Sent with the compliments

of Dr. Charles H. Blake

BIOLOGICAL SURVEY

OF THE

MOUNT DESERT REGION

Conducted by

WILLIAM PROCTER

Research Associate in Marine Biology,
Academy of Natural Sciences
of Philadelphia

PART V

A report of the organization, laboratory equipment, methods and station lists together with a list of the

MARINE FAUNA

with descriptions and places of capture. To which is added a list of the Arachnida and other non-marine forms.

Parts II, III and IV bound herewith

From the Laboratory of

THE BIOLOGICAL SURVEY OF THE MOUNT DESERT REGION
Corfield, Bar Harbor, Maine

Published by
THE WISTAR INSTITUTE OF ANATOMY AND BIOLOGY
Philadelphia

1933

To my wife

EMILY

without whose sympathy and encouragement I could never have re-entered the field of Natural History.

ILLUSTRATIONS

The plates and figures of the Bryozoa are not listed here, but are referred to in the Report on that group. Also the plates and figures in Parts II, III, and IV are not included in the list.

ACKNOWLEDGMENTS

Working in a field of this kind, one receives many kindnesses and much help, and I am very grateful to many for assistance, without which I should have been unable to carry on the survey.

First, I wish to speak of my great loss in my friend the late Charles W. Johnson, Curator of the Boston Society of Natural History. Rarely does one meet with such a man—the old type of naturalist. Scholarly, and with rare appreciation of the beauties of nature, he was always ready to draw on his fund of scientific knowledge to help others. We joined in publishing our first report and had been working together toward amplifying the census of the insects of the Island. My thanks are due to Miss Mary E. Cobb, Librarian of the same Institution, for her interest in sending books of reference; and I wish here to express my appreciation of the custom of the Trustees of the Boston Society of Natural History in lending books of reference during the summer; and to draw the attention of others to the great help that their lending of books is to workers who are far from a large reference library.

To my friend Dr. Milton J. Greenman, Director of The Wistar Institute of Anatomy and Biology, Philadelphia, for his help and criticism, to say nothing of his assistance in placing The Wistar Institute Press at my disposal, which has made the printing of the reports possible, I am most grateful. I also wish to thank the staff of The Wistar Institute for their interest in getting out the publications. Miss Elizabeth L. Betten, of Newport, Rhode Island, whose gift of books and pamphlets from the library of her uncle, the late Dr. Wolcott Gibbs, has been of great assistance. Mr. Dwight Blaney, whose kindness in furnishing me with type specimens of Mollusca, has saved many hours of work. Dr. A. L. Treadwell for his kindness in identifying many of the marine worms; Dr. W G. Van Name for his assistance on the Ascidians;

Dr. H. W. Shimer for his assistance with the classification of the Brachiopoda occurring in this region. The Museum of Comparative Zoölogy, Cambridge, for the loan of books of reference; Dr. A. F. Huettner, of New York University, for his advice and for the plate of Aporrhais; Dr. W. J. Clench; Dr. Waldo L. Schmitt, Dr. J. P. Moore, and to Profs. E. B. Wilson, T. H. Morgan, G. N. Calkins, J. H. McGregor, Dr. A. H. Sturtevant, Dr. F. Schrader, and Dr. D. E. Lansfield, for their many kindnesses when I was working in Columbia University.

In connection with the actual work in the field and laboratory, I owe much to the great interest taken by Dr. Charles H. Blake, who has been one of the staff of the Survey from the beginning and has been the one to whom all have turned for help of various kinds. In addition to his own work, he has revised and edited the notes on many of the other forms, and what success we have had is due in a great measure to his interest.

I also wish to express my appreciation of the difficult and exacting work of Dr. S. J. Conrad, of the staff, in developing the technique of the Bryozoa drawings (the drawings speak for themselves), and his interest in making the Survey a success; and to Mrs. E. J. Glidden, who has acted as Secretary to the Survey for 3 years, for her painstaking care in the important part of typing and reading the proof. I am deeply grateful to Dr. Raymond C. Osburn, of Ohio State University. Doctor Osburn took all of our material and drawings and wrote the report on the Bryozoa. His kindness made the inclusion of this group possible and the fact that he did it gives the stamp of authority. In his report he thanks Dr. Anna B. Hastings, of the British Museum of Natural History. I wish to add mine for the time and interest shown. I am also glad to express my appreciation of what Miss Rogick did in helping with the drawings.

Fig. 1 Chart Mount Desert Island Region.

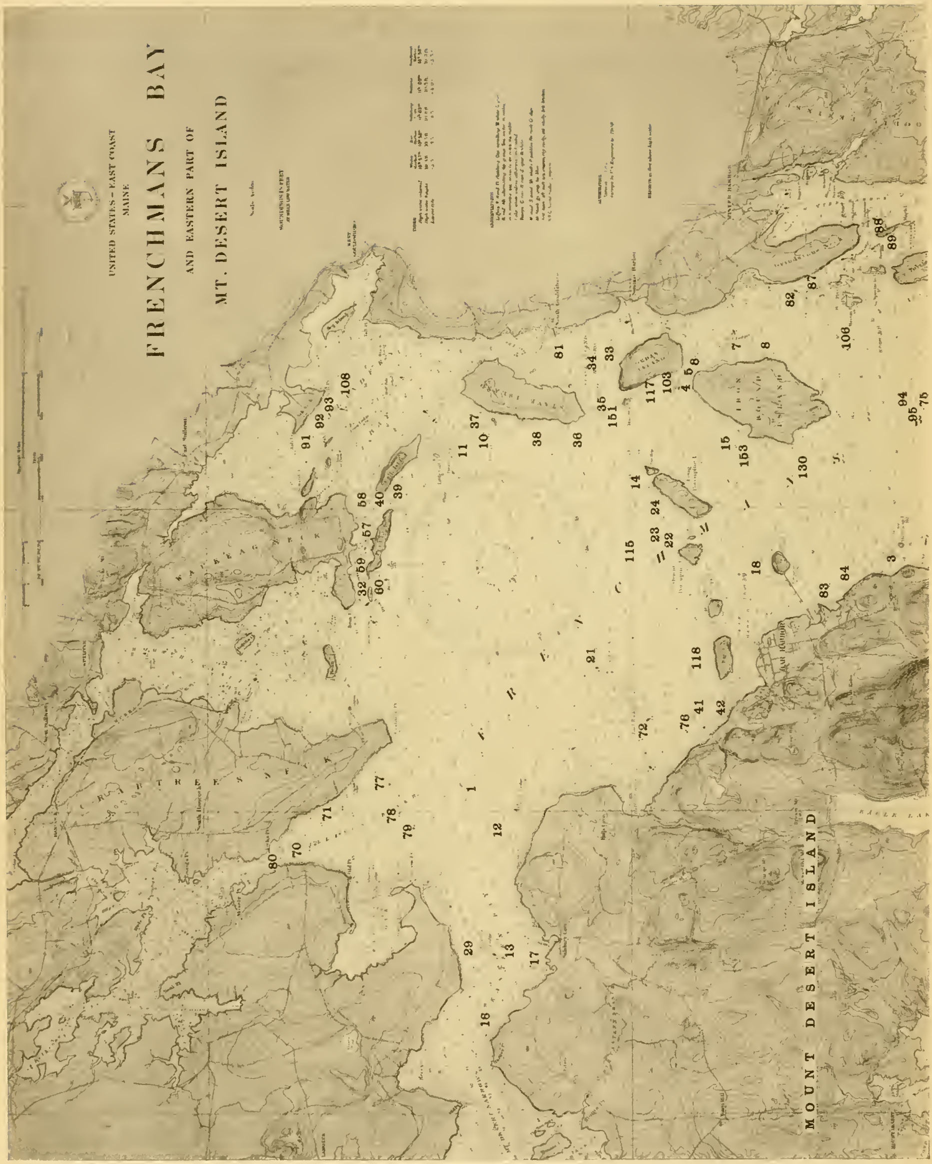

UNITED STATES – EAST COAST
MAINE
FRENCHMANS BAY
AND EASTERN PART OF
MT. DESERT ISLAND
MOUNT DESERT ISLAND

Fig. 2 Chart Mount Desert Region—eastern side, showing dredging stations.


MANUFACTURED BY
THE NATIONAL SURVEY CO.
MAP
OF
MOUNT DESERT ISLAND
☆ MAINE ☆
SHOWING
ACADIA NATIONAL PARK
PUBLISHED BY
H. DUANE HIGGINS
SOUTHWEST HARBOR, MAINE
TELEPHONE 57
PRICE 60 CENTS
ROADS
CARRIAGE ROADS
PATHS
Park Limits
1929 EDITION
TOWN OF TRENTON
Auto route No 183
Ellsworth
F R E N C H M A N B A Y
E A S T E R N B A Y
W E S T E R N B A Y
Goose Cove
Alley Island
HULLS COVE
SALISBURY COVE
TOWN OF BAR HARBOR
BAR HARBOR
CORFIELD LABORATORY
EAGLE LAKE
TOWN OF MOUNT DESERT
HALL QUARRY
S O M E S
Burnt Porcupine I.
Bald Rock
Union River Bay
Oak Point

Fig. 3 Map of Mount Desert Island, showing shore stations.


UNITED STATES – EAST COAST
MAINE
FRENCHMANS BAY
AND EASTERN PART OF
MT. DESERT ISLAND
BLUE CLAY
ROCKY
GRAVEL SHELL
SOFT
HARD
FRENCHMAN
BAR HARBOR

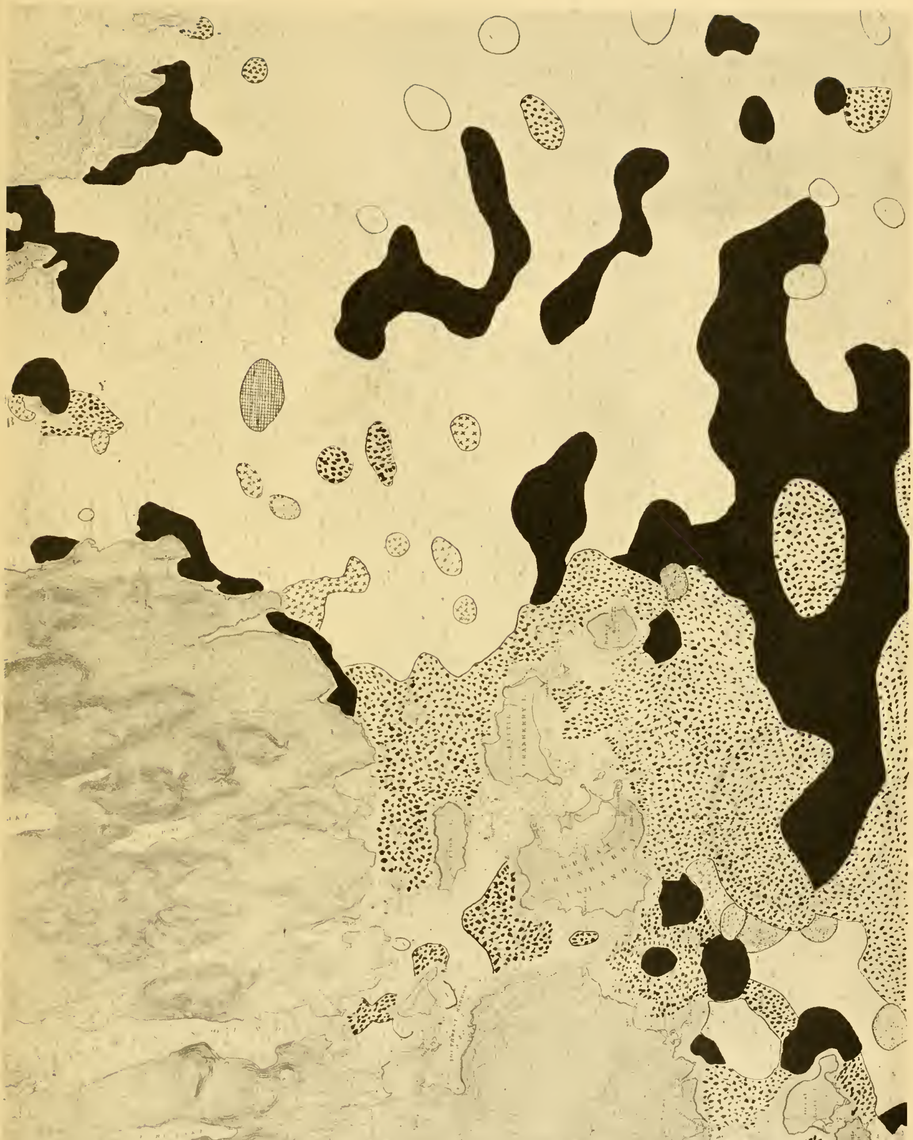


Fig. 4 Chart showing kinds of bottom.

FOREWORD

*"Every kingdom, every province,
should have its own monographer."*

—GILBERT WHITE, Natural History
of Shelborne, 1789.

No science can afford to neglect or ignore systematic work. Without systematic work no science can advance. It is therefore unnecessary to explain why I undertook to make a Survey of this Region.

Impressed by the fact that the Natural Sciences could not have reached their present status unless supported by the interest of the general public, and aware of the great amount of knowledge that has been added by those who have made them their avocation, I have endeavored to set forth a picture of the Region that will assist the young Corinthian and, at the same time, give the specialist information to which he may refer.

An idea that I have kept firmly in mind has been to plot as accurately as possible the place where each form was taken so that anyone wishing to collect them for biological purposes in the future may be able without extra expense or loss of time to get what he wishes. There has been far too much secrecy as to where one may collect material.

To one who wishes to understand or work on the fauna of this Region, I particularly recommend the following authors. Observations on the Glacial Phenomena of Labrador and Maine with a view of the recent Invertebrate Fauna of Labrador, A. S. Packard, 1865. Report upon the Invertebrate Animals of Vineyard Sound and Adjacent Waters, A. E. Verrill and S. I. Smith. U. S. Fish. Com. Report, 1871–1872. Physical Oceanography of the Gulf of Maine, Henry B. Bigelow, Bur. Fisheries Doc. 969, 1927. Catalogue of the Marine Invertebrata of Eastern Canada, J. F. Whiteaves, Geol. Survey of Canada, 1901. Publications of the Boston Society of

Natural History, and last, but not least, The Sea-beach at Ebb-tide, by Augusta Foote Arnold, that so-called 'popular' work which belies its critics by being so well thumbed in all laboratories.

After a summer's spotting of the territory with a hand dredge, I organized the Survey and started work in the spring of 1926 and have continued the work each year, from the last week in June until the first week in September, up to the present time. It has been my aim to publish the results as the work progressed and there have already been issued the following parts:

Part 1. INSECTA—The insect fauna, with reference to the flora and other biological features, by Charles Willison Johnson, Boston Society of Natural History. 247 pages, 1 portrait.

Part 2. FISHES—A contribution to the life-history of the angler (Lophius piscatorius), by members of the Survey Staff. 30 pages, 5 heliotype plates, 3 maps.

Part 3. CRUSTACEA—New Crustacea from the Mount Desert Region, by Charles H. Blake, Massachusetts Institute of Technology. 34 pages, 15 text figures.

Part 4. VERMES—Three new species of worms belonging to the Order Echinodera, by Charles H. Blake, Massachusetts Institute of Technology. 34 pages, 8 text figures.

This volume covers the following forms. In it have been bound Parts 2, 3, and 4 which were originally issued in pamphlet form.

CLASSIFICATION OF ANIMALS

recorded by the Biological Survey of the
Mount Desert Region

Phylum PROTOZOA

Class RHIZOPODA
Order FORAMINIFERA

Phylum PORIFERA
Order MONAXONIDA

Phylum COELENTERATA

Phylum CTENOPHORA

Phylum PLATYHELMINTHES
Class TURBELLARIA

Phylum NEMERTINEA

Phylum ASCHELMINTHES
Class ECHINODERA

Phylum BRYOZOA

Phylum BRACHIOPODA

Phylum ANNELIDA

Phylum ECHINODERMATA

Phylum MOLLUSCA

Phylum ARTHROPODA

Phylum CHORDATA

When the Survey is completed, the original records together with the type specimens will be deposited with The Academy of Natural Sciences, Philadelphia.

This publication is not intended to be a complete list of all species which have been recorded from this district, but only such as have been found as a result of the work carried on by the Survey or for which the exact locality of capture is known. All references or records which appear to be in any way questionable have been deliberately omitted. It is hoped that in the further work of the Survey some forms which should be found in this latitude will be checked up. This seems preferable to entering a record which may be false and less readily corrected.

In connection with the comparatively few references given, it is well to call attention to the ever-widening circle of references. Each reference which we give is in itself a source of additional earlier references, and each of those is a source of still further references, so that one very soon, by following out this circle of references, gets in contact with the bulk of literature on a given field.

It has not, however, been thought necessary in all cases to give a detailed description, as it would be merely a repetition of information published elsewhere. By supplying in each case a reference to a good description taken from a recognized monograph of a group, preference being given to one with illustrations, I consider that this phase of the work has been amply covered; and concerning the question of nomenclature we have endeavored to eliminate all error as regards the precise species which the name is intended to indicate.

With the exception of the Foraminifera, Echinodera, Hirudinea, and Arthropoda, which have been identified by Dr. Charles H. Blake, I have personally checked up or identified all the species herein classified and described. In cases where there was the slightest doubt the specimens were submitted to a specialist for critical examination. I am therefore perfectly confident that the animals dredged by us have been accurately identified.

The users of Surveys might well be warned to beware of traditional identifications. These are of two kinds: First, that the names used in any given survey are necessarily fixed. This, of course, is not true. Zoölogical names change from time to time, sometimes for good and sometimes for insufficient reasons. Secondly, the publication of one or more species as occurring in a region is obviously no proof that those are the only species in that particular group which do occur.

We have been careful in these publications to hold to the original names of places that have come down since they were first given. We have paid no attention to some fanciful names recently given. The mountains on the island that have gone down in zoölogical literature under their original names have been renamed and with what imagination! One huge mass of granite now bears the name of 'Flying Squadron'!

The Foraminifera, Platyhelminthes, Echinodera, and Arthropoda were identified and the notes written by Dr. Charles H. Blake. The sorting and measuring of the spicules of the Porifera was done by Dr. Edwin R. Helwig, who also looked up literature on this group; the notes were edited by Dr. Charles H. Blake. Doctor Helwig also listed the Coelenterata and Echinodermata. The Nemertinea, Polychaeta, Oligochaeta, and Gephyra were assembled and sorted by Dr. Victor C. Twitty, Dr. J. E. Morrison, and Philip B. Powers, and some of the notes written by Mr. Powers. I am greatly indebted to Dr. A. L. Treadwell for identifying the Vermes material of our first three years' collecting, which was most helpful in the later years, also for his counsel and the scheme of general classification which has been followed. The Hirudinea were identified by Dr. J. E. Morrison and Dr. Charles H. Blake and the notes written by the latter. The identifications of the Chordata were made by Dr. Henry C. Tracy. The Mollusca were identified and notes written by William Procter.

The following list shows the species which have been taken by the Survey and which are new to the New England region. Some of these species are, of course, new to a still wider area, which can be determined from the text. For the Bryozoa please refer to Doctor Osburn's report.

This list also includes the species new to science which were described in the course of the work of the Survey.

The present general list of the Survey includes the following new forms in Ostracoda: The genus *Cushmanidea,* the subgenus *Pterygocythereis,* and the species *Leptocythere augusta.*

PROTOZOA

FORAMINIFERA

Crithionina pisum
Proteonina difflugiformis
Tholosina bulla
Hippocrepina indivisa
Saccorhiza ramosa
Quinqueloculina fusca
Massilina secans
Nodosaria filiformis
Lagena gracillima
  perlucida
  substriata
Globulina glacialis

PORIFERA

Halichondria genitrix
  fibrosa
Eumastia sitiens
Reniera cinerea
  heterofibrosa
  ventilabrum
  urceolus
Esperiopsis quatsinoensis
Mycale lingua
Myxilla incrustans
  fimbriata
Tedania suctoria
Stylotella simplissima
Iophon chelifer
Suberites montalbidus

COELENTERATA

HYDROZOA

Obelia gracilis

ASCHELMINTHES

KINORHYNCHA

Pycnophyes frequens
Trachudemus mainensis
Echinoderella remanei

ANNELIDA

POLYCHAETA

Spinther miniaceus

GEPHYREA

Phascolosoma minutum

ARTHROPODA

CRUSTACEA

CLADOCERA

Ophryoxus gracilis

COPEPODA

Zaus abbreviatus
Parathalestris jacksoni
Robertsonia tenuis
Cyclopina norvegica
Artotrogus orbicularis
Doropygopsis longicauda
Cryptopodus amarouci
Sphaeronella photidis
pilosa
caprellae

OSTRACODA

Philomedes globosus
Asterope abyssicola
Limnocythere reticulata
Cyprideis sorbyana
Cytheretta tracyi
Eucythere declivis
Cythere lutea
Leptocythere angusta
castanea
Palmenella americana
Cytheris procteri
leioderma
(Pterygocythereis) inexpectata
Cytherura undata
striata
Cytheropteron pyramidale
alatoides

ISOPODA

Gnathia cristata
Cirolana impressa
Pleurogonium rubicundum
inerme
Desmosoma lobiceps

AMPHIPODA

Orchomenella groenlandica
Harpinia laevis
Metopa hirsutimana
Casco bigelowi
Gammarus duebeni
Ericthonius difformis
hunteri
Corophium volutator
crassicorne
bonellii
Dulichia falcata
Paradulichia secunda
Mayerella limicola

CUMACEA

Ekdiastylis cornuifer
Eudorella difficilis

DECAPODA

Spirontocaris zebra

PYCNOGONIDA

Nymphon rubrum

CHORDATA

ASCIDIACEA

Synoicum pulmonaria

TERRITORY

The Mount Desert Region named in these publications is the territory of the Island of Mount Desert, Maine, and its immediate surroundings in the extreme northeastern part of the United States. Latitude 44° 20′, longitude 68° 20′. In this area of approximately 100 square miles is found a combination of sea and mountains with accompanying bays, rivers, brooks, lakes, swamps, valleys, and flats, that is not found in any other place on the globe.

In the center is the Island whose mountains rise from the sea to a level of over a thousand feet. Between mountain peaks numerous lakes are found; some at a considerable elevation, while others are lower. Approaching the sea level, swamps or 'heaths' are formed, where the water is fresh from the land drainage above or salt from the sea's penetration.

Outside is the open ocean, while between it and the Island are smaller islands forming a sheltered thoroughfare and the harbors of Seal, Northeast, Southwest, and Manset; and from there the fjord called Somes Sound penetrates toward the center of the Island for some miles.

On the east the open waters of Frenchmans Bay are checked in their sweep by smaller islands which, with Mount Desert Island, enclose a large stretch of water between them and the mainland to the north, and on which Bar Harbor is located. This bay is quite distinct biologically from the waters to the south.

Into the bay flow several brooks. Some are real brooks draining adjacent terrain, while others are tortuous channels from the sea extending many miles inland with a swift current moving one way or the other, due to the shifting tides which rise and fall normally about 10 feet. On the mainland toward the north are brooks and lakes, varying in accordance with their method of formation.

Still farther to the west, and beyond the Narrows, is the Western Bay. Fed by several large brooks and the Union River, the life here is in many ways quite different from that in Frenchmans Bay.

The belief that a region possessing such a variety of environmental conditions in a limited area, while situated on the northern line of the transitional zone of the Austral and the southern line of the Boreal region, should offer an exceptional opportunity for biological research was what caused me to undertake this Survey.

Only by studying a chart showing the depths, banks, and adjacent coast lines can anyone appreciate fully the landlocked character of the Gulf of Maine. The character of the Maine coast is influenced mainly by the tides of the Bay of Fundy and one might say with slight exaggeration that Mount Desert Island lies just off its mouth. Test dredgings made in Chalmers Bay north of the Moos-a-bec Reach showed a marked difference in forms, particularly in the sea-weeds, from an average haul in Frenchmans Bay.

The climate of the Island has a July average of 65° F., a January average of 24°F., and a yearly average of 43°F. Our records show a 6-year average for the months of July and August of 58° for the surface and 48½° for the bottom. The annual precipitation is 43 inches, evenly distributed throughout the year.

On looking at the shores of this region, one is struck by the marked difference in their heights, which range all the way from mud flats to precipitous cliffs, one of them being the highest headland on the Atlantic coast.

The conditions of the inner bay differ from those in the outer bay chiefly in respect to the force of the action of the waves and the circulation of the water, the water of the inner bay being greatly modified by the Porcupine Islands. In such manner are the waters of the thoroughfare between Mount Desert Island and Cranberry, Greenings and Suttons Islands sheltered.

Due to this and the nature of the rocks, there are no tide pools on the inner side of the Porcupine Islands. On the other hand, the tide pools on the outer side of the Porcupine Islands, subject as they are to heavy wave action, are among the best in the region and equalled only by the tide pools on

Fig. 5. Mud flats and mussel beds near Narrows. Upper part of Bay.

Fig. 6 Cliffs on outside of Long Porcupine Island. At their base are some of the best pools.

the extreme southwestern shore of the Island in the vicinity of Ship Harbor, and along a stretch of reef between Southwest Harbor and the southwestern shore of the Island.

The character of the rocks plays a very large part in the formation of the tide pools, for while the granite is formed into them by wave action the sedimentary rock, flaggy slate and shale, through the action of the waves and frost splits off and prevents their formation.

Unlike the region further south, the collecting along the shore of the estuaries discloses some of them to be almost barren of forms on account of the large amount of clay silt that is washed down and the absence of sandy beaches. This is also true of many of the flats where the mud has covered the original stones and sand that indications show must have been what they were before they became covered with a thick layer of mud.

The shores of the Region, of course, are constantly changing, and this is particularly true of the flats and beaches in the inner Bay and the upper part of the Western Bay. The change is noticeable even in the 12 years that I have been watching them, and as an example of this the taking of *Venus mercenaria* is interesting.

In looking over some old maps of Mount Desert Island in 1921 I noticed the name Quahog Bay given to one of the places on the west side of the Island and, thinking that it might have acquired the name from the fact that quahogs were found there, I searched but did not find any nor did I find them in any of the coves up the west side of the Island until I reached the most northwesterly one at a place called Clark's Cove, where I took one in 1927. In the field work of the Survey we took another in August, 1928, a very large one (125 mm.), and later I took a pair of dead valves. The records show that part of this Cove was at one time called Sand Beach and on digging down one finds that there has been a sand beach which has gradually become silted over with mud. This probably accounts for the fact that only large individuals were found and no indication of young.

Fig. 7 A tide pool with sea coming in.

Fig. 8 Same pool with sea receding.

Fig. 9 A tide pool in the granite rocks near Ship Harbor. South side of Island.

Fig. 10 Same pool showing tide setting in. Note the sea urchin Strongylocentrotus drobachiensis.

Venus mercenaria has never been reported in Maine north of Casco Bay, though a common species of the shallow southern and warmer regions of the eastern coast of Canada; and yet at one time it must have been fairly well distributed on the sand beaches. It has gone with the sand beaches and is a striking example of the changes that go on in the fauna of a region even within the lifetime of an individual. Expert opinion put the age of the animal we took at 40 years, and so about 40 years ago the sand beaches which are now covered with mud must have been exposed, for this animal could not have lived there and reproduced. They could have lived there, as some of them have for many years, but they would gradually die out, for the spat could not live in the mud. About 50 years ago heavy cutting of timber took place on the upper reaches of the three branches of Union River, and the subsequent burning and erosion filled this river with silt and is still filling it, and the result has been a gradual covering of the beaches and filling up of the inner bay by the soft mud carried down. This mud is so soft that from certain places in the Bay a fine mesh dredge holding two bushels can be hung in the water at the surface and towed around and washed out, and there will not be more than a handful of old shells left. It is practically barren of life. The same thing is true of parts of Somes Sound. This Sound is full of mud from one end to the other and in one or two places there are ridges or peaks extending up from the bottom that rise like small islands above the level of the mud. On these are found the more common forms, while elsewhere in the Sound, particularly in the upper part, there are large areas almost devoid of life.

The one sandy beach of the Island is on the eastern side and faces toward the south. Contrary to what one would expect, this is a very barren locality, for the southern storms drive the shells in toward it and break them up and the constant movement of these shells really grinds the life out of everything that would be there. The sand itself is composed almost entirely of finely ground shells. The nearest beach is about 30 miles north of the mainland.

One is struck also by the three forms which predominate and impress themselves upon one's attention. The first are the large masses of the common barnacle which covers the upper zone from high tide down, and directly below them or near half tide down to low-water mark hang the great clusters of olive brown rock weed, *Fucus nodosus.* This beautiful weed, which reaches its prime in August, either hangs from the rocks or lies flat upon their surface when left by the tide, but is floated up by means of its abundant air vessels when the tide rises. Third is the lower zone of the mussel *Mytilus edulis.* Nowhere are the three zoölogical zones of Balanus, Fucus, and Mytilus more clearly marked.

We know that certain places have certain depths, that in some spots there is certain bottom, but it gives no real idea of the bottom of the sea. Imagine an airship dropping a dredge to the earth's surface and dragging it or a net across the country, while below them a mass of clouds would hide the earth and no one could see where the dredge was going. Would such a history, based upon what the dredge would bring up, give a true picture of animal life in detail? Of course it would not, and yet by such methods alone do we know anything of the ocean's floor and its inhabitants. It is marvelous that we have learned so much, and what we do know has been accomplished bit by bit by persons whose interest has led them to carry on the work. For years the United States Government carried on this work through the Fish Commission, but of late years it has been stopped, and what work has been done has been carried on by private individuals, but not along the Atlantic coast, for there is always a romance connected with things far away from home.

Moreover, a great many of the more active creatures are apt to escape the slow-moving dredge, while others deep in the crevices are passed over. It is therefore highly probable that the animals we obtain by this method are no more representative of all of the denizens of the deep than land animals captured in the same way would be typical of the living creatures which inhabit the earth.

This brings up the question of rarity. We hear constantly that certain creatures are rare. Is this so or does it just mean that they happen to be scarce in some particular place or that they are not easily found? They certainly must be in abundance somewhere or the continuance of the species would not go on. The truth probably is that the dredge that has been scraping the bottom has missed one of the centers of population.

Take as an example the mollusk *Panomya arctica,* which gets down into crevices in the rocks. We were given one adult by a fisherman who was dragging for scollops, and in one of our dredgings we took several very young specimens embedded in a lump of hard clay which the dredge tore from the bottom. They undoubtedly occur in abundance, but their habit of getting into crevices prevents the dredge from dislodging them. Some of the Ascidians which attach themselves to ledges must be far more numerous than the dredgings would indicate.

Then again, we have the questions of seasonal distribution, of temperature and depth, and the combination of the two. Some years the waters will be filled with the Medusa *Aurelia flavidula,* while in others there will be only a moderate amount. This, however, I have noticed to be connected with the movement of anchor ice on the shores which had destroyed the sessile winter forms. Some years we have large numbers of *Cyanae arctica* floating in the Bay and at times these have become quite large. One year, dozens of individuals were cast up on the shore of Frenchmans Bay averaging close on to 3 feet in diameter, while the average size is less than one-third of that. At times when the conditions are ripe, the Bay will be full of Ctenophores, while we see very few at other times.

This was most strikingly demonstrated in August, 1931, in the inner Bay. Early in the month we noticed a slight red coloration in the Bay between Stave and Jordan Islands. The summer weather was abnormal with temperature far above the average for the month and a complete lack of intervening cool days, with less wind than had been on the Bay for 10 years. The surface temperature, therefore, raised and remained undisturbed, and this protozoan divided at such a rapid rate that by the end of the month most of the Bay was red; so red that in swirling around the laboratory dock it looked as though blood had been poured into the water. Upon investigation this animal proved to be a protozoan closely resembling the fresh-water Halteria, and as far as we are able to find out it is of an undescribed species. This protozoan has undoubtedly existed in this region for many years, but the conditions for its rapid growth were not as favorable as in August, 1931.

Unfortunately, this protozoan has been described as a larva, and the statement published that it disappeared at night and that its presence was due to the large amount of food brought into the Bay in 1931. All of which may be disregarded, for 1931 was normal as to the brook flow; it did not disappear at night, and was not a larva but easily recognized as a protozoan.

SEA BOTTOM

The sea bottom of this Region, with the exception of parts of the inner Bay, is rock with patches of blue clay, of broken shells, of gravel, and of mud, and of various mixtures of these; and so much mud has been washed into the inner Bay that the greatest portion of it is soft, sticky, grayish-black mud that harbors but few forms compared with other bottoms. A study of our dredging shows that these patches are in all parts and because of the rock they vary in extent from a hundred yards down to a few feet, where a small crevice in the rock has been filled up.

Statements have been made that the inner Bay is affected by the flow of the rivers, but such is not the case, for these rivers are merely small brooks as far as fresh water is concerned, and the 'rivers' are simply long, narrow estuaries where the tide flows to and fro. As an example, in the case of the Skillings River, there are mussel beds and even a good scollop bed two miles above the so-called mouth, and the brook that flows into it is about 2 feet wide. The only river that affects this Region is the Union River, which flows into the Western Bay and has carried down the silt that has covered the beaches on the western side of the Island. The mud of the inner Bay is from the erosion of the clay banks of the shores which are constantly being worked upon by the ice which the tide moves.

However, wherever there is sand present, even in a small quantity, there is an immediate increase in the number of molluscs. This is particularly noticeable in the region between Suttons and Greenings islands, where in some cases there is more sand than mud. There the dredge will bring up a great number of molluscs and where more occur than in any other place. One dredging there has produced twenty-two species of molluscs alone, a thing that would not happen in any other part of the Region.

Figure 4 is a chart on which we have marked out in a general way the different types of bottom as we have found it from the dredging. It gives a far better idea of the Region than would a description in words. At the same time, we wish to draw attention to several features that will assist anyone looking for forms. From the chart it will be seen that there is not much use to dredge around in the middle of either the inner or outer Bay, for most of the forms are found near shore or near one of the hard-bottom or ledge areas. Particular attention should be paid to the blue clay patches which are extremely rich in fauna. While dredging patches along the edges, one can get all of the forms that would be found in the middle parts of the Bay.

The distance from the north side of the Island around to the western side prevented much work being done there, because the channel at the Narrows is filled up and is composed mostly of mussel beds and it is only at high tide that a boat may go through; therefore, one has to go all the way around the south side and return, making the trip too long. It is hoped that at some future time we may take this western territory and by making a temporary headquarters there for the boat, explore it thoroughly. Had this been attempted while working on other portions the amount of time consumed would have interfered seriously with the work.

EQUIPMENT

For the purpose of carrying on this work and furthering research in marine biology in this locality, I built a laboratory on my property 'Corfield' in Bar Harbor, with an adequate dock and other facilities. Inasmuch as there are but few marine biological laboratories in the United States, I think it well to devote a few words to a simple description of the laboratory, water system, boat, and equipment, so that anyone wishing to pursue this line of work in shallow waters may have the information at hand. All of the information on boats, dredging, and the like, refers to deep-sea work with large boats, wire rope, and heavy equipment; so when this work was contemplated I was obliged to design and lay out equipment that would suit our needs and could be handled by hand. The only thing one could be sure of was to copy the form of dredge that has been used since the time of Muller.

Inasmuch as we could feel the dredge by hand and circle around and loosen it when caught, I had some teeth riveted on to one of the edges as shown in figure 17, for use on soft bottoms. This dredge proved most satisfactory and I heartily recommend it to anyone working under conditions similar to ours.

The 'Lophius' is of 16 tons burthen, slightly over 55 feet in length with a 12-foot beam, and draws 3 feet 4 inches. Her lines were designed to bring about a quick recovery and withstand rough weather. This matter of recovery is a most important one, for it not only affects work on the boat and facilitates sorting of material, but it also keeps the dredge from jumping over the bottom and permits it to drag more evenly.

The boat is powered with a Sterling Chevron engine which gives her a cruising speed of 11 knots with considerable over if needed, while at the same time it can be throttled down to a very slow speed in order to dredge slowly when tide or wind were not sufficient to move the boat against drag of the dredge. The engine is set low in order to bring the weight where it should be and is covered by an engine house bolted to the deck so that it may be lifted off entirely and the engine removed for repairs if necessary.

Large gasoline tanks are set low and placed in zinc-lined sinks with drainage outlets to below water line in case of leakage. Ventilation for all this part of the boat is from two ventilators running down from the top of the bridge deck and then out of an opening at the stern. This entire space under the decks can be flooded at a moment's notice with carbon dioxide gas from a large tank carrying 300 pounds pressure and piped to all parts of the hold. I mention this as quite important because when dredging and moving slowly, by touching up the engine now and then, there is always a formation of gasoline vapor which must be taken care of. This danger of explosion was also taken care of by placing Oberdorfer mufflers on the carburetor, thus preventing the escape of any back-fire flame.

Fig. 11 Typical shore Frenchmans Bay.

The large open cockpit shown in figure 12 approximates 16 feet long, 9¼ feet wide at the forward end and 6½ feet wide at the stern, giving something over 130 square feet of space. The floor is heavily planked and sealed and made self-bailing by a good-sized outlet in each corner. In the center, slightly aft, there is an outlet $2\frac{1}{2}$ inches in diameter, going by a pipe straight through to the outside at the bottom. When the sorting table is placed in the cockpit a 2-inch rubber hose extends into this opening, and all can be washed through, carrying off mud and everything up to coarse gravel. This does away with clogged pipes and the deck is kept fairly clean. Upon returning to the wharf after a trip, the whole cockpit is flushed in a few minutes and washed down with fresh water through a hose. The thorough sealing of the cockpit ensures a constantly dry hull with no bilge.

The floor of the cockpit is 2 feet 10 inches below the combing, which was found to be the proper distance in order not to lose one's balance when handling the dredge or doing other work that meant leaning over the side in a sea.

The picture shows what the boat looks like and so the only other description necessary is that she has a good-sized galley forward, and aft of that a saloon with berths for four men and wash room, lockers, etc. The enclosed bridge deck has ample space for charts and instruments and drawer lockers under a seating space sufficient for everyone in inclement weather. I may say, that were I to rebuild I would not change things in any way. All one needs for this kind of work is something simple, stout, and workable.

The davit is made of steel pipe with an outside measurement of 2 inches, bent, and with a brace welded in as shown in figure 16. This davit is slipped through a plate bolted to the side of the cockpit and a shoe which is bolted to the deck extends up 2 inches into the hollow end of the davit; it is thus securely fastened and at the same time may be swung to and fro and held in any desired position by the guy ropes. The block—a snatch block—may be brought exactly opposite the thimble of the hoisting gear, which is necessary, and when the dredge comes up it may be swung around over the table. This method we found practical and never failed us in any of our work.

Fig. 12 LOPHIUS at the laboratory float.

Fig. 13 Dock at low tide showing pump intake.

The dredging table is made of cypress, it is 3 feet wide by 7 feet in length; the height from the deck is 3½ feet, which is the most convenient; and the inside depth is 10 inches. The bottom of the table slopes to the center, where there is a sunken coupling to which a 2-inch hose connects, leading to the connection in the floor of the cockpit. This slope in the table is very slight so that jars and bottles may be placed on it without upsetting. The bottom of the table, after two coats of marine paint, is covered with canvas and then given two more coats, and with one coat a year it is as good today as when it was made. Along the inside bottom edge of this table is a raised strip on which the frame holding the sieves is placed and on which it may be shoved back and forward. See figure 15. Into this frame can be easily slipped any of the sieves and these sieves are made so that each may be fitted into the other. The sieves are stoutly constructed, which is necessary if they are to be of service, and are shown in figure 15. I found three sizes sufficient—1/16th, 3/16th, and 3/8th mesh. In addition, mud was taken from the dredge when it came up and washed out in jars in the laboratory when searching for smaller forms.

One of the conveniences of this method is that the dredging table can be lifted out of the boat on the return to the laboratory, as can the sieves and the davit. Also, when out in rough weather or traveling from point to point, the dredging table could be turned upside down and the davit and dredges placed on it, adding greatly to the comfort of traveling in rough weather.

After a short trial, a small gasoline hoisting engine fastened to the cockpit was discarded because its vibration racked the cockpit so that it would leak and it made more of a mess than it was worth. I therefore put an oak table, securely bolted through to the frame of the cockpit and on it a set of gears so that the dredge could be hauled by hand. This was found satisfactory and a further description is unnecessary, as it is shown in figure 14.

Fig. 14 Cockpit with winch, table, davit, and dredge.

Fig. 15 Rack for sieves, sieves and table. Note strip along which rack slides.


Fig. 17 Showing dredge with teeth for use on soft bottoms.

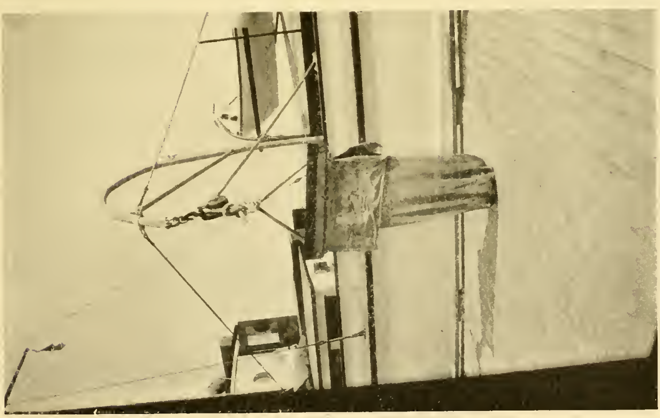


Fig. 16 Showing regulation type of dredge.

LABORATORY

The laboratory is an asbestos-shingle covered building something over 50 feet in length and 20 feet wide; the sides are almost entirely plate glass, so that one may work in any part of it, and to allow sufficient light to go through to the aquaria.

The building is on concrete piers carried through to the ledge; the floor beams were built extra heavy and cross braced, and upon them was placed a very heavy floor so that there is no vibration which can affect the microscopes. This floor was covered with rubber cement and on it layed the heaviest kind of battleship linoleum; therefore, it may be run over with a mop and fresh water and will dry out, and not stay damp and smelly as is the case with wooden floors. At one end are appropriately fitted shelves for glass, a sink with ample drain boards, and racks for apparatus.

The two lower panels of the door are hinged so that they may be opened, and in addition to the ventilators shown in the sketch there are three small copper ventilators. Leaving these panels in the door open permits air to constantly circulate and we have thus never had trouble from dampness due to the aquaria.

One end of the laboratory is partitioned into two rooms, one of which the Director uses as his office, and in which specimens are kept on shelves so arranged that they may be referred to easily. The other room is used as a library and is where writing, drawing, etc., has been done.

The windows are furnished with shades so that if the light is too strong they may be drawn and a microscope lamp used. On one side they draw from the bottom up and on the other from the top down.

Around the laboratory at the proper height is a continuous workbench so that microscopes and other apparatus may be moved to convenient locations, and in addition there are separate small, movable tables, built with a bookrack so that any worker may have his literature close at hand.

Fig. 18 Laboratory from dock.

Fig. 19 Dock at high water from Laboratory.

The aquaria are carried on a long double-deck bench, and if an aquarium, bucket, or a jar carried material there was always fastened to the side, by a wooden clothespin, a number showing where the material had come from so that it might always be checked back to its original station.

Fig. 20 Laboratory, view from land.

The water for the aquaria is handled through a centrifugal lead pump drawing water from the outside crib of the dock and supplying it along the dock through a lead-lined pipe to the large wooden tank. Running the water directly through to the tank and then having it return to the laboratory relieves the pressure on the spigots and they can therefore be turned on with confidence that the amount of water flowing through them will be constant instead of being forced at times from the pump and fed at other times from the return. The capacity of the tank is such that all of the spigots on the laboratory could be allowed to run for 15 hours without draining off all the water. This permits leaving it overnight without danger and also prevents being caught with a low tide—a 10-foot tide has to be reckoned with at times.

The water returning from the wooden tank is carried through other lead-lined pipes and then fed to the aquaria through hard rubber spigots that are burnt and not soldered into the lead pipe. Therefore, no water coming into the laboratory touches anything but lead, wood, and hard rubber, consequently is non-toxic, and no allowance need be made for error due to contact with metal.

The drainage from the aquaria runs down along the bench and then flowing through a 2-inch vent drops into a large V-shaped trough that runs to the edge of the beach. I mention this particularly because there is always so much sediment washed into a drainage pipe in a laboratory that it clogs things up and makes a lot of trouble. With an open V-shaped trough the sediment can be swept down every 2 weeks with a whisk-broom and no pipes will be clogged.

The other drainage pipes from the laboratory run independently and as no connection is made the contamination by gas is eliminated. The power for regulating the pump is supplied by a General Electric motor attached to the pump by direct drive and was built for me by the National Lead Company, who also made the special lead valves and supplied the pipe, etc., according to my measurements. I wish to express here my appreciation of their care, because the high tides, the level at which the laboratory had to be placed, and the consequent level of the tank, necessitated most careful attention to angles laid out in the plan.

The pipe is 1½ inches in diameter and of ¼-inch lead covered with steel. The lead lining is backed on the flanges and when the pipe is coupled a thin washer of rubber is also placed between the flanges. All valves are of the cone type of solid lead especially constructed for this purpose.

The connection from the pump to the line of pipe running along the dock is of lead, with a curve sufficient to take up any contraction or expansion due to changes in temperature; and where the pipe runs along the dock it is covered over, as it is between the dock and the laboratory, to keep the water as cool as possible before reaching the tank.

Fig. 21 Showing interior view of laboratory.

Fig. 22 Showing interior view of laboratory.

The intake is of pure lead 2-inch pipe and runs down the side of the outer crib and is connectted with a cast lead foot valve, while at the tank end of the system there are the proper valves for turning on and off the supply, overflow pipes, and the like.

The motor and pump are bolted onto a form made of 6 by 6-inch joists, and this in turn is screwed to the dock with 10-inch bronze lag screws. In the fall the motor is disconnected from the long intake pipe, and with the pipe along the dock, the lag screws drawn, then placed on a small truck and wheeled into the laboratory. A heavy plank is slipped down along the lead intake, lashed to it, lifted up and carried into the laboratory, and the pipe along the dock, is disconnected and brought into the laboratory and put on wooden horses to prevent sagging. This takes two men about 3 hours. In the spring the pipes are connected along the dock, the motor wheeled out and the intake placed in position at low tide, the valves connected and everything is ready for work in about 5 hours' time. It will be seen that no elaborate apparatus is needed for a marine laboratory, and simplicity should be the rule.

DREDGING

The method of carrying out the dredgings was to go to some point that from indications on the chart would look suitable and then drag across this area once, twice, or three times and, of course, the different stations were revisited. When the material came up it was dumped into the sieves and washed down with buckets of water, and each person picked out the forms he was personally checking. While the dredge was down a bottom temperature was taken as well as one at the surface and the exact position of the station was marked on the dredging sheet, thus taking the information at the time and not relying on memory. Into each container was dropped one of the perforated tags from the dredging sheet on which its number was written, and when sufficient material had been obtained the boat returned to the laboratory and the forms were put into the aquaria and then run down.

As the dredgings were done in the morning and we could return, most of the common forms were checked up that day. The forms readily understood were generally noted while sorting and were not brought back to the laboratory. As these forms were checked up, they were entered by each individual on the dredging sheet, thus insuring an accurate record of each dredging without having to refer to notebooks or other memoranda; in other words, each dredging sheet told exactly what was done without any further explanation. Figure 23 shows a dredging sheet before being filled out. The same general method was employed in shore and other work, and figures 24 and 25 show Shore and Plankton sheets.

When a new station was established, a tack carrying a number was at once put on the chart on the laboratory wall. This not only served to show the stations and was constantly referred to, but it also was of great assistance in laying out the work which had always to conform to wind and tide. A marked chart of this kind is absolutely necessary in the proper checking of a region and should be worked in connection with a chart like figure 4 and other charts upon which are painted in colors the different depths to serve as a ready reference.

Figure 2 is a reproduction of the chart for the eastern side of the Bay, with the numbers of the Dredging Stations marked on it. Those on the western side of the Island are not put on the chart, for they are but few and that part of the Region will be covered later. A list of them follows, as does a list of the test dredgings taken toward the eastward as far as Chandler's Bay.

For ready reference a list is also given showing the numbers, depth, and bottom of the dredging stations, for on account of the inequality of the bottom and the fact that we do not always find it as marked on the chart might lead one astray. All depths shown are in feet. Dredging station numbers are preceded by a D, those of the Shore stations by an S and the Plankton by a P.

STATION NO. DREDGING RECORD

LOCATION DATE OBSERVER

DEPTH

BOTTOM { Rock, Gravel, Sand, Clay, Mud

CURRENT

VEGETATION

TIME

TIDE

AIR TEMP.

WIND N E S W

PRIOR CONDITIONS

NO. HAULS

SURFACE TEMPS.

BOTTOM TEMPS.

SALINITY

PH.

REMARKS

SPECIES	ABDNCE.	SIZE	GONADS	STOMACH CONTS.	REMARKS

STAT. NO.	STAT. NO.	STAT. NO.	STAT. NO.	STAT. NO.	STAT. NO.	STAT. NO.

Figure 23

STATION NO. SHORE RECORD

LOCATION DATE OBSERVER

SOIL { Rock, Gravel, Sand, Clay, Humus, Mud }

POSITION { High, Medium, Low }

MOIST
WET
DRY

SLOPE { Level, Slight, Moderate, Steep, Cliff }

VEGETATION
OPEN WATER
CAVE
INLET
POOL

TIME
TIDE
AIR TEMP.
WEATHER
PRIOR COND.
EXPOSURE N E S W
REMARKS

SPECIES	ABNCE	SIZE	GONADS	FOOD	REMARKS

STAT. NO.	STAT. NO.	STAT. NO.	STAT. NO.	STAT. NO.	STAT. NO.	STAT. NO.

Figure 24

STATION NO. PLANKTON RECORD

LOCATION DATE OBSERVER

Distance from shore Open water, bay, cove, inlet, creek.
Salinity Ph. Depth Time Tide Air temp. Surface temp.
CURRENT—stagnant, still, slight, moderate, swift, Exposure NESW
PRESENT COND— clear, pt. cloudy, cloudy, hazy, fog, rain
WIND— N E S W, strong, moderate, calm; twilight, dark.
PRIOR COND. 12 hrs. clear, pt. cloudy, cloudy, hazy, fog, rain.
WIND— N E S W, strong, moderate, calm; dark

Species; description of eggs of fishes and invertebrates; larvae of fishes and invertebrates. Relative abundance of each.

STAT. NO.	STAT. NO.	STAT. NO.	STAT. NO.	STAT. NO.	STAT. NO.	STAT. NO.

Figure 25

DREDGING STATIONS

List showing character of bottom and depth in feet.

Number		*Bottom*	*Depth*
1	July 7, 1926	mud	90
1–2	June 29, 1927	mud	130
2	July 8, 1926	sand and shell	60
3	July 9, 1926	rock, sand, gravel	46–48
3–2	July 20, 1928	rock	40
3–3	July 21, 1926	rock	30
4	July 12, 1926	rock	20
5	July 17, 1926	rock	50
5–2	July 17, 1928	rock	66
6	July 19, 1926	rock	60
7	July 19, 1926	rock	65–110
7–2	July 30, 1929	rock	54
8	July 19, 1926	mud	95–105
9	July 22, 1926	sand and shell	50
10	July 26, 1926	rock and mud	39
11	July 26, 1926	gravel and mud	46
12	July 26, 1926	gravel and mud	20–30
13	Aug. 31, 1927	mud	trawl set on bottom
13–2	July 28, 1926	rock and mud	30–70 trawl
13–3	Sept. 1, 1926	rock and mud	50 trawl
14	Aug. 4, 1926	mud and shell	49–61
15	Aug. 10, 1926	blue clay	220
16	Aug. 9, 1926	mud	40–45
17	Aug. 9, 1926	mud	16
18	Aug. 12, 1926	gravel and mud	156
19	Aug. 16, 1926	rock and gravel	87
19–2	July 27, 1931	rock	90
20	Aug. 20, 1927	rock	90
21	Aug. 17, 1926	rock and mud	50–60
22	Aug. 19, 1926	rock	90
22–2	July 8, 1929	mud and stone	60
23	Aug. 19, 1926	rock, gravel, clay, mud	75
24	Aug. 19, 1926	gravel and mud	85
24–2	July 8, 1929	gravel and mud	49
25	Aug. 20, 1926	gravel, sand, mud	42
25–2	July 4, 1926	mud	40
26	Aug. 20, 1926	smooth rock	57
27	Aug. 20, 1926	sand and mud	51
27–2	July 20, 1929	rock	63
28	July 4, 1926	sand and mud	55

Number		*Bottom*	*Depth*
29	June 29, 1927	mud	40
29–2	Aug. 19, 1927	sand and mud	40 tow net
24–2	July 8, 1929	gravel and mud	49
25	July 20, 1929	sandy mud	60
26	July 20, 1929	sandy mud	50
27	July 20, 1929	rock	63
29	June 29, 1927	mud	40
29–2	Aug. 19, 1927	mud	40
30	July 1, 1927	rock	28
31	July 1, 1927	rock	30
32	July 5, 1927	rock and gravel	20–50
32–5	Aug. 28, 1928	mud	—
33	July 10, 1927	mud	35
34	July 10, 1927	gravel and sand	35
35	July 11, 1927	rock	30
35–2	Aug. 26, 1929	gravel, sand, mud	36
36	July 11, 1927	hard mud	65
36–2	Aug. 26, 1929	hard	60
37	July 19, 1927	rock	100
38	July 19, 1927	gravel and mud	100
39	July 22, 1927	rock, stones, shells	70
39–2	Aug. 10, 1927	rock	69
39–4	July 25, 1930	rock	69
39–3	July 6, 1929	rock and gravel	70–84
40	July 22, 1927	rock, stones, shells	62
40–2	Aug. 27, 1929	rock	69
41	July 26, 1927	rock	30
42	July 26, 1927	rocks and mud	30
43	July 29, 1927	rock, gravel, sand, mud	35
44	July 29, 1927	rock	85
45	July 29, 1927	sandy mud and stones	68
46	Aug. 3, 1927	mud and shells	70
47	Aug. 3, 1927	mud and shells	60
48	Aug. 3, 1927	black mud	30
49	Aug. 3, 1927	rock	30
50	Aug. 3, 1927	rock	35
51	Aug. 3, 1927	rock	26
52	Aug. 3, 1927	rock and sand	70
53	Aug. 3, 1927	sandy mud and shells	67
54	Aug. 4, 1927	mud, stones, shells	36
55	Aug. 4, 1927	sand, mud, shells	30–40
56	Aug. 4, 1927	stones and sand	68
57	Aug. 10, 1927	mud	8–15

Number		*Bottom*	*Depth*
58	Aug. 10, 1927	rock, sand, and mud	25
59	Aug. 10, 1927	rock and mud	10–12
59–2	Aug. 11, 1927	mud	10–12
60	Aug. 10, 1927	gravel and mud	59
61	Aug. 17, 1927	sand and mud	50
62	Aug. 17, 1927	sand and mud	50–58
62–2	July 20, 1929	rock	50
63	Aug. 17, 1927	sandy mud and shells	58
64	Aug. 17, 1927	rock and shells	84
65	Aug. 17, 1927	sand mud and shells	57
66	Aug. 17, 1927	black mud	45
67	July 18, 1927	blue clay and stones	300–333
68	Aug. 20, 1927	gravel and shell	101
69	Aug. 21, 1927	gravel, barnacle, shells	60–65
70	Aug. 25, 1927	rock, stones, mud	58
71	Aug. 25, 1927	rock, stones, mud	52
71–2	Aug. 30, 1927	rock, blue clay, sand	52–68
72	July 3, 1928	rock	49
73	July 9, 1928	rock	56
74	July 9, 1928	rock	75
75	July 9, 1928	broken shells	65–95
75–2	July 11, 1928	rock, broken shells	65
76	July 10, 1928	mud	45
77	July 12, 1928	sand and stones	87
78	July 12, 1928	rock	87
79	July 13, 1928	mud	56
80	July 13, 1928	rock	58
81	July 16, 1928	mud	50–60
82	July 17, 1928	rock	20–50
83	July 19, 1928	sand and shell	85
84	July 19, 1928	rock	75
85	July 19, 1928	rock	35–50
86	July 20, 1928	mud	50
87	July 20, 1928	rock	25–30
88	July 20, 1928	rock	31
89	July 20, 1928	gravel	75
90	July 20, 1928	gravel	30
91	July 26, 1928	mud and blue clay	54–67
92	July 26, 1928	rock	57
93	July 26, 1928	soft	55
94	Aug. 3, 1928	rock	71
94–2	July 10, 1929	rock	76
94–3	July 27, 1931	rock	76–95

Number		*Bottom*	*Depth*
95	July 13, 1928	rock and shells	76–95
96	July 13, 1928	rock and mud	62
96–2	July 22, 1929	rock	77–81
97	July 14, 1928	gravel	72
98	July 14, 1928	rock	72
99	July 14, 1928	rock	78–114
100	July 16, 1928	rock	70
101	July 17, 1928	rock	99
102	July 17, 1928	rock	34–78
103	July 17, 1928	rock and mud	60
104	July 12, 1929	rock	90
105	July 11, 1929	rock	159
106	July 11, 1929	rock	78–90
107	July 12, 1929	rock	165
108	July 15, 1929	mud and gravel	56
109	July 16, 1929	mud and pebbles	48–135
110	July 16, 1929	rock	23–54
111	July 16, 1929	hard mud	60–90
112	July 16, 1929	mud	68
113	July 16, 1929	rock	43–48
114	July 16, 1929	rock	32–42
115	July 18, 1929	rock	72
115–2	July 25, 1930	gravel	72
117	July 23, 1929	rock	54
118	July 25, 1929	rock	45
119	July 27, 1929	hard	42–60
120	July 27, 1929	hard	36–60
121	July 27, 1929	gravel and shells	28–20
122	July 27, 1929	gravel	75
123	July 27, 1929	rock	38–50
124	July 27, 1929	rock	78
125	July 27, 1929	rock	27
126	July 27, 1929	gravel	48
127	July 27, 1929	rock	72
128	July 27, 1929	hard	54
130	July 30, 1929	blue clay	239
131	July 31, 1929	blue clay	194
132	Aug. 2, 1929	rock	128
133	Aug. 3, 1929	rock	116
134	Aug. 2, 1929	hard	57
135	Aug. 9, 1929	rock	51
136	Aug. 10, 1929	rock	22–25
137	Aug. 10, 1929	rock	34

Number		*Bottom*	*Depth*
138	Aug. 10, 1929	rock	38–45
139	Aug. 10, 1929	mud and shells	51
140	Aug. 10, 1929	hard	57
141	Aug. 10, 1929	hard	39
142	Aug. 10, 1929	hard and stones	51
143	Aug. 10, 1929	sandy mud	45–54
144	Aug. 22, 1929	rock and mud	50–58
145	Aug. 5, 1930	mud	27
146	Aug. 6, 1930	rock	25
147	Aug. 6, 1930	gravel and mud	36
148	Aug. 6, 1930	gravel—clean	25
149	Aug. 6, 1931	rock	100
150	Aug. 6, 1931	blue clay and mud	210
151	Aug. 6, 1931	gravel and mud	100
152	Aug. 10, 1932	gravel and mud	162
153	Aug. 30, 1932	gravel and shell	75–150

DREDGING STATIONS

(Not marked on Chart)

Number	*Bottom*	*Depth*	*Location*
67	Blue clay	300–333	Hole west of Goose Cove Rock.
100	Rock	70	Mount Desert Rock.
104	Rock	90	Mount Desert Rock.
107	Rock with red algae	165	Mount Desert Rock.
109	Mud and pebbles	48–135	East of Trumpet Island.
110	Hard	23–54	Between Bar and Trumpet Islands.
111	Hard mud	60–90	Between Bar and Tinkers Islands.
112	Mud	68	East of John Island, Pretty Marsh.
113	Hard	43–48	North of Indian Head and Alley's Island.
114	Rock	32–42	East of Ship Island.
119	Hard with gravel	42–60	Stanleys Point north of Sally's Island.
120	Hard with gravel	36–60	Petit Manan Point.
121	Gravel and shells	28–30	Between Petit Manan and Egg Rock.
122	Gravel	—	West of Green Island.
123	Rock	28–50	Horse Ledge 3 miles S. by S.E. from Corea.

124	Rock	78	400 yards S.W. Eastern Island.
125	Rock	27	Off Samson's Point.
126	Gravel	48	Gouldsboro Bay off Newman's Cove.
127	Rock	72	Between Black Ledge and Cranberry Point Bell.
128	Hard with red algae	54	500 yards W. of Cranberry Point.
135	Hard and rock	51	150 yards W. of Kelp Ledge.
136		22–25	N. Kelp Ledge off Chandler's Bay.
137		34	300 yards N.E. ledge Chandler's Bay mouth.
138	Hard with algae	38–45	300 yards S.W. Ballard Island.
139	Shells and mud	51	300 yards E. Ballard Island
140	Hard with algae	57	Between Roque and Little Spruce Islands.
141		39	Spindle North end Moose-a-bec Reach.
142	Hard and stones	51	500 yards N.E. Kelp Ledge.
143	Sand and mud	45–54	Bay Ledges, Moose-a-bec Reach.
145	Hard	—	Head of Gouldsboro Bay.
146	Rock	25	Roque Island Ledge.
147	Gravel	36	Roque Island Harbor.
148	Gravel	25	Between Double Short and Great Spruce Islands.

SHORE STATIONS

In using this list refer to figure 3, Map of Mt. Desert Island.

1 Bald rock and ledge.
2 100 yards south of Thunder Hole
3 100 yards south of Thunder Hole, small pool at base of cliff, fresh water on surface
4 Coaling Station piles of dock
5 Cove east of Emery Cove.
6 Emery Cove.
7 Newport Cove, sand beach and small rocks at east end.
8 Anemone Cove.
9 Salisbury Cove.
10 West Shore Thomas Bay, beginning at Blunt's Point.
11 Googin's Lodge.
12 Long Porcupine Island, south side, west end.

13 East end of Long Porcupine beyond bar connecting with Hop.
14 Sorrento Dock.
15 East shore Thomas Bay from mouth of Northeast Branch to East Pt.
16 Twinnies Islands, Thomas Bay.
17 Tide Flats in Narrows east of Bridge.
18 Sand Point.
19 Ledge off Cape Levi.
20 Pools on Long Porcupine Island on shore west of Grass Point.
21 Dock at Corfield.
22 Small pond south of road, Dunton House.
23 Lake Wood.
24 Eastern S. S. Pier, Northeast Harbor.
25 Clark's Cove.
26 Point northwest of Clark's Cove.
27 Brook flowing into southwest part of Clark's Cove near mouth.
28 500 yards northeast of Emery Point.
29 Duck Brook Path.
30 McCagg Point.
31 Reef at north of Racoon Cove Shooting Ledge.
32 West end of Racoon Cove.
33 Mussel beds in center of Racoon Cove.
34 Emery Cove east point.
35 Cove of Negro Point.
36 Leland Cove west side of Leland Point.
37 Eagle Lake—Inlet from Bubble Pond.
38 Field North of St. Leonard's Cottage, Salisbury Cove.
39 Bridge between Mt. Desert Island and Mainland.
40 Bar between Long Porcupine and the Hop.
41 Indian Point.
42 Cove opposite Birch Island Cove on Bartlett Island.
43 The Nubble—the best pool on the Island.
44 Seal Cove where creek empties.
46 Gilpatrick Cove (Northeast Harbor).
47 Mitchell Cove, rocky point on north side.
48 Nutter Point.
49 Duck Cove (near southwest corner of Island) on west side of cove about half way.
50 Dix Point.

PLANKTON STATIONS

No list of Plankton Stations is given. The lower numbers refer to hauls off of shore stations of the same number, and the others are referred to in the text. P. 10B is the most important one, about 400 yards north of Salisbury Cove, the hauls made in 1926 and 1927.

PROTOZOA

RHIZOPODA

Order FORAMINIFERA

From the coast of New England north of Cape Cod there are recorded in the literature 23 species of Foraminifera from depths of 50 fathoms or less. Our survey material contains at present at least 38 species. Fifteen of these are entirely new to the New England region, 10 are recorded from other portions of the region, either south of Cape Cod, or (one species) from depths between 50 and 100 fathoms. The remaining 9 species were already recorded from shallow water in northern New England. Fourteen of the 23 species first mentioned have not yet been taken.

Whiteaves reports 63 species from eastern Canada. Of these we have taken about 16. It is difficult, however, to determine exactly to what some of Whiteaves' names refer.

Haplophragmoides scitulus, previously recorded only from south of Nantucket in 78 to 129 fathoms, we have in Frenchmans Bay at a depth of 40 fathoms.

Several of our forms, such as *Discorbis obtusa* and *Crithionina pisum,* exhibit only small and juvenile forms. These hardly show enough of the true character of the species to enable them to be recognized. Some of these species are probably not fully developed anywhere in the region. An observation to be detailed below leads me to feel that these variations in development are not dependent on the ordinary factors of geographic variation, temperature, depth, salinity, etc., but are more dependent on the chance that an individual does or does not find itself in a position favorable to maximum development by reason of shelter and food supply.

The observation mentioned above concerns *Haplophragmoides canariensis, Quinqueloculina seminula,* and *Q. fusca.* These species have been taken free in sand or sandy mud. The specimens are uniformly small, though exhibiting perfectly the specific characters.

At dredging station 19, these species were found embedded to the point of invisibility in a muddy matrix surrounding worm tubes, stems of *Pyura ovifera,* and similar objects. When extracted from this matrix the great size of the individuals was very striking.

	Free specimens	*Specimens from D 19*
H. canariensis	0.86 mm.	1.07 mm.
Q. seminula	0.73 mm.	0.77 mm.
Q. fusca	0.78 mm.	1.06 mm.

The series of specimens for measurement is unfortunately very small, but it indicates that the embedded individuals run 4 to 49 per cent larger than free specimens. It is probable that the conditions of life of the former enable them to attain a greater age rather than more rapid growth.

I desire to thank Dr. Joseph A. Cushman very heartily for his assistance in identifying this material and for his comments on the nomenclature of some of the species.

Almost all the species will be found figured in Cushman's account of the Foraminifera of the Atlantic Ocean and in Cushman and Ozawa's monograph of the Polymorphinidae. I give here chiefly special figures of the apertural characters of some species. Flint's description of the 'Albatross' Foraminifera gives excellent figures, but the nomenclature is quite out of date.

In certain genera, notably *Pyrgo,* the present state of our knowledge renders specific identification nearly impossible. Doctor Cushman has shown me some very beautiful specimens from Greenland, which, when they are described, will clear up a number of these doubtful cases.

It is evident from the fact that more than one-third of the species reported here are new to the New England region that much still remains to be done on our foraminiferal fauna. This result seems the more striking since the material is derived from only a few stations visited chiefly during the last two years of the Survey's investigations, and the study of the material was undertaken in the intervals of the investigation of the arthropods.

Astrorhizidae

Crithionina Goës

C. pisum Goës. Specimens were identified by Dr. J. A. Cushman. The species is new to New England.

The specimens are small and somewhat atypical. They are spherical to slightly egg-shaped, diameter 0.35 to 0.54 mm. The aperture is irregular, almost slitlike, and giving the appearance of an artifact. The wall usually contains relatively large sand grains in some numbers.

The species was taken from arenaceous mud, depth 45 to 52 feet, fairly common.

Stations: D 71, 76.

Saccamminidae

Proteonina Williamson

P. difflugiformis (H. B. Brady). This form is new to New England. Taken on mud, sand, and blue clay, depth 30 to 210 feet. Common at D 150.

Stations: D 35, 62, 83, 112, 150.

Tholosina Rhumbler

T. bulla (H. B. Brady). This is also new to New England. Attached to objects, such as large sand grains, depth 36 to 239 feet, rare.

Stations: D 35, 76, 130.

Hyperamminidae

This family is new to the New England region.

Hippocrepina Parker

H. indivisa Parker. On blue clay, depth 210 feet, fairly common.

Station: D 150.

Sacchoriza Eimer and Fickert

S. ramosa (H. B. Brady). Found with the preceding species, rare.

Station: D 150.

Reophacidae

Reophax Denys de Montfort

R. dentaliniformis H. B. Brady. Found with the preceding species, abundant.

Station: D 150.

R. pilulifera H. B. Brady. Also found with the preceding species.

Station: D 150.

Lituolidae

Haplophragmoides Cushman

H. canariensis (d'Orbigny). In mud, depth 68 to 87 feet, uncommon.

Stations: D 19, 112.

H. scitulus (H. B. Brady). On blue clay, depth 210 to 239 feet, common at D 150.

Stations: D 130, 150.

Ammobaculites Cushman

A. cassis (Parker). In sand or arenaceous mud, depth 50 to 85 feet. Very common on the more sandy bottom at D 83, but elsewhere rather rare.

Stations: D 62, 76, 81, 83.

Verneuilinidae

Verneuilina d'Orbigny

V. advena Cushman. This pretty little species shows very constantly the rust-brown color described by Cushman. It is evidently due to darkening of the cement by age and may be wanting in a newly formed chamber.

In arenaceous mud and blue clay, shore to 210 feet, quite common. The shore specimens are in clumps of *Mytilus* and bryozoans.

Stations: S 21, 48; D 19, 76, 150.

Miliolidae

Quinqueloculina d'Orbigny

Q. fusca H. B. Brady. North Pacific specimens of this form have been figured recently by Cushman which agree well with ours. The species was hitherto unknown from the western Atlantic. The general color of the dry test is pale dust-brown. Found on sand and blue clay from the shore to 210 feet.

Stations: S 21, 25, 48; D 19, 150.

Q. seminula (Linné). On muddy sand, gravel, and blue clay, from the shore to 210 feet, abundant.

Stations: S 21, 25, 48; D 19, 62, 76, 83, 150.

Q. venusta (Karrer). Our form is figured by Flint (1899, pl. 44, fig. 2). Doctor Cushman does not consider it certain that *Q. fusca* of authors is Karrer's species. On muddy sand and blue clay, from shore to 210 feet, only one specimen on blue clay from D 150.

Stations: S 21, 25; D 76, 150.

Massilina Schlumberger

M. secans (d'Orbigny). This is *M. secans* of authors, but according to Doctor Cushman probably not d'Orbigny's form. It is new to New England. On mud, sand, and blue clay from the shore to 239 feet, not common.

Stations: S 48, D 19, 126, 130.

Triloculina d'Orbigny

T. oblonga (Montagu). The single specimen is 0.46 mm. wide. The 2 last-formed chambers each show 3 or 4 faint longitudinal furrows. On blue clay, depth 239 feet.

Station: D 130.

Pyrgo Defrance

This is a difficult genus of which we have had specimens representing about 5 species. The determinations of the 2 species given below are by no means certain. It is worth noting that the specimens are not bilaterally symmetrical in ventral view owing to the slightly excentric position of the penultimate chamber.

P. BRADYI (Schlumberger). (Fig. 26.) The specimen measures 0.65 mm. long. The surface shows faint transverse grooves. In sand, depth 8 feet.

Station: S 21.

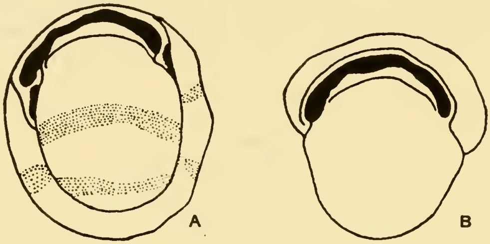


Fig. 26 Pyrgo bradyi. A. ventral view. B. aperture.

P. ELONGATA (d'Orbigny). (Fig. 27.) The dimensions are 0.53 mm. by 0.35 mm. As shown in the figure, the aperture does not quite agree with that figured by Cushman (1908, pl. 5, fig. 9) from Woods Hole. The present specimen is also somewhat smaller and relatively narrower than Cushman's figure. On blue clay, depth 239 feet.

Station: D 130.

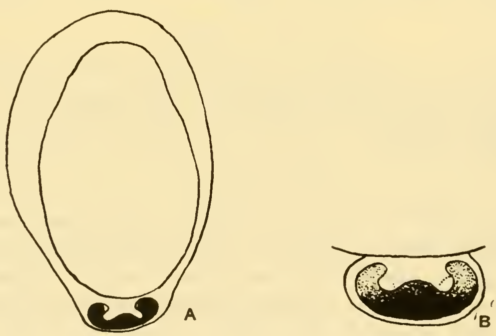


Fig. 27 Pyrgo elongata. A. ventral view. B. aperture.

Trochamminidae

Trochammina Parker and Jones

T. inflata (Montagu). In mud, from shore to 68 feet.
Stations: S 21; D 112.

Lagenidae

Marginulina d'Orbigny

Specimens of this genus occur on blue clay at a depth of 210 feet. An identification has not been possible.
Station: D 150.

Nodosaria Lamarck

N. filiformis d'Orbigny. This species is new to New England and the identification is open to question. On mud, depth 45 feet.
Station: D 76.

Lagena Walker and Jacob

L. acuticosta Reuss. On muddy sand, gravel, and shell bottoms, depth 49 to 87 feet. Our most common *Lagena.*
Stations: D 14, 19, 83.

L. gracillima Seguenza. This species is new to New England. In mud, depth 68 feet.
Station: D 112.

L. perlucida (Montagu). This also is an addition to the New England fauna. On gravel, depth 72 feet.
Station: D 115.

L. substriata Williamson. This species is also new to New England. Found with the preceding species.

Polymorphinidae

Globulina d'Orbigny

G. glacialis Cushman and Ozawa. (1930, pl. 15, figs. 6, 7.) This has only been found previously in New England as a fossil in the Leda clay at Portland, but is known in the living state from the Maritime Provinces. Our specimens are 0.33 to 0.62 mm. long and 0.23 to 0.38 mm. wide. The breadth-length ratio decreases from 0.68 to 0.63 with increase in length of the test. The present examples are somewhat broader than is shown by the measurements of Cushman and Ozawa. One of our specimens was kindly identified by Doctor Cushman. In mud off Prettymarsh Harbor, depth 68 feet; blue clay off Ironbound Island, 239 feet.

Stations: D 112, 130.

Nonionidae

Nonion Denys de Montfort

N. labradoricum (Dawson). On gravel and blue clay, depth 72 to 210 feet, common at D 115.

Stations: D 115, 150.

Elphidium Denys de Montfort

E. arcticum (Parker and Jones). This species has the sutures and umbilicus quite smoothly filled with cement. The retral processes are numerous and close together, but appear only on the periphery. In arenaceous mud and blue clay, shore to 239 feet.

Stations: S 21, 48; D 35, 76, 130, 150.

E. incertum (Williamson). The retral processes are broad and the interspaces are almost circular pits except at the base of the last-formed chamber. The interspaces appear to be gradually obliterated as the suture grows older. Most of our material belongs to the typical variety, the variety *clavatum* Cushman having been taken at only two stations. On arenaceous mud and blue clay, depth 30 to 239 feet.

Stations: D 35, 76, 115, 130.

E. i. var. clavatum Cushman. On same bottoms as the typical variety, depth 45 to 210 feet.

Stations: D 76, 150.

Buliminidae

Bulimina d'Orbigny

An undetermined species of this genus was quite common on blue clay, depth 210 feet.

Station: D 150.

Rotaliidae

DISCORBIS Lamarck

D. OBTUSA (d'Orbigny). (Fig. 28.) Our specimens agree with Cushman's (1931, pl. 6, fig. 2) figures. The circular apertural pores shown in our figure vary in size from 0.006 to 0.019 mm. In arenaceous mud, depth 45 feet, doubtful on gravel and blue clay, depth 87 feet and 239 feet.

Stations: D 76; and with doubt D 19, 130.

Fig. 28 Discorbis obtusa, apertural region.

Cassidulinidae

CASSIDULINA d'Orbigny

C. CRASSA d'Orbigny. On blue clay, depth 210 feet.

Station: D 150.

Anomalinidae

CIBICIDES Denys de Montfort

C. LOBATULUS (Walker and Jacob). Attached to all sorts of objects, shore to 239 feet, very common.

Stations: S 48; D 19, 83, 130, 149, 150.

LITERATURE

CUSHMAN, J. A. 1908 Foraminifera of the Woods Hole region. Proc. Boston Soc. Nat. Hist., vol. 34, pp. 21–34, 1 pl.

——— 1918–1931 The Foraminifera of the Atlantic Ocean. United States Nat. Mus. Bull. 104, no. 1, pp. i–vii, 1–111, 39 pl., part 2, pp. i-vii, 1-111, 18 pl., 3 fig., part 3, pp. i–viii, 1–149, 26 pl., part 4, pp. i–x, 1–228, 42 pl., part 5, pp. i–v, 1–55, 8 pl., part 6, pp. i–viii, 1–129, 22 pl., part 7, pp. i–vi, 1–79, 18 pl., part 8, pp. i–ix, 1–179, 26 pl.

CUSHMAN, J. A., AND OZAWA, YOSHIAKI 1930 A monograph of the foraminiferal family Polymorphinidae recent and fossil. Proc. United States Nat. Mus., vol. 77, no. 6, pp. 1–185, 40 pl., 2 fig.

FLINT, J. M. 1899 Recent foraminifera. A descriptive catalogue of specimens dredged by the U. S. Fish Commission steamer Albatross. Rept. United States Nat. Mus., 1897, vol. 1, pp. 249–349, 80 pl.

PORIFERA

Order MONAXONIDA

The sponges of the Order Monaxonida included in this work were taken in the Mt. Desert region during the summers 1926 to 1931, inclusive, and represent, in all probability, a complete sample of the monaxonid sponge fauna of the shallow water of this region. Most of the species were dredged many times and, in some cases, in considerable abundance without any new forms being found. A comparison with the lists of sponges which have been found in adjacent regions also confirms this conclusion.

With one possible exception, no new species of sponges were discovered. However, the geographic distribution of several species was extended southward from Greenland and Iceland to the shore of continental North America. It is also shown that the sponge fauna of this region has much greater affinities with the more northern or Arctic fauna than it does with that farther south. Only two of the species—*Microciona prolifera* and *Cliona celata*—are found as far south as Beaufort, N. C. Seven (possibly 9)— *Halichondria panicea, Chalina oculata, Mycale ovulum, Homoeodictya palmata, Tedania suctoria, Suberites compacta* (=*concinnus*), *Polymastia robusta, Myxilla* sp. ?, and *Reniera* sp. ?—are found as far south as Woods Hole. *Chalina arbuscula* (Verrill) has been recorded from Vineyard Sound, but has never been taken elsewhere. Ten species—*Gellius flagellifer, Gellius laurentinus, Asbestopluma cupressiformis, Artemisina arcigera, Clathria delicata, Phakellia ventilabrum, Suberites ficus, Tentorium semisuberites, Reniera rufescens,* and *Reniera mollis*—have been reported from the Gulf of St. Lawrence, but from nowhere farther south. However, the sponge fauna of the Atlantic coast of North America will have to be much more carefully studied before much can be said about the distribution of these forms.

The classification of the Monaxonida is difficult because of the few characters of taxonomic value these forms present. Those characters which are of use to the systematist do not appear to be so definitely fixed as in some of the higher groups of organisms and seem capable of extreme modification as a result of environmental influences. In this order of sponges the external form is almost useless as a character of diagnostic value. This is especially true of the shallow-water forms, although in some cases individuals of the same species have a similar external form as shown by *Eumastia sitiens* and *Suberites concinnus.* However, the external form and mode of growth are relatively unimportant as a guide to classification, and in this paper they are not treated in detail.

The arrangement of the skeleton is likewise of little value in many cases as a criterion for distinguishing genera and species, as this character may vary greatly in different individuals and even in different parts of the same individual. Lundbeck records the occurrence in the Danish seas of specimens of *Chalina oculata,* which have polyppicular fibers present in great numbers instead of the characteristic unispicular ones.

The amount of spongin present has been used by many workers as a distinguishing trait, but this has likewise been shown to be of little value, as the degree of spongin development depends upon the age of the individual, the temperature of the water, and the geographical locality. Bowerbank (1866,

p. 363) states that in old individuals of *Chalina oculata* the amount of spongin increases progressively as you proceed from the base, where the spongin fibers are "very strongly developed," to the tip where the amount of spongin "was so small as to render it doubtful whether the section represented a *Chalina*." In individuals from exposed situations, the same author reports that the spongin fibers are generally stouter, though not richer in spicules, than sponges from sheltered localities. Furthermore, the development of spongin seems to depend somewhat upon temperature, as sponges with horny fibers are much more abundant in tropical and subtropical seas than in temperate or frigid areas.

The classification of the sponges, comprising the Monaxonida, depends essentially upon the spicules, of which there are two categories—megascleres and microscleres. The shape of the spicules is quite constant and seems to be independent of external conditions and age. In the Homorrhaphidae, where only smooth oxeote spicules and no microseleres are present, the only distinguishing features between genera and species are the relative sizes and proportions of the spicules and, in some cases, their arrangement in the skeleton. Judgment must be exercised in employing this feature, as there is often considerable variation in size within a single species. The length of the spicules in *Halichondria panicea* varies in different individuals from 0.35 mm. to 1.0 mm. Both *Halichondria* and *Reniera* possess oxeote spicules, but usually a glance is sufficient to distinguish the long, gradually tapering spicules of *Halichondria* from the short, more robust, sharply pointed spicules of *Reniera*. Forms with spicules intermediate between these conditions are known, and their determination, in the absence of other characters, is necessarily arbitrary. However, this difficulty was not encountered in the sponges of this region.

The microseleres, when present, are of greater diagnostic value than the megascleres, as they are very constant in their shapes and sizes. Ridley and Dendy suggest that, in all probability, they are not subjected to any modification by environmental influences and represent constant genetic features. Thus, of all the tangible characters found in sponges the shape, and, usually, the size of the spicules, especially of the microscleres, constitute the best basis for classification.

Most of the taxonomy of the sponges was done before the development of genetics had broadened our conception of a species and many of the 'literature-species' will undoubtedly be found after more intensive study to be only local varieties of more widely spread species, especially as many of these species rest upon a few and, in many cases, a single specimen or a 'few fragments.' However, such cannot be avoided until more is known of the limits of variation within single species as exhibited throughout its entire range of distribution. Thus, in the cosmopolitan and well-known *Halichondria panicea* the size of the spicules varies from 0.2 mm. to 1.0 mm. This indicates that such might be the case in many other species if they were as well studied as *H. panicea.* However, judging by the descriptions in the literature, very little variation was tolerated by the older workers. Such a variable character as the size of the spicules has been shown to be in one case, was defined within very narrow limits, and many of the 'literature species' rest upon this criterion along. H. V. Wilson has pointed out that as our knowledge of sponges increases the number of genera and species known to grade into one another increases. In such cases it is either necessary to overhaul the system in use and establish new categories or else define arbitrary limits to genera and species. Due to the author's limited experience and material it has been considered advisable to do the latter and leave the more difficult task of renovating the system to more experienced workers with a greater amount of material at their disposal. There is very little literature of any worth on the sponges of the northeastern coast of America. Lists of the sponges taken in the Gulf of St. Lawrence (Whiteaves), Casco Bay (Kingsley, Verrill), Vineyard Sound and adjacent waters (Verrill, Woods Hole Survey), and Hudson Bay (Lambe) are available, but no descriptions are included and one can only trust that the determinations are correct. Lambe has published descriptions of the sponges taken at various times from the Gulf of St. Lawrence, coast of Nova Scotia, Davis Strait, and Baffin Bay, and these descriptions have been of great service, as the sponge fauna of the Mt. Desert Island region appears to be almost identical with those regions farther north. The Danish Ingolf Expedition came as far west as Davis Strait and the forms belonging to the three families, Homorrhaphidae, Heterorrhaphidae, and Desmacidonidae, have been most carefully and painstakingly described by Lundbeck. The Challenger Expedition dredged south of Halifax, Nova Scotia, in 85 fathoms, and the Prince of Monaco's Expedition worked at a depth of 75 fathoms off the coast of Newfoundland.

All the records of the occurrence of monaxonid sponges which have been taken at 100 fathoms or less have been extracted from these various reports and lists and tabulated. The table includes the records for a region extending from Vineyard Sound to Cape Farvel, the southernmost point of Greenland. Cape Farvel was chosen as the limit of the American forms because the 0°C. isotherm comes into the shore at about Cape Farvel and this isotherm is not resumed to the west except in the northern part of Baffin Bay and also because the depth of the water falls off very rapidly to 1000 Danish fathoms (= 1060 English fathoms) at this place. The monaxonid sponges taken by the Danish Ingolf Expedition in Davis Strait could not be included in its entirety because only three families have been studied thus far.

The depth of 100 fathoms was chosen as including, for the most part, the greatest depth found in the Continental Shelf. However, in the Gulf of Maine, Davis Strait, and Gulf of St. Lawrence, there are regions which are deeper than 100 fathoms and essentially deep-water forms have been taken from these places.

The terminology and method of classification used in the following descriptions is the same as that used by Lundbeck, who in turn has largely followed Ridley and Dendy. No attempt has been made to give a complete synonymy, although reference has been included under each species to the fullest descriptions and best illustrations. Wherever possible reference is made to Lundbeck, who always includes a complete synonymy and whose descriptions and figures are excellent.

HOMORRHAPHIDAE	WOODS HOLE SURVEY	VINEYARD SOUND VERRILL	CASCO BAY VERRILL	CASCO BAY KINGSLEY	GULF OF ST. LAWRENCE WHITEAVES	DAVIS STRAIT LAMBE	DAVIS STRAIT LUNDBECK	OFF HALIFAX CHALLENGER	OFF NEWFOUNDLAND TOPSENT	HUDSON BAY AND STRAIT LAMBE
Halichondria panicea	—	—		—	—		—			
Halichondria glabra									—	
Halichondria fibrosa							—			
Halichondria sp. ?		—	—							
Reniera rufescens					—	—				
Reniera mollis					—	—				—
Reniera cinerea							—			
Reniera laxa							—			
Reniera tubulosa							—			
Reniera sp. ?	—	—	—					—		
Eumastia sitiens					—		—			
Chalina oculata	—	—	—	—	—					
Chalina arbuscula	—	—								
Chalina spatula							—			
Chalina sp. ?		—								
HETERORRAPHIDAE										
Gellius flagellifer					—					
Gellius laurentinus					—	—				
Gellius angulatus							—			
Gellius proximus							—			
Gellius porosus							—			

The depths given in this work are in Danish fathoms (1 Danish fathom = 1.06 English fathoms).

With respect to the size of spicules, an attempt has been made to give an idea of the characteristic size and shape, with the result that immature forms and extremes are excluded. The young forms of the microscleres may cause some confusion to the inexperienced worker, but Lundbeck has usually figured these. In all cases fifty or more spicules have been measured and the mode ascertained. This was considered best, as in this way the subtle differences in the size of spicules distinguishing some of the species (=varieties?) are disclosed, whereas such are hidden when only the extremes of length are given. The latter, however, is the usual method.

DESMACIDONIDAE	WOODS HOLE SURVEY	VINEYARD SOUND VERRILL	CASCO BAY VERRILL	CASCO BAY KINGSLEY	GULF OF ST. LAWRENCE WHITEAVES	DAVIS STRAIT LAMBE	DAVIS STRAIT LUNDBECK	OFF HALIFAX CHALLENGER	OFF NEWFOUNDLAND TOPSENT	HUDSON BAY AND STRAIT LAMBE
Esperiopsis forcipula							—			
Mycale lingua					—		—		—	
Mycale ovulum	—		—?	—?	—					
Mycale thaumatochela							—			
Asbestopluma cupressiformis					—	—				
Artemisina arcigera					—					
Homeodictya palmata	—	—			—					
Myxilla incrustans					—		—			
Myxilla brunnea							—			
Myxilla sp. ?	—									
Lissodendoryx indistincta							—			
Iophon chelifer					—	—				
Tedania suctoria							—		—	
Tedania sp. ?		—								
Stylotella pannosa			—							
Microciona prolifera	—	—								
Clathria delicata					—					
AXINELLIDAE										
Phakellia ventilabrum			—	—	—	—				—
Tragosia infundibuliformis			—	—						

The size of the spicules is frequently shorter in the specimens from this region than it is in those reported from farther north, but this is only what might be expected, as the evidence from the geographical distribution of most of these species would indicate that they are northern, Arctic forms and in the Mt. Desert Region these species may be near their southern limit of distribution. Consequently, by analogy with other better-known groups of organisms, they might be considered somewhat atypical when compared with individuals from farther north.

The geographical distribution given for the various species in this work includes usually only those localities recorded within the region from Vineyard Sound to Cape Farvel,

SUBERITIDAE	WOODS HOLE SURVEY	VINEYARD SOUND VERRILL	CASCO BAY VERRILL	CASCO BAY KINGSLEY	GULF OF ST. LAWRENCE WHITEAVES	DAVIS STRAIT LAMBE	DAVIS STRAIT LUNDBECK	OFF HALIFAX, N. S. CHALLENGER	OFF NEWFOUNDLAND TOPSENT	HUDSON BAY AND STRAIT LAMBE
Suberites ficus					—					
Suberites hispidus			—	—	—					
Suberites montalbidus						—				—
Suberites montiniger									—	
Suberites compactus										
Suberites concinnus	—	—								
Suberites sp. ?			—							
Polymastia robusta	—?	—?	—	—?	—			—		
Polymastia sp. ?	—		—							
Quasillina brevis								—		
Cliona celata	—	—		—	—					
Cliona sp. ?			—							
Tentorium semisuberites					—	—		—		
Stylocordyla borealis			—	—				—		
TETHYIDAE										
Tethya gravida	—									

Greenland. However, many of these species are found around Iceland, where conditions of temperature and depth of water are quite similar to the regions reported in this paper, as well as Jan Mayen Island, Faroe Islands, and Spitsbergen. Lundbeck includes a fine chart of these regions and the stations from which specimens have been taken.

The color of most of the monaxonid sponges is a dark, brownish gray and those which have a distinctive color quickly fade in alcohol. In this paper the color is noted only when it is distinctive and characteristic.

Family Homorrhaphidae[2]

HALICHONDRIA Fleming
HALICHONDRIA PANICEA (Pallas)

Bowerbank (1866, p. 229, 1874, pls. 39, 40), Ridley and Dendy (1887, p. 2, pl. 2, figs. 2, 3), Lundbeck (1902, p. 17, pl. 9, fig. 1.

This species is by far the commonest form taken in this region and is found in a great variety of shapes. Most frequently it is encrusting on rocks, shells, piles, etc., or forms cushions or mats from which arise numerous low cones or lobes, at the tops of which are oscula. Erect forms are infrequently found and these consist of tubes which are often branched or partially coalesced to form flattened tubes with oscula at their tips.

Skeleton. In the encrusting forms the skeleton is confused, while in the erect forms, although the skeleton is undoubtedly confused as a whole, there is a slight tendency for the spicules to be collected into fibers.

Spicules. These are long, slender, gradually tapering, usually slightly curved oxea. The modal length of the spicules varies greatly in different individuals, but in the encrusting forms from this region the spicules range in size from .219 to .511 mm., although the mode for the majority of specimens is .438. In the few erect tubular forms the spicules are slightly smaller, ranging from .324 to .405 mm., with a mode of .364. Further study of these erect forms with their smaller spicules and tendency to form indistinct fibers may show them to be a variety distinct from the more common encrusting form.

Geographical distribution. Common in Vineyard Sound, Gulf of Maine, Gulf of St. Lawrence, and Davis Strait. It is a very cosmopolitan species.

[2] The name of this family is not correct according to rule.—Ed.

Halichondria genitrix (O. Schmidt)

Lundbeck (1902, p. 18, pl. 9, fig. 2a-c).

This species was taken once in Chandler Bay, on hard bottom, in about 50 feet of water.

Skeleton. Spicules are scattered with no noticeable tendency to form fibers.

Spicules. These are long, slender, gradually tapering, slightly bent oxea which occur in two classes as to size. The large oxea of one specimen range in size from .292 to .693 mm. and the small oxea from .121 to .203 mm. In the other specimen the large and small oxea vary in size from .405 to .851 mm. and .131 to .219 mm., respectively. Oxea of sizes intermediate between the large and small ones are found, but these are relatively scarce and it would appear that the existence of the two classes is real.

Geographical distribution. West Greenland (Lundbeck), Mount Desert Region.

Halichondria fibrosa (Fristedt)

Lundbeck (1902, p. 20, pl. 9, fig. 3a-c).

Of this species there are several large specimens which somewhat resemble *Halichondria genitrix* in their mode of growth and outward appearance. These were taken at Station D 104, rock bottom, depth 90 feet, 30 miles off shore.

Skeleton. The skeleton is rather more confused than reticulate, but, in addition to scattered spicules, there is a tendency for the oxea to be roughly arranged into tracts. Lundbeck states that in his specimens the skeleton consists of "loose and irregular, not sharply marked fibers, which form, at all events, frequently, a very irregular and indistinct network."

Spicules. These are slightly bent oxea which are abruptly pointed and of almost equal thickness throughout the length of the shaft of the spicule. These oxea fall into classes; the larger ones vary in length from .511 to .730 mm. and the smaller ones from .109 to .182 mm.

Remarks. *Halichondria fibrosa* is distinguished from *Halichondria genitrix* by the presence of small closely packed oxea perpendicular to the surface.

Lambe has described from Vancouver Island a species, *H. disparalis,* which has two sizes of spicules. In this species the large oxea vary in length from .438 to 1.28 mm., whereas the small ones average .091. The spicule length in these two species overlap slightly, but the modal length is probably different. As both *H. disparalis* and *H. fibrosa* rest upon a single specimen each, further study may show that the limits of variation will include both within the same species. This seems probable, especially as Fristedt has recorded the occurrence in Behring Straits of *Amorphina fibrosa,* which Lundbeck has shown belongs among the *Halichondria.*

Geographical distribution. West Greenland (Lundbeck); Mount Desert Region.

Eumastia O. Schmidt
Eumastia sitiens O. Schmidt

Lambe (1896, p. 182, pl. 1, fig. 1); Lundbeck (1902, p. 31, pl. 4, figs. 1–6; pl. 10, figs. 9–12).

This species is very common throughout this region, being as abundant as *Halichondria panicea.* It is one of the few sponges which has a constant and characteristic form, and the species has been described and illustrated in detail by Lundbeck.

Skeleton. The skeleton consists of loose indistinct fibers as well as many scattered but closely packed spicules.

Spicules. These are slender, slightly bent oxea which taper gradually to a fine point and vary in length from .324 to .647 mm., with a mode of .486 mm.

Geographical distribution. Davis Strait (Lundbeck); West Greenland (Fristedt); Gulf of St. Lawrence and off southern coast of Nova Scotia (Lambe); Mount Desert Region.

Reniera Nardo
Reniera cinerea (Grant)

Lundbeck (1902, p. 43, pl. 11, fig. 10).

There is only one specimen of this species, taken at Station 40, on rock in 69 feet of water, which has been placed in this species with some misgivings.

Skeleton. The skeleton is consistently unispicular and regularly reticulate with some triangular instead of characteristic rectangular meshes. The spicules are bound together at their ends by small masses of spongin.

Spicules. These are oxea varying in length from .145 mm. to .185 mm., with a modal length of .162 mm.

Remarks. In skeletal arrangement and size of spicules this specimen closely resembles *Chalina oculata,* but it has not been considered such because of its obviously encrusting mode of growth, which has never been encountered in *C. oculata* even in very young forms, and also because of the tendency in the latter species for the spicules to be enclosed in a very thin sheath of spongin, which does not appear to be the case for this specimen.

Lambe has recorded from the Gulf of St. Lawrence a new species, *Reniera rufescens,* which has a 'moderately regular' unispicular reticulum of oxea varying from .124 mm. to .189 mm. in length. A comparison between Bowerbank's (1874, pl. 48, figs. 1–5) figures for *R. cinerea* and those of Lambe (1893, pl. 4, fig. 6) for *R. rufescens,* shows identically the same habit of growth. In Bowerbank's specimen the spicules measure .152 mm. in length, whereas those in Lambe's specimens vary in length from .124 mm. to .189 mm. There seems to be no apparent reason for considering *Reniera rufescens* as different from the previously described *R. cinerea,* especially as the latter is known from Davis Strait, which is one of the places where Lambe has taken *R. rufescens* but not *R. cinerea.*

Geographical distribution. Davis Strait (Lundbeck); Mount Desert Region.

Reniera heterofibrosa Lundbeck

Lundbeck (1902, p. 47, pl. 2, fig. 8; pl. 11, fig. 11).

This species is an encrusting form which occurs abundantly in this region and outwardly resembles *Halichondria panicea* very closely, but an examination of the spicules places it without doubt in the genus *Reniera.*

Skeleton. The skeleton can hardly be considered as reticulate, although ill-defined fibers, 3 or 4 spicules in width for the most part, are present. In addition there are many scattered spicules so that the skeleton resembles that of *Halichondria* more than it does the typically reticulate renierine skeleton.

Spicules. These are short, stout, slightly bent oxea, characteristic of *Reniera*. They vary in different specimens from .109 mm. to .219 mm., but within the individual there is little variation and a definite modal length is apparent. In four different specimens the spicules vary in length from: 1) .121 mm. to .203 mm.; 2) .161 mm. to .178 mm.; 3) .145 mm. to .178 mm.; 4) .146 mm. to .182 mm., but all of these have a modal length of .162 mm.

Lambe has described a new species, *Reniera mollis,* which is found in the Gulf of St. Lawrence and Davis Strait. This form has a skeleton consisting of fibers which "vary from two to three spicules in breadth, though they occasionally become unispicular." However, the skeleton is described as a 'regular reticulation' of these fibers. The specimens from this region show variations in spicule size which include the sizes reported by Lambe for *R. mollis* and by Lundbeck. The figures for *R. mollis* Lambe (1893, pl. 2, fig. 3) and *R. heterofibrosa* Lundbeck agree very well in showing the same mode of growth. As *R. heterofibrosa* Lundbeck has a somewhat irregular skeleton whereas *R. mollis* Lambe is described as having a regular reticulum, the forms from this region show a greater affinity to the former, although the identity of the two species seems probable.

Geographical distribution. Iceland (Lundbeck); Mount Desert Region.

Reniera ventrilabrum Fristedt

Lundbeck (1902, p. 40, pl. 11, figs. 6, 7).

This species is represented by several well-preserved specimens taken at Stations D 43 and 39, on hard bottom, depth 35 to 70 feet. All of them are erect and attached by a short thick stalk; usually they are irregularly leaf-shaped, with the plane of the leaf curved so that the edges are in opposition or overlapping. In one specimen the edges have almost completely coalesced so that the specimen is funnel-shaped.

Skeleton. This is composed of a rather regular reticulation of primary ascending fibers connected at intervals by transverse secondary fibers. For the most part the fibers are unispicular.

Spicules. These are slightly curved oxea, varying in length from .145 mm. to .186 mm., with the mode at .161 mm. The size of the spicules is quite constant, although numerous slightly shorter and much finer spicules which are immature forms are present.

Remarks. Lundbeck has described three new species: *Reniera parenchyma, folium,* and *hyalina,* and there is no reason to consider them more than varieties of *Reniera ventilabrum.*

R. parenchyma. "Erect, leaf-shaped, oblong-oval. The dermal membrane thin, without spicules; the ends of the fibers projecting, and the surface consequently finely shaggy. Oscula small, only occurring on one side? The skeleton a regular network of primary and secondary fibers, the fibers unispicular. Particular polyspicular fibers are found running longitudinally through the sponge from the base. Spicula curved, sharply pointed oxea, ca. 0.238 mm." (Lundbeck.)

This species agrees as to the length of the spicules with *R. ventilabrum,* but some of the spicules of *R. parenchyma* are a "little thinner in the middle than towards the ends." This species was described from one incomplete specimen and there is no assurance that this characteristic is constant and nothing more than an individual variation, especially as not all the spicules of this specimen exhibit this characteristic.

R. folium. "Erect, irregularly leaf-shaped, the leaves may be irregular coalesced. The dermal membrane is thin without spicules, and the ends of the fibers project, making the surface finely shaggy. Oscula small, numerous, only found on one side. The skeleton forms a regular network of primary and secondary fibers, the fibers are unispicular. Particular polyspicular fibers running longitudinally are found. Spicula are slightly curved, rather gradually tapering oxea, 0.19 to 0.21 mm.'' (Lundbeck.) This species is erected on six 'more or less damaged' fragments of a couple of specimens.

R. hyalina. ''Erect, leaf-shaped. The dermal membrane without spicules; the ends of the fibers projecting, and the surface consequently finely shaggy. Oscula? The skeleton a regular network of primary and secondary fibers, the fibers unispicular. Particular polyspicular longitudinal fibers are found. Spicula are slightly curved, evenly tapering oxea, .261 to .31 mm.'' (Lundbeck.) This species rests on 'only one specimen,' which is, moreover, a 'fragment.'

The length of the spicules in these species is here presented for comparison in the following table:

SPECIES	LENGTH OF SPICULES	NUMBER OF SPECIMENS	DEPTH	GEOGRAPHICAL DISTRIBUTION
	mm.			
R. ventilabrum	.145–.186	3 specimens	Less than 100 fathoms	Mount Desert
R. folium	.19– .21	6 fragments	720 fathoms	Faroe Islands
R. ventilabrum	.21– .25	1 specimen	420 fathoms	Davis Strait
R. parenchyma	.238	1 specimen	1236 fathoms	Denmark Strts.
R. hyalina	.268– .31	1 specimen	471 fathoms	Faroe Islands

These differences in the lengths of the spicules are very small and form a finely graded series. This fact along with the few specimens which have been studied, the similarity of regions, and continuity of their distribution make it seem probable that these four species may only be varieties or geographical races of a single species.

Topsent gives .245 to .265 mm. as the length of the spicules in a specimen of *Reniera ventilabrum,* and this measurement renders less significant the differences in spicule length which alone seems to be the criterion for their separation. In organisms so responsive to their environment such small variations as the descriptions indicate, as well as the minute differences in spicule length, will undoubtedly be shown upon further study to fall within the limits of normal variation for a single species.

Geographical distribution. Davis Strait (Lundbeck); Mount Desert Region.

Reniera urceolus (Rathke and Vahl)

Lundbeck (1902, p. 35, pl. 1, fig. 6; pl. 11, fig. 1).

There are 2 beautiful specimens of this species, which were taken at Station 21, hard bottom, 50 to 60 feet deep. This species appears to have a definite mode of growth, one specimen consisting of a single erect tube 125 mm. high with a single osculum, 7 to 8 mm. in diameter, at the top of a slightly raised prominent margin or collar. The specimen is broadly attached at the base. The other specimen is 150 mm. high and has a broad base which is considerably narrowed at the point of attachment. From the base arise 3 broad tubes; the middle one terminates in a single small osculum; each of the lateral tubes bifurcates near the top, and at the tips of each of these branches there is a small osculum. All the oscula in this specimen are quite small (2 to 3 mm. in diameter). Both specimens are hollow.

Skeleton. This consists of a regular mesh, mainly rectangular. The longitudinal fibers are distinct and complete, whereas the transverse ones are indistinct and often not continuous. Most of the fibers are unispicular and the spicules are firmly united at their ends by a definite globule of spongin. In addition to these fibers, there are present some comparatively thick, polyspicular fibers which are stouter and more numerous in the base and stalk of the sponge.

Spicules. The spicules are thick, slightly curved oxea, varying from .219 mm. to .255 mm. in length.

Geographic distribution. Iceland (Lundbeck); Mount Desert Region. This is the first time this species has been reported from the coast of continental North America.

Chalina Grant

Chalina oculata (Pallas)

Bowerbank (1864, p. 208, pl. 13, fig. 262; 1866, p. 361; 1874, p. 169, pl. 66, figs. 1–3). Lambe (1896, p. 184, pl. 1, figs. 2, 2a). Lundbeck (1902, p. 10, pl. 8, fig. 7).

This species was taken at Stations D 19, 67, 86, 149. Young individuals were taken at Station 19. It occurs on hard bottoms, depth 50 to 330 feet.

This species has a characteristic form and mode of growth. In older individuals it is stalked and branching, whereas young specimens are unbranched. Oscula are small but conspicuous and usually arranged in rows on one side of the branch.

Skeleton. This is chiefly unispicular, but polyspicular fibers are found in the older portions of the specimen and toward the middle of the branches, but they contain only a few spicules. The amount of spongin varies in different individuals, as well as in different parts of the same individual, usually being more abundant in the older portions and the stalk. In mature individuals the spicules may be surrounded by a thin sheath of spongin. Globules of spongin firmly unite the ends of the spicules.

Spicules. These are slightly curved, evenly and gradually tapering oxea which vary from .121 mm. to .146 mm. in length. The variation in size is very slight within the individual.

Geographical distribution. This species is very common in Vineyard Sound, Massachusetts Bay, Casco Bay (Verrill, Kingsley); Bay of Fundy, and Gulf of St. Lawrence (Lambe); Mount Desert Region.

Family Desmacidonidae

Esperiopsis Carter

Esperiopsis quatsinoensis Lambe

Lambe (1893, p. 67, pl. 3, figs. 8, 9; pl. 5, figs. 8a–c).

This species has been taken at stations 136 and 149, rock bottoms, depth 22 to 100 feet. Only one well-preserved specimen was taken at D 149. It is stalked and spatulate and is 60 mm. high and 30 mm. broad at its greatest breadth. The oscula are from 1 to 2 mm. in diameter and confined almost entirely to the sides. In some cases their margins are slightly elevated.

Skeleton. This consists of a meshwork of polyspicular fibers making a fairly regular reticulum of rectangular meshes. Spongin is small in amount or wanting.

Spicules. Megascleres are stout, usually curved styli, which vary from .146 to .219 mm. in length.

Microscleres are small isochelae of the type found in the genus *Homeodictya* and vary from .024 mm. to .028 mm. in length. These isochelae are very scarce and Lambe reports the same for his specimens from Vancouver Island, British Columbia.

Remarks. This specimen closely resembles *Homoedictya palmata* except that this species has oxea instead of styli.

Lambe has described three new species of *Esperiopsis* with the typical *Homoeodictya*—chelae from the Pacific coast of North America. As the species of this genus present a variety of forms, the exterior appearance of these specimens cannot be used as a criterion for distinguishing them. The only difference between them to be found in his brief descriptions is the size of the spicules, and these form a so nicely graded series as to make it questionable whether this character is an adequate criterion for separating them. Lambe's diagnosis of these three species is tabulated below.

There seems to be no adequate reason for separating these three forms, and from their descriptions there seems to be no real distinction between any of them and the form from the Mount Desert Region. As the size of the spicules for the specimen from this region coincides with those given for *Esperiopsis quatsinoensis,* it has been placed in that species.

H. V. Wilson has described *Esperiopsis obliqua* from Beaufort, North Carolina but this species has toxa as well as isochelae. *Esperiopsis forcipula* has been described from Davis Strait, but this species possesses forceps in addition to isochelae. Consequently *Esperiopsis quatsinoensis* is not to be confused with these two species.

Geographical distribution. Vancouver Island, Straits of Georgia, British Columbia; Atka Island (Aleutian Islands), (Lambe); Mount Desert Region.

SPECIES	STYLI	ISOCHELAE	SKELETON	DISTRIBUTION
	mm.	*mm.*		
vancouverensis	.109–.163	av. .019 abundant	Composed of a rather irregular reticulation of spiculo fibers	West coast of Vancouver Island north of Quatsino Sound, 30 to 50 fathoms
quatsinoensis	.144–.216	av. ..026 scarce	Consisting of bands of stout distinct spiculo fibers radiating outwards to the surface, joined together by less regularly disposed and less robust fibers, the whole forming an irregular reticulation	West coast of Vancouver Island north of Quatsino Sound, 30 to 50 fathoms
laxa	av. .222	av. .026	Composed of bands of outwardly ascending spiculo fibers crossed at right angles and in an irregular manner by secondary fibers, forming an irregular reticulation	Oyster Bay, Vancouver Island, 20 fathoms

Esperiopsis sp. (? alderi Bowerbank)

Lundbeck (1905, p. 15, pl. 8, figs. 30a–c).

There is one small, bulbous, slenderly stalked specimen of this species, taken at D 95, on rock and shell bottom, depth about 80 feet. This specimen differs in some minor details from *Esperiopsis quatsinoensis,* and it has been somewhat doubtfully identified as *Esperiopsis* (? *alderi*).

Spicules. Megascleres. The styli are usually rather strongly curved and taper gradually to a rather long point. Their length varies from .364 mm. to .445 mm., with the mode at .405 mm.

Microscleres. These are isochelae of one type and vary from .024 mm. to .031 mm. in length. In lateral views these isochelae somewhat resemble the *Homoeodictya* chelae except that the inwardly projecting tooth is not so strongly developed.

Remarks. This form differs from *Esperiopsis quatsinoensis* in the length of the styli and in the degree of development of the projecting tooth of the isochelae.

Lundbeck described a specimen from Iceland of this species in which the styli measure .38 mm. to .44 mm. in length. This specimen contains the peculiar *Homoeodictya* chelae, although he reported that this peculiarity was not found in all of them. Vosmaer claims that *E. alderi* is a synonym of *E. normani* and Topsent considers *E. alderi* to be a synonym of *E. fucorum.*

Geographical distribution. Iceland (Lundbeck); Mount Desert Region.

Mycale Gray

Mycale lingua (Bowerbank)

Lundbeck (1905, p. 29, pl. 9, fig. 6a–f).

This species has been taken at Stations D 117 and 130, rock and blue clay, depth 54 to 239 feet. The specimens are massive and lobate and rather soft in consistence.

Skelton. This consists of branching and anastomosing fibers which extend from the base throughout the sponge.

Spicules. Megascleres are styli for the most part, although quite a few subtylostyli are present. These specimens contain in abundance the constricted spicules described by Bowerbank for *Desmacidon constrictus,* which Topsent considers as identical with *Mycale lingua.* Some of these spicules have more than one constriction. The styli vary in length from .445 mm. to .567 mm., with a mode at .486 mm. Microscleres consist of anisochelae and sigmata. The anisochelae are of two sizes, with so few of an intermedite size as to eliminate the possibility of the smaller ones being only developmental forms of the large ones. The large anisochelae are frequently found in rosettes, which does not seem to be the case for the small ones. The large anisochelae range in length from .064 mm. to .097 mm., with a mode at .081 mm. The small anisochelae vary in length from .022 mm. to .056 mm., with the mode at .028 mm. The sigmata are both simple and contort and average about .02 mm. in length.

The specimens from this region seem to be lacking in rhaphides or else they are so scarce as to have entirely escaped notice, although they were especially looked for. However, Topsent records that "here and there, some rhaphides exist in bundles or scattered, and if the rhaphides are sometimes lacking it occurs in specimens identical in every other respect to those which possess them."

Geographical distribution. Davis Strait (Fristedt); off Newfoundland (Topsent); Gulf of St. Lawrence (Lambe); northeastern coast of United States (Verrill); Greenland (Lundbeck); Mount Desert Region.

Mycale ovulum (O. Schmidt)

Lundbeck (1905, p. 34, pl. 1, figs. 6–8; pl. 10, fig. 1a–e).

One small specimen of this species was taken at Station 67, encrusting the stem of a hydroid, depth 330 feet. Another large specimen was obviously encrusting, probably on a stone.

Skeleton. Consists of a rather regular network of polyspicular fibers irregularly connected usually by single transverse specules.

Spicules. Megascleres are styli which are usually rather abruptly curved with the curve nearer the blunt end. These styli vary in length from .162 mm. to .243 mm., with the mode at .203 mm. Microscleres are palmate anisochelae of two sizes; otherwise they are identical. The large ones vary from .037 mm. to .043 mm. in length, and the small ones from .0179 mm. to .024 mm. These anisochelae are characterized by the smaller end being larger than usual, and thus more nearly approaching the other end in size, which is characteristic for the *Mycale* anisochelae. The small anisochelae are much more abundant than the large ones, which are quite scarce, and according to Lundbeck, are not always found in all indi viduals. Developmental forms of both the large and small anisochelae were abundant in all stages of development.

Remarks: *Mycale ovulum* is distinguished by the absence of sigmata from *Mycale lingua.*

From the Gulf of St. Lawrence Lambe has described as *Esperella modesta* a form which Lundbeck considers to be very probably identical with *Mycale ovulum.*

Geographical distribution. Davis Strait (Lundbeck); Gulf of St. Lawrence (*Esperella modesta,* Lambe); Mount Desert Region.

Myxilla O. Schmidt

Myxilla incrustans (Johnston)

Lundbeck (1905, p. 132, pl. 4, figs. 6, 7; pl. 14, fig. 3a–h).

This species was taken at Shore Station 4, encrusting a *Modiolus,* near low water.

Skeleton. This is chiefly a polyspicular reticulation of triangular meshes, although it may be quite irregular and more diffuse.

Spicules. Megascleres are straight or slightly curved spined styli with the head end swollen (tylostyli) and more heavily spined than the shaft of the spicule.

Frequently the curve in the spicule is displacd toward the head end. These spicules vary in length from .145 mm. to .243 mm., with the mode at .203 mm.

The tornota are straight or curved with the bend occurring, sometimes abruptly, at almost any point on the shaft. In the majority of these the ends are minutely spined and dissimilar; one end is more bulbous than the other, which is elongately oval in shape. These spicules vary in length from .162 mm. to .203 mm., with a modal length of .186 mm.

Microscleres are isochelae of two sizes and sigmata. The large isochelae are tridentate and vary in length from .037 mm. to .05 mm., with the mode at .043 mm. The small isochelae vary in length from .018 mm. to .026 mm., and, in this specimen, they are not so abundant as the large isochelae.

Simple and contort sigmata are present in great abundance and vary from .024 mm. to .037 mm., with a modal length of .028 mm.

Geographical distribution. Davis Strait (Lundbeck); Gulf of St. Lawrence (Lambe); Mount Desert Region.

MYXILLA FIMBRIATA (Bowerbank)

Lundbeck (1905, p. 141, pl. 4, figs. 9, 10; pl. 14, fig. 5a–i).

This species was taken at Stations D 40, 96, 117. On hard bottoms, depth 62 to 81 feet. Has a somewhat lumpy, sometimes lobed form and is frequently found attached to shells, stones, etc. The specimens taken in this region are rosy-red in the living condition, but soon become dark brown in alcohol.

Skeleton. This is a polyspicular, most frequently irregular network of triangular or rectangular meshes.

Spicules. Megascleres are spined styli, usually smooth, with a slight curve nearer the blunt end, although straight styli are found. These styli are not so heavily spined as the corresponding ones in *Myxilla incrustans*. Bowerbank described them as being 'incipiently spined.' The styli vary in length from .259 mm. to .364 mm., with a mode at .284 mm. Smooth tornota, usually straight, are present, but not so abundantly as the styli. The two ends of the tornota are usually dissimilar with one end finely and gradually pointed whereas the other end is more broadly pointed, ending in a little mucro. These tornota usually have a distinct constriction at the broadly pointed end and vary in length from .243 mm. to .284 mm., with the mode at .267 mm.

Microscleres are tridentate isochelae of two sizes. The isochelae are present in profusion; the small isochelae are much more abundant than the large ones. The large isochelae vary in length from .072 mm. to .089 mm., with a modal length of .081 mm. The small isochelae are identical in form with the large ones and range in size from .028 mm. to .043 mm., with the mode at .033 mm.

Remarks. This species is most conspicuously distinguished from *Myxilla incrustans* by the absence of sigmata.

Geographical distribution. Davis Strait (Lundbeck; Mount Desert Region.

Homoeodictya Ehlers
Homoeodictya palmata (Johnston)

Lundbeck (1905, p. 121, pl. 13, fig. 6a–c).

One small fragment of this species was found at Station 94, on rock in 71 feet of water, but due to the peculiar type of isochelae in this species there is no doubt of its identification.

Skelton. The skeleton is composed of a rather regular reticulation of polyspicular fibers bending toward the surface. Transverse, though discontinuous, fibers make with the primary fibers a rectangular meshwork.

Spicules. Megascleres are straight or slightly curved oxea whose length varies from .182 mm. to .219 mm., with the mode at .204 mm.

Microscleres are all isochelae of a peculiar type. These isochelae are carefully described and well illustrated by Lundbeck in the reference cited above. They vary only slightly in size and measure .03 mm. in length.

Remarks. This species is easily distinguished from *Esperiopsis quatsinoensis* and *Esperiopsis* (*alderi?*), which also have peculiar *Homoeodictya*—isochelae, by the presence of oxea, in *Homoeodictya* in contrast to styli, which are found in *Esperiopsis.*

Geographical distribution. Nova Scotia, Sable Island, Bay of Fundy (Lambe), Massachusetts Bay, Gulf of Maine (Verrill), Mount Desert Region.

Tedania Gray
Tedania suctoria O. Schmidt

Lundbeck (1910, p. 1, pl. 1, figs. 1–5; pl. 4, fig. 1).

This species was taken at Stations D 37, 71, 112, 117. The specimens from 37 and 71 were quite large. Found on hard bottoms, depth 52 to 100 feet.

This species seems to have a fairly definite mode of growth and a characteristic appearance. Typically, it is massive and attached to a substratum. All the specimens are characterized by numerous wartlike papillae, although in young individuals the papillae are few and indistinct. The papillae have no openings at their summits.

Skeleton. The main skeleton is a rather diffuse and irregular polyspicular reticulation. Single spicules contribute in many places to the main skeleton. The dermal skeleton is formed of large and small bundles of spicules lying horizontally or in a more or less erect position. Single spicules are also found scattered in the dermal membrane.

Spicules. Megascleres. 1) The skeletal spicules are styli with an even slight curve nearer the rounded end. They vary slightly in length in different individuals, although their size is quite constant within the specimen. These styli range in size from .364 mm. to .486 mm., with a mode of .405 mm. 2) The dermal spicules are usually straight, sometimes slightly curved, tylota. At each end they have a distinct, somewhat elongated swelling, which passes evenly and gradually into the shaft of the spicule. The tylota vary in length from .284 mm. to .364 mm., with a modal length of .324 mm.

Microscleres. Raphides are present in abundance and are scattered as well as in bundles. They have one end abruptly pointed, while the other end tapers gradually into a long, very fine point. These spicules exhibit a 'roughness' in distinction to 'spination' or 'microspination.' The rhaphides vary in length from .12 mm. to .284 mm., with the mode at .243 mm.

Geographical distribution. Davis Strait (Lundbeck), off Newfoundland (Topsent); Mount Desert Region.

Stylotella Ledenfeld

Stylotella simplissima (Bowerbank)

Bowerbank (1874, p. 324, pl. 90, figs. 1–3) (*Raphiodesma simplissima*).

This species was taken once at Station 119. There was only one specimen. Taken on hard bottom in 42 to 60 feet of water.

This sponge forms a thick incrustation with an uneven surface, due to the presence of grooves, mounds, and cones. The oscula are few in number, inconspicuous, and small. These do not exceed a millimeter or two in diameter and are usually situated at the apex of the cones.

Skeleton. This is composed of 'multispiculous fasciculi,' which are exceedingly variable in width and length, and these bundles are irregular disposed. Usually they are no longer than a spicule in length and there is no discernible tendency for them to be organized into fibers or tracts. Bowerbank emphasizes the coincidence of the heads and points of all the spicules within a bundle. A tendency toward such an arrangement is noticeable but not invariably found in the specimens from this region.

Spicules. These are long, slender, gradually tapering, usually curved styli. The curve or bend is sometimes quite abrupt and usually nearer the blunt or head end. These spicules are almost all of one size and measure .324 mm. in length. Bowerbank mentions and figures two types of styli which are identical except for a difference in their widths. The more slender styli are recorded as variable in size and composing the dermal membrane, whereas the stouter styli, although variable in length and breadth, compose the skeletal fasciculi. In the specimens from this region these slender styli of all sizes are quite abundant in all parts of the sponge. As they show all gradations in size between the smallest and largest spicules and are otherwise identical, it would appear that they are nothing more than developmental forms.

Remarks. Verrill has recorded the occurrence in Casco Bay of *Stylotella pannosa,* but did not give any description of it. If Verrill's determination of his specimens be correct, it can be distinguished from *Stylotella simplissima* by its spicule length (.14 mm.) in addition to other minor features, according to Bowerbank's description of *S. pannosa.*

Geographical distribution. Mount Desert Region. This is the first time that this species has been described from the Atlantic coast of North America, although the occurrence of the genus (*Stylotella pannosa*) has been recorded by Verrill for Casco Bay and by Wilson (*Stylotella heliophila*) for Beaufort, North Carolina.

IOPHON Gray

IOPHON CHELIFER Ridley and Dendy

Ridley and Dendy (1887, p. 119, pl. 16, fig. 3; pl. 17, figs. 1, 3, 8). Lambe (1894, p. 30, pl. 2, figs. 7, 7a–f).

This species is very abundant in this region and is found always encrusting on *Terebratulina septentrionalis.* The older sponges are massive and lobate. In the living condition they are brownish-gray, but soon become dark brown or black in alcohol.

Skeleton. This is composed of an irregular loose reticulation of spined spicules with a more or less rectangular meshwork. Two main lines of spicules are roughly distinguishable; one of these is approximately perpendicular to the surface of the sponge.

Spicules. Megascleres consist of spined styli and tylota. 1) The spined styli compose the major portion of the skeleton and vary from .161 mm. to .243 mm. in length. 2) Tylota with minutely spined ends are found in the dermal membrane and are few in number when compared with the abundance of spined styli. The tylota vary from .162 mm. to .243 mm. in length.

Microscleres consist of anisochelae and bipocilli. 1) The anisochelae vary from .015 mm. to .019 mm. in length. 2) Bipocilli, having the characteristic pronged ends, measure .009 mm. in length. These bipocilli are more regular and consistent in shape than those figured by Ridley and Dendy for specimens from the south Indian Ocean and agree well with those figured by Lambe for this species from the Straits of Georgia (Vancouver Island). Lambe states that the specimens from the Gulf of St. Lawrence are exactly similar in spiculation to those from the Pacific coast.

Geographical distribution. Gulf of St. Lawrence (Lambe), Mount Desert Region.

MICROCIONA Bowerbank

MICROCIONA PROLIFERA Verrill

George and Wilson (1919, p. 157, pl. 62, fig. 31; pl. 63, figs. 35, 36; pl. 66, fig. 57a–e).

This species was found only once in this region, at Station 97, in 72 feet of water, and it was encrusting an old barnacle shell. In the living condition it is bright red. At Woods Hole, and Beaufort, North Carolina, it is an erect, intricately branched sponge.

Skeleton. This consists of vertical columns or fibers, 2 or 4 spicules in thickness. Echinating spicules are arranged in unilateral tufts.

Spicules. Megascleres. 1) Styli are smooth, slender, slightly fusiform, often rather bluntly pointed and are the chief skeletal element. In some cases the head end is slightly inflated with an indistinct neck between the fusiform shaft and head of the spicules. No spines could be detected, although they were sought for. These spicules vary from .243 mm. to .324 mm. in length, with a mode at .284 mm. 2) Small spinose styli, which frequently have slightly enlarged heads, are present but are not so abundant as the larger smooth styli. They taper gradually from the head to a sharp point and vary in length from .105 mm. to .203 mm., with the mode at .145 mm. 3) Large spinose styli, with slightly enlarged and heavily spined heads, are about as abundant as the small spinose styli. These spicules taper gradually from the head to a sharp point. The spination becomes progressively less heavy from the head to the tip. They vary in length from .284 mm. to .405 mm. This class of spicules is absent in specimens from Woods Hole, and the measurements given by George and Wilson for the spinose styli from material taken at Beaufort would not include them.

Microscleres. These are stout isochelae, with no variation in size, and measure .121 mm. in length. These isochelae have usually 2 teeth, although a few with 3 or 4 teeth are found.

Remarks. George and Wilson record the presence of toxa in 'considerable abundance' in the Beaufort specimens, and in an examination of material from Woods Hole these spicules were found to be excessively rare. No toxa were found after a careful search in the specimens from this region. Thus, this specimen differs mainly in the presence of large spinose styli and the absence of toxa from those from Beaufort, North Carolina, and Woods Hole, but until more material can be studied it was thought advisable to consider this specimen as *Microciona prolifera.*

A comparison of material from these three localities is made in the following table:

	MOUNT DESERT REGION	WOODS HOLE	BEAUFORT, N. C.
Smooth styli	.243 – .324 mm. mode, .284 mm.	.109 – .363 mm.	.150 – .5 mm.
Large spinose styli	.284 – .405 mm.	Absent	Absent
Small spinose styli	.105 – .203 mm. mode, .145 mm.	.060 – .090 mm. mode, .079 mm.	.080 – .10 mm.
Isochelae	.0121 mm.	.012 – .0165mm. mode, .015 mm.	.012 – .016 mm.
Toxa	Absent	.030 mm. Excessively rare	.01 – .04 mm. Abundant

Geographical distribution. Vineyard Sound (Verrill), Beaufort, N. C. (George and Wilson), Mount Desert Region.

Family Suberitidae

Suberites Nardo

Suberites hispidus (Bowerbank)

Lambe (1896, p. 194, pl. 2, figs. 5, 5a–d).

This species was taken at Stations D 19, 107, 130, 132. It was very abundant at Station 132. Found on rock and blue clay in 87 to 239 feet of water.

All the specimens are irregularly circular, subhemispherical, with an even very hispid surface. In the living condition this sponge is yellow except where the color is obscured by adhering particles of mud and sand. In alcohol the specimens soon become a yellowish gray. Lambe has described the osculum in this species as a depressed opening about 6 mm. in diameter and situated at the summit of the sponge. Lambe's interpretation of this area is thought to be erroneous, as the 'osculum' (Lambe) represents rather an oscular area which is composed of many, sometimes ten or more, short, irregular, often strap-shaped, papillae clustered within a depression. This opening is circular or ovoid in shape and about 6 mm. in diameter; the details of this region are often obscured by the quantities of mud and sand which usually adheres to the surfaces of the specimens. The true oscula are to be found, it is suspected, at the tips of the papillae. In small specimens there is present usually only a single oscular area, but in large individuals as many as 5 or 6 may be present. Lambe states that "at the margin of the osculum [= oscular area] the projecting tylostyli are directed toward a point a little above the opening." Such is the case in most of the specimens from this region, and this condition is another factor which helps to obscure the true nature of this area.

Skeleton. This is composed of loose fibers which pass from the base to the surface of the sponge. In the cortex, two sizes of tylostyli are present. The small tylostyli, radiating outward, are densely packed together and project slightly beyond the surface. The inner cortical layer contains larger tylostyli which are loosely and irregularly placed. Long cortical tylostyli, similar to those in the main fibers, project beyond the surface. At the margins of the oscular areas projecting tylostyli are frequently found directed toward a point a little above the center of this area.

Spicules. 1) Stout, fusiform, gradually tapering and finely pointed tylostyli with feebly developed heads form the skeletal fibers. These vary in length from 1.08 mm. to 1.64 mm. 2) Stout, slightly bent, sharply pointed tylostyli with well-marked heads compose the inner layer of the cortex. They range from .324 mm. to .526 mm. in length. 3) Small, usually curved, sharply pointed tylostyli with well-developed heads are very abundant in the dermal layer of the cortex. These vary from .121 mm. to .203 mm. in length. 4) Very long, sharply pointed tylostyli with well-developed heads project far beyond the surface of the sponge and give it a very hispid surface. These spicules vary from 2.47 mm. to 3.28 mm. in length.

Geographical distribution. Portland, Maine (Dawson); Gulf of St. Lawrence (Lambe), Mount Desert Region.

SUBERITES MONTALBIDUS Carter

Lambe (1895, p. 127, pl. 3, figs. 6, 6a–c).

Several fragments representing probably 2 or 3 individuals of this species were taken at Station 107, on rock, depth 165 feet.

Skeleton. This is composed of large tylostyli irregularly intermixed. The dermal skeleton is composed of two forms of small spicules and distinct bundles of small tylostyli placed at right angles to the surface and projecting slightly beyond it. The small inflated spicules are also scattered throughout the interior of the sponge.

Spicules. 1) Tylostyli as well as some subtylostyli vary in length from .324 mm. to .405 mm., with a mode at .364 mm. These spicules may be straight or curved and frequently have small secondary inflations near the head end. Lambe does not record the presence of any subtylostyli, although Carter (1880, p. 256) in the original description describes the head as 'variable in shape.' 2) A few small oxeote spicules, inflated at their midlengths, are found and these vary from .041 mm. to .052 mm. in length. Lambe found these spicules to be minutely spined, but there is no evidence of spination in the specimens of this region. Carter makes no mention of their being spined in the original description. 3) Small, straight or curved, cylindrical spicules, with rounded ends and inflated at or near the midlength of the shaft, are present in large numbers. These are always smaller than the oxeote spicules and vary from .013 mm. to .028 mm. in length. Lambe records these spicules as minutely spined also, but there is no evidence of spination in these specimens.

Remarks. *Suberites montalbidus* is readily distinguished from the other species of *Suberites* which are found in this region by the presence of the small inflato-spicules. It is distinguished from *Suberites ficus*, which has been reported from the Gulf of St. Lawrence but never taken in this region, by the presence of the small inflated oxeote spicules.

Geographical distribution. Hudson Bay (Lambe), Mount Desert Region.

Suberites concinnus Lambe

?*S. compacta* Verrill (1873, p. 744); *S. concinnus* Lambe (1895, p. 128, pl. 2, figs. 12, 12a).

This species was taken at Station D 110 and one specimen at Station D 40, hard bottoms, depth 23 to 69 feet.

There are six specimens of very hard sponge which have been placed with some doubts in this species. These specimens are irregularly circular, subhemispherical, smooth, and very hard, almost stony. The oscula are few and very inconspicuous.

Skeleton. In the body of the sponge the spicules are scattered and without definite arrangement. At the surface they are perpendicular and seem frequently, although not invariably, gathered into bundles forming a compact cortex. The styli project but very slightly beyond the surface.

Spicules. These are tylostyli varying in length from .203 mm. to .324 mm., with the mode at .284 mm. They are long and slender with one end tapering gradually to a point. The other end is slightly enlarged, but usually largest a slight distance from the tip, so that this end has a somewhat ovate form.

Remarks. Verrill and Smith have described a species, *Suberites compacta*, but have included in their description no figures, measurements of spicules, nor any details of skeletal arrangement. This species is recorded as being remarkable for the compactness of its tissues; as having small and inconspicuous oscula, and as having a smooth surface. The spicules from the specimens from this region are identical with those described for *Suberites compacta*. From the Pacific coast of North America Lambe has described *Suberites concinnus*. Our specimens fit the description of this latter species in every detail except that the spicules of *S. concinnus* are described and figured as having evenly rounded basal ends instead of somewhat ovoid ends. It seems very probable that these species are identical but due to the inadequacy of Verrill's prior description it is thought best to consign the present specimens to *Suberites concinnus.*

Geographical distribution. (*Suberites compacta.*) Off Martha's Vineyard (Verrill and Smith), Arctic Ocean, Behring Sea, North Pacific Ocean (Lambe), Mount Desert Region.

POLYMASTIA Bowerbank

POLYMASTIA ROBUSTA Bowerbank

Bowerbank (1866, p. 62; 1874, p. 23, pl. 10, figs. 5–8; 1882, p. 31). Lambe (1896, p. 195, pl. 2, figs. 6, 6a–b).

This species was taken at Stations D 52, 73, 75, 102, on rock, depth 34 to 38 feet.

There are seven specimens of this species and they range in size from a small circular one, 20 mm. in diameter, with a single fistula, to one 50 mm. long and 30 mm. broad, having 17 fistulae. These fistulae are usually not over 20 mm. long with a diameter of 3 mm. However, in one of the specimens the fistulae are unusually long and graceful, the longest one being almost 40 mm. in length. There are no visible openings at the distal ends of these fistulae. These specimens were found growing on rocks. According to Whiteaves, this species may be several inches in length.

Skeleton consists of stout fibers (.243 to .324 mm. in diameter) perpendicular to the surface. Upon approaching the cortical layer these fibers expand slightly, extend through this layer, and project a bit beyond the surface of the sponge.

In the outer part of the cortical layer there is an abundance of small spicules, closely packed, and perpendicular or slightly oblique to the surface. When the surface is viewed in profile under the microscope these spicules are seen to project very slightly, thus giving the surface a slight hispidity which is not observable by the unaided eye.

In the inner cortical layer the spicules are larger and arranged for the most part parallel to the surface, but otherwise with no definite arrangement, as they lie scattered in all directions.

Spicules: 1) Cortical tylostyli (a) from the dermal layer of the cortex. These tylostyli are small, usually rather strongly curved, slightly fusiform with well-developed heads. They vary in length from .061 to .218 mm., with the mode at .186 to .20 mm.; (b) from the inner layer of the cortex. These tylostyli are similar to those found in the skeletal fibers. They vary in length from .445 to .688 mm. and in breadth from .008 to .012 mm. These spicules have feebly developed heads and are sometimes rather abruptly curved near the head end. 2) Tylostyli from the skeletal fibers. These tylostyli have such feebly developed heads as hardly to justify calling them tylostyli.

These spicules are slightly fusiform, tapering gradually to a long sharp point at one end and tapering slightly toward the head, which is almost imperceptibly inflated. These spicules vary in length from 1.08 to 1.36 mm. and in breadth from .016 to .024 mm. This type and the preceding show no definite modal length.

Remarks. Lambe records only two sizes of spicules: those from the cortex and the skeletal fibers. However, he adds that "spicules similar in size and form to those of the main fibers of the body of the sponge occur in some numbers beneath the cortex, [= inner cortical layer] parallel to the surface." The measurement given by him for the small cortical tylostyli agrees very well with those from our specimen. The sizes given by Lambe for the 'large tylostyli of the body' embrace those given here for both the spicules of the inner cortical layer and the skeletal fibers. However, there is a discontinuity in size in our specimen as well as a slight structural difference noted above, but there is little doubt of the identity of the two forms.

Geographical distribution. Gulf of St. Lawrence (Lambe), Portland, Maine (Sir William Dawson); off Halifax ('Challenger'), northeast coast of United States (Verrill), Mount Desert Region.

Polymastia Sp. ?

This form was taken at Stations D 19, 90, 101, 135.

There are six specimens of this form, which has a marked tendency to be circular. These specimens range from 5 mm. to 50 mm. in diameter. The largest specimen has between 85 and 90 papillae, which do not exceed 8 mm. in height. These papillae, when growing very near each other, have a tendency to coalesce. The diameter of these papillae does not exceed 4 mm. In some of the specimens a few of the papillae are curved at their distal ends; thus extending roughly parallel to the general surface of the sponge. There are no visible openings on the distal ends of the papillae. The thickness of the specimens varies with its size; the largest specimen is 15 mm. in height. This form is more massive and robust than *P. robusta.* Around the edges, which are below the general level of the sponge, there is a marked hispidity which is quite noticeable as a dirty-brown rim due to the adherence of fine particles of silt. In living condition this sponge is a bright yellow, often an orange yellow.

Skeleton consists of stout fibers (.081 to .203 mm. in diameter) perpendicular to the surface. Unlike *P. robusta*, these fibers only occasionally extend into or through the cortical layer.

In the outer part of the cortical layer there is an abundance of small spicules, closely packed and generally perpendicular to the surface beyond which they project very slightly. Thus, in a profile view under the microscope there is discernible a slight hispidity, which otherwise is not noticeable.

In the inner part of the cortical layer the spicules are larger and, in general, arranged parallel to the surface, but otherwise there is no definite arrangement.

Spicules. 1) Cortical tylostyli (a) from the dermal layer of the cortex. These spicules are usually curved, stout, and strongly fusiform with well-developed heads. Many of these spicules are subtylostyli, with a distinct inflation just median to the end of the spicule. These spicules vary in length from .161 to .226 mm. in length, and are .0073 to .0094 mm. at their greatest breadth. The mode for the length of these spicules is .203 mm.; (b) from the inner layer of the cortex. These tylostyli are smaller but similar to those found in the skeletal fibers, being strongly fusiform. They taper gradually to a long fine point at one end, while the other end has the head so feebly developed as to barely justify classing them as tylostyli. They rather more resemble styli with a slight and indefinite constriction. These spicules vary from .405 to .526 mm. in length and from .0075 to .0094 mm. in breadth. There is no modal length for these spicules except there are fewer of the extremes. 2) Tylostyli from the skeletal fibers. These spicules are strongly fusiform as well as being similar in all other respects, except size, to those from the inner layer of the cortex. These spicules vary fom 1.087 to 1.5 mm. in length and from .018 to .022 mm. in breadth.

Remarks. This species resembles *P. laganoides* Lambe (1895, p. 129, pl. 4, figs. 5, 5a–c) in certain features. However, the distribution of the various classes of spicules within the sponge is quite different. In *P. laganoides* the spicules of the dermal layer do not belong to the smallest class, whereas in this form they do. It is barely possible that Lambe may have been mistaken in this, for in most *Polymastia* the dermal layer contains the smallest spicules found in the sponge. He calls attention to the fact that in this sponge there is the "absence of a regular radiating arrangement of the spicules of the cortex; the spicules are closely intermixed and lie at all angles to the surface, those that project beyond it causing a slight hispidity." This description fits rather well for the inner layer of the cortex and is unusual for the dermal layer in this genus. As Lambe described this species from a single specimen it may be that in this case the dermal layer has been injured and partially destroyed. His description of the surface and oscula also suggests this possibility. Such other minor differences as exist between them might well come within the limits of variation when more material is studied.

Geographical distribution. Mount Desert Region; probably some of the *Polymastia* sp. ? of Verrill's lists may be identical with this form.

CLIONA Grant

CLIONA CELATA Grant

George and Wilson (1919, p. 138, pl. 56, figs. 2, 4, 5; pl. 66, fig. 50).

A common sponge in this region and always found boring in old shells.

Skeleton. This consists of irregularly scattered tylostyli.

Spicules. These are tylostyli and subtylostyli, varying in length from .243 mm. to .364 mm., with a modal length of .324 mm. These spicules are sharply pointed and slightly curved, with the curvature in the upper half or head end. In the majority of the spicules the head is subterminal.

Geographical distribution. Vineyard Sound (Verrill), Casco Bay (Kingsley), Gulf of St. Lawrence (Lambe), Beaufort, N. C. (George and Wilson); Mount Desert Region.

LITERATURE

BOWERBANK, J. S. 1864–1882 A monograph of the Britsh Spongiadae. Ray Society: vol. 1 (1864), pp. i–xx, 1–290, 37 pl.; vol. 2 (1866), pp. i–xviii, 1–388; vol. 3 (1874), pp. i–xvii, 1–367, 91 pl.; vol. 4 (1882), pp. i–xvii, 1–250, 17 pl.

CARTER, H. J. 1880 In D'Urban, W. S. M. The zoology of Barents Sea. Ann. Mag. Nat. Hist., ser. 5, vol. 6, pp. 253–277.

GEORGE, W. C., AND WILSON, H. V. 1919 Sponges of Beaufort (N. C.) harbor and vicinity. Bull. Bur. Fish., vol. 36, pp. 129–179, 11 pl.

HANITSCH, R. 1894 Revision of the generic nomenclature and classification in Bowerbank's "British Spongiadae." Trans. Liverpool Biol. Soc., vol. 8, pp. 173–206.

KINGSLEY, J. S. 1901 Preliminary catalogue of the marine Invertebrata of Casco Bay, Maine. Proc. Portland Soc. Nat. Hist., vol. 2, pp. 159–183.

LAMBE, L. M. 1893 On some sponges from the Pacific coast of Canada and Behring Sea. Trans. Roy. Soc. Canada, vol. 10, sect. 4, pp. 67–78, 4 pl.

——— 1894 Sponges from the Pacific coast of Canada, Trans. Roy. Soc. Canada, vol. 11, sect. 4, pp. 25–43, 3 pl.

——— 1895 Sponges from the western coast of North America. Trans. Roy. Soc. Canada, vol. 12, sect. 4, pp. 113–138, 3 pl.

——— 1896 Sponges from the Atlantic coast of Canada. Trans. Roy. Soc. Canada, ser. 2, vol. 2, sect. 4, pp. 181–211, 3 pl.

——— 1900 a Sponges from the coasts of northeastern Canada and Greenland. Trans. Roy. Soc. Canada, ser. 2, vol. 6, sect. 4, pp. 19–50, 6 pl.

——— 1900 b Notes on Hudson Bay Sponges. Ottawa Naturalist, vol. 13, pp. 277–279.

LUNDBECK, WILLIAM 1902 Porifera. (Part I). Homorrhaphidae and Heterorrhaphidae. Danish Ingolf-Exped., vol. 6, part 1, pp. i, 1–108, 19 pl., 1 fig.

——— 1905 Porifera. (Part II). Desmacidonidae (pars). Danish Ingolf-Exped., vol. 6, part 2, pp. i, 1–219, 20 pl., 7 fig.

——— 1910 Porifera. (Part III). Desmacidonidae (pars). Danish Ingolf-Exped., vol. 6, part 3, pp. i, 1–124, 11 pl.

PACKARD, A. S., JR. 1868 Observations on the glacial phenomena of Labrador and Maine, with a view of the recent invertebrate fauna of Labrador. Mem. Boston Soc. Nat. Hist., vol. 1, pp. 210–303, 2 pl.

RIDLEY, S. O., AND DENDY, ARTHUR 1887 Report on the Monaxonida collected by H. M. S. Challenger during the years 1873–76. Rept. Voy. Challenger, zool., vol. 20 (part 59), pp. i–lxvii, 1–275, 51 pl., 22 fig.

SUMNER, F. B. OSBURN, R. C., AND COLE, L. J. 1913 A catalogue of the marine fauna of Woods Hole and vicinity. Bull. Bur. Fish., vol. 31, pp. 547–794.

TOPSENT, EMILE 1892 Contribution a l'étude des spongiaires de l'Atlantique nord. Rés. Camp. Scient. Monaco, fasc. 2, pp. 1–165, 11 pl.

VERRILL, A. E. 1873 Report upon the invertebrate animals of Vineyard Sound and the adjacent waters, with an account of the physical characters of the region. Rept. Comm. Fish., 1871, 1872, pp. 295–778, 38 pl.

VERRILL, A. E. 1874 Explorations of Casco Bay by the U. S. Fish Commission in 1873. Proc. Amer. Assoc. Adv. Sci., meeting 22, part 2, pp. 340–395, 6 pl.

WHITEAVES, J. F. 1901 Catalogue of the marine Invertebrata of eastern Canada. Geol. Surv. Canada, pp. 1–271.

COELENTERATA

Of the 61 species of coelenterates found in this region, only 3—*Acaulis primarius*, *Filellum serpens*, and *Obelia gracilis*—are not recorded in the Woods Hole Survey. The first is undoubtedly a northern form. *Filellum serpens* is a very small, characteristically blue-green form which is quite common in this region but has not been reported for the northeastern coast of America, except from Casco Bay by Kingsley.

Obelia gracilis was described from specimens taken in Puget Sound and has never been recorded from the Atlantic coast. Its characters are quite definite and the identification appears to be valid.

On the other hand, one finds some 15 species recorded from Woods Hole which have not been taken in the Mount Desert Region.

Class HYDROZOA

Order HYDROIDA Hydroids

Suborder ATHECATA

Clavidae

Clava Gmelin

C. leptostyla L. Agassiz. (Hincks, 1868, p. 6, pl. 2, fig. 1.) A common species, especially abundant on *Fucaceae.* Dredged only once, on blue clay, depth 194 feet. Sexually mature, end of June, 1927. Stations: D 131; S 4, 13, 26, 28, 31, 39–41.

Corynitis McCrady

C. agassizii McCrady. (Nutting, 1900, p. 329, fig. 4.) Three specimens from stem of *Pyura ovifera,* depth 90 feet. Station: D 20.

Bougainvilliidae

Bougainvillia Lesson

B. carolinensis (McCrady). (Nutting, 1900, p. 330, fig. 5.) Taken on hard bottoms, from shore to 150 feet. Stations: D 18, 32, 39, 40, 52, 60; S 4, 14.

Hydractinia Van Beneden

H. polyclina L. Agassiz. (Nutting, 1900, p. 335, fig. 12.) Found only on shells inhabited by hermit crabs, from shore to 330 feet. Stations: D 20, 67, 94, 139; S 9.

Eudendriidae

Eudendrium Ehrenberg

These forms are quite variable and specific differences are slight. Hence the determinations are doubtful and further study may show some of the species to be identical.

E. ramosum (Linné). (Hincks, 1868, p. 82, pl. 13.) Taken on hard bottoms, depths 39 to 100 feet. Stations: D 10, 37, 38, 71, 94.

E. dispar L. Agassiz. (Nutting, 1900, p. 332, fig. 7.) Also taken on hard bottoms, depths 65 to 95 feet. Stations: D 39, 40, 56, 75.

E. CARNEUM Clarke. (Nutting, 1900, p. 333, fig. 9.) Taken once on rock bottom in 57 feet of water. The validity of this species is questionable. Station: D 92.

E. ALBUM Nutting. (Nutting, 1900, p. 334, fig. 11.) Taken once with the preceding species.

Pennariidae

ACAULIS Stimpson

A. PRIMARIUS Stimpson. (Fig. 29.) (Stimpson, 1853, p. 10, pl. 1, fig. 4; Allman, 1872, p. 378.) Taken on mud bottoms, depths 35 to 150 feet. Stations: D 1, 18, 33, 36, 81; P 10B.

Tubulariidae

TUBULARIA Linné

T. CROCEA (L. Agassiz). (Nutting, 1900, p. 340, fig. 19.) Taken on hard bottoms, from low water to 100 feet, most common on wharf piles. Sexually mature about the end of June. Stations: D 13, 29, 38, 68, 70, 92, 94, 96; S 4, 14, 24, 39.

T. TENELLA (L. Agassiz). (Nutting, 1900, p. 339.) Taken in similar situations to the preceding, from shore to 69 feet. This is probably only a small variety of the last species. Stations: D 14, 31, 40; S 4.

Corymorphidae

CORYMORPHA M. Sars

C. PENDULA L. Agassiz. (Nutting, 1900, p. 337, fig. 15.) A common species on mud bottoms in 30 to 130 feet of water. Most common at depths of 50 to 100 feet. Stations: D 1–3, 5, 29, 38, 45, 51, 61–63, 75, 83, 84, 94, 106.

Suborder THECATA

Haleciidae

HALECIUM Oken

H. BEANII (Johnston). (Hincks, 1868, p. 224, pl. 43, fig. 2.) Taken on rock and stone, depth 30 to 85 feet. Difficult to distinguish from the next in the absence of gonosomes. Stations: D 31, 44, 56.

H. HALECINUM (Linné). (Hincks, 1868, p. 221, pl. 42.) Also taken on hard bottoms, depths 50 to 330 feet. Stations: D 5, 14, 67, 75, 130.

Fig. 29 Acaulis primarius, habitus figure.

H. TENELLUM Hincks. (Hincks, 1868, p. 226, pl. 45, fig. 1.) On hard bottoms, from shore to 330 feet. The most common species of the genus in this region. Gonosomes present in August. Stations: D 6, 10, 15, 20, 37, 39, 40, 60, 67, 69, 73, 80, 90, 94; S 14.

H. ARTICULOSUM Clark. (Nutting, 1900, p. 357, fig. 51.) Distribution similar to *H. halecinum,* depth 26 to 330 feet. Stations: D 20, 44, 51, 67, 75, 130.

Campanulariidae

CAMPANULARIA Lamarck

C. VOLUBILIS (Linné). (Nutting, 1915, p. 31, pl. 1, figs. 4–6.) On hard bottoms, depths 50 to 95 feet, usually common. Stations: D 20, 36, 69, 73, 86, 94.

C. FRAGILIS (Hincks). (Nutting, 1915, p. 49, pl. 9, fig. 1.) Taken on shells, depth 49 to 61 feet, at Station D 14. Nutting considers it doubtful that this form occurs in New England.

C. AMPHORA (L. Agassiz). (Nutting, 1915, p. 50, pl. 9, figs. 5–7.) On hard bottom, in 70 feet of water. Identification doubtful. Station: D 39.

C. INTEGRA Macgillivray. (Nutting, 1915, p. 33, pl. 1, fig. 7; pl. 2, fig. 3.) Taken once on blue clay, depth 220 feet. Station D 15, and once in tide pool, S 12. Identification doubtful.

C. CALCIOLIFERA Hincks. (Nutting, 1915, p. 49, pl. 9, figs. 2–4.) Taken twice on rock, depths 20 to 57 feet. Identity open to question. Stations: D 4, 92.

C. FLEXUOSA (Alder). (Nutting, 1915, p. 45, pl. 7, figs. 1–6.) The most common species of the genus, especially abundant near low water on rock and seaweed, depth to 239 feet. There is no doubt of its determination. Stations: D 82, 130; S 1, 2, 4, 12–14, 26, 28, 40.

C. NEGLECTA (Alder). (Nutting, 1915, p. 46, pl. 8, figs. 1, 2.) Taken once on *Laminaria,* near low water. Gonosomes present June 25, 1927. Station: S 24.

Orthopyxis L. Agassiz

O. caliculata (Hincks). (Nutting, 1915, p. 64, pl. 15, fig. 4.) Attached to other hydroids, depth 20 to 58 feet. Stations: D 12, 70.

Clytia Lamouroux

C. cylindrica (L. Agassiz). (Nutting, 1915, p. 58, pl. 12, figs. 6–7.) Chiefly found attached to other hydroids, from low water to 150 feet. Stations: D 18, 37, 39, 44, 52, 56, 60, 75, 83; S 12, 14.

C. bicophora (L. Agassiz). (Nutting, 1915, p. 56, pl. 12, figs. 1–3.) Habitat similar to the preceding, shore to 239 feet. Stations: D 32, 34, 36, 56, 130; S 14.

Obelia Péron and Lesueur

In the absence of the gonosomes the species of this genus are difficult to distinguish, as the trophosomes are quite variable, and, in many species, very similar.

O. dichotoma (Linné). (Nutting, 1915, p. 80, pl. 20, fig. 7.) Attached to a variety of solid objects, from shore to 47 feet; a common species where found. Mature in July. Medusae found at S 24, June 25, 1927. Stations: D 3, 4, 10; S 4, 11, 12, 14, 24.

O. geniculata (Linné). Nutting, 1915, p. 73, pl. 18, figs. 1–5.) Uusually noted as attached to algae, shore to 60 feet. Stations: D 3, 55, 103; S 12, 14, 24.

O. longissima (Pallas). (Nutting, 1915, p. 85, pl. 23, figs. 1–3.) In similar situations to the preceding, from shore to 220 feet. Gonosomes were abundant about the end of June, 1927. Stations: D 15, 24, 39, 44, 51, 94; S 4, 14, 24, 28, 29.

O. commissuralis McCrady. (Nutting, 1915, p. 83, pl. 21, figs. 1–5.) Attached to shells and *Laminaria,* shore to 156 feet. Stations: D 18, 52; S 14, 24.

O. gracilis (Calkins). (Fig. 30.) (Nutting, 1915, p. 78, pl. 19, figs. 2–4.) Taken with other species to a depth of 330 feet. This is the first record of the species from the Atlantic coast. It was described from Puget Sound. Stations: D 67; S 14, 31.

GONOTHYRAEA Allman

G. LOVENI (Allman). (Nutting, 1915, p. 68, pl. 17, figs. 1–2.) Attached to various objects, low water to 90 feet. Stations: D 13, 20, 27, 39, 40, 52, 56, 60, 92; S 29.

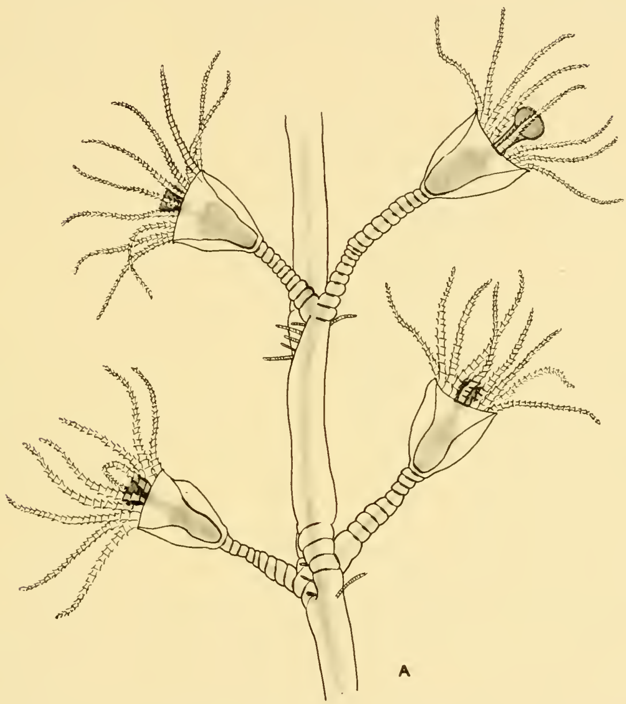


Fig. 30 Obelia gracilis. A. hydrosomes.

HEBELLA Jäderholm

H. CALCARATA (A. Agassiz). (Nutting, 1900, p. 353, fig. 56.) Attached to hydroids and bryozoa, depth 30 to 150 feet. Stations: D 18, 20, 37, 49.

Campanulinidae

Opercularella Hincks

O. lacerata (Johnston). (Hincks, 1868, p. 194, pl. 39, fig. 1.) Taken near low water, on piles and *Mytilus*. Gonosomes present, June 25, 1927. Stations: S 14, 24.

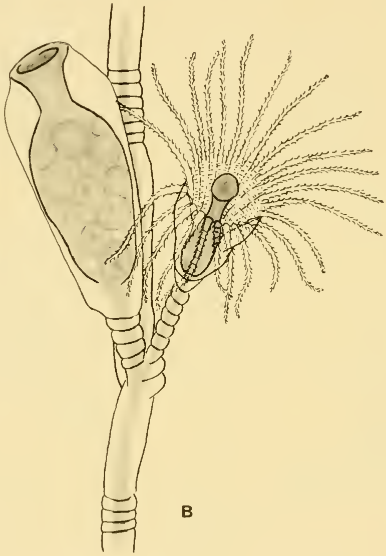


Fig. 30 Obelia gracilis. B. gonosome.

Cuspidella Hincks

C. grandis Hincks. (Hincks, 1868, p. 210, pl. 40, fig. 4.) Taken once attached to *Sertularella tricuspidata* in 65 feet of water. Station: D 36.

Calycella Hincks

C. syringa (Linné). (Hincks, 1868, p. 206, pl. 39, fig. 2.) Found attached to other organisms, chiefly hydroids, on various hard bottoms, from shore to 330 feet. A common species. Gonosomes present, August 10, 1927. Stations: D 5, 10, 15, 18, 20, 31, 35–37, 39, 40, 44, 51, 52, 56, 60, 67, 69, 70, 73, 86, 93, 94, 102, 104, 130; S 12, 14, 29.

Lovenella Hincks

L. grandis Nutting. (Nutting, 1900, p. 354, fig. 45.) On other organisms, from low water to 60 feet. Stations: D 11, 14; S 12.

Lafoeidae

Lafoea Lamouroux

L. dumosa (Fleming). (Hincks, 1868, p. 200, pl. 41, fig. 1.) A common species, usually attached to other hydroids, depth 30 to 330 feet. Stations: D 5, 7, 10, 15, 18, 20, 37, 38, 44, 49, 55, 56, 60, 67, 80, 103.

Filellum Hincks

F. serpens (Hassall). (Hincks, 1868, p. 214, pl. 41, fig. 4.) Attached to numerous objects, chiefly hydroids and bryozoa, from shore to 330 feet. An abundant species when found. This blue-green species has previously been reported from the Atlantic coast of America only at Casco Bay. Stations: D 3, 5, 6, 14, 15, 18, 20–22, 34, 36–38, 43, 56, 67, 86, 94, 130; S 9, 11, 14.

Sertulariidae

Diphasia L. Agassiz

D. rosacea (Linné). (Nutting, 1904, p. 107, pl. 28, figs. 4, 5.) Found on rock and blue clay, depth 30 to 239 feet. Gonosomes present August 10, 1926. Stations: D 13, 15, 20, 130.

D. fallax (Johnston). (Nutting, 1904, p. 109, pl. 29, figs. 2–6.) On gravel and blue clay, depth 150 to 220 feet. Gonosomes found August 12, 1926. Stations: D 15, 18.

Sertularia Linné

S. pumila Linné. (Nutting, 1904, p. 51, pl. 1, figs. 1–3.) Almost always attached to algae, from low water to 61 feet. Gonosomes present in July and early August. Stations: D 3, 14, 73, 86; S 4, 12, 13, 26, 28, 31, 39–41.

Sertularella Gray

S. polyzonias (Linné). (Nutting, 1904, p. 90, pl. 21, figs. 1, 2.) On various hard bottoms, from the shore to 220 feet. Gonosomes found in July and August. Stations: D 6, 15, 20, 27, 31, 37, 38, 44, 52, 56, 60, 73, 86, 93, 94, 96; S 12, 14.

S. rugosa (Linné). Nutting, 1904, p. 82, pl. 17, figs. 1–5.) A well-characterized species which may be safely determined in the absence of gonosomes. On rock, shore to 80 feet. Stations: D 94; S 12.

S. tricuspidata (Alder). (Nutting, 1904, p. 100, pl. 25, figs. 3–7.) On rocks and shells, depth 30 to 239 feet. Gonosomes present late in July and early in August. Stations: D 3, 15, 20, 35, 36, 39, 40, 44, 55, 60, 73, 86, 94, 103, 130.

Abietinaria Kirchenpauer

A. abietina (Linné). (Nutting, 1904, p. 114, pl. 32, figs. 1–3.) On hard bottoms, from the shore to 330 feet. Gonosomes found August 3, 1927. Stations: D 20, 37, 51, 52, 60, 67–69; S 29.

Hydrallmania Hincks

H. falcata (Linné). (Nutting, 1904, p. 124, pl. 38, figs. 1–4.) Also on hard bottoms from shore to 239 feet. Gonosomes found August 3, 1928. Stations: D 20, 31, 36–38, 43, 44, 49–52, 56, 68, 86, 90, 94, 103, 130; S 14.

Thuiaria Fleming

T. argentea (Linné). (Nutting, 1904, p. 71, pl. 12, figs. 3–9.) Taken on hard bottoms, from shore to 239 feet. A common species. Gonosomes found July 18, 1926. Stations: D 3, 10, 15, 18, 38, 39, 44, 55, 56, 73, 75, 80, 86, 87, 102–104, 130; S 12, 14.

T. thuja (Linné). (Nutting, 1904, p. 62, pl. 7, figs. 1–3.) Taken on rock, depth 28 to 75 feet. Determination somewhat doubtful owing to the absence of gonosomes. Stations: D 30, 94.

T. cupressina (Linné). (Nutting, 1904, p. 72, pl. 13, figs. 1–3.) Taken on hard bottoms, depth 30 to 330 feet. Stations: D 3, 5, 7, 67, 94.

Class SCYPHOMEDUSAE

Order STAUROMEDUSAE

Lucernariidae

LUCERNARIA O. F. Müller

L. QUADRICORNUS O. F. Müller. Rather rare (most common at D 4) on bottoms of rocky or sandy mud, depth 20 to 110 feet, only once below 55 feet. Stations: D 3, 4, 7, 10, 25, 142, 143.

Order SEMAEOSTOMEAE

Cyaneidae

CYANEA Péron and Lesueur

C. ARTICA Péron and Lesueur (*capillata* O. Fabricius). Seen quite commonly at the surface, though never as abundant as the next species. The tentacles are frequently met with tangled on the dredge rope when the species is not visible at the surface.

Aureliidae (Ulmaridae)

AURENIA Péron and Lesueur

A. AURITA (O. Fabricius), (*flavidula* Péron and Lesueur). Occurs rather irregularly, but sometimes in enormous schools. It was very abundant at the surface off Salisbury Cove (P 10) July 13, 1926, 10.30 P.M. During the daytime it may stay about 3 feet below the surface when abundant.

Class ANTHOZOA

Subclass ALCYONARIA

On four occasions specimens of a soft coral (*?Alcyonium*) were taken. Three of these stations were spread from Greenings Island to the middle of Somes Sound, the other is off Heron Island. The bottom in all cases was stones and rock, depth 35 to 90 feet. Stations: D 43, 44, 56, 106.

Subclass ACTINIARIA

Order NYNANTHEAE

Suborder ENDOMYARIA

Actiniidae

TEALIA Goose (Urticina)

T. FELINA (Linné), (*crassicornis* O. F. Müller). To which variety our specimens belong has not been determined. On rock, from shore to 87 feet. Common at the shore stations but rarely dredged. Stations: S 2, 12; D 39, 78, 146.

Suborder MESOMYARIA

Metridiidae

METRIDIUM Oken

M. SENILE (Linné), (*dianthus* Ellis, *marginatus* Lesueur). It is probable that our material represents the variety *dianthus* (Ellis). The species is taken rather abundantly at both shore stations and dredging stations on rocks and piles. Depths up to 100 feet. Stations: S 1, 2, 4, 9, 11, 12, 14, 24, 28, 39, 40; D 3, 7, 10, 13 (took bait of fish trawl), 32, 39, 51, 83, 94, 123.

CTENOPHORA

Class TENTACULATA

Order LOBATAE

Bolinopsidae

BOLINOPSIS L. Agassiz

B. INFUNDIBULUM (O. F. Müller). Mayer, 1912, p. 21, pl. 4, figs. 12–15.) Occasionally quite abundant, especially early in the summer. This species is not seen every year in the inner part of Frenchmans Bay. Stations: D 30; P 5.

LITERATURE

Allman, G. J. 1871–1872 A monograph of the gymnoblastic or tubularian hydroids. Ray Society: pp. i–xxiv, 1–450, 23 pl.

Hargitt, C. W. 1925 The Medusae of the Woods Hole region. Bull. Bur. Fish., vol. 24, pp. 21–79, 7 pl., text-figs.

Hincks, Thomas 1868 A history of the British hydroid zoophytes. London: pp. i–lxviii, 1–338, 67 pl., 62 fig.

Mayer, A. G. 1912 Ctenophores of the Atlantic coast of North America. Carnegie Inst., publ. 162, pp. 1–58, 17 pl., 12 fig.

Nutting, C. C. 1900 The hydroids of the Woods Hole region. Bull. United States Comm. Fish., vol. 19, pp. 325–386, 105 fig.

——— 1904 American hydroids. Part II. The Sertularidae. United States Nat. Mus., spec. bull., pp. 1–325, 41 pl., 139 fig.

——— 1915 American hydroids. Part III. The Campanularidae and the Bonneviellidae. United States Nat. Mus., spec. bull., pp. 1–126, 27 pl., 70 fig.

Stephenson, T. A. 1928 The British sea anemones. Ray Society: pp. i–xiv, 1–148, 14 pl., 41 fig.

Stimpson, William 1853 Synopsis of the marine Invertebrata of Grand Manan. Smiths. Contrib. Knowl., vol. 6, art. 5, pp. i–iv, 1–66, 3 pl.

PLATYHELMINTHES

Since no member of the Survey staff had special knowledge of this group, the following list represents only a few conspicuous forms, chiefly from fresh water, which could be determined with certainty from the literature at hand without making a special study of the group. The North American free-living members of this group have been best treated in two papers, Stringer (1918) and von Graff (1911). We may also refer to the series on the Turbellaria by L. H. Hyman (1931, etc.) and another by Kepner and his students, both in course of publication.

As to the parasitic forms, it will suffice to call attention to Manter's (1925) report on some species from the Mount Desert Region.

Class TURBELLARIA

Order TRICLADIDA

Suborder DIPLONEURA

Rhynchodemidae

RHYNCHODEMUS Leidy

R. SYLVATICUS (Leidy). (Stringer, 1918, p. 360, fig. 641.) One specimen was found in humus under a log at S 37.

Suborder HAPLONEURA

Tribe RETROBURSALIA

Micropharyngidae

MICROPHARYNX Jägerskiöld

M. PARASITICA Jägerskiöld. (Wilhelmi, 1909, p. 359, pl. 9, fig. 25, text figs. 49, 60.) Not an uncommon parasite attached to the dorsal integument of skates.

Tribe PROBURSALIA

Planariidae

CURTISIA von Graff

C. FOREMANII (Girard). (Stringer, 1918, p. 355, fig. 629.) A few specimens were taken at S 23.

EUPLANARIA Hesse

E. GRACILIS (Haldeman). (Stringer, 1918, p. 359, fig. 639.) Some specimens were taken at S 37.

FONTICOLA Komárek

F. TRUNCATA (Leidy). (Stringer, 1918, p. 358, fig. 636.) A few were taken with the preceding.

LITERATURE

GRAFF, LUDWIG VON 1911 Acoela, Rhabdocoela und Alloeocoela des Ostens der Vereinigten Staaten von Amerika. Zeits. wiss. Zool., Bd. 99, S. 321–428, 6 pl.

HYMAN, L. H. 1931 Studies on the morphology, taxonomy, and distribution of North American triclad Turbellaria. IV. Recent European revisions of the triclads, and their application to the American forms, with a key to the latter and new notes on distribution. Trans. Amer. Micro. Soc., vol. 50, pp. 316–335, 1 pl.

MANTER, H. W. 1925 Some marine fish trematodes of Maine. Jour. Parasit., vol. 12, pp. 11–18, 1 pl.

STRINGER, C. E. 1918 The free-living flatworms (Turbellaria). Ward and Whipple: Fresh-Water Biology, pp. 323–364, 62 fig.

WILHELMI, J. 1909 Tricladen. Fauna Flora Neapel, monogr. 32, pp. i–xii, 1–405, 16 pl., 80 fig.

NEMERTINEA

Following the view of Dr. A. L. Treadwell (in litt.) this group is treated as a phylum. Such a treatment introduces certain problems of internal classification which we do not feel qualified to solve, and so we have passed directly to the orders without attempting to arrange the group in classes.

Order HOPLONEMERTEA

Amphiporidae

AMPHIPHORUS Ehrenberg

A. ANGULATUS (O. F. Müller). (Verrill, 1892, p. 10, pl. 33, figs. 1, 1a, 2.) The species ranges in length here from 11 to 140 mm. It is most abundant in the shell beach which forms a part of the Nubble, but has also been dredged. Stations: D 146; S 43, 48, 49.

Tetrastemmatidae

TETRASTEMMA Ehrenberg

T. CANDIDUM (O. F. Müller). (McIntosh, 1874, p. 167, pl. 11, figs. 2, 3; Verrill, 1892, p. 25, pl. 33, figs. 9–10a; pl. 35, figs. 9, 10.) Rather common among algae at low tide. Sexes are mature during August. Station: S 49.

Order SCHIZONEMERTEA

Lineidae

Lineus Sowerby

The two species noted below may be distinguished when alive by their behavior when teased with a pipette. *L. ruber* when disturbed merely contracts, while *L. socialis,* under the same conditions, can only shorten its body by coiling into a cylindrical helix.

L. ruber (O. F. Müller). (*viridis* Verrill, 1892, p. 418, pl. 37, figs. 5–5a; pl. 38, figs. 6–6d; pl. 39, figs. 18, 22.) All varieties of this species are found on shore between tide marks in great abundance. The breeding season is during June and July. Stations: S 43, 48, 50.

L. socialis (Leidy). (Verrill, 1892, p. 424, pl. 37, figs. 8, 8a; pl. 38, figs. 7, 7a.) Four specimens were found living with the preceding. The color was bright reddish brown. Stations: S 48, 49.

Cerebratulus Renier

C. lacteus (Leidy). (Verrill, 1892, p. 433, pl. 35, figs. 1, 1a; pl. 36, fig. 2; pl. 37, figs. 1–1b; pl. 39, figs. 19–21.) This species is very abundant in the muddy coves along the western and southwestern parts of Mount Desert Island. Specimens have been taken up to 28 cm. long. These are young specimens and hence the breeding season must be in the early spring. Stations: S 33, 43, 46, 48, 50.

Order PALEONEMERTEA

Cephalotrichidae

Cephalothrix Oersted

C. filiformis (Johnston).[1] (*linearis* Verrill, 1892, p. 442, pl. 36, figs. 4, 5; pl. 39, figs. 10–15.) This species is found in great abundance under stones embedded in mud between tide marks, particular in mussel beds. Their breeding season must be in the early spring, for a great number of young animals are found in July and August. Stations: S 43, 48–50.

[1] This is probably *C. spiralis* Coe (1930, p. 101).—Ed.

LITERATURE

COE, W. R. 1930 Two new species of nemerteans belonging to the family Cephalotrichidae. Zool. Anz., Bd. 89, pp. 97–103, 8 fig.

MCINTOSH, W. C. 1873–1874 A monograph of the British Annelids. Part I. The Nemerteans. Ray Society: pp: i-xiii, 1–214, 23 pl., 14 fig.

VERRILL, A. E. 1892 The marine nemerteans of New England and adjacent waters. Trans. Conn. Acad., vol. 8, pp. 1–30, 411–456, 7 pl., 9 fig.

ASCHELMINTHES

This phylum is taken as including the Rotatoria, Gastrotricha, and Echinodera, with due recognition of the fact that these groups are not as closely related as might be desired when combining them into a single phylum. Only the last-named group is represented in the Survey results.

KINORHYNCHA

Class ECHINODERA

The collections of the Survey comprise but three species, which were all described as new by Blake (1930). These are the only species known from the Western Hemisphere.

Order HOMALORHAGAE

Pycnophyidae

PYCNOPHYES Zelinka

P. FREQUENS Blake. In soft mud, depth 40 to 130 feet, common when found. Stations: D 1, 76, 112.

Trachydemidae

TRACHYDEMUS Zelinka

T. MAINENSIS Blake. In mud near low water. Stations: S 25, 42.

Order CYCLORHAGAE

Echinoderidae

ECHINODERELLA Zelinka

E. REMANEI Blake. Taken once in mud, depth 68 feet. Station: D 112.

LITERATURE

BLAKE, C. H. 1930 Three new species of worms belonging to the order Echinodera. Biol. Surv. Mt. Desert Region, part 4, pp. 1–10, 8 fig.

BRACHIOPODA

Class ARTICULATA

Order TELOTREMATA

Terebratulidae

Terebratulina d'Orbigny

Terebratulina septentrionalis (Couthouy)

This brachiopod is the only one from this Region and is found very generally where the bottom is rocky in the outer Bay. Stations D 68, 80, 98, 107, 132, 135 are typical ones. It is usually covered with the sponge *Iophon chelifer* and this is the usual occurrence of this sponge in this Region. When *T. septentrionalis* is found on a gravel or shelly bottom or out beyond the mouth of the Bay the sponge does not cover it. We dredged many and large specimens at 107, off the western end of Mount Desert Rock. I am indebted to Dr. H. W. Shimer for the classification of this group.

ANNELIDA

In this phylum Dr. A. L. Treadwell has very kindly given us the benefit of his counsel and communicated to us the scheme of general classification which is here followed.

Class CHAETOPODA

Subclass POLYCHAETA

Polychaete annelids of the waters in the region which may be called the mouth of the Bay of Fundy have been collected and described by a number of workers: Stimpson (1853), Verrill (1871–1881), and Webster and Benedict (1884). Verrill (1884) catalogued all of the species listed in the works of others, as well as his own, and thus gave us a very complete picture of the Annelida of the New England coast as known in his time. For Canada, Whiteaves (1901) compiled a list of marine invertebrates which included many of the annelids known also to Verrill for the eastern New England coast. Moore (1909) lists a group dredged from off the coasts of Labrador, Newfoundland, and Nova Scotia, while McIntosh in his monograph of British annelids (1900–1923) described many of the forms found in American waters.

The student will find that as a general introduction to the literature, morphology, and taxonomy of this group, Fauvel (1923, 1927), in his monograph of the polychaetes of France, has summarized all of the essential information and has presented it in a very accessible form. Chamberlin (1919) gives an even more valuable discussion of the taxonomy.

Following a method devised by Mayor and used by Treadwell, the animals were first narcotized in a solution of $MgSO_4$ (154 grams to the liter), and killed in 5 per cent formalin. As soon as dead they were transferred to 90 per cent alcohol until hardened, and then run down to 70 per cent alcohol, to be subsequently returned to a stronger alcohol. Storing in 80 or 90 per cent alcohol seemed to insure the best preservation. In mounting parapodia, jaws, and other structures for microscopic study, the use of Euparal was found to be most convenient and entirely satisfactory.

The writer is greatly indebted to Dr. A. L. Treadwell for his kindness in giving freely of his advice and reprints, and for a considerable number of identifications made by him; and to Dr. J. Percy Moore for reprints. Dr. Waldo L. Schmitt has been most generous in allowing facilities for the study of material at the United States Museum and for the loan of specimens for use during the summer.

In accord with Dr. Treadwell's advice this subclass has been arranged directly into families following the order of Chamberlin's (1919) paper on the 'Albatross' polychaets.

The following species of this subclass have been found sexually mature during July and August:

Polynoidae
- Harmothoë imbricata
- Gattyana cirrosa
- Lepidonotus squamatus

Aphroditidae
- Aphrodita hastata

Nephthydidae
- Nephthys caeca

Phyllodocidae
- Eteone robusta
- Eulalia annulata
- Hypoeulalia bilineata

Lumbrinereidae
- Lumbrinereis fragilis

Ariciidae
- Nainereis quadricuspida

Spionidae
- Spio setosa
- Polydora ciliata
- Polydora concharum

Cirratulidae
- Cirratulus cirratus
- Dodecaceria concharum

Sternaspididae
- Sternaspis scutata

Maldanidae
- Clymenella torquata

Terebellidae
- Amphitrite brunnea

Ampharetidae
- Anobothrus gracilis

Serpulidae
- Spirorbis spirorbis

Spintheridae

Spinther Johnston (*Oniscosoma, Cryptonota*)

S. miniaceus Grube (McIntosh, 1900, p. 232, pl. 24, figs. 1, 2; Fauvel, 1923, p. 140, fig. 50a–f). One specimen, 3.2 mm. long and 1.9 mm. wide, with 14 setigerous segments was found on a sponge growing on the shell of *Terebratulina.* The color is a yellowish ochre, resembling very much the sponge upon which it was found.

This species differs from *S. oniscoides,* the form previously described from this coast by Verrill and Stimpson, in its smaller size and absence of central cirri. *S. miniaceus* has from 12 to 24 segments and measures from 1 to 8 mm. long; *oniscoides* has 20 to 26 segments and measured 9 to 12 mm. Station: D 90.

Polynoidae

Harmothoë Kinberg

H. imbricata (Linné). McIntosh, 1900, p. 314, pl. 26, fig. 3; Fauvel, 1923, p. 55, fig. 18f–l.) A species of wide distribution and common throughout this Region. Found from low water to 330 feet on all kinds of hard bottoms. There is a marked variation in color, arrangement of papillae and cilia on the elytra. A large number of specimens are only half-grown, varying in size from 5 mm. to 34 mm. in length. Their breeding season must come in the spring, for only 1 or 2 adults have been taken full of germ products early in July. Stations: The best stations are D 19, 39, 56; S 4, 9, 11, 42. It was taken in all at 55 dredging stations, 13 shore stations, and P 10B.

Eunoë Malmgren

E. nodosa (M. Sars). (McIntosh, 1900, p. 292, pl. 27, fig. 9; pl. 32, fig. 3; Fauvel, 1923, p. 50, fig. 18a–e.) We have two specimens, 27 and 38 mm. long, with 39 setigerous segments. The elytra are thickly covered with small tubercles, which become very stout and large near the posterior margin. Occasional parasitic growths are encountered on the elytra. The preserved specimens are brown. Taken on rock in 75 feet of water. Station: D 94.

Gattyana McIntosh

G. cirrosa (Pallas). (McIntosh, 1900, p. 285, pl. 25, fig. 3; Fauvel, 1923, p. 49, fig. 17a–f.) We have one specimen identified by Doctor Treadwell, and two very small specimens, 3 mm. long, from S 4, where they seemed to be commensal in the tubes of *Amphitrite brunnea.*

Lepidonotus Leach

L. squamatus (Linné). (McIntosh, 1900, p. 274, pl. 25, fig. 1; Fauvel, 1923, p. 45, fig. 16f–j.) Perhaps the most abundant scale worm in this Region. Found from low water to 239 feet, especially frequent at the lesser depths. Very abundant among calcareous algae at S 43. Stations: The best stations are D 19, 27, 56; S 4, 11, 14, 35, 39, 43, 50. Found in all at 34 dredging and 15 shore stations.

Aphroditidae

Aphrodita Linné

A. hastata Moore. (Moore, 1905a, p. 295, figs. 1–4.) This species is usually found on mixed bottoms containing much mud, depth 30 to 239 feet. Specimens have been found ranging in size from 15 to 230 mm. Adults are filled with mature eggs and sperm in August. Their length of life must be over 2 or 3 years to account for the great variation in size. Stations: D 25, 35, 36, 38, 63, 71, 72, 83, 99, 103, 109, 118, 130, 144. The best are D 36 and 103.

Sigalionidae

Pholoë Johnston

P. minuta (O. Fabricius). (Fauvel, 1923, p. 120, fig. 44a–h.) This species ranges in size up to 5 mm. Found from low water to 100 feet on bottoms containing mud. Rare at any one station. The best stations were D 48, 59, 75. Stations: D 12, 14, 32, 38, 39, 46, 51, 54–56, 59, 70, 72, 73, 75, 94; S 4, 11, 12, 14, 19, 31, 34; P 10B.

Nephthydidae

Nephthys Cuvier

N. caeca (O. Fabricius.) (McIntosh, 1908, p. 9, pl. 66, fig. 3; Fauvel, 1923, p. 365, fig. 142.) This species is found from extreme low tide to 330 feet. It is most abundant in deep, soft mud and among broken shells. The best stations are D 1, 81, 110, 112, 113, 125, 150, 151. Stations: Fifty dredging stations and S 11, 25, 33, 35, 41, 43.

N. ciliata (O. F. Müller). (Ehlers, 1868, p. 629, pl. 23, fig. 36; Fauvel, 1923, p. 371, fig. 145a–g.) This species is more commonly dredged than taken by shore collecting. The worm is usually light pink in life and the setae on the parapodia are very fine and delicately arranged. Stimpson records the Grand Manan specimens as being mostly jet black. The best stations are D 16, 144, and S 5. Range of depth is low water to 239 feet. Stations: D 16, 27, 96, 108, 130, 134, 141, 143, 144; S 5, 6, 9, 43, 44.

Phyllodocidae

Phyllodoce Savigny

P. catenula Verrill. (Verrill, 1873, pp. 494, 587; 1881, pl. 5, fig. 4.) Common among algae and on hard bottoms with mud, from low water to 330 feet. Preserved specimens are white to greenish brown. The transparent young have been taken with a tow net. Best stations are D 33, 40; S 4. Stations: D 14, 18, 19, 32, 33, 35, 39, 40, 42, 46, 47, 52, 53, 56, 57, 62, 63, 65–67, 70, 71, 81, 95; S 4, 12, 14, 26.

P. badia Malmgren. (Malmgren, 1867, p. 22, pl. 2, fig. 6.) One of our specimens was determined by Doctor Treadwell. Taken on hard bottom in 57 to 69 feet of water, rare. Stations: D 40, 60, 140.

P. mucosa Oersted. (Fauvel, 1923, p. 152, fig. 54a–e.) Color of the preserved specimen is light yellow.

P. groenlandica Oersted. (Fauvel, 1923, p. 153, fig. 54f–i.) Some examples were identified by Doctor Treadwell. The living worms are bright green, the preserved ones brown with a slight green tinge. After roots of seaweeds have stood in the aquaria over night, these worms are often found crawling about the glass at the water line. Found on mixed bottoms from low water to 220 feet. Stations: D 14, 15, 18, 19; S 12.

P. maculata Oersted. (Fauvel, 1923, p. 152, fig. 53a–c.) One adult was taken at S 43.

Eulalia Oersted

E. annulata Verrill. (Verrill, 1873, p. 585.) Most of the specimens extrude the proboscis when killed. Ovigerous examples are numerous. Found on hard bottoms from low water to 150 feet. The best stations are D 71 and S 43. Stations: D 5, 18, 19, 42, 56, 68, 71, 75, 94, 109; S 1, 2, 4, 12, 14, 24, 30, 43.

Hypoeulalia Bergström

H. bilineata (Johnston). (McIntosh, 1908, p. 50, pl. 43, fig. 5; pl. 50, fig. 4; Fauvel, 1923, p. 162, fig. 58a–e.) A number of specimens contained egg masses. The eggs are green. Found on hard bottoms from shore to 90 feet. Best stations: D 106, S 43. Stations: D 5, 13, 14, 19, 27, 39, 42, 56, 71, 75, 92, 101, 106, 119, 146; S 14, 43.

Eteone Savigny

E. robusta Verrill. (Fig. 31.) (Verrill, 1873, p. 588.) Two adults filled with eggs were taken, length 24 to 35 mm. The eyes are so small as to be almost invisible. Station: S 11.

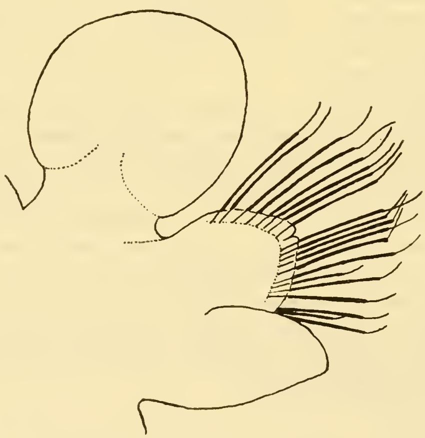


Fig. 31 Eteone robusta, parapod 21.

Syllidae

Eusyllis Malmgren

E. blomstrandi Malmgren. (Fauvel, 1923, p. 293, fig. 112h–m.) One specimen taken on rock in 75 feet of water at D 94.

Autolytus Grube

A. cornutus A. Agassiz. (A. Agassiz, 1862, p. 392, pls. 9–11; Verrill, 1881, pl. 12, figs. 4, 6.) The tube is cylindrical and attached to algae, hydroids, etc. Females filled with eggs are taken in the tow net during July. Found from low water to 130 feet, usually on hard bottoms. Stations: D 1, 30, 36, 39, 62, 104; S 4, 12, 14.

Nereidae

Nereis Cuvier

N. pelagica (Linné). (Fauvel, 1923, p. 336, fig. 130a–f.) Most abundant on mud flats at low tide, but also dredged from mixed bottoms to 239 feet. Young specimens are usually taken in dredging. Stations: D 3, 6, 7, 14, 15, 19, 20, 39, 40, 51, 56, 60, 70, 71, 73, 75, 94, 96, 103, 104, 107, 130, 132, 136, 141, 146; S 2, 4, 11, 12, 14, 24, 29, 43, 46.

N. virens M. Sars. (Verrill, 1873, p. 590, pl. 11, figs. 47–50; Fauvel, 1923, p. 348, fig. 134g–k.) Not so common as the preceding and limited to shore stations. Abundant at S 44, 46. Stations: S 5, 6, 9, 32, 33, 35, 44, 46, 49.

Onuphididae

Hyalinoecia Malmgren

H. artifex Verrill. (Verrill, 1880, p. 357; 1885a, pl. 41, fig. 178.) Our specimens vary in length from 12 to 43 mm. The species is most abundant at D 8, 100. Depth 60 to 165 feet. Stations: D 8, 100, 101, 103, 107.

Lumbrinereidae

Lumbrinereis de Blainville

L. fragilis (O. F. Müller). (Fauvel, 1923, p. 430, fig. 171k–l.) Common in sticky mud. In early August females are beginning to fill with ripened eggs which appear through the skin as a fine stippling of white. The best stations were D 35 and S 46. From low water to 220 feet. Stations: D 1, 12, 14–16, 32–36, 38, 44, 46, 51, 52, 61, 62, 72, 78, 89, 90, 92–94, 96, 101, 103, 105, 109, 110, 113, 131, 150; S 41, 42, 46.

Ninoë Kinberg

N. nigripes Verrill. (Verrill, 1873, p. 595.) Not common. Found on mud and muddy sand, from shore to 62 feet. Six specimens were found at D 12. Stations: D 12, 16, 96; S 6, 9.

Glyceridae

Glycera Savigny (*Rhynchobolus*)

G. capitata Oersted. (Fauvel, 1923, p. 385, fig. 151a–e.) This species has been taken on mixed bottoms to 87 feet and abundantly at low tide in Gilpatricks Cove. Stations: D 2, 19, 97, 98, 100; S 46.

G. dibranchiata (Verrill). (Verrill, 1873, p. 596, pl. 10, figs. 43, 44.) Common on mud flats at low tide and dredged to 101 feet. Stations: D 68, 69, 83, 94; S 5, 6, 9, 11, 25, 32, 33, 35, 41, 46.

Ariciidae

Nainereis de Blainville

N. quadricuspida (A. Fabricius). (McIntosh, 1910, p. 517, pl. 65, fig. 5; Fauvel, 1927, p. 23, fig. 8a–g.) Found under stones and among shells. Dredged once in 39 feet of water. Common at S 4, 11. Stations: D 141; S 1, 4, 11, 14, 19, 41, 42, 46.

Scoloplos de Blainville

S. armiger (O. F. Müller). (McIntosh, 1910, p. 510, pl. 56, fig. 7; Fauvel, 1927, p. 20, fig. 6k–q.) An uncommon shore form. Stations: S 6, 9.

S. ACUTUS (Verrill). (Fig. 32.) (Verrill, 1873, p. 599.) Common on a mud bottom in 35 feet of water. May be taken from the surface of the mud with a tow net. Station: D 33.

Fig. 32 Scoloplos acutus, lateral view of anterior end.

Goniadidae

GONIADA Audouin and Milne-Edwards

G. MACULATA Oersted. (McIntosh, 1910, p. 462, pl. 56, fig. 2; Fauvel, 1923, p. 392, fig. 154a–g.) Taken twice in 20 to 128 feet of water. Stations: D 12, 132.

Spionidae

SPIOPHANES Grube

S. VERRILLI Webster and Benedict. (Webster and Benedict, 1884, p. 728, pl. 6, figs. 65–72.) A specimen of this worm was identified by Doctor Treadwell.

SPIO O. Fabricius

S. SETOSA Verrill. (Verrill, 1873, p. 602, pl. 14, fig. 77.) Common on shores of muddy sand, under stones. The breeding season is in early June. Stations: S 25, 32, 41, 46.

Polydora Bosc

P. ciliata (Johnston). (Fauvel, 1927, p. 49, fig. 16i–p.) Abundant on rocks at low tide and dredged from mixed bottoms to 220 feet. This species covers empty shells with its intricate tunnels and seems to favor scollop shells and shells inhabited by hermit crabs. It also builds its tubes in sheltered spots among the rocks at low tide. Sexually mature specimens may be found throughout July and August. The intestine is infected with an acephaline gregarine. Stations: D 13, 15, 34, 39, 42, 54, 58, 60, 64, 68, 71, 75, 84, 94, 96, 144; S 4, 10, 12, 14, 25, 26, 39.

P. concharum Verrill. (Verrill, 1879, p. 174; 1885a, pl. 43, fig. 186.) This species inhabits tubes constructed on and in empty shells on various bottoms from 26 to 68 feet. Abundant at D 43. Stations: D 13, 43, 45, 51, 53, 55, 56, 61, 69, 71.

P. gracilis Verrill. (Fig. 33.) Verrill, 1879, p. 174.) An uncommon species taken on mud and blue clay from low water to 220 feet. Stations: D 13, 15; S 11.

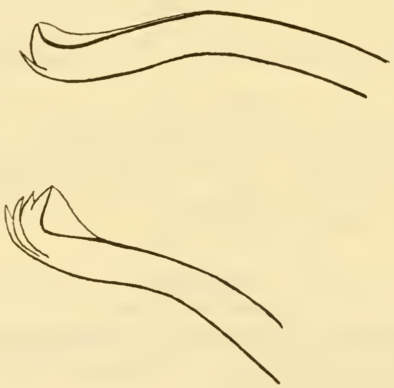


Fig. 33 Polydora gracilis, typical large hooks.

P. quadrilobata Jacobi. (Fauvel, 1927, p. 54, fig. 18 l–r.) The tubes are built on stones and old *Pecten* shells. Abundant at D 92. Stations: D 72, 92, 94, 95.

PRIONOSPIO Malmgren

P. STEENSTRUPI Malmgren. (Fauvel, 1927, p. 60, fig. 21f–i.) Fragments only have been taken on hard mud in 35 to 57 feet of water. Stations: D 33, 134.

Cirratulidae

CIRRATULUS Lamarck

C. CIRRATUS (O. F. Müller). (McIntosh, 1915, p. 249, pl. 91, fig. 2; Fauvel, 1927, p. 94, fig. 33a–g.) Adults, a dull olive green in color and sexually mature, are found on the beach at low tide at S 43 during August. The young are often found in masses with their tentacles so intertwined that they cannot be separated. Dredged to 220 feet on mixed bottoms. Stations: D 14, 15, 27, 30, 64, 68, 70, 123; S 4, 14, 24, 29, 43.

DODECACERIA Oersted

D. CONCHARUM Oersted. (Fauvel, 1927, p. 102, fig. 36a–n.) Found in old shells taken on hard bottoms from 30 to 150 feet. Only a few specimens are taken at one place. Stations: D 3, 11, 13, 14, 18, 32, 70, 71, 77, 93.

Opheliidae

AMMOTRYPANE H. Rathke

A. FIMBRIATA Verrill. (Verrill, 1873, p. 604, pl. 15, fig. 79.) An uncommon species on hard bottoms containing mud, from 20 to 330 feet of water. Stations D 25, 32, 34, 62, 63, 67, 90, 107, 112.

Flabelligeridae

BRADA Stimpson

B. GRANOSA Stimpson. (Fig. 34.) (Stimpson, 1853, p. 32.) One specimen taken on mud and sand in about 40 feet of water. It is 21 mm. long, has 21 segments, and is dark brown, covered with granulate papillae. Station: D 110.

STYLARIOIDES della Chiaje

S. AFFINIS (Leidy). (Verrill, 1873, p. 605, pl. 14, fig. 75.) Found on mud from low water to 60 feet. Stations: D 35, 120; S 9, 33, 35.

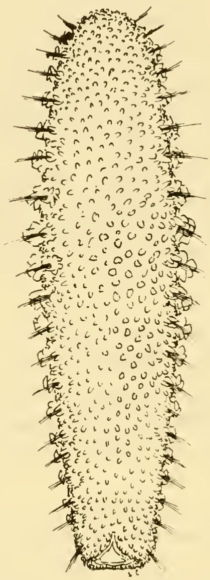


Fig. 34 Brada granosa, ventral view.

Sternaspididae

STERNASPIS Otto

S. SCUTATA (Ranzani). (Fauvel, 1927, p. 216, fig. 76a–g.) Often abundant on bottoms of sandy mud and blue clay, from low water to 239 feet. Stations: D 14, 15, 24, 25, 29, 35–38, 51–54, 62, 63, 65, 72, 77, 78, 96, 103, 105, 130, 131, 134, 143, 144, 150; S 12.

Maldanidae

Clymenella Verrill

C. torquata (Leidy). (Verrill, 1873, p. 608, pl. 14, figs. 71–73.) Associated with sand and mud, of which its tubes are formed, from shore to 239 feet. Most abundant at shore stations. Stations: D 24, 27, 35, 36, 105, 106, 110, 115, 119, 124, 130, 131, 133, 134, 141, 144; S 5, 9, 25, 32, 33, 35, 41, 46, 48, 49.

Maldane Grube

M. elongata Verrill. (Verrill, 1873, p. 609; 1881, pl. 9, fig. 1.) Found in mud at low tide and once in about 85 feet of water. Stations: D 106; S 25, 35.

Nicomache Malmgren

N. lumbricalis (O. Fabricius). (Malmgren, 1867, p. 99, pl. 10, fig. 60.) The tubes of this species are about 46 mm. long and less than 1 mm. in thickness, constructed of very fine sand. Taken on gravel, mud, and blue clay, from 20 to 220 feet. Stations: D 15, 18, 25, 32, 34–36, 38, 45, 70.

Iphianissa Kinberg

I. gracilis (M. Sars). (McIntosh, 1915, p. 324, pl. 101, fig. 5.) Taken once on a rock and mud bottom in 62 feet of water. Station: D 96.

Petaloproctus de Quatrefages

Unidentified fragments of a member of this genus have been taken at D 110.

Ammocharidae

Ammochares Grube

A. artifex Verrill. (Fig. 35.) (Verrill, 1885b, p. 439.) The flexible tubes of this species are covered with flat sand grains and bits of shell, giving them somewhat the appearance of the cocoon of a bag worm. Taken on hard bottoms in 65 to 85 feet. Stations: D 36, 44, 46, 99.

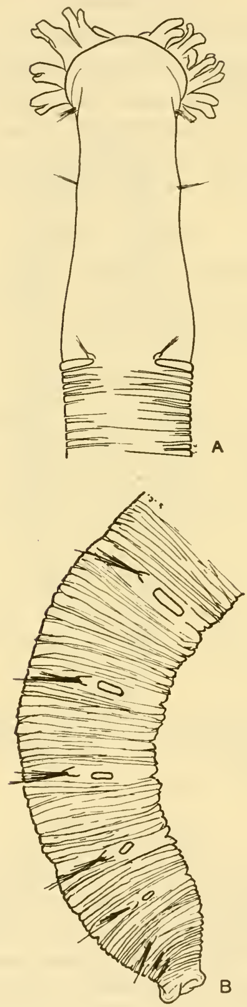


Fig. 35 Ammochares artifex. A. head, dorsal view. B. posterior end, lateral view.

Terebellidae

Amphitrite O. F. Müller

A. brunnea (Stimpson). (Verrill, 1874, pp. 45, 132; 1881, pl. 10, fig. 2.) Found in thick-walled tubes of mud and sand, from low water to 90 feet, on hard bottoms; most common at D 27 and S 43. Stations: D 20, 27, 30, 39, 94, 96, 100; S 4–6, 9, 14, 28, 29, 31, 33, 43.

Thelepus Leuckart

T. cincinnatus (O. Fabricius). (Fauvel, 1927, p. 271, fig. 95i–m.) The tubes are thin, leathery, and straw colored, usually covered externally with pebbles and Bryozoa. Found on hard bottoms from 28 to 165 feet. Stations: D 3, 19, 20, 30, 43, 56, 62, 68, 69, 71, 73, 75, 90, 94, 96, 104, 107.

Polycirrus Grube

P. eximius (Leidy). (Verrill, 1873, p. 616, pl. 16, fig. 85.) Found among roots of algae and ascidian stems from low water to 239 feet. Stations: D 19, 27, 70, 71, 94, 100, 130; S 43.

P. phosphoreus Verrill. (Verrill, 1879, p. 181.) Found on clay and gravel bottoms, from 30 to 239 feet. Stations: D 13–15, 18, 19, 104, 109, 130.

Terebellides M. Sars

T. stroemi M. Sars. (McIntosh, 1922, p. 209, pl. 120, fig. 3.; Fauvel, 1927, p. 291, fig. 100i–g.) Taken on gravel and mud bottoms in 68 to 87 feet of water. Stations: D 19, 24, 112.

Ampharetidae

Anobothrus Levinsen

A. gracilis (Malmgren). (Fauvel, 1927, p. 229, fig. 80 l–p.) The body is flesh colored, greenish posteriorly. The tube is composed of mud and sand. Found on bottoms of blue clay or sandy mud, from 27 to 239 feet. Common at D 150. Stations: D 1, 14, 15, 38, 55, 60, 79, 94, 96, 103, 108, 118, 123, 125, 130, 131, 150.

Amage Malmgren

It was not possible to determine the two species of this genus with entire certainty.

A. auricula Malmgren. (McIntosh, 1922, p. 80, pl. 118, fig. 10.) One specimen from rock bottom in 30 feet of water. Station: D 35.

A. pusilla Verrill. (Verrill, 1873, p. 613.) One specimen from piles at low water. Station: S 4.

Melinna Malmgren

M. cristata (M. Sars). (McIntosh, 1922, p. 83, pl. 118, fig. 9; Fauvel, 1927, p. 237, fig. 83i–n.) Taken on rock in 63 to 70 feet of water. Stations: D 27, 100.

Amphictenidae

Pectinaria Lamarck

P. granulata (Linné). (Fig. 36.) (Malmgren, 1865, p. 359.) Found from low water to 100 feet, among sand and stones. Stations: D 6, 12, 19, 32, 34, 38, 39, 48, 51, 55, 56, 58, 59, 63, 110, 112, 123, 125; S 11, 24, 28.

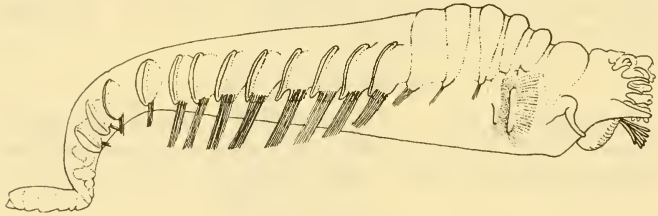


Fig. 36 Pectinaria granulata, lateral view.

Capitellidae

Notomastus M. Sars

N. luridus Verrill. (Verrill, 1873, p. 610.) A few specimens taken among rocks from shore to 30 feet. Stations: D 41,; S 25, 43, 48–50.

Sabellidae

SABELLA Linné

S. SPETSBERGENSIS Malmgren. (Malmgren, 1865, p. 399, pl. 29, fig. 93.) A few specimens were taken on mud and gravel from low water to 150 feet. Stations: D 5, 14, 18, 19, 30–32; S 15.

POTAMILLA Malmgren

P. RENIFORMIS (O. F. Müller). (Fauvel, 1927, p. 309, fig. 107a–f.) A few were taken on sand and mud in 48 to 135 feet of water. Stations: D 27, 94, 101, 109, 142.

FABRICIA de Blainville

F. LEIDYI Verrill. (Fig. 37.) (Verrill, 1873, p. 619.) Taken on mud at low water and at a depth of 130 feet. Stations: D 1; S 26.

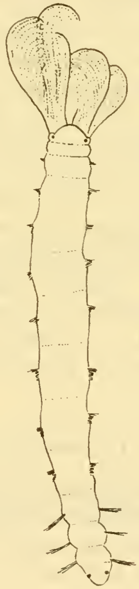


Fig. 37 Fabricia leidyi, dorsal view.

Euchone Malmgren

E. elegans Verrill. (Verrill, 1873, p. 618, pl. 16, fig. 84.) The tubes of this species are very slender and covered with fine sand. Taken on various bottoms from 20 to 239 feet. Stations: D 3, 12, 24, 32, 68, 108, 109, 125, 130, 132.

Myxicola H. Koch

M. infundibulum (Renier). (Fauvel, 1927, p. 342, fig. 119a–i.) Taken rarely on rock from 57 to 128 feet. Stations: D 92, 96, 132.

Serpulidae

Pomatoceros Philippi

P. triqueter (Linné). (McIntosh, 1923, p. 362, pl. 117, fig. 1.) Found on a scollop shell at D 96, depth 62 feet.

Spirorbis Daudin

Certain examples in the collection which are not in a condition satisfactory for identification indicate that additional species occur here beside the 2 treated below.

S. spirorbis (Linné). (McIntosh, 1923, p. 409, pl. 122, fig. 10; pl. 132, fig. 4.) Common, especially in shallow water, attached to algae, shells, and stones, to 159 feet. Cords of eggs and embryos in all stages of development may be found in the tubes of adult worms during August. Stations: D 20, 39, 40, 51, 56, 60, 68, 69, 71, 96, 104–106, 149; S 12, 21, 26, 42, 44.

S. spirillum (Linné). (Fauvel, 1927, p. 392, fig. 132f–p.) Usually abundant on algae, Bryozoa, and hydroids, from shore to 239 feet. Stations: D 3, 5, 6, 10, 13, 14, 18, 20, 21, 31, 32, 35, 36, 38–40, 42, 52, 68, 69, 71, 73, 82, 86, 94, 96, 100, 130, 138, 148; S 12, 14, 29, 34.

Subclass OLIGOCHAETA

With two exceptions the species listed below are fresh-water and terrestrial forms. Besides the papers especially referred to below, reference should be made to the monograph by Stephenson (1930), which has been followed in the arrangement of the families.

Naididae

Stylaria Lamarck

S. fossularis Leidy. (F. Smith, 1918, p. 639, fig. 984b.) A few specimens found in the Northeast Branch.

Slavina Vejdovsky

S. appendiculata (d'Udekem). (F. Smith, 1918, p. 639.) One specimen found with the preceding species.

Tubificidae

Tubifex Lamarck

T. tubifex (O. F. Müller). (*rivulorum* Beddard, 1895, p. 244.) A few specimens from the outlet of Bubble Pond and the heath south of Salisbury Cove.

T. benedeni d'Udekem. (Michaelsen, 1927, p. 18, fig. 20.) Found in mud usually under stones in the intertidal zone and to a depth of 15 feet. Stations: D 57; S 6, 11, 31, 32, 41.

Clitellio Savigny

C. arenarius (O. F. Müller). (*irrorata* Verrill, 1881, pl. 8, fig. 3; Moore, 1905b, p. 377.) Abundant under rocks near low tide: Stations: S 6, 11, 32, 48.

Lumbricidae

Allolobophora Eisen

A. caliginosa (Savigny). (Olson, 1928, p. 64, fig. 2.) In leaf mold at Salisbury Cove.

Lumbricus Linné

L. terrestris Linné. (Olson, 1928, p. 58, fig. 2.) One specimen from Salisbury Cove.

L. rubellus Hoffmeister. (Olson, 1928, p. 59, fig. 2. Several taken with the preceding at Salisbury Cove.

Class HIRUDINEA

Order RHYNCHOBDELLAE

Glossiphoniidae

GLOSSIPHONIA Johnston

G. STAGNALIS (Linné). (Moore, 1918, p. 651.) A few found in Lake Wood.

G. COMPLANATA (Linné). Moore, 1918, p. 652.) One specimen taken with the preceding species.

Order GNATHOBDELLAE

Hirudinidae

HAEMOPIS Savigny

H. GRANDIS (Verrill). (Moore, 1918, p. 658.) A few found in Lake Wood and Witch Hole Pond.

Class ? GEPHYREA

The question mark above is to indicate that we do not commit ourselves as to the rank and allocation of this aberrant group.

The relative scarcity of our material precluded dissections, and it was therefore not possible to completely confirm certain determinations.

The best collecting ground was dredging station 150, which is mixed mud and blue clay, at a depth of 210 feet. Most of the species reported occur at this station.

Subclass SIPUNCULOIDA

Sipunculidae

PHASCOLOSOMA Leuckart

P. GOULDI (de Pourtalès). (Andrews, 1890, p. 389, pl. 44–47.) A few adults have been taken, always singly. Found on muddy bottoms, from low water to 210 feet. Stations: D 38, 72, 96, 115, 150; S 33.

P. EREMITA (M. Sars). (Gerould, 1913, p. 385, pl. 58, fig. 4, text fig. 1.) One specimen, 17 mm. long, taken at D 150.

P. MINUTUM Keferstein. (Paul, 1909, p. 3, pl. 1, figs. 1--24.) The only specimen of this species in the collection is 18 mm. long and 9 mm. in diameter. Anteriorly the mouth is located between 2 broad lips which in life are in a constant gliding motion. The body is covered with closely set, white spines or bristles, which are longer toward the posterior end.

If the identification be correct, this is the first record of the species on our coast. Station: D 150.

PHASCOLION Théel

P. STROMBI (Montagu). (Gerould, 1913, p. 403, pl. 60, figs. 10, 12, text figs. 9, 10.) The only common sipunculid in this region. Found in the shells of *Dentalium* and all sorts of gastropods of medium size. Sexually mature in August. Its abundance rather parallels that of gastropods. Taken on various bottoms from low water to 330 feet. Stations: 42 dredging stations, of which the best are: 25, 27, 64, 144, 150; and S 11.

Subclass ECHIUROIDA

Echiuridae

ECHIURIS Cuvier

E. pallasii Guérin. (Wilson, 1900, p. 170, figs. 1, 2.) Found 15 to 20 cm. deep, in mud under mussel beds. The specimens range in length up to 65 mm. Stations: S 9, 33.

LITERATURE

AGASSIZ, ALEXANDER 1862 On alternate generations in annelids, and the embryology of Autolytus cornutus. Boston Jour. Nat. Hist., vol. 7, pp. 392–409, 3 pl.

ANDREWS, E. A. 1890 Notes on the anatomy of Sipunculus gouldii Pourtalès. Stud. Biol. Lab., Johns Hopkins Univ., vol. 4, pp. 389–430, 4 pl.

BEDDARD, F. E. 1895 A monograph of the order of Oligochaeta. Oxford: pp. i–x, 1–769, 5 pl., 52 fig.

CHAMBERLIN, R. V. 1919 The Annelida Polychaeta. Mem. Mus. Comp. Zool., vol. 48, pp. 1–514, 80 pl.

———— 1920 a Polychaeta. Rept. Canad. Arct. Exped., vol. 9, part B, pp. 1–41, 6 pl.

———— 1920 b Gephyrea. Rept. Canad. Arct. Exped., vol. 9, part D, pp. 1–21, 1 pl.

EHLERS, ERNST 1864–1868 Die Borstenwürmer (Annelida Chaetopoda). Leipzig: Bd. 1, pp. i–xx, i–iv, 1–748, 24 pl.

FAUVEL, PIERRE 1923 Polychètes errantes. Faune de France, no. 5, pp. 1–488, 181 fig.

———— 1927 Polychètes sédentaires. Faune de France, no. 16, pp. 1–494, 152 fig.

GEROULD, J. H. 1913 The sipunculids of the eastern coast of North America. Proc. United States Nat. Mus., vol. 44, pp. 373–437, 5 pl., 16 fig.

MALMGREN, A. J. 1865 Nordiska Hafs-Annulata. Öfvers. kung. Veten.-Akad. Förh., 1865, pp. 51–110, 181–192, 355–410, 22 pl.

———— 1867 Annulata Polychaeta Spetsbergiae, Groenlandiae, Islandiae et Scandinaviae hactenus cognita. Helsingforsia: pp. 1–127, 14 pl.

MCINTOSH, W. C. 1900–1923 A monograph of the British marine annelids. Ray Society: [vol. 1], part 2, pp. i–x, 215–444, 20 pl., 19 fig.; vol. 2, part 1, pp. i–viii, 1–232, 22 pl., 24 fig.; vol. 2, part 2, pp. i–vi, 233–524, 23 pl., 37 fig.; vol. 3, part 1, pp. i–viii, 1–368, 41 fig.; vol. 3, part 2, pp. i–vi, 24 pl.; vol. 4, part 1, pp. i–vi, 1–250, 15 pl., 15 fig.; vol. 4, part 2, pp. i–xii, 251–539, 14 pl., 24 fig.

MICHAELSEN, W. 1927 Oligochaeta. Tierwelt Nord-Ostee, Teil $6c_1$, pp. 1–44, 38 fig.

MOORE, J. P. 1905 a A new species of sea-mouse (Aphrodita hastata) from eastern Massachusetts. Proc. Acad. Nat. Sci., 1905, pp. 295–298, 4 fig.

———— 1905 b Some marine Oligochaeta of New England. Proc. Acad. Nat. Sci., 1905, pp. 373–399, 2 pl.

———— 1908 Some polychaetous annelids of the northern Pacific coasts of North America. Proc. Acad. Nat. Sci., vol. 60, pp. 321–364, 4 fig.

———— 1909 The polychaetous annelids dredged in 1908 by Mr. Owen Bryant off the coasts of Labrador, Newfoundland, and Nova Scotia. Proc. United States Nat. Mus., vol. 37, pp. 133–146.

———— 1918 The leeches (Hirudinea). Ward and Whipple: Fresh-water Biology, pp. 646–660, 14 fig.

Olson, H. W. 1928 The earthworms of Ohio. Ohio Biol. Surv., bull. 17, pp. 45–90, 8 fig.

Paul, Georg 1909 Über Petalostoma minutum Keferstein und verwandte Arten. Zool. Jahrb. Anat., vol. 29, pp. 1–50, 2 pl.

Smith, Frank 1918 Aquatic earthworms and other bristle-bearing worms (Chaetopoda). Ward and Whipple: Fresh-water Biology, pp. 632–645, 17 fig.

Smith, S. I., and Harger, Oscar 1874 Report on the dredgings in the region of George's Banks, in 1872. Trans. Conn. Acad., vol. 3, pp. 1–57, 8 pl.

Stephenson, J. 1930 The Oligochaeta. Oxford: pp. i–xv, 1–978, 242 fig.

Stimpson, William 1853 Synopsis of the marine Invertebrata of Grand Manan. Smiths. Contrib. Knowl., vol. 6, art. 5, pp. i–iv, 1–66, 3 pl.

Verrill, A. E. 1873 Report upon the invertebrate animals of Vineyard Sound and the adjacent waters, with an account of the physical characters of the region. Rept. Comm. Fish, 1871, 1872, pp. 295–778, 38 pl.

——— 1873–1874 Brief contributions to zoology from the Museum of Yale College, Nos. XXV–XXIX. Amer. Jour. Sci., vol. 6, pp. 435–441; vol. 7, pp. 38–46, 131–138, 405–414, 498–505, 5 pl., 3 fig.

——— 1879 Notice of recent addition to the marine Invertebrata of the northeastern coast of America, with descriptions of new genera and species, and critical remarks on others. Proc. United States Nat. Mus., vol. 2, pp. 165–205.

——— 1880 Notice of recent additions to the marine Invertebrata of the northeastern coast of America, with descriptions of new genera and species, and critical remarks on others. Proc. United States Nat. Mus., vol. 3, pp. 365–405.

——— 1881 New England Annelida. Trans. Conn. Acad., vol. 4, pp. 285–324, 10 pl.

——— 1885 a Results of the explorations made by the steamer ''Albatross,'' off the northern coast of the United States, in 1883. Rept. Comm. Fish., 1883, pp. 503–699, 44 pl.

——— 1885 b Notice of recent additions to the marine Invertebrata of the northeastern coast of America, with descriptions of new genera and species, and critical remarks on others. Proc. United States Nat. Mus., vol. 8, pp. 424–448.

Webster, H. E., and Benedict, J. E. 1884 The Annelida Chaetopoda from Provincetown and Wellfleet, Mass. Rept. Comm. Fish., 1881, pp. 699–747, 8 pl.

Whiteaves, J. F. 1901 Catalogue of the marine Invertebrata of eastern Canada. Geol. Surv. Canada, pp. 1–271.

Wilson, C. B. 1900 Our North American echiurids. Biol. Bull., vol. 1, pp. 163, 178, 1 pl.

ECHINODERMATA

This phylum has been arranged according to Mortensen's Handbook (1927). The stations are not listed for a few of the species, since they are found almost everywhere and are the most conspicuous invertebrates of the Region.

Class ASTEROIDA Sea-stars

Order PHANEROZONIA

Suborder PAXILLOSA

Porcellanasteridae

CTENODISCUS Müller and Troschel

C. CRISPATUS (Retzius). (Mortensen, 1927, p. 53, fig. 30.) Taken on a few muddy bottoms, depth 62 to 210 feet. Most common on the mixed blue clay and mud bottom at D 150, where it ranged in size on August 6, 1931, from small specimens up to 65 mm. Stations: D 27, 96, 131, 150.

Order SPINULOSA

Solasteridae

SOLASTER Forbes Sun-stars

S. (CROSSASTER) PAPPOSUS (Linné). Mortensen, 1927, p. 112, figs. 66(1), 67.) Taken uncommonly on rocky bottoms, depth 52 to 76 feet. Stations: D 39, 40, 71, 94.

S. ENDECA (Linné). (Mortensen, 1927, p. 115, fig. 68.) Taken more frequently than the preceding on rocky bottoms with an admixture of finer material, clay, gravel, or mud, from about low water to 194 feet. Common at D 39 and 43. Stations: D 18, 31, 39, 40, 43, 44, 50, 68, 70, 71, 94, 98, 106, 131, 139, 146; S 19, 29, 50.

Echinasteridae

HENRICIA Gray (*Cribrella*)

H. SANGUINOLENTA (O. F. Müller). (Clark, 1904, p. 555, pl. 3, figs. 10, 11; pl. 4, fig. 22; Mortensen, 1927, p. 118, fig. 70.) The occurrence of this species is very similar to that of

Solaster endeca, both as to the type of bottom and the depth. It was noted from 32 dredging stations and at S 12, 29. Stations: Common at D 39, 40, 50–52, 56.

Order FORCIPULATA

Asteridae

ASTERIAS Linné

A. VULGARIS (Verrill). (Clark, 1904, p. 553, pl. 1, figs. 3, 4; pl. 4, figs. 16, 17.) This species occurs, usually commonly, on all kinds of bottom, down to a depth of 240 feet.

A. FORBESI (Desor). (Clark, 1904, p. 552, pl. 1, figs. 1, 2; pl. 4, figs. 14, 15.) We have not been able to satisfactorily distinguish these 2 species.

Class OPHIUROIDA Brittle or Serpent-stars

Order EURYALAE

Gorgonocephalidae

GORGONOCEPHALUS Leach Basket-stars

G. ARCTICUS Leach. (*agassizii* Stimpson.) (Clark, 1904, p. 561, pl. 6, figs. 35, 36; pl. 7, figs. 45–47.) Two specimens taken on rock bottom, depth 75 feet. Station: D 94.

Order OPHIURAE

Ophiactidae

OPHIOPHOLIS Müller and Troschel

O. ACULEATA (Linné). (Clark, 1904, p. 559, pl. 5, figs. 24–27; pl. 7, figs. 41, 42; Mortensen, 1927, p. 204, fig. 116.) The most common brittle-star of this Region. Taken on almost all bottoms, from the shore to 194 feet. An entire dredge full of them was taken at D 70. Ovigerous females were taken July 22, 1927. The species was found at 44 dredging stations and 7 shore stations. Very abundant at D 40.

Amphiuridae

AMPHIPHOLIS Ljungman

A. SQUAMATA (della Chiaje). Clark, 1904, p. 560, pl. 6, figs. 33, 34; pl. 7, figs. 43, 44; Mortensen, 1927, p. 221, fig. 125.) This species may have been confused in some cases with the young of the preceding. It is definitely determined from hard bottoms, depth 60 to 75 feet. Stations: D 36, 46, 56, 94.

Ophiolepidae

OPHIURA Lamarck

O. ROBUSTA (Ayres). Clark, 1904, p. 558, pl. 6, figs. 31, 32; pl. 7, figs. 39, 40; Mortensen, 1927, p. 242, figs. 84 (part), 131 (1, 2.)) Taken twice on blue clay, depth 210 to 220 feet. Stations: D 15, 150.

O. BREVISPINA (Say). (Clark, 1904, p. 558, pl. 5, figs. 28–30; pl. 7, figs. 37, 38.) Taken on rock bottom, depth 76 feet. Station: D 94.

Class ECHINOIDA Sea-urchins

Order DIADEMATOIDA

Suborder CAMARODONTA

Strongylocentrotidae

STRONGYLOCENTROTUS Brandt

S. DRÖBACHIENSIS (O. F. Müller). (Clark, 1904, p. 563, pl. 9, figs. 53–57; Mortensen, 1927, p. 313, fig. 181.) Very frequently taken, often abundantly, on all kinds of bottom from the shore to 100 feet. Many small ones taken (D 131) on blue clay, depth 194 feet. More common on hard bottoms than on mud.

Order CLYPEASTROIDA

Scutellidae

ECHINARACHNIUS Gray

E. PARMA (Lamarck). Clark, 1904, p. 564, pl. 10, figs. 58–62.) Common and widely distributed on bottoms containing an admixture of sand, from shore to 70 feet. Recorded rarely to 194 feet. Gonads are mature chiefly in the late summer.

Class HOLOTHUROIDA Sea-cucumbers

Order DENDROCHIROTA

Cucumariidae

CUCUMARIA de Blainville

C. FRONDOSA (Gunnerus). Clark, 1904, p. 566, pl. 11, figs. 65, 66, pl. 12, figs. 76–80; Mortensen, 1927, p. 398, fig. 236.) Taken very widely and often in great numbers on most sorts of bottom. Most abundant from low water to about 70 feet. Taken only twice in water deeper than 85 feet, greatest depth (D 15) 220 feet. The young larvae are found in great abundance in July.

C. PULCHERRIMA (Ayres). (Clark, 1904, p. 567, pl. 12, figs. 81–85.) Taken on bottoms containing mud with sand: not common. Seven of the eleven stations are between the mouth of Somes Sound and Sutton's Island. Stations: D 27, 51, 52, 54, 55, 62, 63, 71, 83, 115, 141.

Psolidae

PSOLUS Oken

P. PHANTAPUS (Strussenfelt). (Mortensen, 1927, p. 415, fig. 251.) On gravel and small stones, rare, depth 68 to 101 feet. Stations: D 38, 56, 68.

Order MOLPADONIA

Molpadiidae

MOLPADIA Cuvier

M. OOLITICA (de Pourtalès). (Clark, 1904, p. 570, pl. 11, fig. 72; pl. 13, figs. 105–108.) Two specimens from rocky bottom at a depth of 76 feet. Station: D 94.

Order APODA

Synaptidae

Leptosynapta Verrill

L. inhaerens (O. F. Müller). (Clark, 1904, p. 571, pl. 11, fig. 74; pl. 14, figs. 109–112; Mortensen, 1927, p. 427, fig. 261.) Found hidden under stones where there is also sandy mud, from low water to 35 feet. Common at S 11, 43. Stations: D 33, 35; S 11, 39, 43.

LITERATURE

Clark, H. L. 1904 The echinoderms of the Woods Hole region. Bull. United States Fish Comm., vol. 22, pp. 547–574, 14 pl.

Mortensen, Th. 1927 Handbook of the Echinoderms of the British Isles. Oxford: pp. i–ix, 1–471, 269 fig.

MOLLUSCA

Scire tuum nihil est nisi te scire hoc sciat alter?—Persius.

As I sit down to write up this list, I think of the late C. W. Johnson's statement, when writing his list of the Mollusca of New England, that the preparation of any list, when nomenclature is so unsettled, is fraught with sad misgivings, as one sees many of the names familiar from boyhood swept into the synonomic sea. I was most fortunate in having Mr. Johnson for a friend. In our many talks while we compared doubtful individuals with the collection in the Boston Society of Natural History, he taught me much, and I have followed the classification he used in the Occasional Papers of the Boston Society of Natural History—VII Fauna of New England 13, List of Mollusca, 1915.

In but few species the Report on the Invertebrata of Massachusetts, second edition, comprising the Mollusca, by A. A. Gould, edited by W. G. Binney, 1870, is the reference for plates and figures.

Of the five faunas admitted for the several subdivisions of the eastern American coast by naturalists such as Dana, Packard, and Verrill, but two need be considered in this paper —the Syrtensian and Acadian.

The Acadian, to quote Verrill in U. S. Fish Com. Report, 1872, "named by Lutken, but first distinguished as the Nova Scotian by Dana. It extends from the Syrtensian southerly to Cape Cod, close to the shore, but pushes farther southward in deeper water, and at a distance from the shore." The molluscan fauna of this Region is distinctly Acadian and, as is natural, grades both up and down the coast into the forms typical of those faunas. As pointed out by Verrill, they tend to go off shore as they progress toward the south.

The Mollusca of this Region, as we found them, are composed of 140 species and three varieties, as shown in the list. They are all marine, and the freshwater forms will be treated in a later publication.

The species herein recorded are from live specimens. I do not take seriously the reporting of dead valves and shells, for I have seen far too many flounder draggers, scollop dredgers, and others clean their boats and throw overboard forms taken from a quite different bottom, at a different depth, and miles from the bottom on which they lived. Refuse has been dumped in the Bay for years, which, with that from yachts and other boats, probably accounts for the reports of the oyster and the hard clam. Dead valves are apt in this Region to be defective evidence of the occurrence of a form in a particular locality.

In every case the dredging station where forms were taken is given, but not all dredging stations are included, only those where they were found in sufficient numbers to warrant special attention. Some forms are so general that they may be taken almost anywhere, and in such instances it will be noticed that the dredging stations are omitted.

It seems worth while to say a word or two regarding the more common species.

The nuculidae are of three species, *Nucula proxima, N. tenuis,* and *N. delphinodonta,* and in actual numbers undoubtedly exceed any other mollusc. Almost every dredging brings them up and they may be obtained in large quantities in the inner Bay.

The Ledidae are another common form and are represented by four species, with *Yoldia sapotilla* the most prominent. They occur in large numbers, particularly *Y. sapotilla,* and undoubtedly are one of the most valuable of fish foods that the waters afford. They are found everywhere that any kind of mud bottom occurs, whether it be on the large patches of mud bottom or among the rocks where deposits of mud have lodged and the animal can find a foothold.

The average length dredged is a scant inch and large species are rarely met with, proving that they do not acquire much growth before being eaten. This is borne out by the fact that very few large dead valves are dredged, and also that large specimens may be dredged back in the estuaries. The codfish enter the inner Bay in the cold months and cruise over its bottom until May and sometimes beyond, but they do not go into the estuaries, and therefore these forms are given an opportunity to acquire their full size.

The Pectinidae give us two species, one of them the giant scollop of commerce. These bed very hard here and it takes considerable effort to get them up. They used to be very numerous, but the recent fishing has kept them down. A favorite spot was the Western Bay and Blue Hill Bay, and they must have been very abundant years ago, for I have found large masses of shells carefully stacked up in lots of 10 or more cubic feet, now covered by a foot or more or soil and moss and growing trees a foot in diameter.

Mytilus edulis is, of course, everywhere throughout this Region. On the piles, rocks, or wherever it can attach itself, and also forms large beds in the flats, acres in extent. *Modiolus modiolus* is also distributed. They are the chief Mytilidae, which give us eight species, but mention must be made of *Crenella,* which is common.

The Astartidae occur generally and in five species, with *Astarte undata* the very common form, and the beautiful *A. castanea* scarce.

Of the Carditae, *Venericardia borealis* has a general occurrence with *V. novangliae*, more plentiful in the southeastern part of the Region than elsewhere.

Mya arenaria is one of the representative species of the Myacidae, but makes up for all of the other forms by its value as a food.

The Margarites of the Trochidae are five and of very general occurrence, though in small numbers.

The Naticidae also have five forms here, with *Polinices heros* var. *triseriata* very widely distributed.

The one species of the Skeneidae is *Skenea planorbis,* which is found everywhere in tide pools.

Five species of the Litorinidae occur and are our most prominent Gasteropod to the eye. They are everywhere; said to be a migrant from northern Europe by way of Greenland, it is now found along the entire New England coast. A quotation from an article written in 1892 by A. E. Verrill will be of interest.

"It is well known to American conchologists that this common European species has become well established on the New England coast within ten or twelve years, appearing first on the coast of Maine about 1868; Dr. Dawson, however, states that he collected it on the shores of Nova Scotia at a much earlier date. I wish, at present, merely to put on record some additional data as to its recent progress along the coast. In 1873, it was collected in abundance at Saco, Maine, by the U. S. Fish Commission, and it was found sparingly at Peake's I., Casco Bay. In 1872 it was very rare at Provincetown, Mass., but in 1875 it was common there. In 1875 it was collected by the writer at Barnstable, Mass., on the shores of Cape Cod Bay, in large quantities. In 1879, it had become exceedingly abundant at Provincetown. In 1875, our parties found two specimens only, on the southern shores of Cape Cod, at Woods Hole, but in 1876 it was found to be common there, and is now very abundant. The first specimen found so far westward as New Haven was obtained by Professor S. L. Smith, during the past winter. Other solitary specimens have since been obtained here by Mr. E. A. Andrews, and by Mr. J. H. Emerton. It is, at present, exceedingly abundant at Newport, R. I."

In *Aporrhais occidentalis* var. *mainensis,* we have our own special mollusc which has been reported from but one other place, the Isle of Shoals, and forms the subject of figure 38.

Fig. 38 A series of Aporrhais occidentalis var. mainensis Johnson. Showing growth of lip. Actual size.

The Murcidae furnish our most beautiful form in *Thais lapillus,* which favors most exposed parts of the rocky coast. This little mollusc is found throughout the entire region, slowly creeping about in the tide pools or feeding on the barnacles which cover the boulders. Like *Litorina,* it is presumed to be an immigrant from Great Britain, having found its way across the sea by way of Iceland and Greenland, and thence down the coast. Being a cold-water animal, it does not extend down the Atlantic coast for any distance, and even in this latitude its best development is in open, rocky exposures. One rarely finds a specimen over an inch and a half long, the majority being an inch and under. The color runs from white through yellow, orange, and chocolate, and the specimens on the eastern shore of the Island are marked with bright vermillion bands and there are other bright-colored colonies, as on Yellow Island, etc. On the south shore, in the region of Bass Harbor Head, one does not find as many bright specimens and there is a tendency for the color to grade into purple. The eggs are contained in smooth vase-shaped capsules with a short stalk, ranging in color from white to a purple tinge and are layed in clusters either on the sheltered side of rocks or under them.

There has been some discussion as to whether or not *T. lapillus* can attack clams and mussels by boring their shells, as does *Urosalpinx cinerea.* After thoroughly searching, one finds very few of the mussel shells being bored, for *U. cinerea* does not occur in this Region and the mussel is evidently not the natural food of *T. lapillus.* They can bore a large-size mussel if they wish, and we have a mussel taken with the animal in the act of boring it. They bore one side and then go to the other side, thus showing that it is a natural habit. In this Region the abundance of barnacles and other food probably suffices their needs. An examination of necklaces worn by the Cro-Magnon people of southern France reveals the fact that their attractive color and shape appealed to the eye a long time ago.

The common whelk, *Buccinum undatum,* is the shore representative of the Buccinidae, and is also commonly dredged. Other species are *Neptunea decemcostata,* commonly called Chrysodomus, and the two *Sipho* forms, *S. stimpsonii* and *S. pygmaeus. S. stimpsonii* attains quite a size and we have taken specimens 5 inches long, with the majority around 2 inches. The epidermis is rather velvety, light brown, and smooth, which helps distinguish it from *S. pygmaeus,* with which the young are found associated. *S. pygmaeus* is a smaller animal, rarely found over an inch long, but has a wide range from shore stations to considerable depths. The epidermis is hirsute, corrugated, and of a grayish color. All are common.

The Turritidae as found in the different *Bela* species are general, and a fish food of importance. More may be obtained from fish maws than in any other way. The nomenclature of the *Belas,* owing to their similarity and consequent imperfect original descriptions and illustrations, has always been in a state of confusion. I have, therefore, listed as taken by us only those forms which I have been able to compare with specimens that have valid identifications.

The Calyptraeidae are so poorly represented, while so common further south, that it is worth while mentioning. Though *Crucibulum* is found frequently, *Crepidula* is so scarce both along the shore and on the bottom that we found but six individuals during our entire field work. One large individual of *C. fornicata,* two *C. glauca* in the dredging, and several quite large specimens of *C. fornicata* attached to rocks on the western side of the Island. These were so flat and with such a thin shell that they could easily have been taken for *C. plana.*

The two New England forms of the Acmaeidae, *Acmaea testudinalis* and *A. alveus,* are commonly found attached to rocks in the tide pools and elsewhere. Earlier writers and many people today consider these two forms as separate species, but after years of collecting on the flats and in the pools, I am quite convinced that there is no difference between them in this Region. I know this statement will produce a raising of the eyebrows in certain quarters, but in this Region there is no difference between the two forms. They occur together indiscriminately where rocks and eel-grass are together, and the *alveus* form, which is supposed to live on eel-grass, occurs on all rocks and the *testudinalis* on the eel-grass. To test this out the writer took 55 specimens on eel-grass and 25 from a rock surrounded by the eel-grass. Of those from the rock, the largest of which, varying from 11 to 17 mm. in length, are typical *testudinalis,* while the 12 smaller ones, varying from 5 to 10 mm. in length, approach the form *alveus.* Among those from the eel-grass, the 5 largest are typical testudinal, the largest measuring 11 mm. in width and 15 mm. in length; about 20 would be considered the form *alveus,* the largest having a width of 77 mm. and a length of 12 mm. Thirty were intermediate, completely bridging the two forms. These forms were checked over by C. W. Johnson and mentioned in Nautilus. One may go to the Narrows at low tide today and find the above conditions, with thousands of individuals readily accessible to prove the above observation.

Phylum MOLLUSCA

AMPHINEURA

POLYPLACOPHORA

Lepidopleuridae

HANLEYA Gray

HANLEYA MENDICARIA Mighels and Adams

Ischnochitonidae

TONICELLA Carpenter

TONICELLA MARMOREA (Fabricius)

TRACHYDERMON Carpenter

TRACHYDERMON ALBUS (Linné)
TRACHYDERMON RUBER (Linné)

Acanthochitidae

Amicula Gray

Amicula vestita (Broderip and Sowerby)

PELECYPODA (Lamellibrachiata)

PRIONODESMACEA

Nuculidae

Nucula Lamarck

Nucla proxima (Say)
Nucula tenuis (Montagu)
Nucula delphinodonta (Mighels and Adams)

Ledidae

Leda Schumacher

Leda tenuisulcata (Couthouy)

Yoldia Müller

Yoldia limatula (Say)
Yoldia sapotilla (Gould)
Yoldia myalis (Couthouy)
Yoldia (Portlandia) thraciaeformis (Storer)

Pectinidae

Pecten (O. F. Müller)

Pecten (Chlamys) islandicus Müller
Pecten (Placopecten) magellanicus (Gmelin)

Anomiidae

Anomia Linné

Anomia aculeata (Müller)
Anomia simplex d'Orbigny

Mytilidae

Mytilus Linné

Mytilus edulis Linné
Mytilus edulis pellucidus (Pennant)

MODIOLUS Lamarck

MODIOLUS MODIOLUS Linné

MUSCULUS Bolten

MUSCULUS SUBSTRIATUS (Gray)
MUSCULUS NIGER (Gray)
MUSCULUS CORRUGATUS (Stimpson)

CRENELLA Brown

CRENELLA GLANDULA (Totten)
CRENELLA DECUSSATA (Montagu)

Periplomidae

PERIPLOMA Schumacher

PERIPLOMA FRAGILIS (Totten)

Thraciidae

THRACIA Blainville

THRACIA MYOPSIS Möller
THRACIA TRUNCATA Mighels and Adams
THRACIA CONRADI Couthouy

Pandoridae

PANDORA Bruguière

PANDORA (CLIDIOPHORA) GOULDIANA Dall

Lyonsiidae

LYONSIA Turton

LYONSIA HYALINA (Conrad)
LYONSIA ARENOSA (Möller)

TELEODESMACEA

Pleurophoridae

CYPRINA Lamarck

CYPRINA ISLANDICA (Linné)

Astartidae

Astarte Sowerby

Astarte undata Gould
Astarte undata latisulca (Hanley)
Astarte castanea (Say)
Astarte subaequilatera Sowerby
Astarte borealis (Schumacher)
Astarte quadrans Gould
Astarte portlandica Mighels
Astarte striata (Leach)

Carditidae

Venericardia Lamarck

Venericardia (Cyclocardia) borealis (Conrad)
Venericardia (Cyclocardia) novangliae (Morse)

Thyasiridae

Thyasira Lamarck

Thyasira gouldii (Philippi)
Thyasira plana (Verrill and Bush)

Axinopsis G. O. Sars

Axinopis orbiculata G. O. Sars
Axinopis orbiculata inequalis Verrill and Bush

Kelliellidae

Turtonia Hanley

Turtonia minuta (Fabricius)

Cardiidae

Cardium Linné

Cardium (Cerastoderma) ciliatum Fabricius
Cardium (Cerastoderma) pinnulatum Conrad

Serripes Beck

Serripes groenlandicus (Gmelin)

Veneridae

Venus Linné

Venus mercenaria Linné

Liocyma Dall

Liocyma fluctuosa (Gould)

Tellinidae

Macoma Leach

Macoma balthica (Linné)
Macoma calcarea (Gmelin)

Solenidae

Ensis Schumacher

Ensis directus (Conrad)

Mactridae

Spisula Gray

Spisula (Hemimactra) solidissima (Dillwyn)

Myacidae

Mya Linné

Mya arenaria Linné
Mya truncata Linné

Saxicavidae

Saxicava Bellevue

Saxicava arctica (Linné)

Panomya Gray

Panomya arctica (Lamarck)

SCAPHOPODA

SOLENCONCHAE

Dentaliidae

Dentalium Linné

Dentalium entalis Linné
Dentalium occidentale Stimpson

GASTEROPODA

Subclass STREPTONEURA

ASPIDOBRANCHIA

Acmaeidae

ACMAEA Eschscholtz

ACMAEA TESTUDINALIS (Müller)
ACMAEA ALVEUS (Conrad)

Lepetidae

LEPETA Gray

LEPETA CAECA (Müller)

Fissurellidae

PUNCTURELLA R. T. Lowe

PUNCTURELLA PRINCEPS (Mighels and Adams)

Trochidae

MARGARITES Leach

MARGARITES CINEREA (Couthouy)
MARGARITES GROENLANDICA (Gmelin)
MARGARITES HELICINA (Phipps)
MARGARITES OLIVACEA (Brown)

MOLLERIA Jeffreys

MOLLERIA COSTULATA (Möller)

SOLARIELLA S. Wood

SOLARIELLA OBSCURA (Couthouy)

CALLIOSTOMA Swainson

CALLIOSTOMA OCCIDENTALE (Mighels and Adams)

CTENOBRANCHIATA

Pyramidellidae

TURBONILLA Risso

TURBONILLA NIVEA (Stimpson)

Odostomia Fleming

Odostomia modesta (Stimpson)

Cremula Iredale

Cremula eburnea (Stimpson)

Couthouyella Bartsch

Couthouyella striatula (Couthouy)

Epitoniidae

Epitonium Bolten

Epitoneum (Arctoscala) greenlandicum (Perry)

Naticidae

Natica Lamarck

Natica (Cryptonatica) clausa Broderip and Sowerby

Polinices Montfort

Polinices (Euspira) heros (Say)
Polinices (Euspira) var. triseriata (Say)
Polinices (Euspira) groenlandica (Möller)
Polinices (Euspira) immaculata (Totten)

Amauropsis Mörch

Amauropsis islandica (Gmelin)

Lamellariidae

Velutina Blainville

Velutina laevigata (Linné)
Velutina undata Brown

Calyptraeidae

Crucibulum Schumacher

Crucibulum striatum (Say)

Crepidula Lamarck

Crepidula fornicata (Linné)
Crepidula glauca Say

Amnicolidae

Paludestrina d'Orbigny

Paludestrina minuta (Totten)

Rissoidae

Cingula Fleming

Cingula carinata Mighels and Adams
Cingula castanea (Möller)
Cingula arenaria Mighels and Adams
Cingula areolata (Stimpson)

Onoba Adams

Onoba aculeus (Gould)

Skeneidae

Skenea Fleming

Skenea planorbis (Fabricius)

Litorinidae

Litorina Férussac

Litorina littorea (Linné)
Litorina obtusata palliata (Say)
Litorina rudis (Donovan)
Litorina rudis tenebrosa (Montagu)

Lacuna Turton

Lacuna vincta (Montagu)
Lacuna vincta fusca (Gould)

Turritellidae

Turritella Lamarck

Turritella erosa Couthouy

Turritellopsis G. O. Sars

Turritellopsis acicula (Stimpson)

Trichotropidae

Trichotropis Broderip

Trichotropis borealis Broderip and Sowerby

Aporrhaidae

Aporrhais Dillwyn

Aporrhais (Arrhoges) occidentalis (Beck)
Aporrhais (Arrhoges) occidentalis var. mainensis Johnson

Muricidae

Trophon Montfort

Trophon truncatus (Ström)

Thais Bolten

Thais (Nucella) lapillus (Linné)

Columbellidae

Columbella Lamarck

Columbella (Astyris) rosacea (Gould)
Columbella (Astyris) dissimilis Stimpson

Alectrionidae

Alectrion Montfort

Alectrion (Tritia) trivittata (Say)

Buccinidae

Buccinum Linné

Buccinum undatum Linné

Neptunea Bolten

Neptunea decemcostata (Say)

Colus Humphrey

Colus stimpsonii (Mörch)
Colus pygmaeus (Gould)

Cancellariidae

Admete Kröyer

Admete couthouyi (Jay)

Turritidae

Bela Leach

Bela nobilis (Möller)
Bela incisula Verrill
Bela harpularia (Couthouy)
Bela cancellata (Mighels and Adams)
Bela bicarinata var. violacea (Mighels and Adams)
Bela rugulata gouldii Verrill
Bela exarata (Möller)
Bela pleurotomaria (Couthouy)
Bela decussata (Couthouy)
Bela blaneyi Bush

Tornatinidae

Retusa Brown

Retusa pertenuis (Mighels)
Retusa gouldii (Couthouy)

Scaphandridae

Diaphana Brown

Diaphana debilis (Gould)

Cylichna Lovén

Cylichna alba (Brown)

Philinidae

Philine Ascanius

Philine lima (Brown)

Suborder NUDIBRANCHIA

Aeolidiidae

Aeolidia Cuvier

Aeolidia papillosa (Linné)

Coryphellidae

Coryphella Gray

Coryphella rufibranchialis (Johnson)
Coryphella rufibranchialis mananensis (Stimpson)
Coryphella stellata (Stimpson)

Dotoidae

Doto Oken

Doto coronata (Gmelin)

Dendronotidae

Dendronotus Alder and Hancock

Dendronotus frondosus (Ascanius)

Goniodoridae

Lamellidoris Alder and Hancock

Lamellidoris aspera (Alder and Hancock)
Lamellidoris bilamellata (Linné)
Lamellidoris (?) grisea (Gould)

CEPHALOPODA

DIBRANCHIA

OCTOPODA

Polypodidae

Polypus Schneider (*Octopus* Lamarck)
Polypus arcticus (Prosch)

AMPHINEURA

POLYPLACOPHORA

Lepidopleuridae

Hanleya Gray

H. mendicaria (Mighels and Adams). (*Chiton mendicarius* Mighels and Adams, 1842, Boston Jour. Nat. Hist.; *Hanleya mendicaria* Pilsbry, 1892, Manual Conch. Ser. 1, vol. 14, p. 18, pl. 4, figs. 82–85.) One individual at dredging station 15. Curiously enough, Blaney reports but one specimen dredged and that from a station not far from where we took ours. Reported from Eastport, Georges Bank, Grand Manan rare (Stimpson), Le Havre Bank, N. S.

Ischnochitonidae

Tonicella Carpenter

T. marmorea (Fibricius). (*Chiton marmoreus* Fabricius, 1780, Fauna groenlandica; *Chiton fulminatus* Couthouy, 1838, Boston Jour. Nat. Hist., vol. 2, p. 80, pl. 3, fig. 19; *T. marmorea* Pilsbry, 1892, Manual Conch. Ser. 1, vol. 14, p. 41, pl. 10, figs. 8–15.) Common in tide pools and dredgings. Reported from Casco Bay, Massachusetts Bay. Common as far as Greenland, low-water mark to 50 fathoms. One small specimen from Hudson Bay.

Trachydermon Carpenter

T. albus (Linné). (*Chiton albus* Linné, 1767, Syst. Nat. ''Oceano Islandico.'' *Chiton albus* Gould, 1870, p. 263, fig. 525.) This species is found on rocky and hard clay bottoms. Is a food for haddock, being found in their stomachs. Stations: D 19, 95. Reported from Casco Bay, Isle of Shoals. Common and distributed as above.

T. ruber (Linné). (*Chiton ruber* Linné, 1767, Syst. Nat. ''Oceano Septentrionali,'' *Chiton ruber* Gould, 1870, p. 260, fig. 523.) This is the common species and is found everywhere clinging on the rocks from tide pools to the hard bottoms of the Bay. Is very partial to the hard blue clay bottoms. Stations: D 39, 43, 63, 87, 95, 125, 130; S 11, 12, 31. Reported as 'occasional' from Woods Hole and one specimen dredged by that survey; Eastport, Casco Bay, off Watch Hill, R. I., off New London. Grand Manan abundant. See Whiteaves, p. 155.

Acanthochitidae

Amicula Gray

A. vestita (Broderip and Sowerby). (*Chiton vestitus* Broderip and Sowerby, 1829, Zool. Journ ''Oceano Arctico''; *Amicula emersonii* Gould, 1870, Inv. Mass., p. 264, fig. 527; *Amiclua vestita* Pilsbry, 1893, Manual Conch. Ser. 1, vol. 15, p. 43, pl. 8, figs. 23–26.) Reported by Blaney; Casco Bay, Massachusetts Bay, from fish. ''Widely distributed but apparently very local (in Canada).'' Whiteaves.

PELECYPODA (Lamellibranchiata)

PRIONODESACEA

Nuculidae

NUCULA Lamarck

N. PROXIMA (Say). (Gould, 1870, Inv. Mass., p. 150, fig. 458; (*Nucula proxima truncula* Dall, 1898, Trans. Wagner Free Inst. Sci.) Found abundantly everywhere on muddy bottoms and is one of the leading foods for fish. Probably, in point of numbers, the commonest form of the Region. Particularly plentiful in the inner Bay. Stations: D 1, 32, 33, 36–39, 45, 46, 51, 53–55, 58, 61, 70, 72, 81, 83, 115, 120. Common from Maine to Connecticut in 2 to 30 fathoms. Grand Manan, Bay of Fundy, Annapolis Basin abundant, Halifax fishing banks rare.

N. TENUIS (Montagu). (*Arca tenuis* Montagu, 1808, Test. Brit. Suppl.; Gould, 1870, Inv. Mass., p. 149, fig. 457.) Common inside the Porcupine Islands and occurring with the other two species on muddy bottoms. Reported from Eastport, Casco Bay, Saco, Me.; Pleistocene. Circumpolar in from 4 to 100 fathoms. North to Arctic Ocean.

N. DELPHINODONTA Mighels and Adams, 1842, Boston Jour. Nat. Hist. (Gould, 1870, Inv. Mass., p. 153, fig. 461.) Common with the preceding two species and, as with them, one of the chief foods of haddock. Station: D 65. Woods Hole Survey, Eastport, 10 to 100 fathoms; Casco Bay, off Cape Ann, East of Block Island, Grand Manan, 25 fathoms; Halifax banks, Gaspé Bay, in 50 fathoms mud.

Ledidae

LEDA Schumacher

L. TENUISULCATA (Couthouy). (Couthouy, 1838, Boston Jour. Nat. Hist.; Gould, 1870, Inv. Mass., p. 161, fig. 468.) Widely distributed in small numbers throughout the outer Bay and off Northeast Harbor. Serves as a fish food. Stations: D 27, 36, 38, 94–96, 99, 105, 106. Reported from Eastport, Casco Bay, Isle of Shoals, Newport, from fish caught off Massachusetts coast. Grand Manan common on muddy bottoms, Passamaquoddy Bay, off Cape des Rosiers in 110 fathoms.

YOLDIA Müller

Y. SAPOTILLA (Gould). (Gould, 1870, Inv. Mass., p. 159, fig. 466.) A very common species occurring wherever there is mud. Being a favorite food for fish, it rarely reaches a large size. Stations: D 1, 14, 27, 32, 35, 36, 38, 39, 43, 46, 51, 55, 58, 65, 72, 91, 96, 103, 106, 108, 112, 144. Some very large specimens were taken at D 91. Reported from Eastport, Casco Bay, Provincetown, Duxbury, east of Block Island. Grand Manan, Northumberland Strait occasional, and a Canadian fossil form.

Y. (PORTLANDIA) THRACIAEFORMIS (Storer). (*Nucula thraciaeformis* Storer, 1838, Boston Jour. Nat. Hist.; *Yoldia thraciaeformis* Gould, 1870, Inv. Mass., p. 157, fig. 465.) Not a common form except the young. Being a fish food probably accounts for this. Favorite bottom is mud and broken shells. Stations: D 1, 2, 37, 38, 77, 105, 115. No definite record from Woods Hole, though the region is included within the range of the species. Eastport, Casco Bay, off Cape Cod, Bay of Fundy, Halifax, dredged rare by Whiteaves in 200 fathoms between Anticosti and Gaspé.

Y. LIMATULA (Say). (*Nucula limitula* Say, 1831, Amer. Conch.; *Yoldia limatula* Gould, 1870, Inv. Mass., p. 154, fig. 462.) Scarce in the inner Bay and more common on the south side and in Somes Sound. Specimens found average larger than the 2 preceding forms. Stations: D 46, 61, 66, 141. Reported from Casco Bay, Salem, Boston Harbor, Buzzards Bay, off New Haven, Bay of Fundy, common through Northumberland Strait, rare northern Gulf of St. Lawrence. Fossil in the Leda clay.

Y. MYALIS (Couthouy). (*Nucula myalis* Couthouy, 1838, Boston Jour. Nat. Hist.; *Yoldia myalis* Gould, 1870, Inv. Mass., p. 160, fig. 467.) Only a few specimens found in outer Bay. Stations: D 15, 117. Reported from Eastport, Casco Bay, Massachusetts from fish. A more northerly species than *Y. limatula*. Rather general occurrence to Hudson Strait.

Pectinidae

Pecten O. F. Müller

P. (Chlamys) islandicus (Müller). Müller, 1776, Zool. Danicae, Prodr.; *Chlamys islandicus* Verrill, 1897, Trans. Conn. Acad., vol. 10, p. 72, pl. 16, figs. 2–5b; pl. 20, fig. 9; pl. 21, fig. 2.) Only small specimens found and but in 2 places on hard bottom. Stations: D 36, 40. Reported from Eastport, Casco Bay, Marthas Vineyard, Georges Bank, Stonnington, Conn.; from Gulf of St. Lawrence, Hudson Bay Strait, and various other Canadian localities. A Canadian fossil form.

P. (Placopecten) magellanicus (Gmelin). (*Ostrea magellanica* Gmelin, 1790, Syst. Nat.; *P. tenuicostatus* Mighels and Adams, 1842, Boston Jour. Nat. Hist.; *P. fuscus* Linsley, 1845, Amer. Jour. Sci.; *P. tenuicostatus* Gould, 1870, Inv. Mass., p. 196, fig. 494; *P. clintonius* Verrill, 1884, Trans. Conn. Acad.; *P. (Placopecten) magellanicus* Dall, 1898, Wagner Free Inst. Sci.) This is the giant scollop of commerce, and occurs in places in large beds. One of them was recently located just inside of Bald Porcupine. Found from the outer Bay to estuaries. Occurs some distance up the Skillings River. Favorite bottom gravel, clay, and broken shells. Stations: D 15, 18, 38, 67. Beds frequently occur in the western Bay. Reported from whole New England coast and southward, Passamaquoddy Bay, Gulf of St. Lawrence. The most northern locality of record is the north shore of the Gulf just inside the Strait of Belle Isle. A fossil form of Canada.

Anomiidae

Anomia Linné

A. aculeata (Müller). (Müller, 1776, Zool. Danicae Prodr., p. 249; Gould, 1870, Inv. Mass., p. 204, fig. 498.) Very common on stones and shells at low water and in the Bay. Reported from Casco Bay and northward, off Gay Head, off Stonington; widely distributed in Gulf of St. Lawrence at depths of less than 100 fathoms.

A. SIMPLEX d'Orbigny. (d'Orbigny, 1845, Moll. Cubana; *A. ephippium* Gould, 1870, Inv. Mass., p. 204, fig. 497.) Common with the preceding form and distinguished from it by lack of scales on the surface. Common Maine to Connecticut; southern coast of Nova Scotia, off Cape Sable, 8 fathoms.

Mytilidae

MYTILUS Linné

M. EDULIS (Linné). (Linné, 1758, Syst. Nat.; Gould, 1870, Inv. Mass., p. 183, fig. 483.) The common mussel of commerce, and occurs in great abundance in this Region, adhering to piles, rocks, etc., and forming vast beds on the mud flats. Serve as bait for fishermen. Their growth interferes seriously with channels through the flats. Common on the Canadian and Labrador shores. Is circumpolar and also a Pleistocene fossil in Canada.

M. EDULIS PELLUCIDUS (Pennant). Pennant, 1777, Brit. Zool.; *M. edulis* var. *pellucidus* Gould, 1870, Inv. Mass., p. 184, fig. 484.) While not so common as the preceding form, it occurs with it in great quantities. Very inconstant as to radiations and shading.

MODIOLUS Lamarck

M. MODIOLUS (Linné). (*Mytilus modiolus* Linné; *M. modiolus* Lamarck, 1799, Nouv. Class. Coq.; *M. modiolus* Gould, 1870, Inv. Mass., p. 186, fig. 485.) This inhabitant of deep water is often cast upon the shore after storms attached to *Laminaria*. Common and known as the 'horse mussel.' Specimens taken nearly 6 inches in length. Sometimes found in tide pools at spring tides. Hard and shell bottoms. Stations: D 53, 135; S 14, 21. Some large ones in tide pools on outer side of Long Porcupine. Common from Maine to Connecticut, from low water to 80 fathoms. Common, circumpolar, and a Canadian fossil form, though rare.

Musculus Bolten

M. substriatus (Gray). (*Modiolaria laevigata* var. *substriata* Gray, 1824, Parry's Voyage; *Modiolaria discors* Gould, 1870, Inv. Mass., p. 192, fig. 489.) Lives on hard bottom and on branches of seaweed of various kinds, which its small size permits. A common species. Stations: D 37, 68, 70, 104. Abundant just inside Mount Desert Rock. Reported from Eastport to New Haven. Circumpolar; a Canadian Pleistocene fossil; reported north to Hudson Strait.

M. nigra (Gray). (*Modiolaria nigra* Gray, 1824, Parry's Voyage [Northwest Passage]; *Modiolaria nexa* Gould, 1841, Inv. Mass.; *M. nigra* Gould, 1870, Inv. Mass., p. 190, figs. 487–488.) An inhabitant of muddy bottom, but rather scarce. Stations: D 62, 63, 77; S 35. Reported by Woods Hole Survey. Fossil at Kennebeck, Me.; Bay of Fundy, Hudson Strait.

M. corrugatus (Stimpson). (Stimpson, 1851, Shells of N. E.; *Modiolaria corrugata* Gould, 1870, Inv. Mass., p. 193, fig. 491.) As with the previous species, this one is scarce, but is found on hard bottoms. Stations: D 38, 103, 117. Reported from Casco Bay, Marthas Vineyard, 20 to 25 fathoms; Georges Bank, off New London. Circumpolar; north to Hudson Strait; in Canadian Pleistocene.

Crenella Brown

C. glandula (Totten). (*Modiolaria glandula* Gould, 1870, Inv. Mass., p. 194, fig. 492.) Abundant on muddy bottoms, if not too soft, from the inner Bay to Mount Desert Rock. Stations: D 27, 33, 34, 46, 51, 53, 54, 61, 62, 66, 68, 80, 100. Reported from Eastport to New London at various places; from Passamaquoddy Bay at various points to Atlantic coast of Labrador.

C. decussata (Montagu). (*Mytilus decussatus* Montagu, 1803, Test. Brit. Suppl.; *C. decussata* Verrill, 1882, Trans. Conn. Acad., vol. 5, p. 578, pl. 44, fig. 7.) Abundant on muddy bottoms, occurring with the previous species. Stations: D 33, 46, 61, 62. Reported from Eastport to Stonington, 4 to 115 fathoms; Annapolis Basin, Gaspé Bay, Greenland.

Periplomidae

PERIPLOMA Schumacher

P. FRAGILIS Totten. (*Anatina fragilis,* Totten, 1835, Amer. Jour. Sci.; *Anatina papyracia,* Gould, 1870, Inv. Mass., p. 66, fig. 382; *P. fragilis,* Dall 1889, Bull. U. S. Nat. Mus.) This animal, with its thin, white, fragile shell, is found generally in somewhat shallow waters. Many found in fish. Stations: D 2, 33, 35, 36, 38. Reported from Casco Bay, Massachusetts Bay, off Block Island, Gaspé Bay, 40 fathoms; Gulf of St. Lawrence, 70 to 80 fathoms; Chateau Bay, Labrador. Sandy bottom mentioned for all localities.

Thraciidae

THRACIA Blainville

T. MYOPSIS Möller. (Möller, 1842, Krøyer's Naturh. Tidskr.; *T. couthouyi,* Stimpson, 1851, Shells of N. E.; *T. myopsis,* Gould, 1870, Inv. Mass., p. 71, fig. 385.) This is the most frequent of the 3 *Thracias* found here, but is not a common form. Stations: D 14, 22, 23, 24, 33–35, 62. Reported from Eastport, Casco Bay, Massachusetts Bay, Georges Bank, and various places along the Atlantic coast to Greenland.

T. TRUNCATA Mighels and Adams. (Mighels and Adams, 1842, Boston Jour. Nat. Hist.; Gould, 1870, Inv. Mass., p. 72, fig. 386.) Readily distinguished by its truncated form, this species was dredged by us just inside of Mount Desert Rock, but not in the Bay. Reported from Eastport, Casco Bay, Massachusetts Bay, Marthas Vineyard, George Bank, off Block Island, Grand Manan, Bay of Fundy, Halifax, Greenland.

T. CONRADI Couthouy. (Couthouy, 1830, Boston Jour. Nat. Hist,; Gould, 1870, Inv. Mass., p. 69, fig. 384; Morse, 1913, Nautilus.) This species is readily distinguished by the absence of teeth in the hinge. Blaney reports taking young, but we did not take it. Reported from Eastport, Casco Bay, and various points to Caribou. "Burrows so deeply in the mud or sand, that it is seldom taken alive in the dredge." Verrill.

Pandoridae

Pandora Bruguière

P. (Clidiophora) gouldiana Dall. (*P. trilineata* Conrad, 1832, Amer. Marine Conch.; *P. trilineata* Gould, 1870, Inv. Mass., p. 62, fig. 379; *P.* (*Clidiophora*) *gouldiana* Dall, 1886, Bull. M. C. Z.) This curious shell is easily recognized by its pearly substance. Its home is on sandy bottoms in sheltered water. It is common in the region of Somes Sound and the waters off Northeast Harbor. We did not take it in any other place. Stations: D 27, 43, 51, 53, 62, 63, 144. Common from Maine to Connecticut, Grand Manan, Cape Breton, Prince Edward Isle.

Lyonsiidae

Lyonsia Turton

L. hyalina Conrad. (*Mya hyalina* Conrad, 1831, Jour. Acad. Nat. Sci. Phila.; *L. hyalina* Conrad, 1832, Amer. Marine Conch.; Gould, 1870, Inv. Mass., p. 64, fig. 380.) This form is common in low water in the inner Bay and inside the islands to the south. Stations: D 10, 11, 25, 26, 27, 28, 37, 62, 63, 64, 65, 66. Common from low-water mark to 30 fathoms, Maine to Connecticut; Bay of Fundy, low-water mark to 30 fathoms (Verrill).

L. arenosa (Möller). (*Pandorina arenosa* Möller, 1842, Krøyer's Naturh. Tidskr.; *L. arenosa* Gould, 1870, Inv. Mass., p. 65, fig. 381.) Reported from Eastport, Frenchmans Bay, but we did not take it. A Greenland shell that Verkruzen collected in the Annapolis Basin. See Whiteaves for critical remarks.

TELEODESMACEA

Pleurophoridae

Cyprina Lamarck

C. islandica (Linné). (*Venus islandica* Linné, 1767, Syst. Nat.; *C. islandica* Lamarck, 1818, Hist. Nat. Anim. sans Vert.; Gould, 1870, Inv. Mass., p. 129, fig. 443.) This is the 'Arctic clam' and easily distinguished from the *Venus mercenaria* or 'quahog' by its brown epidermis and the absence of any purple marking on the inside of the shell. The common size dredged is from ½ to 1½ inches long, and on these the epidermis is a beautiful fawn brown shade. Widely distributed in small numbers, but occurs in great abundance at stations D 25–27. A large specimen was taken at Sand Beach after a storm. Stations: D 2, 25–28, 61–63, 65, 71, 113, 120, 125. Reported from Eastport to off Block Island at various places, Bay of Fundy, Annapolis Basin. Although recorded by Fabricius as a Greenland shell, this species has not yet been found in the Gulf of St. Lawrence north of the Baie des Chaleurs (Whiteaves, 1901).

Astartidae

Astarte Sowerby

A. undata Gould. (Gould, 1841, Inv. Mass.; *A. sulcata* Gould, 1870, Inv. Mass., p. 119, fig. 432.) This is the common *Astarte* of this Region and is found in practically every dredge haul and in sizes from the young an eighth of an inch long and bright yellow, through the immature forms with their concentric ridges and depressions and color from greenish yellow to brown, to the adult, about an inch long and slightly higher with its dark-brown epidermis. Stations: D 14, 25–28, 32, 36, 38, 51–54, 61–63, 65, 71, 72, 97, 98, 103, 105, 106, 112, 125, 126, 142–144. Common from Eastport to Casco Bay, Minas Basin, Halifax Harbor, Northumberland Strait. Not known to occur as far north as Miramichi Bay (Whiteaves).

A. undata latisulca Hanley. (*Crassina latisulca* Hanley, 1843, Cat. Rec. Biv. Shells; *A. undata latisulca* Dall, 1903, Proc. U. S. Nat. Mus., vol. 26, p. 938.) This variety is common with the preceding, and found on most of the same stations. Reported from Eastport. Whiteaves says that this variety occurs with *A. undata* in the Bay of Fundy and Minas Basin, but not in Northumberland Strait.

A. portlandica Mighels. (Mighels, 1843, Boston Jour. Nat. Hist., vol. 4, p. 320, pl. 16, fig. 2; Blaney, 1906, Nautilus.) Blaney reports taking many valves and a few live specimens off Heron Island. Mighels reported "stomach of haddock . . . . taken in Casco Bay." "var. *Portlandia* occurs . . . . Bay of Fundy, 10 to 25 fathoms, not common." (Verrill.)

A. CASTANEA (Say). (*Venus castanea* Say, 1822, Jour. Acad. Nat. Sci. Phila.; *A. castanea* Gould, 1870, Inv. Mass., p. 117, fig. 431.) We dredged this species but 4 times and then but a few specimens were taken. The stations, however, were widely apart, indicating such a distribution. Stations: D 27, 89, 100, 107. Reported from Casco Bay, Massachusetts Bay, Nantucket, Marthas Vineyard, Chatham, off New London. "Does not seem to range farther northward than the Bay of Fundy and Atlantic coast of Nova Scotia." (Whiteaves.)

A. SUBAEQUILATERA Sowerby. (Sowerby, 1855, Thes. Conch.; *A. crebricostata* Gould, 1870, Inv. Mass., p. 126, fig. 440.) Not so widely distributed as *A. undata,* but common except on soft bottoms. Stations: D 9, 19, 26, 35, 73, 94, 95, 101, 105, 106. Reported from Eastport, Penobscot Bay, Casco Bay, off Nauset Light. An interesting reference is in Whiteaves Cat. Marine Inv. of Eastern Canada, p. 132.

A. BOREALIS (Schumacher). (*Tridonta borealis* Schumacher, 1817, Essai. Nouv. Syst. Hab. Test.; *A. semisulcata* Gould, 1870, Inv. Mass., p. 121, fig. 433; *A. borealis* Dall, 1903, Proc. U. S. Nat. Mus., vol. 26, p. 941.) Blaney reports dredging valves of this species, but although we had stations in the same territory, we did not take it. According to the literature, it is a most variable form. Reported from Massachusetts Bay. Although this is supposed to be a northern species, Whiteaves makes no mention of it. After going over thousands of *Astarte* forms and aware of their variations, I would doubt its being a valid species.

A. QUADRANS Gould. (Gould, 1870, Inv. Mass., p. 123, fig. 434.) This small but distinctly quadrilateral species we took in but two dredgings and only three individuals. Stations: D 68 and 69, just outside of Egg Rock on hard Bottom. Reported from Casco Bay, Massachusetts Bay, Provincetown, Marthas Vineyard, Georges Bank, Stonington, Bay of Fundy (not common), north shore of St. Lawrence off Esquimaux Point.

A. STRIATA (Leach). (*Nicania striata* Leach, 1819, Ross's Voyage; *A. banskii* Gould, 1870, Inv. Mass., p. 125, fig. 438.) We did not take this species. Blaney reports only valves. Reported from Massachusetts Bay northward, 10 to 25 fathoms (Dall). Off Halifax, Gaspé Bay, Labrador and Greenland coasts.

Carditidae

VENERICARDIA Lamarck

V. (CYCLOCARDIA) BOREALIS (Conrad). (*Cardita borealis* Conrad, 1832, Amer. Marine Conch.; *Cardita borealis* Gould, 1870, Inv. Mass., p. 146, fig. 455; *V. (Cyclocardia) borealis* Dall, 1902, Proc. Nat. Acad. Sci. Phila.) A very common species on hard or shelly bottoms. The epidermis, which is greenish yellow in the young, gradually turns brown unless in water which says free of sediment. As the animal gets older the shell changes greatly in shape. From the young, where the beaks are nearly central, a little elevated, and just a bit recurved, they gradually become more elevated and oblique. Stations: D 5, 14, 23, 27, 36, 38, 45, 46, 51, 53, 54, 62–66, 68, 72, 83, 84, 89, 94, 97, 99, 100, 103, 106, 107, 112, 119, 125, 126, 144. Reported from Eastport to off New London. Generally distributed along Atlantic coast to Hudson Strait; a Pleistocene fossil.

V. (CYCLOCARDIA) NOVANGLIAE (Morse). (*Actinobolus (Cyclocardia novangliae* Morse, 1869, Peabody Acad Sci.; *Cyclocardia novangliae* Verrill, 1873, Inv. Vineyard Sound, p. 684, pl. 29, fig. 215.) Occurs on hard bottoms with the preceding and may be distinguished from it by the hinge margins and by the finer sculpture. Growth of shell like *V. borealis.* Not recorded for Woods Hole, but reported "mouth of Vineyard Sound and off Gay Head, 10 to 25 fathoms."—Verrill; Eastport, Casco Bay, off New London. According to Verrill, this form appears to be only an inconstant variety of *V. borealis* and has a range co-extensive with the latter. From my experience, I agree.

Thyasiridae

Thyasira Lamarck

T. gouldii (Philippi). (*Lucina flexuosa* Gould, 1841, Inv. Mass.; *Lucina gouldii* Philippi, 1845, Zeitsch. für Malak.; *Cryptodon gouldii* Gould, 1870, Inv. Mass., p. 100, fig. 406; *Thyasira gouldii* Dall, 1901, U. S. Nat. Mus.) This small animal, with its white shell about half an inch across, occurs generally in deep water on mud and sand bottoms and is a favorite food for haddock, cod, etc. Station: D 100. Not reported from Woods Hole. ''Buzzards Bay, six fathoms, mud''; also listed for ''muddy bottoms off the open coast.''—Verrill. Eastport, Casco Bay, off Block Island, Stonington. Widely but apparently very sparingly distributed from Bay of Fundy to Labrador and Greenland at about 10 to 313 fathoms (Whiteaves).

T. plana (Verrill and Bush). (*Cryptodon plana*, Verrill and Bush, 1898, Proc. U. S. Nat. Mus., vol. 20, p. 788, pl. 88, figs. 3, 4.) Mr. Blaney reports that a few of this species were identified by Professor Verrill and Miss Bush among a number of *T. gouldii*. We did not take it. Reported from Casco Bay, Wiscasset, Penobscot Bay, Bay of Fundy, Halifax Harbor.

Axinopsis G. O. Sars

A. orbiculata G. O. Sars. (Sars, 1878, Moll. Reg. Arct. Norv., p. 63, pl. 19, fig. 11a–d; Verrill, 1882, Trans. Conn. Acad., vol. 5.) Neither this species nor the variety *A. inequalis* were found in our dredgings. Blaney reports it as rare and a few found off Ironbound Island. Reported from Broad Sound, Casco Bay, 15 to 30 fathoms. The variety *A. inequalis* is reported from off Cape Ann, 18 to 26 fathoms. Verrill and Bush report the variety *inequalis* from Bay of Fundy.

Kelliellidae

Turtonia Hanley

T. minuta (Fabricius). (*Venus minuta* Fabricius, 1780, Fauna Groenlandica; *T. minuta* Gould, 1870, Inv. Mass., p. 85, fig. 395.) This very minute shell, averaging only one-fifteenth of an inch in diameter, which is found everywhere in north Atlantic waters, inhabits crevices in rocks, piles, and adheres to floating objects and roots of sea weed. Common in the crevices of dock piles. Reported from Sable Island common (Willis); Greenland (Fabricius and Moller).

Cardiidae

Cardium Linné

C. (Cerastoderma) ciliatum (Fabricius). (*C. ciliatum* Fabricius, 1780, Fauna Groenlandica; *C. pubescens* Couthouy, 1838, Boston Jour. Nat. Hist.; *C. islandicum* Gould, 1870, Inv. Mass., p. 139, fig. 450.) This one of the two species from here is partial to hard bottoms, but found widely distributed, and of all sizes, on other bottoms as well. Specimens nearly 2 inches in length were taken. Epidermis present on all living individuals. Stations: D 23, 27, 33, 63, 126. Reported from Eastport, Casco Bay, Marblehead Harbor, off Cape Cod. Pleistocene of Portland, Me., and Canada. Common throughout eastern Canad to Hudson Bay.

C. (Cerastoderma) pinnulatum (Conrad). (*C. pinnulatum* Conrad, 1831, Acad. Nat. Sci. Phila.; *C. pinnulatum* Gould, 1870, Inv. Mass., p. 141, fig. 452.) This is the common form of wide distribution and is found with *C. ciliatum.* Is small, but readily distinguished from the young of that species by having fewer ribs and the scales crossing them. Is generally found in the stomachs of fishes. Common, especially north of Cape Cod. Stations: D 5, 14, 27, 33, 34, 36, 38, 62, 71, 77, 94, 95, 105. Common eastern Canada, but Packard says does not occur north of the Strait of Belle Isle. A Leda clay fossil.

Serripes Beck

S. groenlandicus (Gmelin). (*Cardium groenlandicum* Gmelin, 1790, Syst. Nat.; *Aphrodite groenlandica* Gould, 1870, Inv. Mass., p. 144, fig. 454; *S. groenlandicus* Dall, 1900, Proc. U. S. Nat. Mus.) The young of this species are readily distinguished by the brown angular markings. We did not dredge any adults, not even dead valves. Stations: D 23, 24, 36. Reported from Casco Bay, Cape Cod Bay, off Stonington. Common at moderate depths northward to Hudson Strait and Greenland.

Veneridae

Venus Linné

V. mercenaria Linné, 1758, Syst. Nat. (Gould, 1870, Inv. Mass., p. 133, fig. 445.) This is the quahog or hard clam of commerce and has not heretofore been reported alive in Maine north of Casco Bay. See account in General. Common on shores of Nova Scotia, throughout Northumberland Strait, south shore Baie des Chaleurs.

Liocyma Dall

L. fluctuosa (Gould). (*Venus fluctuosa* Gould, 1841, Inv. Mass.; *Tapes fluctuosa* Gould, 1870, Inv. Mass., p. 136, fig. 447; *L. fluctuosa* Dall, 1902, Proc. U. S. Nat. Mus.) Not dredged, but Blaney reports a few valves. No living animal reported from New England. Widely distributed from the Atlantic coast of Nova Scotia to Labrador and Greenland, in from 10 to 50 fathoms, but apparently local, though usually abundant where found. (Whiteaves).

Tellinidae

Macoma Leach

M. balthica (Linné). (*Tellina balthica* Linné, 1758, Syst. Nat.; *M. fusca* Gould, 1870, Inv. Mass., p. 93, fig. 400; *M. fragilis* Verrill, 1873, Inv. Vineyard Sound; *M. balthica* Dall, 1900, Proc. U. S. Nat. Mus.) Very common in coves. Some shells very thin, particularly when near mouth of brook like station S 35. Eaten by wild duck. Common to the harbors and bays of New England, and along Atlantic coast of Canada.

M. CALCAREA (Gmelin). (*Tellina calcarea* Gmelin, 1790, Syst. Nat.; *M. proxima Gould,* 1870, Inv. Mass., p. 95, fig. 401; *M. sabulosa* Verrill, 1873, Inv. Vineyard Sound; *M. calcarea* Dall, 1900, Proc. U. S. Nat. Mus.) Also a common form in the inner bay, but we did not take it outside. Stations: D 10, 11, 14, 21–24, 33, 34. No definite Woods Hole records, though according to Verrill it is taken on muddy shores between tides in that region. Reported from Eastport, Casco Bay, and various places to off Stonington. Extends to Greenland, both sides of Atlantic, and has been taken on coast of British Columbia.

Solenidae

ENSIS Schumacher

E. DIRECTUS (Conrad). (*Solen directus* Conrad, 1843, Proc. Acad. Nat. Sci. Phila.; *Solen ensis* var. *americanus* Gould, 1870, Inv. Mass., p. 42, fig. 366; *Ensatella americana* Verrill, 1873, Rep. Inv. Vineyard Sound; *E. directus* Dall, 1899, U. S. Nat. Mus.) The 'razor shell' that is commonly found on the beaches of the New England coast. Some quite large patches along the shores of the Bay. Is beginning to be used in chowder as a substitute for *M. arenaria.* One specimen an inch long was dredged at station 125. Reported from various Atlantic coast places to Gaspé, low-water mark to 40 fathoms.

Mactridae

SPISULA Gray

S. (HEMIMACTRA) SOLIDISSIMA (Dillwyn). (*Mactra solidissima* Dillwyn, 1817, Cat. Recent Shells; *M. solidissima* Gould, 1870, Inv. Mass., p. 73, fig. 387; *S.* (*Hemimactra*) *solidissima* Dall, 1894, Nautilus.) This is the beach or hen clam. Reported from the coves on the west side of the Island. Specimens said to have weighed 2 pounds reported from Newberry Neck. This is the shell that the Indians used as a tool to hoe corn. We took one specimen at D 2, at a depth of 60 feet. Common from Maine to Connecticut, Atlantic coast northward to Strait of Belle Isle.

Myacidae

Mya Linné

M. arenaria Linné, 1759. "O. europae septendrionalis." (Gould, 1870, Inv. Mass., p. 55, fig. 375.) This common clam of the New England coast, and known as the soft clam, abundant throughout the Region wherever there is enough mud to hold one. From our experience, I am skeptical of the reports of the young of this species being dredged from deep water. What looked like young at first sight proved to be *Saxicava* or *Panomya.* Is circumpolar alive and as a fossil. A food for the raven, eider, and Arctic fox in Greenland.

M. truncata Linné. (Linné, 1758, Syst. Nat.; Gould, 1870, Inv. Mass., p. 58, fig. 376.) Blaney reports valves only. It could have easily been mistaken for *Panomya arctica* unless the valves were new and showed the triangular tooth. Reported from Eastport, Casco Bay, Massachusetts Bay, Georges Bank. Is also circumpolar. See Whiteaves, p. 148.

Saxicavidae

Saxicava Bellevue

S. arctica (Linné). (*Mya arctica* Linné, 1767, Syst. Nat.; *Saxicava arctica* Gould, 1870, Inv. Mass., p. 89, fig. 397.) A very common form found wedged between stones in tide pools, in the crevices of piles, and is a familiar object in the dredge. Due to its habit it is quite variable in shape. Specimens taken from the very small form up to 45 mm. in length. Stations: D 5, 6, 10, 13, 37–40, 43, 71, 80; S 1, 2, 4, 9, 11–13, 31. Common from Maine to Connecticut. See Whiteaves, p. 149.

Panomya Gray

P. arctica (Lamarck). (*Mya norvegica* Spengler, 1793, Skirv. U. S. Kjobenhaven; *Glycimeris arctica* Lamarck, 1818, Nat. Hst. Anim. sans Vert.; *Panopaea arctica* Gould, 1870, Inv. Mass., p. 51, fig. 373; *P. arctica* Iredale, 1915, Proc. Mal. Soc. London.) Gould mentions the interet of this shell on account of the genus being found plentifully in the fossil state, while recent specimens are so rare. Owing to the long siphons, this animal burrows deep and so is rarely brought up alive by a dredge; this probably accounts for the rarity. We have one large, beautiful specimen dredged by a scollop fisherman outside of the Porcupine Islands, and we dredged many young embedded in blue clay, the best spot being D 130, in 239 feet of water. Reported off Casco Bay, 115 fathoms; Eastport, 40 fathoms; Georges Bank, Grand Manan, Halifax, Gaspé. No Canadian specimens dredged alive.

SCAPHOPODA

SOLENCONCHAE

Dentalidae

Dentalium Linné

D. entalis Linné, 1758, Syst. Nat. (*D. striolatum* Stimpson, 1851, Boston Soc. Nat. Hist.; *Entalis striolata* Gould, 1870, Inv. Mass., p. 266, fig. 528.) A widely distributed form where there is grit of some kind in the mud. Stations: D 14, 27, 58, 62, 64, 65, 94, 99, 100, 103, 105, 106, 144. Reported from Eastport southward to Massachusetts Bay. Abundant on southern coast of New Brunswick, Annapolis Basin, Nova Scotia.

D. occidentale Stimpson. (*D. dentale* Gould, 1841, Inv. Mass.; *D. occidentale* Stimpson, 1851, Shells of New England; Pilsbry and Sharp, 1897, Manual Conch. Ser. 1, vol. 17, p. 47, pl. 13, figs. 9–11; pl. 9, figs. 41–43. Blaney reports a few dead shells. Reported from Eastport, Casco Bay, Massachusetts Bay, Gulf of St. Lawrence, especially around Anticosti Island; Nova Scotia.

GASTEROPODA

Subclass STREPTONEURA

ASPIDOBRANCHIA

Acmaeidae

Acmaea Eschscholtz

A. testudinalis (Müller). (*Patella testudinalis* Müller, 1776, Zool. Davicae Prodr.; *Tectura testudinalis* Gould, 1870, Inv. Mass., p. 267, fig. 529; *A. testudinalis* Pilsbry, 1891, Manual Conch.) Very common on rocks along shore, and on rocks and eelgrass on flats. Common along the entire coast to New Haven, where it is reported as rare. Frequent as far as Greenland.

A. alveus (Conrad). (*Patella alveus* Conrad, 1831, Jour. Acad. Nat. Sci. Phila.; *Tectura alveus* Gould, 1870, Inv. Mass., p. 269, fig. 530.) Same as above. See statement in General.

Lepetidae

Lepeta Gray

L. caeca (Müller). (*Patella caeca* Müller, 1776, Zool. Danicae Prodr.; *L. caeca* Gould, 1870, Inv. Mass., p. 270, fig. 531.) Not widely distributed. Stations: D 37, 38, 80. Reported from Eastport, Casco Bay, and from stomach of fish caught off Barnstable. From Grand Manan at various places to Greenland.

Fissurellidae

Puncturella R. T. Lowe

P. princeps (Mighels and Adams). (*Cemoria princeps* Mighels and Adams, 1842, Boston Jour. Nat. Hist.; *Cemoria noachina* Gould, 1870, Inv. Mass., p. 276, fig. 537; *P. noachina* Pilsbry, 1890, Manual Conch.) Found adhering to rocks and shells. Stations: D 2, 10, 35, 36, 38, 75, 94, 95. Reported from Eastport, Casco Bay, Georges Bank. See Whiteaves, p. 156.

Trochidae

MARGARITES Leach

M. CINEREA (Couthouy). (*Turbo cinereus* Couthouy, 1838, Boston Jour. Nat. Hist.; *Margarita cinerea* Gould, 1870, Inv. Mass., p. 279, fig. 539.) Found with the others. Stations: D 14, 23, 24, 36, 38, 100, 106. Reported from West Isles near Eastport, Casco Bay, from fish caught in Massachusetts Bay. Various places to Greenland.

M. OLIVACEA (Brown). (*Turbo olivaceus* Brown, 1827, Illustr. Conch.; *Margarita argentata* Gould, 1870, Inv. Mass., p. 282, fig. 544.) Blaney reports as rare. We did not take it. Reported from Eastport, Casco Bay, off Cape Ann and Cohasset, Gulf of St. Lawrence, Gaspé Bay.

M. HELICINA (Phipps). (*Turbo helicinus* Phipps, 1770, Voyage toward the North Pole; *Margarita arctica* Gould, 1841, Inv. Mass.; *Margarita helicina* Gould, 1870, Inv. Mass., p. 281, fig. 542.) A common form of the tide pools. There is considerable variation in shape between sexes. Reported from Eastport, Casco Bay, Duxbury, Plymouth, Gulf of St. Lawrence, Hudson Strait, Ungava Bay.

M. GROENLANDICA (Gmelin). (*Trocus groenlandicus* Gmelin, 1790, Syst. Nat.; *Margarita undulata* Gould, 1870, Inv. Mass., p. 280, fig. 541.) Fairly common. Stations: D 87, 94, 125. Found in pools on Bald Rock and Long Porcupine. Reported from Eastport, Casco Bay, Massachusetts Bay, up to Atlantic coast of Labrador.

MOLLERIA Jeffreys

M. COSTULATA (Möller). (*Margarita costulata* Möller, 1842, Krøyer's Naturh. Tidskr.; *Adeorbis costulata* Gould, 1870, Inv. Mass., p. 278, fig. 538.) Rather rare. Stations: D 74, 94, 95. Reported from Eastport, off Cape Ann, Nantucket, Grand Manan, Gaspé Bay.

SOLARIELLA S. Wood

S. OBSCURA (Couthouy). (*Turbo obscurus* Couthouy, 1838, Boston Jour. Nat. Hist.; *Margarita obscura* Gould, 1870, Inv.

Mass., p. 283, fig. 545; *S. obscura* Pilsbry, 1899, Manual Conch.) From sandy mud and hard bottoms between Greenings and Suttons Islands. Stations: D 25–27, 61, 62. Reported from Eastport to Stonington at various places up the Atlantic coast, but not yet recorded from Greenland.

CALLIOSTOMA Swainson

C. OCCIDENTALE (Mighels and Adams). (*Trochus occidentalis* Mighels and Adams, 1842, Boston Jour. Nat. Hist., vol. 4, p. 4, fig. 16. 'Casco Bay.' *C. occidentalis* Pilsbry, 1889, Manual Conch., Ser. 1, vol. 11, p. 393, pl. 37, figs. 2, 3.) Two perfect specimens dredged at D 104 off Mount Desert Rock. Reported from Casco Bay, Penobscot Bay, Eastport, Grand Manan, in 25 to 40 fathoms in the Hake Bay.

CTENOBRANCHIATA

Pyramidellidae

ODOSTOMIA Fleming

O. MODESTA (Stimpson). (*Chemnitzia modesta* Stimpson, 1851, Proc. Boston Soc. Nat. Hist.; *O. modesta* Gould, 1870, Inv. Mass., p. 327, fig. 596). This small *Odostomia* with its four whorls is not a common form. Stations: D 23, 24, 72. Woods Hole region, two records by Bartsch; Duxbury.

CREMULA Iredale

C. EBURNEA (Stimpson). (*Rissoa eburnea* Stimpson, 1851, Shells of New England, p. 34, pl. 1, fig. 1; *Rissoella? eburnea* Gould, 1870, Inv. Mass., p. 297; *Odostomia* (*Liostoma*) *eburnea*, Bartsch, 1909, Boston Soc. Nat. Hist.; *C. eburnea* Iredale, 1915, Mal. Soc. London.) Fairly common in small quantities. Stations: D 20, 22, 24, 27. Reported off Grand Manan in 25 fathoms (Stimpson), Casco Bay, off Cape Ann, Duxbury. One specimen reported from Gulf of St. Lawrence.

COUTHOUYELLA Bartsch

C. STRIATULA (Couthouy). (*Pyramis striatulus* Couthouy, 1838, Boston Jour. Nat. Hist.; *Menestho albula* Gould, 1870, Inv. Mass., p. 333, fig. 604.) Not a very common form except in certain places. Prefers a shelly bottom. Stations: D 25, 27, 28, 62, 63, 65, 71, 83, 99. Reported from Eastport to Bridgeport, Grand Manan, Bay of Fundy, Gaspé Bay.

Epitonidae

Epitonium Bolten

E. (Arctoscala) greenlandicum (Perry). (*Scalaria greenlandica* Perry, 1811, Conch. or Nat. Hist. Shells; *Scalaria subulata* Couthouy, 1838, Boston Jour. Nat. Hist.; *Scalaria groenlandica* Gould, 1870, Inv. Mass., p. 314, fig. 170.) Wherever there was sand this beautiful white animal was found. The best stations were D 27, 56, 71. Reported from Eastport to Block Island Sound, Grand Manan, Gulf and River St. Lawrence, Gaspé Peninsula.

Naticidae

Natica Lamarck

N. (Cryptonatica) clausa Broderip and Sowerby. (*N. clausa* Broderip and Sowerby, 1829, Zool. Jour; Gould, 1870, Inv. Mass., p. 342, fig. 612.) Not a common form. Stations: D 27, 98, 100, 104. Reported from Eastport, Casco Bay, Massachusetts Bay. Not taken by Woods Hole Survey. ''One small dead specimen . . . . dredged . . . . in 19 fathoms, off Gay Head; no record of living specimens south of Cape Cod.'' —Verrill. Throughout the entire Canadian Atlantic region.

Polinices Montfort

P. (Euspira) heros (Say). (*Natica heros* Say, 1822, Jour. Acad. Nat. Sci. Phila.; *Lunatia heros* Gould, 1870, Inv. Mass., p. 338, figs. 608, 609.) Not very common in this Region, due to lack of sand, which it favors. There used to be very large specimens at Sand Beach, but the 'trippers' have cleaned them out. Common Maine to Connecticut, from low water to 40 fathoms; at various places in Canadian Atlantic, with the most northern record from Strait of Belle Isle.

P. (Euspira) heros var. triseriata (Say). (*Natica triseriata* Say, 1826, Jour. Acad. Nat. Sci. Phila.; *Lunatia triseriata* Gould, 1870, Inv. Mass., p. 340, fig. 610.) This is the common form here and found in every dredging. Very similar distribution and bathemetrical range to *P. heros* in Canadian waters.

P. (Euspira) groenlandica (Möller). (*Natica groenlandica* Möller, 1842, Krøyer's Naturh. Tidstkr.; *Lunatia groenlandica* Gould, 1870, Inv. Mass., p. 341, fig. 611.) Not very common. Stations: D 6, 27, 52, 56, 71, 94, 95, 99. Not reported from other places except Massachusetts Bay from fishes. Common northward to Greenland.

P. (Euspira) immaculata (Totten). (*Natica immaculata* Totten, 1835, Amer. Jour. Sci.; *Mamma? immaculata* Gould, 1870, Inv. Mass., p. 344, fig. 614.) We did not find this common. Stations: D 14, 71, 83. Reported from Eastport to Connecticut, Sable Island, Bay of Fundy, Gaspé Bay.

Amauropsis Mörch

A. islandica (Gmelin). (*Nerita islandica* Gmelin, 1790, Syst. Nat.; *Amauropsis helicoides* Gould, 1870, Inv. Mass., p. 348, fig. 617.) Reported by Henderson off Otter Creek, 27 fathoms. One specimen from fish in Massachusetts Bay (Gould), Georges Bank, Sable Island, very rare in good condition (Whiteaves).

Lamellariidae

Velutina Blainville

V. laevigata (Linné). (*Helix laevigata* Linné, 1767, Syst. Nat.; *V. haliotoidae* Gould, 1870, Inv. Mass., p. 334, fig. 605.) Very common in tide pools and in deeper water. Stations: D 5, 36, 39, 56, 112, 130. Woods Hole Survey dredged this from 15 to 17 fathoms. Reported from Eastport and places in Massachusetts. Locally as far as Greenland.

V. undata Brown, 1839, Mem. Wern. Nat. Hist. Soc. (*V. zonata* Gould, 1870, Inv. Mass., p. 335, fig. 606.) Have taken this form from fish maws, but did not dredge it. Not taken by Woods Hole Survey. Reported from Eastport, Casco Bay, from fish off Cape Ann, Grand Manan, Halifax fishing banks, Halifax Harbor, Gaspé Bay, Little Metis, and Kamouraska.

Calyptraeidae

Crucibulum Schumacher

C. striatum (Say). (*Calyptraea triata* Say, 1826, Jour. Nat. Acad. Sci. Phila.; *C. striatum* Gould, 1870, Inv. Mass., p. 275, fig. 536.) A common form on rocky bottom. The 'cup and saucer' limpet. One 23 mm. in diameter taken. Stations: D 39, 62–64, 83, 87, 119, 142, 144. Reported from Eastport to off New London, Grand Manan, Bay of Fundy, to 30 fathoms; Charlotte Co., N. B., very abundant; Annapolis Basin, not abundant.

Crepidula Lamarck

C. fornicata (Linné). (*Patella fornicata* Linné, 1767, Syst. Nat.; *C. fornicata* Gould, 1870, Inv. Mass., p. 271, fig. 532.) One large specimen dredged at station D 63, and some very large specimens taken at spring tides, S 44, with shells very thin. This is the 'boat shell.' Common from Casco Bay to Connecticut. Reported abundant throughout entire Canadian region on oysters, northward to Caraquette Bay.

C. glauca Say. (Say, 1822, Jour. Acad. Nat. Sci. Phila.; Gould, 1870, Inv. Mass., p. 274, fig. 535.) But two individuals dredged and both at station D 43. Woods Hole Survey reports it as *C. convexa,* while Johnson, in the Fauna of New England, Boston Soc. Nat. Hist., lists it is *C. glauca convexa,* "a form due to growing on the shells of *Alectrion obsoleta* and other convex surfaces." "*C. glauca* Say, which was included by Willis in his latest list of Nova Scotian shells, was regarded by Dr. Stimpson as a synonym of *C. fornicata.*" (Whiteaves).

Amnicolidae

PALUDESTRINA d'Orbigny

P. MINUTA (Totten). (*Turbo minutus* Totten, 1834, Amer. Jour. Sci.; *Rissoa minuta* Gould, 1870, Inv. Mass., p. 298, fig. 566; *Littorinella minuta* Verrill, 1873, Inv. Vineyard Sound.) A common form from the marshes of the entire New England coast. At, or a little below, low-water mark throughout entire eastern Canada. (Whiteaves).

Rissoidae

CINGULA Fleming

C. CARINATA Mighels and Adams. (*Cingula semicostata* Mighels and Adams, 1842, Boston Jour. Nat. Hist.; *Rissoa pelagica* Stimpson, 1851, Boston Soc. Nat. Hist.; *Rissoa carinata* Gould, 1870, Inv. Mass., p. 301, fig. 572.) This form is not widespread, but is found in sandy mud. Stations: D 25–27, 61–63. Reported from Eastport, Casco Bay, Grand Manan, Gaspé Bay, Trinity Bay.

C. CASTANEA (Möller). (*Rissoa castanea* Möller, 1842, Krøyer's Naturh. Tidskr.; *C. castanea* G. O. Sars, 1878, Moll. Reg. Arct. Norv., p. 174, pl. 10, figs. 1a, b.) A mud bottom form and fairly common. Stations: D 1, 11, 12, 93, 108. Reported from Eastport, Penobscot Bay, Gaspé Bay, Labrador.

C. ARENARIA Mighels and Adams. (Mighels and Adams, 1842, Boston Jour. Nat. Hist., vol. 4, p. 49, pl. 4, fig. 24; *Rissoa exarata* Stimpson, 1851, Proc. Boston Soc. Nat. Hist.; *Rissoa mighelsi* Gould, 1870, Inv. Mass., p. 301.) Found with *C. castanea* and fairly common. Stations: D 1, 11, 12, 93, 108. Reported from Eastport at various places southward to Watch Hill. Grand Manan, Bay of Fundy.

C. AREOLATA (Stimpson). (*Turritella areolata* Stimpson, 1851, Shells of New England; *C. areolata* Verrill, 1882, Trans. Conn. Acad. Sci., vol. 5, p. 524, pl. 43, fig. 2.) Found with the two preceding forms, but not as great numbers. Reported from Mount Desert, 10 to 15 fathoms (Verrill); Massachusetts Bay, off Marthas Vineyard, 130 fathoms; north shore Gulf of St. Lawrence.

Onoba Adams

O. aculeus (Gould). (*Cingula aculeus* Gould, 1841, Inv. Mass.; *Rissoa aculeus* Gould, 1870, Inv. Mass., p. 299, fig. 568.) In crevices and under stones in tide pools and a common form. Reported by Verrill from Vineyard Sound in same habitat. Eastport to Stratford, Conn.; common, Bay of Fundy.

Skeneidae

Skenea Fleming

S. planorbis (Fabricius). (*Turbo planorbis* Fabricius, 1780, Fauna Groenlandica; *S. planorbis* Gould, 1870, Inv. Mass., p. 296, fig. 563.) A very small form found in tide pools and on rocks at low-water mark. Common from Eastport to New Haven. Nova Scotia, Greenland.

Litorinidae

Litorina Ferussac

L. littorea (Linné). (*Turbo littoreus* Linné, 1758, Syst. Nat.; *Littorina litorea* Gould, 1870, Inv. Mass., p. 308, fig. 577.) Covers the rocks between high and low water and is the most abundant of the four species. Common along the entire New England coast, where it first appeared in 1871. Nova Scotia, Labrador.

L. obtusata palliata (Say). (*Turbo palliatus* Say, 1922, Jour. Acad. Nat. Sci. Phila.; *Littorina palliata* Gould, 1870, Inv. Mass., p. 309, fig. 578; *Littorina obtusata palliata* Dautzenberg and Fischer, 1915, Jour. de Conch.) Common on the rocks between tides like the preceding, and when protected by seaweed is of beautiful yellow and orange shades. Entire New England coast; throughout the Canadian Atlantic coast.

L. rudis (Donovan). (*Turbo rudis* Donovan, 1804, Brit. Shells; *Littorina rudis* Gould, 1870, Inv. Mass., p. 304, fig. 575.) Common on the rocks like the preceding. Seems to prefer exposed shores. Entire New England coast, Labrador, Greenland, Hudson Bay.

L. rudis tenebrosa (Montagu). (*Turbo tenebrosus* Montagu, 1803, Test. Brit.; *Littorina tenebrosa* Gould, 1870, Inv.

Mass., p. 306, fig. 576.) This species prefers quiet shores, pools, and marshes, and is widely distributed. Entire New England coast.

LACUNA Turton

L. VINCTA (Montagu). (*Turbo vinctus* Montagu, 1803, Test. Brit.; *L. vincta* Gould, 1841, Inv. Mass., p. 262, fig. 168.) A very common form from seaweed, in shallow water water and tide pools at spring tides. Woods Hole Survey. Verrill states that this species occurs at depths of 4 to 5 fathoms, but this is certainly not usual, for the Woods Hole Survey dredged it from only four stations and we not at all. To and including Labrador Atlantic coast.

L. VINCTA FUSCA. (Gould, 1870, Inv. Mass., p. 263, fig. 169.) Common along the New England coast; associated with the above.

Turritellidae

TURRITELLA Lamarck

T. EROSA Couthouy. (Couthouy, 1838, Boston Jour. Nat. Hist.; *T. erosa* Gould, 1870, Inv. Mass., p. 317, fig. 585.) The only place we dredged this form was at station D 152, on hard and gravel bottom, at a depth of around 160 feet. They were plentiful. Entire Canadian Atlantic coast.

TURRITELLOPSIS G. O. Sars

T. ACICULA (Stimpson). (Stimpson, 1851, Boston Soc. Nat. Hist.; Gould, 1870, Inv. Mass., p. 319, fig. 588.) Fairly common on mud bottoms when the mud is not too soft. Stations: D 25–28. Reported from near Eastport, Casco Bay, and places in Massachusetts. Same distribution as *T. erosa.*

Trichotropidae

TRICHOTROPIS Broderip

T. BOREALIS Broderip and Sowerby. (Broderip and Sowerby, 1828, Zool. Jour.; *T. costellatus* Couthouy, 1838, Boston Jour. Nat. Hist.; *T. borealis* Gould, 1870, Inv. Mass., p. 390, fig. 651.) This most interesting form is found on sand, shell, and hard bottoms. It so happened that we did not find a single specimen in all our first-year dredging. Stations: D 35, 36, 38, 39, 43, 56, 63, 71, 83. Reported from Eastport, Casco Bay, deep waters of Massachusetts Bay (Couthouy), Canadian coast, Hudson Strait, Labrador, Greenland.

Aporrhaidae

Aporrhais Dillwyn

A. (Arrhoges) occidentalis (Beck). (*Rostellaria occidentalis* Beck, 1836, Mag. de Zool.; *Aporrhais occidentalis* Gould, 1870, Inv. Mass., p. 320, fig. 589.) But one specimen was taken by us, just outside of Egg Rock. It would appear to be a more outside form, for it is reported constantly from deeper water and fisherman complain of its boring holes in the fish that are caught in gill nets and reach the bottom, and say that frequently fish are found with several of these large red wounds on them.

In the territory extending out from Gilpatrick's Ledge at Northeast Harbor, between Greenings and Suttons Islands, where the best mollusc ground is, *Aporrhais* is found abundantly. This species has been identified as *Aporrhais occidentalis* var. *mainensis* by C. W. Johnston, who has described it in Nautilus.

The record shows that this is the only place it has been taken with the exception of the Isle of Shoals. This beautiful animal is found here in great abundance in all sizes and a series is shown in figure 38. We never dredged it at any other place, and Blaney does not report this variety and lists *A. occidentalis* as rare, and no specimens fully matured. Nova Scotia, St. Lawrence, Labrador Atlantic coast, 10 to 60 fathoms; fossil from Labrador.

Muricidae

Trophon Montfort

T. truncatus (Ström). (*T. clathratus* Gould, 1870. Inv. Mass., p. 377, fig. 643.) Quite common, but in small numbers. Stations: D 24, 25, 35, 36, 38, 103, 117. Reported from Eastport, Casco Bay, Annapolis Basin, Gaspé Bay, Halifax.

Thais Bolten

T. (Nucella) lapillus (Linné). (*Buccinum lapillus* Linné, 1758, Syst. Nat.; *Purpura lapillus* Gould, 1870, Inv. Mass., p. 360, fig. 630.) The most beautiful snail of our coast; occurs on the shore everywhere among the rocks. The variety *P. imbricata* of Lamarck, with its sharp ridges, is found on stones on the west side of the Island, generally hidden in seaweed, and is always white. See On Some Varieties of Thais lapillus in the Mount Desert Region, etc., by H. S. Colton, Proc. Acad. Nat. Sci. Phila., 1916. Reported common Maine to Connecticut. Common Bay of Fundy and Atlantic coast of Nova Scotia; Gaspé.

Columbellidae

Columbella Lamarck

C. (Astyris) rosacea (Gould). (*Buccinum rosaceum* Gould, 1840, Amer. Jour. Sci.; *C. rosacea* Gould, 1870, Inv. Mass., p. 357, fig. 627.) This pink-tinged small form is dredged at stations inside the Porcupines. Stations: D 14, 15, 22–24, 36, 38. Reported from Eastport to east of Block Island, in 6 to 29 fathoms. Sparingly distributed throughout entire Canadian Atlantic region.

C. (Astyris) dissimilis Stimpson. (Proc. Boston Soc. Nat. Hist., 1851, vol. 4, p. 114. 'Bay of Fundy.' *Buccinum zonalis* Linsley, 1845; *Astyris zonalis* Verrill, 1872.) A few were taken with *C. rosacea* at D 27 in one dredging. Reported from Penobscot Bay, Eastport Harbor, Grand Manan.

Alectrionidae

Alectrion Montfort

A. (Tritia) trivittata (Say). (*Nassa trivittata* Say, 1822, Jour. Nat. Sci. Phila.; *Nassa trivittata* Gould, 1870, Inv. Mass., p. 364, fig. 632.) This active animal, with a shell quite unlike any of our other snails, is common everywhere on mud bottom from Eastport, Me., southward. A piece of meat sunk to the bottom will be covered in a short time. The 'mud snail.' Bay of Fundy, Atlantic Coast of Nova Scotia, Baie des Chaleurs.

Buccinidae

Buccinum Linné

B. undatum Linné. (Linne, 1767, Syst. Nat.; Gould,, 1870, Inv. Mass., p. 366, fig. 634.) This species is the common representative of this family upon our coast and is exceedingly abundant in the entire Gulf of Maine region. Although it is never used here as food, it is found in the markets of the British Isles under the name of 'whelk.'

It seems to be everywhere in this Region and is found along the shore at low water and brought up in the dredge from all depths and every kind of bottom except the softest mud. Reported from Eastport to Stonington; entire Canadian Atlantic region to 170 fathoms.

Neptunea Bolten

N. decemcostata (Say). (*Fusus 10-costatus* Say, 1826, Jour. Acad. Nat. Sci. Phila.; *F. dedemcostatus* Gould, 1870, Inv. Mass., p. 375, fig. 642; *Chrysodomus decemcostatus* Dall, 1870, Proc. Boston Soc. Nat. Hist., vol. 13, p. 242.) This striking form is very common and grows to quite a size here. Stations: D 5, 25, 38, 51, 62–64, 71, 72, 107, 125, 126, 135, 139, 140, 144.

As its name indicates, this animal is decorated with 10 costae normally and these permanent keels are upon the body whorl, the upper one being the largest and the others diminishing in size toward the base of the shell. It is one of the prominent shells of this Region and, in fact, of the whole New England coast and attains quite a size. The animal is much the same as *B. undatum,* and the species is closely associated with it but not so common and not so apt to be found in shallow water. Reported from Eastport, Casco Bay, off Nahant, off Cape Cod. ''Bay of Fundy and Atlantic coast of Nova Scotia from low-water to 45 fathoms, but not certainly known to extend so far northward as the Gulf of St. Lawrence.'' (Whiteaves).

Colus Humphrey

C. stimpsonii (Mörch). (*Fusus stimpsonii* Mörch, 1868, Vid. Medd. Naturh. Foren.; *Fusus islandicus* Gould, 1870, Inv. Mass., p. 371, fig. 638; *Neptunea curta* Verrill, 1873, Inv. Vineyard Sound; *Sipho stimpsonii* Verrill, 1882, Trans. Conn. Acad.) A common form from hard bottoms and found in all sizes. Mostly young taken in the Bay, but large ones are found outside. Stations: D 64, 68, 75, 94, 120, 122, 139. Dredged by the Woods Hole Survey in 16 to 20 fathoms, showing that it favors deeper water toward the south. Reported from Eastport and Casco Bay, Bay of Fundy, Atlantic coast of Nova Scotia.

C. pygmaeus (Gould). *Fusus islandicus* var. *pygmaeus* Gould, 1841, Inv. Mass.; *Fusus trumbulli* Linsley, 1845, Amer. Jour. Sci.; *Fusus pygmaeus* Gould, 1870, Inv. Mass., p. 372, fig. 639; *Neptunea* (*Neptunella*) *pygmaea* Verrill, 1873, Inv. Vineyard Sound.) Common and found generally with the preceding form, but easily distinguished by its epidermis. More widely distributed than *S. stimpsonii.* Not taken by Woods Hole Survey. "Off Buzzards Bay, 25 fathoms; off Gay Head, 19 fathoms, mud, abundant and large."—Verrill. Stations: D 5, 8, 14, 23, 27, 37, 38, 43, 51, 53, 62–65, 71, 77, 83, 84, 89, 94, 95, 99, 100. Reported various places from Eastport to Connecticut, Bay of Fundy, Atlantic coast of Nova Scotia, Gulf of St. Lawrence. Verrill gives the bathymetrical range of this species from low water to 430 fathoms.

Cancellariidae

Admete Kröyer

A. couthouyi (Jay). (*Cancellaria buccinoides* Couthouy, 1838, Jour. Boston Soc. Nat. Hist.; *Cancellaria couthouyi* Jay, 1839, Cat. Shells; *A. viridula* Simpson, 1851, Shells of New England; *A. viridula* Gould, 1870, Inv. Mass., p. 391, fig. 652.) Quite abundant at places in the outer Bay near Egg Rock. Stations: D 9, 19, 20, 68, 74, 94. Reported from Eastport, Casco Bay, Massachusetts Bay, off Nauset Light. "Entire Canadian Atlantic region from 10 to 60 fathoms." (Whiteaves).

Turritidae

Bela Leach

B. incisula Verrill. (Verrill, 1882, Trans. Conn. Acad., vol. 5, p. 461, pl. 43, fig. 12.) A common form found generally distributed but in small numbers. Reported from Eastport to off Newport.

B. nobilis (Möller). (*Defrancia nobilis* Möller, 1842, Krøyer's Naturh. Tidskr.; *B. nobilis* G. O. Sars, 1878, Moll. Reg. Arct. Norv., p. 228, pl. 16, figs. 19, 20.) This easily recognized form is also generally distributed. Reported from Eastport to Cape Cod in 10 to 40 fathoms.

B. harpularia (Couthouy). (*Fusus harpularia* Couthouy, 1838, Boston Jour. Nat. Hist.; *B. harpularia* Gould, 1870, Inv. Mass., p. 352, fig. 621.) Common and widely distributed. Reported from Eastport to off Block Island at various places, 10 to 50 fathoms.

B. cancellata (Mighels and Adams). (*Fusus cancellatus* Mighels and Adams, 1842, Boston Jour. Nat. Hist.; *C. cancellata Verrill,* 1882, Trans. Conn. Acad., vol. 5, p. 475, pl. 43, figs. 10, 11; pl. 57, fig. 13.) Less common than the preceding, and all taken from rocky bottom. Reported off Massachusetts Bay and Cape Cod, 12 to 92 fathoms; off Marthas Vineyard, 126 to 312 fathoms.

B. pleurotomaria (Couthouy). (Gould, 1870, Inv. Mass., p. 355, fig. 625; Verrill, 1882, Trans. Conn. Acad., vol. 5, p. 478.) Reported by Blaney from 10 to 50 fathoms. Reported from Eastport to off Chatham, various places, 10 to 122 fathoms.

B. bicarinata var. violacea (Mighels and Adams). (*Pleurotoma violacea* Mighels and Adams, 1842, Boston Jour. Nat. Hist., vol. 4, p. 51, pl. 4, fig. 21.) This purple species of the *Belas* is also a common form, but not taken in quantity at any time. Reported from Eastport, Casco Bay, off Cape Ann, off Cape Cod, Vineyard Sound, off Stonington.

B. decussata (Couthouy). (*Pleurotoma decussata* Couthouy, 1839, Boston Jour. Nat. Hist.; *B. decussata* var. *tenui-*

costata Verrill, 1882, Trans. Conn. Acad.; *B. decussata* Gould, 1870, Inv. Mass., p. 354, fig. 623.) Reported from Eastport, Frenchmans Bay, Casco Bay.

B. EXARATA (Möller). (*Defrancia exarata* Möller, 1842, Krøyer's Naturh. Tidskr.; *B. concinnula* Verrill, 1882, Trans. Conn. Acad., vol. 5, p. 468, pl. 43, fig. 15.) Blaney reports rare. Reported from Casco Bay, Gulf of Maine, off Cape Cod, Massachusetts Bay.

B. BLANEYI Bush. (Bush, 1909, Nautilus, vol. 23, p. 61, fig. 1.) Taken by Dwight Blaney and named for him.

Tornatinidae

RETUSA Brown

R. PERTENUIS (Mighels). (*Bulla pertenuis* Mighels, 1826, Boston Jour. Nat. Hist.; *Utriculus pertenuis* Gould, 1870, Inv. Mass., p. 218, fig. 509; *R. pertenuis* Pilsbry, 1893, Manual Conch.) By carefully shifting sandy mud from the dredge and washing it out this very small animal is found. Common in the inner Bay. Stations: D 11–13, 33–37, 39, 77–79. Reported from Casco Bay, Massachusetts Bay, Duxbury, Mass.; Grand Manan, Northumberland Strait and Gaspé Bay, Strait of Belle Isle.

R. GOULDII (Couthouy). (*Bulla gouldii* Couthouy, 1839, Boston Jour. Nat. Hist.; *Utriculus gouldii* Gould, 1870, Inv. Mass., p. 217, fig. 508; *R. gouldii* Pilsbry, 1893, Manual Conch.) Larger and more white than the preceding form, it is also found in sand and mud and inhabits the inner Bay. Stations: D 33–37, 78. Reported from Casco Bay, Stellwagens Bank, 15 to 25 fathoms; from fish taken off Massachusetts coast and Georges Bank. The only Canadian report is Annapolis Basin, N. S., seldom. (Verkruzen).

Scaphandridae

DIAPHANA Brown

D. DEBILIS (Gould). (*Bulla debilis* Gould, 1840, Amer. Jour. Sci.; *Amphysphyra pellucida* Verrill, 1881; *D. debilis* Gould, 1870, Inv. Mass., p. 216, fig. 507.) Not commonly found.

Stations: D 33, 34, 58, 81, 93, 108. Reported from Casco Bay, 6 fathoms; Massachusetts Bay, Stonington, Conn., from stomach of cod (Linsley); Bay of Fundy, Halifax fishing banks, Gulf of St. Lawrence, north shore.

Cylichna Lovén

C. alba (Brown). (*Volvaria alba* Brown, 1827, Ill. Conch. Great Britain; *Bulla triticea* Couthouy, 1838, Boston Jour. Nat. Hist.; *C. alba* Gould, 1870, Inv. Mass., p. 220, fig. 511.) Almost always one or two of this little animal are found in the mud in the dredge. A common form from fish maws. Stations: D 14, 27, 33, 38, 52, 63, 83, 119, 125. Reported at various localities from Eastport to Stonington. Entire Canadian Atlantic region.

Philinidae

Philine

P. lima (Brown). (*Bulla lineolata* Couthouy, 1839, Boston Jour. Nat. Hist.; *Utriculus lima* Brown, 1844, Illus. Recent Conch. Great Britain; *P. lineolata* Gould, 1870, Inv. Mass., p. 214, fig. 504.) Reported from Frenchmans Bay off Egg Rock, Massachusetts Bay from fishes, Georges Bank, Grand Manan, Gulf of St. Lawrence, Strait of Belle Isle.

GASTROPODA

Suborder NUDIBRANCHIA

Aeolidiidae

Aeolidia Cuvier

A. papillosa (Linné). (*Limax papillosus* Linné, 1761, Fauna Suecica; *Eolis papillosa* Gould, 1870, Inv. Mass., p. 228, fig. 518; pl. 18, figs. 257, 261.) Found in pools and under stones. Best pools outside Long Porcupine, station S 20, where they grow large. Smaller ones at S 18. Reported from Eastport, Casco Bay, Massachusetts, Watch Hill. Local occurrence in eastern Canada and to Greenland.

Coryphellidae

Coryphella *Gray*

C. rufibranchialis (Johnson). (Sars, 1878, Moll. Reg. Arct. Norv.; *Eolis rufibranchialis* Johnson, 1832, Loudon's Mag. Nat. Hist.; *Aeolis rufibranchialis* Gould, 1870, Inv. Mass., p. 242, pl. 19, figs. 269, 272.) We took this form in but one shore station, 12, a pool outside Long Porcupine, and dredged it once at station 71, depth 52 feet.

C. rufibranchialis mananensis (Stimpson). (Balch, 1909, Nautilus; *Eolis mananensis* Stimpson, 1854, Smiths. Contr. Knowl.; *Aeolis rufibranchialis* Gould, 1870, Inv. Mass., p. 242, fig. 519.) Taken in the same place with the above. For reference on these 2 species see Fauna of New England, Boston Soc. Nat. Hist. See Whiteaves for eastern Canadian reports.

C. stellata (Stimpson). (Stimpson, 1892, Bergh. Syst. der Nud. Gaster; *Eolis stellata* Stimpson, 1854, Smiths. Contr. Knowl.; *Aeolis stellata* Gould, 1870, Inv. Mass., p. 245, pl. 19, figs. 271, 278.) Dredged from rock, gravel bottom, as station D 39, where found attached to rocks and hydroids, and about 25 mm. long. Reported from Grand Manan. "Found under stones at low-water mark, and when disturbed rolls itself up so that its branchiae project in all directions like the rays of a star." (Stimpson).

Dotoidae

Doto Oken

D. coronata (Gmelin). (Gould, 1870, Inv. Mass., p. 236, fig. 517, pl. 16, figs. 233–237; *Doris coronata* Gmelin, 1790, Syst. Nat.) A common form from Casco Bay to the Bay of Fundy. It is commonly found on piles, as at Sorrento Dock and the Coaling Station. Found in pool at station S 12, and dredged at 36, 39, 94. Common from Bay of Fundy to Long Island Sound. Near Duck Island, Grand Manan, on rocks, in 15 fathoms. (Stimpson.)

Dendronotidae

DENDRONOTUS Alder and Hancock

D. FRONDOSUS (Ascanius). (*Amphitrite frondosa* P. A. Ascanius, 1774, 'In Mari Norvegico'; *Tritonia arborescens* Gould, 1841, Inv. Mass.; *Tritonia reynoldsii* Couthouy, 1838, Boston Jour. Nat. Hist.; *D. arborescens* Gould, 1870, Inv. Mass., p. 234, pl. 22, figs. 311, 313.) Very abundant on piles, weir stakes, and the like. Under stones in pools at stations S 12 and 18. Dredged at station 55 on hydroid stems at 30 to 40 feet. Hatched in laboratory first part of July from eggs on material collected June 19, 1932. Dredged at station 94 from rock, depth 71 feet, and taken from the Sorrento Dock and Coaling Station piles. Reported from Grand Manan to Watch Hill. Grand Manan, Halifax, Strait of Belle Isle, Labrador.

Goniodoridae

LAMELLIDORIS Alder and Hancock

L. ASPERA. (Alder and Hancock, 1892, Bergh. Syst. der Nud. Gaster; *Doris aspera* Alder and Hancock, 1842, Am. Mag. Nat. Hist.; *Doris pallida* Gould, 1870, Inv. Mass., p. 229, pl. 20, figs. 284, 287, 288; *Onchidoris pallida* Verrill, 1870, Amer. Jour. Sci.) A very common form along the coast of this Region, occurring at times in great numbers. In 1921 the stones at the eastern end of Sand Beach were covered with thousands on the under side. In 1926 the under side of the float of the laboratory dock was similarly covered with them. Generally found on piles at Sorrento Dock and Coaling Station. Reported from Eastport to Watch Hill at various points. Grand Manan, "off the northern point of Duck Island, in 25 fathoms gravel" (Stimpson); common in the Bay of Fundy (Verrill).

L. BILAMELLATA (Linné). (Linné, 1878, Bergh. Semper's Reisen Archipel d. Philippinen; *Limax bilamellatus* Linné, 1861, Fauna Suecica 'Maris Norvegici'; *Doris bilamellata* Gould, 1870, Inv. Mass., p. 228, pl. 20, figs. 285, 286; pl. 21, figs. 299, 305–309.) Found on piles, but not as abundant as above. Reported from Boston Harbor.

L.(?) GRISEA (Gould). (Gould, 1892, Bergh. Syst. der Nud. Gaster; *Doris grisea* Gould, 1870, Inv. Mass., p. 232, pl. 20, figs. 292, 295; *Onchidoris grisea* Verrill, 1870, Amer. Jour. Sci.) We dredged this form once at 52 feet at station 71, from a rock, sand, and mud bottom. Size, 4 mm. Reported from near Eastport and from two places in Massachusetts.

CEPHALOPODA

DIBRANCHIA

DECAPODA

Polypodidae

POLYPUS ARCTICUS (Prosch)

OCTOPUS ARCTICUS Prosch, 1849, Kong. Dansk. Vid. Selk. Skrift. (*O. bairdii* Verrill, U. S. Fish Com. Report, 1879; Trans. Conn. Acad., 1881, vol. 5, p. 368, pl. 33, figs. 1, 1a; pl. 34, figs. 5, 6; pl. 36, fig. 10; pl. 38, fig. 8; pl. 49, figs. 4, 4a; pl. 51, figs. 1, 1a; *Polypus arcticus* Hoyle, 1902, Jour. Conch.)

One specimen taken at station D 130, at a depth of 239 feet, in a hole in a lump of hard blue clay. It was a female inasmuch as the third arm on the right side was not modified. Its length was 56 mm. over all. Dredged from 50 to 192 fathoms at various places from Eastport to Newport. Bay of Fundy, Grand Manan, Halifax, Newfoundland.

LITERATURE

BLANEY, DWIGHT 1904 List of shell-bearing Mollusca of Frenchmans Bay, Maine. Proc. Boston Soc. Nat. Hist., vol. 32, no. 2, pp. 23–41, pl. 1.

———— 1906 Shell-bearing Mollusca of Frenchmans Bay, Maine. Nautilus, vol. xix, no. 10, pp. 110, 111.

DAUTZENBERG, P., AND FISCHER, H. 1912 Resultats des Campagnes Scientifiques par Albert 1er Prince de Monaco. Fascicule xxxvii.

GOULD, A. A. W. G. BINNEY, Ed. 1870 Report on the Invertebrata of Massachusetts. Second Edition, comprising the Mollusca, with 524 pages, many figures and plates.

JOHNSON, C. W. 1926 Mollusca collected by Mr. Owen Bryant along the coasts of Labrador, New Foundland, and Nova Scotia. Nautilus, vol. xxxix, no. 4, pp. 128–135. ✓

PACKARD, A. S. 1865 Observations on the glacial phenomena of Labrador and Maine, with a view of the recent invertebrate fauna of Labrador.

SARS, G. O. 1878 Mollusca regionis articae Norvegiae. Universitetsprogram f. f. h. Christiania.

SUMNER, F. B.; OSBURN, RAYMOND C., AND LEON J. COLE 1911 A biological survey of the waters of Woods Hole and vicinity. Bull. Bur. Fish., vol. 31, Part 2.

VERRILL, A. E. 1872 Recent additions to the Mulluscan Fauna of New England and the adjacent waters, with notes on other species. Amer. Jour. of Sci. and Arts, vol. III, pp. 209–213 and pp. 281–290, 3 pl., 22 fig.

VERRILL, A. E., AND SMITH, S. L. 1872 Report upon the invertebrate animals of Vineyard Sound and the adjacent waters, with an account of the physical characters of the region. Rep. Fish. Com., 1871–1872.

——— Various papers in the transactions of the Connecticut Academy of Sciences. Various volumes.

WHITEAVES, J. F. 1901 Catalogue of the marine invertebrata of eastern Canada. Geol. Survey of Canada.

WOODWARD, S. P. 1880 Manual of the Mollusca, 4th Edition. London.

ARTHROPODA

Class CRUSTACEA

The crustacean fauna of the Mount Desert Region is not dissimilar in its general facies to what would be expected anywhere north of Cape Cod. It is unfortunate that we do not have a fairly complete view of the Crustacea of some locality on the northern Massachusetts coast, Gloucester, for example. I note this point since it is still an open question whether Cape Cod marks the only faunal boundary on the New England coast.

Turning to a comparison of the crustaceans of this region with those of Woods Hole, a very striking fact is the occurrence at Mount Desert of notodelphyoid and chonistomatoid Copepoda, which Dr. C. B. Wilson tells me are entirely absent at Woods Hole, except for *Choniosphaera.* Further, the Mount Desert fauna quite lacks the species of Mediterranean affinities which are a conspicuous part of the Woods Hole fauna.

A few forms, for example, *Parathalestris jacksoni* and *Cytheropteron pyramidale,* give a distinct Arctic facies to the group. On the whole, however, the Crustacea resemble those of Norway and the Maritime Provinces of Canada, and the fauna is definitely lacking in southern species.

There is no 'royal road' to a knowledge of the Crustacea. They yield their secrets only to those who are willing to make the necessary dissections and to attend carefully to the minutiae of structure. Similarly, it is not possible to refer at once to a comprehensive work covering our species and giving complete descriptions and illustrations. For the groups which it covers, G. O. Sars' "Account of the Crustacea of Norway" is indispensable. For other works useful in the determination of species the reader is referred to the discussion of the various orders.

In so large and diversified a group as the Crustacea it is almost unavoidable that the treatment should be somewhat uneven and not equally detailed in all orders. In the present case this is especially true of the benthonic Copepoda.

Subclass ENTOMOSTRACA

Order CLADOCERA

The two works by Birge and Lilljeborg referred to in the list of literature are in general satisfactory for the discrimination of the American species of this group. The coordinate method of form analysis as exemplified in Rammner's recent papers on *Scapholeberis kingi* yields information on variation which was unobtainable by the older methods of description and cannot be overlooked by the serious student.

Suborder CALYPTOMERA

Tribe CTENOPODA

Sididae

LATONA Straus

L. SETIFERA (O. F. Müller). (Birge, 1918, p. 690, fig. 1052.) A common fresh-water species. Station: S 23.

Tribe ANOMOPODA

Daphniidae

Scapholeberis Schödler

S. mucronata (O. F. Müller). (Birge, 1918, p. 699, fig. 1076.) Very common in the small temporary pond designated as S 22.

Macrothricidae

Ophryoxus G. O. Sars

O. gracilis G. O. Sars. (Birge, 1918, p. 708, fig. 1100.) Quite common at S 23, near shore. The first record for New England.

Acantholeberis Lilljeborg

A. curvirostris (O. F. Müller). (Birge, 1918, p. 710, fig. 1105.) Two found at S 23.

Ilyocryptus G. O. Sars

I. spinifer Herrick. (Birge, 1918, p. 713, fig. 1110.) Taken with the preceding species and in Witch Hole Pond.

Chydoridae

Chydorinae

Acroperus Baird

A. harpae (Baird). (Birge, 1918, p. 719, fig. 1121.) It is very doubtful if *A. angustatus* G. O. Sars can be maintained as a distinct species. A fairly common species. Station: S 23.

Alona Baird

A. affinis (Leydig). (Birge, 1918, p. 723, fig. 1130.) Stations: S 23 and Sargent Mountain Pond.

A. rectangula G. O. Sars var. pulchra Hellich. (Birge, 1918, p. 723, fig. 1129f.) Not very common. Sargent Mountain Pond.

Graptoleberis G. O. Sars

G. testudinaria (Fischer). (Birge, 1918, p. 724, fig. 1132.) Rare, at S 23.

RHYNCHOTALONA Norman

R. FALCATA (G. O. Sars). (Birge, 1918, p. 724, fig. 1133.) Uncommon. Station: S 23.

CHYDORUS Leach

C. FAVIFORMIS Birge. (Birge, 1918, p. 731, fig. 1148.) Found rather rarely at S 23.

C. BICORNUTUS Doolittle. (Birge, 1918, p. 731, fig. 1149.) Found with the preceding and in Witch Hole Pond. Also an uncommon species.

C. SPHAERICUS O. F. Müller). (Birge, 1918, p. 732, fig. 1151.) Found abundantly in all ponds. Stations: S 22, 23, Witch Hole.

Suborder GYMNOMERA

Tribe HAPLOPODA

Polyphemidae

Within this family *Polyphemus, Podon,* and *Evadne* form a group which is quite distinct from *Bythotrephes* and its allies from the Caspian Sea. The latter group seems to be unknown in the Western Hemisphere. With one exception, all the true marine Cladocera beyong to the present family and the 2 species noted below are marine. Our forms breed in July.

PODON Lilljeborg

P. LEUCKARTII (G. O. Sars). (Lilljeborg, 1901, p. 636, pl. 85, fig. 12; pl. 86, figs. 1–3.) A common member of the plankton. This is a northern species, and Sharpe's record of it from Woods Hole is erroneous, applying probably to *P. intermedius*. Stations: D 1, 54; P 5, 6, 10, 11.

EVADNE Lovén

E. NORDMANNI Lovén. (Lilljeborg, 1901, p. 641, pl. 86, figs. 4–17.) Found quite commonly with the preceding. Stations: D 1, 30, 54; P 5, 6, 10.

LITERATURE

BIRGE, E. A. 1918 The water fleas (Cladocera). Ward and Whipple: Fresh-water Biology, pp. 676–740, 121 fig.

LILLJEBORG, WILHELM 1901 Cladocera Sueciae. Nova Acta Reg. Soc. Sci. Upsal., ser. 3, vol. 19, pp. i–vi, 1–701, 87 pl.

Order COPEPODA

Suborder BRANCHIURA (Fish Lice)

Argulidae

ARGULUS O. F. Müller

A. FUNDULI Kröyer. (Wilson, 1902, p. 710, pl. 14.) Taken in some numbers from *Fundulus heteroclitus*. Stations: S 6, 10.

Suborder EUCOPEPODA

This extensive group has been divided by G. O. Sars and Brehm into 9 tribes, of which 7 are represented in our fauna. Whether this very convenient system will stand the test of embryological investigation remains to be seen. I will here refer the reader to two discussions by Gurney (1931, pp. 22–25; 1932, pp. 1–3) in his volumes on the British fresh-water copepods.

The work by Gurney just mentioned and the volume by Sars on the Copepoda in his 'Account' should be familiar to anyone attempting work on this group. For the parasitic forms, the long series of papers by C. B. Wilson are the best existing treatise.

Key to the tribes of Eucopepoda

1 The last cephalothoracic segment firmly joined to the preceding and movably articulated to the genital (first abdominal) segment. Fifth feet asymmetric in male; symmetric, wanting, or rarely asymmetric in female. Reproductive organs asymmetric in male. Heart present .... Calanoida
The above characters not combined ... 2

2 First legs more or less transformed (a few exceptions). Female reproductive openings ventral. Mouthparts not reduced in number, 5 pairs of legs present. First antennae of male usually subchelate. Rarely parasitic .... Harpacticoida
The above characters not combined ... 3
3 Mandibles wanting 4
Mandibles present 5
4 Only the mandibles wanting .... Cyclopoida
Other mouthparts also wanting 8
5 Mouth more or less adapted to suction... 6
Mouth and mandibles adapted for biting.. 7
6 Last cephalothoracic segment fused with genital segment 9
Last cephalothoracic segment distinct ... Cyclopoida
7 Maxilliped of 2 or more segments, not prehensile. Eggs not carried in a brood pouch .... Cyclopoida
Maxmillipeds of not more than 4 segments. Eggs carried in a dorsal brood pouch or externally, in which case the maxillipeds are prehensile .... Notodelphyoida
8 Head and mouth present, sexes similar .. Monstrilloida
Head and mouth replaced by absorptive processes in female. Male a pygmy attached to female .... Herpyllobii
9 Male relatively large and independent of the female .... Caligoida
Male a pygmy, often attached to female.. 10
10 Female large, usually elongate. Parasites of fishes. Male attached to female.... Lernaeopodidea
Female less than 2 mm. long. Parasites of Crustacea. Male not attached to female .... Choniostomata

Tribe CALANOIDA

Subtribe AMPHASCANDRIA

In this subtribe and the following I consider it advisable to greatly reduce the number of families given by G. O. Sars (1901–1902, p. 8–49). The following arrangement depends largely on the structure of the natatory legs.

	G. O. Sars
Calanidae	Calanidae
Eucalanidae	Eucalanidae
	Paracalanidae
Pseudocalanidae	Pseudocalanidae
	Aetideidae
	Euchaetodae
	Phaennidae
	Scolecithricidae
Platycopiidae	Platycopiidae Sars 1911

Key to the families of Amphascandria

1 Inner ramus of first leg 3-segmented .....Calanidae
  This ramus 1-segmented 2
2 Inner ramus of second leg 3-segmented...3
  This ramus 1-2-segmented ....Pseudocalanidae
3 Pelagic forms with normal legs ....Eucalanidae
  Benthonic forms with the rami of the legs broadened and the setae largely replaced by spines ....Platycopiidae

Calanidae

CALANUS Leach

C. FINMARCHICUS (Gunnerus). (G. O. Sars, 1901, p. 9, pls. 1–3.) Probably wanting in the inner Bay. Taken in surface tow at D 104.

Pseudocalanidae

PSEUDOCALANUS Boeck

P. ELONGATUS (Boeck). (G. O. Sars, 1901, p. 20, pls. 10, 11.) Taken in plankton at the surface. Stations: P 5, 6, 10, 11.

Subtribe HETERARTHRANDRIA

In this subtribe also it is necessary to reduce the number of families very much from that given by G. O. Sars, 1902, 1903).

	G. O. Sars
Centropagidae	Centropagidae
	Diaptomidae
	Pseudodiaptomidae
	Lucicutiidae
	Temoridae
	Metridiidae
	Heterorhabdidae
	Arietellidae
Candaciidae	Candaciidae
Pontellidae	Pontellidae
	Parapontellidae
	Acartiidae
	Tortanidae (part)
Mormonillidae	Tortanidae (part)
Pseudocyclopidae	Pseudocyclopidae

The Tortanidae (G. O. Sars, 1902, p. 73) included the two genera *Tortanus* and *Mormonilla.* The first is here replaced in the family Pontellidae, the second makes up the family Mormonillidae.

Key to the families of Heterarthrandria

1	First antenna composed of a few very elongate segments	Mormonillidae
	First antenna normal	2
2	Terminal spine of the outer ramus of the second to fourth legs smooth	Pseudocyclopidae
	These spines saw-edged	3
3	Lobes wanting on the second maxilla	Candaciidae
	Lobes present on the second maxilla	4
4	Maxilliped strong, the proximal segment usually elongate, never laterally expanded	Centropagidae
	Maxilliped weak, the proximal segment laterally expanded	Pontellidae

Centropagidae

Centropages Kröyer

C. typicus Kröyer. (G. O. Sars, 1902, p. 75, pls. 49–51.) A few specimens taken in surface tow at D 104.

C. HAMATUS (Lilljeborg). (G. O. Sars, 1902, p. 76, pl. 52.) Common in surface tow at D 104.

TEMORA Baird

T. LONGICORNIS (O. F. Müller). (G. O. Sars, 1902, p. 97, pls. 65, 66.) A common species in the plankton, especially early in the summer. Stations: D 1, 30; P 4–6, 10, 11.

EURYTEMORA Giesbrecht

E. HERDMANI Thompson and Scott. (Thompson and Scott, 1897, p. 78, pl. 5, figs. 1, 8, 10.) Rare in plankton at P 6, 11.

Pontellidae

ANOMALOCERA Templeton

A. PATERSONII Templeton. (G. O. Sars, 1902, p. 139, pls. 92–94.) A few taken in surface tow at D 104.

ACARTIA Dana

Steuer (1915) in dividing the genus *Acartia* into a number of subgenera distributed Dana's two identifiable species, *negligens* and *tonsa,* into subgenera neither of which bore the name *Acartia,* as one of them by rights should have. I here designate *Acartia negligens* Dana as the type of the genus *Acartia,* and hence the type of the typical subgenus which must under the rules bear the name *Acartia* (*Acartia*) *negligens.*

A. ACARTIURA) LONGIREMIS (Lilljeborg). G. O. Sars, 1903a, p. 149, pls. 99, 100.) Taken once in plankton at P 11.

A. (ACANTHACARTIA) BIFILOSA (Giesbrecht). (Gurney, 1931, p. 230, figs. 329–344.) Occasionally common in the plankton. Stations: D 30; P 5, 10.

TORTANUS Giesbrecht

T. DISCAUDATUS (Thompson and Scott). (Thompson and Scott, 1897, p. 80, pl. 6, figs. 1, 10, 11; pl. 7, figs. 1, 2.) Rare at the surface during the day, but often abundant there at night. Stations: P 6, 10, 11.

Tribe HARPACTICOIDA

Subtribe ACHIROTA

Longipediidae

LONGIPEDIA Claus

L. CORONATA Claus. (G. O. Sars, 1903b, p. 10, pls. 3, 4.) Taken on mud flats at low water, only on the west side of the island. Stations: S 25, 41.

Ectinosomatidae

ECTINOSOMA Boeck

E. PROXIMUM G. O. Sars. (G. O. Sars, 1919, p. 23, pl. 15, fig. 1.) Taken once in mud, depth about 60 feet. Station: D 91.

MICROSETELLA Brady and Robertson

M. NORVEGICA (Boeck). (G. O. Sars, 1904, p. 44, pl. 24.) Taken in surface tows, sometimes very abundant close to shore. Rather rare in July. Stations: P 4–6, 10.

Subtribe CHIROGNATHA

Harpacticidae

ZAUS Goodsir

Z. ABBREVIATUS G. O. Sars. (G. O. Sars, 1904, p. 58, pl. 32.) Taken once at low water. The first American record. Station: S 34.

Peltidiidae

ALTEUTHA Baird

A. PURPUROCINCTA Norman. (*depressa* G. O. Sars, 1904, p. 64, pl. 38.) Not uncommon on algae from low water to 57 feet. Stations: D 35, 92, 93; S 33.

Thalestridae

PARATHALESTRIS Brady and Robertson

P. JACKSONI (T. Scott). (T. Scott, 1899, p. 109, pl. 8. figs. 3–9; G. O. Sars, 1905, p. 114, pl. 69.) The examples I have examined agree perfectly with Scott's figures, but show a slight deviation from Sars'. The differences are not of specific value. The species is new to New England. Several taken on mud in 10 feet of water. Station: D 59.

HALITHALESTRIS G. O. Sars

H. CRONI (Kröyer). (G. O. Sars, 1905, p. 118, pl. 72.) Two specimens taken in surface tow at D 94.

Diosaccidae

STENHELIA Boeck

S. LONGICAUDATA Boeck. (G. O. Sars, 1906, p. 190, pl. 125, fig. 1.) Station: S 25.

Canthocamptidae

CANTHOCAMPTUS Westwood

C. STAPHYLINOIDES Pearse. (Pearse, 1905, p. 151, pl. 15, figs. 14–21.) A fresh-water species found at S 22.

Laophontidae

LAOPHONTE Philippi

L. HORRIDA Norman. (G. O. Sars, 1908, p. 246, pls. 166, 167.) Taken in about 10 feet of water, mud bottom, at D 59, 76.

L. MACERA G. O. Sars. (G. O. Sars, 1908, p. 259, pl. 179.) Taken once at low water. Station: S 14.

L. INOPINATA T. Scott. (G. O. Sars, 1908, p. 263, pl. 183.) Taken once with the preceding species, at S 14.

Tachidiidae

TACHIDIUS Lilljeborg

T. BREVICORNIS Lilljeborg. (G. O. Sars, 1909, p. 328, pls. 218, 219.) Taken once on mud flat at S 25.

ROBERTSONIA Brady

R. TENUIS Brady. (G. O. Sars, 1909, p. 334, pl. 222.) The specimens in the collection differ from the figures given by

Sars in having an extra seta on the distal segment of the fifth foot. The species is new to New England. On mud, depth 90 feet. Station: D 1.

Tribe CYCLOPOIDA

Subtribe GNATHOSTOMATA

Kiefer's (1929) monograph in Das Tierreich is an invaluable guide to the literature of this group as well as to his important views on nomenclature and synonymy.

Oithonidae

Oithoninae

Oithona Baird

O. similis Claus. (*helgolandica* G. O. Sars, 1913, p. 8, pl. 3.) In the early part of the summer a common plankton form. Stations: D 30; S 6; P 5, 6, 10.

Cyclopinidae

Cyclopininae

Cyclopina Claus

C. norvegica Boeck. (G. O. Sars, 1921a, p. 102, pl. 69, fig. 1.) Taken at low water on a mud flat. New to New England. Station: S 25.

Cyclopidae

The general of the two fresh-water species included here are taken according to the definitions of Kiefer.

Eucyclopinae

Macrocyclops Claus

M. annulicornis (C. L. Koch) comb. nov. (G. O. Sars, 1914, p. 68, pl. 42.) In the shallow pond, S 22.

Cyclopinae

CYCLOPS O. F. Müller

C. (ACANTHOCYCLOPS) INSECTUS S. A. Forbes comb. nov. (E. B. Forbes, 1897, p. 41, pl. 11, figs. 3–6.) In shallow water. Stations: S 22 and the heath south of Salisbury Cove.

Subtribe SIPHONOSTOMATA

Artotrogidae

ARTOTROGUS Boeck

A. ORBICULARIS Boeck. (G. O. Sars, 1915, p. 133, pl. 78.) Dredged on rock bottom, depth 70 to 90 feet. The species is new to New England. Stations: D 20, 94. Four females were taken on an encrusting bryozoan at D 153. These specimens were apparently feeding on contents of the ovicells of the bryozoan, *Schizomavella auriculata* (Hassall).

Tribe NOTODELPHYOIDA

The two commensals of ascidians given below are the only members of this tribe known from New England.

Doropygidae

DOROPYGOPSIS G. O. Sars

D. LONGICAUDA (Aurivillius). (G. O. Sars, 1921b, p. 47, pl. 23.) Found rather sparingly in *Ascidia callosa*, the sexes occurring together. Stations: S 11, 42. (At the latter station an undetermined species of *Botryllophilus* occurs in the same host.)

Enterocolidae

CRYPTOPODUS Hesse

C. AMAROUCI Blake. (Blake, 1929, p. 6, fig. 1.) Found in *Amaroucium glabrum* and *Didemnum albidum*, dredged at a depth of 20 to 68 feet. Stations: D 32, 56.

Tribe CALIGOIDA

Caligidae

Caliginae

CALIGUS O. F. Müller

C. CURTUS O. F. Müller. (Wilson, 1905, p. 578, pl. 10.) Taken occasionally from cod.

Lernaeidae

Lernaeocerinae

LERNAEOCERA de Blainville

L. BRANCHIALIS (Linné). (Wilson, 1917, p. 85, pls. 10, 12, 17.) Also taken from the gill region of cod.

Tribe LERNAEOPODIDEA

Lernaeopodidae

Clavellinae

CHAROPINUS Kröyer

C. DALMANNI (Retzius). (T. Scott, 1900, p. 169, pl. 8.) A few taken from skates.

CLAVELLA Oken

C. UNCINATA (O. F. Müller). (Wilson, 1915, p. 680, pls. 27, 48, 49.) Not uncommon in the mouths of cod.

Tribe CHONIOSTOMATA

Choniostomatidae

SPHAERONELLA Salensky

S. PHOTIDIS Blake. (Blake, 1929, p. 8, fig. 3.) Taken from the marsupium of the amphipod *Photis reinhardi.*

S. PILOSA Blake. (Blake, 1929, p. 8, fig. 2.) Also found in the marsupium of *Photis reinhardi.*

S. CAPRELLAE Blake. (Blake, 1929, p. 10, fig. 4.) A single pair from the marsupium of *Caprella linearis.*

LITERATURE

BLAKE, C. H. 1929 New Crustacea from the Mount Desert Region. Biol. Surv. Mt. Desert Region, part 3, pp. 1–34, 15 fig.

FORBES, E. B., JR. 1897 A contribution to a knowledge of North American freshwater Cyclopidae. Bull. Ill. Lab. Nat. Hist., vol. 5, pp. 27–83, 13 pl.

GURNEY, ROBERT 1931 British fresh-water Copepoda. Ray Society, vol. 1, pp. i–iii, 1–238, 344 fig.

——— 1932 British fresh-water Copepoda. Ray Society, vol. 2, pp. i–ix, 1–336, 852 fig.

KIEFER, FRIEDRICH 1929 Cyclopoida Gnathostoma. Das Tierreich, Leif. 53, pp. i–xvi, 1–102, 42 fig.

PEARSE, A. S. 1905 Contributions to the copepod fauna of Nebraska and other States. Trans. Amer. Micr. Soc., vol. 26, p. 145–160, 5 pl.

SARS, G. O. 1901–1903 a An account of the Crustacea of Norway. Vol 4, Copepoda Calanoida. Bergen: pp. 1–171, 108 pl.

——— 1903 b–1911 An account of the Crustacea of Norway. Vol. 5, Copepoda Harpacticoida. Bergen: pp. 1–449, 284 pl.

——— 1913–1918 An account of the Crustacea of Norway. Vol. 6, Copepoda Cyclopoida. Bergen: pp. 1–225, 118 pl.

——— 1919–1921 a An account of the Crustacea of Norway. Vol. 7, Copepoda, supplement. Bergen: pp. 1–121, 76 pl.

——— 1921 b An account of the Crustacea of Norway. Vol. 8, Copepoda Monstrilloida and Notodelphyoida. Bergen: pp. 1–91, 37 pl.

SCOTT, THOMAS 1899 Report on the marine and freshwater Crustacea from Franz-Josef Land, collected by Mr. William Bruce, of the Jackson-Harmsworth Expedition. Jour. Linn. Soc. London, vol. 27, pp. 60–126, 7 pl.

——— 1900 Notes on some crustacean parasites of fishes. Rept. Fish. Board Scotl., vol. 18, part 3, pp. 144–187, 4 pl.

STEUER, ADOLF 1915 Revision der Gattung *Acartia* Dana. Zool Anz., Bd. 45, S. 392–397, 6 fig.

THOMPSON, I. C., AND SCOTT, ANDREW 1897 Notes on new and other Copepoda. Proc. Trans. Liverpool Biol. Soc., vol. 12, pp. 71–82, 3 pl.

WILSON, C B. 1902 North American parasitic copepods of the family Argulidae, with a bibliography of the group and a systematic review of all known species. Proc. United States Nat. Mus., vol. 25, pp. 635–742, 20 pl., 23 fig.

——— 1905 North American parasitic copepods belonging to the family Caligidae. Part 1. The Caliginae. Proc. United States Nat. Mus., vol. 28, pp. 479–672, 25 pl., 50 fig.

——— 1915 North American parasitic copepods belonging to the Lernaeopodidae, with a revision of the entire family. Proc. United States Nat. Mus., vol. 47, pp. 565–729, 32 pl., 15 fig.

——— 1917 North American parasitic copepods belonging to the Lernaeidae, with a revision of the entire family. Proc. United States Nat. Mus., vol. 53, pp. 1–150, 21 pl., 4 fig.

Order OSTRACODA

This order, with the Copepoda Harpacticoida, forms the most important item in the fauna of mud bottoms in this Region. The Ostracoda of this Region are still quite imperfectly known, even though the following list shows a high proportion of additions to the New England fauna. It is interesting to find that Cushman's (1906) opinion that certain forms represented only by dead shells in the Woods Hole region would be found living north of Cape Cod is amply confirmed.

After trying various methods of mounting, it is the writer's conclusion that the appendages must be handled separately from the shell. The former may be mounted in gum damar or, better, in Farrant's medium sealed with soft paraffin (m. p. about 40°C.) after the fashion of Myers' rotifer mounts. The shells are carefully cleaned, any glycerin from the preliminary examination and dissection washed out with alcohol, and mounted in hollow slides of the type used by Cushman for Foraminifera.

As a guide to the classification and literature of this order, one should be familiar with three works: G. W. Müller's (1912) monograph in Das Tierreich, Skogsberg's (1920) valuable discussion of the appendages and the taxonomy of the order, and G. O. Sars' (1922–1928) account of the Ostracoda of Norway. Further, one must, of course, have at hand Cushman's (1906) paper on the species occurring at Woods Hole. In view of the intimate relation between recent and fossil forms and the necessity for the student of one group to familiarize himself with the other, I cannot omit to mention the synopsis by Ulrich and Bassler (1923). In spite of its manifest sins in the treatment of the more recent families (geologically), it remains the best existing account of fossil ostracods.

Suborder MYODOCOPA

Cypridinidae

Philomedinae

PHILOMEDES Llljeborg

P. GLOBOSUS (Lilljeborg). (G. O. Sars, 1922, p. 12, pls. 5–7.) Three ovigerous females were taken on hard bottom in 45 to 60 feet of water. Both captures were about the first of August. The species is new to New England. Stations: D 14, 118.

Sarsiellidae

SARSIELLA Norman

S. ZOSTERICOLA Cushman. (Cushman, 1906, p. 364, pl. 27, figs. 1–6.) Chiefly taken on mud flats at low water, but dredged once on a mud and shell bottom in 70 feet of water. Stations: D 46; S 25, 33.

Asteropidae

ASTEROPE Philippi

A. ABYSSICOLA G. O. Sars. (G. O. Sars, 1922, p. 19, pl. 10, fig. 2.) Taken on a bottom of mud and shells in 70 feet of water. The first record for New England. Station: D 46.

Suborder PODOCOPA

Cypridae

Candoninae

CYPRIA Zenker

C. EXSCULPTA (Fischer). G. O. Sars, 1925, p. 96, pl. 44.) Rather common in the shallow temporary pond known as S 22.

Cyprinae

CYPRICERCUS G. O. Sars

C. PASSAICUS (Sharpe) comb. nov. (*Spirocypris p.* Sharpe, 1903, p. 982, pl. 66, figs. 1–3.) This species differs from other northern members of its genus in producing an abundance of males. This is perhaps correlated with its habitat in a very temporary pond. Station: S 22.

Cypridopsis Brady

C. vidua (O. F. Müller). (G. O. Sars, 1925, p. 135, pl. 63.) One specimen taken in Witch Hole Pond.

Cytheridae

Key to the subfamilies of Cytheridae

1	Gnathobase of the mandible much elongated, styliform	Paradoxostomatinae
	Gnathobase of the mandible normal	2
2	Hinge of shell with terminal closing teeth	3
	Hinge without closing teeth	4
3	First antenna with unguiform setae	Cytherinae
	First antenna without unguiform setae	Loxoconchinae
4	First antenna 5-segmented	5
	First antenna 6-segmented	6
5	Limbs 5 to 7 about the same length	Limnocytherinae
	Limb 7 much longer than limb 5	Cytherideinae
6	Exopod of mandible much reduced	7
	Exopod of mandible well developed	Bythocytherinae
7	Posterior margin of shell produced	Cytherurinae
	Posterior margin of shell not produced	Xestoleberinae

Limnocytherinae

Limnocythere Brady

L. reticulata Sharpe. (Fig. 39.) (Sharpe, 1918, p. 806, fig. 1250.) One male taken at S 23. The first record for New England of this genus. The reticulation of the shell, as shown in figure 39 C, consists of various sizes of low tubercles so arranged as to form a polygonal pattern.

Cytherideinae

Cyprideis Jones

C. sorbyana (Jones). (Jones, 1856, p. 44, pl. 4, fig. 6.) The species is new to New England. One specimen taken on sandy mud in about 55 feet of water. Station: D 62.

Cushmanidea Blake gen. nov.

This genus is distinguished from *Cytheridea* chiefly by the structure of the hinge, and from all of its subfamily by certain rather remarkable features of the appendages.

The general structure of the shell is that of a *Cytheridea*, but the hinge is composed of thin, overlapping flanges, not

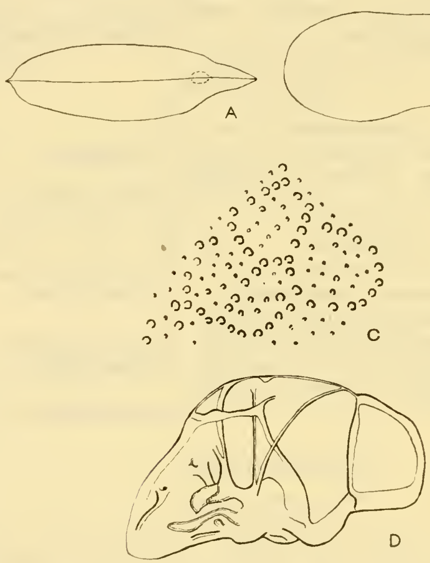


Fig. 39 Limnocythere reticulata, male. A. dorsal view. B. right lateral view. C. detail of shell sculpture. D. genitalia.

rows of small teeth fitting into sockets. We may consider these flanges as three pairs. The anterior one is the longest, comprising half the length of the hinge, and the left flange here overlaps the right. The center pair is one-fourth the length of the hinge and the left member underlies the less conspicuous right member. The posterior pair has the same mutual relations as the anterior pair. The great length and the curvature of the hinge line indicates that permanent contact of the valves is made only at the two ends of the middle pair of flanges, as in *Pontocypris*.

The penultimate segment of the first antenna has the two distal claws set on distinct processes of the segment.

The exopod of the second antenna is similar in the two sexes. The lateral comb of the distal segment of the endopod described by Cushman is peculiar to the male, and so far known nowhere else in the Cytheridae. This segment is relatively more slender in the male than in the female, and the proximal claw is situated basally in the male and subterminally in the female. The basal segment of the second antenna has a prominent brush of long hairs on the ventral margin.

The epipod of the mandible has 1 long seta, 3 rudimentary ones, and a knob.

This genus is named for Dr. Joseph Augustine Cushman, of Sharon, Mass., in recognition of his pioneer work on New England ostracods a quarter of a century ago and his personal kindnesses to the writer.

C. seminuda (Cushman). (*Cytheridea s.* Cushman, 1906, p. 374, pl. 33, figs. 62–64; pl. 34, figs. 76, 77.) This species is the monotype of the genus. We have taken it in about 8 feet of water on a sandy bottom at S 21.

Cytheretta G. W. Müller

C. tracyi Blake. (Blake, 1929, p. 18, fig. 9.) Taken in some numbers on mud bottoms in 10 to 40 feet of water. Stations: D 59; P 10B.

Eucythere Brady

E. declivis (Norman). (G. O. Sars, 1925, p. 163, pl. 75, fig. 2.) A few taken on sandy bottom in 6 feet of water at S 21. The genus is new to New England.

Cytherinae

Cythere O. F. Müller

C. lutea O. F. Müller. (G. O. Sars, 1925, p. 167, pl. 77.) Taken around the bases of algae in muddy situations, depths to 12 feet. This species is new to New England. Stations: D 59; S 4, 11.

Leptocythere G. O. Sars

L. angusta Blake sp. nov. (Fig. 40.) Description of the male. Taking the length of the shell as 100, the width is 33 and the height 43. In side view the valves are rather low posteriorly, with the postdorsal angle quite prominent. The posterior hinge tooth and its socket are located in this angle. The surface is devoid of strong sculpture, being only ornamented by close-set polygonal pits. The dorsal view is almost the same as that of *L. castanea.* The general color of the animal is rather a dark chestnut, resembling the species just mentioned. The male is about 0.72 mm. long.

The first antenna is 5-segmented. The lengths of the segments (second segment taken as 10) are: 10, 10, 3.7, 5.3, 5. Each segment is narrower than the preceding. The outer surface of the basal segment bears a quadrant of fine hairs. The second segment has two groups of fine hairs. The first consists of about five long hairs at the end of the proximal third of the outer margin. The other group is at the anterodistal corner and the hairs are much shorter. The posterodistal corner bears a spine as long as the two succeeding segments of the appendage. The next segment has a clawlike seta at the anterodistal corner, which seta is as long as the third and fourth segments together. The fourth segment bears two groups of setae, and, in addition, a single seta arising from the center of the medial face which extends to just beyond the end of the segment. The first group referred to above is at the middle of the anterior margin. The long claw is about one-fifth longer than the combined length of segments 3 and 4. The short claw is as long as the third segment. Its insertion is slightly proximal to that of the long claw. The

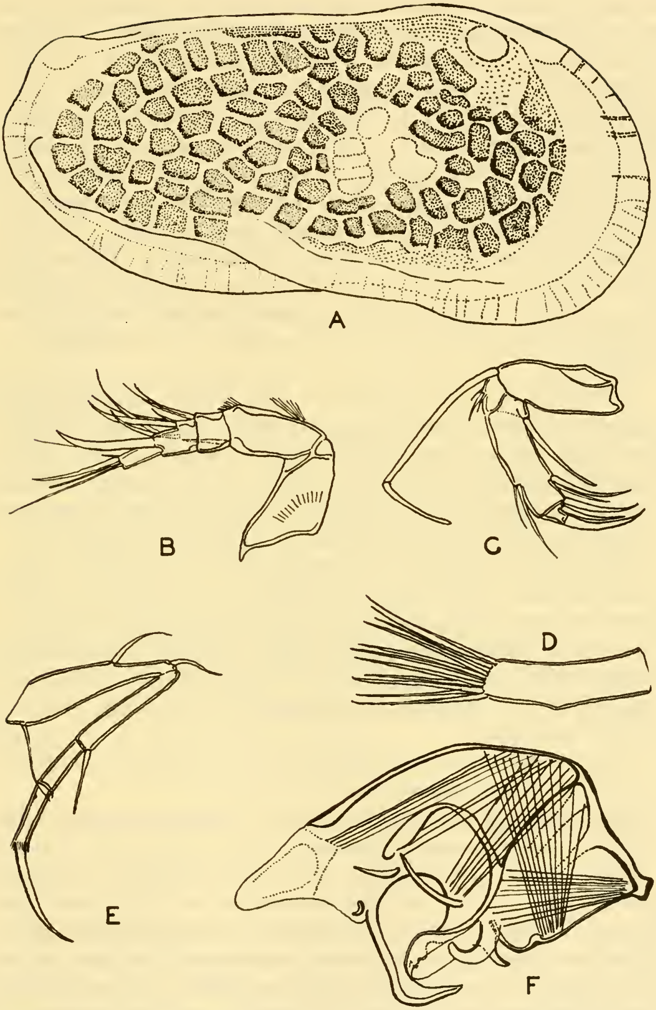


Fig. 40 Leptocythere angusta, male. A. right valve. B. first antenna. C. second antenna. D. scopus. E. seventh limb. F. genitalia.

distal group on the fourth segment consists of a hair, lateral to it the short claw, and distal to it the long claw. The hair is the longest of the three. The long claw is about one-third longer than the combined length of segments 3 and 4. Laterally and posteriorly to the long claw is a still longer hair. The final segment bears a short hair just beyond the middle of the lateral face near the anterior margin. Distally the segment has, anteriorly, a claw twice as long as the segment, and posteriorly, a hair and a sensilla, basally fused. The hair exceeds the claw by half the length of the latter. The sensilla just falls short of the length of the claw, and has a length of 65 μ, of which $9\frac{1}{2}$ per cent is the basal portion fused with the adjoining seta. The tip of the sensilla is very slightly expanded.

At this point it is desirable to note that in this genus the claw-shaped setae, both large and small, of the first antenna bear each a fine lateral hairlike branch arising at the beginning of the distal third of the claw and extending slightly beyond the main point of the claw. The peculiarity has been found also in *L. castanea,* but not in *Cythere* and *Cythereis.*

The second antenna is 3-segmented, with ratio of lengths (basal segment taken as 10): 10, 12, 1.4. Aside from differences of proportion and the lack of a distinct division in the second segment, this limb closely resembles that figured by Sars (1925, pl. 79, fig. 1) for *Leptocythere pellucida.* The sensilla of the penultimate segment is 40 μ long and not clavate terminally.

The mandible and maxilla agree very exactly with Sars' figures for *L. pellucida.*

The scopus of the male is rather attenuated and provided with only about a dozen bristles.

Limbs 5 to 7 (the walking legs) are, as regards setae and general structure, of the type common to the Cytherinae, and do not display sexual dimorphism. The proportions given below are referred to the second segment of the limb as 10. The claws are measured across the ends, not around the curve, and the claw of the fifth limb is omitted because of its great curvature.

Limb 5 — 15.9, 10, 6.2, 5, claw omitted
Limb 6 — 16.6, 10, 5.9, 5.2, claw 10.
Limb 7 — 11.9, 10, 4.3, 4.3, claw 8.5.

The proximal apophysis of the penis is small and bent almost into a semicircle, the middle one is strongly bent at the tip and expanded somewhat at the point of curvature. It is noteworthy that these two apophyses are curved in opposite directions. Unlike the species discussed by Sars, the terminal apophysis is small, blunt, and lacks the proximally directed limb, or perhaps this limb is fused to the base of the middle apophysis.

The female closely resembles the male in the structure of the appendages, but the shell is more compact, that is, relatively higher and broader. The proportions are: length, 100; width, 40; height, 51.

This species may be distinguished from other northern members of the genus by the proportions and sculpturing of the shell, the relatively great length of the fourth segment of the first antenna, and the structure of the penis.

The shell of this form bears a strikingly resemblance to *Cythere canadensis* as figured by Brady and Norman, but not to the figures originally given by Brady.

We have taken this species on soft bottoms, in 10 to 70 feet of water, at Stations D 35, 46, 59, 76; P 10B.

L. castanea (G. O. Sars). (G. O. Sars, 1925, p. 174, pl. 80, fig. 1.) Taken once on sand bottom in 6 feet of water at S 21. The species is new to New England.

Palmenella Hirschmann

P. americana Blake. (Blake, 1929, p. 12, fig. 5.) Taken on muddy bottoms in 30 to 40 feet of water. Stations: D 35; P 10B.

Cythereis Jones

The classification and delimitation of this genus is still in a most unsatisfactory state. It is a large genus (more than 120 recent species are known with some certainty) which, as is often the case in large genera, exhibits complex interrelationships within the genus. Further, the as yet unselected type is a Cretaceous species, so that we shall in all probability never know the appendages of the type and I quite agree with Skogsberg that a knowledge of the appendages is very necessary to the discrimination of subgenera in *Cythereis.* Skogsberg (1928), in the second part of his studies, has given a valuable discussion of this genus and its internal divisions as he conceives them. Unfortunately, I do not find myself able to agree with him on certain points.

As far as we are concerned here, the most important disagreement is with the subgenus *Cythereis* which he sets up on page 38. Skogsberg fails to show that it includes any of Jones' original species, and on his own showing (p. 16), I think it is virtually impossible for us ever to be sure to what subgenus any of Jones' species belong. Hence, to avoid nomenclatorial difficulties, the subgenus in question should have received a distinct name from that of the genus. It may be remarked at this point that, through correspondence with Dr. Charles I. Alexander, I have been convinced that certain of Jones' species are congeneric with the genus *Cythereis* as conceived by G. W. Müller and Skogsberg.

Further, a careful comparison of Skogsberg's subgeneric descriptions with the descriptions of *Hemicythere* and *Cythereis* as given by G. O. Sars (1925, pp. 182, 191, and plates) shows clearly that the former genus must be withdrawn or at least reduced to the rank of a subgenus of *Cythereis.*

As far as the present list is concerned, *Hemicythere* is treated as a subgenus, as also a small and well-characterized group of winged species. The remaining species are placed without subgeneric discrimination.

C. DUNELMENSIS Norman. (G. O. Sars, 1925, p. 195, pl. 90.) Taken once on rock, in 30 feet of water, at D 35.

C. DAWSONI (Brady). (Cushman, 1906, p. 372, pl. 35, figs. 84, 85.) The sculpture of this species has a curious and characteristic eroded appearance. Limbs 5 to 7 of the male are slightly unlike on the two sides. Taken on mud bottom in 10 to 70 feet of water. Stations: D 46, 59.

C. TUBERCULATA (G. O. Sars). (G. O. Sars, 1925, p. 192, pl. 88.) Taken twice on muddy bottoms, in 40 to 70 feet of water. Stations: D 46; P 10B.

C. PROCTERI Blake. (Blake, 1929, p. 13, fig. 6.) Taken twice with the preceding.

C. LEIODERMA (Norman) comb. nov. (Brady and Norman, 1889, p. 139, pl. 15, figs. 12, 13.) In spite of the remarkable form of the shell, the hinge and the appendages show this to be a normal species of *Cythereis*. It occurred twice in mud, in 10 to 40 feet of water. The species is new to New England. Stations: D 59; P 10B.

C. (HEMICYTHERE) CONCINNA (Jones) comb. nov. (Jones, 1856, p. 29, pl. 4, fig. 7; G. O. Sars, 1925, p. 189, pl. 87, fig. 1.) Our specimens agree excellently with the figure given by Jones, but show slight deviations from Sars' figures of the shell. It occurs on mud, in 20 to 72 feet of water. Stations: D 32, 46, 48, 54, 115; P 10B.

C. HEMICYTHERE) ARENICOLA Cushman comb. nov. (Cushman, 1906, p. 379, pl. 36, figs. 97–107.) Rather common on sand, in about 6 feet of water, at S 21.

Subgenus PTERYGOCYTHEREIS Blake nov.

This subgenus is distinguished by the shape of the shell and by the pellucid, hyaline nature of its substance. The shell seen from above is rather broadly triangular, due to two prominent ventrolateral wings. The outer margin of these wings is almost straight, considering the tips of the spinous processes, of which the wings are fundamentally composed, as marking the margin. Other similar conical processes may occur elsewhere on the shell, particularly alongside the hinge and at the two ends of the shell.

The species for which the appendages are known have the fifth to seventh limbs very notably attenuated.

Cythereis jonesi Baird is designated as the type of the subgenus which contains, in addition, *C. mucronata* G. O. Sars, *inexpectata* Blake, and *cornuta* (Roemer).

C. (Pterygocythereis) inexpectata Blake comb. nov. (Blake, 1929, p. 12, fig. 7.) An uncommon inhabitant of muddy bottoms, in 10 to 55 feet of water. Stations: D 32, 35, 48, 54, 59, 62; P 10B.

Cytherurinae

Cytherura G. O. Sars

C. undata G. O. Sars. (G. O. Sars, 1926, p. 213, pl. 99, fig. 1.) Taken once near low water, at S 48. This species and the following are both new to New England.

C. striata G. O. Sars. (G. O. Sars, 1925–1926, p. 208, pl. 97, fig. 1.) Taken once in sand, in 6 feet of water, at S 21.

Loxoconchinae

Loxoconcha G. O. Sars

L. bairdi G. W. Müller. (*impressa* G. O. Sars, 1926, p. 218, pl. 100.) Found on mud, from the shore to 72 feet, rare. Stations: D 46, 115; S 25, 33.

L. guttata (Norman). (Cushman, 1906, p. 370, pl. 31, figs. 42–48; pl. 32, fig. 56.) Taken on mud, in 20 to 50 feet of water. Stations: D 32; P 10B.

Cytheropteron G. O. Sars

C. pyramidale Brady. (Hirschmann, 1915, p. 576, figs. 1–4.) Found with the preceding species, but extending to a depth of 72 feet. New to New England. Stations: D 29, 32, 35, 46, 62, 115; P 10B.

C. alatoides Blake. (Blake, 1929, p. 16, fig. 8.) A few taken on mud and shell bottom, in 72 feet. Station: D 46.

Xestoleberinae

Xestoleberis G. O. Sars

X. depressa (G. O. Sars). (G. O. Sars, 1928, p. 244, pl. 111, fig. 2.) Associated with mud and algae, from low water to 90 feet, rare. Stations: D 59, 104; S 4.

Paradoxostomatinae

Sclerochilus G. O. Sars

S. contortus (Norman). (G. O. Sars, 1928, p. 247, pl. 112.) Müller's (1912, pp. 260–261) key to this genus fails for *S. contortus,* since the Norwegian specimens attain a length of 0.8 mm. and the New England specimens 0.71 mm. This species is found with algae and Bryozoa, from the shore to 90 feet. Stations: D 29, 35, 104; S 4, 43.

LITERATURE

Blake, C. H. 1929 New Crustacea from the Mount Desert Region. Biol. Surv. Mt. Desert Region, part 3, pp. 1–34, 15 fig.

Brady, G. S., and Norman, A. M. 1889 A monograph of the marine and freshwater Ostracoda of the North Atlantic and of northwestern Europe. Section I. Podocopa. Trans. Roy. Dublin Soc., ser. 2, vol. 4, pp. 63–270, 16 pl.

Cushman, J. A. 1906 Marine Ostracoda of Vineyard Sound and adjacent waters. Proc. Boston Soc. Nat. Hist., vol. 32, pp. 359–385, 12 pl.

Hirschmann, Nicolai 1915 Ostracoda of the Baltic Sea collected by N. M. Knipovitch and S. A. Pavlovitch in the summer of 1908. [In Russian.] Ann. Mus. Petrog., vol. 20, pp. 569–597, 27 fig.

Jones, T. R. 1856 A monograph of the Tertiary Entomostraca of England. Palaeontogr. Soc., 1856, pp. i–xii, 1–68, 6 pl.

Müller, G. W. 1912 Ostracoda. Das Tierreich, Lief. 31, pp. i–xxxiii, 1–434, 92 fig.

Sars, G. O. 1922–1928 An account of the Crustacea of Norway. Vol. 9, Ostracoda. Bergen: pp. 1–277, 119 pl.

Sharpe, R. W. 1903 Report on the fresh-water Ostracoda of the United States National Museum, including a revision of the subfamilies and genera of the family Cyprididae. Proc. United States Nat. Mus., vol. 26, pp. 969–1001, 6 pl.

——— 1918 The Ostracoda. Ward and Whipple: Fresh-water Biology, pp. 790–827, 59 fig.

Skogsberg, Tage 1920 Studies on marine ostracods, part I. Zool. Bidr. Uppsala, suppl. vol. 1, pp. 1–784, 153 fig.

——— 1928 Studies on marine ostracods, part II. Occas. Papers Calif. Acad. Sci., no. 15, pp. 1–154, 6 pl., 23 fig.

Ulrich, E. O., and Bassler, R. S. 1923 Paleozoic Ostracoda: their morphology, classification, and occurrence. Md. Geol. Surv. Silurian, pp. 271–391. 16 fig.

Order CIRRIPEDIA

Suborder BALANAMORPHA

Balanidae Acorn barnacles

Balaninae

Balanus Gronovius

B. (Balanus) balanus (Linné). (Pilsbry, 1916, p. 149, pls. 33–35, text figs. 43–47.) Widely distributed on rock, shell, and gravel bottoms, from low water to 300 feet. Stations: 30 dredging stations and S 4, 11, 12, 14, 24.

B. (Balanus) crenatus Bruguière. (Pilsbry, 1916, p. 165, pls. 39, 40, text figs. 49–54.) Several specimens from *Lithodes maja* (identified by Doctor Pilsbry) and from a *Cancer*.

Doctor Pilsbry kindly informs us that the specimens submitted to him were the first of which he had any record as occurring on crabs. The species is found on rocks and shells.

B. (Semibalanus) balanoides (Linné). (Pilsbry, 1916, p. 182, pl. 44, text fig. 58.) Found everywhere on rocks, mollusks, and piles, between tide marks.

In the laboratory this species may be permanently submerged in running sea water for weeks and still remain in good health. The specimens grow rapidly under such conditions. On small stones subjected to ice scour during the winter this species is not found until July.

Unidentified nauplius and cypris larvae of barnacles have been taken in the plankton about the end of July.

LITERATURE

Darwin, Charles 1851 A monograph on the subclass Cirripedia, with figures of all the species. The Lepadidae; or pedunculated cirripedes. Ray Society, pp. i–xi, 1–400, 10 pl., 4 fig.

——— 1854 A monograph on the subclass Cirripedia, with figures of all the species. The Balanidae (or sessile cirripedes); the Verrucidae, etc. Ray Society, pp. i–viii, 1–684, 30 pl., 11 fig.

Pilsbry, H. A. 1907 The barnacles (Cirripedia) contained in the collections of the U. S. National Museum. United States Nat. Mus., bull. 60, pp. i–x, 1–122, 11 pl., 36 fig.

——— 1916 The sessile barnacles (Cirripedia) contained in the collections of the U. S. National Museum; including a monograph of the American species. United States Nat. Mus., bull. 93, pp. i–xi, 1–366, 76 pl., 99 fig.

Subclass MALACOSTRACA

Series EUMALACOSTRACA

Division PERACARIDA

Order MYSIDACEA

Suborder MYSIDA

Mysidae

Mysinae

Tribe ERYTHROPINI

ERYTHROPS G. O. Sars

E. ERYTHROPHTHALMA (Goës). G. O. Sars, 1870, p. 24, pl. 1.) Taken rather uncommonly on mud bottoms, from 40 to 156 feet. Stations: D 5, 18, 29, 46; P 10B.

Tribe MYSINI

MICHTHEIMYSIS Norman

M. MIXTA (Lilljeborg). (G. O. Sars, 1879, p. 76, pl. 33.) Found on what may be called mixed bottoms, that is, gravel and mud, rock and shell, or rock with heavy growth of Bryozoa. It occurs from low water to 156 feet. Stations: D 18, 28, 32, 35, 37–39, 71, 82, 92, 94, 103, 136, 138.

NEOMYSIS Czerniavski

N. AMERICANA (Smith). (Fig. 41.) (Smith, 1873, p. 552.) Found in similar situations to the preceding species, from shore to 70 feet. Stations: D 10, 12, 28, 29, 32, 43, 46, 51, 52; S 35.

LITERATURE

SARS, G. O. 1870 Monographi over de ved Norges Kyster forekommende Mysider. Carcinolog. Bidr. Norges Fauna I, pp. 1–64, 8 pl.

SARS, G. O. 1879 Monographi over de ved Norges Kyster forekommende Mysider. Hefte 3. Univ.-Progr. 1880, sem. 1, pp. i–iv, 1–131, 34 pl.

SMITH, S. I. 1873 In Verrill: Report upon the invertebrate animals of Vineyard Sound and the adjacent waters, with an account of the physical characters of the region. Rept. Comm. Fish., 1871–1872, pp. 295–778, 38 pl., 3 fig.

Order TANAIDACEA

Tanaidae

Leptochelia Dana

L. rapax Harger. (Richardson, 1905, p. 30, figs. 30, 31.) A single female was found on a mud flat, at S 41. For literature, see under the following order: Richardson (1905), G. O. Sars (1896–1899), Wallace (1919).

Order ISOPODA

The three papers referred to under the Tanaidacea form also the most important accounts of the Isopoda of this coast.

Fig. 41 Neomysis americana, female. A. antennal scale. B. telson and right uropod.

Superfamily GNATHIODEA

Gnathiidae

Gnathia Leach

G. hirsuta (G. O. Sars). (*cristata* Richardson, 1905; Monod, 1926, p. 363, figs. 142, 143.) This species has been found by us only in cavities in *Iophon chelifer,* a sponge encrusting the brachiopod *Terebratulina septentrionalis.* Males, females, and young of various ages are all found living together in the cavities. The species is new to New England. Stations: D 20, 90, 94.

Superfamily ANTHUROIDEA

Anthuridae

Calathura Norman and Stebbing

C. branchiata (Stimpson). (G. O. Sars, 1897, p. 46, pl. 19.) Two specimens were taken on blue clay, depth 220 feet. Station: D 15.

Superfamily CYMOTHOOIDEA

Cirolanidae

Cirolana Leach

C. impressa Harger. (Richardson, 1905, p. 97, figs. 78, 79.) An ovigerous female, 24 mm. long, was taken on sandy bottom, in 87 feet of water. The eggs measured 1.5 by 2 mm. This species is new to New England, having previously been recorded only from depths of 100 fathoms or more. Station: D 77.

Limnoriidae

Limnoria Leach

L. lignorum (Rathke). (G. O. Sars, 1897, p. 76, pl. 31.) Found in waterlogged sticks, from low water to 70 feet. We have not found any evidence that this animal attacks piles in this region.

Superfamily IDOTHEOIDEA

Idotheidae

Idothea J. C. Fabricius

I. baltica (Pallas). (G. O. Sars, 1897, p. 80, pl. 32.) Taken near low water, among heavy growths of algae. Stations: S 7, 25, 35, 36, 39, 41.

I. phosphorea Harger. (Richardson, 1905, p. 367, figs. 398, 399.) This species is very close to *I. granulosa* H. Rathke, but may be distinguished by the broader urosome and concave frontal margin. Taken on rock bottom, from shore to 90 feet. Stations: D 104; S 12, 43.

Edotea Guérin-Méneville

E. triloba acuta Richardson comb. nov. (Richardson, 1905, p. 395, figs. 439, 440.) A rare form, on mud, in 36 to 130 feet of water. Stations: D 1, 10, 29, 35, 38, 46, 62; P 10B.

Superfamily ASELLOIDEA

Janiridae

Jaera Leach

J. albifrons Leach. (*marina* G. O. Sars, 1897, p. 104, pl. 43.) Found only near low water, chiefly under stones. Stations: S 2, 3, 6, 8, 12, 25, 39, 41.

Munnidae

Munna Kröyer

M. fabricii Kröyer. (G. O. Sars, 1897, p. 108, pl. 45, fig. 2.) Taken on muddy bottoms, in 10 to 70 feet of water. Stations: D 46, 59, 94.

Pleurogonium G. O. Sars

P. rubicundum (G. O. Sars). (G. O. Sars, 1897, p. 113, pl. 47, fig. 2.) On mud, in 20 to 50 feet of water. New to New England. Station: D 32.

P. inerme G. O. Sars. (G. O. Sars, 1897, p. 114, pl. 48, fig. 1.) Found on a mud and shell bottom, in 70 feet of water. Also new to New England. Station: D 46.

Desmosomatidae

DESMOSOMA G. O. Sars

D. LOBICEPS Blake. (Blake, 1929, p. 26, fig. 13.) Taken on sandy mud, in 40 feet of water. Station: D 29.

Superfamily BOPYROIDEA

Bopyridae

HEMIARTHRUS Giard and Bonnier (*Phryxus*)

H. ABDOMINALIS (Kröyer). (G. O. Sars, 1898, p. 215, pls. 90, 91.) Found twice on *Spirontocaris pusiola*. It is noteworthy that this host is the only species of its genus which breeds in this region during the summer. Stations: D 4, 18.

BOPYROIDES Stimpson

B. HIPPOLYTES (Kröyer). (G. O. Sars, 1898, p. 199, pl. 84, fig. 2.) Taken twice as a branchial parasite of *Spirontocaris fabricii*. Stations: D 117, 132.

Superfamily ONISCOIDEA

The following species are terrestrial forms.

Tribe ATRACHEATA

Trichoniscidae

TRICHONISCUS Brandt

T. (TRICHONISCUS) DEMIVIRGO Blake. (Blake, 1931, p. 341, fig. 1a–h.) A gregarious species found in damp places under logs and dead leaves. Corfield, Duck Brook Path, Lake Wood.

Tribe PLEUROTRACHEATA

Oniscidae

ONISCUS Linné

O. ASELLUS Linné. G. O. Sars, 1898, p. 171, pl. 75.) Corfield, Duck Brook Path, Bar Island.

PHILOSCIA Latreille

P. (PHILOSCIA) MUSCORUM (SCOPOLI) var. SYLVESTRIS (Fabricius). (G. O. Sars, 1898, p. 173, pl. 76, fig. 1.) Found especially about the bases of trees. Salisbury Cove, Hulls Cove, Bar Island.

Porcellionidae

CYLISTICUS Schnitzler

C. CONVEXUS (De Geer). G. O. Sars, 1898, p. 186, pl. 81.) Corfield, Bar Island.

PORCELLIO Latreille

P. (PORCELLIO) SCABER Latreille. (G. O. Sars, 1898, p. 176, pl. 77.) Salisbury Cove, Duck Brook Path, Bar Island, very abundant on Long Porcupine Island.

TRACHELIPUS Budde-Lund

T. (TRACHELIPUS) RATHKEI (Brandt). (G. O. Sars, 1898, p. 180, pl. 79, fig. 1.) More generally distributed than the other species. Salisbury Cove, Hulls Cove, Bar Harbor, Bar Island.

LITERATURE

BLAKE, C. H. 1929 New Crustacea from the Mount Desert Region. Biol. Surv. Mt. Desert Region, part 3, pp. 1–34, 15 fig.

——— 1931 New land isopods from New England. Occas. Papers Boston Soc. Nat. Hist., vol. 5, pp. 341–348, 2 fig.

MONOD, TH. 1926 Les Gnathiidae, essai monographique. Paris: pp. 1–668, 1 pl. 277 fig.

RICHARDSON, HARRIET 1905 A monograph on the isopods of North America. United States Nat. Mus., bull. 54, pp. i–liii, 1–727, 740 fig.

SARS, G. O. 1896–1899 An account of the Crustacea of Norway. Vol. 2, Isopoda. Bergen: pp. i–x, 1–270, 104 pl.

WALLACE, N. A. 1919 The Isopoda of the Bay of Fundy. Univ. Toronto Stud. Biol. Ser., no. 18, pp. 1–42, 12 fig.

Order AMPHIPODA

The present order is less instructive from a zoögeographical point of view than are some others. One may, however, call attention to the presence of certain boreal forms, such as

Orchomenella groenlandica and *Metopa carinata,* and the absence of southern elements, notably the genera *Stenothoe* and *Microdeutopus,* which are conspicuous forms at Woods Hole.

The members of this order are abundant and form a nicely graded series of sizes from 25 mm. down to about 2 mm. They may be recommended, therefore, as excellent practice material for dissection under the microscope and as objects for vital staining experiments.

The most valuable papers on New England species of this order are: Holmes (1905), G. O. Sars (1890–1895), and Shoemaker (1930).

Suborder GAMMARIDEA

Lysianassidae

Anonyx Kröyer

A. nugax (Phipps). (Holmes, 1905, p. 472, pl. 3, fig. 3, text fig.). A few were taken on bottoms of mud and gravel, depth 20 to 135 feet. Stations: D 32, 97, 109, 112.

Hippomedon Boeck

H. serratus Holmes. (Holmes, 1905, p. 473, pl. 4, fig. 2, text fig.) Taken twice on rock bottom, in 45 to 64 feet. Stations: D 27, 118.

Orchomenella G. O. Sars

O. pinguis (Boeck). (G. O. Sars, 1890, p. 67, pl. 24.) The most common member of its family in the region. Found on various bottoms, from low water to 156 feet. Stations: D 13, 18, 21, 25, 28, 36, 39, 55, 96; S 6; P 10B.

O. groenlandica (Hansen). (G. O. Sars, 1891, p. 70, pl. 26.) One specimen taken on rock bottom, in 70 feet of water, at D 94. The species is new to New England.

Ampeliscidae

Ampelisca Kröyer

A. macrocephala Lilljeborg. (G. O. Sars, 1891, p. 172, pl. 60.) Found on various bottoms, but always in the presence of an admixture of sand, depths 30 to 330 feet. A very common species. Stations: 32 dredging stations and P 10B.

Haustoriidae

Pontoporeia Kröyer

P. femorata Kröyer. (G. O. Sars, 1891, p. 123, pl. 41, fig. 1.) Taken once on mud, in 40 feet of water, at P 10B.

Phoxocephalidae

Phoxocephalus Stebbing

P. holbölli (Kröyer). (G. O. Sars, 1891, p. 144, pl. 49.) Taken on bottoms containing mud and blue clay, depths 30 to 220 feet. Stations: D 15, 18, 23, 55; P 10B.

Harpinia Boeck

H. plumosa (Kröyer). (G. O. Sars, 1891, p. 151, pl. 52.) Found on bottoms of mixed rock, gravel and mud, depths 30 to 75 feet. Stations: D 14, 23, 35, 118.

H. laevis G. O. Sars. (G. O. Sars, 1891, p. 161, pl. 56, fig. 2.) Taken twice on bottoms of mud and stones, depths 49 to 68 feet. The species is new to New England. Stations: D 45, 74.

Stenothoidae

The former family Metopidae is included here, since the gap between these two families in the structure of the mandibular palp is well bridged by *Stenothoides* Chevreux and *Proboliella* Walker.

Metopa Boeck

M. hirsutimana Blake. (Blake, 1929, p. 20, fig. 10.) Taken on rock bottom and once from the branchial chamber of *Pyura ovifera*. Stations: D 20, 94.

M. carinata Hansen. (Hansen, 1888, p. 99, pl. 4.) An examination of the mouth parts shows that this species must be referred to *Metopa*. It is usually found on muddy bottoms, depth 10 to 70 feet. Stations: D 35, 46, 54, 59, 92; P 10B.

Lafystiidae

LAFYSTIUS Kröyer

L. STURIONIS Kröyer. (G. O. Sars, 1893, p. 384, pl. 134.) Found as an external parasite of skates at D 13, 21.

Acanthonotosomatidae

ACANTHONOTOSOMA Boeck

A. SERRATUM (O. Fabricius). (G. O. Sars, 1893, p. 374, pl. 131, fig. 1.) Found, always in small numbers, on hard bottoms, in 40 to 220 feet of water. Stations: D 10, 15, 40, 69, 94, 96.

Oedicerotidae

MONOCULODES Stimpson

M. EDWARDSI Holmes. (Holmes, 1905, p. 487, text fig.) Taken once on blue clay, in 220 feet of water. Station: D 15.

Tironidae

SYRRHOË Goës

S. CRENULATA Goës. (G. O. Sars, 1893, p. 390, pl. 136.) Taken once from muddy gravel, in 156 feet of water. Station: D 18.

Calliopiidae

HALIRAGES Boeck

H. FULVOCINCTUS (M. Sars). (G. O. Sars, 1893, p. 436, pl. 154.) Taken from blue clay and muddy gravel, depth 156 to 220 feet. Stations: D 15, 18.

CALLIOPIUS Lilljeborg

C. LAEVIUSCULUS (Kröyer). (G. O. Sars, 1893, p. 449, pl. 158.) Chiefly taken on rock, in 20 to 48 feet of water. Stations: D 3, 4, 17.

Pleustidae

PLEUSTES Bate

P. PANOPLUS (Kröyer). (G. O. Sars, 1893, p. 344, pl. 121.) Found on hard bottoms, depth 20 to 68 feet, rare. Stations: D 10, 56, 82.

Eusiridae

Rhachotropis Smith

R. inflata (G. O. Sars). (*tumida* G. O. Sars, 1893, p. 430, pl. 152.) Taken on a stony bottom, in 70 feet of water, at D 39.

Pontogeneiidae

Pontogeneia Boeck

P. inermis (Kröyer). (G. O. Sars, 1893, p. 451, pl. 159.) Taken on all kinds of bottom, rarely pure mud, from shore to 220 feet. Stations: D 3–6, 8, 10, 15, 17, 18, 20, 25, 35, 36, 53, 104; S 1, 11, 12, 14, 33.

Gammaridae

Gammarellus Herbst

G. angulosus (H. Rathke). (G. O. Sars, 1894, p. 492, pl. 173, fig. 2.) Found especially on *Laminaria* near low water, dredged once in 35 feet of water. Stations: D 33; S 2, 6, 12, 29, 43.

Casco Shoemaker

C. bigelowi (Blake). (*Cheirocratus b.* Blake, 1929, p. 22, fig. 11; Shoemaker, 1930, p. 354, figs. 52–54.) Taken on mixed bottoms, in 26 to 194 feet of water. Stations: D 35, 38, 45, 51, 54, 72, 81, 93, 96, 103, 113, 118, 131, 143.

Melita Leach

M. dentata (Kröyer). (G. O. Sars, 1894, p. 513, pl. 181, fig. 1.) A few taken on rock bottom, in 30 feet of water, at D 41.

Maera Leach

M. danae (Stimpson). (Stimpson, 1853, p. 46, fig. 32; Holmes, 1905, pl. 12, fig. 2.) Found on various bottoms containing mud. Most common near low water, but dredged to 156 feet. Stations: D 6, 10, 18, 32, 38, 39, 63; S 11, 32.

Dikerogammarus Stebbing

D. fasciatus (Say). (Kunkel, 1918, p. 105, fig. 25.) Taken twice in brackish estuaries. Stations: S 10, 27.

GAMMARUS J. C. Fabricius

G. ANNULATUS Smith. (Kunkel, 1918, p. 110, fig. 27.) Taken once on a beach with *Idothea baltica.* Station: S 27

G. MARINUS Leach (G. O. Sars, 1894, p. 497, pl. 175.) Found twice in rock pools in very exposed situations. Stations: S 1, 12.

G. DUEBENI Lilljeborg. (G. O. Sars, 1894, p. 502, pl. 177, fig. 1.) Abundant at shore stations and dredged once in 58 feet of water. This species replaces *G. locusta* in northern New England, but has not been previously reported. Stations: D 70; S 1, 5–10, 12–14, 17, 19, 20, 25, 32, 33, 35.

CARINOGAMMARUS Stebbing

C. MUCRONATUS (Say). (Kunkel, 1918, p. 113, fig. 29.) Found in a brackish bay. Station: S 10.

Talitridae

ORCHESTIA Leach

O. PLATENSIS Kröyer. (Kunkel, 1918, p. 118, fig. 31.) In decaying weed, above high-water mark, at Salisbury Cove, Corfield, and Sand Beach.

TALORCHESTIA Dana

For discussions of the specific distinctness of the following two species see Shoemaker (1930) and Kunkel (1918).

T. MEGALOPHTHALMA (Bate). (Kunkel, 1918, p. 125, fig. 34.)

T. LONGICORNIS (Say). (Kunkel, 1918, p. 122, fig. 33.) Nine specimens of the preceding species and 30 of this one were taken at Sand Beach above tide mark.

HYALE H. Rathke

H. PREVOSTII (H. Milne-Edwards). (*nilsonii* G. O. Sars, 1890, p. 26, pl. 11, fig. 1.) Found in algae about high-water mark. Stations: S 1, 2, 12.

HYALELLA Smith

H. AZTECA (de Saussure). (*knickerbockeri* Kunkel, 1918, p. 129, fig. 36.) Found in fresh water. Sargent Mountain Pond, heath south of Salisbury Cove, Lake Wood, Witch Hole Pond.

Photidae

PHOTIS Kröyer

P. REINHARDI Kröyer. (G. O. Sars, 1895, p. 569, pl. 202.) Taken chiefly on mud bottoms, in 20 to 90 feet of water. Stations: D 1, 4, 32, 35, 45, 48, 93, 104, 112.

LEPTOCHEIRUS Zaddach

L. PINGUIS (Stimpson). (Kunkel, 1918, p. 144, fig. 42.) A common species, almost always found on bottoms containing mud, from low water to 330 feet. Stations: 44 dredging stations and S 12, 20; P 10B.

Amphithoidae

AMPHITHOË Leach

A. RUBRICATA (Montagu). (G. O. Sars, 1895, p. 579, pl. 206.) Usually associated with green algae (see Skutch, 1926), but has been dredged on hard bottoms to 220 feet. Stations: D 3, 15, 87, 104, 136, 148; S 1–4, 8, 12, 14, 24, 39.

Jassidae

ISCHYROCERUS Kröyer

I. ANGUIPES Kröyer. (G. O. Sars, 1895, pp. 588, 589, pls. 209, 210, fig. 1.) An extremely variable species, usually associated with algae on hard bottoms, from low water to 100 feet. Stations: D 3–5, 10, 12, 20, 27, 68, 87, 94; S 2, 12.

Corophiidae

ERICTHONIUS H. Milne-Edwards

E. DIFFORMIS H. Milne-Edwards. (G. O. Sars, 1895, p. 604, pl. 216, fig. 1.) This species inhabits tubes attached by one side to other objects, usaully on hard bottom, depth 20 to 300 feet. Stations: D 6, 9, 12, 18, 20, 27, 68, 75, 94, 96, 104, 120.

E. HUNTERI (Bate). (G. O. Sars, 1895, p. 605, pl. 216, fig. 2.) Found in similar situations to the preceding, depth 46 to 330 feet. While neither this species nor the preceding have been reported as occurring in New England, it is probable that they have been taken and confused with *E. rubricornis*. Stations: D 3, 5–7, 10, 18, 39, 67, 69, 104.

UNCIOLA Say

U. IRRORATA Say. (Kunkel, 1918, p. 166, fig. 50.) Found on various bottoms, usually with rock or gravel, from low water to 330 feet, but most frequently between 30 and 70 feet. Stations: 38 dredging stations and S 39.

COROPHIUM Latreille

C. VOLUTATOR (Pallas). (*grossipes* G. O. Sars, 1895, p. 614, pl. 219.) Found abundantly on certain mud flats. This species and the following are new to New England. Stations: S 6, 9, 10.

C. CRASSICORNE Bruzelius. (G. O. Sars, 1895, p. 615, pl. 220.) Taken twice on hard bottom, in 30 to 63 feet of water; both stations are near Greenings Island. Stations: D 27, 55.

C. BONELLII (H. Milne-Edwards). (G. O. Sars, 1895, p. 616, pl. 221, fig. 1; Ussing and Stephensen, 1924, p. 69, fig. 3.) Common among mussels at low water and dredged to a depth of 60 feet. Stations: D 28, 32, 41, 59, 71, 72, 92; S 4, 14.

Podoceridae

DULICHIA Kröyer

D. FALCATA (Bate). (G. O. Sars, 1895, p. 640, pl. 231, fig. 1.) Taken once on a gravel and mud bottom, in 156 feet of water. The species is new to New England.

D. PORRECTA (Bate). (G. O. Sars, 1895, p. 637, pl. 229.) Found on muddy bottoms, depth 20 to 130 feet. Stations: D 1, 6, 10, 20, 27–30, 32, 48, 54, 93; P 10B.

PARADULICHIA Boeck

P. SECUNDA Blake. (Blake, 1929, p. 24, fig. 12.) Found once with *Dulichia falcata*.

Suborder CAPRELLIDAE

Specific variability is so great in this suborder that identification must be made with much care. Reference should be had in doubtful cases to the monographs by Mayer, beginning with the caprellids of the Siboga Expedition (1903) and going back to the earlier ones.

Caprellidae Skeleton shrimps

AEGININA Norman (*Aegina*)

A. LONGICORNIS (Kröyer). (G. O. Sars, 1895, p. 651, pl. 234, fig. 2.) Found on bottoms yielding algae, Bryozoa, and similar organisms, depth 25 to 330 feet. Stations: D 3, 5, 10, 13, 15, 25, 28, 30, 36, 38, 43, 45, 51–53, 56, 67, 94, 96, 104, 109, 110, 119, 130, 131, 135, 138, 140.

MAYERELLA Huntsman

M. LIMICOLA Huntsman. (Huntsman, 1915, p. 40, pls. 5, 6.) Found on mud, in 30 to 70 feet of water. Hitherto this species was known only from St. Andrews, N. B. Stations: D 46, 48, 76.

CAPRELLA Lamarck

C. ACUTIFRONS Lamarck. (Mayer, 1903, p. 79, pl. 3, figs. 4–28; pl. 7, figs. 62–65.) An extremely variable species found on algae and hydroids, from shore to 54 feet of water. Stations: D 3, 12, 110; S 12.

C. EQUILIBRA Say. (G. O. Sars, 1895, p. 663, pl. 238, fig. 3.) Taken with various arborescent organisms, shore to 239 feet of water. Stations: D 4–6, 12, 15, 18, 21, 25, 38, 52, 72, 96; S 14.

C. LINEARIS (Linné). G. O. Sars, 1895, p. 657, pl. 236.) Found with various organisms, very frequently crawling on the sea-cucumber, from low water to 330 feet. Stations: D 4, 5, 13, 15, 16, 18, 21, 25, 28, 32, 36, 39, 43, 51, 56, 67, 71, 73, 96, 112; S 6, 11.

Suborder HYPERIIDEA

Hyperiidae

Euthemisto Bovallius

E. compressa (Goës). (G. O. Sars, 1890, p. 12, pl. 5, fig. 2.) One specimen taken in surface tow at D 104.

LITERATURE

Blake, C. H. 1929 New Crustacea from the Mount Desert Region. Biol. Surv. Mt. Desert Region, part 3, pp. 1–34, 15 fig.

Hansen, H. J. 1888 Malacostraca marina Groenlandiae occidentalis. Vidensk. Medd., 1887, pp. 5–226, 6 pl., 1 map.

Holmes, S. J. 1905 The Amphipoda of southern New England. Bull. Bur. Fish., vol. 24, pp. 457–529, 13 pl., text figs.

Huntsman, A. G. 1915 A new caprellid from the Bay of Fundy, Contrib. Canad. Biol. 1911–1914, fasc. 1, pp. 39–42, 2 pl.

Kunkel, B. W. 1918 The Arthrostraca of Connecticut. Conn. Geol. Nat. Hist. Surv., bull. 26, pp. 1–261, 84 fig.

Mayer, Paul 1903 Die Caprellidae der Siboga-Expedition. Siboga-Exped. Uitkomsten, livr. 12, pp. 1–160, 10 pl.

Sars, G. O. 1890–1895 An account of the Crustacea of Norway. Vol. 1, Amphipoda. Christiania: i–viii, 1–711, 244 pl.

Shoemaker, C. R. 1930 The Amphipoda of the Cheticamp Expedition of 1917. Contrib. Canad. Biol., vol. 5, pp. 221–359, 54 fig.

Skutch, A. F. 1926 On the habits and ecology of the tube-building amphipod *Amphithoe rubricata* Montagu. Ecology, vol. 7, pp. 481–502, 2 fig.

Stebbing, T. R. R. 1906 Amphipoda I. Gammaridea. Das Tierreich, Lief. 21, S. i–xxxix, 1–806, 127 fig.

Stimpson, William 1853 Synopsis of the marine Invertebrata of Grand Manan. Smiths. Contrib. Knowl., vol. 6, part 5, pp. i–iv, 1–66, 3 pl.

Ussing, Hj., and Stephensen, K. 1924 *Corophium Bonelli* (M.-Edw.?) G. O. Sars, ny for Danmark, med noter om andre Corophium-arter. Vid. Medd., vol. 78, pp. 69–79, 3 fig.

Order CUMACEA

In view of the uncertainty as to the division of this order into families, I give below a revision of Stebbing's (1913) scheme. It is based primarily on the presence or absence of the telson, the number of pleopods in the male, and the number of pereiopods furnished with exopods.

	Stebbing
Ceratocumatidae	Ceratocumatidae
Hemilampropidae	Chalarostylidae
	Paralampropidae
	Platysympodidae
Diastylidae	Diastylidae
	Diastyloididae
	Colurostylidae
	Oxyurostylidae
	Pseudodiastylidae
	Ekdiastylidae
	Holostylidae
Pseudocumatidae	Pseudocumatidae
Lampropidae	Lampropidae
Dicidae	Dicidae
	Gynodiastylidae
Vaunthompsoniidae	Vaunthompsoniidae
	Sympodommatidae
	Bodotriidae
Leptocumatidae	Leptocumatidae
Leuconidae	Leuconidae
	Paraleuconidae
	Hemileuconidae
Heteroleuconidae	Heteroleuconidae
Nannastacidae	Nannastacidae
	Procampylaspididae
	Campylaspididae

To determine our species one must refer especially to Calman (1912) and Stebbing (1913) for literature, and to Sars (1871, 1900) for figures.

Diastylidae

Diastylis Say

D. bispinosus (Stimpson). (*quadrispinosa*, G. O. Sars, 1871, p. 28, pls. 10, 11.) A common species, usually on muddy bottoms, from low water to 220 feet. Stations: D 6, 10, 15, 17, 24, 25, 27, 28, 32, 33, 37, 38, 46, 53–55, 59, 62, 63, 65, 71, 72, 103, 112, 118; S 12; P 10B.

D. lucifer Kröyer). (G. O. Sars, 1900, p. 49, pl. 38.) Two specimens taken by towing at night, at P10.

Leptostylis G. O. Sars

L. longimanus (G. O. Sars). (G. O. Sars, 1900, p. 68, pl. 48.) Taken on mud bottoms, in 20 to 70 feet of water. Stations: D 32, 46, 48.

Ekdiastylis Stebbing

I hold with Stebbing that the species included here are generically distinct from *Diastylis*. If this view is not taken, virtually the entire family must be placed in one genus.

E. sculptus (G. O. Sars). (G. O. Sars, 1871, p. 24, pls. 1–9.) This species also is found on muddy bottoms, depth 20 to 220 feet. Stations: D 1, 10, 13, 15, 17, 23, 25, 29, 32, 33, 35, 46, 47, 53, 55, 59, 61–63, 70, 92, 93, 118; P 10B.

E. cornuifer Blake. (Blake, 1929, p. 30, fig. 15; Zimmer, 1930, p. 649, fig. 47.) Taken once on a bottom of mud and shells, in 70 feet of water. This species is known to occur from Eastport to Casco Bay. Station: D 70.

Lampropidae

Lamprops G. O. Sars

L. quadriplicata Smith (fig. 42). (Smith, 1879, p. 118.) The coloration of this species is more striking than is usual in the Cumacea. The carapace shows a dividing line passing diagonally forward from just in front of the postdorsal angle to just behind the anteroventral notch. The area in front of this line is greenish white and behind it deep brown.

The general surface of the rest of the animal is without color, except that the first free thoracic segment is yellowish white, the next 2 or 3 have brown middorsal spots, and the epimera of the next to the last thoracic segment are brown. The abdominal segments have postdorsal brown bands. The telson is yellow, due to the color of the rectum. The distal portion of the basis of the uropods is brown. Taken on sand bottom, in 8 feet of water, at S 21.

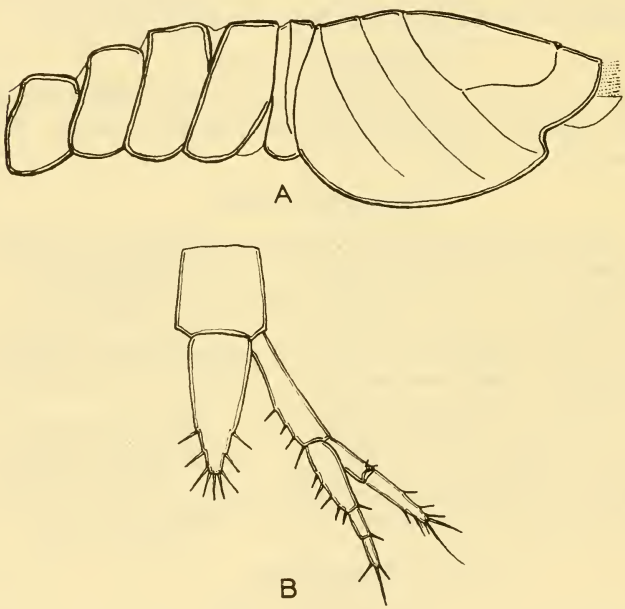


Fig. 42 Lamprops quadriplicata, female. A. lateral view of cephalothorax. B. telson and right uropod.

Leuconidae

Leucon Kröyer

L. nasicoides Lilljeborg. (G. O. Sars, 1900, p. 31, pl. 23.) One taken on blue clay, in 220 feet of water. Station: D 15.

Eudorella Norman

E. difficilis Blake. (Blake, 1929, p. 28, fig. 14.) Found on muddy bottoms, in 30 to 68 feet of water. Stations: D 16, 25, 27, 32, 33, 42, 54, 71, 112, 118; P 10B.

E. hispida G. O. Sars. (G. O. Sars, 1871, p. 49, pl. 18.) Similar in habitat to the preceding, but seems to prefer more sheltered bays, depth 30 to 58 feet. Stations: D 17, 48, 62; P 10B.

Nannastacidae

Campylaspis G. O. Sars

C. rubicunda (Lilljeborg). (G. O. Sars, 1900, pp. 84, 108, pls. 56. 57.) Taken once on a mud and shell bottom, in 70 feet of water. Station: D 46.

LITERATURE

Blake, C. H. 1929 New Crustacea from the Mount Desert Region. Biol. Surv. Mt. Desert Region, part 3, pp. 1–34, 15 fig.

Calman, W. T. 1912 The Crustacea of the order Cumacea in the collection of the United States National Museum. Proc. United States Nat. Mus., vol. 41, pp. 603–676, 112 fig.

Sars, G. O. 1871 Beskrivelse af de paa Fregatten Josephines expedition fundne cumaceer. Kong. Sven. Veten.-Akad. Handl., vol. 9, no. 13, pp. 1–57, 20 pl.

——— 1899–1900 An account of the Crustacea of Norway. Vol. 3, Cumacea. Bergen: pp. i–x, 1–115, 72 pl.

Smith, S. I. 1879 The stalk-eyed crustaceans of the Atlantic coast of North America north of Cape Cod. Trans. Conn. Acad., vol. 5, pp. 27–138, 5 pl.

Stebbing, T. R. R. 1913 Cumacea (Sympoda). Das Tierreich, Lief. 39, S. i–xvi, 1–210, 137 fig.

Zimmer, Carl 1930 Untersuchungen an Diastyliden (Ordnung Cumacea). Mitt. Zool. Mus. Berlin, Bd. 16, S. 583–658, 47 fig., 2 maps.

Division EUCARIDA

Order DECAPODA

The decapods of northern seas largely lack good monographic treatments, Miss Rathbun's volumes on American crabs constituting a notable exception. However, the same authority has in her paper (1929) on the Canadian Atlantic forms figured the species found in the Mount Desert Region.

In this place I wish to express my particular gratitude to Mr. S. N. F. Sanford, of the Boston Society of Natural History, for his kindness in facilitating my study of certain decapods in the Museum which had been determined by Miss Rathbun.

Suborder NATANTIA

Tribe CARIDEA

Pandalidae

Pandalus Leach

P. montagui Leach. (Rathbun, 1929, p. 8, fig. 5.) On rock bottoms, depth 30 to 101 feet, not common. Stations: D 3, 5, 20, 35, 39, 40, 41, 68, 69, 71, 77, 94, 103, 117.

Hippolytidae

Spirontocaris Bate (*Hippolyte*)

Miss Rathbun's (1904) paper on Pacific decapods is particularly valuable for this genus. The first of the following keys is based on her key. The second key, based largely on the characters of the rostrum, applies to the species as they occur in this region.

1 One or more supraorbital spines 2
  No supraorbital spines 5
2 First to third abdominal segments laterally spinous .... groenlandica
  These segments laterally rounded 3
3 Two supraorbital spines .... spina
  One supraorbital spine 4
4 Rostrum barely longer than eye .... zebra
  Rostrum more than twice as long as eye .... polaris
5 Rostrum at least as long as the rest of the carapace .... fabricii
  Rostrum much shorter than rest of carapace. pusiola

1 First to third abdominal segments laterally spinous .... groenlandica
These segments laterally rounded 2
2 Rostrum about as long as eye 3
Rostrum much longer than eye 4
3 Two superior rostral spines behind and 3 in front of eye .... zebra
One such spine behind and 2 in front of eye.. pusiola
4 About 10 middorsal spines .... spina
Four or 5 middorsal spines 5
5 Three spines behind and one in front of eye. fabricii
Two spines behind and 3 in front of eye .... polaris

S. GROENLANDICA (J. C. Fabricius). (Rathbun, 1929, p. 11, fig. 8.) Found on rock and gravel bottoms, in 22 to 165 feet of water, rather rare. Stations: D 3, 6, 30, 38, 39, 107, 117, 136, 148.

S. SPINA (Sowerby). (Rathbun, 1929, p. 14, fig. 14.) Taken on hard bottoms, from 22 to 330 feet. Uncommon, but most frequent at D 39, 40. Stations: D 6, 37, 39, 40, 67–69, 71, 73, 75, 94, 96, 107, 117, 130, 135–138, 142, 146, 148.

S. POLARIS (Sabine). (Rathbun, 1929, p. 12, fig. 9.) Taken rarely in similar situations with the preceding, depth 20 to 100 feet. Stations: D 4, 6, 23, 32, 36, 38, 40, 43, 52, 64, 69, 92, 94.

S. ZEBRA Leim. (Rathbun, 1929, p. 13, fig. 11.) Taken only once, on rock, in 25 feet of water, at D 136. Previously reported only from St. Andrews, N. B., and Nova Scotia.

S. FABRICII (Kröyer). (Rathbun, 1929, p. 15, fig. 15.) Taken on hard bottoms, depth 20 to 300 feet. The most common species of the genus here. The best stations were D 39, 94, 107. It was taken in all at 48 dredging stations.

S. PUSIOLA (Kröyer). (Rathbun, 1929, p. 17, fig. 19.) Also found on hard bottoms, from low water to 239 feet. Not very common, but being a small species it may escape through the dredge net. This is the only species of the genus which breeds in this region during the summer. Stations: D 1, 3, 4, 6, 15, 18, 20, 30, 35, 39, 40, 43, 69, 75, 82, 93, 94, 130; S 11.

Cragonidae

Crago Lamarck (*Crangon*)

C. septemspinosus Say. (Rathbun, 1929, p. 20, fig. 24.) Found usually on hard bottoms, from low water to 135 feet. Our best stations were D 43 and S 6. It is best taken with a fine-meshed seine in coves at low tide. The species breeds during the summer. Stations: 53 dredging stations and S 5, 6, 9.

Sclerocrangon G. O. Sars

S. boreas (Phipps). (Rathbun, 1929, p. 20, fig. 25.) Taken on rock bottoms, in 22 to 76 feet of water, not common. Stations: D 39–41, 94, 117, 135–137, 148.

Suborder REPTANTIA

Tribe ANOMURA

Paguridae

Pagurus J. C. Fabricius

The two species which we have taken may be distinguished by the following couplet:

1 The antennal scale projects beyond the eye. The hands of the chelipeds are scarcely hairy . . . acadianus
The antennal scale falls short of the end of the eye. The hands of the chelipeds are very hairy . . . . pubescens

P. acadianus Benedict. (Benedict, 1901, p. 454, text fig.) Found on hard bottoms, from near low water to 95 feet. This is the more common of our two species, and breeds during the summer. Stations: D 3, 32, 75, 94, 120, 123, 124, 126, 129, 134, 135, 137; S 5, 8, 9, 11, 12.

P. pubescens Kröyer. (Rathbun, 1929, p. 28, fig. 37.) Found in similar situations to the preceding, but more rarely, from low water to 76 feet. Stations: D 36, 94, 126; S 43.

Lithodidae

Lithodes Latreille

L. maja (Linné). (Rathbun, 1929, p. 29, fig. 39.) Two specimens taken in the winter in lobster pots, one east of Ironbound Island, in 90 feet of water, the other off Corea, Me. One of these specimens was kindly identified for us by Dr. W. L. Schmitt.

Tribe BRACHYURA

Subtribe BRACHYGNATHA

Superfamily MAJOIDEA (Oxyrhyncha)

Majidae

Pisinae

Hyas Leach

H. araneus (Linné). (Rathbun, 1925, p. 253, pls. 92, 93, text figs. 91, 92.) Taken in small numbers, on hard bottoms, from low water to 135 feet. During the summer all sizes have been found and an ovigerous female in July. Stations: D 6, 13, 24, 36, 39, 40, 84, 94, 103, 104, 109, 113, 126; S 4, 12, 43.

H. araneus var. coarctatus Leach. (Rathbun, 1925, p. 258, pls. 94, 95, text fig. 93.) One specimen undoubtedly referable to this variety was taken on rock bottom, in 50 feet of water, at D 13.

Superfamily CANCROIDEA (Brachyrhyncha)

Cancridae

Cancer Linné

C. irroratus Say. (Rathbun, 1930, p. 180, pl. 85, fig. 1, text figs. 29, 30.) Taken in rocky places, near low water, and 3 specimens dredged in depths to 68 feet, on hard bottoms. Ovigerous specimens have been taken in July. Stations: D 56, 63, 87; S 1, 9, 11, 12, 42, 43.

C. borealis Stimpson. (Rathbun, 1930, p. 182, text fig. 31.) Taken in pools, at low water, apparently much rarer than the preceding. Stations: S 12, 18.

LITERATURE

BENEDICT, J. E. 1901 The hermit crabs of the Pagurus bernhardus type. Proc. United States Nat. Mus., vol. 23, pp. 451–466, 6 fig.

LEIM, A. H. 1921 A new species of Spirontocaris with notes on other species from the Atlantic coast. Trans. Roy. Canad. Inst., vol. 13, pp. 133–145, 5 pl.

RATHBUN, M. J. 1904 Decapod crustaceans of the northwest coast of America. Harriman Alaska Series, vol. 10, pp. 3–210, 10 pl., 95 fig.

———— 1925 The spider crabs of America. United States Nat. Mus., bull. 129, pp. i–xx, 1–613, 283 pl. 153 fig.

———— 1929 Decapoda. Canadian Atlantic Fauna, no. 10m, pp. 1–38, 53 fig.

———— 1930 The cancroid crabs of America of the families Euryalidae, Portunidae, Atelecyclidae, Cancridae and Xanthidae. United States Nat. Mus., bull. 152, pp. i–xvi, 1–609, 230 pl., 85 fig.

Class PYCNOGONIDA Sea spiders

Order CRYPTOCHELATA

Ammotheidae

ACHELIA Hodge

A. SCABRA E. B. Wilson. (Wilson, 1880, p. 475.) A few specimens taken on hard bottoms, from low water to 71 feet. Stations: D 35, 94, 125; S 12, 29, 43.

Order EUCHELATA

Nymphonidae

NYMPHON J. C. Fabricius

N. RUBRUM Hodge. (G. O. Sars, 1891, p. 58, pl. 5, fig. 2.) A single ovigerous male was taken on rock, in 71 feet of water, August 3, 1928. The species is new to New England. Station: D 94.

Pallenidae

PSEUDOPALLENE E. B. Wilson

P. CIRCULARIS (Goodsir). (G. O. Sars, 1891, p. 38, pl. 3, fig. 3.) One ovigerous male was taken with the preceding species.

Phoxichilidiidae

PHOXICHILIDIUM H. Milne-Edwards

P. FEMORATUM (Rathke). (G. O. Sars, 1891, p. 21, pl. 2, fig. 1.) Taken chiefly on piles, but dredged once on rock bottom, in 70 feet of water. Stations: D 100; S 4, 12, 14, 24, 32.

Order ACHELATA

PYCNOGONUM Brünnich

P. LITORALE (Ström). (G. O. Sars, 1891, p. 7, pl. 1, fig. 1.) One specimen taken near the east end of the Moosabec Reach, in about 30 feet of water. Recorded as evidence that the western boundary of this species in shallow water is east of Frenchmans Bay.

LITERATURE

NORMAN, A. M. 1908 The Podosomata (= Pycnogonida) of the temperate Atlantic and Arctic Oceans. Jour. Linn. Soc. Zool., vol. 30, pp. 198–238, 2 pl.

SARS, G. O. 1891 Pycnogonidea. Norweg. North-Atlantic Exped., 1876–1878, pp. 1–163, 15 pl., 1 map, 1 fig.

WILSON, E. B. 1880 Report on the Pycnogonida of New England and adjacent waters. Rept. Comm. Fish., part 6 (1878), pp. 463–506, 7 pl.

Class ARACHNIDA

Order CHELONETHIDA (Pseudoscorpiones)
(False or Book Scorpions)

I have here followed the systematic arrangement of J. C. Chamberlin (1930). To his book and to the account in process of publication in 'Das Tierreich,' by Max Beier, the reader is referred for literature and descriptions.

Group HETEROSPHYRONIDA

Suborder HETEROSPHYRONIDA

Chthonioidea

Chthoniidae

CHTHONIUS C. L. Koch

C. TETRACHELATUS (Preyssler). One specimen under a stone on Bar Island, August 15, 1931.

Group HOMOSPHYRONIDA

Suborder MONOSPHYRONIDA

Cheliferoidea

Chernetidae

CHELANOPS Nicolet

C. SANBORNI (Hagen). Under stones and logs, in damp places. Shore of Lake Wood, Duck Brook Path, Salisbury Cove, and Corfield. Our most common species.

Cheliferidae

CHELIFER Geoffroy de St. Hilaire

C. CANCROIDES (Linné). One specimen taken in a house, August 10, 1931.

LITERATURE

CHAMBERLIN, J. C. 1930 The arachnid order Chelonethida. Stanford Univ. Publ. Sci., vol. 7, pp. 1–284, 71 fig.

Order PHALANGIDA (Opiliones)
(Harvest Spiders)

For this small group of species, it seems better to give keys rather than to refer to the somewhat scattered literature. Roewer in his monograph (1923) describes all the species, but the work is naturally rather unwieldy for occasional consultation. Comstock (1913) is also very helpful.

Suborder PALPATORES

Phalangiidae

Key to the genera found in the Mount Desert Region

1 Claw of the palp pectinate .... *Liobunum*
  Claw of the palp not pectinate 2
2 Basal segment of chelicera armed with a ventral spine 3
  Basal segment of chelicera unarmed .... *Phalangium*
3 Optic tubercle as wide as head .... *Caddo*
  Optic tubercle less than one-third as wide as head .... *Odiellus*

Caddo Banks

C. agilis Banks. A small, very active species found among moss in very damp places. Duck Brook Path, path from Ocean Drive to Bowl, Long Porcupine Island. Adults appear early in July.

Odiellus Roewer

O. pictus (Wood). Our most abundant form; found chiefly in grass, at the foot of trees. Corfield, Duck Brook Path, Salisbury Cove. Adults appear about the middle of July.

On August 21, 1931, a partly moulted specimen of this species was found. The old integument had split on the ventral surface and the cephalothorax, abdomen except the very tip, chelicerae, palpi, and bases of the legs were free. The old skin was gathered at the tip of the abdomen, with its legs extending backward. The animal's legs were placed with the femora bent into more than a semicircle forward and ventrally, the patellae were ventral to the mouth, and the more distal portions were close together, parallel, against the ventral surface, and extending beyond the body into their old integument. The palpi embraced the legs, one or the other frequently passing between and slightly separating the legs. At the same time the chelicerae grasped one leg after another, moving them slowly forward. The legs themselves writhed at short intervals. This motion seemed to be for the purpose of forcing the body fluids into the parts already free in order to straighten them. A leg was not released by the palpi until the very tip had passed between them. By the time this occurred, the segments of the leg were quite straight and seemed to be well hardened.

Phalangium Linné

P. opilio Linné. A rare form here. One male taken at Corfield early in July. Also taken at Jonesport.

Liobunum C. L. Koch

Key to the species of Liobunum found in the Mount Desert Region

1 Femur of palp cylindric, normal 2
  Femur of palp with an apophysis ....*calcar* (male)
2 Trochanters much darker than coxae .....*politum*
  Trochanters about the same color as coxae. 3
3 Femur of palp ventrally hairy ....*longipes*
  Femur of palp ventrally toothed 4
4 Tibia of palp dorsally smooth ....*calcar* (female)
  Tibia of palp finely toothed dorsally ......*ventricosum*

L. calcar (Wood). Corfield, Norway Drive. Not common. Adult males appear as early as the first of July.

L. politum Weed. Duck Brook Path. Found in similar situations to *Caddo agilis.* Rather rare.

L. longipes Weed. Found very rarely with the preceding species.

L. ventricosum (Wood). Edges of meadows and about houses. Salisbury Cove, not uncommon.

LITERATURE

Comstock, J. H. 1913 The Spider Book. Garden City: pp. i–xvi, 1–721, 770 fig.

Roewer, C. F. 1923 Die Weberknechte der Erde. Jena: pp. i–v, 1–1116, 1212 fig.

Order ARANEAE (True Spiders)

The general classification and arrangement of genera used here follows Petrunkevitch's (1928) 'Systema Aranearum.' The species are arranged alphabetically under the genera. The specific names, in general, agree with those of Crosby and Bishop in Leonard (1928). 'The Spider Book' by Comstock (1913) furnishes the most convenient starting point for the determination of our spiders. From there one proceeds to the numerous papers by Emerton cited in the bibliography of Comstock's book. In determining this collection of spiders, I owe much to the personal assistance of the late Mr. J. H. Emerton and to the collection of New England spiders which he deposited in the Boston Society of Natural History.

Suborder ARACHNOMORPHAE

Branch TRIONYCHA

Amaurobiidae

Amaurobius C. L. Koch

A. americanus (Emerton). Under stones, in a very hot, dry area. Adult and rather common in late June. The Hop.

A. bennetti Blackwall. Under bark on stumps and under logs and stones in woods. Females common in July and August, males not taken. Corfield, Hulls Cove.

Agelenidae

Ageleninae

Agelena Walckenaer

A. naevia Walckenaer. Abundant in meadows and bushy fields, everywhere. Adult in August.

Cicurina Menge

The clypeus is as high or higher than the height of the anterolateral eyes. The dorsal spines of the femora are: leg I, II, 1-1-1; leg III, IV, 1-1-2.

Key to the species of Cicurina

1 Anterolateral eyes elongate .... *arcuata*
Anterolateral eyes almost circular .... *brevis*

C. arcuata Keyserling. Lake Wood, base of Newport Mountain.

C. brevis (Emerton). North end of Echo Lake.

Cryphoeca Thorell

This genus closely resembles *Cicurina*. Our species may be distinguished by two points. The height of the clypeus is about half that of the anterolateral eyes. The dorsal spines of the femora are: leg I, 1-1; leg II, 1; leg III-IV, 0.

C. montana (Emerton). Two young taken at base of Newport Mountain, determination slightly doubtful.

Hahniinae

HAHNIA C. L. Koch

H. AGILIS Keyserling. The most common species of the genus. Sifted from dead leaves in the woods with the two following forms. Duck Brook Path, Ocean Drive, Lake Wood, base of Newport Mountain, north end of Echo Lake, Long Porcupine Island.

H. BRUNNEA Emerton. One specimen. Duck Brook Path.

H. CINEREA Emerton. One specimen. Duck Brook Path.

Pisauridae

Thaumasiinae

DOLOMEDES Latreille

D. SCRIPTUS Hentz (*fontanus* Emerton). A female guarding her nest, taken on west side of Bubble Pond, August 9, 1932; also Lake Wood.

Lycosidae Wolf Spiders

Lycosinae

LYCOSA Latreille

L. FRONDICOLA Emerton. Norway Drive, Lake Wood.

L. HELLUO Walckenaer. One specimen. Hulls Cove.

L. PRATENSIS Emerton. One specimen. Eden (Northeast Branch).

Pardosinae

PARDOSA C. L. Koch

P. BRUNNEA Emerton. One specimen. Eden (Northeast Branch).

P. LAPIDICINA Emerton. Quite common among stones just above the high-water line. Corfield, Salisbury Cove.

P. UNCATA (Thorell). Two females. Lake Wood.

P. XERAMPELINA (Keyserling). Uncommon. Lake Wood, base of Newport Mountain, Eden (Northeast Branch).

Dictynidae

Dictyninae

Dictyna Sundevall

D. foliacea (Hentz). In Woods. Females taken during the first half of July. The Bowl, Ireson Hill, base of Newport Mountain, Duck Brook Path.

D. sublata (Hentz). One young male, middle of August. Bay Shore drive.

D. volucripes Keyserling. The most common species of the genus. The females build conspicuous nests in dead goldenrod or similar plants during July and August. More common in August. Generally distributed around the edges of fields.

Theridiidae

Asageninae

Crustulina Menge

C. guttata (Wider). Under stones, uncommon. The Hop.

Enoplognatha Pavesi

E. marmorata (Hentz). One female. Lake Wood.

Steatoda Sundevall

S. borealis (Hentz). In sheltered crannies about houses, quite common. Adults taken from July 1 to middle of September. Bar Harbor, Hulls Cove, Salisbury Cove.

Argyrodine

Rhomphaea L. Koch

R. fictilium (Hentz). One specimen. Mount Kebo.

Theridiinae

Theridion Walckenaer

T. aurantium Emerton. Two females. Salisbury Cove.

T. differens Emerton. Norway Drive, the Bowl, heath south of Salisbury Cove.

T. FRONDEUM Hentz. Uncommon, but widely distributed in woods.

T. GLOBOSUM Hentz. In undergrowth, rare. Hulls Cove.

T. MURARIUM Emerton. One female taken on window. Bar Harbor.

T. TEPIDARIORUM C. L. Koch. Not uncommon in sheltered spots about the Corfield Laboratory. Probably an escape from a neighboring greenhouse.

T. ZELOTYPUM Emerton. On trees, uncommon. Corfield.

THERIDULA Emerton

T. OPULENTA (Walckenaer). Among bushes at the edge of woods, uncommon. Adult in first half of July. Bay Shore Drive, Hulls Cove, Salisbury Cove.

Linyphiidae

Linyphiinae

BATHYPHANTES Menge

B. CONCOLOR (Wider). Under stones, scarce. Corfield.

DRAPETISCA Menge

D. ALTERANDA Chamberlin (*socialis* Emerton). On spruce trunks, 2 specimens. Duck Brook path.

LEPHTHYPHANTES Menge

L. NEBULOSUS (Sundevall). One female. Long Porcupine Island.

LINYPHIA Latreille

L. MANDIBULATA Emerton (*pusilla* Comstock). One female. Corfield.

L. MARGINATA C. L. Koch. In woods, chiefly coniferous, living near the ground. Very common and widely distributed.

L. PHRYGIANA C. L. Koch. In similar situations to the preceding, fairly common. Widely distributed.

TAPINOPA Westring

T. BILINEATA Banks. Rare. Corfield, Long Porcupine Island.

Lophocareninae

CERATICELUS Simon

C. FISSICEPS (Cambridge). Among leaves and on shrubs, very common. Duck Brook Path, Hulls Cove.

Erigoninae

CERATINOPSIS Emerton

C. INTERPRES (Cambridge). One specimen. Heath south of Salisbury Cove.

DIPLOCEPHALUS Bertkau

D. CRISTATUS (Blackwall). One pair. Corfield.

GRAMMONOTA Emerton

G. PICTILIS (Cambridge). In woods, on tree trunks. Duck Brook Path.

Uloboridae

Hyptiotinae

HYPTIOTES Walckenaer

H. CAVATUS (Hentz). In underbrush, uncommon. The Bowl, base of Newport Mountain.

Argiopidae Orb-weavers

Argiopinae

ARGIOPE Audouin

A. TRIFASCIATA (Forskål). Quite common. Adult in late August and September. Eden (Northeast Branch), Salisbury Cove, Hulls Cove, Norway Drive, Somesville.

Araneinae

ARANEUS Clerck

A. CAVATICUS (Keyserling). On houses and barns, common. Corfield, Hulls Cove, Salisbury Cove, Beech Hill.

A. GIGAS (Leach). One female. Salisbury Cove.

A. MARMOREUS Clerck. One specimen. Corfield.

A. NORDMANNI (Thorell). Rare. Corfield, Salisbury Cove.

A. SERIATICUS Clerck. Rare. Corfield, Hulls Cove.

A. THADDEUS (Hentz). One specimen. Eden (Northeast Branch).

A. TRIFOLIUM (Hentz). Rare. Beech Hill.

A. WESTRINGI (Thorell). In woods, fairly common. Lake Wood, Corfield, Salisbury Cove.

CYCLOSA Menge

C. CONICA (Pallas). Rather rare. Lake Wood, base of Newport Mountain, Long Porcupine Island.

MANGORA Cambridge

M. GIBBEROSA (Hentz). Uncommon. Eden (Northeast Branch), Heath south of Salisbury Cove.

MARXIA McCook

M. STELLATA (Walckenaer). One female. Eden (Northeast Branch).

METEPEIRA F. Cambridge

M. LABYRINTHEA (Hentz). Rare. Emery District, heath south of Salisbury Cove.

NEOSCONA Simon

N. ARABESCA (Walckenaer). One specimen. Heath south of Salisbury Cove.

SINGA C. L. Koch

S. VARIABILIS Emerton. Low bushes, very abundant. Adult in July and August. The coloration amply justifies the specific name. Eden (Northeast Branch), Salisbury Cove, Norway Drive, Corfield, Duck Brook Path.

ZILLA C. L. Koch

Z. ATRICA (C. L. Koch). Quite common around the Corfield Laboratory.

Tetragnathinae

TETRAGNATHA Latreille

T. ELONGATA Walckenaer. Not common. Eden (Northeast Branch), Norway Drive.

T. STRAMINEA Emerton. More common than the preceding. Heath south of Salisbury Cove, Hulls Cove, the Hop.

THERIDIOSOMA Cambridge

T. GEMMOSUM (L. Koch). In low, wet places, uncommon. Duck Brook Path, base of Newport Mountain, north end of Echo Lake.

Branch DIONYCHA

Gnaphosidae (Drassidae)

Drassodinae

DRASSODES Westring

D. NEGLECTUS (Keyserling). Under stones, in warm, open places. Lake Wood, the Hop.

HERPYLLUS Hentz

H. VASIFER (Walckenaer). In houses, rare. Hulls Cove, Bar Harbor.

ZELOTES Gistel

Z. SUBTERRANEUS (C. L. Koch). Taken with *Drassodes neglectus*. Lake Wood.

Thomisidae Crab Spiders

Philodrominae

PHILODROMUS Walckenaer

P. PERNIX Blackwall. West of Lake Wood, heath south of Salisbury Cove, Eden (Northeast Branch), Corfield.

P. RUFUS Walckenaer. Heath south of Salisbury Cove, Hulls Cove, Ocean Drive near the Sand Beach.

THANATUS C. L. Koch

T. COLORADENSIS Keyserling. In unmown fields and roadsides. Hulls Cove, heath south of Salisbury Cove.

TIBELLUS Simon

T. OBLONGATUS (Walckenaer). Swept from grass, the most common member of this subfamily. West of Lake Wood, heath south of Salisbury Cove, Norway Drive, Hulls Cove, meadow east of Newport Mountain.

Thomisinae (Misumeninae)

MISUMENA Latreille

M. VATIA (Clerck). On flowers, common. West of Lake Wood, heath south of Salisbury Cove, Norway Drive, Hulls Cove, Corfield, Ironbound Island.

MISUMENOIDES F. Cambridge

M. ALEATORIUS (Hentz). In similar situations to the preceding species, but much more abundant and widely distributed. Eden (Northeast Branch), Salisbury Cove, heath south of Salisbury Cove, Emery District, west of Lake Wood, Hulls Cove, Burnt Porcupine Island.

TMARUS Simon

T. ANGULATUS (Walckenaer). One specimen. Salisbury Cove.

XYSTICUS C. L. Koch

Owing to the great scarcity, during the summer months, of adult specimens of this genus, the determinations given below are open to question. Immature specimens probably outnumber all other thomisids taken together.

X. FEROX (Hentz). Ironbound Island.

X. GULOSUS Keyserling. Norway Drive, Sand Beach.

X. LIMBATUS Keyserling. Salisbury Cove, Hulls Cove.

X. LUCTANS (C. L. Koch). Ironbound Island.

X. TRIGUTTATUS Keyserling. Indian Point, Eden (Northeast Branch).

Clubionidae

Clubioninae

CLUBIONA Latreille

C. RIPARIA L. Koch. One specimen. Duck Brook Path.

Micariinae

CASTANEIRA Keyserling

C. CINGULATA (C. L. Koch). An ant mimic. One specimen. Hulls Cove.

MICARIA Westring

M. MONTANA Emerton. This also is an ant mimic. Rare. Salisbury Cove.

Salticidae (Attidae)

Pelleninae

PELLENES Simon

P. HOYI (Peckham). Salisbury Cove, Lake Wood.

P. SPLENDENS (Peckham). Heath south of Salisbury Cove.

Heliophaninae

TUTELINA Simon

T. ELEGANS (Hentz). Heath south of Salisbury Cove.

Dendryphantinae

PHIDIPPUS C. L. Koch

P. CLARUS Keyserling. Heath south of Salisbury Cove, Lake Wood.

Sitticinae

SITTICUS Simon

S. PALUSTRIC (Emerton). Meadow east of Newport Mountain.

Salticinae (Marpissinae)

SALTICUS Latreille

S. SCENICUS (Clerck). Usually around houses. Salisbury Cove, Hulls Cove.

LITERATURE

COMSTOCK, J. H. 1913 The Spider Book. Garden City: pp. i–xvi, 1–721, 770 fig.

LEONARD, M. D. 1928 A list of the insects of New York with a list of the spiders and certain other allied groups. Cornell Univ. Agric. Exp. Sta., Mem. 101, pp. 1–1121, map.

PETRUNKEVITCH, ALEXANDER 1928 Systema Aranearum. Trans. Conn. Acad., vol. 29, pp. 1–270.

Class DIPLOPODA Millipedes

The synonymy of our millipedes is still in a state of considerable confusion. Williams and Hefner (1928) have described all of our forms, although not always under the names used here. Blake (1931) gave notes on the distribution of some of the species and some habitus figures and color notes.

Subclass PSELAPHOGNATHA

Polyxenidae

Polyxenus Latreille

P. fasciculatus Say. (Williams and Hefner, 1928, p. 103, fig. 6D; Blake, 1931, cover figure.) Found quite commonly under stones on Bar Island near the bar. This is the most northern known occurrence. Young were found the middle of August, 1931. Males appear to be wanting.

Subclass CHILOGNATHA

Division PROTERANDRIA

Order PROTEROSPERMOPHORA

Polydesmidae

Polydesmus Latreille

P. serratus Say. (Blake, 1931, p. 17, fig. 1.) The denticulation of the carinae is sharp, and noticeable with but slight magnification. The species is found, quite rarely, under logs and stones. Heath south of Salisbury Cove and Corfield. The Mount Desert Region is probably its northern limit.

Pseudopolydesmus Attems

P. canadensis (Newport). (Blake, 1931, p. 18; Verhoeff, 1931, p. 305, figs. 1–7.) The last reference contains much important structural detail. The denticulation of the carinae is very ill-defined and visible only under moderately high magnification. The species is not uncommon under logs in more moist localities than the preceding. Duck Brook Path, Lake Wood.

Order NEMATOPHORA

Trichopetalidae

Trichipetalum Harger

T. lunatum Harger. (Williams and Hefner, 1928, p. 115, fig. 12D; Blake, 1931, p. 18, fig. 1; Verhoeff, 1932, p. 509, pl. 6, figs. 39, 40.) This is a gregarious form living in mats of dead leaves in rather damp situations. It is not certainly known to range any farther north than Mount Desert. The animals are sexually mature in July and August. Duck Brook Path, Lake Wood, base of Newport Mountain.

Order OPISTHOSPERMOPHORA

Julidae

Diploiulus Berlese

D. londinensis (Leach) var. caeruleocinctus (Wood). (Williams and Hefner, 1828, p. 120, fig. 16B.) This introduced species is widely and abundantly distributed in northeastern America. In our Region it is locally common under logs and stones. Corfield, Hulls Cove.

Ophiiulus Berlese

O. pilosus (Newport). (Williams and Hefner, 1928, p. 120, fig. 16A.) This species, also introduced from the Old World, is quite common about dwellings in situations similar to, though slightly damper than, those inhabited by the preceding form. Duck Brook Path, Corfield, Hulls Cove, Ocean Drive.

Paraiulidae

Paraiulus Humbert and de Saussure

P. canadensis (Newport). (Williams and Hefner, 1928, p. 125, figs. 18A, B; Blake, 1931, p. 18, fig. 2.) An inhabitant of thin woods under logs and stones, not common. Lake Wood, Duck Brook Path., back of Sand Beach.

Class CHILOPODA Centipedes

The paper by Williams and Hefner referred to above will furnish a satisfactory introduction to our species. In addition to the two forms named below, two or three other lithobiids and geophilids occur, but have not been determined.

Order LITHOBIOIDA

Lithobiidae

Lithobius Leach

L. forficatus (Linné). (Williams and Hefner, 1928, p. 142.) In our Region a lithobiid exceeding 20 mm. in length, and having the coxal pores of the last pair of legs transversely elongate and arranged in a single row, will belong to this species. Fairly common and generally distributed under stones and logs. Corfield, Hulls Cove, Salisbury Cove, Ocean Drive.

Bothropolys Wood

B. multidentatus (Newport). (Williams and Hefner, 1928, p. 143). The pores of the last pair of coxae are nearly circular and arranged in more than one row. A little smaller than the preceding, much rarer, but found in the same sort of habitats. Base of Newport Mountain.

LITERATURE

Blake, C. H. 1931 Notes on New England millipedes. Bull. Boston Soc. Nat. Hist., no. 60, pp. 15–29, 2 fig. and cover.

Verhoeff, K. W. 1931 Pseudopolydesmus "im Wechsel der Zeiten." Zool. Anz., Bd. 94, pp. 305–318, 7 fig.

——— 1932 Diplopoden-Beiträge. (124. Diplopoden-Aufsatz.) Zool. Jahrb. Syst., Bd. 62, pp. 469–524, 3 pl.

Williams, S. R., and Hefner, R. A. 1928 The millipedes and centipedes of Ohio. Bull. Ohio Biol. Surv., no. 18, pp. 93–147, 26 fig.

CHORDATA

UROCHORDA

Class TUNICATA

Order ASCIDIACEA

The general arrangement and nomenclature of genera and families is that adopted by the Marine Biological Association (1931). The specific names agree with those used by Van Name (1910, 1912). We wish to thank Doctor Van Name for the determination of the specimen of *Synoicum pulmonaria* and the forms associated with it, and for assistance with the nomenclature.

Molgulidae (Caesiridae)

Bostrichobranchus Traustedt

B. pilularis (Verrill). (Van Name, 1912, p. 458, pls. 43, 44, 69, fig. 137, text fig. 1.) On various bottoms in which there is an admixture of sand. Depth, 30 to 65 feet. Stations: D 29, 31, 75, 81, 84, 137, 141, 142; P 10B.

Molgula Forbes (*Caesira*)

M. pannosa Verrill. (Van Name, 1912, p. 484, pls. 47, 48, fig. 25; pl. 71, fig. 148, text fig. 9.) On piles, just about low water mark, abundant. Hartmeyer (1913, p. 105–106) considers this to be *M. siphonalis* M. Sars. Station: S 14.

M. citrina Alder and Hancock. (Van Name, 1912, p. 488, pl. 48, figs. 26–30; pl. 73, fig. 163, text figs. 10, 11.) Common on piles, but dredged rarely to 150 feet. Stations: D 18, 33; S 14.

Pyuridae

Pyura Molina

P. echinata (Linné). (Van Name, 1912, p. 523, pl. 54, figs. 61–65; pl. 70, figs. 143, 144, text fig. 23.) Found adherent to stones, on hard bottom, from low water to 90 feet, usually not common. Taken with ripe eggs August 20, 1927. Stations: 20, 32, 43, 56, 96, 136–138, 145; S 29, 35, 47.

P. OVIFERA (Linné). Sea Potato. (Van Name, 1912, p. 527, pl. 55, fig. 66; pl. 56, figs. 68–70; pl. 67, fig. 133; pl. 70, fig. 145, text fig. 24.) Generally distributed on hard bottoms, from low water (very rarely) to 239 feet. Most common at depths of 75 to 100 feet. Stations: D 7, 19–21, 30, 31, 35, 68, 69, 73, 85, 89, 90, 94–96, 112, 125, 128, 130, 135, 140, 142, 145, 146; S 8, 12. The best stations are 20 and 94.

P. PYRIFORMIS (Rathke) (*aurantia* auctt.) Sea Peach. (Van Name, 1912, p. 532, pl. 55, fig. 67; pl. 56, figs. 71–74; pl. 67, fig. 134, text fig. 25.) Attached especially to the underside of stones or on piles. Primarily a shore form, ranging from low water to 68 feet. Most common at S 47. Stations: D 30, 56, 146; S 9, 18, 24, 47.

Styelidae (Tethyidae)

DENDRODOA MacLeay

D. CARNEA (L. Agassiz). (Van Name, 1912, p. 585, pl. 64, figs. 114–117; pl. 72, fig. 158, text fig. 40.) Attached, chiefly, to shells and stones, depth 20 to 90 feet. Eggs and larvae found August 20, 1927. Stations: D 20, 27, 39, 40, 60, 70, 71, 75, 80, 86, 87, 90, 94, 95, 97, 108, 112, 118, 127, 136–138.

Ascidiidae (Phallusiidae)

ASCIDIA Linné (*Phallusia*)

A. CALLOSA (Stimpson).[1] (Van Name, 1912, p. 599, pl. 66, fig. 129; pl. 72, fig. 156, text fig. 42.) Attached to stones and shells, not uncommon, from low water to 90 feet, most common near low water. Eggs and larvae have been taken through July and August. The largest specimens measured 44 by 30 mm. and 60 mm. Stations: D 20, 27, 39, 40, 43, 56, 71, 80, 95, 101, 107, 108, 112, 125, 145, 147; S 4, 11, 14, 29, 30, 31, 35, 42–44, 47.

[1] The name of this species has been altered to agree with Hartmeyer's (1924, pp. 34, 35, 49, 50) conclusions.—Ed.

Synoicidae

AMAROUCIUM H. Milne-Edwards

A. GLABRUM Verrill. (Van Name 1910, p. 410, pl. 35, fig. 2, text fig. 24.) On shells, *Pyura* stems, *Laminaria* holdfasts, and stones, from shore to 239 feet. Stations: D 91–94, 96, 108, 112, 113, 117, 127, 130, 136–138, 140, 146; S 42.

SYNOICUM Phipps

S. PULMONARIA (Ellis and Solander). (*Macroclinum pomum* Van Name, 1910, p. 396, pl. 38, fig. 8, text fig. 21.) One large specimen attached to a stone, from 90 feet of water, just north of Bald Porcupine Island. This appears to be the first record of the species for New England.

Didemnidae

DIDEMNUM Savigny

D. ALBIDUM (Verrill). (Van Name, 1910, p. 378, pl. 35, fig. 2; pl. 39, fig. 13, text figs. 13–15.) Widely distributed as a white incrustation on all sorts of objects, from the shore to 239 feet. Most abundant at stations which yielded *Pyura ovifera*, arborescent bryozoa, or algae. Stations: Over 40 dredging stations and S 29, 34, 42, 47, 49.

ADELOCHORDA

Class ENTEROPNEUSTA

Order BALANOGLOSSIDA

Harrimaniidae

DOLICHOGLOSSUS Spengel

D. KOVALEVSKY (A. Agassiz). (Spengel, 1893, p. 309, pl. 1, fig. 10; pl. 18; pl. 30, figs. 84–102.) A single specimen from shore station 32 is referred with doubt to this species.

VERTEBRATA

Class PISCES

The fishes of this general region have been quite completely covered by Bigelow and Welsh (1925), and no great number of fishes were taken by the Survey in the deeper waters; in fact, our methods of collecting did not lend themselves particularly well to the capture of fishes. We, however, kept records of such fishes as came under our notice, and we have seen of some of these the eggs or young fishes.

The work which we were able to do on the embryology of *Lophius* has already been published in Part II of the Survey reports.

We were also able to find the eggs of *Cyclopterus*.

To simplify the use of the list by American readers, the book by Bigelow and Welsh has been followed both as to arrangement and nomenclature. It is not, therefore, necessary to give a special reference under each species, since the descriptions and figures can be found in that work under the names used here.

The account of fishes in Die Tierwelt der Nord- und Ostsee by Ehrenbaum et al. (1925–1929) gives a more adequate idea of the modern classification of fishes, and should be referred to by those who are interested in the more complicated system as developed by Regan and others.

Subclass ELASMOBRANCHII

Order SELACHII Sharks

Squalidae

Squalus Linné

S. acanthias Linné. Dogfish. Quite commonly taken on trawls. More frequent inshore in the latter part of the summer.

Order BATOIDEI

Rajidae

Raja Cuvier

R. erinacea Mitchell. Bonnet skate. Taken on trawls. Stations: D 13, 21.

R. diaphanes Mitchell. Spotted skate. Taken with the preceding, apparently more numerous. Stations: D 13, 21.

R. stabuliforis Garman. Barndoor skate. Also with the preceding, but usually not common. Stations: D 13, 21.

Subclass TELEOSTOMI

Order TELEOSTEI

Anguillidae

Anguilla Cuvier

A. rostrata (Lesueur). Eel. In streams and brackish estuaries. Stations: S 10, 25. Very large specimens from Witch Hole Pond.

Poecilidae

Fundulus Cuvier and Valenciennes

F. heteroclitus (Linné). Minnow. Near shore in shallow bays, also in Northeast Branch. Ripe specimens taken the middle of July. Stations: S 6, 10, 15, 25, 35.

Gasterosteidae

Pungitius Costa

P. pungitius (Linné). Nine-spined Stickleback. A few seined in coves with gravel bottoms. Stations: S 6, 9.

Gasterosteus Artedi

G. aculeatus Linné. Three-spined Stickleback. Found in similar situations to the preceding, common at S 9 and 10. Nearly ripe females have been taken the middle of July. Examination of stomach contents showed the specimens at S 9 to have been feeding on *Corophium volutator, Gammarus duebeni*, copepod metanauplii, and fish eggs. Stations: S 6, 9, 10, 20.

Apeltes DeKay

A. quadracus (Mitchill). Four-spined Stickleback. Adult specimens taken commonly on one occasion. Station: S 10.

Syngnathidae

Siphostoma Kaup

S. fuscum (Storer). Pipefish. One specimen, 22 cm. long, taken at surface near Corfield.

Atherinidae

Menidia Bonaparte

M. notata (Mitchill). Silverside. Several taken on one occasion. Station: S 15.

Cottidae

Myoxocephalus Tilesius

M. octodecemspinosus (Mitchill). Longhorn Sculpin. Two specimens, 30 and 45 mm. long, were taken in 47 feet of water, among red algae. The top and sides of the head were red, as were three broad transverse bands on the body. One other was dredged in 55 feet of water. Stations: D 3, 62.

Agonidae

Aspidophoroides Lacepède

A. monopterygius (Bloch). Alligatorfish. One young adult, 85 mm. long, taken on rock bottom, in 69 feet of water.

Cyclopteridae

Cyclopterus Artedi

C. lumpus Linné. Lumpfish. One large male guarding its eggs was taken June 25, 1926, just below low water, from the piles at the Eastern Steamship Company pier at Northeast Harbor. Young from 6 to 20 mm. long were taken adhering to floating *Laminaria,* middle of June to middle of July. Stations: D 1, 72, 75; S 4, 6, 24, 39.

Triglidae

Prionotus Lacepède

P. carolinus (Linné). Sea robin. A specimen 32 cm. long was taken in Frenchmans Bay, September, 1931.

Blenniidae

Pholis Artedi

P. gunnellus (Linné). Butterfish. Quite common under stones and among algae, near low water. Two specimens dredged in 30 and 58 feet of water. Stations: D 35, 80; S 1, 2, 11, 14, 35.

Zoarcidae

Lycenchelys Gill

L. verrillii (Goode and Bean). Wolf eel. One specimen, 92 mm. long, taken on mud bottom, 130 feet. Station: D 1.

Gadidae

Gadus Artedi

G. callarias Linné. Cod. Two specimens taken on trawl. Stations: D 13, 21.

Melanogrammus Gill

M. aeglifinus (Linné). Haddock. One taken on trawl. Station: D 21.

Urophycis Gill

U. tenuis (Mitchill) Hake. One taken on trawl. Station: D 21.

Pleuronectidae

Pseudopleuronectes Bleeker

P. americanus (Walbaum). Flounder. Seined, sometimes abundantly. Most of the seined specimens were 30 to 42 mm. long, about the middle of July. A 16-cm. specimen had been feeding on *Corophium volutator*. Specimens 31 to 35 mm. long had 55 rays in the dorsal fin and 39 in the anal. Stations: S 9, 10, 15.

Lophiidae

Lophius Artedi

L. piscatorius Linné. Goosefish. Our experience with the eggs and young larvae of this fish has already been recorded in Part 2 of the Survey.

LITERATURE

Bigelow, H. B., and Welsh, W. W. 1925 Fishes of the Gulf of Maine. Bull. Bur. Fish., vol. 40, part 1, pp. 1–567, 278 fig.

Ehrenbaum, Ernst et al. 1925–1929 Vertebrata. XII c–h. Pisces. Tierwelt Nord- Ostsee, Teil 12 c, pp. 1–104, 1 pl., 20 fig.; Teil 12 e, pp. 1–66, 44 fig; Teil 12 f, pp. 1–86, 24 fig.; Teil 12 g, pp. 1–148, 115 fig; Teil 12 h, pp. 1–164, 117 fig.

Hartmeyer, R. 1923 Ascidiacea. (Part I.) Danish Ingolf-Exped., vol. 2, part 6, pp. 1–365, 1 pl.

——— 1924 Ascidiacea. (Part II.) Danish Ingolf-Exped., vol. 2, part 7, pp. 1–275.

Marine Biological Association 1931 Plymouth Marine Fauna. Plymouth: ed. 2, pp. 1–371, 1 chart.

Spengel, J. W. 1893 Enteropneusten. Fauna Flora Neapel, monogr. 18, pp. i–xii, 1–757, 37 pl.

Van Name, W. G. 1910 Compound ascidians of the coasts of New England and neighboring British provinces. Proc. Boston Soc. Nat. Hist., vol. 34, pp. 339–424, 6 pl., 25 fig.

——— 1912 Simple ascidians of the coasts of New England and neighboring British provinces. Proc. Boston Soc. Nat. Hist., vol. 34, pp. 439–619, 31 pl., 43 fig.

THE BRYOZOA OF THE MT. DESERT REGION

RAYMOND C. OSBURN
Ohio State University

The region about Mt. Desert Island, off the coast of Maine, is of special interest in the study of this group, since it lies intermediate to localities in which the Bryozoa have been given considerable attention. The long stretch of coast known as the Gulf of Maine, reaching from Cape Cod to Nova Scotia, has been but little studied as far as this group is concerned, though some of Packard's and Verrill's records extend into this region.

To the northward Stimpson (1853) made the first records, and in his ''Marine Invertebrata of Grand Manan'' listed sixteen species of Bryozoa. Eleven of these were described as new, but only three of these are now recognized, the others being synonyms. Dawson, in 1859 and 1865, listed twenty-two species from the Gulf of St. Lawrence, describing three as new, one of which remains. Packard followed, in 1863 and 1867, with short lists of species from Labrador and Maine. Hincks, in 1888, 1889, and 1892, contributed three short papers on the ''Polyzoa of the St. Lawrence,'' in which he listed twenty-eight species, four of them new. Whiteaves, in his ''Catalog of the Marine Invertebrates of Eastern Canada'' (1901), recorded 119 species known in that region, but some of these are no longer considered good species. Cornish (1907) listed thirty-one species as occurring at Canso, Nova Scotia, and Osburn (1912 a) noted fifty-two species in the collections made by Owen Bryant in the waters of Labrador, Newfoundland, and Nova Scotia.

In the southern New England region Desor (1848) mentioned a few species from about Nantucket Island, and Leidy (1855) recorded eight from Rhode Island and New Jersey. Verrill (1874) reported thirty-two species in his

"Report on the Invertebrate Fauna of Vineyard Sound," and subsequently (1879), listed about 140 species for the whole of the New England and southern Canadian coasts. Many of the species of this list, however, are of doubtful validity or doubtful occurrence. Nickerson (1898) described a new species of *Loxosoma* from southern Massachusetts. Osburn (1912) listed eighty-one species and varieties in the region about Woods Hole, Massachusetts, as a result of intensive colecting for several years in a limited area.

The present paper deals with eighty-three species and a few additional varieties of Bryozoa collected in the course of six summers (1926 to 1931) by the Biological Survey of the Mount Desert Region, under the direction of Mr. William Procter. The work of collecting and separating the species was tentatively done by Dr. Henry C. Tracy, and all of the material has been forwarded to the writer by Mr. Procter for study. The author is further indebted to Mr. Procter for the notes on the region contained in the following paragraph.

Mount Desert Island is in the extreme northeastern part of the United States, Latitude 44° 20′, Longitude 68° 20′. It comprises about 100 square miles of exceedingly varied terrain, with mountain peaks over 1000 feet in height, numerous lakes and swamps, incised by 'creeks' and fjords, some of them several miles long. The very irregular shore line is bordered by mud flats, swamps, and cliffs, one of the latter being the highest headland on the Atlantic coast. Outside of the Island are numerous smaller islands and reefs, offering some protection from the open sea; on the east is Frenchmans Bay, with many reefs and islands, and on the west is Western Bay. The Island is separated from the mainland by the 'Narrows.' The climate of the Island has a July average of 65°F., a January average of 24°F., and a yearly average of 43°F. The water temperature average for the six years, during July and August, was 58°F. at the surface and 48½°F. at the bottom. The strong 10-foot tides naturally tend to equalize the water temperatures to some extent. The bottom is exceedingly variable, ranging all the way from solid rock to shifting silt and black mud. There are swift tide runs in many places, deep tide pools on the rocky outer shores, and placid protected coves on the inner side of the Island. All of this naturally makes for great variety in the life of the region. Zoögeographically the fauna falls naturally and strictly into the Acadian Division.

All of the collections were made in shallow water, the greatest depth at which dredgings were made being only 330 feet, or just down to the 100-meter line. Also, they were all close to land, none of them being more than 4 miles off shore and none more than 6 miles from Mount Desert Island. The region studied was therefore a very limited one.

As might be expected, practically all of the eighty-three species of Bryozoa occur in Canadian waters, only five of the present list not being known to occur north of Mt. Desert Island in American waters. These are:

Hippodiplosia americana (Verrill)
Cryptosula pallasiana (Moll)
Smittina novanglia n.sp.
Alcyonidium parasiticum (Fleming)
Buskia armata (Verrill)

Of the present list, twenty-three species have not been known to occur south of Canadian waters, though their presence in the colder waters of the Gulf of Maine might be expected. These species whose range has been extended southward in this study are:

Barentsia gracilis (Sars)
Tubulipora lobulata (Hassall)
Diplosolen obelium (Johnston)
Oncousoecia canadensis n.sp.
(= Stomatopora diastoporides, Whiteaves, pars)
Diaperoecia harmeri n.sp.
(= Entalophora clavata, Cornish ?)
Pyripora catenularia (Jameson)
Amphiblestrum trifolium (S. Wood)
Callopora dumerilii (Audouin)
Hippothoa expansa Dawson

Escharoides rosacea (Busk)
Posterula sarsi (Smitt)
Stomachetosella producta (Packard)
Hippodiplosia reticulatopunctata (Hincks)
Hippodiplosia smitti (Kirchenpauer)
Hippoponella hippopus (Smitt)
Smittina bella (Busk)
Mucronella abyssicola (Norman)
Mucronella spinulifera Hincks
Rhamphostomella radiatula (Hincks)
Rhamphostomella scabra (Fabricius)
Porella skenei (Ellis and Solander)
Porella plana Hincks
Alcyonidium mamillatum Alder

In Osburn's list of about eighty species from the Woods Hole Region (1912) there are twenty-three species not found in the present list. These are chiefly species of more southern distribution, which find Cape Cod their northern limit. A few of them, however, occur farther north and may be looked for in the future about Mt. Desert Island.

Four species are described as new. One of these, *Oncousoecia canadensis* n.sp., has been confused with *O.* (*Stomatopora*) *diastoporides* Norman by Hincks, Norman, and Whiteaves, and Canadian records for *diastoporides,* at least in part, refer to it. Another, *Diaperoecia harmeri* n.sp., has been listed as *Entalophora clavata* Busk by Cornish, without much question. A third, *Smittina reduplicata* n.sp., was confused with *S.* (*Porella*) *concinna* Busk by Osburn and probably by other writers on New England and Canadian Bryozoa. The fourth, *Smittina novanglia n.sp.,* has been separated from *S.* (*Porella*) *bella* Busk.

The illustrations for this paper were, for the most part, made by Dr. S. J. Conrad, and were completed before the collection came into my hands for study. Miss Mary D. Rogick, my assistant, has contributed some additional drawings in ink, especially of details of structure. Three others, done by Mr. Howard J. Shannon, for the Bryozoa of Woods Hole, are repeated here.

BRYOZOA Ehrenberg, 1831

Subclass ENTOPROCTA Nitsche, 1869

Pedicellinidae Johnston, 1847

PEDICELLINA M. Sars, 1835

PEDICELLINA CERNUA (Pallas), 1771. (Osburn, 1912, p. 213, for synonymy and American records.) Common on stones at the Nubble at the entrance to Bunkers Cove. A few specimens show the spines on the stalk of calyx, but for the most part they appear to represent the nominal variety *glabra*. This species is common to the southward and Cornish found it at Canso, Nova Scotia, but it has not been recorded farther northward on the American coast.

BARENTSIA Hincks, 1880

BARENTSIA MAJOR Hincks, 1888. (Hincks, 1888, p. 226, Gulf of St. Lawrence; Jullien and Calvet, 1903, p. 27 (*B. elongata*), Grand Banks of Newfoundland; Osburn, 1912, p. 213, Woods Hole, Mass.) A single small colony was observed in the material sent for examination, but this and the following species were noted without separation by the collector from shore station 11 and dredge stations 27, 67, 83, and 135.

Hincks (l. c.) described this species from the Gulf of St. Lawrence. It was found to be fairly commonly distributed around Woods Hole, though never in very large numbers. It is easily recognized by the large calyx and the elongate imperforate stalks which taper slightly downward toward the enlarged base, which joins directly with the stolon without any change in size.

BARENTSIA GRACILIS (Sars), 1835. (Whiteaves, 1901, p. 114, on the authority of Hincks from the Gulf of St. Lawrence; Cornish, 1907, p. 79, Canso, Nova Scotia.) Several colonies were found on a pebble without a station number, and, as indicated under the previous species, it may occur at several places about the Mt. Desert Island Region. The specimens show a great deal of variation. Some of the stalks are short and unjointed, others very long with 1 or 2 muscular joints of varying degrees of development. No spines were observed. Harmer, 1915, "Polyzoa of the Siboga Expedition," part 1, p. 27, gives a very full synonymy and discussion of the species.

It is widely distributed in northern seas, Spitzbergen, and Greenland, southward to the coast of France. The present record is the farthest south the species has been noted in American waters.

Subclass GYMNOLAEMATA

Order CYCLOSTOMATA Busk, 1852

Crisiidae Johnston, 1847

Crisia Lamouroux, 1812

Crisia eburnea (Linnaeus), 1758. Pl. 1, figs. 3, 4; pl. 4, fig. 3. (Osburn, 1912, p. 215, for records and references; Whiteaves, 1901, p. 109, for Canadian records.) This common and well-known species is abundant, and was taken at twenty stations. Its distribution is cosmopolitan. On the eastern coast of North America it has been noted from Greenland to the Chesapeake Bay.

It is very difficult to distinguish the species of this genus except by the characters of the ooecium, and many of the earlier records are questionable. The growth habit of *C. eburnea* is different from that of the following species, being more sprawling and the branches noticeably incurved.

Crisia cribraria Stimpson, 1853. Pl. 1, figs. 1, 2, 10; pl. 4, fig. 2. (Osburn, 1912, p. 215, for references, synonymy, occurrences, and description.) Common at all depths which afford proper attachment, on shells, bryozoan stems, etc., and often associated with *C. eburnea.* It has a stiffer habit of growth than *eburnea,* from which it may be positively separated by the ooeciostome which is transversely elongated and flared outward, while that of *eburnea* is slightly sinuated on the anterior border and not at all flaring.

Apparently this is a species of American waters in the north Atlantic. At any rate, it is at present known only from Cape Cod to Cape Sable, Nova Scotia.

Oncousoeciidae Canu, 1918

"Stomatopora diastoporides"

Various species have been confused under the name *diastoporides* on the American side of the Atlantic as they have on the European side. This is due to the fact that older workers paid little attention to the ooceia and attempted to draw their descriptions from the zoaria. In more recent years, we have learned that the zoarial form may vary widely in this group and the only certain criteria are those of the ovicell and its aperture, the ooeciostome. This, in fact, holds good for most of the Cyclostomata.

At least three northern species on the American coast are included under the name *diastoporides* in former reports of those who have worked on Canadian and New England Bryozoa, and are here separated on the basis of the ooecia, which are so striking as to leave no doubt of their distinctness. After having determined the species on ooecial characters, it is possible to note certain zoarial and zooecial characters by which they may be separated without much doubt when oeecia are lacking.

Since it appeared necessary, in order to straighten out the tangle, to compare the American species with type and other named material from European waters, specimens were sent to Dr. Anna B. Hastings, of the British Museum of Zoölogy, who kindly undertook the work of comparison and made an exhaustive report (in litt.). I desire to express my thanks for this work, without which the following analysis of these species would have been impossible.

Oncousoecia diastoporides (Norman), 1868. Pl. 2, figs. 5–8. (*Alecto*, *Stomatopora*, and *Diastopora diastoporides* auctt.; Osburn, 1912, p. 218, *Stomatopora*.) The only positive previous record for the eastern coast of North America is the one above, by Osburn, for more by accident than otherwise the species from Woods Hole, Mass., was correctly identified. Specimens preserved in the author's collection have been carefully restudied, and some of them referred to the British Museum for comparison. It is quite possible that it has been recorded under other names by former authors. Whiteaves (1901, p. 110) lists it as common in the Gulf of St. Lawrence, but specimens in the British Museum from Canada, in both Hincks' and Norman's collections, belong in part to the new species described below, according to Miss Hastings, who has furnished me with the following notes concerning the species:

"The holotype from Shetland unfortunately has no ooecia, but there are ovicelled colonies from Shetland in the Norman Collection, which I take it can be regarded as paratypes. They include the one figured by Hincks (1880, Brit. Mar. Pol., pl. 63, fig. 4)."

The species appears as a simple fan-shaped or lobulated incrustation on stones and shells. The layer is only moderately thick, and usually two rows of incomplete zooecia appear distally to the youngest mature ones. The horizontal portion of the tubule is punctured, though in older specimens the punctures may be covered by a secondary layer of calcification. The average width of the horizontal tubules is about 0.32 mm., and the zooecial aperture measures about 0.15 mm. The ooecia resemble the zooecia rather closely, but are slightly more swollen and more thickly punctured. Often several of them appear in one colony. The ooeciostome is about one-half the diameter of the zooecial aperture (about 0.08 mm.), much less prominent than the erect portion of the tubule, and near the distal end of the zooecium, which appears to slope away from it. No doubt the general similarity of the ooecium to the zooecia has prevented its earlier discovery, though they are distinct enough, and Miss Hastings has discovered it on the specimen from Shetland which was figured by Hincks (B. M. P., pl. 63, fig. 4) from a specimen in the Norman Collection. Miss Hastings writes, "Your discovery of the ovicells of *S. diastoporides* finally disposes of Smitt's suggestion (K. svensk. Vet. Akad. Forh., 1871, p. 1117) that *Mesenteripora meandrina* Wood is the full-grown state of *S. diastoporides*."

The species is common in the region about Mt. Desert Island, at all depths down to 100 meters, on stones and shells, and was noted at twenty-three different stations. In my collection the species is otherwise represented by specimens from the Gulf of St. Lawrence (J. F. Whiteaves, 1873), from Crab Ledge off Cape Cod, from United States Fisheries Station 68, and off the Isles of Shoals (Str. Bache, 1874). The last specimen bears the label '*Diastopora hyalina* (Flem.) Smitt,' presumably in Verrill's writing.

This species is here placed in the genus *Oncousoecia* Canu, 1918. "The ovicell is a dilation of the entire visible part of the tube. The ooeciostome is not turned toward the base." While the conception of the genus is good, Canu was most unfortunate in his selection of the genotype '*Tubulipora lobulata* Hincks." In his description of the genus, Canu had in mind the ooecium shown in Hincks figure 5 (British Marine Polyzoa,, pl. 61), which he reproduces. Now Doctor Hastings writes that "Hincks expressly states that he based his description on material from the Isle of Man and drew figure 4 of plate 61 from that locality, but he drew figure 5 from a specimen from Shetland in the Norman Collection, which proves on examination to be specifically distinct. In my opinion it is to be identified with *Alecto dilatans* Thomson (Johnston, 1847, British Zoophytes, ed. 2, p. 281)." *A. dilatans* Thomson should therefore stand as the genotype of *Oncousoecia* Canu.

Doctor Hastings' study of the genotype specimen necessitates a short addition to Canu's description. "The fertile zooecium originates in its normal place in the series of zooecia and the proximal portion of the part visible is indistinguishable in shape, position and pores from an ordinary zooecium. This part is short and the greater part of the visible portion is dilated and closely punctate, with a rather flat frontal surface. The fertile zooecium is a good deal longer than an ordinary zooecium and thus extends distally beyond the point at which an ordinary zooecium would have opened. The ooeciostome is terminal. It is a circular tube directed upwards and may be attached to the peristome of a neighboring zooecium, but not always. The ovicell may terminate in short branches occupying the hollows between the zooecia distal to it, but the great part of the dilated portion is unbranched.''

Hincks mistook the ooeciostome and evidently 'schematized' his drawing of his figure 5 somewhat. Miss Hastings has sent me a correct drawing of the same ovicell which Hincks drew, which shows the ovicell somewhat irregular in form distally and the ooeciopore at one side, instead of in the middle, as Hincks drew it. He evidently took the small central zooecial orifice for the ooeciopore. Miss Hastings' drawing is reproduced herewith (pl. 2, fig. 9) in correction of the error.

Oncousoecia canadensis n.sp. Pl. 2, figs. 1–4. Zoarium a flabellate or irregularly lobulate incrustation, much thinner than *diastoporides*. The tubules are thin-walled and are definitely punctured. They are more slender (average width about 0.18 mm.) than those of *diastoporides,* which they somewhat resemble, and never more than one row of incomplete zooecia appear at the margin. The erect portions of the tubes are short and thin-walled, and the apertures measure about 0.095 mm. in diameter. The ooecia are like small, thin-walled blisters. The fertile zooecium arises in the same manner as the infertile ones, but soon expands both frontally and laterally, and the adjacent tubes appear as if separated by the growth of the ooecium. In one case, the expansion is cordate in outline and does not extend beyond the ooeciopore, but in the other ovicelled specimen a lobe of the expansion extends distally on either side of the ooeciopore for some distance. The ooeciopore opens between, but not close to the apertures of the adjacent tubules. The ooeciopore is rounded or slightly elliptical transversely, only slightly raised above the general level, and measures 0.06 mm.

Seven specimens are in my possession. Three of these bear the data 'Gulf of St. Lawrence, J. F. Whiteaves, 1873.' Two others, given me by Verrill some 25 years ago, were labeled '*Stomatopora diastoporides*, Norman, Canada.' Another is from the Bay of Fundy, 'U. S. Fish Com., 1873.' The seventh specimen is from Mt. Desert Island (station not indicated). All of the specimens encrust shells, except the one from the Bay of Fundy, which was on a pebble. Doctor Hastings adds the following records from the British Museum: Gulf of St. Lawrence, Whiteaves, Norman Collection, and Gaspé, Hincks Collection, both with ovicells and both labeled '*Stomatopora diastoporides.*' Miss Hastings further writes, "So far I have not found a specimen from anywhere but Canada. It seems clear that it is the *S. diastoporides* of Whiteaves' paper." However, as the true *diastoporides* also occurs in the Gulf of St. Lawrence (I have a specimen labeled 'J. F. Whiteaves, 1873'), it is more probable that Hincks and Norman, who identified Whiteaves' material, did not recognize the present species as different.

Diaperoeciidae Canu, 1918

Diaperoecia Canu, 1918

Diaperoecia harmeri n.sp. Pl. 3, figs. 6–8; pl. 4, fig. 1. (? Cornish, 1907, p. 78 (*Entalophora clavata*), Canso, Nova Scotia.) Common on hard bottom, at 40 to 240 feet, attached to various objects, but especially to algae and hydroid and bryozoan stems.

The zoarium begins as an incrustation, but soon becomes erect and free in the form of an irregularly rounded stem with tubules projecting from all sides. Frequently the stems are branched and often more than one stem rises from the basal portion. The erect stems are about 4 to 6 mm. in height. The upper part of the stem is slightly curved or deflected, while the expansion of the ooecium on the side of the greater curvature gives the upper part a somewhat clavate appearance in side view. The free portion of the zooecial tubes is rather long, frequently as long as the breadth of the stalk, and irregularly corrugated. The apertures measure about 0.11 mm. in diameter. The ooecium rises in the position of an ordinary zooecium, about half way up the stem, and expands gradually for about half of its length, then, as it reaches the upper part of the stem, it widens rapidly and irregularly between the other tubules. Its exposed portion is distinctly swollen or obese in appearance. The ooeciopore is terminal or nearly so, closely associated with and partly surrounding the base of one of the projecting tubules. It usually appears as a lunate opening at the same level with the ooecial wall, or somewhat indented into the wall of the related zooecial tubule. In only one case of the many examined was the ooeciopore separated from a tubule, and in this case the ooeciopore was rounded. The other characters were so similar that I call attention to it for the present merely as a variant form.

I also have specimens from Georges Bank and from off Cape Sable. The species which Cornish listed as *Entalophora clavata* Busk is probably this form. Miss Hastings writes: "I cannot find any specimen of *Entalophora* agreeing with yours in our collection." There have been many species described in *Entalophora* which are unidentifiable, as they were based on zoarial characters. The present species may be one of these, but as it is impossible to know with certainty, it is described and named as new, and may be known from the ooecial characters, upon which we must depend for definite identification.

I take great pleasure in naming this species in honor of Sir Sidney F. Harmer, former Director of the Natural History Departments of the British Museum, who has contributed so greatly to our knowledge of the Bryozoa, and especially to our understanding of the nature of reproduction and the ovicell in the Cyclostomata.

Diplosolen Canu, 1918

Diplosolen obelium (Johnston), 1838. Pl. 1, fig. 7. (Whiteaves, 1901, p. 112 (*Diastopora*), Gulf of St. Lawrence.) Taken only once, near Egg Rock, on rocky bottom, at 80 feet (dredging station 20). It is a widely distributed species; the writer has examined specimens from Hudson Strait and various places on the New England coast north of Cape Cod;

Jullien and Calvet (1903, p. 163) recorded it from the Grand Banks of Newfoundland; Canu and Bassler (1928, p. 62) have noted its presence north of Cuba, and on European shores various authors have recorded it from the Mediterranean to the Arctic Ocean.

It may be readily identified by the presence of small vestigial (?) tubes interspersed among the normal ones and by the ooecium, which appears like a rounded or oval blister-like inflation on the surface of the colony, always surrounding a few zooecial tubes.

Tubuliporidae Johnston, 1838

Tubulipora Lamarck, 1816

Tubulipora flabellaris (Fabricius), 1780. Pl. 2, fig. 10; pl. 5, fig. 1. (Osburn, 1912, p. 218, for records and references.) Common on hard bottoms; taken at a few shore stations, especially on algae. When growing on hydroid stems the colonies are highly irregular in form. Collected at five shore stations and nineteen dredging stations. The species is common and widely distributed in northern waters on both sides of the Atlantic.

The zooecial tubes are elongate and rather irregular in distribution. The ooecium is an irregular lobate inflation among the bases of the erect tubules. The ooeciostome is a narrow slit-like opening at the end of a shorter erect tubule which is about half the size of the ordinary tubule and is sometimes twisted.

Tubulipora liliacea (Pallas), 1766. Pl. 2, fig. 11. (Osburn, 1912, p. 217, for references and synonymy; Whiteaves, 1901, p. 111, for Canadian records.) A single specimen from an unnumbered station had an ovicell sufficiently developed for identification. The species is widely distributed on both sides of the Atlantic.

This form usually grows attached to the stems of hydroids and other Bryozoa and occasionally on shells. The outline of the colony is very irregular as a rule. The erect portions of the tubules are tall and often connate in series, though they may be distinct. The ooecium is very irregular in form and distributed among the bases of the erect portions of the tubules. The ooeciostome opens sidewise at the end of a short tube which is about the size of the ordinary tubes.

? TUBULARIA LOBULATA (Hassall), 1841. Pl. 1, fig. 9; pl. 3, figs. 1–5. (Whiteaves, 1874, p. 6; 1901, p. 111, Gulf of St. Lawrence.) Whiteaves' material was identified by Norman, who considered the *T. lobulata* of Hincks as distinct from the *T. lobulata* of Hassall, according to Dr. Anna B. Hastings (in litt.). However, as Norman had a specimen of this same species in his collection labeled '*D. diastoporides,*' it might appear that neither he, nor Hincks, nor anyone else for that matter, knew any too much about it. Miss Hastings has gone carefully over our material, comparing it with that in the British Museum, and has come to the conclusion that "it is likely that it is *T. lobulata* Hassall." We can give a detailed account of the ooecium and some other notes from our American material which may be of use.

Zoarium a simple fan-shaped or somewhat lobulated incrustation on stones and shells. The crust is thick, much thicker at the middle, and three or four rows of incomplete zooecia appear successively in a graded series beyond the developed zooecia. The zooecial walls are heavily calcified, the erect portions of the tubes thick, and there is no evidence of puncturing of the walls, except slightly in the earliest zooecia of the colony. The zooecial apertures appear to vary greatly, but on the average measure about 0.16 mm. in diameter. The ooecia are quite irregular in outline, usually bilobulate, but sometimes transversely elongated, and distinctly flattened or even depressed on the frontal surface. Its surface is distinctly punctured. The ooeciostome is much smaller than the zooecial aperture, rounded, only slightly raised, and usually, if not always, located close beside a zooecial tube. Its wall is somewhat thickened and the aperture measures about 0.07 mm. in diameter.

At Mt. Desert Island the species occurs rather uncommonly on stony bottoms, but was taken at fifteen stations. Whiteaves' specimens were dredged at Metis and Gaspé, in the Gulf of St. Lawrence.

IDMONEA Lamouroux, 1821

IDMONEA ATLANTICA Johnston, 1847. Pl. 1, figs. 5–6. (Osburn, 1912, p. 217 (*Tubulipora*), for synonymy and references; 1912 a, p. 276, Browns Bank off Cape Sable, Nova Scotia; Whiteaves, 1901, p. 111, for Canadian records.) Common on hard bottoms and taken at thirteen stations. The species is widely distributed in both European and American waters.

The zoarium is erect and spreading and branched dichotomously in an irregular fashion, as much as an inch in height. The zooecia are arranged in series of usually 3 to 5 in parallel rows on the frontal surface of the branch, which is triangular in cross section. The ooecium is an irregular inflation of the middle of the frontal surface between the rows of tubules, usually beginning below a bifurcation and extending up both branches. The ooeciostome is somewhat trumpet-shaped and is turned sidewise at the end of short tube, which is adnate for most of its length to one of the ordinary tubes.

Lichenoporidae Smitt, 1866

LICHENOPORA Defrance, 1823

LICHENOPORA VERRUCARIA (Fabricius), 1780. Pl. 1, fig. 8. (Osburn, 1912, p. 219, synonymy and records; 1912 a, p. 276, off Cape Sable; Whiteaves, 1901, p. 113, for Canadian records.) Common on stony shores and bottoms, particularly in shallow water, most frequently attached to algae. Noted at nine shore stations and twenty-seven dredging stations. A very common northern species, in the Arctic Ocean and on both European and American shores.

The colony is discoidal and small, less than ¼-inch across, and is attached by a short central stalk or base. The ovicell is an inflation of the central portion of the disc. The ooeciostome is a large trumpet-shaped expansion at the end of a short tubule which is considerably larger than the ordinary zooecial tubes.

Lichenopora hispida (Fleming), 1822. (Whiteaves, 1901, p. 112, synonymy and Canadian records; Verrill, 1875, p. 414 (*Tubulipora hispida* + *T. crates* Stimpson), from Jeffrey's Ledge (Stimpson's record for *T. crates* is from the Bay of Fundy.) Two colonies were taken at station 50. It is a very widely distributed species, found on both shores of the Atlantic, from the Arctic Ocean to Florida and the Mediterranean, and in the Pacific as far south as the Strait of Fuca.

The frontal surface of the zoarium is perforated by small irregular pores which, under higher magnification, appear stellate from the presence of small projections from the periphery of the pore.

Order CHEILOSTOMATA Busk

Suborder ANASCA Levinsen, 1909

Division I, Inovicellata Jullien, 1888

Aeteidae Smitt, 1867

Aetea Lamouroux, 1812

Aetea anguina (Linnaeus), 1758. Pl. 15, fig. 12. (Osburn, 1912, p. 220, for New England records.) Apparently rare, only two small colonies being observed, both on algae attached to a pebble, dredging station 55.

The species is found almost all over the world, in both cold and warm seas. It is a stolonate form, growing over the stems of hydroids, algae, and Bryozoa, and occasionally on stones and shells. The zooecium consists in part of an enlargement of the stolon and from this arises an erect tubular portion which is slightly enlarged toward the upper end with a flat, membranous area on one side. The stalk is annulated and the swollen portion of the stonon minutely punctate. There is no ovicell, but eggs are held for a time at least in temporary membranous capsules at the dorsal side of the aperture.

Division II, Malacostega Levinsen, 1909

Gemellariidae Busk, 1859

Gemellaria Van Beneden, 1845

Gemellaria loricata (Linnaeus), 1758. Pl. 4, figs. 5–6; pl. 7, fig. 1. (Osburn, 1912, p. 221, for synonymy, references, and records; Whiteaves, 1901, p. 91, for Canadian records.) Common on hard bottoms, dredged at eighteen stations. The species is circumpolar in distribution, extending southward along coasts. In North American waters it occurs to a short distance south of Cape Cod on the east coast and to Vancouver Island on the west coast.

It is a rather delicate, erect, flexible, and much-branched species. The colony form seems to vary a good deal, sometimes being only a couple of inches high and rather shrubby in appearance, under other conditions growing to a height of 6 or 8 inches and more flexible. The individuals are placed in pairs, back to back, a flattened membranous area occupies a large part of the ventral side and there are no avicularia, ooecia, or spines. (It may be noted here that in a variety, var. cornuta Osburn, of this species from Hudson Bay the upper outer corners of the zooecium are continued into short curved processes.)

Eucratiidae Hincks, 1880

Scruparia Oken, 1815

Scruparia clavata Hincks, 1857. Pl. 15, fig. 11. (Osburn, 1912, p. 221; Whiteaves, 1901, p. 92.) Not common, but dredged at stations 27, 52, 93, 94, 135, 147, on hard sand and hard mud bottoms, among algae, hydroids, and other bryozoans. It ranges from the Gulf of St. Lawrence to Cape Cod and about the British Islands.

A delicate branching form spreading among hydroids, delicate seaweeds, etc. The individuals are in two series, back to back and alternating. The reproductive individuals are much reduced in size and the ooecium is perforated with rather large pores. The zooecia are sometimes uniserial, or the infertile zooecia may be so placed that the fertile zooecia are back to back against them.

Electrinidae d'Orbigny, 1851

Electra Lamouroux, 1816

Electra pilosa (Linnaeus), 1766–1768. Pl. 6, fig. 1. (Osburn, 1912, p. 228 (*Membranipora*), for synonymy and references; Whiteaves, 1901, p. 95, for Canadian records.) Rather common at shore stations and occasionally in dredgings, especially encrusting algae, more commonly as the nominal form *dentata* with short spines. Taken at eighteen stations. Cosmopolitan.

This well-known Bryozoan may be distinguished by the absence of avicularia and ooecia and by the presence of long spines about the margin, one of which, below the proximal part of the aperture, is much larger than the others. When growing on flat surfaces, as the fronds of *Laminaria,* the spines may all be short (form *dentata*). On small stems or the edges of fronds the spines reach their maximum development and the central spine especially may occasionally be several times as long as the zooecium. The frontal area of the zooecium below the aperture is conspicuously perforated. The species grows very profusely and colonies are often several square inches in area.

Electra monostachys (Busk), 1854. Pl. 15, fig. 13. (Osburn, 1912, p. 227 (*Membranipora*), for synonymy and references.) Very abundant in dredgings on hard bottom and occasionally at shore stations, noted at thirty stations. It is a common North Atlantic species and has been recorded several times from the Arctic Ocean, but apparently it is more common at intermediate temperatures. It appears somewhat strange that earlier authors, Stimpson, Packard, Verrill, and Whiteaves, did not record it, but perhaps it was confused with the following species, which in its branching state it somewhat resembles.

Usually in form of radiating colonies on shells, stones, and the broader algae. As a rule, it has a single stout median spine and occasionally delicate spines along the lateral border of the aperture. The frontal area of the zooecium below the aperture is usually very minutely punctate, though sometimes this is covered over by a secondary calcification and may appear rugose. No ovicells nor avicularia.

PYRIPORA d'Orbigny, 1852

PYRIPORA CATENULARIA (Jameson), 1814. Pl. 14, figs. 3–4. (Whiteaves, 1901, p. 96, for synonymy and references.) Taken at stations 1, 4, 29, 39, 43, 48, 55, 58, 64, and 69; not uncommon on pebbles. It is a North Atlantic species, occurring as far north as Spitzbergen and Greenland and southward to the Mediterranean. On the American coast it has not been recorded south of Cape Cod.

Spreading in loosely arranged colonies over pebbles and shells. Zooecia usually arranged in a single series, but frequently these series coalesce into branches with 2 or 3 or more series of zooecia. In general, the species resembles the preceding, but the base of the zooecium below the aperture is much more prolonged and often distinctly narrowed and is imperforate and distinctly rugose and is without spines. Lateral branches are frequently given off at right angles.

Alderinidae Canu and Bassler, 1927

CALLOPORA Gray, 1848

CALLOPORA AURITA (Hincks), 1877. Pl. 6, figs. 2–3. (Osburn, 1912, p. 230 (*Membranipora.*) Not at all common. Apparently this species is more limited in its temperature range than most other northern Bryozoa, though I have seen a specimen from Hudson Strait. It has not been recorded from Greenland nor from the more northern coasts of Europe, nor does it seem to enter the warmer waters of subtropical regions. On the North American coast it is best developed about Cape Cod.

When ooecia are present the species is usually easy to distinguish by the paired avicularia placed at the sides of the aperture pointed forward. The ovicell bears a triangular area on its front when fully calcified. Infertile zooecia are often quite irregular and possess a single avicularium near the base of the zooecium pointed backwards. A pair of small spines, one on each side of the aperture just back of the operculum; often one of these is smaller than the other or may be absent.

Callopora craticula (Alder), 1857. Pl. 6, fig. 4. (Osburn, 1912, p. 229 (*Membranipora*), for references and synonymy; 1912 a, p. 278 (*Membranipora*), Labrador and Newfoundland; Whiteaves, 1901, p. 96 (*Membranipora*), Gulf of St. Lawrence.) One of the commonest species of the region, taken at twelve shore stations and twenty-two dredging stations. It is a very common and widely distributed northern species, and, on the North American coast, ranges from Greenland to south of Cape Cod.

This beautiful species grows as an incrustation on flat surfaces, the colonies seldom being over ½-inch in extent. The zooecia are small, usually arranged rather evenly in radiate series. The raised margin of the aperture is provided with about 12 or 14 long spines. The most anterior are longer and stouter than the others. The first pair are directed well forward, the second pair more erect, while the remaining ones bend forward and downward over the area in a very characteristic manner. The avicularia are comparatively large, located on the basal part of the zooecium, often wanting. The ooecium is globose, with a raised rib across it near the middle. There are no spines projecting into the pore chambers.

Callopora lineata (Linnaeus), 1766–1768. (Osburn, 1912, p. 228 (*Membranipora*) for synonymy and references; Cornish, 1907, p. 76 (*Membranipora*), Canso, Nova Scotia; Whiteaves, 1901, p. 96 (*Membranipora*), Gulf of St. Lawrence. Not common, but dredged at stations 40, 45, 67, and 69. Like the preceding species, it is common and widely distributed in colder waters. It occurs as far south as the Mediterranean, but on the North American coast has not been noted much south of Cape Cod.

Growing much as in the preceding species, which it resembles, but the colonies reach a larger size and the zooecia are larger. Eight to 12 pairs of spines are present on the margin. These are rather slender and pointed, the anterior 1 or 2 pairs being larger and bent somewhat forward; the others are directed upward and curve somewhat over the aperture. The avicularium is smaller in comparison with the zooecia than in the preceding species. The ooecium has a transverse rib across its middle. Seen from the dorsal side, the zooecium has two pairs of lateral pore chambers and a single large anterior one, with spinules projecting into the chambers.

Callopora dumerilii (Audouin), 1826. Pl. 6, fig. 6. (Whiteaves, 1901, p. 96 (*Membranipora*), Gulf of St. Lawrence.) Distributed on both sides of the North Atlantic, in Europe from Norway to the Mediterranean. Recorded only once previously from North America, by Whiteaves (l.c.) on the authority of Norman. The species was taken at dredging station 13, on Googins Ledge, in the inner bay, August 31, 1927, on the bark of a water-logged branch. In the writer's collection there are also specimens from Georges Bank.

Zooecia regularly arranged, well separated by deep fissures, the walls rather high and thin-edged; a pair of elongated spines, one on either side at the level of the operculum; sometimes an additional pair of smaller ones. The membranous area of the front is quite regularly oval on its larger proximal part, then suddenly narrowed forward at about the level of the operculum. Ooecium more or less globose, sometimes considerably elongated, in other cases shorter than wide, even in the same colony. Avicularia are wanting on the Mt. Desert Island specimen, but pointed avicularia are common to the species; in the few American specimens I have seen they are not as numerous as in European material.

Tegella Levinsen, 1909

Tegella arctica (d'Orbigny), 1851. Pl. 6, fig. 5. (Osburn, 1912, p. 229 (*Membranipora*); Whiteaves, 1901, p. 96 (*Membranipora sophiae*.) Rare, taken only at shore station 11 and dredging stations 75, 102, and 119. A northern species of wide range, occurring on the American coast from Greenland to Cape Cod as well as the northern shores of Europe.

It is a striking species in our fauna, readily distinguished by the presence of 4 to 6 very stout flattened spines which bend across the membranous area. There is a high degree of secondary calcification and in old colonies the short, broad, and flattened ooecium becomes deeply immersed.

Tegella unicornis (Fleming), 1828. (Osburn, 1912, p. 230 (*Membranipora*); 1912 a, p. 279 (*Membranipora*), Labrador; Whiteaves, 1901, p. 96 (*Membranipora*), Gulf of St. Lawrence.) This is an abundant species, occurring almost everywhere in the region. It was found at fifteen shore stations and forty dredging stations. It ranges from south of Cape Cod to the Arctic Ocean and from the British Islands to Nova Zembla.

This is a variable species, differing especially in the size and length of the spines, the form of the zooecia, and the presence and arrangement of avicularia. The full complement of spines is four, the anterior pair being small and often wanting. The other pair, just posterior to the operculum, are usually very unequal in size and the longer one may be very prominent. An avicularium is usually present at the base of the zooecium mounted on a raised projection; when an ovicell is present the avicularum appears as if mounted on its anterior surface and is pointed somewhat forward, but when the ovicell is absent the avicularium is reversed in position, the mandible pointing backward.

Tegella unicornis var. armifera (Hincks), 1880. Pl. 6, fig. 7. (Osburn, 1912, p. 229 (under *Membranipora arctica*); Whiteaves, 1901, p. 97 (*M. sophiae*, var. *armifera*), Gulf of St. Lawrence.) Occurring with the typical form at various stations, but not nearly so abundant. The variety *armifera* appears to accompany the typical *unicornis* throughout most of its range.

A well-marked variety, which differs in the smaller size of the spines, in the presence of a pair of small avicularia situated at the sides of the operculum anteriorly with the mandible pointing backward. It is the form which was listed by Packard and Verrill as *Membranipora americana* d'Orbigny.

Cauloramphus Norman, 1903

Cauloramphus cymbaeformis (Hincks), 1887. (Osburn, 1912, p. 230 (*Membranipora*), synonymy; Whiteaves, 1901, p. 96 (*Membranipora*), Gulf of St. Lawrence.) Very common on stems of hydroids and other bryozoans, rarely on algae, shells and pebbles. Taken in thirty dredging stations, but in none of the shore stations. Its known range is from south of Cape Cod to Arctic America, Greenland, Spitzbergen, and the Kara Sea.

The zooecia are very deep in comparison with their length, and they are especially characterized by the presence of tall stalked avicularia among the spines. These avicularia appear to begin their development like the spines, then enlarge gradually upward and terminate in a clavate portion with a small, pointed avicularium. There are no ovicells. This species is also peculiar in its manner of growth, as in hundreds of colonies which I have seen nearly all were attached to the stems of Bryozoa and hydroids. The dorsal surface of *Dendrobaenia murryana* is a favorite situation.

Amphiblestrum Gray, 1848

Amphiblestrum flemingii (Busk), 1854. Pl. 6, figs. 8–9. (Osburn, 1912, p. 231 (*Membranipora*) for references.) Not uncommon on stones and shells and taken at thirteen dredging stations; rare, and occurring at only two shore stations. It is found from the Mediterranean Sea to Spitzbergen in European waters. On the North American shore it appears to be common from Cape Cod to Nova Scotia, and it has been recorded several times from Greenland, but strange to say it has not been noted in collections from eastern or northern Canada, where it seems to be replaced by the following species.

The frontal area is partially closed in by a calcareous layer (cryptocyst), leaving a somewhat trilobate membranous space. Four to six spines is the usual complement, one of these usually attaining a much larger size than the others. Occasionally all the spines are wanting. The ovicell is rounded, with a raised rib, which usually encloses a somewhat quadrangular space. When the ooecium is present there are usually two avicularia, one on either side, pointed forward on the base of the zooecium in front of the ovicell. In the absence of ooecia, a single avicularium is present, pointed more or less backward.

Amphiblestrum trifolium (S. Wood), 1850. Pl. 14, fig. 2. (Whiteaves, 1901, p. 97 (*Membranipora*), for synonymy and references; Osburn, 1912 a, p. 279 (*Membranipora*), for further references.) Rare; found only a few times in the collections on stones and shells. It ranges northward on both sides of the Atlantic to the polar seas.

As in the preceding species, the cryptocyst extends over a considerable portion, leaving a trifoliate membranous area. Spines are usually wanting, and the tall spines of the preceding species are never present. Avicularia also are not common and when present are placed on small elevations at the border of the zooecium. The rounded ooecium bears a more or less triangular area.

Division V, Cellularina Smitt, 1867[1]

Scrupocellariidae Levinsen, 1909

Scrupocellaria Van Beneden, 1845

Scrupocellaria scabra (Van Beneden), 1849. Pl. 7, fig. 4. (Osburn, 1912, p. 223, for references; Whiteaves, 1901, p. 93, Gulf of St. Lawrence.) Common, attached to shells, stones, algae, and the stems of hydroids and bryozoans, on hard bottoms; dredged at nineteen stations. Some specimens show a tendency toward the northern variety, *paenulata* Norman, in the size of the frontal scute. This is a well-known species on the American coast from Cape Cod to Greenland; on the eastern side of the Atlantic it occurs from Madeira to Spitzbergen.

Whiteaves (1901, p. 92) lists *S. scruposa* Linnaeus for the Gulf of St. Lawrence, and Cornish (1907, p. 76, as *S. elliptica*

[1] Division III, Coilostega Levinsen, 1909, and Division IV, Pseudostega Levinsen, 1909, are not represented in the present collection.

Reuss) also records it for Canso, Nova Scotia, but I must agree with Verrill in never having seen this species on the American coast.

The erect dichotomous zoarium consists of branches in which the zooecia are arranged in two series, alternating and facing the same direction. The membranous area on the front of the zooecium is protected by a modified spine nearly as large as the area. The surface of this shell or scute is figured with an antler-like area. There are small frontal and larger lateral avicularia.

TRICELLARIA Fleming, 1828

TRICELLARIA TERNATA (Solander), 1786. Pl. 7, fig. 3. (Osburn, 1912, p. 222 (*Menipea*), for references and synonymy; 1912 a, p. 277 (*Menipea*), off Cape Sable; Cornish, 1907, p. 75 (*Menipea*), Canso, Nova Scotia; Whiteaves, 1901, p. 92 (*Menipea*), for references in Canadian waters.) Taken at twenty-nine stations in dredging, on hard bottoms. Not found at shore stations. Chiefly represented by the variety *gracilis* Busk. It is a very common northern species, occurring on the western shores of Europe and from southern New England to Greenland and other Arctic localities.

This species shows a great variety in the number of zooecia forming an internode. The typical three zooecia are occasionally present, but they may range all the way to 10 or 11 (var. *gracilis*). The irregular branches spread among hydroids, Bryozoa, and the smaller algae. Two spines are usually present at the outer angle and a small lateral avicularium is usually present just back of these. A minute frontal avicularium is occasionally present just proximal to the aperture.

TRICELLARIA PEACHII (Busk), 1851. Pl. 7, fig. 2. (Osburn, 1912, p. 223 (*Cellularia*), for synonymy and references.) Occasional in shallower dredgings; found at twelve stations, but not taken at shore stations. A common northern species, ranging from Cape Cod to Greenland and from the British Islands to Spitzbergen. It has been variously placed in the genera *Cellularia* and *Scrupocellaria,* and Verrill (1879, p. 53) erected a new genus, *Bugulopsis,* for it. Harmer (1923, p. 355) places it in *Tricellaria* especially on account of its mode of bifurcation.

The spreading branches of this species are usually found on other Bryozoa, hydroids, etc., reaching an inch or more in height. A single stout spine at the outer angle of the aperture and occasional rounded frontal avicularia are used to distinguish the species. There are no lateral avicularia. The terminal zooecium of an internode bears a single median stout spine.

Caberea Lamouroux, 1816

Caberea ellisii (Fleming), 1828. Pl. 4, fig. 7; pl. 8, figs. 1–2. (Osburn, 1912, p. 222, for references; 1912 a, p. 277, off Cape Sable; Whiteaves, 1901, p. 93, for Canadian records; Cornish, 1907, p. 76, Canso, Nova Scotia, 20 to 50 fathoms.) Dredged at twenty-two stations; common, but not taken at shore stations. Range, southern New England to Greenland, western Europe to Arctic seas.

The zoarium is erect, somewhat fan-shaped, branching. Branches rather stout and slightly widened upward. The zooecia are arranged in 2 to 4 rows, in alternating series, all facing the same direction. The membranous aperture is large, broadly elliptical, and small rounded avicularia are present on the bases of the zooecia. The species is readily distinguished by the presence of a complete series of large vibracula on both edges of the branch. The vibraculum is very elongate, usually twice as long as the width of the branch, with secondary spinules, especially near the tip of the vibraculum. The vibracular chambers are very large, the two series covering nearly the whole of the back of the zooecia on which they are situated.

Bugulidae Gray, 1848

Bugula Oken, 1815

Bugula flabellata (Thompson), 1847. Pl. 8, fig. 4. Osburn, 1912, p. 225, synonymy and references.) Not common, not found at shore stations but dredged on shallow stony bottoms at stations 21, 27, 90, 93, 126, 127. It is a well-known species on both sides of the Atlantic, extending southward to Florida on the American coast, and from the British Islands to the Mediterranean on the coast of Europe. It also occurs on the Pacific coast of North America at San Diego, California. Dr. Alice Robertson (1900, p. 321) listed it for Sitka, Alaska, but later (1905, p. 271) described this form as a new species, *B. pugeti*.

Mt. Desert Island apears to be about the northern limit of the species on the American coast, as no collector has reported it from Canadian waters.

There seems to be a peculiar hiatus in the distribution of this family in northern New England and eastern Canada. There are six species common about Cape Cod, including this and the following, and about ten are known from more northern waters. Whiteaves recorded only *Bugula murrayana* and two species of *Kinetoskias* from eastern Canada, Osburn (1912, p. 277) added *B. cucullifera*, and Cornish mentions but one species from Canso, Nova Scotia (*Bugula* sp. = ? *B. cuculifera* Osburn).

Dendrobeania Levinsen, 1909

Dendrobeania murrayana (Johnston), 1847. Pl. 4, fig. 8; pl. 8, fig. 3. (Osburn, 1912, p. 226 (*Bugula*), for synonymy and references; 1912 a, p. 277 (*Bugula*), additional Canadian records; Whiteaves, 1901, p. 93 (*Bugula*), for Canadian records.) One of the most abundant species, occurring especially on hard bottoms, attached to stones and shells; common also on stony shores. Taken at six shore stations and forty-one dredging stations. The more slender variety (*fruticosa* Packard) occurred in some numbers along with the typical form. The large lateral avicularia are usually wanting, and in some cases smaller avicularia are present on the lateral zooecia of the branches. There is great variation in the width of the branches, but none were observed to approach the form *quadridentata* Loven. The species occurs from southern New England northward to Arctic seas and southward on the European coast to the British Islands. It is also found on the Pacific coast as far south as the Strait of Fuca.

The zoarium is dichotomously divided into broad foliose or ribbon-like strips reaching the height of 1 to 1½ inches. Frequently the branches are narrow and linear (var. *fruticosa* Packard) and all sorts of intermediate conditions exist. The zooecia are multiserial, in 4 to 12 rows, alternating, oblong, truncate above, and usually narrowed below. The frontal aperture reaches nearly but not quite to the proximal end of the zooecium. There is an erect spine at each distal angle, and a varying number, 1 to 6, of smaller spines bend over the aperture. Avicularia are of two kinds, smaller ones with elongate beaks attached at the middle of the proximal part of the zooecia, and much larger ones, often wanting, attached to the outer margins of the fronds. The ooecia are large, globose, with radiating striae, and are attached across the whole distal end of the zooecium.

Division VI, Cribrimorpha Harmer, 1926

There is much uncertainty among recent students of the Bryozoa concerning the disposition of the old Hincksian Family Cribrilinidae. Levinsen (1909, p. 156) placed the group in the Suborder Anasca, Group II, Malacostega. Harmer (1926, p. 470) erects the present Division VI of the Anasca to include the 'Cribrimorphs' of Lang (1916). Canu and Bassler (1929, pp. 27, 30, etc.) have separated the group, placing certain genera (*Cribrilina, Gephyrotes*) under the Family Alderinidae in the Division Malacostega, while other genera (*Puellina, Figularia, Colletosia,* etc.) are located in the Family Costulae, Suborder Ascophora.

The simplest and probably most primitive members of the group (e.g., *Membraniporella* and *Cribrilina*) have a complete frontal membrane of the 'Membraniporidan' type, which is secondarily covered over more or less completely by a frontal arch resembling in a general way the frontal wall of the Ascophora. In its mode of development, however, it is quite different, as it is formed by the union of a series of flattened marginal spines, leaving pores or lacunae between them. This is shown both by the mode of development and by dissection. In other cases, the most advanced, there is only a small centro-distal area of the front wall that is so formed, and Harmer (1926, pp. 471–472) suggests that the area represents a reduced frontal shield which is supplanted over most of the frontal surface by the partial development of the gymnocyst, which in the Ascophora comes to cover the entire frontal surface. In other words, in this group we have a series of gradations leading from the Membraniporidan to the Lepralian type of organization, or intermediate between the Anasca and Ascophora.

Apparently one may take his choice of placing them all in the Ascophora, as Marcus has done (1922, p. 427); of splitting them between the Anasca and Ascophora, as Canu and Bassler have done (1929, pp. 27–30); or to hitch them on to the end of the Anasca, recognizing that they constitute an intermediate group, as Harmer has done (1926, p. 470). Until there is further evidence to show differences in the manner of development of the frontal shield between such forms as *Cribrilina* and *Figularia,* the writer is inclined to the use of Harmer's Division Cribrimorpha. If this group is intermediate between the Anasca and Ascophora, the only solution would be to create another suborder, which in the present state of our knowledge would appear at least unnecessary.

Cribrilinidae Hincks, 1880

Cribrilina Gray, 1848

Cribrilina punctata (Hassall), 1842. Pl. 8, figs. 5–6. (Osburn, 1912, p. 232, synonymy and reference.) Frequently taken on stones and shells and along shore, at nine shore stations and thirteen dredging stations. It appears to be at its optimum in this region; at least the colonies are larger than we have seen them either to the north or south along the American coast. It ranges from southern New England and the Madeira Islands northward to the Arctic Ocean.

Encrusting shells and pebbles. Sometimes the zoarium may cover 2 or 3 square inches. The zooecia are small, subcylindrical, and perforated more or less irregularly by a variable number of large, irregular openings. In reality, the frontal shield is formed by the fusion of marginal spines which grow together in an irregular way over the area. The orifice is somewhat semicircular. The lower border bears a small mucro at the middle which is often bifid (formed by the junction of the anterior pair of frontal spines). Four small marginal spines usually present about the aperture; in the fertile cells the anterior pair is usually fused with the ovicell. Two avicularia are frequently present, one on either side of the orifice, pointing obliquely forward and outward. The ooecium is somewhat elongated, smooth and glossy, and perforated by a number of small pores. In older colonies the secondary calcification often changes the appearance greatly.

Cribrilina annulata (Fabricius), 1870. Pl. 8, fig. 7. (Osburn, 1912, p. 232, for synonymy and references; 1912 a, p. 279, off Cape Sable; Whiteaves, 1901, p. 98, for Canadian records.) Not common, but occasionally taken on hard bottom and rarely along shore, at three shore stations and six dredging stations. A widely ranging northern species, circumpolar and extending southward along both the Atlantic and Pacific coasts. Cape Cod is apparently near its southern limit on the New England coast.

Usually in the form of small rounded colonies of a reddish or brownish color. The zooecial punctures are arranged in definite rows, transverse distally, but tending to radiate toward the proximal end. The primary aperture is nearly semicircular, sometimes with a small denticle on the lower border, but in later stages of calcification this border becomes greatly thickened, especially in the fertile zooecia. Usually four short spines project forward on the anterior border. These may be seen only in the marginal cells of the colony. Avicularia wanting. The ooecium is small, hemispherical, punctured with a few pores, and with a heavy rib bordering the aperture. Frequently infertile zooecia of smaller size than usual stand nearly erect between the ordinary zooecia.

Suborder ASCOPHORA Levinsen, 1909

Hippothoidae Levinsen, 1909

HIPPOTHOA Lamouroux, 1812

HIPPOTHOA HYALINA (Linnaeus), 1766–1768. Pl. 9, figs. 1–3. (Osburn, 1912, p. 235, for synonymy and references, and 1912 a, p. 280, for additional Canadian records; Whiteaves, 1901, p. 100, for Canadian records.) The most abundant bryozoan of the region, taken at eighteen shore stations and thirty-five dredging stations. It is one of the most cosmopolitan species known, being circumpolar and circumtropical and ranging from the high arctic to the tropics, and in the southern hemisphere to Cape Horn and the Kerguelen Islands. It grows in great profusion all along the New England and eastern Canadian coasts.

It shows a great amount of superficial variation, though the fundamental characters are fairly constant. Young colonies always present much the same appearance, with rather elongate, transversely wrinkled, semihyaline zooecia, well separated and showing interspaces. As the colonies become mature, the zooecia become heaped up, more or less erected, and turned in every direction. Also in this state large numbers of the dwarf fertile zooecia are produced, and these with their ooecia give an altogether different appearance to the colony.

Encrusting stones, shells, algae, and stems of various sorts. In the young colony forming rather regular hyaline encrustations, but older colonies become very irregular, the cells piling up on each other, more or less erected, and forming rough crusts. Zooecia are elongate, subcylindrical, narrowed proximally; the surface hyaline, glossy, and transversely rugose. The orifice is rounded, with a broad, well-defined sinus on the proximal margin, but this is often obscured from above by an overhanging umbo. Ooecia globose, punctured, borne on slightly dwarfed zooecia which often stand erect among the other cells. No avicularia.

Hippothoa expansa Dawson, 1859. Pl. 9, fig. 4. (Dawson, 1859, p. 255; Packard, 1869, p. 270; Verrill, 1885, p. 232 (*H. divaricata* var. *expansa*); Whiteaves, 1901, p. 101, for Canadian records.) Rare, dredged at stations 27, 53, 64, and 65; small colonies on pebbles. It is a northern species, ranging to Greenland, Jan Mayen, and Franz Josef Land, and has been taken in the British Islands. It is an inconspicuous form, with narrow branches of 1 to 3 zooecia in width, adhering closely to a shell or pebble, and semi-hyaline. The sinuate orifice, lateral basal expansion of the zooecium, and the reduced fertile zooecia easily distinguish it from any other species.

The zoarium forms small branching colonies, adnate to stones and shells. One to three zooecia in alternating series in a branch. Margins of the lateral zooecia are expanded all along the dorsal side, this expansion frequently being half as wide as the zooecium. The front is definitely rugose, the rugosities extending out over the expanded margin. Aperture rounded, with a small proximal sinus. Ooecia globose, with a few punctures and a median rib. The fertile zooecia are somewhat smaller than the infertile ones.

Galeopsidae Jullien, 1903

Cylindroporella Hincks, 1877

Cylindroporella tubulosa (Norman), 1868. Pl. 14, fig. 1. (Whiteaves, 1901, p. 98 (*Porina*), Canadian records; Osburn, 1912, p. 233 (*Porina*), vicinity of Cape Cod.) Not infrequent on stones and shells, found at six shore stations and thirteen dredging stations. Northern in distribution, ranging from Greenland and Spitzbergen south to the British Islands and Cape Cod.

The colonies are always small, rarely ¼-inch across, the zooecia forming a single layer. The tall tubular peristome, with the rounded ascopore at the base of the tube in front, and the ovicell situated well below the top of the peristome, distinguish it readily from any other in our fauna.

Stomachetosellidae Canu and Bassler, 1917

Escharoides Milne-Edwards, 1836

Escharoides rosacea (Busk), 1856. Pl. 10, fig. 1. Verrill, 1879, p. 149 (*Escharopsis*); Cornish, 1907, p. 78, Canso, Nova Scotia.) Taken only once, at dredging station 94. The species is widely distributed in northern waters, a number of places in the Arctic Ocean, and south on the European coast to the British Islands, but appears to be nowhere abundant.

Zoarium erect, consisting of a short stalk with one or more compressed lobate expansions, usually not more than about $\frac{1}{4}$-inch in height, white or rosy in color. The primary aperture is nearly elliptical, but this is soon covered by the secondary aperture with a deep slit-like sinus, at one side of which is a rounded avicularium. Ooecium hemispherical, imperforate, granular. The frontal wall of the zooecium becomes very thick and all primary characters are obscured.

Posterula Jullien, 1905

Posterula sarsi (Smitt). Pl. 15, fig. 4. (Whiteaves, 1901, p. 102 (*Escharoides*), synonymy, references, and Canadian records; Osburn, 1912 a, p. 286 (*Escharoides*), Labrador and Cape Sable, Nova Scotia.) Rare, a portion of one colony observed. A well-known northern species; Greenland, Franz Josef Land, northern Norway, and southward on the American coast to Mt. Desert Island.

The zoarium is erect, foliaceous, rising from a broad encrusting base, the branches or frills bilaminar. Zooecia large, rather regular, smooth and somewhat swollen in the young stage, with a marginal row of ovate pores. The primary aperture is oval, without sinus or denticles, but it soon becomes covered with a secondary aperture of an elongate pyriform shape, within the deep sinus of which one or more small, pointed avicularia are present. The secondary calcification proceeds with great rapidity, covering everything with a heavy layer, so all that can be seen are the secondary apertures. Ooecia small, hemispherical, and become completely embedded.

STOMACHETOSELLA Canu and Bassler, 1917

STOMACHETOSELLA SINUOSA (Busk), 1860. Pl. 2, figs. 1–2. (Osburn, 1912, p. 238 (*Schizoporella*), synonymy and references; Whiteaves, 1901, p. 100 (*Schizoporella*), Gulf of St. Lawrence; Cornish, 1907, p. 77 (*Schizoporella*), Canso, Nova Scotia.) Common on stones, taken at three shore stations and eighteen dredging stations. A common northern species, from the Arctic Ocean to Cape Cod and to the British Islands. Also on the Pacific coast south to Puget Sound.

Canu and Bassler, who erected the family, indicated that this species belongs in it, but did not state the generic relations. O'Donoghue (1926, p. 62) has located it in the present genus. This species in younger stages has much the appearance of a *Schizoporella,* but the heavy secondary calcification makes its appearance almost at once all around the aperture, as well as over the front of the zooecium. The rounded ovicell usually bears a large median pore, and though the ovicell may be covered during secondary calcification, the pore remains evident. There are no avicularia. The zoarium usually forms regularly rounded purplish to reddish-brown patches one stones and shells, one layer of zooecia in thickness, and so heavily calcified at an early stage that it is difficult to make out any of the primary characters except at the last row on the margin.

STOMACHETOSELLA PRODUCTA (Packard), 1863. Pl. 15, figs. 1–3. (Packard, 1863, p. 407, pl. I, fig. 1 (*Lepralia producta,* n.sp.); Hincks, 1889, p. 430, pl. 21, fig. 2 (*Smittia*); Whiteaves, 1901, p. 106 (*Smittia*); Nordgaard, 1906, p. 19, pl. 2, figs. 19–21 (*Schizoporella.*)) Apparently very rare; observed only once, encrusting a pebble. The species was described from Caribou Island, off southern Labrador, in the Gulf of St. Lawrence. Dawson later sent material to Hincks, who accepted Packard's name for the species and redescribed it in more detail under the genus '*Smittia.*' Whiteaves records it from the Gulf of St. Lawrence 'at many localities.' Nordgaard found it in material from the second 'Fram' expedition, dredged in Jones Sound and Winter Haven, on the west side of Baffin Bay, and placed it in the genus *Schizoporella.* Kluge later recorded it from the west side of Greenland. The present record from Mt. Desert Island appears to be the most southerly.

As indicated above, the species has been shifted about considerably. After the examination of my material, including two specimens from the Gulf of St. Lawrence (one of them from Verrill's collection and identified by Dawson), I am again changing the generic status. The more recently described genus *Stomachetosella* of Canu and Bassler, 1917, appears to fit it better than any other, and it has certain relationships with *Lepralia sinuosa* Busk, which has already been transferred to this genus. The form of the primary aperture, in the absence of lyrula or sinus, is neither that of *Smittina* nor *Schizoporella,* while the heavy secondary calcification, which appears almost at once and which covers the whole of the zooecia and ooecia, forms a secondary aperture with a deeply notched secondary sinus or spiramen.

The zoarium forms a thick, rough, reddish-brown crust on pebbles and shells. The zooecia are large, perforated around the border with about a dozen large pores, and a few similar pores appear irregularly disposed on the front. The primary aperture is rounded, somewhat more straight on the proximal border, with no indication of a sinus; the hinge denticles are small and rounded; the ooecium is globose and imperforate. Soon, almost at once, the primary characters are covered by a very thick tremocyst, through which the frontal pores are continued without much change in size, and this layer is continued evenly over the whole surface, forming a deep peristome, which is deeply and irregularly notched at the proximal border. The ooecia also are covered and become completely imbedded. There are no avicularia or spines.

Escharellidae Levinsen, 1909

This family was established by Levinsen to include a number of genera of the *Schizoporella-Lepralia-Microporella* sort and others, some of which have later been removed to other families. Canu and Bassler, in 1917, partly solved the problem of expressing relationships in this loosely associated family by indicating four groups—Schizoporellae, Hippoporae, Peristomellae, and Microporellae—with an addendum of 'divers genera' unplaced. Later (1929) they raised these groups to the dignity of subfamilies without making use of the recognized subfamily ending 'inae.' Still a number of genera cannot be placed definitely and must be given further study before they can be allocated in the present subfamilies or new groups established for them.

Schizoporellinae Canu and Bassler, 1917

This subfamily is constituted chiefly of the old genus *Schizoporella,* which has now been broken up into numerous genera. According to the usage adopted by Canu and Bassler, *Schizoporella* is retained for those species which are not well enough understood to be placed in other genera which are better known.

SCHIZOPODRELLA Canu and Bassler, 1917

SCHIZOPODRELLA UNICORNIS (Johnston), 1847. (Osburn, 1912, p. 236 (*Schizoporella*), for synonymy and references.)

Rare, one colony, without special data, encrusting a pebble. The species is cosmopolitan. On the Atlantic coast of North America it occurs abundantly from Cape Cod to Florida, and it has been reported from Greenland waters a number of times and from other places in the Arctic, so it is difficult to explain why it seems to run out north of Cape Cod and why it has not been recorded for eastern Canada.

It is so well known as to scarcely need any description in this place. In our specimen, the front wall is rather coarsely perforated with tremopores, and the surface is irregular in secondary calcification. The umbo below the zooecial aperture is large, broad, and in some cases roughly granular. The pointed avicularia (often wanting) are present in the usual position, on one or both sides of the aperture at the level of the sinus. The ovicell is roughly granular.

Schizomavella Canu and Bassler, 1917

Schizomavella auriculata (Hassall), 1842. Pl. 9, fig. 5. (Osburn, 1912, p. 237 (*Schizoporella*), for synonymy and references; 1912 a, p. 280, Cape Sable, Nova Scotia, and St. Pierre Bank, Newfoundland; Whiteaves, 1901, p. 100, as *Schizoporella auriculata,* and p. 106 as *Smittia globifera* (Packard), Canadian records.) Common on stones and stems of other organisms, taken at seven shore stations and ten dredging stations. It is cosmopolitan in distribution, ranging from high Arctic to tropical seas. The somewhat flattened frontal area of the ovicell, which is provided with pores, together with the shallow sinus and median rounded avicularium just proximal to the aperture, will separate the species from other American forms.

Stephanosella Canu and Bassler, 1917

Stephanosella biaperta (Michelin), 1841–1842. Pl. 15, figs. 5–6. (Osburn. 1912, p. 237 (*Schizoporella*), for synonymy and references; Whiteaves, 1901, p. 100 (*Schizoporella*), for Canadian records.) Rare, only one specimen observed, dredged at station 60. The species has a very wide range, Spitzbergen and Greenland to the tropics, and in the Pacific as well as the Atlantic. It may be distinguished by the imperforate ovicell, which has a flattened frontal surface with a raised border, by the small V-shaped sinus, and by the presence of a small oval avicularium on one or both sides of the aperture at the level of the sinus.

Hippoporinae Canu and Bassler, 1917

Hippodiplosia Canu, 1916

This genus was erected by Canu to include certain escharellidan species with a broad 'poster,' the region of the aperture proximal to the cardelles or hinge denticles, the operculum narrowed at the cardelles, a hyperstomial ooecium closed by the operculum, and a frontal tremocyst. Unfortunately, he followed Hincks, who confused the *Eschara pallasiana* of Moll, and named this species as the genotype. Later, 1925 a, p. 32, Canu and Bassler corrected this error and erected the genus *Cryptosula* for *E. pallasiana* Moll, leaving the *pallasiana* of Hincks as the genotype. Later (1928 a, p. 106), Canu and Bassler included the *Cellepora pertusa* of Esper in *Hippodiplosia*, and Hastings (1930, p. 725) added Verrill's *Lepralia americana*. There are two other species, which, if I understand them, should be included in this genus, viz., *Lepralia reticulato-punctata* Hincks and *Lepralia smitti* Kirchenpauer. These have been variously placed in *Lepralia*, *Escharella*, *Schizoporella*, and *Smittina*. Levinsen (1916, pp. 456, 457) and Nordgaard (1918, pp. 61, 66) agree in placing them in *Smittina*. The characters of these species appear to me much more closely allied to the Escharellidae as delimited by Canu and Bassler (1920, p. 334), and seem to fall naturally in the genus *Hippodiplosia*, along with *H. pertusa* Esper. The tremocyst is incomplete about the aperture, leaving a portion of the olocyst exposed; the ooecium develops next to the olocyst of the distal zooecium, and the operculum closes the ooecial aperture. The frontal pores are much larger than in *pertusa*, but this is a character which may vary greatly.

Hippodiplosia americana (Verrill), 1875. Pl. 14, figs. 6–7. (Osburn, 1912, p. 241 (*Lepralia*), synonymy and references; Hastings, 1930, p. 725, Balboa, Panama.) Rare, several well-developed colonies with ooecia, encrusting stones dredged at stations 21, 94, and 96. The species is common along the southern New England coast, and Verrill recorded it as far north as Beverly, Massachusetts. The present record is the farthest north, and it has not thus far been noted in Canadian waters. Hastings has recorded it from Balboa, on the Pacific side of Panama, with the difference that the occasional suboral avicularium is wanting and instead a larger pointed one is often present at the side of the aperture.

The front of the zooecium is perforated by very large irregular pores, which sometimes give it the appearance of being incompletely calcified, yet this appearance may be preserved under secondary calcification. The rather large aperture is rounded anteriorly, more straight on the proximal border, and the presence of a pair of denticles gives the appearance of a very broad sinus reaching almost the width of the aperture. The peristome is often raised at the side of the aperture. The semi-globose ooecium is also provided with a few very large and irregular pores. A suboral avicularium is occasionally present, separated somewhat from the aperture, but this is wanting in Mt. Desert specimens.

HIPPODIPLOSIA PERTUSA (Esper), 1794–1797. Pl. 14, fig. 8. (Osburn, 1912, p. 241 (*Lepralia*), synonymy and references; Whiteaves, 1901, p. 101 (*Lepralia*), records and discussion.) Apparently rare; only three small colonies were observed, encrusting pebbles, dredging station 27. Cosmopolitan. On the Atlantic coast of North America it is known from Greenland to Florida. Hastings records it from the Galapagos Islands (1930, p. 724).

The front of the ooecium is thickly perforated, rather smooth in young colonies, but granular in old specimens. The aperture is almost round, but a pair of weakly developed denticles give the appearance of a very broad shallow sinus at the proximal border. The round ooecium is quite prominent, and in secondary calcification the surface becomes rather coarsely granular, with occasionally an umbonate process at the top. A suboral umbo is present also in some zooecia. There is no evidence of avicularia on Mt. Desert Island specimens.

HIPPODIPLOSIA RETICULATO-PUNCTATA (Hincks), 1877. Pl. 10, fig. 2; pl. 13, fig. 6. (Whiteaves, 1901, p. 107 (*Smittia*), Gulf of St. Lawrence; Osburn, 1912 a, p. 286 (*Smittia*), south of Cape Sable, 45 fathoms.) Rare, one small colony with ooecia, dredged at station 6, and one without ooecia at station 27. The species has not been recorded this far south, but I have a specimen from Cape Ann, on the coast of Massachusetts. It has been recorded at various places in more northern waters, though, as it has been confused with the following species, the records are somewhat uncertain.

The zooecia are rather broad and but little inflated, the whole frontal surface is perforated with very large tremopores which increase in size outward to such an extent that the frontal wall of old zooecia looks like a network. The tremocyst, however, does not involve the oral border, but leaves a roughly V-shaped area proximally to the aperture and also leaves the thin-walled low peristome free. Oval avicularia, turned in various directions, sidewise or backward, are occasionally present on the area behind the aperture. The ooecia are globular and distinctly perforated by numerous pores. The aperture is regularly rounded distally, back to the broad strong cardelles, behind which is the arc of a smaller circle, giving the appearance of a very broad sinus. The operculum has a nearly complete chitinous ring well within the border, joining with the tips of the cardelles and fading out as they approach the proximal edge.

Hippodiplosia smitti (Kirchenpauer), 1874. Pl. 9, fig. 6. (Hincks, 1892, p. 154, pl. 8, fig. 2 (*Schizoporella cincta,* var.), Gulf of St. Lawrence.) Rather rare, on stones and shells, taken at shore stations 12, 43, 46, 47, and dredging stations 13, 27, 36, 147. It has hitherto been known only from more northern waters, but I have a specimen from off Cape Ann, Massachusetts, 30 fathoms, encrusting hard clay, H. S. Collins, collector. My specimen from the Foulke Fjord, western Greenland, agrees closely with the Mt. Desert material. It is probably circumpolar in distribution, and has not been found on the European coast south of northern Norway.

Waters (1900, p. 65, pl. 9, figs. 10–12) described the species under the name of *Schizoporella harmsworthi,* including the *S. cincta,* var. Hincks and *Eschara legentili* form *prototypa* Smitt as synonyms, and recognized that *Leprali smitti* Kirchenpauer is the same species, but he objected to the use of Kirchenpauer's name. Later Nordgaard (1905, p. 166) made *harmsworthi* a synonym of *reticulato-punctata* Hincks, but afterward (1918, p. 61) he and Levinsen (1916, p. 458) agreed in placing *harmsworthi* in the synonymy of *smitti.*

The zooecia present much the same general appearance as those of *reticulato-punctata,* with the large tremopores occupying a large portion of the frontal wall, narrowing inward, but the imperforate area proximal to the aperture is larger, often more than half the length of the zooecium, but varying greatly. Often this area is more raised and bears a spatulate or blunt-pointed avicularium, which is usually situated transversely just proximal to the aperture. The ooecium is about the same size and shape as that of *reticulato-punctata,* but it is not perforated as it is in that species. The aperture is similarly shaped, but the cardelles, instead of being low and broad, are unusually long and pointed. A chitinous ring is present well within the border of the operculum, joining with the points of the hinge teeth and fading away toward the proximal border. As in the preceding species there may be a rough umbonate process at a little distance behind the aperture, and the thin-walled peristome is not encroached upon by the tremocyst. The two species are undoubtedly closely allied, but can readily be separated by the differences in the imperforate frontal area, the shape of the cardelles, and the presence or lack of perforations in the ooecium.

Cryptosula Canu and Bassler

In 1925 Canu and Bassler (Les Bryozoaires du Maroc et du Mauritainie, p. 32) erected this genus for the reception of the *Lepralia pallasiana* Moll (non Hincks, 1880, which belongs in the preceding genus).

Cryptosula pallasiana (Moll), 1803. Pl. 10, fig. 4. (Osburn, 1912, p. 240 (*Lepralia*), for synonymy and references.) Rare, taken only once. It is common along the southern New England coast. Since Hincks (1880, p. 297) confused the species, it is difficult to state its general distribution, but it is known from the Mediterranean Sea and the coasts of Morocco, Portugal, and France.

The peculiar shape of the zooecial aperture is the most distinguishing character. It is elongate, rounded anteriorly, and posteriorly suddenly widens until it is much broader than the anterior portion. The proximal border is straight or nearly so. The zooecia are usually arranged quite regularly in a flat crust. The front is thickly punctured with rather large rounded pores. Ovicells and avicularia are wanting.

Hippoponella Canu and Bassler, 1920

Hippoponella hippopus (Smitt), 1867. Pl. 10, fig. 3; pl. 11, figs. 3–4. (Whiteaves, 1901, p. 101 (*Lepralia*), Gulf of St. Lawrence; Osburn, 1912 a, p. 282 (*Lepralia*), Labrador.) Abundant one stones from hard bottoms, only once at a shore station 12. The species is a common North Atlantic form, ranging from Spitzbergen and Greenland southward along both coasts to the British Islands and Cape Cod.

The zoarium is white and glistening. The aperture is round anteriorly, nearly straight on the posterior border, with a pair of large denticles on the sides near the posterior border, giving the aperture somewhat the appearance of a horseshoe. Rounded or short oval avicularia are situated irregularly on the front of the zooecium, often several of them on one zooecium. The ooecium is hemispherical, smooth, and imperforate. Secondary calcification is usually very heavy, so that even the ooecium may be completely covered.

Microporellinae Canu and Bassler, 1917

Microporella Hincks, 1877

Microporella ciliata var. stellata (Verrill), 1875. Pl. 8, figs. 8–9. (Osburn, 1912, p. 233, synonymy and references.) Common, taken at three shore stations and eighteen dredging stations. It is world-wide in distribution and runs into numerous varieties, of which the *Porellina stellata* of Verrill is one common on all the New England coast. It is a heavily encrusted form, in which the secondary calcification largely conceals the primary characters. It has been discussed by Osburn (l.c.). The presence of a stellate pore just proximal to the posterior border of the semicircular aperture is a distinguishing character. Pointed avicularia are usually present at one or both sides of the aperture, pointed forward and outward.

Smittinidae Levinsen, 1909

Smittina Norman, 1903

Smittina trispinosa (Johnston), 1838, and var. *nitida* Verrill, 1875. Pl. 10, fig. 6. (Osburn, 1912, p. 246, (*Smittia*) for synonymy and references; 1912 a, p. 286, for Canadian references and records; Whiteaves, 1901, p. 106 (*Smittia*), Canadian records.) Rare in dredgings, stations 6, 18, 43, 94, and 95, not taken at shore stations. Most of the specimens are of the variety *nitida*, with oval avicularia, but some of them have the pointed avicularian mandibles of the true *trispinosa*. It is a cosmopolitan species with many varieties. On the American coast the variety *arborea* occurs in Greenland, the variety *nitida* ranges from Hudson Strait to the Carolina coast, and the variety *spathulata* from thence southward to Florida, Porto Rico, and Curaçao. The typical form occurs from Greenland to at least as far south as Cape Cod.

The zoarium often forms quite thick encrustations on pebbles and shells. The zooecia have raised borders, marginal pores, and avicularia of pointed or oval form variously situated. Occasionally a number of avicularia are present, but never, as far as I have observed, in the suboral position so common in other species in the genus. The lyrula or median shelf and the lateral denticles are conspicuous. The ooecium is hemispherical and perforated by a number of pores of irregular size and arrangement. Secondary calcification is often very heavy, frequently obscuring the primary characters, the peristome may be raised, especially on the sides, and umbonate processes may appear suborally and on the top of the ooecium.

Smittina concinna (Busk), 1852. Pl. 10, fig. 5. (Osburn, 1912, p. 247 (*Porella*), in part, synonymy and references; Whiteaves, 1901, p. 102 (*Porella*), Canadian records.) Stations 10, 13, 33, 36, 39, 40, 60, 69, 83, 89, 120, 121, and shore station 42. It is difficult to state the distribution of *S. concinna,* as it has been considered an extremely variable species, and probably several species have been recorded under this name. The *Lepralia belli* of Dawson (1859, p. 256) is probably correctly indicated as a variety of *concinna,* as it seems to differ only in the manner of secondary calcification and not in any primary character. Our specimens from Mt. Desert Island seem to come close to this variety. On the other hand, some of the records for *concinna* by Osburn (1912, p. 247, and 1912 a, p. 283) for Crab Ledge, Cape Cod, and for Labrador, Newfoundland, and Nova Scotia are confused with the following species. Figure 67 a of plate 27 of Osburn (1912) probably represents another species. It resembles the variety *gracilis* of Hincks (1880), which Busk later raised to a new species (1884, p. 154), *graciosa,* if indeed Busk was not dealing with still another form. I have in my collection specimens sent me by Sir Sidney F. Harmer from the English coast which appear to be the true *concinna,* and some of my specimens from Cape Cod and Shoal Tickle, Labrador, as well as those mentioned above from Mt. Desert Island, compare well with Harmer's specimens. Hincks has listed it and figured it as well (1892, pl. 8, fig. 6, var. *belli*), but his earlier figure (1889, pl. 21, fig. 4), showing the front of the zooecium perforated, appears to me to be another species.

The true *concinna* has the zooecia rather regularly disposed in lines, the frontal in young cells somewhat arched and finely granular, with a varying number of marginal pores, ordinarily 8 to 12. The suboral avicularium resembles closely in form and position that in the genus *Porella,* but a wide lyrula (nearly half as wide as the aperture) is present on the proximal border of the primary aperture. In secondary calcification, the frontal surface becomes thickened and more coarsely granular, forming an almost level crust, through which the marginal pores show in their original position. The ooecium is subglobose and imperforate (sometimes a single median pore may be present near the aperture), granular, and later becomes involved in the secondary crust. The zooecial aperture of a specimen from Plymouth, England, measures 0.079 mm. in length by 0.102 mm. in width, on the average; the zooecia average 0.47 mm. long by 0.35 mm. wide.

SMITTINA REDUPLICATA n.sp. Pl. 11, fig. 9; pl. 13, figs. 2–3; pl. 14, figs. 9–10. (Osburn, 1912, p. 247; 1912 a, p. 283 (*Porella concinna,* pars.) Encrusting stones and shells, common, taken at three shore stations and twenty-five dredging stations. The species is also represented in the author's collection from Great Round Shoal, off Nantucket Island, from Crab Ledge, off Cape Cod, from the Isles of Shoals, and from Shoal Tickle, near Nain, Labrador.

Zoarium in younger stages forming a semitranslucent, rather regular and even crust; in older specimens, with the increase in calcification, the presence of ooecia and secondary avicularia, becoming rough and white. Colonies an inch or more across have been observed. Zooecia somewhat elongate, regularly disposed where the substratum permits, broadest a little back of the aperture, the frontal surface regularly rounded from side to side and rising gradually from the base toward the aperture. The pores are limited to a marginal row, usually about twenty in number, which are separated by strong ribs which run only a short distance toward the center. In secondary calcification the frontal wall becomes very thick and the ribs continue to rise between the marginal pores, which are strikingly evident even in advanced stages. The primary aperture is semicircular, a little narrowed posteriorly, without cardelles, and with a very broad lyrula (resembling that of *concinna,* but much broader). The operculum has oblique sclerites and there are two small oral spines. A small rounded avicularium is situated on the proximal border of the aperture, as in *concinna,* but its chamber is more ventricose and broader, continued outward on the sides to the margin. In the infertile zooecia there remains this single avicularium, but in the fertile individuals a secondary avicularium of the same shape and size surmounts the first as the peristome rises. Occasionally this secondary avicularium is not in the midline and more rarely there are two, more or less symmetrically placed behind the aperture. Another type of avicularium, very small and with a pointed mandible, occurs occasionally on the distal border of the aperture, conforming to the curve of the aperture, and, with secondary calcification, opening into the orifice. This is difficult to see, except in calcined specimens, and I have not observed it when an ooecium is developed. The ooecium is hemispherical, prominent, and in secondary calcification becomes thick-walled, but is not at all immersed. It is imperforate, except occasionally a minute pore near the aperture, and the high peristome is continued around the aperture from the duplicate oral avicularium to the sides of the ooecium, the whole anterior part, consisting of oral avicularia, peristome, and ooecium, stands high and prominent above the remainder of the zooecium.

Zooecia measure about 0.59 mm. long by 0.36 mm. wide, and the aperture averages 0.125 mm. in width by 0.1 mm. in length.

The species shows resemblances to *S. concinna* in the presence of the lyrula, the form of the aperture, and the form, size, and position of the primary oral avicularium. The costate border of the zooecium reminds one of *Porella proboscidea* Hincks, and there are also certain resemblances to *Porella* (*Phylactella*) *peristomata* Nordgaard. Because *S. concinna* has been considered a very variable species, and because I originally listed this with *concinna*, I sent specimens to Dr. Anna B. Hastings, of the British Museum, for comparison. Miss Hastings writes, "we have a great variety of specimens purporting to be *concinna*, some have more numerous and regular marginal pores than the type, some have mandibles with oblique sclerites, some have conspicuous fertile zooecia, but none have these characters combined as in yours and none have ribs between the marginal pores." Therefore I feel that, even in a group that greatly needs revision, I am fairly safe in describing this form as a new species, and I have named it *reduplicata* on account of the secondary oral avicularia of the fertile zooecia, which appear in all of my material from Cape Cod to Labrador.

SMITTINA BELLA (Busk), 1860. Pl. 9, fig. 7; pl. 13, fig. 9; pl. 14, fig. 11. (Whiteaves, 1901, p. 103 (*Porella*), references, Gulf of St. Lawrence.) Not common, taken once at a shore station, 12, and at dredging stations 58, 62, 71, 83, and 121. The synonymy of this species has been greatly confused, and I am not at all certain that it is completely untangled yet. Nordgaard (1918, p. 67) gives a partial synonymy, with references. The Mt. Desert Island specimens in every detail agree well with the excellent figures of Levinsen (1916, pl. 24, figs. 13 and 14). I have no doubt of the identity of Nordgaard's and Levinsen's material, nor of the identity of my specimens with theirs, but if Hincks' figures and description are correctly taken from Busk, there is a mistake somewhere, as his description indicates deep sutures between the zooecia, and a punctured ovicell. In the *bella* of Nordgaard and Levinsen and of the present paper, the zooecia are somewhat rounded up on the frontal surface and with shallow marginal depressions only for a short time in the young, while the ooecium is imperforate except for a single pore of varying size (often quite large) in the distal portion. Also, the secondary calcification (which appears very early) covers both zooecia and ooecia with an almost level crust, with large tremopores on the frontal surface and the large pore of the ooecium. The secondary crust from the zooecia on either side meets in the midline of the ooecium to cover the half or more of the ooecium nearest the aperture, while the similar layer of the distal zooecium grows backward to cover the distal portion of the ooecium. The large pore of the ooecium may be at the junction of the three secondary layers, or it may be surrounded by the layer from the distal zooecium. Dissection shows this pore penetrating the primary layer of the ooecium. The oral lyrula is distinct and squared, the cardelles not well developed, though dissection shows them as small pointed teeth. The operculum is thin, with a pair of curved sclerites well within the border.

In addition to the Mt. Desert Island specimens, I have one from Gaspé Bay, Gulf of St. Lawrence, labeled "Whiteaves, 1869, *Porella bella* Busk." As Whiteaves' material was identified by Norman, I take it that his record is correct. Whether Verrill's record (1879, p. 192) is correct may be doubted.

The zooecia measure on the average 0.7 mm. long by 0.5 mm. wide, and the primary aperture 0.12 mm. long by 0.15 mm. wide.

Smittina novanglia n.sp. Pl. 9, figs. 8–9; pl. 13, figs. 7–8; pl. 14, fig. 5. This species, which is apparently undescribed, bears a very close resemblance to *S. bella* in its general appearance and mode of secondary calcification, but the ooecium is entirely imperforate and is not overgrown by the secondary crust; the lyrula is variable, usually smaller and shorter, and is often rounded or pointed on its free border (sometimes it is scarcely evident), and the cardelles are larger. It occurred at dredging stations 56 and 62, near the entrance to Sommes Sound, at about 60 feet, in the Mount Desert Island collections. I have specimens also from Great Round Shoal, east of Nantucket Island, at 8 fathoms, and from Georges Bank.

Zoarium forming a single layer on stones and shells, rather coarse in texture, white to light yellowish brown in dried specimens. Zooecia large, coarsely and unevenly punctured by large tremopores, the frontal wall becoming very thick almost from the beginning of calcification; the marginal grooves moderately distinct in younger stages. The primary aperture about as in *bella*, though a little larger and longer in comparison. The lyrula is usually less prominent, smaller, sometimes rectangular, but usually with rounded corners, frequently roughly triangular, and sometimes reduced so as to be scarcely evident; the hinge denticles are much stronger than in *bella*, so that between them and the lyrula the oral border appears bisinuate. The thin operculum bears a pair of curved sclerites well separated from the border. A small rounded or oval avicularium behind the lyrula becomes enclosed within the secondary aperture, which is pyriform and bears a deep sinus in its proximal border. Ooecium moderate in size, hemispherical, without pores of any kind; instead, it is finely granular over the whole of the exposed surface at all stages; it becomes thick-walled in older stages of calcification, but it is never covered and obscured by encroachment on the sides by neighboring zooecia. The frontal surface of the zooecium also becomes very thick with the early formation of the tremocyst, but presents much the same appearance as in younger stages. A delicate granular surface is presented in final calcification, as in *bella*. Also a rounded or short-pointed umbonate process is sometimes present proximal to the secondary aperture.

The zooecia measure somewhat smaller than in *bella*, about 0.6 mm. in length by 0.4 mm. in breadth, while the primary aperture is a trifle larger, about 0.14 mm. long by 0.16 mm. wide.

Probably another genus will be required for these and other thick-walled porous species, since they seem to differ materially from typical *Smittina*, but for the present I prefer to assign them to this genus.

Mucronella Hincks, 1880

Mucronella immersa (Fleming), 1847. Pl. 11, fig. 8; pl. 15, fig. 9 a. (Osburn, 1912, p. 243 (*M. peachii*), for references and synonymy; Whiteaves, 1901, p. 107 (*M. peachii*), Canadian records.) Common on stones at both shore and dredging stations; taken at eight shore and thirty-three dredging stations. An abundant North Atlantic species from Spitzbergen and Greenland southward to the British Islands and southern New England. The primary characters include a row of marginal pores, a rounded aperture with a conspicuous tooth on the proximal border, and 5 or 6 slender spines on the oral margin. The ooecium is hemispherical and imperforate. Secondary calcification is often heavy and may obscure most of the primary characters. The smooth front of the zooecium then becomes rough, and grooves may extend inward from the marginal pores.

Mucronella ventricosa (Hassall), 1842. Pl. 15, figs. 7 and 9 b. (Osburn, 1912, p. 243, for references; Whiteaves, 1901, p. 107, for Canadian records.) Common on shells and stones, on hard bottoms; taken at twenty-one dredging stations, not found at shore stations. Abundant in northern seas, probably circumpolar, on the American coast occurring from Greenland to Cape Cod. The frontal surface of the zooecium is swollen, smooth, or minutely granular in radiating rows. A row of small marginal pores is present, and a conspicous double-pointed tooth occupies the middle of the proximal border of the rounded aperture. A projecting umbo often obscures this tooth from above. The ooecium is conspicuous, globular, and imperforate.

Mucronella abyssicola (Norman), 1868. Pl. 15, figs. 8–9 c. (Whiteaves, 1901, p. 107, Canadian records.) Rare, dredged at stations 52 and 62 on pebbles. An Arctic and North Atlantic species, Spitzbergen and Greenland and southward nearly to Cape Cod. The zooecia are swollen, broadest at the middle and somewhat tapered at both ends, separated by deep fissures. The aperture is comparatively small, considerably broader than long, with a very broad denticle on the proximal margin. The denticle is overhung by a broad flattened umbonate process, which in fertile zooecia is often continued around the sides of the aperture to meet the ooecium and form a spout-like peristome. The ooecium is of moderate size, globose, broader than long, and minutely granular like the frontal surface. Two or three short spines are often present on the oral border.

Mucronella spinulifera Hincks, 1889. Pl. 15, fig. 10. (Hincks, 1889, p. 431, pl. 21, fig. 3; 1892, p. 152 (*Monoporella*), Gulf of St. Lawrence; Whiteaves, 1901, p. 108 (*Monoporella*); Osburn, 1912 a, p. 282, Labrador.) Rare, noted only once, a small colony on a pebble at dredging station 62. An Arctic and North Atlantic species which has been previously recorded from Franz Josef Land, northern Norway, Greenland, and south to the Gulf of St. Lawrence.

The zoarium forms reddish-brown incrustations. The zooecia are large, distinctly separated, the front somewhat inflated, granular, and with a row of marginal pores (seen after calcining). The aperture is quite simple, rounded distally, without hinge denticles, and with a single sharp median spine on the proximal border. There is no peristome, and avicularia and spines (other than the median tooth) are wanting. The ooecium is hemispherical, inconspicuous, and subimmersed. The frontal wall is thick, and this, with the great simplicity of the zooecium and the presence of the single short spine-like denticle on the oral border, will easily distinguish it from any other species in our fauna.

Hincks described it in the genus *Mucronella,* but later (1892, p. 152) removed it to *Monoporella.* As the latter genus is understood at present, *spinulifera* cannot possibly belong in it. It is possible that it may not belong in *Mucronella,* but I leave it there for the present, as my material is too scanty for more than the determination of the species.

Umbonula Hincks, 1880

Umbonula arctica (Sars), 1851. Pl. 11, fig. 7. (Osburn, 1912, p. 243 (*Mucronella pavonella*), for references; Whiteaves, 1901, p. 107 (*Mucronella pavonella*), Canadian records.) Occasionally taken, thirteen dredging stations, not found at shore stations. Found in great numbers on a sunken spruce tree which was pulled up from a depth of 85 feet at station 13. The species is common in the Arctic and North Atlantic and as far south as Cape Cod.

The zoarium forms rounded or fan-like incrustations on stones and shells and often projects, shelf-like, from the stems of hydroids and other bryozoans. The zooecia are large and broad, regularly arranged, areolated around the margin, with ribs extending toward the center. The aperture is large, nearly round, with a small triangular tooth on the middle of the proximal border. A small oval avicularium on either side of the aperture. Ooecia wanting.

RHAMPHOSTOMELLA Lorenz, 1886

RHAMPHOSTOMELLA OVATA (Smitt), 1867. Pl. 11, figs. 5–6. (Osburn, 1912, p. 245, references and synonymy; 1912 a, p. 286, Cape Sable, Nova Scotia, and Labrador; Whiteaves, 1901, p. 108, Gulf of St. Lawrence.) Common, usually on stems of various sorts, but also on stones and shells, at four shore stations and twenty-one dredging stations. Arctic seas, Greenland, Iceland, etc., and southward on the American coast to Cape Cod. On the European coast it apparently does not extend southward beyond the Lyngenfjord, Norway.

Zooecia large, somewhat convex, with large punctures and marginal areolae. The aperture is large, ovoid, the larger rounded end anterior, the narrowed proximal end usually somewhat unsymmetrically placed. An oval avicularium is situated on the anterior surface of a blunt, smooth rostrum and facing toward the aperture. The large ooecia are imperforate or very finely punctured and globose in form.

RHAMPHOSTOMELLA SCABRA (Fabricius), 1780. (Whiteaves, 1901, p. 108, for references and records.) Taken only once, station 69. As far as our observations go, *R. scabra* does not appear to be at all common on the North Atlantic coast of America. Norman's identification of Dawson's material from the Gulf of St. Lawrence is no doubt correct, but Verrill's statement ''Vineyard Sound to Greenland' is undoubtedly open to question, as I have determined by the examination of his material that he confused both *costata* and *bilaminata* with *scabra*. As a matter of fact, all of the older records in this genus must be accepted with caution, at least until the work of Lorenz (1886) became known. The true *scabra* has not been found as far south as Vineyard Sound, though I have a specimen from Georges Bank, in the Gulf of Maine. The species is a high northern one, reported most frequently from the Arctic Ocean, Nova Zembla to Greenland, and the coast of northern Norway.

The surface of the zooecium is somewhat ribbed, but the ribs do not extend upon the rostrum, which is strong, bluntly pointed, and not very high (in comparison with *R. costata*).

There is a row of marginal pores between the ribs. The oral aperture is large, unsymmetrically oval, with occasionally a small denticle on the middle of the proximal border, though this is usually lacking. A small oval avicularium is situated at one side and partially beneath the rostrum. Larger avicularia of the same general form are scattered irregularly over the zoarium. Ooecia are hemispherical, wide open toward the aperture, and irregularly perforated.

Rhamphostomella costata Lorenz, 1886. Pl. 10, fig. 7. (Osburn, 1912, p. 244, references and synonymy; 1912 a, p. 286, records for Labrador and Nova Scotia; Whiteaves, 1901, p. 108, 'abundant among St. Lawrence dredgings.') Very common on stones and Pyura stems on hard bottom. Dredged at thirty-three stations, not found at shore stations. In my experience, this is by far the most common member of the genus on the American coast north of Cape Cod. It often forms heavy incrustations on coarser stems. Like the other species of this genus here listed, it is high northern in range, Franz Josef Land to Greenland and south to Cape Cod.

There appears to be some question whether *costata* should be considered a distinct species or a variety of *scabra*. At any rate, the true *costata* has a very prominent pointed rostrum, with the strong frontal ribs of the zooecium contined upon it to near its tip; the suboral avicularia are larger and bluntly pointed, as are also the frontal avicularia. The upper surface of the large hemispherical ooecium is coarsely and irregularly perforated. The oral denticle is large and irregular.

Occasional specimens show the character of the variety *cristata*, with a transverse bar across the tip of the rostrum.

Rhamphostomella bilaminata (Hincks), 1877. Pl. 10, fig. 8. (Osburn, 1912, p. 244, synonymy and references; Whiteaves, 1901, p. 108, Canadian records.) Common on stones and *Pyura* stems, from hard bottom; not taken at shore stations, but dredged at twenty-five stations. Spitzbergen to Greenland and along the North American coast to south of Cape Cod. Of all the members of the genus here recorded it is the only one that extends into the more temperate waters of Vineyard Sound and Buzzards Bay. The others appear to stop rather abruptly at Crab Ledge, off Cape Cod, and the outer waters of the Nantucket Shoals. This species, like the preceding, was confused by Verrill with *R. scabra,* and his Vineyard Sound records for that species doubtless are to be referred to *R. bilaminata.*

The zooecia are large, smooth, or with small ribs which run part way to the base of the rostrum. Behind the large aperture the peristome rises into a double fold with a deep notch between the thin lip-like projections, and through this notch the narrow denticle is visible on the proximal border of the primary aperture. Ooecium very large, hemispherical, smooth and punctured, obscuring about half of the aperture and the frontal surface of the distal zooecium as far as the base of the rostrum.

Rhamphostomella radiatula (Hincks), 1877. Pl. 12, figs. 1–2. (Osburn, 1912 a, p. 286, off Cape Sable, Nova Scotia.) Rare, noted only at dredging stations 6, 69, 94, and 95. This is the southernmost record to date. Whiteaves did not list it for the Gulf of St. Lawrence, but the colonies are always very small in comparison with others of the genus and may be readily overlooked. I have seen specimens from Hudson Strait, and to the northward it extends from Greenland to Spitzbergen.

The zooecia are small, especially in comparison with other members of the genus, and the frontal surface bears strong radiating ribs. The peristome rises high on the sides of the aperture and in fertile zooecia extends forward upon the sides of the ooecium. The primary aperture bears a denticle on the proximal border, the secondary aperture is quite irregular, with a proximal notch within which is located a small avicularium. The secondary calcification is quite heavy, but does not involve the smooth rounded ooecia, which are provided with a few small scattered pores. The zoaria usually form small irregular nodules on stems of various kinds.

PORELLA Gray, 1848

PORELLA PROPINQUA (Smitt), 1867. Pl. 12, figs. 3–4. (Osburn, 1912, p. 248, synonymy and references; 1912 a, p. 285, Cape Sable, Nova Scotia; Whiteaves, 1901, p. 105, Gulf of St. Lawrence.) Very common on stones, shells, and stems, on hard bottom; dredged at forty-two stations and taken at one shore station. A common northern species, Spitzbergen, Greenland, and south to the waters about Cape Cod. It does not extend so far south on the European coast, being recorded only from northern Norway.

Zooecia large, convex, surface roughened by raised ribs which extend part way toward the center from between the marginal pores. A raised border separates the zooecia. The rather large aperture is rounded distally, somewhat narrowed proximally by a pair of lateral denticles. Peristome only slightly raised in infertile zooecia, but when ooecia are present the peristome is carried up on the sides of the aperture into a pair of flap-like projections which are continued forward upon the ovicell and backward to partially or entirely enclose the oral avicularium. Immediately behind the aperture is a rather large avicularian chamber, bearing a round avicularium. A large broadly spatulate avicularium is occasionally present on the front of the zooecium and rarely this type may replace the small round oral one. The large, subglobose ooecium is punctured, the pores often arranged in an outer ring and a central cluster. The dorsal wall of the zooecium is perforated by numerous small punctures.

PORELLA ACUTIROSTRIS Smitt, 1867. Pl. 12, figs. 5–6. (Osburn, 1912, p. 248, Cape Cod; Whiteaves, 1901, p. 103, Gulf of St. Lawrence.) Not very common, encrusting stones and shells, taken at shore stations 11 and 42 and dredged at stations 94, 118, 121, and 126. A high northern species, distributed from Franz Josef Land to Greenland and south on the American coast to Cape Cod. In Europe it occurs southward only to northern Norway.

The zoaria form thin and usually very regularly arranged incrustations on flat surfaces. The zooecia are of moderate size, convex, smooth, or granular, with a row of marginal pores. Primary aperture round in front, straight on the proximal border, the secondary aperture formed by the high thin peristome, which runs forward upon the ooecium to form a conspicuous frontal border; posteriorly the fold extends backward to join with the sides of the rostrum, but not to enclose it. The suboral avicularium has a bluntly triangular (sometimes short oval) mandible and is mounted on a rather high smooth rostrum. The ooecium is large, prominent, globose, smooth, and imperforate.

Porella proboscidea Hincks, 1888. Pl. 10, fig. 9. (Osburn, 1912, p. 249, synonymy and references; 1912 a, p. 285, Labrador and Cape Sable, Nova Scotia; Whiteaves, 1901, p. 103, Gulf of St. Lawrence.) The most abundant Porella of the region, encrusting stones, shells, and larger stems; taken at five shore stations and thirty-one dredging stations. Greenland to Nova Zembla and southward on the American coast to Nantucket and No-mans-land Islands.

The white zoarium forms rough encrustations, or extends shelf-like or in frills from the sides of stems. Younger zooecia have a row of areolae around the margin, with strong ribs running often to the base of the rostrum. In older zooecia the secondary calcification becomes very heavy, covering the ribs, the raised margins, and even the rostrum and ooecium, producing a rather smooth flat layer. The primary aperture is round, with a straight proximal border; the secondary aperture is pyriform, the smaller end enclosing the rounded suboral avicularium. The ooecium is subglobose, smooth, imperforate, and prominent in the young state, but later immersed in the continuous crust.

Porella skenei (Ellis and Solander), 1786. Pl. 12, figs. 7–8. (Whiteaves, 1901, p. 104, synonymy, references, Gulf of St. Lawrence and Le Have Bank, Nova Scotia; Osburn, 1912 a, p. 285, references, Cape Sable, Nova Scotia.) Rare, taken only once, near Egg Rock, encrusting a stone. Kara Sea to Greenland and south along both coasts, in Europe to southwestern France, on the American shore to St. Georges Bank, in the Gulf of Maine.

The zooecia are large, rather tubular in form, thick-walled, with 3 or 4 digitate processes of the peristome, which may or may not bear rounded avicularia. The zooecia are raised anteriorly and the peristome is high, quite obscuring the primary aperture. The ooecia are small, globular, and imperforate.

Porella plana Hincks, 1888. Pl. 13, fig. 1. (Whiteaves, 1901, p. 104 (*P. skenei*, var. *plana*), Gulf of St. Lawrence.) Apparently very rare. It is an Arctic and high northern species, though Hincks described it from the Gulf of St. Lawrence. Probably Mt. Desert Island is about the southern limit of its range.

The zoarium becomes erect and branched from an encrusting base, the branches flattened and lobate. The zooecia are large and regularly disposed, with a row of marginal pores, few in number. At first glance the species seems to resemble *P. skenei* rather closely, but the suboral umbonate processes, 1 to 3 in number, so characteristic of that species, are lacking entirely, except in very young stages, when a small umbonate process (avicularian chamber) is present above the middle of the proximal border of the aperture. This soon becomes covered in and the avicularium obscured. There are two lateral processes, one on each side of the aperture, bearing avicularia with rounded mandibles turned more or less toward the aperture. The ooecium is like that of *P. skenei*, but is somewhat larger.

Celleporidae Busk, 1852

Schizmopora MacGillivray, 1888

Schizmopora canaliculata (Busk), 1884. Pl. 13, figs. 4–5. (Osburn, 1912, p. 239 (*Cellepora*), synonymy and references; Whiteaves, 1901, p. 109 (*Cellepora*), Gulf of St. Lawrence.) Occasionally on hydroid stems, dredged at stations 15, 90, 94, 95, 96, 105, 107, and 149. This fine species is not recorded elsewhere than on the New England and southern Canadian coasts. Busk described the species from near Halifax, Nova Scotia, since when it has been noted in the Gulf of St. Lawrence, near Cape Sable, Nova Scotia, and about Cape Cod.

The zoarium encrusts small stems, usually forming rounded colonies, though I have seen roughly branched ones. The young zooecia are somewhat ovate, punctured about the base, and smooth; in older colonies the zooecia become erect, or nearly so, and very irregularly disposed. The orifice is rounded, with a rather broad sinus. Above the aperture rises a very tall, stout, somewhat curved rostrum, grooved on its anterior surface, and bearing at its tip a small round avicularium. From the sides of the thin peristome a broad flange connects with the sides of the rostrum. The ooecium is large, broader than high, flattened on its proximal surface, and irregularly punctured.

Order CTENOSTOMATA Busk, 1852

Flustrellidae Hincks, 1880

Flustrella Gray, 1848

Flustrella hispida (Fabricius), 1780. Pl. 5, fig. 8. (Osburn, 1912, p. 250, synonymy and references; Whiteaves, 1901, p. 114, Nova Scotia; Cornish, 1907, p. 79, common at Canso, Nova Scotia.) Extremely abundant on rock weed at shore stations 26 and 42, and found also at stations 13 and 20. Dredged at only one station, 30, in about 60 feet. The species is a typical shorewise form, usually found in only a few feet of water, and frequently between tide marks. Its distribution is Arctic and North Atlantic, Greenland and south to southern New England, the Murman coast and northern Norway and south to France.

The rather firm brownish gelatinous zoarium is entirely encrusting, usually on the stems of *Fucus* and *Ascophyllum*. The zooecia are large, but their structure is not easily observed, except in younger zooecia, as the entire surface of the colony bristles with the large chitinous spines, which are arranged around the margin and the orifice. The aperture is bilabiate and slightly raised. The presence of the spines and the absence of calcification are sufficient to distinguish the species on the Atlantic coast.

Alcyonidiidae Hincks, 1880

Alcyonidium Lamouroux, 1821

Alcyonidium polyoum (Hassall), 1841. Pl. 5, figs. 5–7. (Osburn, 1912, p. 251 (*A. mytili*), synonymy and references.) Frequent at both shore and dredging stations, encrusting stones, shells, and at station 14 extraordinarily abundant on *Laminaria* stems. Noted at six shore stations and twenty-two dredging stations. Ranging from Arctic seas, Spitzbergen, and Greenland, southward on both sides of the Atlantic to France and southern New England, on the Pacific coast to British Columbia, and Harmer reports it for the Torres Straits. Strange to say, it has not been reported for eastern Canada, though I have specimens from Hudson Strait.

In the "Report on the Bryozoa of the Woods Hole Region," Osburn listed the species under the commonly accepted name, *A. mytili* Dalyell, with the suggestion that it might be synonymous with Hassall's *Sarchochitum polyoum.* Since then Harmer (1915, p. 37) has discussed this question and has accepted the synonymy.

The zoarium is encrusting, forming rather firm, dingy white, yellowish, reddish, gray, or brown colonies, sometimes quite dark, at other times almost transparent. In young, rapidly growing colonies the layer may be very thin and transparent, in older stages the gelatinous zooecial wall thickens. There is a good deal of variation in appearance in the different stages, to which the differences in color add more variety. Verrill described the red variety as a new species, *A. rubrum.* The surface of the zooecium is smooth, except where the retracted polypide forms a small papilla near the middle of the frontal wall.

Alcyonidium parasiticum (Fleming), 1828. Pl. 5, figs. 3–4. (Osburn, 1912, p. 251, references.) Dredged at fourteen stations, encrusting the stems of hydroids, etc., one colony on the carapace of a *Hyas.* The species occurs on both sides of the Atlantic, on the European side from Spitzbergen to the British Islands, but on the American side it has not been reported farther north than the present record, while it extends south to the Chesapeake Bay.

This form is not parasitic in the true sense, but appears to grow only on the surfaces of other animals, especially on rounded stems, and I have never observed it on algae. The zoarium is covered with a coat of earthy matter to such an extent that it is difficult to study the zooecia except at the extreme edge of the colony. The frontal area of the zooecium is smooth, with a row of small marginal papillae. The septa between the zooecia are very distinct in the young, but soon the colony appears as a grayish layer with small depressed areas which represent the middle of the zooecia.

Alcyonidium gelatinosum (Linnaeus), 1766–1768. (Osburn, 1912, p. 252, references; Whiteaves, 1901, p. 114, Gulf of St. Lawrence.) Rare, taken only at shore stations 4 and 14 and at dredging station 21, all in inner waters of the region. It is a circumpolar species, taken at numerous points in the Arctic Ocean, southward to the Mediterranean, to southern New England, and to British Columbia on the Pacific coast.

The zoarium is erect, simple or branching, very irregular in form, the branches nodulose and usually roughly subcylindrical. The branches are usually a quarter of an inch or more in diameter, the central portion semitransparent, gelatinous, and the zooecia packed closely together in the outer layer. The orifices of the zooecia are in low papillae, and other small and low papillae are often present.

Alcyonidium mamillatum Alder, 1857. Not uncommon on shells, stones, and stems; noted at five shore stations and nine dredging stations. It is probably circumpolar in distribution, as it has been recorded from the Kara Sea westward to the Dolphin and Union Strait, Arctic Canada. Hincks noted its presence in deep water off the coast of England, but in American waters it has not been recorded south of Greenland, except at Richmond Gulf, east side of Hudson Bay. Its presence in such numbers at Mt. Desert Island indicates that it is not a mere straggler in this region, and it will probably be found along the coasts of Nova Scotia, Newfoundland, and Labrador.

The zoarium usually encrusts stems, forming a coarse, brownish layer from which arise tall, stout, transversely wrinkled papillae, in the tips of which are located the apertures.

Vesiculariidae Hincks, 1880

Bowerbankia Farre, 1837

Bowerbankia gracilis Leidy, 1855. Pl. 5, fig. 2. (Osburn, 1912, p. 253, synonymy and references; 1912 a, p. 287, the variety *caudata* Hincks, Cape Sable, Nova Scotia.) Frequent, taken at seven shore stations and eighteen dredging stations, in shallow water, growing over stems of various kinds. Most specimens show the caudate process representing the var. *caudata* of Hincks. The range of the species on the American coast is from Curaçao, in the Caribbean Sea, to Greenland, and Hincks described his *B. caudata* from England. Whiteaves and other writers have not listed it for eastern Canada (except Osburn, see above), but as I have specimens from Hudson Strait, it is probably distributed along the entire coast.

The zoarium is branching and stolonate, usually loosely attached, but sometimes with free branches. The small zooecia are attached irregularly to the stolon. They are elongated, subcylindrical, usually somewhat squared at the distal end and narrowed at the base. They are transparent enough so that the rounded gizzard may be seen readily.

Buskiidae Hincks, 1880

Buskia Alder, 1856

Buskia armata (Verrill), 1874. Pl. 4, fig. 4. (Osburn, 1912, p. 256 (*Hippuraria*), synonymy and references.) Rare, only one small colony noted, among specimens of *Bowerbankia gracilis,* at dredging station 20, near the mouth of Salisbury Cove on the north side of the island. The species has hitherto been recorded only from southern New England, though I have seen specimens from north of Cape Cod. The present record is probably about its northern limit. Southward it extends to the Carolina coast.

The zoarium is stolonate and creeps over stems, with occasional branches rising free. The small, long ovate zooecium has a flattened area on one side which is less heavily chitinized, and four small tubercles at the distal end bear long slender spines. The zooecia are attached in pairs at the ends of internodes. A gizzard of a peculiar type is present. It consists of four bluntly conical discs with teeth which project into the lumen (see Osburn and Veth, 1922, p. 158, Ohio Journal of Science).

Harmer (1915, p. 88) has assigned the present species to the genus *Buskia* and states that it is closely allied to *B. setigera* Hincks. In this I believe him to be correct, but in the hundreds of specimens of *armata* I have examined I have not observed the spiny protuberances for attachment at the base of the zooecia, as in *setigera,* and the zooecial wall is not transparent, but of a yellowish horn color. I have specimens of *B. setigera* from Porto Rico, and it is probably circumtropical in distribution.

LITERATURE

1. New England and eastern Canadian references.

CORNISH, G. A. 1907 Report on the marine Polyzoa of Canso, Nova Scotia. Marine and Fisheries Report of Canada, sessional paper no. 22 a. Ottawa.

DAWSON, J. W. 1859 In: Geological Survey of Canada for 1858, Polyzoa, pp. 255–257. Ottawa.

——— 1865 Note on a species of Gemellaria from Sable Island. Proc. and Trans. Nova Scotia Institute of Nat. Sci., vol. I, pt. 3. Halifax.

DESOR, E. 1848 Ascidoidian polyps or Bryozoa (from Nantucket). Proc. Boston Soc. Nat. Hist., vol. III.

HINCKS, T. H. 1888 Polyzoa of the St. Lawrence. Ann. and Mag. Nat. Hist., ser. 6, vol. I.

——— 1889 Polyzoa of the St. Lawrence, pt. 2. Ibid., vol. III.

——— 1892 Polyzoa of the St. Lawrence, pt. 3. Ibid., vol. IX.

LEIDY, J. 1855 Contributions toward a knowledge of the marine invertebrate fauna of Rhode Island and New Jersey. Jour. Acad. Nat. Sci. Philadelphia, 2nd ser., vol. III, Polyzoa, pp. 9–11.

NICKERSON, W. S. 1898 Preliminary notice of a new species of endoproct, Loxosoma davenporti, from the Massachusetts coast. Science, n.s., vol. 7.

OSBURN, R. C. 1912 Bryozoa of the Woods Hole Region. Bull. U. S. Bureau of Fisheries, vol. 30 (for 1910).

——— 1912 a Bryozoa from Labrador, Newfoundland and Nova Scotia. Proc. U. S. Nat. Mus., vol. 43, no. 1933.

OSBURN, R. C., AND VETH, R. M. 1922 A new type of Bryozoan gizzard, with remarks on the genus Buskia. Ohio Journal of Science, vol. XXII, no. 6.

Packard, A. S. 1863 List of animals dredged near Caribou Island (Labrador). Canadian Naturalist and Geologist for 1863. Montreal.

——— 1867 Invertebrate fauna of Labrador and Maine. Proc. Boston Soc. Nat. Hist., vol. 1.

——— 1869 Observations on the glacial phenomena of Labrador and Maine, with a view of the recent invertebrate fauna of Labrador. Mem. Boston Soc. Nat. Hist., vol. I.

Stimpson, W. 1853 Synopsis of the marine invertebrate fauna of Grand Manan, or the region about the mouth of the Bay of Fundy, New Brunswick. Smiths. Contr. to Knowledge, vol. VI, no. 5, Bryozoa, pp. 17–19.

Verrill, A. E. 1872 Brief contribution to zoölogy from the Museum of Yale College, no. XIX. Recent additions to the molluscan fauna of New England and adjacent waters, with notes on other species. Am. Jour. Sci. and Arts, vol. IX, Bryozoa, p. 212.

——— 1875 Idem., no. XXXII. Results of dredging expeditions off the New England coast in 1874. Ibid., vol. IX, Bryozoa, p. 414.

——— 1875 a Idem., no. XXXIII. Results of dredging expeditions off the New England coast in 1874. Ibid., vol. X, Bryozoa, pp. 41–42.

——— 1879 Idem., no. XLIII. Notice of recent additions to the marine fauna of the eastern coast of North America, no. 6. Ibid., vol. XVIII, pp. 52–54.

——— 1880 Notice of recent additions to the marine invertebrata of the Atlantic coast of North America. Proc. of the U. S. Nat. Mus., vol. 2, Polyzoa, pp. 188–196.

——— 1885 Results of explorations made by the Str. Albatross of the east coast of the United States in 1883. Ann. Rept. of the Commissioner of Fish and Fisheries for 1883. Bryozoa, p. 530.

Verrill, A. E., and Smith, S. I. 1874 The invertebrate animals of Vineyard Sound and adjacent waters. Rept. of the Commissioner of Fish and Fisheries for 1871–1872. Bryozoa, pp. 707–714, 747.

Whiteaves, J. F. 1874 On recent deep-sea dredging operations in the Gulf of St. Lawrence. Am. Jour. Sci. and Arts, vol. VII.

——— 1901 Catalog of the marine Invertebrata of Eastern Canada. Geol. Survey of Canada, Ottawa. Polyzoa, pp. 91–114.

2. Other references cited

Busk, G. 1884 Polyzoa. Cheilostomata. Challenger Reports, vol. X, pt. 30.

Canu, F., and Bassler, R. S. 1917 A synopsis of American early tertiary cheilostome Bryozoa. Bull. U. S. Nat. Museum, no. 96.

——— 1920 North American early tertiary Bryozoa. Bull. U. S. Nat. Mus., no. 106.

——— 1925 North American later tertiary and quaternary Bryozoa. Bull. U. S. Nat. Mus., no. 125.

——— 1925 a Les Bryozoaires du Maroc et de Mauritanie. 1er Mémoire. Mem. de la Soc. des Sci. Nat. du Maroc, no. X.

——— 1926 Studies on the cyclostomatous Bryozoa, pt. 2. Proc. U. S. Nat. Mus., vol. 69, art. 21.

——— 1928 Fossil and recent Bryozoa of the Gulf of Mexico region. Proc. U. S. Nat. Mus., vol. 72, art. 14.

CANU, F., AND BASSLER, R. S. 1928 a Les Bryozaires du Maroc et de Mauritanie. 2e Mémoire. Mem. Soc. Sci. Nat. du Maroc, no. XVIII.

——— 1929 Bryozoa of the Philippine region. Bull. U. S. Nat. Mus., Bull. 100, vol. 9.

HARMER, S. F. 1915 The Polyzoa of the Siboga Expedition. Part 1, Entoprocta, Ctenostomata and Cyclostomata. Report of the Siboga Exped., XXVIII a.

——— 1923 On Cellularine and other Polyzoa. Jour. Linn. Soc., Zool., vol. XXXV.

——— 1926 The Polyzoa of the Siboga Expedition. Part 2, Cheilostomata anasca. Rept. of the Siboga Exped., XXVIII b.

HASTINGS, A. B. 1930 Cheilostomatous Polyzoa from the vicinity of the Panama Canal, collected by Dr. C. Crossland. Proc. Zool. Soc. London, no. XLVII, part IV.

HINCKS, T. H. 1880 British Marine Polyzoa. 2 vols. London.

JULLIEN, J., ET CALVET, L. 1903 Bryozoaires provenant des campagnes de l'Hirondelle. Résultats des Campagnes Scientifiques du Prince de Monaco, fasc. XXIII. Monaco.

KLUGE, H. 1907 Zur Kenntnis der Bryozoen von West-Grönland. St. Petersburg, Bulletin Academie Science, series 6, vol. I.

LEVINSEN, G. M. R. 1909 Morphological and systematic studies on the Cheilostomatous Bryozoa. Copenhagen.

——— 1916 Bryozoa. Danmark-Exspeditionen til Grönlands Nordöstkyst, 1906–1908, vol. 3, no. 16.

LORENZ, L. VON 1886 Bryozoen von Jan Mayen. K.-K. Akad. der Wissenschaften zu Wien. Die Internationale Polarforschung 1882–1883, Bd. III.

MARCUS, E. 1922 Bryozoen von den Aru-Inseln. Abhandl. d. Senckenb. Naturf. Gesellsch., vol. 35.

NORDGAARD, O. 1905 Hydrographical and biological investigations in Norwegian fjords. Bergen Museum.

——— 1906 Bryozoa from the second 'Fram' expedition, 1898–1902. Rept. of the second Norwegian Arctic Exped. in the 'Fram,' no. 8.

——— 1918 Bryozoa from the Arctic regions. Tromsö Mus. Aarshefter, vol. 40, no. 1.

O'DONOGHUE, C. H., AND O'DONOGHUE, E. 1926 A second list of Bryozoa (Polyzoa) from the Vancouver Island Region. Contr. to Canadian Biol. Stations of Canada, n.s., vol. 30, no. 3.

OSBURN, R. C. 1923 Bryozoa. Rept. of the Canadian Arctic Exped., 1913–1918, vol. VII, part D.

ROBERTSON, A. 1900 Papers from the Harriman Alaska Expedition, 6. The Bryozoa. Proc. Washington Acad. Sci., vol. 2.

——— 1905 Non-incrusting chilostomatous Bryozoa of the west coast of North America. Univ. of California Publications, Zool., vol. 2, no 5.

SMITT, A. F. 1864–1871 Kritisk Förteckning öfver Skandinaviens Hafs-Bryozoer Ofversigt af Kongl. Svenska Vetenskaps-Akademiens Forh., Oct. 1864, pp. 115–142; Oct. 1865, pp. 395–534; Feb. 1867, pp. 279–429; 1868, bihang, pp. 1–230; 1871, bihang, pp. 1113–1134.

WATERS, A. W. 1900 Bryozoa from Franz-Josef Land, collected by the Jackson-Harmsworth Expedition in 1896–1897. Chilostomata. Jour. Linn. Soc. London, Zool., vol. 28, pp. 43–105.

PLATES

DESCRIPTION OF PLATES

(All figures not otherwise indicated in the following plates were drawn by Dr. S. J. Conrad.)

PLATE 1

Fig. 1 *Crisia cribraria,* a characteristic internode.
Fig. 2 The same, side view of ooecium and ooeciostome.
Fig. 3 *Crisia eburnea,* characteristic internode.
Fig. 4 The same, side view of ooecium and ooeciostome.
Fig. 5 *Idmonea atlantica,* mode of branching and arrangement of zooecia.
Fig. 6 The same, detail of ooecium and ooeciostome (Rogick, after Osburn).
Fig. 7 *Diplosolen obelium,* edge of zoarium, showing ooecium with ooeciostome and other details.
Fig. 8 *Lichenopora verrucaria,* young colony.
Fig. 9 *Tubulipora lobulata,* habit sketch and portion of a lobe.
Fig. 10 *Crisia cribraria,* detail of ooeciopore.

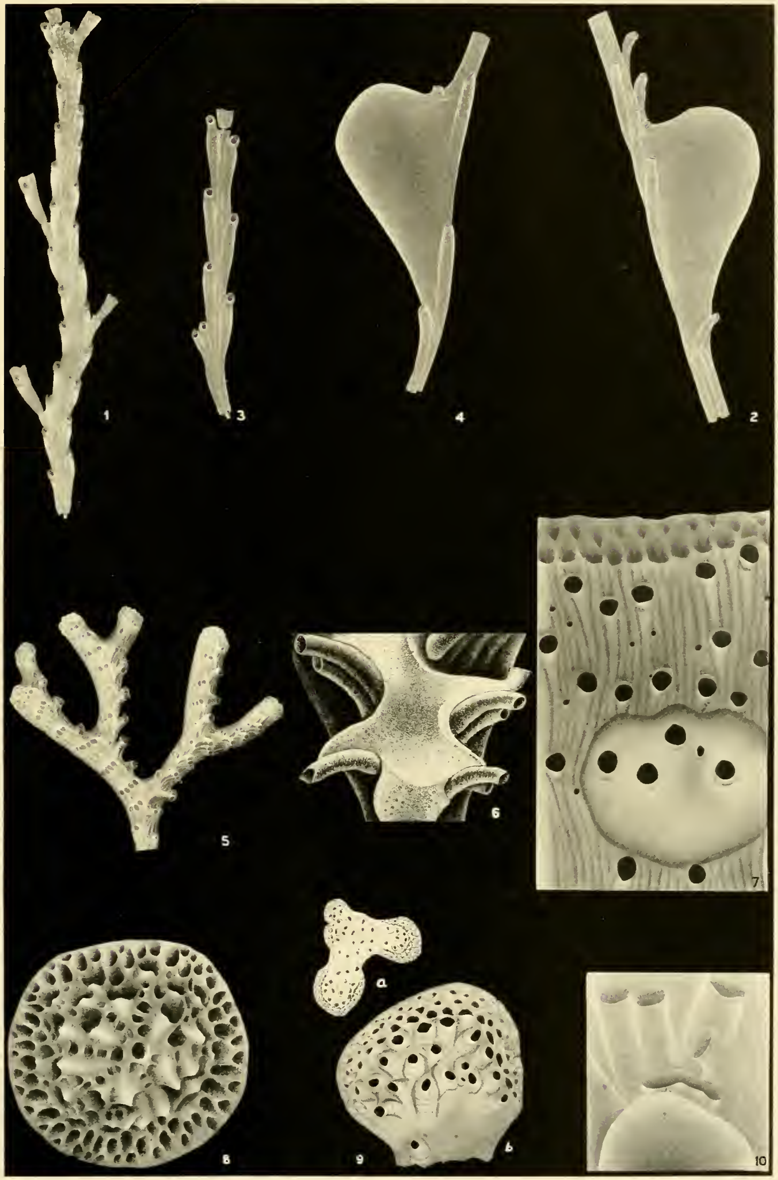

1
3
4
2
5
6
7
a
8
9
b
10

PLATE 2

Fig. 1 *Oncousoecia canadensis*, n.sp., habit sketch (Rogick).

Fig. 2 The same, ooecium and ooeciostome (Rogick).

Fig. 3 The same, incompleted ooecium at edge of zoarium, showing relation to zooecia (Rogick).

Fig. 4 The same, diagram of a bilobate ooecium (Rogick).

Fig. 5 *Oncousoecia diastoporides*, zooecia, ooecium, and ooeciostome.

Fig. 6 The same, ooecium and ooeciostome (Rogick).

Fig. 7 The same, another ooecium of slightly different form (Rogick).

Fig. 8 The same, base of colony, showing ancestrula (Rogick).

Fig. 9 *Oncousoecia* (*Alecto*) *dilatans* (Thomson), corrected drawing of the specimen figured by Hincks (B. M. P., pl. 61, fig. 5) as *Tubulipora lobulata*, and taken by Canu as the genotype of *Oncousoecia*.

Fig. 10 *Tubulipora flabellaris*, detail of ooecium and ooeciostome (Shannon).

Fig. 11 *Tubulipora liliacea*, detail of ooecium and ooeciostome (Shannon).

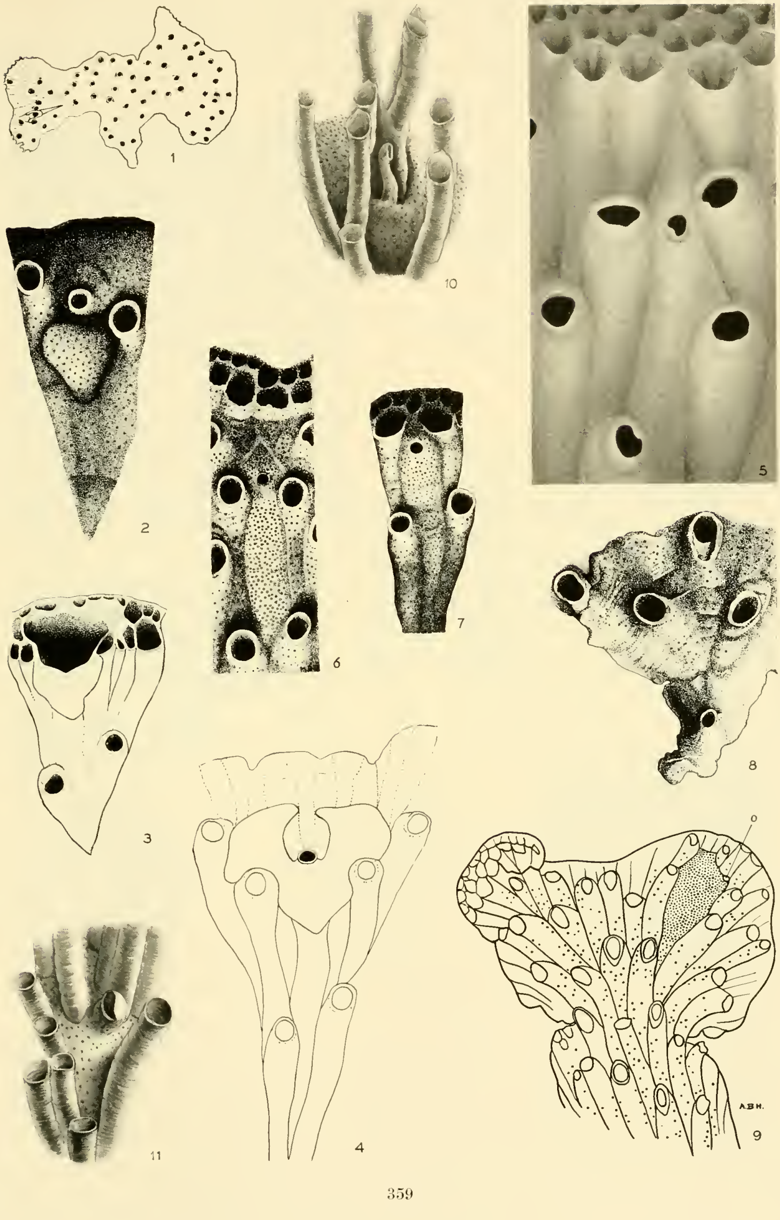

1
10
5
2
6
7
8
3
o
A.B.H.
9
11
4

PLATE 3

Fig. 1 *Tubulipora lobulata*, margin of zoarium, a portion of an ooecium shown at left.

Fig. 2 The same, a transverse ooecium (Rogick).

Fig. 3 The same, a bilobate ooecium, the usual form (Rogick).

Fig. 4 The same, diagram of a bilobate ooecium, dissected to show the internal cavity (Rogick).

Fig. 5 The same, a young zoarium showing ancestrula (Rogick).

Fig. 6 *Diaperoecia harmeri* n.sp., tip of branch showing ooecium with the usual semicircular ooeciopore (Rogick).

Fig. 7 The same, characteristic position of ooecium among the zooecial tubules (Rogick).

Fig. 8 The same (?), circular ooeciopore remote from tubules (Rogick).

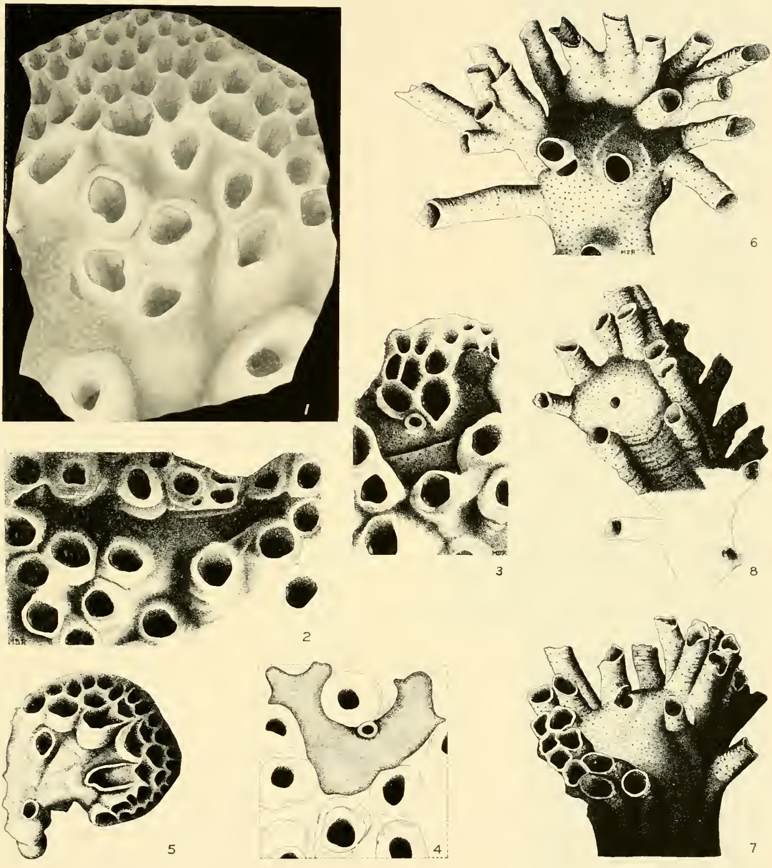


PLATE 4

Fig. 1 *Diaperoecia harmeri* n.sp., habit sketch.

Fig. 2 *Crisia cribraria* habit sketch.

Fig. 3 *Crisia eburnea*, habit sketch.

Fig. 4 *Buskia armata*, habit sketch (Shannon).

Fig. 5 *Gemellaria loricata*, slender variety.

Fig. 6 The same, stouter variety (= *americana* Lamouroux, = *dumosa* Stimpson, = *willisii* Dawson).

Fig. 7 Caberea ellisii, habit sketch.

Fig. 8 *Dendrobeania murrayana*, habit sketch.


1
2
5
7
3
4
6
8

PLATE 5

Fig. 1 *Tubulipora flabellaris*, portion of characteristic zoarium.
Fig. 2 *Bowerbankia gracilis*, portion of zoarium, the var. *caudata* Hincks.
Fig. 3 *Alcyonidium parasiticum*, showing mode of growth.
Fig. 4 The same, young zooecia at edge of zoarium.
Fig. 5 *Alcyonidium polyoum*, young, uncrowded zooecia at edge of zoarium.
Fig. 6 The same, older part of colony.
Fig. 7 The same, crowded condition of growth.
Fig. 8 *Flustrella hispida*, habit of growth and partly covered by *Bowerbankia gracilis*.

PLATE 5

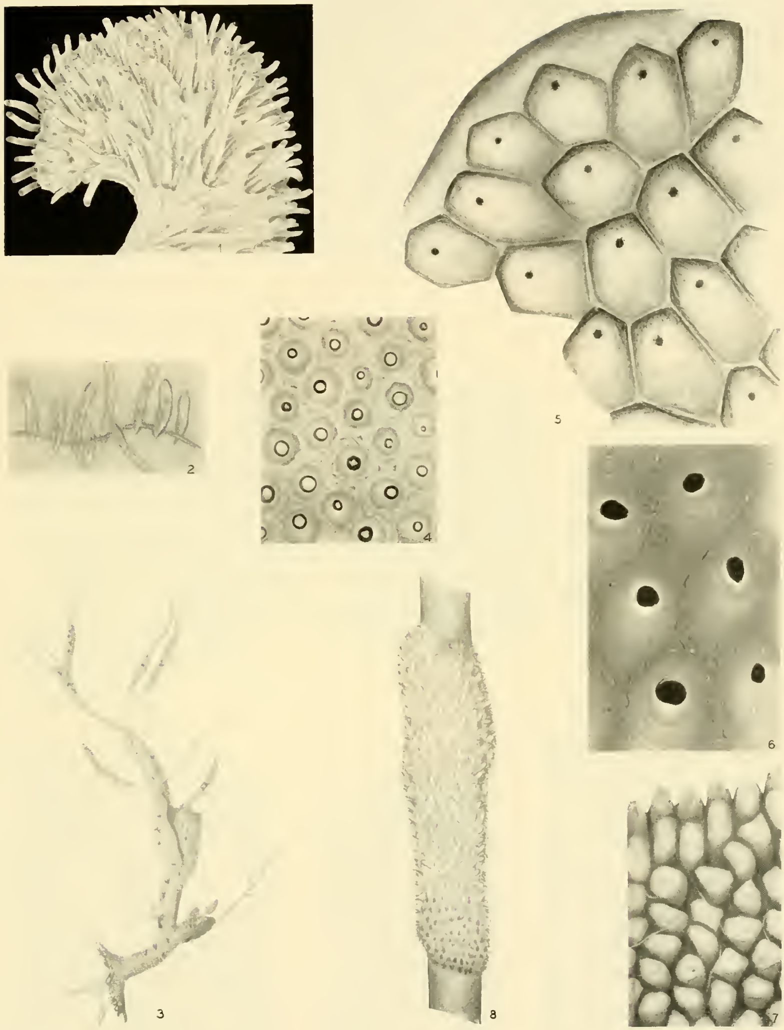


PLATE 6

Fig. 1 *Electra pilosa*, long spined phase.

Fig. 2 *Callopora aurita*, infertile zooecia near center of zoarium.

Fig. 3 The same, fertile zooecia, note position of avicularia in absence of ooecium in lower right corner.

Fig. 4 *Callopora craticula*, the zooecium in the upper left corner shows the spines in their most characteristic form.

Fig. 5 *Tegella arctica*, highly calcified.

Fig. 6 *Callopora dumerilii*, details of zooecia.

Fig. 7 *Tegella unicornis* var. *armifera*, details of zooecia.

Fig. 8 *Amphiblestrum flemingii*, usual appearance with avicularia.

Fig. 9 The same, zooecia crowded and without avicularia.

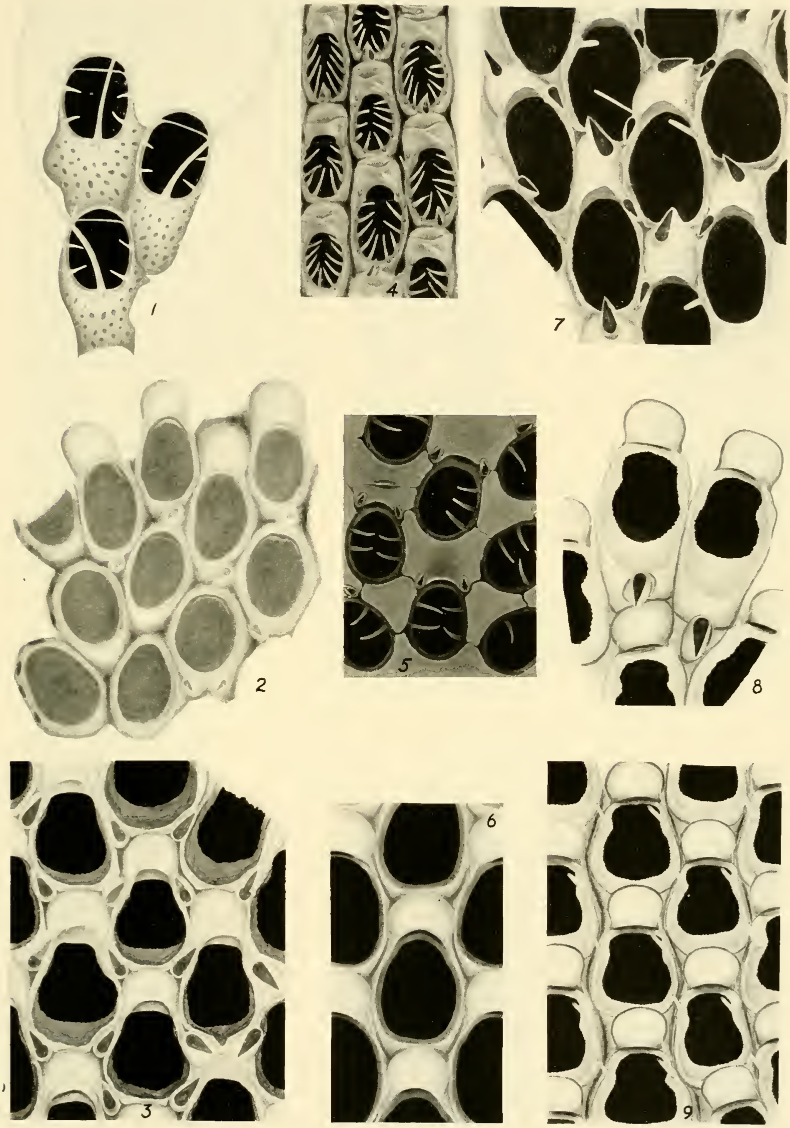

1
4
7
2
5
8
3
6
9

PLATE 7

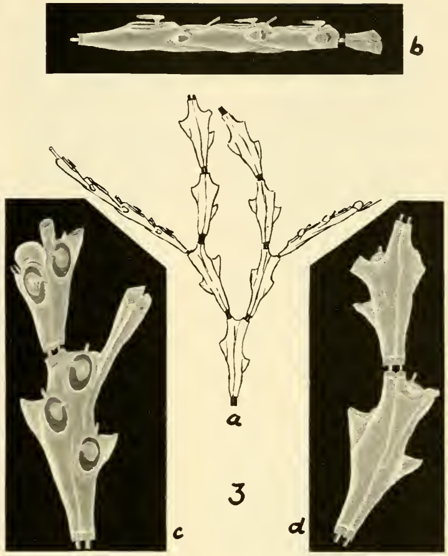
Fig. 1 *Gemellaria loricata*, portion of zoarium showing arrangement of zooecia and mode of branching.

Fig. 2 *Tricellaria peachii*, a single internode.

Fig. 3 *Tricellaria ternata*, habit sketch and front, back, and side views of zooecia.

Fig. 4 *Scrupocellaria scabra*, habit sketch and front, back, and side views of zooecia; the long vibracula denuded.


1


b
a
c
3
d


2


b
a
c
d
4

PLATE 8

Fig. 1 *Caberea ellisii,* dorsal view, showing the large vibracular chambers and dentate vibracula.

Fig. 2 The same, front view, details of zooecia.

Fig. 3 *Dendrobeania murrayana,* front view of branch. The much larger lateral avicularia occasionally present are wanting.

Fig. 4 *Bugula flabellata,* front view, showing details, and two views of avicularium.

Fig. 5 *Cribrilina punctata,* young and infertile zooecia.

Fig. 6 The same, fertile zooecia.

Fig. 7 *Cribrilina annulata,* characteristic portion of zoarium.

Fig. 8 *Microporella ciliata,* var. *stellata,* heavy secondary calcification.

Fig. 9 The same, younger zooecia.

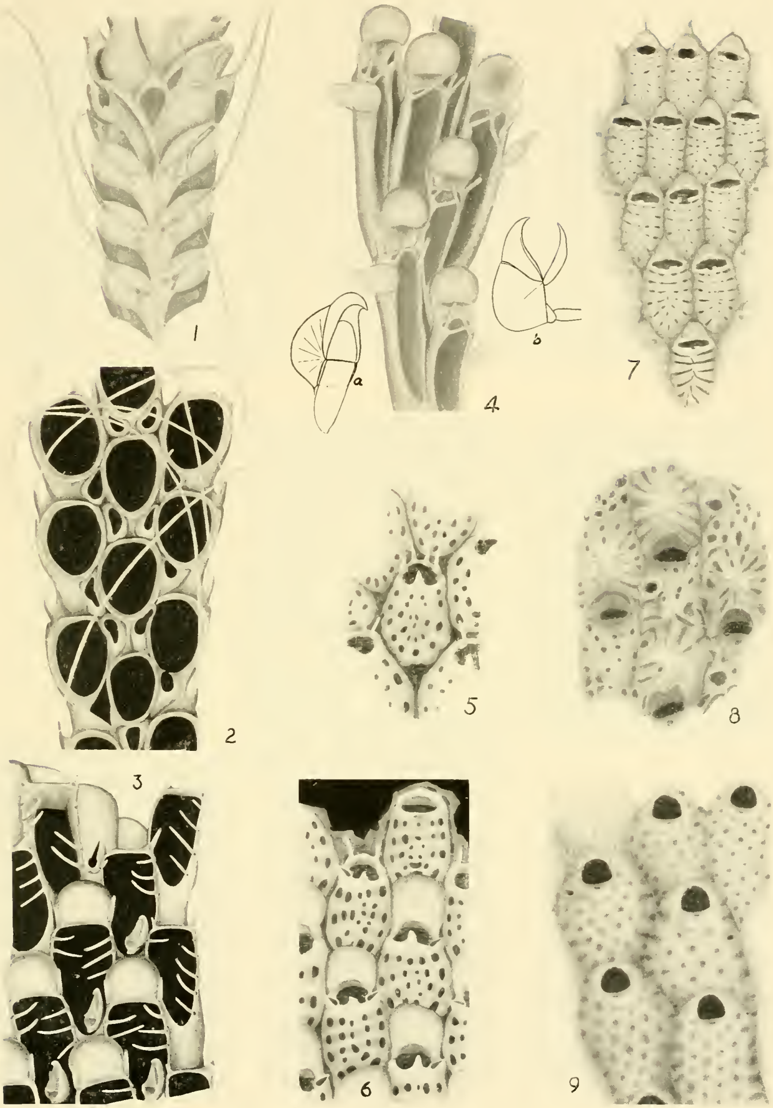

1
a
b
4
7
2
5
8
3
6
9

PLATE 9

Fig. 1 *Hippothoa hyalina*, young zooecia at edge of zoarium.

Fig. 2 The same, inside margin of colony, zooecia not crowded.

Fig. 3 The same, much crowded condition, with numerous ooecia.

Fig. 4 *Hippothoa expansa*, fertile and infertile zooecia and the expansion of the margin of the dorsal side (Rogick).

Fig. 5 *Schizomavella auriculata*, details of fertile zooecia.

Fig. 6 *Hippodiplosia smitti*, fertile and infertile zooecia.

Fig. 7 *Smittina bella*, highly calcified condition, showing ooecia covered by neighboring zooecia (except for the large ooeciopore).

Fig. 8 *Smittina [illegible]* n.sp., high calcification, ooecia not covered by the zooecia on either side.

Fig. 9 The same, final stage of calcification.

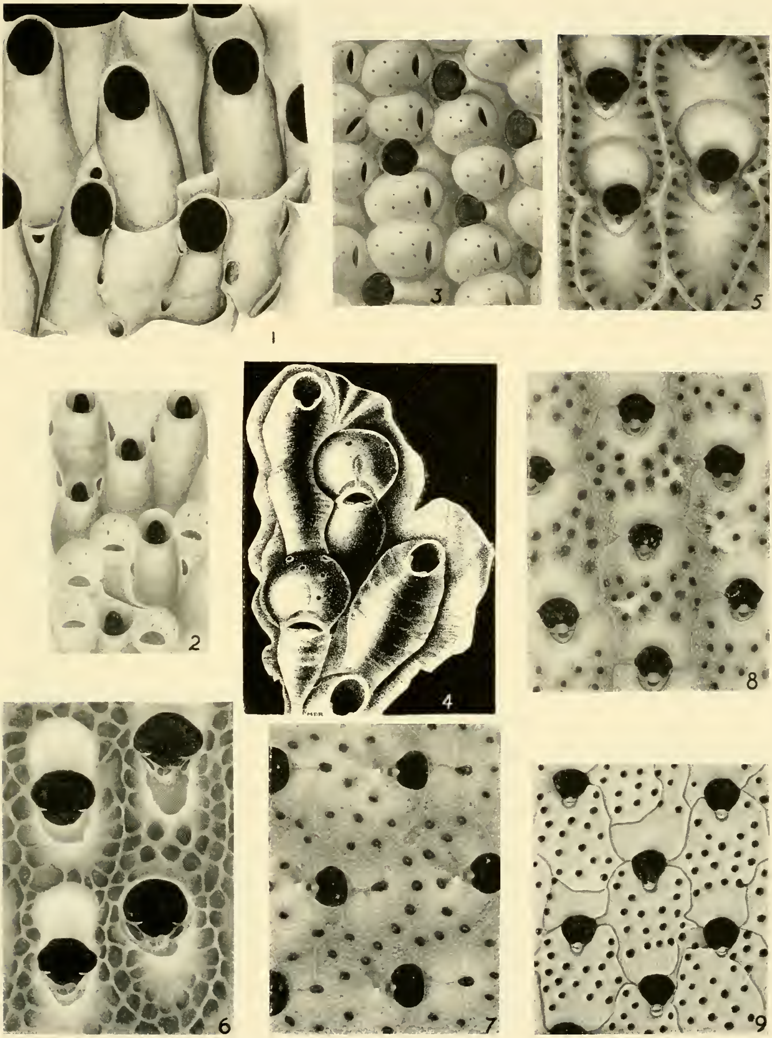

1
2
3
4
5
6
7
8
9

PLATE 10

Fig. 1 *Escharoides rosacea*, margin of zoarium.

Fig. 2 *Hippodiplosia reticulato-punctata*, infertile zooecia, the frontal imperforate area is smaller and less V-shaped than usual.

Fig. 3 *Hippopodinella hippopus*, characteristic appearance of zooecia in secondary calcification.

Fig. 4 *Cryptosula pallasiana*.

Fig. 5 *Smittina concinna* var. *belli*, in final calcification.

Fig. 6 *Smittina trispinosa*.

Fig. 7 *Rhamphostomella costata*.

Fig. 8 *Rhamphostomella bilaminata*.

Fig. 9 *Porella proboscidea*, the costae are fewer than usual.

PLATE 10

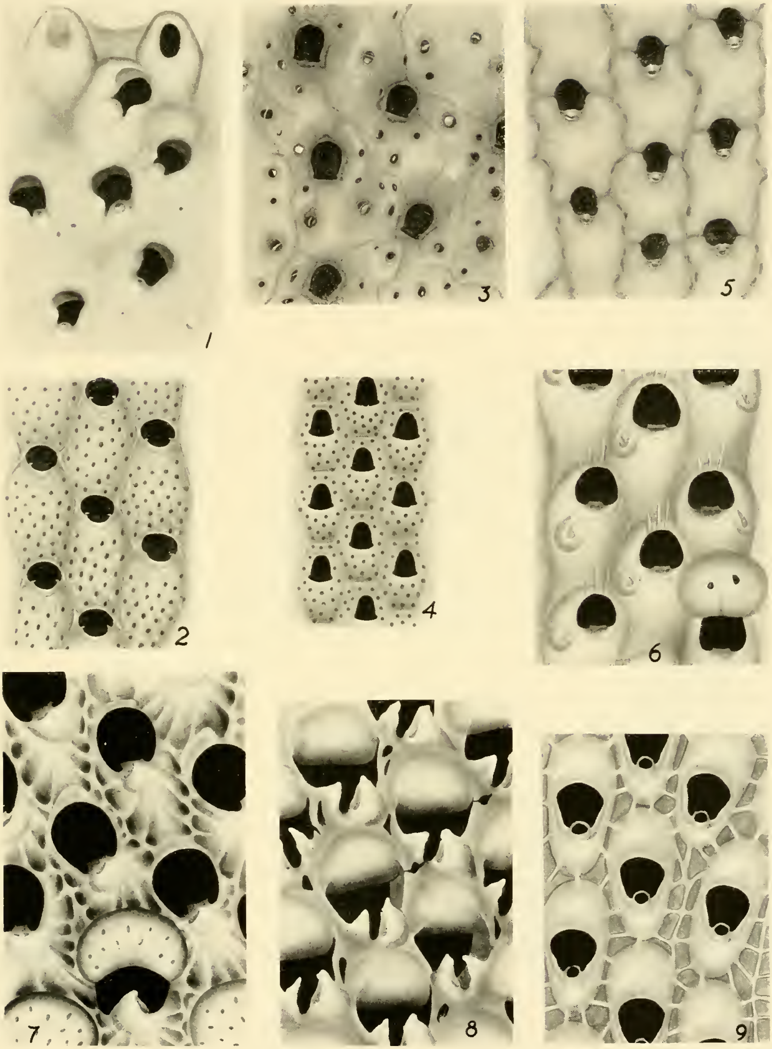


PLATE 11

Fig. 1 *Stomachetosella sinuosa*, young zooecia at margin of colony.

Fig. 2 The same, secondary calcification.

Fig. 3 *Hippopodinella hippopus*, young zooecia at margin of colony and beginning of secondary calcification.

Fig. 4 The same, somewhat older zooecia.

Fig. 5 *Rhamphostomella ovata*, young zooecia.

Fig. 6 The same, highly calcified.

Fig. 7 *Umbonula arctica*, young zooecia.

Fig. 8 *Mucronella immersa*

Fig. 9 *Smittina reduplicata* n.sp., advanced stage of calcification. Three conditions of the secondary oral avicularium are shown, median (usual) and lateral and bilateral (unusual). The surface is exceedingly rough.

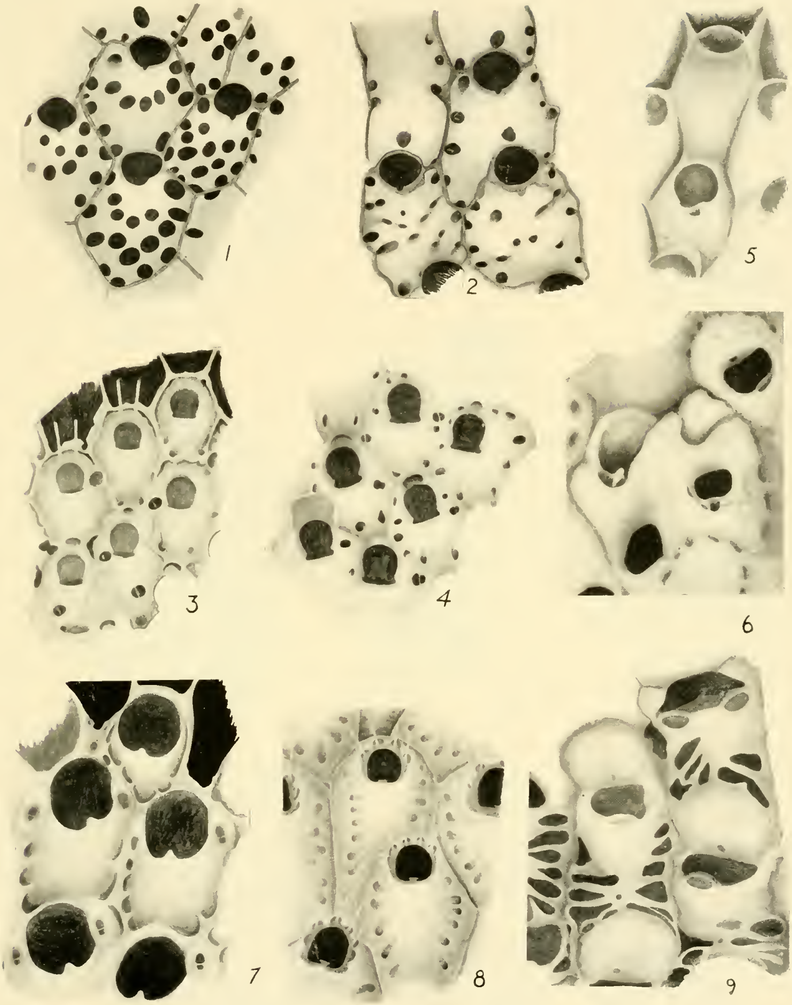

1
2
5
3
4
6
7
8
9

PLATE 12

Fig. 1 *Rhamphostomella radiatula*, characteristic appearance of zooecia with ovicells.

Fig. 2 The same, habit sketch.

Fig. 3 *Porella propinqua.*

Fig. 4 The same, detail of fertile and infertile zooecia.

Fig. 5 *Porella acutirostris.*

Fig. 6 The same, detail of aperture.

Fig. 7 *Porella skenei.*

Fig. 8 The same, two views of ooecium and umbonate processes.

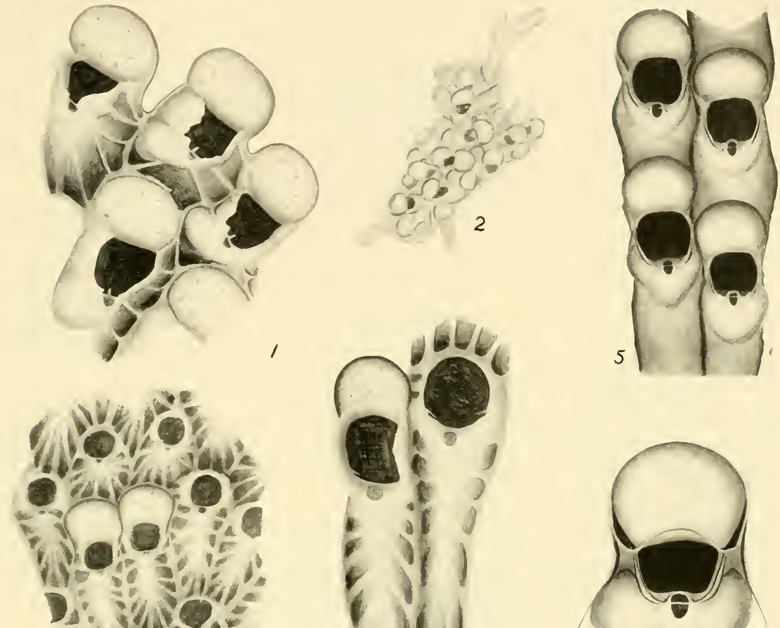

1
2
3
4
5
6
7
8

PLATE 13

Fig. 1 *Porella plana*, young zooecia at margin of zoarium.

Fig. 2 *Smittina reduplicata* n.sp., young infertile zooecia showing beginning of secondary calcification.

Fig. 3 The same, detail of aperture in high secondary calcification.

Fig. 4 *Schizmopora canaliculata*, details of zooecia.

Fig. 5 The same, habit sketch.

Fig. 6 *Hippodiplosia reticulatopunctata*.

Fig. 7 *Smittina novanglia* n.sp., secondary calcification.

Fig. 8 The same, outline sketch showing relations of zooecia to the aperture and ooecium (Rogick).

Fig. 9 *Smittina bella*, secondary classification showing relations of zooecia to aperture and ooecia. A portion of the secondary calcification is broken away on the left side showing a part of the primary ooecial wall with large pore (Rogick).

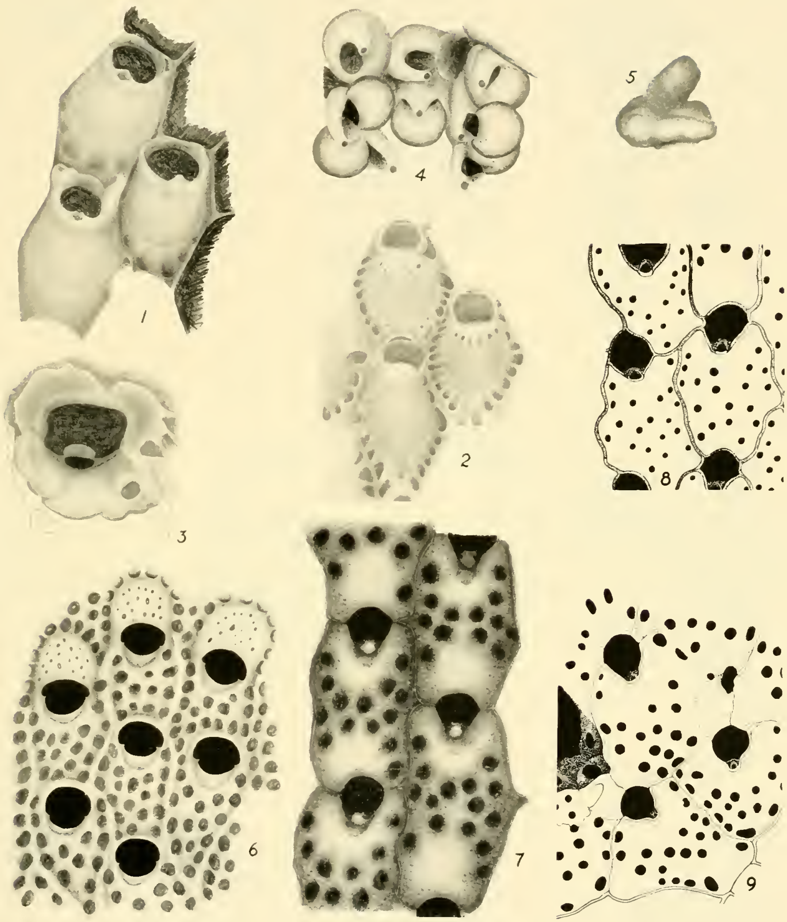

1
4
5
3
2
8
6
7
9

PLATE 14

(All figures by Miss Rogick except figure 1, by Conrad.)

Fig. 1 *Cylindroporella tubulosa.*

Fig. 2 *Amphiblestrum trifolium,* details of fertile zooecium.

Fig. 3 *Pyripora catenularia,* detail of zooecium.

Fig. 4 The same, mode of branching.

Fig. 5 *Smittina novanglia* n.sp., internal view of aperture.

Fig. 6 *Hippodiplosia americana,* fertile zooecium.

Fig. 7 The same, infertile zooecium.

Fig. 8 *Hippodiplosia pertusa,* fertile and infertile zooecia.

Fig. 9 *Smittina reduplicata* n.sp., detail of primary aperture.

Fig. 10 The same, diagrammatic longitudinal section of a fertile zooecium, showing primary and secondary oral avicularia and median pore of ooecium.

Fig. 11 *Smittina bella,* operculum.


1
2
3
5
6
9
4
8
7
11
10

PLATE 15

(All figures by Miss Rogick.)

Fig. 1 *Stomachetosella producta*, secondary calcification.

Fig. 2 The same, diagram of a longitudinal section showing thickness of frontal wall.

Fig. 3 The same, form of primary aperture.

Fig. 4 *Posterula sarsi.*

Fig. 5 *Stephanosella biaperta.*

Fig. 6 The same, detail of ooecium.

Fig. 7 *Mucronella ventricosa.*

Fig. 8 *Mucronella abyssicola.*

Fig. 9 *Mucronella*, the lyrulae of:

a. *M. immersa.*

b. *M. ventricosa.*

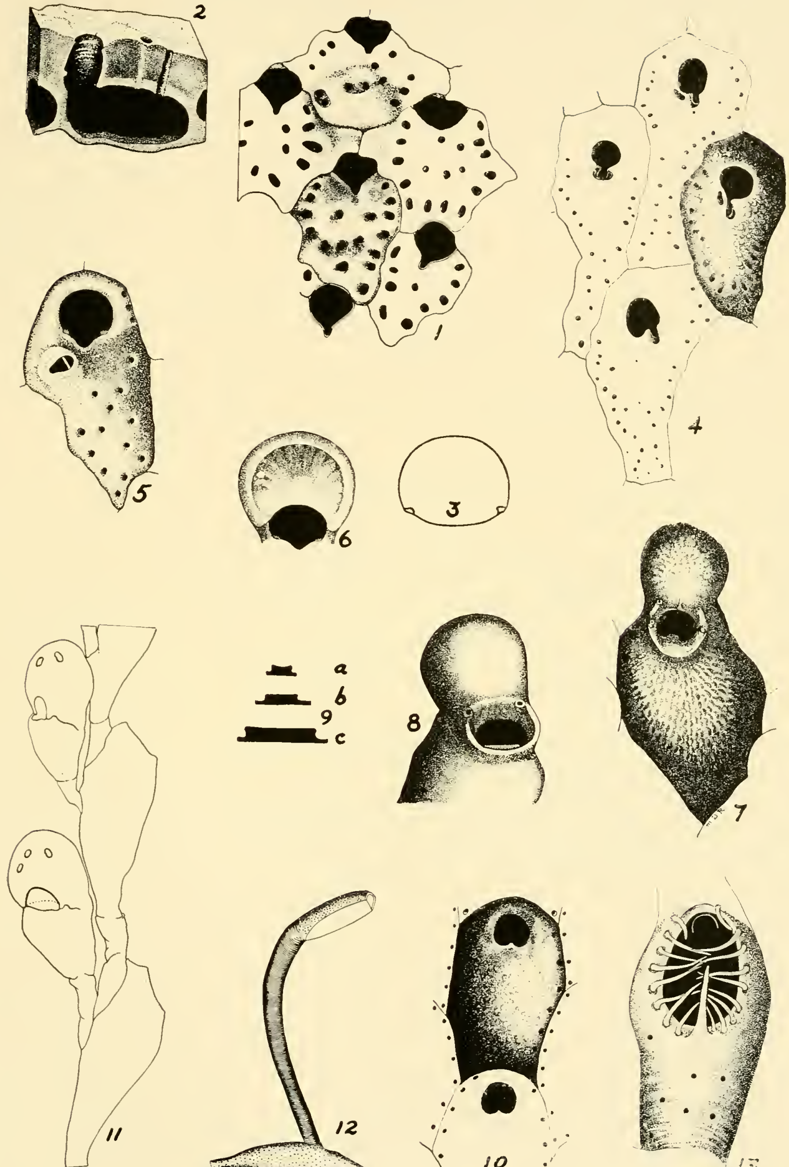
c. *M. abyssicola.*

Fig. 10 *Mucronella spinulifera.*

Fig. 11 *Scruparia clavata*, outline sketch showing normal and reduced fertile zooecia.

Fig. 12 *Aetea anguina.*

Fig. 13 *Electra monostachys*, spinous variety, frequently all of the spines except the large basal one are wanting.


2
1
4
5
6
3
a
b
9
c
8
7
11
12
10
13

ERRATA

Page 30, line 34. Esperiopsis quatsinoeusis should read Esperiopsis quatsinoensis.

Page 95, lines 7 and 11. Homeodictya should read Homoeodictya.

Page 125, line 18. Aurenia should read Aurelia.

Page 162, line 36. Carditae should read Cardiidae.

Page 165, line 1. Murcidae should read Muricidae.

Page 179, line 2. Prionodesacea should read Priondesmacea.

Page 210, line 22. Gastropoda should read Gasteropoda.

INDEX

To and Including Genera

Chart 1 Blue Hill Bay and western portion of Mount Desert Island.

Chart 2 Frenchmans Bay and eastern portion of Mount Desert Island; location of Sorrento Harbor is indicated by the star.

BIOLOGICAL SURVEY
OF THE
MOUNT DESERT REGION

Directed by

WILLIAM PROCTER

Research Associate in Marine Biology,
Academy of Natural Sciences
of Philadelphia

PART 2

FISHES

A contribution to the life-history of the angler
(Lophius piscatorius)

BY THE SURVEY STAFF

WILLIAM PROCTER,
Bar Harbor, Maine

HENRY C. TRACY,
University of Kansas

EDWIN HELWIG,
University of Pennsylvania

CHARLES H. BLAKE,
Massachusetts Institute of Technology

J. E. MORRISON,
University of Minnesota

SIMON COHEN,
Artist, University of Kansas

From the Laboratory of

THE BIOLOGICAL SURVEY OF THE MOUNT DESERT REGION
Corfield, Bar Harbor, Maine

Published by
THE WISTAR INSTITUTE OF ANATOMY AND BIOLOGY
Philadelphia

1928

A CONTRIBUTION TO THE LIFE-HISTORY OF THE ANGLER (LOPHIUS PISCATORIUS)

THREE CHARTS AND FIVE HELIOTYPE PLATES

It is well known that Lophius piscatorius (variously named in different localities the angler, monkfish, goosefish, fishing frog, etc.) spawns by emitting from each ovary a thin ribbon-like film of mucus, or 'veil,' in which the eggs are embedded. It has usually been assumed, mostly on indirect evidence, that the spawning process takes place in deep water toward the edge of the continental shelf. Early in the present summer (1928) two veils were found during the work of the Biological Survey of the Mount Desert Island Region, Maine, under circumstances which leave little doubt as to the time and place where the spawning occurred. It is the purpose of this paper to describe the finding of these veils and to present figures of the developing eggs and early larvae.

The two veils were taken June 29, 1928, about 3 P.M., among the piles of the steamboat wharf in Sorrento Harbor on the east side of the upper part of Frenchmans Bay. The location of this finding is indicated on the maps accompanying this paper (charts 2 and 3). The significance of veils with embryos at an early stage of development occurring in that locality is evident when the topography of this region is considered.

The upper part of Frenchmans Bay is practically cut off from direct access to the open sea by the line of islands known as the Porcupine Islands and Iron Bound Island (chart 2). Just below this line of islands the bay narrows to about four miles across. Sorrento Harbor itself is about fourteen miles from the open sea, about 175 miles to the deepest part of the Gulf of Maine (184 fathoms, 338 meters on the northern slope of Georges Bank), and something less than 200 miles to the edge of the continental shelf. Sorrento Harbor is guarded by Dram and Preble Islands (chart 3), giving two entrances at an angle to each other; connection with Flanders Bay to the east is nearly cut off by a bar exposed at low water. There is only a slight flow of tide through this harbor. The ebb flow of tide in Frenchmans Bay is considerably stronger than the flood, because of the large influx of fresh water from several streams. The balance of tide movement, then, would tend to carry the veils out toward the sea rather than in the reverse direction.

These two veils were found only a few yards apart under the wharf. One veil was two or three yards under the east side of the wharf well entangled among the piles; this veil was the earlier in development at the stage shown in figures 1 and 2 in the germ-ring stage. The other veil was just at the west edge of the wharf, partly outside, but with one end among the piles; this veil was apparently about a day older—an inference based on the subsequent rate of development of the embryos in the laboratory.

Certain conclusions to be drawn from the finding of these veils under the circumstances described above seem inevitable. In the time between fertilization and the early stage of development shown by the embryos (eight to twelve hours for the younger veil, thirty-six hours for the older) it is hardly conceivable that these two veils would have drifted even from some place near in the deep water of the open sea and into the narrow mouth of Sorrento Harbor with a weak tide current, particularly with the balance of the tide flow out rather than in, as explained above.

Here it may be pertinent to consider how much credence can be put in the belief that Lophius goes out into the open sea to spawn. Essentially a bottom fish and with a form and motion least adapted to swimming out into the open sea, it would seem reasonable to believe that the veils are cast in bays and coves by the fish coming up from their natural habitat.

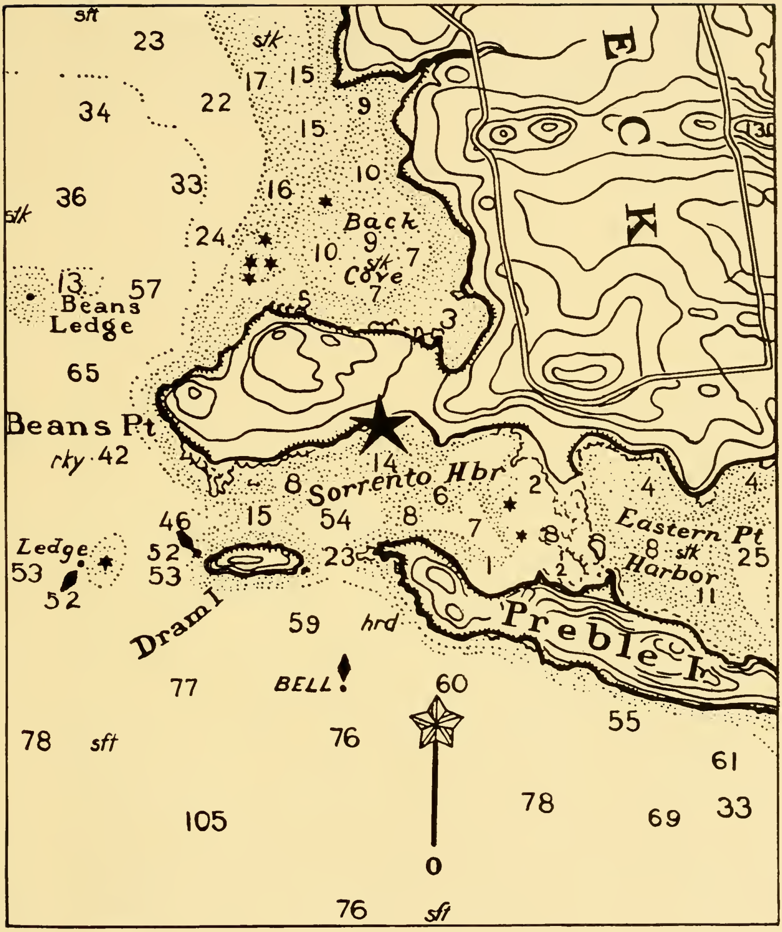


Chart 3 Sorrento Harbor; location of the steamboat wharf where the veils were found is indicated by the star. The distance from this point to the outer limit of Frenchmans Bay is fourteen miles.

Upon being told by a boat captain that he had seen "over 20 fathom" cast up this year upon the shore, a test was made and it was found that the veil would rarely be seen when along the shore and would be unrecognizable after two hours of exposure on the beach. Can it not be that the veils seen have drifted out?

The spawning ground of the north-European Lophius was located by Tåning in deep water up to 2000 meters; he believes that differences in physical conditions on the east and west coasts of the north Atlantic are such that the North American Lophius spawns nearer the coast, as had been suggested by the reports of other observers (Agassiz, Prince, and others). It is, however, far from clear what these differences are. Tåning's inferences as to the location of the Lophius spawning ground are largely based on capture of larvae. The European records certainly suggest a difference in water depths of spawning on the European as compared with the American coast; but such a difference cannot be considered as established until there are more exact records of the capture of early-stage veils with exact data as to locations, time, degree of development, etc.

The general appearance of these veils corresponds with that described by previous observers. Their length was not less than 25 or 30 feet. The younger veil was a pale orange color as it floated in the water, pinkish on closer view; the older appeared purple or lavender in the water. On close inspection, the mucus of the veil is colorless with highly reflecting surfaces. The orange color of the earlier veil is apparently due chiefly to light reflected from the orange or pinkish oil globule in the eggs. In the older veil the embryos were nearly black with pigment; possibly a factor in the production of the purple color is light refraction on the thin plates of mucus around the capsule-like spaces in which the embryos are inclosed.

The early stage of development which these embryos presented when found enables us to fix the time of spawning with considerable accuracy. As shown in figure 2, the embryos of the younger veil presented a small blastoderm at one pole of the egg with the germ ring well developed. The embryos of some teleosts with a similar type of pelagic eggs as described in the literature are known to reach the corresponding stage of development in four or five hours.

We may not unreasonably assign about twice that period for these embryos, on account of the cold water of this region (about 14°C.). It is also known that many teleosts spawn in the early morning. It may therefore be concluded with a considerable degree of certainty that the younger veil was spawned and fertilized eight to twelve hours previously on the morning of the day it was found. It may be said with almost as great a degree of certainty that the embryos of the older veil could hardly have been more than a day older than those of the younger, and hence were spawned on the morning of the preceding day. That the two veils were found in the same place entangled in the piles, twenty-four hours apart in development, leads to the probable inference that both veils were spawned from the same female from the two ovaries twenty-four hours apart.

A part of each veil was left at the dock, and on returning, four days later, the first veil had disappeared, but part of the one outside the dock remained, which upon examination showed that it had not progressed as far as that part of it taken to the laboratory. The average water temperature in Sorrento Harbor at that time is in the neighborhood of 14°C., which is about 3° under the water temperature in the laboratory. Allowance, of course, must be made for slower development in colder water when estimating the rate of development of these embryos under natural conditions.

Several pieces of each veil were brought into the laboratory and placed in aquaria. Each day embryos were taken out, and drawn while alive. Specimens were also fixed and preserved each day for future study.

The embryos lie in a single layer in the mucus of the veil in capsule-like spaces containing from one to three or four eggs (fig. 1). The capsules sometimes slightly overlap each other; they contain a fluid which is apparently water, or possibly a thinner mucus. The eggs in the veil of the earlier stage of development measured 1.61 to 1.84 mm. in diameter. They were nearly spherical. The eggs of the older veil were slightly prolate, and became progressively more so along the diameter parallel with the body axis as the body of the embryo developed, as is shown by the following measurements. When first taken into the laboratory, on June 29th, the eggs of the older veil measured on the short diameter 1.56 to 1.63 mm.; along the long axis, 1.61 to 1.86 mm. Just before hatching, on July 1st, eggs of the same set measured 1.72 to 1.74 mm. on the short diameter, and 1.79 to 1.94 mm. on the long axis.

The embryos hatched in large numbers in an apparently normal manner; the eggs of the older set began to hatch on July 1st; those of the younger veil about a day later. The larvae thrived and grew at a rate slightly less than a millimeter in length for five or six days; then growth slowed down and stopped. From about July 8th to July 12th there was no increase in length; during this period the larvae began to die; all had disappeared on July 13th.

On July 7th, the larvae were swimming about, being distributed evenly on the surface. Later on the same day, they were seen to be endeavoring to swing toward the bottom and all were almost upright. The morning of July 8th found them all swimming head downward with large numbers about 3 inches below the surface. At 5 P.M. almost all were swimming about the jars at all levels and every fish with its head downward. On July 9th, in the morning, the majority of the individuals were near the bottom and very few were in the upper half, except those still remaining on the surface, probably held by the scum from the veil. In some cases a tendency to swim downward toward the side from which the light came was noticed. The 10th and 11th found conditions the same, and on the 12th they died very rapidly.

Great difficulty was experienced in keeping the fish in the tanks as soon as they hatched, for they would either float over the top or get drawn against the strainers, which would kill them at once, and if the water did not circulate freely enough, they died from the rise in temperature. At this period we were going through abnormally hot weather, and the room temperature in the laboratory was high.

The degree of development and length of the larvae at their disappearance were somewhat less than the last which Marie Lebour ('25) was able to raise from the egg. It is evident that there is a critical stage in the development of the larvae about six or eight days after hatching when they are 6 or 7 mm. in length; something is required at this time which ordinary aquaria conditions cannot supply.

The history of the development of the embryo and larvae, so far as can be seen by microscopic study of living material, is given by the figures (figs. 2 to 22). Little comment is necessary, except to call attention to the most important features of the embryo at each day of development and to give the length, measurements, and temperatures. The figures were drawn by Mr. Simon Cohen, medical student at the University of Kansas and artist of the Survey.

DESCRIPTION OF EMBRYOS AND LARVAE

June 29th, 4 P.M. Embryos immediately after capture.

Embryos of younger veil (figs. 1 and 2), probably fertilized eight to twelve hours previously: embryos show blastoderm at one pole of egg with germ ring well formed; anlage of body visible as a thickened area of the blastoderm extending inward from the germ ring; single oil globule. Embryos of older veil showed body well outlined and scattered pigment; slightly more advanced than embryo shown in figure 3.

June 30th, first day after capture (fig. 3, from younger veil). Temperature, 10.30 A.M., 14.7° to 15.0°C.; 3.30 P.M., 14.0° to 15.0°C.

Anterior part of body well outlined; blastoderm not quite inclosing yolk; small unexpanded pigment spots along sides of neural cord, also lateral to somites and along edge of blastoderm; sparsely scattered over rest of blastoderm.

A later embryo of the same day from the older veil (fig. 4) shows the posterior end of the body beginning to project over the surface of the yolk sac; blastoderm now completely surrounding the yolk; pigment on the ventral side of the body; enlargement of the optic vesicle. The heart is first visible at about this stage.

Further development is shown in figure 5 (from older veil); growth of posterior end of body; intestine outlined by pigment; lens vesicle visible. The heart beat begins at about this stage.

July 1st, second day of development (fig. 6). Temperature, 10 A.M., 14.2°C.; 7 P.M., 13.0° to 13.8°C.

Further development of intestine shown by the line of pigment along its sides; optic and lens vesicles well defined.

Later in the day, some of the embryos hatched (fig. 7). Length, 2.44 to 2.52 mm.; yolk sac, 1.58 to 1.62 mm. in diameter; heart and pericardial cavity very large; brain a single only slightly differentiated tube.

July 2nd, third day of development (fig. 8). Temperature, 10.30 A.M., 14.5° to 15.0°C.

Cerebral vesicles well differentiated; eyes and heart now relatively smaller; diffuse pigment in posterior end of body.

July 3rd, fourth day of development (fig. 9). Temperature, 9.30 A.M., 16.0° to 16.5°C.

Cerebral vesicles further developed; eyes strongly pigmented; pectoral fins present.

The lateral view (fig. 10), a few hours older, shows the large head and its contour due to the mesencephalic flexure and the large cerebral vesicles; also position of the pectoral fins and the simple, slightly convoluted intestine. A considerable amount of yolk absorption has taken place; pigmentation is well advanced on the anterior part of the neural tube, under the notochord and on the dorsal side of the yolk sac.

July 4th, fifth day of development (fig. 11). Temperature, 10.30 A.M., 16.0° to 17.0°C.; the water was cut off a short time during the day. Temperature at 5.30 P.M., 20.5°C.

Rapid increase in size and length of body; more rapid growth of intestine is shown by its increased convolutions; pigment of posterior end of body shows a tendency to differentiate into three bands; a shallow notch dorsally behind the head has appeared in the broad thin fin which encircles the whole body in the sagittal plane during the larval stages; pelvic fins behind the pectorals on the yolk sac near the body.

July 5th, sixth day of development (fig. 12).

A slight protuberance at the bottom of the dorsal notch (beginning of the great dorsal ray); cartilages around the mouth beginning formation; pigmentation of posterior end of body in three well-differentiated bands; yolk absorption well advanced. Larvae 4.5 to 5.1 mm. in length.

July 6th, seventh day of development (fig. 13). Temperature, 10.30 A.M., 16.5° to 17.5°C.; 3.45 P.M., 16.0° to 17.5°C.

Pelvic fin has shifted its origin to side of body over yolk sac and ventral to pectoral fin; pelvic fin greatly increased in length and pigmented toward distal end; mouth cartilages well advanced in development; otic vesicle visible.

The shift in position of the pelvic fin along with the considerable absorption of the yolk indicates that the yolk sac has become incorporated into the body and its walls are now definitely a part of the body wall. A conspicuous feature of the head of this stage is the large mesencephalon (optic vesicles)—probably an expression of the functional development of the eye-brain mechanism which soon comes to be an essential in the capture of food when the yolk has been absorbed.

July 7th, eighth day of development (fig. 14). Temperature, 10 A.M., 16.5° to 18.0°C.

Chief features of this stage are the growth of the dorsal ray and advance in development of mouth structures. Larvae 5.3 to 6.2 mm. in length.

July 8th, ninth day of development (fig. 15). Temperature, 12 M., 17.0° to 18.5°C.

Dorsal ray conspicuous; mouth parts well developed; mouth begins to open; yolk nearly absorbed; origin of pelvic fin far forward; second band of pigment in middle of pelvic fin. Larvae 6.1 to 6.7 mm. in length.

July 9th, tenth day of development (fig. 16). Temperature, 10.45 A.M., 19.5° to 21.0°C.

A second ray appearing behind the first dorsal ray; the posterior part of the intestine and anus well differentiated; growth of the above-mentioned structures is apparently correlated with an increased depth of the head and of the part of the body behind the anal region; a remaining trace of yolk visible. The relations of the fins and of the dorsal ray are shown in figure 17.

July 10th, eleventh day of development (fig. 18). Temperature, 11 A.M., 18.0°C.

A small spur has appeared on the ventral edge of the pelvic fin near its base; mouth open; relations of fins, of dorsal spine and of operculum are shown in figure 19.

July 11th, twelfth day of development (fig. 20).

Mouth structures well developed; spur at base of pelvic fin and dorsal rays are longer. The dorsal view (fig. 21) shows the well-differentiated brain vesicles, pigmentation of the abdominal viscera, the large thin flexible pectoral fins, and the long oar-like pelvic fins. Larvae 5.6 to 6.2 mm. in length.

July 12th, thirteenth day of development (fig. 22). Temperature, 3 P.M., 19.0°C.

Little advance over the preceding day; pigmentation somewhat reduced; body and head slightly slimmer; these changes may be the expression of reduced metabolism. The larvae have decreased slightly in length since the ninth day (July 8th). At this time only a dozen or so specimens remained, and the next day all were dead.

Comparison of these specimens with the development of larvae from Plymouth, England, as figured by Marie Lebour ('25), shows apparently unimportant differences. The English specimens were reared in the laboratory for twelve days; ours, thirteen days; but since the English specimens when captured were hatched, whereas ours were only a few hours after fertilization, our final stages correspond in time to the eight- or nine-day stage of the English series (figs. 3c and 4a, in the paper referred to above). The drawings of the embryos figured show our final stage (thirteenth day) to be slightly less advanced in structure (third dorsal ray not present, pelvic fins relatively shorter) than the eight-day English specimen (fig. 3c). The water temperature of the English specimens averaged about a degree higher. The rate of development of the English specimens and ours shows as close a degree of correspondence as could be expected.

The most nearly constant difference appears to be the pigmentation of the posterior part of the body. Practically all our specimens after the fifth day (July 4th, fig. 11) have two and usually three pigmented areas, as shown in the figures; the most posterior spot is practically constant. On the other hand, Marie Lebour figures two ventral pigment spots in figure 3b of her paper (seventh day, corresponding to about the fifth day of our series) and one dorsal spot in figure 3c (eighth day of her series). Miss Lebour remarks that the pigmentation is not constant in her specimens (p. 726); also the pigmentation on the pelvic fin is more diffuse in the English specimens than in ours.

In general, the development of our specimens appears to give no evidence to support the suggestion which has been made that the American Lophius is a different species from the European.

CONCLUSIONS

1. The circumstances under which the two Lophius veils described in this paper were taken indicates that they must have been spawned in the shallow water of Sorrento Harbor, and not out in deep water away from the shore.

2. The degree of development of the embryos of the two veils indicated that the younger was not over eight to twelve hours from fertilization; the older, less than thirty-six hours old.

3. It may be considered likely that the two veils were shed from the two ovaries of the same female, the younger on the morning of the same day that it was found; the older, on the dawn of the preceding day.

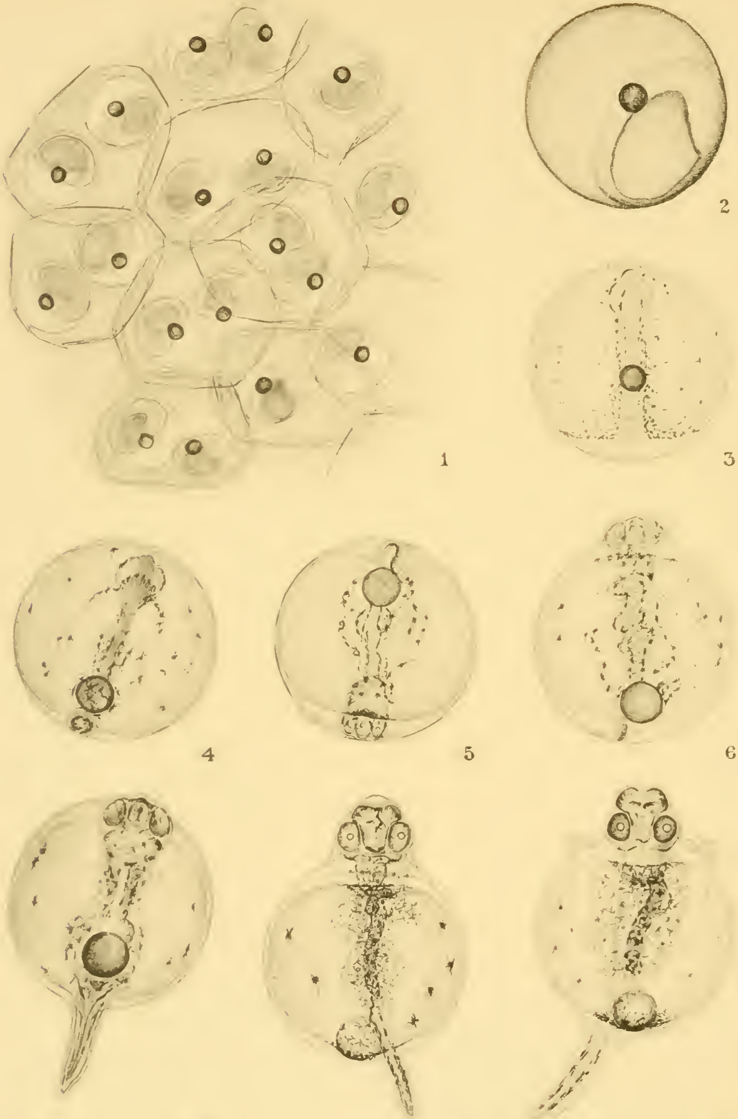
4. The development of the larvae shows no important differences from the larvae of the north-European Lophius.

LITERATURE CITED

LEBOUR, MARIE V. 1919 Feeding habits of some young fish. Journal Marine Biol. Assoc. Plymouth, vol. 12, no. 1, N. S.

——— 1925 Young anglers in captivity and some of their enemies, etc. Journal Marine Biol. Assoc. Plymouth, vol. 13, no. 3, N. S.

TÅNING, A. V. 1923 Lophius. Report on the Danish Oceanographical Expeditions, 1908–10, to Mediterranean and adjacent seas. Vol. 2, no. 7, Biology A, 10.



1 2 3 4 5 6 7 8 9

EXPLANATION OF PLATES

Figure 1 was drawn with the binocular microscope under low magnification.

Figures 2 to 22 were drawn under higher magnification ($\times$ 10 oculars, 40-mm. and 22-mm. objectives). Figures 1 to 3 were taken from the younger veil; figures 4 to 22 were drawn on successive days from the most advanced specimens among the embryos and larvae of the older veil. The number of the day refers to number of days after capture of the veils. Since the younger veil was probably spawned on the morning of the same day that it was found (p. 3), it is evident that the day number gives the age for that veil from fertilization for the temperatures given. The embryos of the older veil are about a day older from the time of fertilization.

PLATE 1

EXPLANATION OF FIGURES

1 Portion of younger veil immediately after capture; embryo in capsules in natural position.

2 Embryo of younger veil immediately after capture.

3 Embryo of younger veil one day after capture; dorsal view.

4 Embryo of older veil one day after capture; ventral view.

5 Embryo one day after capture; ventral view. A few hours older than embryo shown in figure 4.

6 Embryo, second day; ventral view.

7 Larva, second day; ventral view.

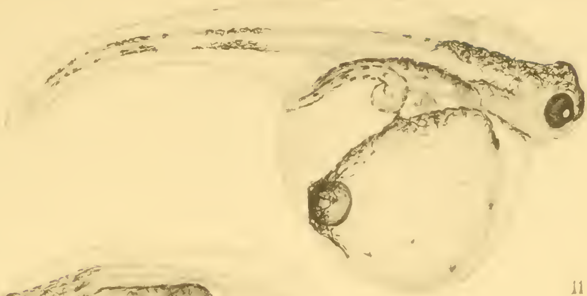
8 Larva, third day; ventral view.

9 Larva, fourth day; ventral view.

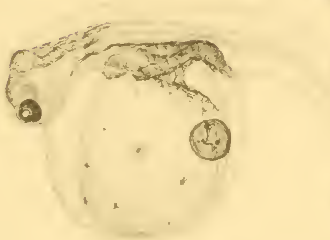
PLATE 2

EXPLANATION OF FIGURES

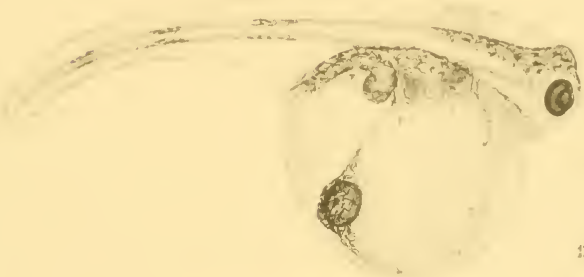
10 Larva, fourth day; lateral view.
11 Larva, fifth day; lateral view.
12 Larva, sixth day; lateral view.
13 Larva, seventh day; lateral view.



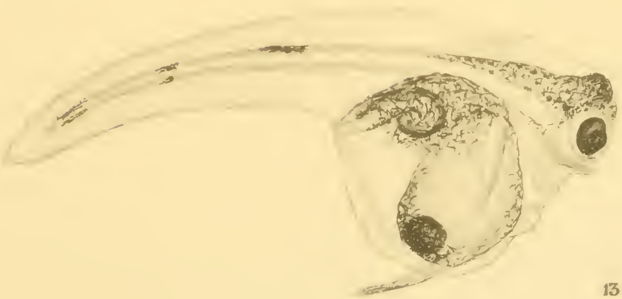
11



10



12

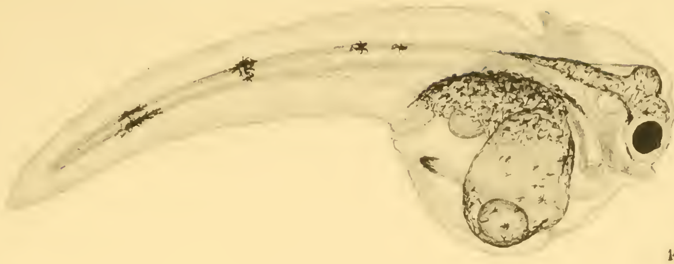


13

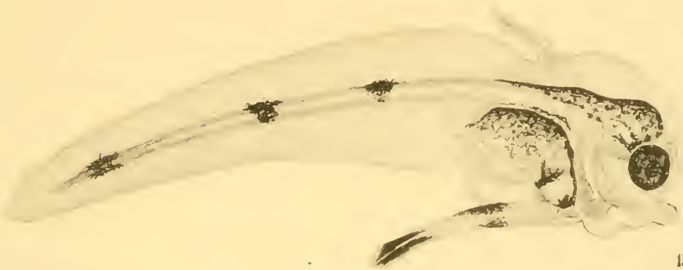
PLATE 3

EXPLANATION OF FIGURES

14 Larva, eighth day; lateral view.
15 Larva, ninth day; lateral view.
16 Larva, tenth day; lateral view.

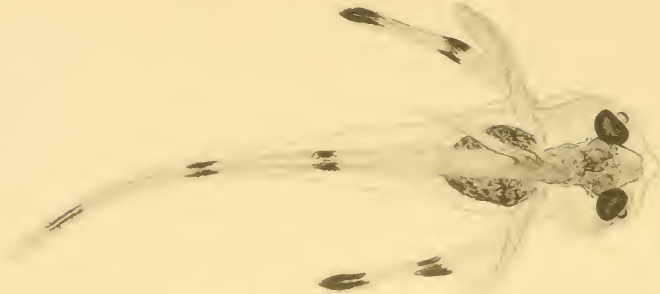


14

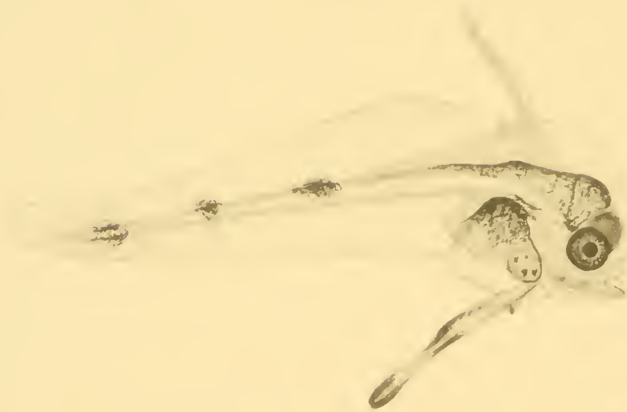


15

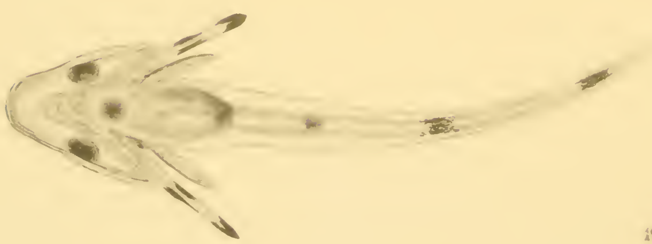
16



17



18



19

PLATE 4

EXPLANATION OF FIGURES

17 Larva, tenth day; dorsal view.
18 Larva, eleventh day; lateral view.
19 Larva, eleventh day; ventral view.

PLATE 5

EXPLANATION OF FIGURES

20 Larva, twelfth day; lateral view.
21 Larva, twelfth day; dorsal view.
22 Larva, thirteenth day; lateral view.

20

21

22

BIOLOGICAL SURVEY
OF THE
MOUNT DESERT REGION

Directed by

WILLIAM PROCTER

Research Associate in Marine Biology,
Academy of Natural Sciences
of Philadelphia

PART 3

CRUSTACEA

New Crustacea from the Mount Desert Region

By CHARLES H. BLAKE

Massachusetts Institute of Technology

From the Laboratory of

THE BIOLOGICAL SURVEY OF THE MOUNT DESERT REGION

Corfield, Bar Harbor, Maine

Published by

THE WISTAR INSTITUTE OF ANATOMY AND BIOLOGY

Philadelphia

1929

NEW CRUSTACEA FROM THE MOUNT DESERT REGION

CHARLES H. BLAKE
Massachusetts Institute of Technology

FIFTEEN FIGURES

The Crustacea to be described here have been taken in the course of the investigations of the Biological Survey of the Mount Desert Region, Maine. They are distributed systematically as follows:

Copepoda Notodelphyoida
    Enterocolidae
        Cryptopodus amarouci
Copepoda Choniostomata
    Choniostomatidae
        Sphaeronella photidis
        Sphaeronella pilosa
        Sphaeronella caprellae
Ostracoda Podocopa
    Cytheridae
        Palmenella americana
        Cythereis inexpectatus
        Cythereis procteri
        Cytheropteron alatoides
        Cytheretta tracyi
Amphipoda Gammaridea
    Stenothoidae
        Metopa hirsutimana
    Gammaridae
        Cheirocratus bigelowi
    Podoceridae
        Paradulichia secunda

Isopoda Aselloida
    Desmosomatidae
        Desmosoma lobiceps
Cumacea
    Leuconidae
        Eudorella difficilis
    Diastylidae
        Ekdiastylis cornuifer

The Choniostomatidae described here are the first members of the family taken in New England.

I have to thank Mr. S. N. F. Sanford, of the Boston Society of Natural History, for the loan of the specimens of Cumacea in the collection of the Society.

Unless otherwise noted, the type material mentioned is in the collection of the Biological Survey of the Mount Desert Region and is catalogued under the numbers given.

The bibliography includes the literature consulted and all the titles as far as I know on the family Choniostomatidae since the publication of Hansen's monograph (1897).

The figures have been prepared by Mr. Simon Cohen, the artist of the Survey, mostly from the author's drawings.

ABBREVIATIONS FOR ALL FIGURES

A., antenna
Ant., anterior
C., carapace
Ce., cephalon
D., right
Ep., epimere
F., furca
Gen. area, genital area
Lat., lateral
Marg., margin
P., pereiopod
Pp., pleopod
S., left
T., telson
U., uropod
Us., urosome
Ventr., ventral

A number following the abbreviation is the serial number of the appendage.

COPEPODA NOTODELPHYOIDA

ENTEROCOLIDAE

Cryptopodus amarouci spec. nov. (fig. 1)

Female: The general form of the body is in no way remarkable. The cephalothorax and genital segments are coalesced and show no indication of segmentation other than three grooves surrounding the body and located between the first and second, second and third, and third and fourth pairs of legs, respectively. The posterior end of this part of the body bears a pair of conspicuous, dorsolateral, conical papillae. The abdomen consists of two quadrate segments, the anterior one being much the larger. The furca has each branch in the form of a cone directed outward and ventrally and ending in a conical claw. It bears, in addition, two setae near the middle of the outer margin, two on the outer margin near the base of the claw, and a dorsal seta near the base of the claw.

The other appendages show little of interest. The outer ramus of the fourth leg bears two terminal claws, and a seta and papilla near the middle of the outer margin.

Male: Unknown.

Length: 2.0 mm.

Color: Pinkish-white, the body rather opaque. The eggs are borne in two long strings and are pale violet.

Hosts: Type from *Amaroucium* (? *A. glabrum*), paratypes from *Tetradidemnum albidum*. I am indebted to Dr. Henry C. Tracy for naming the hosts. Both are compound ascidians.

Type: B 166; paratypes, B 149.

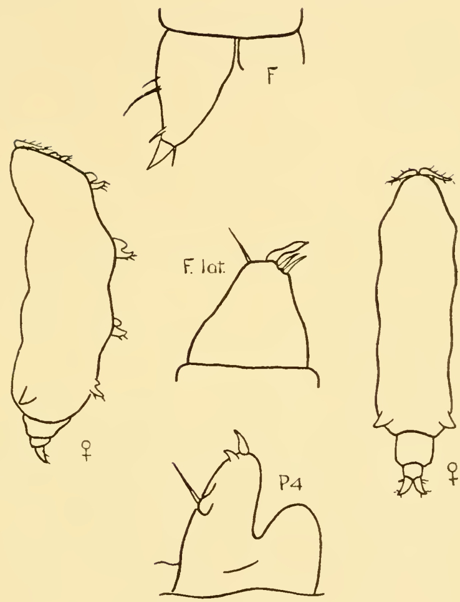


Fig. 1 Cryptopodus amarouci

COPEPODA CHONIOSTOMATA

CHONIOSTOMATIDAE

Sphaeronella photidis spec. nov. (fig. 3)

Female: The body is rather broader than long and devoid of hairs. The second maxilla is long and slender. The terminal joint with its claw is one-third the length of the basal joint. The maxilliped is slightly shorter than the head. The basal joint is three times as long as wide and unarmed. The terminal joint bears a single claw with a spur at its base.

Male: Unknown.

Length: 0.52 mm.

Type: B 133.

Host and site: Marsupium of *Photis reinhardi* (Crustacea Amphipoda).

Remarks: This species and *S. pilosa* spec. nov. are the first Choniostomatidae to be described from *Photis reinhardi.*

Sphaeronella pilosa spec. nov. (fig. 2)

Female: The body is globular and its whole surface is sparsely beset with conspicuous hairs. The maxilliped barely exceeds the head in length. A chitinous bar is present at the bases of the maxillipeds. The basal joint is three times as long as wide and widest at the end of the proximal third. It bears five setae on the lateral margin, one on the medial margin, three at the mediodistal angle, and two at the laterodistal angle. In addition, there is a row of short hairs across the middle of the anterior face. The distal joint with its claw is three-fourths the length of the basal joint. The claw bears a fine hair near its center.

Male: Unknown.

Length: 0.45 mm.

Type: B 168.

Host and site: Marsupium of *Photis reinhardi.*

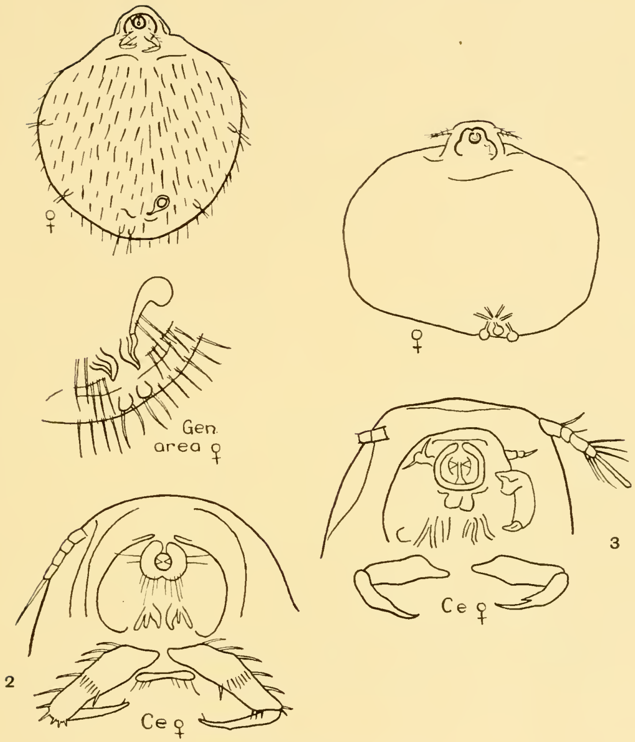


Fig. 2 Sphaeronella pilosa
Fig. 3 Sphaeronella photidis

Sphaeronella caprellae spec. nov. (fig. 4)

Female: The body is of the usual globular shape. Short hairs are present around the genital area and furca. The frontal margin is evenly rounded, without hairs. The second maxillae have a nearly cylindrical basal joint and a short terminal joint armed with a single claw. The maxilliped is somewhat longer than the head and rather slender. There is no chitinous bar at the base. The basal joint is about three and a half times as long as wide and slightly expanded distally. The rest of the appendage just misses being as long as the basal joint and is composed of two joints of about the same length. They are half the width of the basal joint. The terminal joint is armed with a subterminal spur and two terminal claws.

Male: Frontal margin evenly arched, with three or four hairs above the base of each antennule. The second maxilla is nearly as in the female. The maxilliped is similar to that of the female, except that it is shorter proportionately and the basal joint bears a distally directed spine on the medial margin near the base, followed by a hump. The basal joint also bears a few hairs at the mediodistal corner.

Length: Female, 0.68 mm.; male, 0.26 mm.

Type: Female, B 170; cotype, male, B 131.

Host and site: Marsupium of *Caprella linearis* (Crustacea Amphipoda).

Remarks: This is the second species of Choniostomatidae to be found on a species of Caprellidae. The other is *S. aeginae* Hansen. I quite agree with Hansen in his remarks on the extreme rarity of *Sphaeronella* parasitic on Caprellidae.

Fig. 4 Sphaeronella caprellae

OSTRACODA PODOCOPA

CYTHERIDAE

Palmenella americana spec. nov. (fig. 5)

The shell seen from above has the sides nearly parallel, but divided almost into thirds by distinct sinuses. The posterior tips of the ventrolateral wings are acute. Seen laterally, the shell has nearly the same shape as in *P. limicola*, but the ocular node is better developed and there are but two nodes on the posterodorsal portion.

The terminal portion of the penis is less sharply acuminate than in *P. limicola*.

Length: Male, 0.69 mm.

Type: Male, B 172.

Remarks: This, the second known species of *Palmenella*, bears a close general resemblance to *P. limicola* (Norman). It has, however, only been taken in comparatively shallow water, 5 to 6 fathoms, while *P. limicola* is recorded generally from rather considerable depths, up to 100 fathoms. The chief structural difference is the presence of a well-developed eye in *P. americana*, which is entirely wanting in the other species. As regards the shell, tips of the ventrolateral wings are obtuse in *P. limicola* and the posterodorsal portion has three nodes.

Cythereis inexpectatus spec. nov. (fig. 7)

The shell is rather transparent and smooth-surfaced. The only sculpture consists of two fins, one near the dorsal margin, the other ventrolateral. The dorsal fin parallels the hinge and is quite near it. The ventral fin forms the lateral margin of the shell as seen from above and consists of a row of triangular points joined together by a very thin lamella of shell. This type of ornament is found, I believe, on no other species of *Cythereis*. The shells of the two sexes are very similar.

The penis has the terminal portion rather short and high and the basal part of the dorsal margin produced to form an angle.

Length: Male, 1.1 mm.; female, 1.5 mm.

Type: Male, B 134; paratypes, B 127.

Remarks: This species shows a certain resemblance in general aspect to *C. jonesi* and to *C. mucronata.* Both of these species have the processes composing the ventrolateral fin separated in the adult and joined by a lamella in the young. Hence *C. inexpectatus* may be considered ancestral to the *C. jonesi* group. The other species have the general surface ornamented by mucronate processes, which are wanting in *C. inexpectatus.*

Cythereis procteri spec. nov. (fig. 6)

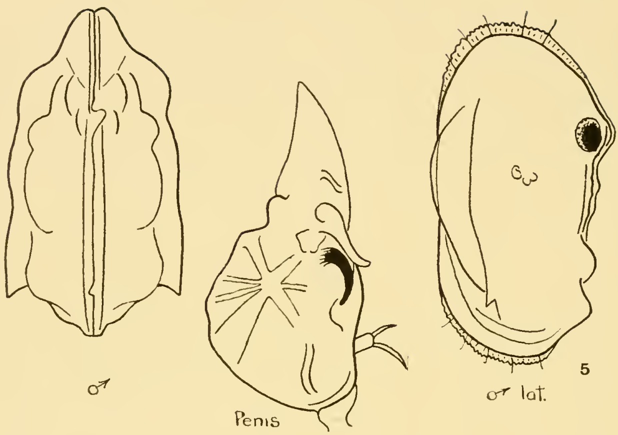
The shell is rather thin with a reticulate surface. Each areole has one or two short hairs within it. There is a ventrolateral row of small blunt teeth extending about half the length of the shell at the middle. The posterior half of the dorsal margin bears three small teeth. The usual posterior and anterior teeth and hairs are present.

The penis has the terminal part subtriangular and large relative to the basal portion.

Length: 1.05 mm.

Type: Male, B 169.

Remarks: It gives me great pleasure to name this species for Mr. William Procter, the Director of the Biological Survey of the Mount Desert Region.



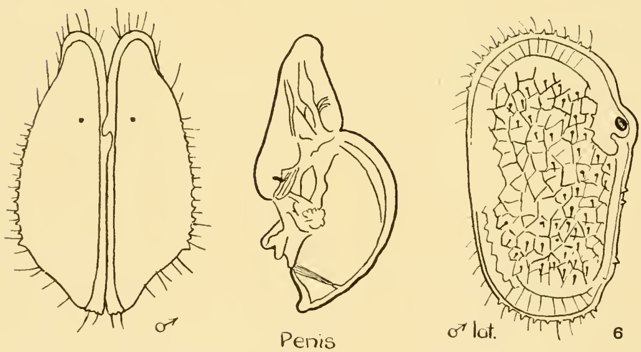


Fig. 5 Palmenella americana
Fig. 6 Cythereis procteri

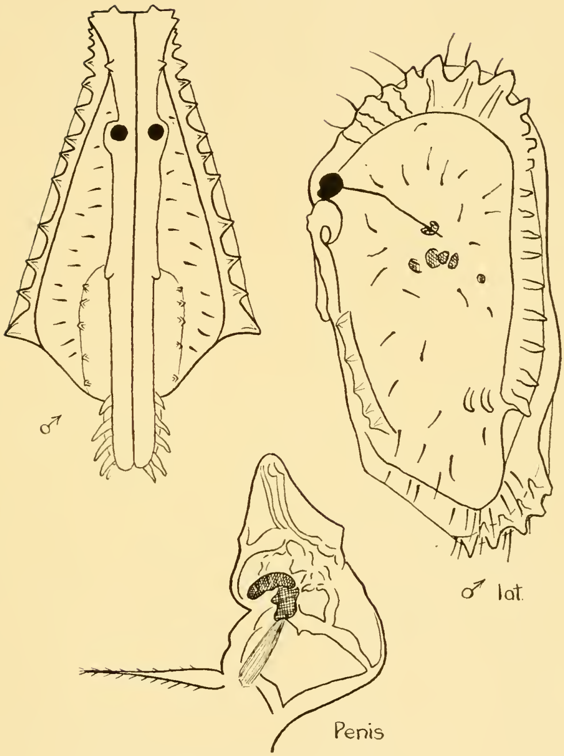


Fig. 7 Cythereis inexpectatus

Cytheropteron alatoides spec. nov. (fig. 8)

This species has a smooth, white shell. It may be considered intermediate between *C. alatum* G. O. Sars and *C. hamatum* G. O. Sars. The points of the wings are excurved, somewhat as in *C. hamatum,* but the comb found on the posterior margin of the wings in *C. alatum* is also present. In addition to the spur-like point at the tip of the wing, two to four smaller spurs may be found on the posterior margin of the wing, crowded up against the terminal spur.

Length: 0.70 mm.

Cotypes: B 167.

Remarks: The specific name refers to the resemblance of this species to *C. alatum.*

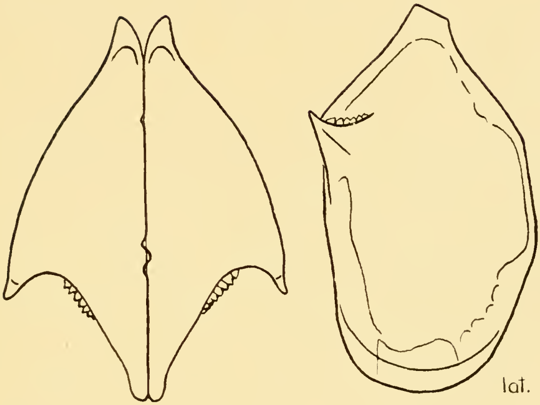


Fig. 8 Cytheropteron alatoides

Cytheretta tracyi spec. nov. (fig. 9)

The shell has the dorsal and ventral margins quite straight and nearly parallel. The angle between the dorsal and posterior margins is more marked than in *C. edwardsi.* The inner shell margin is slightly sinuous and distant from the outer margin.

The right first leg of the male appears to consist only of four joints, the second and third being fused. The penultimate joint is two and a third times as long as the distal joint. It is evenly rounded distally. There is a conspicuous seta on the anterior margin. The distal joint is distinctly constricted at the base.

Length: Male, 1.38 mm.

Type: Male, B 157; paratypes, B 146.

Remarks: It gives me great pleasure to dedicate this interesting species to Dr. Henry C. Tracy, of the Biological Survey of the Mount Desert Region.

This species shows a closer general resemblance to *Cytheretta edwardsi* (Cushman) than to *C. rubra* G. W. Müller in the great asymmetry of the first legs of the male. It differs from both in having the depression in the inner shell margin below the adductor muscle very shallow.

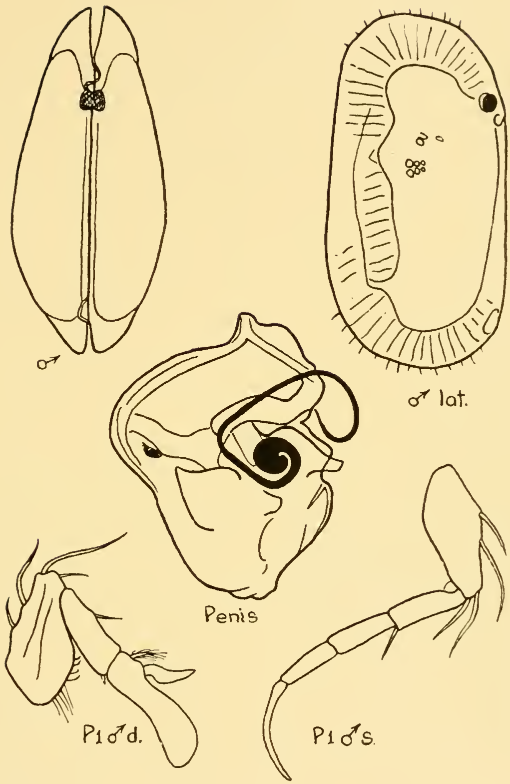


Fig. 9 Cytheretta tracyi

AMPHIPODA GAMMARIDEA

STENOTHOIDAE

Metopa hirsutimana spec. nov. (fig. 10)

Male: The first and second pairs of antennae are not very different in length. The first pair bears a small accessory flagellum. The mouth parts resemble those of other species of *Metopa* very closely. The first gnathopod has the fifth and sixth joints large and rather hairy; the fifth, quadrangular; the sixth, triangular and distally broad. The second gnathopod is strong. The sixth joint is quadrangular with the palm irregularly serrate and rather oblique. The fourth side plate is longer than deep, with the ventral margin nearly straight. The second joint of the sixth pereiopod is moderately expanded. The telson is linguiform and acuminate, without spines or setae.

Female: The second gnathopod has the hand slightly smaller than in the male, but otherwise very similar.

Length: 4 to 6 mm.

Cotypes: B 84.

Remarks: The present species is one of the larger members of the genus. Its color is a conspicuous pale pink. The species is found free and also in the branchial chamber of the ascidian *Pyura ovifera*.

The specific name refers to the hairiness of the hands of the gnathopods.

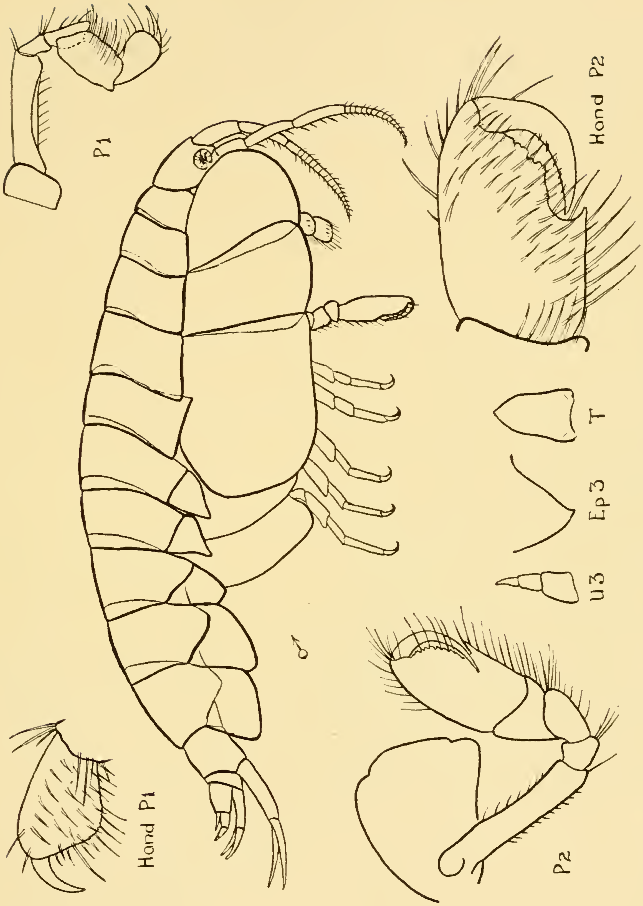


Fig. 10 Metopa hirsutimana

GAMMARIDAE

Cheirocratus bigelowi spec. nov. (fig. 11)

Male: The general appearance of this species is similar to that of the others of the genus. Only the first segment of the urosome (fourth pleon segment) has a dorsal mucro. This mucro has a spine at each side. The next segment also bears a pair of dorsolateral spines. The first side plate has the inferoanterior corner produced and pointed. The second gnathopod has the dactyl closing medial to the oblique palm. The dactyl is slightly toothed at the beginning of the distal third. The seventh pereiopod has the fourth to sixth segments not wider than the same segments of the fifth and sixth pereiopods. The third abdominal epimere has a distinct notch immediately above the inferoposterior corner.

Female: The dactyl of the second gnathopod closes laterally. The hand is smaller and proportionately narrower than in the male. The palm is very oblique, ill-defined, and slightly concave.

Length: Male, 15 to 20 mm.; female, 10 to 15 mm.

Type: Male, B 156; cotypes, B 108.

Remarks: This handsome species is dedicated to my friend and teacher, Dr. Robert P. Bigelow, of the Massachusetts Institute of Technology.

The animal is strikingly marked with red and white stripes. *Cheirocratus sundewalli* (Rathke) may be taken as the nearest relative of the present species. *C. bigelowi* differs from it in the form of the first side plate, the epimere of the third abdominal segment, and the lack of a mucro on the fifth abdominal segment, as well as in more minor points.

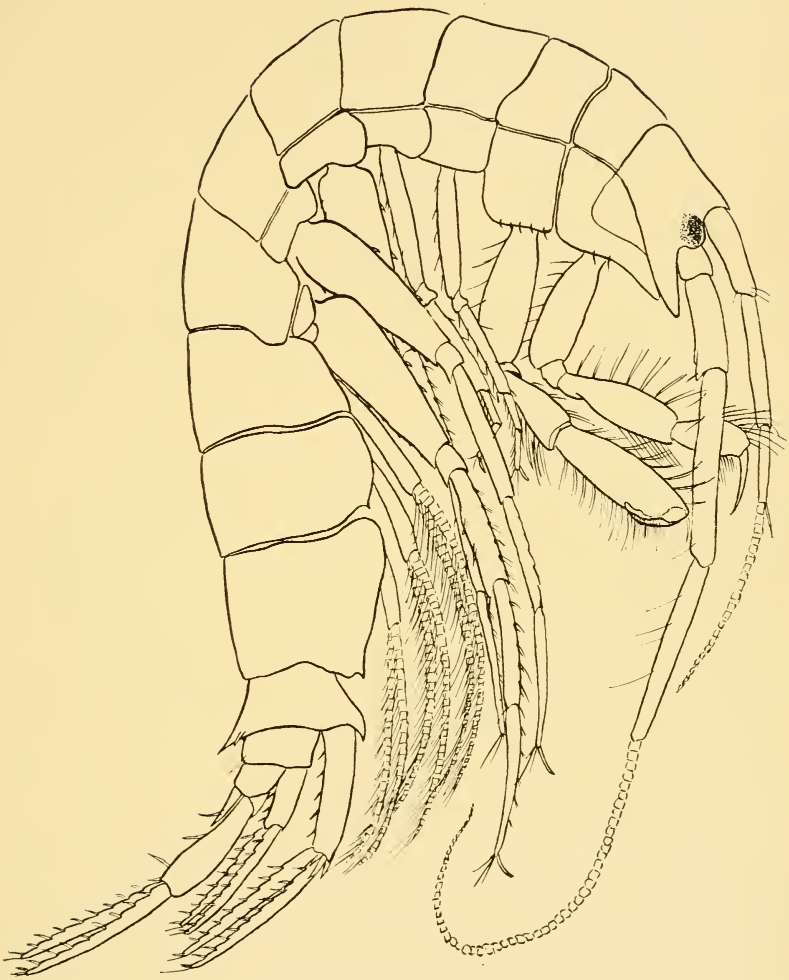


Fig. 11 Cheirocratus bigelowi ♂

PODOCERIDAE

Paradulichia secunda spec. nov. (fig. 12)

The present species, the second of the genus, is closely allied to *P. typica* Boeck. The general aspect of the body is not different.

The second joint of the peduncle of the first antenna is the longest. The whole peduncle equals the distance from the rostrum to the middle of the fourth pereional segment. The whole second antenna equals the distance from the rostrum to the end of the third pereional segment. The second segment of the palp of the maxilliped is about twice as long as broad. The sixth joint of the first gnathopod is slightly more than three times as long as wide. The corresponding joint of the second gnathopod is two and a half times as long as wide.

Length: 4 to 5 mm.

Cotypes: B 151.

Remarks: The peduncle of the first antenna and the whole second antenna are proportionately shorter than in *P. typica.* The second joint of the palp of the maxilliped is relatively broader and the sixth joints of the gnathopods relatively narrower than in the other species.

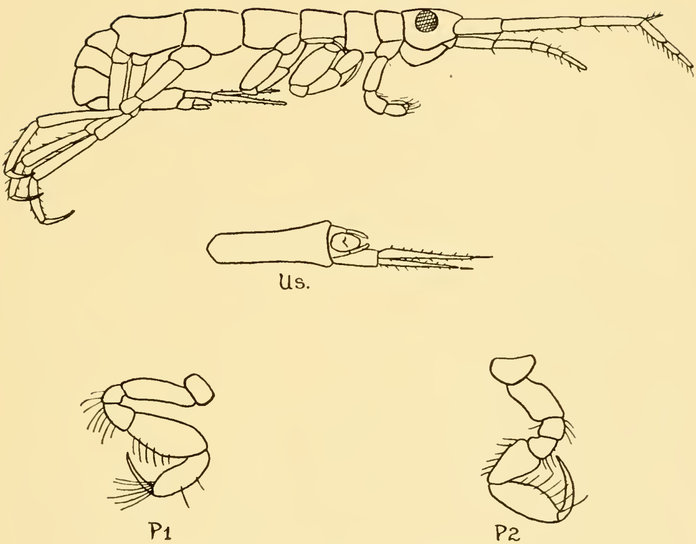


Fig. 12 Paradulichia secunda

ISOPODA ASELLOIDA

DESMOSOMATIDAE

Desmosoma lobiceps spec. nov. (fig. 13)

Male: The body is nearly six times as long as wide. The first four thoracic segments are as long as the fifth and sixth combined. The second and third thoracic segments are slightly wider than the others. The head is about two-thirds as long as wide. From above it consists of two parts, a semicircular hinder part and a quadrate anterior part which is distinctly narrower than the posterior part. The frontal margin has a distinct medial depression, giving the two-lobed outline alluded to in the name *lobiceps*. The abdominal segment is oviform, rounded before and behind.

The first antenna is about half as long as the head and comprises five segments, of which the second is the longest and the fifth the shortest. The second antenna is about twice as long as the head and divided equally between the four-jointed peduncle and the eight-jointed flagellum. The peduncle segments in order of decreasing length are: 4, 3, 1, 2. The first leg has the epimere acutely produced at the tip. The segments in order of decreasing length are: 2, 6, 5, 3, 7, 4. The uropod has a quadrangular peduncle slightly wider than long. The inner ramus is about twice as long as the outer and both are one-jointed.

Female: The general appearance is almost exactly like that of the male. The frontal margin of the head is evenly rounded. The abdominal operculum has the posterior margin nearly straight.

Length: Male, 1.5 mm.; female, 2.0 mm.

Type: Female, B 164; cotypes, B 165.

Remarks: This species belongs in the group to which Meinert applied the generic name *Eugerda*. The present species is chiefly remarkable in showing slight sexual differences as compared with the marked differences shown by other *Desmosomata*. It is the first member of its family to be reported from New England.

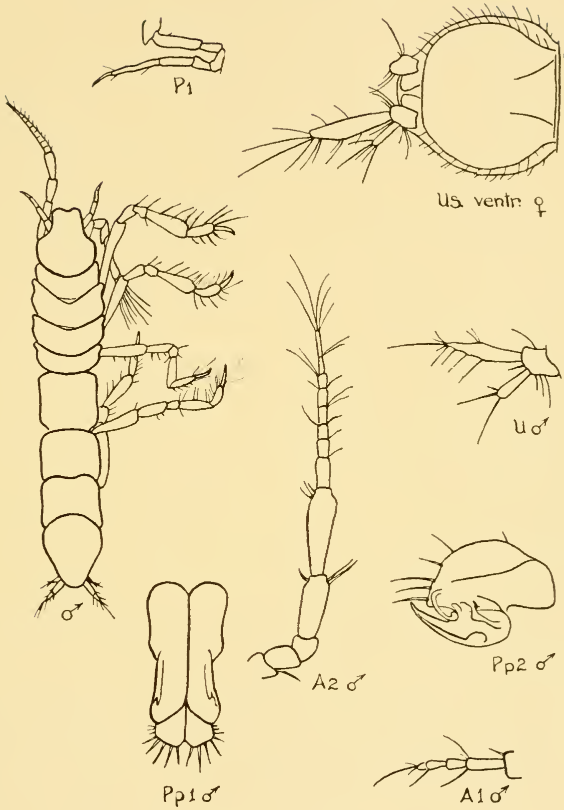


Fig. 13 Desmosoma lobiceps

CUMACEA

LEUCONIDAE

Eudorella difficilis spec. nov. (fig. 14)

Female: The general aspect of the body is in no way noteworthy. The sinus above the anterolateral corner of the carapace consists of a triangular indentation with two minute teeth on its lower margin, below that a large tooth pointing slightly downward. This is followed by a larger indentation with a vertical, nearly straight, posterior margin and having its lower margin formed by a tooth projecting slightly beyond the upper margin. The anterior margin of the carapace is serrate nearly to the top of the pseudorostral lobe. The inferior margin bears about half a dozen saw teeth just behind the anterolateral corner. The fifth pleon segment bears a posterodorsal group of two or three setae about as long as the segment. The pleon bears, in addition, a few short hairs. The peduncle of the uropod is as long as the exopod and very slightly longer than the first joint of the endopod. The second joint of the endopod is about one-fourth the length of the first joint. The apical spine is longer than the joint and completely fused to it. The pereion shows distinct sculpture composed of polygonal areas separated by raised lines.

Male: I have seen no adult males.

Length: Female, 5 mm.

Type: Female, B 163; paratypes, Crust. 1124 Boston Soc. Nat. Hist.

Remarks: This species most closely resembles *E. nana* G. O. Sars, but may be distinguished by the form of the sinus and by the shorter second joint of the endopod of the uropod. *E. monodon* Calman has a middorsal tooth on the carapace and the terminal spine of the endopod is distinct.

In addition to the specimens collected by the Biological Survey of the Mount Desert Region, I have also seen specimens from Eastport, Maine, in the collection of the Boston Society of Natural History.

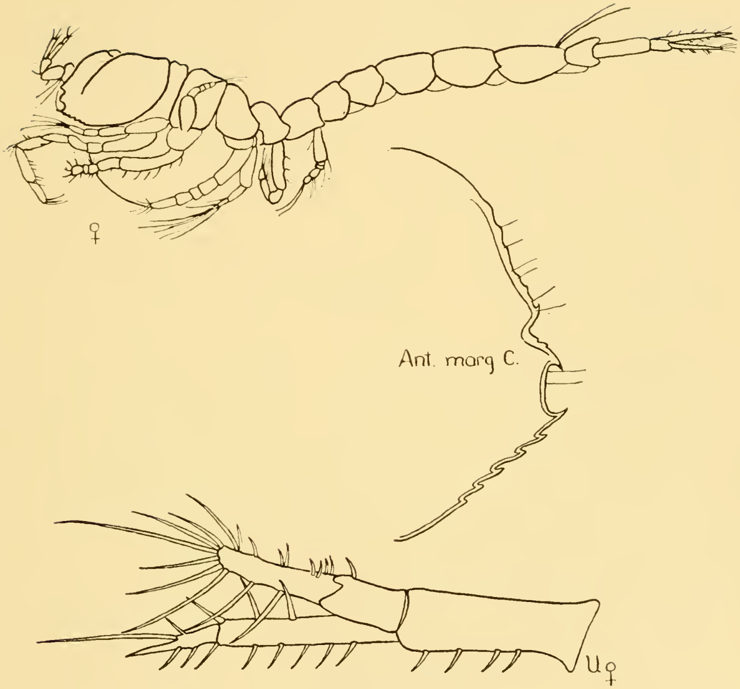


Fig. 14 Eudorella difficilis

DIASTYLIDAE

Ekdiastylis cornuifer spec. nov. (fig. 15)

Female: The carapace seen from above is pentagonal, the anterolateral corners marked by short spines, one on each side and each followed by a second smaller spine. The lateral margins of the pseudorostral lobes are divided approximately into thirds by two minute spines. A minute middorsal spine occurs at the base of the eye-lobe and another near the posterior margin of the carapace. Each of the pedigerous segments and the first three pleon segments bears a pair of small dorsal spines. The epimera of each of the pedigerous segments bear two or three marginal spines. The fourth and fifth pleon segments bear single midlateral spines and a posterior flange. The peduncle of the uropod is about twice the length of the sixth pleon segment and once and a half the length of the exopod. The telson is broken.

Male: The general appearance is similar to that of the female. The spines at the anterolateral corners are closer together and almost the same size. They are larger than in the female. The lateral margins of the pseudorostral lobes bear a varying number of spines on the middle half. The posterior half of the inferior margin of the carapace bears a row of spines. The spinulation of the pedigerous segments and the pleon is the same as in the female, except that as many as four spines may be present on the epimera. Two pairs of partly developed pleopods are present. The telson is slightly longer than the peduncle of the uropod and has three lateral spines on the left side and four on the right. The terminal portion is a little more than half the length of the whole telson. The exopod is about two-thirds of the length of the peduncle of the uropod. The endopod slightly exceeds half the length of the peduncle, and the second joint is three-fourths the length of the first.

Length: 5 to 6 mm. in the immature examples.

Type: Female, Crust. 1125; cotype, male, Crust. 1126 Boston Soc. Nat. Hist.; paratype, immature female, B 171.

Remarks: I have not yet seen any fully adult specimens of this species. It belongs to the group comprising *E. hexa-*

ceros (Zimmer), *E. argentata* (Calman), and *E. granulatus* (Zimmer), all of which are southern in distribution. All these species agree in possessing anterolateral processes on the carapace. *E. insignis* (G. O. Sars) with inferolateral processes should perhaps be included.

In addition to the specimen in the collection of the Biological Survey of the Mount Desert Region, I have examined two from Eastport, Maine, in the collection of the Boston Society of Natural History.

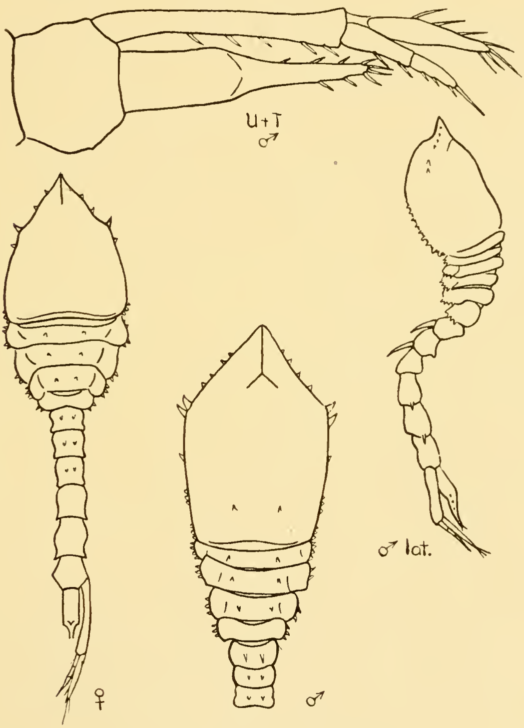


Fig. 15 Ekdiastylis cornuifer

BIBLIOGRAPHY

General

Brady, G. S. 1911 Notes on marine Ostracoda from Madeira. Proc. Zool. Soc. London, 1911, pp. 595–601, 3 pl.

Brady, G. S., and Norman, A. M. 1889 A monograph of the marine and freshwater Ostracoda of the North Atlantic and of north-western Europe. Section I. Podocopa. Sci. Trans. Roy. Dublin Soc., ser. 2, vol. 4, pp. 63–270, 16 pl., 7 fig.

Brüggen, Ernst von der 1909 Beiträge zur Kenntniss der Amphipoden-Fauna der russischen Arktis. Mém. Acad. Impér. Sci. St.-Pétersb., sér. 7, phys.-math. class, T. 18, no. 16, pp. 1–56, 3 pl., 4 fig.

Calman, W. T. 1912 The Crustacea of the order Cumacea in the collection of the United States National Museum. Proc. U. S. Nat. Mus., vol. 41, pp. 603–676, 112 fig.

Chatton, Eduard, et Harant, Hervé 1924 a Notes sur les copépodes ascidicoles. XVI. Le nouveau genre *Haplostomella*. Deux espèces nouvelles de ce genre. Remarques sur les oostégites et la 5° paire des péréiopodes. Bull. Soc. Zool. France, T. 49, pp. 398–406, 2 fig.

——— 1924 b Notes sur les copépodes ascidicoles. XVII. Le nouveau genre *Haplostomides* et deux espèces nouvelles de ce genre: *Haplostomides Scotti* et *Haplostomides Brementi*. Bull. Soc. Zool. France, T. 49, pp. 406–412, 2 fig.

——— 1924 c Notes sur les copépodes ascidicoles. XVIII. *Haplostoma Canui* n.sp.—État actuel de la systématique des *Haplostominae* n. subf.—Le nouveau genre *Haplosaccus*. Bull. Soc. Zool. France, T. 49, pp. 413–422, 1 fig.

Cushman, J. A. 1906 Marine Ostracoda of Vineyard Sound and adjacent waters. Proc. Boston Soc. Nat. Hist., vol. 32, pp. 359–385, 12 pl.

Hansen, H. J. 1888 Malacostraca marina Groenlandiae occidentalis. Vidensk. Medd., 1887, pp. 5–226, 6 pl., 1 map.

——— 1916 Crustacea Malacostraca. III. The order *Isopoda*. Danish Ingolf-Exp., vol. 3, pt. 5, pp. 1–262, 16 pl.

——— 1920 Crustacea Malacostraca. IV. The order *Cumacea*. Danish Ingolf-Exp., vol. 3, pt. 6, pp. 1–86, 4 pl.

Hirschmann, Nicolai 1915 Ostracoda of the Baltic Sea collected by N. M. Knipovitch and S. A. Pavlovitch in the summer of the year 1908 (title a translation from the Russian). Ann. Mus. Petrog., vol. 20, pp. 569–597, 27 fig.

Holmes, S. J. 1905 The Amphipoda of southern New England. Bull. Bur. Fish., vol. 24, pp. 457–529, 13 pl., text figs.

——— 1908 The Amphipoda collected by the U. S. Fisheries Steamer "Albatross" off the west coast of North America, in 1903 and 1904, with descriptions of a new family and several new genera and species. Proc. U. S. Nat. Mus., vol. 35, pp. 489–543, 46 fig.

Müller, G. W. 1894 Ostracoden. Fauna Fl. Golfes von Neapel, monogr. 21, S. i–viii, 1–404, 40 pl.

——— 1912 Ostracoda. Das Tierreich, Lief. 31, S. i–xxxiii, 1–434, 92 fig.

NORMAN, A. M. 1907 Notes on the Crustacea of the Channel Islands. Ann. Mag. Nat. Hist., ser. 7, vol. 20, pp. 356–371, 2 pl., 1 fig.

REIBISCH, J. 1905 Faunistisch-biologische Untersuchungen über Amphipoden der Nordsee. I. Teil. Wiss. Meeresunters., Abt. Kiel, new ser., Bd. 8, S. 145–187, 2 pl.

SARS, G. O. 1871 Beskrivelse af de paa Fregatten Josephines expedition fundne cumaceer. Kong. Sven. Veten.-Akad. Handl., vol. 9, no. 13, pp. 1–57, 20 pl.

——— 1873 a Beskrivelse af syv nye cumaceer fra Vestindien og det Syd-Atlantiske Ocean. Kong. Sven. Veten.-Akad. Handl., vol. 11, no. 5, pp. 1–30, 6 pl.

——— 1873 b Om cumaceer fra det store dybder i Nordishavet. Kong. Sven. Veten.-Akad. Handl., vol. 11, no. 6, pp. 1–12, 4 pl.

——— 1879 Nye bidrag til kundskaben om Middelhavets invertebratfauna. Arch. Math. Naturv., vols. 3, 4, pp. 1–196, 60 pl. [Separate copy.]

——— 1887 Report on the Cumacea collected by H. M. S. Challenger during the years 1873–76. Rpts. Voy. Challenger, vol. 19 (pt. 55), pp. 1–78, 11 pl.

——— 1890–1895 An account of the Crustacea of Norway. Vol. 1. Amphipoda. Christiania: pp. i–viii, 1–711, 244 pl.

——— 1896–1899 An account of the Crustacea of Norway. Vol. 2. Isopoda. Bergen: pp. i–x, 1–270, 104 pl.

——— 1899–1900 An account of the Crustacea of Norway. Vol. 3. Cumacea. Bergen: pp. i–x, 1–115, 72 pl.

——— 1921 An account of the Crustacea of Norway. Vol. 8. Copepoda Monstrilloida and Notodelphyoida. Bergen: pp. 1–91, 37 pl.

——— 1922–1928 An account of the Crustacea of Norway. Vol. 9. Ostracoda. Bergen: pp. i–xii, 1–277, 119 pl.

SCHELLENBERG, A. 1922 Neue Notodelphyiden des Berliner und Hamburger Museums. II. Teil. Mitt. Berlin Mus., Bd. 10, S. 277–298, 12 fig.

STEBBING, T. R. R. 1906 Amphipoda I. Gammaridea. Das Tierreich, Lief. 21, S. i–xxxix, 1–806, 127 fig.

——— 1913 Cumacea (Sympoda). Das Tierreich, Lief. 39, S. i–xvi, 1–210, 137 fig.

——— 1917 South African Crustacea (part IX of S. A. Crustacea for the Marine Investigations in South Africa). Ann. South. Afr. Mus., vol. 17, pp. 23–46, 8 pl.

ZIMMER, CARL 1902 Cumaceen. Hamb. Magalh. Sammelr., Bd. 6, No. 3, S. 1–18, 31 fig.

——— 1908 Die Cumaceen der "Deutschen Tiefsee-Expedition." Wiss. Ergeb. Deutschen Tiefsee-Exp., Bd. 8, S. 157–196, 11 pl.

——— 1909 Die Cumaceen der Schwedischen Südpolarexpedition. Wiss. Ergeb. Schw. Südpolar-Exp., Bd. 6, No. 3, S. 1–31, 8 pl.

——— 1921 Einige neue und weniger bekannte Cumaceen des Schwedischen Reichsmuseums. Ark. Zool., Bd. 13, No. 21, S. 1–9, 6 fig.

——— 1926 Northern and Arctic invertebrates in the collection of the Swedish State Museum. X. Cumaceen. Kung. Sven. Veten.-Akad. Handl., ser. 3, vol. 3, no. 2, pp. 1–88, 4 pl., 97 fig.

Choniostomatidae

Bonnier, Jules 1896 Édriophthalmes. Ann. Univ. Lyons, T. 26, pp. 527–689, 13 pl.

Fraenkel, K. L. 1915 Die Choniostomatiden bei Cumaceen der Murmanküste. Trav. Lab. Zool. Petrog., vol. 4, pp. 173–196, 6 fig.

Giard, A., et Bonnier, J. 1895 Contributions à l'étude des épicarides. XX. Sur les épicarides parasites des arthrostracés et sur quelques copépodes symbiontes de ces épicarides. Bull. Sci. France Belg., T. 25, pp. 417–493, 9 pl., 4 fig.

Hansen, H. J. 1897 The Choniostomatidae. Copenhagen: pp. 1–205, 13 pl.

——— 1904 Two new forms of Choniostomatidae: Copepoda parasitic on Crustacea Malacostraca and Ostracoda. Quart. Jour. Micr. Sci., ser. 2, vol. 48, pp. 347–358, 1 pl.

——— 1923 Crustacea Copepoda. II. Copepoda parasita and hemiparasita. Danish Ingolf-Exp., vol. 3, pt. 7, pp. 1–92, 5 pl.

Scott, Andrew 1907 [Faunistic Notes.] Proc. Trans. Liverpool Biol. Soc., vol. 21, pp. 39–41.

Scott, Thomas 1904 Notes on some rare and interesting marine Crustacea. Rpt. Fish. Board Scotl., vol. 22, pt. 3, pp. 242–261, 3 pl.

——— 1905 On some new and rare Crustacea from the Scottish seas. Rpt. Fish. Board Scotl., vol. 23, pt. 3, pp. 141–153, 4 pl.

THE WISTAR INSTITUTE PRESS
PHILADELPHIA, PA.

BIOLOGICAL SURVEY

OF THE

MOUNT DESERT REGION

Directed by

WILLIAM PROCTER

Research Associate in Marine Biology,

Academy of Natural Sciences

of Philadelphia

PART 4

VERMES

Three New Species of Worms belonging to the Order Echinodera

By CHARLES H. BLAKE

Massachusetts Institute of Technology

From the Laboratory of

THE BIOLOGICAL SURVEY OF THE MOUNT DESERT REGION

Corfield, Bar Harbor, Maine

Published by

THE WISTAR INSTITUTE OF ANATOMY AND BIOLOGY

Philadelphia

1930

THREE NEW SPECIES OF WORMS BELONGING TO THE ORDER ECHINODERA

CHARLES H. BLAKE
Massachusetts Institute of Technology

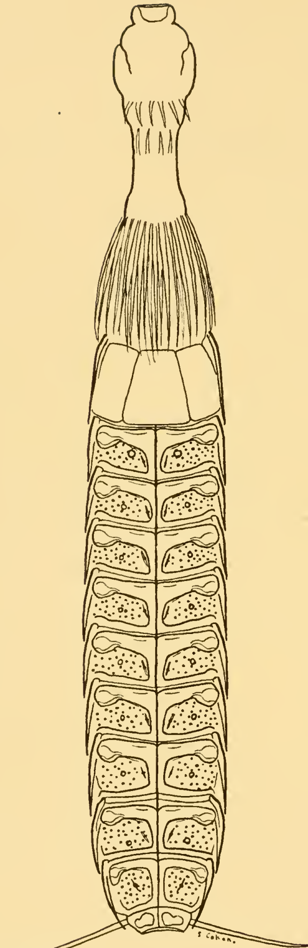
EIGHT FIGURES

The Echinodera are a small group of marine, falsely segmented worms. The group has recently been the subject of a splendid monograph by Dr. Karl Zelinka ('28). A summary of the species and their distribution is not without interest. All told, Zelinka records twenty-eight species of which the adults are known, forty-eight larval forms which appear to represent additional species, and six species inquirendae. The seventy-six certain species are distributed as follows:

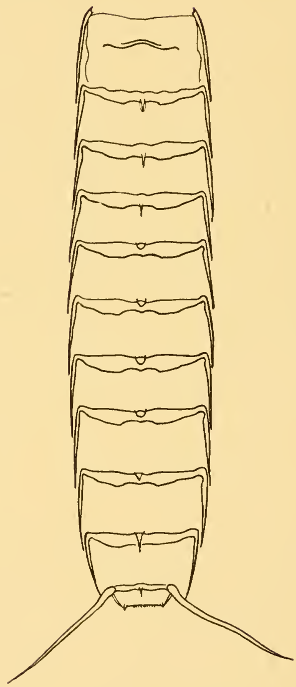
	Species
Mediterranean and Adriatic Seas,	64
Eastern Atlantic Ocean, North and Baltic Seas,	16
Black Sea,	11
East Africa,	1
Antarctic Ocean,	1
Barents Sea,	1
(East Asia,	1 inquirenda)

The number of species known from any one region is proportionate to the study devoted to the region rather than to the actual number of forms present. It will be seen also that the group must be represented on all the coasts of the world.

In the present paper I am able to announce the presence of three species in the Mount Desert Region (Maine), which have been taken by the Biological Survey of the Mount Desert Region. All the species appear to be undescribed.



1



2

Fig. 1 *Pycnophyes frequens*, male, ventral view. × 120.
Fig. 2 Same, dorsal view. × 120.

The figures of *Pycnophyes frequens* were prepared by Mr. Simon Cohen, the artist of the Survey. The rest were prepared by the author.

Order ECHINODERA

Suborder HOMALORHAGAE

Pycnophyidae

Pycnophyes Zelinka

Pycnophyes frequens spec. nov. (figs. 1 to 3)

The nearest relative of this species is *P. communis* Zelinka, to which it runs out in his key (Zelinka, '28, pp. 309–310). It has the same parallel sides to the body. The length-breadth ratio is 4.3–4.6 : 1.

Length: 0.73 to 0.81 mm.; breadth, 0.16 to 0.19 mm.

Middorsal spines are present, though very short; the first three and the last three are pointed, the others are rounded. The last spine is exceedingly short and does not always seem to be present.

The dorsal pachycycle (Pachyzyklus of Zelinka) of zonite III has no cusps at the posterior margin. The median arc is more than one-third the width of the zonite. The ventral pachycycle of zonite IV appears rather broader than in *P. communis*.

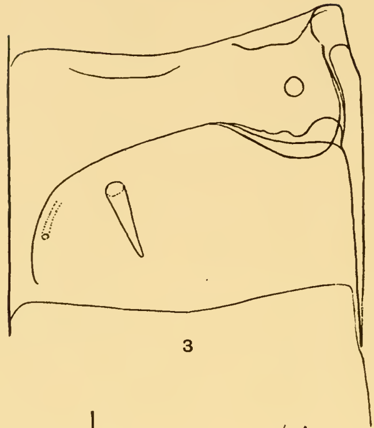
The posterior extremity of the male has the nearly straight median portion, bounded by a spine at each end and provided with short fine hairs, which is found in *P. communis*. In the female the delicate membrane between the bounding spines is nearly semicircular and supported by a few, fine, unbranched processes.

Nearly the whole of each dorsal plate and an oval patch just lateral to the middle of each ventral half-plate is perforated by very small pores, which give the areas a finely stippled appearance.

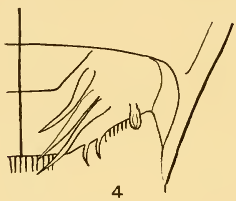
Habitat: Fine, sticky, brown mud in 40 to 120 feet of water, probably also in deeper water. It is quite common.

Type: G 2 (Collection Biological Survey Mount Desert Region).

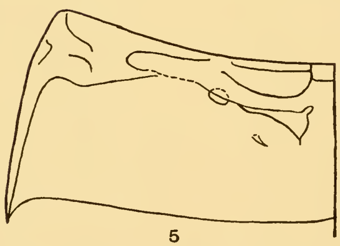
Remarks: This species may be readily distinguished from *P. communis* by the greater size and by the lack of cusps on the posterior margin of the dorsal pachycycle of zonite III.



3



4



5

Fig. 3 *Pycnophyes frequens,* left ventral plate of zonite IV.

Fig. 4 *Trachydemus mainensis,* male, left half of zonite XIII and part of zonite XII, ventral view.

Fig. 5 Same, right ventral plate of zonite IV.

Trachydemidae

Trachydemus Zelinka

Trachydemus mainensis spec. nov. (figs. 4 to 6)

The only previously known species of *Trachydemus* is *T. giganteus* Zelinka. From lack of specimens, I have not been able to compare the new form with the larval species grouped in *Leptodemus*. Except for the lack of cercal spines, *T. mainensis* bears a most striking resemblance to *Pycnophyes kielensis*.

Length: 0.61 to 0.63 mm.; width: 0.19 mm. Length-width ratio, about 3.2 : 1.

There are no middorsal spines. The body is noticeably contracted at the ends, the width of the posterior margin of the twelfth zonite being only slightly more than half that of the middle zonites.

The anterior dorsal margin of zonite III is evenly rounded. There is no dorsal pachycycle. The midventral plate has its anterior margin straight, the plate therefore projecting above the ventrolateral plates at the lateral corners. The ventral pachycycle of zonite IV is well developed, covering nearly one-third the area of the zonite.

The posterior extremity of the male is rounded and provided medially with a row of fine hairs.

Habitat: A mud flat near low-tide line.

Cotypes: G 1, two males (Collection Biological Survey Mount Desert Region).

Remarks: This form is shorter and broader than *T. giganteus*. It also lacks middorsal spines. The two points or spines near the lateral margins of the last zonite, which Zelinka refers to as the lateral angles of this zonite, appear to be greatly reduced cercal spines. They are bifid or trifid in *giganteus* and club-shaped in *mainensis*.

The study of this interesting species leads me to feel that eventually the distinction between the Trachydemidae and the Pycnophyidae will disappear. It seems very probable that forms will be found with short but evident cercal spines and also forms in which these spines are long, but clavate or multifid.

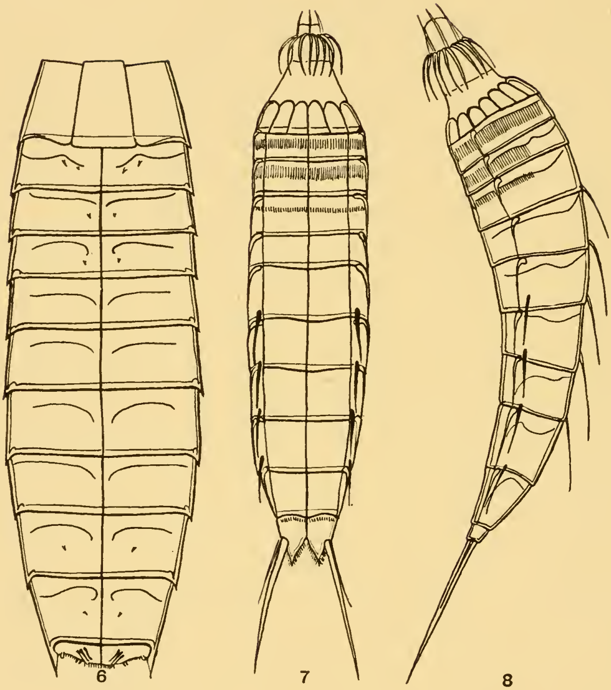


Fig. 6 *Trachydemus mainensis*, ventral view. × 170.
Fig. 7 *Echinoderella remanei*, female, ventral view. × 230.
Fig. 8 Same, left lateral view. × 230.

Suborder CYCLORHAGAE

Echinoderidae

Echinoderella Zelinka

Echinoderella remanei spec. nov. (figs. 7 and 8)

The body is distinctly contracted at the extremities. The middorsal spines are rather long and are present on zonites VI–X.

Length: 0.33 mm.; width: 0.08 mm. Length-width ratio, 4.1:1.

Lateral spines are present on the margins of the dorsal plates of zonites VIII–XI. There are no more large spines, except the two pairs of cercal spines.

Small setae are scattered over the whole dorsal surface of zonites IV–XIII. A close-set, even row of setae occurs on the lateral and ventral portions of zonite IV about the middle of the zonite. A similar row occurs on the ventrolateral and ventral portions of zonite V, and a row of shorter, finer setae on zonite VI. Scattered setae appear on the ventral plates of zonites V–XII. The anterior and posterior margins of zonite XIII are each marked by a row of extremely fine setae.

The posterior margin of zonite XIII is deeply incised and the projecting tips each end in a conspicuous mucro. The lateral cercal spines are about half as long as the mediolateral.

The pachycycles are narrow and plain, without cusps or accessory pachycycles.

Occurrence: Dredged once in company with *Pycnophycs frequens.*

Type: G 3 (Collection Biological Survey Mount Desert Region).

Remarks: Except for the absence of eyes, this species would be better assigned to *Echinoderes.* The number and size of the middorsal spines will distinguish it, both from the two species of *Echinoderella,* and from the larger species of *Echinoderes.*

I take pleasure in naming this species for Dr. Adolf Remane, of the Christian-Albrechts-Universität (Kiel).

BIBLIOGRAPHY

As far as I know, only the three works noted below have appeared since Zelinka's monograph went to press in 1919. A complete bibliography of the group will be found in that monograph (Zelinka, '28, pp. 1–4).

REMANE, ADOLF 1928 Kinorhyncha. Tierw. Nord Ostsee, Teil 7 d_2 (Lief. 11), S. 57–84, 20 figures.

——— 1929 Kinorhyncha—Echinodera. Kükenthal and Krumbach, Handb. Zool., Bd. 2, Teil 4, S. 187–242, 50 figures (not finished).

ZELINKA, KARL 1928 Monographie der Echinodera, S. i–iv, 1–396, 27 plates, 73 figures. Leipzig.

THE WISTAR INSTITUTE PRESS
PHILADELPHIA