

ART. XLI.—*Notice of the remarkable Marine Fauna occupying the outer banks off the southern coast of New England*; by A. E. VERRILL. (Brief Contributions to Zoology from the Museum of Yale College: No. XLVII.)

DURING the present season the headquarters of the U. S. Fish Commission, Professor S. F. Baird, Commissioner, were at Newport, R. I. The investigation of the marine invertebrate fauna of the region was very effectually carried out by the large party employed under the general direction of the writer. Large collections were made in the shallower waters of the coast, both at the surface and along the shores, as well as by dredging and trawling. The new steamer "Fish Hawk," of 480 tons, built last year specially for the Fish Commission, and fitted up with suitable appliances for its scientific work, was employed in the trawling and dredging. It was commanded by Lieut. Z. L. Tanner, U. S. N., who was also in command of the "Speedwell" last season. The writer had, as associates and assistants, for the invertebrata, Mr. Richard Rathbun, Mr. Sanderson Smith, Mr. J. H. Emerton (as artist), Mr. B. F. Koons, Mr. E. A. Andrews, Mr. Charles Bent, Mr. N. P. Scudder. Capt. H. C. Chester, as usual, had charge of the apparatus. Wire rope was very satisfactorily used for the dredging and trawling. In September and October, three very successful trips were made to the outer banks, or the region where the wide area of shallow water more rapidly falls off into the deep water of the Atlantic basin.

The first of these trips was made Sept. 3d to 5th, south of Martha's Vineyard, about 75 to 80 miles (stations 865 to 872) where the depth was from 65 to 192 fathoms. The bottom was mostly fine compact sand, with some mud, and with a large percentage of Foraminifera. The second trip was made Sept. 12th to 14th, nearly south from Newport, 90 to 105 miles, where the depth was from 85 to 325 fathoms (stations 873 to 881). The third trip, Oct. 1st to 3d, was to the same region, but somewhat farther west and south, and in deeper water, (stations 891 to 895). At all these stations, except 867, a large beam-trawl was used; at 867 a heavy "rake-dredge," of a new form, was used with good success.

The temperature determinations, owing to the violent motions of the steamer, are unreliable at stations 865 to 872. At stations 873-878 the bottom temperature was usually 51° to 53° F.; at 879-881, it was 42° to 43° F.; at 893, 894, it was 40° F.

All these stations are located in the region designated on the charts as "Block Island Soundings," and nearly all proved to be exceedingly rich in animal life, the vast abundance of individuals of many of the species taken being almost as surprising

as the great number and variety of the species themselves. Crustacea, Mollusca, Annelids and Echinoderms were the most numerous. The very large quantity of specimens obtained on these three trips has, as yet, been only partially examined, but enough has already been done to prove this region to be altogether the richest and most remarkable dredging ground ever discovered on our coast.

*Dredging stations on the outer bank, in 1880.*

No.	Lat.	Locality.	Long.	Depth, Fathoms.	Nature of bottom.
865	40° 05'	N. 70° 23'	W.	65	Fine compact sand with some mud.
866	40 05 18"	N. 70 22 18"	W.	65	" " "
867	40 05 42	N. 70 22 06	W.	64	" " "
868	40 01 42	N. 70 22 30	W.	162	" " "
869	40 02 18	N. 70 23 06	W.	192	Mud and fine sand, soft.
870	40 02 36	N. 70 22 58	W.	155	Fine sand with some mud.
871	40 02 54	N. 70 23 40	W.	115	" " "
872	40 05 39	N. 70 23 52	W.	86	Shells and sponges.
873	40 02	N. 70 57	W.	100	Fine sand and mud.
874	40	N. 70 57	W.	85	" " "
875	39 57	N. 70 57 30	W.	126	" " "
876	39 57	N. 70 56	W.	120	" " "
877	39 56	N. 70 54 18	W.	126	" " "
878	39 55	N. 70 54 15	W.	142½	" " "
879	39 49 30	N. 70 54	W.	225	" " "
880	39 48 30	N. 70 54	W.	252	Mud and fine sand.
881	Somewhat farther south.			325	Mud. Trawl partially fouled.
891	39 46	N. 71 10	W.	± 500	Mud and fine sand.
892	39 46	N. 71 05	W.	487	Mud, fine sand, small stones.
893	39 52 20	N. 70 58	W.	372	" " "
894	39 53	N. 70 58 30	W.	365	" " "
895	39 56 30	N. 70 59 45	W.	238	" " "

MOLLUSCA.—Of Mollusca, about 175 species were taken. Of these, 120 species were not before known to occur on the southern coast of New England; about 65 species are additions to the American fauna; of these about 30 species are, apparently, undescribed. The known species now added to our fauna have mostly been described by G. O. Sars, Jeffreys, and others, from the deep waters of the European coast and the Mediterranean.

*List of Mollusca new to the New England coast.*

[Those with *n* prefixed were previously known from off Nova Scotia or farther north. Various undetermined species are not included.]

<i>Heteroteuthis tenera</i> V.. nov.	<i>Lamellaria pellucida</i> V., nov.
<i>Calliteuthis reversa</i> V.. gen. and sp. nov.	<i>n. Lovenella Whiteavesii</i> Verrill, nov.
<i>Alloposus mollis</i> V., sp. and gen. nov.	<i>Cingula turgida</i> (Jeff.)
<i>Argonauta Argo</i> Linné.	<i>n. Cingula Jan-Mayeni</i> (Friele) V.
<i>Taraxis Morchii</i> Sars.	<i>Lepetella tubicola</i> V. & S., gen. and sp. nov.
<i>n. Bela tenuicostata</i> Sars.	<i>Scalardia Dalliana</i> V. & S., nov.
<i>Pleurotoma Agassizii</i> V. & S., nov.	<i>Scalardia</i> (fragile).
<i>Pleurotoma Carpenteri</i> V. & S., nov.	<i>Scalardia Pourtalesii</i> V. & S., nov.
<i>Margarella roscida</i> Rav. ?	<i>Solarium</i> , sp. (sharply carinated).
<i>n. Neptunea propinqua</i> (Alder).	<i>Aclis Walleri</i> J.
<i>Tritonofusus latericeus</i> (Möll.) Morch.	<i>Calliostoma Bairdii</i> V. & S., nov.

*Margarita regalis* V. & S., nov.  
*Margarita lamellosa* V. & S., nov.  
*Turbonilla Rathbuni* V. & S., nov.  
*Turbonilla formosa* V. & S., nov.  
*Eulima intermedia* Cantr.  
*Eulima distorta* Desh.  
*n. Philine Finnarchica* Sars.  
*Philine amabilis* V., nov.  
*Amphisphyræ globosa* Lovén.  
*Diaphana gemma* V., nov.  
*Diaphana nitidula* (Lovén).  
*Pleurobranchæa tarda* V., nov.  
*Doris complanata* V., nov.  
*Carinaria Atlantica* Ad. & R.  
*Clio pyramidata* Linné.  
*Balantium*.  
*Cymbulia calceola* V., nov.  
*Spiralis retroversus* (Flem.)  
*Cavolina longirostris* (Les.)  
*Cavolina uncinata* (Rang.)  
*Siphonentalis Lofotensis* Sars.  
*Cadulus Pandionis* V. & S., nov.

*Cadulus Jeffreysii* (Monteros.)  
*Cadulus propinquus* G. O. Sars.  
*Poromya rotundata* Jeff.  
*Neæra rostratu* (Speng.) Lovén.  
*Neæra costellata* ?  
*Neæra jugosa* S. Wood.  
*Pecchiolia abyssicola* Sars.  
*n. Kennerlia glacialis* (Leach) Carp.  
*Cardium*, sp. nov. (cancelled.)  
*Loripes lens* V. & S., nov.  
*Cryptodon ferruginosus* (Forbes).  
*n. Yoldia frigida* Torell.  
*Leda unca* Gould.  
*Limopsis cristata* Jeff. ?  
*Limopsis minuta* (Phil.)  
*Modiola polita* V. & S., nov.  
*Avicula hirundo* ? var. *nitida* V.  
*n. Pecten vitreus* (Gmel.) Wood.  
*n. Pecten Hoskynsi* Forbes, var. *pustulosus* V.  
*Pecten fenestratus* Forbes ?  
*Limæa subovata* (Jeffreys) Monteros.

*List of Mollusca new to the southern coast of New England, but previously known to me from the northern coast.*

*Rossia sublevis* Verrill.  
*Octopus Bairdii* Verrill.  
*Admete Couthouyi* Jay (= *A. viridula* Gld.)  
*Bela exarata* (Möll.) Ad.  
*Bela impressa* Morch (S. 814).  
*Bela violacea* (Migh.) Ad. (S. 812).  
*Neptunea decemcostata* (Say) Ad.  
*Neptunea Stimpsoni* (Morch), (= *Fusus Islandicus* Gld.)  
*Anachis costulata* (Cant.) (= *Columbella Haliaæti* Jeff.)  
*Lunatia Grönlandica* (Möll.) Ad.  
*Lunatia nana* (Möll.) (S. 812, 814).  
*Torellia vestita* Jeff.  
*Aporrhais occidentalis* Beck.  
*Calliostoma occidentale* (Migh.) Dall.  
*Puncturella nouachina* (L.) Lowe.  
*Turbonilla nivea* (St.) Ad.  
*Odosstomia modesta* Stimp.  
*Ringicula nitida* V.  
*Scaphander puncto-striata* (Migh.) Ad.  
*Amphisphyræ pellucida* (Brown) Lovén.  
*Cylichna occulta* (Migh.) Ad.

*Siphonodentalium vitreum* Sars.  
*Dentalium occidentale* Stimp. (= *D. abyssorum* Sars.)  
*Teredo megotara* Hanl.  
*Saxicava Norvegica* (Speng.) Woodw.  
*Cyrtodaria siliqua* (Speng.) Woodw.  
*Neæra obesa* Lovén (= *N. pellucida* St.)  
*Neæra arctica* Lovén.  
*Neæra glacialis* G. O. Sars.  
*Poromya granulata* (Nyst.) F. and Han.  
*Thracia myopsis* Möll.  
*Cardium Islandicum* Linné.  
*Astarte crenata* Gray (= *A. lens* St.)  
*Nucula delphinodonta* Mighels.  
*Yoldia thraciformis* (Storer) Stimp.  
*Yoldia expansa* Jeff. (?)  
*Arca glacialis* Gray.  
*Arca pectunculoides* Sc. (? var. of last).  
*Crenella decussata* (Mont.) Macg.  
*Dacrydium vitreum* (Möll.) Sars.  
*Pecten Islandicus* Müller.  
*Terebratulina septentrionalis* (Couth.)

*Descriptions of new species included in the preceding lists.\**

*Heteroteuthis tenera* Verrill, sp. nov.

Body small, rather short, scarcely twice as long as broad, obtuse. Fins thin, rounded, relatively very large, length about two-thirds that of the body, longer than broad, the anterior edge extending forward beyond the mantle. Arms

\* In an article in the Proceedings of the National Museum, detailed descriptions of the new species will be given. Therefore only the more diagnostic characters are given here.

slender; in the male the left dorsal arm is hectocotylized, being broader than its mate, with four rows of minute suckers, while on the right one, and in the female on both, there are two regular rows of larger suckers. Lateral and ventral arms have the middle suckers (eight to ten) much larger than the distal and proximal ones; in the male this disparity becomes very marked, the larger suckers being eight or ten times as large as the proximal ones. These suckers are deep, laterally attached, with small opening and smooth rim. Tentacular arms long, slender, with broader club; suckers numerous, unequal, in about eight rows, those in the upper rows much larger than the others, with denticulated rims. Color translucent white with large purple chromatophores, which are also found on the inner surfaces of the arms and between the suckers. Length of body 25 to 40<sup>mm</sup>. More or less abundant at all the stations, from 865 to 880, inclusive. About 200 specimens were taken.

*Calliteuthis* Verrill, gen. nov.

Form much as in *Histioteuthis*, but without any web between the arms. Body short, tapering to a free tip; fins small, united behind. Siphon united to head by two dorsal bands; an internal valve. Mantle connected to sides of siphon by lateral elongated cartilages and grooves. Arms long, free; suckers in two rows, largest on middle of lateral and dorsal arms. Eyes large, with oval openings. Buccal membrane simple, sac-like.

*Calliteuthis reversa* Verrill, sp. nov.

Arms long, tapering, the lateral pairs equal; the dorsal and ventral about equal, somewhat shorter than laterals; tentacular arms slender, compressed, (the ends absent). Fins small, thin, transversely rhomboidal, white. Color reddish brown; the ventral surface of body, head and arms covered with large, rounded verrucæ; their center or anterior half pale, the border or posterior half dark purplish brown; upper surface of body with much fewer and smaller scattered verrucæ; a circle of same around the eyes; inner surface of arms and buccal membranes chocolate-brown. Total length, 133<sup>mm</sup>; to base of arms, 67; of mantle, 51; of fin, 17; breadth of fins, 24; of body, 20; diameter of eye-ball, 16<sup>mm</sup>. Station 894.

*Alloposus* Verrill, gen. nov.

Allied to *Philonexis* and *Tremoctopus*. Body thick and soft, smooth; arms all (in the male only seven) united by a web extending nearly to the ends, the length of the arms decreasing from the dorsal to ventral ones; suckers sessile, simple, in two rows; mantle united firmly to the head by a ventral and two lateral *commisures*, the former placed in the median line, at the base of the siphon, and by a broad dorsal band; free end of the

siphon short, well forward. In the male the right arm of the third pair is hectocotylized, and developed in a sac, in front of the right eye; as found in the sac, it is curled up, and has two rows of suckers; the groove along its edge is fringed; near the end, the groove connects with a rounded, obliquely placed, lateral, concave lobe, with interior plications; the terminal portion of the arm is a lanceolate thickened process, with ridges on the inner surface. The permanent attachment of the mantle and neck, by means of commissures, is a very distinctive character.

*Alloposus mollis* Verrill, sp. nov.

Body stout, ovate, very soft and flabby. Head large, as broad as the body; eyes large, their openings small. Arms rather stout, not very long, webbed nearly to the ends, the dorsal 60<sup>mm</sup> longer than the ventral arms; suckers large, simple, in two alternating rows. Color deep purplish brown, with a more or less distinctly spotted appearance. Length, total, 160; of body, to base of arms, 90; of mantle beneath, 50; of dorsal arms, 70; breadth of body, 70<sup>mm</sup>. The sexes scarcely differ in size. Stations 880, in 225 fathoms, (2 ♂, 1 ♀), 892, 893, 895.

*Cymbulia calceola* Verrill, sp. nov.

Test thick, transparent, broad-ovate, rounded at both ends, covered, above and below, with low rounded verrucæ; aperture large, with simple unarmed edges. Animal pale pink, with brown nucleus; fins very large, connate, broadly rounded. Length of test, 40<sup>mm</sup>; breadth, 20. Stations 865 to 872, (near surface), common.

*Pleurotoma Agassizii* Verrill and Smith,\* sp. nov.

Shell large and handsomely sculptured; whorls eight, convex, shouldered, with about sixteen thick, rounded, oblique ribs, separated by concave interspaces; the ribs do not extend above the shoulder, leaving a rather broad, flattened band, which is covered by raised revolving lines, more or less decussated by prominent lines of growth and slight riblets, running down from the suture; the revolving lines become stronger and more elevated below the shoulder, and cross the ribs as well as their intervals; toward the canal the ribs fade out and the revolving lines become still more prominent. Outer lip with a wide and rather deep rounded notch below the suture; below this it curves strongly forward, and recedes again at the canal, which is rather short, narrowed, and a little excurved. Columella smooth, curved, and obliquely

\* Mr. Sanderson Smith has been associated with me, during the present and two preceding seasons, in working up the testaceous mollusca. The species here briefly described under our joint names will be described, in detail, in a special article in the Proceedings of the National Museum.

narrowed at the canal. Aperture subovate, sinuous, rather large. Shell white, except the columella, which is stained with orange-brown. Length, 31; breadth, 14; length of aperture, 16; breadth, 6<sup>mm</sup>. Stations 865-880; 891, 892; 894; 895.

The animal has neither operculum nor eyes, and does not properly belong to *Pleurotoma* (restricted). It is, perhaps, most nearly related to *Pleurotomella* V. The uncini differ from all those figured by G. O. Sars, resembling most those of *Thesbia*. The basal appendage is large and oblique.

*Pleurotoma Carpenteri* Verrill and Smith, sp. nov.

Shell rather small, solid, slender; surface glossy. Whorls eight, somewhat convex, crossed by about twelve strong, elevated, flexuous, smooth, rounded longitudinal ribs, which extend entirely across the upper whorls, and on the body whorls from the suture to the middle, below which the surface is smooth; the interstices between the ribs are deeply concave, wider than the ribs, and perfectly smooth, except the faint lines of growth. Outer lip with a broad shallow notch, below the suture. Aperture rather small, ovate; canal short, narrow, straight; columella nearly straight. Color, pale brownish. Length, 7; breadth, 2.75<sup>mm</sup>. Stations 870-873.

*Scalaria Pourtalesii* Verrill and Smith, sp. nov.

Shell pure white, rather stout, with seven well-rounded whorls, crossed by about sixteen high, thin, lamellar, somewhat oblique ribs, which rise into acute angles or points just below the suture. Whorls scarcely united, except by the ribs, which often alternate on successive whorls. Interstices covered with fine revolving lines, not visible without a lens. Aperture round, with a broad, somewhat reflexed lip; umbilicus small, concealed behind the inner lip; no basal keel. Length, 17.5; breadth, 10; of aperture, 4<sup>mm</sup>. Stations 873, 874.

*Scalaria Dalliana* Verrill and Smith, sp. nov.

Shell smaller and much slenderer than the last, thin, delicate, bluish white. Whorls eleven, evenly rounded, with deeply indented sutures. Ribs about twenty, on the lower whorls, moderately high, thin, oblique, often with a small sharp denticle, just below the suture; they often alternate; interstices wider than the ribs, smooth, without distinct revolving lines. Aperture round with a reflexed lip, nearly even all around; umbilicus none. Length, 10.5; breadth, 3.5<sup>mm</sup>. Stations 869, 870, 871, 873, etc., not uncommon.

*Lamellaria pellucida* Verrill, sp. nov.

Animal yellowish brown mottled with darker, broad elliptical, swollen, without tubercles on the back. Shell ovate, with

oblique spire, delicate, transparent, smooth; aperture broad ovate, not showing the interior of the spire, except from an endwise view. Middle tooth of the odontophore with the basal portion oblong and truncated posteriorly, (not bilobed as in other species). Length, 12 to 16<sup>mm</sup>, when living. Stations 870, 871, 872, several specimens, ♂ and ♀

*Lepetella* Verrill, gen. nov.

Shell small, smooth, oval or oblong, limpet-shaped, conical, with a simple sub-central apex, not spiral. Animal much as in *Lepeta*, but with distinct eyes. Odontophore tænioglossate, with seven regular rows of teeth.

*Lepetella tubicola* Verrill and Smith, sp. nov.

Shell thin, white, smooth, conical, with the apex acute and nearly central; aperture broad elliptical, oblong, or subcircular, usually more or less warped, owing to its habitat; edge thin and simple. Sculpture none, lines of growth slight, outer surface dull white; inner surface smooth, with the pallial markings faint. Length of largest specimens 3.75; breadth, 3; height, 2<sup>mm</sup>. On inside of old tubes of *Hyalinæcia*; twenty-seven were taken from one tube. Stations, 869, 192 fath., and 894.

*Lovenella Whiteavesii* Verrill, sp. nov.

Shell slender, white, acute, allied to *L. metula*. Whorls nine or ten, flattened, with a prominent nodulous carina below the middle, a smaller one just below the suture, and another on the last whorl, in line with edge of lip, below this smooth; the whorls are crossed by numerous elevated, rounded, curved ribs. Columella much incurved above; canal excurved; outer lip with three angles. Length 4.5<sup>mm</sup>; breadth 1.5<sup>mm</sup>; one is considerably larger. Stations 891, 894; also Gulf St. Lawrence (Whiteaves).

*Calliostoma Bairdii* Verrill and Smith, sp. nov.

Shell large, strong, regularly conical, with a flattened base, no umbilicus, yellowish white or light yellow, with more or less numerous narrow, spiral bands of pale brown or dark brown, and with large squarish spots of bright rosey red on the spire. Whorls nine or ten, flattened, or concave, below the suture, which is not impressed. The last whorl has eight to ten conspicuous, raised, nodulous revolving ribs, of which three or four are much smaller and alternate with the larger ones; the strongest rib is just below the suture; interstices concave, brownish, glossy, obliquely striated by the lines of growth, and sometimes with subordinate, revolving, raised lines. The four principal ribs are continued on the upper whorls, but the intermediate ones gradually disappear on the middle whorls. The nodules

on the ribs are prominent, rounded and smooth, whitish, and extend to near the apex. Nuclear whorl smooth; next with three carinæ. Base with about twelve spiral, nodulous ribs with some intermediate, smaller ones; umbilical region slightly excavated, spirally. Columella strongly concave, terminating in an indistinct tooth. Animal yellowish with long tentacles, and with four long cirri on each side; eyes well developed. Dentition somewhat different from the typical species of the genus; there is no large lateral tooth, between the inner and outer series; outermost ones broad flat, curved. Operculum thin, circular, with many narrow whorls. Length, 32; breadth, 30; breadth of aperture, 15<sup>mm</sup>. Taken alive at nearly all the stations, from 865 to 880, inclusive. A very handsome and showy species, having a tropical aspect.

*Margarita regalis* Verrill and Smith, sp. nov.

Shell rather large for the genus, thin and delicate, whitish, brilliantly iridescent or pearly, externally and internally, broad conical, turreted, wider than high, with a convex base, and deep umbilicus. Whorls seven, much flattened, with the suture scarcely impressed; the upper whorls are coronated by two, and the body whorl by three, revolving, strongly nodulous ribs, along which the conical, often acute nodules are very regularly arranged. The first of these rows of nodules is just below the suture; the second is separated from the first by a wide, flat, or slightly concave interspace; the third is not far from the second, and surrounds the periphery, usually corresponding with the line of the suture; the second and third are usually the most elevated; on the base there are five or six strong, rounded, revolving ribs, part of them usually somewhat nodulous, separated by deep, concave interspaces, rather wider than the ribs; one or two additional ones often appear in the umbilical opening, which is funnel-shaped and moderately large, but often partially obstructed by the reflexed edge of the inner lip. The interspaces between all the ribs are covered with close, slightly raised lines of growth, and usually with traces of a thin epidermis. Aperture somewhat quadrangular, large, lip thin. Animal with long tentacles and large black eyes; four large lateral cirri on each side, with a group of four or five small intermediate ones; snout with a broad, bilobed crescent-shaped expansion in front. Odontophore without a large lateral tooth between the inner and outer series, otherwise much like typical *Margaritæ*. Length, 14; breadth, 15<sup>mm</sup>; often larger. Stations 865, 870, 871, 873, 880, 891-895, common.

*Margarita lamellosa* Verrill and Smith, sp. nov.

Shell small, fragile, conical, canaliculate, with a wide umbilicus. Whorls five, angulated and carinated below the middle,

swollen just below the suture, which lies in a deep channel; they are crossed, above the peripheral carina, by numerous elevated, thin, oblique ribs, which rise into lamellæ near the suture, where they join the carina forming small nodules; between the ribs are fine parallel lines of growth and sometimes a few fine revolving lines. Below the periphery, in line with the posterior edge of the lip, there is a smaller, plain, angular rib, and around the umbilicus there is a strong nodulose rib. Between these ribs, the base is covered with fine revolving lines. Within the umbilicus are radiating raised lines which cross two or three small revolving ribs. Aperture rounded, with angles corresponding to the ribs. Length, 3; breadth, 3<sup>mm</sup>. Station 871, scarce.

*Turbonilla Rathbuni* Verrill and Smith, sp. nov.

Shell white, large for the genus, elevated, with twelve rather convex whorls, and impressed sutures. The whorls are slightly flattened and crossed by numerous slightly flexuous, elevated, smooth, even ribs, of which there are about thirty on the lower whorls; intervals about as wide as the ribs, concave, crossed by impressed revolving lines, of which there are eight or ten on the spire. Aperture somewhat oblong, with the lip a little prolonged and slightly effuse anteriorly. Columella nearly straight, smooth. Umbilicus none. Length, 13; breadth, 4<sup>mm</sup>. Station 869, 192 fathoms, common; 894, 895.

*Turbonilla formosa* V. and S., sp. nov.

Shell white, lustrous, large, in form and size resembling the preceding; whorls twelve, somewhat flattened; aperture ovate, effuse in front; sculpture, strong rounded ribs, but without any revolving lines. Stations 891, 892.

*Pleurobranchæ tarda* V., sp. nov.

Body ovate, stout, swollen, strongly convex, yellowish brown, reticulated with dark brown. Gill plumose, at middle of right side, purple. Tentacles short, inrolled, obtuse. Proboscis large, purple. Odontophore large and broad, with 150 to 170 rows of teeth, no median tooth; teeth all similar, but gradually changing toward margins; inner ones narrow, lanceolate, curved, acute, with a stout denticle on the inner edge, near the end; outer teeth have the side denticle rudimentary. Length 30 to 40<sup>mm</sup>. Common at stations 814, 865-880; 28 to 250 fathoms; over 200 specimens taken. One, 60<sup>mm</sup> long, from station 895.

*Philine amabilis* V., sp. nov.

Shell very thin, diaphanous, delicate, and shining with bright iridescence; very large for the genus, and very open,

showing the interior of the spire, broad oblong, with rounded ends; outer lip evenly rounded posteriorly and scarcely projecting beyond the spire; apex occupied by a shallow pit. Sculpture, conspicuous wavy lines of growth, and microscopic wavy spiral striæ, over the whole surface. Length of shell, 15; breadth, 10<sup>mm</sup>. Odontophore with a large hook-shaped inner lateral tooth, on each side, and a slender spiniform outer one. Gizzard large, with three calcareous plates. Station 876, several living specimens.

*Diaphana (Utriculus\*) gemma* V., sp. nov.

Shell white, rather solid, resembling, in size and form, *Cylichna occulta* (Migh.), but distinguished by having a small, distinct umbilicus, and also a narrow deep pit at the apex of the spire. Sculpture, a few distinct spiral lines at each end; middle region of shell smooth. Length, 4.2; breadth, 2.5<sup>mm</sup>. Stations 871, 873.

*Doris complanata* V., sp. nov.

Body large, broad elliptical, depressed, pale brown to dusky brown, more or less mottled, back nearly smooth, with few minute verrucæ. Dorsal tentacles stout, clavate, with many crowded lamellæ, sheaths plain. Gills ten, large, bipinnate, brown, retractile into a large cavity. Oral tentacles free, ovate, tapered. Odontophore with 70 to 80 rows of lateral teeth, the outermost smallest: 22 to 24 inner lateral ones, on each side, sharp, hook-shaped, with two side lobes; those exterior to these, have obtuse, incurved, denticulate ends. Length, 50; breadth, 25<sup>mm</sup>. Station 872, eight specimens.

*Cadulus Pandionis* V. and S., sp. nov.

Shell very large for the genus, white, transparent, very smooth and polished, shining, strongly curved, largest in front of the middle, with the aperture oblique; sculpture none. The shell is somewhat transversely elliptical in section, slightly gibbous and most swollen at about the anterior third, on the convex side; from this point gradually tapering to the slender posterior end, and to the mouth, which is slightly broader than high, and recedes considerably on the convex side of the shell, with a thin smooth margin. Posterior opening small, with a semicircular notch above and below. Length, 10; breadth, 2.25; breadth of aperture, 1.75; of anal aperture, .40<sup>mm</sup>. Stations 869-871, 873, 874, 876 (abundant), 877, 891.

\* I here use *Diaphana* for the restricted genus *Utriculus*, as adopted by G. O. Sars. It is peculiar in lacking the odontophore. *Utriculus* is preoccupied by Schumacher (1817). Our "*Utriculus Gouldii*" is, in its gizzard and dentition, a true *Cylichna* and should be called *Cylichna Gouldii*. The *Diaphana pertenuis* (Migh.) is very distinct from it.

*Loripes lens* Verrill and Smith, sp. nov.

Shell white, well-rounded, nearly equilateral, slightly convex, thin; lunule small, cordate, deeply excavated; sculpture slightly raised, concentric lines of growth, distinct at the ends, but nearly obsolete on the median portion of the shell. Posteriorly the outline is more obtusely rounded, so as to form a rounded angle with the dorsal and ventral edges; dorsal edge incurved in front of the beaks; a faint undulation runs from the beak to the posterior angle. Teeth none. Length, 14; height, 12.5<sup>mm</sup>. Stations 865 to 872; 873 to 879, common. Also dredged off Cape Cod, 1879, in many places (40 to 120 fathoms).

*Modiola polita* Verrill and Smith, sp. nov.

Shell thin, translucent, without sculpture; epidermis pale yellow, smooth and polished. Umbos prominent; hinge-line straight; posterior end broadly rounded, compressed; anterior end prolonged decidedly beyond the beak, narrow, rounded. Greatest length, 40; breadth, 21<sup>mm</sup>. Station 895, two specimens.

*Pecten fenestratus* Forbes (?).

The small species that I refer doubtfully to this species is beautifully marbled with brown, red and white. The ears are prominent. The lower valve is covered with thin concentric riblets, while the upper valve is cancellated with fine radiating and concentric raised lines. Station 872.

## ECHINODERMS.

The star-fishes and ophiurans were exceedingly abundant and beautiful at all the stations, and many species not known previously on our coast were taken, several of which appear to be undescribed, while others were known only from northern Europe, or from the deep waters off Florida. Many of the species have only recently been obtained from the northern fishing banks off Nova Scotia, and are recorded in this Journal. One new species of *Archaster* (*A. Americanus*) was particularly abundant, several thousands of specimens having been taken; but the two largest and most beautiful species of this genus were *Archaster Agassizii* (new) and *A. Floræ*. Of *Odontaster hispidus*, over 100 were taken. One of the most conspicuous star-fishes was the remarkable *Pteraster multipes* Sars,\* one specimen of which was over six inches in diameter, and very thick and heavy. Its color, in life, is rich purple above, with the lower side orange, streaked with brown, and

\* This species differs so widely from typical *Pteraster* as to merit generic separation. I propose for it the name *Diplopteraster*, characterized especially by having suckers in four rows, and by having the horizontal radiating interbranchial spines of the lower surface imbedded in, and concealed by, a thick skin, when adult, (exposed in the young).

with large dark purple suckers. A large and handsome orange-colored species of *Luidia* (apparently *L. elegans*) often ten to fifteen inches broad, was very common, but nearly all the specimens dismembered themselves before they came to the surface. Large specimens of two Floridian sea-urchins (*Echinus gracilis* and *E. Norvegicus*) were taken.

*Partial List of Echinodermata.*

E. = European; F. = off Florida; n. = northern coasts of New England or Nova Scotia; \* = new species. Numbers refer to list of stations; ab. = abundant.

- n. *Thyone scabra* Verrill. (876, 877.)  
*Caudina*. (876.)  
n. *Schizaster fragilis* D. & Kor. (865, 871, 873, 874, 876, ab., 877, ab.)  
F. *Echinus gracilis* A. Ag. (872, two large specimens.)  
F. *Echinus Norvegicus* D. & K.  
F. *Temnechinus maculatus* A. Ag.  
*Asterias vulgaris* Stimp. (869, one sp.)  
\* *Asterias Tanneri* V., nov. (869, 870, 871, 872, 877.)  
n. *Stephanasterias albula* (Stimp.) Verrill. (865, 866, ab., 871, 872.)  
*Cribrella sanguinolenta* Lütke. (871, 872.)  
E. *Diplopteraster multipes* (Sars) Verrill. (869, one very large, 880, two. 895, one.)  
n. *Porania grandis* Verrill. (869, several, 872.)  
n. *Porania spinulosa* Verrill. (869, 879, three, 894, 895.)  
n. *Porania borealis* Verrill (= *Asterina borealis* V.) (869, several, 879, few.)  
\* *Odontaster hispidus* V., gen. nov. (865, 869, ab., 871, 872, ab., 873, 878, 894, 895.)  
n. *Archaster Floræ* Verrill. (869, several, large, 879, 881, 895.)  
\* *Archaster Americanus* V. (865-8, very ab., 871, ab., 873, 877, ab., 879.)  
\* *Archaster Agassizii* V. (879, 880, sev., 881, sev., 891-894.)  
n. *Archaster Parellii* D. & K. (879, 892-894.)  
F. *Luidia elegans* Perrier. (865-872, many large, 873, 876, 877.)  
n. *Ctenodiscus crispatus* D. & Kor. (879, one.)  
*Ophiopholis aculeata* Gray. (865, 869, 872, 879, 895.)  
n. *Ophioglypha Sarsii* Lyman. (865-869, ab., 870, ab., 871, 877, ab., 879, 895.)  
n. *Ophioglypha affinis* Lyman. (869, 875, 877, 878.)  
\* *Ophioglypha*. (879, 880, 895.)  
n. *Ophiacantha millespina* Verrill. (869, ab., 871.)  
n. *Ophioscolex glacialis* M. & Tr. (869, 871.)  
n. *Amphiura Otteri* (?) Ljung.  
*Amphiura*. (865, 879.)  
*Amphiura*. (880, two.)  
F. *Ophiocnida olivacea* Lym. (869, 871, ab., 872, 873-877, ab.)  
n. *Antedon Sarsii* (D. & K.) (870, 871, 873-876, 878-880.)

*Asterias Tanneri* Verrill, sp. nov.

A large, handsome, five-armed, dark red species, with a small disk and long narrow arms. Radii about as 1 : 7. Skeleton-plates rather strong. Lateral and dorsal spines one to a plate, elongated, round, tapering, forming five simple rows, in adults; in young, only three distinct rows. Ventral spines, long, obtuse, two to a plate, forming a double row, remote from the lateral, with large groups of papillæ between. Adambulacral spines long, slender, two to a plate, divergent, forming two regular rows. Minor pedicellariæ form close wreaths around bases of lateral and dorsal spines, and clusters on outer side of external ventrals; major ones, large, long-ovate, pointed,

scattered between the dorsal spines and clustered around their bases. Radius of disk, 11; of arms, 75<sup>mm</sup>; larger specimens, 250<sup>mm</sup> in diameter, were secured, but most of them had dismembered themselves, before reaching the surface.

*Odontaster* Verrill, gen. nov.

Form and appearance like *Archaster*; two rows of marginal plates; dorsal surface with paxillæ; ventral plates polygonal, spinulose. Each jaw bears a large, strong, sharp, erect or everted tooth, outside of the marginal spinules.

*Odontaster hispidus* V., sp. nov.

Rays five, rarely six, broad, tapering, sub-acute; body broad, densely spinulose beneath, flattened dorsally; larger paxillæ, each with a group of fifteen to twenty slender, equal, divergent spinules; those near the marginal plates much smaller. Upper marginal plates squarish, densely covered with small, sharp spinules; lower ones with larger and longer spinules; ventral plates, each with a crowded group of six or eight larger, stout, acute spinules, varying in stoutness; adambulacral plates, each with two, three, or more, blunt spinules, on the inner edge, in a row, and others, of similar form, outside of them. Central tooth of jaws with sharp, smooth tip, straight or recurved, longer and much larger than adjacent spines. Color pale salmon, or yellowish, when living. Radius of disk, 15; of arms, 42<sup>mm</sup>.

*Archaster Americanus* Verrill, sp. nov.

Arms five, rarely six, long, regularly tapered, moderately broad, rather flat. Radius of disk to that of arms, commonly, 1:5. Color in life, pale yellow, orange-yellow, or salmon. Dorsal area covered with slender paxillæ, not crowded, each bearing a stellate group of eight to ten very slender, long spinules, with a central one of the same size. Upper marginal plates rather large, elongated vertically, densely covered with small spinules, which radiate around the margin; sometimes a few plates, in the angles between the arms, bear, each, a single spine, at the upper end. Lower plates large, broad, reaching nearly to the ambulacral groove, covered with slender, sharp spinules, the middle row longest; two or three of the outermost of these are much longer and larger than the rest, and more or less flattened. Ventral plates very few, spinulose. Adambulacral plates, each with an inner group of three or four slender spines, in a row, and an irregular outer group of three or four larger ones; jaw-spines numerous, blunt. Largest specimens have the larger radius 74; lesser 12<sup>mm</sup>.

*Archaster Agassizii* Verrill, sp. nov.

A large and elegantly formed species, with rather large pentagonal disk and wide, rapidly tapered arms. Color, in life, bright orange-red.

Dorsal surface closely covered with large, even paxillæ, which are crowned with very numerous, short, blunt, granule-like spinules, six or eight larger ones forming a central group, with twenty to thirty smaller and more acute ones fringing the border; next the marginal plates the paxillæ are smaller and crowded; a group of larger and more conspicuous ones surrounds and partially covers the large madreporic plate. Upper and lower marginal plates equal in number and nearly so in size, their sutures coincident; proximal plates higher than long; those toward the ends of the arms nearly square; all are densely covered with small rounded granules; in many specimens the lower marginal plates bear, each, a single short, stout, blunt spine, on the outer side, but these are often partially wanting, and sometimes entirely absent. Ventral plates form triangular areas, extending out a short distance on the arms; they are angular, covered with short, rounded spinules, and form a close pavement. Adambulacral plates bear, each, about seven or eight slender, nearly equal spines, in one row, with a group of outer, small, short spinules. Greater radius 57; lesser 21<sup>mm</sup>.

*Luidia elegans*? Perrier. Arch. Zool. Expér., p. 256, 1876.

The species taken by us grows to more than 350<sup>mm</sup> in diameter. Color deep orange above, lighter below. Paxillæ crowded, smallest in middle of arms; large laterally; each bears a large group of slender spinules, and usually one to three larger, blunt pedicellariæ. Marginal plates with a vertical row of three long, tapering, acute spines, the upper ones largest; adambulacral plates also with a row of three sharp spines, which are smaller and recurved; the middle one largest. A row of large, ovate, bilabiate pedicellariæ between the lateral and adambulacral plates. The specimen described by Perrier was very young, if of this species.