains are as tall as Norwegians, and well-made men. They have usually little or no hair on the chin or cheeks, and but slight moustache; the hair is light or brown, less often dark, the cheek-bones usually high, and the eyes mostly of a cold blue colour.

The Lapps are short, and their average height not more perhaps than 5 feet. There are three sections of them:—

(a) Mountain or Nomadic Lapps. These are the purest breed. They are characterized usually by broad faces and dark hair, and are very commonly bow-legged. They live in tents, or, in winter, in temporarily constructed huts—wandering from place to place, in order to procure the reindeer-moss or other food for their herds of reindeer. Their clothes are chiefly made from the skins of those animals.

(b) River Lapps. These reside in the river-valleys of the extreme north. They are agriculturists, cultivating the land and having their cattle and sheep, and also feeding on the salmon in which the rivers (*e. g.*, Tana) abound. The only reindeer they have are for use in sledging.

(c) Sea Lapps. These reside on the coast and fish in the

* All Lapps in Russia belong to the Greek Church; but those who live in the Swedish and Norwegian parts of what used to be called Lapland are Lutherans.

sea. With Sea Lapps Norwegians occasionally intermarry, but very rarely with Nomadic Lapps. When on my voyage north we stopped at Hammerfest, a Norwegian companion with whom I became acquainted on board lionized me through this most northern town in the world, showing me its reservoir, fountain, buildings, &c. It was Sunday morning. The bell was ringing for service, and the Sea Lapps were trooping to it; their dress was extremely pretty and picturesque, consisting of white flannel bound with crimson or bright blue. I was much pleased with the place, and resolved on my homeward journey to stop there for a week's dredging. The entire town, with all its warehouses and church, was built of wood. Only a week later news came to us at Vadsö that the whole town had been destroyed by fire. When the steamer touched there on my return voyage not a single house or building remained. The coal-heap by the wharf was still burning; all else was blackness and ruin. I went to where the church had stood, and there found and brought away a piece of the melted bell which I had heard summoning the Lapps to their morning service.

There is an affinity between the languages of the Lapps and Quains; but they differ entirely from all other European languages, the nearest perhaps being Hungarian.

Norway is, as it were, a skeleton. Denudation during the Glacial Epoch has been carried to an extreme; almost all sedimentary rocks have been swept off into the sea, and primary rocks for the most part alone remain. It is this which gives such a peculiar facies to the scenery within vision, for as we steam along the entire coast roches moutonnées everywhere meet the eye. Here and there, of course, some sedimentary rocks are still to be found. One of the most important deposits in northern Norway is on the outlying island of Andø, lat. 69°, which is at the northern extremity of Nordland. In this island there is a small Jurassic deposit characterized by such fossils as *Ammonites*, *Belemnites Blainvillei*, Desh., and *brevicornis*, Voltz, *Gryphaea dilatata*, Sow., several *Pectens*, *Lima duplicata*, Sow., *Astarte excavata*, Sow., *Scleropteridium Dahllianum*, Heer, *Pinus Nordenskiöldi*, Heer, *P. microphylla*, Heer, &c., &c. There is also here a seam of inferior coal.

Other small deposits of secondary rocks occur here and there on the islands to the north of this; but on the mainland up to Hammerfest and the North Cape we meet with igneous rocks, gneiss, granite, and serpentine. At the North Cape first appears a series of rocks of unknown horizon called the

“Gaisa” * system. It consists of two series—an upper, which is continued from the North Cape along the East Finmark coast as far as the Tana Fiord; and a lower series, commencing on the eastern side of the Tana Fiord and extending thence to Nordvaranger. The “Gaisa” system is composed of conglomerates embracing lumps of sandstone, quartz, granite, dolomite, &c. Up to the time of my visit all attempts to find embedded fossils in the fragments of these conglomerate rocks, and thus obtain a clue to their age, had been unavailing. A beautiful section of these rocks was seen from the steamer as we passed Kjolle and Ox Fiords, the strata presenting layers of very varied and lovely colouring. The geological formation at Vadsö and the northern shores of the Varanger Fiord consists of “Gaisa,” with some glacial deposits here and there along the shore; but on crossing the fiord to Sydvaranger this interesting formation is left behind and the rocks are again igneous. This geological change, of course, cannot be without exhibiting effects on the flora and perhaps also on the fauna of the fiords.

The chief factor, however, which influences the fauna of East Finmark consists in the difference of climate. West Finmark, up to the North Cape and beyond it, is indebted to the influence of the Gulf Stream for a temperature all through the winter months which keeps the sea free from ice. The climatic conditions of the Varanger Fiord are, however, very different, and the smaller fiords, such as those of Sydvaranger, where my dredging was chiefly carried on, are completely frozen over from December or January to the middle of May or into June, the ice attaining a thickness of 2 to 3 feet. As a necessary consequence the fauna of the Varanger Fiord and of the other fiords of that district is of more arctic character than that round the North Cape, although in latitude the latter is somewhat more northern. In the summer months the difference of temperature is evidenced by the dense fogs which are commonly met with off the coast of East Finmark, and which are the result of contact of the warm air coming from the west with the cold currents passing westward from the Kara Sea. It was in one of these fogs, during which we had to lie to for twenty-seven hours, that while other passengers were filling great tubs with the cod which so freely took the bait, I employed my time in casting from the deck of the steamer a little hand-dredge off the mouth of Laksefjord, and thus obtained animals some of which are recorded as from that locality in the following notes.

* Gaisa, the name of a mountain in the Porsanger district.

MAMMALIA.

The following notes on a few of the mammals were given me in conversation by Herr J. Sparre Schneider when we were together in Finmark.

Ursus arctus, Linn. (Brown Bear.) Occurs through Norway; abundant in the valleys of Tromsö Amt, but scarce in East Finmark.

Gulo luscus, Linn. (Glutton.) Common in East Finmark, as throughout mountains of Norway.

Mustela martes, Linn. (Pine-Marten.) Occurs in West Finmark and perhaps in East.

Putorius ermineus, Linn. (Ermine.)

Canis lupus, Linn. (Wolf.) Common in East Finmark, but almost extinct in the rest of Norway. It comes in numbers on the ice in winter on the Pasvik River. Nine were killed one night by Herr Figenschou about five years before I was staying with him.

Vulpes alopeax, Linn. (= *V. vulgaris*, Briss.). (Common Fox.) Common.

— *lagopus*, Linn. (Arctic Fox.) Found throughout Norway, but most abundant in mountains of Finmark. Two hundred were killed by poison in one winter at Vadsö some years ago.

[*Felis lynx*, Linn. (Lynx.) Does not occur in East Finmark. It has been killed in West Finmark, and is most abundant in the neighbourhood of Trondhjem, coming into the outskirts of the town in the winter months.]

Trichechus rosmarus, Linn. (Walrus.) Has been seen rarely in Finmark.

Halichærus gryppus, Fabr. (Grey Seal.) Breeds at Trondhjem, but does not now reach East Finmark, although bones of it have been found there.

Erignathus barbatus, Fabr. (Great Seal.)

Phoca vitulina, Linn. (Common Seal.)

— *fætida*, Fabr., = *P. annellata*, Schinz, = *P. hispida*, Schreb. (Marbled Seal.)

Pagophilus groenlandicus, Fabr. (Greenland Seal.)

Lemmus norvegicus, Desm. (Lemming.)

Evotomys ruficanus, Sund.

Microtus ratticeps, Keys. & Blas. No rat or house-mouse occurs in East Finmark.

Alces machlis, Gray. The Elk is now altogether absent from, or, if present, very rare in, East Finmark, nor is it found on the west coast of Norway. It is still abundant about Namsos and a little further north.

Rangifer tarandus, Desm. All the Reindeer in East Finmark are now tame. They are still wild in the Hardanger district and in the central range of mountains.

Megaptera boops, Linn. Not so common as the two following.

Balænoptera musculus, Linn. This and the next are the two great whales, measuring when adult 70-80 feet in length, which chiefly occur at Vadsö.

— *Sibbaldii*, Gray.

— *borealis*, Lesson. Sporadic at Vadsö, more common in West Finmark.

— *rostrata*, Fabr. Smaller species; not hunted, caught in nets and often shot. Chiefly found in Bergen district, occasionally in East Finmark.

Balæna biscayensis, Gray. Extinct in East Finmark for some 200 years(?); bones found at Vadsö and Sörö.

Hyperoodon rostratus, O. F. Müll. (Bottle-nosed Whale.) Chiefly killed in Arctic seas, but occurring in ice-floes to the north of East Finmark.

Monodon monoceros, Linn. (Narwhal.) Killed once in Varanger Fjord about eighty years ago.

Delphinapterus leucas, Pallas. (White Whale.) This species, the inhabitant of the seas of Nova Zembla, Spitsbergen, Greenland, and N.E. America, has occurred off the East Finmark coast.

Orca gladiator, Laplace. (Grampus.) Rarely killed. It swims in herds and attacks the great whales.

Globocephalus melas, Traill. Occasional; chiefly enclosed by nets in narrow fjords and then shot. As many as 2500 have been killed at Lofoten at one time.

Lagenorhynchus albirostris, Gray. Occurs throughout the whole of Norway.

The whales which are chiefly killed for oil are *Megaptera boops*, *Balænoptera Sibbaldii*, *musculus*, *borealis*, and *rostrata*. Some years ago Vadsö was the great centre of Norwegian whale-fishery; I have a note (but do not remember whence it was taken, and therefore, though I believe it to be correct, I cannot vouch for its accuracy) that in 1884 450 whales were killed, in 1885 1398, and in 1886 954. When the fishery was at its height the harbour of Vadsö was covered with floating oil, and the stench from the dead whales must have been something frightful. The fishery at Vadsö was at the time of my visit closed; but the fishery was still continued at Mehavn, Sörö, and Jan Fjord. But the whales are now scarce. I only saw one which had been killed and perhaps half a dozen alive spouting. Their great destruction has been due to the mode of slaughter invented by the well-known

Herr Svend Foyn, whom I saw as an old man, and who has since died. He hunted the whales in steamers of about 80 tons, with engines of about 30 horse-power, shooting the whales with harpoons to which were attached cartridges, which, exploding, blew holes in the whales' sides.

MOLLUSCA.

The following catalogue contains all the Mollusca which are known to occur in East Finmark. The species found by myself have a locality attached; species of which the name only is given are inserted on the authority of G. O. Sars and others; species in this and other lists which have a * prefixed were procured by me in 1890 either at Tromsö or Svolvær, Lofoten Islands, but not in East Finmark.

CEPHALOPODA.

The following seven species are recorded by G. O. Sars:—

- Ommastrephes sagittatus*, Lamarck.
- Gonatus amoenus*, Lichtenstein.
- Rossia glaucopsis*, Lovén.
- Octopus arcticus*, Prosch.

PTEROPODA.

- Limacina helicina*, Phipps.
- *balea*, Möller.
- Clione limacina*, Phipps.

GASTROPODA.

- **Tornatina nitidula*, Lovén. Svolvær, Lofoten, 5–10 fathoms.
- *pertenuis*, Gould. Vadsö, in 5–25 fathoms; Klosterelv Fiord.
- Cylichna alba*, Brown. Very common in East Finmark.
- var. *corticuta*, Beck. Vadsö and Sydvaranger.
- *propinqua*, M. Sars. In shallow water at Vadsö and in all the Sydvaranger fiords.
- Diaphana hyalina*, Turton. Vadsö and Klosterelv Fiord.
- *globosa*, Lovén, = *hyemalis* (Gould), G. O. Sars. Bog and Klosterelv Fiords, but only a single specimen in each locality.
- Scaphunder punctostriatus*, Mighels.
- Philine finnmarkica*, M. Sars. Bog Fiord.
- *quadrata*, S. Wood. Lang Fiord, very fine specimens.
- *— *scabra*, Müller. Lofoten.
- *lima*, Brown. Vadsö and Bog Fiord.

Philine fragilis, G. O. Sars.

Acanthodoris pilosa, Müll. Tide-marks, Vadsö.

Lamellidoris muricata, Müll. Tide-marks, Vadsö.

— *bilamellata*, Linn. Vadsö Sound.

Doris obvelata, Müll. Tide-marks, Vadsö.

Issa lacera, Müll.

Dendronotus frondosus, Ascanius. Vadsö.

— *velifer*, G. O. Sars.

Æolidia papillosa, Linn. Vadsö.

Limapontia capitata, Müller. Tide-marks, Vadsö.

Bela pyramidalis, Ström. Vadsö and fiords of Sydvaranger; also Lofoten.

var. *semiplicata*, Sars. Vadsö.

— *Pingelii*, Beck. Harbour at Vadsö, and in a bay west side of Bog Fiord.

— *rugulata*, Troschel. Abundant.

var. *assimilis*, G. O. Sars. Bog and Lang Fiords.

— *nobilis*, Möll. Varanger and Sydvaranger Fiords.

— *scalaris*, Möll. Lang Fiord, 5–15 fathoms, one large living specimen; Vadsö Harbour, one dead.

— *exarata*, Möll., = *nitridula*, Lovén. The most abundant *Bela* in the district.

— *obliqua*, Möll. One living specimen in Lang Fiord, 5–15 fathoms.

— *cancellata*, Migh., = *elegans*, Sars. Klosterelv and Lang Fiords.

var. *declivis*, Lovén. Much more frequent than the type, Varanger and Sydvaranger Fiords.

— *Trevelyana*, Turton. Varanger Fiord, down to 125 fathoms; fiords of Sydvaranger and also Lofoten.

— *decussata*, Couthouy, = *viridula*, Möll. Vadsö and Bog and Lang Fiords.

var. *conoidea*, G. O. Sars.

— *tennicostata*, M. Sars. One only in Bog Fiord, 100–125 fathoms.

— *harpularia*, Couthouy. Vadsö, Bog and Lang Fiords, 5–30 fathoms.

— *Kobelti*, Verkrüzen, = *B. viridula*, G. O. Sars (non Möll.). Varanger Fiord, east of Vadsö, in 10–25 fathoms.

— *cinerea*, Möll.

— *bicarinata*, Couthouy.

var. *violacea*, Migh. In all the fiords and at Lofoten in 5–30 fathoms.

Bela bicarinata, var. *cylindracea*, Beck. One living in 100–120 fathoms, Bog Fiord.

— *angulosa*, G. O. Sars.

— *simplex*, Midd.

— *expansa*, G. O. Sars.

* *Clathrella linearis*, Montagu. Svolvær, Lofoten.

Typhlomangelia nivalis, Lovén.

Spirotropis carinata, Phil.

Teretia amoena, G. O. Sars. A living specimen, Varanger Fiord, 125–150 fathoms.

Turanis cirrata, Brugnone, = *T. Mörchi*, Malm. Klosterelv and Bog Fiords, 5–10 fathoms.

Admete viridula, Fabr. Throughout the district, and of larger size than it attains in West Norway; reaches 16 millim. in length.

var. *undato-costulata*, Verkrüzen. Vadsö and Sydvaranger, and as large as the types.

Trophon truncatus, Ström. Living between tide-marks at Vadsö, and dredged in 5–30 fathoms in all the Sydvaranger fiords examined.

— *clathratus*, Linn. In all the fiords down to 120 fathoms.

var. *Gunneri*, Lovén. Varanger, Lang, and Bog Fiords, 15–80 fathoms.

— *barvicensis*, Johnston. "Porsanger Fiord" (*vide* Friele).

Purpura lapillus, Linn., and var. *imbricata*, Lamk. Vadsö, of a rich purplish-brown colour.

Astyris rosacea, Gould. Lang, Klosterelv, and Bog Fiords, and at Svolvær, Lofoten, 5–50 fathoms.

Nassa incrassata, Ström. Svolvær, Lofoten. Recorded by G. O. Sars from East Finmark.

Boreofusus bernicensis, King.

Volutopsis norvegica, Chemn.

Ukko Turtoni, Bean. Vardö, fishermen's lines.

Neptunea despecta, Linn. Bog Fiord; Vardö, fishermen's lines; Svolvær, Lofoten.

Sipho gracilis, Da Costa, var. *glabra*, Verkr. Vardö, from fishermen's lines.

— *islundicus*, Chemn. Vardö, fishermen's lines.

— *latericeus*, Müll. Varanger Fiord, 100–125 fathoms, and Lang Fiord, 3–30 fathoms.

Siphonorbis Verkrüzeni, Kobelt.

— *luchesis*, Mörch.

— *tortuosus*, Reeve.

var. *turritus*, M. Sars. Vadsö.

Siphonorbis ebur, Mörch.

— *fusiformis*, Brod.

Buccinum undatum, Linné.

var. *borealis*, nov. nom., = var. *pelagica*, G. O. Sars (but not var. *pelagica*, King). Vadsö, in shallow water. The nearest approach to the form that we have in British seas is var. *flexuosa* of Jeffreys, from Shetland, which it resembles in its elongated form and flexuose ribs; but the latter is a much more delicate and in all respects more elegant form.

var. *cerulea*, G. O. Sars. This variety is found at low water at Vadsö; the substance of the shell is commonly of a rich vinous-purple colour, which is especially evident on the columella. Sars says of the colouring "fusco-cærulea, faucibus intense nigro-castaneis." The ribs are often almost entirely absent on the lower whorls. It passes into var. *borealis* at a few fathoms depth.

var. *Schneideri*, Verkrüzen. A beautiful pure white form which comes up very constantly on the fishermen's lines at Vardö. I have seen half-grown specimens which might pass for the rare white variety of var. *zetlandica*; but the form is much less produced than in that variety from the Shetland Haaf; the whorls are more tumid and the ribs much more developed. Occasionally pure white examples of var. *zetlandica* occur; but in the case of var. *Schneideri* the whole race is a pure white one—at least, I did not see any similar specimens of a different colour on the quay at Vardö.

Buccinum finmarchianum, Verkrüzen. This beautiful species is brought up in great numbers by the Vardö fishermen's lines; among a large number which I procured at Vardö there was a single white specimen. I have an example in my cabinet, kindly given me by Herr Schneider, which is no less than 80 millim. long; it is referable to var. *attenuata*, G. O. Sars; 60 millim. may be considered as the ordinary limit of measurement of a full-grown shell. Sars gives as measurement of the usual form 55 millim., of var. *attenuata* 58 millim., of var. *scalaris* "Long. usque ad 65 mm."

Buccinum groenlandicum, Chemnitz. Between tide-marks, Vadsö.

var. *nuda*. I propose this name for a remarkable form of *Buccinum* to be found on the outer side of the island which shelters the harbour of Vadsö. The form is more evenly conical than *groenlandicum*, the whorls usually being flatter and the suture less deep. In general the whorls are perfectly smooth, without any trace of ribs, riblets, or puckers; but in other cases flexuose ribs are, more or less, developed on all the whorls accompanied by spiral riblets, and the resemblance to *B. undatum* becomes so exact that such a specimen taken by itself might be ascribed by a conchologist as being without doubt a small variety of that species. The

colour varies greatly: some are pure white, others rich purple, others mottled with rufous spots on a paler yellowish ground. The length of full-grown specimens is an inch and a half. I have left to the last the important character which distinguishes it so markedly from *B. grœnlandicum*: the *epidermis* is perfectly smooth, and at no age, nor on any specimen that I have seen, could a trace be found of the longitudinal epidermal pleats, crowned with backward directed setose processes, which are so characteristic of *B. grœnlandicum*. It is not *B. parvulum*, Verkrûzen, it is not at all like his figures, nor has it anything to do with a specimen in my collection which came thus named from him indirectly to myself, and which agrees perfectly with his figures, and has the seta-crowned epidermal pleats of *B. grœnlandicum*. I previously, however, had the form *nuda* in my collection (a) from Professor G. O. Sars, and (b) from Verkrûzen, labelled in his writing "*Buccinum?* n. sp., Finmark occidentalis"; and also a shorter form of the same thing, with the mouth somewhat more expanded, received from Prof. Sars, "*Buccinum grœnlandicum*, var. *patula*." I am rather inclined to believe that this form is not, in the ordinary sense of the term, a variety, but that it is a hybrid between *B. undatum* and *B. grœnlandicum*. The conditions under which it occurs are curious. The island to which I have referred is only a little place. At its north-eastern corner between tide-marks *B. undatum*, var. *cœrulea*, G. O. Sars, is found accompanied by ordinary *B. grœnlandicum*. A little further round—though really close by—for perhaps a hundred yards or so, var. *nuda* occurs in the greatest profusion; and beyond this again *B. grœnlandicum* takes its place with the usual epidermis. The purple colour so prevalent in var. *nuda*, but totally absent in the normal forms, is exactly the same colour which is so marked in Sars's *B. undatum*, var. *cœrulea*.

Buccinum hydrophanum, Hancock, var. *tumidulum*, G. O. Sars.
Varanger Fiord in 100–150 fathoms.

Odostomia turgida, G. O. Sars.

— *turrita*, Hanley.

— *unidentata*, Mont.

Liostomia eburnea, Stimpson. Vadsö, in 10–25 fathoms.

Pyrgulina eximia, Jeffreys.

— *spiralis*, Montagu.

Eulima bilineata, Alder. Entrance to Vadsö Harbour.

Scularia grœnlandica, Möll. Vadsö and Svolvear, Lofoten, 10–25 fathoms.

var. *Loveni*, G. O. Sars. One only. Lang Fiord, 15–25 fathoms.

var. *crebricostata*, G. O. Sars. One only. Varanger Fiord, 100–125 fathoms.

Scalaria obtusicostata (S. Wood), G. O. Sars.

Læocochlis granosa, Wood.

Cerethiopsis costulata, Möll. Lang Fiord, 30 fathoms; Bog Fiord, 20–30 fathoms.

Newtoniella metula, Lovén.

Turritellopsis acicula, Stimpson. Vadsö and Varanger Fiord, in shallow water to 15 fathoms.

Trichotropis borealis, Brod. & Sow. Lang and Bog Fiords and also Lofoten, down to 80 fathoms.

— *conica*, Möll.

Littorina littorea, Linn. Vadsö, Lang Fiord, &c.

— *rudis*, Maton, var. *greenlandica*, Möll. Extremely abundant. When found near or quite at high-water mark on rocks it is of smaller size than when living lower down, and at the same time more richly coloured. The colour is very variable: pure white; white banded with black or brick-red; grey; grey mottled with dispersed yellow spots; black; black banded with white. A form taken in Bog Fiord has the spire more elevated than usual, and corresponds to our English var. *tenebrosa*. The surface of the shell is usually smooth or sculptured only with slightly elevated spiral ridges. At Vardö, however, a large variety occurs which is girt with strong spiral ribs, and is quite indistinguishable from *Littorina sitchana*, Philippi, from Vancouver and the Behring Sea. It is figured by Sars, Moll. Reg. Arct. Norv. pl. ix. fig. 10.

*— *obtusata*, Linn. Occurs of quite the normal British form and appearance at Svolvær, Lofoten. In East Finmark it gives place to the following very remarkable varieties:—

var. *palliata*, Say, Sars, pl. ix. fig. 9. Tromsö, Vardö, Vadsö, &c.

forma *elatiior*, Sars, pl. xxi. fig. 19, has the spire so much elevated that it has the shape of *L. rudis*; it occurs between tide-marks not far from low-water mark at Vardö.

forma *coarctata*, Sars, pl. xxi. fig. 20. This extraordinary shell occurs with the last at Vardö, and is indeed an extreme form of forma *elatiior*, with which, and with *palliata* of ordinary form but of large size, it is found.

Lacuna pallidula, Da Costa. Tide-marks, Vadsö.

— *divaricata*, Fabr., var. *solidula*, Lovén. Vadsö and Bog and Klosterelv Fiords.

var. *frigida*, Lovén. Klosterelv Fiord. In both these varieties the specimens have been compared with cotypes received from the late Professor Lovén.

Skenea planorbis, Fabr. Vadsö; Klosterelv Fiord and Svolvær.

Hydrobia minuta, Totten.

- **Rissoa parva*, Da Costa. Svolveær. The type not from East Finmark.
var. *interrupta*, Adams. Vadsö and Svolveær.
Alvania Jan-Mayeni, Friele. Varanger Fiord, in 100–125 fathoms.
New to the Norwegian fauna.
—— *Jeffreysii*, Waller.
Cingula castanea, Möll. Lang Fiord, in 5 fathoms.
—— *tumidula*, G. O. Sars.
Onoba striata, Adams, var. *saxatilis*, Möll. (= *aculeus*, Gould).
Tide-marks and shallow water, Vadsö; Lang and Bog Fiords;
Svolveær.
Jeffreysia globularis, Jeffr. Klosterelv and Lang Fiords, 5–15
fathoms.
Homologyra atomos, Philippi.
Velutina levigata, Penn. Lang and Bog Fiords.
—— *lanigera*, Möll.
Morvillia unilata, Brown. Lang Fiord.
Velutella flexilis, Mont.
—— *cryptospira*, Midd.
Marsenia prodita, Lovén.
—— *micromphala*, Bergh.
—— *grænlandica*, Möll.
Onchidiopsis glacialis, M. Sars.
Natica affinis, Gmel., = *N. clausa*, Brod. & Sow. In all the East
Finmark Fiords and at Lofoten.
**Lunatia Alderi*, Forbes. Svolveær.
* —— *Montagui*, Forbes. Svolveær.
—— *grænlandica*, Beck. Lang and Bog Fiords and Svolveær,
5–120 fathoms.
—— *nana*, Möll. Vadsö, in 10–50 fathoms.
Amauropsis islandica, Gmel. Vadsö and middle of the Varanger
Fiord, 10–125 fathoms.
Calliostoma occidentale, Migh. & Ad. Bog Fiord, 20–30 fathoms.
Machæroplax obscura, Couth.
var. *bella*, Verk. Varanger, Lang, Bog, and Klosterelv
Fiords, in shallow water.
var. *albula*, Gould. Vadsö, in 10–25 fathoms.
—— *varicosa*, Migh. Vadsö and Bog Fiord.
**Gibbula cineraria*, Linn. Svolveær.
—— *tumida*, Mont. Svolveær; and given to me by Herr Dahl, of
Vardö, as from that place.
Margarita grænlandica, Chemn. In all the East Finmark Fiords,
at Tromsö, and at Svolveær.
var. *levior*, Jeffr. With the last.

- Margarita olivacea*, Brown. Varanger, Lang, and Bog Fiords.
 — *cinerea*, Couth. Throughout the district from shallow water to 125 fathoms.
 — *helicina*, Phipps. Vadsö; Lang and Bog Fiords.
Mölleria costulata, Möll. Vadsö; Lang, Bog, and Klosterelv Fiords.
Cyclostrema Petterseni, Friele. Klosterelv and Bog Fiords in shallow water.
Scissurella crispata, Flem. In all the Sydvaranger Fiords.
Puncturella noachina, Linn. Throughout the district.
Lepeta caeca, Müll. Throughout the district.
Pilidium fulvum, Müll.
Acmea virginea, Müll. Varanger, Klosterelv, and Bog Fiords; and at Svolveær.
 — *testudinalis*, Müll. Vadsö and Sydvaranger Fiords.
 — *rubella*, Fabr.

POLYPLACOPHORA.

- Tonicella marmorea*, Fabr. Throughout the district, but small.
Trachydermon ruber, Lowe. Common everywhere, but small.
 — *albus*, Linn. Throughout the district.
Leptochiton arcticus, G. O. Sars. Vadsö and Lang Fiord.
Hanleyia debilis, Gray. Lang Fiord; one very fine, measuring 22 millim. when dried. It thus approaches *H. abyssorum*, M. Sars.

SCAPHOPODA.

- Dentalium entalis*, Linn. Vadsö; Lang and Bog Fiords.
 — *occidentale*, Stimpson. Vadsö.
Siphonodentalium vitreum, M. Sars. Varanger, Lang, and Bog Fiords, down to 125 fathoms.

PELECYPODA.

- Anomia ephippium*, Linn. Varanger and Klosterelv Fiords.
 var. *aculeata*, Müll. Svolveær. Sars records it from East Finmark.
Pecten islandicus, Müll. Varanger and Klosterelv Fiords.
 — *tigrinus*, Müll. Lang Fiord.
 — *septemradiatus*, Müll.
 — *imbrifer*, Lovén.
 — *grœnlandicus*, Sow. Varanger and Bog Fiords, in 80-125 fathoms.
Limca Sarsi, Lovén.

- Mytilus edulis*, Linn. In several places.
- Modiola modiolus*, Linn. Lang and Klosterelv Fiords.
- *phaseolina*, Phil. Vadsö and Lang Fiord.
- Modiolaria discors*, Linn. Among Corallina in rock-crevices between tide-marks at the back of the island which forms the harbour of Vadsö.
- *laevigata*, Gray. Bog and Lang Fiords, in 10–30 fathoms.
- *nigra*, Gray. In all the Fiords, but not abundant, and I saw no large specimens, 10–125 fathoms.
- *corrugata*, Steenst. Lang Fiord, in 15–25 fathoms.
- Dacrydium vitreum*, Möll. Varanger, Bog, and Lang Fiords, in 30–125 fathoms.
- Crenella decussata*, Mont. Vadsö, and all Sydvaranger Fiords, in 15–125 fathoms.
- Arca glacialis*, Gray. Varanger and Bog Fiords, 30–125 fathoms.
- Nucula tenuis*, Mont. Abundant throughout the district.
- *delphinodonta*, Migh.
- Leda minuta*, Müll. Throughout the district.
- *pernula*, Müll. Throughout the district.
- Yoldia limatula*, Say. A dead specimen brought up in a small dredge which I threw out from the steamer when lying in a fog off the mouth of Laksefiord.
- Portlandia lucida*, Lovén. Varanger and Lang Fiords, in 25–125 fathoms.
- *intermedia*, M. Sars. Varanger, Lang, and Bog Fiords, 80–125 fathoms.
- *lenticula*, Fabr. Varanger, Lang, and Bog Fiords, in 5–100 fathoms.
- *frigida*, Torell. In all the fiords, in 5–125 fathoms.
- Astarte compressa*, Linn. (= *A. elliptica*, Brown). In all the fiords of Sydvaranger, in 5–50 fathoms.
- *borealis*, Chemn. Lang Fiord, Tromsö and Svolvær.
- var. *placenta*, Mörch. Klosterelv Fiord, 5 fathoms.
- *crebricostata*, Forbes. Varanger, Lang, and Klosterelv Fiords, in 5–125 fathoms.
- *striata*, Leach (= *compressa*, Mont., non Linn.). Vadsö; Lang and Klosterelv Fiords, in 5–25 fathoms. Species showing considerable variation. A striking feature in East Finmark is the great abundance of Nuculidæ and Astartidæ.
- Turtonia minuta*, Fabr. Tide-marks, Vadsö and Klosterelv Fiord.
- * *Montacuta bidentata*, Mont. Svolvær.
- * — *ferruginosa*, Mont. Svolvær.
- *Maltzani*, Verk.

**Cardium echinatum*. Svolvær.

— *elegantulum*, Beck. Varanger, Lang, and Bog Fiords, 25–125 fathoms.

— *ciliatum*, Fabr. (= *islandicum*, Chemn.). Varanger, Lang, and Klosterelv Fiords, 5–25 fathoms.

— *fasciatum*, Mont. In all the fiords, also at Tromsö and Svolvær.

Serripes grœnlandica, Linn. In Laminarian zone throughout the district.

Cyprina islandica, Linn. Klosterelv Fiord, 2–5 fathoms. The extreme profusion in which this species occurs in the Glacial Clays of Scotland I had always supposed to be a state of things which had entirely passed away; until at Svolvær, Lofoten Islands, I found *Cyprina* living in the same extraordinary abundance. The shore there is densely strewn with the dead shells and their comminuted remains which have been cast up.

Venus gallina, Linn. Vadsö.

— *casina*, Linn. “Vardö,” *fide* Lovén.

Timoclea ovata, Penn. Svolvær. Entered by Sars as found in East Finmark.

Thyasira flexuosa, Mont.

var. *Sarsi*, Phil. Vadsö, Klosterelv and Bog Fiords, and at Svolvær.

var. *Gouldii*, Phil. Varanger, Lang, and Bog Fiords, 20–125 fathoms.

— *obesa*, Verrill. Vadsö, in 10–25 fathoms.

Axinopsis orbiculata, G. O. Sars. Vadsö and all the Sydvaranger Fiords, in 2–50 fathoms.

Lucina borealis, Linn. Svolvær. Sars records it from East Finmark.

Maetra elliptica, Brown. Vadsö.

— *subtruncata*, Da Costa. Lang Fiord. A single specimen.

**Syndosmya prismatica*, Mont. Svolvær.

Tellina balthica, Linn. Very abundant; living between tide-marks in Klosterelv and Lang Fiords. The shells are of comparatively small size, with a dull chalky-like surface. The substance of the Klosterelv shells is white, while that of almost all those from Lang Fiord is pink.

— *calcarca*, Chemn. Vadsö; Lang and Klosterelv Fiords; also Svolvær.

*— *fabula*, Gmel. Svolvær.

Mya arenaria, Linn. Vadsö; Klosterelv Fiord; Svolvær.

— *truncata*, Linn. One dead, Klosterelv Fiord.

Corbula gibba, Olivi.

Panopea norvegica, Spengler. Dead valves, perhaps fossil, in Klosterelv Fiord. Sars records this from West but not from East Finmark.

Saxicava rugosa, Linn. Common throughout the district.

var. *arctica*, Linn. Occasional.

Thracia truncata, Brown. Varanger and all the Sydvaranger Fiords, 3–30 fathoms.

Cuspidaria arctica, M. Sars. This very large and fine species was found in the Varanger and Bog Fiords in 80–125 fathoms, but very rare.

— *glacialis*, G. O. Sars. Varanger Fiord; rare in 100–125 fathoms.

— *subtorta*, G. O. Sars. Varanger, Lang, and Bog Fiords, in 3–30 fathoms.

— *obesa*, Lovén.

Poromya granulata, Nyst and West. “Porsanger Fiord,” *vide* Friele.

BRACHIOPODA.

Terebratulina caput-serpentis, Linn., var. *septentrionalis*, Couth. Lang and Bog Fiords, in 5–100 fathoms.

Eudesia cranium, Müll. Lang Fiord, 25 fathoms. A single broken specimen.

Rhynchonella psittacea, Gmel. Varanger, Lang, and Bog Fiords, in 15–30 fathoms.

Of the Mollusca found in East Finmark the following are not as yet known elsewhere:—

Philine fragilis.

Dendronotus velifer.

Bela expansa.

Siphonorbis Verkruzeni.

Scalaria obtusocostata.

Cingula tumidula.

The following are North American, and not found elsewhere on the Norwegian coast:—

Liostomia eburnea.

Thyasira obesa.

Cuspidaria arctica.

The following are Arctic species which reach East Finmark, but are not known further south on the Norwegian coast:—

Bela simplex.

Siphonorbis lachesis.

Alvania Jan-Mayeni.

Cingula castanea.

Velutella cryptospira.

Marsenia grænlandica.

Lunatia nana.

Machæroplax varicosa.

Turritellopsis acicula.

Portlandia intermedia.

Cardium ciliatum.

Serripes grænlandicus.

Montacuta Maltzani.

Cuspidaria glacialis.

— *arctica*.

The following species have not been found under more arctic conditions than those existing in East Finmark:—

Typhlomangelia nivalis.
Spirotropis carinata.
Taranis cirrata.
Olostomia turgida.
 — *uvidentata.*
 — *turrita.*
Pyrgulina eximia.
 — *spiralis.*
Eulima bilineata.
Alvania Jeffreysii.
Jeffreysia globularis.
Marsenia prodita.

Gibbula tumida.
Pilidium fulvum.
Hanleyia debilis.
Pecten tigrinus.
 — *septemradiatus.*
Limea Sarsi.
Modiola phaseolina.
Venus gallina.
 — *fasciata.*
Lucina borealis.
Mactra subtruncata.
Corbula gibba.

A comparison of this list of East Finmark Mollusca with two Norwegian catalogues which I have previously published will illustrate the changes in the Molluscan Fauna as we go further north up the Norwegian coast (see Norman, "Mollusca of the Fiords near Bergen," *Journal of Conchology*, vol. ii. 1879, p. 8; and "A Month on the Trondhjem Fiord," *Ann. & Mag. Nat. Hist.* ser. 6, vol. xii. 1893, p. 341).

[To be continued.]

Notes on the Natural History of East Finmark. By Canon
A. M. NORMAN, M.A., D.C.L., LL.D., F.R.S., F.L.S.

[Continued from p. 361.]

[As it was quite possible that in the introductory notes to these papers I might have fallen into some errors, I sent a proof to Herr Schneider and requested him to criticize closely. To-day (Nov. 13) I have received his reply. In respect of Mammalia:—

Vulpes lagopus, Linn. (Arctic Fox). The two hundred were killed by poison in one winter at Vardö (not Vadsö).

Halichoerus grypus, Fabr. (Grey Seal), "is still living in Finmark. A large male specimen was killed at Soærholt this last spring. I got the splendid cranium" (Schneider).

The following are verbal corrections. My head dredger's name should be spelt Bjerking (not Bjerking). M. Figenschau's place should be spelt Kirkenes (not Kirchenes); Bög Fiord should be read everywhere for Bog Fiord. Two

important mistakes, which I cannot tell how I came to make, are:—

Page 344, line 12, for "Bombyces" read "Bombidæ."

Page 354, line 24, for "north-eastern" read "north-western."

MOLLUSCA (continued).

The following additional species and varieties were recorded in 1882 from Vardö and Kirkenes by J. Sparre Schneider *:—

Thesbia nana, Lovén.

Buccinum Donovanii †, Gray.

— *fragile*, Verkrüzen.

— *parvulum*, Verkrüzen.

Buccinum Humphreysianum, Ben.

Sipho Sarsii, Jeffr.

Helcion pellucidum, Linn.

Gibbula cineraria, Linn.

Since the preceding part was sent to press I have received from Herr Friele an account of the Mollusca dredged by the 'Michael Sars' in 1900 ‡. Among these are five species from the Porsanger Fiord which are additions to the fauna of East Finmark:—

Coryphella Sarsi, sp. n.

Dendronotus robustus, Verrill.

Acera bullata, O. F. Müller.

Ampullina Smithii, Brown.

Limopsis minuta, Phil.

The number of Mollusca of East Finmark, according to the foregoing lists, is 232; of these, 164 were found in 1890 by myself, and 68 are added on the authority of G. O. Sars, Lovén, Schneider, and Friele.

Professor G. O. Sars, in the concluding pages of his 'Mollusca regionis Arcticæ Norvegiæ,' 1878, divides the Norwegian Mollusca under the two headings of Arctic and Boreal species. Although I should myself refer a few of the species which he characterizes as arctic rather to a boreal origin (as he himself would perhaps do with our present knowledge of distribution), it may nevertheless be interesting to state that he classifies the whole of the species contained in the preceding lists as of arctic origin, with the exception of the following fourteen:—

* Schneider (J. Sparre), "Nogle zoologiske-iaagttagelser fra Vardö," Tromsø Museums Aarsberetning, 1882, p. 81; and *Thesbia nana*, Lovén, from Kirkenes, Schneider, "Undersøgelser af dyrelivet i de arktiske fjorde. III. Tromsøsundets Molluskfauna," Tromsø Museums Aarshefter, viii. 1886, p. 22.

† This and the two following *Buccina* I regard as varieties of *B. undatum* and *B. groenlandicum*.

‡ Friele (H.), "Mollusken der ersten Nordmeerfahrt des Fischereidampfers 'Michael Sars' 1900 unter Leitung von Herrn Dr. Johan Hjort," Bergens Museums Aarbog, 1902.

Ommastrephes sagittatus.
Acera bullata.
Thesbia nana.
Trophon barvicensis.
Eulima bilineata.
Jeffreysia globularis.
Littorina obtusata.

Gibbula cineraria.
Helcion pellucidum.
Dentalium entalis.
Pecten tigrinus.
Dosinia exoleta.
Maetra subtruncata.
Poromya granulata.

In 1857 Dr. Danielssen made a zoological excursion in Nordland and Finmark, and published a full account of the Invertebrata* he met with. In his list the following Mollusca are recorded from Vadsö :—

Teredo norvegica.
Neera cuspidata.
Thracia phaseolina, var. arctica.
Syndosmya intermedia.
Cardium edule.
 — *echinatum.*
 — *nodosum.*
 — *suecicum.*
Yoldia pygmaea.
Arca Korenii.

Pecten striatus.
 — *similis.*
Crania amomale.
Chiton asellus.
 — *lewis.*
 — *alveolus.*
Velutina halioiidea.
Cylichna cylindracea.
Bulla Cranchii.

Now of these 19 species only 2 are arctic, while 17 are boreal, and it seems impossible not to suppose that some error has been made. Moreover, Sars has not entered these species in his East Finmark column.

In 1875 Mr. Verkrüzen, after a visit to East Finmark, published a paper †, in which a list is given of Mollusca found on different parts of the Norwegian coast. The entire list contains 190 species, but of these 97 are referred to East Finmark, and include the following Mollusca which are not in the lists which I have given :—

Utriculus obtusus.
Columbella nana.
Odostomia rissoides.

Odostomia acuta.
Rissoa albella.
Chiton cinereus.

In this paper Verkrüzen described *Buccinum finmarchianum*, *Margarita bella*, and *Montacuta Maltzani*.

In the following year Kobelt described and figured some Fusidæ and other Mollusca which Verkrüzen had brought

* Danielssen (D. C.), "Beretning om er Zoologisk Reise foretagen Sommeren 1857," *Nyt Mag. for Naturvidenskaberne*, vol. ii. 1861, pp. 1-58.

† Verkrüzen (T. A.), "Bericht über einen Schabe-Ausflug im Sommer 1874," *Jahrb. der deutschen malakozoologischen Gesellschaft*, 1875, p. 229.

back from East Finmark †. Among the species are *Sipho Verkrüzeni*, Kobelt, *Buccinum parvulum*, Verkrüzen, and *Admete undatocostata*, Verkrüzen.

In 1881 M. Jules de Guerne, accompanied by other French naturalists, went to the Varanger Fiord on a "Mission scientifique." Two papers on the expedition were published by M. de Guerne ‡. These naturalists went in their vessel 'Coligny' to Elvenes, at the mouth of the Pasvik River, in order that they might proceed thence to Lake Onega, and thus they dredged in Klösterelv Fiord. The only list of Marine Invertebrata published by them is contained in the second paper. It is one of 97 species of Mollusca, which, with the exception of "*Rissoa proxima*, Alder," are recorded in my lists.

INLAND MOLLUSCA.

A paper entitled "Land and Freshwater Mollusca in the Arctic Regions of Norway," by Miss Birgithe Esmark §, gives the following list of the species known in East Finmark:—

Arion subfuscus, Drap. Mouth of the Tana River.

Vitrina angelicæ, Beck. Vardö.

Hyalinia petronella, Charp.*

Conulus fulvus, O. F. Müller. Vardö.

Patula harpa, Say. "Of this pretty little mollusk Schneider has in July found two dead specimens in the stem of a decayed birch-tree at Kirchenes in South Varanger. It was first found in North America, later in the country of Amur, but not yet in Siberia, while in Finland it goes as far as the shores of the Arctic Ocean."

Patula pygmæa, Drap. Vardö.

— *runderata*, Studer. Elvenes, in Sydvaranger.

Arionta arbustorum, Linn.*

† Kobelt (W.), "Beiträge zur arctischen Fauna," Jahrb. der deutschen malakozoologischen Gesellschaft, 1876, pp. 60, 165, 371.

‡ De Guerne (Jules), "Conférences faites par M. Jules de Guerne. Souvenirs d'une Mission Scientifique en Laponie," Union Géographique du Nord de France, 1882; and "Notes sur l'histoire naturelle des régions arctiques de l'Europe, la Varangerfjord," Bull. des Sci. de la Soc. roy. Malacol. de Belgique, vol. xviii. 1883, and xxi. 1886.

§ 'Tromsø Museums Aarshefter,' vol. v. 1882, p. 93.

* The species to which an asterisk is appended must, I think, be received with doubt. Miss Esmark does not give any locality for them, but has introduced them into the East Finmark column apparently (see p. 95) on the authority of G. O. Sars (Mollus. reg. Arct. Norveg. p. 369); but the column of Sars from which the names are taken does not relate to East

Pupa muscorum, L. Hornö at Vardö.

— *inornata*, Mich., var. *Gredleri*, Cless., = *columella* (Bens.), Wester. Abundantly under stones on Hornö at Vardö.

— *arctica*, Wallenb. "This species is new to Norway. Mr. Schneider found it this summer under stones together with *P. Gredleri* on Hornö at Vadsö. Wallenberg found it first in Lulea Lapmark. Müller and Mörch mention it from Greenland as *P. Hoppei*. It is found in many places in Sweden."

Succinea putris, Linn.*

Limnæa stagnalis, Linn. "At Gadde-Luobbal, Pasvik River, in Sydvaranger."

Planorbis borealis, Lovén. "One shell from Varanger Fiord belongs to the museum at Upsala."

Margaritana margaritifera, Linn. Berlevaag in East Finmark.

CRUSTACEA.

As in the list of Mollusca, I have in the following notes inserted without locality the names of Crustacea which have been found in East Finmark by Sars and by others, but which were not met with by myself. This is therefore a complete catalogue of the Crustacea of this high northern district of Europe.

PODOPHTHALMA.

Hyas araneus, Linn. Bög Fiord.

— *coarctatus*, Leach. Varanger and Lang Fiords.

Stenorhynchus rostratus, Linn.

Lithodes maia, Linn. Vadsö.

Eupagurus bernhardus, Linn. Varanger Fiord.

— *pubescens*, Kröyer. Vadsö, Lang, and Klosterelv Fiords.

Munida rugosa, Fabr. Vadsö (*vide* Wollebæk, 1900).

Crangon vulgaris, Linn. Klosterelv Fiord and Svølvær. The former is, I believe, the most north-eastern locality of our common shrimp. M. Sars recorded it in 1858 from Öxfjord.

Pontophilus norvegicus, M. Sars.

but to the whole of Finmark; and why these three species have been inserted from that column, and not also *Hyalinia hammonis* and *Limnæa peregra*, there is no evidence to show. If a mistake has been made it has been repeated, since Westerlund, in "Land- och Söttvatten-Mollusker insamlade Vega-expeditionen" (Vega-expeditionens Vetenskapliga Iakttagelser, vol. iv. 1885, p. 148), gives a list of East Finmark Inland Mollusca which is identical with, and evidently has been taken from, the column "East Finmark" in Miss Esmark's paper.

Sclerocrangon boreas, Phipps. Varanger, Bög, and Klosterelv Fiords.

Sabinea septemcarinata, Sabine. Vadsö, Klosterelv, and Lang Fiords.

— *Sarsii*, S. I. Smith. One specimen, Lang Fiord.

Spirontocaris securifrons, Norman. Vadsö Harbour; Lang and Klosterelv Fiords.

— *Gaimardi*, H. M.-Edw. In all the fiords.

— *polaris*, Sabine. Varanger, Bög, and Klosterelv Fiords; Svølvær.

— *turgida*, Krøyer. In all the Sydvaranger Fiords, Laksefiord, and Tromsö.

— *pusiola*, Krøyer. Vadsö; Klosterelv and Lang Fiords; Svølvær.

Pandalus borealis, Krøyer. Varanger Fiord.

— *Montagu*, Leach.

Caridion Gordoni, Bate.

Mysis oculata, Fabr. Klosterelv Fiord.

Michthemysis mixta, Lilljeborg. Bög and Klosterelv Fiords.

Considering the number and characters of the genera into which the old genus *Mysis* has now been divided, *Mysis mixta* can no longer remain in the same genus as *M. oculata*. I therefore propose a genus *Michthemysis* to receive it. From *Mysis*, as represented by *M. oculata* and its allies, it differs in having the antennal scale unprovided with a second joint, but drawn out to an excessive length, and finally terminated in a spine-like point. In the male the sexual fourth pleopod is quite different from the same organ in *Mysis* (proper) and agrees in structure with that of *Schistomysis*.

Erythrops Goëssii, G. O. Sars. In all the fiords.

— *abyssorum*, G. O. Sars. Varanger Fiord, 110–150 fathoms.

Pseudomma truncatum, S. I. Smith.

Amblyops abbreviata, G. O. Sars. Taken by the Norwegian North-Atlantic Expedition east of Vadsö (Stat. 262).

Parerythrops robusta, S. I. Smith.

— *abyssicola*, G. O. Sars.

Stilomysis grandis, Goës.

Macromysis inermis, Rathke. Klosterelv Fiord.

Nyctiphanes norvegica, M. Sars.

Thysanoessa neglecta, Krøyer, = *T. borealis*, G. O. Sars.

— *longicaudata*, Krøyer, = *T. tenera*, G. O. Sars.

CUMACEA.

- Lamprops fasciata*, G. O. Sars. Vadsö, Svolvær.
 — *fuscata*, G. O. Sars. Lang and Klosterelv Fiords.
Hemilamprops rosea, Norman. Lang and Bög Fiords.
 — *assimilis*, G. O. Sars.
Leucon nasicus, Kröyer. Lang and Klosterelv Fiords.
 — *fulvus*, G. O. Sars.
 — *acutirostris*, G. O. Sars.
Eudorella truncatula, Bate. Lang and Bög Fiords, only a single specimen in each locality.
 — *emarginata*, Kröyer. In all the fiords.
Diastylis Rathkii, Kröyer. In all the fiords.
 var. *Sarsi*, nov. nom. The variety figured by Sars in 'Crustacea of Norway, Cumacea,' pl. lxx., occurred in 110-125 fathoms in the Varanger Fiord.
 — *lucifera*, Kröyer.
 — *spinulosa*, Heller.
 — *echinata*, Bate. Varanger Fiord, rare.
 — *scorpioides*, Lepechin. In all the fiords and down to 125 fathoms.
 — *Goodsiri*, Bell. Lang Fiord, in 5-30 fathoms.
Diastylopsis vesima, Kröyer. In all the fiords, and especially abundant in a bay on the west side of Bög Fiord.
Leptostylis macrura, G. O. Sars.
 — *villosa*, G. O. Sars.
 — *ampullacea*, Lilljeborg.
Pseudocuma cercaria, J. van Ben.
Petalosarsia declivis, G. O. Sars.
Campylaspis rubicunda, Lillj. Bög Fiord.
 — *costata*, G. O. Sars.

ISOPODA.

- Apseudes spinosus*, M. Sars.
Sphyrapus anomalus, G. O. Sars.
Typhlotanais tenuicornis, G. O. Sars. Varanger Fiord, in 110-125 fathoms.
 — *finmarchicus*, G. O. Sars. Bög Fiord.
Leptognathia longiremisa, Lillj. Varanger and Klosterelv Fiords.
 — *brevimana*, Lillj.
Pseudotanais forcipatus, Lillj. Klosterelv Fiord, 3-5 fathoms.
 — *macrochela*, G. O. Sars.

- Calathura brachiata*, Stimpson. Varanger and Bög Fiords, 100–125 fathoms.
- Gnathia elongata*, Kröyer. In all the fiords.
- Ega psora*, Linn. One specimen in Varanger Fiord.
- Limnoria lignorum*, Rathke. Klosterelv Fiord.
- Astucilla longicornis*, Sow.
- Idotea balthica*, Pallas. Vadsö and Svolvær.
- *neglecta*, G. O. Sars. Vadsö.
- Janira muculosa*, Leach. Klosterelv and Bög Fiords.
- Jera marina*, Linn. Vadsö, tide-marks.
- Pleurogonium rubicundum*, G. O. Sars. Vadsö.
- *spinosissimum*, G. O. Sars.
- Munnopsis typica*, M. Sars. Varanger and Bög Fiords, in 80–120 fathoms.
- Echinozone coronata*, G. O. Sars.
- Aspidarachna clypeata*, G. O. Sars.
- Ilyarachna hirticeps*, G. O. Sars. Varanger Fiord.
- Eurycope cornuta*, G. O. Sars.
- *producta*, G. O. Sars.
- Bopyroides hippolytes*, Kröyer.
- Phryxus abdominalis*, Kröyer.
- Dajus mysidis*, Kröyer.

AMPHIPODA.

- Hyalé Nilssoni*, Rathke.
- Opisa Eschrichti*, Kröyer.
- Socarnes Vahli*, Kröyer. Vardö (*J. S. Schneider*).
- Ambasia Danielsseni*, Boeck. Lang and Klosterelv Fiords, but only a single example in each locality.
- Aristias neglectus*, Hansen. One only, Bög Fiord, 20–30 fathoms.
- *tumidus*, Kröyer.
- Hippomedon denticulatus*, Bate. Entrance to Vadsö Harbour.
- *propinquus*, G. O. Sars. A few specimens in Bög Fiord and off Vadsö.
- Orchomene serratus*, Boeck. One only, Klosterelv Fiord, 2–5 fathoms.
- *pectinatus*, G. O. Sars.
- Tryphosa grœnlandica*, Hansen.
- *minuta*, Kröyer. Vadsö, Tromsö, and Svolvær.
- Tryphosites longipes*, Bate. Vadsö.
- Anonyx nugax*, Phipps. In all the fiords and at Tromsö and Svolvær.

- Haplonyx cicada*, Fabr. Varanger Fiord, down to 125 fathoms.
Centromedon pumilus, Lillj. Klosterelv Fiord, 2-5 fathoms.
Pseudalibrotus littoralis, Kröyer. In great abundance by washing sand dug at low water in Klosterelv Fiord and at Kirkenes.
Onesimus Edwardsi, Kröyer. Vadsö.
 — *plautus*, Kröyer. Recorded by Schneider from Vardö †.
 **Menigrates obtusifrons*, Boeck. Svolvær.
Euonyx chelatus, Norman.
Lepidepcreum umbo, Goës. Lang Fiord, 20-30 fathoms.
Bathyporeia pelagica, Bate.
Argissa hamatipes, Norman, = *Argissa typica*, Boeck. Vadsö, 10-25 fathoms.
Phoxocephalus Holbölli, Kröyer. In all the fiords and at Tromsö and Svolvær.
Paraphoxus oculatus, G. O. Sars.
Harpinia neglecta, G. O. Sars. Throughout the district.
Pontoporeia femorata, Kröyer. In shallow water, Klosterelv and Bög Fiords.
Ampelisca Eschrichti, Kröyer. Varanger, Bög, and Lang Fiords, down to 125 fathoms.
 — *macrocephala*, Lillj. Throughout the district and also at Svolvær.
Byblis Gaimardi, Kröyer. Klosterelv, Lang, and Bög Fiords.
 — *erythrops*, G. O. Sars. Varanger Fiord.
Haploops tubicola, Lillj. Throughout the district.
 — *setosa*, Boeck. Varanger and Bög Fiords, to 80 fathoms.
Stegocephalus inflatus, Kröyer. Klosterelv Fiord, in 2-5 fathoms.
Andaniopsis nordlandica, Boeck. Bög Fiord, 20-30 fathoms.
Andaniella pectinata, G. O. Sars. One only, in the same locality as the last.
Astyra abyssi, Boeck.
Amphilocheus manudens, Bate.
Amphilochoides odontonyx, Boeck.
Gitanopsis inermis, G. O. Sars.
 — *arctica*, G. O. Sars.
Gitana Sarsi, Boeck.
Metopa rubrovittata, G. O. Sars.
Sthenometopa robusta, G. O. Sars. Varanger Fiord, in 110-125 fathoms.

† For this and other species entered on Schneider's authority see Schneider (J. Sparre), "Nogle zoologiske-iaagttagelser fra Vardö," Tromsö Museums Aarsberetning, 1882, p. 16.

In my paper on 'British Amphipoda,' Ann. & Mag. Nat. Hist. ser. 7, vol. vi. 1900, p. 45, I instituted a genus *Metopina* to receive *M. palmata* and its allies, including *M. robusta*. *Metopina* had, however, been previously used, and I therefore here substitute the name *Sthenometopa* for my genus.

Ediceros saginatus, Kröyer. One specimen, west side of entrance to Vadsö Harbour, 25 fathoms.

Parædiceros lynceus, M. Sars. Very common in all the fiords and at Svølvær.

— *propinquus*, Goës, = *Ediceros microps*, G. O. Sars. Lang Fiord, in 5–30 fathoms.

Monoculodes tessellatus, Schneider. In all the fiords, in 5–30 fathoms.

— *borealis*, Boeck. Very common in all the fiords and at Svølvær.

— *subnudus*, Norman, = *M. fulcatus*, G. O. Sars. Klosterelv and Lang Fiords, 5–30 fathoms.

— *latimanus*, Goës. Lang and Bög Fiords, 5–30 fathoms.

— *longirostris*, Goës. Lang and Bög Fiords, 5–50 fathoms.

— *Packardi*, Boeck. Varanger Fiord, 100–125 fathoms.

— *norvegicus*, Boeck.

— *tuberculatus*, Boeck.

Monoculopsis longicornis, Boeck. Vadsö and Bög Fiord, 20–30 fathoms.

Periculodes longimanus, Bate. Lang and Bög Fiords, 3–30 fathoms, and at Svølvær.

Halimædon brevicar, Goës. Bög Fiord, shallow water, and Svølvær.

— *parvimanus*, Bate & Westw.

— *megalops*, G. O. Sars.

Bathymædon obtusifrons, Hansen. Varanger and Bög Fiords, 50–125 fathoms.

Pontocrates arcticus, G. O. Sars.

Aceros phyllonyx, M. Sars. In all the fiords, 5–125 fathoms.

Aceroides latipes, G. O. Sars, = *Aceros distinguendus*, Hansen. One specimen, Varanger Fiord, 125 fathoms.

Pleustes panoplus, Kröyer. Vadsö and Svølvær.

Paramphithoe bispis, Kröyer. Vardö, *vide* Schneider.

— *pulchella*, Kröyer. Varanger and Lang Fiords, 3–30 fathoms.

— *brevicornis*, G. O. Sars.

Parapleustes latipes, M. Sars. Lang Fiord, 5–15 fathoms.

Parapleustes glaber, Boeck. Tromsö and Svolvær. Sars says that it is found "off the whole coast of Finmark."

— *pulchellus*, G. O. Sars.

Acanthozone cuspidata, Lepechin.

Acanthonotosoma serratum, Fabr. Bög Fiord, 20–30 fathoms.

*— *cristatum*, Owen. Svolvær.

Odius carinatus, Bate. Bög Fiord, 20–30 fathoms.

Syrrhoë crenulata, Goës. In all the fiords, 5–125 fathoms.

Tiron acanthurus, Lillj., = *Tessarops hastata*, Norman. Lang Fiord, 20–30 fathoms.

Pardalisca cuspidata, Kröyer. Klosterelv and Bög Fiords, in 5–10 fathoms.

Halice abyssi, Boeck.

Eusirus cuspidatus, Kröyer.

Rhachotropis Helleri, Boeck. One specimen, in the Varanger Fiord.

— *inflata*, G. O. Sars, = *R. tumidus*, G. O. Sars. (Crust. Norway, Amphip. p. 430). Klosterelv Fiord, 3–5 fathoms.

— *macropus*, G. O. Sars.

Halirages fulvocincta, M. Sars. Vadsö and Bög Fiord, 10–20 fathoms.

**Apherusa bispinosa*, Bate. Svolvær.

— *tridentata*, Bruz.

— *megalops*, G. O. Sars.

Calliopius leviusculus, Kröyer. Tide-marks, Vadsö.

**Paratylos uncinatus*, G. O. Sars. Svolvær, one specimen.

— *Swammerdamii*, H. M.-Edw.

— *Smitti*, Goës.

Dexamine spinosa, Mont. Svolvær. Dr. Danielssen found it at Vadsö.

— *thea*, Boeck. Abundant, tide-marks, Vadsö.

Melphidippa borealis, Boeck.

Amathilla homari, Fabr. Vadsö and Bög Fiord, tide-marks and dredged in shallow water, also at Svolvær.

Gammarus locusta, Linn. Tide-marks throughout the district.

Melita Goësi, Hansen ('Oversigt over de paa Dijnphna-Togtet insamlade Krebsdyr,' 1886, p. 46, pl. xxi. fig. 13). A fine and quite perfect specimen, taken in Lang Fiord, in 20–30 fathoms. This species is at once distinguished from *Melita dentata* by the long, narrow, parallel-sided, basal joints of the last three pairs of peraeopods and the less spinous armature of the mesosoma. New to the Norwegian fauna. Previously known from the Kara Sea and (?) Spitsbergen; and dredged by Mr. Whiteaves in the Gulf of St. Lawrence.

- **Cheirocratus assimilis*, Lillj. Svolvær.
Lilljeborgia pallida, Bate. Lang and Klosterelv Fiords, in 5–25 fathoms.
 — *fissicornis*, M. Sars. One only, Bög Fiord, 20–30 fathoms.
Idunella cequicornis, G. O. Sars. Varanger Fiord, 100–125 fathoms.
Microdeutopus sp. A small female, too young to assign with certainty to a species.
Protomedeia fasciata, Kröyer. Abundant in all the fiords of Syd-varanger; also at Svolvær.
Gammaropsis melanops, G. O. Sars. Varanger Fiord.
Photis tenuicornis, G. O. Sars. Vadsö, in 10–25 fathoms.
 — *Reinhardi*, Kröyer.
Amphithoe rubricata, Mont. Vadsö and Svolvær.
Ischyrocerus anquipes, Kröyer. Vadsö, tide-marks.
 * — *megalops*, G. O. Sars. Svolvær.
 — *minutus*, Lillj. Vadsö.
Parajassa pelagica, Leach, = *Podocerus capillatus*, Rathke. Vadsö, tide-marks.
Corophium crassicorne, Bruz. Vadsö and Lang Fiord, Tromsö, Svolvær.
 — *affine*, Bruz. Vadsö, Klosterelv and Bög Fiords.
Unciola leucopis, Kröyer. Varanger Fiord, 120–150 fathoms.
 — *planipes*, Norman.
Dulichia curticauda, Boeck. Klosterelv Fiord, 2–5 fathoms.
 — *porrecta*, Bate. Klosterelv Fiord, 2–5 fathoms.
 — *spinosissima*, Kröyer.
 — *monacantha*, Metzger.
 — *falcata*, Bate.
Phthisica marina, Slabber.
Caprella linearis, Linn. One male, Varanger Fiord.
 — *septentrionalis*, Kröyer. Varanger Fiord, Tromsö.
Paracyamus boopis, Lütken.

PHYLLOCARIDA.

Nebalia bipes, Fabr. Vadsö.

PHYLLOPODA.

The following three Phyllopoda and two of the Cladocera have been found by Sars in East Finmark:—

Branchinecta paludosa, O. F. Müll.

Polyartemia forcipata, S. Fischer.

Limnetis brachyurus, O. F. Müll.

CLADOCERA.

- Holopedium gibberum*, Zaddach. Sydvaranger.
Daphnia magna, Strauss.
Cephaloxus cristatus, G. O. Sars. Kirchenes.
 **Ceriodaphnia quadrangula*, O. F. Müll. Hammerfest.
Bosmina obtusirostris, G. O. Sars. Sydvaranger and Hammerfest.
Macrothrix arctica, G. O. Sars.
Acantholeberis curvirostris, O. F. Müll. Sydvaranger.
Ophryocoxus gracilis, G. O. Sars. Vardö and Sydvaranger.
Alonopsis elongata, G. O. Sars. Sydvaranger, also Hammerfest.
Acroperus harpæ, Baird. Sydvaranger.
Alonella excisa, S. Fischer. Sydvaranger.
 — *nana*, Baird. Sydvaranger.
 **Chydorus sphericus*, O. F. Müll. Hammerfest.
Polyphemus pediculus, Linné. Sydvaranger, also Hammerfest.
 **Bythotrephes Cederströmi*, Schædler. Tromsö.

OSTRACODA.

In the Annals & Mag. Nat. Hist. ser. 6, vol. vii. (1891) p. 108, I published "Notes on the Marine Crustacea Ostracoda of Norway," among which were included the species I had obtained in East Finmark in 1890. Referring to that paper for an account of exact localities &c., I give here a list of the Ostracoda obtained, in order to make this enumeration of the Crustacea of East Finmark complete.

- | | |
|---|--|
| <i>Pontocypris trigonella</i> , G. O. Sars. | <i>Cytheridea Sorbyana</i> , R. Jones. |
| <i>Argilloecia cylindrica</i> , G. O. Sars. | <i>Encythere declivis</i> , Norman. |
| <i>Cythere lutea</i> , Müller. | — — —, var. <i>argus</i> , G. O. Sars. |
| — <i>pellucida</i> , Baird. | |
| — <i>confusa</i> , Brady & Norman. | <i>Krithe bartonensis</i> , R. Jones. |
| — <i>gibbosa</i> , Brady & Robertson. | <i>Loxoconcha tamarindus</i> , R. Jones. |
| — <i>limicola</i> , Norman. | — <i>fragilis</i> , G. O. Sars. |
| — <i>cluthæ</i> , Brady, Crosskey, & Robertson. | <i>Xestoleberis depressa</i> , G. O. Sars. |
| — <i>villosa</i> , G. O. Sars. | <i>Cytherura affinis</i> , G. O. Sars. |
| — <i>tuberculata</i> , G. O. Sars. | — <i>sella</i> , G. O. Sars. |
| — <i>concinna</i> , R. Jones. | — <i>undata</i> , G. O. Sars. |
| — <i>emarginata</i> , G. O. Sars. | — <i>grœnlandica</i> , Brady & Norman. |
| — <i>finmarchica</i> , G. O. Sars. | — <i>similis</i> , G. O. Sars. |
| — <i>angulata</i> , G. O. Sars. | — <i>nigrescens</i> , Baird. |
| — <i>mirabilis</i> , G. S. Brady. | — <i>rudis</i> , G. S. Brady. |
| — <i>dunelmensis</i> , Norman. | — <i>cellulosa</i> , Norman. |
| <i>Cytheridea papillosa</i> , R. Jones. | <i>Cytheropteron latissimum</i> , Norman. |
| — <i>punctillata</i> , G. S. Brady. | |

<i>Cytheropteron nodosum</i> , G. S. Brady.		<i>Paradoxostoma variabile</i> , Baird.
<i>Bythocythere constricta</i> , G. O. Sars.		— <i>rostratum</i> , G. O. Sars.
— <i>recta</i> , G. S. Brady.		— <i>inflexum</i> , Brady & Norman.
<i>Pseudocythere caudata</i> , G. O. Sars.		<i>Polycopse orbicularis</i> , G. O. Sars.
<i>Sclerochilus contortus</i> , Norman.		<i>Philomedes brenda</i> , Baird.

The six following species were additions to the Norwegian fauna :—

<i>Cythere cluthæ.</i>		<i>Cytherura rudis.</i>
— <i>mirabilis.</i>		<i>Bythocythere recta.</i>
<i>Cytherura grœnlandica.</i>		<i>Paradoxostoma inflexum.</i>

Professor G. O. Sars has recorded the following additional species from East Finmark :—

Herpetocypris glacialis, G. O. Sars.

The following East Finmark Crustacea have as yet not been found elsewhere :—

<i>Typhlotanais finmarchica.</i>		<i>Apherusa megalops.</i>
<i>Pseudotanais Lilljeborgii.</i>		<i>Paradoxostoma rostratum.</i>
<i>Gitanopsis inermis.</i>		— <i>inflexum.</i>
— <i>arctica.</i>		

Arctic species not known to occur further south than East Finmark :—

<i>Pseudomma truncatum.</i>		<i>Aceroides latipes.</i>
<i>Mysis oculata.</i>		<i>Parapleustes pulchellus.</i>
<i>Dyustylis spinulosa.</i>		<i>Paratylus Smitti.</i>
<i>Calathura brachiata.</i>		<i>Mera Goëssi.</i>
<i>Dajus mysidis.</i>		<i>Idunella leucicornis.</i>
<i>Opisa Eschrichtii.</i>		<i>Unciola leucopsis.</i>
<i>Aristias tumidus.</i>		<i>Paracymus boopis</i> (?).
<i>Ædiceros borealis.</i>		<i>Cytherura grœnlandica.</i>
— <i>saginata.</i>		— <i>rudis.</i>
<i>Monoculodes longimanus.</i>		<i>Herpetocypris glacialis.</i>

Species which are not as yet known to occur under more arctic conditions than those of East Finmark :—

<i>Stenorhynchus rostratus.</i>		<i>Hemilamprops rosea.</i>
<i>Crangon vulgaris.</i>		— <i>assimilis.</i>
<i>Spirontocaris securifrons.</i>		<i>Leucon acutirostris.</i>
<i>Caridion Gordoni.</i>		<i>Eudorella truncatula.</i>
<i>Parerythropros abyssicola.</i>		<i>Leptostylis villosa.</i>
<i>Mysideis insignis.</i>		— <i>ampullacea.</i>
<i>Macromysis inermis.</i>		<i>Pseudocuma cercaria.</i>
<i>Lamprops fasciata.</i>		<i>Campylaspis costata.</i>

Apseudes spinosus.
Leptognathia brevimana.
Pseudotantis macrocheles.
Limnoria lignorum.
Idotea baltica.
 — *neglecta.*
Astacilla longicornis.
Pleurogonium rubicundum.
 — *spinosissimum.*
Echinozone coronata.
Aspidarachna clypeata.
Pseudarachna hirsuta.
Eurycope cornuta.
 — *producta.*
Hyale Nilssoni.
Ambasia Danielsseni.
Hippomedon denticulatus.
 — *propinquus.*
Tryphosites longipes.
Euonyx chelatus.
Harpinia neglecta.
Byblis erythrops.
Andaniopsis nordlandica.
Astyra abyssii.
Gitana Sarsii.
Metopa rubrovittata.
Sthenometopa robusta.
Monoculodes tessellatus.
 — *norvegicus.*
 — *subnudus.*

Monoculodes Packardi.
Perioculodes longimanus.
Halimeton parvimanus.
Paramphithoe brevicornis.
Parapleustes latipes.
Halice abyssii.
Rhachotropis Helleri (?).
Apherusa tridentata.
Paratylus Swammerdamii.
Dexamine spinosa.
 — *thea.*
Melphidippa borealis.
Lilljeborgia pallida.
Parajassa pelagica.
Corophium affine.
Dulichia monacantha.
 — *falcata.*
Phtisia marina.
Pontocypris trigonella.
Argillœcia cylindrica.
Cythere pellucida.
Loxocochea fragilis.
Cytherura affinis.
 — *sella.*
 — *similis.*
 — *nigrescens.*
 — *cellulosa.*
Cytheropteron nodosum.
Bythocythere recta.
Polycope orbicularis.

Future investigations will undoubtedly greatly modify these lists, and also, though in a very much less degree, the division of the Mollusca into Arctic and Boreal species.

North and south are not in these papers so much regarded as affecting distribution as the more or less arctic conditions. Thus from a distributional point of view the North Cape, although really north of the greater part of East Finmark, may be regarded zoologically as to the south, since all boreal species must pass round the North Cape to reach East Finmark, and are also at the North Cape living under less arctic conditions. On the other hand, all South Greenland, Iceland, and the Murman coast may zoologically be considered to be more northern, since their climate is more arctic.

[To be continued.]

Notes on the Natural History of East Finmark. By Canon
A. M. NORMAN, M.A., D.C.L., LL.D., F.R.S., F.L.S.

[Continued from vol. x. p. 486.]

[Plates I.-IV.]

CRUSTACEA (continued).

THE gatherings of Copepoda which were brought by me from East Finmark have been placed in the hands of Mr. Thomas Scott, whose knowledge of the smaller and more difficult forms of this order is unsurpassed. I am greatly indebted to him for his report, which makes the account of the Crustacea complete.

The following species, which are not among those collected by myself, have been recorded from East Finmark—the first seven by Professor G. O. Sars *, the *Canthocamptus* by

* Sars (G. O.), 'An Account of the Crustacea of Norway,' vol. iv. Copepoda Calanoida (now in course of publication).

Prof. Lilljeborg* in a paper received during the present month, and the *Balenophilus* by Aurivillius †. *Balenophilus* is described as living on the baleen-plates of *Balenoptera Siblaldii*, Gray.

<i>Pseudocalanus elongatus</i> , Boeck.	<i>Metridia longa</i> , Boeck.
<i>Undinopsis Bradyi</i> , G. O. Sars.	<i>Canthocamptus insignipes</i> , Lilljeborg.
<i>Euchæta norvegica</i> , Boeck.	<i>Balenophilus unisetosus</i> , P. O. C. Aurivillius.
<i>Diaptomus bacillifer</i> , Koelbel.	
— <i>laciniatus</i> , Lilljeborg.	
<i>Heterocope borealis</i> , S. Fischer.	

Among the Copepoda dredged in the Varanger Fiord was a beautiful new genus which I had procured two years previously in the Firth of Clyde. I have had for some years full drawings of this Copepod ready for publication, and I here give a preliminary notice of it.

ANCORABOLUS ‡, Norman, gen. nov.

Antennules three-jointed. *Antennæ* without a secondary branch, composed of two elongated joints. *First feet* with the second basal joint produced and bent outwards, with the inner branch attached to the base of this joint, and two-jointed; the second joint terminating in three plumose setæ (instead of the claw which is usual in some allied genera): outer branch also two-jointed. *Second, third, and fourth feet* with second basal joints long, the inner branch two-jointed, the first being small; outer branch three-jointed. *Fifth feet* elongated and slender, inner branch terminating in a narrow elongated lobe of unusual length; outer branch also consisting of a single narrow joint.

The antennæ and second and two following feet in this genus resemble those of the genus *Laophontodes*, but the first and last feet are very different from those of that or of any other allied genus.

Ancorabulus mirabilis, Norman, sp. n.

Cephalosome with a well-developed horizontally directed rostrum, which is cleft at the extremity and bears either one or two pairs of setæ on the sides situated on little protuberances. Cephalosome, metasome, and first three segments of

* Lilljeborg, "Synopsis specierum hucusque in aquis dulcibus Sueciæ observatarum familiæ Harpacticidarum," Kongl. Svenska Vet.-Akad. Handl. vol. xxxvi. (Oct. 1902).

† Aurivillius (P. O. C.), "New Genus and Species of Harpacticida," K. Svenska Vet.-Akad. Handl. vol. v. (1879).

‡ An anchor-caster, ἀγκύρα and βάλλω.

urosome ornamented with a wonderful series of simple, furcate, or three-branched large horn-like processes, which are arranged as follows:—As regards the dorsal surface: on each side of the centre of the hinder margin of the cephalosome is a backward-directed, simple, lancet-shaped, setose process, flanked on the inner side by two minute similar processes; each of the four following segments is furnished with a similar pair of lancet-shaped processes, but devoid of the more minute flanking processes. This dorsal decoration is, however, inconspicuous and of little moment compared with the large appendages borne on the lateral margins, which are as follows:—On each side of the cephalosome there is near the base of the antennule a small simple process*; this is followed by a trifid process, then by a bifid process, this again by another trifid process; these four processes increase in size from the first to the last. The first, second, and third segments of the metasome bear on their side a trifid process similar to the last of those on the cephalosome. On the fourth segment of the metasome and on the first three of the urosome the smaller of the three horns of the trifid process disappears, and the two that remain are more entirely separated from each other at their base and have acquired still greater size; so that the lower and larger of them attains on these segments a length which equals about three quarters of the breadth of the segment from which they spring.

The branches of the caudal furca are very long, nearly equalling the length of the three preceding segments; at half their length there is a spinule on the outer margin, and they terminate in a strong and greatly produced stiliform seta, at the base of which are two or three minute setæ. The length of the furca and its attached setæ is nearly if not quite equal to that of the entire rest of the animal.

Length 0·8 millim.

This is a most extraordinary and beautifully constructed species. Only one other genus of the Harpacticoida has yet been found which surpasses *Ancorabolus* with respect to the remarkable development of the body ornament: that species is the wonderful *Pontostratiotes abyssicola*, G. S. Brady, of the 'Challenger' Expedition, which was dredged on the bed of the North Atlantic, lat. 37° 29' S., long. 27° 31' N., in 2200 fathoms.

Ancorabolus mirabilis was first dredged in 1888 in the Firth of Clyde, when I was a guest of Sir John Murray in his steamer the 'Medusa.' It was blowing rather hard for dredging, and we ran under the lee of the east side of Little

* This first small simple process appears to be sometimes absent.

Cumbræ and let down the dredge in about 20 fathoms. It came up filled with nothing but decaying seaweeds, which had been drifted together to that spot and which looked absolutely rubbish. But long experience had taught me that the most unlikely places sometimes produce most interesting things. I consequently worked some of this dead stuff through sieves in a tub of water, and that water having been passed through a muslin bag, the contents of the bag was bottled. Very few Crustacea were found on examination, but nevertheless there were three species new to Britain and two of them new to science—the Cumacean *Campylaspis sulcata*, G. O. Sars, the present species of *Ancorabolutus*, and a second species of the same genus.

It is curious that two years after I should have a second time met with *A. mirabilis* at such a distance from its first-known habitat in the Varanger Fiord.

Notes on some Copepoda from the Arctic Seas collected in 1890 by the Rev. Canon A. M. Norman, F.R.S. By THOMAS SCOTT, F.L.S.

The Copepoda recorded here are for the most part members of the family Harpacticidæ, but a few belong to other groups; they were collected by the Rev. A. M. Norman about the end of June and beginning of July, 1890, while on a visit to the Lofoten Islands and East Finmark, and I desire to express my indebtedness to him for permitting me to examine and record them. I have also to acknowledge the valuable assistance rendered by my son, Mr. Andrew Scott, in the identification of the smaller and doubtful species and for the drawings necessary to illustrate some of the descriptions of rare or apparently new forms.

The species and varieties recorded number sixty-four, and they belong to thirty-two genera. The localities where they were obtained are as follow:—Svolvær, Lofoten Islands; and in East Finmark from Lakse Fiord, Vadsö, Varanger Fiord, Bög Fiord, and Klosterelv Fiord. The following are the species identified or described:—

Fam. Calanidæ.

Genus CALANUS, Leach, 1816.

Calanus finmarchicus (Gunnerus).

One or two specimens, slightly immature, but apparently belonging to this species, were obtained in a gathering from Bög Fiord.

Fam. Phaënnidæ, G. O. Sars.

Genus PSEUDOPHAÆNNA, G. O. Sars, 1902.

? *Pseudophaëнна typica*, G. O. Sars.1902. *Pseudophaëнна typica*, G. O. Sars, The Crustacea of Norway, vol. iv. (Copepoda), parts iii. & iv. p. 44, pls. xxix., xxx.

Two imperfect specimens which appear to belong to this species occurred in the same gathering with *Calanus finmarchicus*. Prof. G. O. Sars obtained *Pseudophaëнна typica* at several places on the Norwegian coast from Christiania Fiord to Vardö, and adds that it is a true bottom form.

Fam. Stephidæ, G. O. Sars.

Genus STEPHOS, T. Scott, 1892.

Stephos lamellatus, G. O. Sars.1902. *Stephos lamellatus*, G. O. Sars, *op. cit.* parts v. & vi. p. 62, pls. xli., xlii.

A few specimens (male and female) of this distinct species were also obtained in the same gathering from Bög Fiord with the species just recorded. Sars states that he obtained it not unfrequently at Bodö and Hammerfest, Finmark, in depths of about 30 fathoms, muddy bottom, and occasionally off the west coast of Norway at Christiansund. In *Stephos lamellatus* the fifth pair of thoracic feet of the male are moderately stout and prominent and the right leg terminates in a fascicle of digitiform appendages, which form one of the more distinctive characters of the species.

Fam. Diaptomidæ.

Genus DIAPTOMUS, Westwood, 1836.

Diaptomus graciloides, Lilljeborg.1838. *Diaptomus graciloides*, Lilljeborg, Bull. Soc. Zool. de France, vol. xiii. p. 156.

This *Diaptomus* was common in a gathering from a small lake at Kirkenes, East Finmark, collected in July 1890. Sars states that it is not unfrequent in small tarns at Hammerfest and at Matsjok in Finmark. It appears to be a widely distributed species; it has been recorded by Prof. G. S. Brady from the British Islands.

Fam. Temoridæ.

Genus HETEROCOPE, G. O. Sars, 1863.

Heterocope appendiculata, G. O. Sars.1863. *Heterocope appendiculata*, G. O. Sars, Oversigt af de indenlandske Ferskvandes-Copepoder, p. 224.

Specimens of this *Heterocope* occurred very sparingly in the gathering from the lake at Kirkenes containing the *Diatomus graciloides*. The appendages on the underside of the first abdominal segment of the female appear to be peculiar to this species. G. O. Sars speaks of it as abundant in the great lakes of Norway, and it has been recorded by Nordquist from several lakes in the south-east of Finland. The species seems to have a wide distribution in Northern Europe.

Fam. Cyclopidæ.

Genus CYCLOPINA, Claus, 1863.

Cyclopina gracilis, Claus.1863. *Cyclopina gracilis*, Claus, Die frei lebenden Copepoden, p. 104, t. x. figs. 9-15.

This species was observed sparingly in a gathering from Vadsö, but in none of the others; it appears, however, to have a wide distribution.

Cyclopina Schneideri, sp. n. (Pl. I. figs. 1-6.)

Description of the female.—The specimen represented by the drawing (fig. 1) measures rather more than 1 millim. in length. The cephalothorax, which is moderately robust, is fully one and a half times the length of the slender abdomen. The forehead is rounded, and the antennules, which scarcely reach to the end of the cephalic segment, are composed of twelve joints (fig. 2). The structure of the antennules resembles very closely that of the antennules of *Cyclopina gracilis*, Claus; but in the present species there are six small end joints, instead of five. The formula shows approximately the proportional lengths of the various joints:—

Numbers of the joints. .	1	2	3	4	5	6	7	8	9	10	11	12
Proportional lengths ..	12	7	11	5	7	22	4	4	5	3	4	6

The antennæ also resemble the same appendages in *Cyclopina gracilis*; they are composed of four joints, the penultimate one being the shortest (fig. 3).

The mandibles (fig. 4) are short and stout and have a broad dentated biting-end; the palp is large and two-branched. The other mouth-organs appear to be similar to those of *Cyclopina littoralis*, G. S. Brady.

All the four pairs of swimming-feet, which also resemble those of that species, are comparatively short and have both branches of about equal length and composed of three joints; fig. 5 represents the first pair, and the other three are somewhat like this in form and structure.

The fifth pair are small and are each composed of two moderately broad joints (fig. 6); the first joint bears a single subapical seta, but the end joint is armed with two spines, one at each distal angle, and a small intermediate seta.

The genital segment of the abdomen appears to consist of two coalescent segments and is about equal to half the entire length of the abdomen; the remaining three segments are comparatively short (fig. 1).

The caudal furcæ are scarcely equal in length to the last segment of the abdomen.

I am very pleased to accede to the request of the Rev. A. M. Norman to name this distinct species after the well-known Norwegian carcinologist Herr J. Sparre Schneider, who was Dr. Norman's companion in his expedition of 1890.

Hab. Vadsö Sound, East Finmark; rather rare. No males were observed.

Remarks. *Cyclopina Schneideri*, as already stated, is in some respects not unlike *Cyclopina gracilis*, Claus, but it differs in having more robust mandibles and in the caudal furca being very short; moreover, it is about double the size of that species. It does not agree satisfactorily with any described species known to me.

Genus EURYTE, Philippi.

Euryte longicauda, Philippi.

1843. *Euryte longicauda*, Philippi, "Fernere Beobachtungen über die Copepoden des Mittelmeeres," Archiv f. Naturg. Jahrg. 9, p. 63, pl. iii. fig. 3, a-d.

1864. *Thorellia brunnea*, Boeck, Oversigt Norges Copepoder, p. 26.

This species was obtained in gatherings from Svolvær, Lofoten Islands; Bög Fiord, Lakse Fiord, Vadsö Sound, and Varanger Fiord, East Finmark, and was of moderately frequent occurrence; the specimens appeared to be for the most part rather larger than those found in Scottish waters.

Genus CYCLOPS, O. F. Müller.

Cyclops strenuus, Fischer.

1851. *Cyclops strenuus*, Fischer, Bull. de la Soc. imp. Naturalistes de Moscou, t. xxiv. (2nd part) p. 419, pl. ix. figs. 12-21.

This species was moderately common in the gathering from Lake Kirkenes along with *Diaptomus graciloides* and *Heterocope appendiculata*. In these specimens the caudal furca appears to be proportionally rather shorter than in those from the Scottish lakes, but, as Dr. Schmeil has shown in his splendid work on the freshwater Copepoda of Germany (1892-96), this, which is a widely distributed species, exhibits a tendency to variation even greater than is observed in some of the other members of the genus.

Cyclops Brucei, T. Scott.

1899. *Cyclops Brucei*, T. Scott, "The Crustacea of Franz-Josef Land," Journ. Linn. Soc., Zool. vol. xxvii. p. 93, pl. vi. figs. 1-6.

A number of specimens of *Cyclops Brucei* were collected near Vadsö; these are identical with those from which the species was described and which were obtained in a pond at Elmwood, near Cape Flora, Franz-Josef Land*. Several of the specimens from Vadsö carried ovisacs.

Fam. Harpacticidæ.

Genus ECTINOSOMA, Boeck.

Ectinosoma Sarsi, Boeck.

1864. *Ectinosoma Sarsi*, Boeck, Nye Slægter og Arter af Saltsvands-Copepoder, p. 45.

1880. *Ectinosoma spinipes*, G. S. Brady, British Copepoda, vol. ii. p. 9, pl. xxxvi. figs. 1-10.

A number of specimens of this *Ectinosoma* were collected in Vadsö Sound, but the species was not observed in the other gatherings; it is one of the larger species of *Ectinosoma*.

Ectinosoma propinquum, T. & A. Scott.

1896. *Ectinosoma propinquum*, T. & A. Scott, Trans. Linn. Soc. 2nd ser. Zool. vol. vi. p. 428, pl. xxxvi. figs. 19, 27, 46, et seq.

This species was obtained very sparingly in gatherings from Lakse, Klosterelv, and Varanger Fjords. In general

* In the original description of *Cyclops Brucei* it is stated inadvertently that the third and fifth joints of the female antennules are the shortest, instead of the third and sixth as shown by the drawing.

appearance and in size *Ectinosoma propinquum* resembles *Ectinosoma Sarsi* and may readily be mistaken for it; but one of the more obvious differences, and one I have found constant in all the specimens examined, is that in *E. propinquum* the fifth thoracic feet are shorter in proportion to their width, *i. e.* each of the fifth pair is about as broad as long, whereas in *E. Sarsi* the length is greater than the width.

Ectinosoma curticorne, Boeck.

1864. *Ectinosoma curticorne*, Boeck, Oversigt Norges Copepoder, p. 13.

Ectinosoma curticorne, which is a small species of a brownish colour, was obtained in Bög Fiord and between tide-marks at Vadsö, but it was less frequent in the Vadsö gathering than in that from Bög Fiord.

Ectinosoma erythropros, G. S. Brady.

1880. *Ectinosoma erythropros*, G. S. Brady, British Copepoda, vol. ii. p. 12, pl. xxxvi. figs. 11-17.

The only gathering in which this species was observed was collected in Lakse Fiord; very few specimens were obtained.

Ectinosoma Normani, T. & A. Scott.

1896. *Ectinosoma Normani*, T. & A. Scott, *tom. cit.* p. 435, pl. xxxvi. figs. 21, 29, 39, pl. xxxvii. figs. 12, 26, 34, 51, pl. xxxviii. figs. 5, 18, 42, 45.

This species occurred very sparingly in a gathering from Vadsö Sound—the only one in which it was observed.

Ectinosoma finmarchicum, sp. n.
(Pl. I. figs. 7-13.)

An *Ectinosoma* which differs to some extent from any species known to me, and which I propose to describe under the above name, was also obtained in Vadsö Sound.

The female (fig. 7) is moderately slender and elongated and has a general resemblance to *Ectinosoma Herdmani*, T. & A. Scott, but the form and especially the armature of the fifth pair of thoracic feet differ to a considerable extent; in the present species the joints of the fifth pair (fig. 13) are rather longer in proportion to their breadth, and the inner one of the two apical setæ on the basal joint and the middle seta of the secondary joint are each of them about twice as long as the others; but in *Ectinosoma Herdmani* the terminal setæ of the fifth pair in the female are all of nearly equal

length. In *Ectinosoma finmarchicum* the form and armature of the fifth pair somewhat resemble the fifth pair in *Ectinosoma Sarsi*, Boeck, but in that species the setæ are shorter.

A form which appears to be the male of this species is somewhat smaller and stouter than the female. The specimen represented by the drawing (fig. 8) measures scarcely .9 millim., but, with the exception of the modified antennules (fig. 10), all the appendages appear to resemble more or less closely those of the female.

Both forms were apparently rare in the gathering from Vadsö Sound.

Ectinosoma atlanticum (Brady & Robertson).

1880. *Ectinosoma atlanticum*, G. S. Brady, *op. cit.* vol. ii. p. 13, pl. xxxviii. figs. 11-19.

A small *Ectinosoma*, which appears to be identical with the species to which I have ascribed it, was obtained rather sparingly in a gathering from Lakse Fiord—the only one in the present collection in which it was observed. The same species has been recorded from Franz-Josef Land and from various other parts of the Arctic Sea.

Genus BRADYA, Boeck, 1872.

Bradya typica, Boeck.

1872. *Bradya typica*, Boeck, *Nye Slægter og Arter af Saltsvands-Copepoder*, p. 15.

This well-marked species was obtained in gatherings from Bög Fiord, Lakse Fiord, and Klosterelv Fiord, but was not very common.

Genus ZOSIME, Boeck, 1872.

Zosime typica, Boeck.

1872. *Zosime typica*, Boeck, *op. cit.* p. 14.

This, which is also one of the more easily recognized species, occurred sparingly in gatherings from Varanger Fiord and Vadsö.

Genus TACHIDIUS, Lilljeborg.

Tachidius discipes, Giesbrecht (= *T. brevicornis*, Brady).

1882. *Tachidius discipes*, Giesb. *Die freilebenden Copepoden Kieler Foehrde*, p. 108, pl. ii. figs. 4 *et seq.*

This species was moderately frequent in a gathering from

Bög Fiord, but was not observed in any of the others. *T. discipes* is not uncommon as a British species, especially in inshore waters and brackish pools.

Tachidius littoralis, Poppe.

1885. *Tachidius littoralis*, Poppe, "Die freilebenden Copepoden des Jodebusens," Abhandl. d. nat. Ver. zu Bremen, Bd. xi. p. 167, t. vii. figs. 10-20.

A number of specimens of *Tachidius littoralis* were obtained in the same gathering with the last. The two species are quite distinct, the difference in the structure of the antennules and fifth thoracic feet in the female being very marked. *T. littoralis* is more a brackish-water species than the other, though they are frequently found living together.

Genus AMYMONE, Claus, 1863.

Amymone spherica, Claus.

1863. *Amymone spherica*, Claus, Die frei lebenden Copepoden, p. 14, t. xx. figs. 1-9.

A few specimens of *Amymone spherica* occurred in a gathering from Lakse Fiord, E. Finmark, and in another from Svolvev, Lofoten Islands. These Copepods are, from their small size and peculiar form, easily missed, unless they are carefully looked for.

Genus STENHELIA, Boeck, 1864.

Stenhelium hirsutum, I. C. Thompson.

1893. *Stenhelium hirsutum*, I. C. Thompson, "Revised Report on the Copepoda of Liverpool Bay," Trans. Biol. Soc. Liverpool, p. 20, pl. xxxi. (separate reprint).

This species occurred very sparingly in gatherings from Bög and Klosterelv Fiords. It has the antennules short and moderately stout, while the caudal furcæ are somewhat elongated.

Stenhelium hyperborea, sp. n. (Pl. II. figs. 9-13.)

Description of the female.—The specimen represented by the drawing (fig. 9) measures about 1.1 millim.; the body is moderately slender and the rostrum is prominent. The antennules (fig. 10) are eight-jointed; the first four joints are moderately stout, but the others are narrow; the end joint, which is longer than any of the three preceding ones, is about equal in length to the fourth. The proportional

lengths of the various joints are shown approximately by the formula:—

Numbers of the joints. . .	1	2	3	4	5	6	7	8
Proportional lengths . .	16	13	9	11	5	6	6	11

The antennæ have the secondary branches three-jointed, the middle joint being very small.

The mouth-organs are somewhat similar in structure to those of *Stenhelia hispida*, G. S. Brady.

In the first pair of thoracic feet (fig. 11) the outer branches, which are composed of three subequal joints, are rather longer than the third joint of the inner branches. The inner branches are comparatively short and do not greatly exceed the length of the outer ones; the first joint is about one and a third times the entire length of the second and third joints. The armature of the first pair is somewhat similar to that of the third pair of *Stenhelia hispida*. The second, third, and fourth pairs resemble the same three pairs of the species just referred to.

The fifth pair are comparatively small; the produced part of the basal joints is subtriangular in outline and furnished with five plumose setæ—three on the inner margin and two on the bluntly pointed apex. The secondary joints, which extend somewhat beyond the basal joints, are subcylindrical and nearly twice as long as broad, and they are each provided with five setæ round the distal end, as shown by the drawing (fig. 12).

The caudal furcæ are very short (fig. 13).

Hab. Bög Fiord and Klosterelv Fiord, rather rare.

The *Stenhelia* just described differs in the structure of the antennules and of the first and fifth thoracic feet from any species of the genus with which I am acquainted.

Genus AMEIRA, Boeck, 1864.

Ameira longipes, Boeck.

1864. *Ameira longipes*, Boeck, Oversigt Norges Copepoder, p. 49.

This, the only species of *Ameira* observed, occurred in gatherings from Bög Fiord, Vadsö, and Varanger Fiord, but appeared to be somewhat rare.

Genus DELAVALIA, G. S. Brady, 1868.

Delavalia robusta, Brady & Robertson.
(Pl. I. fig. 19; Pl. II. figs. 1-3.)

1875. *Delavalia robusta*, Brady & Robertson, Brit. Assoc. Report, p. 196.

A *Delavalia* which appears to be identical with *D. robusta* was not unfrequent in gatherings from Klosterelv, Varanger, and Bög Fiords.

In the first pair of thoracic feet the inner branches, which are two-jointed and rather shorter than the outer branches, have the end joint distinctly shorter than the first one and furnished with three terminal setæ, the middle seta being plumose and rather longer and more spiniform than the one on either side.

The basal joint of the fifth pair bears on its inner aspect one very small and three elongated setæ. The secondary joint, which is subquadrate in outline, is furnished with six setæ; the three outermost and the inner setæ are elongated, but the other two are small, as shown by the drawing (fig. 3, Pl. II.).

The caudal furcæ are slender and nearly as long as the last two abdominal segments. These Arctic specimens are very similar to British specimens of the same species.

Delavalia robusta, var. *finmarchica*, var. n.
(Pl. I. figs. 14-18.)

This form agrees generally with *Delavalia robusta*, but differs in the following particulars:—(1) It is rather larger than the typical form; (2) the antennules (fig. 15) differ slightly in the proportional lengths of the joints; (3) the secondary joints of the fifth thoracic feet are distinctly smaller than those of *D. robusta* (fig. 17), and there is also a slight difference in their armature; but otherwise, however, this variety agrees very closely with the typical form.

Hab. Varanger Fiord, E. Finmark; not common.

Delavalia mimica, T. Scott.

1897. *Delavalia mimica*, T. Scott, Fifteenth Ann. Rep. Fishery Board for Scotland, pt. iii. p. 150, pl. i. figs. 1-9.

This species was moderately frequent in gatherings from Bög and Lakse Fiords, Vadsö Sound, and Varanger Fiord.

Delavalia mimica differs so markedly from the typical

species in the structure of the first pair of thoracic feet, that it should perhaps be removed from this genus to some other one.

Genus JONESIELLA, G. S. Brady, 1890.

Jonesiella spinulosa (Brady & Robertson).

1875. *Zosime spinulosa*, B. & R., Brit. Assoc. Rep. p. 196.

1880. *Jonesiella spinulosa*, G. S. Brady, Brit. Copep. vol. ii. p. 41, pl. xlviii. figs. 14-17, pl. xlix. figs. 14, 15.

Jonesiella was moderately frequent in gatherings from Vadsö Sound and Varanger Fiord. The same species has also been recorded from Franz-Josef Land and other parts of the Arctic seas.

Genus CERVINIA, Norman.

Cervinia Bradyi, Norman.

1878. *Cervinia Bradyi*, Norman, Brady's Brit. Copep. vol. i. p. 86, pl. xxiv. A, figs. 3-13.

A single specimen of this rare and somewhat curious species was obtained in Bög Fiord, and was the only one observed in this Finmark collection. *Cervinia Bradyi* was discovered by the Rev. A. M. Norman at Oban in 1876, and has since then been obtained in several places both in England and Scotland; but seldom more than one or two specimens are noticed in any single gathering.

Genus CANTHOCAMPTUS, Westwood, 1836.

Canthocamptus parvus, T. & A. Scott.

1896. ? *Canthocamptus parvus*, T. & A. Scott, Ann. & Mag. Nat. Hist. (6) vol. xviii. p. 6, pl. ii. figs. 14-22.

This small species was obtained in Bög Fjord, but was apparently very rare. *Canthocamptus parvus* has been very sparingly observed near Cape Flora in Franz-Josef Land, as well as in a few places in Scotland.

Genus ATTHEYELLA, Brady, 1840.

Attheyella arctica (Lilljeborg) *.

(Pl. II. figs. 14-19; Pl. III. figs. 1, 2.)

1902. *Canthocamptus arcticus*, Lillj. Kongl. Svenska Vetensk.-Akad. Handl. B. xxxvi. No. 1, p. 37, t. ii. fig. 23, t. iii. figs. 1-4.

* This species was described and figured by me under the name of *Canthocamptus finmarchicus*, and the MS. for the printer had passed out of my hands when, on October 3rd, I received Lilljeborg's paper, and I have much pleasure in substituting his name for the one I had adopted.

Description of the female.—Length about $\cdot 74$ millim. ($\frac{1}{34}$ of an inch). Its general appearance is that of a small *Canthocamptus*. The antennules are moderately short and composed of eight joints; the first four are somewhat dilated, while the four end joints are rather slender; the fourth and fifth joints, which are subequal in length, are shorter than the others (fig. 15).

The antennæ are furnished with short and apparently one-jointed secondary branches.

The various mouth-organs resemble somewhat those of *Attheyella pygmæa* (G. O. Sars).

In the first pair of thoracic feet the inner branches, which are about equal in length to the outer, consist of two joints; the end joint is rather narrower and shorter than the proximal one, and is furnished with a moderately long and slender terminal spine and two setæ, one being very long and slender and one (the innermost) very short; a short spiniform seta also springs from near the end of the inner margin of the proximal joint (fig. 16); both joints have a fringe of minute hairs on the outer margin. The outer branches are moderately stout and composed of three subequal joints; their armature is somewhat similar to that of the outer branches of the first pair in *Attheyella pygmæa*.

The second and third pairs are somewhat similar to each other in structure; the outer branches consist of three and the inner of two joints; the first joint of the inner branches is very short and moderately stout; the second joint is narrower and tapers towards the distal extremity, which reaches to near the end of the second joint of the outer branches; this end joint bears two coarsely-feathered terminal setæ, one being short and spine-like and one very long and slender. In the second pair the second joint of the inner branches appears also to carry one small hair on the lower half of the inner margin (fig. 17), while the same joint of the inner branches of the third pair carries two setæ similarly situated; in this pair the terminal spine is also stouter than the terminal spine of the second pair (fig. 18). The structure of the outer branches is somewhat like that of the outer branches of the first pair, but a small seta springs from near the middle of the inner margin of the third joint; moreover, the terminal spine of the end joint is very long, and a very long and slender seta also springs from the inner distal angle of the same joint. In the fourth pair the inner branches, which are very short and scarcely reach to the end of the first joint of the outer branches, have the proximal joint extremely small, while the end joint, which is the longer of the

two, appears to be furnished with four terminal setæ, as shown by the drawing (fig. 1, Pl. III.); the outer three-jointed branches are also moderately stout.

In the fifth pair the inner produced part of the basal joint is moderately broad and has the abruptly and somewhat irregularly rounded apex provided with six setæ; the three innermost setæ are considerably elongated, the next two are moderately short, while the outermost is very small; the space between the two middle setæ is rather greater than that between the others, so that the setæ appear as if they were arranged into two groups with three setæ in each; the secondary joints, which extend slightly beyond the inner produced portion of the basal joints, are broadly ovate, the breadth being equal to about three fourths of the length, and they are furnished with five setæ round the outer distal margin and end; the setæ vary in length, but the middle one is the shortest (fig. 2, Pl. III.). The furcal joints are not longer than the last abdominal segment and are somewhat wide apart.

Hab. Pools at Kirkenes, E. Finmark; apparently not very rare.

This species, which I have ascribed to the genus *Attheyella*, while differing from any that are known to me, seems to combine the characters of several: one of its nearest allies appears to be the *Canthocamptus rhæticus* of Schmeil* (= *Attheyella MacAndrewæ*, T. & A. Scott) †; but the peculiar structure of the inner branches of the first four pairs of feet and the somewhat different form of the fifth pair are sufficient for its separation from that or any other nearly allied form.

Genus TETRAGONICEPS, G. S. Brady.

Tetragoniceps incertus, T. Scott.

1892. *Tetragoniceps incertus*, T. Scott, Tenth Ann. Rep. Fishery Board for Scotland, pt. iii. p. 254, pl. xii. figs. 1-17.

This species was only observed in a gathering from Lakse Fiord, and appeared to be extremely rare; but it is small and of a slender form and easily overlooked.

* "Copepoden d. Rhälikon Gebirges," Abhandl. d. natur. Ges. zu Halle, Bd. xix. p. 23, Taf. ii. (1893).

† Ann. & Mag. Nat. Hist. (6) vol. xv. p. 457, pl. xvi. figs. 1-6 (1895).

Genus LAOPHONTE, Philippi.

Laophonte horrida, Norman.

1876. *Laophonte horrida*, Norman, "Report 'Valorous' Exped.," Proc. Roy. Soc. vol. xxv. p. 206.

Several specimens of this well-marked species were obtained in gatherings from Lakse Fiord and Varanger Fiord. The species was recorded from the Arctic seas by Buchholz in his Report on the North German Expedition, 1869-70, under the name of *Cyclops minuticornis*, O. F. Müller; and it was also collected by Mr. W. S. Bruce in Franz-Josef Land, as well as near Bear and Hope Islands, Spitzbergen.

Laophonte inopinata, T. Scott.

1892. *Laophonte inopinata*, T. Scott, Tenth Ann. Rep. Fishery Board for Scotland, pt. iii. p. 256, pl. xi. figs. 1-11.

The only gathering in which this species was observed was collected between tide-marks at Vadsö, and it was apparently very rare.

Laophonte depressa, T. Scott.

1894. *Laophonte depressa*, T. Scott, Twelfth Ann. Rep. Fishery Board for Scotland, pt. iii. p. 245, pl. vi. figs. 24-31, pl. vii. figs. 1-3.

This, like *Laophonte inopinata*, was found only in one gathering, viz., that from Bög Fiord, and it appeared also to be very rare. This species was also collected by W. S. Bruce at Franz-Josef Land in 1896-97.

Laophonte perplexa, T. Scott.

1899. *Laophonte perplexa*, T. Scott, "Crust. from Franz-Josef Land," Journ. Linn. Soc., Zool. vol. xxvii. p. 98, pl. v. fig. 14, pl. vi. figs. 7-11.

This species occurred with moderate frequency in gatherings from Bög Fiord, Vadsö Sound, and Varanger Fiord.

Laophonte thoracica, Boeck.

1863. *Laophonte thoracica*, Boeck, Oversigt Norges Copepoder, p. 54.

One or two specimens which I ascribe to this species were obtained in a gathering from Bög Fiord, but it was observed in none of the other gatherings.

Genus ANCORABOLUS, Norman.

Ancorabulus mirabilis, Norman.

A few specimens of this remarkable species were obtained
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in a gathering from Varanger Fiord. *Ancorabulus mirabilis* was observed many years ago by the Rev. A. M. Norman along with one or two other curious forms in a gathering of Clyde Crustacea; drawings of these forms were prepared, and these, with suitable descriptions, would have been published ere this time, but the stress of other work has delayed this being done; it is expected, however, that these descriptions and drawings will now soon be ready for publication. The occurrence of this strange form in the Arctic seas as well as in the Firth of Clyde suggests that its distribution may be more general and diffused than has been observed hitherto. The extremely spiny armature of the carapace tends to collect around the animal a coating of mud, which helps to conceal it and prevent its recognition.

Genus CLETODES, Brady, 1872.

Cletodes hirsutipes, T. Scott.

1897. *Cletodes hirsutipes*, T. Scott, Fifteenth Ann. Rep. Fishery Board for Scotland, pt. iii. p. 171, pl. vii. figs. 11-18.

This species occurred very sparingly in gatherings from Vadsö and Varanger Fiord.

Cletodes curvirostris, T. Scott.

1894. *Cletodes curvirostris*, T. Scott, Twelfth Ann. Rep. Fishery Board for Scotland, pt. iii. p. 250, pl. viii. figs. 18-24.

A single specimen of *Cletodes curvirostris* was observed along with the species just recorded in the gathering from Varanger Fiord, and this was the only gathering in which it was noticed.

Cletodes varians, T. Scott, sp. n.
(Pl. III. figs. 7-11.)

Description of the female.—The body is narrow and cylindrical in form; the first two segments of the abdomen appear to be coalescent and the last is armed with a small dorsal tooth (fig. 7); the rostrum is small; the caudal furcæ are moderately elongated and about equal to the combined lengths of the last two abdominal segments. The specimen represented by the drawing measures about $\cdot 6$ millim. ($\frac{1}{40}$ of an inch) in length.

The antennules are short and composed of five joints; four of the joints are of moderate size, but the penultimate one is small; the last three joints are provided with a few somewhat stout and coarsely plumose and plain setæ (fig. 8).

The antennæ and mouth-organs are similar to those of *Cletodes tenuipes*, T. Scott.

The first pair of thoracic feet have the outer branches moderately elongated and three-jointed, but the inner branches appear to be rudimentary; they each consist of a minute rounded process, which may be articulated to the basal joint, but, if so, the articulation is indistinct; a single short seta is the only armature observed on these rudimentary branches (fig. 9). In the second, third, and fourth pairs the outer branches, which are three-jointed, are somewhat similar to the outer branches of the first pair, but are rather more elongated; the inner branches are apparently entirely obsolete.

The fifth pair, which somewhat resembles the fifth pair of *Cletodes tenuipes*, has the basal joint small, slightly produced inferiorly, and furnished with two apical setæ; the secondary joint is narrow and elongated, being about six times longer than broad, and bears one seta near the middle of the outer margin and other four near the distal end and apex, as shown by the drawing (fig. 10).

The male has a general resemblance to the female, but the antennules are modified for grasping, and the fifth pair of thoracic feet are extremely small (fig. 11).

Hab. Bög Fiord; rare.

This species is in some respects similar to the form to be next described, but differs in having the inner branches of the first four pairs of thoracic feet rudimentary or wanting.

Cletodes tenuipes, T. Scott, var.
(Pl. II. fig. 20; Pl. III. figs. 3-6.)

1897. *Cletodes tenuipes*, T. Scott, Fifteenth Ann. Rep. Fishery Board for Scotland, pt. iii. p. 170, pl. i. figs. 19-27.

This species, which is comparatively small, was obtained in the same gathering with the last. The length of the specimen represented by the drawing (fig. 3, Pl. III.) is only about .56 millim. (scarcely $\frac{1}{45}$ of an inch). The species was first described from Clyde specimens, but has since been obtained on other parts of the Scottish coasts. In these East Finmark specimens one or two apparently slight differences are noticed. They have usually, for example, a straight outline, whereas the specimens from the Scottish seas, when seen from the side, are almost invariably incurved; the inner branches of the second, third, and fourth pairs of thoracic feet appear also to be rather smaller (fig. 5, Pl. III.), and

the secondary branches of the fifth pair are narrow and sub-cylindrical (fig. 6, Pl. III.).

The antennules (fig. 20, Pl. II.), which resemble very closely those of *C. varians*, are short and moderately stout, and composed of five joints, the penultimate joint being very small, and they are also sparingly setiferous. The antennæ and mouth-organs are apparently similar in structure to the same appendages in Scottish specimens of *Cletodes tenuipes*; so also are the first pair of thoracic feet (fig. 4, Pl. III.). In the next three pairs the inner branches, as already remarked, are rather smaller, and the secondary branches of the fifth pair are also slightly different; but these differences do not appear to be of sufficient importance to be of specific value.

Cletodes perplexa, T. Scott.

1899. *Cletodes perplexa*, T. Scott, Seventeenth Ann. Rep. Fishery Board for Scotland, pt. iii. p. 257, pl. xi. figs. 12-20, pl. xii. fig. 1.

This curious species occurred very sparingly in a gathering from Bög Fiord, the only one in which it was observed. *C. perplexa*, which has not till now been recorded out of Scotland, is readily distinguished by the form of the fifth thoracic feet, and that even without dissection.

Cletodes lata, T. Scott.

1892. *Cletodes lata*, T. Scott, Tenth Ann. Rep. Fishery Board for Scotland, pt. iii. p. 257, pl. x. figs. 10-18.

The gathering in which this species was obtained was collected in Klosterelv Fiord. I find no previous record of this *Cletodes* from the Arctic seas. In general appearance it is not unlike *Cletodes similis*, but it differs from that species in some details of structure, and especially in the form of the fifth thoracic feet in the female.

* *Cletodes similis*, T. Scott.

1895. *Cletodes similis*, T. Scott, Thirteenth Ann. Rep. Fishery Board for Scotland, pt. iii. pl. iii. figs. 22-26, pl. iv. figs. 1-3.

This species was observed in a gathering from Svolvær, Lofoten Islands, the only gathering in which it was noticed. It is one of the species collected by Mr. Bruce at Franz-Josef Land and also to the eastward of Spitzbergen. Only one or two specimens occurred in the Svolvær gathering.

Genus PLATYCHELIPUS, G. S. Brady, 1880.

Platychelipus littoralis, G. S. Brady.

1880. *Platychelipus littoralis*, G. S. Brady, Brit. Copep. vol. ii. p. 103, pl. lxxix. figs. 20-23, pl. lxxx. fig. 15.

The only gathering in which this species occurred was from Bög Fiord, and very few specimens were observed. *Platychelipus* was collected by W. S. Bruce, along with *Nannopus palustris*, G. S. Brady, on the east side of Kolguev Island, while cruising in Mr. Coates's yacht the 'Blencathra.'

Genus DACTYLOPUS, Claus, 1863.

Dactylopus tisboides, Claus.

1863. *Dactylopus tisboides*, Claus, Die frei lebenden Copepoden, p. 127, pl. xvi. figs. 24-28.

This species was of frequent occurrence in gatherings from Bög Fiord, Lakse Fiord, Vadsö, between tide-marks, Varranger Fiord, East Finmark; and also from Svolveær, Lofoten Islands. There appeared to be two forms, and the one which was the more common of the two had pellucid markings along the outer margins both of the secondary joint and of the inner produced part of the basal joint of the fifth pair of thoracic feet; similar to specimens of the same species collected by Mr. Bruce at Franz-Josef Land (Journ. Linn. Soc., Zool. vol. xxvii. p. 104, 1899).

Dactylopus longirostris, Claus.

1863. *Dactylopus longirostris*, Claus, *op. cit.* p. 127, pl. xvii. figs. 4-6.

A few specimens apparently belonging to this species occurred in gatherings from Bög Fiord and Vadsö Sound. One or two specimens were observed in the gathering from Vadsö, which, though differing from the typical *D. longirostris*, resemble that species very closely in their general structure, and I propose to describe them under the following varietal name:—

Dactylopus longirostris, Claus, var. *finmarchicus*.
(Pl. II. figs. 4-8.)

The specimen represented by the drawing (fig. 4) measures about .8 millim. long. The rostrum is prominent. The antennules are slender and elongated and composed of eight joints; the first, second, fourth, and last are subequal in length and considerably longer than the others, while the fifth

is very small (fig. 5): The antennæ and mouth-organs are similar to those of *D. longirostris*.

The first pair of thoracic feet (fig. 6) are moderately stout; the outer branches, which are composed of three nearly equal joints, are about as long as the first joint of the inner branches, the spines on the outer margins are elongated and slender, and the second joint bears a plumose seta on the inner distal angle; the length of the first joint of the inner branches is equal to about twice the length of the second and third combined, but the second joint is very small; the armature of the inner branches is similar to that of the same branches in typical specimens of *D. longirostris*. The next three pairs of thoracic feet are somewhat similar to those of the typical form, but the fifth pair seems to differ in one or two particulars; the inner produced part of the basal joint in this pair is broadly subcylindrical and the obliquely truncated apex is furnished with five plumose setæ; the two outermost setæ spring from the outer angle and are close together, but the others are more widely apart; the secondary joint is broadly ovate and extends somewhat beyond the end of the basal joint; the armature of this joint consists of the same number of setæ as on the secondary joint of the same pair in *D. longirostris* (fig. 7). The furcal joints (fig. 8) are very short.

Hab. Vadsö Sound; rare.

It will be observed that this form, while agreeing generally with the typical *D. longirostris*, Claus, has the first pair of thoracic feet proportionally stouter and shorter, and the outer branches are about as long as the first joint of the inner ones, and the fifth pair are more broadly foliaceous; but though these differences are fairly well marked, they can scarcely be considered of specific value.

Dactylopus tenuiremis, Brady & Robertson.

1875. *Dactylopus tenuiremis*, Brady & Robertson, Brit. Assoc. Report, p. 197.

This species occurred very sparingly in gatherings from Bög Fiord, Lakse Fiord, and Vadsö Sound. It has also been collected in the Arctic seas by Mr. Bruce.

(?) *Dactylopus brevicornis*, Claus.

1866. *Dactylopus brevicornis*, Claus, Die frei lebenden Copepoden von Nizza, p. 29, t. iii. figs. 20-25.

One or two specimens apparently belonging to this small species were collected in Bög Fiord and Vadsö Sound.

Dactylopus Strömii (Baird), var. *arcticus*, T. Scott.
(Pl. IV. figs. 1-7.)

1899. *Dactylopus Strömii* (Baird), var. *arcticus*, T. Scott, "Crust. from Franz-Josef Land," Journ. Linn. Soc., Zool. vol. xxvii. p. 106, pl. v. figs. 11-17.

Several female specimens of this variety were obtained in gatherings from Bög Fiord and Vadsö Sound. In this variety the antennules are nine-jointed; the posterior foot-jaws appear to be more hirsute than in the typical form, and the first and fifth thoracic feet are somewhat similar to the same appendages in *D. similis*, Claus.

One or two male specimens apparently belonging to the same variety were also obtained in the gathering from Bög Fiord, and as no special mention was made to the male form in the original description of the variety in my "Report on the Franz-Josef Land Crustacea" referred to above, I will here glance briefly at a few of the more important characters by which it is distinguished from the female. It differs from the female in having the antennules modified as shown in the drawing (fig. 2). The second pair of thoracic feet have the inner branches apparently two-jointed; the first joint is very short, but the second is elongated and narrow except at the base, where it is dilated on the outer aspect; this joint, which reaches to near the end of the outer branches, bears on the dilated basal part a stout spine-like appendage that reaches to the end of the joint, as shown in the drawing (fig. 5), while the end of the joint itself terminates in what looks like a recurved bifid process, which has one branch of the fork elongated and slender, extending to near the base of the joint, but the other branch is short; the spines on the outer distal angles of the joints of the outer branches of the second pair of feet are also moderately stout—proportionally more so than in the female.

The fifth feet (fig. 6) are small; the inner part of the basal joint, which is only slightly produced and rounded, is armed with three small spines; the secondary joint is broadly ovate and is furnished with a few marginal and terminal setæ, as shown by the figure.

The specimen represented by the drawing (fig. 1) measured about a millimetre in length.

Genus *THALESTRIS*, Claus, 1863.

Thalestris helgolandica, Claus.

1863. *Thalestris helgolandica*, Claus, Die frei lebenden Copepoden, p. 131, t. xvii. figs. 12-21.

A number of specimens of this *Thalestris* were obtained in gatherings from Bög Fiord, East Finmark, and Svolveær, Lofoten Islands.

Thalestris polaris, T. Scott.

1899. *Thalestris polaris*, T. Scott, "Crust. from Franz-Josef Land," Journ. Linn. Soc., Zool. vol. xxvii. p. 106, pl. vii. figs. 8-16.

This species occurred in gatherings from Bög Fiord, Lakse Fiord, Vadsö, between tide-marks, and Varanger Fiord.

Thalestris Jacksoni, T. Scott.

1899. *Thalestris Jacksoni*, T. Scott, *op. cit.* p. 109, pl. viii. figs. 3-9.

A single specimen of this fine species was obtained in a gathering collected between tide-marks at Vadsö. This species attains to at least one tenth of an inch in length.

Thalestris Clausii, Norman.

1868. *Thalestris Clausii*, Norman, Brit. Assoc. Report, p. 297.

A single female specimen was observed in the Finmark collection; it occurred in a gathering from Lakse Fiord.

The fifth pair of feet in this specimen are foliaceous; the basal joint is subtriangular, with a somewhat broadly but irregularly rounded apex, which reaches to about the end of the secondary joint and is furnished with six moderately short and plumose setæ round the lower inner margin and end, but the first seta, counting from the inner margin, is rather shorter and more coarsely plumose, and the space between it and the next seta is greater than that between any of the others; moreover, the fourth seta, still counting from the inside, is rather more slender than the other five; the secondary joint is broadly ovate, the breadth being equal to about two thirds of the length; this joint is furnished with six setæ on the lower outer margin and apex; the basal part of each of the three uppermost setæ on the outer margin and the innermost apical seta is comparatively stout, but they become very slender towards the end; the remaining two setæ, which are near the apex and are closer to each other at the base than they are to those on either side, are rather longer and more slender than the other four. Both the inner and the outer margins of the secondary joint are ciliated. Prof. G. S. Brady, in his 'Monograph of the British Copepoda,' states that this is perhaps the most common of

the British species belonging to the genus *Thalestris*; but there does not seem to be much known respecting its distribution outside the British area.

Thalestris longimana, Claus. (Pl. IV. figs. 8-13.)

1863. *Thalestris longimana*, Claus, Die frei lebenden Copepoden, p. 130, t. xviii. figs. 1-11.

A single specimen of *Thalestris longimana* was obtained in the Varanger Fiord gathering. The dissections represented by the drawings have been carefully compared with similar dissections of Scottish specimens, and the only important difference observed was in the basal and secondary joints of the fifth pair of thoracic feet. In the specimen from Varanger Fiord the basal and secondary joints of the fifth pair (fig. 12) are not so broadly foliaceous, both branches being of a more cylindrical form; but this difference may be only accidental or due, perhaps, to the specimen being scarcely mature. The antennules (fig. 9) and the second maxillipeds (fig. 10) are identical with the same appendages in Scottish specimens. In the second maxillipeds the inner concave part of the hand has the same minutely tuberculated surface peculiar to that species; the general form of the hand is also exactly similar. *Th. longimana*, which was first recorded by Prof. Claus from Heligoland, has a distribution apparently coextensive with the British Islands; it was recorded by the Rev. A. M. Norman in 1869 from Bressay, Shetland*, and from various other places around our shores by Prof. G. S. Brady† and others. Its occurrence in the gathering from Varanger Fiord extends its distribution to the Arctic seas.

Thalestris Normani, sp. n. (Pl. III. figs. 12-18.)

This *Thalestris* closely resembles *Thalestris frigida*, T. Scott, in its general appearance and size, but differs from that species in several details of structure. The following is a brief description of the species:—

(1) *The female*.—The antennules of the female are composed of nine joints; the first four, which gradually decrease in length, are together about twice the length of the remaining five joints; the fifth, seventh, and eighth joints are smaller than any of the others (fig. 13).

* "Last Report on Dredging among the Shetland Isles," Brit. Assoc. Report for 1868 (published 1869), p. 297.

† Brit. Copep. vol. ii. p. 136 (1880).

The antennæ are furnished with three-jointed secondary branches.

The second maxillipeds and other mouth-organs are somewhat similar to those of *Thalestris frigida*.

The first pair of thoracic feet are moderately short and stout and the outer branches are distinctly shorter than the inner ones (fig. 14); the spiniform seta on the outer distal angle of the second basal joint is comparatively large, but the spine on the inner distal angle is considerably smaller; the terminal claw of the inner branches is very long and slender and the plumose seta which springs from near the middle of the inner margin of the second joint is also elongated; the general structure and armature of both branches resemble those of the first pair in *Thalestris robusta*, Claus, while the second, third, and fourth pairs are somewhat similar to those of *Thalestris frigida*.

The fifth pair (fig. 15) have also a general resemblance to the fifth pair of that species, but the basal joint is proportionally rather broader at the base, and its armature is somewhat differently arranged; the arrangement of the armature of the secondary joint is also somewhat different from that of the secondary joints of the species referred to.

The caudal furcæ are very short.

(2) *The male*.—The male resembles the female, but is rather smaller. The antennules have a modified structure to fit them for grasping. The spine on the inner distal angle of the second basal joints of the first pair of thoracic feet is strong and distinctly hooked at the end, as shown in Pl. III. fig. 14 a.

The inner branches of the second pair of feet resemble generally the same branches in the male of *Thalestris frigida*, but they are distinctly broader in proportion to their length, and there is a slight difference in their armature, as shown in the drawing (fig. 16).

The fifth pair also resemble somewhat those of the male of the species referred to, especially in their armature, but the inner produced part of the basal joint is less prominent and more broadly rounded and the secondary joint is rather smaller (fig. 17).

Hab. Bög Fiord; not very common.

This *Thalestris* comes very near *Th. frigida*, and I was at first inclined to regard it as belonging to that species; but it was found that the difference in the structure of the first pair of thoracic feet in both the male and female and of the inner branches of the second pair in the male was alone sufficient to distinguish it from the species referred to. The structure of

the first pair is in some respects not unlike that of *Th. robusta*, Claus, from Nice and Messina †, but the fifth pair in form and armature is decidedly different. It may be further remarked that the structure of the first pair of feet in both of the species named exhibits a close resemblance to that of the first pair in certain species of *Dactylopus*, so that the species may be almost considered a connecting-link between the two genera *Thalestris* and *Dactylopus*.

Genus PSEUDOTHALESTRIS, G. S. Brady, 1883.

Pseudothalestris major (T. & A. Scott).

1895. *Pseudowestwoodia major*, T. & A. Scott, Ann. & Mag. Nat. Hist. (6) vol. xv. p. 56, pl. vi. figs. 17-30.

This small species was moderately frequent in a gathering collected between tide-marks at Vadsö; but it was not observed in any of the other Finmark gatherings.

Four British species of *Pseudothalestris* have been described—the first in 1894 in the Twelfth Ann. Report of the Fishery Board for Scotland, pt. iii. p. 257, pl. xi. figs. 21-29, under the name of *Pseudowestwoodia Andrewi*, T. Scott: descriptions of other two species by T. & A. Scott were published in the Ann. & Mag. Nat. Hist. for January 1895 under the names of *Pseudowestwoodia pygmaea* and *major*; in the 'Annals' for the following month of June (p. 463) these authors withdrew the name *Pseudowestwoodia*, T. Scott, in favour of *Pseudothalestris*, G. S. Brady, as it was found that the two genera were identical and that the latter name had been published several years before the other. The description of the fourth species by Prof. G. S. Brady was published early in 1901 in Nat. Hist. Trans. N. D. & N. C. vol. xiv. p. 59, pl. iii. figs. 11-16, under the name of *Pseudothalestris monensis*, from specimens obtained at Port Erin, Isle of Man. *Pseudothalestris major* has not previously been recorded from the Arctic seas.

Genus WESTWOODIA, Dana.

* *Westwoodia nobilis* (Baird).

1845. *Arpacticus nobilis*, Baird, Trans. Berw. Nat. Club, vol. ii. p. 155.

This pretty little species resembles very closely the British species of *Pseudothalestris*, but differs distinctly in the structure of the first pair of thoracic feet. It was of rare

† Die frei lebenden Copepoden, p. 129, t. xviii. figs. 17-23, t. xix. fig. 1.

occurrence in the present collection; the only gathering in which the species was observed was from Svolvear, Lofoten Islands, and only one or two specimens were noticed.

Genus HARPACTICUS, H. M.-Edw., 1838.

Harpacticus chelifer (O. F. Müller), var. *arcticus*, Poppe.

1884. *Harpacticus chelifer*, var. *arcticus*, Poppe, "Stillen Ocean u. Behrings Meer freileb. Copep.," Arch. f. Naturgesch. 50 Jahrg. i. Bd. p. 296, t. xxiii. figs. 1, 2, 4-7, t. xxiv. figs. 1-7, 9, 10.

This Harpacticid was obtained in gatherings from Bög Fiord, Lakse Fiord, Vadsö, and Varanger Fiord, E. Finmark; and from Svolvear, Lofoten Islands. Most of the specimens appeared to belong to the variety *arcticus*, Poppe.

Genus ZAUS, Goodsir, 1845.

Zaus aurelii, Poppe.

1884. *Zaus aurelii*, Poppe, *op. cit.* p. 286, t. xx. figs. 7-9, t. xxi. figs. 5-15.

A good number of specimens of *Zaus*, all of which were apparently referable to *Z. aurelii*, were obtained in gatherings from Bög Fiord, Lakse Fiord, Vadsö, and Svolvear.

Genus IDYA, Philippi, 1843.

Idya furcata (Baird).

1837. *Cyclops furcata*, Baird, Mag. Zool. & Bot. vol. i. p. 330, t. ix. figs. 26-28.

Idya was moderately common in Bög Fiord and Lakse Fiord and sparingly in one or two other gatherings. Though the specimens were all more or less carefully examined, there appeared to be only the one species represented.

Fam. Lichomolgidaæ.

Genus HERRMANELLA, Canu, 1891.

? *Herrmanella finmarchica*, sp. n.
(Pl. IV. figs. 14-19.)

The form described under this name was collected in Bög Fiord; there were very few specimens in the gathering, and they were all more or less damaged.

The specimen represented by the drawing (fig. 14)

measured about 1.3 millim. ($\frac{1}{19}$ of an inch) in length and had a general resemblance to *Lichomolgus*.

The antennules, which were imperfect, are moderately short and composed of six (or seven) joints, but only five were present (fig. 15); the third joint is small, but the others are of moderate length.

The mandibles and maxillæ were not observed.

Both pairs of maxillipeds are small; the end joints of the first maxillipeds are furnished on the upper aspect with two moderately long setæ and a few minute spines; one seta springs from near the base of the joint, but the other is subterminal; both setæ appear to be ciliated along one side, as shown by the drawing (fig. 17). The second pair of maxillipeds have the end joints armed with a small but stout terminal claw, in addition to one or two small spines (fig. 18).

All the four pairs of swimming-feet are moderately short and stout and have both branches three-jointed and of nearly equal length.

In the first pair the first and second joints of the outer branches are each furnished with a stout spine on the outer margins, and there is also a seta on the inner margin of the second joint, but not on the first; the end joint bears four spines on the outer margin and apex and four setæ on the inner margin. The first two joints of the inner branches have each a seta on the inside margin, while externally their distal angles form each a small tooth-like process; the end joint of the inner branches is armed with a stout subterminal spine on its outer aspect and with five setæ on its inner margin (fig. 19); all the setæ appear to be plumose.

The other three pairs are somewhat similar to the first, but differ to some extent in the armature chiefly of the end joints. In the second pair the only apparent difference is that the end joints of the outer branches are furnished interiorly with five instead of four setæ, while the end joints of the inner branches are each furnished with three spines on the outer and three setæ on the inner margin. The armature of the third pair appears to be similar to that of the second. In the fourth pair the second joint of the outer branches bears two setæ on the inner margin, while the end joint is armed with three spines and three setæ; the only difference observed in the armature of the inner branches is in the end joints being provided with three slender spines and two setæ.

The fifth pair are small and apparently only one-jointed (fig. 14).

The genital segment, which is composed of two coalesced

segments, is moderately dilated and rather more than half the entire length of the abdomen.

The caudal furcæ are slender and elongated, their length being somewhat greater than that of the last two abdominal segments combined.

Hab. Bög Fiord; apparently rare.

The species is provisionally ascribed to the genus *Herrmanella* of Canu*; the second maxillipeds are, however, more feebly clawed than those of any of the species already described, and because of this and one or two other differences this East Finmark form should, perhaps, be placed in another genus; but it will be necessary to have more perfect specimens ere its position can be satisfactorily determined.

EXPLANATION OF THE PLATES.

PLATE I.

Cyclopina Schneideri, sp. n.

- Fig.* 1. Female, dorsal view, $\times 53$. 2. One of the antennules, $\times 144$.
3. One of the antennæ, $\times 120$. 4. Mandible and palp, $\times 216$.
5. Foot of first pair, $\times 144$. 6. Foot of fifth pair, $\times 180$.

Ectinosoma finmarchicum, sp. n.

- Fig.* 7. Female, seen from the side, $\times 53$. 8. (?) Male, seen from the side, $\times 53$. 9. One of the female antennules, $\times 270$. 10. One of the male antennules, $\times 180$. 11. One of the antennæ, $\times 180$.
12. Foot of fifth pair, male, $\times 270$. 13. Foot of fifth pair, female, $\times 180$.

Delavalia robusta, Brady & Robertson, var. *finmarchica*, nov.

- Fig.* 14. Female, seen from the side, $\times 53$. 15. One of the antennules, $\times 180$. 16. Foot of first pair, $\times 180$. 17. Foot of fifth pair, $\times 240$. 18. Part of abdomen and caudal furca, $\times 105$.

Delavalia robusta, Brady & Robertson.

- Fig.* 19. Part of abdomen and caudal furca, enlarged.

PLATE II.

Delavalia robusta, Brady & Robertson.

- Fig.* 1. One of the antennules, $\times 180$. 2. Foot of first pair, $\times 180$.
3. Foot of fifth pair, $\times 240$.

* "Les Copépodes marins du Boulonnais," Bull. Scientifique de la France et de la Belgique, p. 480 (1891).

Dactylopus longirostris, Claus, var. *finmarchicus*, nov.

Fig. 4. Female, seen from the side, $\times 53$. 5. One of the antennules, $\times 180$. 6. Foot of first pair, $\times 135$. 7. Foot of fifth pair, $\times 180$. 8. Part of abdomen and caudal furca, enlarged.

Stenhelia hyperborea, sp. n.

Fig. 9. Female, seen from the side, $\times 39$. 10. One of the antennules, $\times 180$. 11. Foot of first pair, $\times 135$. 12. Foot of fifth pair, $\times 180$. 13. Part of abdomen and caudal furca, enlarged.

Attheyella arctica, Lilljeborg.

Fig. 14. Female, seen from the side, $\times 37$. 15. One of the antennules, $\times 270$. 16. Foot of first pair, $\times 240$. 17. Foot of second pair (inner and part of outer branches), $\times 240$. 18. Foot of third pair (inner and part of outer branches), $\times 240$. 19. Part of abdomen and caudal furca, enlarged.

Cletodes tenuipes, T. Scott, var.

Fig. 20. Antennule, female, $\times 540$.

PLATE III.

Attheyella arctica, Lilljeborg.

Fig. 1. Foot of fourth pair, $\times 140$. 2. Foot of fifth pair, $\times 140$.

Cletodes tenuipes, T. Scott, var.

Fig. 3. Female, dorsal view, $\times 79$. 4. Foot of first pair, $\times 540$. 5. Foot of fourth pair, $\times 360$. 6. Foot of fifth pair, $\times 360$.

Cletodes varians, sp. n.

Fig. 7. Female, seen from the side, $\times 106$. 8. One of the antennules, $\times 432$. 9. Foot of first pair, $\times 270$. 10. Foot of fifth pair (female), $\times 270$. 11. Foot of fifth pair (male), $\times 540$.

Thalestris Normani, sp. n.

Fig. 12. Female, seen from the side, $\times 40$. 13. One of the antennules, $\times 180$. 14. Foot of first pair, $\times 135$. 14a. Spine on inner distal angle of second basal joint of first pair (male), $\times 135$. 15. Foot of fifth pair (female), $\times 135$. 16. Inner branch of second foot (male), $\times 135$. 17. Foot of fifth pair (male), $\times 180$. 18. Part of abdomen and caudal furca, enlarged.

PLATE IV.

Dactylopus Strömii (Baird), var. *arcticus*, T. Scott (male).

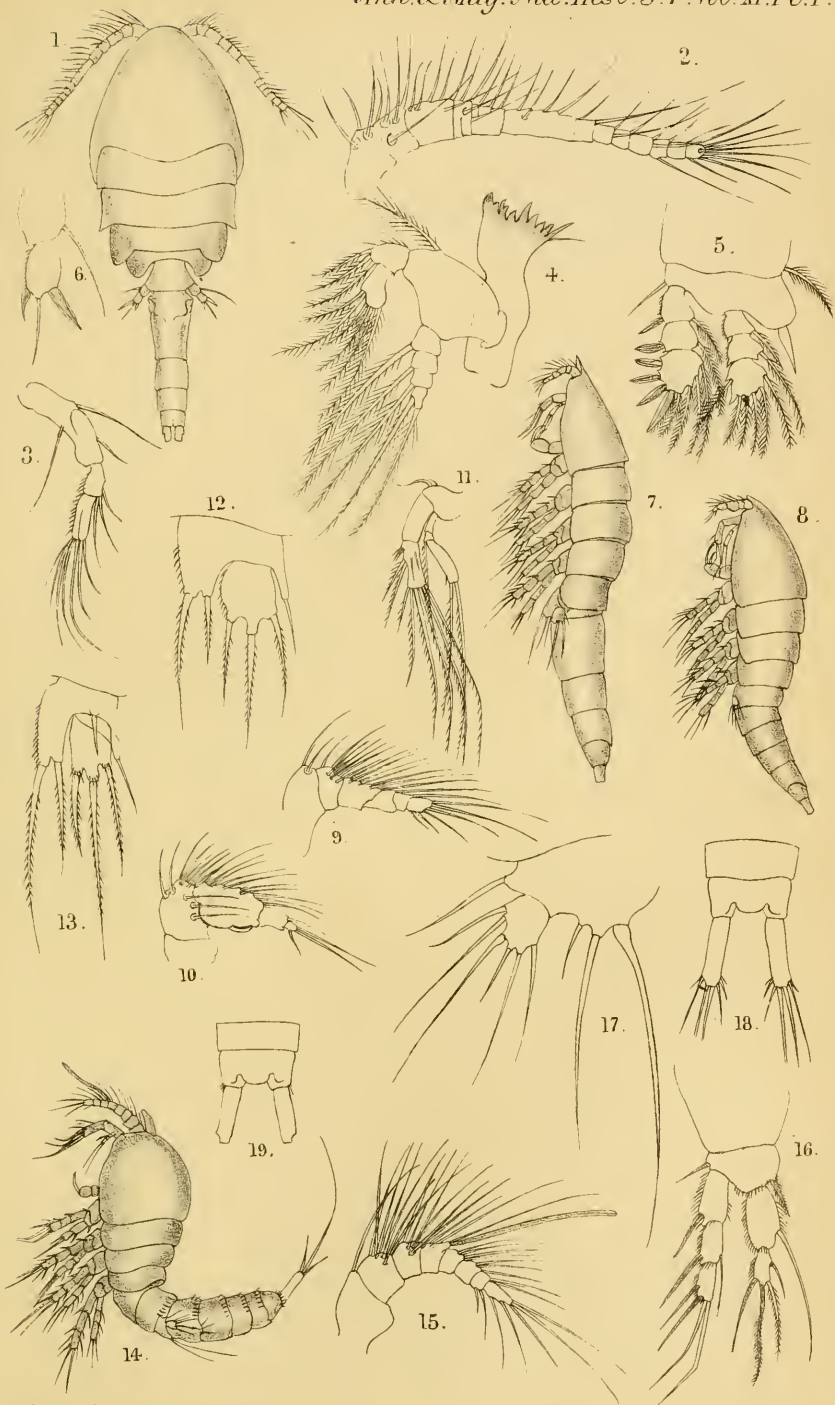
Fig. 1. Male, seen from the side, $\times 53$. 2. One of the male antennules, $\times 180$. 3. One of the second maxillipeds, $\times 270$. 4. Foot of first pair, $\times 105$. 5. Foot of second pair, $\times 180$. 6. Foot of fifth pair, $\times 180$. 7. Part of abdomen and caudal furca, enlarged.

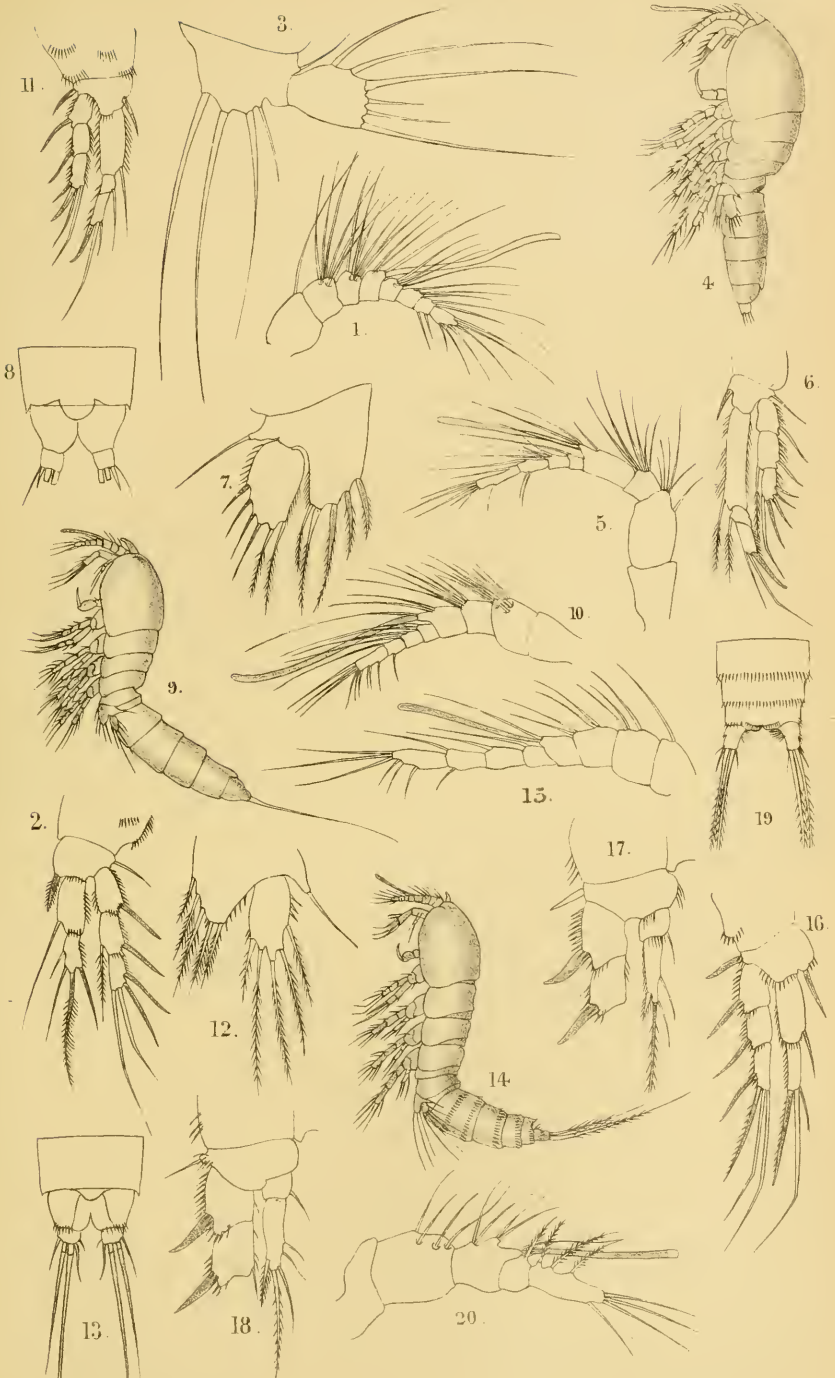
Thalestris longimanus, Claus.

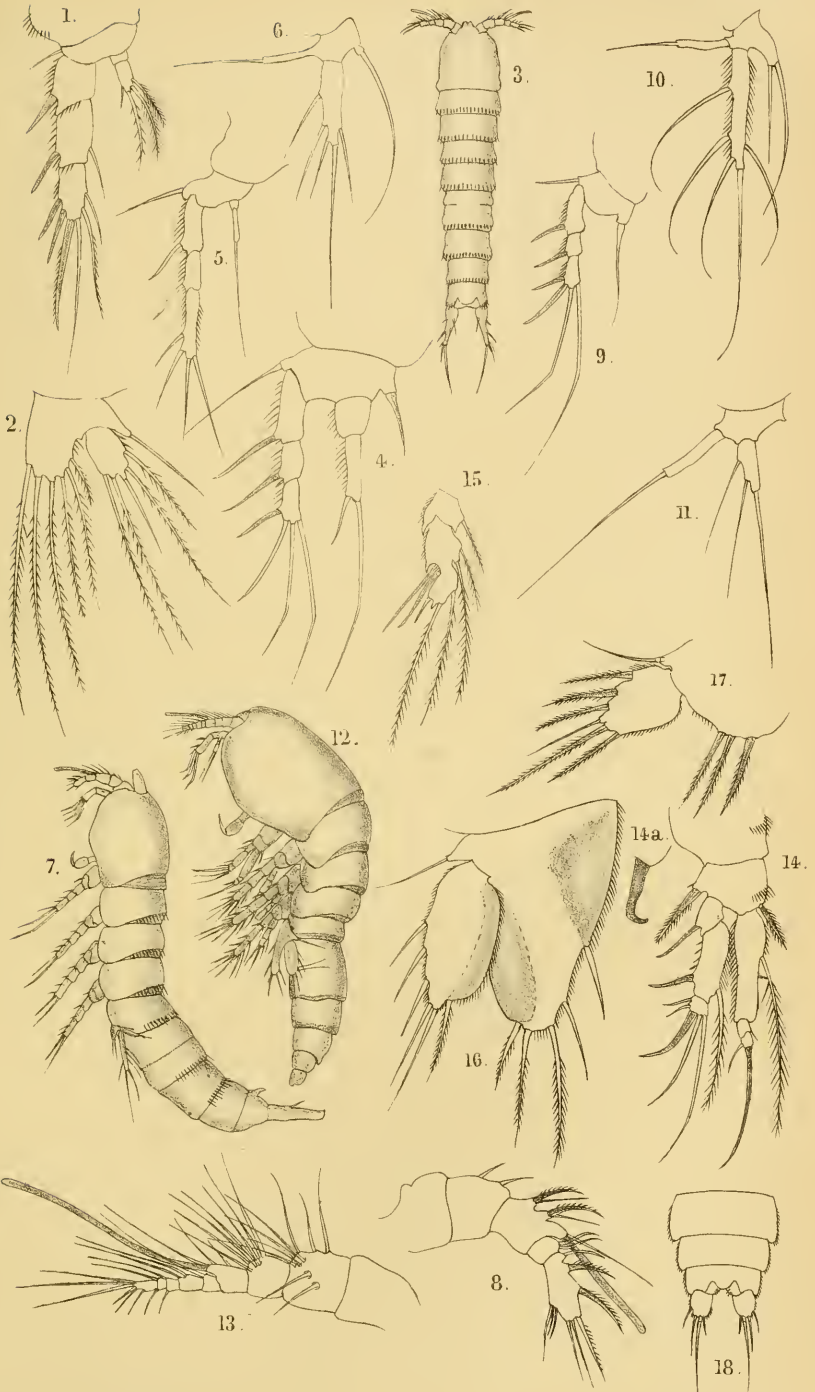
Fig. 8. Female, seen from the side, $\times 40$. 9. One of the antennules, $\times 135$. 10. One of the second maxillipeds, $\times 105$. 11. Foot of first pair, $\times 105$. 12. Foot of fifth pair, $\times 158$. 13. Part of abdomen and caudal furca, enlarged.

(?) *Herrmanella finmarchica*, sp. n.

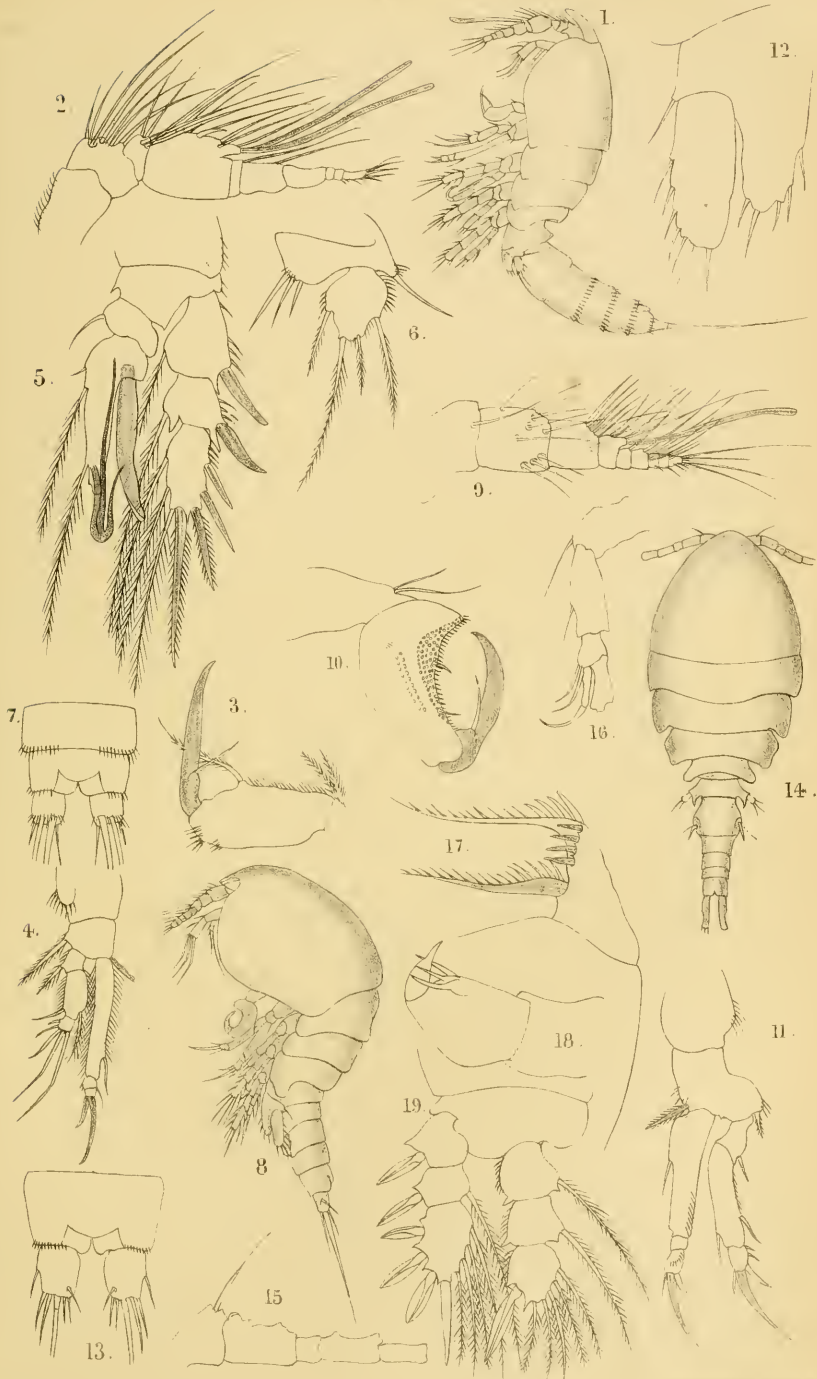
Fig. 14. Female, dorsal view, $\times 40$. 15. One of the antennules (imperfect), $\times 108$. 16. One of the antennæ (imperfect), $\times 108$. 17. One of the first maxillipeds, $\times 220$. 18. One of the second maxillipeds, $\times 146$. 19. Foot of first pair, $\times 154$.











Notes on the Natural History of East Finmark. By Canon
A. M. NORMAN, M.A., D.C.L., LL.D., F.R.S., F.L.S.

[Continued from p. 32.]

PODOSOMATA, Leach.
(= PANTOPODA, Dohrn.)

IN the following list the species without habitat have been found by G. O. Sars in the Varanger Fiord except *Nymphon macrum* and *Chaetonymphon macronyx*, which were dredged by the Norwegian North-Atlantic Expedition, Stat. 262, lat. 70° 36' N., long. 32° 35' E., in 148 fathoms, in the sea to the east of Vardö*.

Pycnogonum littorale, Ström.

Phoxichilidium femoratum, Rathke. Vadsö, tide-marks.

Pseudopallene circularis, Goodsir, = *P. intermedia* and *P. discoidea*, Kröyer.

— *spinipes*, Fabricius.

Cordylochele brevicollis, G. O. Sars.

Nymphon longitarse, Kröyer. Dredged near Vadsö.

— *gracilipes*, Heller.

— *macrum*, Wilson.

Chaetonymphon hirtipes, Bell. Varanger and Bög Fiords.

— *macronyx*, G. O. Sars.

Boreonymphon robustum, Th. Bell, = *Nymphon abyssorum*, Norman. Varanger Fiord, 125 fathoms. It is the first time that this species, which is abundant in great depths in the Arctic Ocean, has been found in a fiord.

INSECTA.

COLEOPTERA.

Herr Schneider informs me that he knows about 400 species of Coleoptera from Sydvaranger, but that he does not wish to publish a fresh list until he has worked out certain groups. The coleopterist may, however, refer to Herr Schneider's paper, "Sydvarangers entomologiske Fauna, 1st Bidrag, Coleoptera," Tromsø Mus. Aarsh. xv. 1893, pp. 17-104. One hundred and ninety species are recorded in that paper.

* Sars (G. O.), 'Norwegian North-Atlantic Expedition,' Pycnogonidea (1891).

HYMENOPTERA.

Bombidæ of Sydvaranger. By J. SPARRE SCHNEIDER.

Bombus alpinus, <i>Zetterstedt.</i>	Bombus Kirbyellus, <i>Curtis</i> , = ni-	
— lapponicus, <i>Fabr.</i>		valis, <i>Zetterstedt.</i>
— pratorum, <i>Linne.</i>		— hypnorum, <i>Linne.</i>
— terrestris, <i>Linne.</i>		— hyperboreus, <i>Schönh.</i>
— jonellus, <i>Kirby</i> , = scrim-		Psithyrus vestalis, <i>Fourcr.</i>
shiranus, <i>auct.</i>	— lessonurus, <i>Thoms.</i>	

The third part of the second volume of Römer and Schaudinn's 'Fauna Arctica' has reached me to-day (Dec. 20, 1902). The first paper in this part is by Hans Kiaer, "Die arktischen Tenthrediniden," which contains many East Finmark records; but these will be found more fully given in a paper by the same author, "Uebersicht der phytophagen Hymenopteren des arktischen Norwegens," in 'Tromsø Museums Aarshefter,' vol. xix. 1898.

The second paper is by H. Friese, "Die arktischen Hymenopteren mit Ausschluss der Tenthrediniden." This is illustrated by a plate, which gives excellent coloured figures of *Bombidæ*, including some of the species in Herr Schneider's list here given, together with some notes by my friend on the family. H. Friese gives the number of Hymenoptera (exclusive of Tenthredinidæ) which are found in Arctic Norway and Lapland as three hundred and eighty (including forty-five *Apidæ*, of which fifteen belong to *Bombus*), but there is no separate information with respect to the East Finmark species.

LEPIDOPTERA of *Sydvaranger* *. By J. SPARRE SCHNEIDER.

RHOPALOCERA.

<i>Papilio machaon</i> , <i>L.</i>	<i>Lycæna argyrognomon</i> , <i>Bergst.</i> (= <i>argus</i> , <i>auct.</i>)
<i>Pieris brassicæ</i> , <i>L.</i>	
— <i>rapæ</i> , <i>L.</i>	
— <i>napis</i> , <i>L.</i> , var. <i>bryoniæ</i> , <i>O.</i>	
<i>Colias palæno</i> , <i>L.</i> , and var. <i>lap-</i>	
<i>ponica</i> , <i>Stgr.</i>	
<i>Thecla rubi</i> , <i>L.</i>	
<i>Polyommatus phlœas</i> , <i>L.</i> , var.	
<i>americana</i> , <i>Darb.</i>	
— <i>amphidamas</i> , <i>Esper.</i>	<i>— oplilete</i> , <i>Knz.</i> , var. <i>cyparissus</i> , <i>Hb.</i>
	— <i>eumedon</i> , <i>Esp.</i>
	<i>Vanessa urticæ</i> , <i>L.</i> , var. <i>polaris</i> , <i>Stgr.</i>
	— <i>antiopa</i> , <i>L.</i>
	— <i>cardui</i> , <i>L.</i>
	<i>Melitæa iduna</i> , <i>Dalm.</i>

* For full notes on the Lepidoptera of *Sydvaranger* see "Sydvarangers entomologiske Fauna, 2^{det} Bidrag, Lepidoptera," J. Sparre Schneider, Tromsø Museums Aarshefter, xviii. 1895. A few species are added by Herr Schneider in this list, in order to complete it up to the present time.

Melitæa parthemiæ, <i>Bkh.</i>	Argynnis polaris, <i>B.</i>
Argynnis aphirape, <i>Hb.</i> , var. ossianus, <i>Hbst.</i>	— freya, <i>Thbg.</i>
— selenæ, <i>Schiff.</i> , and var. hela, <i>Stgr.</i>	— frigga, <i>Thbg.</i>
— euprosyne, <i>L.</i> , var. fingsal, <i>Hbst.</i>	— aglaia, <i>L.</i>
— pales, <i>S. V.</i> , var. lapponica, <i>Stgr.</i>	Erebia lappona, <i>Esp.</i>
— arsilache, <i>Esp.</i> , var. lapponica, <i>Schöyen.</i>	— embla, <i>Thbg.</i>
	— disa, <i>Thbg.</i>
	Gneis norna, <i>Thbg.</i>
	— bore, <i>Schn.</i>
	Syrichthus centaureæ, <i>Rbr.</i>

SPHINGES.

Acherontia atropos, <i>L.?</i>	Zygæna exulans, <i>Hoch.</i> , and var. vanadis, <i>Dalm.</i>
Sphinx pinastri, <i>L.?</i>	Sesia culiciformis, <i>L.</i>
Deilephila Galii, <i>Roth.</i>	

BOMBYCES.

Nola karelica, <i>Tystr.</i> (=arctica, <i>Schöyen.</i>)	Leucoma salicis, <i>L.</i>
Arctia festiva, <i>Bkh.</i>	Bombyx cratægi, <i>L.</i> , var. ariæ, <i>Hb.</i>
— Quenseli, <i>Payk.</i> , var. gelida, <i>Mösch.</i>	Eriogaster lanestris, <i>L.?</i>
Spilosoma fuliginosa, <i>L.</i> , var. borealis, <i>Stgr.</i>	Saturnia pavonia, <i>L.</i>
Hepialus fuscinebulosus, <i>De Geer</i> (=vellida, <i>Hb.</i>)	Notodonta dromedarius, <i>L.</i>
Phymatopus hecta, <i>L.</i>	— dictæoides, <i>Esp.</i> , var. frigida, <i>Zett.</i>
Psyche Standfussii, <i>H.-S.</i>	Cymatophora duplaris, <i>L.</i>
	Asphalia flavicornis, <i>L.</i> , var. finmarchica, <i>Schöyen.</i>

NOCTUÆ.

Acronycta auricoma, <i>S. V.</i> , var. pyhævaræ, <i>Hoffm.</i>	Plusia parilis, <i>Hb.</i>
Agrotis hyperborea, <i>Zett.</i>	— diasema, <i>B.</i>
— gelida, <i>Sp. Schneider.</i>	— Hochenwarthi, <i>Hoch.</i>
— speciosa, <i>Hb.</i> , var. arctica, <i>Zett.</i>	Anarta Bohemanni, <i>Stgr.</i>
— (Pachnobia) carnea, <i>Thbg.</i>	— cordigera, <i>Thbg.</i>
— conflua, <i>Tr.</i>	— melaleuca, <i>Thbg.</i>
Manestra glauca, <i>Hb.</i> , var. lapponica, <i>Dup.</i>	— funebris, <i>Hb.</i>
Hadena Maillardii, <i>Hb.</i>	— melanopa, <i>Thbg.</i>
— adusta, <i>Esp.</i>	— quieta, <i>Hb.</i> (=Schoenherri, <i>Zett.</i>)
Anomogyna lætabilis, <i>Zett.</i>	— Schoenherri, <i>Stgr.</i> (non <i>Zett.</i>)
Orthosia iris, <i>Zett.</i> , var. crasis, <i>H.-S.</i>	— lapponica, <i>Thbg.</i>
Plusia interrogationis, <i>L.</i>	— Zetterstedtii, <i>Stgr.</i>
	Brepbos parthenias, <i>L.</i>

GEOMETRÆ.

Acidalia fumata, <i>Stph.</i>	Psodos coracina, <i>Esp.</i>
— Schöyeni, <i>Sp. Schneider.</i>	Pygmæna fusca, <i>Thbg.</i>
Selenia bilunaria, <i>Esp.</i>	Fidonia carbonaria, <i>Cl.</i>
Ploseria pulverata, <i>Thbg.</i>	Anaitis paludata, <i>Thbg.</i> , and var. obscurata, <i>Schöyen.</i>
Biston pomonarius, <i>B.</i>	Lobophora carpinata, <i>Bkh.</i>
Gnophos sordarii, <i>Thbg.</i>	

<i>Lygris prunata</i> , L.	<i>Cidaria dilutata</i> , Schiff.
— <i>populata</i> , L.	— <i>cineraria</i> , Schöyen.
<i>Cidaria truncata</i> , Hufn., var.	— <i>caesiata</i> , Lang.
<i>Schneideri</i> , Sandberg.	— <i>sociata</i> , Bkh.
— <i>munitata</i> , Hb.	— <i>lugubrata</i> , Stawdyr., var.
— <i>turbata</i> , Hb., var. <i>arctica</i> ,	<i>obductata</i> , Moeschl.?
<i>Schöyen</i> .	— <i>subhastata</i> , Nolck.
— <i>incursata</i> , Hb.	— <i>affinitata</i> , Stph., var. <i>turbaria</i> ,
— <i>fluctuata</i> , L.	<i>Stph</i> .
— <i>montanata</i> , Bkh., var. <i>lap-</i>	— <i>minorata</i> , Tr.
<i>ponica</i> , Stgr.	— <i>alchemillata</i> , L.
— <i>ferrugata</i> , Cl., var. (ab.) <i>spa-</i>	— <i>adæquata</i> , Bkh.
<i>dicearia</i> , Bkh.	— <i>albulata</i> , Schiff.
— <i>suffumata</i> , S. V., var. <i>arctica</i> ,	<i>Eupithecia togata</i> , Hb.?
<i>Schöyen</i> .	— <i>hyperboreata</i> , Stgr.
— <i>designata</i> , Hufn.	— <i>satyrata</i> , Hb.
— <i>abrasaria</i> , H.-S.	— <i>altenaria</i> , Stgr.

PYRALIDINA.

<i>Scoparia centuriella</i> , Schiff.	<i>Crambus truncatellus</i> , Zett.
— <i>gracilalis</i> , Stt.	— <i>maculalis</i> , Zett.
— <i>sudetica</i> , Z.	— <i>furcatellus</i> , Zett.
— <i>murana</i> , Curt., var. <i>tuoniana</i> ,	— <i>biarcticus</i> , Tgstr.
<i>Hoffm</i> .	<i>Pempelia fusca</i> , Hw.
<i>Botys decrepitalis</i> , H.-S.	<i>Myelois annulatella</i> , Zett.
— <i>inquinalis</i> , Z.	— <i>tetricella</i> , S. V.
<i>Crambus ericellus</i> , Hb.	

TORTRICINA.

<i>Tortrix ministrana</i> , L.	<i>Penthina Schutziana</i> , F., and var.
— <i>Forsterana</i> , F.	<i>jivaarana</i> , Hoffm.
— <i>viburnana</i> , S. V.	— <i>rivulana</i> , Scop.
— <i>rubicundana</i> , H.-S.	— <i>cespitana</i> , Hb.
— <i>laponana</i> , Tgstr.	— <i>lacunana</i> , S. V.
<i>Sciaphila ooseana</i> , Scop.	— <i>bifasciana</i> , Hw.
<i>Cochylis deutschiana</i> , Zett.	— <i>bipunctana</i> , F.
<i>Retina resinella</i> , L.?	<i>Grapholitha subocellana</i> , Don.
<i>Penthina sororculana</i> , Zett.	— <i>tetraquetra</i> , Hw.
— <i>dimidiana</i> , Sodoff.	<i>Steganoptycha ericetana</i> , H.-S.
— <i>sauciana</i> , Hb.	— <i>quadrana</i> , Hb.
— <i>lediana</i> , L.	— <i>Gyllenbaliana</i> , Thbg.
— <i>turfosana</i> , H.-S.	— <i>mercuriana</i> , Hb.?
— <i>metallicana</i> , Hb.	<i>Phoxopteryx unca</i> , L.
— <i>nebulosana</i> , Zett.	— <i>unquicella</i> , L.
— <i>palustrana</i> , Z.	— <i>myrtillana</i> , Tr.
— <i>Schæfferana</i> , H.-S.	

TINEINA.

<i>Talæporia borealis</i> , Wk.	<i>Tinea</i> sp.?
<i>Solenobia cembrella</i> , L.	<i>Myrmecozela ochraceella</i> , Tgstr.
<i>Scardia tessulatella</i> , Z.	<i>Incurvaria velutella</i> , Zett.
<i>Blabophanes rusticella</i> , Hb.	— <i>capitella</i> , Cl.
<i>Tinea arcuatella</i> , Stt.	— <i>rupella</i> , Schiff.
— <i>cloacella</i> , Hw.	<i>Nemophora Panzerella</i> , Hb.
— <i>picarella</i> , Cl.	<i>Adela Esmarkella</i> , Wöcke.

Adela cuprella, <i>Thbg.</i>	Gelechia viduella, <i>F.</i>
Swammerdamia griseocapitella, <i>Zett.</i>	— diffinis, <i>Hw.</i>
— conspercella, <i>Tgstr.</i>	Pleurota bicostella, <i>L.</i>
Argyresthia Gødartella, <i>L.</i>	Cecophora stipella, <i>L.</i>
Plutella cruciferarum, <i>Z.</i>	— similella, <i>Hb.</i>
Semioscopis avellanella, <i>Hb.</i>	Ornix, sp.
Depressaria ciniflonella, <i>Z.</i>	Coleophora laripennella, <i>Z.</i>
Gelechia infernalis, <i>H.-S.</i>	Butalis chenopodiella, <i>Hb.</i>
— continuella, <i>Z.</i>	Endrosis lacteella, <i>Schiff.</i>
— virgella, <i>Thbg.</i>	Elachista atricomella, <i>Stt. ?</i>
— perspercella, <i>Wk.</i>	Lithocolletis rayella, <i>L.</i>
— lugubrella, <i>F.</i>	Nepticula sp.

MICROPTERYGINA.

Micropteryx aureatella, <i>Scop.</i>	Micropteryx semipurpurella, <i>Stph.</i>
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PTEROPHORINA.

Platyptilia Zetterstedtii, <i>Z.</i>	Leioptilus tephradactylus, <i>Hb.</i>
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Notes on the List of Lepidoptera. By A. M. N.

Entomologists who desire to know the synonymy and learn the Arctic distribution of the Sydvaranger Lepidoptera may consult Dr. Arnold Pagenstecher's "Die arktische Lepidoptera" in the 'Fauna Arctica,' vol. ii. 1902, pp. 198-400. It should be borne in mind, however, that the catalogue given here by Schneider is still later than that of Pagenstecher.

It may be interesting to throw into tabular form the Sydvaranger Lepidoptera, and for comparison with them the numbers of Lepidoptera which are known to inhabit a locality in West Norway as well as those of other Arctic parts of Norway.

Column 1 is filled in from Schneider (J. Sparre), "Coleoptera og Lepidoptera ved Bergen og i nærmest omegn," Bergens Museum Aarsbog, 1901.

Columns 3 and 5 from Schneider (J. Sparre), "Lepidopterfauna'en på Tromsöen og i nærmeste omegn," Tromsö Museums Aarshefter, xv. 1893, p. 150.

Columns 2 and 4 from Schneider (J. Sparre), "Tillæg til Tromsö og omegns Lepidopterfauna," Tromsö Museums Aarshefter, xxiii. 1901, p. 200.

Column 6 from this paper.

These figures show how very rich Sydvaranger is in larger Lepidoptera, and especially in butterflies. No doubt considerable additions will be hereafter made to the groups of smaller species. Considering the small area of country

included in Sydvaranger and its Arctic situation the list must be considered altogether very full.

	Bergen.	Whole of Arctic Norway.	Saltalen.	Tromsö.	Alten.	Sydvaranger.
Rhopalocera.....	28	49	30	18	26	31
Sphingæ.....	6	10	2	4	2	5
Bombycæ.....	24	29	14	4	7	15
Noctuæ.....	59	50	25	14	22	25
Geometræ.....	76	84	57	30	38	38
Pyralidina.....	24	37	23	11	18	14
Tortricina.....	45	80	38	28	39	32
Tineina.....	24	109	51	35	62	38
Mycropterygina.....	1	4	3	2	3	2
Pterophorina.....	4	10	7	2	2	2
Alucitana.....	1	0	0	0	0	0
	292	462	250	148	219	202

DIPTERA.

One most unpleasant experience in Sydvaranger is derived from the enormous swarms of mosquitos. These are bred in the marshy ground near the margin of the fiords, and when dredging clouds were perpetually settling upon us. The natives escaped, however, their persecution altogether; my Norwegian friends were not much troubled; but I was a victim, containing delicious sweet blood which no previous mosquitos had tainted, and they made the most of me. Hands, forehead, and neck were one mass of bites, and for a fortnight the irritation was most trying; however, smearing all exposed parts with oil of cloves did not a little to keep them off, and after a time they did not attack me so cruelly as they had done at first. Why was this? It is a wonderful thought, but yet it is, I believe, the fact that the bites of these little wretches had at the same time that they sucked my blood infused something into the blood they were sucking which had affected the whole of that in my body in such a way that their wonderful power of scent told other mosquitos that it was no longer so delicious as it had been, in that it had now been subjected to the attacks of their brethren. Although the bites of these mosquitos are not malaria-

infecting, the extreme irritation naturally made their martyr very feverish. Luckily they attack by day in bright sunshine, and did not come into the house at night.

I think that there must be two species of these mosquitos, because while all vestige of hundreds of bites has passed away, about a dozen spots still remain, and through life will remain, on the backs of my hands, to remind me of the Sydvaranger pests, and to point to some of them as apparently belonging to a more venomous kind than the majority*.

The following is what M. de Guerne writes concerning these mosquitos (*l. c.* † p. 21), as experienced by him in Klosterelv Fiord:—"Malheureusement, au mois de juillet, les moustiques gâtèrent tout le charme de ce séjour. Ils s'abattaient en foule sur la navire, pénétrant jusque dans la cale, sans qu'il fût possible de leur faire une guerre efficace. Un des officiers du bord étant descendu à terre sans avoir revêtu l'indispensable voile de gaze, reparut méconnaissable au bout de quelques heures; ces maudites bestioles l'avaient tellement piqué autour des yeux que ses paupières gonflées l'empêchaient de voir. Je comprends aujourd'hui la kyrielle d'épithètes injurieuses lancées contre ses insupportables diptères par tous ceux qui ont visité le Finmark. Avant le départ j'étais disposé à trouver leurs récits exagérés sur le point; il n'en est rien. A l'heure présente, ayant souffert comme mes prédécesseurs, je suis d'avis que la vocabulaire français n'offre pas le qualificatif assez énergique pour désigner ce lamentable fléau, cette peste vivante causée par une insecte si bien appelé par Pallas *infestissimus*."

Again, writing of the banks of the Pasvik River he says (p. 33):—"Il est impossible de se faire une idée de l'abondance extraordinaire de ces odieux insectes; tout les récits à ce sujet paraissent absolument exagérés, il n'en est rien. On a plein les yeux de moustiques, plein la bouche en mangeant, plein le nez; le moustiquaire est indispensable et l'on ne peut quitter les gants. Je me suis plusieurs fois enfoncé les mains dans les chaussettes pour supprimer toute interruption entre les gants et la manche de l'habit; les poignets sont noirs de ces sales bêtes. Plusieurs fois, le sommeil m'a été impossible à cause de ces maudits animaux; on a beau s'enfumer, se couvrir d'huile aromatique, il en vient tant et

* Herr Schneider informs me that common species of the district are *Culex nemorosus*, Mug., *C. pipiens*, Linn., *C. cantans*, Mug., and *C. annulatus*, Fabr.

† 'Union Géographique du Nord de la France. Conférences faites par M. Jules de Guerne. Souvenirs d'une Mission Scientifique en Laponie, 1880.'

tant qu'on est malgré tout forcé de souffrir. Jugez d'après cela de ce que sont les nuits passées en plein air sur les bords du Pasvik, j'étais bien heureux de rencontrer en passant de pauvres cabanes éclairées par la cheminée seule ; j'entrais à genoux dans ces réduits enfumés où j'avais au moins la satisfaction de reposer tranquillement à l'abri des insupportables diptères. Une exploration scientifique est assez méritoire dans les pareilles conditions."

[To be continued.]

Notes on the Natural History of East Finmark. By Canon
A. M. NORMAN, M.A., D.C.L., LL.D., F.R.S., F.L.S.

[Continued from p. 173.]

[Plate XIII.]

POLYZOA.

I HAVE in the following paper on Polyzoa extended the scope of the subject beyond the limit of East Finmarkian species, in order to introduce matter relating to classification and observations on some Arctic and other species. The species which have been found in East Finmark have been numbered, and such species as have no prefixed number will be understood not to have connexion with the fauna of that district.

Herr F. A. Smitt, in 1865-74, published his 'Kritisk Förteckning öfver Skandinaviens Hafs bryozoer.' This work contained an admirable series of illustrations of Scandinavian and Arctic Polyzoa. The figures, though small, were excellent, and they have been and must continue to be

of great value to the student. Smitt was highly conservative with respect to nomenclature, in so far that he adopted existing genera, enlarging or altogether altering their characters so that they might embrace the species with which he was dealing. Indeed, he formed only one new genus—*Anarthropora*—among the Cheilostomata. Moreover, he instituted very few new species, distributing most of the interesting new varieties which he found, as well as many previously described species, under existing names, not calling these freshly acquired Polyzoa varieties, but “*formæ*.”

Now it is not far from the truth to say that in the opinion of recent writers these “*formæ*,” with few exceptions, are regarded as entitled to specific rank. This is, however, of course, a mere matter of opinion, and his work remains a most valuable contribution to our knowledge of the Polyzoa. He was, moreover, the pioneer who maintained that among the Escharine and Lepralian groups the form which the zoarium assumes is of little value as affording generic or specific characters in comparison with the structure of the individual zoœcia which make up the zoarium, and in the application of this principle he took his characters from the several features of the zoœcium and its appendages. Soon after the publication of his work, through the kindness of Prof. Lovén and Herr Smitt I received in exchange from the Stockholm Museum a very full series of the Polyzoa which were described in the latter’s monograph; and these specimens have been of very great value in enabling me to positively determine certain forms.

Smitt, in the work referred to and in his “*Bryozoa marina in regionibus arcticis et borealibus viventia*,” *Öfvers. k. Vet.-Akad. Förh.* (1867) 1868, p. 443, recorded eighty species and “*formæ*” from Finmark, but there is no means of knowing in what part of Finmark they had been found.

While Daniellssen supplies one or two East Finmark species, our previous knowledge of the Polyzoa of the district is due to papers by Herr O. Nordgaard; one of these is “*Norwegian North Atlantic Expedition, Polyzoa*,” 1900, and the others “*Systematisk fortegnelse over de i Norge hidtil observerede arter af marine Polyzoa, I. Cheilostomata*,” *Bergens Mus. Aarbog*, 1895, and “*II. Cyclostomata*,” *ibid.* 1896.

The ‘*History of British Marine Polyzoa*’ is a work of the greatest value and importance on the species of our fauna. It is unfortunate that some of the genera which Mr. Hincks founded mainly on the form of the oral opening were so loosely characterized that they admitted forms which have

really little in common. His work, moreover, contained a most serious mistake. He acted in it as though there were no such things as rules of nomenclature, casting aside many old genera as though they never existed and misapplying others. The primary law of nomenclature, which alone can save zoology from hopeless confusion, is that "The name originally given by the founder of a group or the describer of a species should be permanently retained, to the exclusion of all subsequent synonyms." The mistake of Hincks in this matter and the injustice caused to previous writers must sooner or later be rectified. It is to be regretted that this has not been done long since. Verrill has made some corrections, and further delay will only render the necessary changes when made the more serious, as it would allow of the addition of further useless synonyms. I know of no other class in which the law I have referred to has been so ruthlessly set aside. Was it that Hincks was ignorant of all law? or was it that as the characters given to the old genera were totally inadequate from the modern point of view, he considered that they might be disregarded? The answer is that two items remain permanent, unless they be synonyms of earlier described forms—the name of a genus and the name of a species. The definition of a genus or species must of necessity be continually changing with increasing knowledge of the forms themselves and of others more recently discovered which are allied to them. If it were otherwise, could some of Hincks's own genera—say *Schizoporella*, *Smittia*, or *Mucronella*—be at this moment maintained with the definition which he gave to them? The following are instances in which the law of priority was disregarded among the Cheilostomata.

Chorizopora Brongniartii.—The generic name is that of Hincks, the specific of Audouin. Both must yield to *Berenicea prominens*, Lamouroux (Expos. méthod. des Genres de l'Ord. des Polyp. 1821, p. 80, pl. lxxx. figs. 1, 2). The type of Lamouroux's species was from the Mediterranean, and it unquestionably was drawn from the netted state of the species (see Hincks, Brit. Pol. pl. xxxii. fig. 2). There is an earlier genus among Medusæ—*Berenice*, Péron & Lesueur, 1809—but the two generic names are sufficiently distinct.

Schizoporella, Hincks, ought to have been named *Escharina*, H. Milne-Edwards, since it included *E. vulgaris* (Moll) (see Lamarck and Gray). But I have always considered that *E. vulgaris* was wrongly placed by Hincks in his genus, and that its keyhole-like oral opening and the avicularia situated so low down on the zoœcia, with their vibraculoid

character, pointed to much closer relationship to what Hincks called *Mastigophora*. Recently Levinsen ('Studies on Bryozoa,' 1902, p. 26) has intimated his intention of removing some other "*Schizoporella*" into the same genus.

Mastigophora, Hincks.—This genus ought not to have been instituted unless the genus *Herentia*, Gray, had been used for some other form, since the first species which Gray placed in the genus was *Herentia Hyndmanni*, the very species which Hincks made the type of his *Mastigophora*. But, as intimated in the preceding paragraph, *Escharina*, H. Milne-Edwards, must apparently take precedence of both these names.

Lepralia, Hincks.—This has no connexion whatever with *Lepralia*, Johnston. It does not contain a single species which Johnston had placed within it when the genus was formed! Moreover, an extraordinary liberty has been taken here. *Eschara foliacea*, the type species of the oldest genus of Cheilostomata except *Cellepora*, is actually submerged in the *Lepralia* of Hincks and the genus slaughtered.

Umbonula, Hincks.—The type *U. verrucosa*, Esper; but this same species is the type of the old genus *Discopora*, Lamarek (see Lamarek and Lamouroux, the latter author deciding the type).

Escharoides of Smitt and Hincks is not *Escharoides*, Lamarek, the type of which is *Cellepora coccinea*, Abildgaard (see Lamarek and Gray, who determine the species intended by their references to Fleming and Johnston).

Mucronella, Hincks.—If some doubt existed as to the species which was described by the name *Cellepora coccinea*, it certainly was either what is now known as *coccinea* or *ventricosa*, Johnston, both of which species were included in the *Mucronella* of Hincks, which therefore ought to have borne the name *Escharoides*, H. Milne-Edwards; but if *M. coccinea* is now placed in a different genus from *M. ventricosa*, as must, I think, be the case, Gray's genus *Escharella*, 1848, should be used for the *ventricosa* group. Gray placed in his genus three species—*immersa*, Fleming (= *Peachii*, Johnston), *violacea*, Johnston, and *variolosa*, Johnston,—the first and third of which would remain in it. *Escharella*, Gray, 1848, is not the subsequently described *Escharella*, d'Orbigny, 1850, nor *Escharella*, Smitt, 1867.

Since the publication of the 'History of British Marine Polyzoa' most valuable work has been carried out by many students on the structure—using the word in its widest sense—of the Escharine Polyzoa. But I shall refer here only

briefly to points which afford the chief assistance in the classification of the forms.

1. *The Compensation-Sac.*

The compensation-sac was first observed by Jullien, and has been lately worked out fully by S. F. Harmer, "On the Structure and Classification of Cheilostomous Polyzoa" (Proc. Cambridge Phil. Soc. vol. xi. 1900, p. 11). The importance of the compensation-sac is so great that it ranks in classification as dividing the order Cheilostomata into two sections, the one provided with and the other not possessing the compensation-sac. The genera which possess a compensation-sac, and which embrace the greater portion of the Escharine and Lepralian forms, Levinsen ("Studies on Bryozoa," Vidensk. Medd. fra den Naturh. Fören. i Kjöbenhavn, 1902, p. 2, separate copy) proposes to unite under the term *Camarostega*.

2. *The Front Wall.*

Jullien rightly called attention to the importance of taking into consideration the structure of the front wall in the classification.

3. *The Operculum.*

Waters, as long ago as 1878, in his paper "The Use of the Opercula in the determination of the Cheilostomatous Bryozoa" (Proc. Manchester Lit. & Phil. Soc. vol. xviii. p. 8), pointed out that the form of the operculum was more reliable in classification than the outline of the oral aperture, since the latter is subject to great modification, while the former is stable. Since that time the operculum has been much studied by Waters, Lorenz, Levinsen, and others. There cannot be a doubt that it is of great value in classification as regards, first, its nature (membranous or calcareous, separable or inseparable); second, its form and structure; and third, the mode of its attachment in the oral opening and the muscular scars which it exhibits.

4. *The so-called 'Rosette-plates' (or 'Origelles' of Jullien) and Pore-chambers.*

These have been chiefly studied by Waters, Jullien, and Levinsen. They are destined to play a very important part in classification. The rosette-plates have been studied for a

long time, but the observations on the pore-chambers are of more recent date. It is Levinsen who has played the chief part in their examination, and he has published figures of those of many species: first in 'Videnskab-Udbytte Kanonbaden "Haugh's" Togter,' 1891, pls. ii. & iii., and subsequently in 'Zoologica Danica, Mosdyr,' 1894, pls. iii.-vi. Waters, in some of his more recent papers, and more especially in his "Observations on the Membraniporidae," Journ. Linn. Soc., Zool. vol. xxvi. 1898, p. 654, has described and illustrated pore-chambers of certain species. I have, in the following paper, made much use of them in dividing the old genus *Membranipora*, as well as in other cases.

5. *The Avicularia.*

Hincks made some use of the avicularia and vibracula in the establishment of certain genera, and they have been, of course, used constantly in specific characters; but these organs deserve far more attention than they have hitherto received. Their structure and their position in the zoarium or zoecium would seem to constitute often most reliable aid in assigning the forms to what we designate species or genera among the Polyzoa, just as the presence or absence and the forms and position of pedicellariæ have been found of very great importance in the classification of Echinoderma. The foregoing sentence was written some months ago, and in writing it I had more especially in my mind the Asteroidea. I have now (March 1903) just received the beautiful work of Th. Mortensen on the Echinoidea ('The Danish Ingolf Expedition,' vol. iv.—I. Echinoidea, pt. i. 1903). The following sentences are from his work, and are worthy of consideration in connexion with the value of the avicularia of the Polyzoa:—

"The characters which have hitherto chiefly been used for the distinguishing between the genera and species are the following: the pores, the spines, the tubercles, the mouth-slits, the lining of the buccal membrane with larger or smaller plates, and the calycinal area. All these structures may give excellent characters, and, of course, they are always to be taken into consideration. But most frequently they are so relative, that it is exceedingly difficult or impossible, by means of these structures, to decide whether a specimen in hand belongs to one species or another. . . . By these researches the pedicellariæ and spicules proved to be of very great systematic value; they give the most excellent characters we may want. . . . *The pedicellariæ in effect give absolutely excellent systematic characters, sometimes only specific*

characters, sometimes also generic ones. . . It may, perhaps, seem unreasonable to lay so much stress, as is done here, on so minute features as the pedicellariæ—to use them for the characterizing of as well species as genera and families. But when it proves to be a real fact that these minute features give excellent constant characters, it may be taken to be reasonable to use them without regard to their being small or large. . . The supposition by Stewart that by the examination of the pedicellariæ &c. we might find a closer relation between forms not otherwise regarded as related, has been amply justified by these researches, even to so high a degree that the classification hitherto used proves to be quite a failure (with regards to the groups treated of here). A good proof of the correctness of the new classification given here, which has been found especially by the examination of the pedicellariæ, is found in the fact that forms with the same kind of pedicellariæ also agree in other important respects.”

The avicularia have been little used in the classification of Polyzoa, but I am satisfied that they are destined to play a far more prominent part in the future. In some genera Hincks made use of them with good results; in others he disregarded them altogether and left genera (e. g. *Membranipora*, *Schizoporella*, *Mucronella*, and *Lepralia*) to contain a most miscellaneous assemblage of species. Busk, in his ‘Challenger’ Report, used them with satisfactory result, especially as applied to the very difficult genus *Cellepora*. But the following sentences from the paper by Waters, “Observations on the Membraniporidae” (Journ. Linn. Soc., Zool. vol. xxvi. 1898, pp. 655–657) relate to a more minute point among his “Membraniporidae.” He says: “the avicularium only exceptionally has a complete bar.” Then writing of an aberrant group (the genus *Chaperia*, Jullien) he says: “Kirkpatrick refers *Chaperia acanthina*, Q. & G., to *Lepralia*, but in *Chaperia* the avicularia have not a complete bar; whereas in all the *Lepraliae* I have examined the bar is complete, and the muscular attachment of *Lepralia* is not quite similar.” I have confirmed Waters’s statement as to the incomplete bar in the avicularia of *Membranipora* in the following species: *fustroides*, *lineata*, *craticula*, *aurita*, *Dumerillii*, *unicornis*, *armifera*, *Sophieæ*, *nigrans*, *tenuirostris*, *granulifera*, *trifolium*, and *Flemingii*. But the bar is incomplete also in other genera, e. g. *Lepralia nitida*, *Reptadeonella violacea*, *Cribilina punctata*, *innominata*, and *radiata*, and *Mucronella* (?) *pavo-nella*; while it is complete in *Cribilina figularis*, *Chorizopora Bronniartii*, *Microporella ciliata*, *Schizoporella unicornis*, *linearis*, and other species of the genus, *Smittia trispinosa*,

reticulata, and many of their allies which I have examined. The absence of the complete bar seems therefore to be nearly general among the Membraniporidæ, but to occur also in some other instances. The interest of this question lies in affording evidence that not only the presence or absence of avicularia, or their general form when present, is worthy of consideration, but even such minute points in regard to the building up of the avicularium itself as this little slender bar.

But the bar is not always incomplete among what have been called Membraniporidæ. It would seem that in cases when the oval or oblong avicularium occupies a distinct chamber apart from the zoecium the bar is complete; this is the case in *Oochilina crassimarginata* and *tensa* and *Lernacicus corniger*.

Class POLYZOA.

Subclass I. ENTOPROCTA.

Genus LOXOSOMA, Keferstein.

1. *Loxosoma phascolosomatum*, C. Vogt.

Bög Fiord on *Phascolion*.

Genus PEDICELLINA, M. Sars.

2. *Pedicellina cernua* (Pallas).

Var. *belgica*, J. van Beneden, = var. *glabra*, Hincks.

The smooth-stemmed variety of *P. cernua* was taken between tide-marks at Vadsö.

Subclass II. ECTOPROCTA.

Order GYMNOLÆMATA.

Suborder I. CYCLOSTOMATA.

Genus CRISIA, Lamouroux.

3. *Crisia denticulata* (Lamarek).

Varanger Fiord down to 150 fathoms; and also in Bög and Lang Fiords; and it was dredged by the Norwegian North Atlantic Expedition off Vardö in 148 fathoms.

4. *Crisia eburnea* (Linné).

Between tide-marks at Vadsö.

GENUS STOMATOPORA, BRONN.

5. *Stomatopora fungia* (Couch).
Sværholt (*Nordgaard*).

GENUS IDMONEA, LAMOUROUX.

6. *Idmonea atlantica*, E. Forbes.
Vardö ; Vadsö ; Lang and Bög Fiords ; also at Svolvær.
7. *Idmonea serpens* (Linné).
Vadsö (*Danielssen*)*.

GENUS DIASTOPORA, LAMOUROUX.

8. *Diastopora obelia*, Johnston.
On Hydroids from Vardö fishing-boats.

GENUS HORNERA, LAMOUROUX.

9. *Hornera lichenoides* (Linné).
Bög Fiord, in 120 fathoms (*A. M. N.*) ; Vadsö (*Danielssen*).

GENUS LICHENOPORA, DEFRANCE.

10. *Lichenopora hispida* (Fleming).
Vadsö, at entrance of harbour ; and Nordgaard records it from Sværholt.
11. *Lichenopora verrucaria*, Fabricius.
Sværholt (*Nordgaard*).

GENUS DEFRANCIA, BRONN.

12. *Defrancia lucernaria*, M. Sars.
1851. *Tubulipora lucernaria*, M. Sars, "Beretning om en i Sommeren 1849 foretagen zoologisk Reise i Lofoten og Finmark," *Nyt Mag. Naturvid.* vol. vi. p. 25 (separate copy).
1856. *Defrancia truncata*, Busk, *Ann. & Mag. Nat. Hist.* ser. 2, vol. xviii. p. 35, pl. i. figs. 8 a, b (non *Millepora truncata*, Jameson).
1862. *Defrancia lucernaria*, M. Sars, "Beskrivelse over nogle norske Polyzoer," *Vidensk.-Selskab. Förhand.* p. 26 (separate copy).

* Danielssen, 'Beretning om zoologisk Reise foretagen i Sommeren 1857.' Christiania, 1859.

1875. *Defrancia lucernaria*, Busk, Cat. Marine Polyzoa, Brit. Mus. pt. iii. Cyclostomata, p. 36, pl. xxxiii. fig. 3.

1900. *Defrancia lucernaria*, Nordgaard, Norwegian N. Atlantic Exped. pt. xxvii. Polyzoa, p. 20, pl. i. figs. 16, 17.

Vadsö (*M. Sars*); Porsanger Fiord, 'Voringen' (*Nordgaard*). I have also found this species at Florö in West Norway.

Suborder II. CTENOSTOMATA.

Genus ALCYONIDIUM, Lamouroux.

*13. *Alcyonidium hirsutum* (Fleming).

1866. *Alcyonidium papillosum*, Smitt, "Kritisk Förteckning, &c." pt. ii., Eftvers. Kongl. Vet.-Akad. Förhand. pp. 499, 516, pl. xii. figs. 20, 21.

As has been pointed out by Hincks, the *A. hirsutum* of Smitt is not this species but *A. mamillatum*, Alder, and *A. lineare*, Hincks.

I did not take this species in East Finmark, but found the encrusting form on *Fucus* at Svolvær, Lofoten Islands.

14. *Alcyonidium gelatinosum* (Linné).

Taken by the Norwegian North Atlantic Expedition in the Porsanger Fiord.

Genus FLUSTRELLA, Gray.

*15. *Flustrella hispida* (Fabricius).

Svolvær, Lofoten Islands.

16. *Flustrella corniculata* (Smitt).

1871. *Alcyonidium corniculatum*, Smitt, "Kritisk Förteckning, &c." pt. v., Eftvers. Kongl. Vet.-Akad. Förhand. p. 1123, pl. xx. figs. 10-16.

The clusters of zoœcia of this species were found wrapped round the stems of *Gemellaria loricata* living between tide-marks at Vadsö. It has previously been found at Spitsbergen and in the sea to the north of Norway; but not on the Norwegian coast.

Genus CYLINDRÆCIUM, Hincks.

17. *Cylindræcium dilatatum*, Hincks.

1856. *Avenella fusca*, Busk, Quart. Journ. Micr. Sci. vol. iv. p. 94, pl. iii. fig. 6 (but not *A. fusca*, Dalyell).

1860. *Furrella dilatata*, Hincks, Quart. Journ. Micr. Sci. vol. viii. p. 279, pl. xxx. fig. 7.

1866. *Vesicularia fusca* (forma simplex), Smitt, "Kritisk Förteckning, &c." pt. ii., (Eftvers. Kongl. Vet.-Akad. Förhand. pp. 503, 524, pl. xiii. fig. 38.

1880. *Cylindrocium dilatatum*, Hincks, Brit. Marine Polyzoa, p. 536, pl. lxxviii. figs. 1, 2, pl. lxxix. figs. 1-3.

In Lang Fiord, on *Bugula Murrayana*. I also found this species at Florö in 1882. The length of the zoecia is about 1.5 millim.

Suborder III. CHEILOSTOMATA, Busk.

Genus GEMELLARIA, Savigny.

18. *Gemellaria loricata*, Linné.

Tide-marks, Vadsö, and dredged in 120 fathoms in Bög Fiord.

This deep-water form is very delicate and drawn out; the space between the apertures is greater, often much greater, than the length of the apertures. The form is more produced than that figured by Smitt, and much more produced than the tide-mark Vadsö form and usual British specimens. It thus diverges from the type in the opposite direction from the Gulf of St. Lawrence variety, which was named by Dawson *G. Willisii* (see Hincks, pl. iii. fig. 3).

Genus BUGULOPSIS, Verrill, 1879.

(Amer. Journ. Science & Arts, Brief Contrib. xliii. vol. xviii. p. 53; and Proc. U.S. Nat. Mus. 1879, no. 190.)

= *Cellularia*, Busk (nec *Cellularia*, Pallas).

Type, *Bugulopsis Peachii* (Busk).

19. *Bugulopsis Peachii* (Busk) = *Cellularia Peachii*, Busk.

Varanger Fiord, in 100-150 fathoms. Verrill in 1879 gave the name *Bugulopsis* to receive the species assigned to *Cellularia* by Busk, a position which could not be maintained. No true *Cellularia* was found in East Finmark; but to explain the use here of the genus *Bugulopsis* I add the following history of *Cellularia*:—

CELLULARIA, Pallas.

= *Cellaria*, Lamouroux & Hincks, = *Salicornaria*, Cuvier.

The genus *Cellularia* cannot be used in the sense in which Busk and Hincks have employed it for the following reasons:—Pallas, the author of the genus *Cellularia*, divided it into sections, the first of which was thus defined "Cellulariæ geniculatæ, undique cellulosæ," and in it were placed

three species, *C. opuntoides*, *C. salicornaria*, and *C. filiformis*. The second of these is the *Eschara fistulosa*, Linné, and was figured by Ellis on plate xxiii. In Ellis and Solander's work we find the spelling of the name changed, without any reason, to *Cellaria*.

Lamouroux, when he refers to the genus, adopts the spelling *Cellaria*, quotes *Cellularia*, Pallas, as a synonym, and retains only two of the species of Pallas in the genus—*C. salicornaria* and *C. opuntoides*. The spelling of the name was simply changed, the genus is the same, its type *C. salicornaria*. *Cellaria* must disappear as being an absolute synonym of *Cellularia*. In 1817 Cuvier made what was already the type of *Cellularia* the type of a new genus which he named *Salicornaria*. Now "*Cellularia*, Pallas" (sic), has been employed by Busk and Hincks in an entirely different sense; and as used by them *does not contain any species placed by Pallas in his genus*. Under any circumstances therefore—that is, if a type of *Cellularia* had not at a very early date been indicated—Busk's usage could not be maintained. The remarks of Hincks (Brit. Polyz. p. 104) should be consulted also on this point. That author took a step in the right direction when he went back to Solander and Ellis and to Lamouroux, but a step further was required to that excellent author Pallas; and Hincks, unfortunately, used both the names *Cellaria* and *Cellularia*. His *Cellaria fistulosa* must become *Cellularia fistulosa*.

Genus MENIPEA, Lamouroux.

= *Tricellaria*, Fleming, 1828, = *Cellarina*, J. van Beneden, 1848.

I think it very doubtful whether Lamouroux's genus can be employed for the northern forms placed in it; Verrill considers that it cannot. *Tricellaria*, which is the next generic name in date, would scarcely be applicable. There remains *Cellarina*, J. van Beneden.

20. *Menipea ternata* (Ellis & Solander).

Vardö and Vadsö (*A. M. N.*); Nordkyn and Sværholt (*Nordgaard*).

21. *Menipea gracilis* (J. van Beneden).

1848. *Cellarina gracilis*, J. van Beneden, "Recherches sur les Polypes Bryozoaires de la Mer du Nord," Bull. Acad. Brux. vol. xv. p. 41, figs. 1, 2.

I am indebted to the late Prof. J. van Beneden for a portion of the type specimen of his *Cellarina gracilis* in the

Brussels Museum; and it is undoubtedly the same as *C. ternata*, var. *gracilis*, of Smitt, and *M. gracilis*, Busk; so that although the name is not changed, it must be assigned to the first-named instead of the last author. Although Van Beneden's lower figure (fig. 2) looks more like *ternata* from its set of three zoœcia, it is merely accidental; for while *M. gracilis* usually has five to nine or even twelve zoœcia in an internode, there may sometimes be found as few as three.

In Van Beneden's *Cellarina gracilis*, as illustrated by the fragment in my possession, which he kindly cut for me in my presence from the type, the lateral avicularia are larger than usual, there is no medium avicularium, the fornx or scutum is of moderate size, and there are two or three oral spines (Van Beneden figures four on young zoœcia); the median zoœcium has no central mucro. Smitt's figure 23 most nearly represents it, but the lateral avicularia are larger; Van Beneden's specimen is exactly like some from Spitsbergen, for which I am indebted to Herr Smitt.

Vardö, Varanger and Sydvaranger Fiords.

A form was dredged in 125-150 fathoms in the Varanger Fiord in which the spines of the zoœcium attained very great development. There were in this form usually three mouth-spines, two of which are of great length, and one of them extraordinarily so, it being from three to four times the length of the zoœcium from which it springs.

22. *Menipea Jeffreysi*, Norman.

1893. *Menipea Jeffreysi*, Norman, "A Month on the Trondhjem Fiord," Ann. & Mag. Nat. Hist. ser. 6, vol. xii. p. 446, pl. xix. fig. 1.

A small fragment in Bög Fiord, 150 fathoms.

GENUS SCRUPOCELLARIA, J. van Beneden.

23. *Scrupocellaria scabra*, J. van Beneden.

Varanger and Sydvaranger Fiords (*A. M. N.*), Nordkyn (*Nordgaard*).

Var. *pænulata*, nom. nov.

1893. *Scrupocellaria scabra*, var., Hincks, "The Polyzoa of the St. Lawrence," Ann. & Mag. Nat. Hist. ser. 6, vol. ix. p. 427, pl. xxi. fig. 1.

The remarkable form of *Scrupocellaria scabra* described and excellently figured by Hincks in his paper referred to occurs also in East Finmark, where I obtained it among the

rejectamenta of the fishing-boats at Vardö and by dredging in Bög Fiord in 120 fathoms. The great development of the fornix is exactly as represented by Hincks. It not only covers the entire oral opening but extends forwards to about half the length of the oœcium. The frontal avicularia are apparently entirely absent; but a vibraenular cell of the unusual character peculiar to *S. scabra* is occasionally, though very rarely, developed. These, however, Hincks failed to find, and upon this ground pointed out that one of the characters which distinguishes *Scrupocellaria* from *Menipea* broke down. These vibraenular appendages are usually pretty freely developed on British examples of the typical form, but are rarely present in all the Finmarkian varieties of the species.

Var. *septentrionalis*, nom. nov., subvar. *congesta*, nom. nov.

At Vadsö, between tide-marks, occurred a form of *S. scabra* which in all essential details, in the small size of the lateral avicularia, in the free development of small frontal avicularia, and in the rudimentary character of the fornix, agrees with var. *elongata*, Smitt; and in all these points it has characters which are the exact opposites of those of var. *pæmulata* in relation to the typical form of the species. But while thus far agreeing with var. *elongata* it is anything but elongated, indeed just the reverse, for the zoœcia are closely crowded together, so that each overlaps its successor to the extent of nearly half the length of the area; thus the aspect of the entire polyzoary is that of a stout little bush. As the name *elongata*, therefore, is not applicable, I propose a varietal name, *septentrionalis*, with two subvarieties: 1. *elongata*; 2. *congesta*.

Genus CABEREA, Lamouroux.

24. *Caberea Ellisii* (Fleming).

Vardö fishing-boats and Lang Fiord (*A. M. N.*); Sværholt (*Nordgaard*).

Genus KINEKOSKIAS, Danielssen.

25. *Kinekoscias arborescens*, Danielssen.

1867. *Kinekoscias arborescens*, Danielssen, Förhand. Videns.-Selskab. Christiania, p. 23 (*vide* Koren and Danielssen, this paper not being in my library).

1867. *Bugula umbella*, Smitt, "Kritisk Förteckning, &c.," Öfvers. K. Vet.-Akad. Förhand. pp. 292 & 353, pl. xix. figs. 28-31.

1877. *Kinekoscias arborescens*, Koren and Danielssen, Fauna Littoralis Norvegiæ, part 3, p. 107, pl. xii. figs. 9-14.

1894. *Kinekoscias arborescens*, Norman, "A Month on the Trondhjem Fiord," Ann. & Mag. Nat. Hist. ser. 6, vol. xiii. p. 113.

The two type "specimens of this species were found by Danielssen at Vadsö at a depth of 90 fathoms on a clayey sand bottom."

Genus BUGULA, Oken.

26. *Bugula purpurotincta*, Norman.

Lang Fiord (*A. M. N.*), Mehavn * (*Nordgaard*).

27. *Bugula Murrayana* (Johnston).

In the fiords generally.

a. Var. *fruticosa*, Packard.

1863. *Menipea fruticosa*, Packard, "List Animals dredged Caribou Island, Southern Labrador," Canad. Naturalist and Geologist, vol. viii. p. 9 (separate copy), pl. i. fig. 3.

1867. *Bugula Murrayana*, var. *fruticosa*, Smitt, "Kritisk Förteckning, &c.," l. c. pl. xviii. fig. 23.

Varanger and Bög Fiords, 50-120 fathoms.

b. Var. *quadridentata*, Lovén (MS.).

Bugula Murrayana, var. *quadridentata*, Smitt, "Kritisk Förteckning, &c.," l. c. pl. xviii. figs. 25, 26.

Bög Fiord in 120 fathoms, with var. *fruticosa*, of which it is a very narrow form, not more than two zoëcia wide. Taken also by the Norwegian North Atlantic Expedition, Stat. 262, off Vardö, 148 fathoms.

Genus CARBASEA, Gray, 1848.

= *Flustrina*, J. van Beneden, 1849, = *Semiflustra*, d'Orbigny, 1851.

I take this opportunity of making some remarks on this genus. *Carbasea* is one of the cases in which the structure of the polyzoary may be conveniently used as a generic character. One group of *Flustra* is composed of a double series of zoëcia, back to back, and these are typical of the genus; but another has invariably only a single layer of zoëcia, and these constitute Gray's genus *Carbasea*. The genus has five North Atlantic and Mediterranean representatives, viz. *Carbasea membranaceo-truncata*, Smitt (Arctic),

* Mehavn is a small village lying between Lakse Fiord and Tana Fiord.

C. pusilla, Hincks (Adriatic), *C. pedunculata*, Busk (about lat. 38° N. and long. 28° W., in 450–900 faths., ‘Challenger’), *C. papyrea*, Pallas (Mediterranean), and *C. Solanderi*, nom. nov. (boreal). A few remarks on the last two species may here be added :—

Carbasa papyrea, Pallas.

1725. *Porus cervinus*, Marsillus, Hist. Phys. de la Mer, p. 64, pl. vi. figs. 25, 26.

1766. *Eschara papyrea*, Pallas, Elenchus Zoophyt. p. 56.

1767. *Flustra papyracea*, Linn. Syst. Nat. ed. xii. p. 1301.

1879. *Flustra carbasa* (nec Ellis & Sol.), Waters, Ann. & Mag. Nat. Hist. ser. 5, vol. iii. p. 119.

1889. *Flustra papyracea*, Carus, Prod. Faun. Med. vol. ii. p. 9.

1896. *Flustra papyrea*, Waters, “Interzoöcial Intercommunication in Flustridae and Notes on *Flustra*,” Journ. Mic. Sci. p. 287.

Zoöcia rhombic or lozenge-shaped, being angled at the middle of their sides; of nearly the same length as those of *C. Solanderi*, being about 1 millim., but wider, 0.65 to 0.75 millim., narrowed both antecally and postecally, the greatest breadth being in the middle; the anterior extremity and oral opening markedly narrower than in *C. Solanderi*. Oöcia of moderate size, semiglobose, well raised.

Specimens in my collection are from Naples (Zool. Stat. sent as “*Flustra carbasa*”) and Mediterranean (Mr. Waters as “*Flustra papyrea*,” Pallas). The species is not only distinct with respect to the form of the zoöcium, but it is also furnished with oöcia, which are well represented on my Naples example, though Mr. Waters states that he has never seen any; while oöcia are unknown in *C. Solanderi*. Considering the date of the work of Marsillus, his figure gives an admirable idea of the form of the cells and the extent of variation in that form. A comparison of the two following passages is certainly curious:—“Attachées à la Roche, quoique sans Racine. J’en ai une en mon Cabinet, qui tient à l’écorce d’un petit Canere” (Marsillus, A.D. 1725). “This is very common upon a Crab (*Pisa armata*), which usually carries a small colony of this *Flustra* on its back. I do not remember seeing any at Naples except from this Crab” (Waters, A.D. 1879). In this species Waters tells us that there are only one distal and two lateral rosette-plates, each with only a single pore.

28. *Carbasa Solanderi*, nom. nov.

1786. *Flustra carbasa*, Ellis and Solander, Nat. Hist. curious and uncommon Zoophytes, p. 14, pl. iii. figs. 6, 7 (et auct. plur.).

1848. *Carbasa papyracea*, Gray, List Brit. Anim. Brit. Mus., Centronia, p. 105 (nec *Flustra papyracea*, Linn.; nec *Flustra papyracea*, Ell. & Sol.).

1848. *Flustrina carbacea*, J. van Beneden, Bull. Acad. Roy. Belg. vol. xv. p. 651.
 1851. *Semiflustra carbacea*, d'Orbigny, Palæont. Franç., Terr. Crét. vol. v. p. 326.
 1867. *Flustra papyrea*, Smitt, "Krit. Förteck., &c." pp. 359 & 380, pl. xx. figs. 9-11 (nec *Eschara papyrea*, Pallas).

This species, which is also *Flustra papyrea* of Busk (B. M. Cat.) and *Flustra carbacea* of Hincks (Hist. Brit. Polyz.), is distinguished from *C. papyrea* by its loop-shaped or linguiform zoëcia, which are proportionately wider in front and narrower in the middle than in that species; and are entirely devoid of the angular projections in the middle of the lateral margins. Oœcia are not known to occur. Its distribution is boreal and arctic, from Britain to Spitsbergen and Greenland. In this species Waters describes numerous distal and six lateral rosette-plates—the former with a single pore, the latter with several pores.

Nordgaard records this species from Sværholtklubben.

29. *Carbacea membranaceo-truncata* (Smitt).

1867. *Flustra membranaceo-truncata*, Smitt, "Kritisk Förteck., &c." p. 358, pl. xx. figs. 1-5.
 1884. *Flustra membranaceo-truncata*, Vigelius, Die Bryozoen 'Willem Barents,' p. 10, pls. i.-vi.

According to Waters this species has three distal and six lateral rosette-plates, all with only one pore. Vigelius (*l. c.*) has published a most elaborate memoir on this species. The margins of the zoëcia are typically quite unarmed, but in a specimen from 150 fathoms in the Varanger Fiord I find a spine on each side at the front corner of the lateral margins. In an example from Greenland similar spines occur, while they are wholly absent from other Greenlandic specimens, from those in my collection from the St. Lawrence, and from others kindly given me by the describer, Herr Smitt, from Finmark and Spitsbergen. Off Vardö, in 148 fathoms, 'Voringen' Expedition.

Genus FLUSTRA, Linné.

30. *Flustra abyssicola*, M. Sars.

1872. *Flustra abyssicola*, G. O. Sars, 'Some remarkable Forms of Animal Life,' Christiania, p. 19, pl. ii. figs. 25-30.

Dredged by the 'Voringen' in 148 fathoms off Vadsö.

“MEMBRANIPORA.”

The so-called genus *Membranipora* contains a heterogeneous assemblage of forms which only agree in these particulars—namely, that a larger or smaller portion of the front wall consists of a membranous covering, and that the oral opening is generally of the simplest character in the anterior part of this membrane. It has always been a matter of surprise to me that, though Hincks removed two or three species to other genera, he left such a strange assemblage of forms to be associated with *Membranipora membranacea*. The explanation is, I suppose, that he relied almost entirely on the oral opening for the establishment of his genera. I cannot but think that in dividing this group use should be made of the presence or absence of the œcium, for the mode of reproduction must be of more importance than most other characters. The character of the œcium when present, and the partial or entire membranous epitheca, must be considered. The absence or presence of avicularia, their character, whether occupying a separate chamber or belonging to the zoœcium, their position and structure are more or less valuable according to other characters which accompany these differences. Mr. Waters, Herr Levinsen, and others have devoted much time and labour to the examination of the pore-chambers and rosettes: the former has summarized his observations in his paper “Observations on the Membraniporidae,” Journ. Linn. Soc., Zool. vol. xxvi. 1898, p. 654; and Herr Levinsen has given figures of the pore-chambers of several species in his excellent ‘Zoologica Danica, Mosdyr,’ 1894. In the preparation of this paper I have examined almost every northern species with respect to the pore-chambers, and have found them to be very valuable as generic characters. They are often very easily seen; but in some cases, though they exist in the walls of the zoœcia, they do not project beyond them and are then often very difficult to determine with certainty. I have used three methods in their examination: first, incineration; secondly, boiling in liquor potassæ; thirdly, placing in Eau de Javille. The use of the latter destroys not only the soft tissues but dissolves chitine, so that it must not be used when it is desired to observe the opercula.

I have illustrated the pore-chambers of several species, but have purposely omitted drawings of those species which Levinsen has already figured, unless the species is the type of a genus as here instituted.

I may mention two little matters which have struck me as interesting in my investigations:—

First, as to incineration. *Megapora ringens* is the only species which, when subjected to fire, has shrivelled up to nothing, yet when treated with Eau de Javille it is found to have a calcareous skeleton; while *Setosella vulnerata*, small as it is, has a strong calcareous front wall which resists fire; and *Membranipora membranacea* when burnt is shown to have a well-developed calcareous structure.

Secondly, it was a surprise to me to find that the largest of all our Cheilostomata, *Eschara foliacea*, as also its variety *fascialis* of the Mediterranean, when dissolved in nitric acid, should exhibit scarcely a trace of chitin, less so than in any other species which I have similarly treated. When the calcareous matter is got rid of scarcely a sign of anything is left except the opercula, which stand out entirely by themselves, so that no teasing is required or indeed could be applied.

Genus HINCKSINA*, gen. nov.

Zoëcia incrusting, having the entire area membranous, the margin surmounted by numerous spines. Oëcia small, short, and little raised. Avicularia occupying distinct cells sparingly scattered among the zoëcia, oval, with semicircular mandible. No pore-chambers.

Type, *Hincksina (Membranipora) flustroides*, Hincks.

This genus with its separate avicularian cells and absence of pore-chambers should, I think, be removed to the family Flustridæ. Waters mentions six lateral rosette-plates.

Genus MEMBRANIPORA, Lamouroux.

Type, *Membranipora membranacea* (Linné).

The *Flustra membranacea*, Linné, has by general consent been accepted as the type of this genus. No other species placed in it by Hincks are congeneric or even belong to the same family. A family Calloporidæ with genus *Callopora* as type will include most of the genera provided with pore-chambers, &c.

Front wall entirely membranous; no oëcia; no avicularia (furnished with tower-cells of unknown use?). No pore-chambers. No lateral spines. Rosette-plates two distal, and two to four lateral, with many pores (*Waters*).

31. *Membranipora membranacea* (Linné).

Nordkyn (*Nordgaard*).

* After the author of 'British Marine Polyzoa.'

Genus ELECTRA, Lamouroux, 1834.

Type, *Electra verticillata*, Lamouroux.

See Norman, "Month on the Trondhjem Fiord," Ann. & Mag. Nat. Hist. ser. 6, vol. xii. p. 113.

With respect to the synonyms I gave in the place referred to :—

1st, *Amphiblestrum*, Gray. All that I wrote in the note is, I believe, correct; but I have since examined the specimens in B. M. which Gray had named *A. membranacea*, Abild., and find that they are not that species, but the *Amphiblestrum Flemingii*, Busk. It seems to me therefore that the specimens should take precedence of the name erroneously given to them by Gray, and that the genus *Amphiblestrum* may be used in the sense in which Busk employed it, for although he makes no reference to the matter, he no doubt had himself examined these specimens in the British Museum.

2nd, *Conopeum*. I have re-examined the specimens in B. M. referred to this genus and find them, as I stated then from long memory, to be *M. Lacroixii*. If it should be deemed therefore at any time desirable to use a separate genus for that species, *Conopeum* is ready for the purpose.

This genus is not furnished with pore-chambers. At one time I was inclined to unite in one species *M. Lacroixii*, Audouin, and *M. monostachys*, Busk. They often occur together on the same oyster or other large shell, mingled in such a way as to be puzzling; but I am now satisfied as to their specific difference. I may here mention that I have failed to observe in any northern specimen examined by me such a back with lucid spots as that represented by Waters in his paper on the Membraniporidae, pl. xlvi. figs. 14, 15, or such an operculum as he refers to *M. Lacroixii**; but I do see on most specimens examined the two processes at the distal extremity, which look as though they were for muscular attachment. The following I regard as some of the specific differences between *E. monostachys* and *E. Lacroixii*:—

Electra monostachys. Typically there is a single spine at

* I am indebted to Dr. Levisen for a very interesting form of *E. monostachys* from Denmark which has a calcareous operculum, but of quite a different form from that figured by Waters and attributed to *Lacroixii*. I subsequently sent to Dr. Levisen specimens of our British var. *fossaria*, Hincks, and he found them to agree with his variety from Denmark in having calcareous opercula &c. I may say that with respect to figures given by Levisen in the 'Zoologica Danica, Mosdyr,' 1894, I should refer his figs. 37, 38, 40 to *E. monostachys* and fig. 39 to *E. Lacroixii*.

the lower margin of the area; when this is present it at once determines the species among northern forms. Under favourable conditions, more especially in young incrusting colonies, the lateral margins may be furnished with a pair of spines by the oral opening, or numerous spines all along the margin, but in these cases the basal spine is always the largest and characteristic. When the colony is entirely devoid of spines, it may be distinguished from *E. Lacroixii* by the lateral margins being smooth, except that their inner edge may be very slightly granulated, but the calcareous posterior portion of the front wall is *smooth*.

E. Lacroixii in favoured positions may have a few extremely fine and delicate spines on the lateral margins with the front pair of larger size, or these latter only present (but never the distinctive posterior central spine of *E. monostachys*). Apart from spines this species may be distinguished from the last by the coarsely granulated character of the entire margins, *including the whole portion posterior to the membranous area*. When present, moreover, the remarkable "hollow triangular spaces," scattered often in extraordinary numbers among the zoecia, are at once distinctive. Hincks wrote of these: "They are not true avicularia, but consist of a three-cornered area inclosed by calcareous walls and covered in by a transparent membrane." The membrane is frequently destroyed, and they then appear as hollow triangular structures, which bear a general resemblance to a hollow occupied by a pointed form of avicularium.

M. Lacroixii and *M. monostachys* are only provisionally placed in the genus *Electra*: further observations are necessary to determine their position. In 1894 Levinsen united the three species *Lacroixii*, *monostachys*, and *catenularia*, Jameson, under the last name. *M. catenularia* is a species which in the boreal and arctic fauna appears to stand quite by itself. It has been placed by McCoy in a genus *Pyripora*.

32. *Electra pilosa*, Linné.

Nordkyn (*Nordgaard*).

Fam. Calloporidæ.

GENUS CAULORAMPHUS*, GEN. NOV.

Front wall entirely membranous, the calcareous border bearing spines. Avicularia stalked and situated among the

* *καυλός*, a stalk; *ράμφος*, a bird's beak.

spines on the lateral margin of the zoëcium (oëcia, when present, very shallow and inconspicuous). Pore-chambers in the type three pairs of lateral and one terminal; the latter is sometimes divided into two or even three small chambers.

Type, *Cauloramphus spinifer* (Johnston) (Pl. XIII. fig. 1).

33. *Cauloramphus cymbæformis* (Hincks).

1867. *Membranipora spinifera*, Smitt, "Kritisk Förteckning, &c." p. 366, pl. xx. fig. 32 (nec *M. spinifera*, Johnston).

1877. *Membranipora cymbæformis*, Hincks, "Polyzoa of Iceland and Labrador," Ann. & Mag. Nat. Hist. ser. 4, vol. xix. p. 99.

1881. *Membranipora spinifera*, Vigelius, Zoologischen Ergebnisse 'Willem Barents,' Polyzoa, p. 12.

1887. *Membranipora cymbæformis*, Hincks, "Polyzoa of the St. Lawrence," Ann. & Mag. Nat. Hist. ser. 6, vol. i. p. 217, pl. xv. fig. 4.

Vardö, in 1890: when I took this species it was new to the Norwegian Fauna, but it has since been recorded by Nordgaard from Hammerfest. Specimens in my collection are also from Spitsbergen (*Smitt*) and the Gulf of St. Lawrence (*Dawson and Whiteaves*).

I have never seen this species on stone or shell; so far as my observations go, it grows either on branching Polyzoa or Hydroids.

Cauloramphus spinifer has not as yet occurred in Norway either to Nordgaard or myself; its most northern locality at present known to me is Shetland, but it will probably be yet found between tide-marks in Southern Norway.

Genus CALLOPORA, J. E. Gray.

Callopora, Gray, List Brit. Anim. Brit. Mus., Centroniæ, 1848, pp. 109 & 146.

Type, *Callopora lineata*, Linné.

Front wall entirely membranous. Marginal walls more or less thickened and crowned with spines, which may be many or few. Oëcia globose, of good size, commonly with a rib across the front. Sessile avicularia with acute mandible at the bottom of the zoëcium and above the oëcium or in a lateral position on one or both sides of the oral opening, or in both positions in the same species. Usually two pairs of lateral pore-chambers and one distal; size and form of the chamber varying with the species*. In

* It will be understood that two pairs of lateral pore-chambers added to the pore-chambers on the other side of the walls of the hinder part of the zoëcium implies that there are at least four rosette-plates on the side.

C. unicornis pore-chambers are rarely developed, but sometimes one or two may be so.

I have examined the pore-chambers in the following species, which I would include in the genus. Two pairs of lateral and one distal pore-chambers are present in *lineata*, *craticula*, *Whiteavesii*, *Dumerilii*, *aurita*; two pairs of lateral and ? one distal (the latter not being clearly seen) occur in *Sophiea*. Levinson has placed *unicornis* among the species which have no pore-chambers; that is true as a rule, but rarely there is one chamber or one pair of lateral chambers, and rarely two pairs, and this applies also to var. *armifera*, Hincks. I have not been able to see the pore-chambers in *nigrans*, as it is usually loosely attached and the back is too solid and dark to enable the pore-chambers to be seen. Of *curvirostris* and *arctica* (Smitt) my specimens are too small to allow of sacrificing them; and *discreta*, Hincks, is unknown to me. In *craticula* and *Whiteavesii* the membranous area occupies only the central portion of the front wall, and outside the spines which surround it there is a calcareous crust of some breadth which completes the front wall.

34. *Callopora lineata* (Linné). (Pl. XIII. fig. 2.)

Vadsö, on seaweeds; stones and shells of *Buccinum graenlandicum*, var. *nuda*; at Vardö on *Neptunea despecta*; also Svolvear and in Bergen and Hardanger Fiords. The East Finmark specimens which I have seen are remarkable from the absence of both oœcia and avicularia. Spitsbergen with oœcia and avicularia (from Smitt).

35. *Callopora craticula* (Aldër). (Pl. XIII. fig. 3.)

Varanger Fiord in 100–125 fathoms; and I may add "Finmark" (Smitt, as "*M. lineata*"), West Greenland, 'Valorous,' Gulf of St. Lawrence (*Whiteaves*).

The figure of Hincks is not quite satisfactory: it does not illustrate how close the flattened glistening spines are to each other at their edges; nor does he show any avicularium at the top of the oœcium, which is its usual position. The spines in this species ordinarily almost meet and even cross in the centre, thus forming a kind of roof over the zoœcium; and if the tips of the spines coalesced we should have a *Membraniporella*, but in this case they do not show the slightest tendency to form union.

Callopora Whiteavesii, sp. n. (Pl. XIII. fig. 9.)

1867. *Membranipora lineata*, Smitt (partim), "Kritisk Förteckning, &c." pl. xx. fig. 26.

Zoœcia small, 0.5 millim., oval, each area with its own

distinct calcareous margin, margin of area in living specimens porcellan-white; surmounted by about fourteen to sixteen spines, which are short, slender, and almost upright, very easily abraded. Oœcium globose, porcellanous; either smooth (as in Smitt's figure) or having a raised pointed arch in front (somewhat as in *M. aurita*), caused by the incorporation of two of the spines into the front wall of the oœcium. Avicularia, if any, unknown.

As compared with its close ally, *C. craticula*, the zoœcia are larger (from the same district), the spines more slender and nearly upright, the oœcium without the rib, and avicularia are (apparently) altogether absent.

A peculiarity in this species is its appearance when the spines are all abraded; the membranous front wall appears thickened, and has a yellow and waxy appearance. It might be supposed to be chitinous, but it is dissolved away at once in acid, and only the primitive membrane remains. On the other hand, it is not destroyed by liquor potassæ, and thus it would appear that the strengthening material is calcareous.

Thirty-five miles off Cape Rozier, Gulf of St. Lawrence (*Whiteaves*, after whom I name the species); off Holsteinborg, Greenland, 57 fathoms, 'Valorous,' 1875; Spitsbergen (Smitt, as "*M. lineata*").

The species perhaps comes nearest to *M. discreta*, Hincks, but this Arctic form certainly is not remarkable for the margin being "cut into lobes" nor do the spines "incline inwards."

36. *Callopora Sophiæ*, Busk.

‡ 1851. *Reptoflustrina arctica*, d'Orbigny, Palæont. Franç., Terr. Crét. vol. v. Bryozoaires, p. 582.

1855. *Membranipora Sophiæ*, Busk, Quart. Journ. Micr. Sci. vol. ili. p. 255, pl. i. fig. 7.

1884. *Membranipora Sophiæ*, form *matura*, Hincks, "Polyzoa Queen Charlotte Islands," Ann. & Mag. Nat. Hist. ser. 5, vol. x. p. 9 (separate copy).

1886. *Membranipora arctica*, Lorenz, Bryoz. Jan Mayen, p. 8, pl. vii. fig. 1 (separate copy).

1900. *Membranipora arctica*, Waters, "Bryozoa from Franz-Josef Land," Journ. Linn. Soc., Zool. vol. xxviii. p. 60.

There are commonly two and sometimes three pairs of lateral spines, sometimes none are present. The lateral avicularia have the *mandible pointing upwards and inwards*. The oœcium ordinarily bears a semicircular rib (see Busk's original figure, and Smitt, fig. 24), but sometimes a pair of spines being taken into the front wall it presents an acute-angled rib instead. In the space between the zoœcia there

is often developed an acute mandibled avicularium, sometimes a raised process without avicularium (see Smitt, figs. 25 & 27, and Lorenz's figure); and when the zoëcium below a median avicularium bears an oëcium, the latter is tilted up, and the avicularian process is seen behind it at a lower level. In older specimens without oëcia the interzoëcial space has a raised wall inclosing a hollow space within it, most variable in shape (square, oblong, triangular, round, or crescentic), the avicularium is no longer seen, but in one or two instances I have seen the space covered with a membrane with a central opening or pore, in others instead of any hollow a large nodule with the avicularium on one side of it. The zoëcia in this species are smaller than in *C. unicornis*, var. *armifera*, from which it is most readily distinguished by the lateral avicularia having the mandible directed *upwards and inwards* (instead of *downwards and outwards*): it seems but a small difference, but would appear to be constant.

When *C. Sophiæ* is found living in exposed situations, such as the shell of living *Neptunea despecta*, spines are not ordinarily seen, and the margin of the zoëcia becomes much thickened and strongly granulated.

The variations are very great. In some Spitsbergen specimens, for which I am indebted to Smitt, the whole space between the zoëcia is elevated into a flat-topped, nearly square, slab-like plate; at each corner of the slab is a lateral avicularium, those at the bottom of the slab belonging to the zoëcium below, and those at the top belonging to the alternating zoëcia on either side above; in front is seen the arch of the oëcium, which thus would seem to lie under the slab.

Varanger Fiord (*A. M. N.*), Sværholt (*Nordgaard*). Other specimens in my collection are from "Finmark" and Spitsbergen (*Smitt*), North Cape (*A. M. N.*), west of Holsteinborg, Greenland, in 57 fathoms ('Valorous,' 1875), Davis Strait (*A. Hancock*), Gulf of St. Lawrence (*Whiteaves*).

Callopora unicornis, Fleming, var. *armifera*, Hincks. (Pl. XIII. figs. 10, 11.)

1867. *Membranipora lineata*, forma *americana*, Smitt, "Kritisk Förteckning, &c." p. 366, pl. xx. fig. 31.

1880. *Membranipora armifera*, Hincks, "Contrib. gen. hist. Polyzoa," Ann. & Mag. Nat. Hist. ser. 5, vol. vi. p. 82, pl. xi. fig. 5.

1892. *Membranipora armifera*, Hincks, "Polyzoa St. Lawrence," Ann. & Mag. Nat. Hist. ser. 6, vol. ix. p. 155, pl. viii. fig. 4.

1898. *Membranipora Sophiæ*, var. *armifera*, Waters, "Observations on the Membraniporidae," Journ. Linn. Soc., Zool. vol. xxvi. p. 860, pl. xlvi. fig. 18.

At the outset let me say that I consider that Hincks's *M. armifera* has nothing to do with *C. Sophie*, with which Waters has united it. It can at once be distinguished by the avicularia on the sides of the oral opening, which in the former point downwards and outwards, and in the latter point upwards and inwards. An examination of specimens from many localities proves that this is an unvarying rule. Secondly, let me add that, notwithstanding the presence of these lateral avicularia in *M. armifera*, I am unable to regard it as more than a very interesting Arctic form of *C. unicornis*, Fleming. I arrive at this conclusion because it resembles *unicornis*—and it alone among allies—in usually possessing no pore-chambers; in the form of the oœcium and its surmounting avicularium; in the presence sometimes of a pair of lateral spines, of which one is of moderate length and acutely pointed at the end, while that which is opposite to it is immensely developed, of great length, and in the form of a hollow tube.

The peculiarity which at once distinguishes it from typical *C. unicornis* is the presence of avicularia at the sides of the oral opening (see Pl. XIII. figs. 10, 11) with the mandible pointing downwards and outwards. Commonly these avicularia are on each side: sometimes on one side only and on the other a spine; sometimes over considerable spaces, or a whole polyzoary, they are altogether absent. I have never seen both avicularia and both lateral spines developed on the same zoœcium; the former when present would seem to supersede the latter. Besides the lateral pair of spines there is, at each corner of the upper margin, a small spine, and these spines often remain buried in the oœcium, in which minute round holes (for the spines are hollow) seen at the lower corners of the oœcium indicate their presence. The oœcium is similar to that of *C. unicornis*, with a similar arched rib in front; and, as in that species, at the base of the zoœcium is an avicularium of considerable size and pointed mandible; when the oœcium is developed this avicularium is seen above and appears to be part of it. Occasionally this avicularium attains immense size (see Hincks's figure in his paper of 1892 and my figure, Pl. XIII. fig. 11). My specimen, which has these very large avicularia, is from Torske Bank, West Greenland, and all the avicularia over the zoarium are of the same abnormal size. Now it is curious that this zoarium should have been found on a large valve of *Pecten islandicus*, and that on the other parts of the same valve were two other zoaria of the same species, on which the oœcia were of the normal dimensions (Pl. XIII.

fig. 10). The length of a zoëcium is about 0·8 millim., while that of *C. unicornis* is 0·6 millim.; but there is considerable variation in the size of both forms.

E. unicornis, var. *armifera*, is in my collection from the following localities:—Spitsbergen (Smitt as “*Membranipora unicornis*”); Upper Torske Bank, W. Greenland (‘Valorous,’ 1875); Gulf of St. Lawrence (*Whiteaves*); Nantucket, N.E. America (received among some unnamed specimens from Prof. Verrill).

One difficulty presented to us in studying the Polyzoa is the circumstance that all the zoëcia in a polyzoary imitate any marked peculiarity of varietal characters which is developed on the earliest zoëcia; and thus, without a series of specimens to show the connecting-links, such a specimen may be regarded as possessing more permanent characters than it is entitled to: the two forms of this species on the *Pecten* from the Torske Bank are a case in point, which might be multiplied endlessly. Even if the earliest zoëcia are of smaller or larger size than usual, the whole colony will follow suit and maintain that dimension. I have made some observations on this subject in my paper “A Month on the Trondhjem Fiord,” when treating of *Electra pilosa* (Ann. & Mag. Nat. Hist. ser. 6, vol. xiii. 1893, pp. 121, 122).

Callopora nigrans, Hincks. (Figs. 1, 2.) *

‡ 1851. *Reptoflustrella americana*, d'Orbigny, Palæont. Franc., Terr. Crét. vol. v. p. 571.

1867. *Membranipora lineata*, forma *americana*, Smitt, “Kritisk Förtækning, &c.” p. 266 (*partim, nec figure*).

1882. *Membranipora nigrans*, Hincks, “Polyzoa Charlotte Islands,” Ann. & Mag. Nat. Hist. ser. 5, vol. x. p. 9 (separate copy), pl. xix. fig. 2.

1900. *Membranipora macilenta*, Waters, “Bryozoa Franz-Josef Land,” Journ. Linn. Soc., Zool. vol. xxxviii. p. 61, pl. viii. fig. 10.

Zoëcia very large, commonly 0·8 and 0·9 millim., ovate (oblong or linguiform when crowded), margin crenated; oral opening large, semicircular; a lateral avicularium is soon developed high up on each side, with acute mandible pointing obliquely downwards. The zoëcium is now in the condition in which it is represented by Waters and my fig. 1*b*. Next, above the zoëcium is produced a transversely oblong fillet, the margins of which are slightly raised, so that there is a slight hollow on the middle portion, and the distal corners are rounded off (see fig. 2*a*). Next, upon the

* Figures of this species will be given with the next part; those here mentioned refer to them.

rounded corners there grow out nodulous processes, sometimes of very considerable size, and the slight central hollow is filled up; the structure now assumes the form of fig. 2 c. When this nodulous growth is fully developed the zoarium has a very peculiar appearance, and reminds us somewhat of *C. awrita*, for the lateral avicularia of the two alternating zoœcia above nearly meet, and rarely actually coalesce with the nodulous interzoœcial growth which has been described. The foregoing would appear to be a peculiar form of œcium and it is that which is the common one found in the species. Very rarely, so far as my observations go, the form of a shallow cap is taken on (fig. 2 a), and this is the œcium, which Hincks figured from the Charlotte Isles. On one portion of my specimen from the 'Vega' Expedition a very different form of œcium is found (fig. 1 c): I have seen it only on zoœcia in which the usual lateral avicularia are absent. The form taken reminds one of a "fool's cap," the front rim of which is well rounded; from this the œcium narrows gradually, and at the same time is also more depressed, until it ends in a nodulous process. There are perhaps twenty such œcia together, though there is considerable variation in their exact length; close to them are, on other zoœcia, œcia of the ordinary form (fig. 2 b).

This is a very large species, which grows most luxuriantly and is generally only loosely attached to the object on which it is developed. It is of a rich deep brown colour, Hincks says "deep black," but, notwithstanding that statement, he has given it a very expressive specific name in "*nigrans*." I have compared my specimens with the type of Hincks, from the Charlotte Islands, which is now in the British Museum; and the 'Vega' locality, which I shall presently give, affords additional evidence that it is a circumpolar form.

It may be the *Reptoflustrina americana* of d'Orbigny. Smitt refers to that species, which was found at Newfoundland, and he also states that the species from Labrador which Packard recorded under the name "*?Lacroixii*," but without any description, was, from specimens sent to him by that writer, identical with what he calls "*forma americana*." It must remain in some doubt to which of two forms Smitt in that statement refers, for while his fig. 31 with its large avicularia on the ovicells undoubtedly represents what I have here described as *C. unicornis*, var. *armifera*, specimens which he kindly sent to me named "*forma americana*" are as undoubtedly that which I here refer to *C. nigrans*, Hincks, which, among other marked characters, never has large avicularia on the œcia.

Specimens here described are from Spitsbergen (*Smitt*), and others were found growing luxuriantly on a shell of *Neptunea fornicata*, given me by Prof. Lovén, from the Stockholm Museum, and which was dredged by the 'Vega,' lat. $66^{\circ} 58' N.$, long. $171^{\circ} 35' E.$, that is, in Bering Strait; while the type described by Hincks came from Queen Charlotte Islands, and the early stage of development figured by Waters from Franz-Josef Land. It is thus a circumpolar form.

Genus *Oochilina*, gen. nov.

Type, *Oochilina* (*Membranipora*) *crassimarginata*, Hincks.

Zoëcia with front wall entirely membranous, ovate (long ovate or short ovate, more rarely linguiform), depressed, with crenated or smooth margin, no lateral spines. A round, oval, or oblong avicularian chamber developed between and taking the place of a zoëcium; avicularium typically with a complete bar, the mandible rounded (or acute). Oëcium semiglobose. (Pore-chambers?)

Besides *O. crassimarginata* and *O. tensa*, the following are apparently referable to this genus: *M. tenuirostris*, *relata*, *plana*, and *valde munita*, of Hincks; *M. papulifera* and *Biflustra perfragilis*, MacGillivray; and perhaps *M. gregaria*, Heller.

The bar of the avicularium is complete and the mandible rounded in *O. crassimarginata* and *O. tensa*; but the bar is incomplete and the mandible acute in some of the species which I have temporarily assigned to the genus.

Oochilina tensa, sp. n. (Pl. XIII. fig. 12.)

Spreading on stones as a thin coating in large patches. Zoëcia normally oval, but owing to pressure on each other, &c., they assume various forms—nearly oblong, linguiform, or lozenge-shaped; the frontal membrane is very thin, delicate, and transparent; the side walls are lightly formed, only showing symptoms here and there of crenulation of the border. In a separate chamber between the zoëcia is situated an avicularium, small and not nearly occupying the whole of the top of the chamber; the bar complete, the mandible rounded; the avicularium is perpendicularly placed. Oëcia subglobose, well raised, porcellanous, and of a milk-white colour and smooth surface.

On pieces of stone, chiefly granite; dredged in the Bergen Fiord in 1878, and in the Hardanger Fiord in 1879.

It would be very easy to mistake this delicate creeping form for incrusting *Flustra Barleci*, but in that species the avicularium holds a decidedly oblique position, and the

oœcia are not prominently raised and are also smaller in size than in this species.

GENUS ELLISINA*.

Type, *Ellisina (Membranipora) levata*, Hincks.

Differs from *Oochilina* in not having avicularia occupying separate cells between the zoœcia; but, instead, furnished with avicularia, ovoid or triangular, situated on the hinder portion of the zoœcium. The oœcium is well developed, typically with a flattened area on its front. In the type species the pore-chambers are very large (Pl. XIII. fig. 4): one distal; the position of the remaining chambers is very unusual, the two front lateral pairs project *outside* the side walls; and the two posterior pairs are seen *inside* the side walls, which is the reverse of the usual rule.

Membranipora albida, *coronata*, and *minuscula* of Hincks, and *M. incrustans*, Waters, would seem to belong to this genus.

GENUS ALDERINA †, gen. nov.

Front wall entirely membranous, side walls usually crenulated; no lateral spines. No avicularia (but nodulous processes sometimes developed in different positions on the side of the zoœcium). Oœcium usually bearing (either a rib or) a depressed area in front. Pore-chambers in the type, two pair of lateral and two distinctly marked and separated distal (well figured by Levinson, Zool. Dan., Mosdyr, 1894, pl. iv. fig. 27). As in *Ellisina*, the two front pairs of pore-chambers usually extend outside the lateral walls, and the two posterior inside.

Type, *Alderina (Membranipora) imbellis*, Hincks.

I provisionally place *M. solidula* in this genus, but it differs considerably from the type. The parts of the generic description which are in brackets apply to it, and not to *A. imbellis*.

Pl. XIII. fig. 8 represents the front portion of a young zoœcium at the edge of the zoarium of *A. solidula*.

GENUS AMPHIBLESTRUM, Gray.

Type, *Amphiblestrum Flemingii*, Busk ‡. (Pl. XIII. fig. 5.)

Hinder portion of the area covered with a calcareous

* After John Ellis, the old and excellent author on "Corallines."

† Named after that excellent naturalist, J. Alder, the dearly loved friend of bygone years.

‡ See Busk, Report 'Challenger' Exped., Polyzoa, 1884, p. 65.

erust; in front of this a considerable portion of the area, typically trifoliate, but sometimes semielliptic or subrotund, is covered only by a thin membrane, at the distal extremity of which is situated the simple oral opening. Margin of zoëcium thickened, often granulated, sometimes bearing a pair (or more) of lateral spines; oral spines found in young specimens. Reproduction by means of prominent oëcia. Sessile avicularia often present, sometimes one, sometimes two on the hinder portion of the zoëcium. Pore-chambers: two pairs of lateral and one distal.

The pore-chambers are very conspicuous in *M. Flemingii*, but narrow and difficult to see (if always present?) in *M. trifolium*.

37. **Amphiblestrum trifolium* (Busk). (Pl. XIII. fig. 6.)

Svolvær, Lofoten Islands; not yet found in East Finmark. Other specimens in my collection are from Shetland, type and var. *quadrata* (*A. M. N.*); Wick, N.B., var. *quadrata* (*C. Peach*); Adriatic as "*M. Flemingii*" (*Prof. Heller*); Bergen Fiord, Norway (*A. M. N.*); Greenland ('Valorous,' 1875); Gulf of St. Lawrence (*Whiteaves*).

Genus RAMPHONOTUS, Norman, 1894.

Type, *Ramphonotus minax* (Busk).

The zoëcia, if developed freely in form, are pyriform, widening upwards from the base, with a calcareous portion posterior to, and occupying a larger part of the front wall than that of, the membranous portion; the membranous portion of the area is nearly as wide as long, and often somewhat trifoliate in shape, the mouth-opening is simple and, as usual, close to its anterior margin; the border surrounding the membranous area is calcareous. There may be lateral spines. Oëcia large, globose, and imperforate. An acute bird's-beak-like avicularium mounted on a pedicel, with acute mandible of large size (often monstrously so), would seem to be habitually developed on the adult zoëcium, situated on the central portion of the zoëcium on, or immediately behind, the hinder margin of the area. [Zoarium incrusting in type species.] Pore-chambers: two pairs of lateral and one distal—the former very narrow and rarely extending beyond the side walls; the latter small and apparently sometimes not present.

38. *Ramphonotus minax* (Busk). (Pl. XIII. fig. 7.)

1867. *Membranipora Flemingii*, forma *minax*, Smitt, "Kritisk Förteckning, &c." p. 367, pl. xx. figs. 43, 44.

1880. *Membranipora princeps*, Hincks, Brit. Polyz., Introduction, p. lxxiii, woodcut xxxv.
 1880. *Membranipora minax*, Hincks, Brit. Polyz., Introduction, p. lxxi, woodcut xxx. a, and p. 169, pl. xxii. figs. 2, 2 a-c.
 1894. *Ramphonotus minax*, Norman, "A Month on the Trondhjem Fiord," Ann. & Mag. Nat. Hist. ser. 6, vol. xiii. p. 122.

Sværholt, East Finmark (*Nordgaard*). Specimens in my collection are from Shetland; Bergen and Trondhjem Fiords, Norway (*A. M. N.*); Gulf of St. Lawrence (*Whiteaves*). The specimens from the St. Lawrence have the zoëcia of very much larger size than those from the other localities.

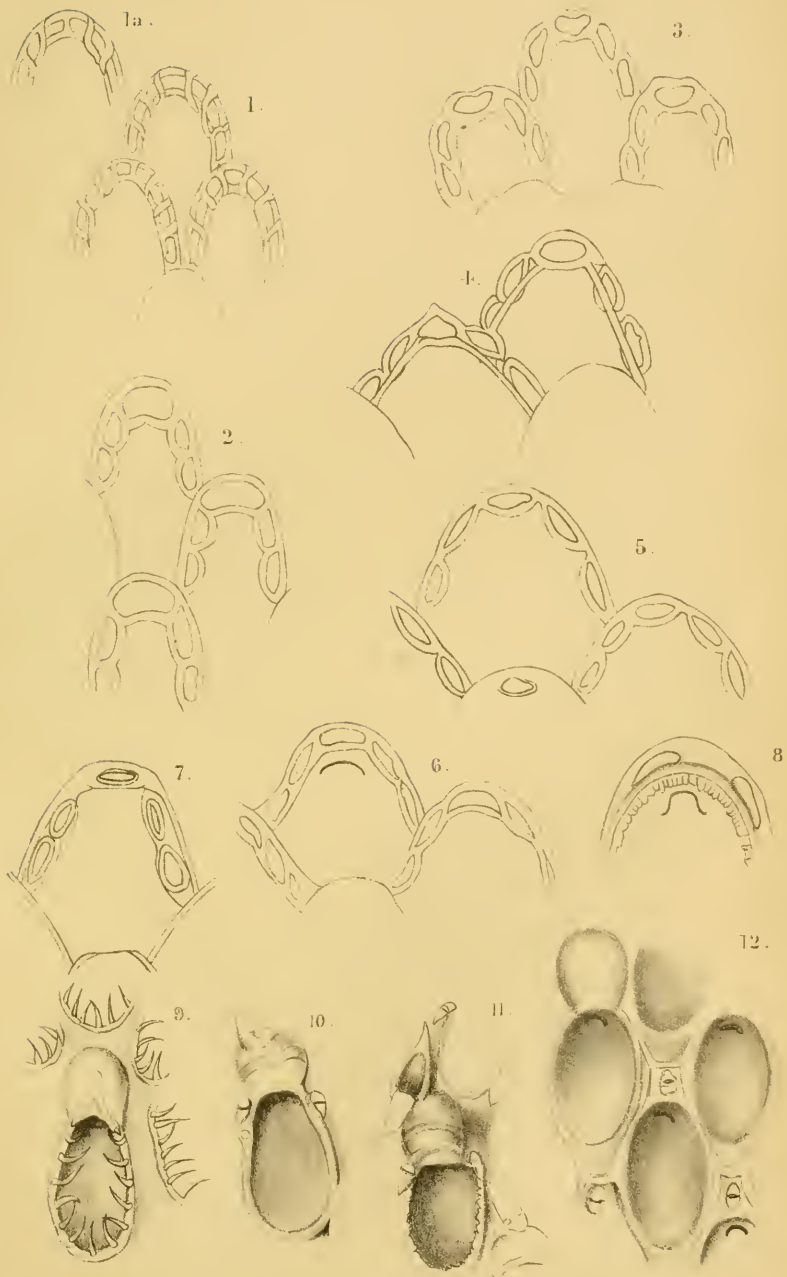
It escaped my memory when I was writing my Trondhjem Fiord report that Hincks had, in the introduction to his work, called attention to the remarkable avicularium in this species, and had given the form in which the avicularium is fully developed a different specific name (*M. princeps*, see p. lxxiii, note); but a comparison of his woodcuts xxx. a and xxxv. will indicate, what is really the case, that the latter is only the more developed state of the former; and although on many polyzoaries only the first form will be found, the latter occurs both on Shetland and Norwegian specimens in my collection. The avicularia are very easily abraded in this species; and polyzoaries always have far more of the holes which indicate where avicularia have been than avicularia actually present (see Hincks, pl. xxii. fig. 2; no perfect avicularium is here shown).

DESCRIPTION OF PLATE XIII.

This Plate is chiefly occupied with figures of the backs of certain species in order to illustrate the pore-chambers. They must be regarded as in a great measure diagrammatic; for whereas in some species the pore-chambers are seen very easily, in other cases they are so hidden in the side walls that they are very difficult to observe.

Fig. 1. Pore-chambers of *Cauloramphus spinifer*.

2. " " *Callopora lineata*.
3. " " *Callopora craticula*.
4. " " *Ellisina levata*.
5. " " *Amphiblestrum Flemingii*.
6. " " *Amphiblestrum trifolium*.
7. " " *Ramphonotus minax*.
8. " " *Alderina solidula*; a young zoëcium at the edge of a zoarium.
9. Zoëcium of *Callopora Whiteavsi*, sp. n.
10. Zoëcium of *Callopora unicornis*, var. *armifera*, Hincks, with the usual avicularia.
11. Zoëcium of the same, the last with gigantic avicularium on zoëcium.
12. *Oochilina tensa*, sp. n.



Notes on the Natural History of East Finmark. By
Canon A. M. NORMAN, M.A., D.C.L., LL.D., F.R.S., F.L.S.

[Continued from vol. xi. p. 598.]

[Plates VIII. & IX.]

POLYZOA (*continued*).

Genus LARNACICUS *, gen. nov.

Type, *Larnacicus corniger*, Busk. (Pl. VIII. fig. 3.)

Membranipora cornigera, Hincks, Hist. Brit. Marine Polyzoa, p. 164,
pl. xxi. fig. 4, and pl. xxii. fig. 3.

Differs from *Amphiblestrum*: 1st, in the avicularia being situated in distinct and separate cells from the zoëcia (in the type species they vary greatly in size: the larger are long, ovate, contracted near the middle in the position of the complete but easily broken bar; in the smaller the anterior portion is loop-shaped and the posterior a mere slit); 2nd, in the absence of pore-chambers (at any rate, I have not succeeded in seeing any); 3rd, in the remarkable character of the distal end of the zoëcium, which is divided into chambers by a transverse and usually one or two vertical connecting-bars. These chambers most probably are in connexion with the oëcium, which is well raised, globose, and situated over the chamber just described. There are two or three pair of spines, the lower pair forked at their extremity. I illustrate the oëcium, which has not hitherto been figured.

Specimens of this species from 100 fathoms off Shetland, and from the Hardanger Fiord, Norway, are in my collection.

Genus ANTROPORA †, gen. nov.

Type, *Antropora (Membranipora) granulifera* (Hincks).
(Pl. VIII. fig. 4.)

Membranipora granulifera, Hincks, "General History Marine Polyzoa,
Ann. & Mag. Nat. Hist. ser. 5, vol. vi. (1880) p. 72, pl. ix. fig. 4.

Zoëcia triangular or subtriangular, but very irregular in form. Calcareous portion of the area similar to that of *Am-*

* *λάρναξ*, a chest or coffer, in allusion to the structure of the anterior part of the zoëcium.

† *ἄντρον*, a cave or hollow, with reference to the hollow in which the oral opening lies.

phiblestrum behind, but here also extending up the sides and round the front, so that the membranous portion is completely surrounded by it, and the calcareous portion sloping inwards and downwards; the membranous portion with the oral opening is situated in a deep hollow. On the distal margin, in the place usually occupied by the oral spines, a pair of avicularia, with their pointed mandibles directed inwards in such a way so that their tips nearly meet in the middle. There are three pair of lateral pore-chambers and several (four usually) lucid spots in the hind wall.

Antropora is remarkable on account of the most unusual position of the avicularia transversely situated above the oral opening. Avicularia occur on the sides of the oral opening and sometimes appear above it (as in *Amphiblestrum Flemingii*), but in this latter case they belong to the bottom of the zoëcium above; here they are in the extreme upper part of the zoëcium. The back of the zoëcium is characterized by three pair of conspicuous pore-chambers, and on the anterior part of the back wall, which is more thickened than the portion posterior to it, are at the front two transparent bays, and behind these a pair of round lucid spots, behind which again are sometimes seen two others of much smaller size (fig. 4).

The types were described by Hincks from specimens sent to him from Madeira by Mr. J. Y. Johnson. In 1896 I dredged it not rarely off that island in 70–100 fathoms, encrusting small shells such as young *Pectens*, *Venus mediterranea*, *Dentalium*, &c., and it especially affected fragments of the coral *Madracis asperula*. The polyzoon most commonly associated with it was *Onychocella antiqua*, Busk. These species often grew over each other, and were so curiously alike in general form and appearance that the avicularia of *Antropora* were the available character for separating them with a hand-lens.

Genus *AMMATOPHORA* *, gen. nov. (Pl. VIII. figs. 5, 6, 7.)

Type, *Ammatophora (Membranipora) nodulosa* (Hincks).

Membranipora nodulosa, Hincks, Hist. Brit. Marine Polyzoa, p. 170, pl. xx. fig. 9.

Zoëcia and oëcia depressed and flattened. Zoëcia sub-ovate; a calcareous crest occupying about two-thirds of the area. Oral opening at distal end of the membranous portion. Walls thin, terminating at the oëcium in a knob. Oëcium entirely separable from the zoëcium, resting on the knobs just mentioned; of unusual and varied form (see figures).

* ἄμμα, a knot, and φέρω.

Surface of zoarium with raised nodulous processes. No avicularia. No pore-chambers.

Ammatophora nodulosa is a rare species which I have only seen from two localities—in deep water off the Antrim coast, and in about 15 fathoms at Guernsey; in the former case on a stone, in the latter on small valves of *Pecten opercularis*. The living zoarium is covered with a glistening yellowish epitheca, which conceals much of the real structure. The operculum in the Guernsey specimens is simple and the margin but slightly thickened; in the Antrim specimen it is more highly chitinized, in form of half a circle, with the lower corners slightly turned out. The nodulous processes consist generally of one at the bottom of the zoecium or of two at the angles of the bottom. The oecium rests upon, but is not firmly united with, the knob which terminates the side wall of the zoecium. It is very difficult to understand the different forms which the oecium assumes, and which will be better understood from the figures (figs. 5, 6, 7) than from any description. The figures and generic characters are drawn from specimens which have been boiled in liquor potassæ, and thus the epitheca have been removed. Hincks's drawing represents the zoarium in its natural condition. This is a very curious species; in the process of boiling some of the oecia entirely separated themselves from the zoecia, and that without any fracture. The granulated knob at the summit of the side walls, and the knobs of the oecium which rests upon it, forcibly reminded me of the limb-joints in the human body!

GENUS ROSSELIANA, Jullien.

Rosseliana, Jullien, 'Mission Scientifique du Cap Horn, 1882-1883,' 1888, p. 79.

Type, *Rosseliana (Flustra) Rosselii* (Audouin).

Membranipora Rosselii, Hincks, Hist. Brit. Marine Polyzoa, p. 166, pl. xxii. fig. 4.

There are two, more rarely three, pair of lateral pore-chambers and one large distal one—this last sometimes divided into two or three; but the chambers do not project beyond the breadth of the walls. In a specimen coating the inside of a shell of *Pecten opercularis*, in that part which was attached to the wavy portion near the edge of the *Pecten*, the back wall of the zoarium was much thickened and every zoecium was separately marked out (*i. e.* higher in the middle and sloping at the sides); and each bore about three pustules

(? rosette-plates), the appearance of which was exactly that of those figured as characteristic of the genus *Steganopora* (see d'Orbigny, Paléont. Franç., Terr. Crét. pl. dexxi. figs. 3, 7, 11; and Jullien, "Les Costulides," Bull. Soc. Zool. de France, 1886, pl. xvii. fig. 2 and pl. xix. fig. 2).

The Zoæcium-building in Cribriliniæ.

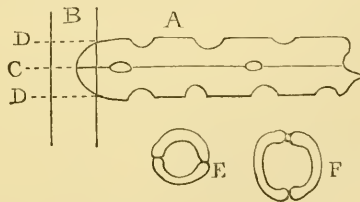
In describing the structure of *Lepralia* (*Membraniporella nitida*), Hineks wrote that "in its earlier condition it closely resembles one of the spiniferous *Membraniporæ*. The ribs of the adult state are represented by suberect spines set round the margin. As growth proceeds the spines bend inwards and increase in size, and gradually take on the flattened rib-like appearance. After a time the opposite rows meet in the centre of the cell-area, and the extremities, which are often enlarged, are soldered together, so as to form a well-marked median line. In some instances the ribs unite laterally to a great extent, and the front becomes a solid wall. In others they continue quite separate." In his account of *Cribrilina annulata* he writes:—"In its earliest stage the zoæcium exhibits the simple Membraniporidan form—the area occupying the entire front and being closed by a membranous covering. The ribs which compose the frontal wall in the adult are given off on each side as tubular processes from the edge of the nascent cell, and, gradually lengthening, meet in the centre and unite, the line of junction giving the subcarinate appearance of the zoæcium. These tubular girders, which are probably the equivalent of the marginal spines on many of the *Membraniporæ*, are connected at intervals by lateral outgrowths of calcareous matter; and in this way the porous structure of the furrows is produced. The mode of formation may be well studied in the thickened anterior margin of the orifice, which is composed of two tubular pieces, the pointed extremities of which in meeting often bend outwards and give rise to the central mucro. Sometimes they are not closely welded together, but overlap one another or remain partially separate, so as to give a bifid appearance to the mucro. Occasionally they do not unite at all, but continue permanently free and detached."

All this is in every particular correct as regards the two species referred to; and the description of *Cribrilina annulata*, of course, was intended to be applicable in a general sense to the whole of the species which he placed in Gray's genus *Cribrilina*. My object in the following notes is to go into the question more minutely, for the purpose of showing

how the process of modification takes place and the various forms are developed. As all the species cannot, in my opinion, remain in the two genera to which Hincks assigned them, I prefer to refer to them simply by their specific names.

The majority of the Cribrilinidæ are furnished with pore-chambers, but the following are without them:—*melolontha*, no pore-chamber and only two rosette-plates on the whole side; *nitido-punctata* and *figulina*. *Nitida* has two pair of large lateral pore-chambers and one distal, the last sometimes being divided into two. In *annulata* Levinson has figured (Zool. Dan. pl. v. fig. 24) the pore-chambers as very irregular, one lateral pair and one or two distal, or two pair lateral, the former of which meet in the middle of the distal margin, and I have seen the same variations in British specimens; but in the var. *spitsbergensis* I have not seen any pore-chambers in the example treated with liquor potassæ, the side walls are narrow and possibly the underlying pore-chambers have been destroyed in the preparation: *radiata* and the form *innominata* have four pair of lateral pore-chambers and one (or two) distal; *punctata* has three pair lateral (and two distal?); *cryptoæcium* has three or four pair lateral and two distal; *Balzaci* has four pair lateral and *Gattyæ* three pair lateral.

The cribriline portion of the front wall in Cribrilinidæ is built up by bars, which would seem to represent the spines of the so-called "Membraniporidae." The diagrams annexed indicate the process of development. The bar A always has



its proximal end rounded, and this rounded end I shall call the *loop*, C: in most cases the loop has its origin in the *side wall*, B, in the same manner as a spine; but in certain species, as *Gattyæ*, *Balzaci*, and *figulina*, in which the areolated or cribriliform portion only occupies the central part of the front wall, and is separated from the side wall by a considerable unsculptured interval, the "loops" have their origin in the front wall and not in the side. The bar is hollow, and in

such a species as *nitida* this hollow or *lumen* is very manifest ; but in most cases the lumen is only indicated by a line seen along the centre of the bar, which, whether actually visible or not, may be called the *lumen-line*. On this lumen-line there are often openings into the lumen, which may be called *lumen-pores* (see woodcut, line of C), at other times calcareous matter is heaped up along the lumen-line, so that a strong *rib* is formed. The side of the bar may be called the *lateral line*, and the poral openings usually developed upon it may be styled *lateral lacunes**, and those at its extremity *median lacunes*.

The great peculiarity in the structure of this group consists in the curious fact that, while the openings along the centre of the bars are simple pores or openings into the lumen, no *lacune*, whether lateral or distal, is ever formed without the combined assistance of two adjacent bars ; and indeed in the posterior portion of such a species as *Gattyæ*, where several bars meet at one point, at that point three, or even four, bars seem sometimes to contribute to the building up of the circle of a single very small lacune. In the woodcut the semicircular hollows which break the lateral lines indicate the portion of as many lacunes which that line contributes to form, and similarly the two distal hollows indicate the share which this bar takes towards the structure of two of the median lacunes, the remaining portion of which will be supplied by a bar or bars which have their origin in the opposite wall of the zoecium. A lateral lacune therefore consists of two parts divided horizontally (see E), owing its origin to the lateral walls of two adjacent bars ; while a median lacune consists of two vertical portions contributed by the distal extremities of two opposite bars F.

The Cribrilinidan zoecia which are figured and described here were thus treated :—After being boiled in liquor potassæ they were again boiled in water, the water poured off, and the shell or stone dropped into cold water, when the zoarium often at once detaches itself ; and if it should not a slight pressure with a scalpel at its edge will often suffice to dislodge it. If this does not succeed the shell is held against the side of the flame of a spirit-lamp in such a way that the surface opposite to that to which the zoarium is attached is in contact with the flame, and the shell, when it is extremely heated, is suddenly dropped into cold water, when the zoarium is usually liberated ; in obstinate cases the heating has to be repeated.

I undertook the following investigations from the desire

* *Lacuna*, a space not filled up.

to thoroughly understand the way in which *C. nitido-punctata* assumed its unusual form, and this led on to the examination of the entire family.

Nitida (Pl. VIII. fig. 8).—Three bars are here represented. It will be observed that they are of irregular form, the exact character of which is decided by the necessity of forming distal junction with their collateral and opposite neighbours: the line of junction in this particular species has a waved zigzag character. *The bar at its commencement in the side wall is a rounded loop.* This is the first point of great importance to note because the *existence of such a loop in the side or front wall of ALL Cribrilineæ* leads us to understand the building up of the zoëcium in some obscure cases. The second point of primary importance is the presence of a very large lumen, which here occupies the whole of the interior of the bar. In some forms we find that this lumen is only indicated by a fine central line, or by the presence in that line of a minute pore; or all trace of it may be obliterated by the overgrowth of a rib, which is raised over the lumen-line.

Melolontha (Pl. VIII. fig. 9).—The character of the bars is similar to that of *nitida*. In the first bar which is drawn there will be noticed a tendency of the lumen to divide and form a fork. In other species it will be found that this is carried further.

Annulata (Pl. VIII. fig. 10).—The figure given is drawn from an unusually simple form of the species * living on a frond of *Laminaria*, but has some special characteristics. The bars are only loosely attached and not cemented together; and on boiling in liquor potassæ the zoëcium in many cases broke up, the bars separating. The lacunes between the bars in the zoëcium illustrated are the result of the simple contact of two bars here and there, and each bar retains its own strongly marked margin; and thus we have the earliest and *simplest mode of formation of these lacunes, in the producing of which two bars always take part.* The bars themselves, which in this specimen are more flattened than usual, have the appearance, at first sight, from their opacity and brownish colour, of being solid; but closer inspection reveals a pellucid circle in the loop of the bar within the marginal line of the zoëcium which indicates the end of the lumen, while at the distal end of many of the bars there is a small pore, and the conviction becomes almost a certainty that a lumen fills the whole bar except the narrow marginal line. The ordinary

* Kindly given me by Dr. Harmer; he procured it at Godösand, off Tysnäsö in Björne Fiord, Norway.

British forms of this species, as will be seen by reference to the figures of Hincks (pl. xxv. figs. 11, 12), come much nearer to the following Arctic variety, except as regards certain points which will be referred to when I come to describe that variety.

Annulata, var. *spitsbergensis* (Pl. VIII. fig. 11).—Here the bars are closely consolidated together, the elevated ribs indicate the bars, and along their middle a faint line may be noticed with occasionally a very minute pore which makes known the existence of the lumen below; lines of lateral lacunes occupy the junction of the two adjacent bars, and are formed, as always, by their joint participation in the manner which has been already described.

Nitido-punctata (Smitt) (Pl. VIII. figs. 12, 13).—This beautiful species possesses some very distinctive characters and variations from the more normal forms, which are of much interest. The bars (see fig. 13, which represents some bars in the middle of the zoëcium) are at first narrow and widely separated, so that, instead of ordinary lacunes, there are entirely open spaces between them; at about three-fifths of the distance to the middle line the bar widens and forms half an arch on each side to be met by half an arch from the neighbouring bar to complete its formation at *b* and *c*, from the points indicated by these letters the bar is projected straight forward until it meets the median line of the zoëcium *d*, forming on its way, with the assistance of the adjoining bar, a lacune; the figure given represents a pair of completed lacunes, which are divided by the median line, and belong the one to two bars proceeding from the left, and the other from two bars proceeding from the right side of the zoëcium, and below these is seen a pair not fully formed. It might have been supposed, at first sight of their position in the middle of the zoëcium, that these were median lacunes, but that is not so—they are lateral lacunes, horizontally divided. A line is over the lumen at *a*, and has usually two small pores, one of which is in the loop and the other beyond the division into the half-arches. Fig. 12 represents the building up of the bridge and the oral lip. The bar *a* bifurcates and the lumen shares the bifurcation and has three pores, one at the base in the loop and the other at the end of the lumen in each branch of the fork; the lower branch of the fork is on the same level as the rest of the zoëcium, the upper branch of the opposite bars is projected upwards and outwards, and joining leave below them a large open foramen, which they overhang, and on them the solid outspread bars *b* are attached, forming in front the lower lip of the oral

opening and leaving at the sides behind large lateral foramina, *d*. The foramen *c* is ordinarily so much overhung by the arch formed by the upper portions of the forked bars *a* that it is hidden when the zoëcium is viewed from the front (see the figure of Smitt), but, so far as my observations go, it is never closed; and doubtless serves some special function.

Punctata.—The lacunes are ordinarily unusually large, and they are all lateral lacunes; for median lacunes are rarely present, the median line being occupied by a ridge running down the centre of the zoëcium and developed on the distal meeting-line of the bars. The lumen seems always to have a pore of somewhat larger size than usual just beyond the expansion in breadth in the loop; and sometimes a second minute pore much further in. Sometimes the lumen-line is occupied by an elevated ridge (see Hincks, pl. xxvi. fig. 4), and these bar-ridges unite with the central longitudinal ridge as in Hincks's figure, but in other cases they die out before they reach that ridge. One pair of bars takes part in the formation of the lower lip, and while its hinder margin contributes its share to the formation of the foremost row of lacunes, its front margin constitutes the lower lip, and the lumen-line is usually raised in the form of a rib; the inner front corners of the bars are either cemented together and produce a simple rostrum, or they remain ununited at the tips and constitute a bifid rostrum; both these forms of the rostrum are shown in Hincks's pl. xxvi. fig. 1. In this species the oëcium is globose and somewhat elongated; it remains permanently exposed, but is subject to nodulous outgrowths, and frequently bears an avicularium on its summit (see Hincks, pl. xxvi. fig. 4). I have in my collection an interesting specimen in which many of the zoëcia, as well as the tuberculated oëcium with its avicularium, closely agree with the figure just referred to with the following important additions; there is a pair of lateral oral avicularia the direction of which is perfectly horizontal and the raised lumen-rib has at its base a large pore (as in *Cribrilina hippocrepis*, Hincks, "Polyzoa Queen Charlotte Islands," Ann. & Mag. Nat. Hist. ser. 5, vol. x. 1882, pl. xx. fig. 6) and often a second more distal smaller pore; in some zoëcia there is only one lateral lacune (as in the figure of Hincks, Brit. Pol. pl. xxvi. fig. 4), but in other zoëcia there are two.

Cryptoëcium, sp. n. (Pl. IX. figs. 1, 2).—The building up of the zoëcium is of the same character as in *punctata*. There are usually not more than four large lacunes on the whole breadth of the zoëcium, nor more than five bars on a side;

and as the posterior rows never have so many lacunes, fourteen may be considered the usual full number.

Radiata and the species or variety *innominata* (Pl. IX. fig. 3, *innominata*).—In these forms the bars in the youngest state have a pore in the loop, but soon afterwards the lumen-line is raised into a more or less prominent ridge, and the pore is commonly obliterated. The lateral lacunes are generally three or four in number: there are usually no median lacunes, their place being occupied by a longitudinal central rib, which is evident at an early stage of development, and to the sides of which the lumen-ribs commonly afterwards unite themselves. The oral opening is formed much in the same way as in *nitido-punctata*, but in a more simple manner: the lower bar does not fork as in that species, but its front margin is outspread at the sides until it unites with the oral bar, but leaves in the middle a single large lacune. The form *radiata* differs from the *innominata* which I have just described in having more numerous bars, more numerous lacunes, with a few median lacunes occasionally to be seen; the lumen-ribs are only slight, the longitudinal rib seldom developed. The junction of the oral and suboral ribs, instead of leaving only one large central lacune, is indicated by from one to seven lacunes; though it is seldom that the number is confined to the single lacune characteristic of *innominata*, and I have only seen such instances of single lacunes in this position in the case of a zoecium here and there in a zoarium. The *radiata* forms which I have examined are from Birturbuy Bay, Ireland, Guernsey, Naples, and Madeira. A very beautiful form of the variety *innominata* occurs at Guernsey, all the ribs are very much raised, the central longitudinal rib rises in front to a much elevated process; but the chief peculiarity consists in spine-formed hollow processes which rise above the base of the lumen-ribs just over the place where in the young is seen the lumen-pore, and from which they doubtless take their origin. I have now described the ordinary cribriline structure in these two forms. But an entirely new feature appears here. Hincks described a "very delicate setiform appendage" as developed on each side of the lower margin of the orifice, and in his description of the plate called these organs "vibraculoid setæ." Dr. Harmer has recently ("On the Morphology of the Cheilostoma," *Quart. Journ. Micr. Sci.* vol. xlv. n. s. 1902, p. 326, pl. xv. fig. 7) traced the matter further, and found these appendages in reduced size present also at regular intervals along the side of the zoecium. Dr. Harmer is of opinion that they not only represent the spines of the ancestrula, which he figures, and that "the

base of each papilla is a pore in the calcareous front wall"; but he adds: "It has usually been assumed that the radiating series of pores correspond with slits between the bars; but in *C. radiata* there can be no doubt that the pores are in the same radii as the membranous marginal spines." "The lateral junctions of the frontal bars are indicated by prominent radial ridges, each of which rises to a small tubercle just inside the line of the membranous papillæ above described. The pores consequently lie, as described by other observers, in radiating furrows. That the union between the bars has not been complete is indicated by the fact that a thin line of air in some cases underlies the ridge." Thus Dr. Harmer considers that this particular form totally differs from ordinary Cribrilinidæ in that the line of lacunes is here the centre of the bar, and that the ribs are its sides. My own conclusion is different. I regard these papillæ as really in the line of junction of the bars. It is my endeavour to show in these notes that all the different Cribrilinidan forms depend upon the different structural building up of the bars which we first meet with in their simplest form in *Lepralia nitida*, and that the bars may be invariably recognized by their basal loop, which usually has its origin in the side wall; but in cases where the Cribrilinidan structure occupies only the central part of the front wall the loop of the bar will be found buried in that front wall. If the illustration (Pl. IX. fig. 3) which I have given of a portion of the front wall of *innominata* be now referred to, it will be seen that three bars are represented with their basal loops situated in the side wall, that at the inner end of the loop there is a minute pore, and a line passes down the centre of the bar indicating the lumen beneath*. Between the bars (that is, at their junction) is the usual line of lacunes; between the loops of the bars, and excluded from the normal Cribrilinidan structure by the fact that the arch which connects the bars passes inside them, are the papillæ (*a*, *b*, &c.), which are thus in the line of, but really outside of the junction of the bars which form, the lacunes. If an opening (*c*), from which the papilla has been removed, be examined it will be found to be inside of the side wall, and that it is directed inwards and downwards so as to pass into the body-cavity. Now if the bars and their lumen represent the spines of what have been called Membraniporidæ, and if the lacunes with the line which passes through them be the junction-line of two adjacent bars, then these papillæ cannot represent the spines. What are they then? Their resistance in boiling liquor potassæ

* The "thin line of air" which Dr. Harmer observed was, in my opinion, in this lumen.

seems to prove that they are of chitinous structure, which does not militate against the view entertained of them by Smitt, who, writing of what he termed the "pair of movable bristles," says: "as to their use, they seem to represent sensorial vibracula. Very often they are laid down along the side of the zoœcium" ('Floridan Bryozoa,' pt. ii. 1873, p. 22). They, at any rate, appear to be entirely independent structures; and I trust that Dr. Harmer may have an opportunity before long of throwing further light upon them. These organs are not confined to *radiata* and its variety *innominata*; they are present also in *M. Gattyæ*, and also in *figulina*, where they are represented in a similar position between the loops of the bars by small slits; but though I have seen these openings, I have only seen the papillæ themselves in *radiata* and its variety and the frontal pair only in *Gattyæ*.

Gattyæ.—The figure given (Pl. IX. fig. 4) will by itself, after what has been already written, explain the structure in the form which is usually found on red seaweed. Pl. IX. fig. 5 is taken from a form encrusting a shell taken in Guernsey. In this the papillæ-holes can be made out down the sides, while in the red weed specimen it was only the first which I could distinguish plainly. The former has a remarkable peculiarity, the minute lacunes on the marginal line are in pairs, which is a unique feature; the margin of each bar appears to make a loop and then the interval between them is filled in. The number of lacunes from the margin to the centre is, moreover, double that of the other and more usual form of *Gattyæ*. It may prove to be a distinct species.

Balzaci (Audouin), Waters, = *cribrosa*, Waters *olim*, from Madeira (Pl. IX. fig. 6), has usually only one large lacune on the marginal line and some minute lacunes round the middle.

Figulina (Pl. IX. fig. 7) has a very simple structure. A row of comparatively small lacunes occupies the lateral line and runs right up to the median line, and there is a total absence of median lacunes. The lumen-line has a remarkably large pore in the loop, and between these large pores and a little exterior to them there is a small, elongated, narrow pore. I have figured this last pore as exterior to the Cribrellinid system, and in the place of the papillæ-pores of *radiata*, and I think that I have done right in doing so; but I do not feel quite certain upon the point, the thickness of the shell in this species makes it difficult to trace the exact outline of the loops of the bars; but, as well as I have been able

to determine, that margin passes inside and not outside of these little elongate pores.

This species is, I think, entitled to generic rank; the character of the front wall, with the Cribrilinidan portion not extending to its margin, and the peculiar facies of that portion, the vicarious avicularia, the well-developed operculum, and perhaps, above all, the processes on the side of the oral opening for the hingement of the operculum, seem to point to the reasonableness of adopting Jullien's genus *Figularia* to receive it; and the same author's genus *Puellina* (type *P. Gallyæ*) might be adopted for those species which are furnished with lateral papillæ.

"LEPRALIA."

When Johnston (Brit. Zooph. edit. i. 1838, p. 277) instituted the genus *Lepralia*, after stating that *Berenicea*, Fleming, had been previously employed, he added: "Milne-Edwards names the genus '*Escharoides*,' but neither this nor *Escharina*, another of his names, can be adopted, since some naturalists use the terminations *-oides* and *-ina* as family appellations. Moreover, what saith Linnæus? 'Generic names including other generic names are unworthy of a scientific nomenclature.' And, again, 'Generic names in *-oides* are prohibited' (see Young's Med. Literature, p. 28)." Here is his reason for giving a new name to his genus. It was a valid reason at the time, though not according to more recent usage. *Lepralia* is a name so old and so familiar that it can hardly be dropped as a synonym; and it would scarcely be justice to Johnston to omit its use. In what sense, then, must it be employed? Here comes in no small difficulty. It is a primary law of nomenclature that some species which Johnston placed in it when he instituted the genus must be the type. The species thus included were as follows:—*L. hyalina* (Linn.), *nitida* (Fleming), *coccinea* (Lamk.), Johnston, *variolosa*, Johnston, *ciliata* (Pallas), *trispinosa*, Johnston, and *immersa* (Fleming). The name used as Smitt and Hincks employed it is not *Lepralia*, Johnston; and the definition of Hincks excludes from it all Johnston's species. As Jullien has written*: "Genre *Lepralia*, Th. Hincks (not Johnston, 1838), 1880.—Cet ancien genre de Johnston a été entièrement bouleversé par Th. Hincks, et ne devrait plus exister aujourd'hui." Of the species which Johnston placed in his *Lepralia*, *hyalina*

* Miss. Scient. Cap Horn, Bryozoaires, 1888, vol. i. p. 57.

belongs to the earlier genus *Hippothoa*, Lamarck, and *coccinea* is the type of the earlier genus *Escharoides*, Lamarck, as settled by Gray. Gray instituted a genus *Escharella*, to which he removed *variolosa* and *immersa*; and Hincks established three new genera, in which he placed the three remaining species *Membraniporella nitida*, *Micro-porella ciliata*, and *Smittia trispinosa*. We have seen that Johnston's *L. hyalina* has its place in the earlier described genus *Hippothoa*; the second species in his work was *Lepralia nitida*, and I would suggest that that species be regarded as the type of his genus.

GENUS LEPRALIA, JOHNSTON.

= *Membraniporella*, Hincks (nec *Lepralia*, Smitt, nec *Lepralia*, Hincks).

Type, *Lepralia nitida*, Johnston.

39. *Lepralia nitida*, Johnston. (Pl. VIII. fig. 8.)

Nordkyn (*Nordgaard*). I have not myself seen any specimen of this species from Norwegian or Arctic seas; nor would it appear that Smitt had met with it, since the only localities he gives are Britain and Bahusia. The record of this species, therefore, in East Finmark extends our knowledge of its range very considerably.

GENUS GEPHYROTES*.

Type, *Gephyrottes (Cribrilina) nitido-punctata*, Smitt.

Bars narrow, and widely separated more than halfway to the central line, leaving broad open intervals between them, then bending to either side they unite with the adjoining bars forming thus a regular arch, beyond this are large lateral lacunes, few in number, no median lacunes usually developed. The foremost bar but one is forked, the lower limbs of the opposite forks uniting transversely across the zoëcium, the upper limbs directed upwards and forwards and then uniting, thus leaving a large opening below. Oral bars large and solid, resting, as regards their central portion, on the upper limbs of the fork behind, and in front forming the lower lip of the oral opening, and at their sides below two large openings, but these are not equal in size to the central opening already mentioned; the bridge thus formed by the foremost bar and the front members of the second bar is projected outwards and overhangs the rest of the zoëcium in such a way that the large central opening is often concealed from sight when the zoëcium is viewed from the front.

* γεφῦρωτής, a bridge-builder.

A pair of avicularia with mandible pointing upwards are often developed on the side walls of the oral opening. Ooecia subglobose and imperforated. No pore-chambers.

Gephyrotes nitido-punctata (Smitt). (Pl. VIII. figs. 12, 13.)

1868. *Escharipora figularis*, forma *nitido-punctata*, Smitt, "Kritisk Förteckning, &c." p. 4, pl. xxiv. figs. 2, 3.

1873. *Cribrilina nitido-punctata*, Smitt, Floridan Bryozoa, pt. 2, p. 22.

1895. *Cribrilina nitido-punctata*, Nordgaard, Bergen Mus. Aarbog, 1894-95, p. 19, pl. iv. fig. 3.

The type specimens of this fine species described by Smitt were taken by Lovén in 40-60 fathoms at Hamnerfest. Examples in my own collection are from the Bergen Fiord, where I found it to be not uncommon in 1878, and West Greenland, 'Valorous,' 1875*. Nordgaard has also recorded it from the Trondbjem Fiord.

GENUS CRIBRILINA, Gray.

Type, *Cribrilina punctata* (Hassall).

Gray in instituting this genus placed only one species in it, namely *Lepralia punctata*, Hassall, which, therefore, must be the type of the genus. Yet, notwithstanding this, Hincks, in his paper "On the Classification of the British Polyzoa" (Ann. & Mag. Nat. Hist., Feb. 1879), substituted "*Cribrilina*, Gray. Type, *C. radiata*." The next step to confusion was taken by Jullien, who, in his paper on "Costulides" (=Cribrilinidæ), instituted a large number of genera, and, describing *Cribrilina*, followed Hincks in making *C. radiata* the type, and then gave to that genus characters which would exclude the true type, *C. punctata*, from it! Such is the unfortunate result here, as in so many other instances among the Polyzoa, of the disregard of the simplest laws of nomenclature!

Cribrilina punctata, Hassall.—I have already noticed some of the variations in the structure of the zoecium of this species. The zoaria are of small size, rarely reaching as much as half an inch in diameter. The avicularia, when developed, are usually only on one side of the oral opening, rarely on both sides. Oral opening with lower lip not greatly thickened but generally centrally produced, often acutely so. Oral spines four. In cells bearing oecia two lateral spines often remain and attain a great size, arching forwards and upwards. Ooecium large, globose (see Hincks,

* On the same stone with a specimen of this species was also *Rhabdopleura Normani*, Allman, a genus which is an interesting addition to the fauna of Greenland.

pl. xxvi. fig. 1), and frequently carrying an avicularium at its summit.

Specimens of *C. punctata* as here restricted are in my collection from Naples; Salcombe, Devon; Birturbuy Bay, Ireland; Wick, 40 fathoms; Shetland, including the largest zoëcia I have seen of the species, from 120 fathoms; and Nantucket, N.E. America.

40. *Cribrilina cryptocœcium*, sp. n. (Pl. IX. figs. 1, 2.)

1867. *Escharipora punctata*, Smitt, "Kritisk Förteckning, &c." p. 4, pl. xxiv. figs. 4-7.

1880. *Cribrilina punctata*, Hincks, Hist. Brit. Marine Polyzoa, p. 190 (*partim*), pl. xxiv. fig. 3, and pl. xxvi. fig. 3.

1894. *Cribrilina punctata*, Levinsen, Zool. Dan., Mosdyr, p. 61, pl. v. figs. 13-18, &c.

1900. *Cribrilina punctata*, Waters, "Bryozoa Franz-Josef Land," Journ. Linn. Soc., Zool. vol. xxviii. p. 62, pl. viii. fig. 22.

Front wall with lacunes of considerable size, arranged in transverse rows, not usually more than four in a row, between the marginal lacunes riblets may or may not be developed in young zoëcia on the lumen-line of the bars; lower lip of oral aperture considerably pouting outwards and unusually thick; in the centre at the junction of the bars the mucro may be single or double. No central longitudinal keel. Oœcia in quite young cells with a strong frontal arched rib, behind which the oœcium itself lies at a lower level. Lateral avicularia with mandible pointing upwards and slightly outwards, almost invariably present on both sides of the oral opening.

Such is the character of zoëcia just built up at the edge of the zoarium. Only a few cells further in it will be found that the whole oœcium, except the front arched rib, has been hidden and buried under the nodulous growth of what Levinsen would call a "kenozoœcium," and which seems to be representative here of the avicularium often developed in the same situation in *C. punctata*.

In old zoaria overgrowth has taken place in a very remarkable manner, which, when fully developed, is only faintly realized in such a drawing as my fig. 2. The appearance assumed is extraordinary. The most prominent feature is the great massive under lip, above this is the strongly developed front rib of the oœcium, above this again another transverse rib (sometimes divided across the middle into two), which is the outgrowth of the kenozoœcium over the oœcium concealed below. Then all the lumen-lines of the bars have been raised into ribs of such a size that the lacunes are almost entirely hidden between them.

The very different characters of the oœcium and the remarkable overgrowth are the most prominent of the distinguishing characters of this species, when compared with *C. punctata*, with which it has hitherto been confused. It is of much more vigorous growth than *C. punctata*; zoaria usually exceeding half an inch in diameter and in some cases one inch. It would seem to be essentially a littoral form. In East Finmark I found it between tide-marks, at Vadsö on stones and on the shell of *Buccinum grœnlandicum*, var. *nuda*, Norman; and it is no doubt this form which Nordgaard has recorded as *C. punctata* from Nordkyn. I have the species also from Guernsey (tide-marks); Birturbuy Bay, Ireland (tide-marks), Hebrides and Shetland (both tide-marks); Bergen Fiord, Norway, 1878, and Svolvær, Lofoten Islands, 1890.

41. *Cribrilina annulata* (Fabricius). (Pl. VIII. fig. 10.)

Mchavn, East Finmark (*Nordgaard*).

Figures 8 and 9 of Smitt represent a simple form of this species; although not so primitive a variety as that of which I have represented some bars. The labial mucro is sometimes present, sometimes absent; when it is present it appears, usually at any rate, to be the termination of a central longitudinal keel of the zoœcium, which keel may be entirely absent or more or less prominent. Smitt figures only a pair of lateral oral spines, but besides these there are ordinarily one or two distal spines (see Hincks, pl. xxxv. fig. 11); the lateral lumen-ribs are either well pronounced, as in the figure just referred to, or very conspicuous, as in Hincks's fig. 12. I have not seen any specimen in which they are so few in number, so strongly developed, and all converging forwards as in Smitt's fig. 10. The ordinary oœcium is represented in Hincks's fig. 12, having the lateral spines uniting and forming an arch in front of the oœcium, but these spines are often taken up by and built more completely into the frontal wall of the oœcium.

Var. *spitsbergensis*, nom. nov. (Pl. VIII. fig. 11.)

1900. *Cribrilina annulata*, Waters, "Bryozoa Franz-Josef Land," Journ. Linn. Soc., Zool. vol. xxviii. p. 64, pl. viii. fig. 21.

The form which Waters has figured in the paper quoted above as occurring in Franz-Josef Land is a very marked one, and worthy of a distinctive name. The zoœcia are about double the usual size, rather flat, without central keel; the series of riblets and pores eight or nine; the oral

spines are replaced by short flattened plates; the oecium is much larger than in the type, semiglobose, sparingly punctate, with a longitudinal keel; in fertile zoecia the flattened plates just referred to do not nearly meet in the centre of the oecium, but form two outspread wings overhanging the oral opening.

I am not sure that this should not be regarded as a species rather than a variety; Mr. Waters gives the locality of the Jackson-Harmsworth specimen as off a glacier between Cape Flora and Cape Gertrude, Franz-Josef Land, in about 30 fathoms. The specimens in my own collection are from Gray Hook, Spitsbergen, 90 fathoms (*Smitt*), and off Holsteinborg, Greenland, 57 fathoms ('Valorous,' 1875). It would thus seem not only to be a high Arctic but also a deep-water form, since I also possess the ordinary typical form on shore-weed from both Greenland and Spitsbergen.

J. E. Gray (Cat. Brit. Anim. B. M. pl. i., *Centronia*, p. 148) appears to suggest a generic name, *Microstoma*, for this species. This name can never, however, be employed, since it had previously three times been used for other genera.

GENUS REPTADEONELLA, Busk, 1884.

In his 'Challenger' Report, Polyzoa, pl. i. 1884, Busk instituted a genus *Reptadeonella*, for the reception of the Adeonean form *Lepralia violacea*, Johnston (= *Microporella violacea*, Hincks). Three years later Macgillivray (Cat. Marine Polyzoa of Victoria, 1887, p. 110) instituted a genus *Adeonellopsis* with *Adeonella distoma* (= ? *Eschara coscinopora*, Reuss) as its type; and this last genus J. W. Gregory ("British Palæogene Bryozoa," Trans. Zool. Soc. vol. xiii. 1893) united with *Reptadeonella*, Busk. But *Adeonellopsis* has a distinct frontal area containing many fimbriated pores, and is a group for which Levinsen, doubtless not remembering Macgillivray's genus, has recently suggested another name, *Lobopora* ("Studies on Bryozoa," Vid. Medd. fra den Nat. Fören. i Kjöbenhavn, 1902, p. 24, separate copy).

The dorsal view of the zoecium of *Reptadeonella violacea* is very pretty and of unusual interest, for there are not less than twenty-eight radii of alternating colour, darker or lighter, arranged all round the cell, which indicate many passages of communication between the zoecia.

Of the other British species which Hincks placed in *Microporella*, *Microporella Malusii*, Audouin, has been made by Jullien the type of a genus *Fenestulina* (Miss. Scient. Cap

Horn, vol. vi. Bryozoaires, i. p. 37), and Levinsen has in his "Studies on Bryozoa" mentioned a new genus *Haplopoma*, to which he proposes to transfer *Microporella impressa*, Audouin.

GENUS MICROPORELLA, Hincks, 1877.

Type, *Microporella ciliata* (Pallas).

42. *Microporella ciliata* (Pallas).

Sværholt (*Nordgaard*).

43. *Microporella arctica*, sp. n.

1869. *Microporella ciliata*, Smitt (partim), "Kritisk Förteckning, &c.," (Eftvers. Kongl. Vet.-Akad. Förhand. p. 6, pl. xxiv. figs. 13-16.

Zoëcia of considerably larger size than is usual in *M. ciliata*. In a young condition the whole front wall is brightly glistening and covered with large pores (Smitt, fig. 13); the crescentic suboral pore is scarcely, if at all, larger than the other pores, and often cannot be seen at all. The form of the oral opening is as in *M. ciliata*, and closest examination generally fails to give the slightest evidence of oral spines; yet in the case of a few zoëcia which were situated in a very sheltered position, I have found four or five very delicate spines. The oëcium is globose, and in this early stage of growth is ornamented with radiating riblets; lateral avicularia are very sparingly developed, a large portion of the polyzoary often not exhibiting any at all. The description just given is that of the young zoëcia of a thoroughly healthy colony, but in zoëcia at a little distance from the margin overgrowth rapidly takes place, choking up all the pores and even the crescentic pore, and smoothing over the oëcium in such a way that the polyzoary assumes the aspect of Smitt's fig. 14.

Another form is that represented in Smitt's fig. 16. The adult zoëcia have the surface granulated more or less roughly, the crescentic pore remains open, and the lateral avicularium is very rarely developed.

The first form I have seen only on stones between tide-marks at Vadsö, where it is accompanied by *Cribrilina cryptoëcium*, *Harmeria scutulata*, *Porella minuta*, &c.

The second form was taken by the 'Valorous,' 1875, off Holsteinborg, Greenland, in 57 fathoms, and was also sent to me by Smitt very soon after the publication of his works as "*Porina ciliana forma dura*, Spitsbergen" *.

* It must be understood that these specimens were received thus named before the publication of the last part (pt. v.) of his "Kritisk

Genus DORYPORELLA, gen. nov.*

Zoëcia with front wall punctated, furnished with a median pore, in front of which is a spine with spatulate or pear-shaped head. Orifice somewhat horseshoe-shaped, being slightly contracted at the sides and the proximal margin quite straight, distal margin spined. Ooëcia globose, punctate. Avicularia at the sides of the oral opening.

Type, *Doryporella spatulifera* (Smitt).

44. *Doryporella spatulifera* (Smitt).

1867. *Lepralia spatulifera*, Smitt, "Kritisk Förteckning, &c.," (Elfers. Kongl. Vet.-Akad. Förhand. p. 20, pl. xxvi. figs. 94-98.

1900. *Microporella spatulifera*, Waters, "Bryozoa from Franz-Josef Land," Journ. Linn. Soc., Zool. vol. xxviii. p. 87, pl. xii. fig. 6.

This is a very remarkable little species. The mother-cell is short, ovate, with spined margins. In young zoëcia the pore is much larger in proportion than it is at subsequent periods of growth; it is wide open, and the spine rises from its anterior margin; in one instance I have seen this spatulate spine forked at the extremity and of excessive length. At a later period of growth the pore is often covered over, sometimes with a yellow membrane, sometimes with a calcareous lid. The oral opening has four spines, often of great length; in one case the lower spines were forked at the extremity. In older zoëcia an avicularium with oval mandible is placed high up on each side of the oral opening; and in mature specimens the surface of the zoëcium is granulated.

On *Hypothyris psittacea* in Lang Fiord. Other specimens in my collection are from Gray Hook, Spitsbergen, 90 fathoms, on stone (*F. A. Smitt*); "Finmark" (*F. A. Smitt*); Greenland, off Holsteinborg, 57 fathoms, on *Hypothyris* and *Pecten islandicus* ('Valorous,' 1875); Greenland, on *Hypothyris* (from Copenhagen Museum); Gulf of St. Lawrence, on shell (*Whiteaves*). The species would seem to be especially fond of the shell of *Hypothyris psittacea* as its dwelling-place.

Förteckning, &c." in 1874. In that paper he restricted the term "*forma dura*" to his figure 17, and called it *Discopora cruenta* (Norman). It was not, however, my *Lepralia cruenta*, and Hincks subsequently described it under the name *Monoporella spinulifera* (Ann. & Mag. Nat. Hist. ser. 6, vol. iii. 1889, p. 431, pl. xxi. fig. 3, and vol. ix. p. 152, but not var. *præclara*).

* δόρυ, a spear.

GENUS *HARMERIA*, gen. nov.*

Zoëcia ovate, thin, glassy, hyaline, with a scutiform or ovate space on the front, distinctly circumscribed by a raised line, within which the surface is punctate. Oral aperture semielliptic; lip straight in the younger stage, but afterwards overhung by a suboral collar-like process with more or less developed rostrum. No visible oëcia. No avicularia.

Type, *Harmeria scutulata* = *Lepralia scutulata*, Busk.

The mode of development in this genus is very remarkable. The zoëcia radiate from a centre, and the polyzoary is in the form of a round patch. It is only at the centre that the zoëcia attain their complete development and are fully exposed, so that their unpunctured bases are entirely visible; with succeeding growth additional zoëcia are continually interposed laterally, and each zoëcium is smaller in size than the one which precedes it, and at the same time overlaps its successor, so that at the circumference of the zoarium they are seen to be heaped up one upon another. The suboral rostrum differs much in size and sometimes assumes great development.

45. *Harmeria scutulata* (Busk).

1855. *Lepralia scutulata*, Busk, "Zoophytology," Quart. Journ. Mic. Sci. vol. iii. p. 255, pl. ii. figs. 1, 2.

1867. *Discopora scutulata*, Smitt, Æfvers. Kongl. Vet.-Akad. Förhand. p. 25, pl. xxvii. figs. 160, 161.

1895. *Cribrilina scutulata*, Nordgaard, Bergens Museums Aarbog, 1894-95, p. 20.

1900. *Cribrilina scutulata*, Bidentkap, Fauna Arctica, vol. i. p. 512.

On stones and shells of *Buccinum* between tide-marks at Vadsö, and Nordgaard records it from the Laminarian zone at Nordkyn. I also have it in my collection from 0-1 fathom, Smeerenberg Bay, Spitsbergen (*F. A. Smitt*). These last specimens are on *Laminaria*, and it would seem to be essentially a tide-mark or very shallow-water species. Busk's West Greenland types were "on fucus"; Smitt speaks of the specimens he has seen as being "in regione algarum haud frequentem," and as "*Laminariæ affixam*," but Bidentkap gives 16-20 metres.

** From this point I do not propose to attempt any re-arrangement of the rest of the Cheilostomata, and shall only refer to existing genera. I had already written the greater

* Dedicated to my friend, Dr. S. F. Harmer, who is doing such admirable work in the study of the Polyzoa.

part of that which precedes as relates to new genera, and also contemplated the formation of some others relating to groups further on, when I received from Herr G. M. R. Levinsen his "Studies on Bryozoa." From that short paper I learnt that he was engaged on the rearrangement of the Polyzoa, and that he had made very extensive observations, and was thus in an excellent position to undertake the task. To him, therefore, I leave it as regards the rest of the Cheilostomata. But as I feel that I cannot use, as though they were my own, many associations of generic and specific names which have been employed, I shall signify my doubts as to the allocation of the species by printing the generic name within commas; at the same time I would have it to be understood that this only implies doubt, as in many cases I have not subjected the species to special critical examination.

Genus HIPPOTHOA, Lamouroux, 1821.

= *Celleporella*, Gray, 1848, = *Diazeuxia*, Jullien, 1888.

Type, *H. divaricata*, Lamouroux.

The genera of Gray and Jullien were founded on the same type, *Cellepora hyalina*, Linné.

In my paper, "A Month on the Trondhjem Fjord" (Ann. & Mag. Nat. Hist. ser. 6, vol. xiii. 1894, p. 130), I wrote:—"Since Jullien declines even to place them [i. e. *Celleporella* (*Diazeuxia*) and *Hippothoa*] in the same family, it is better to wait for his further views rather than at once merge *Celleporella* in the earlier genus *Hippothoa*." Death has deprived us of Jullien's further opinion, and, for the reasons stated in my paper referred to, I now employ the genus *Hippothoa*. Levinsen has expressed the same opinion, though he "puts the cart before the horse" when he writes "the species of the genus *Hippothoa*, I think, must be merged in *Diazeuxia*" ("Studies on Bryozoa," Videns. Medd. Naturh. Förn. 1902, p. 23, separate copy); and Waters has (Journ. Linn. Soc., Zool. vol. xxviii. p. 70) placed *C. hyalina* in *Hippothoa*.

46. *Hippothoa hyalina* (Linné).

On shells of *Buccinum*, *Neptunea*, &c. throughout the district*.

* In my Shetland Report of 1868 I recorded two Polyzoa of very small size and little character under the name *Celleporella lepralioides* and *Celleporella pygmaea*. The former is the same species which Hincks subsequently described under the name *Lagenipora socialis*, the latter may, I think, perhaps be placed in the genus *Phylactella*.

ESCHARINA, H. Milne-Edwards, 1836.

= *Herentia*, Gray, 1848 (first species *H. Hyndmanni*), = *Mastigophora*, Hincks, 1877 (type *M. Hyndmanni*).

Type, *E. vulgaris*, Moll.

Levinsen ("Studies of Bryozoa," p. 26) removes *Alderi* into *Mastigophora*, and I have now heard from him that he would also place in it *vulgaris*, which, with its keyhole-shaped oral opening and vibraculoid avicularia, which are situated unusually low down on the zoecium, comes very near *Hyndmanni*. When Hincks made his genera he ought to have employed *Herentia* and *Escharina*, instead of establishing *Mastigophora* and *Schizoporella*; but the taking *vulgaris* into the same genus with *Hyndmanni* will throw them all into the old genus *Escharina* (cf. Lamarek, Hist. ed. 2, p. 231, and Gray, List Brit. Radiata Brit. Mus. 1848, p. 123).

47. *Escharina Alderi*, Busk (= *Schizoporella Alderi*, Hincks).
Sværholt (*Nordgaard*).

GENUS SCHIZOPORELLA, Hincks, 1877.

Type, *Schizoporella unicornis*, Johnston.

Schizoporella embraces an extraordinary assemblage of species, as Levinsen has said the same form of oral opening occurs "within a number of different families, and it is impossible to put up sharply separated types of orifice. So, for instance, the forms of orifice regarded as characteristic for the genera *Lepralia* and *Schizoporella* are connected by a number of transitional forms not only with each other, but also with the orbicular and suborbicular orifice." The only species I have to record here will doubtless be removed by Levinsen from association with *Schizoporella unicornis*.

48. "*Schizoporella*" *sinuosa* (Busk).

Sværholt (*Nordgaard*).

The following British *Schizoporellæ* have already been removed into other genera:—

hyalina into *Hippothoa*.

Alderi and *spinifera* by Levinsen into *Mastigophora*; and as I have now heard from him that he would also remove *vulgaris* with the above, the genus will become, as I have already pointed out, *Escharina*.

venusta into *Trypostega*, Levinsen, MS.

GENUS *LEIESCHARA*, M. Sars.

[“Beskr. over nogle norske Polyzoer,” Videns.-Selskab. Förhand. 1862, p. 17 (separate copy).]

Type, *Leieschara coarctata*, M. Sars.

I do not think that this genus, with its entirely different oral opening and its avicularia, can be united with the previously described *Myriozone* (Donati), of which the type is the common Mediterranean species *M. truncatum*, Pallas.

49. *Leieschara plana* (Dawson).

1860. *Lepralia plana*, J. W. Dawson, in Durban (W. S. M.) and Bell (R.), “Contributions to Canadian Natural History” (from Report Geological Survey for 1858), Montreal, p. 33.

1867. *Myriozone crustaceum*, Smitt, “Kritisk Förteckning, &c.” p. 18, pl. xxv. figs. 88–91.

1878. *Leieschara crustacea*, Smitt, “Recensio Bryozoarum ad insulas Novaja Semlya, &c.,” Öfvers. K. Vet.-Akad. Förhand. p. 20.

1886. *Schizoporella crustacea*, Lorenz, Bryozoën von Jan Mayen, p. 5, pl. vii. fig. 2.

1887. *Leieschara crustacea*, Levinsen, Dijnphna-Togtets zool.-bot. Udbytte, p. 317.

1892. *Myriozone planum*, Hincks, “Polyzoa of the St. Lawrence,” Ann. & Mag. Nat. Hist. ser. 6, vol. ix. p. 157.

1900. *Schizoporella crustacea*, Waters, “Bryozoa of Franz-Josef Land,” Linn. Soc. Journ., Zool. vol. xxviii. p. 64, pl. viii. figs. 11–13.

1901. *Myriozone planum*, Whiteaves, “Cat. Marine Invert. of Eastern Canada” (Geol. Surv. Canada, Ottawa, p. 99).

It will be seen that Smitt, who had first placed this species and its allies in the genus *Myriozone*, subsequently transferred them to *Leieschara*. Dawson’s description of *Lepralia plana* was very inadequate; but I have seen specimens named by him, and there can be no doubt as to the species which he intended.

Varanger Fiord, 120–150 fathoms. I also have specimens from Parry’s Island, Spitsbergen, and Beeren Eiland Banks, 15–40 fathoms (*F. A. Smitt*); and Greenland, ‘Valorous,’ 1875.

The Genus Eschara.

In 1724 John Ray described, in his ‘Synopsis methodica stirpium Britannicarum,’ p. 31, *Eschara retiformis* from the south-east coast. He thought that it was vegetable, yet the few words of description make it clear that he meant the species described by Pallas. Ray, as pre-Linnean, cannot be the authority for the specific name.

Ellis (‘Nat. Hist. Corallines,’ 1745, p. 71, pl. xxx. figs. a, A, B, C) describes and figures our “*Eschara foliacea*,” those

two words being merely the pre-Linnean commencement of his diagnosis; he gives also a figure *b*, "a piece of an Italian coral." Ellis refers to Ray as above.

Linné, in the tenth edition of the 'Systema Naturæ,' 1758, has an "*Eschara foliacea*," but this is what we now know as *Flustra foliacea*, and at p. 790 Ray and Ellis's species appears under the name *Millepora cellulosa*. In his 'Fauna Succica,' edit. altera, 1761, he drops the genus *Eschara* altogether, and substitutes *Flustra* for certain species.

Pallas, in his admirable 'Elenchus Zoophytorum,' 1766, restores *Eschara*, blaming Linné for having substituted *Flustra*: "*Escharæ* nomen nuper ab Ill. Linnæo, sine nulla necessitate, cum *Flustræ* nova appellatione commutatum est (Faun. Succ. ed. ii.). Ego vero idem servare malui, cum antiquitate et communi autorum consensu ita innotuisse videatur, ut nulla confusio inde oriri possit, saltem non tanta, ut ad molestam et damnosam nominum arbitrariam commutationem ideo confugiendum esse credam." In Pallas's work we have Ellis's species under the name *Eschara fascialis*, with two varieties, (a) the Mediterranean *fascialis*, (b) the broad-lobed British form *lamellosa*.

Linné, in Syst. Nat. ed. xii. 1768, gives us the name *Millepora fascialis*.

In Solander and Ellis, 1786, we find *Millepora foliacea*, and *Millepora fascialis*, Linn., as a synonym.

Lamarck ('Système des Animaux sans vertèbres,' 1801, p. 375) re-established *Eschara*, giving as his first species *Eschara foliacea*, with references to Ellis and Solander and Ellis.

Moll, in 'Eschara' (or 'Die Seerinde'), 1803, gives us on pl. i. excellent figures of what he names *Eschara fascialis* and its variety *lamellosa*.

From the time of publication of Lamarck's work of 1801 our largest British Cheilostomous Polyzoon has been known as the type of the genus *Eschara* (a genus dating back to 1724, when it was supposed to be of vegetable origin). But as used by Pallas in company with *Cellularia* these two genera included almost all the Cheilostomous Polyzoa known to him, and *Eschara* embraced such creeping forms as *Eschara (Electra) pilosa* and *Eschara (Microporella) ciliata*. The genus was restricted by Lamarck, and if, in his characters, he inserted one which was not in accordance with our present existing ideas, the characters should have been emended, not the genus destroyed; if genera were so treated none would exist after some years. Two forms described by Pallas of his *Eschara fascialis* I believe to be really varieties, and not

species. The Mediterranean form generally assumes a different mode of growth, that of narrow thongs instead of broad fronds, and the sides of the oral opening incline inwards in the middle (see Milne-Edwards, 'Recherches sur les *Eschares*,' pl. i. fig. 1 a; Waters, Ann. & Mag. Nat. Hist. ser. 5, vol. iii. pl. xv. fig. 8; Hincks, pl. lxxvii. fig. 4 = *Eschara bidentata*, M.-Edwards, l. c. pl. iii. fig. 2 a). I felt some doubt whether the Mediterranean and British forms should be regarded as one species, but that doubt was removed when an examination of their respective opercula proved them to be absolutely identical, showing that the difference in the oral opening was entirely superficial. It would appear therefore that our British form must be called

Eschara fascialis, Pallas.

Var. *foliacea*, Ell. & Sol. (= var. *lamellosa* of Pallas and Moll),

and such of the species of Hincks's *Lepralia* as may be regarded as congeneric with this species must be styled *Eschara*.

But had there been no genus *Eschara* to claim precedence, could the name *Lepralia* have been employed in the sense in which Hincks used it, for reasons which I have already given under *Lepralia*, Johnston, = *Membraniporella*, Hincks?

GENUS DISCOPORA, Lamarck.

= *Umbonula*, Hincks.

Type, *Discopora verrucosa*, Lamarck.

Harmer has investigated the organization of this species (Quart. Journ. Mier. Sci. n. s. vol. xlvi. p. 293, pl. xv. figs. 11, 12), and has placed *Mucronella pavonella*, Alder, in the same genus. He does not refer to the rosette-plates, so I may mention that there are only two in *pavonella*, but four which are multipored in *verrucosa*.

GENUS PORELLA, Gray, 1848.

Type, *Porella compressa* (Sowerby).

50. *Porella concinna* (Busk).

Varanger Fiord, 120-150 fathoms.

51. *Porella aperta* (Boeck).

1861. *Lepralia aperta*, Boeck, Förh. Vid.-Selsk. Christiania, p. 50 (*fide* Smitt).

1868. *Porella levis*, Smitt, partim, "Kritisk Förteckning, &c." pt. iv. p. 21, and in description of plate "*Lepralia aperta*, Boeck," figs. 112-113.

1900. *Porella inflata*, Waters, "Bryozoa Franz-Josef Land," Journ. Linn. Soc., Zool. vol. xxviii. p. 83, pl. x. figs. 6, 7.

Waters appears to have overlooked the fact that this species had been described by Boeck, whose type Smitt had figured.

Lang Fiord. I have also in my collection specimens from Spitsbergen given me by Smitt under the name "*Porella levis*," and others collected by Principal Dawson in Gaspé Bay, Gulf of St. Lawrence.

52. *Porella struma* (Norman).

Sværholt (*Nordgaard*). I did not myself meet with this species in East Finmark. Specimens in my collection are from Shetland, Greenland, Gulf of St. Lawrence; "Cashes Ledge," N.E. America, as "*Eschara verrucosa (cervicornis)*?" from U.S. Nat. Mus.; and Bergen and Hardanger Fiords, Norway, where I found it to be not uncommon.

53. *Porella minuta* (Norman).

On stones between tide-marks at Vadsö in company with *Cribrilina cryptoæcium*, Norman, and *Harmeria scutulata*, Busk; also in Bög and Lang Fiords, 0-3 fathoms.

Porella minuta has very small zoæcia, which are arranged in unusually regular lines radiating from the centre of the colony. Zoæcia imperforate, more or less minutely granular, moderately raised; oral opening rounded above, straight at the sides, and straight lower lip (unless, as sometimes is the case, interrupted by the avicularium); the avicularium with rounded mandibles either within the oral opening, when a tooth-like process appears in front of it, or situated on the lip itself, and in the latter case more markedly there is a swelling on the zoæcia below the lip indicative of the avicularian cell. Oæcium semiglobose, imperforate. In old specimens there is some filling up of the spaces between the parallel lines of zoæcia, which are often bridged over by bars of calcareous growth (see Hincks, pl. xxix. fig. 1).

The Vadsö specimens, which agree in every other respect, differ from those previously in my collection in having the surface of the zoæcia ornamented with slightly raised lines converging from the sides; similar to the common condition of the zoæcia in *Escharella immersa*.

54. *Porella proboscidea*, Hincks.

1888. *Porella proboscidea*, Hincks, "The Polyzoa of the St. Lawrence," Ann. & Mag. Nat. Hist. ser. 6, vol. i. p. 223, pl. xiv. fig. 4.

1895. *Porella proboscidea*, Nordgaard, "Systemat. förteg. Norge Marine Polyzoa," Bergens Mus. Aarbog, 1894-95, no. 2, p. 25, pl. i. fig. 4.

Nordgaard records this species from Mehavn and Nordkyn.

55. *Porella lævis* (Fleming).

Mehavn (*Nordgaard*).

I take the opportunity of describing a Greenland *Porella*.

Porella princeps, sp. n. (Pl. IX. figs. 8-11.)

1892. *Monoporella spinulifera*, var. *præclara*, Hincks, "The Polyzoa of the St. Lawrence," Ann. & Mag. Nat. Hist. ser. 6, vol. ix. p. 152, pl. viii. fig. 3.

Zoëcia of immense size, the largest known to me, measuring 1 millim. long and 0·6 to 0·7 broad, ovate or oblong, moderately convex, with deep separating sutures; shell-substance very massive and surrounding the oral opening like a collar; no oral spines; frontal surface punctate all over; origelles of slightly larger size are round the base. Oral opening well arched above, truncate below, but in old zoëcia sometimes subrotund. A large round avicularium within the lip and not rising quite to its level, so that it might be overlooked. The operculum (Pl. IX. fig. 10) has the form of three fifths of an oval, being rather longer than broad, abruptly truncate below, the angles slightly rounded off; from the angles proceeds a bar, for the attachment of the muscles, which bends a little inwards and then passes two thirds of the length of the operculum upwards, at some little distance from the margin. Colour rich rosy red.

A peculiarity of this species is the frequent presence of many aborted cells; in one case two zoëcia unite with one oral opening; but the usual abnormality consists in zoëcia having no room to grow among their large surrounding brethren, and consequently reduced in size, squeezed into all sorts of irregular shapes; many of these have an oral opening, many are quite "blind"; there may be as many as seven to ten blind zoëcia around and including the primary zoëcium (Pl. IX. fig. 9), as well as many others scattered throughout the zoarium. Oöcium buried below the surface (Pl. IX. fig. 11).

I have given Hincks's *Monoporella spinulifera*, var. *præclara*, as a synonym, under the assumption that he overlooked a deep-seated avicularium, the presence of which, however, appears to be indicated by the umbo-like swelling below the oral opening which he described and figured.

Taken by the 'Valorous,' 1875, off Holsteinborg, W. Greenland, in 57 fathoms.

Genus MONOPORELLA, Hincks, 1881.

Type, *Monoporella nodulifera*, Hincks.

Monoporella spinulifera, Hincks.

1889. *Mucronella spinulifera*, Hincks, "The Polyzoa of the St. Lawrence," Ann. & Mag. Nat. Hist. ser. 6, vol. iii. p. 431, pl. xxi. fig. 3; and *Monoporella spinulifera*, vol. ix. p. 152 (but not var. *præclara*).

Hincks was quite right in making *Discopora cruenta*, Smitt (but not *Schizoporella cruenta* (Norman)), a synonym of this species, which I have in my collection from the Gulf of St. Lawrence (*Whiteaves*); Greenland, off Holsteinborg, 57 fathoms ('Valorous,' 1875); and Spitsbergen, lat. 76° 41' N., long. 10° E., in 100-120 fathoms, as "*Discopora cruenta*," from Smitt; and other specimens from Spitsbergen named "*Porina ciliata*, forma *dura*," from Smitt. I cannot understand how Mr. Waters ("Bryozoa Franz-Josef Land," Journ. Linn. Soc., Zool. vol. xxviii. 1900, p. 73) can have reverted again to Smitt's mistaken name, and included *Monoporella spinulifera* under *Lepralia cruenta*; apart from all other differences, the front wall of the former is always entire and imperforated, the latter at all ages of growth has the front wall punctate, its oral opening is quite different, and it never has the little spine-point on the lower lip, which, though so insignificant in size, is a very marked characteristic of *spinulifera*.

Cryptic Oœcia.

I have in this paper described an oœcium in *Cribrilina cryptoœcium* which becomes completely covered with overgrowth except the frontal arch, and Levinsen ("Studies of Bryozoa," p. 12) refers to other species which have what he terms "oœcia covered by kenozoœcia"; but in all these cases the oœcia are in the early stage on the surface of the zoarium and clearly seen. The character of the oœcia I am about to call attention to is entirely different. They belong to species of which no oœcia were previously known, and can only be found by partial decalcification of the frontal wall, when they

are discovered to be buried beneath it. The avicularium of *Porella princeps* cannot be seen from the front, and in order to have it revealed more clearly I decalcified the upper layers of this very strongly walled massive species. The result was that I not only laid bare the avicularium, but also an oecium of normal form over a zoecium (Pl. IX. fig. 11). This led me to treat in a similar manner two other species remarkable for the massiveness of their front wall, and of which no oecia were known; the result was the revelation of a very similar buried oecium in *Schizoporella cruenta* (Norman) (Pl. IX. fig. 13) and in *Monoporella spinulifera*, Hincks (Pl. IX. fig. 12). These oecia cannot be rare in these species, inasmuch as in each case the treatment of a single small fragment of the species sufficed to make known their existence.

“ESCHAROIDES,” “ESCHARELLA,” “MUCRONELLA.”

Escharoides, H. M.-Edwards (Lamarck, ed. 1836, pp. 218 & 259), embraced many species. Of these species Gray, 1848, made *Cellepora coccinea*, Abildgaard, the type (Cat. Brit. Radiata, p. 124). Authors are not agreed as to the species which Abildgaard described, some supposing it to be *ventricosa*, Hassall, or *immersa*, Fleming (= *Peachii*, Johnston), while others regard it, as English authors have done, as the *appensa* of Hassall. But there can be no doubt as to the species intended by both Milne-Edwards and Gray, since both give references to the *coccinea* of Fleming and of Johnston. Therefore in any division of the genus *Mucronella*, Hincks, which removes *coccinea* (= *appensa*) from it, that species should be placed in the genus *Escharoides*.

Escharella, Gray, 1848 (not *Escharella*, d'Orbigny, 1850, nor *Escharella*, Smitt), contained three species—*immersa*, Fleming (= *Peachii*, Johnston), *violacea*, Johnston, and *variolosa*, Johnston; the first and third of these point to this genus as another which had claim to have been used by Hincks when he instituted the genus *Mucronella*, which thus at the time of its creation was a synonym of two other genera which he included within it. *Mucronella* is a peculiarly appropriate name for the *immersa* section, but unfortunately it must yield to the earlier *Escharella*.

As long ago as 1879 Verrill saw the necessity of breaking up the genus *Mucronella* (Proc. U.S. Nat. Mus. 1879, p. 195), and proposed to use *Escharoides* for the *ventricosa* section and *Mucronella* for *appensa* (*coccinea*) and allies; but such a use of Hincks's genus *Mucronella* cannot be made, since he

specially placed all the species of the *ventricosa* section first, both in his original creation of the genus in 1879 and in his work; and we have seen that *Escharoides* can be used for the *appenda* section, but could not be used for the other.

Genus *ESCHARELLA*, Gray, 1848.

= *Mucronella*, Hincks, 1879.

Type, *Escharella immersa* (Fleming) (= *L. Peachii* Johnston).

Zoëcia convex or somewhat flattened; front wall strongly calcareous and granulated, generally imperforated on all the central portion; round the base a row of pores. Oral opening semicircular or nearly so, a mucro on the lower lip, and within it a simple or bifid denticle and a "well-developed oral bow" (*Levinsen*). Operculum membranous. Oecium semiglobose, imperforated. No avicularia. Rosette-plates very numerous (about 18-24) and carried round the distal margin, of the same character as those of the lateral margins.

The passages of communication between the walls of the zoëcium in this genus make a pretty appearance on the back. *Levinsen's* figure of the back of *E. immersa* (*Zool. Dan. pl. vi. fig. 3*) is illustrative of all the species, though each has a character of its own. As regards the number, I shall count the number of the upper half of a side of the zoëcium to the centre of the distal margin, and the rosette-plates for a whole side will therefore be double that of the number given: *ventricosa*, 8-10; *immersa*, 5-7; *variolosa*, 10-12, the wall very thin; *abyssicola*, about 10.

Of species which should be excluded from *Escharella*—

appenda, Hassall (= *coccinea* auct., but ? *Abildgaard*).—The back as well as the front of the zoëcium is utterly different from that of the true *Escharella*. It is like that of a *Callopora* or *Lepralia* (= *Membraniporella*), for there are one distal and two lateral pore-chambers exactly as in those genera. This species should, I think, be regarded as the type of *Milne-Edwards's* genus *Escharoides*. *Levinsen* ("Studies of Bryozoa," p. 26) has created a genus *Peristomella* for it.

pavonella, Alder, is equally removed as the last from *ventricosa*; for the whole side of the zoëcium there are only two rosette-plates. Harmer would place it with *verrucosa* in the genus *Umbonula*, or, as I should say, *Discopora*.

microstoma, Norman.—I have not satisfied myself as to the position which this species should take; the semierect mouth, which is very small and round, and the oecium tilted back off the zoëcium, seem to point to alliance with such a species as *sincera*.

56. *Escharella immersa* (Fleming).1828. *Berenicea immersa*, Fleming, Hist. Brit. Animals, p. 533.1847. *Lepralia Peachii*, Johnston, Hist. Brit. Zoophytes, edit. ii. p. 315, pl. lv. figs. 5, 6.

To remove any doubt as to this synonymy, I may state that I have examined Johnston's specimens of *Lepralia immersa* in the British Museum, and they are undoubtedly the same as his *L. Peachii*.

Taken at Nordkyn (*Nordgaard*).

57. *Escharella abyssicola* (Norman).

Sværholt (*Nordgaard*).

58. "*Mucronella*" *sincera* (Smitt).1867. *Discopora sincera*, Smitt, "Kritisk Förteckning, &c." p. 28, pl. xxvii. figs. 178-180.1876. *Discopora sincera*, Norman, 'Valorous' Report, Proc. Roy. Soc. vol. xxv. p. 208.1877. *Lepralia sincera*, Hincks, "Polyzoa Iceland and Labrador," Ann. & Mag. Nat. Hist. ser. 4, vol. xix. p. 102, pl. xi. fig. 2.1880. *Hemeschara sincera*, Busk, "Polyzoa North Polar Exped.," Journ. Linn. Soc., Zool. vol. xv. p. 237.1880. *Mucronella simplex*, Hincks, "Hydrozoa and Polyzoa of Barents Sea," Ann. & Mag. Nat. Hist. ser. 5, vol. vi. p. 280, pl. xv. fig. 7.1900. *Mucronella sincera*, Nordgaard, Norwegian N. Atlan. Exped. xxviii. Polyzoa, p. 14, pl. i. figs. 13-15.

Bög Fiord, East Finmark, in 120 fathoms (*A. M. N.*); Sværholt (*Nordgaard*). Other specimens in my collection are from Spitsbergen (*Smitt*); off Hare Island, Waigat Strait, Greenland, 175 fathoms ('Valorous,' 1875); also Greenland (Copenhagen Museum), and Proven, Greenland (*Smitt*); and the form *Mucronella præ lucida*, Hincks, Gulf of St. Lawrence (*Whiteaves*).

The oral opening is subject to considerable variation; the lower lip is often more or less produced, commonly evenly (see Nordgaard's figure 15), more rarely acutely (as Nordgaard, figs. 13, 14), and the last condition seems to be the *Mucronella simplex*, Hincks, and hence it has been placed by himself and Nordgaard in the genus *Mucronella*; but with this genus it has no connexion, for the oral point is a mere projection of the margin, and, as Hincks himself wrote, "the oral denticle is wanting." The form of the oral opening is also subject to considerable variation. In zoëcia without oëcia the outline is circular or subcircular, but in other cases (Spitsbergen examples) it is nearly of the form assigned by Hincks to his genus *Lepralia*. Oral spines are unknown.

Avicularia I have seen sparingly developed, but only on Spitsbergen specimens and on one side of the zoëcium, as figured by Smitt. Nordgaard, however, illustrates a zoëcium with two avicularia, which were developed on a specimen from a "place unknown."

Nordgaard has referred the *Mucronella præluçida* of Hincks* with a ? to this species. With respect to the Queen Charlotte Islands type specimens I think that there may be some doubt, but I am very much inclined to refer the St. Lawrence form to *M. sincera*. I have a specimen from that locality the zoëcia of which exactly correspond with the left-hand zoëcium of Hincks's illustration; but the oral lip processes are none of them truncate as drawn on the other three oëcia. I consider my specimen to be *M. præluçida* (of St. Lawrence), a variety of *M. sincera* in which the zoëcia are shorter than usual.

59. "*Mucronella*" *labiata* (Boeck).

1867. *Discopora coccinea*, forma *labiata*, Boeck MS., Smitt, "Kritisk Förteckning, &c." p. 27, pl. xxvii. fig. 176.

1878. *Discopora labiata*, Smitt, Öfvers. Kongl. Vet.-Akad. Förhand. p. 23.

1880. *Phylactella* (?) *grandis*, Hincks, "Hydrozoa and Polyzoa Barents Sea," Ann. & Mag. Nat. Hist. ser. 5, vol. vi. p. 280, pl. xv. figs. 4, 5.

1887. *Mucronella labiata*, Levinsen, Dijnphna-Togtets zool.-botan. Udbytte, p. 323.

1900. *Phylactella* (?) *labiata*, Waters, "Bryozoa from Franz-Josef Land," Journ. Linn. Soc., Zool. vol. xxviii. p. 90, pl. xii. figs. 3, 4 (illustrations of the larva).

Varanger Fiord, in 120–150 fathoms, on shell of *Astarte*, and Nordgaard has kindly sent me a specimen from Sværholt. This last specimen is developed on *Hornera lichenoides*, a habitat which the species seems especially to affect, as fine examples were dredged upon it in 175 fathoms off Hare Island, Disco, Greenland, by the 'Valorous' in 1875.

It would seem that Smitt at first included more than one form under the term "forma *labiata*," since a specimen received from him just after he had finished his work is undoubtedly a variety of *Escharella ventricosa* with produced lip; but I think that there can be no doubt that his figure 176 represents the species which was subsequently named by Hincks *Phylactella* (?) *grandis*.

It would be quite possible that *Escharella abyssicola* might be mistaken for this species. There is a very general resem-

* "Polyzoa Queen Charlotte Islands," Ann. & Mag. Nat. Hist. ser. 5, vol. xiii. p. 26, pl. iv. fig. 1; and "Polyzoa St. Lawrence," Ann. & Mag. Nat. Hist. ser. 6, vol. i. p. 225, pl. xv. fig. 3.

blance, especially when the oral lip is more than usually produced, as in the specimen figured by Hincks (pl. xxxviii. fig. 1); but that species may be at once distinguished by the presence of a bifid denticle within the mouth; this denticle is deeply seated and is not shown in the figures given by Hincks, though his description is entirely accurate.

GENUS PALMICELLARIA, Alder.

60. *Palmicellaria Skenei* (Ellis & Solander).

The variety *bicornis* (Busk, Crag Polyz. pl. viii. figs. 6, 7) has been recorded by Nordgaard from Sværhoit.

GENUS SMITTINA, NOV. NOM.

= *Smittia*, Hincks, 1879 (partim), nec *Smittia*, Holmgren, 1874 (Diptera), = *Escharella*, Smith (partim, nec *Escharella*, Gray).

Type, *Smittina Landsborovii*, Johnston.

Some of the following species, as well as others which have been described, will not be allowed to remain, in my opinion, in this genus, which no doubt Levinsen will revise; such species are those in which there is an absence of the "lyrula" or tooth-like process behind the avicularium (which is a product of the primary orifice), and there is an absence of the "origelles" at the base of the zoecium, and other material differences.

61. *Smittina Jeffreysi*, Norman.

1876. *Lepralia Jeffreysi*, Norman, "Biology of 'Valorous' Cruise," Proc. Roy. Soc. vol. xxv. p. 208.

1877. *Lepralia trispinosa*, var., Hincks, "Polyzoa of Iceland and Labrador," Ann. & Mag. Nat. Hist. ser. 4, vol. xix. p. 160, pl. xi. fig. 1.

1887. *Escharella trispinosa*, var. *arborea*, Levinsen, Dijnphna-Togtets zool.-bot. Udbytte, p. 320, pl. xxvii. figs. 7, 8.

1897. *Smittia trispinosa*, var. *arborea*, Bidekap, "Bryozoen von Ost-Spitsbergen," Zool. Jahrbücher, vol. x. p. 619.

1900. *Smittia trispinosa*, var. *arborea*, Nordgaard, Norweg. N. Atl. Exped., Polyzoa, p. 13, pl. i. fig. 9.

1900. *Smittia trispinosa*, var. *lamellosa*, Smitt, Waters, "Bryozoa Franz-Josef Land," Journ. Linn. Soc., Zool. vol. xxviii. p. 88, pl. xii. figs. 19-21.

This form or species has been recorded from the Porsanger Fiord by Nordgaard.

It is a common form in the Arctic seas, and very generally rises in free hollow cups or tubes, often branching. Among other characters, this northern form is remarkable for the abundant distribution of oval avicularia on the zoecia, as

well as one of larger size and acute mandible; but the most important difference is the form of the oral opening, which in this northern form, whether it be tubular or encrusting, is wider below than above and has a straight underlip.

In my cabinet are specimens from off Disco, Greenland, 100 fathoms ('Valorous,' 1875); Gulf of St. Lawrence (*Whiteaves*); Cashes Ledge, N.E. America (*Verrill*, as "*Escharella Jacotini*").

I am indebted to Smitt for a specimen of his var. *lamellosa* from Spitsbergen, which certainly has not the characters of the foregoing form, nor does d'Orbigny's figure (Pal. Franç. Crét. pl. dcxxii. fig. 1) of his *Semieschara lamellosa*, to which Smitt refers, bear any resemblance to it; it is wholly without avicularia.

62. *Smittina arctica*, Norman.

1869. *Escharella porifera*, forma *majuscula*, Smitt, "Krit. Förteck. &c." pt. iv. p. 9, pl. xxiv. figs. 36-38, and forma *minuscula*, figs. 33-35.

1888. *Smittia Landsborovi*, form *porifera*, Hincks, "Polyzoa St. Lawrence," Ann. & Mag. Nat. Hist. ser. 6, vol. i. p. 225, pl. xiv. fig. 2.

1894. *Smittia arctica*, Norman, "A Month on the Trondhjem Fiord," Ann. & Mag. Nat. Hist. ser. 6, vol. xiii. p. 128.

1895. *Smittia arctica*, Nordgaard, "System. förtegn. Norge Marine Polyzoa," Bergens Mus. Aarbog, no. 2, p. 27, pl. i. fig. 2.

1900. *Smittia Landsborovi*, var., Waters, "Bryozoa Franz-Josef Land," Journ. Linn. Soc., Zool. vol. xxviii. p. 90, pl. xii. fig. 7.

This is a very pretty form, the front wall regularly punctate all over; the avicularium on or just below the lower lip of the oral opening with round mandible and a very slender lyrula behind it, which, however, can seldom be seen except on young specimens; sides and upper lip of oral opening raised; the oecium, which is imperforated, generally but not always falls back from the raised upper margin of the oral opening.

I do not understand the transverse and circular lines which Nordgaard represents on the oecium; Waters's figure is characteristic, but the upper lip and the attachment of oecium are rather more marked in their special character than usual.

On an annelid tube in Bög Fiord in 100-120 fathoms.

63. "*Smittia*" *porifera* (Smitt).

1867. *Escharella porifera* (typica), Smitt, "Kritisk Förteckning, &c." p. 9, pl. xxiv. figs. 30-32.

1877. *Lepralia porifera*, Hincks, "Polyzoa of Iceland and Labrador," Ann. & Mag. Nat. Hist. ser. 4, vol. xix. p. 102, pl. x. figs. 1, 2.

1895. *Smittia porifera*, Nordgaard, "System. förtegn. i Norge Marine Polyzoa," Bergens Mus. Aarbog, 1894-95, p. 26, pl. ii. fig. 1.
 1900. *Lepralia porifera*, Waters, "Bryozoa Franz-Josef Land," Journ. Linn. Soc., Zool. vol. xxviii. p. 75, pl. viii. figs. 14, 15.

Waters has figured the operculum, which I have not myself examined.

Mehavn, East Finmark (*Nordgaard*).

Specimens in my collection are from Spitsbergen (*Smitt*), Gulf of St. Lawrence (*Principal Dawson*), and West Greenland ('Valorous,' 1875).

Smitt, in his work on the Floridan Bryozoa, separated his formæ *majuscula* and *minuscula* from *porifera*, and regarded his typical *porifera* as more nearly related to *palmata* and the other forms to *Landsborovii*.

64. "*Smittia*" *lineata*, Nordgaard. (Pl. IX. figs. 14, 15.)

1895. *Smittia lineata*, Nordgaard, "System. förtegn. i Norge Marine Polyzoa," Bergens Mus. Aarbog, 1894-95, no. 2, p. 27, pl. ii. fig. 2.

This recently described species has been known to me for years, and has been regarded as an undescribed form.

The types of Nordgaard were taken by him off Nordkyn, and I am indebted to him for a specimen which enables me to be certain of its identification; and I also found the species in another East Finmark locality—namely, encrusting *Escharopsis rosacea* dredged off Vadsö.

Other specimens in my collection are one received from Smitt taken at Spitsbergen, and named *Escharella auriculata*; others from the Gulf of St. Lawrence (*Whiteaves*), and off Holsteinborg, Greenland, in 57 fathoms ('Valorous,' 1875).

This, in my opinion, cannot remain in the present genus, and is more nearly related to *auriculata*, as Smitt considered it. I have figured the operculum of *auriculata* (Pl. IX. fig. 16) for comparison with that of *lineata* (fig. 15).

65. "*Lepralia*" *reticulato-punctata*, Hincks.

1867. *Escharella porifera*, forma *edentata*, Smitt, "Krit. Förteck., &c." pt. iv. p. 9, pl. xxiv. fig. 39.
 1877. *Lepralia reticulato-punctata*, Hincks, "Polyzoa Iceland and Labrador," Ann. & Mag. Nat. Hist. ser. 4, vol. xix. p. 103, pl. x. figs. 3, 4.
 1887. *Escharella reticulato-punctata*, Levinsen, Dijnphna-Togtets zool.-bot. Udbytte, p. 318, pl. xxvii. fig. 4 (the operculum).

I dredged this species in 100-120 fathoms in Bög Fiord, and Nordgaard records it from Sværholt. I have it also from Spitsbergen (*Smitt*), Jan Mayen (Austro-Hungarian

Exped.), Gaspé, Gulf of St. Lawrence (*Principal Dawson*), and West Greenland ('Valorous,' 1875).

It is probable that Smitt's figure of "*forma cancellata*" (figs. 40, 41) may also belong to this species, but I have not seen any specimens identical, that is, having the projecting point on the under lip. Kirchenpauer, in 1874, named this last form *Hemeschara* (?) *contorta* ('Die zweite deutsche Nordpolarfahrt,' vol. ii. p. 422).

Levinsen, who figures the operculum, says rightly of the avicularia: "avicularia in plurimis desunt; ubi adsunt, paulo sub peristomia varie deposita."

I may mention here another species which has been often described and would appear to be allied to some of the preceding forms.

"*Lepralia*" *Smitti*, Kirchenpauer.

1867. *Escharella Legentilii*, forma *prototypa*, Smitt, "Kritisk Förteck., &c." p. 10, pl. xxiv. figs. 47-49.

1874. *Lepralia Smitti*, Kirchenpauer, Die zweite deutsche Nordpolarfahrt, vol. ii. p. 420.

1887. *Escharella reticulata*, Levinsen, Dijnphna-Togtets zool.-bot. Udbytte, p. 319, pl. xxvii. figs. 5 & 6.

1892. *Schizoporella cincta*, var., Hincks, "Polyzoa St. Lawrence," Ann. & Mag. Nat. Hist. ser. 6, vol. ix. p. 154, pl. viii. fig. 2.

1897. *Smittia reticulata*, Bidentkap, "Bryozoen von Ost-Spitsbergen," Zool. Jahrbücher, vol. x. p. 622, pl. xxv. fig. 3.

1900. *Schizoporella Harmsworthii*, Waters, "Bryozoa Franz-Josef Land," Journ. Linn. Soc., Zool. vol. xxviii. p. 65, pl. ix. figs. 10-12.

The known localities of this species are Spitsbergen (*Smitt*), East Greenland (*Kirchenpauer*), Gulf of St. Lawrence (*Hincks*), Kara Sea (*Levinsen*), and Franz-Josef Land (*Waters*)*.

Genus *ESCHAROPSIS*, Verrill †.

= *Escharoides*, Smitt, Hincks, &c. (nec H. Milne-Edwards).

Type, *Escharopsis lobata*, Lamouroux, = *E. Sarsii*, Smitt.

66. *Escharopsis rosacea* (Busk).

Not uncommon near Vadsö and in the middle of the Varanger Fiord down to 100-120 fathoms; also recorded by Nordgaard from Sværholt in 30-40 fathoms.

Other localities from which examples are in my cabinet

* Since this paper was sent to the printer, *Lepralia Smitti* has received yet another name, viz. *Smittia Levinseni*, Nordgaard, 'Die Bryozoen des westlichen Norwegens,' 1903, p. 92.

† Verrill, Proc. U.S. Nat. Mus. 1879, p. 196.

are Greenland, off Holsteinborg, 57 fathoms ('Valorous,' 1875); Brandewyne Bay, Spitsbergen (*Smitt*); Orphan Bank, Gulf of St. Lawrence (*Smitt*); Loch Fyne, Scotland (*A. M. N.*).

GENUS PSEUDOFUSTRRA, Bidentkap*.

Type, *Pseudoflustra solida*, Stimpson.

67. *Pseudoflustra solida* (Stimpson).

1853. *Flustra solida*, Stimpson, Invert. of Grand Manan, p. 19, pl. i. figs. 12 a, b.
1862. *Eschara palmata*, M. Sars, "Beskr. over nogle norske Polyzoer," Vidensk. Selsk. Förhand. 1862, p. 8 (separate copy).
1867. *Escharella palmata*, Smitt, "Krit. Förteck., &c." (Eftvers. K. Vet.-Akad. Förhand. p. 10 (separate copy), pl. xxiv. figs. 42-46.
1879. *Flustrimorpha solida*, Verrill, Proc. U.S. Nat. Mus. p. 191.
1880. *Flustra solida*, Hineks, "Hydroida and Polyzoa from Barents Sea," Ann. & Mag. Nat. Hist. ser. 5, vol. vi. p. 282, pl. xv. figs. 2, 3.
1882. *Eschara solida*, Vigelius, "Cat. Polyzoa of 'Willem Barents' in 1878 and 1879," Nederl. Archiv f. Zoologie, p. 15, figs. 2 & 3 a, b.
1887. *Escharella palmata*, Levinsen, Dijnphna-Togtets zool.-bot. Udbytte, p. 318, pl. xxvii. fig. 3.
1892. *Flustra solida*, Hincks, "Polyzoa of the St. Lawrence," Ann. & Mag. Nat. Hist. ser. 6, vol. ix. p. 149, pl. viii. figs. 1 & 1 a-c.
1897. *Pseudoflustra solida*, Bidentkap, "Bryozoen von Ost-Spitsbergen," Zool. Jahrbücher, vol. x. p. 618.
1900. *Smittia palmata*, Nordgaard, Norweg. N. Atl. Exped., Polyzoa, p. 12.
1900. *Pseudoflustra palmata*, Waters, "Bryozoa from Franz-Josef Land," Journ. Linn. Soc., Zool. vol. xxviii. p. 71, pl. viii. figs. 7-8 (operculum and avicularium).

I have given this list of references, only omitting those which relate solely to the record of a locality, to show how this unfortunate species has been thrown from genus to genus. Let us hope that it will now find a resting-place in a genus of which it is made, and, I think, rightly made, the type. In the latest paper in the list above given Mr. Waters discards Stimpson's specific name *solida*, and uses the later *palmata*. He does this upon the ground that it is not clear that Stimpson's description refers to this species, and then he proceeds not only to give a reference to Stimpson without any mark of interrogation, but also inserts Stimpson's locality as one of the habitats of the species. That the European Arctic species belongs to the same genus, and is apparently only a slight variation of the species described by Stimpson, is, I think, quite clear from the fact that the description and figure in the 'Invertebrata of Grand Manan,'

* Bidentkap, "Bryozoen von Ost-Spitsbergen," Zoolog. Jahrbücher, vol. x. 1897, p. 618.

though not minutely accurate, can apply to no other genus ; and, secondly, because Stimpson's form is well known in the district where he found it and also in the Gulf of St. Lawrence. *Pseudoflustra* is perhaps hardly a happy name to have given to the genus, but becomes expressive when the specific name *solida* is added to it.

The following differences are seen in the specimens in my collection :—

a. Cashes Ledge, N.E. America, 70 fathoms (*Prof. Verrill*).—The form described by Hincks in his St. Lawrence paper, p. 150. The growth is in narrow strips, which at the same time are somewhat thicker and more solid-looking than the other varieties. The avicularium is nearly round (see Hincks, fig. 1) ; a slight sinus is more or less evident on the lower margin of the oral opening, but this sinus is not evident on oœcium-bearing zoœcia. Length of a frond 25 millim., greatest breadth 4 millim.

b. "*Escharella palmata*, Sars, Spitsbergen," from F. A. Smitt.—Zoœcia narrow and greatly elongated ; avicularium linguiform (as Smitt, fig. 43).

c. Varanger Fiord, 100–150 fathoms.—Fronde very thin and broad, 18 millim. long, 13 millim. broad. Zoœcia of much larger size than from the other localities, not much produced ; avicularia linguiform (as Smitt, fig. 44).

It was also taken by the Norwegian North-Atlantic Expedition off Vardö (Stat. 262).

GENUS RHAMPHOSTOMELLA, LORENZ.

Type, *Rhamphostomella scabra* (Fabricius), Smitt.

68. *Rhamphostomella costata*, LORENZ.

1867. *Cellepora scabra*, Smitt (*partim*), "Krit. Förteckning, &c." p. 30, pl. xxviii. figs. 186–188.

1886. *Rhamphostomella costata*, Lorenz, Bryozoen von Jan Mayen, p. 12, pl. vii. fig. 11.

1892. *Rhamphostomella costata*, Hincks, "Polyzoa St. Lawrence," Ann. & Mag. Nat. Hist. ser. 6, vol. iii. p. 426, pl. xxi. figs. 6–8.

Varanger Fiord, in 120–150 fathoms, and Nordgaard records it from Mehamn, and it was dredged by the Norwegian North Atlantic Expedition off Porsanger Fiord (Stat. 260).

69. *Rhamphostomella plicata*, SMITT.

1867. *Cellepora scabra*, forma *plicata*, Smitt, *l. c.* p. 30, pl. xxviii. figs. 189–191, 195.

1877. *Cellepora plicata*, Hincks, "Polyzoa Iceland and Labrador," Ann. & Mag. Nat. Hist. ser. 4, vol. xix. p. 106, pl. xi. figs. 3, 4.
 1886. *Rhamphostomella plicata*, Lorenz, l. c. p. 12.

I dredged this form in 120–150 fathoms in the Varanger Fiord; also found at Nordkyn (*Nordgaard*).

GENUS CELLEPORA, Fabricius.

Type, *Cellepora pumicosa* (Pallas), Linné.

70. *Cellepora pumicosa*, Pallas.

Varanger and Lang Fiords and Vardö. Nordgaard records it from Sværholt.

71. *Cellepora ramulosa*, Linné.

Mchavn (*Nordgaard*).

GENUS RETEPORA, Lamarck.

Type, *Retepora reticulata* (Imperato), Lamarck.

Retepora Beaniana, King.

Bög Fiord, in 120 fathoms; also Sværholt (*Nordgaard*) and Vadsö (*Danielssen*).

72. *Retepora cellulosa*, Linné.

1867. *Retepora cellulosa*, Smitt, "Krit. Förteck., &c." p. 35, pl. xxviii. figs. 222–225.
 1895. *Retepora cellulosa*, Waters, "Mediterranean and New Zealand *Retepora*," Journ. Linn. Soc., Zool. vol. xxv. p. 259, pl. vi. figs. 17 & 19, pl. vii. fig. 12.

In Bög Fiord, 120 fathoms, and also in Lang Fiord, in 20–30 fathoms (*A. M. N.*); Mchavn and Nordkyn (*Nordgaard*).

73. *Retepora Wallichiana*, Busk.

1867. *Retepora cellulosa*, forma *notopachys*, var. *elongata*, Smitt, "Kritisk Förteckning, &c." p. 36, pl. xxviii. figs. 226–232.
 1877. *Retepora Wallichiana*, Busk MS., Hincks, "Polyzoa from Iceland and Labrador," Ann. & Mag. Nat. Hist. ser. 4, vol. xix. p. 107, pl. xi. figs. 9–13.
 1878. *Discopora elongata*, Smitt, "Recensio Bryoz. Nov. Semlya," Öfvers. K. Vet.-Akad. Förhand. p. 25 (separate copy).
 1887. *Retepora elongata*, Levinsen, Dijnphna-Togtets zool.-bot. Udbytte, p. 323, pl. xxvii. fig. 12.

Lang Fiord.

In examining this species the descriptions of Hincks and of Levinsen should be consulted in addition to Smitt's work.

EXPLANATION OF THE PLATES.

N.B.—The description of figures 1 and 2 in this Plate, *Callopora nigrans*, will be found in the preceding part of these papers, vol. xi. p. 593.

PLATE VIII.

- Fig. 1.* *Callopora nigrans*, Hincks. *a*, young zoecium; *b*, with avicularia; *c*, an unusual form of oecium in a part where growth is very rapid and there are no avicularia. These zoecia, and also those of fig. 2, not developed side by side, but brought here together for illustration. Fig. *b* resembles state illustrated by Waters from Franz-Josef Land.
- Fig. 2.* *Callopora nigrans*, Hincks. *a*, early stage of development of oecium; *b*, the usual form of oecium; *c*, a form of which I have only seen two or three examples (it is this form which is figured by Hincks).
- Fig. 3.* *Larnacicus corniger*, Busk, with oecium, and the chambers in the situation usually occupied by an oecium.
- Fig. 4.* *Antropora granulifera*, Hincks. View of the back of a zoecium: *a*, openings resulting from the avicularia; below these are seen the pair of lucid bays, and below again the lucid spots.
- Fig. 5.* *Ammatophora nodulosa*, Hincks. This and the following two figures have been taken from specimens in which the epitheca has been removed in order to show the structure. The form of the oecium represented in fig. 5 is seldom seen.
- Figs. 6 & 7.* *Ammatophora nodulosa*, Hincks. The more usual forms of the oecium: fig. 6 the younger, fig. 7 the mature condition.
- Fig. 8.* *Lepralia nitida*, Fabricius. Three bars of the zoecium, to show their structure.
- Fig. 9.* *Lepralia melonantha*, Landsborough. Three front bars, to show the structure.
- Fig. 10.* *Cribrilina annulata*, Fabricius. Three bars of the zoecium of a very simple form of this species.
- Fig. 11.* *Cribrilina annulata*, var. *spitsbergensis*, Norman. Anterior portion of a zoecium.
- Fig. 12.* *Gephyrotes nitido-punctata*, Smitt. The anterior portion of a zoecium, to show the structure of the bridge and oral opening.
- Fig. 13.* *Gephyrotes nitido-punctata*, Smitt. Middle bars of the zoecium.

PLATE IX.

- Fig. 1.* *Cribrilina cryptoecium*, Norman. Zoecium with oecium in earliest stage of development as seen at the edge of a zoarium.
- Fig. 2.* The same. An older zoecium, with the oecium except the front arch concealed beneath overgrowth, and a transverse rib developed over it.
- Fig. 3.* *Cribrilina innominata*, Couch. Three bars of zoecium: *a*, *b*, lateral papillæ; *c*, the opening outside the arch of the bars and into the body of the Polyzoön, which a papilla has occupied.
- Fig. 4.* *Cribrilina Gattya*, Busk. Anterior portion of a zoecium of the ordinary form.
- Fig. 5.* *Cribrilina Gattya*. Variety on shell from Guernsey, with interesting duplicated lateral lacunes.
- Fig. 6.* *Cribrilina Balzaci* (Audouin), Waters, from Madeira.
- Fig. 7.* *Cribrilina figularis*, Johnston, showing the very large lumen-pore on the base of the bars, the small lateral lacunes, and narrow chinks (? openings for papillæ) between the loops of the bars.

Fig. 8. Porella princeps, Norman.

Fig. 9. The same, to show the number of blind zoecia ("kenozoecia," Levinsen) and irregularly shaped zoecia around the ancestrula.

Fig. 10. The same, operculum.

Fig. 11. The same, in which the thick outer calcareous wall has been removed by acid, and a previously entirely concealed oecium and the oral avicularium have been exposed to view.

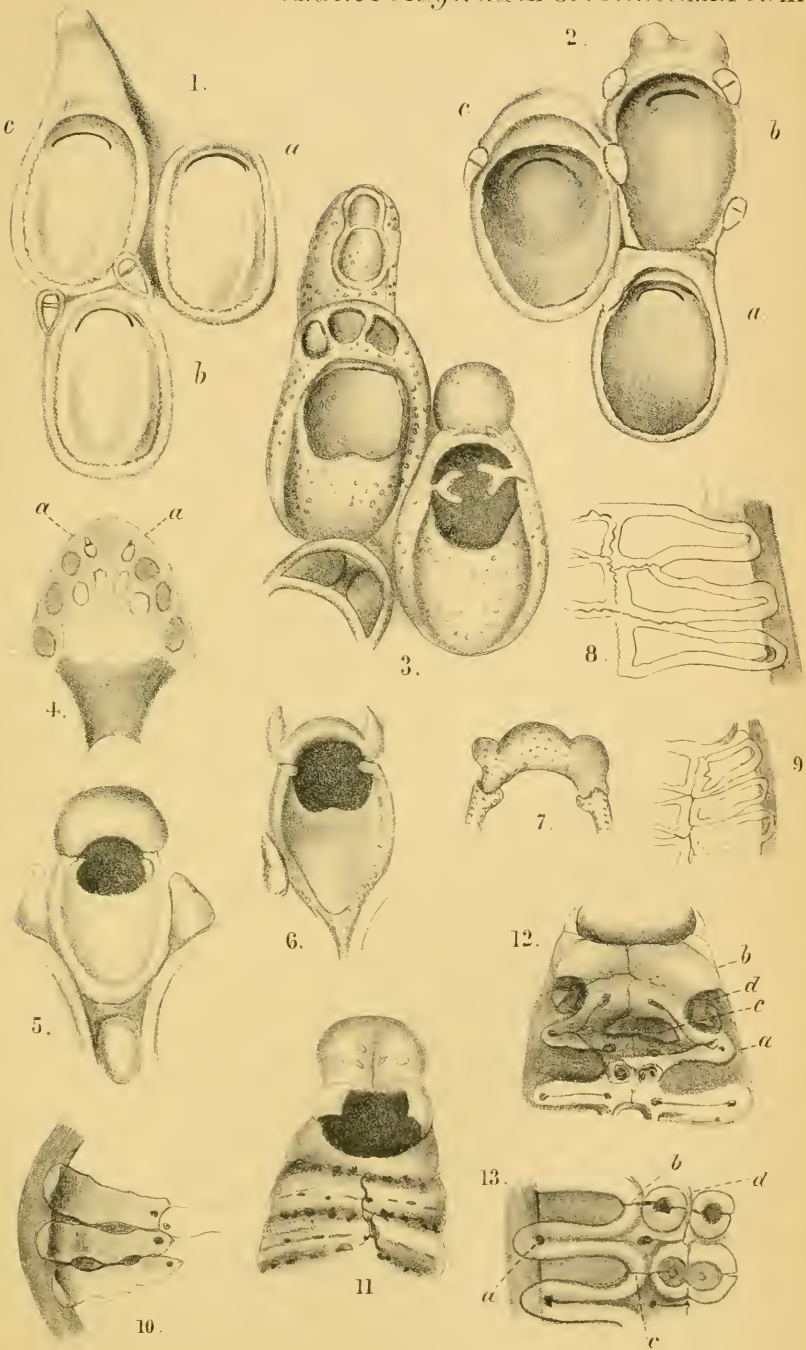
Fig. 12. Monoporella spinulifera, Hincks. A zoecium which has, like the last, been partially decalcified, and an oecium has been brought to view.

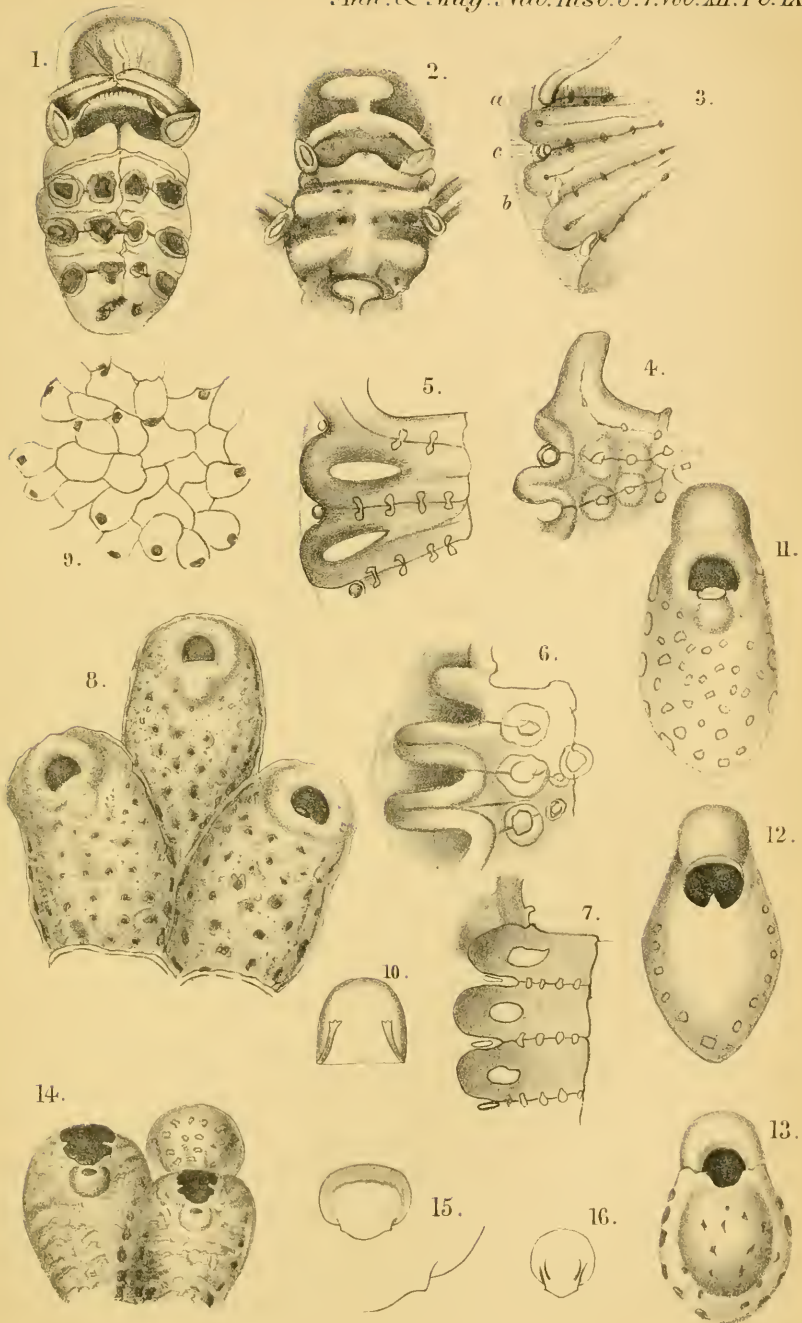
Fig. 13. Schizoporella cruenta, Norman. A zoecium which has been similarly treated, as the two previous species, with nitric acid, and an oecium of which the existence was previously unknown has been brought to light.

Fig. 14. Smittia lineata, Nordgaard.

Fig. 15. The same. Operculum and outline of margin more magnified.

Fig. 16. Schizoporella auriculata, Hassall. Operculum, for comparison with the preceding.





Notes on the Natural History of East Finmark. By Canon
A. M. NORMAN, M.A., D.C.L., LL.D., F.R.S., F.L.S.

[Continued from p. 128.]

ANNELIDA POLYCHÆTA.

PROFESSOR M'INTOSH kindly determined for me many of the Polychæta which I collected; these included several species not previously recorded from this district. The list of Polychæta has been made as far as possible complete by adding the Annelida collected by M. Sars, Esmark, Danielssen, and others in this district. I have gone through a large number of papers with care. All that was known of Norwegian Polychæta up to 1894 as regards species, though not fully with respect to habitats, will be found in Olaf Bidentkap's

“Systematisk oversigt over Norges Annulata Polychæta,” Christ. Vidensk.-Selsk. Forhandl. 1894. Dr. Armauer Hansen’s Report on the Annelids in the Norwegian North-Atlantic Expedition also gives many Annelids of East Finmark from Stats. 160, 161, and 162.

The following particulars with regard to the distribution of Annelids on the Norwegian coast are derived from Bidenkap’s lists:—

1. Total number of species of Polychæta known in Norway ..	207
2. Species found on the south coast	118
3. Species found on the west coast up to Trondhjem	150
4. Species found in the Trondhjem Fiord	94
5. Species found in the Lofoten Islands sea	97
6. Species in the whole of Norway north of the Lofoten Islands.	108
7. Recorded here from East Finmark	80

The areas represented by these figures are very variable in size, 4, 5, and 7 being much smaller than the others; 7 is, of course, a part, and only a very small part, of 6.

Twenty years ago G. W. R. Leviusen published his “Systematisk-geografisk Oversigt over de nordiske Annulata, Gephyrea, Chætognathi og Balanoglossi” (Vidensk. Meddel. fra den naturh. Foren. i Kjöbenhavn, 1882 and 1883). Since that time additions have been made to the several faunas; but it remains the most recent summary of the annelidan fauna of the northern countries.

Denmark	138
Sweden	147
Norway	191
Novaja Zembla and Kara Sea	97
Siberia and Berings Strait	66
Spitsbergen	82
Faroe Islands	64
Iceland	71
Greenland	109
North-east America	106

Unfortunately we have no recent complete work on British Polychæta or even anything like a catalogue of the species. At the present time many British species have merely been indicated by perhaps a few lines in the midst of a paragraph. The fullest local catalogues we have are those of Dr. J. F. Gemmill of the Clyde District*, which contains 121

* ‘Fauna, Flora, and Geology of the Clyde Area,’ Glasgow, 1901. (Published by Local Committee of the British Association.)

species, and of Dr. McIntosh of the fauna of St. Andrews *, which embraces 109 species. I made a MS. list of British species a few years ago, and, adding more recently described and recorded forms, I do not think I shall be far wrong if I estimate the British Polychæta at over 260.

Harmothoe rarispina, M. Sars.

— *Sarsi*, Malmgren.

— *nodosa*, M. Sars.

— *imbricata*, Linné. In all the fiords.

Lepidonotus squamatus, Linné.

— *cirrosus*, Pallas. Lang Fiord.

Aphrodite aculeata, Linné.

Letmonice filiformis, Kinberg.

Leanira tetragona, Örsted. N. N. A. Exped., St. 261.

Eulalia viridis, Müller. Vadsö; Lang Fiord, 2-5 fathoms.

Phyllodoce maculata, Müller.

Nephtys Malmgreni, Théel, = *M. longisetosa*, Malmgren. Bög Fiord, 100-125 fathoms.

— *ciliata*, Müller. Klosterelv Fiord.

— *Hobergi*, Aud. & Edw. N. N. A. Exped., Stat. 262.

Glycera capitata (Örsted), M. Sars. Bög Fiord, 100-125 fathoms.

— *alba*, Rathke.

Goniada norvegica, Örsted. N. N. A. Exped., Stat. 261.

— *maculata*, Örsted. See G. O. Sars, 'Bidrag til Kundskaben om Christianiafjordens Fauna,' iii. 1873, p. 30. "Vadsö."

Lumbriconereis fragilis, Müller. Varanger Fiord.

Onuphis conchylega, M. Sars. Varanger Fiord.

— *hyperborea*, A. Hansen. Varanger Fiord, 100-125 fathoms.

Ceratocephale Lovéni, Malmgren.

Nereis pelagica, Linné. Klosterelv Fiord.

Laodice norvegica (Linn.), Savigny. Vadsö Harbour.

Syllis Blomstrandii, Malmgren.

— *armillaris*, Örsted. Varanger Fiord.

Ephesia gracilis, H. Rathke. Varanger Fiord.

* McIntosh (W. C.), 'The Marine Invertebrates and Fishes of St. Andrews,' 1875, pp. 115-132.

- Spio cirratus*, M. Sars. Klosterelv Fiord, 3-5 fathoms.
Spiochaetopterus typicus, M. Sars.
Chaetopterus norvegicus, M. Sars.
 **Chatogone setosa*, Malmgren. Svolvær, Lofoten Islands.
Cirratulus cirratus, Müller. Klosterelv and Lang Fiords.
Scolophos armiger, Müller. Klosterelv Fiord, 3-5 fathoms.
Annotrypane aulogaster, Rathke. Varanger Fiord.
Travisia Forbesi, Johnston. Varanger Fiord.
Ophelia limacina, Rathke.
Flabelligera affinis, M. Sars.
Trophonia plumosa, Müller.
 — *hirsuta*, A. Hansen.
 — *glauca*, Malmgren.
Brada villosa, Rathke. Lang and Klosterelv Fiords.
 — *granulata*, Malmgren. Lang Fiord, 15-25 fathoms.
Euphrosyne borealis, Örsted.
Spinther arcticus, M. Sars.
Scalibregma inflatum, Rathke. Klosterelv Fiord.
Notomastus latericeus, M. Sars. Svolvær, Lofoten Islands (*A. M. N.*);
 Vadsö (*Danielssen*).
Arenicola marina, Linné. Sydvaranger Fiord.
Clymene Mülleri, M. Sars.
 — *pretermissa*, Malmgren. N. N. A. Exped., Stat. 260.
 — *gracilis*, M. Sars.
Nicomache lumbricalis, Fabricius. Varanger Fiord.
Maldane biceps, M. Sars.
Owenia assimilis, M. Sars.
Pectinaria hyperborea, Malmgren. Lang Fiord, 10-30 fathoms.
 — *belgica*, Pallas.
Melinna cristata, M. Sars.
Subellides octocirrata, M. Sars. N. N. A. Exped., Stat. 261.
 — *borealis*, M. Sars. Klosterelv Fiord, 3-5 fathoms.
Amphicteis Gunneri, M. Sars. Lang Fiord, 5-30 fathoms.
Leucariste albicans, Malmgren.
Terbellides Strömii, M. Sars. Klosterelv Fiord.
Thelepus circinnatus, Fabricius. Varanger Fiord.
Amphitrite cirrata, Müller. Varanger Fiord.
 — *grœnlandica*, Malmgren.
Terbella debilis, Malmgren.
Lecœna abranchiata, Malmgren.

- Amphicora Fabricii*, Müller. Varanger Fiord.
Euchone papillosa, M. Sars. Lang and Klosterelv Fiords.
Chone infundibuliformis, Kröyer.
Dasychone infarcta, Kröyer.
Sabella Fabricii, Kröyer.
Potamilla neglecta, M. Sars.
 — *reniformis*, Müller.
Leptochoone Steenstrupii, Kröyer.
Filograna implexa, Berkeley.
Apomatus globifer, Lovén.
Potamocerus triquetus, Mörch.
Placostegus tridentatus, Fabricius.
Spirorbis borealis, Linné.
 — *spirillum*, Linné.
 — *granulatus*, Linné.

GEPHYREA.

Fam. Sipunculidæ.

Genus PHASCOLOSOMA, Leuckart.

Phascolosoma eremita, M. Sars.

1850. *Sipunculus eremita*, M. Sars, Mag. for Naturvid. p. 77, and Nyt Mag. f. Naturvid. 1857, p. 197.
 1857. *Phascolosoma eremita*, Diesing, "Revision der Rhyngoden," Sitz. d. mathem.-naturw. Cl. der k. Akad. der Wiss. vol. xxxvii. p. 760.
 1865. *Phascolosoma boreale*, Keferstein, Nachricht. d. k. Ges. d. Wiss. Göttingen, p. 206, and Zeitschr. f. wiss. Zool. vol. xv. 1865, p. 437, pl. xxxi. fig. 7, & pl. xxxiii. fig. 33.
 1875. *Phascolosoma boreale*, Théel, Bihang till K. Svenska Vet.-Akad. Handl. vol. iii. no. 6, p. 10.
 1877. *Phascolosoma eremita*, Koren & Danielssen, Fauna litt. Norvegiæ, pt. iii. p. 134, pl. xv. fig. 45.

Found at Vadsö and in Sydvaranger.

Phascolosoma margaritaceum, M. Sars.

1851. *Sipunculus margaritaceus*, M. Sars, Nyt Mag. for Naturvid. vol. vi. p. 196.
 1865. *Phascolosoma margaritaceum*, Keferstein, Nachricht. d. k. Ges. d. Wiss. Göttingen, vol. iv. p. 201, and Zeitschr. f. wiss. Zool. p. 430, pl. xxxi. fig. 9, & pl. xxxii. figs. 28, 29.
 1865. *Phascolosoma Erstedii*, Keferstein, Nachricht. d. k. Ges. d. Wiss. Göttingen, p. 205, and Zeitschr. f. wiss. Zool. p. 436, pl. xxxi. fig. 8, & pl. xxxiii. fig. 39.
 1871. *Phascolosoma Erstedii*, Ehlers, Sitzungsber. d. phys.-med. Soc. zu Erlangen, vol. iv. p. 83.

1875. *Phascolosoma Ærstedii*, Théel, Bihang till K. Sv. Vet.-Akad. Handl. vol. iii. no. 6, p. 9.

1877. *Phascolosoma margaritaceum*, Koren & Danielssen, Fauna littoralis Norvegicæ, pt. iii. p. 135, pl. xv. figs. 43, 44.

In 100-120 fathoms, Bög Fiord.

Phascolosoma albidum and *Phascolosoma fulgens* of Théel are also referable to this species.

GENUS PHASCOLION, Théel.

Phascolion Strombi (Montagu).

I lump under this name a number of forms varying in size, amount of development of tubercles of the surface, &c. The genus requires more careful working out than it has hitherto received, notwithstanding the papers of Théel and others. Some of the East-Finmark specimens are referable to var. *verrucosa*, Kor. & Dan. *Phascolion* was found inhabiting tubes of *Serpula* and shells of *Trophon truncatus*, *Admete viridula*, *Pyrene rosacea*, *Bela* (species), *Macharoplax verrucosa*, *Margarita grænlandica*, young *Fusi*, *Dentalium*, *Trichotropis*, *Cylichna alba*, and *Lacuna quadrifasciata*.

Fam. Priapulidæ.

GENUS PRIAPULUS, Lamarck.

**Priapulus caudatus*, Lamarck.

I dredged this species at Svolvær, Lofoten Islands, but not at East Finmark.

GENUS PRIAPULOPSIS, Koren & Danielssen, 1875.

Priapulopsis typicus, Koren & Danielssen.

1868. *Priapulus bicaudatus*, Danielssen, Forhand. Skand. Naturforsk. tiend Møde, p. 542 (*vide* Kor. & Dan.).

1875. *Priapulopsis typicus*, Koren & Danielssen, "Bidrag til de norske Gephyreers Naturhistorie," Nyt Mag. Naturf. vol. xxi. p. 28 (separate copy).

1877. *Priapuloides typicus*, Koren & Danielssen, Fauna litt. Norvegicæ, pt. iii. p. 147, pl. xvi. figs. 10-14.

1881. *Priapuloides typicus*, Danielssen & Koren, Norwegian North-Atlantic Exped. 1876-1878, Gephyrea, p. 13, pl. iii. figs. 1-12, & p. 147.

The two type specimens described in the 'Fauna littoralis Norvegicæ' were found in the Varanger Fiord in 120 fathoms on a clay bottom. It was taken in the same district by the Norwegian North-Atlantic Expedition at Stat. 262, lat.

70° 36' N., long. 32° 35' E., in 148 fathoms. Koren and Danielssen, when they instituted *Priapuloides*, appear to have forgotten that they had previously named the genus *Priapulopsis*.

Genus HALICRYPTUS, Siebold, 1849.

Halicryptus spinulosus, Siebold.

1849. *Halicryptus spinulosus*, Siebold, Neue preuss. Provincialblätter, Königsberg, vol. vii. p. 184.

1859. *Halicryptus spinulosus*, Diesing, "Revision der Rhyngoden," Sitzb. d. mathem.-naturw. Cl. xxxvii. Bd. no. 21, p. 779.

1862. *Halicryptus spinulosus*, Siebold, Zeitschr. f. wiss. Zool. vol. xi. p. 413.

1862. *Halicryptus spinulosus*, Ehlers, Zeitschr. f. wiss. Zool. vol. xi. p. 401, pl. xxiv.

1870. *Halicryptus spinulosus*, Säger, "The Baltic Representatives of *Gephyrea*; *Halicryptus* and *Priapul*," Trans. Second Congress of Russian Naturalists in Moscow, p. 207 (in Russian).

1871. *Halicryptus spinulosus*, Willemoës-Suhm, Zeitschr. f. wiss. Zool. vol. xxi. p. 385.

1871. *Halicryptus spinulosus*, Willemoës-Suhm, Ann. & Mag. Nat. Hist. ser. 4, vol. viii. p. 143.

1871. *Halicryptus spinulosus*, Ehlers, Sitzungsbericht d. phys.-med. Soc. zu Erlangen, vol. iii. p. 84.

1885. *Halicryptus spinulosus*, Apel, Beitrag zur Anat. und Histol. des *Priapul caudatus* und des *Halicryptus spinulosus*.

1885. *Halicryptus spinulosus*, Scharff, "Skin and Nervous System of *Priapul* and *Halicryptus*," Quart. Journ. Micros. Sci. n. s. vol. xxv. p. 193, pl. xiv. figs. 3, 4, 5, 11.

Not uncommon; dug between tide-marks in Klosterelv Fiord. So far as I am aware it has not previously been found in Norway. Its localities are best given by Théel as Spitsbergen and the Baltic, where it occurs not further north than Bräviken or further south than Ystad (Théel, "Etudes sur les Géphyriens inermes des Mers de la Skandinavie, du Spitsberg et du Groënland," Bihang till K. Svensk. Vet.-Akad. Handl. vol. iii. 1876, p. 24).

[To be continued.]

Notes on the Natural History of East Finmark. By CAN 1
A. M. NORMAN, M.A., D.C.L., LL.D., F.R.S., F.L.S.

[Continued from p. 286.]

[Plate XXVII.]

ECHINODERMATA.

IN East Finmark the Echinodermata are very fully represented; but the percentage of species found by myself in this class is much less than in those classes with which I have already dealt. The reason is obvious. I did not employ the instruments most suitable for their capture, namely, either a trawl or wide-meshed dredge. As usual, I was more intent on the smaller and generally less studied animals, and my fine dredge-bag, quickly filling with mud, passed over comparatively little ground; and therefore the capture of many of the larger animals, such as Echinodermata, was not to be expected.

I propose in dealing with the Echinodermata to depart from the rule which I have observed in previous parts of these notes of only giving the names of East Finmark species which had not been found by myself, and to briefly indicate their locality and its authority. The authorities on whom I have relied are as follows:—

1. DANIELSSEN (D. C.).—“Beretning om en zoologisk Reise foretagen en Sommeren 1857,” *Nyt Mag. for Naturvidenskaberne*, vol. xi. 1861, p. 1.
2. SARS (MICHAEL).—“Oversigt af Norges Echinoderm,” 1861.
3. DANIELSSEN (D. C.) and KØREN (A.).—(a) *Holothuroidea*, (b) *Asteroidea*, (c) *Echinoidea*, in ‘The Norwegian North-Atlantic Expedition, 1876–1878.’ 1882, 1884, and 1892.
4. GRIEG (J. A.).—*Ophiuroidea* in ‘The Norwegian North-Atlantic Expedition, 1876–1878.’ 1893. The word ‘Vöringen’ in the following notes, which was the name of the vessel employed, indicates that the authority is in the Norwegian North-Atlantic Expedition Reports.
5. GRIEG (J. A.).—“Oversigt over det nordlige Norges Echinoderm,” *Bergens Museum Aarbog*, 1902.
6. ÖSTERGREN (HJALMAR).—“The *Holothuroidea* of Northern Norway,” *Bergens Museum Aarbog* (1902), 1903, p. 3.

A full account of the distribution of the species and full synonymy will be found in the treatises on the different orders in Römer and Schaudin’s ‘*Fauna Arctica*.’

OPHIUROIDEA.

- Ophiura Sarsii*, Lütken. In all the Sydvaranger fiords.
 — *albida*, Forbes. Vadsö (*Danielssen*).
 — *robusta*, Ayres. Varanger, Bög, and Lakso Fiords. Also Svolveær, Lofoten Islands, shallow water to 125 fathoms.
 — *carnea*, M. Sars. Vadsö, in 50–100 fathoms (*M. Sars*).
 — *affinis*, Lütken. Unusually large in the Varanger Fiord; also at Svolveær, Lofoten Islands.
Ophiocten sericeum, Forbes. Off Vardö, in 148 fathoms ('Vöringen,' Stat. 262).
 **Amphiura elegans*, Leach. I found this species at Svolveær, Lofoten Islands. It is not yet known in East Finmark, though it has been recorded from as far east as the Murman coast by Jarzynsky.
Ophiopholis aculeata, Linné. In all the fiords.
Ophiacantha bidentata, Retzius. Varanger and Lang Fiords, down to 125 fathoms (*A. M. N.*); Porsanger Fiord (*Grieg*).
Ophioscolex glacialis, Müller & Troschel. Off Vardö, in 148 fathoms, four small specimens ('Vöringen,' Stat. 262).
 — *purpureus*, Düben & Koren. Dr. Hjort, in the 'Michael Sars,' dredged this species in 1900 in the Porsanger Fiord (*Grieg*).
 [*Asteronyx Lovéni*, Müller & Troschel. Herr Grieg informs me (*in litt.*) that this species was inserted by mistake in the East Finmark column of his paper. It was taken by M. Sars in Öxfjord, West Finmark, and not in Oxfjord in East Finmark.]]
Gorgonocephalus Lamarcki, Müller & Troschel. Herr Grieg writes to me that a specimen of this species from Varanger Fiord (Vadsö) is in the Bergen Museum.
 — *eucnemis*, Müller & Troschel. Taken by M. Sars at Vadsö in 1857 on *Primnoa lepadifera*; but some doubt attaches to the identification of the young specimen (*Sars*, 2).
 — *Agassizii*, Stimpson. This species is in the Bergen Museum from the Varanger Fiord (*Grieg*). This is the only instance of its occurring on the European coast. It is known from N.E. America, Greenland, and Jan Mayen.

ASTEROIDEA.

- Archaster tenuispinus*, Düben & Koren. Porsanger Fiord and off Vardö, in 127–148 fathoms ('Vöringen').
Plutonaster Parelii, Düben & Koren, var. *longibrachialis*, Dan. & Kor. In the same two dredgings as the preceding ('Vöringen').
Ctenodiscus crispatus, Retzius. Inner reach of Lang Fiord, in 5–30 fathoms: Bög Fiord, in 100–120 fathoms; and Varanger Fiord, 100–125 fathoms.

- Leptophycaster arcticus*, M. Sars. Tana Fiord and off Vardö, in 127-148 fathoms ('Vöringen').
- Psilaster andromeda*, Müller & Troschel. Danielssen and Koren write of this species, "along the entire Norwegian coast," and Grieg has inserted it in the East Finmark column on this authority; but though I have searched carefully I have been unable to find any actual statement of its occurrence there. It may certainly be expected, as Jarzynsky has found it on the Murman coast.
- Pentagonaster granularis*, Retzius. Sværholt, by the 'Michael Sars,' 1901; Tana Fiord and off Vardö ('Vöringen').
- Goniaster phrygianus*, Parelius. Porsanger Fiord and off Vardö ('Vöringen'); Sværholt (Grieg).
- Poraniomorpha rosea*, Danielssen & Koren. Dredged by Herr Hjort in the 'Michael Sars' in 1901, S.S.W. of Kibergnæsset in the Varanger Fiord, in 188-216 metres (Grieg).
- Hexaster obscurus*, Perrier. Dredged by the 'Michael Sars' in 1901 east of Ekero in the Varanger Fiord, in 180-216 metres (Grieg).
- Pteraster militaris*, O. F. Müller. Vadsö (Danielssen); Sværholt (Grieg).
- *pulvillus*, M. Sars. Lang Fiord, in 25 fathoms (A. M. N.); Sværholt (Grieg).
- Crossaster papposus*, Fabricius. In Lang and Klosterelv Fiords.
- *affinis*, Brandt. One small specimen of this ten-armed *Crossaster* was dredged by the 'Vöringen' off Vardö (Stat. 262). It is a question whether it is really distinct from *C. papposus*, with which Ludvig unites it; but, on the other hand, Danielssen and Koren write that after careful examination of exterior features and internal skeleton they have "arrived at the conclusion that the difference between *Solaster affinis* and *Solaster papposus* is so great and also so constant that we must still affirm the former to be a distinct species."
- Solaster endeca*, Gmelin. Herr Grieg writes to me that Dr. Johan Hjort has collected this species in Kongs Fiord. This small fiord will not be found marked on ordinary maps; it is situated in long. 47° 20' E.
- *sytensis*, Verrill. Dredged by the 'Michael Sars' in 1901 to the east of Ekero in the Varanger Fiord, in 188 metres (Grieg). I do not know this eight- or nine-armed form. Ludvig, in 'Fauna Arctica Seesterne,' 1900, unites it with *S. endeca*.
- Cribrella sanguinolenta*, O. F. Müller. In Lang and Klosterelv Fiords.
- [*Pedicellaster typicus*, M. Sars. Herr Grieg informs me that he inserted this species in his East Finmark column because it

was dredged by the 'Vöringen' in Barents Sea (*i. e.* Stat. 267, lat. 71° 42' N., long. 37° 1' W., in 148 fathoms*.)]

Asterias rubens, Linné. Varanger Fiord.

— *Mülleri*, M. Sars. Vadsö (*Danielssen*); Sværholt (*Grieg*).

[? — *glacialis*, Linné. Grieg marks this in his East Finmark column, but gives no locality, and, indeed, states that it is found up the whole coast to Komag Fiord; but that fiord is in West Finmark.]

Asterias Linckii, Müller & Troschel.

1733. *Pentadactylosaster reticulatus digitis prælongatis*, Linck, De Stellis Marinis, p. 34, pls. ix. & x. no. 16.

1842. *Asterias Linckii*, Müller & Troschel, System der Asteriden, p. 18.

1869. *Asteracanthion stellionura*, Perrier, Recherches sur les Pédicellaires et les Ambulacres des Astéris et des Oursins, p. 48, pl. i. figs. 10 *a-d*.

1882. *Asterias Gunneri*, Danielssen & Koren, "Fra den norske Nordhavsexpedition," Nyt Mag. for Naturvid. vol. xxvii. p. 268.

1884. *Asterias Gunneri*, Dan. & Kor. Norw. North Atlant. Exped., Asteroidea, p. 7, pls. ii., iii. figs. 8, 9.

1884. *Asterias stellionura*, *id.* *ibid.* p. 14, pl. iv. figs. 1-9.

1887. *Asterias stellionura*, Levinsen, Dijnphna-Togtets zool.-botan. Udbytte, p. 395, pl. xxxiv. figs. 7, 8, *a, b*.

Levinson's figures and description should be consulted when determining this species. His fig. 7 illustrates the adambulacral papillæ &c., and shows the absence of those adambulacral spines to which I shall call attention in my notice of the next species.

The type of "*A. Gunneri*" was taken by the 'Vöringen' in Advent Bay, Spitsbergen, while "*A. stellionura*" was taken by the same expedition not only a little to the south of Spitsbergen, but also off Vardö in 148 fathoms (Stat. 262). Lovén has also recorded it from the Varanger Fiord, and more recently it has been again dredged by the 'Michael Sars' in 180 metres off Ekerø, at the mouth of the same fiord.

Asterias panopla, Stuxberg.

1878. *Asterias panopla*, Stuxberg, "Echinod. Nordenskiöldska Exped. 1875-76," Öfvers. K. Vet.-Akad. Förhand. xxxv. p. 32.

1881. *Asterias panopla*, F. Jeffrey Bell, "Species of the Genus *Asterias*," Proc. Zool. Soc. p. 505.

1884. *Asterias panopla*, Dan. & Kor. Norweg. North Atlant. Exped., Asteroidea, p. 17, pl. v.

1887. *Asterias panopla*, Levinsen, Dijnphna-Togtets zool.-bot. Udbytte, p. 394.

* I have not in these papers taken into account the 'Vöringen' stations 267, 270, 273, and 275, which were to the north of East Finmark. If this were done, other species would be added to the fauna.

I dredged this species on two occasions in quite shallow water, in 5–30 fathoms, in the inner part of Lang Fiord. It is new to the Norwegian fauna. The size of one of these specimens is nearly double that represented in Danielssen and Koren's plate, and the single row of spines passing down the centre of the back of each arm is very conspicuous, as in the figure referred to. On the other hand, in much smaller specimens collected in the Kara Sea by the 'Dijmphna' expedition, for which I am indebted to the Copenhagen Museum, this central row of spines is scarcely noticeable. The character which at once distinguishes *A. panopla* from *A. Linckii* consists in the spines on the under surface of the arms, where bordering the ambulacra is seen a row of slender spines which are in pairs, and exterior to these another row of well-developed and conspicuous spines (see Dan. & Kor. pl. v. fig. 2, at the base of the left-hand side of the arm). The following quotation from Leviusen well describes the adambulacral papillæ and spines, outside of which is the other row of spines to which I have just referred:—"Papillæ adambulacrales biseriales appositæ, inter papillas singulas serici interioris jam pedicellariæ, jam spinæ, vestigia transformationis in pedicellarias sæpe exhibentes, site. Spinæ extra papillas adambulacrales per paria dispositæ, spinis singulorum parium ad basin concurrentibus, supra divergentibus."

ECHINOIDEA.

Echinus norvegicus, Düben & Koren. Rather small specimens were taken by the 'Vöringen' off Vardö (Stat. 262).

— *esculentus*, Linné. Herr Grieg writes to me that this species has recently been taken by Dr. Johan Hjort in the Varanger Fiord to the south of Kiberg.

Strongylocentrotus dröbachiensis, O. F. Müller. Varanger, Lang, and Klosterelv Fiords.

— *pictus*, Norman. Varanger Fiord, 100–125 fathoms; Klosterelv and Lang Fiords, in 3–30 fathoms. This form—whether species or variety—is characterized among points already described by the very large size of the "sphérides" (Lovén). Professor Lovén showed me the same form under another name in the Stockholm Museum. Unfortunately I did not make a note at the time, and have forgotten what that name was.

Schizaster fragilis, Düben & Koren. Taken in mid-channel in the Varanger Fiord in 100–125 fathoms. A specimen measured 75 millim. long, 65 millim. broad, and 40 millim. deep.

Spatangus purpureus, O. F. Müller. Sværholt (Grieg).

Echinocardium flavescens, O. F. Müller. Vadsö (M. Sars); Sværholt (Grieg).

— *cordatum*, Pennant. Sværholt (Grieg)*.

Echinocyamus pusillus, O. F. Müller. Vadsö and Bög Fiord.

HOLOTHUROIDEA.

GENUS STICHOPUS, Brandt.

Stichopus tremulus (Gunnerus).

“In the Christiania Museum there is a specimen which G. O. Sars caught in the Varanger Fiord” (Nordgaard, 1903).

GENUS CUCUMARIA, Jæger.

Cucumaria frondosa (Gunnerus).

I procured young specimens (= *C. fucicola*, Forbes) between tide-marks at Vadsö.

GENUS PHYLLOPHORUS, Grube.

Phyllophorus pellucidus (Fleming).

Michael Sars recorded that he had taken two specimens of this species in the Varanger Fiord near Vadsö, in 60–80 fathoms, in 1857.

GENUS PSOLUS, Oken.

Psolus phantapus (Strussenfeldt).

Bög and Lang Fiords, in 5–30 fathoms (A. M. N.). Michael took it in the Varanger Fiord in 1857.

GENUS TROCHOSTOMA, Danielssen & Koren.

Trochostoma boreale (M. Sars).

1861. *Molpadia borealis*, M. Sars, Oversigt af Norges Echinodermer, p. 116, pls. xii., xiii.

1877. *Haplodactyla arctica*, v. Marenzeller, “Cœlenteraten, Echinodermen und Würmer der k. k. öster.-ungar. Nordpol-Exped.,” Denkschr. math.-nat. Klasse kais. Akad. d. Wiss. Zool. vol. xxxv. p. 29, pl. iv. fig. 1.

* I have inserted this species and *Spatangus purpureus* in this list because Grieg (5) gives the locality Sværholt; yet he does not mark them in his East Finmark column at p. 37. Was that an accidental omission, or are there two places named Sværholt?

1882. *Trochostoma Thomsonii*, Danielssen & Koren, Norwegian North-Atlantic Exped., Holothuroidea, p. 42, pls. vii., viii., ix. figs. 38-41, pl. xiii. fig. 4, and var. *maculatum*, p. 94, pl. xiii. figs. 5, 6.
 1882. *Trochostoma boreale*, iid. *ibid.* p. 64, pl. x. figs. 7-11.
 1882. *Trochostoma arcticum*, iid. *ibid.* p. 65, pl. ix. figs. 1-5, pl. x. fig. 6, pl. xiii. fig. 3.

Ludvig, in 'Fauna Arctica,' vol. i. Holothuroidea, p. 161, unites all the forms described by Danielssen and Koren under the *Molpadia borealis*, M. Sars.

The form called *Trochostoma arcticum* by Danielssen and Koren was dredged by the 'Vöringen' in the Porsanger Fiord in 127 fathoms (Stat. 260), and in the same depths in the Tana Fiord (Stat. 261).

GENUS ANKYRODERMA, Danielssen & Koren.

Ankyroderma Jeffreysii, Danielssen & Koren.

1879. *Ankyroderma Jeffreysii*, Danielssen & Koren, "Fra den Norske Nordhavsexpedition Echinodermer, III.," Nyt Mag. for Naturvid. vol. xxv. p. 128, pls. v. & vi. figs. 11-19, 21.
 1879. *Ankyroderma affine*, iid. *ibid.* p. 133, pls. v. & vi. figs. 22-28.
 1882. *Ankyroderma Jeffreysii*, Dan. & Kor. Norw. N.-Atlant. Exped., Holothuroidea, p. 67, pls. x., xi., xii. figs. 12-28.
 1882. *Ankyroderma affine*, iid. *ibid.* p. 71, pl. xii. figs. 29-36.

Ludvig (*l. c.*) has united the two forms to which the describers had assigned specific rank.

This most interesting new form discovered by the 'Vöringen' was dredged at Stations 260, 261, 262, at the Porsanger and Tana Fiords, and also off Vardö in 127-148 fathoms. It possesses anchors like those of a *Synapta*, but instead of resting for support upon a single calcareous plate, as in that genus, they are attached at the central junction of the "heads" of five or six "battledore"-shaped spicules, the long "handles" of which spicules radiate from the centre. Other spicules not unlike those of a *Thyonidium* are profusely scattered throughout the epidermis.

The *Ankyroderma musculus* (Risso) from the Mediterranean comes very near to this species (*vide* Ludvig, Zeits. f. wiss. Zool. vol. li. p. 571, pl. xxix.).

GENUS EUPYRGUS, Lütken.

Eupyrgus scaber, Lütken. (Pl. XXVII. figs. 1-3.)

1857. *Eupyrgus scaber*, Lütken, Oversigt over Grönlands Echinodermata, p. 22.
 ? 1857. *Eupyrgus scaber*, Barrett, "Description of Four new Species of

Echinodermata," Ann. & Mag. Nat. Hist. ser. 2, vol. xx. p. 46, pl. iv. figs. 2 a, b.

1868. *Echinosome hispidum*, Semper, Reisen in Archipel der Philipinen, vol. ii. Holothurien, p. 44, pl. x. figs. 7, 10, 11, 13, 15, 16.

1868. *Eupyrigus scaber*, iid. ibid. p. 268.

1886. *Eupyrigus scaber*, Theel, Report 'Challenger' Exped., Holothuroidea, pt. 2, p. 49.

I dredged this species, which is new to the Norwegian coast, in the Varanger Fiord, in 125–150 fathoms, and also in Bög Fiord in 100–120 fathoms. It had been obtained by the 'Vöringen' in the sea to the north of East Finmark (Stat. 267), and has a distribution ranging from Labrador and Greenland to Spitsbergen and Barents and Kara Seas.

The calcareous deposits in the test of *Eupyrigus scaber* have not been well figured, and I therefore now illustrate them. It is true that Barrett* figured two deposits which he referred to this species; but if they belonged to it at all, they were certainly abnormal. I have been unable to find any such irregular forms either in a type specimen from Greenland received from Dr. Lütken soon after he described the species or in these East Finmark specimens which I have now taken.

These calcareous deposits (fig. 2) consist of tables which are round or nearly so, with irregular margin, perforated with about twenty to twenty-five openings with simple margins, the openings around the base of the spine being larger than those outside them, and generally oval in form, while the smaller outer holes are round; the spire is very long (fig. 3), longer than the diameter of the table from the centre of which it rises; it gradually tapers to a point which is rough or slightly spinous at the point; it is built up of three rods, which are united to each other by about four cross-bars. The surface of the test is densely clothed with these tables which are situated in it, while the spires are projected freely from the test (fig. 1). The genus *Eupyrigus* being entirely devoid of feet, it is not improbable that these spires of the calcareous plates may in some degree supply a help to locomotion through the mud, aided by the muscular movements of the animal's body; but no doubt they are primarily a means of defence, as well as serve the purpose of strengthening the cutis.

* The Holothurian which Barrett described as *Eupyrigus hispidus* is, of course, no *Eupyrigus*, but must be called *Echinocucumis hispidus* (Barrett), = *Echinocucumis typicus*, M. Sars; but *Echinosome hispidum* of Semper is the present species.

GENUS SYNAPTA, Eschscholtz.

Synapta Buski, M'Intosh.

1864. *Synapta tenera*, Norman, Brit. Assoc. Rep. for 1863, p. 106.
 1866. *Synapta Buski*, M'Intosh, Proc. Roy. Soc. Edinb. p. 611, woodcut 6.
 1871. *Synapta tenera*, Brady & Robertson, Proc. Zool. Soc. p. 690, pl. lxxi. figs. 1-3.
 1892. *Synapta Buski*, F. Jeffrey Bell, Cat. Brit. Echin. Brit. Mus. p. 34, pl. i. fig. 3 (wrongly numbered in letterpress and on plate, fig. 2).
 1898. *Labidoplax Buski*, Östergren, "Das System den Synaptiden," Öfvers. K. Vet.-Akad. Förhand. p. 115.

Östergren, in his paper on "The Holothuroidea of Northern Norway" (Bergens Museum Aarbog (1892) 1893, p. 12), tells us that "The specimens of *Synapta inhærens* which Danielssen and Koren (1882) mention from the Porsanger Fiord, long. 70° 54' N., have proved on my examination to be *Labidoplax Buski*," and also the specimens which Danielssen (1861) recorded under the same name from Vadsö.

GENUS CHIRODOTA, Eschscholtz.

Chirodota lævis, Fabricius. (Pl. XXVII. fig. 4.)

1780. *Holothuria lævis*, Fabricius, Fauna Grœnlandica, p. 353.
 1806. *Holothuria pellucida*, Vahl, in Müller, Zool. Dan. iv. p. 17, pl. cxxxv. fig. 1.
 1857. *Chirodota læve*, Lütken, Oversigt over Grønlands Echinodermata, p. 16, figs. 2-4.
 1861. *Chirodota pellucida*, M. Sars, Oversigt af Norges Echinodermter, p. 124, pls. xiv.-xvi.
 1867. *Chirodota typica*, Selenka, "Beit. z. Anat. und System. der Holothurien," Zeits. f. wiss. Zool. vol. xvii. p. 366, pl. xx. figs. 126, 127.
 1867. *Chirodota tigellon*, id. ibid. p. 366.
 1881. *Chirodota lævis*, Duncan & Sladen, Memoir on the Echinodermata of the Arctic Sea to the West of Greenland, p. 12, pl. i. figs. 14-19.

Dredged in the Varanger Fiord in 125-150 fathoms; and also in Lang Fiord, within the narrows, in 5-30 fathoms.

Its range extends from N.E. America and Labrador coast, Greenland, and Spitsbergen, to the Murman coast and Kara Sea.

The illustrations in M. Sars's work of this species are extremely good; nevertheless, if the wheel-deposits as figured by him be compared with the figure given by Duncan and Sladen, I think it will be conceded that, if corresponding wheels were found in a fossil state, or had such apparently

different spicules been procured from different parts of the world, it would be believed that they belonged to different species. The fact is that the figures of Sars do not represent the fully adult wheel, while that figured by Duncan and Sladen is quite mature. In the latter condition the calcareous deposit is much more developed, the central and narrow portions of the spokes have the greatest thickness, and the rest of the spokes the next greatest thickness; while the spokes themselves have been widened and a considerable part of the intermediate spaces have been filled up with later and thinner deposit; the crenation of the rim is not very easily seen.

Genus MYRIOTROCHUS, Steenstrup.

Myriotrochus Rinkii, Steenstrup. (Pl. XXVII. figs. 5-9.)

1851. *Myriotrochus Rinkii*, Steenstrup, Videnskab. Middel. fra den naturhist. Forening i Kjöbenhavn, p. 55, pl. iii. figs. 5-7.

1852. *Chirodota brevis*, Huxley, Sutherland's Voyage Baffin's Bay, vol. ii., Appendix, p. cexi.

1877. *Myriotrochus Rinkii*, Theel, "Quelques Holothuries des Mers de la Nouvelle Zemble," Nov. Acta Reg. Soc. Sc. Upsala, ser. iii. p. 3, pl. i.

1881. *Myriotrochus Rinkii*, Duncan & Sladen, Memoir Echinodermata of the Arctic Sea to the West of Greenland, p. 15, pl. i. figs. 20-24.

1882. *Myriotrochus Rinkii*, Danielssen & Koren, Norwegian North-Atlantic Exped., Holothuroidea, p. 28, pl. v. figs. 1-4, pl. xiii. fig. 1.

1892. *Myriotrochus Rinkii*, Ludvig, "Die Rädchen der Synaptiden," Zeits. f. wiss. Zool. vol. liv. p. 358, pl. xvi. figs. 12-14.

1900. *Myriotrochus Rinkii*, Ludvig, Fauna Arctica, p. 160.

1902. *Myriotrochus Rinkii*, Östergren, "Holothuroidea of Northern Norway," Bergens Mus. Aarbog, no. 9, p. 14.

Ludvig and other recent authors have united *Oligotrochus vitreus*, M. Sars (Fauna littor. Norveg. part 3, 1877, p. 49, pl. vii. fig. 1), with *Myriotrochus*; but Östergren, in his recently published paper, again separates them. He has examined a large number of specimens, and his opinion I here follow, though not without much doubt. I have frequently taken the form *Oligotrochus vitreus* in West Norway, but on now examining them I can find no spicules; they have evidently from some cause been destroyed. Not having it in my power therefore to carry out such an investigation as that made by Herr Östergren, I am in no position to call in question the justice of his view. While *Myriotrochus* (= *Oligotrochus*) *vitreus* lives in deep water on the west and south coasts of Norway, *Myriotrochus Rinkii* (typical) has only now, in Östergren's paper, been added to the fauna of the colder fiords of West and East Finmark.

I dredged *Myriotrochus Rinkii* in 1890 in 2-5 fathoms in Klosterelv Fiord, and in 5-30 fathoms in the inner part of Lang Fiord.

The two forms above referred to are the only known recent representatives of the genus; but M. Schlumberger has described under the name *Stueria elegans* ("Note sur les Holothuridées du Calcaire Grossier," Bull. Soc. Géol. de France, sér. 3, vol. xvi. p. 440, figs. 12-14) spicules which it seems difficult to distinguish from those of the recent form. In a subsequent paper ("Seconde Note sur les Holothuridées fossiles du Calcaire Grossier," *l. c.* vol. xviii. p. 191) M. Schlumberger refers the species which he had previously described to the genus *Myriotrochus*, and adds a second fossil species, *Myriotrochus operculum*.

The wheel-spicules of *Myriotrochus Rinkii* are very beautiful objects. Most of the illustrations which have been already given are not fully satisfactory, as not giving a side view; but the oblique figures of Ludvig (figs. 12 & 13) are excellent. His fig. 14 seems to have been drawn from a specimen in which calcification has been carried further than in any specimen previously figured or in any that I have myself seen. The spokes have widened at the middle of their length and become united with each other, but small intervening spaces remain open near their junction with the central boss.

In the early stage of a wheel from the central boss there are developed all round radiating bars or spokes (fig. 5). These spokes at their distal extremity then widen out laterally, and, uniting with each other, form the tyre which completes the wheel; then from the upper and inner edge of the tyre a series of triangular processes are projected horizontally inwards, and overhang the spokes which are attached to the other edge of the tyre; these triangular lobes are always somewhat more numerous than the spokes. The structure will be best understood by comparison of the figures here given—fig. 6 representing the upper, fig. 7 the under surface, and fig. 8 the wheel as seen obliquely. The spokes at their attachment to the central boss are bent slightly upwards, and then with a gentle arching curve downwards and ultimately upwards again they form junction with the tyre*. The double bend of the spokes, which is very elegant in itself, keeps the entire thickness of the wheel as seen from the side (fig. 9). I do not find any material difference in the wheels of this species as found in East Finmark when compared

* Ludvig's fig. 13 admirably illustrates the double curve of the spokes.

with others in my collection from Greenland; the number of spokes in the Finmark specimens ranges from sixteen to twenty-one.

GENUS *TROCHODERMA*, Theel.

Trochoderma elegans, Theel.

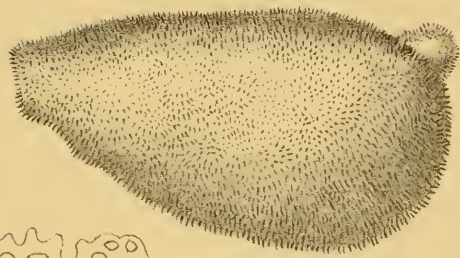
1877. *Trochoderma elegans*, Theel, "Quelques Holothuries des Mers de la Nouvelle Zemble," Nov. Acta Reg. Soc. Sc. Upsala, ser. iii. p. 11 (separate copy), pl. ii.

This genus, like the last, is furnished with wheel-like spicules, but the tyre is rounded and armed with spines instead of furnished with triangular inward-directed processes, as in *Myriotrochus*.

Östergren writes:—"I have now before me a specimen of this species which is new to the Norwegian fauna; it was obtained by G. O. Sars at Mortensnes, in the Varanger Fiord" ("Holothuroidea of Northern Norway," Bergens Mus. Aarbog, 1902, p. 21).

EXPLANATION OF PLATE XXVII.

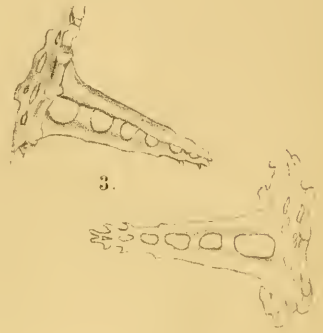
- Fig. 1.* *Eupyrgus scaber*, Lütken, magnified; the actual length indicated by the line below.
- Fig. 2.* The same. Spicules as seen from above.
- Fig. 3.* The same. Spicules as seen from the side.
- Fig. 4.* *Chirodota lavis*, Fabricius. A spicule.
- Fig. 5.* *Myriotrochus Rinkii*, Steenstrup. Wheel-spicule in early stage of development.
- Fig. 6.* The same. Wheel-spicule seen from above.
- Fig. 7.* The same. Wheel-spicule seen from below.
- Fig. 8.* The same. Wheel-spicule seen obliquely.
- Fig. 9.* The same. Wheel-spicule seen from the side.



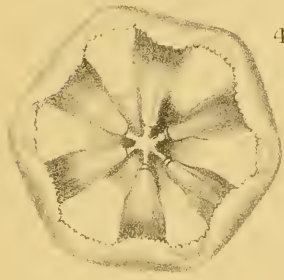
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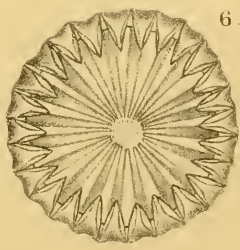
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3.



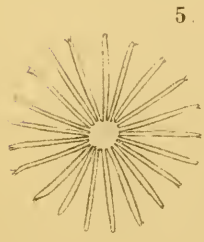
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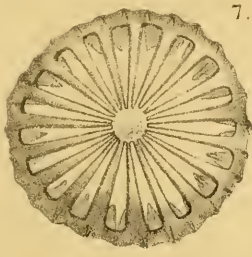
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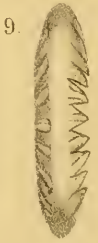
8.



5.

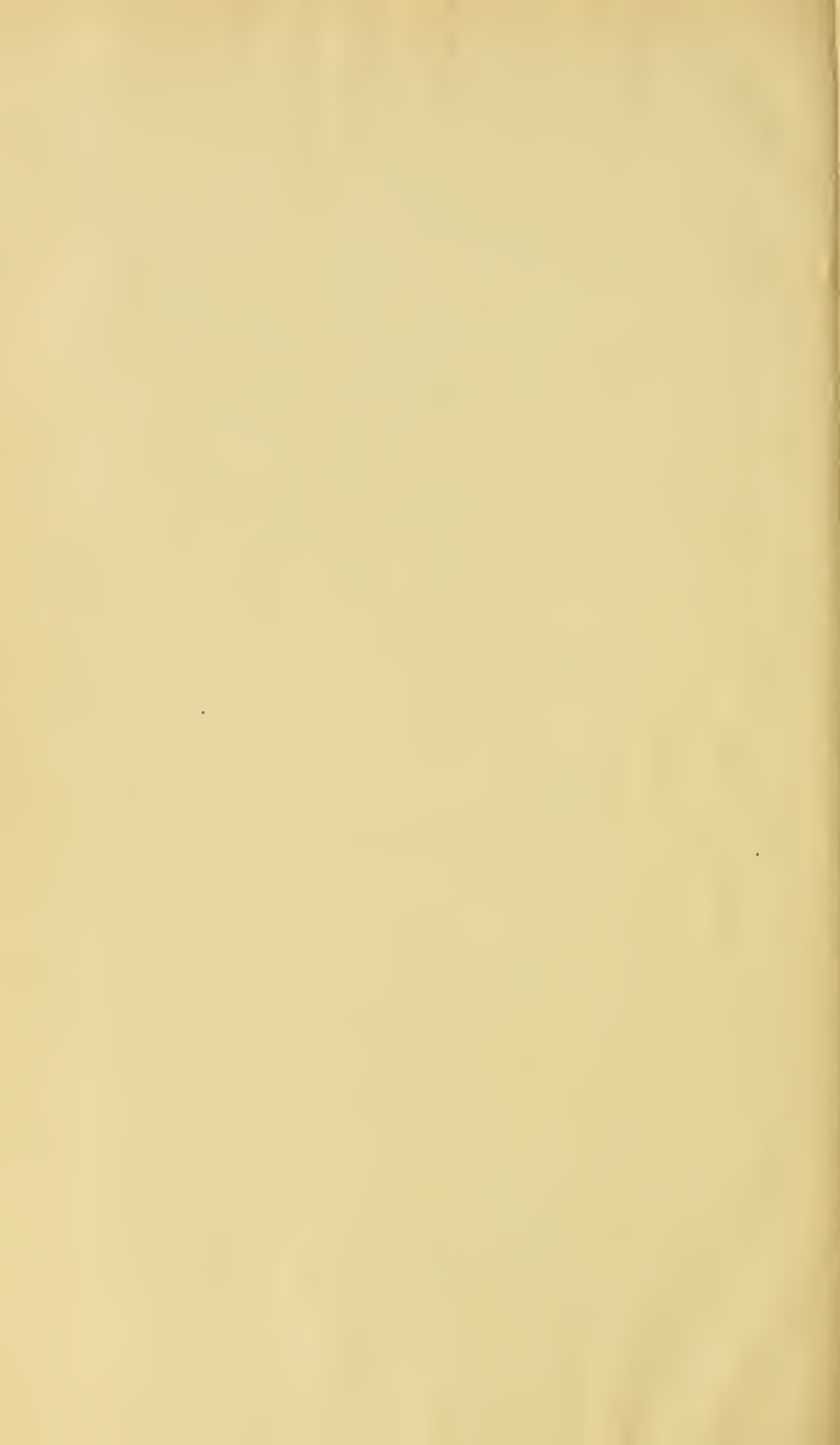


7.



9.

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