SOME FOSSIL CORALS FROM THE ELEVATED REEFS OF CURAÇAO, ARUBE AND BONAIRE.

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INTRODUCTORY REMARKS.

While I was in Europe in the summer of 1897, it was my good fortune to meet Prof. K. MARTIN, Director of the Leyden Geological Museum, who upon hearing that I was making a special study of West Indian fossil corals, kindly offered to place at my disposal the specimens that he had collected in the Dutch West Indies. Hon. CHAS. D. WALCOTT, Director of the United States Geological Survey, has permitted me to study this material and write a report upon it.

The principal object of my journey to Europe during the last International Geological Congress was to visit and study collections bearing upon our American fossil corals. Type collections of a good many of the species discussed in this paper were examined, and it is my pleasant duty here to make acknowledgements for courtesies extended to me at several museums. Dr. WILHELM WELTNER, Custos in the Museum für Naturkunde at Berlin, was very kind to

me, and enabled me to study all of EHRENBERG's types from the West Indies. I also examined some of KLUNZINGER's types. Prof. CAMERANO at Turin, gave me every facility for studying such types of DUCHASSING and MICHELOTTI as are preserved there. The assistants of Prof. EDMOND PERRIER permitted me to study a considerable amount of the material of MILNE-EDWARDS and HAIME in the Muséum d'Histoire Naturelle at Paris. Dr. HENRY WOODWARD and Dr. GREGORY gave me every facility for studying the fossil corals in the British Museum of Natural History; and Prof. F. JEFFREY BELL and Mr. H. M. BERNARD gave me access to all of the recent corals that I desired to study in that institution. The officers of the Geological Society of London gave me all the assistance possible. I studied there most of the types of DUNCAN.

The whole collections of the United States National Museum and of the U. S. Geological Survey have been unrestrictedly at my disposal. Besides these collections the whole material collected by Mr. R. T. HILL, during his many years of work in the West Indies, that collected by Dr. J. W. SPENCER, and the recent collections of the U. S. FISH COMMISSION, have been submitted to me for study. Therefore, putting all together, I probably have been able to examine and study larger bulks of West Indian recent and fossil reef corals than any other one student. I am indebted to Mr. ALEXANDER AGASSIZ and Mr. SAM'L HENSHAW for the loan of books from the Museum of Comparative Zoology, and to Dr. W. H. DALL and Dr. LEONARD STEJNEGER for the use of books in their private libraries. I have often consulted Dr. DALL, Dr. C. W. RICHMOND and Mr. G. S. MILLER, JR., concerning questions of nomenclature.

In stating the synonymy of the species discussed, the references to articles published in the transactions of so-

cieties are to the page numbers of the volumes and not to the page numbers of the separates. This is true of EHRENBERG's *Beiträge zur Kenntniss der Corallenthiere des Rothen Meeres*, in fhe *Abhandlungen der Kgl. Akademie der Wissenschaften zu Berlin*, the articles of DUCHASSAING and MICHELOTTI, etc. In these instances the actual title of the paper is not always mentioned. It may be found in the appended bibliography.

I have credited the article in *Encyclopédie Méthodique* on *Zoophytes* to LAMOUROUX; it is usually credited to DESLONGCHAMPS.

It seems proper to call attention here to the very great difficulty in delimiting the species of compound corals, and to the extremely perplexing synonymy of many of the species; for instance *Orbicella acropora* possesses ten specific synonyms. One of the first causes of trouble is that the older zoophytologists took very little into account the possibilities, and actual facts, of the variations of species. It is especially true of compound corals, where so many features of the corallum are due to the interactiou of individuals, where also the colonies are sedentary and are subjected to so many extraneous influences, character of bottom, depth and purity of water, strength and direction of currents, wave action, etc., that no two colonies or no two coralla, are exactly alike. Many species were founded on the most iusignificant differences. DANA, MILNE-EDWARDS and HAIME, DUCHASSAING and MICHELOTTI, DUNCAN and others have made too many species in this way. Some species have been erected because of insufficient material for comparison. Other species have been made because of gross ignorance and carelessness. DUNCAN is the greatest sinner in this manner. The best work that has been done on these corals is that of POURTALÈS. Nearly all of his work is excellent.

Much of the confusion regarding the naming of the species

is due to the neglect by MILNE-EDWARDS and HAIME of the work done before them, and no one since them has taken the trouble to make a thorough study of the work of the pioneers in zoophytology-LINNÆUS, PALLAS, ESPER, OKEN, LAMARCK, etc., but practically every one has accepted the dictum of the great French authors as law and gospel. They were often arbitrary in their use and manufacture of names, either through ignorance or because they considered themselves sufficient authority for making any changes in nomenclature, or any misapplication of names, pass as valid.

The following paper is a study in synonymy and to a certain degree in stratigraphic distribution. Only nineteen fossil species are identified, but it is hoped that the names of these species are fixed, and that the synonymy so far as given is correct.

This paper may be looked upon as an excerpt from a larger paper, „*The Post-Eocene Corals of the United States*", now in course of preparation. This larger paper will treat of all the post-Eocene species in the United States, and as the species found in Florida, etc., are often not to be separated from the West Indian species, a complete revision of the whole West Indian post-Eocene faunas will be necessary. In that paper more data on the structure of the hard parts of the corals will be given. In my „*Eocene and Lower Oligocene Corals of the United States*", Monograph XXXIX of the U. S. Geological Survey, the microscopic structure of several West Indian species is described as incident to the description of other species. Another paper by myself, for the United States Fish Commission, now completed, contains plates of nearly all the corals collected by the FISH COMMISSION in Puerto Rican waters. To a certain degree it is a companion of this paper.

PAST WORK ON THE WEST INDIAN REEF CORALS.

I have appended to this paper a bibliography of the literature bearing on West Indian and northern South American stony corals and on the coral reefs of those regions. The literature on the subject is so scattered, and it has taken such a long time and so much work for me to get it together, that it has seemed to me that it might be of much use to students intending to undertake work on the subject, if the titles were brought together in a compact form. I shall esteem it a personal favor for any one to notify me of any title that may be omitted from the list of papers.

In the following notes I shall confine my remarks to the palæontology of the reefs. Very little has been published on these fossils in spite of the enormous West Indian literature. SCHOMBURGK in his *History of Barbados*, p. 562, gives an imperfect list of a few species. DUCHASSAING has published a few notes (see Bibliography), and DUNCAN has mixed up, as GREGORY has pointed out, species from Miocene (or Oligocene) to Pleistocene or recent. There are other brief notes but the only really extensive paper is one by GREGORY „*Contributions to the Geology and Physical Geography of the West Indies*" [1]).

As I was able to examine all of GREGORY's material, it may be worth while to give a somewhat critical review of his treatment of the species. His specimens came from Barbados.

Madracis decactis (Lyman). The genus should be *Axhelia*.

1) Quart. Jour. Geol. Soc. Lond., vol. LI, 1895, pp. 255—310, Pl. XI.
GREGORY had previously furnished JUKES BROWNE and HARRISON a list of the Barbadan elevated reef corals. This list, which, excepting some typographic errors, is in all essentials the same as the subsequent more detailed paper on the Geol. and Phys. Geog. of the West Indies, was published by them in their „*Geology of Barbados*" (Quart. Jour. Geol. Soc. Lond. vol. XLVII, 1891, p. 226).

Lithophyllia lacera (Pallas).

Lithophyllia cubensis (M.-Ed. & H.).

I am not sure that these two species are really distinct; however, I am sure that *Antillia ponderosa* Duncan (non-Milne-Edwards and Haime) is a distinct species and does not belong in the synonymy of *L. cubensis*. As Duncan wrongly identified the species with Milne-Edwards and Haime's *Montlivaultia ponderosa*, it has no name. Therefore I propose to call it *Antillia gregorii*, nom. nov. Gregory makes no reference to the work of Brüggemann on „A Revision of the Recent Mussacea" [1]). Brüggemann with perfect justice uses *Scolymia* Haime (op. cit. p. 301) for *Lithophyllia* Milne-Edwards and Haime. The name as first used by Haime [2]) is an exact equivalent of the *Caryophyllia* of Milne-Edwards and Haime (non-Stokes) [3]). The type of which is *Madrepora lacera* Pallas. The *Madrepora lacera* Pallas therefore is the type of *Scolymia*. Milne-Edwards and Haime were not justified in discarding *Scolymia* and proposing in its stead *Lithophyllia* [4]). I agree with Gregory's remarks about the relative values of epitheca and septal dentations in the classification of this group of corals, but I am not prepared to combine *Antillia*, type *A. gregorii* Vaughan (= *A. ponderosa* Duncan [5]), non-*Montlivaultia ponderosa* Milne-Edwards and Haime) with *Scolymia* Haime (type *S. lacera* (Pallas)), because of differences in the septal dentations and in the bases of the coralla of the two species.

Lithophyllia walli Gregory (non-Duncan).

This is not the *Antillia walli* of Duncan. Duncan's species is a true Bowden fossil, and is Miocene (old usage) or

1) Ann. Mag. Nat. Hist. (4), vol. XX, 1877, pp. 300—313.

2) Mém. Soc. Géol. France, t. IV, 1852, p. 279, foot-note.

3) Comptes Rend., t. XXVII, 1848, p. 491.

4) Hist. Nat. Corall., t. II, 1857, p. 290.

5) Duncan Quart. Jour. Geol. Soc. Lond., vol. XX, 1864, p. 28, Pl. V, Fig. 5.

Oligocene (later usage) in age. It belongs most probably in the genus *Circophyllia*. Mr. R. T. HILL has collected some good material in Jamaica but I have not yet completed the study of it.

Eusmilia fastigiata (Pallas).

Eusmilia knorri M.-Edw. & Haime.

I agree with his remarks on these two species.

Mussa angulosa (Pallas). Correct.

Dendrogyra cylindrus Ehrenberg. Correct.

Pectinia mæandrites (Pallas).

Should be Linnæus, becomes *Meandrina mæandrites* (Linn.).

Diploria cerebriformis (Lam.).

Becomes *Diploria labyrinthiformis* (Linn.).

Manicina areolata (Pallas). Correct.

Linnæus first named the species.

Mæandrina filograna (Esper).

Includes two species. One *Platygyra clivosa* (Ell. & Sol.), the other *Platygyra viridis* (Le Sueur).

Mycetophyllia lamarcki M.-Edw. & Haime.

Should be *Mycetophyllia lamarckana* M.-Edw. & H.

Colpophyllia gyrosa (Ell. & Sol.). Correct.

Hydnophora latefundata, n. sp.

Surficial casts of *Agaricia agaricites* (Linn.).

Dichocœnia stokesi M.-Edw. & Haime. Correct.

Lamellastræa smythii Duncan.

Not this species, probably *Dichocœnia stokesi* M.-Edw. & H.

Favia ananas (Pallas).

Becomes *Favia fragum* (Esper).

Orbicella radiata (Ell. & Sol.).

Becomes *Orbicella cavernosa* (Linn.).

Orbicella acropora (Linn.). Correct.

Solenastræa hyades and *abdita* do not belong in its synonymy.

Solenastræa stellulata (Ell. & Sol.).

Probably correct. This group of species is in great confusion.

Cyphastræa costata Duncan.

Gregory's specimens are *Orbicella acropora* (Linn.).

Echinopora franksi, n. sp.

= *Orbicella acropora* (Linn.).

Stephanocœnia intersepta (Esper). Correct.

Astræa radians (Pallas).

Astræa siderea (Ell. & Sol.).

Species correct; genus should be *Siderastrea.*

Agaricia agaricites (Pall.). Correct.

Linnæus first described the species.

Agaricia elephantotus (Pallas).

I am doubtful if *Mycedium fragile* should be included in the synonymy of the species.

Madrepora muricata Linn.

Should be *Isopora muricata* (Linn.).

Porites clavaria Lam.

Should be *Porites porites* (Pallas).

Porites astræoides Lamarck. Correct.

The spelling is *astreoides.* Ehrenberg's *Porites astræoides* is a *Stylophora, St. ehrenbergi* M.-Edw. & Haime.

The reasons for most of the changes of the names used by GREGORY appear in the subsequent discussions of the synonymy of the species.

The revised list of his species is as follows:

1. Axhelia decactis (Lyman).
2. Scolymia lacera (Pallas).
3. Scolymia cubensis (M.-Edw. & Haime).
4. Scolymia walli (incorrect identification, apparently a new species).
5. Eusmilia fastigiata (Pallas).
6. Eusmilia knorri M.-Edw. & Haime.
7. Mussa angulosa (Pallas).

8. Dendrogyra cylindrus Ehrenberg.
9. Meandrina mæandrites (Linn.).
10. Diploria labyrinthiformis (Linn.).
11. Manicina areolata (Linn.).
12. Platygyra viridis (Le Sueur).
13. Mycetophyllia lamarckana M.-Edw. & Haime.
14. Colpophyllia gyrosa (Ell. & Sol.).
15. Dichocœnia stokesi M.-Edw. & H. (+ *Lamellastræa smythi* Greg., non Duncan).
16. Favia fragum (Esper).
17. Orbicella cavernosa (Linn.).
18. Orbicella acropora (Linn.) + *Cyphastræa costata* Duncan (pars) + *Echinopora franski* Gregory, n. sp.
19. Solenastrea stellulata (Ell. & Sol.).
20. Stephanocœnia intersepta (Esper).
21. Siderastrea radians (Pallas).
22. Siderastrea siderea (Ell. & Sol.).
23. Agaricia agaricites (Linn.) + *Hydnophora latefundata* Gregory.
24. Agaricia elephantotus (Pallas).
25. Agaricia fragilis (Dana).
26. Isopora muricata (Linn.).
27. Porites porites (Pallas).
28. Porites astreoides Lam.

Out of thirty-one species I recognize twenty-eight, modified by the remarks made in the foregoing critical review.

THE REEF CORALS OF CURAÇAO, ARUBE AND BONAIRE.

Prof. K. MARTIN in his work *„Geologische Studien über Niederländisch West Indien, auf Grund eigener Untersuchungen"* [1])

1) Leiden, E. J. Brill, 1888.

has given an account of the elevated reefs of the island, and any one interested in the subject may consult his memoir.

Species of the recent Reefs: The U. S. Fish Commission Steamer Albatross, in 1888, made a rather extensive collection of the recent reef corals found around Curaçao, and the material has been deposited in the U. S. National Museum. The following is a list of the species:

Eusmilia fastigiata (Pallas). The species with poorly developed columella.

Stephanocœnia intersepta (Esper).

Mussa angulosa (Pallas).

Favia fragum (Esper).

Colpophyllia gyrosa (Ell. & Sol.).

Diploria labyrinthiformis (Linn.).

Platygyra clivosa (Ell. & Sol.).

Siderastrea radians (Pallas).

Siderastrea siderea (Ell. & Sol.).

Agaricia agaricites (Linn.). One specimen wrapped around a stick. The calices resemble those of *A. agaricites* but are on one side of the lamina as in *fragilis*. The specimen seems intermediate between the two species.

Isopora muricata (Linn.) forma *muricata* s. s. (= *cervicornis* Lam.).

Isopora muricata (Linn.) forma *prolifera* Lam.

Isopora muricata (Linn.) forma *palmata* Lam.

Porites porites (Pallas) forma *clavaria* Lam., but very near *furcata* Lam. [1]).

Porites astreoides Lam.

Later (Young) Quaternary:

Eusmilia knorri M.-Edw. & H.

Stephanocœnia intersepta (Esper).

1) This specimen is illustrated in my report on the Puerto Rican corals.

Orbicella acropora (Linn.).
Scolymia sp. indet.
Favia fragum (Esper).
Diploria labyrinthiformis (Linn.).
Platygyra viridis (Le Sueur).
Platygyra clivosa (Ell. & Sol.).
Siderastrea radians (Pallas).
Siderastrea siderea (Ell. & Sol.).
Agaricia agaricites (Linn.).
Isopora muricata Linn. *forma muricata* s. s.
Porites porites (Pallas).
Porites astreoides (Lam.).

Old Quaternary:

Meandrina mæandrites (Linn.).
Orbicella acropora (Linn.).
Orbicella cavernosa (Linn.).
Colpophyllia gyrosa (Ell. & Sol.).
Platygyra viridis (Le Sueur).
Siderastrea siderea (Ell. & Sol.).
Agaricia agaricites (Linn.).
Agaricia fragilis (Dana).
Isopora muricata forma *muricata* s. s.

Upper Oligocene (Antiguan):

From Serro Colorado, Arube.
Orbicella cavernosa (Linn.).
Orbicella tenuis (Duncan).
Alveopora regularis (Duncan).

Table showing the Stratigraphic Distribution of the Species.

The following table shows the stratigraphic distribution of the species. The whole fauna is typically Caribbean in

character. It may be of interest to compare the table here given with the one given in GREGORY's paper (already cited) which treats of the Barbadan species. In order to make the camparison, the revised names of GREGORY's species as given in the preceeding pages should be used.

All of the Quaternary species (both Young and Old) are also recent, and I have been able to discover no palæontologic criteria for distinguishing between Quaternary and Recent. In the Caloosahatchie Pliocene of Florida, most, if not all, of the species are also recent, but the proportions

	Recent	Late (Young) Quaternary	Old Quaternary	Oligocene
Eusmilia fastigiata (Pallas)	×	—	—	—
Eusmilia knorri M.-Edw. & H.	—	×	—	—
Meandrina mæandrites (Linn.)	—	—	×	—
Stephanocœnia intersepta (Esper)	×	×	—	—
Orbicella acropora (Linn.)	—	×	×	—
Orbicella cavernosa (Linn.)	—	—	×	×
Orbicella tenuis (Duncan)	—	—	—	×
Scolymia sp.	—	×	—	—
Mussa angulosa (Pallas)	×	—	—	—
Favia fragum (Esper)	×	×	—	—
Colpophyllia gyrosa (Ell. & Sol.)	×	—	×	—
Diploria labyrinthiformis (Linn.)	×	×	—	—
Platygyra clivosa (Ell. & Sol.)	×	×	—	—
Platygyra viridis (Le Sueur)	—	×	×	—
Siderastrea radians (Pallas)	×	×	—	—
Siderastrea siderea (Ell. & Sol.)	×	×	×	—
Agaricia agaricites (Linn.)	×	×	×	—
Agaricia fragilis (Dana)	—	—	×	—
Isopora muricata (Linn.)	—	—	—	—
forma muricata s. s.	×	×	×	—
» prolifera Lam.	×	—	—	—
» palmata Lam.	×	—	—	—
Alveopora regularis Duncan	—	—	—	×
Porites porites (Pallas)	×	×	—	—
Porites astreoides Lam.	×	×	—	—

of the numbers of individuals of the respective species is not the same as at present. The commonest Pliocene species are not so abundant now; and *vice versa*, the commonest recent species were in some instances only sparingly represented then.

Manicina areolata (*pliocenica* Gane) is an exception. It is an abundant Pliocene fossil, as well as being an abundant recent species.

The species from the Serro Colorado are typical Antiguan Oligocene, and in all probability are of the same age as the Chipola beds of Florida and the Bowden beds of Jamaica.

SYSTEMATIC DISCUSSION OF THE SPECIES.

Genus Eusmilia Milne-Edwards and Haime. 1848.

Eusmilia knorri Milne-Edwards and Haime.

1848. *Eusmilia knorri*, MILNE-EDWARDS & HAIME, Monogr. Astréides, Ann. Sci. Nat., 3ième sér., t. X, p. 265, pl. V, fig. 1.
1895. *Eusmilia knorri*, GREGORY, Quart. Jour. Geol. Soc. Lond., vol. LI, p. 261.

Gregory has given (loc. sup. cit.) a synonymy of this species. I have not the data at hand to discuss the synonymy myself, so refer only to the original description of the species and Gregory's synonymy. Only one specimen is in the collection from Curaçao. It comes from Vereis. It is merely a fragment, and possesses a fairly well-developed spongy columella. Because of the character of the columella it is identified as *E. knorri*.

The species possesses a rather wide distribution in the present West Indian seas, and is also found in the elevated Pleistocene reefs of Barbados. (Gregory, loc. sup. cit.).

Genus Meandrina Lamarck. 1808.

Type species: Meandrina pectinata LAMARCK (= *Madrepora mœandrites* ELLIS & SOLANDER, Nat. Hist. Zooph., p. 161, tab. XLVIII, fig. 1).
1801. *Meandrina*, LAMARCK, Syst. Anim. s. Vert., p. 372.

1815. *Pectinia* (*pars*), OKEN, Lehrb. Naturgesch., p. 68.
1815. *Mœandra* (*pars*), OKEN, op. cit., p. 70, pl. II, 2nd column, bottom fig. (= pl. IV*a*, ESPER reduced).
1816. *Meandrina* (*pars*), LAMARCK, Hist. Nat. Anim. s. Vert., t. II, p. 244.
1846. *Ctenophyllia*, DANA, Zooph. Wilkes Expl. Exped., p. 169.
1848. *Ctenophyllia*, MILNE-EDWARDS and HAIME, Ann. Sci. Nat., 3ième sér. t. X, p. 276.
1851. *Pectinia*, MILNE-EDWARDS and HAIME, Arch. Mus. Hist. Nat., t. V, p. 56.
1857. *Pectinia*, MILNE-EDWARDS and HAIME, Hist. Nat. Corall., t. II, p. 206.
1884. *Pectinia*, DUNCAN, Jour. Linn. Soc., vol. XVIII, p. 86.
1820 non *Meandrina*, SCHWEIGGER, Handb. Naturgesch., p. 420.
1846 non *Meandrina*, DANA, Zooph. Wilkes Expl. Expd., p. 252.
1848 non *Meandrina*, MILNE-EDWARDS and HAIME, Comptes Rendus, t. XXVII, p. 493.
1857 non *Mœandrina*, MILNE-EDWARDS and HAIME, Hist. Nat. Corall, t. II, p. 388.
Not *Mœandrina* of subsequent authors.

This name *Meandrina* has had a perplexing and exasperating history. When Lamarck proposed it, he included only one species in the genus, referring at the same time to a figure by Ellis and Solander which is of the *Meandrina pectinata* of Lamarck, the *Madrepora mœandrites* of Linnæus and of Ellis and Solander. This species is the type and it cannot be supplanted by any other. In 1815, Oken proposed the name *Pectinia* for a genus in which he included two species *Meandrina pectinata* and *Madrepora lactuca*. In the same work Oken used *Mœandra* which was defined „Mundungen als Furchen vielfaltig hin und hergewunden wie Hirnwindungen, unverzweigt, in Klumpen" [1]). He included in the genus *M. areola* (*Manicina areolata* (Linn.)); and *M. mœandrites* which he divides into two varieties, „*a.* Gemeines Hirnkorall *Matrepora mœandrites* Pallas *labyrinthiformis* Linn. Blätter gezähnelt. Das gewöhnliche das man in Kabinetten antrifft." This is partly *Diploria labyrinthiformis*, but surely a considerable number of species is here

1) Lehrb. Naturgesch., p. 70.

confused. „*b.* Irrgarten, *M. labyrinthiformis* Pallas, *mæandrites* Linn.; Blätter ungezähnelt. Sehr selten. Amerika, auch im Mittelmeer, u. s. w." This is *Meandrina mæandrites* (Linn.) + *pectinata* Lamarck.

„Hieher *Matrepora gyrosa, dædalea, natans*".

The figure given by Oken, pl. II, 2nd column, bottom figure, is a copy somewhat reduced of Esper's pl. IV A, which is *Madrepora mæandrites* Linn. = *Meandrina mæandrites* (Linn.). I think it best to consider the figured species as the type of the genus. This would make *Mæandra* Oken a synonym of *Meandrina* Lamarck.

Lamarck in 1816 included nine species in his *Meandrina*, the last one being the *Madrepora filograna* of Esper (= *clivosa* of Ellis and Solander). Dana's *Ctenophyllia* covers precisely the same ground as Lamarck's original *Meandrina*. In 1848, Milne-Edwards and Haime in the Ann. Sci. Nat., t. X, use *Ctenophyllia* for Lamarck's original *Meandrina* (following Dana), and in the Comptes Rendus, t. XVII, make *filograna* the type of *Meandrina:* i. e. they ignored the Système des Animaux sans Vertèbres of 1801, and selected as the type of the genus the last species referred to the genus in Lamarck's Histoire Naturelle des Animaux sans Vertèbres of 1816. In 1851, in their Polypiers des Terrains Paléozoiques, *Pectinia* of Oken replaces their previous *Ctenophyllia;* the same course is followed in the Histoire Naturelle des Coralliaires of 1857.

The type of *Meandrina* being absolutely fixed, we can make disposition of the other names.

First as to *Pectinia.* Since two species were originally included in the genus by Oken, one of them must be the type. The species *pectinata* cannot be the type because it was already the type of *Meandrina*, therefore *lactuca* must become the type of *Pectinia* and *Tridacophyllia* of Milne-

Edwards and Haime must become a synonym of *Pectinia*. *Mæandra* becomes a synonym of *Meandrina*.

Ctenophyllia is an exact synonym of *Meandrina*. A new name must be used for what Milne-Edwards and Haime have called *Mæandrina*. The name *Platygyra* of Ehrenberg, which has not been employed by subsequent authors, is available. The name *Platygyra* is fully discussed later in considering the species referable to it.

These changes in names can be summarized thus:

Present names.	Names used by Milne-Edwards in 1857.
Meandrina.	Pectinia.
Pectinia.	Tridacophyllia.
Platygyra.	Mæandrina.

These changes are unfortunate, but they seem inevitable.

Meandrina mæandrites (Linnæus).

1758. *Madrepora mœandrites*, LINNÆUS, Syst. Nat., ed. X, p. 794.
1766. *Madrepora mœandrites*, PALLAS (as applied to Seba, t. III, pl. CXI, fig. 8), Elench. Zooph., p. 292—294.
1766. *Madrepora labyrinthica*, PALLAS (non-Linnæus), op. cit., p. 297. (Synonymy given by Pallas not of *Madrepora mœandrites*).
1767. *Madrepora mœandrites*, LINNÆUS, Syst. Nat., ed. XII, p. 1274.
1786. *Madrepora mœandrites*, ELLIS & SOLANDER, Nat. Hist. Zooph., p. 161, pl. XLVIII, fig. 1.
1789. *Madrepora mœandrites (pars)*, ESPER, Pflanzenth., p. 78, pl. IV A (not pl. IV).
1790. *Madrepora mœandrites*, GMELIN, Linn. Syst. Nat., ed. XIII, p. 3761.
1797. *Madrepora lamellosa*, HUMPHREYS, Mus. Calonn., p. 66.
1797. *Madrepora mœandrites var.*, ESPER, Pflanzenth. Fortsetz., p. 101, pl. LXXX, fig. 2.
1801. *Meandrina pectinata*, LAMARCK, Syst. Anim. s. Vert., p. 372.
1815. *Pectinia pectinata*, OKEN, Lehrb. Naturgesch., p. 68.
1815. *Mœandra labyrinthiformis b*, OKEN, op. cit., p. 70.
1816. *Meandrina pectinata*, LAMARCK, Hist. Nat. Anim. s. Vert., t. II, p. 247.
1820. *Meandrina pectinata*, SCHWEIGGER, Handb. Naturgesch., p. 420. (Ref. to pl. IV of Esper, wrong; this is *Manicina areolata*).
1821. *Meandrina pectinata*, LAMOUROUX, Exp. Méth. Genr. Polyp., p. 54, pl. XLVIII, fig. 1 (non pl. LI, fig. 1).
1823. *Meandrina pectinata*, DE BLAINVILLE, Dict. Sci. Nat., t. XXIX, p. 376.
1824. *Meandrina pectinata*, LAMOUROUX, Encycl. Méth., Zooph., p. 508.

1825. *Pectinia pectinata*, DE BLAINVILLE, Dict. Sci. Nat., t. XXXVIII, p. 201.
1829. *Meandrina pectinata*, EICHWALD, Zool. Spec., p. 185.
1830. *Meandrina pectinata*, DE BLAINVILLE, Dict. Sci. Nat., t. LX, p. 322.
1834. *Manicina pachyphylla*, EHRENBERG, Abhandl. Kgl. Akad. Berlin for 1832, p. 326 (non *Manicina pectinata*, EHRENBERG = *Plerogyra lichtensteini* MILNE-EDWARDS & HAIME; nec *Manicina mœandrites* EHRENBERG = *Colpophylla fragilis* DANA = *C. gyrosa* (Ell. & Sol.)).
1834. *Meandrina pectinata*, DE BLAINVILLE, Man. Actin., p. 357.
1836. *Meandrina pectinata*, LAMARCK, Hist. Nat. Anim. s. Vert., 2ième éd., t. II, p. 387.
1837. *Meandrina pectinata*, LAMARCK, Hist. Nat. Anim. s. Vert., 3ième éd., t. I, p. 290.
1846. *Ctenophyllia meandrites*, p. 170, pl. XIV, fig. 13: *Ctenophyllia quadrata*, p. 170, pl. XIV, fig. 14;? *C. pachyphylla*, p. 172, pl. XIV, fig, 15;? *C. profunda*, p. 172, pl. XIV, fig. 16, DANA, Zooph. Wilkes Expl. Exped.
1848. *Ctenophyllia mœandrites*, p. 277; *Ctenophyllia quadrata*, p. 278;? Ct. *pachyphylla*, p. 279;? Ct. *profunda*, p. 280, MILNE-EDWARDS & HAIME, Ann. Sci. Nat., 3ième sér., t. X.
1850. *Meandrina pectinata*, DUCHASSAING, Anim. rad. Ant., p. 16.
1851. *Pectinia mœandrites*, and P. *quadrata*, MILNE-EDWARDS & HAIME, Arch. Mus. Hist. Nat., t. v., p. 57.
1855. *Meandrina pectinata*, DUCHASSAING, Bull. Soc. Géol. France, sér. 2, t. XII, p. 754.
1857. *Pectinia mœandrites*, p. 207; *P. pachyphylla*, p. 208; *P. quadrata*, p. 209; and? *P. profunda*, p. 210, MILNE-EDWARDS and HAIME, Hist. Nat. Corall., t. II.
1861. *Pectinia quadrata; P. mœandrites; P. disticha, sp. nov.*, pl. IX, fig. 16; *P. elegans, sp. nov.*, p. 342; *P. caribœa, sp. nov.* p. 343, DUCHASSAING & MICHELOTTI, Mém. Corall. Ant.
1866. *Pectinia quadrata, P. mœandrites, P. disticha, P. elegans, P. caribœa*, DUCHASSAING & MICHELOTTI, Sup. Mém. Corall. Ant., p. 168.
1870. *Pectinia quadrata, disticha, elegans, caribœa*, DUCHASSAING, Rev. Zooph. et Spong. Ant., p. 27.
1871. *Pectinia mœandrites*, POURTALÈS, III. Cat. Mus. Comp. Zool., N°. IV (Mem. vol. II), p. 68.
1877. *Pectinia disticha* and *P. mœandrites*, LINDSTRÖM, Kgl. Svenska vet. Akad. Handl., Bd. XIV (Andr. Häft.), N°. 6, p. 22.
1881. *Pectinia mœandrites*, QUENSTEDT, Röhren u. Sternkorall., p. 993, pl. CLXXXI, fig. 47.
1886. ? *Pectinia profunda*, QUELCH, Reef Cor., Chall. Exp., p. 77.
1890. *Manicina areolata*, A. AGASSIZ, Bull. Mus. Comp. Zool., vol. XX, N°. 2, pl. III (non Linnæus).
1895. *Pectinia mœandrites*, GREGORY, Quart. Jour. Geol. Soc. Lond., vol. LI, p. 263.

There have been twelve recent species of *Meandrina* (*Pectinia* auct.) described or named, *viz.*: *mœandrites* by LINNÆUS;

lamellosa by HUMPHREYS; *pectinata* by LAMARCK; *pachyphylla* by EHRENBERG; *quadrata* and *profunda* by DANA; *brasiliensis, danæ* and *sebæ* by MILNE-EDWARDS and HAIME; *disticha, elegans* and *caribœa* by DUCHASSAING and MICHELOTTI.

My study of the synonymy of *mæandrites* has resulted in the identical conclusion of GREGORY, excepting I have included as questionable, DANA's *profunda.*

The American species of *Meandrina* may be divided into two sections, typified by the mode of multiplication of the valleys. Milne-Edwards and Haime recognized these characters, as their descriptions show, but they did not give them the importance that, it seems to me, should be attached to them. The valleys in the *mæandrites* section are usually arranged in a recognizably radial manner, radiating outward from the center of the upper surface of the corallum (the valleys may be irregularly arranged). The other section is typified by *M. brasiliensis.* In traverse outline the csrallum is elliptical and there is often or usually a valley zigzagging along the longer transverse axis or parallel to it. The shorter valleys run perpendicularly outward from the longer transverse axis. This mode of growth is similar to that of *Manicina areolata.*

The granulations on the faces of the septa and the septal dentations in *Meandrina brasiliensis* are coarser than in *Meandrina mæandrites.* These differences are very striking when the specimens are compared side by side. Pourtalès many years ago called attention to the dentation of the septal margins of „*Pectinia*" *mæandrites* [1]). The dentations are small but perfectly distinct.

The following species are included in *Meandrina mæandrites: lamellosa* Humphreys; *pectinata* Lam. (an exact sy-

1) III. Cat. Mus. Comp. Zool., N°. IV (Mem. vol. II), 1871, p. 68.

nonym); *pachyphylla* Ehrenberg (also an exact synonym, the type was examined by me in the Museum für Naturkunde at Berlin); *quadrata* Dana; *disticha, elegans* and *caribœa* Duchassaing and Michelotti. The types of Duchassaing and Michelotti's species were studied in Turin. Their *Pectinia quadrata* and *P. elegans* are the same thing. The width of the valleys is from 13 to 15 mm. The specimen called *P. quadrata* often has the walls separated or there may be a depression along the summit of the colline where the two walls come together; in other instances the fusion of the walls of adjoining series is complete. In *P. elegans* the fusion is more often complete than in the former. I could find absolutely no basis for even varietal separation. The *disticha* and the *caribœa* are absolutely the same, except for some difference in the shapes of the colonies. The valleys in *disticha* are from 8 to 9 mm. wide, in *caribœa* 8 to 10, they are narrower than in the specimens called *quadrata* and *elegans*. A specimen in the U. S. National Museum from Belize, Honduras (A. E. Morlan, collector), has valleys 7, or less, to 15 mm. wide, and 8 or 9 mm. deep. Two specimens, also in the U. S. National Museum, from the Caloosahatchie Pliocene of Florida, show about the same variation. *Ctenophyllia profunda* Dana, is placed questionably in the synonymy of *mœandrites*. Dana's description is not suffieient to base a positive opinion upon, and I have not seen the type.

Pectinia sebæ Milne-Edwards and Haime seemed to be based upon Seba's pl. CVIII, figs. 3 and 5, Ellis and Solander's pl. LI, fig. 1, (Lamouroux, Exp. méth., also pl. LI, fig. 1). All of these figures appear to me to be *Colpophyllia gyrosa*.

Pectinia danæ (Milne-Edwards and Haime) groups with their *brasiliensis*, but is a distinct species. The salient dis-

tinguishing features are, *danæ* possesses an epitheca; the costæ are distinct only above, where they project but little, are not granulated. The costæ of *brasiliensis* consist of rows of tall, distinct, separated granulations. Prof. Edmond Perrier has kindly sent exquisite photographs of the type of *P. danæ*.

The result of the study of the species *Meandrina* is to recognize on the eastern American coast two good species, viz: *M. mæandrites* and *M. brasiliensis*. „*Pectinia sebæ*" is a doubtful species, as is also *profunda* of Dana. The locality of *danæ* is unknown, but it is probably from the Caribbean Sea.

One poor specimen from Groot Berg, Curaçao (Old Quaternary), seems preferable to *Meandrina mæandrites*. The species is found fossil in the elevated reefs of Barbados and other West Indian Islands. It occurs in the Pliocene marls of Caloosahatchie, Florida. The species occurs as recent rather generally throughout the West Indian region, but appears never to be very abundant.

Genus Stephanocœnia Milne-Edwards and Haime. 1848.

Stephanocœnia intersersepta (Esper).

1797. *Madrepora intersepta*, ESPER, Pflanzenth. Fortsetz., Bd. 1, p. 99, pl. LXXIX.

Gregory's synonymy of this species [1]) is extensive and in my opinion is correct, so it is not repeated here. I have given in my „Eocene and Lower Oligocene Corals of the United States", Monograph XXXIX of the United States Geological Survey, pp. 152, 153, a description of the microscopic features of the species, as it is the type of the genus. Felix refers to the species in his „Beiträge zur Kenntniss der Astrocœninæ" [2]).

1) Quart. Jour. Geol. Soc. Lond., vol. LI, 1895, p. 276, with pl. XI, figs 5*a*, 5*b* and 6.

2) Zeitschr. d. Deutsch. geolog. Gesellsch., Bd. L, Heft. 2, 1898, pp. 254 and 255.

Localities: fossil in Curaçao: The foot of Fort Nassau (Young Quaternary); Arube: Spanish Lagoon.

Found fossil in the elevated reefs of many of the West Indian Islands; recent throughout the Caribbean region.

Genus Orbicella Dana. 1846.

1846. *Orbicella*, DANA, Zooph. Wilkes Expl. Exped., p. 205.
1857. *Heliastræa*, MILNE-EDWARDS and HAIME, Hist. Nat. Corall., t. II, p. 456.

Attention has several times been called to the fact that Dana understood by *Orbicella* what Milne-Edwards and Haime meant by their later described *Heliastræa* [1]).

The characterization given by Dana is „Cells nearly circular, more or less prominent, not subdividing, or rarely so; stars with distinct limits formed by the coalescene laterally of the lamellæ, and therefore cells appearing tubular and separated by interstices". From his characterization and subsequent treatment of the species, it is evident that *Orbicella radiata* or *annularis* is regarded as typical. Dana confused some other genera with *Orbicella*, similar to the confusion by Milne-Edwards and Haime of other genera with *Heliastræa;* the meaning of the respective authors, however, is clear, and Dana's name because of priority must replace that of Milne-Edwards and Haime.

I have seen in the literature on corals no reference to the genus *Favites* LINK [2]). He defined the genus „Unförmige, kalkartige Massen, mit oberflächlichen zerstreuten sternförmigen blättrigen Oeffnungen"; and included in it, *F. astrinus*, *Madrepora favites*, Linn. Gmel. Syst. Nat., p. 3763, Esper's

1) POURTALÈS, Mem. Mus. Comp. Zool., vol. II, Ill. Cat. N°. IV, 1871, p. 76.
VERRILL, in Dana's Corals and Coral Islands, 1872, p. 388.
QUELCH, Reef Corals, Challenger Exp., 1886, p. 106.
GREGORY, Quart. Jour. Geol. Soc. Lond., vol. LI, 1895, p. 270.
2) Beschreibung der Naturalien-Sammlung der Universität zu Rostock, 3te Abth., Rostock, 1807, p. 162.

Pflanzenth. Fortsetz., l. Madr., t. 44—46. *F. cavernosus* Linn. Gmel. Syst. Nat. p. 3767, Esp. Fortsetz., l. Madr., t. 37 and *F. pentagonus*. Esp. Fortsetz., l. Madr., t. 39. Link's *Favites astrinus* includes a species of *Favia* (Esper, t. XLIV) and species of *Prionastrea*. *Favites pentagonus* is a *Goniastrea*. Four genera are included in *Favites*. The name *Favia* was first given by Oken, to a species not included in Link's list, but it applies to *Madrepora favosa* of Esper (pl. XLIV); *Orbicella* Dana takes in *F. cavernosa*. *Fiscicella* Dana 1846, contains a conglomeration of forms *Favia*, *Dichocœnia*, *Prionastrea* etc. The name in my opinion should be discarded as it is a sort of renaming of Oken's *Favia*. Milne-Edwards and Haime, 1848 [1]), proposed *Goniastrea* which equals a part of Link's *Favites*, and proposed at the same time *Prionastrea*, which takes in the residue of *Favites*. *Favites* should be used instead of *Goniastrea* or *Prionastrea*. Since, the greater portion of *Madrepora favosa* of Esper is *Prionastrea*, as this is the first name in the list of Link's species, and as *Prionastrea* occurs after the characterization of *Goniastrea*, in my judgment *Favites* should supplant *Prionastrea*.

Tubastrée de Blainville [2]) was not given a Latin form by him, and was not used, Latinized, by him in any combination, so it does not have to be considered in a discussion of synonymy.

Orbicella acropora (Linnæus).

1766. *Madrepora acropora*, Linnæus, Syst. Nat., ed. XII, p. 1276.
1786. *Madrepora annularis*, Ellis & Solander, Nat. Hist. Zooph., p. 169, pl. LIII, fig. 1, 2.; *Madrepora faveolata*, Ibid., p. 166, pl. LIII, figs. 5 & 6.
1790. *Madrepora acropora*, Gmelin, Linn. Syst. Nat., ed. XIII, p. 3767; *Madrepora faveolata*, Ibid., p. 3769.
1797. *Madrepora acropora*, Esper, Pflanzenth. Forsetz., I, p. 21, Taf. XXXVIII.

1) Comptes Rendus Acad. Sci., t. XXVII, p. 495.
2) Man. Actin., 1834, p. 368.

1816. *Astrea annularis*, LAMARCK, Hist. Nat. Anim. s. Vert., t. II, p. 259.
1821. *Astrea annularis*. LAMOUROUX, Exp. Méth. Genres de Polyp., p. 58, pl. LIII, figs. 1 & 2.; *Astrea faveolata*, ibid., p. 58, pl. LIII, figs. 5 & 6.
1824. *Astrea annularis*, LAMOUROUX, Encycl. Méth., Zooph., p. 131.
1827. *Astrea annularis*, BORY de St. Vincent, Explanation pls. Encycl. Méth., pl. 486, fig. 1—2.
1830. *Astrea annularis*, DE BLAINVILLE, Dict. Sci. Nat., t. LX, p. 334.
1834. *Explanaria annularis*, EHRENBERG, Abh. Kgl. Akad. Berl. (1832), p. 308.
1834. *Astrea annularis*, DE BLAINVILLE, Man. Actin., p. 368.
1836. *Astrea annularis*, LAMARCK, Hist. Nat. Anim. s. vert., 2ième éd., t. II, p. 405.
1837. *Astrea annularis*, LAMARCK, Hist. Nat. Anim. s. Vert., 3ième éd., p. 296.
1846. *Astrea* (*Orbicella*) *annularis*, DANA, Zoophytes Wilkes Expl. Exp., p. 214, pl. X, fig. 6.
1848. *Astrea annularis*, SCHOMBURGK, Hist. Barbados., p. 562.
1850. *Astrea annularis*, MILNE-EDWARDS and HAIME, Ann. Sci. Nat., 3ième sér., t. XII, p. 104.
1857. *Heliastræa annularis*, MILNE-EDWARDS and HAIME, Hist. Nat. Corall., t. II, p. 473; *Heliastræa acropora*, Ibid., p. 477.
1861. *Heliastræa annularis*, *H. acropora*, and *H. lamarcki*, DUCHASSAING & MICHELOTTI, Mém. Corall. Antilles, p. 352.
1863. *Phyllocœnia sculpta*, DUNCAN, Quart. Jour. Geol. Soc. Lond., vol. XIX, p. 432; *Phyllocœnia limbata*, Ibid., p. 433; *Cyphastræa costata* (partim), Ibid., pp. 441 & 443; *Astræa barbadensis*, DUNCAN, Ibid., pp. 421 & 444, pl. XV, figs. 6*a*, 6*b*.
1864. *Plesiastræa ramea*, DUNCAN, Quart. Jour. Geol. Soc. Lond., vol. XX, p. 39.
1864. *Orbicella annularis*, VERRILL, Bull. Mus. Comp. Zool., vol. I, N°. 3, p. 48.
1865. *Orbicella annularis*, VERRILL, Proc. Boston Soc. Nat. Hist., vol. X, p. 323.
1866. *Phyllocœnia limbata*, p. 170; *Heliastræa annularis*, *H. lamarcki*, *H. acropora*, p. 179; *H. barbadensis*, p. 180; *Cyphastræa costata*, p. 180; *Plesiastræa ramea*, p. 181; DUCHASSAING and MICHELOTTI, Supl. Mém. Corall. Antilles, pp. 170, 179, 180 & 181.
1868. *Phyllocœnia sculpta* and *Ph. limbata*, p. 23; *Heliastræa barbadensis*, *altissima* and *Cyphastræa costata*, p. 24; *Plesiastræa ramea*, p. 25, DUNCAN, Quart. Jour. Geol. Soc. Lond., vol. XXIV, pp. 23. 24, 25.
1870. *Phyllocœnia limbata*, p. 28; *Heliastræa lamarcki*, *annularis*, *acropora*, *barbadensis*, *Cyphastræa costata*, and *Plesiastræa ramea*, DUCHASSAING; Rev. Zooph. et Spong. Ant., p. 30.
1871. *Orbicella annularis*, POURTALÈS. Ill. Cat. Mus. Comp. Zool., N°. IV (Mem. vol. II), p. 77.
1877. *Orbicella annularis*, LINDSTRÖM, Kongl. Svensk. Vet. Akad. Handl., Bd. XIV (and. Häft.), N°. 6, p. 23.
1880. *Orbicella annularis*, POURTALÈS, Flor. Reef Cor., Mem. Mus. Comp. Zool., vol. VII, N°. 1, pl. IV (all figs.).
1888. *Heliastræa annularis*, ORTMANN, Zool. Jahrb., vol. III for 1888 (Syst.), p. 174.
1890. *Orbicella annularis*, HEILPRIN, Proc. Acad. Nat. Sci. Phila., p. 305.
1890. *Heliastræa annularis*, ORTMANN, Zeitsch. Wiss. Zool., Bd. L, p. 307.

1890. *Orbicella annularis*, A. AGASSIZ, Bull. Mus. Comp. Zool., vol. XX, N°. 2, p. 61, pls. I & II.
1895. *Orbicella acropora*, GREGORY, Quart. Jour. Geol. Soc. Lond., vol. LI, p. 272; *Cyphastræa costata*, p. 274, and *Echinopora franski*, sp. nov., p. 274, pl. XI, fig. 2*a*, 2*b*.
1898. *Orbicella acropora*, VAUGHAN, Bull. Mus. Comp. Zool., vol. XXVIII, N°. 5, p. 275.
1899. *Orbicella acropora*, VAUGHAN, Bull. Mus. Comp. Zool., vol. XXXIV, pp. 153, 155, 156.
1899. *Heliastræa annularis*, DUERDEN, Jour. Jam. Inst., vol. II, N°. 6, p. 621.

GREGORY has published some notes on the synonymy of this species [1]). He bases his placing of *annularis* under the synonymy of *acropora* upon finding that, in some systems of the septa, the costæ of the last cycle have no corresponding septa, while in other systems, or in portions of other systems, septa corresponding to the last cycle of costæ may be well developed, i. e. he destroys the specific distinction established by Milne-Edwards and Haime. The figure of the enlarged corallites given by Esper (pl. XXXVIII) shows three complete cycles of septa and costæ. From his description and figure there can be no doubt about his having had the common small celled *Orbicella* of the West Indies, and that it is the same as the *Madrepora annularis* of Ellis and Solander.

H. Stanley Gardiner [2]) identifies a coral from Rotumä Island in the South Pacific as *Orbicella acropora* (Linnæus), he adds some notes, and calls attention to Esper's (Fortsetzungen) pl. XXXVIII, fig. 2. I have not seen Gardiner's specimens and do not know how closely they resemble those from the West Indies, but we do know that Esper's specimens come from the West Indies. He says concerning his specimens [3]): „Sie kommen aus den südlichen amerikanischen Meeren". We can be sure that what is here called

1) Quart. Jour. Geol. Soc. Lond., vol. LI, 1895, p. 272.
2) Proceed. Zool. Soc. Lond. for 1899, pt. III, p. 752.
3) Op. cit., p. 23.

Orbicella acropora is what Esper called *Madrepora acropora*, and I suspect that Gardiner's *Orbicella acropora* is a different species.

The remainder of the synonymy is extremely perplexing, because of the insufficient description of the species, lack of figures, or that the types are lost or confused.

Cyphastræa oblita Duchassaing & Michelotti. The specimen so labeled in Turin, is a rounded-head, possessing the general aspect of *Orbicella acropora;* the calices are small, usually 2 mm. in diameter; the septa are in three complete cycles, the third cycle being very small; the costæ are as in *Orb. acropora.* A specimen labeled *Cyphastræa oblita* in the Muséum d'Histoire Naturelle at Paris is an entirely different thing. It belongs to the genus *Solenastræa* and is the same as the *Heliastræa abdita* D. & M., which is not a synonym of *Orbicella acropora*, as Gregory states in his synonymy of the species.

Cyphastræa costata Duncan. The type from Barbuda, preserved in the collection of the Geological Society of London, is a specimen of *Orbicella acropora.* Some of the septa are cribriform almost to the corallite wall, while others extend as solid lamellæ far into the corallite cavity joining the columella by septal processes, in fact the columella is made up of these processes. The corallite walls are dense and are united among themselves by costæ which are stout and correspond to all cycles of septa; diameter of corallites, 3 to 4 mm., usually about 3.5. Exotheca well developed, the dissepiments extend straight across the intercostal spaces. Two dissepiments to 1.5 mm. Distance between corallites, 1 to 2 mm., usually only about 1 mm. Almost any corallite of *Orbicella acropora* will show the septal peculiarities of Duncan's *Cyphastræa costata*, so Duncan's species is the exact equivalent of the former. A specimen, also in the Geological

Society of London, from Santo Domingo, seems to be a *Solenastrea*, the corallites are joined by a vesicular exotheca and differ in other ways from Duncan's type. The specimens identified by Gregory from Barbados as *Cyphastræa costata* are *Orbicella acropora*. The material studied by him is in the British Museum. *Orbicella hyades* is, according to Pourtalès [1]), probably a *Solenastrea*. The *Solenastrea hyades* of Duchassaing is a *Solenastrea*, as an examination of the specimens in Turin Museum showed, and is not a synonym of *Orb. acropora* as Gregory makes it. I was unable to find the type of *Heliastræa rotulosa* in Turin, and as the work of Duchassaing and Michelotti is throughout so poor, the species cannot be determined, so should be discarded altogether. Gregory places it in the synonymy of *Orb. acropora*, and so much as one can make out of the original description supports his reference.

The only specimens in Prof. MARTIN's collection showing any noteworthy peculiarity are some from Westpunt, Curaçao (coll. v. KOOLWIJK). Some of these instead of being rounded heads or more or less explanate are small columns or are digitiform. One specimen is about 90 mm. long and possesses a maximum diameter of 25 mm. Excepting form, there is nothing abnormal. *Plesiastræa ramea* Duncan, from Santo Domingo, is absolutely the same as this growth form of *Orbicella acropora*. I have examined the type in the collection of the Geological Society of London, and the officers of that society have kindly sent a duplicate to the U. S. National Museum.

Phyllocœnia limbata Duncan, is the same as the *Plesiastræa ramea* (type, coll. Geol. Soc. Lond.). *Phyllocœnia sculpta* Duncan (non Michelin) var. *tegula* Duncan, also from Santo

1) Mem. Mus. Comp. Zool., vol. II, Ill. cat. N°. IV., 1871, p. 77.

Domingo, is an explanate form of *Orbicella acropora*. Except in form, it possesses no distinguishing characteristics, size of corallites, septa, costæ, columella, exotheca and endotheca as commonly in *O. acropora*. (Type, coll. Geol. Soc. Lond.; duplicate in U. S. National Museum). Gregory's *Echinopora franski* from Barbados, is only a specimen of the same species. At first I thought it could be separated from *O. acropora* by its having solid walls, without exotheca between the corallites, but an examination of the splendid suite of recent specimens in the U. S. National Museum showed this to be only an individual variation. There is no character by which it can be separated from *O. acropora*. (Type in British Museum; duplicate in U.S. National Museum).

Localities where found fossil in Curaçao: In the Harbor on the road to Fort Nassau, Old Quaternary; Plantersrust, loose on the surface; near Plantersrust, Old Quaternary; Hato, Old Quaternary; Savonet, Young Quaternary; Hermanus, Old Quaternary; West Point, Old Quaternary; ?Santa Barbara, in phosphate; in Bonaire: Fontein, Young Quaternary; phosphate of Serro Grande, Old Quaternary; in Arube: Fontein.

Other localities where found fossil: in the elevated reefs of Barbados, Barbuda, Jamaica, Cuba, Costa Rica, etc.

Recent: throughout the Caribbean region.

Orbicella cavernosa (Linnæus).

1758. SEBA, Thesaurus, t. III, pl. CXII, figs. 15, 19, 22.

1766. *Madrepora astroites*, PALLAS, Elench. Zooph., p. 320 (non *Madrepora astroites*, Linnæus, Syst. Nat., X ed., 1758, p. 796.).

1766. *Madrepora cavernosa*, Linnæus, Syst. Nat., ed. XII, t. I, p. 1276.

1786. *Madrepora radiata*, ELLIS & SOLANDER, Nat. Hist. Zooph., p. 169, pl. XLVII, fig. 8.

1790. *Madrepora cavernosa*, GMELIN, Syst. Nat. Linn., ed. XIII, t. I, pars. VI, p. 3767.

1797. *Madrepora cavernosa*, ESPER, Pflanzenth. Fortsetz, 1, p. 18, Tab. XXXVII.
1797. *Madrepora cavernosa*, HUMPHREYS, Mus. Calonn., p. 66.
1807. *Favites cavernosus*, LINK, Rost. Mus., p. 162.
1815. *Favia cavernosa* seu *astroites*, OKEN, Lehrb. Naturg., Bd. I, p. 67.
1816. *Astrea radiata*, LAMOUROUX, Exp. Méth. Genres Polyp., p. 57, pl. XLVII, fig. 8.
1820. *Astrea cavernosa*, SCHWEIGGER, Handb. Naturgesch., p. 1119.
1824. *Astrea argus*, p. 131, and *Astrea radiata*, p. 132, LAMOUROUX, Encycl. Méth., Zooph., pp. 131 & 132.
1829. *Astrea argus*, EICHWALD, Zool. Special., p. 183.
1830. *Astrea radiata* and *Astrea argus*, de BLAINVILLE, Dict. Sci. Nat., t. LX, p. 334.
1834. *Explanaria argus* and *Explanaria radiata*, EHRENBERG, Abh. Kgl. Akad. Wiss. Berlin, for 1832, p. 307.
1834. *Astrea radiata* and *Astrea argus*, de BLAINVILLE, Man. Actin, p. 368.
1836. *Astrea argus*, MICHELOTTI, Specimen Zoophyt. dil., p. 131.
1836. *Astrea radiata* and *Astrea argus*, LAMARCK, Hist. Nat. Anim. s. Vert., 2ième éd., t. II, p. 404.
1837. *Astrea radiata* and *argus* LAMARCK, Hist. Nat. Anim. s. Vert., 3ième éd., t. I, p. 296.
1846. *Astrea* (*Orbicella*) *argus*, p. 207, pl. X, figs. 1*a* & 1*b*, *A.* (*Orbicella*) *radiata* p. 206, DANA, Zooph. Wilkes Expl. Exped., pp. 206 & 207.
1847. *Astrea argus*, DUCHASSAING, Bull. Soc. Géol. France, sér. 2, t. IV (2ième partie), p. 1095.
1847. *Astrea argus*, MILNE-EDWARDS and HAIME, Comptes Rend., t. XXVII, p. 494.
1848. *Astrea radiata* and *Astrea argus*, SCHOMBURGK, Hist. Barbados, p. 562.
1850. *Astrea cavernosa*, p. 97, pl. IX, fig. 1, 1*a*; *Astrea radiata*, p. 101; and *Astrea conferta* p. 102, MILNE-EDWARDS and HAIME, Ann. Sci. Nat., 3ième sér., t. XII, pp. 97, 101 & 102.
1850. *Astrea cavernosa*, MILNE-EDWARDS and HAIME, Brit. foss. corals, p. XXXIX.
1850. *Astrea argus*, DUCHASSAING, Anim. rad. Antilles, p. 15.
1851. *Astrea cavernosa*, MILNE-EDWARDS and HAIME, Arch. Mus. Hist. Nat., t. V, p. 97.
1855. *Astrea argus*, DUCHASSAING, Bull. Soc. Géol. France, sér. 2, t. XII, pp. 754 & 756.
1857. *Heliastræa conferta*, p. 460; *Heliastræa cavernosa*, p. 463; and *H. radiata*, p. 470, MILNE-EDWARDS and HAIME, Hist. Nat. Corall., pp. 460, 463 & 470.
1861. *Heliastræa radiata* and *cavernosa*, DUCHASSAING & MICHELOTTI, Mém. Corall. Ant., p. 352.
1863. *Astræa endothecata*, pl. XV, figs. 7*a*, 7*b*, and *Astræa cylindrica*, pl. XV, fig. 8, DUNCAN, Quart. Jour. Geol. Soc., vol. XIX, p. 434.
1863. ? *Astræa antiguensis*, DUNCAN, op. sup. cit., p. 419, pl. XIII, fig. 8.
1863. ? *Astræa endothecata, var.* 1, DUNCAN, op. cit., p. 419, pl. XIV, fig. 9; and? *Astræa radiata* var. *intermedia*, DUNCAN, op. cit., p. 421.
1863. ? *Astræa antillarum*, DUNCAN, Quart. Jour. Geol. Soc. Lond., vol. XIX, p. 443.

1864. *Astræa brevis*, DUNCAN, Quart. Jour. Geol. Soc. Lond., vol. XX, p. 37 pl. IV, figs. 3*a*, 3*b*.
1864. *Orbicella cavernosa*, VERRILL, Bull. Mus. Comp. Zool., vol. 1, N°. 3, p. 47.
1865. *Orbicella cavernosa*, VERRILL, Proc. Bost. Soc. Nat. Hist., vol. X, p. 323.
1866. *Heliastræa cavernosa* and *H. radiata*, DUCHASSAING & MICHELOTTI, Sup. Mém. Corall. Ant. p. 179.
1868. ? *Heliastræa antiguensis; Heliastræa endothecata, radiata, cylindrica,* ? *antillarium, brevis*, and *cavernosa*, DUNCAN, Quart. Jour. Geol. Soc. Lond., vol. XXIV, p. 24.
1870. *Heliastræa cavernosa, radiata,* ? *antiguensis, endothecata, cylindrica,* ? *antillarium*, and *brevis*, DUCHASSAING, Rev. Zooph. et Spong. Ant., p. 30.
1871. *Orbicella cavernosa*, POURTALÈS, Mem. Mus. Comp. Zool., vol. II, Ill. Cat., N°. IV, p. 76.
1877. *Orbicella cavernosa*, LINDSTRÖM, Kongl. Svenska Vet. Akad., Bd. XIV (and. Häftet), N°. 6, p. 23.
1881. *Astræa cavernosa*, QUENSTEDT, Röhren u. Stern-Kor., p. 777, pl. 173, fig. 28.
1886. *Orbicella cavernosa*, QUELCH., Reef Corals, Chall. Exp., pp. 12, 106.
1890. *Orbicella cavernosa*, HEILPRIN, Proc. Acad. Nat. Sci. Phila., for 1890, p. 306.
1895. *Orbicella radiata*, GREGORY, Quart. Jour. Geol. Soc. Lond., vol. LI, p. 270.
1899. *Orbicella radiata*, VAUGHAN, Bull. Mus. Comp. Zool., vol. XXXIV, p. 156.
1899. *Heliastræa cavernosa*, DUERDEN, Jour. Jam. Inst., vol. II, N°. 6, p. 621. *Orbicella compacta*, RATHBUN, Ms.
1820 non *Madreporites cavernosus*, SCHLOTHEIM, Peterfactenkunde, p. 358.
1832 non *Madrepora cavernosa*, SCHLOTHEIM, Syst. Verz. Petrefact., p. 15.
1842 non *Astrea radiata*, MICHELIN, Icon. Zooph., p. 58, pl. XII, fig. 4.
1842 non *Astrea argus*, MICHELIN, op. cit., p. 59, pl. XII, fig. 6.
1852 non *Astræa cavernosa*, QUENSTEDT, Handb. Petref., p. 1000, pl. LXXX, fig. 41.
1856 non *Astræa radiata*, CATULLO, Terr. Sed. Sup. Ven. Bry. Ant. Spong., p. 58, pl. XII, fig. 5.
1856 non *Astræa argus*, CATULLO, op. cit., p. 59, pl. XII, fig. 2.

The first question to be determined in the synonymy of the species is which name, *cavernosa* or *radiata*, shall stand. Gregory has used *radiata*, as he considered the definition of *cavernosa* too meager. I do not agree with Gregory. All of the Linnæan characterisations of species are unsatisfactory, but in this instance he refers to the figures of Seba, and places the *Madrepora astroites* of Pallas in the synonymy. He furthermore gives the locality „*Habitat in O. Americano*".

Taking all things together, the original characterisation of the species, with the references, seems to me entirely

sufficient to identify the species — in fact, the briet Latin description is not bad.

The further discussion of the synonymy cannot be better introduced than by a full quotation from Pourtalès (Ill. Cat. IV, 1871, p. 76):

„There is considerable variation among the specimens from Florida in the Mus. Comp. Zool., enough apparently to warrant placing them among the three species mentioned in the synonymy: but by carefully examining the different parts of each specimen, passages from one to the other can be found. Thus young polypidoms, expanding rapidly laterally, and with rather distant polyps, appear at first to differ considerably from strongly convex ones with crowded calices; the costæ are larger, flatter, and less sharply denticulate, and the border of the calicles less elevated.

„The size of the calicles, relied on to divide the genus into groups by Milne-Edwards and Haime, is a very uncertain character; one specimen has in one part the calicles varying from 3.5 to 4 mm., in another from 7 to 8 mm. The same specimen has in some parts the contiguous walls united solidly, with very few or no exothecal cells, in others separated by an abundant cellular exotheca. In worn specimens the last cycle disappears first, for that reason probably *Orbicella* (*Madrepora*) *radiata* Ellis has been characterized by Milne-Edwards and Haime as having but three cycles".

The type of Ehrenberg's *Explanaria argus* which is the type of Milne-Edwards and Haime *Astrea conferta* is in the Berlin Museum für Naturkunde. The following notes are based upon it. The specimen is much worn and is apparently somewhat fossilized. The calices are not regularly rounded but frequently are of irregular polygonal outline. The greatest diameter of an average calice is 8.5 mm.;

lesser 7 mm. Thickness of wall between the calices 2.5 mm. In one calice there were 21 large and 21 smaller septa, there may be four complete cycles in some calices. The columella is very large and vesicular, occupies the greater part of the corallite cavity. Dissepiments abundant, about 13 to 5 mm., they slope downward and inward. From reading the Pourtalès description quoted above, it will be evident that this is only a variety of *O. cavernosa* with crowded calices. The *Explanaria radiata* of Ehrenberg is the ordinary *Heliastræa cavernosa* as figured by Milne-Edwards and Haime, excepting the fourth cyclé of septa may not always be complete.

The original specimens of Duchassaing and Michelotti were examined in Turin. Their *Heliastræa radiata* is the same as Ehrenberg's *argus*, Milne-Edwards and Haime's *conferta;* their *cavernosa* is the usual *cavernosa.*

The only other recent species concerning which it seems necessary to make notes is the *Heliastræa aperta* of Verrill. It is especially characterized by having the principal septa, i. e. those that reach the columella, taller and thinner than in the usual *O. cavernosa.* This probably is a good species, but *O. cavernosa* is very variable, in the amount of exsertness and thinness of the septa. *O. aperta* is certainly a good and easily recognizable variety, should it not be accorded specific rank. *Orbicella campacta* Rathbun, ms. (type U. S. N. M.), is a form of *cavernosa* with dense walls between the corallites.

As for the fossil species placed in the above synonymy, *Heliastræa endothecata* and *H. cylindrica* of Duncan are the ordinary *cavernosa* and scarcely need a note. The types are in the Geological Society of London; duplicates in the U. S. National Museum. Duncan's *Heliastræa brevis* seems to be the same species, but with smaller corallites, i. e. smaller

in diameter. *Heliastræa antiguensis* of Duncan is the same as his *H. endothecata* from Antigua, and I could not find specific differences between them and the types of *H. endothecata* from Santo Domingo. I have not seen the type of *H. antillarum* (Duncan), so my placing it in the synonymy of *cavernosa* is a surmise based upon Duncan's description and is indicated as such.

Localities: Fossil in Curaçao: Hato, Old Quaternary; Arube: Serro Colorado, Oligocene (Antiguan).

Fossil elsewhere: in most of the elevated reefs throughout the Caribbean region (Quaternary); it is doubtfully found in the Oligocene of Antigua.

Recent: throughout the Caribbean region, and on the northern coast of Brazil.

Additional note: The specimens from Serro Colorado, Arube, deserve further consideration. I do not feel absolutely certain that they should be referred to *Orbicella cavernosa*. The corallites are circular in cross section, and have a diameter of a centimeter, sometimes slightly greater. The distance between the corallites is 3 mm. or even greater. Endotheca and exotheca are very richly developed. The septa are usually twenty-four in number, alternately larger and smaller, all of the larger reach the columella. They are thin, but are thickened at the wall sufficiently to form a so-called "pseudotheca". There are two specimens of this coral from S. Colorado, one of which is completely silicified, and a large portion of the other has undergone silicification. The mineral transformation has produced considerable changes in the appearance of the coralla. The corallite walls in one specimen have disappeared and the peripheral ends of the septa have become much thickened, producing an appearance similar to that figured by Duncan for his *Astræa* (*Orbicella*) *crossolamellata*. The columella is

lax, spongy, and fairly large, occupying about one-third of the diameter of the corallite cavity. I can discover no tangible characters by which to separate the specimens from *O. cavernosa*, so have referred them to that species.

Orbicella tenuis Duncan.

1863. *Astræa tenuis*, DUNCAN, Quart. Jour. Geol. Soc. Lond., vol. XIX, p. 421, pl. XIII, fig. II.
1866. *Heliastræa tenuis*, DUCHASSAING & MICHELOTTI, Sup. Mém. Corall. Antill., p. 180.
1868. *Heliastræa tenuis*, DUNCAN, Quart. Jour. Geol. Soc. Lond., vol. XXIV, p. 24.
1870. *Heliastræa tenuis*, DUCHASSAING, Rev. Zooph. et Spong. Antill., p. 30.

Locality: Arube, Serro Colorado (Oligocene); also "Oligocene" of Antigua; and what appears to be the same species, from near Lares Puerto Rico (R. T. HILL, collector).

The following are the more important characters of the specimens that I have referred to this species. The corallites are long; are close together, only a millimeter apart, and usually are not round because of having been deformed by mutual pressure; the diameter of the corallites is from 4 to 5 mm. The septa are thin, and crowded; the usual arrangement being four complete cyles. The members of the first and second cycles reach the columella; those of the third cycle are not so long; and those of, the fourth are still shorter. The members of the first and second cycles are of about the same thickness, no constant difference in thickness according to cycles is discernible; there is no marked difference in the thickness of any of the septa at the wall; the members of the third and fourth cycles are slightly thinner. Endotheca is well developed; the exotheca has been destroyed in the process of fossilization. The columella is poorly developed, being formed by the loose fusion of the principal septa in the axial space.

The *Orbicella cellulosa* (Duncan) also from Antigua is very close to *tenuis*, and I am by no means certain that they should not be referred to the same species. The principal difference is, in *O. cellulosa* there are usually about eight septa that are distinctly thicker than the others, the septa are not so nearly of the same thickness.

Genus Scolymia Haime. 1852.

In discussing GREGORY's use of the name *Lithophyllia*, the synonymy of *Lithophyllia* and *Scolymia* has been considered, and is not here repeated. (Supra p. 6).

Scolymia sp.

A small imperfect specimen without nearer data than Santa Barbara and Curaçao. This is probably *Scolymia lacera* (PALLAS).

Genus Favia Oken. 1815.

Favia fragum (Esper.)

1766. *Madrepora ananas*, PALLAS, Elench. Zooph., p. 321 (non Linn. Syst. Nat. ed. X, 1758, p. 797).
1767. *Madrepora ananas* (*pars*), LINNÆUS, Syst. Nat., ed. XII, t. i, p. 1275.
1786. *Madrepora ananas*, ELLIS & SOLANDER, Nat. Hist. Zooph., p. 168, pl. XLVII, fig. 6.
1790. *Madrepora ananas* (*pars*), GMELIN, Linn. Syst. Nat., ed. XIII, t. i, part IV, p. 3764.
1797. *Madrepora fragum* ESPER, Pflanzenth. Fortsetz., Th. I, p. 79, pl. LXIV, figs. 1 & 2 (non *Madrepora ananas* ESPER, Pflanzenth, pp. 128—131, pl. XIX).
1815. *Favia ananas* (*pars*), OKEN, Lehrb. Naturgesch., Bd. I, p. 67.
1816. *Astrea ananas*, LAMARCK, Hist. Nat. Anim. s. Vert., t. ii, p. 260.
1820. *Astrea ananas*, LE SUEUR, Mém. Mus. Hist. Nat. Paris, t. vi, p. 285, pl. XVI, fig. 12.
1821. *Astrea ananas*, LAMOUROUX, Exp. méth. Gen. Polyp., p. 59, pl. XLVII, fig. 6.
1824. *Astrea ananas*, LAMOUROUX, Encycl. Méth. Zooph., p. 127.
1829. *Astrea ananas*, EICHWALD, Zool. Spec., p. 183.

1830. *Astrea ananas*, DE BLAINVILLE, Dict. Sci. Nat., t. LX, p. 335.
1834. *Favia uva* (*pars*), EHRENBERG, Cor. Roth. Meer., p. 318.
1834. *Astrea ananas*, DE BLAINVILLE, Man. d'Actin., p. 369.
1836. *Astrea ananas*, LAMARCK, Hist. Nat. Anim. s. Vert., 2ième éd., t. II, p. 406.
1837. *Astrea ananas*, LAMARCK, Hist. Nat. Anim. s. Vert., 3iéme éd., p. 296.
1846. *Astrea ananas*, DANA, Zooph. Wilkes Expl. Exp., p. 322.
1847. *Parastrea ananas*, MILNE-EDWARDS & HAIME, Comptes rendus, t. XXVII, p. 495.
1847. *Astrea ananas*, DUCHASSAING, Bull. Soc. Géol. France, sér. 2, t. IV, 2ième par., p. 1095.
1848. *Astrea ananas*, SCHOMBURGK, Hist. Barb., p. 562.
1850. *Parastrea ananas*, p. 172, and *Parastrea fragum*, p. 173, MILNE-EDWARDS & HAIME, Ann. Sci. Nat., 3ième sér., t. XII, pp. 172—173.
1850. *Astrea ananas*, DUCHASSAING, Anim. Rad. Antill., p. 16.
1851. *Parastrea fragum*, MILNE-EDWARDS & HAIME, Polyp. foss. Terr. Pal., p. 116.
1855. *Astrea ananas*, DUCHASSAING, Bull. Soc. géol. France, sér. 2, t. XII, p. 756.
1857. *Favia ananas*, p. 435, and *Favia fragum*, p. 439, MILNE-EDWARDS & HAIME, Hist. Nat. Corall., t. II, pp. 435 & 439.
1861. *Favia incerta*, p. 351, pl. X, figs. 13, 14; *Favia coarctata*, p. 352, pl. X, fig. 17, 18; *Favia ananas*, p. 352, DUCHASSAING & MICHELOTTI, Mém. Corall. Ant., pp. 351, 352.
1864. *Favia ananas*, VERRILL, Bull. Mus. Comp. Zool., vol. I, N°. 3, p. 48.
1866. *Favia ananas*, *F. incerta* and *F. coarctata*, DUCHASSAING & MICHELOTTI, Sup. Mém. Corall. Ant., p. 177.
1868. *Favia ananas* and *F. fragum*, VERRILL, Trans. Conn. Acad. Sci., vol. I, p. 355.
1870. *Favia ananas*, *incerta* and *coarctata*, DUCHASSAING, Rev. Zooph. Spong. Ant., p. 30.
1871. *Favia ananas*, POURTALÈS, Ill. Cat. Mus. Comp., N°. IV (Mem. vol. II), p. 75.
1877. *Favia porcata* (?) and *Favia incerta*, LINDSTRÖM, Kongl. Svensk. vet. Akad. Handl., Bd. XIV (and. Häft.), N°. 6, p. 23.
1885. *Astræa ananas* and *coarctata*, QUELCH, Narrative Chall. Rpt., vol. I, pt. I, foot-note, p. 146.
1886. *Astræa coarctata*, p. 9; *Astræa incerta*, *Astræa coarctata* and *Astræa ananas*, p. 12; *Astræa fragum*, p. 13; *Astræa ananas*, *Astræa coarctatata*, p. 98, and *Astræa fragum*, p. 99, QUELCH, Reef corals. Chall. Exp.
1890. *Favia ananas*, DUNCAN, Jour. Linn. Soc., vol. XX, p. 570.
1895. *Favia ananas*, GREGORY, Quart. Jour. Geol. Soc. Lond., vol. LI, p. 260.
1899. *Astræa ananas*, (? *Madrepora favosa*), DUERDEN, Jour. Jam. Inst., vol. II, N°. 6, p. 621.
1760. non *Madrepora ananas*, LINNÆUS, Syst. Nat., ed. X, p. 797.
1832. non *Madrepora ananas*, SCHLOTHEIM, Petrefac., p. 15.
1834. non *Explanaria ananas*, EHRENBERG, Abh. K. Akad. Wiss. Berl. 1832, p. 307.

This species has usually been known by the name *Favia ananas*, the specific name being referred back to Pallas's

Elenchus Zoophytorum. The name *Madrepora ananas* was not available for this species as Linnæus had already applied it to a palæozoic coral from Gothland now known as *Acervularia ananas.* Prof. Lindström has discussed the name as applied to the fossil species in his „On the Corallia Baltica of Linnæus" [1]). After Pallas there followed great confusion, the Baltic fossil and the West Indian recent species bearing the same name, and evidently considered by authors to be the same thing. In the mean time Esper proposed the name *Madrepora fragum* for the West Indian species. Therefore the *ananas* of Linnæus must be restricted to the fossil species, and the *ananas* of Pallas must give way to *fragum* of Esper. The confusion of *ananas* is still greater for Esper, although he re-named Pallas's *ananas,* applied the same name to a species of *Dichocœnia* from the East Indies and now known as *Dichocœnia porcata.* The *Explanaria ananas* of Ehrenberg is, as shown by an examination of his material in the Museum für Naturkunde at Berlin *Dichocœnia stokesi.*

Esper's figures and the description of *fragum* are very good, and answer perfectly to the ordinary West Indian *Favia.* A note is by the figures in the Museum of Comparative Zoology's copy, presumably made by Pourtalès, „this seems to be what we have labelled *F. ananas* throughout the collections". I was able to examine the types of Duchassaing and Michelotti's *Favia incerta* and *Favia coarctata* in Turin. The difference between the three may be tabulated thus:

Favia incerta D. & M., wall between corallites not thick;
[calcular margin not elevated.

1) Öfvers. K. Svensk. vet. Akad. Förhandl. Arg. LII, 1895, pp. 628, 629.

Favia coarctata D. & M., wall between corallites not thick; calicular margin elevated.

Favia ananas LAM., wall between corallites thick; calicular margin elevated.

The first species is founded on a somewhat worn specimen. They have labeled another worn specimen, grouping with *incerta*, *Favia fragum*. The series of six specimens possessed by Duchassaing and Michelotti, had they studied them carefully, should have shown them that they were dealing with variations of a single species, to which they attached four different names.

There is in the U. S. National Museum a suite of over eighty recent specimens from various localities in the West Indian region. Notes on the variations of these specimens may be of interest in connection with the synonymy given above. First there are seventeen specimens from the Island of Curaçao, collected by the Steamer Albatross expedition in 1888. The specimens are all small encrusting, usually capuliform or sub-hemispherical masses. The greatest distance across a colony rarely exceeds 45 mm. The calices are sub-elliptical or are deformed, in only one instance did I find indications of two calicinal centers in a series, except where fission is in progress. Reproduction is by septal budding, i. e. fission. The calices are divided into subequal halves. The calices are not very long, 6.5 mm. in length, by 4.5 in breadth, is large for one in which there is no evidence of the beginning of division. There are calices almost circular, only 3 mm. in diameter. The thickness of the walls between corallites varies very much, from merely a separating rim to 2 mm. or even more. The elevation of the calicular margin also shows great variation. It may not be at all elevated, or it may form the rim of a truncated deformed cone, standing a millimeter, or even slightly more

above the depression between adjoining corallites. The septa vary between three complete cycles and very nearly four complete cycles, common numbers are from thirty-six to a few over forty. The septal cycles are not distinctly marked, but the members of the first and some of the second are usually larger than the others. The youngest septa are much smaller than the bounding older ones. The amount of exsertness and the thickness of the septa are variable quantities, but the septa could scarcely ever be characterized as very thin, though they sometimes are quite thin. The septal margins are irregularly and rather jaggedly dentate, and bear near the columella an irregular jagged paliform tooth. Costæ correspond to all septa, and show a variation in size corresponding to that of the septa; they are rather acute, not very or only fairly prominent, and have their margins pointedly dentate, the dentations on the costæ being more regular than those on the septa. The columella is rather large, very spongy, and usually forms a flattish bottom to the fairly deep calice.

From east of Fort Taylor, Key West (Dr. Edward Palmer, collector), is a lot of thirty-two specimens. These in general differ from the Curaçaoan specimens by having thinner walls between the corallites, 1.5 mm. being about the average thickness, in some specimens the adjoining calices are separated by merely a simple rim; by having the calicular margins not at all or scarcely perceptibly elevated, and by having very often narrow corallites with a tendency to become sinuous. One specimen possesses a calice 6 mm. long and less than 2 mm. wide. The intergradation between these specimens and those from Curaçao is seen to be perfect when some specimens from Key West (collected by Hemphill) and Tortugas (collected by Palmer) are placed between them. There is no need

to cite more specimens, except one from St. Thomas (collected by the Albatross Expedition). This specimen would be referred to *Favia incerta* D. & M. It is an irregularly capuliform mass with a greater diameter of 50 mm., a lesser of 46, and a height of 38. It has the general appearance of the ordinary *F. fragum*, excepting over the whole upper surface of the colony the walls are thin and simple. Instances of simple walls have been cited before, but in no case did such occur over the whole upper surface of the specimen. Around the edges the specimen from St. Thomas has assumed the form of wall usually found in *F. fragum*, so that if one had a piece broken from the edge, especially at one particular end, he would immediately pronounce it *F. fragum*.

From the above discussion one might think that this species has no criterional characters, but it has, and they are quite definite. They are, (1) the size and shape of the colony, (2) the size and shape of the calices, (3) the number of the septa, (4) the septal dentations, the pali and the character of the columella. This gives a number of characters and only throws over the basis on which Duchassaing and Michelotti attempted to differentiate the species.

Verrill has described three species of *Favia* from Hartt's Brazilian collections [1]). They are *Favia leptophylla*, *Favia gravida* and *Favia conferta*, all three from the Abrolhos Reefs. We have in the U. S. National Museum, from Brazil, twenty-nine specimens of this group of *Favia*, and upon them and Verrill's original descriptions I base the following remarks. The features by which the species would be separated among themselves are:

F. leptophylla, septa 24 to 30, calices circular or deformed, about 25 inch in diameter, margins elevated.

1) Trans. Conn. Acad. Sci., vol. I, 1868, pp. 353—355.

F. gravida, about the same as *F. leptophylla*, excepting that there are four complete cycles of septa.

F. conferta possesses narrow long meandriform calices, usually series with several calicinal centers.

There are no specimens of *F. leptophylla* in the U. S. National Museum. The other two species in my mind grade into each other, showing a variation in prominence of calicular margins and thickness of wall between adjoining corallites similar to what has been described for *F. fragum*. The essential specific characters are (1) the number of septa, usually at least four complete cycles, i. e. they are more numerous than in *F. fragum*, (2) the calices are nearly always larger, or at least longer than in *fragum*, and may be so long and sinuous that they are meandriform. When the calicular margins are free and elevated they rise perpendicularly from the common surface of the corallum. (3) The septal dentations seem very much more regular than in *F. fragum*. There are points of resemblance between *fragum* and the Brazilian species, but the two seem to me distinct. I would suggest that of Verrill's two names *gravida* and *conferta*, applied to the Brazillian species, *conferta* be suppressed and *gravida* be used as the specific designation.

As I have seen no specimens of *F. leptophylla*, I can express no opinion upon it.

F. fragum is found fossil in Curaçao: Foot of Fort Nassau, Veeris; in Arube: Spanish Lagoon. It occurs in the elevated reefs of other West Indian Islands, Barbados, &c. As a recent species it is generally distributed in Bermuda, the West Indian and Caribbean region, and is very abundant on the Florida reefs.

Genus Colpophyllia Milne-Edward and Haim. 1848.

Colpophyllia gyrosa (Ellis and Solander.)

1786. *Madrepora gyrosa*, Ellis & Solander, Nat. Hist. Zooph., p. 163, pl. LI.
1789. *Madrepora natans*, Esper, Pflanzenth., p. 140, pl. XXIII.
1790. *Madrepora natans*, p. 3760, and *gyrosa*, p. 3763, Gmelin, Linn. Syst. Nat., ed. XIII, pp. 3760 and 3763.
1815. *Mœandra gyrosa*, Oken, Lehrb. Naturg., p. 70.
1816. *Meandrina gyrosa*, Lamarck, Hist. Nat. Anim. s. Vert., t. II, p. 247.
1821. *Meandrina gyrosa*, Lamouroux, Exp. Méth. Gen. Polyp., p. 55, pl. LI.
1823. *Meandrina gyrosa*, de Blainville, Dict. Sci. Nat., t. XXIX, p. 376.
1824. *Meandrina gyrosa*, Lamouroux, Encycl. Méth. Zooph., p. 508.
1830. *Meandrina gyrosa*, de Blainville, Dict. Sci. Nat., t. LX, p. 323.
1834. *Manicina gyrosa*, *M. fissa* and *M. mœandrites*, Ehrenberg, Abhandl. Ak. Wiss. Berlin, Bd. for 1832, p. 326.
1834. *Meandrina gyrosa*, de Blainville, Man. d'Actin., p. 357.
1836. *Meandrina gyrosa*, Lamarck, Hist. Nat. Anim. s. Vert., 2ième éd., t. II, p. 388.
1837. *Meandrina gyrosa*, Lamarck, Hist. Nat. Anim. s. Vert., 3ième éd., t. I, p. 290.
1846. *Mussa fragilis*, p. 185, pl. VIII, fig. 9, and *M. gyrosa*, p. 186, Dana, Zooph. Wilkes Expl. Exped., pp. 185, 186, Pl. VIII, fig. 9.
1847. *Meandrina gyrosa*, Duchassaing, Bull. Soc. Géol. France, sér. 2, t. IV (2ième partie), p. 1095.
1848. *Colpophyllia gyrosa*, Milne-Edwards & Haime, Comptes Rend., t. XXVII, p. 492.
1848. *Meandrina gyrosa*, Schomburgk, Hist. Barbad., p. 562.
1849. *Colpophylia gyrosa*, p. 266, and *C. breviserialis*, *C. fragilis* and *C. tenuis*, p. 267, Milne-Edwards and Haime, Ann. Sci. Nat., t. XI, 3ième sér., pp. 266 and 267.
1850. *Meandrina gyrosa*, Duchassing, Anim. rad. Ant,, p. 16.
1851. *Colpophyllia gyrosa* and *C. fragilis*. Milne-Edwards and Haime, Arch. Mus. Hist. Nat., t. V., p. 84.
1855. *Meandrina gyrosa*, Duchassaing, Bull. Soc. Géol. France, sér. 2, t. XII, pp. 754 and 756.
1857. *Colpophyllia gyrosa*, p. 384, *C. fragilis*, *C. tenuis* and *C. breviserialis*, p. 385, Milne-Edwards and Haime, Hist. Nat. Corall, t. II, pp. 384 and 385.
1861. *Colpophyllia astreœformis*, *gyrosa*, *fragilis*, *tenuis* and *breviserialis*, Duchassaing and Michelotti, Mém. Corall. Ant., p. 349.
1864. *Colpophyllia gyrosa*, Verrill, Bull. Mus. Comp. Zool., vol. I, No. 3, p. 49.
1866. *Colpophyllia gyrosa*, *fragilis*, *tenuis*, *breviserialis*, *astreœformis*, Duchassaing & Michelotti, Sup. Mém. Corall. Ant., p. 174.
1870. *Colpophyllia gyrosa*, *fragilis*, *breviserialis*, *tenuis*. *astreœformis*, Duchassaing, Rev. Zooph. Spong. Ant., p. 29.
1871. *Colpophyllia gyrosa*, Pourtalès, Ill. Cat. Mus. Comp. Zool., No. IV (Memoirs vol. II), p. 74.

1877. *Colpophyllia gyrosa*, LINDSTRÖM, Kongl. Svensk. vet. Akad. Handl., Bd. XIV (andra Häft.), N°. 6, p. 22.
1880. *Colpophyllia gyrosa*, POURTALÈS, Mem. Mus. Comp. Zool., vol. VII, No. 1, pl. VIII, figs. 1—5 (all figures), and pl. IX, figs. 13—16.
1881. *Colpophyllia gyrosa*, QUENSTEDT, Röhr- u. Sternkorallen, p. 1011, tab. 182, fig. 49.
1886. *Colpophyllia astræiformis* and *C. gyrosa*, QUELCH, Reef Corals, Challenger Exped., p. 12.
1890. *Colpophyllia gyrosa*, ORTMANN, Zeit. wiss. Zool., Bd. L, p. 305.
1895. *Colpophyllia gyrosa*, GREGORY, Quart. Jour. Geol. Soc. Lond., vol. LI, pp. 266, 267.

There is no difficulty in deciding what name this species should bear, as that proposed by Ellis and Solander was accompanied by a good figure and clearly has priority over all others.

The original specimens of Ehrenberg were examined. His *Manicina gyrosa*, *fissa* and *mæandrites* are the same species. The last is referred by Milne-Edwards and Haime to *Colpophyllia fragilis*, but I can see no specific difference between the specimens. Dana's type of *fragilis*, was the property of J. R. Redfield of New-York and is not in the U. S. National Museum. From a comparison of Dana's description of the species and the notes made by him on *Mussa gyrosa*, no specific distinction between the two can be discovered. Notes on the variation of the species are given after the discussion of the synonymy. Milne-Edwards and Haime add two species to those previously described, viz: *C. tenuis* and *C. breviserialis*. *C. tenuis* differs according to the description from *C. fragilis* by having the walls nearer together, slightly narrower and deeper valleys. *C. breviserialis* differs from *C. gyrosa* by having short series, composed of only two or three corallites. This last species has been considered by Gregory as valid [1]), but it seems to me only a phase of *C.*

1) Quart. Jour. Geol. Soc. Lond., vol. LI, 1895, p. 267.

gyrosa. I did not see the original specimens of Milne Edwards and Haime.

The specimens of the Duchassaing and Michelotti collection were examined in Turin. Their *C. gyrosa*, *C. tenuis* (a broken piece), *C. astreæformis* and *C. breviserialis* are all the same species. The *breviserialis* consists of two young heads attached to a piece of the same species or have originated by rejuvenescence from the old colony. The only possible difference is that the septal knotch („échancrure" of Milne-Edwards and Haime) is usually not well marked, but this is not of specific value. The specimens identified as *fragilis* possess characters worthy of note. The valleys are only 9 or 10 mm. deep, while in the other specimens they are 12 to 15; the septa appear more raggedly dentate. The valleys are usually narrower than in the other specimens. The width of the valleys corresponds very closely with what Pourtalès figures in his Florida Reef Corals [1]).

It seems to me that, so far as we at present know, there is only one species of *Colpophyllia* in the West Indian waters.

The following notes on the variations of the species are based upon material in the U. S. National Museum.

There are in the U. S. National Museum eleven excellent and several inferior specimens. The material comes from Belize, Honduras, Curaçao and the Florida Reefs.

The form of the colony has a direct bearing on the depth of the valleys, etc. The colonies may begin by an explanate method of growth, then the valleys are wide and more open at the bottom; or they may begin by a sub-inversely-conical form, when the valleys are deep and narrower, especially near the bottom of the valleys.

I have selected for a somewhat detailed description an

1) Mem. Mus. Comp., vol. VII, n°. 2, 1880, pl. VIII, fig. 2.

excellent specimen from Belize, Honduras (A. E. Morlan, collector), N°. 15779 (U. S. N. M.). It is a somewhat oblong mass with a flattish base, about 28 cm. long, 20 cm. wide and 5 cm. high. Colonies may grow larger. The number of calicinal centers in a series varies from two to seven. The length of a series varies from 35 mm. to 108 mm. The width of the valleys varies from 10 mm., or slightly less, to 25 mm. The depth of the valleys varies from 10 to 12 mm. Other specimens have valleys only 8 mm. deep, the depth may be as much as 17 or 18 mm. In the middle portion of the colony the distance between the walls is from 1.5 to 2.5 mm., 2 mm. is the usual and average distance apart. Near the periphery in one instance, the walls are 6 mm. apart. The septa are eight to ten to the centimeter. The septa on the middle portion of the colony show a fairly regular alternation of large and small, but there are no rudimentary septa. Near the periphery there is often an apparent arrangement in three or four cycles. The upper septal margins are arched, rather prominent, regularly dentate, each dentation corresponding to a septal ridge, or stria. There is a line of divergence of the striæ corresponding in position with the serial wall. Many septa have a knotch on the inner margin dividing off a kind of paliform. This knotch may be well marked or there may be practically no vestige of it.

The descriptions of Milne-Edwards and Haime and the figures of Pourtalès make further notes unnecessary, but it may be of interest to add, the specimens from Curaçao usually have thicker septa and shallower valleys than those from Belize, Honduras, however there is no specific difference between them.

Fossil in Curaçao: Plantersrust, Old Quaternary; elsewhere: elevated reefs of Barbados, &c. Recent:

Caribbean region, Florida. It is one of the common recent Curaçaoan species.

Genus Diploria Milne-Edwards and Haime. 1848.

Diploria labyrinthiformis (Linn.) emend. Esper.

1758. *Madrepora labyrinthiformis (partim)*, LINNÆUS, Syst. Nat., ed. X, p. 794.
1766. *Madrepora mœandrites, var. γ*, PALLAS, Elench. Zooph., p. 293.
1767. *Madrepora labyrinthiformis (partim)*, LINNÆUS, Syst. Nat., ed. XII, p. 1274.
1789. *Madrepora labyrinthiformis*, ESPER, Pflanzenth, p. 74, pl. III.
1790. *Madrepora labyrinthiformis (partim)*, GMELIN, Linn. Syst. Nat., ed. XIII, p. 3760.
1797. *Madrepora sinuosa*, HUMPHREYS, Mus. Calonn., p. 66.
1815. *Mœandra mœandrites (partim)*, including *Mœandra labyrinthiformis (partim)*, OKEN, Lehrb. Naturg., p. 70.
1816. *Meandrina cerebriformis*, LAMARCK, Hist. Nat. Anim. s. Vert., p. 246.
1823. *Meandrina cerebriformis*, DE BLAINVILLE, Dict. Sci. Nat., t. XXIX, p. 376.
1824. *Meandrina cerebriformis*, LAMOUROUX, Encycl. Méth. Zooph., p. 508.
1824. ? *Meandrina cerebriformis*, QUOY & GAIMARD, de Freycinet's Voy. autour du Monde, Zool., p. 654.
1830. *Meandrina cerebriformis*, DE BLAINVILLE, Dict. Sci. Nat., t. LX, p. 323.
1834. *Mœandra (Platygyra) cerebriformis, vars. α* and *β*., EHRENBERG, Abhandl. Kgl. Akad. Wiss. Berl. Bd. for 1832, p. 324.
1834. *Meandrina cerebriformis*, DE BLAINVILLE, Man. d'Actin., p. 357.
1836. *Meandrina cerebriformis*, LAMARCK, Hist. Nat. Anim. s. Vert., 2ième éd., t. II, p. 386.
1837. *Meandrina cerebriformis*, LAMARCK, Hist. Nat. Anim. s. Vert., 3ième éd., t. I, p. 290.
1838. *Mœandrina cerebriformis*, MICHELOTTI, Spec. Zooph. diluv., p. 157.
1846. *Meandrina cerebriformis*, p. 263, pl. XIV, fig. 2, and *Meandrina truncata*, p. 264, pl. XIV, fig. 1 and 1a, DANA, Zooph. Wilkes. Expl. Expéd.
1848. *Diploria cerebriformis*, MILNE-EDWARDS and HAIME, Comp. Rend., t. XXVII, p. 493.
1849. *Diploria cerebriformis*, MILNE-EDWARDS & HAIME, Ann. Sci. Nat., 3ième sér., t. XI, p. 289 and *D. stokesi*, op. cit., p. 290.
1850. *Meandrina cerebriformis*, DUCHASSAING, Anim. Rad. Ant., p. 16.
1851. *Diploria cerebriformis*, MILNE-EDWARDS & HAIME, Arch. du. Mus. Hist. Nat., t. V, p. 92.
1857. *Diploria cerebriformis*, p. 402, *Diploria stokesi*, p. 403, and *Diploria truncata*, p. 405, MILNE-EDWARDS & HAIME, Hist. Nat. Corall., t. II, pp. 402, 403 and 405.
1861. *Diploria cerebriformis* and *truncata*, DUCHASSAING & MICHELOTTI, Mém. Corall. Ant., p. 351.
1864. *Diploria cerebriformis*, VERRILL, Bull. Mus. Comp. Zool., vol. I, N°. 3, p. 48.

1866. *Diploria cerebriformis* and *truncata*, DUCHASSAING & MICHELOTTI, Suppl. Mém. Corall. Ant., p. 176,
1870. *Diploria cerebriformis* and *truncata*, DUCHASSAING, Rev. Zooph. et Spong. Ant., p. 29.
1870. *Mœandrina cerebriformis*, J. M. JONES, Proc. and Trans. Nov. Scot Inst. Nat. Sci., vol. II, pt. II, p. 10.
1871. *Diploria cerebriformis*, POURTALÈS, Ill. Cat. Mus. Comp. Zool., N°. IV, Mem. vol. II, p. 75.
1877. *Diploria cerebriformis*, LINDSTRÖM, Kongl. Svenska vet. Akad. Handl., Bd. XIV (andr. Häft.), N°. 6, p. 22.
1878. *Diploria cerebriformis*, THOMSON, The Atlantic, p. 284.
1882. *Diploria cerebriformis*, REIN, Verhandl. erst. Deutsch. Geograph. Tages., Berlin, 1881, p. 33.
1885. *Diploria cerebriformis*, QUELSCH, Narrative Chall. Rpt., vol. I, foot note, p. 146.
1886. *Diploria cerebriformis*, QUELCH, Reef Corals, Chall. Exp., pp. 11, 12 & 90.
1888. *Diploria cerebriformis*, ORTMANN, Zool. Jahrb., Bd. III for 1888 (Syst.), p. 171.
1888. *Diploria cerebriformis* and *stokesi* HEILPRIN, Proc. Acad. Nat. Sci. Phila., 1888, p. 307.
1890. *Diploria cerebriformis*, HEILPRIN, Proc. Acad. Nat. Sci. Phila., 1890, p. 307.
1890. *Diploria cerebriformis*, ORTMANN, Zeit. Wiss. Zool., Bd. L, p. 301.
1895. *Diploria cerebriformis*, GREGORY, Quart. Jour. Geol. Soc. Lond., vol. LI, p. 264.
1899. *Diploria cerebriformis*, VAUGHAN, Bull. Mus. Comp. Zool., vol. XXXIV, p. 239.
1899. *Diploria cerebriformis*, DUERDEN, Jour. Jam. Inst., vol. II, N°. 6, p. 621.

It is generally conceded that Linnæus confused several species under his *Madrepora labyrinthiformis* [1]), they are what have later been called *Diploria cerebriformis* (Lam), from the West Indies, and *Cœloria labyrinthiformis*, from the Red Sea. Esper in 1789 (Pflanzenthiere, loc. jam cit.) definitely attached the name *Madrepora labyrinthiformis* to what we now call *Diploria cerebriformis*. His application of the name and his restriction of it are perfectly definite and unmistakable. Why it should have been overlooked by Lamarck and Milne-Edwards and Haime is difficult to understand, especially when Esper gives a figure and makes a remark: "Ersterwähntes Exemplar, das nach ausserordentlichen Veranstaltungen und so grossen Kostenaufwand aus dem ame-

rikanischen Ocean ist beygebracht worden, misst in der lange gegen zwey, und in der Breite über einen Schuh". So *Meandrina cerebriformis* Lamarck becomes a synonym of *Madrepora labyrinthiformis* Linn. (emend. Esper), and leaves the *Cœloria labyrinthiformis* of Milne-Edwards and Haime without a name unless it should be merely a variety of some already described species of the genus. The *Madrepora labyrinthica* of Pallas is a different name, and is the same as *M. mæandrites* Linn. Variety *β*. of Ehrenberg's *Mæandra* (*Platygyra*) *cerebriformis*, which Milne-Edwards and Haime make the type of their *Diploria stokesi*, is only a young specimen of *Diploria labyrinthiformis* with distant valleys and wide collines having a rather deep depression along their summit. Ehrenberg's type is in the Museum für Naturkunde at Berlin, where I have seen it. Dana's *Meandrina truncata* from his description is evidentlv only a worn specimen of the *D. labyrinthiformis*. The specimens identified by Duchassaing and Michelotti as *Diploria cerebriformis* and *D. truncata* are in the Turin Natural History Museum. They both belong to the same species.

It seems scarcely necessary to enter into a long discussion of the variation of the species, especially as it has a small synonymy. The principal variation consists in the width of the collines and the depth of the depression along them. The depression on the collines may even be deeper than the valley. On the other hand the series may be so close together that the depression may be simply an obscure furrow. The columella is vary variable. I have spoken of its being lamellar[1]). In instances the lamellar character may not be in evidence, and the columella then consists of a spongy mass as it was first described for the genus.

1) Bull. Mus. Comp. Zool., vol. XXXIV, 1899, p. 239.

Fossil: Curaçao, Westpunt; Bonaire: Fontein, Quaternary; also elevated reefs of Barbados, etc. Recent: throughout the West Indian region and the Bermudas.

Genus Platygyra Ehrenberg. 1834.

1815. *Mœandra (pars)*, OKEN, Lehrb. Naturgesch., pp. 68 and 70.
1816. *Meandrina (pars)*, LAMARCK, Hist. Nat. Anim. s. Vert., t. II, p. 244.
1834. *Mœandra (pars)* (+ subgenus *Platygyra* (pars)), EHRENBERG, Abhandl. Akad. Wissensch. Berlin for 1832, p. 323.
1846. *Meandrina*, DANA, Zooph. Wilkes Expl. Exped., p. 252.
1848. *Meandrina* + *Cœloria*, MILNE-EDWARDS & HAIME, Comptes Rendus, t. XXVII, p. 493.
1857. *Mœandrina*, MILNE-EDWARDS & HAIME, Hist. Nat. Corall., t. II, p. 388 (+ *Coeloria*, op cit., p. 411).
1884. *Mœandrina*, DUNCAN, Jour. Linn. Soc., vol. XVIII, p. 88.

The names *Meandrina* and *Mœandra* have been disposed of. The name *Platygyra* Ehrenberg remains to be considered. Ehrenberg placed the following species in the subgenus (as recognized by him) viz: *labyrinthica* including vars. *α leptochila* and *β pachychila*; *lamellina*, sp. nov.; *cerebriformis* Lamarck, including vars. *α* and *β*; *phrygia* Lamarck; *spatiosa*, sp. nov. I made a careful study of most of the original specimens referred to those species by Ehrenberg.

There are six specimens in the Museum für Naturkunde in Berlin bearing the name *Maeandra* (*Platygyra*) *labyrinthica*, but there appear to be four distinct species.

1. Specimens Nos 682, 683 and 687 are *Cœloria labyrinthiformis* of Milne-Edwards and Haime [1]).

2. Specimen No 668, var. *pachychila* Ehr. = *Cœloria forskælana* Milne-Edwards and Haime [2]).

3. Specimen No. 669. No locality is given. „*M. filograna* Esp." is written on the label below the name given by

1) Hist. Nat. Corall., t. II, p. 413.
2) Hist. Nat. Corall., t. II, p. 414.

Ehrenberg. The corallum is a head deformed by certain parts dying, it is about 160 mm. high. The valleys are very long and sinuous, frequently forming sharp angles in the sinuousities. Wall between the series thin and acute at top, thickening below. Depth of valleys 6.5 to 7 mm. Cross section of colline angular above. Septa, 12 to 15 to cm., nearly all of equal size, only occasionally a small or rudimentary one between a pair of large ones, they do not project much above the wall between the vallays. The septal dentations are subequal excepting the lowest is often much larger than the others. The columella is formed of septal trabeculæ and lobes; it very often is of a loose, spongy texture. This is not *filograna* Esper, but is probably *viridis* Le Sueur (= *strigosa* Dana).

4. Specimen N°. 671 bears „*M. grandilobata* M. E." on the label below Ehrenberg's name. This is correct, only it must now be called *clivosa* of Ellis and Solander.

I did not study *M. Platygyra lamellina.*

M. Platygyra cerebriformis = *Diploria cerebriformis* (Lam.) called *Diploria labyrinthiformis* in the present paper.

M. Platygyra phrygia = *Leptoria phrygia*, fide Milne-Edwards & Haime. *M. Platygyra spatiosa* a synonym of *Dendrogyra cylindrus* Ehrenberg. It is the basal portion of a large column.

Ehrenberg had in his *Platygyra* seven species now distributed among five genera:

Mæandrina 2 sp. (not Meandrina Lamarck 1801).
Cæloria 2 sp.
Diploria 1 sp.
Leptoria 1 sp.
Dendrogyra 1 sp.

The name *Meandrina* cannot be applied to any of these forms.

The order of the publication of the genera above listed, excepting Meandrina, is:

Dendrogyra Ehrenberg 1834.
Diploria Milne-Edwards and Haime 1848[1]) } Arranged accor-
Leptoria Milne-Edwards and Haime 1848 } ding to sequence
Cæloria Milne-Edwards and Haime 1848 } on the page.

Ehrenberg in his treatment of *Platygyra labyrinthica* makes no mention of the West Indian forms, but discusses only those from the Red Sea, therefore if we follow his published work the former must be omitted. The name *Platygyra* must be used instead of one of the four genera above noted. Since *Cæloria* comes last among these proposed by Milne-Edwards and Haime, I substitute *Platygyra* for *Cæloria* following Brüggemann who in his „Corls of Rodriquez"[2]) shows that *Platygyra* should take the place of *Cæloria*, and remarks that the type species is the *Madrepora labyrinthica* from the Red Sea. His course in my mind is the only logical one.

Pourtalès[3]) was the first of whom I know that pointed out the difficulty or impossibility of separating *Cæloria* and *Mæandrina* (Milne-Edwards and Haime). Duncan places *Cæloria* as a subgenus of *Mæandrina*[4]). J. Stanley Gardiner has made some notes on the relations of the genera[5]). I can find no tangible differences between the two, the columellar characters being insufficient, therefore I merge *Cæloria* and *Mæandrina* of Milne-Edwards and Haime into a single genus and call it *Platygyra* Ehrenberg. If the West Indian species cannot be referred to *Platygyra* they must receive a new generic designation.

1) Comptes Rendus, t. XXVII, 1848, p. 493.
2) Phil. Trans. Royal Soc., vol. CLXVIII, 1879, p. 171.
3) Ill. Cat. Mus. Comp. Zool., N°. IV, 1871, p. 73.
4) Jour. Linn. Soc., vol. XVIII, 1884, p. 89.
5) Proc. Zool. Soc. Lond., vol. for 1898, p. 740.

Platygyra viridis (Le Sueur.)

1786. *Madrepora labyrinthica*, Ellis & Solander, Nat. Hist. Zooph., p. 160, pl. XLVI, figs. 3 & 4.

1790. *Madrepora labyrinthica* (*partim*), Gmelin, Linn. Syst. Nat., ed. XIII, p. 3760.

1797. *Madrepora labyrinthica*, Humphreys, Mus. Calonn., p. 66.

1797. *Madrepora maeandrites var.*, Esper, Fortsetz. Pflanzenth., t. i., p. 101, pl. LXXXVII (fide Milne-Edwards & Haime.).

1815. ? *Meandra mœandrites* and ? *M. labyrinthiformis* (*partim*), Oken, Lehrb. Naturgesch., Bd. I, p. 70.

1816. *Meandrina labyrinthica* (*partim*), Lamarck, Hist. Nat. Anim. s. Vert., t. II, p. 246.

1817. *Meandrina labyrinthica*, Le Sueur, Jour. Acad. Nat. Sci. Phil. (1st. ser.), vol. I, p. 180.

1820. *Meandrina sinuosa*, Le Sueur, Mém. Mus. d'Hist. Nat. Paris, t. VI, p. 278, pl. XV, fig. 4, and vars. *viridis*, p. 279, pl. XV, fig. 5; *appressa* p. 280, pl. XV, fig. 6; *rubra*, p. 280, pl. XV, fig. 7; *vineola*, p. 280, pl. XV, fig. 8; also *Meandrina dedalea*, p. 281, pl. XVI, fig. 9 and *M. labyrinthica*, pl. XVI, fig. 10. (Non *Madrepora sinuosa* Ell. & Sol.; nec *Meandrina sinuosa* Quoy & Gaimard).

1821. *Meandrina labyrinthica*, Lamouroux, Exp. Méth. Gen. Polyp., p. 54, pl. XLVI, fig. 3 & 4 (copy from Ellis and Solander).

1823. *Meandrina labyrinthica*, de Blainville, Dict. Sci. Nat., t. XXXIX, p. 376.

1824. *Meandrina labyrinthica*, Lamouroux, Encycl. Méth. Zooph., p. 507.

1829. *Meandrina labyrinthica*, Eichwald, Zool. spec., p. 185.

1830. *Meandrina labyrinthica*, de Blainville, Dict. Sci. Nat., t. LX, p. 323.

1834. *Mœandra* (*Platygyra*) *labyrinthica* (*partim*), Ehrenberg, Cor. Roth. Meeres, Abh. K. Akad. Wiss. Berl. for 1832, p. 323.

1834. *Meandrina labyrinthica*, de Blainville, Man. d'Act., p. 357.

1836. *Meandrina labyrinthica*, Lamarck, Hist. Nat. Anim. s. Vert., 2ième éd., t. II, p. 386.

1837. *Meandrina labyrinthica*, Lamarck, Hist. Nat. Anim. s. Vert., 3ième éd., t. I, p. 289.

1838. *Meandrina labyrinthica*, Michelotti, Specim. Zooph., p. 150.

1840. *Meandrina labyrinthica*, p. 256, pl. XIV, fig. 1; *M. strigosa*, p. 257, pl. XIV, fig. 4a, Dana, Zooph. Wilkes Expl. Exp.

1849. *Meandrina heterogyra*, *M. sinuosissima* p. 281; *M. serrata*, *M. crassa*, p. 282, Milne-Edwards & Haime, Ann. Sci. Nat., 3ième sér., t. XI, pp. 281 & 282.

1857. *Mœandrina heterogyra*, p. 392; *M. sinuossima* and *M. serrata*, p, 393; *M. crassa*, p. 394, Milne-Edwards & Haime, Hist. Nat. Corall., t. II, pp. 392—394.

1861. ? *Leptoria hieroglyphica*, Duchassaing & Michelotti, Mém. Corall., Ant., p. 351.

1861. *Leptoria fragilis*, Duchassaing & Michelotti, ibid, p. 351.

1864. *Mœandrina sinuosissima*, Duncan, Quart. Jour. Geol. Soc. Lond., vol. XX, p. 36.

1864. *Mœandrina strigosa, labyrinthiformis* and *sinuosa*, VERRILL, Bull. Mus. Comp. Zool., vol. I, p. 49.
1866. *Mœandrina serrata, heterogyra* and *sinuosissima*, DUCHASSAING and MICHELOTTI, Sup. Mém. Corall. Ant., p. 175.
1866. ? *Leptoria hieroglyphica*, DUCHASSAING & MICHELOTTI, ibid., p. 176.
1868. *Cœloria labyrinthiformis* and *Mœandrina sinuosissima*, DUNCAN, Quart. Jour. Geol. Soc. Lond., vol. XXIV, p. 24.
1870. *Meandrina serrata, heterogyra* and *sinuosissima*, ? *Leptoria hieroglyphica*, and *L. fragilis*, DUCHASSAING & MICHELOTTI, Rev. Zooph. et Spong. Ant., p. 29.
1871. *Mœandrina labyrinthiformis*, p. 73, and *Mœandrina strigosa*, p. 74, POURTALÈS, Reef Cor., Ill. Cat. N°. IV, Mem. Mus. Comp. Zool., vol. II, pp. 73—74.
1877. *Mœandrina labyrinthiformis, M. sinuosissima, ? M. filograna*, LINDSTRÖM, Köngl. Svensk. vet. Akad. Handl., Bd, XIV (and. Häft.), N°. 6,p.22.
1880. *Mœandrina strigosa*, pl. IX, figs. 6—9, and *M. labyrinthiformis*, pl. IX, fig. 10—12, POURTALÈS, Flor. Reef Corals, Mem. Mus. Comp. Zool., Vol. VII, pl. IX, figs. 6—12.
1885. *Mœandrina strigosa, sinuossima* and *labyrinthiformis*, QUELCH, Reef Cor. Bermuda Is., Chall. Rept. Narrative, vol. I, pt. I, foot-note, p. 146.
1886. *Mœandrina strigosa*, pp. 10, 92; *M. sinuosissima*, pp. 10, 91; *M. labyrinthica*, pp. 10, 12, 91; ? *M. sinuosa*, p. 12, QUELCH, Reef Corals Chall. Exp., pp. 10, 12, 91, 92.
1888. *Mœandrina labyrinthica* and *strigosa*, HEILPRIN, Proc. Acad. Nat. Sci. Phil. 1888, p. 306.
1888. *Mœandrina labyrinthica*, ORTMANN, Zool. Jahrb., Bd. III for 1888 (Syst.), p. 170.
1989. *Mœandrina strigosa*, MURRAY and IRVINE, Proc. Roy. Soc. Endinb., vol. XVII, p. 109.
1890. *Mœandrina strigosa*, HEILPRIN, Proc. Acad. Nat. Sci. Phila. for 1890, p. 306.
1890. *Mœandrina labyrinthica*, ORTMANN, Zeitsch. Wiss. Zool., Bd. L, p. 301.
1895. *Mœandrina filograna*, GREGORY, Quart. Jour. Geol. Soc. Lond., vol. LI, p. 265.
1898. *Mœandrina filograna*, VAUGHAN, Bull. Mus. Comp. Zool., vol. XXVIII, N°. 5, p. 275.

The first available name for this species is *viridis* of Le Sueur. The *sinuosa* of Le Sueur is a mistaken identification of *Madrepora sinuosa* of Ellis and Solander, so it cannot be used.

It has already been shown in the present paper that the name *labyrinthiformis* of Linnæus must be restricted to *Diploria labyrinthiformis* (= *cerebriformis* Lamarck). *Labyrin-*

thica of Ellis and Solander is not available because Pallas had previously applied it to *Meandrina mœandrites*[1]) (= *Madrepora labyrinthica* Pallas).

There are over twenty specimens of the *Platygyra viridis* group in the U. S. National Museum. Before proceeding to a discussion of the specimens it would be best to examine Milne-Edwards and Haime's mode of classification of the species of the genus, and those of their species that come from the West Indies.

Their first section comprises forms with „Le polypier formant une masse fortement gibbeuse ou mème lobée", which comprises *M. filograna* (Esper) and *M. grandilobata* M.-Ed. & H. (to which should be added *M. clivosa* of Ellis and Solander, sp.). The second division has „Le polypier formant une masse legèrement gibbeuse"; here is placed *M. superficialis*. The third „le polypier formant une masse simplement convexe sans gibbosités" and contains *M. heterogyra*, *M. sinuossima*, *M. serrata* and *M. crassa*. *Mœandrina valida* and *M. mammosa* Dana are placed in the „espèces douteuses", and *Meandrina strigosa* Dana is referred to *Cœloria* as a doubtful species.

To tabulate the characters by which *heterogyra*, *sinuossissima*, *serrata* and *crassa* are separated:

M. heterogyra. Corallum convex, oblong, 12 to 14 septa to cm., usually equal; width of valleys, 6 mm.; depth, 4 or 5.

M. sinuosissima. The points of difference given by Milne-Edwards and Haime are the subspheroidal form, the septa crowded and alternating in size, narrow above and enlarging in the interior of the valleys. Valleys nearly a centimeter wide.

1) Elench. Zooph., 1766, p. 297.

M. serrata. Would be separated from the preceeding by having vallays 7 mm. wide and 5 mm. deep.

M. crassa. Form as in *heterogyra*, otherwise resembling *sinuosissima*, excepting the columella is greatly developed, and valleys are 7 mm. wide and 3 or 4 mm. deep.

Milne-Edwards and Haime have based their division of these forms into four species on the following characters: 1) the coralla being elongate or subspheroidal; 2) the septa being all of the same size or alternately larger and smaller; 3) the collines being rounded above or acute; 4) the valleys ranging between 6 mm. and 1 cm. in width and 3 to 5 mm. in depth. Minor importance is laid upon the septal dentations and the development of the columella. I came to the conclusion that we have to deal with a single species from an examination of the material of the Duchassaing & Michelotti in Turin, and again to the same conclusion from a study of the specimens of Milne-Edwards and Haime in Paris and the specimens in the British Museum. I shall now describe in detail, a single specimen from Belize, Honduras (collected by A. E. Morlan).

The specimen is about 23.5 cm. long, by 19 cm. wide on the flattish base, and approximately 10 cm. high, i. e. the form is oblong. On one end the valleys are extremely sinuous; while on the other they are usually parallel, running perpendicular to the axis of elongation of the colony, and show very few sinuosities. The width of the valleys varies from 4.5 mm. to 9 mm., i. e. in width of valleys this specimen takes in all species. The depth of the valleys varies from 2 mm. to 6 mm., this specimen shows depth of valleys both less and greater than the extremes recorded by Milne-Edwards and Haime in their characterization of the species. The walls between the valleys are solid but may vary some in thickness. The septa probably

present the greatest variation of any element of the corallum. For long distances there may be only large septa, with no hint of smaller septa between them, where as on other portions of the surface, the alternation of larger and smaller is perfectly regular. A place where there are only larger septa shows twelve to the centimeter on one side of the colline and thirteen on the other. In another place where there is faintly regular alternation of larger and smaller, there are fourteen larger and thirteen smaller to the centimeter. These measurements cover all the four so-called species. The septa may be narrow at the top, sloping downward into the bottom of the valley, thus giving the colline a triangular profile; or they may arch gently over the top of the colline, and have their inner margins fall perpendicularly to the top of the paliform lobe at the base. The paliform lobes may be absolutely suppressed or they may be greatly developed, but whenever the inner margins of the septa fall perpendicularly to the bottom of the valley, the paliform lobes are well developed. The septal dentations are usually quite regular, and are like the teeth of a saw („en scie"), but there may occasionally be slight irregularities. The columella varies much, it may consist of weak, spongy, calicinal centers, each pair connected by a septum, representative of a lamellar columella; or a spongy columella may be very considerably developed. Endotheca is well developed and quite vesicular, the dissepiments are thin.

It is evident that this one specimen, except in the matter of form, comprises all of the four above discussed species, Whether a coral head is spheroidally rounded above or somewhat elongated in one direction, is so much a matter of pure chance, depending upon the object to which it is attached, &c., that no one would think of separating species on that basis.

It seems to me that *Mæandrina superficialis* of Milne-Edwards and Haime, judging from the specimen I saw in Paris, may belong here but according to their description it is a synonym of the next species. To what species it should be referred depends upon whether the surface of the corallum is thrown into lobes. In my notes on the Paris specimens I have placed it in the synonymy of *Mæandrina strigosa*, and have added „septa to cm. 19, all of the same size: width of valleys, 4 to 6 mm.; columella lamellar interrupted, surrounded by very little vesicular tissue." However *superficialis* may belong under *clivosa* of Ellis and Solander.

The *Leptoria fragilis* of Duchassaing is the same as *Mæandrina heterogyra*, and falls into the synonymy of *P. sinuosa*.

I am not positive as to what should be done with his *Leptoria hieroglyphica*, but believe that it also should be placed in the synonymy of *sinuosa*.

The *Mæandrina labyrinthiformis* and *Mæandrina strigosa* figured by Pourlalès in the Florida Reefs Corals [1]) are the same species. The *labyrinthiformis* has lower collines and the septa are more broadly rounded over the summit of the collines; while in *strigosa*, the septa have a tendency to be almost angular where they cross the wall. The paliform lobes are represented as being fully developed in *strigosa*. The amount of variation of each of these features in a single corallum has already been pointed out. A few notes on the variation of some other specimens should be added: There is a specimen, the *labyrinthiformis* type, from Eastern Dry Rocks, Florida, (collected by Palmer), that I thought could be kept separate from the other specimens because the septal dentations are not saw-toothed („en scie")

1) Mem. Mus. Comp. Zool., vol. VII, N°. 1, 1880.

but often are rather long spines, or they may even be forked. We possess from Bermuda a single specimen in which both types of dentation exist, though in this the teeth are usually longer than in the majority of specimens, but it is not abnormal and the passage to the usual condition is perfect.

It seems scarcely necessary to expand these notes on characters and variation further. Quelch has made extremely interesting remarks in his Report on the Challenger Reef Corals (pp. 91—94). He recognizes *Mæandrina labyrinthica*, *Mæandrina sinuossissima* and *Mæandrina strigosa* with the remark that *sinuosissima* may be only a „very thick and triangular walled variety" of *strigosa*. I go further than he and place the *labyrinthica* or *labyrinthiformis* in the synonymy of the same species, but three usually good varieties may be recognized, in the line of Quelch's separation into three species.

This species can be defined only in terms of its variation. One character seems absolutely invariable, i. e. the form of the upper surface, it is uniformly rounded and never thrown into gibbosities.

Localities where fossil in Curaçao: West Point; Arube: Daimarie; Bonaire: Fontein.

Found fossil elsewhere in many of the quaternary elevated reefs of the West Indies; occurs recent in the West Indian Islands, Honduras, the Bahamas and Bermudas.

Platygyra clivosa (Ellis & Solander).

1786. *Madrepora clivosa*, Ellis & Solander, Nat. Hist. Zooph., p. 163.
1789. *Madrepora filograna*, Esper, Pflanzenth, p. 139, pl. XXII, fig. 1, 2.
1790. *Madrepora clivosa*, Gmelin, Linn. Syst. Nat., ed. XIII, p. 3763.
1790. *Madrepora filograna*, Gmelin, Linn. Syst. Nat., ed. XIII, p. 3760.
1816. *Meandrina filograna*, Lamarck, Hist. Nat. An.s. Vert., t. II, p. 248.

1823. *Meandrina filograua*, DE BLAINVILLE, Dict. Sci. Nat., t. XXIX, p. 377.
1824. *Meandrina filograna*, LAMOUROUX, Encycl. Méth. Zooph., p. 500.
1830. *Meandrina filograna*, DE BLAINVILLE, Dict. Sci. Nat., t. LX, p. 323.
1834. *Mœandrina labyrinthica*, EHRENBERG, Specimen N°. 671 Mus. fûr Naturk. Berlin, Abhand. Kgl. Akad. Wiss., Bd. for 1832, p. 323.
1834. *Meandrina filograna*, DE BLAINVILLE, Man. Actin., p. 358.
1836. *Meandrina filograna*, LAMARCK, Hist. Nat. An. s. Vert., 2ième éd, t. II, p. 389.
1837. *Meandrina filograna*, LAMARCK, Hist. Nat. An. s. Vert., 3ième éd., t. I, p. 290.
1838. *Meandrina filograna*, MICHELOTTI, Specimen Zooph., p. 157.
1846. *Meandrina interrupta*, p. 258, pl. XIV, fig. 18; ? *M. filograna*, p. 262; *M. mammosa*, pl. XIV, figs. 10, 10a; DANA, Zooph. Wilkes Expl. Exp.
1848. *Meandrina filograna*, MILNE-EDWARDS & HAIME, Comptes Rend., t. XXVII, p. 493.
1849. *Meandrina filograna*, p. 280, *M. grandilobata*, p. 281, *M. superficialis*, p. 283, MILNE-EDWARDS & HAIME, Ann. Sci. Nat., 3ième sér., t. XI, pp. 280, 281, 283.
1851. *Meandrina filograna*, MILNE-EDWARDS & HAIME, Arch. Mus. d'Hist., Nat., t. V, p. 90.
1857. *Mœandrina filograna*, p. 390, *M. grandilobata*, p. 390, *M. superficialis*, p. 391, and *M.* ? *mammosa*, p. 396, MILNE-EDWARDS & HAIME, Hist. Nat. Corall., t. II, pp. 390, 391 & 396.
1864. *Mœandrina grandilobata*, DUCHASSAING & MICHELOTTI, Mém. Corall. Ant., p. 350.
1863. *Mœandrina filograna*, DUNCAN, Quart. Jour. Geol. Soc. Lond., vol. XIX, p. 433.
1864. *Mœandrina clivósa*, VERRILL, Bull. Mus. Comp. Zool., vol. I, N°. 3, p. 48.
1865. *Mœandrina clivosa*, VERRILL, Proceed. Bost. Soc. Nat., vol. X, p. 323.
1866. *Mœandrina superficialis, M. interrupta, M. grandiloba* and *M. filograna*, DUCHASSAING & MICHELOTTI, Sup. Mém. Corall. Ant., p. 175.
1868. *Mœandrina filograna*, DUNCAN, Quart. Jour. Geol. Soc. Lond., vol. XXIV, p. 24.
1870. *Meandrina grandiloba, filograna, superficialis* and *interrupta*, DUCHASSAING, Rev. Zooph. et Spong. Ant., p. 29.
1871. *Mœandrina clivosa*, POURTALÈS, Ill. Cat. N°. IV, Mem. Mus. Comp. Zool., vol. II, p. 74.
1877. *Mœandrina clivosa*, LINDSTRÖM, Kongl. Svenska vet. Akad., Bd. XIV (and. Häft), N°. 6, p. 22.
1880. *Mœandrina clivosa*, POURTALÈS, Florida Reef Corals, Mem. Mus. Comp., vol. VII, N°. 1, pl. IX, figs. 1—5.
1881. ? *Mœandrina filograna*, QUENSTEDT, Röhr. u. Sternkor., p. 559, p. 1164, fig. 4.
1888. *Mœandrina clivosa*, ORTMANN, Zool. Jahrb., vol. III for 1888 (Syst.), p. 170.
1895. *Mœandrina filograna* (*partim*), GREGORY, Quart. Jour. Geol. Soc. Lond., vol. LI, p. 265.

The original characterization of *Madrepora clivosa*, given by Ellis and Solander is entirely sufficient for its identification. It reads „*Madrepora conglomerata, anfractibus basi angustatis, dissepimentis subexis aequalibus, ambulacris simplicibus crassiusculis, lamellis alternis abbreviatis.*

„Habitat in Oceano Indiae occidentalis.

„*Corallium* rotundatum, nodulis magnis inaequale."

The part of the description that is especially characteristic is the last line, there is no other West Indian coral „nodulis magnis inaequale."

What Esper has figured as *Madrepora filograna* seems to me to be a worn specimen of the same thing, as Milne-Edwards and Haime[1]) have already noted, in their words „Figure d'un échantillon très usé."

Meandrina interrupta Dana, from the statement „M. convexa et undulata" seems to me to fall in the synonymy ot this species; *M. mammosa* certainly does; *Mœndrina superficialis* and *grandilobata* also certainly do.

The following of the Duchassaing and Michelotti collection at Turin belong to this species, *M. superficialis, M. interrupta, M. grandilobata* and *M. fitograna*. The Ehrenberg specimens at Berlin have been fully described in preceeding pages.

Specimen N°. 671, Gerresheim collection, no locality given, is the *grandilobata* of Milne-Edwards and Haime, and consequently a synonym of *clivosa* (Ell. & Sol.).

Gregory has considered all of the West Indian *Platygyras* as belonging to only one species, a course in my opinion not justifiable, after having had an opportunity to study an enormous amount of material, and having never found any hint of intermediate forms. His specimens from Barbados are *Platygyra viridis.*

1) Hist. Nat. Corall., t. II, p. 390.

There is a fine suite of specimens of this species in the U. S. National Museum, and on them the following notes are based. The most constant, and so far as my experience goes, the invariable character of this species is the presence of gibbosities on the surface. The figures given by Pourtalès in Agassiz's Reef Corals are excellent[1]). The corallum may be in large rounded masses, small irregular heads, or explanate, almost lamelliform masses, but gibbosities are always present. There are other characters that give the coralla distinctive appearances. The valleys are shallower and narrower than in *viridis*, the walls of the collines are denser. The septa never stand high above the collines, so the summits are either very obtuse or almost flat. The septa are more regularly alternately larger and smaller and are more crowded; the number is variable, 14 large and 14 small to the centimeter is that for one specimen, but it may reach 17 or 18 large and as many small. The septal dentations are smaller and more regular than in *P. viridis*. The inner margin of nearly all of the larger septa possess an obscure paliform lobe, and are distinctly thickened in the direction of the axes of the valleys. This thickening of the inner ends of the septa is one of the most pronounced characters of the species. The columella is variable, very poorly developed or a pronounced spongy mass.

Fossil in Curaçao: Exact locality not given.

Recent: Curaçao, and throughout the West Indies and in the Florida Reefs.

Genus Siderastrea de Blainville. 1830.

The validity of the name *Siderastrea* and the non-availability of *Astrea*, have been fully discussed in my paper

1) Mem. Mus. Comp. Zool., vol. VII, No. 1, pl. IX, figs. 1—5.

on „The Eocene and Lower Oligocene Coral Faunas of the United States", Monograph XXXIX of the U. S. Geological Survey, pp. 154—155. That discussion need not be repeated here, further than to state *Astræa* was used in a binomial sense by Bolten in 1798, for some shells now referred to *Turbo* and *Xenophora*. This was three years before Lamarck applied it to a coral, so the name cannot be used for a coral; if it is employed in zoologic nomenclature, it must be applied to a shell. Fischer [1]) gives the date of *Xenophora* 1807 (Fischer de Waldheim) and *Turbo* 1758 (Linn.). Astrea might be applied to the former of these genera, unless a name for it antedates 1798.

Siderastrea radians (Pallas).

1766. *Madrepora radians*, PALLAS, Elench. Zooph., pp. 322—323.
1767. *Madrepora astroites*, LINNÆUS, Syst. Nat., ed. XII, p. 1276, non Pallas 1766.
1786. *Madrepora galaxea*, ELLIS & SOLANDER, Nat. Hist. Zooph., p. 168, pl. XLVIII, fig. 7.
1801. *Astrea galaxea*, LAMARCK, Syst. Anim. s. Vert., p. 371.
1815. *Astræa radians seu astroites*, OKEN, Lehrb. Naturgesch., Bd. I, p. 65.
1830. *Astrea* (*Siderastrea*) *galaxea*, DE BLAINVILLE, Dict. Sci. Nat., t. LX, p. 335.
1834. *Astrea astroites*, EHRENBERG, Corall. Roth. Meer., Abhandl. Kgl. Akad. Wiss. Berlin for 1832, p. 319. Non *Explanaria galaxea* EHRENBERG = *Cyphastræa savignyi* MILNE-EDWARDS & HAIME.
1846. *Siderina galaxea*, DANA, Zooph. Wilkes Expl. Exped., p. 218, pl. X, figs. 12, 12*b*, 12*c* (non figs. 12*a*, *d*).
1880. *Siderastræa galaxea*, POURTALÈS, Mem. Mus. Comp. Zool., Vol. VII, pt. 1, pl. XI, figs. 14—21, pl. XV, figs. 1—12.
1895. *Astræa radians*, GREGORY, Quart. Jour. Geol. Soc. Lond., vol. LI, p. 277.

Linnæus described a *Madrepora astroites* in Systema Naturæ, ed. X, p. 796, but the description is not sufficient for even approximate identification. The only reference in the synonymy that I have been able to verify is the one to Sloane's Jamaica (vol. I, p. 54, pl. XXI, *Lapis astroites s. stellaris*). I cannot identify this figure. When Pallas's descrip-

1) Man. Conch. pp. 810 and 812.

tion of *M. radians* is taken together with Seba's figures (pl. CXII, figs. 12, 14, 17, 18) one can be reasonably sure of the identification being correct. The *Madrepora astroites* of the twelfth edition of Linnæus is the same as the *M. radians* of Pallas. It appears to me that *astroites* of Linnæus must be dropped altogether, and that *radians* of Pallas must be adopted.

Fossil in Curaçao: West Point, and foot of Fort Nassau (Young Quaternary), Beekenburg (Young Quaternary).

Fossil elsewhere: Barbados, Lowlevel reefs; Bahamas, Pleistocene reefs. (Gregory).

Recent: West Indies, Florida, &c.

Siderastrea siderea (Ellis and Solander).

1786. *Madrepora siderea*, ELLIS & SOLANDER, Nat. Hist. Zooph., p. 168, pl. XLIX, fig. 2.
1816. *Astrea siderea*, LAMARCK, Hist. Nat. Anim. s. Vert., t. II, p. 267.
1830. *Astrea* (*Siderastrea*) *siderea*, DE BLAINVILLE, Dict. Sci. Nat., t. LX, p. 335.
1834. *Astræa tricophylla*, EHRENBERG, Corall. Roth. Meer. Abhandl. Kgl. Akad. Wiss. Berlin for 1832, p. 319 (*fide* MILNE-EDWARDS & HAIME).
1846. *Pavonia siderea*, DANA, Zooph. Wilkes Expl. Exped., p. 331.
1850. *Siderastrea siderea*, MILNE-EDWARDS & HAIME, Ann. Sci. Nat., 3ième sér., Zool., t. XII, p. 141.
1857. *Astræa siderea*, MILNE-EDWARDS & HAIME, Hist. Nat. Corall., t. II, p. 509, pl. D 7, fig. 2.
1863. *Sideraslræa crenulata var. antillarum*, DUNCAN, Quart. Jour. Geol. Soc. London, vol. XIX, p. 435.
1863. *Siderastræa grandis*, DUNCAN, op. sup. cit., p. 441, pl. XVI, figs. 5*a*, 6.
1871. *Siderastræa siderea*, POURTALÈS, Ill. Cat. Mus. Comp. Zool., N°. IV (Mem. Vol. II), p. 81.
1895. *Astræa siderea*, GREGORY, Quart. Jour. Geol. Soc. London, Vol. LI, p. 278.

Gregory places *Siderastrea globosa* Milne-Edwards and Haime doubtfully in the synonymy of this species. From the original description of the former I would judge that it is not a synonym of *S. siderea*. *Siderastræa stellata* of Verril, from Brazil, is a distinct species, and does not be-

long in the Synonymy of *S. siderea.* It usually possesses four complete cycles of septa, but in most of its characters it resembles *S. radians* more closely. The upper portions of the septa are flattened as in the latter species. The calices may form short series, sometimes are even meandriform. The examination of a large suite of specimens in the United States National Museum leads me to the conclusion that it is a valid species.

Fossil in Curaçao: Hato, loose on the surface; Beekenburg (Young Quaternary); Spanish Harbor (Young Quaternary); foot of Fort Nassau (Young Quaternary); Veeris (Young Quaternary); Arube: Spanish Lagoon.

Fossil elsewhere: Barbados, Low and High level reefs; Santo Domingo; Jamaica; Cuba.

Recent: throughout the Caribbean regon.

Genus Agaricia Lamarck. 1801.

(+ *Undaria* and *Mycedium* OKEN, 1815).

After having spent considerable time in comparing specimens of *Agaricia* and *Mycedium*, I have reached the same conclusion as Gregory regarding their generic relationships, i. e. that the two genera must be merged into one, and under the former name as it is the older.

There is a large amount of material of *Agaricia agaricites* (Linn.) and *Mycedium fragile* Dana in the U. S. National Museum.

The *Mycedium* condition of the corallites, may appear on specimens of *A. agaricites*, combined with the calicular type usual for the species; and vice versa, specimens of *M. fragile* when seen from above look like the ordinary *A. agaricites.* Young specimens cannot always be specifically identified. The specific distinction consists in *fragile* having

calices on one side of the lamina, while in *agaricites* they are nearly always on both sides; and *fragile* grows in thin laminæ or somewhat funnel-shaped masses, attached in the middle. The young of *agaricites* has calices on only one side, but the older colonies usually have calices on both sides of the irregularly shaped laminated masses.

The corallum of *agaricites* is nearly always heavier than in *fragile*. I have not seen specimens excepting young, that I could not identify with one or the other of the two species, but they sometimes run very close together.

Milne-Edwards and Haime place *Phyllastræa* of Dana (type species *Phyllastræa tubifex* Dana, Fiji Islands) in the synonymy of *Mycedium*[1]). The type (and only) species seems to me utterly distinct from *Mycedium*. Both endothecal and exothecal dissepiments are well developed; if synapticula are present they are rare. The septa of the two lower cycles are very exsert and those next the lamina are prolonged above the calice as strong jaggedly dentate costæ, making the edge of the laminate corallum dentate by their projection. The septa are very dentate. The columella is formed of spines from their inner ends.

It seems that Dana was correct in placing it in his „*Astræacea*." I believe that it should be grouped with *Tridacophyllia* (now *Pectinia*).

Agaricia agaricites (Linnæus).

1758. Seba, Thes., III, pl. CX, fig. 6, cc.
1758. *Madrepora agaricites*, Linnæus, Syst. Nat., ed. X, p. 795.
1766. *Madrepora agaricites*, Pallas, Elench. Zooph., p. 287.
1767. *Madrepora agaricites*, Linnæus, Syst. Nat., ed. XII, p. 1274.
1895. *Agaricia agaricites*, Gregory, Quart. Jour. Geol. Soc. Lond., Vol. LI, pp. 279, 280 (and synonymy). + *Hydnophora latefundata*, Gregory, op. cit., pp. 267, 268, pl. XI, figs. 1*a*, 1*b*.

1) Hist. Nat. Corall., t. III, p. 72.

As my study of the synonymy of this species has led to the same conclusion as that reached by Gregory, I do not repeat the long and complicated synonymy. But Linnæus, and not Pallas, gave the first characterization of the species.

The following species in my opinion are synonyms of *Agaricia agaricites*. *A. undata* (Ell. & Sol.), *A. purpurea* Le Sueur, *A. gibbosa* (Dana), *A. cristata* Lam., *A. lamarcki* Milne-Edw. & Haime, *A. danæ* (Duch. & Micht.), *A. lessoni* (Duch. & Micht.), *A. vesparium* (Duch. & Micht.) and probably *A. sancti-johannis* (Duch. & Micht.)

I saw in Turin the types of Duchassaing & Michelotti's *Mycedium danai*, *lessoni* (labeled *lesueuri*), and *vesparium*, but did not see those of *sancti-johannis* and *cailleti*. From the description the *Mycedium sancti-johannis* seems a synonym of *agaricites*, therefore, though I do not possess positive knowledge, it seems to me that it belongs in the synonymy of this species.

I cannot determine Horne's *Agaricia anthrophylla* from his description[1]) and have not seen the type. The following is the description: „A. late explanata, undata, corallium margine fragile. Superficie inferiore striata; superne laminis erectis (1—3½″ altis) coalitis et meandrinis (saepe 8″ longis); collibus elongatis et æqualibus (1—1½″ altis et latis) lamellis crassis confertissimis.

„Grows in subhemispherical clumps, attached below by its center. It differs from the other Agariciæ in its vertical and coalescing plates. The lamellæ are stout, being greater in the thickness than the width of the species between them. Corallum thin at the edges, interiorly measuring from three to five lines.

„Locality. Unknown. Dr. G. B. Wilson."

1) Proc. Acad. Nat. Sci. Phil., Vol. XII, 1860, p. 435.

Judging from „superficie inferiore striata", this would seem to group with *A. fragilis* or *elephantotus*, but the vertical and coalescing plates recall one of the common varieties of *A. agaricites*. I am inclined to treat the species as Gregory has done, placing it doubtfully as a synonym of the last mentioned species.

The primary division of the genus into species by Milne-Edwards and Haime is based upon the number of septa to the calice. The number is extremely variable. I find their *agaricites* and *lamarcki* combined in one specimen. The real distinction between *agaricites* and *undata* consists in the type of the valleys and collines and certain peculiarities of calicular arrangement (cf. Ellis & Solander pl. XL). It is easy to find on the same corallum long regular valleys and collines of the *undata* type with short broken valleys or even circumscribed calices. Ellis and Solander evidently made no attempt to figure the details of the septal arrangement but they indicate more septa than Milne-Edwards and Haime give. Gregory has pointed out the variation in the calicular arrangement (op. sup. cit.). In the same colony portions may be wide and frond- or fan-like, while other portions are much lobed. The species is so extremely variable that it is very difficult specifically to characterize it, but after one has examined a large number of specimens it is usually easily recognized.

Gregory's *Hydnophora latefundate*[1]) is only a cast of the surface of the same species. It had seemed to me that such was the case from a first study of Gregory's description and figures. There is one such cast in the collection from Curaçao and I have seen others from the elevated reefs of other West Indian Islands. Too, I have seen Gregory's type

1) Quart. Jour. Geol. Soc. Lond., vol. LI, 1895, pp. 267, 268. pl. XI, figs. 1*a*, 1*b*.

in the British Museum. To make myself feel sure of my opinion, I made rubber squeezes from four different specimens. These squeezes show considerable variation, but in general the description of *Hydnophora latefundata* applies splendidly; to one specimen it applies *in toto*. The dentations that are described for the septa of *H. latefundata* appear on the casts of the interseptal loculi. The furrows between the septo-costae of *Agaricia agaricites* are of the same size, as the septa of Gregory's species are of the same size. The details of this comparison might be carried further, but it does not seem necessary to say more.

Fossil in Curaçao: Foot of Fort Nassau (Young Quaternary); summit of Fort Nassau (Old Quaternary), this specimen is a cast of the surface of a specimen of the *undata* type of Ellis and Solander; Veeris (Young Quaternary).

Fossil elsewhere: Low-level reefs of Barbados; Santo Domingo; Guadaloupe.

Recent: West Indies, Caribbean region, Florida.

Agaricia fragilis (Dana).

1846. *Agaricia* (*Mycedia*) *fragilis*, DANA, Zooph. Wilkes Expl. Exp., p. 341.
1880. *Mycedium fragile*, POURTALÈS, Florida Reef. Corals, Mem. Mus. Comp. Zool., vol. VII, N°. 1, pl. XIII, figs. 1—5, pl. XIV, figs. 1—9 (all figures on both plates, excellent illustrations).

Gregory combines *fragilis* with *elephantotus* of Pallas but I have not as yet seen specimens that in my mind warrant their union into a single species, although there is a large suite of *A. fragile* in the U. S. National Museum, and I have seen good specimens of *A. elephantotus*. *Mycedium cailleti* appears to me to be distinguishable. The U. S. Fish Commission collected excellent specimens around Puerto Rico in its 1898—99 expedition. Sufficient notes on the

variation have been made in the discussion of the genus *Agaricia* and in the description of *A. agaricites.*

Fossil in Curaçao: Plantersrust (Old Quaternary).
Fossil elsewhere: elevated reefs of Barbados.
Recent: West Indian Islands, Florida &c.

Genus Isopora Studer. 1878.

1758. *Millepora* (*part.*), LINN., Syst. Nat., ed. X., p. 790.
1766. *Madreporæ anomalæ* (*part.*), PALLAS, Elench. Zooph., p. 279.
1767. *Madrepora* (*part.*), LINN., Syst. Nat., ed. XII, p. 1272.
(Also of ESPER, Pflanzenthiere; ELLIS & SOLANDER, Nat. Hist. Zooph.; LAMARCK, Syst. An. sans Vert., etc.)
1816. *Madrepora*, LAMARCK, Hist. Nat. An. sans Vert., p. 277.
1834. *Heteropora*, EHRENBERG (non DE BLAINVILLE), Corallenth. Roth. Meer., p. 333.
Madrepora, DANA, MILNE-EDWARDS and subsequent authors.
1878. *Isopora* (as subgenus), STUDER, Monatsber. Akad. Wissensch. Berlin, 1878, p. 535.
1893. *Eumadrepora*, *Odontocyathus*, *Polystachys*, *Lepidocyathus*. *Isopora*, *Tylopora*, *Conocyathus*, *Rhabdocyathus* (as subgenera), BROOK, Cat. Madrepor., vol. I, *Madrepora*, Brit. Mus., p. 22.

Brook has pointed out (op. cit. p. 22) that none of the species at present called *Madrepora* were included in the Linnæan *Madrepora* of 1758. *Madrepora muricata* was placed in *Millepora.* What we now call *Madrepora* was subsequently inserted in the original Linnæan genus and later the inserted part was made the type of *Madrepora* when it was subdivided. This is against all rules for nomenclature. The name *Madrepora* cannot be employed as by Dana, Milne-Edwards and Haime and later authors. *Heteropora* Ehrenberg cannot be used because de Blainville had previously applied the name to a genus of Bryozoa. The first available name known to me is *Isopora* Studer applied in a subgeneric sense. I propose here to elevate it to generic rank. Studer included two species in it, *Madrepora labrosa* and *Madrepora securis* both of Dana, designating neither one as a type.

The type species of *Madrepora* must be selected from

the original list of species of Linnæus, but I have not studied the generic history of all the species to determine the one to which the name *Madrepora* should be attached.

Isopora muricata (Linnæus) forma muricata s. s. (=cervicornis Lamarck).

1758. *Millepora muricata (part.)* LINNÆUS, Syst. Nat., ed. X, p. 792.
1767. *Madrepora muricata (part.)*, LINNÆUS, Syst. Nat,, ed. XII, p. 1279.
1893. *Madrepora muricata.* BROOK, Cat. Madrep. Cor. Brit. Mus., vol. I, Gen. *Madrepora*, pp. 23—30, with synonymy.
1895. *Madrepora muricata*, GREGORY, Quart. Jour. Geol. Soc. Lond., vol. LI, pp. 281—282.

After having examined very large suites of specimens of this species and having studied the material in the British Museum and most of Duchassaing and Michelotti's types in Turin, I have reached the same conclusion as Brook, subsequently reiterated by Gregory — i. e. so far, we known only one species of *Madrepora* from the West Indies, and this may be conveniently divided into three formæ or varieties, viz: *muricata* s. s. (*cervicornis* Lam.), *prolifera* and *palmata*. The forma *muricata* s. s. is one of the commonest fossil corals of the elevated reefs of the West Indian Islands. I have given photographic illustrations of the intergradation of these formæ in my report for the U. S. Fish Commission on the recent corals of Puerto Rico.

I propose here to supplement what Brooks has said on the early history of the nomenclature of this species.

The second reference given by Linnæus in his original synonymy of *Millepora muricata*[1]) is „Sloan jam. I, p. 51, t. 18, f. 3 corallium album porosum maximum muricatum." The full title of the work referred to is „A voyage to the Islands of Madera, Barbados, Nieves, S. Christophers and

1) Syst. Nat., ed. X, 1758, p. 792.

Jamaica, with the natural history of the herbs and trees, four-footed beasts, fishes, birds, insects, reptiles, &c. of the last of these islands; to which is prefixed an introduction wherein an account of the inhabitauts, air, water, diseases, trade &c. of that place, with some relations concerning the neighboring continent, and islands of America. Illustrated with the figures of the things described, which have not been heretofore engraved; in large copper plates as big as the life. By Hans Sloane, M. D., in two volumes. London, 1790." This old book contains a considerable number of fairly good figures of Jamaican corals. The figure to which Linnæus makes reference, pl. 18, fig. 3, is the typical *Madrepora cervicornis* of Lamarck. Pallas [1]) divided the species into three varieties: *α.* varietas *ramosa*, under which reference is made to Browne's Jamaica, Sloane's Catalogus plantarum Insulæ Jamaicæ (Lond. 1691), and Sloane's Natural History of Jamaica. He also refers to Seba's Thesaurus. I do not know what pl. CVIII, fig. 6, represents, but pl. CXIV, fig. 1, is the common *cervicornis*. Knorr's (Deliciæ Naturæ) pl. A II, fig. 1, also referred to by Pallas, is the same. Knorr's says „Het is namentlyk dit eige zelve Koral 't welk by Sloane Jamaica. Tab. XVIII, fig. 3, onder den Naam van corallium album porosum muricatum maximum gevonden werd, etc." (op. cit. p. 6). *β.* varietas *corymbosa*. Under this, reference is made to Browne's Jamaica p. 391, N°. 6. „Madrepora maxima compressa, palmata & muricata." Browne states „This grows the largest of all the coralline substances found about Jamaica; it is met with in large single masses of an irregular compressed form, which spread into broad flat lobes towards the top." (Op. loc. cit.). Browne refers to pl. 18 of Sloane's Nat.

1) Elench. Zooph., 1766, pp. 327—331.

Hist. of Jamaica, but seems to me to mean pl. 17, fig. 3. γ. Reference is made to Sloane's Natural History of Jamaica, vol. I, p. 58, n. 5, tab. 17, fig. 3, which is what is usually denominated *Madrepora palmata.* Pallas gives as the „Locus: Mare Americanum & Indicum."

Linnæus in Syst. Nat., ed. XII, pp. 1279, 1280, gives references again, showing that the West Indian forms were included in *Millepora muricata* now transferred to *Madrepora,* following Pallas. Ellis and Solander included the West Indian species in *muricata.* Their var. α is *cervicornis* Lam.; δ has for a synonym var. β of Pallas; ε, is the γ of Pallas, or *palmata* Lamarck. Esper's *Madrepora muricata* [1]) was composed of several species, but included the West Indian forms. In the Museum Calonnianum, 1797, p. 68, usually credited to Humphreys, the name *muricata* so far as I know is for the first time attached definitely to the West Indian species. Dana, Milne-Edwards and Haime and subsequent writers on corals until Brook, have not used the name. Brook was entirely correct in his use of the name. The form hitherto usually called *cervicornis* should be the typical form of the species [2]).

Fossil in Curaçao: One specimen without locality; Hato, loose on the surface: Brievengat, loose on the surface.

Recent: Curaçao, Vera Cruz, West Indies, Florida (and Australia, fide Brook).

Genus Alveopora Quoy and Gaimard. 1833.

Alveopora regularis Duncan.

1863. *Alveopora dædalæa.* Blainville, *var. regularis,* Duncan, Quart. Jour. Geol. Soc. Lond., vol. XIX, p. 426, pl. XIV, figs. 4*a* to 4*c*.
1868. *Alveopora dædalæa,* Duncan, Quart. Jour. Geol. Soc. Lond., vol. XXIV, p. 25.

1) Pflanzenth. Fortsetz., pp. 45—59.

2) J. E. Duerden has some interesting observations on the polyps of this species in Jour. Inst. Jam., vol. II, N°. 6, 1899, pp. 621—622.

The following is Duncan's original characterization of the species: „Corallites prismatic, in all cases radiating from a small base, and lobed above. Walls very regularly perforated and thin. Calices a little smaller than the transverse sections of the corallites, rather deformed, polygonal, ½ line in diameter. Septa spiculiform, and forming a false columella by their junction with some slight cellular trabeculæ.

„From the Chert-and-Marl formations of Antigua."

I am also inclined to believe that Duncan's *Alveopora fenestrata* from the Marl-formation of Antigua belongs to the same species. I saw Duncan's material in the collections of the Geological Society of London. It is very unsatisfactory, being casts and impressions and not furnishing data for complete specific characterization. Duncan gives the diameter of the corallites as ½ line, which is approximately 1 mm. I doubted this, so wrote to Mr. C. Davies Sherborn and requested him to make some measurements for me. The diameter, he writes me, is from 1.5 to 2 mm., more often 2. He has also sent me some rubber squeezes, made parallel to the longitudinal axes of the corallites. I find 2.5 mm. not an infrequent diameter on the squeezes. The diameter of the corallites should have been stated as 1.5 to 2.5 mm. or slightly greater.

The specimen in the collection of Prof. Martin is a mass not quite so large as a man's fist. The original calcareous skeleton has been dissolved and only a cast is now left. The general features of the corallum are the same as those described by Duncan for *regularis*. The diameter of the corallites ranges from 1.5 mm. to 3 mm. or slightly more. The usual diameter is between 2 and 2.5 mm. Neither the septa nor calices are preserved.

There are in the collections of the U. S. Geological Survey

two excellent but young specimens of *Alveopora* from the Upper Oligocene, 2½ miles west of Tampa, Florida. From the size and arrangement of the corallites and the mural perforation, they are evidently the same as *regularis*. These specimens will be fully described and figured in my memoir on the Post-Eocene Corals of the United States, now in preparation. There is also a good large specimen in the collection of fossil corals made by Dr. J. W. Spencer in Antigua. This collection is in the U. S. National Museum.

Fossil in Arube: Serro Colorado. Elsewhere: Antigua, both chert and marl formations; Tampa, Florida, in Tampa beds, also on Hint River, near Bainbridge, Georgia.

Geologic horizon: Miocene of Duncan; formerly Older or Warm Water Miocene of Dall; now designated Upper Oligocene by Dall.

Genus Porites Link. 1807.

Porites porites (Pallas). [1]

1766. *Madrepora porites* (pars), PALLAS, Elench. Zooph., p. 324.
1895. *Porites clavaria*, GREGORY, Quart. Jour. Geol. Soc. Lond., vol. LI, p. 282, with synonymy.

Gregory has omitted the names of three species that should be placed in this synonymy. *Porites polymorphus* Link [2]) is simply a new name for *Madrepora porites* of Pallas. Reference is made to pl. XXI of Esper, which is the *Porites clavaria* of Lamarck. The genus *Porites* does not date from Lamarck 1816, but from Link 1807. The type species is *Madrepora porites* Pallas, here called *Porites porites* (Pallas).

1) The synonymy and variation of this species are fully discussed in my report on the Porto Rican Corals.

2) Beschreib. Natur. Samml. Rostock, 1807, p. 162.

Lamarck did not use *Porites* in his Système des Animaux sans Vertèbres, 1801. The other species omitted by Gregory are *Porites valida* Duchassaing and Michelotti[1]) and *Porites nodifera* Klunzinger[2]). Rehberg in his „Neue und wenig bekannte Korallen[3]) says that Klunzinger's *P. nodifera* is probably the same as *P. clavaria*, and that the locality, Red Sea, as given by Ehrenberg and Klunzinger is erroneous. I studied carefully the figured type of *nodifera* is the Museum für Naturkunde, Berlin, and can state that *nodifera* and *clavaria* are the same, and that it seems to me most probable that Rehberg's suggestion as to the wrong locality label becoming attached to the specimen is correct.

Fossil in Curaçao: Beekenburg, Young Quaternary; foot of Fort Nassau, Young Quaternary; Veeris Young Quaternary; in Arube: Spanish Lagoon. Fossil elsewhere: in the late Tertiary elevated reefs of many West Indian Islands, Barbados. Recent: Bermuda, Florida, West Indies, eastern Mexican coast.

Porites astreoides Lamarck.

1816. *Porites astreoides*, LAMARCK, Hist. Nat. Anim. s. Vert., t. II, p. 269.
1820. *Porites astroides*, LE SUEUR, Mém. Mus. Hist. Nat. (Paris), t. VI, p. 287, pl. XVI, fig. 15.
1824. *Porites astreoides*, LAMOUROUX, Encycl. méth. Zooph., p. 651.
1826. *Porites astreoides*, DE BLAINVILLE, Dict. Sci. Nat., t. XLIII, p. 50.
1829. ? *Porites conglomeratus*, EICHWALD, Zool. Special., p. 182.
1830. *Porites astreoites*, DE BLAINVILLE, Dict. Sci. Nat., t. LX, p. 360.
1834. *Porites astreoites*, DE BLAINVILLE, Man. d'Actin., p. 395.
1836. *Porites astreoides*, LAMARCK, Hist. Nat. Anim. s. Vert., 2ième ed., t. II, p. 435.
1837. *Porites astreoides*, LAMARCK, Hist. Nat. Anim. s. Vert., 3ième éd., t. I, p. 308.
1846. *Porites astræoides*, DANA, Zooph. Wilkes Expl. Exped., p. 561.

1) Supp. Mém. Corall. Ant., p. 188, pl. X, fig. 13.
2) Die Korallenthiere des Rothen Meeres, pt. II, p. 41.
3) Abhand. Naturwiss. Ver. Hamb., Bd. XII, 1892, p. 47.

1850. *Porites astreoides*, DUCHASSAING, Anim. Rad. Ant., p. 17.
1851. *Porites conglomerata (partim)*, MILNE-EDWARDS & HAIME, Ann. Sci. Nat., 3ième sér., t. XVII, p. 29.
1860. *Porites astroïdes*, MILNE-EDWARDS & HAIME, Hist. Nat. Corall., t. III, p. 178.
1861. *Porites incerta, guadalupensis*, and *agaricus*, DUCHASSAING & MICHELOTTI, Mém. Cor. Ant., p. 359.
1863. *Porites collegniana*, DUNCAN, Quart. Jour. Geol. Soc. Lond., vol. XIX, p. 437.
1864. *Porites astræoides*, VERRILL, Bull. Mus. Comp. Zool., vol. I, N°. 3, p. 42.
1865. *Porites astræoides*, VERRILL, Proc. Bost. Soc. Nat. Hist., vol. X, p. 323.
1866. *Neoporites littoralis*, p. 191; *N. astræoides*, p. 192; *N. michelini*, p. 192, pl. X, figs. 9—10; *N. subtilis*, p. 192, pl. X, figs. 7, 8; *N. superficialis*, p. 193; *N. guadalupensis*, p. 193; *N. agaricus*, p. 193; *N. incerta*, p. 193; and *Cosmoporites lævigata*, p. 193, pl. X. figs. 12, 16, Supp. Mém. Corall. Ant., pp. 191—193, pl. X, figs. 7, 8, 9, 10, 12, 16.
1868. *Porites collegniana* and *Porites astroides*, DUNCAN, Quart. Jour. Geol, Soc. Lond., vol. XXIV, p. 25.
1870. *Neoporites littoralis, astræoides, michelini, subtilis, superficialis, guadalupensis, agaricus* and *incerta*, and *Cosmoporites lævigata*, DUCHASSAING, Rev. Zooph. et Spong. Ant., p. 32.
1871. *Porites astraeoides*, POURTALÈS, Reef Corals, Ill. Cat. Mus. Comp. Zool. N°. IV, (Memoirs, vol. II.), p. 85.
1877. *Porites astræoides*, LINDSTRÖM, Kongl. Svenska Vet. Akad. Handl. (Andra Häft.), N°. 6, p. 24.
1880. *Porites astræoides*, POURTALÈS, Fla. Reef Corals, Mem. Mus. Comp. Zool., vol. VII, N°. 1, pl. XVI, figs. 1—12.
1886. *Porites astræoides*, QUELCH, Reef Corals, Chall. Exp., pp. 11, 13, and 182.
1887. *Porites astræoides*, RATHBUN, Proc. U. S. Nat. Mus., vol. X. p. 354.
1888. *Porites astræoides*, HEILPRIN, Proc. Acad. Nat. Sci. Phila. for 1888, p. 306.
1890. *Porites astræoides*, HEILPRIN, Proc. Acad. Nat. Sci. Phila. for 1890, p. 305.
1891. *Porites astræoides*, HEILPRIN, Proc. Acad. Nat. Sci. Phila. for 1891, p. 75.
1895. *Porites astræoides*, GREGORY, Quart. Jour. Geol. Soc. Lond., vol. LI. p. 284.

EHRENBERG's *Madrepora* (*Porites*) *astræoides* is not a *Porites* but is a *Stylophora*, *St. ehrenbergi* MILNE-EDWARDS and HAIME [1]).

The only point in the synonymy of this species demanding especial consideration is the tre tment accorded the species of Duchassaing and Michelotti. I found in Turin the types of five of the eight species described by these authors,

1) Hist. Nat. Cor., t. II, p. 139.

viz: *littoralis*, *superficialis*, *guadalupensis*, *incerta*, and *agaricus*. I could not discover differences of sufficient importance to establish even varieties. There remain *Neoporites michelini*, *N. subtilis*, and *Cosmoporites lævigata*, all of which are figured, besides the names are accompanied by poor brief Latin descriptions. Neither the descriptions nor figures show any characters of value, unless it be in the figure of the calice of *subtilis* showing a greater number of septa than the other species.

The work of Duchassaing and Michelotti is at all times miserable, it has been the most serious misfortune that has befallen the study of the recent West Indian Corals, but their thorough incapacity reached a climax in their treatment of *Porites*, which closes their work on the true corals.

Pourtalès has published superb figures in Agassiz's Florida Reef Corals (Mem. Mus. Comp. Zool., vol. VII, N°. 1, 1880).

Two species grouping with *astræoides* remain to be considered, viz: *Porites solida* Verrill (non *solida* Forskal) = *P. verrilli* Rehberg [1]), and *Porites branneri* Rathbun. The former *P. verrilli* Rehberg, must in my opinion be placed in the synonymy of *P. astreoides*. There are several excellent specimens from Rio Formosa, Pernambuco, Brazil (collected by the Hartt Expedition, 1875), in the U. S. National Museum. These specimens have the same general appearance as *astreoides*. The only feature that could be used for specific differentiation is the usually constant presence of a solid columella, which may have a small slight styliform projection in the center. There are twelve septa, no pali and the wall is as in *astreoides*. The difficulty about

1) Neue und wenig bekannte Korallen, Abh. Naturwiss. Ver. Hamburg., Bd. XII, 1892, pt. 1, p. 48.

using the difference of the columella as of specific value, is that in the specimens of *verrilli* it shows variation in the degree of compactness while in *astreoides* we can find in the same specimen the typical *verrilli* condition or a weak style with very little or no basal deposit around it. There can be no varietal difference.

Porites branneri Rathbun seems to be a perfectly distinct species. There are in the U. S. National Museum several specimens from Pernambuco, Brazil (Hartt Exp., collector). The species grows in small, incrusting masses. The calices are smaller than is common in *astreoides*, but the distinguishing feature is the constant presence of five pali, they are rather slender and erect. The columella space is usually vacant, sometimes a columella is present. The species needs further study, for it suggests the young colony of *Porites porites* (Pallas).

In *P. astreoides* the usual number of septa is twelve, but sometimes rudimentary septa are present between the larger.

Fossil in Curaçao: Foot of Fort Nassau (Young Quaternary); in Arube: Daimarie (Young Quaternary). Fossil elsewhere: in late Tertiary elevated reefs of Barbados and other West Indian Islands, Cuba, &c.

Recent: Bermudas; West Indian Islands; Florida; Vera Cruz; Brazil. Common in Curaçao.

A LIST OF PAPERS ON THE RECENT AND FOSSIL STONY CORALS AND CORAL REEFS OF THE WEST INDIES, FLORIDA, THE BERMUDAS, THE WESTERN SHORES OF THE GULF OF MEXICO AND NORTH-EASTERN SOUTH AMERICA.

This is a list of the papers known to me bearing on the stony corals and coral reefs of these regions. I found if I gave references to all papers which merely alluded to the occurrence of fossil corals, that it would be necessary for me to work up completely all of the geologic literature on the regions; therefore for Cuba and Curaçao, and may be other islands, the bibliography is not complete. I know of papers on each of these islands that I have omitted. I believe that nearly every paper dealing with the synonymy of the species of corals or their geographic distribution is included, probably excepting some notes, &c., published in L'Institut by Milne-Edwards and Haime and Duchassaing. References to text books on geology have not been included. The papers that I have not personally examined are indicated by an asterisk (*).

Dr. H. S. Gane in his „Some Neocene Corals from the United States" gives an extensive bibliography of these corals from those formations in the United States.

I have a similar bibliography in my „Eocene and Lower Oligocene Coral Faunas of the United States." Those bibliographies, I believe, contain references to about all that has been published on the post-Cretaceous stony corals of the

United States and the West Indian and Caribbean regions, except a few papers on the recent fauna of the Pacific coast of North America.

Dr. J. E. Duerden, Curator of the Museum of the Institute of Jamaica, Kingston, Jamaica, is just completing an exhaustive study of the soft parts of the species of stony corals found around that island. Mr. A. W. Greeley of San Diego, California, has in preparation a report on the corals of the Brazilian reefs. I cannot add titles of these papers to the list and do not known when they will be published.

AGASSIZ, A. The Tortugas and Florida Reefs. Mem. Amer. Acad., vol. XI, 1883, pp. 107—132, pls. I to XII.

Three cruises of the Blake. Bull. Mus. Comp. Zool., vol. XV, 1880.

On the Rate of Growth of Corals. Bull. Mus. Comp. Zool., vol. XX, N°. 2, 1890, 4 pls. (Abstr. Jour. Roy. Micr. Soc. Lond., 1891, pt. I, p. 51).

Observations in the West Indies. (In a letter to J. D. Dana, dated Steam Yacht »Wild Duck", Nassau, March, 1893). Am. Jour. Sci., 3rd ser., vol. XLV, 1893, pp. 358—362.

Notes from the Bermudas. (From a letter to Professor J. D. Dana dated Bermuda, March 12, 1894). Am. Jour. Sci., 3rd. ser., vol. XLII, 1894, pp. 111—416.

A Reconnaissance of the Bahamas and of the Elevated Reefs of Cuba in the Steam Yacht »Wild Duck", January to April 1893. With forty-seven plates. Bul. Mus. Comp. Zool., vol. XXVI, Dec. 1894.

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Washington, D. C., June 1900.

POST-SCRIPT.

Since the manuscript of the foregoing paper went to press, I have discovered that I omitted the titles of at least two papers that should have been included in the bibliography; several papers have either been published or have come to my notice since the manuscript left my hands; my finding the extensive development of coral reefs in the Chattahoocheean Oligocene of Southwestern Georgia gives us much more data for determining the chronology of the West Indian fossil reefs.

The following is a list of the additional titles:

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GREGORY, J. W. The Corals (Jurassic Fauna of Cutch)- Palæontolgia Indica, ser. IX, vol. II, pt. 2, 1900, pp. 195 + IX, pls. IIA—XXVII. [See *Stephanocœnia* pp. 63—65].

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Washington, D. C., Mar. 6, 1901.

TABLE OF CONTENTS.