Contributions from the Biological Laboratory of the U. S. Fish Commission,
Woods Hole, Massachusetts.

REPORT OF A DREDGING EXPEDITION OFF THE SOUTHERN COAST OF NEW ENGLAND, SEPTEMBER, 1899.

By FREELAND HOWE, Jr.

On July 29, 1880, the *Fish Hawk* left the builder's yard at Wilmington, Del., and proceeded to Newport, R. I., and after some preliminary dredging in the shallow water off the southern coast of New England started for the locality where the tile-fish had been discovered in May, 1879. The remarkable results of the work of September 4, September 13, and October 2, 1880, were published in the American Journal of Science, November, 1880, and created general comment among men of science, for it had been thought improbable that such a wealth of marine life existed on this portion of the sea bottom. During the following year the *Fish Hawk* made seven excursions to the edge of the continental elevation, and Professor Verrill wrote:

> It is probable that the remarkable richness of the fauna in this region, both in the number of species and in the surprising abundance of the individuals of many of them, is due very largely to the unusual uniformity of the temperature enjoyed at all seasons of the year at all those depths that are below the immediate effects of the atmospheric changes. The region under discussion is subject to the combined effects of the Gulf Stream on one side and the cold northern current on the other, together with the gradual decrease in temperature in proportion to the depth. * * * The vast quantities of free-swimming animals continually brought northward by the Gulf Stream and filling the water, both at the surface and bottom, furnish an inexhaustible supply of food for many of the animals inhabiting the bottom, and probably directly, or indirectly, to nearly all of them. (Report U. S. Fish Commission, 1882, p. 642.)

In the spring of 1882 many forms of life on this portion of the sea bottom were almost exterminated, although the *Fish Hawk* found an abundance of animal life at certain localities. The following year the *Fish Hawk* made only one excursion to the Gulf stream, and the dredges were not lowered into water deeper than 62 fathoms. Although the *Albatross* dredged in the region in 1883, 1884, and 1885, no serious biological examination of this portion of the sea bottom was made until 1899. It was because the results attending a reexamination of this area would prove of considerable scientific interest that arrangements were made for the excursion herein described.

On August 31, 1899, the *Fish Hawk*, under command of Capt. J. A. Smith, left Woods Hole with Prof. H. C. Bumpus and other members of the biological laboratory, and at 5 a. m. September 1st arrived at the spot where nineteen years before the wonderful marine fauna had been discovered.

The principal piece of collecting apparatus was a 7-foot beam trawl. An attempt was made to use a large surface net, but the leverage interfered so materially with the steering of the vessel that its continued use was found to be impracticable. Small tow nets and long-handled dip nets were used in its place. Most of the material was

preserved in 5 per cent formalin. The day was such as to promise excellent surface collecting; the air was calm and the water smooth. Large numbers of chain salpas were seen swimming near the surface and below as far as the sight could penetrate. The chains varied in length from an inch to several feet, and solitary individuals, or those arranged in rings, occasionally drifted by. The longer chains moved through the water much more rapidly than the smaller ones, and in addition to the branchial action they exhibited distinct serpentine movements. The salpas were not present during the midday hours, and my observations would indicate that they were not present at the surface on cloudy or windy days.

In the forenoon 4 dredgings were made, and at each station the trawl was on the bottom from 15 to 30 minutes. The afternoon and evening were spent in the course homeward, the latter part of the journey being through water of remarkable phosphorescence. At about midnight the vessel came to anchor off Nobsque light.

On this excursion fully 100 species of animals were collected, and many of the hauls brought up a surprising variety of bottom forms. A much larger number would doubtless have been recorded if the means for picking over and sorting the material had been adequate and if there had been more time for working up the material preserved. Inasmuch as the four stations were quite near one another, it has not been thought necessary to arrange the specimens in separate groups.

Table of stations at which dredgings were made on September 1, 1899.

[The distances are measured from Gay Head Light in nautical miles.]

Station.	Lat. N.	Long. W.	Locality off Gay Head.	Faths.	Bottom.	Date.	Temperature.		Hour.
							Bottom.	Surface.	
	° ′ ″	° ′					° F.	° F.	
7068	40 04 00	70 20	S. 80 miles...	95	Hard sand	Sept. 1	52.4	71.6	5.05 a.m.
7069	40 01 30	70 21	S. 82 miles...	122	.....do	....do ...	50.7	73.94	6.55 a.m.
7070	39 58 30	70 16	S. 88 miles...	198	Sand, mud	....do ...	48.6	74.12	8.45 a.m.
7071	39 59 30	70 19	S. 87 miles...	168	.....do	....do ...	49.2	75.74	10.25 a.m.

LIST OF SPECIMENS.

In the following list the previously ascribed range of each species is given. The fish were identified by Dr. Hugh M. Smith and Mr. Barton A. Bean. It will be noticed that 8 species are recorded from new localities. The pelagic copepoda collected are accounted for in a special paper by Prof. W. M. Wheeler, entitled "The Free-swimming Copepods of the Woods Hole region," in the Bulletin of the United States Fish Commission for 1899, pages 157–192:

CŒLENTERATA.

Pelagia cyanella Peron & Le Sueur. Caribbean Sea to St. Georges Bank. One specimen. Surface.

Medusa. Dr. R. P. Bigelow, of Boston, Mass., states that this form seems to belong to a new genus and species of *Æginidæ*, which will shortly be described. One specimen. Surface. Sta. 7068.

Pennatula aculeata Koren & Danielssen. Range, 97 to 1,255 fathoms. Ten specimens. Trawled.

Adamsia sociabilis Verrill. Range, 79 to 410 fathoms. Abundant as commensal of *Catapagurus sharreri*. Trawled.

Epizoanthus americanus Verrill. Range, off New Jersey to Gulf of St. Lawrence. Hundreds of specimens growing on gasteropod shells inhabited by *Eupagurus pubescens*. Trawled.

Sagartia abyssicola (Koren & Danielssen) Verrill. Range, 69 to 640 fathoms. Generally two or three occurred on each tube of *Hyalinœcia artifex*, of which thousands were trawled.

Urticina perdix Verrill. Range, 63 to 190 fathoms. Several specimens obtained by schooner *Grampus* on trawls set for tile-fish.

Actinauge nodosa Fabr. Range, 86 to 1,098 fathoms. About 20 specimens. Trawled.

Bolocera tuediæ Gosse. Range, 37 to 1,106 fathoms. One specimen. Trawled.

Tealia crassicornis Gosse? Range, North Sea and Baltic. One specimen. Trawled.

Dasmosmilia lymani Pourtales. Range, 65 to 179 fathoms. Six specimens. Trawled.

VERMES.

Hyalinœcia artifex Verrill. Range, 150 to 640 fathoms. Trawled by thousands, each tube generally bearing two or three *Sagartia abyssicola.*
Nothria conchyphila Verrill. Range, 100 to 300 fathoms. Six specimens. Trawled.
Lepidonotus squamatus Leach. Range, Atlantic Ocean. About 50 specimens. Trawled.
Aphroditea aculeata Linnæus. One specimen trawled in Färöe Channel in 530 fathoms.
Cerebratulus luridus Verrill. Range, 64 to 192 fathoms. Three specimens. Trawled.
Three long rubber-like tubes, about 3 feet long and 3 inches in diameter, possibly some worm-tube.

MOLLUSCOIDA.

Bugula sp. Very abundant on sargassum. Surface.
Polyzoan. Several specimens growing on broken bottle. Trawled.
Membranipora sp. Very abundant on fronds and vesicles of sargassum. Surface.
Terebratulina septentrionalis Couthouy. Range, 16 to 396 fathoms. Three whole shells. Trawled.

ECHINODERMATA.

Linckia sp. Twelve specimens. Trawled.
Poraniomorpha borealis Verrill. Range, 192 to 225 fathoms. Two specimens. Trawled.
Diploaster multipes Sars. Range 124 to 640 fathoms. Two specimens. Trawled.
Archaster agassizii Verrill. Range, 182 to 1,342 fathoms. Five specimens. Trawled.
Archaster (robustus?) Verrill. Range, 938 to 1,467 fathoms. Five specimens. Trawled.
Scizaster fragilis Düben & Koren. Range, 225 to 321 fathoms. Ten specimens. Trawled.
Ophiopholis aculeata Gray. Range, shore to 1,000 fathoms. About 20 specimens. Trawled.
Ophioscolex glacialis Müller & Troschel. Range, 101 to 1,000 fathoms. Several hundred. Trawled.
Ophiacantha (segesta?) Lyman. The specimens most resemble the species *segesta* taken by the *Challenger* near the Philippines. Numerous. Trawled.
Ophiuran. Can not be referred to any described species.
Thyone recurvata Théel. Range, Kerguelen Islands, 10 to 100 fathoms. Nine specimens. Trawled.
Antedon dentata (Say) Verrill. Range, 69 to 640 fathoms. Hundreds. Trawled.

MOLLUSCA.

Cuspidaria fraterna Verrill & Bush. Range, N. lat. 40°, W. long. 69°, and N. lat. 39°, W. long. 74°, 302 to 984 fathoms. Three specimens. Trawled.
Lucina filosa Stimpson. Range, 4 to 349 fathoms. Two whole shells. Trawled.
Yoldia sapotilla Gould. Range, 125 to 321 fathoms. One live specimen. Trawled.
Astarte quadrans Gould. Range, 11 to 100 fathoms. Four live specimens. Trawled.
Cyprina islandica Lamarck. Range, 8 to 128 fathoms. One live specimen. Trawled.
Anomia aculeata Müller. Range, shore to 640 fathoms. Several specimens on broken bottle and on shells of *Fusus islandicus.* Trawled.
Chiton sp. One specimen recorded by Dr. Mulligan, but not found in preserved specimens.
Fusus islandicus Martini. Range, 16 to 300 fathoms. About 30 shells inhabited by *Eupagurus politus*; 3 contained the animals; several served for attachment of *Anomia aculeata.* Trawled.
Fusus ventricosus Gray. Range, bank fishing-grounds. Two shells inhabited by Eupagurids. Trawled.
Fusus pigmæus Stimpson. Range, North Atlantic. Six shells inhabited by Eupagurids. Trawled.
Torellia fimbriata Verrill & Smith. Range, 142 to 321 fathoms. One live specimen. Trawled.
Lunatia grœnlandica Stimpson. Range, 125 to 368 fathoms. Two shells inhabited by small *Eupagurus politus.* Trawled.
Lunatia heros Stimpson. Range, shore to 238 fathoms. Five shells inhabited by Eupagurids. Trawled.
Aporrhais occidentalis Sowerby. Range, 34 to 640 fathoms. About 20 shells, nearly all inhabited by Eupagurids; one shell bearing *Sagartia abyssicola.* Trawled.
Trochus (Ziziphanus) tinctus Watson. Range, 38 fathoms. Two shells. Trawled.
Scaphander mundus Watson. Range, 800 fathoms off Arrow Island. One live specimen and one shell. Trawled.
Pleurobranchia tarda Verrill. Range, 28 to 640 fathoms. Several specimens. Trawled.
Argonauta argo Linnæus. Range, 64 to 487 fathoms. One broken shell. Trawled.
Rossia sublevis Verrill. Range, 115 to 640 fathoms. Several specimens. Trawled. These contain a new *Dicyemid* which will be described by Prof. W. M. Wheeler.

CRUSTACEA.

Ceraphilus agassizii Smith. Range, 263 to 959 fathoms. One specimen. Trawled.
Pontophilus brevirostris Smith. Range, 51 to 233 fathoms. About 10 specimens. Trawled.
Hippolyte sp. About 30 specimens. Surface.
Anomalopus frontalis A. M.-Edwards. Range, 100 fathoms off Barbados; 75 fathoms off Florida. About 20 specimens. Trawled.
Pandalus annulicornis Leach. Range, Mediterranean; east coast of America, etc. Ten specimens. Trawled.

Spirontocaris spinus Sowerby. Range, 85 fathoms south of Halifax. One specimen. Trawled.
Munidia caribæa Smith. Range, 56 to 264 fathoms. About 30 specimens, some with eggs. Trawled.
Nephropsis agassizii A. M.-Edwards. Range, West Indies. One specimen taken at Station 7068. Very rare. When taken was a very brilliant red. Trawled.
Nautilograpsus minutus Milne-Edwards. Occurs with sargassum. One specimen. Surface.
Cancer borealis Stimpson. Shore to 435 fathoms; south to Cape Hatteras. One specimen. Trawled.
Neptunus sayi Stimpson. Occurs with sargassum. About 100 specimens taken in sargassum, nearly all females carrying eggs. Surface.
Catapagurus sharreri A. M.-Edwards. Range, 51 to 264 fathoms. Abundant as commensal of *Adamsia sociabilis*. Trawled.
Eupagurus kröyeri Stimpson. Range, 35 to 640 fathoms. One large specimen having no "house shell." Trawled.
Eupagurus pubescens Stimpson. Range, 26 to 86 fathoms. Abundant as commensal of *Epizoanthus americanus*. Trawled.
Eupagurus politus Smith. Range, 31 to 640 fathoms. About 30 specimens inhabiting large *Fusus* shells; one small specimen in shell of *Fusus pigmæus;* two small specimens in shells of *Lunatia heros;* two small ones in shells of *Lunatia grœnlandica;* about 20 small ones in shells of *Aporrhais occidentalis*. Trawled.
Latreutes ensiferus Stimpson. With gulf weed. About 50 specimens, some parasitized by a *Bopyrus*. Surface.
Epimera loricata G. O. Sars. Range, 90 to 640 fathoms. Ten specimens. Trawled.

TUNICATA.

Molgula sp. Several specimens covered with small sand particles.
Salpa sp. Large, solitary form, about 6 cm. long.
Salpa cordiformis-zonaria Quoy & Gaimard. Very plenty in chain form, a few solitary individuals with characteristic, broader muscle bands being taken. A tunic 75 mm. long, containing a dead and much contracted animal, was trawled. The size of the individuals of the chain as well as the length of the chains varied considerably. The individuals were in various stages of reproduction. Surface.
Cyclosalpa (pinnata?) Forskåhl. Range, Pacific Ocean between Papua and Japan. Several colonies in various stages of reproduction. These forms are of especial interest, as Herdman in Challenger Expedition Report records only one poor specimen of a solitary individual. Surface.

PISCES.

I. Surface Species.

Seriola fasciata (Bloch). Range, West Indies north to Charleston, S. C. One specimen.
Trachurops crumenophthalmus (Bloch). Range, Atlantic coast of United States. Two specimens.
Caranx crysos (Mitchill). Range, Cape Cod to Brazil. One specimen.
Glossamia pandionis (Goode & Bean). Range, deep water off Chesapeake Bay. One specimen.
Abudefduf saxatilis (Linnæus). Range, both coasts of tropical America. One specimen.
Balistes vetula Linnæus. Range, tropical parts of the Atlantic, Gulf Stream to Woods Hole. One specimen.
Monacanthus hispidus (Linnæus). Range, Cape Cod to Brazil. Several specimens.
Lycenchelys verrillii (Goode & Bean). Range, coast of Massachusetts and northward. One specimen.
Merluccius bilinearis (Mitchill). Range, coast of New England and northward. Two specimens.

II. Deep-water Species.

Raia eglanteria Bosc. Range, Cape Cod southward to Florida. One specimen.
Helicolenus maderensis Goode & Bean. Range, deep waters of Atlantic coast from Narragansett Bay to Chesapeake Bay. One specimen.
Peristedion miniatum Goode. Range, Gulf Stream. Two fine, large specimens.
Macrourus bairdii Goode & Bean. Range, West Indies to Massachusetts Bay. One specimen.
Citharichthys arctifrons Goode. Range, deep waters of Gulf Stream. Thirty specimens.
Monolene sessilicauda Goode. Range, deep waters of Gulf Stream. Two specimens.
Symphurus pusillus (Goode & Bean). Range, off Atlantic coast of United States, in deep water. One specimen.
Dibranchus atlanticus Peters. Range, Gulf Stream. Several specimens.

HARVARD UNIVERSITY, *December 30, 1899.*