No. 6. — *Contributions to the Fauna of the Gulf Stream at great depths.* By L. F. de Pourtales, Assist. U. S. Coast Survey.

(Communicated by the Superintendent of the U. S. Coast Survey.)

The study of the constitution and of the inhabitants of the bottom of the sea is a field of research which has attracted the attention of naturalists in comparatively recent times. What Humboldt did with regard to the distribution of life at different heights in the atmosphere, was done by Edward Forbes for the different depths of the ocean. The former's diagrams of the zones of vegetation on the slopes of the Andes are considered indispensable in every atlas of physical geography. But what one man could do where his glance embraced miles of country in height and breadth and where the types of vegetation could frequently be recognized as far as the eye could reach, an investigator even as zealous as Forbes could but sketch in broad though happily drawn lines for the marine animals.

Much has been done in this direction since Forbes's death, particularly in England, where dredging has become a favorite occupation of many naturalists; the Scandinavian seas have also been explored with much success, chiefly by the Norwegian naturalists; but much more remains to be done in a field in which the areas to be explored can, as Jeffreys remarks, be reckoned in square degrees, whilst the research extends only over square yards.

It is particularly in the greater depths, in the so-called abyssal region, that our knowledge is deficient. This is easily understood, since on many coasts the sea is comparatively shoal for a considerable distance from land, and the outfit for deep-sea dredging is beyond the means of but few private individuals. Government expeditions are generally fitted out for other duties, and can rarely devote their time to operations occasioning a delay of many hours. Furthermore, owing to the scantiness of the material, the impression generally prevailed, until recently, that animal life was soon reduced to a minimum with an increase of depth, or at least reduced to the lowest forms, so that the incentive of a rich harvest seemed denied to those who would have undertaken such researches.

Excepting the investigations of Dr. Stimpson on the coast of New England, the dredge has been as yet very little used along our shores. The character and constituents of the bottom are however pretty well known, thanks to the care of the late Superintendent of the Coast Survey, Professor A. D. Bache, who, during his whole administration of that work, required the hydrographical parties to preserve the specimens brought up by the lead. From eight to nine thousand specimens have thus been accumulated at the Coast Survey Office, from a region comprised between the shore and the outer edge of the Gulf Stream, and reaching nearly to 1500 fathoms. But, of course, aside from the Foraminifera and Diatomaceæ, for the study of which this material has proved of high interest, not much was contributed to our knowledge of the animals of the higher classes, the instrument used being only adapted to procure a small quantity of sand or mud.

The present Superintendent of the Coast Survey, Professor B. Peirce, has lately directed the resumption of the investigations of the Gulf Stream, so successfully inaugurated by his predecessor, but interrupted for several years by the war. Besides observations of the depth, velocity, and direction of that current, and the temperature and density of the water at different depths, the researches will be extended to the Fauna of the bottom, of the surface, and of the intervening depths. Not only will an insight be thus obtained into a world scarcely known heretofore, but that knowledge will have a direct bearing on many of the phenomena of that great current. Thus a new light may be thrown on its powers of transportation from shallow to deeper water, or along its bed, on its action in forming deposits in particular localities, or on its possible influence on the growth of coral reefs on its shores.

The first campaign on this plan was organized in 1867, the field of research being in a section between Key West and Havana, incidentally with the purpose of sounding out the line for the telegraph cable, shortly afterwards laid between these two points. The Coast Survey Steamer Corwin was assigned to the work; and here I wish to express my thanks to my colleague, Assistant H. Mitchell, charged with the physical part of the campaign, and to Captain Platt and his officers for the interest they showed to my work, and for their valuable practical aid.

The expedition was unfortunately interrupted by the breaking out of yellow fever on board, so that the dredgings were few in number.

However, short as the season's work was, and few as were the casts of the dredge, the highly interesting fact was disclosed, that *animal life exists at great depths, in as great a diversity and as great an abundance as in shallow water.*

The identifications of the species have been made by me at the Museum of Comparative Zoölogy at Cambridge, in the rich collections of which I have found abundant material for comparison; facilities of every sort were afforded me by Professor Agassiz, for which I wish to express my heartfelt thanks, as also for this opportunity of prompt publication.

The first dredgings were made on May 17th, on the Florida side of the Gulf Stream, about 5 miles S.S.W. of Sand Key, in depths varying from 90 to 100 fathoms, on a bottom of calcareous mud. The following list comprises the animals obtained: —

Articulates. A number of small Crustacea were brought up, which have not yet been determined. They belong to the following or allied genera: *Dromia*, *Ilia*, *Mithrax?* (a mutilated specimen), *Pagurus*, *Euphausia*, and *Orchestia*.

The tubes of several species of Annelids were obtained, but the animals were in most cases too defective for identification. The largest and best preserved is *Marphysa floridana*, nov. sp. (see description). There are also tubes of one or more species of *Serpula*.

The Gephyreans are represented by *Sipunculus corallicola*, Pourt. (Proc. Am. Assoc., 1851).

Molluscs not determined specifically. They are mostly immature specimens or fragments of dead shells, and belong to the following genera: *Murex* (dead), *Turbo?* (operculum), *Leda* (living), *Astarte* (living), *Tellina* (dead). Of Pteropods dead shells of the following species: *Hyalea tridentata*, *Hyalea trispinosa*, *Cuvieria columella*, *Cleodora lanceolata*. The shells of this order are very common in deep-sea soundings. The Bryozoa are represented by *Vincularia margaritacea*, nov. sp. (see description).

Radiata. Of Echinoderms were obtained an *Ophiurian* (an arm, undetermined) and a number of specimens of *Comatula Hagenii*, nov. sp. (see description).

A *Zoanthus*, rather small, was obtained also, but not having been noticed when alive, it would be somewhat uncertain to determine.

Hydroids: *Antennularia triseriata*, nov. sp.; *Thoa pulchella*, nov. sp.; *Th. capillaris*, nov. sp. (see descriptions).

The Foraminifera had nearly all been washed out of the dredge; only the following were noticed: *Textilaria conica* D'O. (very large); *Operculina*

(*Spirillina*) *incerta* D'O.; *Rotalina cultrata* D'O.; and *Globigerina rubra* D'O.

The total for this locality is therefore twenty-nine species, to which a few ought to be added for the undetermined fragments of Annelids.

No dredgings were had in mid-channel; this part had been reserved for the return trip, but the unfortunate interruption of the cruise prevented the execution of the project, at least for this season.

The next casts were obtained off Havana in 270 fathoms on May 24th and 29th, on both days as nearly as possible on the same spot, as the little that was obtained at the first date had given much promise.

The results of the two casts are combined below: —

Articulates. The Crustacea are not determined, but of or near the following genera: *Stenopus*, *Axia*, *Callianassa*, *Orchestia*, and *Idotea*, all living. Annelids: *Marphysa tibiana*, n. sp., and *M. antipathum*, n. sp. (see description). Tubes and fragments of four or five other species.

Of the *Molluscs* the Gasteropods and Acephala have not yet been determined, with one exception.

The following genera are represented: *Mitra?*, *Fusus*, *Turbo*, *Emarginulina*, *Dentalium*, *Nucula*, and *Spondylus*, all dead; *Pedicularia decussata*, Gould (see remarks), and a very small *Anomia*, both living. The Pteropods and Heteropods were all dead; they are: *Hyalea trispinosa*, *affinis* D'Orb., *gibbosa* Rang, and *uncinata* Rang; *Creseis spinifera* Rang; *Cleodora pyramidata* Pér. and Les.; *Spirialis rostrata* Eyd. and Soul.; and *Atlanta Peronii* Les. Of Brachiopods we obtained *Terebratula cubensis*, n. sp., and *Terebratulina Cailleti* Crosse; both living and apparently abundant. The Bryozoa are: *Farcimia cereus*, n. sp.; *Vincularia margaritacea*, n. sp.; *Cellepora reticulata*, n. sp.; *C. sigillata*, n. sp.; *Canda retiformis*, n. sp.; *Canda cornigera*, n. sp., *Idmonea flexuosa*, n. sp. (see descriptions).

Radiata. Echinoderms are represented by the following species: *Spatangus* (dead, fragments); *Fibularia* (dead); *Cidaris annulosa* Gray (probably, young, living); *Tripneustes ventricosus* (living, very young); *Asterias*, sp. (very young, living); *Ophiurians*, at least three species, immature and difficult to determine; *Comatula brevipinna*, n. sp., living; *Pentacrinus*, sp. (fragments of stem, among which some appear quite fresh).

Of Zoantharia the following were brought up: *Antipathes humilis*, n. sp.; *Antipathes filix*, n. sp.; *Acanthogorgia aspera*, n. sp.; *Gorgonia exserta* Ellis; *Swiftia exserta* Duch. and Mich.; *Hyalonema* (spicules); *Caryophyllia formosa*, n. sp.; *Deltocyathus Agassizii*, n. sp.; *Stylaster complanatus*, n. sp.; *Errina glabra*, n. sp.; *Errina cochleata*, n. sp.; *Crypthelia Peircei*, n. sp.;

Distichopora sulcata, n. sp.; *Heliopora? tubulata*, n. sp.; *Heliopora? carinata*, n. sp.; *Isis?* (base of stem); *Sarcodyction rugosum*, n. sp.

Hydroids: *Thoa pulchella*, n. sp.; *Tubularia crinis*, n. sp. Foraminifera: *Lagena striata* Mont., rare; *Nodosaria pyrula* D'O., rare; *Dentalina communis* D'O., rare; *D. (agglutinans?)*; *Lingulina carinata* D'O.; *Textularia trochus* D'O., common, very large, also abundant in shoaler water; *T. agglutinans* D'O., rare; *Nonionina scapha*, rare; *Nonionina umbilicatula* Montg., rare; *Cristellaria crepidula* F. and M., rather common; *Orbiculina adunca* D'O., rare and only in a worn state, its proper habitat is in the littoral zone; *Amphistegina gibbosa* D'O., rare and only young specimens; it is very common throughout the Gulf of Mexico in deep water; *Globigerina rubra* D'O., very abundant, also in the Orbulina form; *Gl. Dutertrei* D'O., common; *Pullenia obliquiloculata* P. and J., rather common; *Pullenia coarctata*, n. sp., rather common; *Sphæroidina dehiscens* P. and J., not common; *Rotalina cultrata* D'O., very common; *Rot. truncatulinoides* D'O., common; *Rot. Poeyi* D'O., rather common; *Rotalina*, 2 other species in single and imperfect specimens; *Biloculina*, sp.; *Triloculina Brongniartiana* D'O., rare; *Quinqueloculina bicostata* D'O., rare.

Many of the specimens of Foraminifera are filled with a yellow mass, like the first stage of transformation into greensand, but the process seems to stop here.

Of Sponges quite a number were obtained, at least a dozen species, which have not yet been determined. Some of the detached spicules are remarkable for their size; one, for instance, of the slender rectangulated sexradiate type of Bowerbank measuring more than half an inch.

The vegetable kingdom was represented in this dredging by a single specimen of a minute alga, *Centroceras clavulatum* Agardh., which Harvey says is found abundantly at low water mark at Key West. In its branchlets was entangled a chain of a species of *Biddulphia*. Other Diatomes are rather scarce and have not yet been determined. We therefore find here also a confirmation of the remark made in European seas, that vegetable life does not extend to depths as great as are reached by animals, and that therefore the greater number of deep-sea animals must be carnivorous.

The dredge contained also a number of nodules of a very porous limestone, similar in color and texture to the limestone forming the range of low hills along the shore of Cuba, but composed apparently of the remains of the same animals which were found living. Thus

our Deltocyathus, Caryophyllia, the various Pteropods were recognized in the stone, and found also in various stages of fossilization. The interstices between the larger forms are generally filled up with Foraminifera.

On May 25th the dredge was sent down in 350 fathoms, outside of the locality occupied on the 24th and 29th. It brought up only a few dead corals: *Caryophyllia formosa*, *Deltocyathus Agassizii*, *Diplohelia profunda*, the latter in numerous specimens (see description). Also a fragment of the siliceous skeleton of a sponge, forming a regular network somewhat like that of Euplectella as figured by Bowerbank, but lacking the spines.

The soundings made during this cruise seem to indicate a kind of submarine terrace, on which the dredgings of the 24th and 29th were made. The cast of the 25th was probably made on the edge of it, and the dredge no doubt touched bottom only for a short time, after which the ship drifted off into water too deep for the line attached.

Remarks and Descriptions of New Species.

Marphysa floridana Pourt.

Head small, with 5 antennæ; no tentacles on the buccal ring. Branchiæ pectinated, with 5 to 7 lobes, small, beginning about the 7th or 9th ring. The composite bristles with a small lancet-shaped appendage. Two eyes, rather large. Superior cirrhi longest, inferior short and conical. Teeth of the labrum large, broad, enamelled, white. Caudal cirrhi two, short. The first ring of the body has only the two superior cirrhi, which are nearly dorsal.

Body rings about 115. Color reddish, iridescent. Length 3 or 4 inches (contracted). Inhabits large deformed paper-like tubes, with lateral openings irregularly placed, though in general alternate, bordered by laciniate and fimbriate flaps.

Off Sand Key in 100 fathoms.

Marphysa tibiana Pourt.

All the characters as in the preceding, but the whole animal is more slender, and in some parts of the body the rings are considerably elongated, which may possibly be due to its position in the tube at the time of death. The branchiæ are almost rudimentary, in the shape of small club-like appendages to the upper cirrhi. It differs particularly from the former by its tubes, which are horny, dark brown, regularly serpentine; at every

bend there is a tubulated aperture directed backwards, with an expanded fimbriated border. Similar tubes have been figured by Ellis, and on them Lamarck founded the genus Tibiana, which he placed among the polyps. (See figure in Ellis, also copied by De Blainville.) In this species the tubes are free and appear to have been buried in the mud by their smaller end. Abundant in 270 fathoms off Havana.

Marphysa antipathum. Pourt.

Animal not observed; tubes differing from those of the preceding species in being attached by their whole length to the stems of a small species of Antipathes. They are also somewhat smaller, and the tubular apertures are entire, without fimbriæ, and only slightly widened.

Found, with the preceding, off Havana in 270 fathoms.

Tubes of various forms were also found, but not containing the animal, or only insufficient fragments of it, so that they cannot be determined. One tube deserves mention; it is white, parchment-like, straight and flattened; it is armed densely with spicules of sponges placed transversely, and stiffened by the long threads of a Hyalonema attached longitudinally; it contained only a very small fragment of the inhabitant. Obtained in 270 fathoms off Havana.

Pedicularia decussata Gould. (Proc. Bost. Soc. Nat. Hist., Vol. V. p. 127.)

As I have not Dr. Gould's specimens at hand for comparison, I refer with some hesitation to this species, a small living shell dredged on May 29th. As it is immature it is difficult to determine by the description alone.

Terebratula cubensis Pourt.

Shell globose, thin, light horn-colored, translucent, obscurely pentagonal, smooth, or showing faintly the lines of growth; the inferior margin of the transverse portion of the loop with three indentations, differing in this respect from *T. vitrea*, in which this part is entire; otherwise these two species resemble each other very closely. The largest specimen is $1\frac{1}{10}$ inch long, $\frac{9}{10}$ of an inch broad, and $\frac{7}{10}$ high.

It may prove to be identical with an undescribed *Terebratula*, from a recent formation of Guadaloupe, mentioned in Bull. Soc. Geol. de France, Tom. xx. 1863.

Several specimens, mostly large, were obtained off Havana in 270 fathoms.

Terebratulina Cailleti Crosse.

A number of specimens of this species, of all ages, were obtained with the former. They are all smaller than the Guadaloupe specimen, figured by Crosse, and perhaps on that account show the depression in the middle of the dorsal valve less distinctly than the figure.

Vincularia margaritacea Pourt.

Irregularly branching, generally at a large angle. White, pearly. Cells set round the axis in six rows alternating by threes, oval, smooth. Aperture rounded, with a small notch on inferior border for the attachment of the horny operculum, which is thin and round. Some of the cells have an accessory upper chamber (*ovarian vesicle*) inflated and cribriform. About 1 inch high; rather abundant off Sand Key in 100 fathoms, and off Havana in 270.

Farcimia cereus Pourt.

Frustules long, cylindrical, branching laterally from the middle of the older ones. Cells in six rows, alternating three and three, concave, oval Aperture small, horseshoe-shaped, with a pore on each side. In old and worn specimens the operculum giving the shape to the aperture is lost and the latter becomes oval. The space between the cells is then also deprived of a kind of epidermis, and shows rows of pores forming lozenges around the cells. Articulating peduncles horny; sometimes strengthened by radicles. Rather abundant in 270 fathoms off Havana.

Cellepora reticulata Pourt.

Flabellate, much anastomosing, pearly; apertures alternate, directed obliquely upward, all on the same side of flabellum, rounded, with small knob on lower part, on which is a small pit for the articulation of the operculum. (The latter all lost from specimen on hand.) About three quarters of an inch high. Off Havana in 270 fathoms.

Cellepora sigillata Pourt.

Flabellate, anastomosing, all the cells opening on the same side of the flabellum. Aperture oval, somewhat truncated towards the top, above which rise four short bristles. Cells irregularly alternate, crowded, concave. Operculum large, pearly, convex with a somewhat turned-up lip.

Only a small fragment was obtained off Havana in 270 fathoms.

Canda* retiformis Pourt.

Flabellate, irregularly dichotomous. Membranous tubular radicles connecting the branches with each other at about every fourth cell, giving the whole the appearance of network. Cells elongated, thin, half-membranous, alternate, opening on the same side of flabellum, punctated, two short blunt spines at the top. Aperture large, occupying about two thirds of the cell, protected by a broad T-shaped shield rising from the side of the aperture. About one inch high. Off Havana in 270 fathoms.

* Cellarina, Van Beneden.

Canda cornigera Pourt.

Flabellate and resembling the former, but the branches are not so dense, and not connected by radicles, which are only numerous near the foot and attached to foreign bodies. Cells as in the other species, but the shield is ramified like a pair of elk horns. Off Havana in 270 fathoms.

Idmonea flexuosa Pourt.

Branching irregularly, calcareous, white. Branches variously curved or flexuous. Cells long, cylindrical, striated; aperture rounded at the end of a curved tubular projection, almost opposite, with a slight tendency to become alternate. Resembles closely the fossil species *Idmonea coronopus*.

Off Havana in 270 fathoms.

Comatula (Alecto) Hagenii Pourt.

Ten arms. Mouth central, with the five brachial grooves radiating from it. Centre of disc convex, surrounded by about 30 cirrhi, each of which is composed of 18 to 20 articulations, much longer than broad, smooth, of nearly equal size throughout the whole length of the cirrhus. Cirrhi in several circles. A small part of the second radial only visible, so that the axial radial appears almost sessile. The radials of two contiguous arms, and the first brachials of the same pair well separated down to the angle. Arms convex on dorsal side. Syzygia composed of three or seldom four articulations, with very oblique joints, and very finely denticulated edges, better recognized by the touch than by the eye. The first three or four pinnules of the arms long and nearly equal, the pinnules of the middle of the arm shorter than those of the base or extremity. Arms about three inches long. Color pale greenish, turning white in alcohol. All the specimens had the pinnules filled with eggs. Quite abundant in 100 fathoms off Sand Key.

Comatula brevipinna Pourt.

Ten arms. Mouth and anus not seen in the only specimen obtained. About 15 cirrhi, with the same number of long articulations. Seven or eight articulations to every syzygium. The two radials are visible, and have, as well as the axial radials and the two first brachials, a smooth tubercle in the middle. The same pieces are denticulated on the sides, the denticulations meeting those of the collateral radials and brachials, so as to close up the angle between them. A row of very small tubercles on the proximal border of the radials and radial axials. The articulations of the arms somewhat imbricate. First pinnule longest, with about twelve joints. The other pinnules very short, having only five or six joints in the middle of the arm, but lengthening out again near the end of the arm, the last ones being tipped with a hook like the cirrhi.

In the only specimen obtained one of the arms is abortive and divided into three very short branches; to compensate, one of the arms of the next pair is divided into two from its origin.

In 270 fathoms off Havana.

Antipathes filix Pourt.

Main stem erect and straight, pinnate, the pinnules set off nearly at right angles, rather short, alternate, covered with spines or short stiff hairs, and showing a succession of slight swellings and contractions. Axis tough and corneous, nearly black, dark amber color by transmitted light. About 3 inches high. Soft parts not observed.

In 270 fathoms off Havana.

Every specimen obtained served as support to the tubes of an Annelid (*Marphysa antipathum*).

Antipathes humilis Pourt.

Differs from the former by its mode of branching, which is dense and irregularly subflabellate, like a spray of heather; more expanded laterally than in height, which is 3 or 4 inches, whilst the spread is 4 or 5. Every swelling corresponds to a polyp. Polyps all on the same side of the flabellum, six-armed, with very elongated calicle in the younger branches, so that the tentacles appear almost like two parallel rows of three tentacles each. It differs from *A. Boscii* in having rather thicker and more hispid branches, curved somewhat downwards, as the branches of an elm.

Abundant in 270 fathoms off Havana.

Gorgonia exserta Ellis.

Two specimens of this species, 3 or 4 inches high, were obtained off Havana in 270 fathoms. They agree very well with the figures in the different authors. One of them has all the polyps retracted and the calicles closed, the other has them all expanded as usually represented. The whole cortical substance is filled with spindle-shaped spicules, by which character it is distinguished from *Thesea guadalupensis* Duch. and Mich., in which the spicules are covered by a squamose layer.

In 270 fathoms off Havana.

Swiftia exserta Duch. and Mich.

I refer to this species a few specimens of a very small Gorgonian, not more than one inch high, which at first sight does not appear different from the preceding species. Under the microscope the cortical substance appears studded with rough irregular calcareous pieces, without spindle-shaped spicules. The polyps are perhaps a little more verrucose than those of the Gorgonia exserta. Off Havana in 270 fathoms.

Acanthogorgia aspera Pourt. (The generic name given by Gray has priority over the name *Blepharogorgia* Duch. and Mich.)

Slender, flabelliform, few-branched, sparsely beset with short spines. Polyps rather scattered, long verruciform (length equal to four or five times the diameter), with eight rows of spines longest at the base and at the summit of the polyp. Tentacles black, the rest of the polyps translucent. Stem dark brown. The whole polypidom not more than two inches high. By its spiny stem, and spines at the base of the polyps, and by the greater length of the latter, it differs decidedly from *A. hirsuta* Gray, *A. Grayi* and *atlantica* Johnson, and from *A.* (Blepharogorgia) *Schrammi* Duch. and Mich.

In 270 fathoms, off Havana.

Sarcodyction rugosum Pourt.

Small polypidoms rising from creeping stolons, on pebbles. Like little knobs, fragile, rough, closed by the contraction of the polyp by means of about six irregular rough pieces meeting together. When opened, the cavity shows six or eight membranous septa, nearly meeting in the centre. Stolons covered with irregular calcareous pieces. Color dirty white. Diameter of polyps one tenth of an inch. In 270 fathoms off Havana.

Caryophyllia formosa Pourt.

More or less turbinate, on a rather thin curved, or straight stem. Costæ equal, distinct only near the calicle. Calicle circular or subovate, moderately deep. Columella formed of four to six very flexuous or twisted laminæ. Six complete systems of septa. Four cycles. Septa thin, prominent, sharp and rounded on the edge; sparsely granulated. Those of the third order sometimes flexuous near the inner end in some specimens. Twelve pali, opposed to the third order, equal, large, flexuous, ornamented with tubercles disposed in horizontal lines on the convexity of the flexures. The young are rather variable, sometimes long and cylindrical, with the septa little developed and showing neither pali nor columella, and sometimes very small and cup-shaped and showing pali and columella.

The largest are $1\frac{1}{4}$ inches high; calicle $\frac{1}{2}$ inch in diameter.

Abundant in 270 fathoms, off Havana. Specimens mostly alive and growing singly or attached to each other.

It differs from *C. Berteriana* which has the costæ more prominent and a different number of septa. I have not seen specimens or figures of *C. Guadulpensis*, which is fossil in volcanic formations of Guadaloupe, and may not be extinct.

Deltocyathus Agassizii Pourt.

Corallum discoidal, free at all ages. Wall nearly horizontal, sometimes with a nipple-shaped projection in the centre. Costæ well marked, covered

with spiny or smooth granules; the six primary costæ in one specimen much broader than the others and forming a star. Septa in six complete systems, with four cycles; covered with small spinous tubercles. Pali of the first, second, and third cycles projecting generally higher than the septa, to which they are soldered at the base. The pali of the first cycle short, those of the third joined to those of the second, as in the fossil species, but the point of junction not being exsert the V or delta is not as apparent. Columella papillose and small, rising from the primary and secondary pali which meet in the centre.

Dredged from 270 fathoms off Havana, in numerous specimens of all ages, but none apparently alive.

Platytrochus coronatus Pourt.

This species, not belonging properly to the region under discussion, is based on a specimen brought up by the sounding lead from a depth of 460 fathoms in lat. 30° 41′ N., and long. 77° 3′ W., by one of the hydrographical parties of the Coast Survey. It is in a bad state of preservation, the outer wall and base being so corroded as to make the characters drawn from the epitheca and costæ very doubtful; the septa and columella are also rather imperfect.

Corallum free, base horizontal, with a tubercle in the centre. The costæ of the primary and secondary order alone distinct, forming a crown of twelve large tubercles around the base, but vanishing towards the edge of the calicle. Wall vertical, almost at a right angle with the base and the circular calicle. Six complete systems of septa, in four cycles. Septa meeting in the centre Those of the tertiary cycle frequently but not regularly coalescing with the primary or secondary ones. Columella probably papillose (nearly destroyed). Diameter $\frac{6}{10}$ of an inch, height (without the central tubercle) $\frac{4}{10}$ of an inch.

Diplohelia profunda Pourt.

Corallum branching, cylindrical, finely granulated or striated, particularly on younger branches and around the calicles, which are projecting, very deep and pocket-shaped. Septa 24, nearly equal, not exsert, finely serrated and tuberculated, nearly meeting at the bottom of the fossa. Columella formed of six or seven club-shaped styles, not very distinct from the septa. The specimens obtained were all in fragments 2 or 3 inches long. Diameter $\frac{2}{10}$ inch.

This species resembles the fossil *Dipl. raristella*, but has deeper calicles and somewhat rougher surface.

Dredged from 350 fathoms off Havana; all the specimens dead; also brought up by the lead in same condition in 1050 fathoms, lat. 28° 24′ N., long. 79° 13′ W.

Crypthelia Peircei Pourt.

Corallum arborescent and subflabellate, irregularly dichotomous, slender, finely striated. Calicles subpedicellate, always of a larger diameter than the stem, facing to one side only of the corallum. Septa 12 to 16, thick, not extending far into the calicle. Columella not seen. The lower border of the calicle prolonged into a rounded lip folded over so as to hide the fossa. Some of the calicles are inflated and globular, perhaps from the presence of parasites. Size: $\frac{1}{2}$ an inch long (broken), diameter of stem from $\frac{1}{20}$ to $\frac{1}{30}$ of an inch, of the calicles $\frac{1}{30}$ to $\frac{1}{40}$.

This very pretty coral was dredged off Havana in 270 fathoms, but appears to be rather rare, only a few small fragments being obtained. It differs from the species described by Milne-Edwards in having a smaller lip, hiding only the fossa of the calicle, whilst in the species from the Pacific the lip is as large as the whole calicle. I have also found worn fragments in a specimen of bottom from 600 fathoms in lat. 31° 32′ N., and long. 78° 20′ W.

Stylaster complanatus Pourt.

Corallum branching, flabellate, not coalescing, slender. Calicles terminal, pedicellate; gemmating from the edge of the preceding calicle, generally on alternate sides, so as to give a zigzag form to the branch, but sometimes two or even three new corallites rise from the border of one. They are directed slightly more towards one side of the plane of the corallum than the other. Calicles compressed in the same plane, moderately deep, the styliform columella appearing at the bottom rising out of a small round fossa, and surrounded by rudimentary pali. Septa 12, appearing like folds of the wall, not extending far into the calicle, and punctured with small pores on the edge. When the branch rising out of a calicle increases in size, the calicle becomes hidden by the plicated lip raised against the stem, and at length becomes obsolete. Spiny ampullæ scattered along the stems, more abundantly on the rear side. It is white, about $1\frac{1}{2}$ inches high; the diameter of the calicles about $\frac{1}{30}$ of an inch.

Obtained in 270 fathoms off Havana.

It approaches nearly to *Stylaster elegans* Duch. and Mich., which has however nearly circular calicles with shorter pedicles and thicker branches. (The name *St. elegans* has been anticipated by Verrill for a species from the Kingsmill Islands, in Bull. Mus. Comp. Zoöl., Cambridge, 1864; I would propose therefore the name of *St. Duchassaingii* for the species from Guadaloupe.) From *Allopora maderensis* Johnson, to which it is very closely allied, it differs also by the compressed form of the calicles.

By its scale-like lip hiding the fossa in the older calicles, and by its transversely elongated terminal calicles, this species forms a passage to the

genus Errina as defined below. It is here retained among the Stylasters on account of its distinct septa and the absence of tubular pores having a longitudinal fissure below. On the other hand the passage through *St. flabelliformis* to the Stylasters with round scattered calicles appears natural. When I have had more opportunity of examining the allied forms, it may be necessary to separate *S. complanatus* generically from the true Stylasters. The whole group of corals comprising the genera Stylaster, Errina, Allopora, and Distichopora, all closely allied, requires careful revision.

Genus Errina.

A comparison of specimens of *Errina aspera* Gray, in the Museum of Comparative Zoölogy in Cambridge, with the two species described below, showed very plainly that Gray has overlooked the true calicles and mistaken for them the tubular pores scattered over the younger branches. In his species these pores are very large and numerous, and the calicles small and concealed; in the new species, here described under the name of *St. cochleatus*, the reverse is the case. The structure of the latter species being once well understood, it is very easy to recognize the same parts in the other; of both I have furthermore made careful sections for the microscope. Whilst retaining the name adopted by Gray, I propose the following generical definition.

Corallum branching, subflabellate, finely granulated or obscurely striated, the younger branchlets more or less studded with tubular pores, split downwards into a furrow. Calicles at first terminal, in shape of a transverse slit, of which one lip continues to grow in a conical shape to repeat the process, whilst the other expands in the shape of a bract or spoon, hiding the calicle after it has become lateral. Fossa circular and very deep; septa obscure or none; pali rudimentary in the shape of small beads; columella pistilliform. Ampullæ as in Stylaster.

Errina cochleata Pourt.

Corallum branching, very slender, subflabellate, finely granulated and striated, studded with echinulated ampullæ. Branchlets almost filiform; the pores on them are sometimes tubular with a longitudinal fissure below. Fossa round and deep, the spoon-shaped lip hiding it entirely. Columella pistilliform and somewhat hirsute, very deep seated. Septa few and indistinct, formed by folds of the wall.

Compared with *Errina aspera* from Fayal, it is found to differ from it in having slenderer branches, with fewer and smaller furrowed tubercles and fewer echinulated ampullæ, whilst the calicles are larger and more conspicuous. The whole corallum is about one inch high. Found in 270 fathoms off Havana.

Fragments of an Errina, closely resembling *E. aspera*, have been also found by me in a specimen of bottom from 600 fathoms, in lat. 31° 32′ N. and long. 78° 20′ W.

Errina glabra Pourt.

Corallum flabellate, not coalescing, with the older parts of the stem massive, faintly granulated and striated; a row of very small perforated tubercles on each side of the branches. Calicles very small, terminal on branchlets, obsolete on larger branches, and their place indicated by a small scale. Septa indistinct. Columella styliform in a deep fossa. Ampullæ scarce and small, smooth. Color white. Two or three inches high.

It differs from *Errina cochleata* in having much thicker branches, even when young, forming smaller angles with the stems. The ampullæ are not spinous. The tuberculated pores are confined to the sides of the branches and have seldom a distinct furrow. From *Errina aspera*, although resembling it in general habitus, it differs in having slenderer branches, less numerous ampullæ, and lacking the large furrowed pores on the younger branches.

Distichopora sulcata Pourt.

Corallum dendroid, much compressed, somewhat rugose. The calicles on the edge, mostly confluent; fossa a deep round hole. Septa about 12, very rudimentary; the border of the calicle pierced by about eight or ten pores which form lateral rows when the calicles are joined. Columella deep seated, seldom visible, styliform, hirsute, similar to the columella of the Stylasters. The interior of the calicle is studded with bead-like tubercles.

This species differs from other known species of the genus in being more compressed, having the pores larger, more distant, and when confluent forming a much deeper furrow. When the calicles are isolated, they present all the characters of Allopora, as shown in *A. oculina*, Ehr.

Found in 270 fathoms off Havana; rather scarce. Also in the shape of worn fragments in a specimen brought up by the lead from 600 fathoms in lat. 31° 32′ N. and long. 78° 20′ W., which is near the outer edge of the Gulf Stream off the coast of Georgia.

Of the close relationship of Distichopora with the Stylasters, and still more with the Alloporas, I entertain no doubt, after a careful examination. Indeed, I can see no reason for separating generically Allopora and Distichopora, which appears to differ only by the confluence or non-confluence of the calicles, both of which characters are found in the same individual in the species described above.

Heliopora tubulata Pourt.

I refer with great doubt to that genus, a form of small corals of which I have obtained but a few fragments, representing two species. Corallum

small, branching, cylindrical, with pores of three kinds: small microscopical, somewhat larger and tubulated, and large round holes. The latter are rather distant, in irregular longitudinal rows. No trace of septa or columella. The internal structure shows a net-work of round canals communicating with the pores and with each other. The larger holes communicate with a cavity in the centre, not communicating with the next except through the small canals; the walls of these cavities are closely perforated. No floors or tabulæ were to be seen in the only section I was able to make. The largest specimen is one inch high.

Off Havana in 270 fathoms.

Heliopora carinata Pourt.

This species differs from the preceding by its much slenderer branches, on which every tubulated pore is at the extremity of a keel or ridge. The larger round pores are proportionally scarcer and smaller.

Off Havana in 270 fathoms.

Antennularia triseriata Pourt.

Tubular stems rising from a clustered root, straight, erect, not branching, corneous, translucent. Hair-like branchlets in three rows. Polyp cells very small, scattered sparsely on the stem, more plentiful but not dense on the branchlets, campanulate, very short on a longer, conical caliciform stem. Aperture entire. Ovarian cells in the axillæ of the branchlets, compressed, semi-lunar or long kidney-shaped, with the aperture on the inside of the upper horn, looking towards the peduncle.

Eight inches high, dark amber color. Off Sand Key in 100 fathoms.

Thoa pulchella Pourt.

Erect, rooted; stem composed of irregularly twisted tubes, regularly pinnate; branchlets alternate. Cells regularly alternate on the stem and branches, moderately distant, more or less corrugated, slightly contracted towards the four-sided aperture, the four angles of which form obtuse teeth. Ovarian cells long campanulate, regularly scolloped on the border with square teeth. Peduncles as long as the cells.

Off Sand Key in 100 fathoms and off Havana in 270.

Thoa capillaris Pourt.

Erect, irregularly branching. Branches almost capillary. Cells alternate, distant, small, tubular, bi- or tri-articulate; aperture terminal and entire. Ovarian cells large, elongated campanulate, denticulate margin, teeth rounded; peduncles as long or longer than the cell, connected with the latter by a small knob-like joint. One inch high. Off Sand Key in 100 fathoms.

Thoa siphonata Pourt.

Stem composed of irregularly twisted tubes; branches irregularly pinnate. Polyp-cells very small and scarce, tubular, at the base of the peduncle of the very long, tubular ovarian cells. The latter are bent at right angle near the top and terminate in a round aperture. Half an inch high, on Terebratulæ.

Off Havana in 270 fathoms.

Tubularia crinis Pourt.

Irregularly branching; branches rather smaller than horsehair, of dark horn-color, wrinkled at intervals; polyps terminal, large, not retractile. About two inches high, attached to tubes of Annelids. Off Sand Key in 100 fathoms.

In determining the Hydroid polyps, I have made use of the older generic names. The newer subdivision of these genera being based chiefly on characters derived from the softer parts, it is almost impossible to assign a polyp to its proper place in them, unless observed alive.

It would be premature to compare this deep-sea Fauna with the animals inhabiting the regions of lesser depth on the coast of Cuba or Florida. In the first place, many of the smaller forms of animals, such for instance as the Bryozoa or the Hydroid polyps of those shores, are not yet sufficiently known to enable us to say if any of the species dredged exist in any other than the abyssal region. Then, a very different value must be assigned to the different classes of animals under examination. Thus, the dead shells must be left out of the question, at least the smaller ones, for they may have been dropped with the excrements of fishes, or, in the case of Pteropods, have sunk from the surface after the death of the animal. The Crustacea and Annelids being abundant and generally sedentary will, when better known, afford good characteristics of the regions of inequal depth. The same remark applies to the Sponges and the Foraminifera; the great abundance of the latter and the ease with which they may be procured with the sounding-lead renders them particularly useful.

The Echinoderms appear to have a wide range in depth; at least we have two species (*Cidaris annulosa* and *Tripneustes ventricosus*) which are common to the shore and to the depth of 270 fathoms. The upper and lower limits of Pentacrinus are not yet known.

Of the corals, none of the species found in our dredgings are known

to exist in lesser depths; nor have any of the common species of the reefs been brought up from a considerable depth. The Gorgonians however are represented in 270 fathoms by at least two species known to belong to the West Indian Fauna in moderate depths.

Farther researches in all the zones of depth are much needed; and we hope to have an early opportunity of continuing our researches in the Gulf of Florida, so as to throw more light upon this interesting subject.

CAMBRIDGE, December 26, 1867.