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.

No. 7. — *Contributions to the Fauna of the Gulf Stream at great depths* (*2d series*). By L. F. DE POURTALES, Assist. U. S. Coast Survey.

(COMMUNICATED BY THE SUPERINTENDENT OF THE U. S. COAST SURVEY.)

THE researches of which an account was given in the preceding number of the Bulletin were continued in the spring of the present year (1868) in connection with the regular explorations of the Gulf Stream by the Coast Survey. The few dredgings obtained in 1867 had given results of so rich and promising a character, that Professor Peirce, the Superintendent of the U. S. Coast Survey, directed me to accompany the party again, and to dredge on all the lines of deep-sea soundings off the Florida reef.

The U. S. Steamer Bibb, Acting Master R. Platt, U. S. N., was assigned to the work. The means of working were much more complete, a small engine having been set up on deck, by which not only a great economy of time and labor was obtained in hauling up the lead or dredge, but it was found perfectly practicable to work both at the same time ; so that our estimate of time, based on the plan of sounding out a line one day and dredging over the same ground the next, was reduced one half, — an advantage which will be understood by those who know the value of a calm day for such work. For the perfection of the mechanical arrangements, and the difficult task of keeping the reckoning in the current with very scanty landmarks, I am again deeply indebted to Captain Platt and his officers.

The region to be explored this season comprised a section of the Gulf Stream from Sombrero, or Dry Rocks Light-house, on the Florida reef, to Elbow Light-house on the Double-headed Shot Keys ; a section of the St. Nicholas Channel from Salt Key to the opposite coast of Cuba ; a section of Santaren Channel from Anguilla Keys to the edge of the Great Bahama Bank ; and a more detailed examination of the slope extending from the Florida reef to the trough of the channel from Sand Key to Sombrero Light. The sections across St.

Nicholas and Santaren channels were quite successful, as far as the soundings and current observations were concerned; but the few dredgings with which we had to be contented, for want of time and good weather, did not produce much of interest. We were more successful on the slope or so-called *apron* of the reef. Here the great advantage of having a safe anchorage every night inside the reef, and within half a mile of the field of work, allowed the soundings and dredgings to be carried on with great rapidity and success.

The six lines run (as far as possible normally to the reef) were the following: Off Coffin's Patches with only two dredgings; off Sombrero Light with seven dredgings, between 111 and 517 fathoms; off Bahia Honda thirteen dredgings, from 19 to 418 fathoms; off the American Shoal fourteen dredgings, from 16 to 266 fathoms; off the Samboes nineteen dredgings, from 13 to 298 fathoms; and off Sand Key twenty dredgings, from 23 to 306 fathoms. Besides these, numerous casts were made in 100 and 120 fathoms off Sand Key, whilst current observations were in progress.

The figures and the character of the bottom developed by the different lines were found quite concordant. At an average the slope, after leaving the reef, is uniform for four or five miles, and the bottom is composed of more or less comminuted shells and corals, with a rather scanty living Fauna. This we may call the first region. The next extends in the form of a band parallel to the reef, ten to twenty miles broad, beginning at a depth of about 90 fathoms, and extending to about 300; the slope being much less inclined than in the first region, and in fact deserving in a great part of its extent the name of a submarine plateau. The bottom is rocky, rather rough, and consists of a recent limestone, continually though slowly increasing from the accumulation of the calcareous *débris* of the numerous small Corals, Echinoderms, and Mollusks living on its surface. These *débris* are consolidated by the tubes of Serpulæ, the interstices filled up by Foraminifera, and further smoothed over by Nullipores. It is not unreasonable to suppose that we have here the foundation of a future reef, which, when in the course of ages it shall have approached the surface, will be covered with a growth of Madrepores and Astreans, such as we find on the present barrier reef, and as have lived on the former reefs constituting the chain of the Florida Keys, the border of the main-land of the peninsula, and probably some older as yet unexplored ones in the Everglades.

This region ceases at a depth varying from 250 to 350 fathoms; the third region begins with a more rapid slope, and extends over the whole trough of the channel, the depth of which in this part does not much exceed 500 fathoms. This is the great bed of Foraminifera, and more specially of Globigerinæ, which covers so great an extent of the bottom of the ocean, and which, as we shall see, is not destitute of living representatives of the higher branches of the animal kingdom.

The Fauna of the three regions is very distinctly marked. The first region is singularly barren, and shows that the rich Fauna of the Florida reef extends but very little to seaward or into depth. The greater number of the shells brought up are dead and broken, and can scarcely be regarded as characteristic, as large numbers of them have evidently served as food for turtles and fishes, and may have been thus transported some distance. Crustaceans and Annelids are more common. The Echinoderms are represented by a few Ophiurians, and the Corals chiefly by *Balanophyllia floridana*, nov. sp., very abundant in some places, particularly near Sand Key.

The second region, on the contrary, is remarkably rich in animal forms, which may be in part attributed to the hard and rough bottom offering points of attachment and shelter. If this formation were emerged, the geologist would find it to consist of beds of limestone full of fossils, of which we shall point out the most characteristic ones; remarking, however that though the great majority of the animals furnishing those remains now live on the bottom, a few contribute by sinking after death from the higher regions of the superincumbent water (teeth of fishes and shells of Pteropods), and others are brought by currents from littoral regions (bones of Manatee, fragments of littoral plants).

The *Vertebrates* are represented by the bones of the Manatee, chiefly fragments of the ribs. These are quite abundant, no less than ten or twelve casts of the dredge having brought them up, generally several pieces at a cast. Until we are better acquainted with the set of the currents on the west coast of Florida and the coast of Cuba, the former *habitat* of these animals cannot be guessed at with much certainty, as their carcasses, either floated out of the estuaries of those coasts, or when very numerous, as they evidently were, the animals may have been in the habit of migrating across the straits, and may have been frequently destroyed by sharks on the passage. As no fresh addition of

these bones is now made to the bottom, nor has been since these coasts have been settled upon by white men, we have a proof that the deposit due to other causes is very slow, since the dredge finds the bones still lying loose on the bottom.

The other vertebrate remains are teeth of sharks and eggshells of skates. Living fishes were obtained in only two instances at about 100 fathoms: one was a Phycis; another, a small fish of the Lophioid family, not yet determined.

The *Crustacea* are rather abundant, but, the specimens not having been fully examined, we can only give now an imperfect list of the genera represented: *Stenorhynchus*, *Inachus*, *Amathia*, *Pisa*, *Mithrax*, *Lupa*, *Ethusa*, *Pilumnus*, *Dromidia*, *Eupagurus*, *Paguristes*, *Galathea*, *Thysanopoda*, *Alima*, *Caridine*, &c.

Of the *Mollusks*, the most abundant in individuals are the Brachiopods, particularly *Terebratula cubensis*, Pourt. (Bulletin Mus. Comp. Zoöl. No. 6), of which over 1,200 specimens were collected, and *Waldheimia floridana*, nov. sp., a little less common. The *Terebratulina Cailleti*, common on the coast of Cuba, was found very rarely on the coast of Florida, and always dead. The Gasteropods are more numerous than the Acephala, but, as well as the latter, are represented by small species. The largest ones are the *Voluta junonia*, and a *Trochus* of about the same size. As the Mollusks of the collection have not yet been determined, a list of the genera must suffice for the present: *Murex* (2 species), *Fusus*, *Nassa*, *Pedicularia*, *Cassis*, *Dolium*, *Pleurotoma*, *Voluta*, *Marginella*, *Natica*, *Vermetus*, *Trochus*, *Monodonta*, *Delphinula*, *Scissurella*, *Fissurella*, *Rimula*, *Emarginulina*, *Pileopsis*, *Dentalium*, *Chiton*, *Marsenia*, *Eolis*; — *Cucullea*, *Pectunculus*, *Nucula*, *Leda*, *Lucina*, *Mactra*, *Neæra*.

The only ones among these abundant in individuals are a Pleurotoma, a Marginella, a Vermetus, a Monodonta, and a Cucullea.

Bryozoa are also frequent in individuals; but there are less species apparently than on the coast of Cuba in similar depths.

The *Radiates* form perhaps the most interesting part of the collection, being represented in many cases by new or little known genera. The Echinoderms have not yet been determined, with the exception of the Holothurians, of which only three species are found; one of them, *Cuvieria operculata*, nov. sp., is tolerably common; the others are a *Thyonidium*, and another which the imperfection of the specimen has

not allowed us to recognize with confidence. Of *Echinida* there are five or six species, of which a *Cidaris* is very abundant, and an *Echinus* rather common. Both are new species, and the immature specimens found on the coast of Cuba, and referred to *Cidaris annulosa* and *Tripneustes ventricosus*, in the Bull. Mus. Comp. Zoöl. No. 6, belong in reality to them. The genera *Echinocyamus*, *Amphidetus*, and a new genus near *Parasalenia*, are also represented. The *Asteridæ* are also represented by several new forms of *Ophidiaster*, *Pteraster*, *Asterias*, and *Luidia*, and among the Ophiurians of genera near *Asteroschema*, *Asteroporpa*, and *Astrophyton*. The *Comatula Hagenii*, Pourt., is found in great abundance. The Gorgonians and Corals will be described at the end of this paper. They belong to the following genera: *Nephthya*, *Primnoa*, 2 sp.; *Gorgonia*, 2 sp.; *Acis*, *Antipathes*, 3 sp. *Cænocyathus*, *Paracyathus*, *Thecocyathus*, *Rhizotrochus*, *Lophohelia*, *Allopora*, *Distichopora*, *Errina*, *Thecopsammia*, n. gen. 2 sp.; *Diaseris*, *Haplophyllia*, n. g. *Pliobothrus*, n. g.

It will be remarked that among the Corals the families of Madreporidæ and Astræidæ are entirely unrepresented, whilst the greater number belong to the families of Caryophyllidæ and Oculinidæ, as defined by Milne-Edwards, or, as we believe, to a new family to be separated from the Oculinidæ, and called Stylasteridæ.

The Sponges are found in this region in numerous forms; they are in general very abundantly provided with siliceous spicula, so much so as to be unpleasant to handle.

The third and last region is characterized by the great Globigerina deposit. No trace of Vertebrates is found here, the accidental remains being probably soon buried in the soft bottom. But other branches of the animal kingdom are still represented as deep as 517 fathoms, beyond which limit we had no occasion to dredge. The Crustaceans are confined to a few small and peculiar forms of Pagurians inhabiting shells of Dentalium and Pteropods. Annelids appear to be comparatively abundant and varied. Of living Mollusks only three species were obtained, — a *Phorus*, a *Dentalium*, and a *Limopsis*, the two latter more numerously; and of dead shells, Pleurotoma, Rimula, and Neæra, besides several kinds of Pteropods, not inhabitants of the bottom. The Radiates comprise a few small *Ophiurians; Bourgueticrinus Hotessieri*, D'Orb. (which will be described further on); *Primnoa*, *Gorgonia*, *Chrysogorgia*, *Acanthogorgia*, *Isis*, *Mopsea*, *Caryophyllia*, *Stephano-*

phyllia, and dead fragments of some of the Corals of the preceding region. Sertularians and Sponges are also found sparingly.

A few general remarks on the deep-sea Fauna may not be inappropriate. First, with regard to dimensions: almost all the species are of small size, compared with the allied forms of the littoral and shoal-water regions in general; the Voluta junonia, the largest shell found, is small for that genus. The only exception is an Echinus, which is nearly of the average size, and an Actinia. The prevailing colors are white, pink, — sometimes playing into orange, — and a pale green. Blue was only seen in a small incrusting Sponge. What proportion of light reaches a certain depth we shall try to determine during our next exploration. It is certain, however, that the deep-sea animals have generally well-developed eyes, larger if anything than those of their congeners of shallow water.

It is rather a matter of surprise to find so great a difference between the Fauna of similar depths on the coasts of Cuba and of Florida, separated as they are by a strait of no great width, and bathed by the same current. The few dredgings obtained on the former coast do not allow us to draw conclusions from the absence of Florida species, but they give still more weight to the inverse. Thus, to restrict our remarks to the Corals, — more carefully studied than the other classes, — of ten species of true Corals from Cuba described in the preceding number of this Bulletin, only two have been found on the Florida coast, and they only in very rare fragments. Something may be due to the gregariousness of Corals in certain spots and their rarity in others. The dredge may come up full of a certain species at one time, and it may never be found again, even in close proximity. This happened to us with regard to Lophohelia affinis, n. sp. The botanist is familiar with such instances among land plants.

We hoped to give in this paper a full catalogue of the species collected; but as time is insufficient, it is thought best to publish the following descriptions as far as completed, and, as the dredgings are to be continued throughout the straits of Florida, the descriptions of the other species will be reserved for a more extended final work.

I take this opportunity again to acknowledge the help I have received from Professor Agassiz in the way of advice and of facilities afforded to me in the Museum of Comparative Zoölogy.

Description of Species.

Waldheimia floridana Pourt.

Shell ventricose, triangular, smooth, wider than long, the widest part being across the front; horn-color. Both valves very convex, the larger one with a shallow longitudinal sinus near the front. Lateral margin of larger valve convex, frontal margin angularly sinuous, and deeply indenting the smaller valve in the middle. Front straight and flattened. Beak prominent and compressed laterally, with a round and rather large foramen. Deltidium small, in two pieces. Loop very long, reaching nearly to the frontal margin of the shell, formed of very thin crura, and a very broad ribbon-shaped reflexed portion. Septum well developed. Lines of growth distinct. Length of shell $\frac{7}{8}$ of an inch, breadth 1 inch.

Very young specimens are flatter, rounder, and have a straight margin; they could scarcely be distinguished from the young of Terebratula cubensis, if it was not for the loop and septum seen by transparency. There is also some variety of form in the old; in some specimens the length is greater than the breadth, and there is considerable diversity in the sinuosity of the frontal margin.

This species is quite common off the Florida reef, between 110 and 200 fathoms, on rocky bottom; it is always associated with Terebratula cubensis, the latter being still more common (in the proportion of about three to one), and making its first appearance in 100 fathoms.

Cuvieria operculata Pourt.

Body oval, flattened, covered with finely and sparsely granulated scales, very compactly imbricated, but overlapping very little except near the mouth and anus. A double row of suckers surrounds the soft abdominal disc, those of the outer row perforating the marginal plates; sometimes two or three suckers indicate a tendency towards a median row near the anterior end. Ten tentacles, of which two are much smaller than the rest. Œsophagial ring of ten pieces shaped like the letter T. The aperture through which the head and tentacles are retracted is closed by five large triangular plates, alternating with and covering five narrow, tooth-shaped ones. In the young the five plates form a very regular pentagonal shield. In the old they close less accurately, and their outside edges are covered by some overlapping body plates. The anus is closed in the same way, but the plates are much less regular or constant.

Length $1\frac{1}{4}$ inches; breadth $\frac{3}{4}$ of an inch. Color light gray.

Not uncommon; in 120 to 150 fathoms off Sand Key.

Thyonidium conchilegum Pourt.

Body very flaccid. Eighteen to twenty tentacles of unequal size, very little ramified, short, with conical papillæ; they are quite difficult to count, as some of them are so small that they may be mistaken for lobes of the larger ones. Suckers in five double rows, with others scattered between. The outer layer of the very thin skin contains a large number of calcareous bodies of the usual type; the base being a square plate with more or less rounded corners, perforated by a round central hole surrounded by eight smaller ones, those at the corners being smaller than those corresponding to the sides of the square. From this plate rise four cylindrical processes, converging towards and supporting a small spiny plate, which projects on the surface of the skin like small warts. These bodies are also plentiful in the suckers up to the terminal disc. In the muscular subcutaneous layer there are patches of smaller bodies formed of agglomerations of round granules. Œsophagial ring provided with retractor muscles, and composed of ten pieces alternately in the shape of a broad letter X and a thin letter T loosely connected. Anus unarmed. Color white, hyaline. Length 2 or 3 inches.

This animal covers itself with shells of Pteropods, particularly those provided with points, one of which seems to be held by every sucker of the body.

It is probably closely allied to T. pellucidum of the northern seas. Not being able to compare specimens, I base this species chiefly on the difference of the number of perforations in the calcareous plates of the skin, the T. pellucidum having four large holes surrounded by twelve smaller ones.

Bourgueticrinus Hotessieri D'Orb.

Several specimens of a living Crinoid were obtained by dredging in 237, 248, and 306 fathoms off the Samboes and off Sand Key, in a bottom of Globigerinæ and other deep-sea Foraminifera. They undoubtedly belong to the genus Bourgueticrinus, as defined by D'Orbigny. I refer them provisorily to the species named above, founded on some small fragments of the stem discovered in the recent breccia of Guadaloupe, which contained the well-known human skeleton now in the British Museum. D'Orbigny gives it as his opinion that his species is probably still living in the West Indian seas; but his figures are insufficient either to prove or disprove the identity of our species with his. A comparison with his specimens even would leave the matter in doubt. It is to be hoped that further researches in the Guadaloupe formation will bring to light specimens perfect enough to settle the question.

The following description is not as full as could be wished, as the specimens are not numerous or perfect enough to warrant a complete dissection.

The *calicle* is in the shape of a regular elongated inverted cone. It is composed of a cycle of elongated basal (pelvic) pieces, followed by the much shorter first radials (costals) alternating with them. These pieces are all so intimately connected with each other that the sutures are seen with difficulty. The surface is perfectly smooth. The first brachials are flat and square, and connected laterally by a membrane. The arms generally break off between these and the second brachials, and the first might therefore be called second radials, as they in a measure contribute to the formation of the calicle; still, as they are movable on the first radials, and similar in shape to the next two joints, it is more natural to name them as we have done. The next two joints, or second and third brachials, are similar, and but little smaller than the first. The arms contract suddenly at the fourth brachial; they are five in number, simple, and composed of forty joints, every pair of which forms a syzygium. The pinnules arise from the side of the upper joint of each syzygium, alternately on one side and on the other. There are none, however, on the four or five first syzygia. The inner side of the arm is channelled, and the middle of the channel is protected by a row of very thin alternate scales.

The *pinnules* are composed of from ten to fourteen somewhat imbricated plates, of which the first two are narrower than the subsequent ones. The inner side is provided with a row of rounded alternate scales similar to those on the inside of the arms.

The *stem* is composed of a variable number of joints; our largest specimen having fifty-nine and the smallest but thirty. The generic character of having the joints flattened at their two ends in planes alternately at right angles to each other is well marked, particularly near the root; it is less apparent near the calicle, though this conformation may still be recognized to within half a dozen articulations of it; the last joints are sensibly round. The length of a joint is on the average about three times its diameter, except the four or five joints preceding the calicle, which are much shorter. The joints are connected by a ligament passing through the central canal, also by two strong ligaments lodged in parallel oval cavities in the articulating surfaces, and finally by a membrane along the edge. This threefold connection is so strong that by applying force it is more easy to break through the body of the joint than to disconnect the articulation.

The *root* is variable; sometimes all its ramifications start from a single joint, whilst in other specimens some five or six joints send out roots from their upper compressed edges. Each root promptly subdivides into a large number of rootlets; the whole is formed of articulated joints, which become much elongated as they become thinner.

The stem and the outside of the calicle are covered with a rough brown skin, which, under the microscope, presents the appearance of a rough, corrugated reticulation. It contains thin calcareous plates without definite shape, and is very liable to fall off. No muscular fibres could be detected under it. J. Müller denies the power of voluntary motion to the stem of Pentacrinus, on account of the total absence of muscles. In Bourguetierinus the stem has indeed no great flexibility, but the complication of the ligaments of the articulations, and the hinge-like arrangement of the latter in two alternate directions would seem unnecessary if the motion is to consist merely in a passive swaying to and fro with the oscillations of the water.

Two specimens have, in place of a calicle, a small conical button, composed of two or three joints. I am not prepared to say whether this is an undeveloped form, or the result of an effort to reproduce a lost head.

The length of the largest stem obtained is $5\frac{1}{8}$ inches, exclusive of root and calicle. The smallest and most complete specimen has a stem measuring only $1\frac{1}{2}$ inches. This specimen has three small stylifers adhering to the outside of its calicle. Small round holes, bored probably by these parasitic mollusks, can be seen also on the calicles of some of the other specimens.

Nephthya nigra Pourt.

Corallum rising from a membraneous expansion, and forming several small tufts of elongated, costate cells, densely grouped. Every part filled with spicules; those of the polyp-cells being long, fusiform, and particularly numerous in the costæ of the cells. Every corallum bears from 150 to 200 polyps. Height 1 inch; color black. Rather common off Sand Key, Florida, from 120 to 152 fathoms.

Primnoa verticillaris Ehrbg.

I refer to this species several branches eight or ten inches long, obtained in 120 fathoms, off Sand Key, Florida. Compared with specimens from the Azores, in the Mus. Comp. Zoöl., some slight differences in the length of the calicles and size of the scales were noticed, but they are not deemed sufficient to warrant a specific separation.

Primnoa trilepis Pourt.

Branches irregularly and sparsely dichotomous, subflabellate. Branchlets very thin and flexible. Calicles in verticils of four, or more generally five, formed of three large cylindrical scales, joined angularly to each other, like the elbows of a stove-pipe. Aperture closed by eight triangular scales. The distance between the verticils is equal to or a little less than the length of the single polyps. The cœnenchyma is very thin, and covered

with irregular imbricated scales. Axis hard and brittle, brown in the thicker branches and yellow in the younger. By its simplified scales, this species makes an approach to the genus *Calyptrophora*, Gray.

A few small branches, five or six inches long, were obtained in 324 fathoms off the Florida reef.

Gorgonia miniata Val.

A small dark crimson Gorgonian, obtained between 100 and 200 fathoms, may perhaps belong to this species. A comparison of the specimens could alone decide, as the description is rather scanty.

My specimens are 3 or 4 inches high, subflabellate; branchlets somewhat flattened at the end. Polyps in two rows, on moderately prominent verrucæ, more closely set than in *G. exserta*. Cœnenchyma rather thick, with fusiform spicules.

Gorgonia exserta Ellis and Solander.

The same Gorgonia which was obtained in the preceding year on the coast of Cuba, and referred to this species, was also brought up from 324 fathoms on the coast of Florida. Having no specimens for comparison, I do not feel quite sure of the determination.

Acanthogorgia hirta Pourt.

Corallum branching irregularly, subflabellate. Stem and branches of about equal thickness. Branchlets flattened and expanded at the end. Cœnenchyma covered with rough fusiform spicules, the upper end of which is free, and raised in the shape of small spires. Verrucæ rather distant on the stems, more numerous towards the ends of the branchlets, irregularly alternate, prominent, lobed, somewhat spinous. Polyps large, filled with long spicules, arranged in a regular pattern, being horizontal near the base, and at length in eight vertical rows, not as long as in most other species. Height about 4 inches; color gray. Dredged in 324 fathoms off the Florida reef.

This species differs from *A. aspera* Pourt. by its thicker stem and branches, less prominent, though thicker, verrucæ, and larger polyps with shorter spines.

Chrysogorgia Desbonni Duch. and Mich.

The specimens obtained by me in 324 fathoms appear to be more loosely branched, and to bear more numerous polyps, than the species to which I provisorily refer them. The figure given by the above authors is too deficient in details for a conclusive comparison.

The cœnenchyma is very delicate, filled with irregular scales, not imbricated. The sclerenchyma is rather brittle, smooth, yellow, of metallic appearance, resembling brass wire. The polyps are alternate, subpeduncculate, numerous, though not contiguous, covered with scales like those of the stem, and closed by eight blunt lancet-shaped scales.

Acis solitaria Pourt.

Corallum never branching, five or six inches long. Cœnenchyma thick, covered with large, elongated, flat spicules, which become smaller and converging on the not very prominent verrucæ. Polyps in two rows, rather closely set; a few scattering ones out of line. No longitudinal furrow. Length 5 or 6 inches; color whitish.

In 200 fathoms.

Isis flexibilis Pourt.

Irregularly branching, subflabellate; branches very long and slender; calcareous joints cylindrical, nearly smooth, or with a few faint striæ, about four times as long as the corneous ones in the thicker branches, but proportionally much longer in the branchlets. Polyps rather thickly set, generally alternate, short, campanulate, armed with short spines. The thickest stems about $\frac{1}{16}$ of an inch in diameter, the branchlets not much thicker than horsehair; the main stems were not obtained. Color dark brown, from a thin cœnenchyma covering the younger branches.

In a few instances the branches appear to arise from the corneous joints.

In 324 fathoms off the Florida reef.

Mopsea eburnea Pourt.

Arborescent, slender, dichotomous. Calcareous joints long, cylindrical, faintly striated, seldom quite straight, not swollen at the ends. Corneous joints very short. (In one case a long straggling branch entirely corneous has grown from a calcareous joiat, and bears four polyps.) Polyps scattered, bright orange, generally arising from the calcareous joints, but also, occasionally, from the corneous ones, surrounded by a spirally twisted bundle of strong spicules, of which eight longer ones project around the tentacles. The latter are pinnate, and strengthened in their whole length by a chain of blunt cylindrical spicules. The color of the whole corallum, with the exception of the corneous joints and the polyps, is pure white.

A fine specimen, 4 inches high, was obtained in 517 fathoms off Sombrero Light, Florida! — The diameter of the thickest part is $\frac{1}{16}$ of an inch; the root was not brought up.

Antipathes tetrasticha Pourt.

Corallum a simple stem, pinnate; the branchlets alternate and double, i. e. two branchlets starting from the same spot at an acute angle, thus forming four rows, two on each side of the main stem. Towards the base one of the branchlets of a pair is frequently abortive. Sclerenchyma black, nearly smooth, showing short spines only under the magnifier. No successive swellings on the branchlets as in *A. filix* Pourt. Polyps small. Height of the corallum 3 or 4 inches.

In 116 and 120 fathoms off Sand Key and the Samboes, Florida.

Antipathes sp.

Fragments of a very slender species were obtained off Sand Key in 26 fathoms, but not sufficient for identification. They are as thin as horsehair, and less, with short blunt spines, and small distant polyps.

Antipathes sp.

Irregularly branching, loosely subflabellate; sclepenchyma black, with very short and scarce spines. Polyps large, as in *A. arborea*, Dana.

Of this species, fragments were dredged up in 195 and 324 fathoms, presenting no very characteristic features in its mode of branching. I shall postpone its identification until an opportunity offers of comparing it with specimens of some of the other described species from the West Indies.

Caryophyllia cornuformis Pourt.

Corallum simple, conical, always regularly curved, distinctly but faintly costate. Calicle circular, rather shallow. Septa very little exsert, thin, and somewhat wavy; in six systems of four cycles. Pali opposite the secondary septa only, sometimes twisted. Columella of one or two twisted processes. Height $\frac{1}{4}$ of an inch; diameter of calicle $\frac{1}{8}$ of an inch. Dredged in 237 and 248 fathoms off Sand Key and the Samboes, Florida, on a bottom consisting of Foraminifera.

This species resembles a Ceratotrochus more than a Caryophyllia, but the single row of pali separates it from the latter genus.

All the specimens obtained have the base broken and apparently decayed, even when living, so that they are probably free when adult. One of them, still alive, was attached to the shell of a Xenophorus by the convex part of its wall.

Cœnocyathus vermiformis Pourt.

Corallum very elongated, cylindrical. Costæ indicated only by lines of very flat tubercles. Calicle circular, shallow. Septa rather thick, flexuose, not exsert in six systems of three cycles. Pali thick, flexuose, in front of the secondary septa. Frequently one of the systems remains incomplete, and

there are then only five pali. Columella of a single twisted lamellar process. The older parts of the corallum are nearly filled up by the thickening of the septa, but the process is never carried out to a total obliteration of the chambers, which can be traced in the shape of slender canals to the very base. Height 1 to 1½ inches; diameter $\frac{1}{16}$ to $\frac{1}{10}$ of an inch.

This small coral is easily mistaken for a tube of an annelid; it is placed in the genus Cœnocya thus, although I have no decided proof of its propagation by budding; in only one case have I found two corallites rising from a common base.

Dredged in 150 to 180 fathoms off Sombrero and Bahia Honda, Florida.

Paracyathus confertus Pourt.

Corallum turbinate, pedicellate. Costæ distinct to the base, not prominent, granulated. Calicle oblong, concave. Septa crowded, thin, entire, slightly exsert, in five cycles, but with considerable irregularity in some of the systems. Pali numerous, difficult to distinguish from the papillæ of the columella.

It resembles *P. De Filippii*, Duch. and Mich., but has a more contracted base and a more elongated calicle.

Rather rare in 50 to 100 fathoms off the Florida reef.

Thecocyathus cylindraceus Pourt.

Corallum attached by a broad base, short, cylindrical. Costæ generally visible through the epitheca which reaches to the border of the circular calicle. Fossa shallow. Septa entire, slightly sinuous, granulated, not exsert, forming six systems of four cycles; one of the systems often incomplete. Pali thick, with sinuous surfaces, fronting all the septa but those of the fourth and fifth order; those of the second order largest. Columella thick; formed of seven or eight papillose processes. Height ½ to ¾ of an inch, diameter about ⅜ of an inch.

Not rare between 100 and 200 fathoms off the Florida reef.

Rhizotrochus fragilis Pourt.

Corallum simple, pedicellate, straight or slightly curved, regularly conical. Calicle subelliptical, deep. Six complete systems of septa, four cycles. Septa very thin, not exsert, finely granulated; those of the first and second order meeting in the centre, and united for about half their height. Costæ not prominent. From the costæ of the second order rudimentary hollow roots arise in pairs at about one third or one half the height of the corallum, and descend along the pedicle to its foot; they are never detached. The wall and the septa are very thin and fragile. Height 1 inch; greater diameter ¾, smaller ½ of an inch.

The color of the polyps is generally greenish, sometimes pale brick red.

Dredged in considerable number from 94 to 324 fathoms off the Florida reef; most abundant about 120 fathoms. It is frequently found growing on a living Cucullæa, much smaller than its parasite.

Oculina disticha Pourt.

Mode of branching unknown. Branchlets slender, with alternate calicles, distant about one diameter from each other. Costæ giving a plicated appearance to the border of the slightly prominent and moderately deep calicles. General surface faintly striated. Septa of the first and second order well developed, those of the third rudimentary, all finely granulated and dentate. Pali fronting the septa of the first and second order. Columella formed by one or two papillæ.

A few dead branchlets only were obtained in 43 fathoms off the American shoal, Florida. They bear a general resemblance to the fossil *Diplohelia raristella*, but the presence of pali prevents the generic association of these corals.

Diplohelia profunda Pourt. (Bull. Mus. Comp. Zoöl. No. 6.)

A few small pieces of this coral were obtained in 324 fathoms off Bahia Honda, Florida. They are in rather a decayed condition, like nearly all the specimens of this species that I have ever seen.

Lophohelia affinis Pourt.

Corallum branching irregularly, sometimes coalescing; the polyps budding in alternate series from the border of the calicle. Surface smooth, or very finely granulated. Calicles very deep. Septa smooth, entire, exsert. Systems unequal. No columella. Color white; polyps flesh-colored, with about twelve club-shaped tentacles, hiding the mouth when contracted. Dredged in some quantity in 195 fathoms off Coffin's Patches, Florida, but no trace of it was found in the numerous other dredgings in the vicinity.

I am unable at present to distinguish this coral from *Lophohelia prolifera* Edw. & Haime (*Madrepora prolifera* Pallas), except that the latter has the calicles a little less expanded, as figured by Ellis. It is rather singular that the largest coral of northern Europe has never been figured since Esper, whose representation is much inferior to Ellis's.

Stylaster erubescens Pourt.

Branching densely, flabellate, not coalescing; younger branchlets slender, with rather dense alternate calicles; older branches much thickened with calicles in irregular rows on one surface, interspersed with ampullæ. Cœnenchyma smooth. Calicles slightly prominent, about $\frac{1}{30}$ of an inch in diameter, deep. Septa nine to twelve, most commonly eleven, equal, shaped

like folds of the wall, joined with each other at a little distance below the edge of the calicle, and thus forming pitlike interseptal chambers. Each one of these chambers encloses a small secondary septum in the shape of a dense vertical fringe of small points resembling hairs, which, when seen foreshortened from above, appears like a small columella.* Columella deep sunk, rounded, and hirsute. Color white, with a delicate pink blush when fresh. Dimensions, 4 to 6 inches in length and breadth of flabellum. Rather common between 120 and 324 fathoms off the Florida reef.

Some of the branches are thickened and hollow, with openings near the end; and the cavities are inhabited by annelids, as has also been noticed by Professor Verrill, in *Allopora californica*. In our specimens the tube seems to be entirely formed by the coral, the annelid contributing nothing himself.

Allopora miniata POURT.

Corallum branching, flabellate, the main trunk rather massive and flattened. Surface finely and sharply granular. Branchlets thick and obtuse. Calicles irregularly but densely distributed on one surface of the branches, becoming obsolete on the main trunk. Small ampullæ abundant between the calicles on the younger branches. Calicles slightly prominent about half a line in diameter, fossa deep, columella spherical, deeply immersed, hirsute. Septa from seven to ten, generally eight, formed as in *Stylaster erubescens*, but the enclosed secondary septa are much larger and distinct, giving the appearance of a calicle surrounded by a number of smaller ones, all provided with columellæ. The edge of the calicle and of the folds is crowded with small sharp points.

The branches seem to have grown in a horizontal trailing manner, as the lower surface often shows signs of contact with foreign bodies.

Color brick red; length, 5 or 6 inches; breadth, 3 or 4 inches. Dredged in depths from 100 to 324 fathoms off the Florida reef, not as frequently as *Stylaster erubescens*.

This species is the most massive of our deep-sea corals; it undoubtedly belongs to the genus Allopora as defined by Milne-Edwards & Haime, if

* This arrangement is particularly apparent in *Allopora miniata* next described, where it was first noticed. It is very distinct also in *Stylaster complanatus* Pourt. I have seen it also in *St. roseus*, Edw. & Haime, *elegans*, Verrill, *tenuis*, Verrill, and *Allopora californica*, Verrill (very distinct); but I failed to see the small septum in *Allopora bella*, Dana, where it is probably more deeply seated, as is the small columella. The character of closed interseptal chambers, containing or not small secondary (or tertiary?) septa, being so general, I see no necessity for separating the genus *Cyclopora*, Verrill, from the true *Stylasters*. This character, furthermore, unites still more closely the genera *Stylaster* and *Distichopora*; in *Errina*, also, the pores mistaken by Gray for calicles are probably only interseptal chambers, soon separated from the calicle by the irregular growth of the cœnenchyma.

we leave out from their generic characters the absence of ampullæ. The two genera Stylaster and Allopora are, however, very closely allied, and in very young specimens the difference in the mode of germination is hardly to be distinguished.

Distichopora foliacea Pourt.

Corallum branching, flabellate, much compressed, finely striated and granulated. The calicles in a somewhat irregular row a little on one side of the edge, which is sharp and finely serrated. One of the rows of lateral pores on the summits of the denticulations, the other not well defined, represented by scattered tuberculated pores. The plane towards which the calicles are situated is thickly studded with ampullæ, each of which has a small lateral opening. They are less numerous on the other surface. Columella deep-seated, but long, hirsute, in the shape of a pointed club. Color orange pink. Height about 2 inches; breadth of the branches about $\frac{1}{4}$ of an inch; thickness $\frac{1}{20}$ of an inch.

This species differs from *D. sulcata* Pourt., from the coast of Cuba, by its smaller calicles not placed in a furrow, irregular lateral pores, and serrated edge.

Dredged rather frequently between 100 and 200 fathoms off the Florida reef.

Errina cochleata Pourt.

Of the two species of Errina found quite abundantly on the coast of Cuba, only this one is found on the Florida side, and that is exceedingly rare, only one small specimen having been obtained in 183 fathoms off Sombrero Light-house.

Balanophyllia floridana Pourt.

Corallum elongated, conical, straight, pedicellate. No epitheca; wall porous, costate to the foot. Calicle rather deep, elliptical. Septa entire, slightly exsert, finely granulated, in six unequal systems of four cycles, with rudiments of the fifth in some of the systems. The septa of the fourth cycle, bent and united in front of the tertiaries, and protracted as one septum to the columella, which is flattened and papillose.

The polyps are red; the mouth very oblong; height about 1 inch; longer diameter $\frac{1}{2}$, shorter $\frac{3}{8}$ of an inch.

Dredged in abundance off Sand Key, Florida, in 26 fathoms. I refer also to this species some dead and worn specimens obtained off the coast of Cuba in 270 fathoms.*

* A *Dendrophyllia* was also obtained in the same dredging off the coast of Cuba, but too much worn to be identified or described.

Genus Thecopsammia Pourt.

Corallum simple, attached, without costæ, covered with a complete epitheca. This genus is intermediate between Balanophyllia and Heteropsammia; like the latter, it is destitute of costæ, but it has an epitheca like some of the Balanophyllia, but still more developed.

Thecopsammia tintinnabulum Pourt.

Corallum subcylindrical, or almost hemispherical, with turbinate base and small, abruptly constricted peduncle. Wall thick, very porous and vermiculated. Epitheca well developed, seldom rising quite to the border of the calicle, its tissue penetrating the mural pores and solidifying the wall. Calicle slightly elliptical, moderately deep. Septa in six unequal systems and four cycles, entire, thin, not exsert, covered with fine granulations; those of the fourth and fifth order scarcely bent towards those of the third, and not connected with the latter or with each other. The septa of the first and second order connected with the columella. The two opposite systems on the longer sides of the calicle always incomplete in one of their halves; and one or two of the other systems also sometimes incomplete in the same manner. The columella is papillose and porous, sometimes sublamellose, and forms three indistinct masses in the adult, of which the middle one is largest.

Height $\frac{3}{4}$ of an inch to an inch; longer diameter of calicle about $\frac{1}{2}$ an inch, shorter about 0.44. Common between 100 and 300 fathoms off the Florida reef.

The mouth of the polyps is elongated, and surrounded by not very numerous conical tentacles; the color, when living, is a handsome pinkish orange.

Thecopsammia socialis Pourt.

Corallum turbinate, rather long conical, with a thick, not constricted, peduncle frequently attached to each other. Wall and epitheca as in the preceding species. Calicle elliptical, fossa moderately deep. Septa entire, smooth, crowded, not exsert; thick, near the wall. Five cycles of septa in six unequal systems. The septa of the fourth cycle bent towards each other, and meeting in front of those of the third, in the deeper part of the calicle (only visible in a horizontal section). The septa of the sixth and seventh order appear only in a few of the systems in old specimens; they become larger than those of the preceding cycle; the tertiaries generally remain the smallest of all. The columella is papillose and porous, though more compact than in the preceding species, and nearly always forms three distinct masses, of which the middle one is largest.

Found in the same depths as the other, but more common towards Sombrero than near Sand Key.

Stephanophyllia folliculus Pourt.

Corallum free, without mark of adherence, purse-shaped, or broader at the base than at the calicle. Costæ broad, granulated, nearly meeting at the apex, the primary ones continuous, the tertiaries uniting with the secondaries. Intercostal furrows narrow. Calicle circular or subhexagonal, slightly concave. Septa in six complete systems of three cycles, covered with large papillæ, not exsert. The primaries and secondaries meet in the centre with each other, and with an indistinct columella; the tertiaries connect with the secondaries at about half the length of the radius.

Height 0.12, diameter of calicle 0.10, diameter of base 0.11 of an inch. Dredged in 237 fathoms off the Florida reef.

I refer this coral, of which I have but one specimen, to the genus Stephanophyllia with some doubt. It has most of the characters of the genus, except the discoid shape. It is, most likely, a very young specimen.

Diaseris pusilla Pourt.

Corallum subelliptical, very fragile. Wall flat or slightly concave, imperforate, very thin, finely costate. Costæ thin, alternatively large and small, finely dentate. The base shows the traces of lobes joined together, often very imperfectly. Septa strongly dentate, laciniate, and perforate, marked with strong ridges and furrows, connected with each other by synapticula near the base. Six unequal systems and five cycles of septa, one or two of the systems generally incomplete. The primary septa more lobed and much higher than the others; those of the lower cycles tending to unite with those of cycles preceding them. Fossa well marked, oblong. Columella rudimentary, in the shape of a narrow ridge. Mouth of the polyp in the shape of a long slit. Color dark brown. Diameter $\frac{1}{2}$ an inch.

Numerous fragments of the living coral were obtained, but it is so fragile that only one was brought up entire. Found in 119 to 143 fathoms off Sand Key.

I suspect from some of the fragments the existence of a second species, with more equal, not lobed septa, and less distinctly costate base, but there is not enough of it for a good description.

The singular Coral next to be described strikes one at first sight by its resemblance to some of the members of the group of the Rugosa of Milne-Edwards & Haime. A closer examination tends to confirm that view, much as it seems improbable to find a living representative of a group so long extinct. In no other division of the corals is the septal apparatus subdivided into systems that are multiples of four; but such is the case in our specimen, though a little obscured by accidental causes. Another, though perhaps less important, character is the smoothness of the septa, which present neither perforations, nor synapticula, nor granulations

Tabulæ, however, there are none, the interseptal chambers being open from top to bottom. Among the Rugosa this character is only found in the family of Cyathaxonidæ, to or near which, therefore, our coral must find its place. From the genus Cyathaxonia it differs in being attached by a broad base, and also by the absence of a septal fossula. The following genus is proposed for its reception : —

Genus Haplophyllia Pourt.

Corallum simple, fixed by a broad base, covered with a thick epitheca; columella styliform, strong, (sometimes double?) very thick at the base. Interseptal chambers deep, uninterrupted by tabulæ or dissepiments.

Haplophyllia paradoxa Pourt.

Corallum subcylindrical, short, fixed by a broad base; epitheca thick, wrinkled, reaching higher than the calicle, and forming around the latter several concentric circles, as if representing the separated borders of several superposed layers. Calicle circular, fossa deep. Septa smooth, without granulations or perforations, not reaching the border of the calicle; like all the internal parts of the calicle, their surface is like enamel. Columella formed of two smooth conical processes, very thick at the base and tending to fill up the chambers. Eight septa larger, and connected with the columella, alternating with smaller ones, which touch the columella at a much lower level. A further cycle is indicated by small ridges of the wall surface, in some of the chambers. No distinction can be made between primary and secondary septa among the eight larger ones, as they all appear equal. This arrangement seems to be the norm. In the specimen before us, the only one unfortunately, there are disturbances in two of the systems or half-systems (systems if we call the eight larger septa primaries, half-systems if we suppose them equivalent to primaries and secondaries). In one case two of the larger septa are joined by a horizontal plate at the top, thus excluding the intervening chamber from the calicle. This structure is probably abnormal, and the result of an effort to exclude a parasite or other foreign matter. A small supernumerary septum has grown out in the next chamber. Nearly on the opposite side of the calicle, one of the secondary septa (counting eight as primaries) has grown to the size of a primary one, and the adjacent tertiary to the size of a secondary, thus disturbing the symmetry.

Height about $\frac{1}{2}$ an inch; diameter of calicle the same.

This coral was living when obtained; the polyp was of a greenish color, but was not otherwise examined when fresh. After having been in alcohol, it could be lifted out entire from the calicle, presenting an exact

cast of the chambers. The mouth is surrounded by a circle of about 16 rather long tentacles, bluntly tuberculated at the tip. Outside the circle of tentacles extends a membranous disc with radiating and concentric folds.

This unique specimen was dredged in 324 fathoms off the Florida reef.

Genus Pliobothrus Pourt.

Tissue more compact than in Millepora; larger pores scarcer, smooth, without any rudiments of septa; smaller pores tubulated; cœnenchyma with still finer linear pores. Form generally branching regularly. Differs from Heliopora by its tissue not being prismatic. I refer to this genus two species described by me as *Heliopora tubulata* and *carinata* (Bulletin Mus. Comp. Zoöl. No. 6), and a third species.

Pliobothrus symmetricus Pourt.

Corallum ramose, rising from an incrusting base and a short trunk, branching into a regular semicircular flabellum. Branches not much divided, cylindrical, and a little flattened and expanded at the tip, which is blunt and rounded. The tendency in branching is towards considerable symmetry between the two halves of the flabellum. Three kinds of pores; very small, linear, over the whole cœnenchyma; larger tubulated, with very minute aperture when unbroken, and larger round or oval ones scattered irregularly. Internal structure somewhat like Millepora, but much coarser. Larger pores interrupted by few but massive tabulæ, but communicating laterally with other canals.

This species is much larger and more branched than *Heliopora tubulata*, and has shorter tubes to the pores.

Color gray; height 1½ inches; spread about three inches; diameter of branches 0.63 of an inch. Not rare between 100 and 200 fathoms off the Florida reef.

Cambridge, Mass., December 8, 1868.

I deeply regret the absence of Count Pourtales from Cambridge at this moment, even though his return to the field of observations which has already yielded him such a rich harvest cannot fail to benefit science in the highest degree. My regret arises chiefly from the fact that he is thus prevented from reaching some conclusions which belong to him by right. But the very day he started on his third journey of

exploration in the Gulf Stream, leaving with me the manuscript of this paper for publication, the memoir of Sars on the *Rhizocrinus* of the Lofoten reached me also, and I at once recognized the identity of the *Bourgueticrinus Hotessieri*, described above, with Sars's *Rhizocrinus lofotensis*, — as far as such relations can be predicated without a direct comparison of the specimens. The identity of animals found at great depths in the Gulf of Mexico and on the coast of Norway would show how extensive the influence of the great Atlantic current is in modifying the geographical distribution of organized beings. The close resemblance of these Crinoids will no doubt lead to a renewed comparison of the *Lophohelia affinis* Pourt. and *Lophohelia prolifera* Milne-Edw. & Haime (*Madrepora prolifera* Pallas). It is now highly probable that Pourtales's species is identical with that long known from the northernmost coasts of Europe, and to which it has very likely been transported by the Gulf Stream; and I doubt not that the identity of other species from Florida, in which a close resemblance to northern species has already been noticed, will also prove identical, as soon as an opportunity is afforded for direct comparisons. Thus happily blended with the investigation of the Gulf Stream, the study of the geographical distribution of animals at great depths cannot fail to make rapid progress, now that — thanks to the comprehensive views of the Superintendent of the Coast Survey — it will no longer be left to chance discoveries, but form a part of the systematic work of the Survey. In this connection it becomes highly important to explore the ocean floor in the vicinity of the Bermudas, as those islands form, as it were, a half-way station between Florida and Norway. On the other hand, the discovery of a coral, Haplophyllia, allied to the extinct type of the Cyathaxonidæ, foreshadows unexpected revelations, as soon as the animal population of the abysses of the ocean shall be extensively explored, instead of being obtained from a few localities only.

I may add that the Museum will supply other institutions with specimens of all the species described above of which duplicates were collected.

LOUIS AGASSIZ.

CAMBRIDGE, December 10, 1868.