

XX.—NOTICE OF THE REMARKABLE MARINE FAUNA OCCUPY-
ING THE OUTER BANKS OFF THE SOUTHERN COAST OF NEW
ENGLAND, AND OF SOME ADDITIONS TO THE FAUNA OF
VINEYARD SOUND.*

BY A. E. VERRILL.

1881.

The United States Fish Commission occupied, during the season of 1881, the station at Wood's Holl,† Mass., on Vineyard Sound, where a laboratory for its use was established in 1875.

The shallower waters of that region had been very fully explored by the Fish Commission in 1871 and 1875. Nevertheless, much was done this year toward completing the investigation of the surface fauna, which is exceedingly rich and varied at Wood's Holl. The larval forms of crustacea, annelida, echinodermata, mollusca, etc., were taken in larger numbers in the towing nets, as well as adult forms of many kinds, including, especially, numerous species of Syllidæ, many of which were new.

The special subject for investigation this year was, however, the rich fauna that was discovered in 1880, in deep water, about 75 to 120 miles off the southern coast of New England, near the edge of the Gulf Stream. A brief account of our discoveries in that region, in 1880, was published by me in the American Journal of Science (vol. xx, p. 390), with notices and descriptions of many of the mollusca and echinoderms then discovered. A more detailed account of the mollusca‡ was published by me in the Proceedings of the National Museum (vol. iii, pp. 356-409, December and January). Prof. S. I. Smith published an account of the crustacea in the same Proceedings (vol. iii, pp. 413-452, January, 1881).

In the following article some of the more interesting species, obtained in both years, are noticed. Some of these species were also dredged on the 16th of November, 1881, by Lieut. Z. L. Tanner, in a trip made to the deep water off the mouth of Chesapeake Bay, after the regular dredging operations of the season had ceased.

* The following article is an abstract of papers published in the American Journal of Science, Vols. XXII-XXIV, 1881 and 1882.

† Formerly written "Wood's Hole," but the name was changed by order of the Postmaster-General, in 1875.

‡ Much fuller reports on the mollusca, with numerous illustrations, have more recently been published by the author in the Trans. Conn. Academy, Vols. V and VI.

As many of the species there obtained are referred to, a list of the stations is here added:

Station.	Locality.		Fathoms.	Bottom.
	N. Lat.	W. Long.		
896	37° 20'	74° 19'	56	Sand, shells.
897	37 25	74 18	157½	Sand, mud.
898	37 24	74 17	300	Mud.
899	37 22	74 29	57½	Sand.
900	37 19	74 41	31	Do.
901	37 10	75 08	18	Do.

Our dredgings this year, in deep water, were also made with the Fish Hawk, Lieut. Z. L. Tanner, commander. Mr. A. P. Chapin, of Warsaw, N. Y., made the temperature observations and records of soundings, etc.

The party immediately associated with the writer in the zoological investigations consisted of Prof. S. I. Smith and Mr. J. H. Emerton (artist), of Yale College; Dr. T. H. Bean and Mr. Richard Rathbun, of the National Museum; Mr. Sanderson Smith, of New York; Prof. L. A. Lee, of Bowdoin College; Mr. B. F. Koons, Mr. E. A. Andrews, and Mr. H. L. Bruner, graduates and special zoological students of the Sheffield Scientific School, of New Haven, and Mr. Peter Parker, of Washington. Most of these gentlemen had been associated with me in the same way in previous years.

The off-shore regions explored this year are included between north latitude 39° 40' and 40° 22', and between west longitude 69° 15' and 71° 32'.

They occupy a region about 42 miles wide, north and south, and about 95 miles long, east and west, or about 105 miles along the 100-fathom line.

Series of dredgings were also made this season off Cape Cod, in Vineyard Sound, in Buzzard's Bay, and off Martha's Vineyard, between the deep-water and shallow-water localities of former years.

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. It is, however, probable that at any given depth below 50 fathoms, the temperature is nearly the same at all seasons of the year. Moreover, there is, in this region, an active circulation of the water at all times, due to the combined currents and tides. The successive zones of depth represent successively cooler climates more strikingly here than

near the coast. 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. A very large species of *Salpa*, often 5 or 6 inches long, occurs both at the surface and close to the bottom, in vast quantities. Sometimes several bushels come up in a single haul of the trawl. I have taken this same *Salpa* in very numerous instances, from the stomachs of star-fishes of many kinds, from Actiniæ of several species, etc. Pteropods also frequently occur in the stomachs of the star-fishes, while Foraminifera furnish a large part of the food of many of the mud-dwelling species of various orders.

The fishes, which are very abundant and of many species, find a wonderfully abundant supply of most excellent food in the very numerous species of crabs, shrimp, and other Crustacea, which occur in such vast quantities that not unfrequently many thousands of specimens of several species are taken in a single haul of the trawl. Cephalopods are also abundant and are eagerly devoured by the larger fishes, while others prey largely upon the numerous gastropods and bivalves.

Table of outer stations occupied in 1881, with temperatures of bottom and surface.

[The distances are measured from Gay Head light, in geographical miles. The bearings are magnetic.]

Station.	Locality.	Fathoms.	Bottom.	Date.	Temp. F.		Hour.
					Bot- tom.	Sur- face.	
OFF MARTHA'S VINEYARD.							
917	S. $\frac{1}{2}$ W. 56 $\frac{1}{2}$ miles	44	Green mud	July 16	42°	63°	4 10 a. m.
918	S. $\frac{1}{2}$ W. 61 miles	46	do	July 16	45	63	5 23 a. m.
919	S. $\frac{1}{2}$ W. 65 miles	53	do	July 16	42.5	66	7 00 a. m.
920	S. $\frac{1}{2}$ W. 68 $\frac{1}{2}$ miles	63	do	July 16	49	66	8 20 a. m.
921	S. $\frac{1}{2}$ W. 78 miles	67	do	July 16	52	70	9 40 a. m.
922	S. $\frac{1}{2}$ W. 77 miles	67	Green mud, sand	July 16	52	72	10 57 a. m.
923	S. $\frac{1}{2}$ W. 78 $\frac{1}{2}$ miles	98	Sand	July 16	52	73	12 27 p. m.
924	S. $\frac{1}{2}$ W. 83 $\frac{1}{2}$ miles	164	do	July 16	44.5	71	1 52 p. m.
925	S. $\frac{1}{2}$ W. 86 miles	229	Sand, mud	July 16	42	71	3 35 p. m.
926	S. $\frac{1}{2}$ W. 85 miles	199	do	July 16	44	71	5 24 p. m.
935	S. by E. $\frac{1}{2}$ E. 108 $\frac{1}{2}$ miles	782	do	Aug. 4	39.5	70	8 14 a. m.
936	S. by E. $\frac{1}{2}$ E. 104 $\frac{1}{2}$ miles	716	Mud	Aug. 4	39.5	71	10 43 a. m.
937	S. by E. $\frac{1}{2}$ E. 102 miles	661	Green sand, mud	Aug. 4	40.5	72	12 45 p. m.
938	S. by E. $\frac{1}{2}$ E. 100 miles	317	do	Aug. 4	42	72.5	2 44 p. m.
939	S. by E. $\frac{1}{2}$ E. 98 miles	264	do	Aug. 4	47	73	4 25 p. m.
940	S. by E. $\frac{1}{2}$ E. 97 miles	184	Sand	Aug. 4	52	72	5 30 p. m.
941	S. by E. $\frac{1}{2}$ E. 80 $\frac{1}{2}$ miles	77	Sand, mud	Aug. 4	52	71	7 45 p. m.
942	S. by W. $\frac{1}{2}$ W. 81 $\frac{1}{2}$ miles	138	do	Aug. 9	50	69	6 15 a. m.
943	S. SW. 83 miles	157	Sand, mud, shell	Aug. 9	49	70	7 10 a. m.
944	S. SW. 82 miles	128	do	Aug. 9	51	70	8 27 a. m.
945	S. by W. $\frac{1}{2}$ W. 84 $\frac{1}{2}$ miles	207	Green mud, sand	Aug. 9	44	71	12 05 p. m.
946	by W. $\frac{1}{2}$ W. 87 $\frac{1}{2}$ miles	247	do	Aug. 9	47	71	2 00 p. m.
947	by W. $\frac{1}{2}$ W. 89 miles	310	Sand, mud	Aug. 9	44	70	4 00 p. m.
940	S. 78 $\frac{1}{2}$ miles	100	Yellow mud	Aug. 23	52	66	4 20 a. m.
950	S. 75 miles	71	Sand, shell, mud	Aug. 23	52	65	5 50 a. m.
951	S. 85 miles	225	Mud	Aug. 23	41	67.5	9 40 a. m.
952	S. $\frac{1}{2}$ E. 87 $\frac{1}{2}$ miles	360	Yellow mud, sand	Aug. 23	40	68	11 28 a. m.
953	S. $\frac{1}{2}$ E. 91 $\frac{1}{2}$ miles	724	Mud	Aug. 23	59.5	68	2 30 p. m.
954	S. $\frac{1}{2}$ E. 91 miles	651	Sand, mud	Aug. 23	59.5	68	4 50 p. m.
964	S. SW. $\frac{1}{2}$ W. 104 $\frac{1}{2}$ miles	868	Mud	Sept. 8	40.5	68	4 50 a. m.
965	S. SW. $\frac{1}{2}$ W. 104 miles	859	Yellow mud, sand	Sept. 8	40.5	68	6 32 a. m.
966	S. SW. $\frac{1}{2}$ W. 104 miles	846	do	Sept. 8	40	67.5	7 35 a. m.
967	S. SW. $\frac{1}{2}$ W. 103 $\frac{1}{2}$ miles	835	Yellow mud	Sept. 8	40	67.5	9 03 a. m.
968	S. SW. $\frac{1}{2}$ W. 102 $\frac{1}{2}$ miles	302	Gravel, mud	Sept. 8	40	68	10 34 a. m.
969	S. SW. $\frac{1}{2}$ W. 100 miles	266	do	Sept. 8	40	68	11 48 a. m.
1025	S. SW. $\frac{1}{2}$ W. 95 miles	216	do	Sept. 8	45	69	1 05 p. m.
1026	S. SW. $\frac{1}{2}$ W. 92 $\frac{1}{2}$ miles	182	do	Sept. 8	47.5	69	2 55 p. m.

Table of outer stations occupied in 1881, with temperatures of bottom and surface—Cont'd.

Station.	Locality.	Fathoms.	Bottom.	Date.	Temp. F.		Hour.
					Bot- tom.	Sur- face.	
OFF MARTHA'S VINEYARD— Continued.							
1027	S. SE. $\frac{1}{2}$ E. 105 $\frac{1}{2}$ miles.....	93	Fine sand	Sept. 14	48 $\frac{1}{2}$	65	7.23 a. m.
1028	S. SE. $\frac{1}{2}$ E. 108 $\frac{1}{2}$ miles.....	410	Yellow mud	Sept. 14	41	66	9.01 a. m.
1029	S. SE. $\frac{1}{2}$ E. 109 $\frac{1}{2}$ miles.....	458	.....do	Sept. 14	40	68	12.13 p. m.
1080	S. SE. $\frac{1}{2}$ E. 108 $\frac{1}{2}$ miles.....	337	.....do	Sept. 14	41	66	1.52 p. m.
1081	S. SE. $\frac{1}{2}$ E. 107 $\frac{1}{2}$ miles.....	255	.....do	Sept. 14	46	65	2.54 p. m.
1082	S. SE. $\frac{1}{2}$ E. 107 miles.....	208	.....do	Sept. 14	46	65	4.00 p. m.
1083	S. SE. $\frac{1}{2}$ E. 106 miles.....	183	Sand, gravel	Sept. 14	.....	63	4.55 p. m.
1084	S. SE. $\frac{1}{2}$ E. 105 $\frac{1}{2}$ miles.....	146	Sand, yellow mud ...	Sept. 14	46 $\frac{1}{2}$	62	5.55 p. m.
1085	S. SE. $\frac{1}{2}$ E. 108 $\frac{1}{2}$ miles.....	120	Sand,	Sept. 14	47	62	6.56 p. m.
1086	S. SE. $\frac{1}{2}$ E. 102 miles.....	94	.....do	Sept. 14	51	61 $\frac{1}{2}$	7.54 p. m.

FISHES.

The fishes obtained by us are of great interest. The large number of species taken will be indicated by the list, which has been made out by Dr. T. H. Bean, who had charge of the fishes this season. (See page 339.)

The new species of fishes taken in 1880, in this region, were described by Mr. G. Brown Goode, and a list of the fifty-one species, obtained by us, was also published by him. (Proc. Nat. Mus., iii, pp. 337-467, November, 1880, and February, 1881.)

The most important of the fishes is the *Lopholatilus chamaeleonticeps* Goode and Bean, or "Tile-fish" (see page 237). This is a large and handsome edible fish, first discovered on these grounds in 1879, and not yet found elsewhere. It seems to be very abundant over the whole region explored by us, in 70 to 134 fathoms. On one occasion a "long-line" or "trawl-line" was put down at station 949, in 100 fathoms, and seventy-three of these fishes were taken, weighing 541 pounds. These varied in weight from 2 $\frac{1}{2}$ to 31 pounds. It is brownish gray, more or less covered with large bright yellow spots. The *Peristedium miniatum* Goode, is a very curious and handsomely colored fish, often bright red throughout. The several species of "hake" (*Phycis*) are common, as well as the "whiting" (*Merluccius bilinearis*). Large specimens of the "goose-fish" or "angler" are often taken in the trawl, in as much as 250 fathoms.

MOLLUSCA.

Most of the mollusca recorded in my papers of last year were again obtained this season, and often in larger numbers. A complete list will be published in a future paper. At the present time I shall refer only to some of the more important ones, and to some of those that were additions to the fauna.

Of the Cephalopods, the following species were taken :
Lestoteuthis Fabricii Verrill. = *Gonatus Fabricii* Steenstrup.

Station 953; 715 fathoms; one large and perfect male specimen. Station 1031; 255 fathoms; one young specimen.

The former is the form recently figured by Steenstrup, under the above name, and considered by him the adult of *Gonatus amœnus*.

Ommastrephes illecebrosus Verrill.

Stations 918, 919, 923-925, 939, 940, 949, 1025, 1033; 45-258 fathoms.

Desmoteuthis tenera Verrill.

Station 952; 388 fathoms. Two specimens.

Rossia sublevis Verrill.

Stations 924, 925, 939, 945-947, 951, 952, 997, 1025, 1026, 1028, 1029, 1032, 1033; 106-388 fathoms. Some of the specimens recently obtained agree more nearly with *R. glaucopsis* Lov., as figured by G. O. Sars, than any seen before. It may prove to be identical.

Heteroteuthis tenera Verrill.

Stations 918, 919, 920, 921, 922, 940, 944, 949, 950, 1026, 1027; 45-182 fathoms. Eggs of this species were taken at stations 922, 940, 949, and in several localities in 1880. They are nearly round, ivory-white or pearly, attached to shells, etc., by one side, in groups, or scattered. On the upper side there is a small conical eminence.

Stoloteuthis leucoptera Verrill.

Stations 947, 952, 998, 989, 1026 (3 juv.); 182-388 fathoms.

Octopus Bairdii Verrill.

Stations 925, 939, 945-947, 951, 952, 994, 997, 998, 1025, 1026, 1028, 1033, 1035; 103-388 fathoms.

Alloposus mollis Verrill.

Stations 937, 938, 952, 953, 994; 310-715 fathoms. Two very large females were taken; one at station 937, in 506 fathoms; the other at 994, in 368 fathoms. The former weighed over 20 pounds. Length from end of body to tip of 1st pair of arms, 31 inches; of 2d pair, 32; of 3d pair, 28; of 4th pair, 28; length of mantle beneath, 7; beak to end of 4th pair of arms, 22; breadth of body, 8.5; breadth of head, 11; diameter of eye, 2.5; of largest suckers, .38.

The only additional Pteropod taken this year is *Triptera columnella* (Rang), from Station 947. Among the Gastropods there are a considerable number of species not obtained last year. Perhaps the most remarkable discovery in this group is a fine typical species of *Dolium* (*D. Bairdii*) taken alive in 202 fathoms. This genus is almost exclusively tropical in its distribution. On our coast, *D. galea* extends northward to North Carolina. This southern genus, with a large *Marginella*, *M. borealis* v., taken both this year (Station 949) and last, *Solarium boreale* v., *Aricula hirundo*, and various other genera, more commonly

found in southern waters, are curiously associated, in this region, with genera and species which have hitherto been regarded as exclusively northern or even Arctic, many of them having been first discovered in the waters of Greenland, Spitzbergen, Northern Norway, Jan Mayen Land, etc.

Among the northern species which had not been found previously south of Cape Cod, the following were dredged: *Trophon clathratus*, 972, 976; *Acirsa costulata* (= *borealis*), 965; *Amauropsis Islandica* (= *helicoides*); *Margarita cinerea*, 981; *Cylichna Gouldii*, 973; *Odostomia* (*Meneutho*) *striatula*, 980.

Dolium Bairdii Verrill and Smith.

A moderately large species, having nearly the form of *D. perdix* and *D. zonatum*. Male. Shell broad ovate, with seven broadly rounded whorls; spire elevated, apex acute; nuclear whorls about three, smooth; suture impressed, but not deep, nor channeled; the last whorl is somewhat flattened (perhaps abnormally) below the suture, for some distance, corresponding to an inward flexure of the outer lip. Aperture elongated, irregularly ovate; outer lip regularly rounded, except for a short distance posteriorly, where it is slightly incurved, its edge is ex-curved, acute externally, distinctly but not prominently crenulated within, except posteriorly, where a posterior canal is slightly indicated; columella straight; canal short and broad. The sculpture is peculiar: it consists of numerous (about 40 on the last whorl) rather prominent, squarish, clearly defined revolving ribs, less than 1^{mm} broad, separated by interspaces of about the same breadth, in which there is usually one small narrow rib, alternating with the larger ones; sometimes there are two or more small ones. The whole surface, both of ribs and interspaces, is covered with fine and regular transverse, raised lines. The surface is covered with a very thin pale olive-yellow epidermis, easily deciduous when dry. Color white, except that the larger ribs are alternately light brown and white, and the apex, consisting of about three smooth nuclear whorls, is dark brown. Length, 68^{mm}; breadth, 56^{mm}; length of aperture, 53^{mm}.

The animal is well preserved. Proboscis blackish, exerted about 20^{mm}, thick (8^{mm}) and clavate at the end, which is surrounded by a sort of collar, with a finely wrinkled or crenulated, white edge. Head large, with a prominent rounded lobe in front. Tentacles large, elongated (10^{mm}), stout, tapering, obtuse. Eyes small, black, on distinct but slightly raised tubercles at the outer base of the tentacles. Head, tentacles, and siphon-tube dull brown. Penis very large (50^{mm} long, 12^{mm} broad), twisted and thickened at base, flattened distally, terminating in a slightly prominent obtuse lobe at the tip; a well-marked groove runs along the posterior edge to the tip.

Off Martha's Vineyard, station 945, 202 fathoms. Station 1036, 94 fathoms; one young specimen and large fragments.

Pleurotoma (Bela) limacina Dall. (*Daphnella* ?)

Bulletin Mus. Comp. Zool., ix, p. 55, 1881.

Four living specimens of this elegant shell were taken at station 994; 368 fathoms. Gulf of Mexico, 447-805 fathoms (Dall). This is not a true *Bela*, for it has no operculum; eyes minute.

Capulus hungaricus (Linné).

Two living specimens were obtained, which appear to belong to this species. They are more delicate and have somewhat finer and more regular radiating ribs than the ordinary European form. It has not been recorded before from our coast.

Stations 922, 1029; 69 and 458 fathoms.

Fiona nobilis Alder and Han.

British Nud. Moll., Æolidæ, Fam. 3, pl. 38 A.

A large and handsome *Fiona*, apparently this species, was found in two instances, in large numbers, on pieces of floating timber, among Anatifers, at stations 935 and 995. They were kept in confinement several days and laid numerous clusters of eggs. These are in the form of a broad ribbon, spirally coiled in about one and a half turns, so as to form a bell-shaped or cup-shaped form, and attached by a slender pedicel, so as to hang from the under side of objects. Alder and Hancock recorded its occurrence, in a single instance, at Falmouth, England.

Issa ramosa Verrill and Emerton.

Body elevated, convex above, elongated, oblong, sides nearly parallel along the middle; foot well-developed, as broad as the body. Dorsal tentacles thick, clavate, obtuse, with numerous lamellæ; sheath scarcely raised. Back and sides with numerous small, simple papillæ. Along the lateral margins of the back there is a carina, with a row of large, much branched papillæ, alternating with much smaller ones; of the large ones there are about six on each side, the most anterior are below the dorsal tentacles; two on each side are posterior to the gills, the last ones largest; a row of similar but smaller processes extends below the tentacles and around the front margin.

Gills five, arborescently branched. Color, pale yellow. The dorsal tentacles darker.

The radula is quite different from that of *I. lacera* and *Triopa claviger*. The median area is wide, with two rows of thin, transversely oblong plates; there are three rows of large, nearly equal teeth on each side, with the tips strongly incurved, obtuse; the innermost tooth has a small lobe on the middle of the inner edge: these are followed by about seventeen or eighteen smaller, oblong plates, with slightly emarginate anterior ends; these gradually decrease in size toward the margins of the radula.

Stations 940, 949; 130 and 100 fathoms.

In form this resembles *I. lacera*, but is easily distinguished by the branched appendages along the sides.

Of the Lamellibranchiata some very interesting new forms occurred. The most important of these are species of *Pholadomya*, *Mytilimeria*, and *Diplodonta*—three genera not before found on this coast. The *Pholadomya* is more related to certain fossil forms than to any of the few described living species. The genus *Mytilimeria* has hitherto had very few living representatives, and none of them resemble our very singular species.

Among the northern forms, not previously found south of Cape Cod, are the following: *Mya truncata*; *Spisula ovalis* (975, 976, 981); *Leda tenuisulcata* (973); *Nucula tenuis*.

Pholadomya arata Verrill and Smith.

Shell triangular, short, wedge-shaped, posterior end angular, somewhat produced, obtuse; anterior end very short and abruptly truncated, clearly defined by a carina extending from the beak to the outer margin; anterior to the carina there is a broad concave furrow, which bounds the slightly convex central area of the front end; the greater part of the sides of the shell is covered with deep, rather wide, concave furrows, separated by elevated, sharp-edged ribs; the furrows vary in width and decrease posteriorly; a small portion, near the tip of the posterior end is covered only by slight ribs. The surface between the ribs is finely granulated. When the thin superficial layer is removed the surface is pearly. The umbos are prominent, strongly incurved, nearly or quite in contact. The hinge in the right valve consists of a small, slightly prominent lamella, running back as a low ridge, and separated from the margin of the shell anteriorly, and from the cartilage-lamina posteriorly, by a narrow groove; the cartilage-pit is long, running forward under the beak as a narrow furrow; it is bounded internally by a prominent lamella. Length, 36^{mm}; height, 29^{mm}; breadth, 26^{mm}.

Stations 940, 949, 950; 69 to 130 fathoms.

Three specimens, all dead, but one is very fresh.

Mytilimeria flexuosa Verrill and Smith.

Shell obliquely cordate, short, higher than long, very swollen, the anterior end rather shorter than the posterior; umbos very prominent, beaks much incurved, pointed and turned forward, with a small, deep concavity just under and in front of them. The outline and surface of the shell is very flexuous, owing to the broad, deep grooves and elevated ribs which divide the surface into several areas. The most prominent rib is very high and rounded, and runs from the beak to the extreme ventral margin, inclining somewhat forward; in front of this the anterior area is flattened with a wide, shallow, concave groove or undulation in the middle, and others less marked; the front edge is broadly rounded, slightly undulated below. The middle area is very elevated, and forms more than a third of the shell; it is flattened or slightly

concave in the middle, and undulated by several faint broad ribs; it recedes posteriorly, and a broad, concave furrow separates it from the small posterior area, which is without ribs, and has a prominent rounded edge. The surface is finely granulated, lines of growth evident. The interior is pearly, angulated by a deep groove, corresponding to the largest external rib. The dorsal hinge-line is nearly straight posteriorly, and strongly incurved anteriorly, in the right valve it projects inward, but not in the left; in the right valve there is a small rounded tubercle, a little back of the beak; from below this a short rib-like process runs back below the deep, partially internal cartilage-pit, which extends forward and upward under the beak as a narrow furrow. Anterior muscular scar deep; posterior one larger, ovate, less distinct; sinus small. Length, 25^{mm}; height, 26^{mm}; breadth from side to side, 22^{mm}.

Station 947; 312 fathoms. One pair of fresh valves, dead.

This and the preceding were both taken by means of the "rake-dredge."

Diplodonta turgida Verrill and Smith.

Shell large for the genus, round-ovate, a little longer than high, very swollen; the two ends nearly equally rounded, the anterior a little narrower; ventral edge broadly and regularly rounded; beaks nearly central, somewhat forward of the middle, strongly curved inward and forward, acute. Surface without sculpture, smooth except for the evident lines of growth. In the right valve there are, opposite the beak, two nearly equal, stout, sharp teeth, separated by a space of about the same width; back of these, and partly joined at base to the posterior one, there is a much larger, broad, stout, obtuse tooth, with a groove on its dorsal side; external cartilage-groove and its lamella are long and narrow, curved. Length, 29^{mm}; height (umbos to ventral edge), 25^{mm}; breadth, 23^{mm}.

Station 950; 69 fathoms. One right valve.

1882.

During the summer of 1882 the headquarters of the United States Fish Commission were at Wood's Holl, Mass. The organization of the party was nearly the same as last year.* The special object this year

*The scientific party associated with the writer in carrying on the dredging operations and making the collections this year consisted of Mr. Richard Rathbun, Mr. Sanderson Smith, Mr. J. H. Emerton (as artist), Prof. L. R. Lee, Mr. B. F. Koons, Mr. H. L. Bruner, Prof. Edwin Linton. Prof. S. I. Smith was with us for a few days. Mr. Peter Parker and R. H. Miner, midshipmen, U. S. N., took charge of the fishes, John B. Blish, midshipman, U. S. N., kept the records of soundings and temperatures, and Capt. H. C. Chester had charge of the dredging apparatus, as in previous years. The dredgings were all made by the Fish Hawk, commanded by Lieut. Z. L. Tanner, U. S. N., as during the two previous years. The writer, as usual, had general charge of these explorations, and of the investigation of the invertebrate fauna.

was to continue the exploration of the sea-bottom and its fauna beneath the edge of the Gulf Stream, which had been so successfully carried on during the two previous seasons. Owing to the unusual delay of the Government appropriations our work was delayed about a month, in the best part of the season, for we could not begin our dredging until August. Unfavorable weather and other causes afterward prevented us from making more than five trips to the Gulf Stream slope this year; but these were very successful.

One trip, occupying three days, was also made to the region east of Cape Cod. On this trip very cold bottom-water was found at moderate depths. It extended southward the known range of a number of northern species, previously unknown on this part of the coast, but did not reveal any new forms. Among the species of most interest taken on this occasion are the following: Several examples of *Urticina multicornis* V. (of which only one specimen was known previously), 55 to 90 fathoms; *Porania spinulosa* V., large, 90 fathoms, station 1088; *Solaster endeca* F., many, large and small, 32 to 90 fathoms; *Hippasteria phrygiana* Ag., several, large, 34 to 90 fathoms; *Astrophyton Agassizii* St., many, 55 to 61 fathoms, off Chatham, stations 1078, 1079; *Pentacta frondosa*, large, 34 to 37 fathoms; *Pandalus borealis*, 90 to 110 fathoms; *Geryon quinquedens*, 110 fathoms; *Balanus hameri*, 33 fathoms; *Rossia Hyatti*, several, large, 44 to 90 fathoms.

Of the five Gulf Stream trips one was made southeastward from Nantucket, farther east than any of those of 1880 and 1881, while another was made to the region about 100 miles south of the eastern end of Long Island, farther west than any of the former ones; the other three were in the intermediate region off Martha's Vineyard. Our dredgings in this region, therefore, now cover a belt about 150 miles, east and west, mostly between the 100 and 600 fathom lines. The total number of successful hauls made along this belt, in more than 100 fathoms, is now over one hundred. These have nearly all been made with the large, improved trawls; a few have also been made with a large rake-dredge. Probably no other part of the ocean-basin, in similar depths, has been more fully examined than this region.

The total number of species of Invertebrata, already on our lists of the fauna of this belt, is about 675. This number includes neither the Foraminifera, nor the Entomostraca, which are numerous, and but few of the sponges. Probably the total list of Invertebrata, already obtained, when completed will include not less than 800 species.* Of these less than one-half were known on our coast before 1880. Of fishes, there are, perhaps, 75 species. Of the whole number, already determined, about 275 are Mollusca, including 20 Cephalopoda; 95 are Crustacea; 60 are Echinodermata; 35 are Anthozoa; 75 are Annelida.

The steamer Fish Hawk, with which we have explored this region

* Subsequent explorations of this region, up to the end of 1883, have nearly doubled the numbers here given.—A. E. V.

during the past three seasons, was built particularly for use in the hatching of shad eggs, in the mouths of shallow rivers, and is, therefore, not adapted for service at sea, unless in very fine weather. A much larger steamer, the Albatross, of 1,000 tons, has been built for the use of the Fish Commission, and fitted up expressly for deep-sea service, for which she is in every respect well adapted, having the best equipment possible for all such investigations, and at all depths. The examination of the bottom beyond the depth of about 600 fathoms was therefore deferred by us till the completion of the Albatross. Nevertheless, the apparatus that we have used on the Fish Hawk has been better, in some respects, than most other vessels engaged in such work have had, whether American or foreign. This year several new improvements were made, especially in the deep-sea thermometers. New forms of traps for capturing bottom animals were also devised. The "*trawl-wings*," first introduced by us in 1881, were used this year with great success, for they brought up numerous free-swimming forms, from close to the bottom, which could not otherwise have been taken. The use of steel wire for sounding, and of wire rope for dredging, enabled us to obtain a much greater number of dredgings* and temperature observations than would have been possible under the old system, adopted on the Challenger.

Of Echinoderms, nearly all of the species previously enumerated† from

*As an illustration of the rapidity with which this work has been done by employing persons skilled in the various operations and using the wire rope, reeled upon a large drum, I give here a memorandum of the time required to make a very successful haul. In 640 fathoms, at station 1124, the large trawl was put over at 4.29 p. m.; it was on the bottom at 4.44, with 830 fathoms of rope out; commenced heaving in at 5.17; it was on deck at 5.44 p. m.; total time for the haul, 1 hour 15 minutes. The net contained several barrels of specimens, including a great number and large variety of fishes, as well as of all classes of invertebrata, probably more than 150 species altogether, several of them new.

At station 1125, in 291 fathoms, the trawl was put over at 6.03 p. m.; on bottom at 6.10, with 500 fathoms of rope out; commenced heaving in at 6.32; on deck at 6.50; total time 47 minutes. This was a very good haul, but not so large as 1124. This was the seventh successful haul of the trawl made that day. All the specimens were assorted, labelled, and packed away in alcohol before 9 p. m.

The adoption of steel-wire rope, since 1880, for dredging on the Fish Hawk has greatly expedited our work. This great improvement, first used by Lieut.-Com. C. D. Sigsbee, on the Coast Survey steamer Blake, in 1877-'78, was invented by Mr. A. Agassiz, who introduced it during that cruise, and also on subsequent ones on the Blake, when commanded by Lieutenant Bartlett. Its introduction and use has been described by Mr. Agassiz in his reports, and also, in detail, by Captain Sigsbee, in his extended work on Deep-Sea Sounding and Dredging. Our arrangements on the Fish Hawk for reeling in the wire rope were unlike those on the Blake, for we used only one drum, with 1,000 fathoms of rope on it. The use of steel wire for sounding goes back to an earlier date than is commonly supposed. It was extensively tried by Lieut. J. C. Walsh, U. S. N., on the schooner Taney, in his survey of the Gulf Stream in 1849 (see Maury's *Winds and Currents of the Sea*, p. 56, 1851). Important improvements have since then been made in the reels for winding it in, by Sir William Thomson, Captain Sigsbee, and others.

† See American Journal of Science, 1880 to 1882.

this region and several additional ones were obtained. Among those of special interest were *Goniocidaris papillata*, 156 to 158 fathoms; *Brisopsis lyrifera*, 158 to 194 fathoms; *Spatangus purpureus*, 89 to 158 fathoms; *Schizaster canaliferus*, 100 fathoms, several; *Echinus Wallisi* A. Ag., 640 fathoms; *E. gracilis*, numerous and of large size at stations 1097 and 1098, in 156 to 158 fathoms; *Phormosoma Sigsbei* A. Ag., station 1123, in about 700 fathoms,* several, both large and small, the largest 124^{mm} in diameter; *Porania grandis* V., abundant in 156 to 158 fathoms; *Odontaster hispidus* V., abundant in 89 fathoms.

Among those added to the fauna this year are a very rare *Diadema-like* sea-urchin (*Hemipedinia Cubensis* A. Ag.) from 194 fathoms, previously known only from the West Indies; *Solaster Earllii* V., of which a large nine-armed specimen, bright scarlet in color, was obtained in 234 fathoms, station 1121; *Lophaster furcifer*, several from 234 and 640 fathoms; *Astrogonium granulare*, from 156 and 640 fathoms; *Astrophyton Lamarckii*, color, bright orange, several from 194 fathoms; *Asteronyx Loveni* M. & Tr., station 1123, in about 700 fathoms, on a pennatulid; color of both bright orange; *Ophioscolex*, new sp., with four arm-spines and a small tentacle-scale, 234 fathoms; *Rhizocrinus Lofotensis*, young, from 640 fathoms.

Most of the Anthozoa of the previous years were again obtained, with some additional ones, including a remarkable new Pennatulid belonging to a new genus,† and two Gorgonians: *Acanthogorgia armata* V., 640 fathoms, and *Paramuricea borealis* V., from 234 fathoms; the former, when living, was bright orange; the latter was pale salmon. Of those previously taken, one of the most interesting was *Pennatula borealis*, obtained in 192, 317, and 640 fathoms. The largest one, from 317 fathoms, was 21.5 inches high, and 5.25 broad.

Of Pycnogonida, we took some large and interesting forms, including two examples of *Colossendeis colossea* Wilson, station 1123, in about 700 fathoms, of which the larger was 19.5 inches across; *C. macerrima* W.,

* The trawl was put down at this station in 780 fathoms, but before it was taken up the depth had become 627 fathoms.

† Most of the Anthozoa obtained by us have been described and figured by the author in the Bulletin Mus. Comp. Zoology, Vol. XI, 1883. See, also, Amer. Journ. Science, 1881-'82.

‡ *Distichoptilum* Verrill.—Slender pennatulids, with an axis through the whole length, and polyps arranged alternately, in a simple row, on each side; calicles bilobed, appressed; zooids three to each polyp, one in front and one on each side of each cell; spicula abundant in the calicles, rachis, and stalk.

Distichoptilum gracile Verrill.—Long and slender, with a long stalk. Polyp-calicles rather large, rigid, closely appressed, with two sharp terminal lobes, filled with spicula, concealing the opening, and overlapping the base of the calicle in front; zooids small, not exsert, showing as small white spots at each side and in front of each polyp cell; stalk long, slender, with a long narrow bulb; color, bright orange-red, due to the spicula; end of bulb yellowish; length, 18 inches, or 456^{mm}; breadth in middle, 2^{mm}; length of stalk, 100^{mm}.

from 317 fathoms; and several of *Nymphon Strömii*, from 234 to 640 fathoms.

Crustacea* were much less abundant than in previous years, but great numbers of large shrimps, *Pandalus leptocerus* and *P. propinquus*, occurred, the latter inhabiting the deeper waters, 158 to 640 fathoms. *Cancer borealis* was frequent in 90 to 194 fathoms. Among the more interesting species were *Geryon quinquedens*, taken in considerable numbers and of large size, at stations 1140 to 1143, in 322 to 452 fathoms; *Lithodes maia*, at station 1125, in 291 fathoms; *Pentacheles sculptus* Smith, one large, at station 1140, in 374 fathoms; *Ceraphilus Agassizii* S., several times, in 291 to 640 fathoms; *Sabinea princeps* S., station 1140 and 1143, in 374 to 452 fathoms; *Boreomysis tridens*, in 351 fathoms; *Hippolyte Liljeborgii*, frequent in 144 to 640 fathoms; *Janira spinosa* Harger, in 640 fathoms; *Astacilla granulata* (Sars) H., in 291 to 640 fathoms.

Many of the other species formerly taken also occurred. Several new species were also added to the fauna; among these are two fine species allied to *Munida*.

Of Cephalopods,† besides the usual forms, we took one new species,‡ belonging to the genus *Abralia* of Gray, a genus not known from the American coast before. A living specimen of the *Argonauta argo* was caught in a dip-net while swimming at the surface, by Dr. Kite. This was taken about 100 miles south of the eastern end of Long Island. We took a fine large specimen of *Eledone verrucosa* V., in about 700 fathoms (station 1123); and the second known example of the large *Rossia megaptera* V., in 640 fathoms (station 1124), the first one having been taken from a halibut's stomach at the Grand Banks.

* The Crustacea of 1880 were enumerated and described by Prof. S. I. Smith, in Proc. Nat. Mus., iii, pp. 413-452, 1880. Some of those of 1881 are included by him in his report on the "Blake Crustacea," Bulletin Mus. Comp. Zool., pp. 1-108 (16 plates), June, 1882. The more difficult species here enumerated were identified by Professor Smith.

† The Cephalopods of this region have mostly been described and figured by the author in Vol. VII of these reports, 1882, and Trans. Conn. Acad., Vol. V.

‡ *Abralia megalops*, Verrill.—Small, eyes large; caudal fin, about two-thirds as long as the mantle, and much broader than long, transversely elliptical; 2d and 3d pairs of arms equal; dorsal a littler shorter; ventrals shortest. Sessile arms with two rows of hooks, which are replaced by small suckers on the distal third; tentacular clubs with two alternating rows of hooks, and with marginal suckers distally, on each side, alternating with the median hooks, and with proximal and terminal groups of smaller suckers. Color pale, with numerous small dark brown chromatophores above, larger and more crowded on the head and bases of arms; lower side with several larger, round, symmetrically placed, purplish-brown spots and with minute ones between them. Length of mantle, 15^{mm}; diameter of body, 7^{mm}; length of fin, 11^{mm}; breadth across fins, 18^{mm}; breadth of head, 7^{mm}; diameter of eye, 4.5^{mm}; length of dorsal arms, 13^{mm}; length of second pair, 14^{mm}; of third pair, 14^{mm}; of tentacular arms, 25^{mm}; of ventral arms, 10^{mm}. Probably this specimen is young. Described from alcohol.

List of off-shore stations occupied by the Fish Hawk in 1882, to September 8.

Station.	Locality.	Fathoms.	Bottom.	Date.	Temp. F.		Hour.
					Bot- tom.	Sur- face.	
OFF CAPE COD.							
Nanset Beacon:							
1078	NW $\frac{1}{2}$ N. 10 miles.....	55	Fine sandy mud.....	Aug. 2	37°	63°	7.30 a. m.
1079	NW by W. $\frac{1}{2}$ W. 8 $\frac{1}{2}$ miles.....	61 $\frac{1}{2}$	Fine sand.....	Aug. 2	37	63.5	8.40 a. m.
1080	NW by W. $\frac{1}{2}$ W. 6 $\frac{1}{2}$ miles.....	55	do.....	Aug. 2	37	61.5	9.40 a. m.
1081	W. by S. $\frac{1}{2}$ miles.....	33 $\frac{1}{2}$	Gravel and pebbles.....	Aug. 2	39	59	10.50 a. m.
Cape Cod Lt.:							
1082	NW $\frac{1}{2}$ N. 11 $\frac{1}{2}$ miles.....	28	Coarse gravel.....	Aug. 2	40	50	11.45 a. m.
1083	W. by N. 15 miles.....	83 $\frac{1}{2}$	do.....	Aug. 2	38	64	12.45 p. m.
1084	W. NW. $\frac{1}{2}$ W. 8 miles.....	37 $\frac{1}{2}$	Coarse sand.....	Aug. 2	38	62.5	2.30 p. m.
Race Point:							
1085	S. 33° E. 2 miles.....	34 $\frac{1}{2}$	Fine sandy mud.....	Aug. 3	39	64	6.15 a. m.
1086	S. 20° W. 2 $\frac{1}{2}$ miles.....	34	Fine sand.....	Aug. 3	39.5	64	7.00 a. m.
Cape Cod Lt.:							
1087	S. SW. 7 miles.....	44	Gray sand.....	Aug. 3	39	62.5	8.30 a. m.
1088	SW. $\frac{1}{2}$ W. 9 $\frac{1}{2}$ miles.....	90	Coarse sand.....	Aug. 3	38	62	9.50 a. m.
1089	SW. $\frac{1}{2}$ W. 14 miles.....	110	Gray mud.....	Aug. 3	38.5	63	10.10 a. m.
1090	SW. $\frac{1}{2}$ W. 13 $\frac{1}{2}$ miles.....	110	do.....	Aug. 3	38.5	62	11.50 a. m.
OFF MARTHA'S VINEYARD.							
N. Lat. W. Long.							
1091	40°03' 00" 69°44' 00".....	65	Gray sand, shells.....	Aug. 11	46	75	5.30 a. m.
1092	39 58 00 69 42 00.....	202	Gray sand.....	Aug. 11	41	75	6.54 a. m.
1093	39 56 00 69 45 00.....	349	Sandy blue mud.....	Aug. 11	40	75	8.35 a. m.
1094	39 57 00 69 47 00.....	301	Blue mud.....	Aug. 11	40	76	10.10 a. m.
1095	39 55 28 69 47 00.....	321	Soft green mud.....	Aug. 11	40	76	11.55 a. m.
1096	39 53 00 69 47 00.....	317	Green mud.....	Aug. 11	40	75.5	1.39 p. m.
1097	39 54 00 69 44 00.....	158	Fine sand.....	Aug. 11	45	75.5	3.10 p. m.
1098	39 53 00 69 43 00.....	156	do.....	Aug. 11	43.5	75	4.85 p. m.
1107	40 02 00 70 35 00.....	116	Gray mud.....	Aug. 22	48	71	6.00 a. m.
1108	40 02 00 70 37 30.....	101	Fine sandy gray mud.....	Aug. 22	48	71	6.55 a. m.
1109	40 03 00 70 38 00.....	89	Gray mud.....	Aug. 22	49	71	7.56 a. m.
1110	40 02 00 70 35 00.....	100	Fine sandy gray mud.....	Aug. 22	47	72	9.10 a. m.
1111	40 01 33 70 35 00.....	124	Fine sand.....	Aug. 22	47	72	10.45 a. m.
1112	39 56 00 70 35 00.....	245	Green sandy mud.....	Aug. 22	43	72	12.43 p. m.
1113	39 57 00 70 37 00.....	192	Green mud.....	Aug. 22	43	72	1.45 p. m.
1114	39 58 00 70 38 00.....	171	do.....	Aug. 22	43	72	2.40 p. m.
1115	39 59 00 70 41 00.....	146	Green sandy mud.....	Aug. 22	45	72.5	3.28 p. m.
1116	39 59 00 70 44 00.....	144	Hard sandy mud.....	Aug. 22	46	72	4.20 p. m.
1117	40 02 00 70 45 00.....	69	Fine sand.....	Aug. 22	48	72	5.30 p. m.
1118	40 03 00 70 45 00.....	70	do.....	Aug. 22	49	72	6.20 p. m.
OFF NANTUCKET, S. SE.							
1119	40 08 00 68 45 00.....	97	Sand, shells.....	Aug. 26	49	65	6.32 a. m.
1120	40 05 00 68 48 00.....	194	Fine sand, stones.....	Aug. 26	43.5	65	7.41 a. m.
1121	40 04 00 68 49 00.....	284	Fine sand, foss. stones.....	Aug. 26	41.5	65	8.05 a. m.
1122	40 02 00 68 50 00.....	351	Sand and stones.....	Aug. 26	40.5	67	10.28 a. m.
1123	39 59 45 68 64 00.....	787	Green sandy mud.....	Aug. 26	39	69	12.00 p. m.
1124	40 01 00 68 64 00.....	640	Fine sand, foss. stones.....	Aug. 26	39	69	4.01 p. m.
1125	40 03 00 68 66 00.....	291	Sandy mud, foss. stones.....	Aug. 26	40	64	5.46 p. m.
OFF BLOCK ISLAND, S.							
1137	39 40 00 71 52 00.....	178	Fine sand.....	Sept. 8	46	70	6.00 a. m.
1138	39 39 00 71 54 00.....	168	Fine soft sand.....	Sept. 8	46	71	7.24 a. m.
1139	39 37 00 71 55 00.....	291	Sandy mud.....	Sept. 8	44	72	8.43 a. m.
1140	39 34 00 71 56 00.....	374	Sandy mud, gravel, peb.....	Sept. 8	40	73	10.35 a. m.
1141	39 32 00 71 57 00.....	389	Sandy mud.....	Sept. 8	40	74	12.27 p. m.
1142	39 32 00 72 00 00.....	322	Fine sandy mud, peb.....	Sept. 8	41	74	1.52 p. m.
1143	39 30 00 72 01 00.....	452	Sandy mud.....	Sept. 8	40	74	3.56 p. m.
1144	39 31 00 72 06 00.....	386	Soft sandy mud.....	Sept. 8	41	74	6.00 p. m.
OFF MARTHA'S VINEYARD.							
SCHOONER JOSIE REEVES.							
1145	40 03 00 70 28 00.....	125	Fine sand.....	Sept. 20	.....	.....	.....
1146	40 02 00 70 41 00.....	140	do.....	Sept. 21	.....	.....	.....
1147	40 01 00 71 02 00.....	125	do.....	Sept. 22	.....	.....	.....
1148	39 54 00 71 22 00.....	110	Hard sand, sponges.....	Sept. 23	.....	.....	.....
1149	.....	.....	do.....	.....	.....	.....	.....
OFF MARTHA'S VINEYARD.							
FISH HAWK.							
1150	39 58 00 70 37 00.....	140	Sand.....	Oct. 4	47°	62°	6.35 a. m.
1151	39 58 30 70 37 00.....	125	do.....	Oct. 4	48	62	7.45 a. m.
1152	39 58 00 70 35 00.....	115	do.....	Oct. 4	48	62	8.42 a. m.
1153	39 54 00 70 37 00.....	225	Sand, mud.....	Oct. 4	44	62.5	10.45 a. m.
1154	39 55 31 70 39 00.....	193	do.....	Oct. 4	.....	62.5	12.10 p. m.
1155	39 52 00 70 30 00.....	554	Very fine sand, soft mud.....	Oct. 4	40	63	4.06 p. m.

Several shells were added to our lists, some of them of special interest. Among these is a fine new species of *Trophon*,* from 70 fathoms, and four species of Chitonidæ, of which one from 640 fathoms represents an Australian genus, *Placophora*,† not before known in the Atlantic. The other three are *Hanleyia mendicaria*, 317 fathoms; *Leptochiton alveolus*, in 291 and 640 fathoms; and what appears to be the true *Trachydermon exaratus* (G. O. Sars), in 194 fathoms. *Choristes elegans* was again found in old skates' eggs, in 640 fathoms, and in the same situation we found *Cocculina Beanii* and *Addisonia paradoxa* Dall. The latter was taken several times in 89 to 640 fathoms. A fine living specimen of *Dolium Bairdii* was taken in 192 fathoms. Two living specimens of *Mytilimeria flexuosa* ‡ occurred in 349 fathoms, associated with *Pecchiolia gemma* V., also living; a fresh valve of *Pholadomya arata*, in 108 fathoms; *Axinopsis orbiculata* G. O. Sars, in 202 fathoms; *Modiolaria polita* V. & S., in 321 fathoms. In trawl-wings, station 1141, 389 fathoms, we took four examples of *Clione papilionacea* Pallas, associated with a living specimen of *Cavolina longirostris*.

The southern species of Pteropods were comparatively scarce this

* *Trophon Lintoni* Verrill & Smith.—Shell stout, rough, with six very convex, somewhat shouldered whorls, crossed by about nine very prominent, thick, obtuse ribs; whole surface covered with strong, elevated, obtuse, scaly, revolving cinguli, usually alternately larger and smaller, separated by narrow, deep grooves; they are crossed by arched scales or lines of growth. Aperture broad; canal short, narrow, a little curved; umbilical pit distinct, but small. Length, 28^{mm}; breadth, 17^{mm}; length of canal and body-whorl, 19^{mm}; length of aperture, 15.5^{mm}; its breadth, 7.5^{mm}. Station 1118. Named in honor of Prof. E. Linton, of our party.

† *Placophora (Euplacophora) Atlantica* V. & Smith.—Broad ovate, with the marginal membrane very broadly expanded in front, and covered with fine spinules above and below, distinctly radially grooved beneath, and with intermediate rows of small verrucæ. Edge of mantle, in front of head, digitately divided into about seven lobes, the anterior ones slender, acute. Gills about 16 on each side, occupying more than two-thirds the length of the foot. Shell, broad-ovate, with short, broad anterior valves, the posterior one very small, lunate, and a little emarginate at the posterior edge; anterior one very broadly rounded, short hind edge with a slight rounded median notch, surface uniformly granulous and faintly radially grooved; inserted edge narrow, with about 30 irregular denticles; middle valves have a slight median beak at the hind edge, their lateral areas are strongly marked, crossed with diagonal rows of low rounded granules, separated by narrow radial grooves; central areas with smaller and less distinct granules, and transverse lines of growth. Color, rusty brown. The largest example is, in alcohol, 32^{mm} long; breadth, 26^{mm}; length of shell, 21^{mm}; breadth of shell, 18^{mm}; length of anterior valve, 4^{mm}; breadth, 15.5^{mm}.

I am indebted to Mr. W. H. Dall for the generic determination of this species.

‡ The animal of this shell, in alcohol, has a small and short anal tube, surrounded by small papillæ, and a very much larger incurvent orifice, occupying a ventral position, and surrounded by numerous long and large tentacle-like papillæ; the orifice for the foot is small; the edge of the mantle is bordered by very small papillæ. There is a slender translucent byssus. The hinge ligament is strengthened by a distinct ossicle, placed lengthwise, more or less ovate in form, with the smaller end next the hinge-teeth, and somewhat truncated.

Pecchiolia gemma also has an ossicle, similarly placed, with the posterior end broader and notched in the middle, the narrower end truncated.

season, and the very large species of *Salpa*, so abundant hitherto, was only once met with this year, but the small species (*S. Caboti*) occurred in large numbers, and with it several very brilliant species of *Saphirina* were taken.

EVIDENCE OF GREAT DESTRUCTION OF LIFE LAST WINTER.

One of the most peculiar facts connected with our dredging this season (1882) was the scarcity or absence of many of the species, especially of Crustacea, that were taken in the two previous years, in essentially the same localities and depths in vast numbers—several thousands at a time. Among such species were *Euprognatha rustellifera*, *Catapagurus socialis*, *Pontophilus brevirostris*, and a species of *Munida*. The latter, which was one of the most abundant of all the Crustacea last year, was not seen at all this season. An attempt to catch the "Tile-fish" (*Lopholatilus*) by means of a long trawl-line, on essentially the same ground where eighty were caught on one occasion last year, resulted in a total failure this year. It is probable, therefore, that the finding of vast numbers of dead tile-fishes floating at the surface in this region last winter, as was reported by many vessels, was connected with a wholesale destruction of the life at the bottom, along the shallower part of this belt (in 70 to 150 fathoms), where the southern forms of life and higher temperatures (48° to 52°) are found. This great destruction of life was probably caused by a very severe storm that occurred in this region at that time, which, by agitating the bottom-water, forced outward the very cold water that, even in summer, occupies the great area of shallower sea, in less than 60 fathoms, along the coast, and thus caused a sudden lowering of the temperature along this narrow, comparatively warm zone, where the tile-fish and the crustacea referred to were formerly found.

As the warm belt is here narrow, even in summer, and is not only bordered on its inner edge, but is also underlaid by much colder water, it is evident that even a moderate agitation and mixing up of the warm and cold water might, in winter, reduce the temperature so much as to practically obliterate the warm belt at the bottom. But a severe storm, such as the one referred to, might even cause such a variation in the position and flow of the tidal and other currents as to cause a direct flow of the cold inshore waters to temporarily occupy this area, pushing outward the Gulf Stream water. The result would be the same in either case, and could not fail to be destructive to such species as find here nearly their extreme northern limits.

In order to test this question more fully, Professor Baird also employed a fishing vessel, the *Josie Reeves*, to go to the grounds and fish systematically and extensively for the tile-fish. On her first trip, ending September 25, she did not find any Tile-fish, but took another food fish (*Scorpena dactyloptera*), known on the European coast, and first taken by us in 1880.

ABUNDANCE OF LIFE.

A large number of species belonging to various zoological groups, are found in this region living gregariously, in vast numbers, at particular spots, while they may not occur at all, or only sparingly, at other stations similar in depth, temperature, and character of the bottom. Thus, among echinoderms, the large ophiuran, *Ophioglypha Sarsii*, occurred at stations 918 and 1026, in 45 and 182 fathoms, in vast quantities; at 1026, between two and three barrels (probably over 10,000 specimens) came up in a single haul; the elegant star-fish, *Archaster Agassizii* V., occurred in great numbers at station 997, in 335 fathoms; the more common *A. Americanus* V. has often occurred in very great profusion, many thousands being taken at a haul, at several stations. A slender-armed *Amphiura* occurred in very great numbers at station 920, in 68 fathoms, but was seldom met with elsewhere. The *Astrochele Lymani* V. occurred at 939, 1028, 1029, and other stations in abundance, twining its arms closely around the branches of the coral, *Acanella Normani* V. A small crinoid (*Antedon dentata* Say) occurred at station 1038, in 146 fathoms, in the greatest profusion, over 10,000 specimens coming up at a single haul. As usual, nearly all the specimens had dismembered themselves before reaching the surface. The great abundance of this and other recent crinoids, at certain localities, is parallel with the abundance of many ancient fossil crinoids, in particular regions. Many other echinoderms might also be cited, though affording less conspicuous examples.

Several very large actinians, among them *Bolocera Tuediæ*, *Actinauge nodosa*, and other related species, occurred in great quantities at many stations (924, 937, 938, 998), more than a barrel of them frequently coming up in the trawl. The pretty bush-like gorgonian coral, *Acanella Normani* V., was very abundant at stations 938, 947, 1029. Of the spiny sea-feather, *Pennatulula aculeata*, we took over 500 specimens, at station 1025, and nearly a hundred of *Anthomastus grandiflorus* V., at station 1029; both these forms are usually scarce. The coral, *Flabellum Goodei* V., was abundant at 894, 895, 925, 952. The large and curious annelid, *Hyalinæcia artifex* V.,* remarkable for the very large, quill-like, free tube that it constructs, must be excessively abundant in many places, as at 869, 892, 938, 998, 1025, 1026; for several thousands are frequently taken at a single haul, and sometimes even four or five bushels, as at station 1032.

Among Crustacea, such cases are also very common. A species of *Munida* (*M. Carabæa* Smith) was very abundant at some stations (871, 922, 941), so that 2,000 or more sometimes came up in one haul, and the same is true of several species of shrimp (*Pontophilus brevivirostris* Smith, at 865, 871, 878, 941; *Pandalus leptocerus* S., at 870, 878, etc.); certain hermit crabs, as *Hemipagurus socialis* S., at 871, 874, 877, 878, 940, 941, 944; the maioid crab, *Euprognatha rastellifera* Stimp., at 871-4, 878, 921, 941, etc.

* Figured in Bulletin Mus. Comp. Zool., vol. xi, pl. 6, fig. 1. 1883.

One of the most striking instances was the occurrence of a very remarkable and hitherto rare hermit crab (*Parapagurus pilosimanus* Smith), with its associated, investing polyp (*Epizoanthus paguriphilus* V.), which is a true commensal, forming, out of its own tissues, the habitation of the crab; and hitherto it has not been found elsewhere than upon the back of this particular species of crab, which, likewise, has rarely been found without its polyp. Of these associated creatures we took about 400 couples, at station 947, in 312 fathoms, at one haul. It had previously only been known by a few specimens taken by the Gloucester halibut fishermen, in deep water, off Nova Scotia, and by ourselves, in 1880.

LIST OF DEEP-WATER ECHINODERMATA TAKEN BY THE FISH HAWK,
1880-1882.*

HOLOTHURIOIDEA.

LOPHOTHURIA FABRICII Verrill. 234 fathoms.

Station 1121, 1 young. Northern, in shallow water.

THYONE SCABRA Verrill. 51-640 fathoms.

S. 870, 871, 876, 877, 894, 898: 919, 939, 943, 949, 1038, 1040, 1049: 1092, 1124, 1142.

TOXODOEA FERRUGINEA Verrill. 100-155 fathoms.

S. 870, 871, 873, 876, 877: 943, 949.

MOLPADIA TURGIDA Verrill. 120-787 fathoms.

S. 876 (1): 1026 (2): 1123.

ECHINOIDEA.

SCHIZASTER FRAGILIS (Duben & Koren) L. Agassiz. 56-321 fathoms.

S. 865, 869, 870, 871, 873, 874, 876, ab., 877, ab., 896: 939-941, 943, 945, 950, 1025, ab., 1026, 1032, ab., 1035, 1036, 1038, ab., 1043, 1045, 1047: 1080, 1091, 1092, 1094-1098, 1110, 1113, 1114, 1119, 1121, 1125, 1138, 1145, 1153, 1154.

SCHIZASTER CANALIFERUS L. Agassiz (variety?). 65-134 fathoms.

S. 871, 873, 874, 876, 877: 921-922 (9), 940, 941, 949: 1108, 1110, 1151, 1152.

BRISSOPSIS LYRIFERA (Forbes) L. Agassiz. 65-194 fathoms.

S. 870: 921, 1038: 1097, 1120. Europe and W. Indies.

SPATANGUS PURPUREUS Leske. 89-158 fathoms.

S. 940 (1 large, living): 1097, 1098, 1109, 1119. Europe and W. Indies.

ECHINOCYAMUS PUSILLUS (Müller) Gray. 146 fathoms.

S. 1038 (1). Europe and W. Indies.

ECHINARACHNIUS PARMA Gray. 10-219 fathoms.

S. 951, 985-989, very ab., 1038, many: 1097, 1109, 1117, 1119, 1120.

PHORMOSOMA SIGSBEI A. Agassiz. 458-787 fathoms.

S. 1029 (1 living): 1123. W. Indies (A. Ag.).

ECHINUS GRACILIS A. Agassiz. 86-202 fathoms.

S. 872 (2): 940 (7), 1038, 1039, 1046 off Delaware Bay, 3 large: 1092, 1097, 1098, ab., 1109, 1119.

* The colons in this list separate the numbers of stations belonging to different years.

ECHINUS WALLISI A. Agassiz. (= *E. Norvegicus* in list of 1880.)
156-640 fathoms.

S. 893, 894: 939, 1028, 1029: 1097, 1098, 1124.

TEMNECHINUS MACULATUS A. Agassiz. 115 fathoms.

S. 871. Gulf of Mexico (A. Ag.).

DOROCIDARIS PAPILLATA A. Agassiz (variety). 104-158 fathoms.

S. 1038 (1), 1046 off Delaware Bay (5): 1097, 1098.

HEMIPEDINA CUBENSIS A. Agassiz. 194 fathoms.

S. 1120. Gulf of Mexico.

ASTERIOIDEA.

ASTERIAS VULGARIS (Stimpson) Verrill. Shore to 208 fathoms.

S. 869: 917-920, 994 (3), 1032 (1), 1035 (12), 1037 (12), 1046 (1), 1047:
1092, abundant in shallower water.

ASTERIAS TANNERI Verrill. 56-194 fathoms.

S. 869-872, 896: 922, ab., 923, ab., 940, 941, ab., 949, 950, 1035, 1047,
ab.: 1097, 1098, 1119, 1120.

ASTERIAS BRIAREUS Verrill. 31-57 fathoms.

S. 899, 900.

STEPHANASTERIAS ALBULA (Stimpson) Verrill. 64-130 fathoms.

S. 865-867, ab., 870-872: 921-923, 940, 949-950, ab., 1035, ab., 1036,
very ab., 1043, ab., 1046, 1047: 1110, 1114, 1148.

CRIBRELLA SANGUINOLENTA (Müller) Lütken. Shore to 194 fathoms.

S. 865-867, 871, 872, 900: S. 928, 933, 934, 949, 956, 957, 985-987, 1009,
1036: 1108, 1114, 1115, 1117, 1120. Commoner and larger, in shallower
water, nearer the coast.

SOLASTER EARLII Verrill. 234 fathoms.

S. 1121. Northern.

LOPHASTER FURCIFER Verrill. 234-640 fathoms.

S. 1121, 1124. Northern and European.

DIPLOPTERASTER MULTIPES (Sars) Verrill. 124-640 fathoms.

S. 869, 878, 895: 924, 925, 938, 939 (13), 940 (10), 945 (11), 947, 951,
very large, 1025, 1026, 1032 (22), 1033, 1038, 1047: 1096-1098, 1111-
1114, 1116, 1120, 1121, 1124, 1125, 1137, 1138, 1153, 1154.

PORANIA GRANDIS Verrill. 65-234 fathoms.

S. 865, 869, 872: 923, 940, sev., 949, 950, sev., 1039, 1046 (9 j.): 1092,
1097, ab., 1098, ab., 1108-1110, 1117, 1121.

PORANIA SPINULOSA Verrill. 86-640 fathoms.

S. 869, 872, 879, 894, 895: 925, 938, 939, 945, 946 (10), 951, 998, 994,
1025, 1032: 1096, 1112, 1113, 1120, 1121, 1124, 1142, 1153, 1154.

PORANIA BOREALIS Verrill. (= *ASTERINA BOREALIS* V.) 192-225
fathoms.

S. 869, 879.

ASTROGONIUM GRANULARE M. and Tr. 156-640 fathoms.

S. 1098, 1124. Northern and European.

ODONTASTER HISPIDUS Verrill. 57-487 fathoms.

S. 865, 868, 869, ab., 871-873, 878, 879, 892, 894, 895, 899: 921, 922,

940, ab., 946, 947, 949, 950, ab., 994, 1043, † 1049 (1 j.): 1091, 1092, 1095, 1097, 1098, 1109, 1110, 1114, 1115, 1117, 1120, 1152.

ARCHASTER FLORÆ Verrill. 100-410 fathoms.

S. 869, 873, 879, 881, 895: 924, 925, 938-940, 943, 945, 946, 951, 997, ab., 1025, ab., 1026, 1028, 1032, 1033, 1038: 1093-1096, 1111-1113, 1116, 1121, 1125, 1146, 1153, 1154.

ARCHASTER AMERICANUS Verrill. 56-225 fathoms; ab. in 64-150.

S. 865-868, very ab., 871, ab., 873-876, very ab., 877, 879, 896, 899: 918, ab., 920-921, very ab., 940-941, very ab., 945, 949, 950, very ab., 1025, 1035-1037, very ab., 1038, 1040, 1043, 1046: 1091, 1092, 1097, 1108-1110, 1115, 1117, 1120, 1148.

ARCHASTER AGASSIZII Verrill. 182-787 fathoms.

S. 879, 880, 881, 891-894, 895, 898: 938, 939, 946, 947, ab., 952, 994, ab., 997, very ab., 998, 1025-1026, ab., 1028, 1029, 1049: 1093, 1122, 1124, 1140, 1142, 1143, 1153.

ARCHASTER PARELII Düben & Koren. 225-487 fathoms; scarce.

S. 879, 892-894: 938, 939, 947, 952, 1028, (1 j.), 1029, 1049 (6): 1140, 1143.

ARCHASTER TENUISPINUS Düben & Koren. 368 fathoms. S. 994 (1).

ARCHASTER MIRABILIS (?) Perrier. 317 fathoms.

S. 938 (1). Gulf of Mexico (A. Ag.).

ARCHASTER ARCTICUS M. Sars. 183-410 fathoms.

S. 925, 938, 939, 946 (2), 951 (3), 1028, 1032, sev., 1033: 1095, 1096, 1120, 1121, 1125, 1154.

ARCHASTER BAIRDII Verrill. 351-396 fathoms. S. 952 (6): 1122.

LUIDIA ELEGANS Perrier. 53-192 fathoms.

S. 865-872, many large, 871 (17), 873, 876, 877: 919, 921-923, ab., 940-941, ab., 949, 950, 1035, 1036, 1038, 1047.

CTENODISCUS CRISPATUS Düben & Koren. 182-321 fathoms.

S. 879: 938, 939 (5), 1025, sev., 1026, 1032: 1095, 1096.

OPHIUROIDEA.

OPHIOGLYPHA SARSII Lyman. 30-368 fathoms.

S. 865-871, ab., 873, ab., 877, ab., 879, 895: 917, 918, very ab., 919, 924, ab. 1., 925, 940, 943, 989-994, 991, ab., 1025, ab., 1026, very ab., 1., 1032, 1033, ab. 1., 1035, 1038, 1047: 1092, 1093, 1096, 1111, 1114, 1115, 1121, 1150-1154.

OPHIOGLYPHA SIGNATA Verrill. 100-264 fathoms.

S. 869, 870 (10), 873 (24), 875, 877, 878: 939, 1038, 1039: 1150, 1151, 1152, 1154.

OPHIOGLYPHA (OPHIOPLEURA) AURANTIACA Verrill. 82-317 fathoms.

S. 869 (2), 872, 880 (2), 895 (4): 938, 939, 946 (6), 951: 1092, 1121, 1124, 1152.

OPHIOGLYPHA CONFRAGOSA Lyman. 238-616 fathoms.

S. 895 (1): 937 (1), 938 (2, large), 1028 (13), 1029.

OPHIOMYSIUM LYMANI W. Thomson, 238-787 fathoms.

S. 891 (11 j.), 892 (5), 895 (1): 994 (2), 1029: 1122, 1123.

OPHIACANTHA BIDENTATA Lyman=*O. SPINULOSA* M. & Tr. 192-640 fathoms.

S. 869: 945, 1029: 1122, 1124.

OPHIACANTHA MILLESPINA Verrill. 100-640 fathoms.

S. 869, ab., 870, 871, 873, 895: 924, 925, ab., 938, 939-940, ab., 945, 951, 1026, 1032-1033, ab., 1034, 1035, 1038, ab., 1039: 1092, 1093, 1096, 1098, 1121, 1122, 1124, 1139, 1150.

OPHIOPHOLIS ACULEATA Gray. Shore to 640 fathoms.

S. 865, 869, 871, 872, 879, 895, 899, 900: 920, 922, 924, 925, 939, 940, 943, 945-947, 949, 951, 986, 989, 1025, 1032, ab., 1033, 1035, 1036, 1038, very ab., 1039, ab., 1043: and many stations in 1882.

AMPHIURA OTTERI (?) Ljungmann. 192-480 fathoms.

S. 869, 880, 891, 895, 898: 997, 998, 999, 1026, 1028: 1093.

AMPHIURA ELEGANS Norman, var. *TENUISPINA* Ljung. 120-487 fathoms.

S. 869, 871, 876, 892, 894, 895: 1038: 1093, 1140.

AMPHIURA MACILENTA Verrill (≠*A. abdita* young). 53-115 fathoms.

S. 865, 871: 919, 920, very ab., 921, 941.

OPHIOCNI DA OLIVACEA Lyman. 64-192 fathoms.

S. 865, 869, 871, ab., 872, 873-877, ab., 878: 921, 940, 941, 949, ab., 1040, ab.

OPHIOSCOLEX QUADRISPINUS Verrill,* sp. nov. 234 fathoms.

S. 1121, two examples.

OPHIOSCOLEX GLACIALIS Müller & Troschel. 115-321 fathoms.

S. 869, ab., 870, 871, 879, 895: 924, 925, 939, 940, 945, ab., 946, 951, 1025, ab., 1026, 1032, 1033: 1092, 1094, 1095, 1096, 1113, 1121, 1138, 1139, 1145, 1153, 1154.

ASTROCHELE LYMANI Verrill. 264-640 fathoms.

S. 938, 939, 1028, ab., 1029, ab., 1122, 1124, 1125, 1139.

ASTROPHYTON LAMARCKII M. & Tr. 194 fathoms.

S. 1120, abundant. Northern.

ASTRONYX LOVENI M. & Tr. 787 fathoms.

S. 1123. Northern.

CRINOIDEA.

ANTEDON DENTATA (Say) V.=*ANTEDON SARSII* (D. & K.). 85-640 fathoms.

S. 868-871, 873-876, 878-880, 895, 897: 925, 939, ab., 940, 943-946, 949, 1025-1027, 1032, 1033, ab., 1035, 1038, very ab., 1043, 1047, 1048: 1092, ab., 1095, 1096, 1098, 1111, 1112, 1116, 1121, 1124, 1137, 1138, ab., 1139, 1145, 1146, 1150, ab., 1151, 1152.

RHIZOCRINUS LOFOTENSIS Sars. 640 fathoms.

S. 1124. European and West Indian.

* This is a large species, with four arm-spines; a slender, acute tentacle-scale; and narrow, oblong, ventral arm-plates.

ADDITIONS TO THE FAUNA OF VINEYARD SOUND—SURFACE DREDGINGS.

During the intervals between the Gulf Stream trips, shore collecting and a large amount of surface dredging, both by day and night, were done in the vicinity of Wood's Holl, by means of the two steam launches belonging to the Fish Commission. In the surface dredging Mr. Emerton took the most active part. The surface work was very productive this season, not only affording a vast number of larval forms of Crustacea, Echinodermata, Annelida, Mollusca, etc., but also a large number of adult Annelida, belonging to the Syllidæ and various other families, including a number of very interesting new species. Certain species of *Autolytus* were unusually abundant. Many thousands of specimens of *A. varians* V. (formerly *A. ornatus* V.) were often taken in a single evening, the males of both the red and green varieties being far more numerous than the females, which were always bright red when containing eggs. The males of a much larger species, the *A. ornatus* (*Proceræa ornata* V., 1873, stem-form), were also abundant; the much larger females, which are transversely banded with red, were taken in smaller numbers. A small but very remarkable new species (*A. mirabilis*),* first discovered by us in 1881; was not uncommon, but only the females were taken at the surface. The stem-form occurred among hydroids and ascidians at moderate depths. This species is remarkable for the large number of sexual individuals that may be developing, simultaneously, from the stem-form. It is not uncommon to find it carrying five or six sexual individuals, in various stages, one behind another.

* *Autolytus mirabilis* V., Trans. Conn. Acad., iv, pl. 13, figs. 8-10.—Stem-form long and slender. Antennæ, tentacular cirri, first pair dorsal cirri, and caudal cirri very long and slender, 4-6 times the breadth of the body; median antenna and first dorsal cirrus longest; second dorsal cirri twice the breadth of body; others varying in length, but mostly longer than breadth of body; two long, narrow epaulets, extending from the head back to third body-segment. Stomach large, oblong; pharynx slender, with one flexure, denticulate at the end. The most anterior formation of the sexual young takes place behind the fiftieth segment; in one individual (see Fig. 8, loc. cit.) six female individuals follow one another, the largest one being nearly ready to separate, and having 22 segments, with a well developed head, four eyes, and long antennæ. Some detached females, bearing eggs, have, however, no more than 16 to 20 segments.

Vineyard Sound and off Gay Head, 4 to 8 fathoms, among hydroids, 1881 and 1882.

Female: Small, with only one pair of slender cirri, longer than breadth of head, on the buccal segment; two anterior body-segments with only short setæ; capillary setæ begin on the third segment; two pairs of eyes close together, the anterior larger; three antennæ nearly equal, long and slender, three or four times the breadth of the head; caudal cirri, when fully developed, about as long as the antennæ; dorsal cirri slender, longer than breadth of body. Length 3^{mm} to 3.5^{mm}. Color, when containing eggs, dark olive-brown; after eggs are laid, pale greenish; eyes dark brown. Wood's Holl, surface, evening, August 2 to September 18, 1882; off Gay Head, with the stem-form, 1881. Description from life.

A very singular Syllidian,* of which only the sexual forms are known, was taken several times at the surface, in the evening. We also took these in 1880 and 1881. They have probably been detached from a very different stem-form. The genus is allied to *Chatosyllis* Mgn., but the head is entirely destitute of antennæ. It has four large eyes and swims very actively.

Odontosyllis lucifera V., of both sexes, was very common in the surface nets all through August and to September 15, but mainly in the evening. With the latter a smaller and more delicate species usually occurred, but in less abundance. This belongs to the genus *Eusyllis*† and has been known to me for a number of years.

* *Tetraglene* Grube, 1863.—Sexual forms: Head distinct, with four large eyes, but with no other appendages. Segments behind the head similar, all bearing large parapodia, with long setæ, a long dorsal cirrus, and a smaller slender ventral cirrus. Caudal cirri two, long, submoniliform.

Tetraglene agilis Verrill.—Trans. Conn. Acad., iv, pl. 25, Fig. 10.—Rather large and stout, head broader than long, subtruncate, or even emarginate in front, constricted abruptly behind; eyes large with front lens round, the two pairs near together, the anterior a little larger and wider apart. Body-segments separated by deep constrictions; parapodia with large setigerous lobe, as long as the breadth of the segments; setæ numerous, longer than the parapodia, the shorter ones with a long, slender article; capillary setæ begin on the third segment; cirri more or less moniliform, slender, tapered, about four times as long as the breadth of the head; caudal cirri similar to dorsal; ventral cirri slender, smooth. Color of males, yellowish white; of females, pale orange yellow or salmon; eyes brown; eggs reddish, laid August 5, 1882. Length of largest (♀) about 25^{mm}; males about 20^{mm}. Taken in the evening, at the surface, near Nomansland, September, 1880; Wood's Holl, August 4, 1881, and from August 5 to September 12, 1882. Description from life.

† *Eusyllis tenera* Verrill, Trans. Conn. Acad., iv, pl. 13, Fig. 12, pl. 14, Figs. 4, a. b.—Slender, 5^{mm} to 7^{mm} long, with very long, slender antennæ and cirri, which are often curled in spirals, and irregularly transversely constricted, smoothish in full extension. Pharynx short, straight, with a large, sharp median tooth at the extreme anterior end; the edge of the tube is divided into numerous (about 30) small, sharp denticles, becoming obsolete on the lower side; sheath of pharynx with a circle of larger, soft papillæ (about 13) in front of the tube. Stomach large, oblong; intestine with a pair of short, rounded, lateral pouches at the end of the stomach. The median antenna and upper tentacular cirri are 3 to 6 times as long as the breadth of the body; lateral antennæ and lower tentacular cirri shorter; the longest dorsal cirri are 5 to 6 times as long as breadth of body; shorter dorsal cirri alternate irregularly with the long ones. The palpi are very flexible and changeable in form, prominent, flattened, tapered or oblong, obtuse. Head rounded in front, widest in front of the middle, opposite the largest eyes. Eyes six; four larger ones nearly equal, the anterior a little larger and wider apart, near the sides of the head; the minute frontal eyes are near the inner bases of the antennæ. Setæ with an oblong, blade-shaped terminal article, obtuse and slightly bidentate at tip.

Sexual individuals have, also, fascicles of long capillary setæ, beginning on the fourteenth setigerous segment.

Color translucent bluish white, pinkish or purplish-brown anteriorly, and more or less purplish-brown or blue-gray on the sides of the body and more decidedly on the bases of the parapodia; cirri white; pharynx and stomach pale brown; intestine brown or olive-green, constricted between the segments; eggs showing through, purplish-brown; eyes dark red.

New Haven to Vineyard Sound; frequent at surface in evening, at Wood's Holl,

Another interesting new species, which was taken at the surface, both this year and last, appears to belong to the genus *Syllides*.* Among the less common forms of Syllidæ were *Grubea Websteri* V.,† *Sphæro-*

from August 2 to September 15, 1881, 1882. Also dredged in Vineyard Sound in 8-12 fathoms, among bryozoa and *Amoræcium pellucidum*. Allied to *Syllis fragilis* Webs., which probably also belongs to *Eusyllis*. Described from life.

**Syllides setosa* Verrill, Trans. Conn. Acad., pl. 24, Figs. 11, 11c.—Body not very slender, with about 50 segments and large parapodia. Head changeable, usually short, obtusely rounded or subtruncate in front, rounded laterally, closely united to buccal segment. Palpi short, often not visible from above; below they appear as flat lobes. Eyes six; two median ones largest, close to sides of head; posterior ones a little smaller and nearer together, and close to the others; front ones very small, close to the outer bases of the palpi. The antennæ and four tentacular cirri are all similar in size, form, and color, but the odd antenna is a little the longest (about three times breadth of head), and the tentacular cirri are usually somewhat shorter than the lateral antennæ (or about twice the breadth of the head); all are contractile and somewhat changeable in form; usually they are distinctly clavate, with narrow bases and obtuse, swollen, transversely wrinkled tips. Anterior dorsal cirri long, slender, usually more or less clavate, with a distinct basal joint and numerous annulations, becoming more marked distally; they are as long as the antennæ, or longer, and about three times the breadth of the segments; they often increase in length on the first few segments, but are apt to vary irregularly; the longest are more than four times as long as the breadth of the segments. The ventral cirri are slender, tapered, with a distinct oblong terminal article; they arise far out on the parapodia and project beyond the setigerous lobe, but are not a third as long as the dorsals anteriorly; posteriorly they are relatively longer. The parapodia are very large in the middle region of the body, with a swollen base and long setigerous lobe. Caudal cirri three; lateral ones very long, transversely annulated, tapered, acute, often coiled spirally; median one small and slender. Setæ numerous, the compound ones with a long, narrow terminal blade, bidentate at the tip; simple long setæ begin singly on the eighth or ninth setigerous segment; fascicles of capillary setæ appear on the eighteenth, in our largest example. Pharynx very dark colored, large, short, stout, straight, surrounded with a broad sheath, apparently unarmed, but sometimes showing a pale, oblong spot, that might be taken for a feeble tooth, near the anterior end; its sheath has a circle of soft papillæ in front; stomach brown, large, oblong, usually slightly constricted near the front end, equal in length to about four segments (or to six in alcohol); intestine very large, with two rounded brown lobes close to the stomach. Color generally dull orange-yellow, or orange-brown, medially, due to the internal organs; the external parts are whitish; buccal segment brownish, intestine yellowish brown. Length of the largest specimen, in alcohol, 12^{mm}. Taken at the surface, evening, July 22, 29, and August 15, 1881; August 3 to September 12, 1882. Described from life. Another very much smaller form, with about 32 segments, perhaps distinct from the above, occurred. In this the antennæ and tentacular cirri are shorter, more decidedly clavate; palpi shorter, scarcely visible from above; setæ with a shorter and less slender article. The stomach and pharynx are dark brown. Bunches of capillary setæ begin on the tenth body-segment. Length about 3^{mm}.

† *Grubea Websteri* Verrill, Trans. Conn. Acad., iv, pl. 24, Figs. 6-8.—Small, slender, whitish, with about 33 segments. Three antennæ, both pairs of tentacular cirri, dorsal and caudal cirri all similar in shape, long-fusiform, thickest below the middle, tapering and acute, not differing much in size nor in length, but the first pair of dorsal cirri, and those following the eighth, are a little longer than the others or the antennæ; cirri longer than the breadth of the body opposite; ventral cirri small, slender. Head short, rounded in front and laterally; palpi large and prominent, tapered, united above nearly to the obtuse, rounded tips; eyes six; frontal ones minute,

syllis, sp., *Podophylax longiceps* V., etc. The *Nereis megalops* V., both in the heteronereis-form (*Neotonereis*) and in the nereis-form (*N. alacris* V.), frequently occurred in our night excursions, and in September the young of the latter of all sizes, from those with only six or eight segments up to those that were 10^{mm} or more in length, occurred abundantly at the surface. These young are very active, translucent, and nearly white, with small, red specks over the surface. A very interesting new species, *Acrocirrus Leidy* V.,* belonging to a genus hitherto not recorded from our coast, was taken at the surface several times this year, and also in 1881. *Podarke obscura* V. was often abundant at the surface, as well as in the soft mud, among eel-grass, in the harbor. Among other surface Annelida were *Cirrhinereis phosphorea* V. and *C. fragilis*, and a species of *Prionospio*, probably identical with *P. tenuis* (*Spiophanes tenuis* V., 1880). This was also taken from the harbor mud, in shallow water, last year. When perfect it has four pairs of gills, all fringed on one side (Tr. Conn. Acad., iv, pl. xix, Fig. 7). A singular larval form, probably belonging to this species, occurred once (September 9) at the surface.

Among the various larval forms of Annelids we were fortunate in obtaining a very large number of *Chaetopterus pergamentaceus*, in various stages, from very young ones up to those having the adult characters distinctly developed. Of these Mr. Emerton made an excellent series of drawings. The adults of this interesting species were dug from the sand just below low-water mark, at Naushon I., † by our party. The

median largest and farthest apart, close to sides of head. Pharynx narrow, straight, a little swollen anteriorly, with a well-marked tooth close to the front edge; stomach oblong, occupying two or three segments, according to their extension; intestine with two rounded lobes, close behind stomach. Setæ with a rather long, flat, blade-like article, strongly fringed on the edge, with the tip distinctly bidentate, and not very slender; long, capillary, sexual setæ begin (when present) on the ninth setigerous segment, and continue on thirteen to seventeen. The eggs and young are carried on these same segments, usually four to each segment. Some examples (op. cit., pl. 25, Fig. 2) similar in other respects, have no sexual setæ and only two eggs to a segment. Three to eight hind segments are without sexual setæ and eggs. Length, 3^{mm} to 4^{mm}. Surface, Newport, R. I., 1880; Wood's Holl, Mass., July 28 to September 12, 1881, 1882. Described from life.

* *Acrocirrus Leidy* Verrill, Trans. Conn. Acad., iv, pl. 19, Fig. 2.—Body slender, with distinct segments, covered with small papillæ. Head changeable, usually rounded, obtuse; eyes four, the front pair very minute; hind pair larger and wider apart; two large, long, usually clavate antennæ on front of head, near together. A pair of large, long, clavate cirri on first four segments, like the antennæ, but larger, the length three or four times the breadth of body. Ventral, compound setæ, with a very long, curved and hooked terminal article, begin singly on the second segment bearing cirri; long, slender, capillary dorsal cirri begin singly on the fourth segment, but form fascicles of six to nine farther back. Color dark olive-green to dark brown; cirri and antennæ paler green with yellow tips. Length, 10^{mm} to 15^{mm}; diameter of largest, about 1^{mm}. Wood's Holl, surface, evening, August 2 to September 9, 1881, and 1882. Described from life.

† This species was first discovered at this place in 1880 by Mr. Charles Webster and Mr. Vinal N. Edwards, from whom I received specimens at that time.

largest of these had U-shaped tubes, 28 to 31 inches in length and over an inch in diameter in the middle. In each tube there was usually a crab (*Pinnixa ohapterana* St.), associated with the worm. These tubes show, very beautifully, the way in which their size is continually increased by the occupant, which is incapable of emerging from it. The worm makes longer or shorter slits in the parchment-like tube, wherever it is to be enlarged (probably using for this purpose the sharp, stiff, lance-like setæ of the anterior segments), and after spreading the tube, from within, to the desired extent, it closes up the opening by means of a fusiform patch (like a "gore" or "gusset"), of the same material as the original tube, but differing slightly in color or luster, so that when the tube is cut open these neat patches show very distinctly on its inner surface.

From the sands of Naushon, at Hadley Harbor, our party also procured several living examples of an European shell, *Tellimya* (or *Montacuta*) *ferruginosa*, not before found on our coast. It was associated, at low-water mark, with living specimens of *M. bidentata* and another species of the family, Kelliadæ, *Corbula contracta*, etc. Drawings were made of the animals of all these by Mr. Emerton.

Of Gastropod veligers, about twenty species were taken in the surface nets. Some of these occurred in vast numbers, but I have not yet been able to identify more than half of the species. Among those recognized are *Anachis avara*, *Astyris lunata*, *Triforis nigrocincta*, etc. One of the largest and most interesting was that of a *Natica*. This had the velum divided into four long, narrow lobes, beautifully marked with brown at the tips. Many of these were kept till they lost the velum and developed the characteristic foot of *Natica*. The species is uncertain.

In a region that has been so thoroughly dredged in past years as Vineyard Sound, it was not to be expected that many new forms would be found, unless among the more minute species, or in those groups not hitherto studied on our coast. Yet one new Planarian,* of large size and with conspicuous colors, was taken, as well as various undescribed Rhabdocœla and Annelida.

* *Stylochopsis zebra* V., sp. nov.—Body broad-elliptical, rather thick, or somewhat swollen. Tentacles small, near the front end, bearing several small ocelli; a cluster of small dorsal eyes in front of tentacles; minute, marginal ocelli, along the front edges. Color brown and pale yellow or whitish, in narrow, alternating, transverse stripes, which run directly across in the middle, but become more and more V-shaped as they approach each end. Length about 20^{mm}, breadth 12^{mm}. Great Harbor, shore; off Menemsha, 10 to 12 fathoms, September 6.

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