

ART. XL.—*Notice of the remarkable Marine Fauna occupying the outer banks off the Southern Coast of New England, No. 7, and of some additions to the Fauna of Vineyard Sound; by A. E. VERRILL. (Brief Contributions to Zoology from the Museum of Yale College: No. LIII.)*

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DURING the present season, as in 1881, the headquarters of the U. S. 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, 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 our 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 fath., sta. 1088; *Solaster endeca* F., many, large and small, 32 to 90 fath.; *Hippasteria phrygiana* Ag., several, large, 34 to 90 fath.; *Astrophylon agassizii* St., many, 55 to 61 fath., off Chatham, sta. 1078, 1079; *Pentacta frondosa*, large, 34 to 37 fath.; *Pandalus borealis*, 90 to 110 fath.; *Geryon quinquedens*, 110 fath.; *Balanus Hameri*, 33 fath.; *Rossia Hyatti*, several, large, 44 to 90 fath.

Of the five Gulf Stream trips, one was made southeastward

\* 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); Professor L. R. Lee; Mr. B. F. Koons; Mr. H. L. Bruner; Professor Edwin Linton. Professor 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.

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 575. 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 700 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 265 are Mollusca, including 14 Cephalopoda; 85 are Crustacea; 60 are Echinodermata; 35 are Anthozoa; 65 are Annelida.

The Steamer "Fish Hawk," with which we have explored this region 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 1000 tons, has been built for the use of the Fish Commission, and is now being fitted up expressly for deep-sea service, for which she will be, in every respect, well adapted, and will have the best equipment possible for all such investigations, and at all depths. The examination of the bottom beyond the depth of about 600 fathoms has, therefore, been 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 have been made, especially in the deep-sea thermometers. New forms of traps for capturing bottom animals have also been devised. The "*trawl-wings*," first introduced by us last year, have been used this year with great success, for they have 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, has 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 this region and several additional ones were obtained. Among those of special interest were *Goniocidaris papillata*, 156 to 158 fath.; *Brissopsis lyrifera*, 158 to 194 fath.; *Spatangus purpureus*, 89 to 158 fath.; *Schizaster canaliferus*, 100 fath., several; *Echinus Wallisi* A. Ag., 640 fath.; *E. gracilis*, numerous and of large size at stations 1097 and 1098, in 156 to 158 fath.; *Phorinosoma Sigsbei* A. Ag., station 1123, in about 700 fathoms,† several, both large and small, the largest 124<sup>mm</sup> in diameter; *Porania grandis* V., abundant in 156 to 158 fath.; *Odontaster hispidus* V., abundant in 89 fathoms.

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

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;

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

‡ *Distichoptilum* V., gen. nov. 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* V., sp. nov. 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<sup>mm</sup>; breadth in middle, 2<sup>mm</sup>; length of stalk, 100<sup>mm</sup>.

## List of off-shore Stations occupied by the Fish Hawk in 1882, to Sept. 8.

Stat.	Locality.	Fath.	Bottom.	Temp. F.		Hour.		
				Date.	Bot- tom.		Sur- face.	
<i>Off Cape Cod.</i>				Aug.				
1078	Nauset Beacon, NW $\frac{1}{2}$ N, 10 m.	55	fine sandy mud	2	37°	63°	7.30 A. M.	
1079	" NW by W $\frac{1}{2}$ W, 8 $\frac{1}{2}$ m.	61 $\frac{1}{2}$	fine sand	2	37	63.5	8.40 "	
1080	" NW by W $\frac{1}{2}$ W, 6 $\frac{1}{2}$ m.	55	fine sand	2	37	61.5	9.40 "	
1081	" W by S, 5 $\frac{1}{2}$ m. ....	33 $\frac{1}{2}$	gravel and pebbles	2	39	59	10.50 "	
1082	Cape Cod Lt., NW $\frac{3}{4}$ N, 11 $\frac{1}{2}$ m.	28	coarse gravel	2	40	59	11.45 "	
1083	" W by N, 15 m. ....	83 $\frac{1}{2}$	-----	2	38	64	12.45 P. M.	
1084	" WNW $\frac{3}{4}$ W, 8 m. ....	37 $\frac{1}{2}$	coarse sand	2	38	62.5	2.30 "	
1085	Race Point, S 33° E, 2 m. ....	34 $\frac{1}{2}$	fine sandy mud	3	39	64	6.15 A. M.	
1086	" S 20° W, 2 $\frac{1}{2}$ m. ....	34	fine sand	3	39.5	64	7.00 "	
1087	Cape Cod Lt., SSW, 7 m. ....	44	gray sand	3	39	62.5	8.30 "	
1088	" SW $\frac{3}{4}$ W, 9 $\frac{1}{2}$ m. ....	90	coarse sand	3	38	62	9.50 "	
1089	" SW $\frac{3}{4}$ W, 14 m. ....	110	gray mud	3	38.5	63	10.10 "	
1090	" SW $\frac{3}{4}$ W, 13 $\frac{1}{2}$ m. ....	110	gray mud	3	38.5	62	11.50 "	
<i>Off Martha's Vineyard.</i>								
	N. Lat.	W. Long.						
1091	40° 03' 00";	69° 44' 00"	65	gray sand, shells	11	46	75	5.30 "
1092	39 58 00;	69 42 00	202	gray sand	11	41	75	6.54 "
1093	39 56 00;	69 45 00	349	sandy blue mud	11	40	75	8.35 "
1094	39 57 00;	69 47 00	301	blue mud	11	40	76	10.10 "
1095	39 55 28;	69 47 00	321	soft green mud	11	40	76	11.55 "
1096	39 53 00;	69 47 00	317	green mud	11	40	75.5	1.39 P. M.
1097	39 54 00;	69 44 00	158	fine sand	11	45	75.5	3.10 "
1098	39 53 00;	69 43 00	156	fine sand	11	43.5	75	4.35 "
1107	40 02 00;	70 35 00	116	gray mud	22	48	71	6.00 A. M.
1108	40 02 00;	70 37 30	101	fine sandy gray mud	22	48	71	6.55 "
1109	40 03 00;	70 38 00	89	gray mud	22	49	71	7.55 "
1110	40 02 00;	70 35 00	100	fine sandy gray mud	22	47	72	9.10 "
1111	40 01 33;	70 35 00	124	fine sand	22	47	72	10.45 "
1112	39 56 00;	70 35 00	245	green sandy mud	22	43	72	12.43 P. M.
1113	39 57 00;	70 37 00	192	green mud	22	43	72	1.45 "
1114	39 58 00;	70 38 00	171	green mud	22	43	72	2.40 "
1115	39 59 00;	70 41 00	146	green sandy mud	22	45	72.5	3.28 "
1116	39 59 00;	70 44 00	144	hard sandy mud	22	46	72	4.20 "
1117	40 02 00;	70 45 00	89	fine sand	22	48	72	5.30 "
1118	40 03 00;	70 45 00	70	fine sand	22	49	72	6.20 "
<i>Off Nantucket, S.S.E.</i>								
1119	40° 08' 00";	68° 45' 00"	97	sand, shells	26	48	65	6.32 A. M.
1120	40 05 00;	68 48 00	194	fine sand, stones	26	43.5	65	7.41 "
1121	40 04 00;	68 49 00	234	fine s'nd, foss. stones	26	41.5	65	9.05 "
1122	40 02 00;	68 50 00	351	sand and stones	26	40.5	67	10.28 "
1123	39 59 45;	68 54 00	780	green sandy mud	26	39	69	12.00 M.
1124	40 01 00;	68 54 00	640	fine s'nd, foss. stones	26	39	65	4.01 P. M.
1125	40 03 00;	68 56 00	291	sandy mud	26	40	64	5.45 "
<i>Off Block Island, S.</i>				Sep.				
1137	39° 40' 00";	71° 52' 00"	173	fine sand	8	46	70	6.00 A. M.
1138	39 39 00;	71 54 00	168	fine soft sand	8	46	71	7.24 "
1139	39 37 00;	71 55 00	291	sandy mud	8	44	72	8.48 "
1140	39 34 00;	71 56 00	374	sandy mud, gr' vel, peb.	8	40	73	10.35 "
1141	39 32 00;	71 57 00	389	sandy mud	8	40	74	12.27 P. M.
1142	39 32 00;	72 00 00	322	fine sandy mud, peb.	8	41	74	1.52 "
1143	39 29 00;	72 01 00	452	sandy mud	8	40	74	3.36 "
1144	39 31 00;	72 06 00	386	soft sandy mud	8	41	74	6.00 "

*Acanthogorgia armata* V., 640 fath., and *Paramuricea borealis* V., from 234 fath.; the former, when living, was bright orange; the latter was pale salmon. Of those previously taken, one of the most interesting was *Pennatulula borealis*, obtained in 192, 317 and 640 fath. The largest one, from 317 fath., 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 fath., of which the larger was 19·5 inches across; *C. macerrima* W., from 317 fath.; and several of *Nymphon Strömii*, from 234 to 640 fath.

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

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 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, have been identified by Professor Smith.

† *Abralia megalops*, sp. nov. 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 little 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<sup>mm</sup>; diameter of body, 7<sup>mm</sup>; length of fin, 11<sup>mm</sup>; breadth across fins, 18<sup>mm</sup>; breadth of head, 7<sup>mm</sup>; diameter of eye, 4·5<sup>mm</sup>; length of dorsal arms, 13<sup>mm</sup>; length of second pair, 14<sup>mm</sup>; of third pair, 14<sup>mm</sup>; of tentacular arms, 25<sup>mm</sup>; of ventral arms, 10<sup>mm</sup>. Probably this specimen is young. Described from alcohol.

the surface, by Dr. Kite, surgeon. 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 (sta. 1123); and the second known example of the large *Rossia megaptera* V., in 640 fathoms (sta. 1124), the first one having been taken from a halibut's stomach, at the Grand Banks.

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;

\* *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<sup>mm</sup>; breadth 17<sup>mm</sup>; length of canal and body-whorl, 19<sup>mm</sup>; length of aperture, 15.5<sup>mm</sup>; its breadth, 7.5<sup>mm</sup>. Station 1118. Named in honor of Professor 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<sup>mm</sup> long; breadth, 26<sup>mm</sup>; length of shell, 21<sup>mm</sup>; breadth of shell, 18<sup>mm</sup>; length of anterior valve, 4<sup>mm</sup>; breadth, 15.5<sup>mm</sup>.

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 incurrent 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.

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 season, and the very large species of *Salpa*, so abundant hitherto, was only met with once, 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, was the scarcity or total absence of many of the species, especially of Crustacea, that were taken in the two previous seasons, in essentially the same localities and depths, in vast numbers,—several thousands at a time. Among such species were *Euprognatha rastellifera*, *Catapagurus socialis*, *Pontophilus brevisrostris*, 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 ( $48^{\circ}$  to  $50^{\circ}$ ) 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 *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 (*Scorpæna dactyloptera*), known on the European coast, and first taken by us, in 1880.

*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

\* *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 Sd. and off Gay Head, 4 to 8 fath., 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 to 3.5 mm. Color, when containing eggs, dark olive-brown; after eggs are laid, pale greenish;



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.

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 *Chaetosyllis* 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 Sept. 15th, 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.

eyes dark brown. Wood's Holl, surface, evening, Aug. 2 to Sept. 18, 1882; off Gay Head, with the stem-form, 1881. Description from life.

\* *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, sub-moniliform.

*Tetraglene agilis* V., sp. nov. 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 Aug. 5, 1882. Length of largest (♀) about 25<sup>mm</sup>; males about 20<sup>mm</sup>. Taken in the evening, at the surface, near Nomansland, Sept., 1880; Wood's Holl, Aug. 4, 1881, and from Aug. 5 to Sept. 12, 1882. Description from life.

† *Eusyllis tenera* Verrill, Trans. Conn. Acad., iv., pl. 13, fig. 12; pl. 14, figs. 4, a. b. Slender, 5 to 7<sup>mm</sup> 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

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

\* *Syllides setosa* V., sp. nov. 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<sup>mm</sup>. 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<sup>mm</sup>.

*Grubea Websteri* V.,\* *Sphærosyllis*, sp., *Pædophylax longiceps* V., etc. The *Nereis megalops* V., both in the heteronereis-form (*Nectonereis*) and in the nereis-form (*N. alacris* V.), frequently occurred in our night excursions, and in September the young of this species of all sizes, from those with only six or eight segments, up to those that were 10<sup>mm</sup> 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 Leidyi* 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 pergamenum*.

\* *Grubea Websteri* V., sp. nov., 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, 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 to 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<sup>mm</sup> to 4<sup>mm</sup>. Surface. Newport, R. I., 1880; Wood's Holl, Mass., July 28 to September 12, 1881, 1882. Described from life.

† *Acrocirrus Leidyi* V., sp. nov., 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 to 15<sup>mm</sup>; diameter of largest, about 1<sup>mm</sup>. Wood's Holl, surface, evening, August 2 to September 9, 1881 and 1882. Described from life.

*taceus*, 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 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 chætopterana* 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, *Tellin*ya (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 Rhabdocela and Annelida.

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

† *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<sup>mm</sup>, breadth 12<sup>mm</sup>. Great Harbor, shore; off Menemsha, 10 to 12 fathoms, September 6.