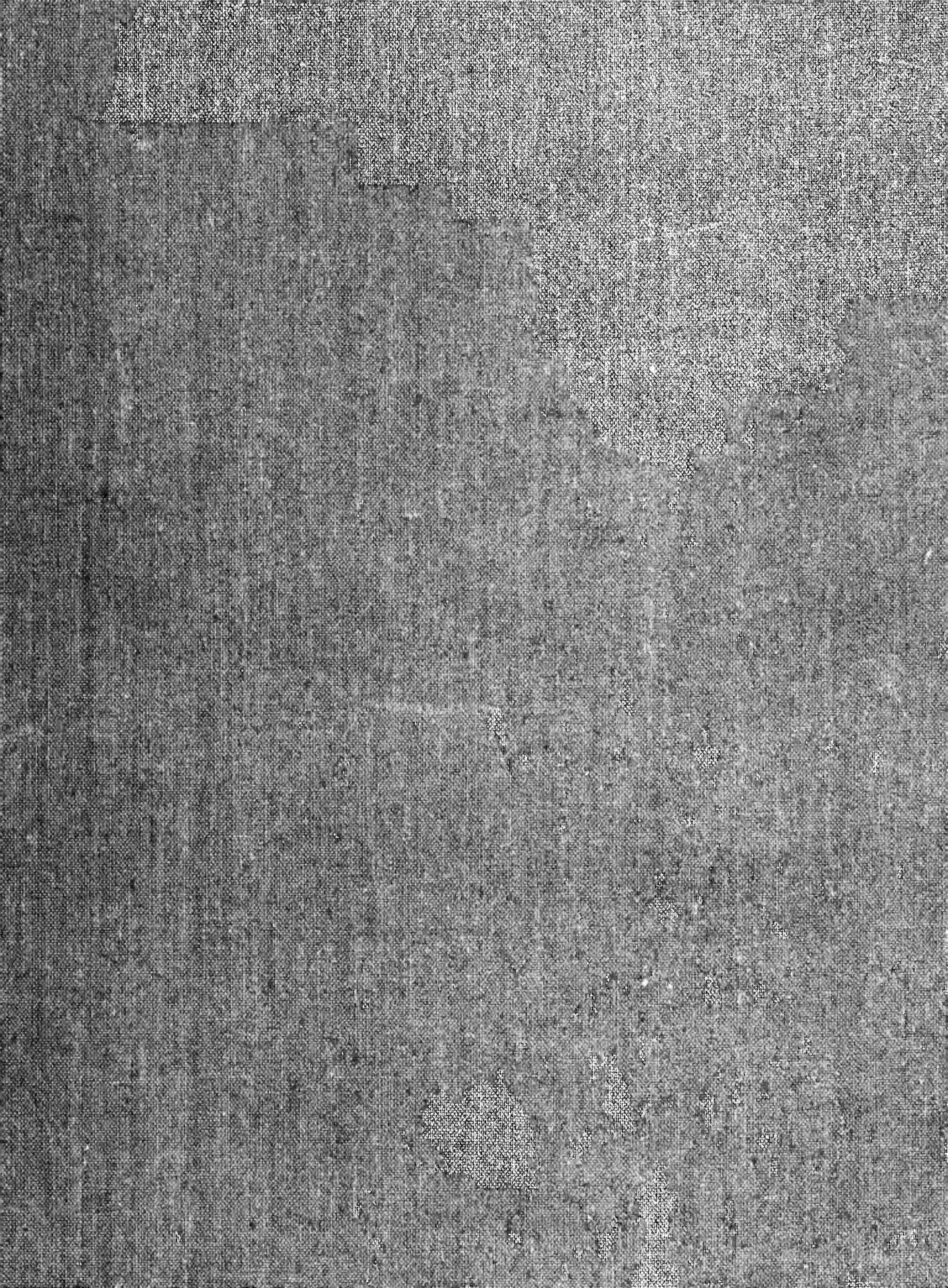

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A MONOGRAPH

OF THE

BRITISH FOSSIL CORALS.

BY

H. MILNE EDWARDS,

DEAN OF THE FACULTY OF SCIENCES OF PARIS; PROFESSOR AT THE MUSEUM OF NATURAL HISTORY;
MEMBER OF THE INSTITUTE OF FRANCE;
FOREIGN MEMBER OF THE ROYAL SOCIETY OF LONDON, OF THE ACADEMIES OF BERLIN, STOCKHOLM, ST. PETERSBURG
COPENHAGEN, VIENNA, KONIGSBERG, MOSCOW, BRUXELLES, HAARLEM, BOSTON, PHILADELPHIA, ETC.,

AND

JULES HAIME.

LONDON:

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J. E. ADLARD, PRINTER, BARTHOLOMEW CLOSE

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FIRST PART.

INTRODUCTION; CORALS FROM THE TERTIARY AND CRETACEOUS FORMATIONS.

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INTRODUCTION.

§ I.[1]

Naturalists often designate under the general name of *Coral*, not only the stony substance of a vivid red which is found on the coast of Barbary, and has been long used for ornamental purposes, but also a vast number of other marine productions, which have a calcareous structure, and are considered as appertaining to Zoophytes, more or less analogous to the Polypi that form the *Isis nobilis* of Linnæus, or real Mediterranean Coral. The remains of the minute plant-like animals which abound in most tropical seas, and constitute in some parts of the globe extensive reefs, or even large clusters of islands, have thus been very properly called *Corals*. But the same appellation has been erroneously given to the lapidified teguments of many beings which differ most essentially from all Zoophytes, and belong some to the great Mollusca tribe, some to the family of Sponges, and others to the Vegetable kingdom. In all Natural classifications it is necessary to separate that which is fundamentally different, and to unite that which is in reality similar. Zoologists must, therefore, be more reserved in the use of this expression, and cannot, without impropriety, continue to comprehend under the same name all the natural productions which are com-

[1] In writing this Monograph in English, a language with which I am not so familiar as I could wish, I much fear that the incorrectness of the phraseology will often strike the reader. I preferred, however, not having recourse to a translator, for the meaning of an author is often misrepresented by those who lend him their pen, and I thought that in a work of this kind accuracy of description would be preferable to elegance of style. Before commencing the task I have undertaken, I must also beg leave to express publicly my grateful feelings for the kind and liberal manner in which Sir H. De la Beche, Mr. Stokes, Mr. J. S. Bowerbank, Professor John Phillips, Mr. Frederick Edwards, Mr. Searles Wood, Mr. Dixon, Mr. Pratt, Mr. Sharpe, Dr. Battersby, Mr. F. W. Fletcher, Mr. J. Gray, and the Council of the Geological Society of London, have communicated to me the palæontological treasures belonging to their respective collections.—H. Milne Edwards.

monly thus blended together. For us the word *Coral*, or *Corallum*, must be synonymous with *Polypidom*,[1] and signify the hard or ossified parts of the body of a Polyp.

In treating of the "Fossil Corals of Great Britain," we must, therefore, exclude from our investigation the various organic remains which bear a certain resemblance to Polypidoms, but which do not in reality belong to beings of the same structure, and we must circumscribe our researches within the boundaries of the group of Zoophytes, which, in a Natural arrangement of the Animal Kingdom, is represented by the CLASS OF POLYPI.[2]

These Zoophytes are closely allied to Medusæ, and in the actual state of science there is some uncertainty respecting the natural limits which separate these two groups; but the mode of organization common to both is so characteristic, that the most superficial anatomical investigation will always enable the zoologist to distinguish a Polyp or an Acaleph from the Bryozoa and the Spongidæ, which, till lately, have been erroneously considered as belonging to the class of Corals. Polypi have a radiate structure; a protractile mouth, surrounded by non-ciliate tentacula; a large and well-organized digestive cavity; but have no anus. In Spongidæ no appearance of tentacula or of a stomach is ever met with; and in Bryozoa an intestinal canal, much resembling that of ordinary Mollusca, is always provided with two distinct openings, a mouth and an anus, the first of which is encircled by ciliated tentacula. The structure of the digestive organs is, therefore, characteristic in all these animals, and in most instances the radiate form of the tegumentary system will alone suffice to render the diagnosis of Polypi an easy task. But when the Polypidom is reduced to its most simple condition, it sometimes bears great resemblance to the calcareous or horny covering of certain Bryozoa, or to the reticulate skeleton of some of the Spongidæ; and the Polypidom being the only part of these animals which is found in the fossil state, it is sometimes hard for the palæontologist to decide whether the organic remains that assume this form are in reality Corals, or whether they do not belong to one of the other above-mentioned Zoological divisions.

Polypidoms may present two very distinct forms. Some, belonging to aggregate Polypi, are developed on the basal surface of these Zoophytes, and constitute a sort of stem in the

[1] In translating the French expression *Polypier* by the word *Polypidom*, which has of late been adopted by some of the most eminent English zoophytologists, we deem it necessary to guard the reader against the erroneous ideas which the etymology of that name might lead to. Till of late the nature of Corals was in general misunderstood; they were supposed to be produced by a plastic exudation moulded round the body of the Polyp, and serving as a dwelling for these singular beings, but not forming a part of their organism. Such is far from being the case; the corallum is a part of the animal, in the same way as the coating of the armadillo or the shell of the lobster belong to the structure of these beings. The words "Polypidom," *Polypier*, &c., might therefore be objected to, if their meaning was not generally known, and had not become independent of their etymology.

[2] The class of Polypi, reduced to its natural limits, corresponds to the *Anthozoa* of M. Ehrenberg, and to the sub-class of *Radiated Zoophytes* of Mr. Johnston. In the excellent work recently published by Mr. Dana, the same group is designated by the name of *Zoophytes*, which is usually employed in a much wider acceptation, and had long ago been given by Cuvier to the great division of radiate animals, comprising Echinoderma and Acalephæ, as well as Polypi, etc.

centre of the ramified mass produced by the multiplication of these plant-like animals. The dendroid red Coral of the Mediterranean Sea and the horny skeleton of Gorgonia are thus inclosed in the axis of cylindrical branches, formed by the thick coriaceous tegumentary tissue belonging to the whole community of aggregate Polypi, and studded, as it were, by the radiate protractile heads of the many individual Zoophytes thus united. Other Corals, appertaining either to simple or to compound Polypi, are, on the contrary, produced by the ossification of this tegumentary tissue itself, and instead of forming a sort of stem, constitute a sheath, or an assemblage of calcareous tubes, each of which belong to an individual Zoophyte, correspond to the lower part of its digestive cavity, and serve as a kind of cell or lodge into which the anterior portion of the animal's body recedes when in a contracted state.

The basal or stalk-like Corals are in general well characterised by their dendroid form, compact tissue, and concentric layers. At first sight they may bear a slight resemblance to certain Bryozoa that have attained a very advanced age;[1] but even then the remains of some non-obliterated cells will always enable an attentive observer to recognise the latter, and the absence of all trace of any such cavities can easily be ascertained, by grinding down or fracturing the stem of the above-mentioned Zoophytes. In some few instances these basal Polypidoms are more like the reticulated skeleton of certain foliaceous Spongidæ; but the concentric lamellæ of their stem contrasting with the fibrous structure of the tissue of the Sponge, will still render them recognisable.

Dermal Corals are in general characterised by features of a more striking aspect, and it is only when these Polypidoms are reduced to their most simple and degraded form, that they can be mistaken for the tegumentary skeleton of some of the lowest Bryozoa, or the reticulate, stony tissue of some highly-organized Spongidæ. In all well-developed Corals of this kind, the central cavity or visceral chamber is more or less completely divided by a certain number of vertical plates, which project from its walls towards its axis, and produce that radiate structure which is so remarkable in the Astræan tribe. In most Bryozoa the mouth, or cephalic aperture of the tegumentary cell, is provided with a horny operculum,[2] but no such organ ever exists in a true Coral; and, on the other hand, the radiate septa which we have just alluded to as being conspicuous in most Polypidoms, never exist in the cells of Bryozoa. The absence of an operculum, or of vertical septa, will not, however, enable the observer to decide whether the coral-like organic remains submitted to his investigation belong to the one or to the other of the two great zoological divisions, for it is a well-known fact that, in many of the inferior forms among recent Bryozoa, the tegumentary skeleton is reduced to a simple non-operculated tubular sheath, and that in certain Polypi (the Tubipora for example), no longitudinal septa are to be found; and the Polypidom is equally reduced to a calcareous tube, tapering and closed at its base, open and more or less enlarged at its upper end.

[1] The *Millepora truncata* of Ellis and Solander, for example.

[2] See "Recherches sur les Eschares," Annales des Sciences Naturelles, 2^me^ serie, t. vi, pl. i.

In cases of this kind the distinction between the Polypi and the Bryozoa is always rendered easy by the most superficial examination of the soft parts of the animal; but it is sometimes a matter of great difficulty for the palæontologist, who is necessarily deprived of all such resources, and can only be guided by the peculiarities observable in the ossified tissues.

In general, the distinction between Corals and Spongidæ is also very easy, for the lamellar structure, so prevalent among the former, is never met with in the latter; but in some Polypidoms (certain Milleporidæ for example), the vertical plates disappear, and the mural tissue becomes extremely porous, irregular, and abundant, so as to resemble much the reticulated mass formed by the stony skeleton of some Spongidæ, where the oscula and aquiferous canals are on the contrary more regular than usual. In cases of this kind it may be necessary to seek for distinctive characters in the internal structure of the Zoophyte; and, independently of the benefit to be obtained by the microscopical investigation of the tissue itself, it will sometimes be found useful to examine the form of the tubular cavities which pervade the mass, and correspond either to the visceral chambers of the Polypi, or to the great aquiferous ducts of the Spongidæ; for in the first instance they are always simple, whereas in the latter they are more or less ramified.

§ II.

The external forms of Corals vary considerably, but are in general more dependent on the mode of aggregation of the different individuals produced by a common parent than on the mode of organization peculiar to the animals to which these tegumentary skeletons belong. Characters derived from these forms can therefore be but of little avail for the natural arrangement of Polypi; and the classification of these Zoophytes, like that of the higher animals, must be founded on the principal modifications observable in their structure. It would lead us too far from the special object of this Monograph, if we were to enter on the investigation of the anatomical facts which alone can furnish satisfactory elements for such a classification; but in order to facilitate the study of the Corals about to be described, it may be useful for us to revert to a few of the leading points in the structure of Polypi, and to define some of the expressions which we shall often have to employ.[1]

The Sclerenchyma, or hardened tissue of Polypi, by which Corals are formed, is always a portion of the tegumentary system of these Zoophytes, but, as we have already stated, it may be produced in two very different ways. In some cases it is the result of a sort of ossification of the chorion or principal tunic of the Polypi; in others it grows on

[1] For more ample details on this subject we must refer to our "Memoir on the Structure and Development of Corals," published in the Annales des Sciences Naturelles, 3me série, t. ix.

certain parts of the surface of that membrane in a manner somewhat similar to that in which calciferous epidermis covers the skin of Crustacea and Mollusca. This *epidermic sclerenchyma* constitutes the tissue which Mr. Dana has designated by the name of "foot-secretion," and is the only anatomical element employed by nature in the formation of the common red Coral, and the horny tubes of Sertulariæ; but in most Polypidoms it is of secondary importance, and the structure is essentially made up with the *dermic sclerenchyma*, or ossified chorion. The calcification of this tegumentary tissue always commences in the centre of the inferior part of the Polyp, and, spreading gradually, rises as the animal grows, so as to inclose the lower part of the gastric cavity, and to constitute a sort of cup or cell, which is sometimes broad and shallow, sometimes long and tubular.

In general the fundamental part of these Corals corresponds to the parietes of the great gastric or visceral cavity of the Polyp, and forms what may be called the *walls* of the Polypidom. The basal disc, the spreading cup, or the columnar sheath so produced, very seldom remains in this simple condition, and in general soon gives rise to a certain number of laminate processes, which converge towards the axis of the body, and divide the central cavity into so many radiating *loculi*. These vertical laminæ, to which we shall exclusively apply the name of *septa*, cover the upper surface of the wall when this spreads out in the form of a disc (as in Fungiæ); but in general they are more or less completely inclosed in the cup-shaped or tubular cell produced by the growth of this wall around the visceral cavity, which pervades the body of the Polyp from top to bottom. In some Corals the septa remain free all along their inner edge; in other species they adhere to a sort of central style or plate, which rises from the bottom of the same cavity, and which M. Ehrenberg has proposed calling the *columella*. The loculi, or interseptal spaces, are then completely separated; and in many Polypidoms, where there is no true columella, the same result is produced by a greater development of the septa, which become united by means of irregular trabiculæ branching off from their inner edge, and forming a *spurious columella*, the structure of which is usually loose and spongy.

Other lamellar or styliform processes, quite distinct from the septa and the columella, are in some Corals interposed between these organs, and form around the central style a sort of circular palisade, somewhat like the staminæ which in most flowers surround the pistil. These additional elements of the Polypidom have been designated by the name of *pali*, and form sometimes one, sometimes two or three, circular rows or *coronets*.

In most Corals other lamellar or spiniform processes extend from the walls outward, and constitute the parts which we propose calling the *costæ* of the Polypidom. In general they correspond exactly to the septa; and in many cases they seem to be mere prolongations of these organs through the sort of sheath formed by the walls. Sometimes, indeed, the walls themselves are no longer composed of a distinct, independent, calcified lamina, and are made up by a slight thickening and cementing of the septa along the line corresponding to the boundaries of the gastric cavity and the inner margin of the costæ.

The cavity thus circumscribed by the walls of the corallum, and subdivided by the

septa, the pali, and the columella, is always closed at its bottom and open at its upper extremity, where it usually presents the appearance of a sort of radiated cup, and constitutes the *calice*. In some species, this central cavity, or *visceral chamber*, remains completely pervious from one extremity of the corallum to the other; and the membranous appendices containing the reproductive organs, and situated in the loculi, extend to its basis, without encountering any obstacle; but in other species a certain number of transverse *trabiculæ* or *synapticulæ* extend from one septum to another at various heights, and fill up, more or less completely, the inferior part of the loculi. In other cases, horizontal or oblique laminæ occupy the same position, and subdivide the loculi into a series of small, irregular cells; and sometimes these partitions are developed to such an extent that no direct communication is preserved between the lower and the upper parts of the visceral chamber, so that the calice, instead of resembling a deep tubular cup, is reduced to the form of a shallow basin. In general, these transversal laminæ, to which the name of *dissepiments* has been given, grow from the sides of the septa in an irregular manner, and do not unite so as to constitute complete horizontal tabulæ, extending from wall to wall; but in some Corals, where the septal apparatus is even rudimentary, the bottom of the visceral chamber is incessantly raised by the formation of new floors or *tabulæ*, which extend horizontally through the centre of the Polypidom, and constitute, under the calices, a vertical series of secondary chambers.

Intercostal dissepiments are frequently met with on the outside of the walls of the corallum and in compound Polypidoms, where the costæ are highly developed, a thick cellular mass is thus formed, and often assumes the appearance of a *cœnenchyma*, or common tissue. In other instances, the calcified derm continues to extend exteriorly without constituting distinct costæ, and forms a dense or a reticulate tissue, which, in certain aggregate Corals, is nowhere referable to any individual Polyp, and produces a sort of intermediate mass or true cœnenchyma.

It is also to be remarked, that the exterior surface of most Corals is covered by a layer of epithelic sclerenchyma, which is sometimes thick and spongy, but in general thin and dense, and then constitutes a species of coating, which may be called the *epitheca*.

These different constitutive parts of the Polypidom furnish the principal characters employed in the classification of Corals; but the mode of multiplication of the Polypi must also be attended to in the methodical arrangement of these Zoophytes. In some species, the young are only produced by the ova, and each corallum is formed by the skeleton of a single individual; but in most, reproduction also takes place by fissiparity or by gemmation, and in those cases the young usually remain adherent to the body of their parent, and thus produce *compound Polypidoms*. The manner in which the different individual Polypidoms, or *corallites* thus united, are grouped together, varies very much, and furnishes also useful zoological characters. It is equally necessary not to neglect studying the changes which take place in the structure of Polypidoms by the progress of age. Corals, when young, are in general much less complicated than in the adult state, and the manner

in which the multiplication of their constituent parts is effected is often a subject of great interest for classifiers as well as for physiologists.

The natural affinities of recent Corals can, in general, be easily recognised by means of facts obtained from these different sources; but the study of fossil Polypidoms presents greater difficulties, and the palæontologist must also direct his attention to the modifications which may have taken place after the death of the Zoophyte, and have been produced by the slow, but long-continued action of solvent or lapidescent fluids. Changes of this kind sometimes efface the most important features of these organic remains, for it often happens that the different parts of a corallum are not modified with an equal degree of facility, and the complete destruction of certain organs in specimens, where other parts are well preserved, may give rise to most delusive appearances. Even generic divisions have thus been established by some palæontologists, on accidental changes due to fossilization alone, and it is indeed often very difficult to avoid errors of this kind in the distinction of species, when the observer is not able to compare a sufficient number of specimens.

§ III.

This Monograph being intended principally for the use of Geologists, we have thought it advisable not to follow the Zoological classification of Corals in describing the species belonging to the Fossil Fauna of Great Britain, but to distribute them in reference to the different Formations in which they are found. We must, however, not lose sight of the Natural arrangement of these Zoophytes, and before entering on the specific history of the organic remains which we have to study, it is necessary that we should make known to the reader the system of classification which we have adopted for Polypi in general. The following Synopsis will suffice for that purpose, and will serve as a sort of framework illustrative of the divers Zoological divisions to which we shall often have to revert as we proceed in the descriptive part of our work.

CLASSIFICATION OF POLYPI.

Sub-kingdom ZOOPHYTA; Section RADIATA.

Class

POLYPI.

Animals of the sub-kingdom of Zoophyta, and of the section of Radiata,[1] organized for a sedentary mode of life, having no locomotive organs, and being provided with a circle of retractile tentaculæ around the mouth, and a central gastric cavity, not communicating with an anus, and containing the reproductive organs when these exist; in general fissiparous, or multiplying by buds as well as by ovules.

The systems adopted by Cuvier, Lamarck, Lamouroux, and their contemporaries, for the subdivision of the class of Polypi, were founded on external characters of very little value, and were quite artificial. In a Memoir, published about twenty years ago,[2] a first attempt was made to establish this classification on anatomical facts, and the Zoophytes presenting the above-mentioned structure were distributed in two groups, characterised by the presence or the absence of internal ovaria, and a membranaceous tube leading from the mouth to the great gastric cavity. Subsequent observations have confirmed these views, and Mr. Dana, whose recent work[3] is one of the most valuable contributions which America has yet made to Natural History, divides in a similar manner the class of Polypi into two secondary groups. We shall continue adopting this classification here; but the name of *Actinoidea*, which Mr. Dana applies to the first of the two sub-classes thus established, having been previously employed by other zoologists in a much narrower acceptation, we have thought it advisable not to make use of it here, and we propose substituting for it that of *Corallaria*. The second group comprises the *Sertularian Polypi* (Milne Edw.), and may be designated by the name of *Hydraria*.

[1] The sub-kingdom of Zoophytes may be divided into two natural groups: the one comprising all the true Radiate animals (Echinoderma, Acalephæ, and Polypi); the other containing the spheroidal or amorphous Zoophytes (such as Spongidæ and certain Infusoria). The first may retain the name of *Radiata*; the second has been designated by that of *Sarcodaria* (Milne Edwards, Cours élémentaire de Zoologie).

[2] Recherches sur les Animaux sans Vertèbres, faites aux îles Chausay, par MM. Audouin et Milne Edwards (Annales des Sciences Naturelles, première série, t. xv, p. 18, Septembre, 1828).

[3] United States Exploring Expedition; Zoophytes. Philadelphia, 1846.

Sub-class 1.

CORALLARIA.

Actinoidea, Dana. Op. cit., p. 16, 1846.

Polypi possessing distinct internal reproductive organs, and having the gastric or visceral cavity surrounded by vertical, radiating, membranaceous lamellæ.

In this division of the class of Polypi, the Corallum is in general calcareous, and may be either tubular, cyathoid, discoidal, or basal; but never assumes the form of cylindrical, tubular, horny sprigs, bearing simple bell-shaped cells, for the reception of the contracted tentacula, as we usually find in the sub-class of Hydraria.

Corallaria present three principal structural modifications, and must therefore be subdivided into three corresponding groups or orders: Zoantharia, Alcyonaria, and Podactinaria.

Order 1.

ZOANTHARIA.

Zoanthaires (*Zoantha*), Blainville. Manuel d'Actinologie, p. 308, 1834.

Zoanthaires (*Zoantharia*), Milne Edwards. Elém. de Zoologie, p. 1045, 1835; Annot. de Lamarck, Anim. sans Vertèb., tom. ii, p. 106, 1836.

Zoophyta helianthoidea, Johnston; in Mag. of Zool. and Bot., vol. i, p. 448, 1837; Hist. of British Zoophytes, p. 207, 1838.

Zoantharia, J. E. Gray. Synop. Brit. Mus., 1842.

Actinaria, Dana. United States Exploring Expedition, Zoophytes, p. 112, 1846.

Anthozoa helianthoidea, Johnston. Hist. of Brit. Zooph., 2d ed., vol. i, p. 181, 1847.

Polypi with conical, tubular, simple or arborescent, but not bipinnate, tentacula, and with numerous perigastric membranaceous laminæ, containing the reproductive organs.

Zoantharia are in general coralligenous, and almost all the known fossil Polypidoms belong to this natural group of Zoophytes.

These Corals are very seldom essentially composed of epidermic tissues, nor do they scarcely ever constitute basal stems, as is usually the case in Alcyonaria. They are almost always formed of calcified dermic sclerenchyma, and inclose, more or less completely, the inferior portion of the great visceral or gastric cavity of the Polyp. Each individual has in general the form of a deep cup or a tubular sheath, the cavity of which is subdivided into a circle of loculi, by vertical septa affecting a radiate disposition. No trace of any such septa is ever met with in Corals belonging to other animals of the same class, and although these parts are sometimes rudimentary in Zoantharia, the starlike appearance of the calice pro-

duced by their existence must be considered as one of the most striking features of this zoological division. The septa are developed successively, as the Polyp grows, and in general six of these vertical laminæ constitute the primary or fundamental cyclum. Shortly afterwards a second circle, equally composed of six septa, appears, and the twelve loculi situated between these secondary septa and the primary ones are next subdivided by a third row or cyclum of twelve younger septa. The number of the septa often augments still more, and is sometimes carried very high; but in general the primary septa continue to be more developed than the others, and thus divide the whole of the radiate structure into six distinct groups or systems. In some instances, however, the secondary, or even the tertiary, septa grow so rapidly, that they soon exactly resemble those of the first cyclum, and in such cases the number of the systems is apparently much greater.[1] Sometimes the number of the primary septa is, on the contrary, reduced to four, or perhaps even to two, but never reaches eight, as would be the case if the Polypi of this order had ever eight tentacula and eight perigastric lamellæ, a structure which is always met with in the order of Alcyonaria. It is also to be noted, that the septa vary considerably in their structure, and thus furnish most important characters, not only for the distinction of species and genera, but even for the formation of higher zoological divisions in this order of Polypi.

Zoantharia may be divided into two principal groups, characterised by the structure of the parietes of their body. One of these sections comprises the species in which the dermal tissue remains soft and flexible; the other contains those the teguments of which assume an osseous structure and constitute a calcareous Polypidom.

The Sclerenchymatous Zoantharia are the only Zoophytes of this order which we shall have to mention in the sequel of this work; it would, therefore, be superfluous for us to treat of the classification of Malacodermous Zoantharia; but it is necessary that we should give a detailed account of the methodical arrangement of the first of these groups. Little is known concerning the anatomical modifications of the soft parts in the different representatives of this zoological form; but the structure of the Polypidom offers great variety, and furnishes, to an attentive observer, data which appear sufficient for the natural classification of Sclerenchymatous Zoantharia. The principal characters which we have made use of for that purpose, are derived from the dense or porous structure of the sclerenchyma; the predominance of the septal apparatus, the mural tissue or the tabular system in the formation of the corallum; the existence or the absence of dissepiments uniting the septa and subdividing the loculi, and the mode of development of the Polypi. Five principal divisions may be thus established in this section, and may be designated by the following appellations: *Zoantharia aporosa*, *Zoantharia perforata*, *Zoantharia tabulata*, *Zoantharia rugosa*, and *Zoantharia cauliculata*.

[1] The laws by which the development of the septal apparatus appears to be regulated, have been laid down in our memoir on the Structure of Corals, published in the Annales des Sciences Naturelles, 3me série, tom. ix, 1848.

Sub-order 1.
ZOANTHARIA APOROSA.

Corallum composed essentially of lamellar dermic sclerenchyma, with the septal apparatus highly developed, completely lamellar, and primitively composed of six elements; no tabulæ.

The foliaceous or lamellar structure of the calcified tissue, which furnishes one of the principal characters of these Corals, is always recognisable in the exterior part of the septa: these organs are never composed of irregular trabiculæ, as is the case in Porites, or even perforated, excepting near their inner margin. The walls are also very seldom porous, and usually constitute an uninterrupted theca, so as to admit of no communication between the visceral chamber and the exterior, except by the calice. The septa form the most important part of the Polypidom; they augment more or less in number as the Polyp rises, but in general remain unequally developed, and are disposed in groups corresponding to the six primitive radii, or to a multiple of that number, but never present a quaternary arrangement, as is often the case in Cyathophyllidæ. The visceral chamber remains open from top to bottom, or is only subdivided by synapticulæ, or by irregular dissepiments, which extend from one septum to another without joining together, so as to form a series of distinct tabulæ or discoid floors; a mode of structure which is on the contrary prevalent, and very remarkable in most of the Corals belonging to our third and fourth sections.

The *Zoantharia aporosa* are the most lamelliferous and stelliform of all the Corallaria; they are very numerous, and belong to four principal families: the *Turbinolidæ*, the *Oculinidæ*, the *Astreidæ*, and the *Fungidæ*; but some few of them cannot find a proper place in any of these natural divisions, and appear to constitute a certain number of satellite or transitional minor groups, which partake of some of the characters of two or more of the above-mentioned principal forms, without possessing any structural peculiarity of sufficient importance to make us consider them as the representatives of a special type; these groups are therefore not of the same zoological value as the preceding, and in order to point out their aberrant nature, we shall designate them by names indicative at once of their principal affinities and their dependent character: *Pseudastreidæ* and *Pseudoturbinolidæ* for example.

Family I.
TURBINOLIDÆ.

Milne Edwards and Jules Haime, Recherches sur les Polypiers; Annales des Sciences Naturelles, 3^{me} série, tom. ix, p. 211, 1848.

Corallum in general simple, never fissiparous, and multiplying by lateral gemmation in compound species. Interseptal loculi extending from the top to the bottom of the visceral

chamber, and containing neither dissepiments, as in the Astreidæ, nor synapticulæ, as in the Fungidæ. *Walls* thin, lamellar, and imperforated. *Septa* highly developed, simple, compact, in general regularly granulated on each side, and never denticulated or lobulated at their apex. *Costæ* in general well marked and straight. No cœnenchyma in the compound Polypidoms.

First Tribe—CYATHININÆ.

Milne Edwards and J. Haime, loc. cit., p. 289, 1848.

Calicule presenting one or more rows of pali, placed between the columella and the septa.

§ 1. A single coronet of pali.

1. *Genus* Cyathina.

Caryophyllia, Stokes. Zool. Jonrn., vol. iii, p. 486, 1828.
Cyathina, Ehrenberg. Corall. des Rothen Meeres, p. 76, 1834; Milne Edwards and J. Haime, op. cit., p. 285.

Corallum simple, never gemmiparous, subturbinate and adherent. *Calice* circular or nearly so, with a broad but not very deep central fossula. *Columella* fasciculate, composed of a certain number (3 to 20) of vertical, narrow, and twisted lamellar processes, and terminated by a convex, crispate surface. *Pali* broad, entire, free in a considerable part of their length, and equally developed. *Septa* straight, broad, exsert, and forming six systems, which are in general unequally developed, and become in appearance much more numerous. *Costæ* straight, slightly prominent near the calice, more or less obsolete lower down, delicately granulated, and never armed with tubercles, crests, or spines.

Typical species, *Cyathina cyathus*, Ehrenb., loc. cit.; Milne Edwards and J. Haime, Ann. des Sc. Nat., 3^{me} série, tom. ix, tab. iv, fig. 1.

2. *Genus* Cœnocyathus.

Milne Edwards and J. Haime, Ann. des Sc. Nat., 3^{me} série, tom. ix, p. 297, 1848.

Corallum composite and adherent; the *corallites* sub-cylindrical, rather tall, segregate (united near their basis, but free in the greatest part of their length), and not grouped in rows. *Calice* circular; fossula not very deep. *Columella* composed of a few twisted, lamellar, vertical processes. *Pali* entire, equidistant from the centre, and similar in size. *Septa* rather broad, not projecting much above the walls, and forming four cycla, the last of which is incomplete in one of the six systems. *Costæ* distinct near the calice only, straight, flat, broad, and delicately granulated.

These Corals have great affinity to Cyathina, from which they differ principally by their gemmiparous mode of multiplication, and the permanent union of the young to the parent.

Typ. sp., *Cœnocyathus cylindricus*, Milne Edw. and J. Haime, loc. cit., tab. ix, fig. 8.

3. *Genus* Acanthocyathus.

Milne Edw. and J. Haime, loc. cit., p. 292, 1848.

Corallum simple, free, subturbinate, slightly compressed, and subpedicellate. *Calice* more or less oval. *Columella* and *pali* as in Cyathina. *Septa* broad, exsert, and forming five cycla; systems unequally developed, so as to form sixteen groups. *Costæ* partly armed with crests or spines.

Typ. sp., *Acanthocyathus Grayi*, Milne Edw. and J. Haime, loc. cit., tab. ix, fig. 2.

4. *Genus* Bathycyathus.

Milne Edw. and J. Haime, loc. cit., p. 294, 1848.

Corallum simple, adherent by a broad basis, tall, subturbinate, and slightly compressed. *Calice* subelliptical, with a broad and very deep fossula. *Columella* small and crispate. *Pali* narrow, feeble, entire, and closely united to the septa. *Septa* exsert, thin, closely set, and forming apparently twelve equally developed systems; five cycla, the last of which is more developed than the penultimate one, the septa of which are closely approximated towards the wall, or even cemented to those of the primary, secondary, and ternary cycla. *Costæ* very narrow, straight, unarmed, delicately granulated, and distinct down to the basis of the corallum.

Typ. sp., *Bathycyathus chilensis*, Milne Edw. and J. Haime, loc. cit., tab. ix, fig. 5.

5. *Genus* Brachycyathus.

Milne Edw. and J. Haime, loc. cit., p. 295, 1848.

Corallum simple, extremely short, widening very rapidly, and becoming free in the adult state. *Calice* circular, and very slightly excavated. *Columella* very thick, fasciculate, and terminated by circular papillæ. *Pali* very broad, entire. *Septa* exsert, narrow, and forming four cycla; the systems equally developed, and apparently twelve in number. *Costæ* unarmed.

Typ. sp., *Brachycyathus Orbignyanus*, Milne Edw. and J. Haime, loc. cit., tab. ix, fig. 6.

6. *Genus* Discocyathus.

Milne Edw. and J. Haime, loc. cit., p. 296, 1848.

Corallum simple, free, and discoidal. *Calice* circular and slightly convex. *Columella* formed by a single vertical lamina; its apex smooth and undivided. *Pali* free and corresponding to the septa of the antepenultimate cyclum. *Septa* very exsert, broad, and striated laterally near their apex. *Wall* horizontal, and covered with an *epitheca* presenting some concentric striæ.

Typ. sp., *Discocyathus Eudesii*, Milne Edw. and J. Haime, loc. cit., tab. ix, fig. 7.

7. *Genus* Cyclocyathus.

Corallum simple, discoidal, and having the same characters as the preceding genus, except that the *columella* is fasciculate and papillous.

Typ. sp., ***Cyclocyathus Fittonii***, nob.

§ 2. Pali of divers orders, forming two or more coronets.

8. *Genus* Trochocyathus.

Milne Edw. and J. Haime, loc. cit., p. 300, 1848.

Corallum simple, pediculate or sub-pediculate, but free in the adult state. *Calice* with a broad but not very deep fossula. *Columella* well developed, and composed of prismatic or twisted processes disposed fascicularly or in a single row. *Pali* well developed, entire, free on both edges, and differing in breadth according to the coronet to which they belong. *Septa* very exsert, broad, thick near the wall, striated laterally, and forming from four to six cycla. *Costæ* often armed.

Typ. sp., *Trochocyathus mitratus*, nob. (*T. mitratus* et *T. plicatus*, Milne Edw. and J. Haime, loc. cit., p. 303); *Turbinolia mitrata*, Goldfuss, op. cit., pl. xv, fig. 5; *Turbinolia plicata*, Michelotti, Specim. Zooph. dil., tab. ii, fig. 9.

9. *Genus* Leptocyathus.

Corallum presenting most of the characters of the preceding genus, from which it differs by its subdiscoid form, and its not showing any trace of adherence.

Typ. sp., ***Leptocyathus elegans***, nob.

10. *Genus* Thecocyathus.

Milne Edw. and J. Haime, loc. cit., p. 317, 1848.

Corallum simple, very short, and adherent, at least when young. *Calice* circular, with the fossula shallow. *Columella* very large, fasciculate, formed by a great number of prismatic processes, and terminated by a flat papillous apex. *Pali* thick, narrow, short, and entire, those corresponding to the penultimate cyclum of septa the most developed. *Septa* not exsert, thick, closely set, and almost equally developed; systems equally developed. *Wall* covered by a complete *epitheca*, slightly striated transversely, and constituting around the calice a small projecting ring.

Typ. sp., *Thecocyathus tintinnabulum*, Milne Edw. and J. Haime, loc. cit., p. 317; *Cyathophyllum tintinnabulum*, Goldfuss, Petref. Germ., tab. xvi, fig. 6.

11. *Genus* Paracyathus.

Milne Edw. and J. Haime, loc. cit., p. 318, 1848.

Corallum simple, subturbinate, and having a broad adherent basis. *Calice* with a large but not very deep fossula. *Columella* very broad, terminated by a papillous surface, and

formed by processes that appear to arise from the lower part of the inner edge of the septa. *Pali* in general lobulated at their apex, narrow, tall, and appearing also to proceed from the inferior part of the margin of the septa, their size diminishing as they approach nearer to the columella. *Septa* nearly equal, very slightly exsert, and closely set, their lateral surface strongly granulated, and presenting sometimes traces of imperfect dissepiments; four or five cycla; systems equally developed. *Costæ* nearly equal, straight, closely set, projecting very little, and delicately granulated.

Typ. sp., *Paracyathus procumbens*, Milne Edw. and J. Haime, loc. cit., tab. x, fig. 6.

12. *Genus* Heterocyathus.

Milne Edw. and J. Haime, loc. cit., p. 323, 1848.

Corallum simple, sub-cylindrical, extremely short, and adherent by a basis at least as broad as the calice, but appearing free, because in the adult state it imbeds in its tissue the small shell to which it is fixed. *Calice* circular, or nearly so, with a broad, deep fossula; *Columella* small, and composed of very slender vertical styli. *Pali* broad, thin, and denticulate. *Septa* very exsert, broad, thick, and covered with conical granulations arranged in radiate series; four or five cycla, the last of which is more developed than the penultimate one, and composed of septa that diverge from the older septa as they advance towards the centre of the visceral chamber. *Costæ* straight, thick, closely set, and strongly granulated.

Typ. sp., *Heterocyathus æquicostatus*, Milne Edw. and J. Haime, loc. cit., tab. x, fig. 8.

13. *Genus* Deltocyathus.

Milne Edw. and J. Haime, loc. cit., p. 325, 1848.

Corallum short, conical, free, and presenting no trace indicating its having been adherent when young. *Calice* circular, and almost flat. *Columella* multipartite. *Pali* highly developed, and very unequal, those of the penultimate circle the largest, and turned towards those of the antepenultimate row, so as to form with them a series of deltæ. *Septa* slightly exsert. *Costæ* straight, unequal, distinct down to the basis of the corallum, and strongly granulated, so as to assume a moniliform appearance.

Typ. sp., *Deltocyathus italicus*, Milne Edw. and J. Haime, op. cit., tab. x, fig. 11; *Stephanophyllia italica*, Michelin, Icon. Zooph., tab. viii, fig. 3.

14. *Genus* Tropidocyathus.

Milne Edw. and J. Haime, loc. cit., p. 326, 1848.

Corallum simple, free, presenting no trace of former adherence, compressed, and having at its basis a large, thick, transverse, vertical crest, or two projecting lobes, resembling wings, or the fins of sepia. *Calice* elliptic and arched, its small axis being much higher than its long axis; fossula not very deep. *Columella* oblong and multipartite. *Pali* entire; those corresponding to the penultimate cyclum of septa taller and broader than the others. *Septa* exsert; the six systems equally developed. *Costæ* well marked, especially at the upper part of the wall, and covered with small granulations.

Typ. sp., *Tropidocyathus Lessonii*, Milne Edw. and J. Haime, loc. cit.; *Flabellum Lessonii*, Michelin, in Guerin's Mag. de Zool., 1843, tab. vi.

15. *Genus* Placocyathus.

Milne Edw. and J. Haime, loc. cit., p. 327, 1848.

Corallum simple, pedicellate, and slightly compressed. *Columella* lamellar, with its apical margin straight. *Pali* thin, resembling lobes of the septa, and corresponding only to the septa of the penultimate and antipenultimate cycla; those facing the latter more developed than the others (a disposition which forms an exception to the common rule). *Septa* numerous, thin, broad, and slightly exsert. *Costæ* distinct from the top to the bottom of the walls, but projecting very little, nearly equal, and appearing to bifurcate towards the upper part of the corallum.

Typ. sp., *Placocyathus apertus*, Milne Edw. and J. Haime, loc. cit., tab. x, fig. 10.

Second Tribe—TURBINOLINÆ.

Milne Edw. and J. Haime, loc. cit., p. 235, 1848.

Corallum destitute of pali; the septa extending to the columella, or meeting in the centre of the visceral chamber.

§ 1. Wall naked, or having only an incomplete epitheca.

16. *Genus* Turbinolia.

Turbinolia (*in parte*), Lamarck, An. sans Vert., vol. ii, p. 359, 1816; *Turbinolia* (*in parte*), Ehrenberg, op. cit., p. 53, 1834; Dana, op. cit., p. 374; *Turbinolia*, Milne Edw. and J. Haime, loc. cit., p. 235, 1848.

Corallum simple, conical, straight, and presenting no trace of adherence. *Calice* circular. *Columella* styliform. *Septa* exsert, those of the last cyclum bent toward the neighbouring ones and united to them. *Costæ* lamellar, straight, entire, and very projecting; the intercostal grooves presenting a double series of small dimples, resembling pores.

Typ. sp., *Turbinolia sulcata*, Lamarck, Hist. Anim. sans Vert., vol. ii, p. 231; Cuvier and Brongniart, Géographie Minéral. des Envir. de Paris, tab. ii, fig. 3.

17. *Genus* Sphenotrochus.

Milne Edw. and J. Haime, loc. cit., p. 240, 1848.

Corallum simple, presenting no trace of adherence, straight, and cuneiform. *Calice* elliptical. *Columella* lamellar, and occupying the great axis of the calice; its upper margin flexuous and bilobate. *Septa* broad, slightly exsert, and forming three cycla; apparently twelve systems in the adult. *Costæ* broad, not very prominent, in general crispate, or represented by series of papillous tubercles.

Typ. sp., *Sphenotrochus crispus*, Milne Edw. and J. Haime, loc. cit., p. 241; *Turbinolia crispa*, Lamarck, op. cit., vol. ii, p. 231; Milne Edwards, Atlas du Règne Animal de Cuvier, Zooph., pl. lxxxii, fig. 4.

18. *Genus* Platytrochus.

Milne Edw. and J. Haime, loc. cit., p. 246, 1848.

Corallum simple, straight, cuneiform, and presenting no trace of adherence. *Calice* elliptical. *Columella* fasciculate, and terminated by papillæ. *Septa* exsert, very broad, nearly equal, and very strongly granulated; three cycla; systems equally developed. *Costæ* of two sorts, those that occupy the middle of each side of the corallum enlarging as they ascend; the lateral ones larger and much broader at their bases than near the calice, so as to render the lateral edges of the corallum almost parallel.

Typ. sp., *Platytrochus Stokesii*, Milne Edw. and J. Haime, loc. cit. tab. vii, fig. 7; *Turbinolia Stokesii*, Lea, Contrib. to Geol., tab. vi, fig. 207.

19. *Genus* Ceratotrochus.

Milne Edw. and J. Haime, loc. cit., p. 248, 1848.

Corallum simple, subpedicellate, free in the adult state, and recurved towards its basis. *Calice* circular, or nearly so. *Columella* fasciculate, and highly developed. *Septa* straight, broad, and exsert. *Costæ* partly armed with spines, crests, or small lobular processes.

Typ. sp., *Ceratotrochus multiserialis*, Milne Edw. and J. Haime, loc. cit., tab. vii, fig. 5; *Turbinolia multiserialis*, Michelotti, Spec. Zool. tab. ii, fig. 7.

20. *Genus* Discotrochus.

Milne Edw. and J. Haime, loc. cit., p. 251, 1848.

Corallum simple, discoidal, and presenting no trace of adherence. *Calice* circular, and almost flat. *Columella* fasciculate, and terminated by papillæ equal in size. *Septa* straight, very broad, and projecting but little laterally. *Wall* horizontal. *Costæ* straight and simple.

Typ. sp., *Discotrochus Orbignyanus*, Milne Edw. and J. Haime, loc. cit., tab. vii, fig. 6.

21. *Genus* Desmophyllum.

Ehrenberg, op. cit., p. 75, 1834.

Corallum simple, and adherent by a broad basis. *Calice* with a very deep fossula. No *columella* (a character which distinguishes this group from all the preceding Turbinolinæ). *Septa* broad, very exsert, free almost all along their inner edge, and grouped in fasciculæ; those of the last cyclum taller than those of the penultimate cyclum, and cemented exteriorly to the older septa. *Costæ* distinct near the calice, but obsolete on the lower part of the wall, where there are only a few granulations.

Typ. sp., *Desmophyllum crista-galli*, Milne Edw. and J. Haime, loc. cit., tab. vii, fig. 10.

§ 2. Wall completely covered by a pellicular epitheca.

22. *Genus* Flabellum.

Lesson, Illustr. de Zoologie, 1831 ; *Phyllodes*, Philippi, Neues Jahrbuch für Miner. Geol. 1841.

Corallum simple, compressed, and in general free in the adult state. *Calice* usually elliptic, very strongly arched in the direction of its long axis ; fossula narrow, and very deep. *Columella* spurious, and formed by marginal trabiculæ of the septa ; very little developed, or even quite rudimentary. *Septa* in general very numerous, appertaining in reality to six primitive systems, but forming in appearance a much greater number of systems ; not projecting above the margin of the wall, and presenting laterally regular rows of well-developed granulations. *Walls* completely covered with a thin, slightly-striated epitheca, and in general armed laterally with long spiniform processes, corresponding with the direction of the long axis of the calice. No radiciform appendices.

Typ. sp., *Flabellum pavoninum*, Lesson, op. cit., pl. xiv.

23. *Genus* Placotrochus.

Milne Edw. and J. Haime, loc. cit., p. 282, 1848.

Corallum resembling much those of the preceding genus, but having a lamellar *columella*.

Typ. sp., *Placotrochus lævis*, Milne Edw. and J. Haime, loc. cit., tab. viii, fig. 15.

24. *Genus* Blastotrochus.

Milne Edw. and J. Haime, p. 282, 1848.

Corallum resembling those of the genus Flabellum, but gemmiparous ; the young produced by buds placed along the lateral edges of the corallum, and becoming free by the progress of their development.

Typ. sp., *Blastotrochus nutrix*, Milne Edw. and J. Haime, loc. cit., tab. viii, fig. 14.

25. *Genus* Rhizotrochus.

Milne Edw. and J. Haime, loc. cit., p. 281, 1848.

Corallum simple, trochoid, and adherent by means of cylindrical radiciform appendices, which proceed from the wall, at different heights, and descend to embrace the extraneous body on which the Zoophyte lives. *Calice* almost oval, with a very narrow and very deep fossula. No *columella*. *Septa* extending to the middle of the visceral chamber, where they unite without presenting any trabiculæ.

Typ. sp., *Rhizotrochus typus*, Milne Edw. and J. Haime, loc. cit., tab. 8, fig. 16.

Aberrant Group.

PSEUDOTURBINOLIDÆ.

Corallum simple, with the loculi open and devoid of synapticulæ or dissepiments, as in Turbinolidæ, but having the septa represented by groups of three vertical laminæ, not adhering together, excepting near their external margin, where they are united by a common costa; a mode of structure, which is quite anormal in the whole order of Zoantharia.

Genus Dasmia.

Milne Edw. and J. Haime, op. cit., p. 328, 1848.

Corallum subturbinate, and appearing not to be free. *Septa* strongly granulated. *Costæ* thick, equal, not numerous, and separated by deep grooves.

Typ. sp., *Dasmia Sowerbyi*, Milne Edw. and J. Haime, loc. cit., tab. vii, fig. 8.

Family II.

OCULINIDÆ.

Corallum composite, produced by gemmation, and presenting in general an abundant, compact cœnenchyma or common tissue, the surface of which is smooth, delicately striate near the calices, or slightly granular, but never echinulate. *Walls* of the corallites complete (that is to say, presenting no perforations), not distinct from the cœnenchyma, and increasing by their internal surface, so as to invade progressively the inferior part of the visceral cavity, and to fill it up more or less completely in old age. Loculi imperfectly divided by a few dissepiments; no synapticulæ. *Septa* entire, or having their upper edge slightly divided.

§ 1. Septa of various sizes, forming distinct cycla.

1. *Genus* Oculina.

(*Pars*) Lamarck, Hist. des An. sans Vert., t. ii, p. 283, 1816; Milne Edw. and J. Haime, Comptes rend. de l'Ac. des Sc., t. xxix, p. 68, 1849.

Corallum in general arborescent; gemmation irregular or affecting a spiral disposition; cœnenchyma highly developed; its surface smooth, excepting near the calices, where it presents slight radiating striæ. *Corallites* with the calice very deep; a *columella* well developed, papillose at its apex, and becoming compact towards its basis. *Pali* corresponding to all the septa, excepting those of the last cyclum. *Septa* almost entire, slightly exsert, and very unequally developed.

Typ. sp., *Oculina virginea*, Lamarck, An. sans Vert., p. 289; *Madrepora virginea*, Ellis and Sol., tab. xxxvi.

2. *Genus* Trymhelia.

Milne Edw. and J. Haime, Comptes rend. de l'Académie des Sciences, t. xxix, p. 68, 1849.

Corallum arborescent, differing from Oculina by the non-existence of a *columella*, and the great development of the *pali*, which are cemented together, so as to form a vertical tube.

Typ. sp., *Trymhelia eburnea*, Milne Edw. and J. Haime, loc. cit., p. 68.

3. *Genus* Cyathelia.

Milne Edw. and J. Haime, loc. cit., p. 68, 1849.

Corallum arborescent; gemmation terminal and regularly opposite. *Corallites* free to a considerable distance from the calice, which are grouped in a way similar to that of flowers constituting a dichotomous cyme. *Columella* large and papillose. *Pali* well developed. *Septa* entire, exsert, and strongly granulated.

Typ. sp., *Cyathelia axillaris*, nob.; *Madrepora axillaris*, Ellis and Solander, tab. xiii, fig. 5.

4. *Genus* Astrhelia.

Milne Edw. and J. Haime, loc. cit., p. 68, 1849.

Corallum in general arborescent, and resembling Oculina by its form and its mode of gemmation, but differing from the three preceding genera by the non-existence of *pali*. *Calice* with a deep central fossula. *Columella* septal; edges of the *septa* denticulated.

Typ. sp., *Astrhelia palmata*, nob.; *Madrepora palmata*, Goldfuss, tab. xxv, fig, 6.

5. *Genus* Synhelia.

Milne Edw. and J. Haime, loc. cit., p. 68, 1849.

Corallum arborescent, with thick branches; gemmation irregular. *Calices* very shallow, their border scarcely projecting above the surface of the cœnenchyma, and united by common striæ. *Columella* compact, styliform, and terminated by a small tubercle. *Septa* scarcely exsert.

Typ. sp., *Synhelia gibbosa*, nob.; *Lithodendron gibbosum*, Goldfuss, op. cit., tab. xxxvii, fig. 9.

6. *Genus* Acrhelia.

Milne Edw. and J. Haime, op. cit., p. 69, 1849.

Corallum arborescent, or forming a ramified cluster; gemmation pretty regularly spiral. Surface of the cœnenchyma smooth, excepting in the immediate vicinity of the calices, where slight traces of radiating costæ are perceptible. *Septa* extremely exsert, lanceolate, and entire; the principal ones uniting towards the lower part of their inner edge, without there being either a columella or pali in the centre of the visceral chamber.

Typ. sp., *Acrhelia Sebæ*, Milne Edw. and J. Haime, loc. cit., p. 69; Seba, Thes., vol. iii, tab. cxvii, fig. 5.

7. *Genus* Lophelia.

Milne Edw. and J. Haime, loc. cit., p. 69, 1849.

Corallum arborescent, segregate, with coalescent branches; no true cœnenchyma, but walls very thick; gemmation irregularly alternate and subterminal. *Calices* with a reverted lamellar border. *Septa* entire, exsert, and uniting at the bottom of the visceral chamber as in the preceding genus. No *columella* nor *pali*.

Typ. sp., *Lophelia prolifera*, nob.; Ellis and Sol., tab. xxxii, fig. 2; *Oculina prolifera*, Lamarck, An. sans Vert., vol. ii, p. 286.

8. *Genus* Amphelia.

Milne Edw. and J. Haime, loc. cit., p. 69, 1849.

Corallum arborescent, with coalescent branches, and well-developed cœnenchyma in aged parts; gemmation subterminal, regularly alternate. *Calice* deep. *Columella* rudimentary. *Septa* slightly exsert, entire, and small. No distinct *costæ*; the surface of the corallum smooth or very delicately striated.

Typ. sp., *Amphelia oculata*, nob.; *Madrepora oculata*, Esper, tab. xii.

9. *Genus* Diplhelia.

Corallum resembling Amphelia, but having a large *columella* and denticulated *septa*.

Typ. sp., *Diplhelia raristella*, nob. *Oculina raristella*, Defrance, Dict. des Sc. Nat., vol. xxxv, p. 356.

10. *Genus* Enallhelia.

D'Orbigny MSS.; Milne Edw. and J. Haime, loc. cit., p. 69, 1849.

Differs from Amphelia by the shallowness of the calices, a greater development of the septa, and the existence of long costal striæ.

Typ. sp., *Enallhelia compressa*, D'Orbigny; *Lithodendron compressum*, Goldfuss, op. cit., tab. xxxvii, fig. 11.

§ 2. Septa equally developed, and forming apparently a single cyclum.

11. *Genus* Axhelia.

Milne Edw. and J. Haime, Compt. rend., t. xxix, p. 69, 1849.

Corallum arborescent, with coalescent branches, and a well-developed cœnenchyma, the surface of which is entirely covered with sub-granulose striæ. *Calices* very shallow. *Columella* compact, very thick, and terminated by a rounded tubercle. No *pali*. *Septa* exsert, entire.

Typ. sp., *Axhelia myriaster*, nob.; *Oculina myriaster*, Valenciennes MSS., Catal. of the Museum of Nat. Hist. of Paris.

12. *Genus* Crypthelia.

Milne Edw. and J. Haime, loc. cit., p. 69, 1849.

Corallum arborescent, flabellate, and unifacial, all the corallites opening on one of the surfaces of the flabellum; surface of the branches quite smooth. *Calices* very prominent, pediculate, explanate, and folded in two. No *columella* nor *pali*.

Typ. sp., *Crypthelia pudica*, Milne Edw. and J. Haime, loc. cit., p. 69.

13. *Genus* Endhelia.

Milne Edw. and J. Haime, loc. cit., p. 69, 1849.

Corallum of the same general form as in the preceding genus, but with the corallites alternate on the branches, which are thick and coalescent. *Calices* immersed; their border not projecting, but armed with a tongue-shaped process. No *columella* nor *pali*.

Typ. sp., *Endhelia Japonica*, Milne Edw. and J. Haime, loc. cit., p. 69 (Mus. of Leyden).

14. *Genus* Stylaster.

Gray, Zool. Miscel., p. 36, 1831; *Allopora*, Ehrenb., Cor. Roth. Meeres, p. 147, 1834; Dana, op. cit., p. 693, 1846; Milne Edw. and J. Haime, loc. cit., p. 69, 1849.

Corallum arborescent and subflabellate; cœnenchyma highly developed, smooth, and presenting certain excrescences or tubercles, the nature of which is problematic. *Calices* rare and not projecting much. Neither *columella* nor *pali*.

Typ. sp., *Stylaster rosea*, Gray, loc. cit.; *Oculina rosea*, Lamarck, op. cit., t. xi, p. 287; Esper., tab. xxxvi.

Transitional Group.

PSEUDOCULINIDÆ.

Corallum composite, with a highly developed, spongy, or cellulose, echinulate, dermic, cœnenchyma. Costal apparatus rudimentary. Walls imperforate, and never invading the visceral cavity. Septal apparatus well developed; dissepiments few in number.

This small group participates of the characters belonging to the *Oculinidæ* and the *Astreidæ*, but differs essentially from both. It does not, however, present any important structural peculiarity, and does not appear to be derived from a special zoological type.

1. *Genus* Madracis.

Milne Edw. and J. Haime, Comptes rend. de l'Acad. des Sc., t. xxix, p. 70, 1849.

Corallum arborescent; cœnenchyma almost compact, and highly echinulated. *Calices* unarmed. *Columella* styliform. *Septa* exsert and equally developed.

Typ. sp., *Madracis asperula*, Milne Edw. and J. Haime, loc. cit., p. 70; *Dentipora asperula*, Gray, MSS. British Museum.

2. *Genus* Stylophora.

Schweigger, Beobacht. auf Natur., t. v, 1819; *Sideropora* and *Stylopora*, Blainville, Manuel d'Actinologie, p. 348, 1830; *Sideropora*, Milne Edw. and J. Haime, loc. cit., p. 70, 1849.

Corallum arborescent; cœnenchyma sub-compact, with a granulated surface. *Calices* armed with a labial process near the upper part of their margin. *Columella* styliform.

Typ. sp., *Stylophora pistillaris*, Schweigger, loc. cit.; *Madrepora pistillaris*, Esper., tab. lx.

3. *Genus* Dendracis.

Milne Edw. and J. Haime, Comp. rend., t. xxix, p. 70, 1849.

Corallum arborescent; cœnenchyma almost compact, with its surface granulated. *Calices* sub-mammiform. No *columella*. *Septa* not exsert, or only very slightly so; nearly equal.

Typ. sp., *Dendraeis Gervillii*, nob.; *Madrepora Gervillii*, Defrance, Dict. des Sc. Nat., vol. xxviii, p. 8; Michelin, Icon., Zooph., pl. xlix, fig. 8.

4. *Genus* Aræacis.

Milne Edw. and J. Haime, loc. cit., p. 70, 1849.

Corallum massive; cœnenchyma spongy, with its surface echinulate. *Calices* with a thin projecting margin. No *columella*. *Septa* unequally developed, entire.

Typ. sp. *Aræacis sphæroidalis*, nob.; *Astrea sphæroidalis*, Michelin, pl. xliv, fig. 9.

Family III.

ASTREIDÆ.

Dana, Exploring Expedition, Zooph., p. 194, 1846.

Corallum composite or simple, circumscribed by imperforated walls, and often increasing by fissiparity. Corallites becoming tall by the progress of their growth; each individual or series of individuals well defined, and separated from the others by perfect walls. Cœnenchyma not existing, or being formed either by the development of the costæ and their dissepiments, or by the epithecal tissue alone, and not forming a compact mass as in the Oculinidæ. The visceral chamber never obliterated inferiorly by the growth of the walls, but subdivided and more or less completely closed up by the interseptal dissepiments, which are in general very abundant; never any synapticulæ like those of the Fungidæ.

First Tribe—EUSMILINÆ.

Septa completely developed and entire (that is to say, with their apical margin neither lobate nor denticulate). *Costæ* always unarmed. *Columella* often compact, or even styliform.

Section I.—EUSMILINÆ PROPRIÆ.

Corallum simple or composite, and in that case formed by distinct corallites, affecting an arborescent disposition, fasciculate, or presenting a linear arrangement; free laterally, at least in a great part of their length, and never having their calices blended together. Reproduction usually fissiparous in the compound species.

1. *Genus* Cylicosmilia.

Milne Edw. and J. Haime, Ann. des Sc. Nat., 3^{me} série, t. x, p. 232, 1848.

Corallum simple, adherent. *Columella* well developed, and of a spongy structure. *Septa* thin, slightly exsert, covered laterally with small granulations, and closely set. *Dissepiments* very abundant. *Wall* thin, with a rudimentary epitheca. *Costæ* simple, not ramified, and distinct down to the basis of the corallum.

Typ. sp., *Cylicosmilia altavillinsis*, Milne Edw. and J. Haime, loc. cit., p. 233 ; *Caryophyllia altavillinsis*, Defrance ; Michelin, Icon. Zooph., tab. lxxiv, fig. 2.

2. *Genus* Placosmilia.

Milne Edw. and J. Haime, loc. cit., p. 233, 1848.

Corallum simple, compressed, free, and subpediculate. *Calice* more or less elliptical. *Columella* lamellar. *Septa* numerous, closely set, slightly exsert, and not much granulated ; systems apparently very numerous. *Dissepiments* abundant. *Wall* naked, or with a rudimentary epitheca. *Costæ* simple, not ramified, and distinct from the basis of the corallum.

Typ. sp., *Placosmilia cymbula*, Milne Edw. and J. Haime, loc. cit., p. 234 ; *Turbinolia cymbula*, Michelin, Icon., pl. lxvii, fig. 1.

3. *Genus* Trochosmilia.

Milne Edw. and J. Haime, loc. cit., p. 236, 1848.

Corallum simple, subpedicellate or adherent. *Calice* nearly horizontal. No *columella*. *Septa* meeting in the centre of the visceral chamber, numerous, and closely set ; systems apparently very numerous. *Dissepiments* abundant. *Wall* naked, or with a rudimentary epitheca. *Costæ* simple, granulated, delicate, usually distinct from the basis, and never ramified.

Typ. sp., *Trochosmilia Faujasii*, Milne Edw. and J. Haime, loc. cit., tab. v, fig. 6.

4. *Genus* Parasmilia.

Milne Edw. and J. Haime, loc. cit., p. 243, 1848.

Corallum simple, adherent or pedicellate, tall, subturbinate, and presenting in general indications of an intermittent growth. *Calice* nearly circular; fossula not very deep. *Columella* spongy. *Septa* exsert, very granular laterally, and arched at their apex. *Dissepiments* not abundant, and existing only in the inferior part of the loculi. *Wall* naked, or with a rudimentary epitheca. *Costæ* straight, simple, not ramified, somewhat granulated, and in general projecting more near the calice than in the lower part of the coral.

Typ. sp., *Parasmilia centralis*, Milne Edw. and J. Haime, loc. cit. ; *Madrepora centralis*, Mantell, Geol. of Sussex, tab. xvi, figs. 2, 4.

5. *Genus* Cœlosmilia.

Differs from Parasmilia by not having any rudiments of a columella.

Typ. sp., *Cœlosmilia poculum; Parasmilia poculum*, Milne Edw. and J. Haime, loc. cit., tab. v, fig. 5.

6. *Genus* Lophosmilia.

Milne Edw. and J. Haime, loc. cit., p. 246, 1848.

Corallum simple, subturbinate, adherent. *Calice* almost circular. *Columella* lamellar, small. *Septa* very exsert, unequal; their apical margin highly arched, and their sides granular; the six systems equally developed. *Wall* naked. *Costæ* simple, and but slightly marked; growth not intermittent.

Typ. sp., *Lophosmilia rotundifolia*, Milne Edw. and J. Haime, loc. cit., tab. v, fig. 3.

7. *Genus* Diploctenium.

Goldfuss, Petref. Germ., p. 50, 1826-30.

Corallum simple, extremely compressed, flabelliform, free, but retaining a thick pedunele. *Calice* representing a very long ellipse, arched so strongly that the extremities of its long axis descend much below the level of its small axis; fossula very narrow, very long, and shallow. No *columella*. *Septa* extremely numerous, nearly equal, thin, very closely set, and slightly exsert. *Dissepiments* simple and numerous. *Walls* naked. *Costæ* extremely numerous, narrow, crowded, nearly equal, distinct from the basis, and dichotomosing, or even dividing into three branches as they rise.

Typ. sp., *Diploctenium lunatum*, Michelin, Icon. Zooph., tab. lxv, fig. 8; *Madrepora lunata*, Bruguiere, Journ. d'Hist. Nat., vol. i, tab. xxiv, figs. 5, 6.

8. *Genus* Montlivaltia.

Lamouroux, Exposit. Méthod. des Genres de Polypiers, p. 78; Milne Edw. and J. Haime, loc. cit., p. 250.

Corallum simple, adherent, or sub-pedicellate. No *columella*. *Septa* exsert, in general numerous and crowded, very broad, and forming apparently twelve or more cycla. *Wall* covered by a highly-developed membraniform epitheca; growth not intermittent.

Typ. sp., *Montlivaltia caryophyllata*, Lamouroux, op. cit., tab. lxxix, figs. 8, 9, 10; Michelin, op. cit., tab. liv, fig. 2.

9. *Genus* Peplosmilia.

Corallum resembling Montlivaltia, but having a large, lamelliform columella.

Typ. sp., *Peplosmilia Austenii*, nob.

10. *Genus* Axosmilia.

Milne Edw. and J. Haime, loc. cit., p. 261, 1848.

Corallum simple, free in the adult state, tall, turbinate. *Calice* circular; fossula large and deep. *Columella* styliform, large, and slightly compressed. *Septa* neither exsert nor crowded, delicately granulated, and all, excepting those of the youngest cyclum, cemented to the columella; loculi deep. *Walls* entirely covered by a membraniform epitheca, presenting strong transverse folds, and extending to the edge of the calice.

Typ. sp., *Axosmilia extinctorium*, Milne Edw. and J. Haime, loc. cit.; *Caryophyllia extinctorium*, Michelin, op. cit., tab. ix, fig. 3ª.

11. *Genus* Eusmilia.

Milne Edw. and J. Haime, loc. cit., p. 262, 1848.

Corallum composite, cespitose, with dichotomous or trichotomous branches, and a stem that does not thicken much by the progress of age. *Corallites* multiplying by fissiparity, becoming rapidly segregate, and not remaining disposed in series at their calicular extremity. *Calices* rather irregular in form, but in general nearly circular; fossula deep. *Columella* of a loose lamello-spongiate texture. *Septa* exsert, broad, thin, straight, not crowded, with their apex strongly arched, and their surface almost smooth. *Dissepiments* well formed, but not very abundant. *Walls* naked or covered inferiorly by a slight pellicular epitheca. *Costæ* indistinct towards the basis of the corallites, but becoming sub-cristiform near the calice.

Typ. sp., *Eusmilia fastigiata*, Milne Edw. and J. Haime, loc. cit., tab. v, fig. 1; *Madrepora fastigiata*, Pallas, Eleuch. Zooph., p. 301.

12. *Genus* Aplosmilia.

D'Orbigny MSS.

Corallum composite, and having the characters of Eusmilia, excepting that the *columella* is lamellar.

Typ. sp., *Aplosmilia aspera*, D'Orbigny MSS.; *Lobophyllia aspera*, Michelin, Icon., tab. xx, fig. 4; *Eusmilia* (?) *aspera*, Milne Edw. and J. Haime, loc. cit., p. 266.

13. *Genus* Leptosmilia.

Milne Edw. and J. Haime, loc. cit., p. 267, 1848.

Corallum composite, cespitose, fissiparous, and presenting the same general disposition as in the preceding genus. No *columella*. *Septa* extremely thin, crowded, broad, very slightly exsert, with their apex slightly arched, and their lateral surfaces sub-glabrous. *Dissepiments* very abundant. *Walls* very thin, plain towards the basis, and costulate near the calices.

Typ. sp., *Leptosmilia ramosa*, Milne Edw. and J. Haime, loc. cit., tab. vi, fig. 1.

14. *Genus* Thecosmilia.

Milne Edw. and J. Haime, loc. cit., p. 270, 1848.

Corallum composite, cespitose, fissiparous, and affecting the same general disposition as

in the two preceding genera. No *columella*. *Septa* closely set, not remarkably thin, slightly exsert, and granulate. *Walls* covered with a strong epitheca, reaching almost to the margin of the calices.

Typ. sp., *Thecosmilia trichotoma*, Milne Edw. and J. Haime, loc. cit.; *Lithodendron trichotomum*, Goldfuss, Petref. Germ., tab. xiii, fig. 6.

15. *Genus* Barysmilia.

Milne Edw. and J. Haime, loc. cit., p. 273, 1848.

Corallum composite, increasing by fissiparity, and forming a very thick stem, on the apex of which the corallites become distinct, and are disposed in transverse series. *Columella* rudimentary or not existing. *Septa* closely set. *Walls* very thick, naked, and covered with delicate costal lines, which are nearly equal and granulate.

Typ. sp., *Barysmilia Cordieri*, Milne Edw. and J. Haime, loc. cit., tab. v, fig. 4.

16. *Genus* Dendrosmilia.

Milne Edw. and J. Haime, loc. cit., p. 274, 1848.

Corallum composite, somewhat arborescent, and increasing by lateral gemmation. *Corallites* with large *septa*, and a spongious *columella*.

Typ. sp., *Dendrosmilia Duvaliana*, Milne Edw. and J. Haime, loc. cit., p. 274.

17. *Genus* Stylosmilia.

Milne Edw. and J. Haime, loc. cit., p. 275, 1848.

Corallum composite, fasciculate, and increasing by lateral gemmation. *Corallites* tall, with a small number of thick *septa*, and a styliform *columella*. *Walls* thick, with obsolete *costæ*.

Typ. sp., *Stylosmilia Michelinii*, Milne Edw. and J. Haime, loc. cit., p. 275, pl. vi, figs. 2, 2ª.

18. *Genus* Placophyllia.

D'Orbigny MSS.

Corallum composite, segregate, and increasing by gemmation, which is almost basal. *Corallites* cylindrical and low. *Columella* well developed. *Septa* probably entire. *Walls* completely covered with a membraniform epitheca, presenting thick transverse folds.

Typ. sp., *Placophyllia dianthus*, D'Orbigny MSS.; *Lithodendron dianthus*, Goldfuss, Petref. Germ., tab. xiii, fig. 8.

Section II.—EUSMILINÆ CONFLUENTES.

Corallum composite, and presenting no separation between the corallites, united in rows, so as to assume a meandriform disposition; multiplication essentially fissiparous.

19. *Genus* Ctenophyllia.

Dana, Zoophytes, p. 169, 1846.

Corallum pedunculate, but increasing very little by its basis, and terminated by a large oval, almost flat, calicular surface; the different series of corallites intimately united together by means of their common walls, and without there being in general any cœnenchyma; the gyri or calicular grooves very long, and the mural ridges thin. *Columella* lamellar, and almost uninterrupted from one end of the gyrus to the other. In general, some traces of *pali*. *Septa* rather closely set, slightly exsert, and delicately granulated. *Dissepiments* very abundant, arched, and oblique; sometimes simple, but in general producing a vesicular mass. The common epitheca rudimentary, and covering only the inferior part of the common exterior walls, in the upper part of which are *costæ*, nearly equal, and more or less cristiform near the margin of the calicular surface.

Typ. sp., *Ctenophyllia mæandrites*, Milne Edw. and J. Haime, Ann. des Sc. Nat., 3^{me} série, vol. x, p. 277; *Meandrina pectinata*, Lamarck; *Madrep. mæandrites*, Solander and Ellis, Zooph., tab. xlviii, fig. 1.

20. *Genus* Dendrogyra.

Ehrenberg, Corall. des Roth. Meeres, p. 100, 1834.

Corallum composite, having the form of a thick, massive, vertical column, in which the corallites are placed perpendicularly to the axis, and constitute very tortuous gyri, completely united by their walls; mural ridges broad, flat, and compact; grooves shallow. *Columella* highly developed, and formed by a series of very compact, enlarged processes. *Septa* very thick and closely set. *Dissepiments* large, but not crowded.

Typ. sp., *Dendrogyra cylindrus*, Ehrenb., op. cit.; Milne Edw. and J. Haime, Ann. des Sc. Nat., 3^{me} série, Zool., t. x, pl. vi, fig. 9.

21. *Genus* Rhipidogyra.

Milne Edw. and J. Haime, loc. cit., p. 281, 1848.

Corallum composed of a single series of corallites and constituting a flabelliform or tall tortuous mass, the lateral walls of which are always free from top to bottom. *Columella* lamellar, but almost rudimentary. *Septa* exsert and crowded. *Dissepiments* abundant. *Costæ* delicate, in general subcristate near the margin of the calice. No *epitheca*, or only a rudimentary one.

Typ. sp., *Rhipidogyra flabellum*, Milne Edw. and J. Haime, loc. cit.; *Lobophyllia flabellum*, Michelin, Icon., tab. xviii, fig. 1.

22. *Genus* Pachygyra.

Milne Edw. and J. Haime, loc. cit., p. 468, 1848.

Corallum adherent by a very thick pedicle; gyri with a narrow calicular groove, and united by a very broad mass of dense cœnenchyma. *Columella* lamellar. *Septa* crowded. *Costæ* delicate and granulated; little or no epitheca.

Typ. sp., *Pachygyra labyrinthica*, Milne Edw. and J. Haime, loc. cit.; *Lobophyllia labyrinthica*, Michelin, Icon., pl. lxvi, fig. 3.

23. *Genus* Plerogyra.

Milne Edw. and J. Haime, loc. cit., p. 284, 1848.

Corallum composed of long, thick, slightly ramified gyri, united laterally by their lower part, and free only near the calicular margin. No *columella*. *Septa* exsert, and broad; interseptal loculi very broad, and almost entirely filled up with large vesicular dissepiments, constituting a cellular mass. *Walls* presenting some *costal* striæ near the calicular margin, but covered in all the other parts by a vesicular structure, which becomes highly developed between the gyri.

Typ. sp., *Plerogyra laxa*, Milne Edw. and J. Haime, loc. cit., tab. vi, fig. 8.

Section III.—EUSMILINÆ AGGREGATÆ.

Corallum composite and massive, in which the corallites are not arranged in series, and although remaining quite distinct, are united together by their walls, by a costal cœnenchyma, or by mural annular expansions.

This group corresponds to the division of the *Astreinæ aggregatæ* of the second tribe of this family, and constitutes with these the great genus *Astrea* of most authors.

24. *Genus* Stylina.

Lamarck, Hist. des Anim. sans Vert., t. ii, p. 220, 1816; *Fasciculatia*, Lamarck, Extrait du Cours, 1812.

Corallum glomerate, astreiform. *Corallites* very tall, united by means of the costal system and its dissepiments, and having the appearance of small truncate cones at their upper end. *Calices* circular, with their margin free; usually distant from each other. *Columella* styliform and projecting. *Septa* exsert, arched at their apex; in general not numerous, and forming as usual six systems. No *pali*. *Walls* thick.

Typ. sp., *Stylina echinulata*, Lamarck, loc. cit.; Milne Edw., Atlas du Règne Animal de Cuvier, Zooph., pl. lxxxv, fig. 3.

25. *Genus* Stylocœnia.

Milne Edw. and J. Haime, An. des Sc. Nat., 3^{me} série, t. x, p. 298, 1848.

Corallum having the form of a very thick sheet, convex or bent in different ways; covered inferiorly by a finely-striated epitheca; and increasing by marginal gemmation. *Corallites* united by their walls, which are thin and prismatic. *Calices* polygonal, their margins simple, and bearing at their angles small, columnar, grooved processes. *Columella* styliform, projecting. *Septa* very thin, not exsert, nor numerous, and forming six systems.

Typ. sp., *Stylocœnia emarciata*, Milne Edw. and J. Haime, loc. cit., tab. vii, fig. 2; *Astrea emarciata*, Lamarck, op. cit., t. ii, p. 266.

26. *Genus* Astrocœnia.

Milne Edw. and J. Haime, loc. cit., p. 296, 1848.

Corallum very dense, and not bearing columnar processes, as in the preceding genus. *Calices* polygonal. *Columella* styliform, not projecting much. No *pali*. *Septa* thick; apparently eight or ten systems, two or four of the secondary septa being as much developed as the six primary ones. *Walls* thick and united, as in Stylocœnia.

Typ. sp., *Astrocœnia Orbignyana*, Milne Edw. and J. Haime, loc. cit., p. 297; *Astrea formosissima*, Michelin, Icon., pl. lxxii, fig. 9.

27. *Genus* Stephanocœnia.

Milne Edw. and J. Haime, loc. cit., p. 300, 1848.

Corallum glomerulate; the *corallites* united by their walls, which are thick and compact; gemmation lateral and marginal. *Calices* subpolygonal. *Columella* styliform, and not projecting much. A coronet of *pali*, corresponding to the septa of the older cycla. *Septa* scarcely exsert, granulated on their sides, and forming six systems, which are in general equally developed.

Typ. sp., *Stephanocœnia intersepta*, Milne Edw. and J. Haime, loc. cit., tab. vii, fig. 1; *Astrea intersepta*, Lamarck, Anim. sans Vert., t. ii, p. 266.

28. *Genus* Phyllocœnia.

Milne Edw. and J. Haime, loc. cit., p. 469, 1848.

Corallum glomerate, astreiform. *Corallites* united by the costæ and the exotheca, which are highly developed. *Calices* with a free margin, slightly elevated. No *columella*, or only traces of a rudimentary one. No *pali*. *Septa* very broad, exsert, and forming six systems; gemmation lateral.

Typ. sp., *Phyllocœnia irradians*, Milne Edw. and J. Haime, loc. cit.; *Astrea radiata*, Michelin, pl. xii, fig. 4.

29. *Genus* Dichocœnia.

Milne Edw. and J. Haime, loc. cit., p. 305, 1848.

Corallum glomerate, astreiform. *Corallites* united by a very abundant and dense costal cœnenchyma, the upper surface of which is subgranulate. *Calices* circular or elliptical, with a projecting margin. *Columella* small. *Pali* corresponding to most of the *septa*, which are exsert and granulated. Multiplication fissiparous.

Typ. sp., *Dichocœnia porcata*, Milne Edw. and J. Haime, loc. cit.; *Astrea porcata*, Lamarck, Anim. sans Vert., t. ii, p. 260.

30. *Genus* Heterocœnia.

Milne Edw. and J. Haime, loc. cit., p. 308, 1848.

Corallum resembling that of Sarcinula, but differing from all the preceding genera by the small number and the unequal development of the *septa*, which form in appearance only three systems. In general, one of the three large primary septa is more developed than the others, and remains sometimes alone in fossil species. *Calices* circular, with a projecting free margin. No *columella* nor *pali*. *Septa* exsert; cœnenchyma abundant, of a foliate structure, and having a granular surface.

Typ. sp., *Heterocœnia exiguis*, Milne Edw. and J. Haime, loc. cit., tab. ix, fig. 13; *Lithodendron exigue*, Michelin, Icon., Zooph. tab. lxxii, fig. 7.

Section IV.—EUSMILINÆ IMMERSÆ.

Corallum composite. *Corallites* disposed as in the preceding Section, but imbedded in an epithecal cellular tissue, and not united by costal laminæ or mural annular expansions; gemmation lateral and basal; reproduction never fissiparous.

31. *Genus* Sarcinula.

(*In parte*) Lamarck, Hist. des Anim. sans Vert., t. ii, p. 222, 1816; *Anthophyllum*, Ehrenb., op. cit., p. 89, 1834.

Corallum fasciculate, and almost massive. *Corallites* tall, free towards their upper end, which projects more or less above the surface of the cellular exotheca. *Walls* strong, with costæ but little developed. No *columella*, or only a rudimentary one. *Septa* very exsert. *Dissepiments* in general simple, and not abundant.

Typ. sp., *Sarcinula organum*, Lamarck, loc. cit., p. 223; Milne Edw., Atlas du Règne Animal de Cuvier, Zooph., pl. lxxxv, fig. 1.

Second Tribe—ASTREINÆ.

Septa having their upper edge lobulated, dentate, or armed with spines, and often imperfect near their inner edge. *Costæ* also spinulous, dentate or crenulate, but never forming simple cristæ, as is often the case in Eusmilinæ. *Columella* in general spongy, rarely lamellar, and never styliform. Corallum in general massive.

Section I.—ASTREINÆ HIRTÆ.

Corallum simple or composite, and then formed by perfectly delineated corallites, produced by fissiparity, or by calicular gemmation.

32. *Genus* Caryophyllia.

(*In parte*) Lamarck, Hist. des Anim. sans Vert., t. ii, p. 224, 1816; Milne Edw. and J. Haime, Comptes rend. de l'Ac. des Sc., t. xxvii, p. 491, 1848.

Corallum simple, and adherent by a broad basis. *Calice* circular, or almost so. *Columella* well developed, spongy, and composed of twisted lamellæ, that advance one over the other. *Septa* broad, exsert, numerous, close set, and armed with spines, the size of which augments from the centre of the calice towards its margin. *Dissepiments* vesicular and abundant. *Wall* presenting *costæ*, formed by a series of spines; epitheca rudimentary.

Typ. sp., *Caryophyllia lacera*, Milne Edw. and J. Haime, An. des Sc. Nat., 3^{me} série, t. xi, p. 237; *Madrepora lacera*, Esper, Pflanz., tab. xxv, fig. 2.

33. *Genus* Circophyllia.

Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 491, 1848.

Corallum simple, subturbinate. *Columella* large and papillose. *Septa* broad, numerous, exsert, with their calicular edge divided in small obtuse lobes. *Dissepiments* abundant, vesicular, and arranged in spiral concentric lines. *Costæ* thin, nearly equal, simple, and delicately granulated.

Typ. sp., *Circophyllia truncata*, Milne Edw. and J. Haime, Ann. des Sc. Nat., 3^{me} série, t. x, tab. viii, fig. 3; *Anthophyllum truncatum*, Goldfuss, Petref., tab. xiii, fig. 9.

34. *Genus* Thecophyllia.

Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 491, 1848.

Corallum simple, adherent, or sub-pedicellate. *Calice* circular, or nearly so. No *columella*. *Septa* very broad, in general slightly exsert, numerous, and armed with nearly equal spiniform teeth. *Wall* covered with a thick, membraniform epitheca.

Typ. sp., *Thecophyllia decipiens*, Milne Edw. and J. Haime, Ann., t. xi, p. 241; *Anthophyllum decipiens*, Goldfuss, Petref., tab. lxv, fig. 3.

35. *Genus* Lobophyllia.

(*Pars*) Blainville, Dict. des Sc. Nat., t. lx, 1830; Milne Edw. and J. Haime, Ann., t. xi, p. 241.

Corallum composite, tall, and increasing by fissiparity. *Corallites* segregate, or united in series, which are always simple, and free laterally. *Calice* with a deep fossula. *Columella* spongy. *Septa* numerous, exsert, very granular, and armed with strong marginal teeth, the most external of which are the largest; loculi shallow. *Walls* striated longitudinally, and armed with spines; epitheca rudimentary.

§ 1. *Lobophyllia cymosæ*. Typ. sp., *Lobophyllia angulosa*, Blainv.; *Caryophyllia angulosa*, Lamarck.—§ 2. *Lobophyllia gyrosæ*. Typ. sp., *Lobophyllia multilobata*, Milne Edw. and J. Haime, loc. cit., p. 250; *Fungus marinus*, Seba, Rer. Nat. Thes., vol. iii, tab. cix, No. 4.

36. *Genus* Symphyllia.

Milne Edw. and J. Haime, Comptes rend. de l'Ac. des Sc., t. xxvii, p. 491, 1848.

Corallum composite, massive, short, and increasing by fissiparity. *Corallites* having distinct calicula, but united in linear series, which are cemented together laterally. The other characters as in the preceding genus.

Typ. sp., *Symphyllia sinuosa*, Milne Edw. and J. Haime, Ann. des Sc. Nat., vol. x, tab. viii, fig. 7.

37. *Genus* Mycetophyllia.

Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 491, 1848.

Corallum massive, composed of corallites intimately united in series by their walls, which are very thin. *Exterior common walls* lobulate, spinulous, and presenting but rudiments of an epitheca. Calicular grooves, very shallow. No *columella*, or only rudiments of one. *Septa* not numerous, scarcely exsert, strongly dentate, and confluent. *Dissepiments* vesicular, large, and abundant; loculi closed almost to their top.

Typ. sp., *Mycetophyllia Lamarckiana*, Milne Edw. and J. Haime, Ann. des Sc. Nat., vol. x, tab. viii, fig. 6.

38. *Genus* Eunomia.

Lamouroux, Exposit. Méthod. des Polypiers, p. 83, 1824.

Corallum cespitose, fissiparous; *Corallites* segregate, tall, cylindroid. *Calices* almost circular. *Columella* rudimentary. *Septa* not very numerous. *Walls* covered with a complete membraniform epitheca, strongly striated transversely.

Typ. sp., *Eunomia radiata*, Lamouroux, op. cit., p. 83; *Lithodendron Eunomia*, Michelin, Icon., pl. xxxiv, fig. 6; *Eunomia lævis*, Milne Edw. and J. Haime, Ann., t. xi, p. 260; *Lithod. lævе*, Michelin, loc. cit., pl. xix, fig. 8.

39. *Genus* Calamophyllia.

Calamites, Guettard, Mém. sur les Sc. et les Arts, vol. ii, p. 404, 1770; *Calamophyllia*, Blainville, Dict. des Sc. Nat., t. lx, p. 312, 1830.

Corallum fasciculate, cespitose, and dichotomous. *Corallites* very long and segregate. *Calices* not very deep. *Columella* rudimentary or not existing. *Septa* thin, numerous, crowded, and armed with apical teeth, the size of which increases from the margin towards the centre of the calice. *Dissepiments* very oblique and crowded. *Walls* delicately striated, devoid of epitheca, but presenting at certain points circular foliaceous expansions.

Typ. sp., *Calamophyllia striata*, Blainville, Dict. des Sc. Nat., pl. ccexii; *Calamite strié*, Guettard, Mém. sur les Sc., t. iii, pl. xxxiv.

40. *Genus* Dasyphyllia.

Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 492, 1848.

Corallum fasciculate, cespitose, and dichotomous. *Corallites* very long and segregate. *Columella* spongy. *Septa* thin, slightly exsert, and armed with apical teeth, the size of which is much greater near the columella than towards the margin of the calice.

Typ. sp., *Dasyphyllia echinulata*, Milne Edw. and J. Haime, Ann. des Sc. Nat., 3me série, t. x, pl. viii, fig. 5.

41. *Genus* Colpophyllia.

Milne Edw. and J. Haime, Comptes rend. de l'Acad. des Sc., t. xxvii, p. 492, 1848.

Corallum sub-glomerate, remarkably light and fragile, composed of series of corallites cemented together laterally, without their respective walls ceasing to be distinct on the calicular surface, where they are parallel, very thin, and constitute a double ridge on each side of the calicular trench. *Calices* individualized by the direction of their septa. *Columella* rudimentary, or not existing. *Septa* extremely thin, broad, and slightly exsert; their apical edge armed with small delicate teeth, and emarginate near the middle. *Dissepiments* very abundant, and closing up the loculi almost to the margin of the calice, and forming a vesicular mass. *Common exterior walls* of the corallum or plate presenting small, lamellar, nearly equal, denticulate costæ; *epitheca* rudimentary.

Typ. sp., *Colpophyllia gyrosa*, Milne Edw. and J. Haime, Ann., t. xi, p. 266; *Madrepora gyrosa*, Ellis and Solander, op. cit.; tab. li, fig. 2; *Manicina gyrosa*, Ehrenberg, op. cit.; *Mussa gyrosa*, Dana, op. cit., p. 186.

42. *Genus* Oulophyllia.

Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 492, 1848.

Corallum composed of a series of corallites, intimately united by their lateral walls, which constitute simple ridges between the trenches formed by the aggregate calices. *Columella* spongy, and in general not highly developed. *Septa* thin, slightly exsert, closely set, and armed with numerous long, sharp, apical teeth, the size of which augments towards the centre of the corallite. *Common exterior walls* sometimes covered with a thin epitheca; multiplication fissiparous.

Typ. sp., *Oulophyllia Stokesiana*, Milne Edw. and J. Haime, Ann. des Sc. Nat., vol. x, tab. viii, fig. 10.

43. *Genus* Latomeandra.

D'Orbigny MSS.; Milne Edw. and J. Haime, Ann. des Sc. Nat., 3me série, t. xi, p. 270, 1849.

Corallum having most of the characters of the preceding genus, but increasing by calicular gemmation. The gyri in general short, the marginal ones distinct, and not forming a common rim. No epitheca.

Typ. sp., *Latomeandra plicata*, Milne Edw. and J. Haime, loc. cit., p. 271; *Lithodendron plicatum*, Goldfuss, Petref. Germ., tab. xiii, fig. 5.

44. *Genus* Tridacophyllia.

Blainville, Dict. des Sc. Nat., vol. lx, p. 327, 1830.

Corallum short, and composed of corallites, arranged in series intimately united by their lateral walls, which, instead of forming a simple ridge as in the preceding genera, constitute very tall, foliaceous expansions, variously twisted, and terminated by a sub-crenulate margin; the calicular trenches broad, very deep, and winding. *Columella* quite rudimentary, but the calicular centres very distinct. *Septa* projecting very little, thin, nearly equal, and serrate. *Dissepiments* abundant, very oblique, convex, and forming long vesicules. *Plate* or exterior surface of the common wall of the corallum covered with lamellar costæ, which extend from the basis of the mass, project slightly, and are irregularly denticulate.

Typ. sp., *Tridacophyllia lactuca*, Blainville, loc. cit.; *Concha fungiformis*, Seba, Thes., v. iii, tab. cxxxix, No. 10; *Pavonia lactuca*, Lamarck, An. sans Vert., vol. ii, p. 239; *Manicina lactuca*, Ehrenberg, op. cit., p. 103.

45. *Genus* Trachyphyllia.

Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 492, 1848.

Corallum short, increasing by fissiparity, and composed of very flexuous series of corallites, free laterally. Common *walls* strongly echinulate. *Epitheca* rudimentary. *Columella* well developed, but of a very loose, spongy texture. *Septa* numerous, crowded, exsert, and strongly granulated laterally.

Typ. sp., *Trachyphyllia amarantum*, Milne Edw. and J. Haime, Ann. des Sc. Nat., 3^{me} sér., vol. xi, p. 275; *Amarantum saxum*, &c. Rumph. Amb. Hort. vi, tab. lxxxvii, fig. 1.

46. *Genus* Aspidiscus.

König, Icon. Foss. Sect., p. 1, 1825; *Cyclophyllia*, Milne Edw. and J. Haime, Comptes rend. de l'Acad. des Sc., vol. xxvii, p. 492, 1848.

Corallum discoidal, with its inferior surface flat, and its upper surface convex. *Corallites* arranged in radiating series, separated by thick and simple, crest-like mural ridges, excepting towards the margin of the calicular surface, where the young individuals spread out so as to form a broad, continuous, lamello-striate border. *Columella* rudimentary, but the calicules well individualized. *Septa* very thin and crowded, but not numerous in each corallite common *plate* covered with a thick epitheca, presenting concentric striæ or folds.

Typ. sp., *Aspidiscus cristatus*, Milne Edw. and J. Haime, Ann. des Sc. Nat., 3^{me} série, vol. xi, p. 277; *Aspidiscus Shawi*, König, Icon. Foss. Sect., pl. i, fig. 6; *Cyclolites cristata*, Lamarck, Anim. sans Vert., t. ii, p. 234.

47. *Genus* Scapophyllia.

Milne Edw. and J. Haime, Comptes rend. de l'Acad. des Sc., t. xxvii, p. 492, 1848.

Corallum columnar, erect, very dense, and formed of corallites arranged in series, completely united laterally. *Columella* tubercular, somewhat compact. *Septa* very thick, neither closely set nor numerous; with their sides very echinulate, and the apex denticulate. *Dissepiments* simple and distant.

Typ. sp., *Scapophyllia cylindrica*, Milne Edw. and J. Haime, Ann. des Sc. Nat., 3^{me} série, vol. x, tab. viii, fig. 8.

Section II.—ASTREINÆ CONFLUENTES.

Corallum massive, increasing by fissiparity, and formed by a series of corallites, the individuality of which is not distinct. The calices, thus united in a common trench, have their septa arranged in a parallel manner in two lines; and the columella, when existing, is continuous in the whole length of the series.

These meandriform Corals much resemble the confluent Eusmilinæ, and in fossils where the apical teeth of the septa may be worn away, it is often difficult to distinguish them. It may therefore be useful to mention that, in the confluent Astreinæ, the gyri are always completely united laterally, and never more or less segregate, which is sometimes the case with the confluent Eusmilinæ; that the columella, which is generally spongy in the latter, never presents that loose structure in this section; and when it is lamellar, the septa are united to it by an undivided margin in the confluent Eusmilinæ, and by a series of trabiculæ or processes in the confluent Astreinæ; lastly, that the sides of the septa are more or less granulated in all these Astreinæ, and are on the contrary almost glabrous in the meandroid Eusmilinæ.

48. *Genus* Meandrina.

(*Pars*) Lamarck, Hist. des Anim. sans Vert., t. ii, p. 244, 1816; Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 493.

Corallum glomerate, adherent by a very broad basis, and having a very dense structure. *Gyri* intimately united by their lateral walls, which constitute simple, compact ridges, with a cristate apex. Calicular trenches very long. *Columella* much developed, spongy and essential (that is to say, not arising from the septa, and distinct from the bottom of the visceral chamber). *Septa* crowded, enlarging near the columella, and not presenting any appearance of a paliform lobe. *Plate* or exterior common walls of the corallum covered with a complete delicate epitheca.

Typ. sp., *Meandrina filograna*, Lamarck, loc. cit., vol. ii, p. 248; Michelin, Icon., pl. xi, fig. 7.

49. *Genus* Manicina.

(*In parte*) Ehrenberg, Corall. des Roth. Meeres, p. 101, 1834; Dana, op. cit., p. 188, 1846; Milne Edw. and J. Haime, Ann. des Sc. Nat., vol. xi, p. 285, 1849.

Corallum free or sub-pedicellate, in the adult state; sub-turbinate when young, but becoming convex, and massive. *Gyri* very long, and united by their walls, so as to form simple ridges, as in the preceding genus; the apex of the ridge cristate or sulcate. Calicular trench broad and deep. *Columella* spongy, and even more developed than in Meandrina. *Septa* thin, crowded, strongly granulated, and armed with delicate, equal teeth; a well-characterised paliform lobe arising from the edge of the principal septa near the columella. *Plate* or exterior common wall covered with thin and very delicately-serrated costæ; its inferior part having an incomplete epitheca.

Typ. sp., *Manicina areolata*, Ehrenberg, loc. cit.; *Madrepora areolata*, Ellis and Solander, op. cit., tab. xlvii, fig. 5.

50. *Genus* Diploria.

Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 493, 1848.

Corallum glomerate, adherent by a broad basis, and of a dense structure. *Gyri* long, very sinuous, and united by highly-developed costæ, and not by the walls themselves; ridges complex, presenting on each side a mural crest, and in the middle a broad concave groove or ambulacrum, formed by the costæ and their dissepiments. *Columella* spongy, essential, and well developed. *Septa* strong, exsert, and armed with closely-set teeth, the largest of which are near the walls.

Typ. sp., *Diploria cerebriformis*, Milne Edw. and J. Haime, Ann., t. xi, p. 289; *Meandrina cerebriformis*, Lamarck, op. cit., vol. ii, p. 246; Seba Thes., vol. iii, tab. cxii, No. 6.

51. *Genus* Leptoria.

Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 493, 1848.

Corallum glomerate, of a light spongy structure. *Gyri* very long, and limited by their walls, which are thin or cellulose, and form simple intercalicular ridges. *Columella* lamellar; its upper edge projecting slightly, and regularly lobated. *Septa* united to the columella by means of marginal trabiculæ; their upper edge slightly exsert, and armed with very small irregular teeth. *Plate* covered with a thin but complete common epitheca.

Typ. sp., *Leptoria tenuis*, Milne Edw. and Haime, Ann. des Sc. Nat., 3^{me} sér., vol. x, tab. viii, fig. 11; *Meandrina cerebriformis*, Quoy and Gaimard, Voy. de l'Astrol., Zooph., pl. xviii, figs. 2, 3; *Meandrina tenuis*, Dana, op. cit., p. 262; Milne Edw., Atlas du Règne An. de Cuvier, Zooph., pl. lxxxiv ter, fig. 2.

52. *Genus* Cœloria.

Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 493, 1848.

Corallum resembling much the true Meandrina, but differing from the four preceding genera by its rudimentary *columella*, which is not essential, but septal, and formed by trabiculæ, springing from the margin of the septa. *Gyri* long, and united by their *walls*, the tissue of which is cellular; ridges simple and continuous. *Septa* delicate, and having neither a paliform lobe nor a lateral expansion near the columella.

Typ. sp., *Cœloria labyrinthica*, Milne Edw. and J. Haime, Ann. des Sc. Nat., 3^{me} série, t. xi, p. 194; *Madrepora labyrinthica*, Ellis and Solander, op. cit., tab. xlvi, figs. 3, 4.

53. *Genus* Astroria.

Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 493, 1848.

Corallum having the same structure as in the preceding genus, but formed of very short gyri, the corallites tending to individualization. This form is intermediate between the ordinary confluent Astreidæ (or Meandrinæ) and the agglomerated Astreidæ, such as true Astrea.

Typ. sp., *Astroria dædalea*, Milne Edw. and J. Haime, Ann. des Sc. Nat., t. xi, p. 297; *Madrepora dædalea*, Ellis and Solander, op. cit., tab. xlvi, figs. 1, 2.

54. *Genus* Hydnophora.

Fischer de Waldheim, Descrip. du Mus. Démidoff, vol. iii, p. 295, 1810; *Monticularia*, Lamarck, Hist. des Anim. sans Vert., t. ii, p. 248, 1816.

Corallum formed of irregular series of corallites, united by their walls, which are thick, compact, and constitute ridges, divided longitudinally, so as to represent rows of conical prominences, or monticulæ. The calicular trenches are transversal as well as longitudinal, and there is no columella. *Septa* nearly equal, and rising to the apex of the conical mural monticulæ. General form sometimes massive and sub-globose or gibbous; sometimes sub-explanate.

Typ. sp., *Hydnophora Demidorii*, Fischer, Oryct. du Gouv. de Moscou, pl. xxxii.

Section III.—ASTREINÆ DENDROIDÆ.

Corallum always increasing by lateral gemmation. The corallites segregate, and having an arborescent or fasciculate arrangement. *Septa* regularly and delicately serrated; those of the principal cycla always bearing pali.

55. *Genus* Cladocora.

(*In parte*) Ehrenberg, Corall. des Roth. Meeres, p. 85, 1834; *Caryophyllia*, Dana, Zoophytes, p. 378, 1846.

Corallum arborescent, forming branched clumps. *Corallites* cylindrical, very long, and completely free laterally. *Calices* circular, or almost so. *Columella* papillose. *Pali* well developed, and corresponding to all the septa, except those of the last cyclum. *Septa* slightly exsert, nearly equal, granulated, and having their apex arched and delicately serrated. *Walls* compact, with simple, granulated, or echinulated costæ, and an incomplete epitheca, which often expands into circular, horizontal leaves, extending to the neighbouring corallites.

Typ. sp., *Cladocora cespitosa*, Milne Edw. and J. Haime; *Madrepora flexuosa*, Solander and Ellis, tab. xxxi, figs. 5, 6.

56. *Genus* Pleurocora.

Milne Edw. and J. Haime, Comptes rend. de l'Ac. des Sc., t. xxvii, p. 494, 1848.

Corallum sub-dendroid. *Corallites* cylindrical, very short; united by their basal part, and free towards their upper end. *Columella*, *pali*, and *septa* much as in the preceding genus. *Walls* compact, extremely thick, and never presenting any traces of an epitheca. *Costæ* distinct from one end of the corallites to the other, and vermiculate.

This genus approximates in some degree to Dendrophyllia and to Oculina.

Typ. sp., *Pleurocora explanata*, Milne Edw. and J. Haime, Ann. des Sc. Nat., 3^{me} série, vol. x, tab. vii, fig. 10.

Section IV.—ASTREINÆ AGGREGATÆ.

Corallum composite, massive, increasing by gemmation or by fissiparity, and in that case not presenting a linear mode of arrangement of the corallites, which are always completely united laterally, but remain well defined, and never lose their individuality, as in the confluent Astreina.

57. *Genus* Astrea.

(*In parte*) Lamarck, Syst. des Anim. sans Vert., p. 371, 1801 ; Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 494, 1848.

Corallum massive, in general convex or sub-globose. Gemmation extra-calicular. *Corallites* tall. *Calicules* having a free, exsert, obtuse, circular margin ; fossula not very deep. *Columella* spongy, and not projecting at the bottom of the calicule. No *pali*. *Septa* complete, exsert, broad, and strongly dentated or lobated ; the largest of their apical teeth near the columella ; their sides strongly granulated. *Costæ* highly developed, and composed of lamellæ ; in general perforated, and united by numerous dissepiments.

Typ. sp., *Astrea cavernosa*, Milne Edw. and J. Haime, loc. cit., vol. x, tab. ix, fig. 1 ; *Madrepora cavernosa*, Esper, Pflanz. Suppl. Mad., tab. xxxvii ; *Astrea argus*, Lamarck, Hist. des Anim. sans Vert., t. xi, p. 259.

58. *Genus* Cyphastrea.

Milne Edw. and J. Haime, Comptes rend. de l'Acad. des Sc., vol. xxvii, p. 494, 1848.

Corallum massive, convex, and globose. Gemmation extra-calicular. *Corallites* united by a compact septal cœnenchyma, the surface of which is strongly granulated, or even echinulated. *Calicular* rims as in the preceding genus. *Columella* papillose, and well developed. *Septa* lamellar near the wall, but cribriform towards the columella, where they are formed by a series of oblique processes, representing a sort of lattice ; their calicular teeth rather larger towards the calice than near the walls.

Typ. sp., *Cyphastrea microphtholma*, Milne Edw. and J. Haime, Ann. des Sc. Nat., 3^{me} série, vol. x, tab. ix, fig. 5 ; *Astrea microphthalma*, Lamarck, op. cit.

59. *Genus* Oulastrea.

Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 495, 1848.

Corallum massive and incrustating. Gemmation extra-calicular. *Corallites* low. *Calices* circular, with a free margin. *Columella* papillose, and appearing to be formed by the inner apical teeth of the septa. No *pali*. *Septa* with a crispate, denticulated, apical margin, and echinulate sides. *Costæ* also echinulate and crispate.

Typ. sp., *Oulastrea crispata*, Milne Edw. and J. Haime, Ann. des Sc. Nat., 3^{me} série, vol. x, tab. ix, fig. 4 ; *Astrea crispata*, Lamarck, Hist. des Anim. sans Vert., vol. ii, p. 265.

60. *Genus* Plesiastrea.

Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 494, 1848.

Corallum globose; its under surface having the form of a naked costulated plate. Gemmation extra-calicular. *Calices* with a free margin, and a fossula rather shallow. *Columella* spongy. *Pali* well developed, and corresponding to all the septa except those of the last cyclum. *Septa* exsert, formed by a well-developed lamina, and having a delicately-serrated apex. *Costæ* and their dissepiments in general well developed.

Typ. sp., *Plesiastrea Urvillii*, Milne Edw. and J. Haime, Ann. des Sc. Nat., vol. x, tab. ix, fig. 2; *Astrea galaxea*, Quoy and Gaim., Voyage de l'Astrolabe, Zooph., pl. xvii, figs. 10-14.

61. *Genus* Leptastrea.

Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 494, 1848.

Corallum very dense and incrusting, and increasing by fissiparity, as well as by extra-calicular gemmation. Costal cœnenchyma quite compact. *Calices* in general much crowded together, but preserving their margins distinct. *Columella* papillose. *Septa* thin, closely set, exsert, delicately granulated, and having their apical margin almost entire near the walls, but delicately denticulated towards the columella. *Dissepiments* not very abundant. *Costæ* rather indistinct.

Typ. sp., *Leptastrea Roissyana*, Milne Edw. and J. Haime, Ann. Sc. Nat., 3^{me} serie, vol. x, tab. ix, fig. 6.

62. *Genus* Solenastrea.

Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 494, 1848.

Corallum forming in general a convex mass, of a light and cellular structure. Gemmation extra-calicular. *Corallites* long, slender, and united by an exothecal structure, and not by the *costæ*, which do not meet, and are often rudimentary. *Calices* circular, with an exsert margin. *Columella* spongy, and in general small. *Septa* very thin; their margin denticulated. *Dissepiments* simple, numerous, and closely set.

Typ. sp., *Solenastrea Turonensis*, nob.; *Astrea Turonensis*, Michelin, Icon., pl. lxxv, figs. 1, 2.

63. *Genus* Phymastrea.

Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 494, 1848.

Corallum forming a convex or a horizontal mass. *Corallites* prismatical; surrounded from top to bottom by a thin epitheca; very nearly approximated to each other, but not united by their walls, and cemented together by means of a certain number of large wart-like processes, so as to leave an empty space between them. Gemmation extra-calicular. *Calices* sub-polygonal, with a free margin. *Columella* spongy, well developed. *Septa* large, slightly exsert, and strongly dentated. *Walls* thick; no trace of costæ.

Typ. sp., *Phymastrea Valenciennesii*, Milne Edw. and J. Haime, Ann. Sc. Nat., 3^{me} série, vol. x, tab. ix, fig. 3.

64. *Genus* Astroides.

Quoy and Gaimard, Ann. des Sc. Nat., 1re série, vol. x, p. 187, 1827 ; *Astroitis*, Dana, Zooph., p. 405, 1846.

Corallum incrusting, and formed of corallites very unequally approximated; some almost entirely free, others crowded so as to become polygonal, but always separated by a more or less developed epitheca. Gemmation extra-calicular. *Calices* deep. *Columella* spongy, large, and projecting very much at the bottom of the fossula, a character which does not exist in any of the preceding Astreinæ. *Septa* not much developed, very thin, not exsert, irregularly and delicately denticulated. *Dissepiments* very abundant. *Walls* composed of a dense spongy tissue. Epitheca complete.

Typ. sp., *Astroides calicularis*, Blainville, Dict. des Sc. Nat., vol. lx. ; *Caryophyllia calicularis*, Lamarck, op. cit., vol. ii, p. 226 ; Milne Edwards, Atlas du Règne Anim. de Cuvier, Zooph., tab. lxxxiii, fig. 2.

65. *Genus* Prionastrea.

Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 495, 1848.

Corallum forming a convex or gibbose mass, the under surface of which constitutes a common plate, covered with a thin, complete epitheca. Gemmation sub-marginal. *Calices* distinct, polygonal; fossula deep; margins united so as to form a simple crest between the different corallites. *Columella* spongy. *Septa* thin, crowded, delicately granulated on their sides, and strongly dentated at their apex; the largest of these teeth are those nearest the columella. *Dissepiments* well developed. *Walls* in general independent towards the basis of the coral, but uniting to the adjacent ones near the calices, so that the visceral chambers appear to be separated only by a single simple lamina.

Typ. sp., *Prionastrea abdita*, Milne Edw. and J. Haime, loc. cit. ; *Astræa abdita*, Lamarck, Hist. des Anim. sans Vert., t. ii, p. 265, 1816 ; *Madrepora abdita*, Soland. and Ellis, t. 50, f. 2.

66. *Genus* Siderastrea.

(*In parte*) Blainville, Dict. des Sc. Nat., t. lx, p. 335, 1830 ; *Siderina*, Dana, Zooph., p. 218, 1846.

Corallum incrusting, forming a convex mass of a very dense tissue. Gemmation sub-marginal. *Corallites* united by their walls, which are thin, and sometimes indistinct. *Calices* sub-pentagonal, with a deep fossula, and their margins rendered thick by the prolongation of the septa. *Columella* papillose, in general not much developed, but having a tendency to become compact. *Septa* very closely set, thin, and regularly denticulated; their lateral surfaces covered with large granulations, which come in contact with those of the adjoining septa, but are not united to them. *Dissepiments* rudimentary.

Typ. sp., *Siderastrea galaxea*, Blainville, loc. cit. ; *Madrepora galaxea*, Ellis and Solander, Hist. of Zooph., tab. xlvii, fig. 7.

67. *Genus* Baryastrea.

Milne Edw. and J. Haime, Comptes rend. de l'Acad. des Sc., t. xxvii, p. 495, 1848.

Corallum incrusting; its tissue very dense and compact. Gemmation marginal or sub-marginal. *Corallites* very intimately united by their walls. *Calices* polygonal and

indistinctly separated by superficial, narrow grooves. *Columella* not much developed at its apex; but having a tendency to become compact, and to fill up the visceral chamber towards its basis. *Septa* very thick, closely set, scarcely granulated, and very feebly denticulated. *Dissepiments* little developed.

Typ. sp., *Baryastrea solida*, Milne Edw. and J. Haime, loc. cit.

68. *Genus* Acanthastrea.

Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 495, 1848.

Corallum forming a slightly convex mass, with its upper surface strongly echinulate, and its under surface constituting a plate, covered with a complete, thin epitheca. Gemmation sub-marginal or marginal. *Corallites* united by their walls, which are somewhat cellular. *Calices* sub-polygonal, with broad, spiniferous, simple, common margins. *Columella* rudimentary or septal. *Septa* exsert, strong, and armed with projecting spiniform teeth, the largest of which are situated near the walls, instead of being the central ones, as in the preceding genera. *Dissepiments* very numerous.

Typ. sp., *Acanthastrea spinosa*, Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 495.

69. *Genus* Synastrea.

Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 495, 1848.

Corallum pediculate, and increasing in breadth more than in height. Gemmation sub-marginal. *Corallites* intimately united by their walls. *Calices* superficial, distinct at their centre, but not so towards their circumference. *Columella* very small. *Septa* confluent, progressing from one calicular centre to another without interruption, exsert, and hiding the walls, over which they extend; their calicular margin almost horizontal, and armed with nearly equal teeth.

Typ. sp., *Synastrea Savignyi*, Milne Edw. and J. Haime, Ann. des Sc. Nat., 3^{me} série, vol. x, tab. ix, fig. 12.

70. *Genus* Thamnastrea.

Thamnasteria (*in parte*), Le Sauvage, Mém. de la Soc. d'Hist. Nat. de Paris, vol. i, p. 241, 1822; *Thamnastrea*, ejusd., Ann. des Sc. Nat., 1re série, vol. xxvi, p. 328.

Corallum having confluent septa, and most of the other characters of Synastrea, but forming a fasciculus of columns or thick branches, erect, and of a more or less arborescent aspect.

Typ. sp., *Thamnastrea dendroidea*, Le Sauvage, Mém. de la Soc. d'Hist. Nat., vol. i, tab. xiv.

71. *Genus* Goniastrea.

Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 495, 1848.

Corallum always increasing by successive fissiparity, and forming a convex or lobulated mass, of a dense structure. *Corallites* intimately united from top to bottom by their walls,

which thus form simple partitions between the visceral cavities, and are thick and compact. *Calices* polygonal; fossula rather deep. *Columella* spongy. *Septa* slightly exsert, their apex arched and denticulated. Well-characterised, denticulated *pali*, corresponding to all the septa, except those of the last cyclum.

Typ. sp., *Goniastrea solida*, Milne Edw. and J. Haime, Ann., 3^{me} série, t. x, pl. ix, fig. 7; *Madrepora solida*, var. *b*, Forskal, Descr. Anim. in Itin. Orient., p. 131.

72. *Genus* Aphrastrea.

Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 495, 1848.

Corallum increasing by fissiparity, and forming a convex mass of a light cellular structure, presenting on its under surface a complete, common epitheca. *Calices* intimately united by their margins, which thus assume the appearance of simple partitions. *Columella* spongy. *Pali* or paliform lobes of the septa corresponding to all the cycla, except the last. *Septa* denticulated, slightly exsert. *Dissepiments* vesicular, and highly developed. *Walls* extremely thick, and completely vesicular.

Typ. sp., *Aphrastrea deformis*, Milne Edw. and J. Haime, Ann. des Sc. Nat., 3^{me} série, vol. x, tab. ix, fig. 11; *Astrea deformis*, Lamarck, Hist. des An. sans Vert., t. xi, p. 264.

73. *Genus* Parastrea.

Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 495, 1848.

Corallum increasing by fissiparity, and having the same general form as in the preceding genus, but differing from it by the mode of union of the corallites, which takes place by means of the costæ and their dissepiments, so that the calices, instead of being separated only by a common simple margin, have each a distinct margin independent of those surrounding it. *Septa* exsert, and armed with teeth, the largest of which are placed near the centre of the calice, and often assume the appearance of pali. *Dissepiments* well developed.

Typ. sp., *Parastrea amicorum*, Milne Edw. and J. Haime, Ann., 3^{me} série, vol. x, pl. ix, fig. 9.

Section V.—ASTREINÆ REPTANTES.

Corallum increasing by the development of buds on stolons, or on membraniform basal expansions. The *corallites* not united by their sides, excepting accidentally by means of their walls, and remaining short. *Septa* feebly denticulated. *Dissepiments* almost rudimentary.

74. *Genus* Angia.

Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 196, 1848.

Corallum composed of short, cylindrical corallites, united by a common gemmiferous basal expansion, and completely free laterally. *Calices* sub-circular; fossula broad and

deep. *Columella* papillose, well developed. *Septa* thin, not exsert; the principal ones having their upper margin almost entire, the others strongly dentated. *Walls* covered with a complete epitheca.

Typ. sp., *Angia rubeola*, Milne Edw. and J. Haime, Ann. des Sc. Nat., 3me série, vol. x, tab. vii, fig. 6; *Dendrophyllia rubeola*, Quoy and Gaimard, Astrolabe, Zooph., tab. xv, figs. 12-15.

75. *Genus* Cryptangia.

Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 496, 1848.

Corallum composed of agglomerate, cylindro-turbinate corallites, which appear to multiply by gemmation on a non-persistent, soft stolon, so that they cease to be organically united when in the adult state, but remain imbedded in an extraneous mass composed of Cellepora. *Calices* circular, with a well-formed fossula. *Columella* papillose, well developed. *Septa* thin, not very closely set; the upper edge of all of them dentate. *Walls* covered with a complete epitheca.

Typ. sp., *Cryptangia Woodii*, Milne Edw. and J. Haime, loc. cit.; *Cladocora cariosa*, Wood, Ann. of Nat. Hist., vol. xiii, p. 12.

76. *Genus* Rhizangia.

Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 496, 1848.

Corallum increasing by the gemmation of stolons, which sometimes become calicified, and are persistent. *Corallites* agglomerate, sub-cylindrical. *Calices* circular; fossula shallow. *Columella* papillose, and not very distinct from the neighbouring denticulations of the septa. *Septa* thin, scarcely exsert, nearly equal, very closely set, with the upper edge slightly arched, and armed with small, regular teeth. *Walls* covered with a complete epitheca, which extends almost as high as the apex of the septa.

Typ. sp., *Rhizangia brevissima*, Milne Edw. and J. Haime, Ann. des Sc. Nat., 3me serie, vol. x, t. vii, figs. 7, 8; *Astrea brevissima*, Deshayes, in Ladoucette, Hist. des Hautes Alpes, tab. xiii, fig. 13.

77. *Genus* Astrangia.

Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 496, 1848.

Corallum incrusting. *Corallites* very short, produced by gemmation on a thin, common, basal expansion, the surface of which is granulated. *Calices* circular, with a deep fossula. *Columella* papillose, sub-echinulate and not distinctly delimitated. *Septa* thin, exsert, nearly equal, granulate, and armed with teeth much resembling those of the columella; the tertiary septa bent towards those of the second cycle, and united to them. *Dissepiments* in general simple and distant. *Walls* naked, with broad, delicately-granulated costæ.

Typ. sp., *Astrangia Michelinii*, Milne Edw. and J. Haime, Ann. des Sc. Nat., 3me série, vol. x, t. vii, f. 5.

78. *Genus* Phyllangia.

Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 497, 1848.

Corallum differing from those of the preceding genus by the structure of the *septa*, the upper edge of which is almost entire in the principal cycle, and slightly denticulated in the others. *Columella* rudimentary.

Typ. sp., *Phyllangia americana*, nob.

79. *Genus* Oulangia.

Milne Edw. and J. Haime, Comptes rend., t. xxvii, p. 497, 1848.

Corallum composed of very low, cylindrical corallites, which appear to arise by gemmation on a basal incrusting expansion, and having their walls naked and costate, as in the preceding genus, but with a highly-developed, papillose columella. *Septa* very exsert, closely set; those of the principal cycla having their upper edge almost entire.

Typ. sp., *Oulangia Stokesiana*, Milne Edw. and J. Haime, Ann. des Sc. Nat., 3me série, vol. x, tab. vii, fig. 4.

Aberrant Group.

PSEUDASTREIDÆ.

Corallum composite, thin, and foliaceous, and increasing by extra-calicular gemmation. *Corallites* short, well circumscribed, and dispersed on the surface of a common lamellar plate. Cœnenchyma echinulate. *Septa* well developed, very echinulate. *Dissepiments* not numerous. No synapticulæ. Common basal wall imperforate, sub-costulate, and naked.

Genus Echinopora.

Lamarck, Hist. des An. sans Vert., vol. ii, p. 252, 1816; *Echinastrea*, Blainville, Dict. des Sc. Nat., vol. lx, p. 343, 1830.

Corallum adherent, near the centre, and expanding into large foliaceous, lobated laminæ. *Calices* circular, with an exsert margin.

Typ. sp., *Echinopora rosularia*, Lamarck, loc. cit., p. 253; Milne Edw., Atlas du Règne Anim. de Cuvier, Zooph., tab. lxxxiii ter, fig. 1.

Transitional Group.

PSEUDOFUNGIDÆ.

Corallum composite and foliaceous, having a perforated plate or basal wall (as in Fungidæ) and interseptal dissepiments (as in Astreidæ). *Calices* forming radiating series, separated by lobes or ridges. No synapticulæ.

Genus Merulina.

Ehrenberg, Corall. des Roth. Meeres, p. 104, 1834. Typ. sp., *Merulina ampliata*, Ehrenberg, loc. cit.

Family IV.

FUNGIDÆ.

Dana, Expl. Exped., Zooph., p. 283, 1846.

Corallum simple or composite, very short and expanding, so as to constitute a disc or foliaceous lamina. *Calice* very shallow, and open laterally in simple species;

confluent, and not circumscribed in the compound species. *Septa* not distinct from the costæ, and formed by complete, imperforate laminæ, with the edge dentate, and the sides covered with styliform or echinulate processes, which, in general, meet so as to constitute numerous *synapticulæ*, or transverse props, extending across the loculi like the bars of a grate. No dissepiments or tabulæ, so that no part of the visceral chamber is completely closed. *Walls* basal, in general porous. The compound species increasing by submarginal gemmation, and not by fissiparity.

First Tribe—CYCLOLITINÆ.

Corallum simple. *Plate* or basal wall having a well-developed *epitheca*, presenting concentric folds.

1. *Genus* Cyclolites.

Lamarck, Syst. des Anim. sans Vert., p. 369, 1801.

Corallum circular, or nearly so, and covered with an immense number of very thin septa. Fossula oblong, narrow, and shallow. The small septa in general united to those of the older cycla.

Typ. sp., *Cyclolites elliptica*, Lamarck, loc. cit., p. 234.

2. *Genus* Palæocyclus.

Milne Edw. and J. Haime, Comptes rend. de l'Acad. des Sc., vol. xxix, p. 71, 1849.

Corallum circular. Fossula deep, very broad, and circular. *Septa* thick and not numerous; none of them cemented together.

Typ. sp., *Palæocyclus porpita*, Milne Edw. and J. Haime, loc. cit.; *Madrepora porpita*, Fougt, Lin. Amœn. Acad., t. i, tab. iv, fig. 5.

Second Tribe—FUNGINÆ.

Corallum simple or composite. *Plate* or basal wall without an epitheca, in general strongly echinulate, and porous.

3. *Genus* Fungia.

(*In parte*) Lamarck, Syst. des An. sans Vert., p. 369, 1801; Dana, Zooph., p. 287, 1846; Milne Edw. and J. Haime, Comptes rend., t. xxix, p. 71, 1849.

Corallum simple, subdiscoidal. *Septa* very numerous, and united so as to appear ramified. Basal *wall* strongly echinulate, and perforated in an irregular manner.

Typ. sp., *Fungia patellaris*, Lamarck, loc. cit., p. 236; Milne Edw. and J. Haime, Ann. des Sc. Nat., t. ix, pl. vi, fig. 1.

4. *Genus* Micrabacia.

Milne Edw. and J. Haime, Comptes rendus, vol. xxix, p. 71, 1849.

Corallum simple, lenticular, plano-convex. *Septa* not extremely numerous, straight. *Wall* scarcely echinulate, and perforated in a regular manner.

Typ. sp., *Micrabacia coronula*, nob.; *Fungia coronula*, Goldfuss, Petref. Germ., vol. i, tab. xiv, fig. 10.

5. *Genus* Anabacia.

D'Orbigny MSS.; Milne Edw. and J. Haime, loc. cit., p. 71, 1849.

Corallum simple and lenticular. *Septa* extremely numerous, thin, and projecting on the under side of the corallum without forming a distinct basal wall or plate. Fossula shallow.

Typ. sp., *Anabacia orbulites*, nob.; *Fungia orbulites*, Lamouroux, Exp. Méth., tab. lxxxiii, figs. 1, 2, 3.

6. *Genus* Genabacia.

Milne Edw. and J. Haime, Comptes rend., t. xxix, p. 71, 1849.

Corallum composite, formed by a parent corallite similar to Anabacia, bearing young calicula arranged circularly.

Typ. sp., *Genabacia stellata*, nob.; *Fungia stellata*, D'Archiac, Mém. Soc. Géol. France.

7. *Genus* Herpolitha.

Eschscholtz, Isis, 1825; *Haliglossa*, Ehrenberg, Corall., p. 50, 1834; *Herpetolithus*, Leuckart; Dana, Zooph., p. 306, 1846.

Corallum composite, free. *Calicula* sub-radiate, and of two sorts; the central ones multi-lamellate, and arranged in a line; the others pauci-lamellate, and dispersed irregularly. *Septa* strong, and alternately thick and thin. Under surface of the common basal wall very echinulate.

Typ. sp., *Herpolitha limacina*, nob.; *Madrepora pileus*, Ellis and Solander, op. cit., tab. xlv.

8. *Genus* Cryptabacia.

Milne Edw. and J. Haime, Comptes rend., t. xxix, p. 71, 1849.

Corallum composite, free and convex above. *Calices* distinctly radiate; the central ones arranged in a line, and more distinct than the others. *Septa* short, and not numerous. Under surface of the common basal walls strongly echinulated.

Typ. sp., *Cryptabatia talpa*, nob.; *Fungia talpa*, Lamarck, Hist. des An. sans Vert., t. ii, p. 237.

9. *Genus* Halomitra.

Dana, Zooph., p. 311, 1846.

Corallum composite, differing from the preceding genus by its very long and numerous septa.

Typ. sp., *Halomitra pileus*, Dana, loc. cit., p. 311; *Fungia pileus*, Lamarck, Hist. des An. sans Vert., t. ii, p. 237.

10. *Genus* Podobacia.

Milne Edw. and J. Haime, loc. cit., p. 71, 1849.

Corallum composite, cyathiform, and adherent by its basis. *Calices* as in Halomitra.

Typ. sp., *Podobacia cyathoides*, nob.; *Agaricia cyathoides*, Valenciennes MSS., in the Gallery of the Paris Museum.

11. *Genus* Lithactinia.

Lesson, Illustr. Zool., 1833.

Corallum composite, free. *Calices* of one sort only, and not radiate. *Septa* short, and separated by very thin, transverse laminæ, which appear to be analogous to columellæ.

Typ. sp., *Lithactinia novæhyberniæ*, Lesson, loc. cit., vi, figs. 1, 2.

12. *Genus* Polyphyllia.

Quoy and Gaimard, Voy. de l'Astrolabe, Zooph., p. 184, 1833.

Corallum composite, free, and having calices of two sorts; the central ones sub-radiate, and arranged in a line.

Typ. sp., *Polyphyllia pelvis*, Quoy and Gaimard, loc. cit., pl. xx, figs. 8—10.

13. *Genus* Zoopilus.

Dana, Zooph., p. 318, 1846.

Corallum composite. *Septa* of two sorts; the large ones radiately prolonged quite to the margin; the intermediate much smaller, and those only interrupted by the calicular fossulæ or orifices.

Typ. sp., *Zoopilus echinatus*, Dana, op. cit., p. 319.

Third Tribe—LOPHOSERINÆ.

Plate (or basal wall) not perforate nor echinulate. No *epitheca*.

14. *Genus* Cycloseris.

Milne Edw. and J. Haime, Comptes rend., t. xxix, p. 72, 1849.

Corallum simple, free, and discoidal. *Septa* very numerous, and united by their inner edge. *Wall* completely horizontal.

Typ. sp., *Cycloseris cyclolites*, nob.; *Fungia cyclolites*, Lamarck., Hist. des Anim. sans Vert., t. ii, p. 236.

15. *Genus* Diaseris.

Milne Edw. and J. Haime, loc. cit., p. 72, 1849.

Corallum simple, free, and discoidal; when young, composed of a certain number of separate, radiating lobes, which, in the adult state, become cemented together. General structure as in Cycloseris.

Typ. sp., *Diaseris distorta*, nob.; *Fungia distorta*, Michelin, in Guerin's Mag. Zool., t. v, Zooph., pl. v, 1843.

16. *Genus* Trochoseris.

Milne Edw. and J. Haime, loc. cit., p. 72, 1849.

Corallum simple, trochoidal, adherent. *Septa* very numerous, and strongly granulated.

Typ. sp., *Trochoseris distorta*, nob.; *Anthophyllum distortum*, Michelin, Icon. Zooph., pl. xliii, fig. 8.

17. *Genus* Cyathoseris.

Milne Edw. and J. Haime, loc. cit., p. 72, 1849.

Corallum composite, trochoid, adherent. *Calices* rather distinctly radiate. *Septa* long and thick. Common basal walls, sometimes forming folds, which rise up so as to constitute lobes or ridges on the upper surface of the corallum.

Typ. sp., *Cyathoseris infundibuliformis*, nob.; *Agaricia infundibuliformis*, Michelin, op. cit., tab. xliii, fig. 12.

18. *Genus* Lophoseris.

Milne Edw. and J. Haime, loc. cit., p. 72, 1849; *Pavonia* (*ex parte*), Lamarck, op. cit., t. ii, p. 238, 1816.

Corallum composite, foliaceous, and adherent, rising in the form of irregular cristæ or of lobes, with confluent, radiate calicules on each side. *Columella* tubercular.

Typ. sp., *Lophoseris boletiformis*, nob.; *Pavonia boletiformis*, Lamarck, loc. cit., p. 240.

19. *Genus* Agaricia.

(*Pars*) Lamarck, Syst. des Anim. sans Vert., p. 375, 1801.

Corallum composite, foliaceous, and irregular. *Calices* arranged in concentric series, separated by unequal ridges. *Columella* tubercular.

Typ. sp., *Agaricia undata*, Lamarck, loc. cit.; *Madrepora undata*, Solander and Ellis, Zooph., tab. xl.

20. *Genus* Pachyseris.

Milne Edw. and J. Haime, loc. cit., p. 72, 1849.

Corallum similar to Agaricia, excepting that the corallites belonging to the same trench are completely blended together. *Columella* well developed and dense.

Typ. sp., *Pachyseris rugosa*, nob.; *Agaricia rugosa*, Lamarck, Hist. des An. sans Vert., t. ii, p. 243.

21. *Genus* Phyllastrea.

Helioseris, Dana, Zooph., p. 269; Milne Edw. and J. Haime, loc. cit., p. 72, 1849.

Corallum composite, composed of frondiform expansions. *Calices* circumscribed, submammillate, and arranged around the parent corallite, which remains larger than the others. *Columella* tubercular.

Typ. sp., *Phyllastrea tubifex*, Dana, loc. cit., tab. xvi, fig. 4.

22. *Genus* Haloseris.

Milne Edw. and J. Haime, loc. cit., p. 72, 1849.

Corallum composite, forming foliaceous, crispate, lobulate expansions, the upper surface of which is covered with very long radii, and shows only obsolete calices. *Columella* rudimentary.

Typ. sp., *Haloseris lactuca*, Milne Edw. and J. Haime, loc. cit.

23. *Genus* Leptoseris.

Milne Edw. and J. Haime, loc. cit., p. 72, 1849.

Corallum composite and adherent; the basal walls rising so as to constitute a subcrateriform disc, in the centre of which is situated a large parent corallite, surrounded by smaller ones. *Calices* very imperfectly circumscribed, but well radiated. *Septa* very long. *Columella* rudimentary.

Typ. sp., *Leptoseris fragilis*, Milne Edw. and J. Haime, loc. cit.

Sub-order 2.

ZOANTHARIA PERFORATA.

Corallum composed essentially of porous sclerenchyma; with the septal apparatus well characterised, and consisting of six primitive elements, but being sometimes represented only by series of trabiculæ. *Dissepiments* rudimentary; no tabulæ.

The principal character of this section of Zoantharia is furnished by the structure of

the sclerenchyma, which, instead of forming imperforated lamella as in the preceding groups, is always porous, or even reticulate. In general the mural apparatus constitutes here the greatest part of the corallum, and does not consist of costal laminæ; the walls are always perforated, and completely or nearly completely naked. It is also to be remarked, that the visceral chamber is almost completely open from top to bottom, and never filled up with dissepiments or synapticulæ, as in most of the *Zoantharia aporosa*, or with tabulæ, as will be seen in the next two sections of this order.

The perforated Zoantharia form three natural families: Eupsammidæ, Madreporidæ, and Poritidæ.

Family V.

EUPSAMMIDÆ.

Milne Edw. and J. Haime, Ann. des Sc. Nat., 3^{me} série, vol. x, p. 65, 1848.

Corallum simple or complex, with well-developed lamellar septa, a spongiose columella, and perforated, granular, subcostulated walls.

The septa are always numerous, and those of the last cyclum are never situated in the direction of a line drawn from the centre of the calice to its circumference, but are bent towards those of the penultimate cyclum, so as to produce the appearance of a six- or twelve-branched star. The interseptal loculi are completely open from top to bottom, or divided only by a few incomplete trabiculæ. The walls have a granulate vermiculate surface, and become often very thick in advanced age, but never constitute a loose spongy mass, as in Madreporidæ and Poritidæ, or a compact cœnenchyma, as in Oculinidæ.

The star-like arrangement of the septa, which is visible in transverse sections of these corallums, as well as in the calice, is not met with in any other family. The principal septa are sometimes imperforate, but those of the succeeding cycla are more or less porous. It is also to be noted that there are never any pali, and that the costæ are always rudimentary; sometimes there is a rudimentary epitheca.

1. *Genus* Eupsammia.

Milne Edw. and J. Haime, Ann. Sc. Nat., 3^{me} série, vol. x, p. 77, 1848.

Corallum simple, subturbinate, free, and not presenting any lateral mural expansions. *Calice* oval and rather deep. *Septa* broad, slightly exsert, granulate, closely set, and forming four or five cycla. *Costæ* simple, distinct from the basis of the corallum, nearly equal, slightly vermiculate, and composed of a series of distinct, projecting granulæ.

Typ. sp., *Eupsammia trochiformis*, Milne Edw. and J. Haime, loc. cit., tab. i, fig. 3; *Madrepora trochiformis*, Pallas; *Turbinolia elliptica*, Brongniart.

2. *Genus* Endopachys.

(*Pars*) Lonsdale, Journ. of the Geol. Soc. of London, vol. i, p. 214, 1845.

Corallum simple, free, and organized as in the preceding genus, but much compressed towards its basis, which is carinate, and continued laterally into two vertical lobiform or cristate expansions. *Calice* arched; fossula long and narrow.

Typ. sp., *Endopachys Maclurii*, Milne Edw. and J. Haime, Ann. Sc. Nat., vol. x, tab. i, fig. 1; *Turbinolia Maclurii*, Lea, Contrib. to Geol., tab. vi, fig. 206.

3. *Genus* Balanophyllia.

Searles Wood, Ann. and Mag. of Nat. Hist., vol. xiii, p. 11, 1844.

Corallum simple and adherent, sub-pediculate, or sub-cylindrical, with a very broad basis. *Columella* well developed, but not projecting at the bottom of the fossula. *Septa* thin, and closely set; those of the last cyclum well developed, and complete in number. *Costæ* narrow, crowded, and nearly equal; no mural expansions.

Typ. sp., *Balanophyllia caliculus*, Searles Wood, loc. cit.

4. *Genus* Heteropsammia.

Milne Edw. and J. Haime, Ann. Sc. Nat., 3^{me} série, vol. x, p. 89, 1848.

Corallum simple, adherent, and growing by its basis so as to cover completely the shell on which it is fixed, and to assume the appearance of being free. *Calice* smaller than the basal part of the corallum. *Columella* well developed. *Septa* thick, slightly exsert, and closely set. *Walls* not having distinct costæ, but presenting small striæ or small papillæ, composed of minute granulæ, and arranged in an irregular manner.

Typ. sp., *Heteropsammia Michelinii*, Milne Edw. and J. Haime, loc. cit., p. 89.

5. *Genus* Leptopsammia.

Milne Edw. and J. Haime, loc. cit., p. 90, 1848.

Corallum simple, adherent. *Calice* elliptical. *Columella* much developed, and projecting at the bottom of the fossula. *Septa* neither exsert nor crowded, very thin, and presenting scarcely any granulations; those of the fifth order rudimentary. *Walls* thin and translucid. *Costæ* distinct from the basis, and formed by series of small granulæ.

Typ. sp., *Leptopsammia Stokesiana*, Milne Edw. and J. Haime, loc. cit., tab. i, fig. 4.

6. *Genus* Endopsammia.

Milne Edw. and J. Haime, loc. cit., p. 91, 1848.

Corallum simple, erect, and adherent. *Calice* circular. *Columella* much developed, but not projecting. *Septa* thick, strongly granulated, and slighty exsert, forming four cycla, the last of which is almost rudimentary. *Walls* covered with an indistinct pellicular epitheca, and having broad, straight costæ.

Typ. sp., *Endopsammia Philippensis*, Milne Edw. and J. Haime, loc. cit., tab. i, fig. 5.

7. *Genus* Stephanophyllia.

Michelin, Diet. des Sc. Nat., Suppl., vol. i, p. 484, 1841.

Corallum simple, free, and presenting no trace of adherence. *Wall* discoidal, horizontal. *Calice* circular and open. *Septa* tall, thin, crowded, not projecting laterally beyond the edge of the mural disc, covered with conical granulations on each side, and all, excepting those of the first cyclum, united by the inner edge. *Costæ* delicate, straight, composed of simple series of obscure granulations, and radiating regularly from the centre of the mural disc to its circumference. No epitheca.

Typ. sp., *Stephanophyllia elegans*, Michelin, Icon. Zooph., pl. viii, fig. 2. Milne Edw. and J. Haime, loc. cit., tab. i, fig. 10.

8. *Genus* Dendrophyllia.

Blainville, Diet. des Sc. Nat., vol. lx, p. 319, 1830.

Corallum composite, and in general arborescent. Corallites cylindrical, or cylindrico-turbinate, and formed by lateral gemmation. *Calices* circular, or nearly so; fossula deep. *Columella* well developed, and in general projecting much at the bottom of the fossula. *Septa* not exsert, thin, and closely set; those of the fourth cyclum well developed. *Walls* becoming very thick, and presenting narrow vermiculate *costæ*, formed by series of granulæ.

Typ. sp., *Dendrophyllia ramea*, Blainville, loc. cit.; Milne Edw., Atlas du Règne Animal de Cuvier, Zooph., pl. lxxxiii, fig. 1.

9. *Genus* Lobopsammia.

Milne Edw. and J. Haime, Ann. des Sc. Nat., 3^{me} série, vol. x, p. 105, 1848.

Corallum composite, arborescent, increasing by successive fissiparity. *Calices* irregular in form. *Septa* forming four complete and well-developed cycla. In other respects similar to Dendrophyllia.

Typ. sp., *Lobopsammia cariosa*, Milne Edw. and J. Haime, loc. cit.; *Lithodendron cariosum*, Goldfuss, Petref. Germ., vol. i, tab. xiii, fig. 7.

10. *Genus* Cœnopsammia.

Milne Edw. and J. Haime, loc. cit., p. 106, 1848; *Tubastrea*, Lesson, Voyage aux Indes orient. par Belanger, 1834.

Corallum composite, dendroid, or sub-globose, increasing by lateral or sub-basal gemmation. *Corallites* cylindrical. *Calices* circular, or nearly so. *Columella* tubercular, well developed. *Septa* not exsert, distant, and forming three cycla; those of the fifth order rudimentary. *Costæ* narrow, sub-vermiculate towards the bases, simple, and formed of a series of granulæ near the calice.

Typ. sp., *Cœnopsammia coccinea*, Milne Edw. and J. Haime, loc. cit., p. 107; *Tubastrea coccinea*, Lesson, op. cit., Zooph., tab. i; *Astrea calicularis*, Blainville, Manuel d'Actinol., tab. liv, fig. 2.

11. *Genus* Stereopsammia.

Corallum presenting most of the characters of Cœnopsammia, but not having any *Columella*.

Typ. sp., *Stereopsammia humilis*, nob., tab. v, fig. 4.

Family VI.

MADREPORIDÆ.

Corallum composite, increasing by gemmation and not by fissiparity. *Cœnenchyma* abundant, spongy, and reticulate. *Walls* very porous, and not distinct from the cœnenchyma. *Septa* lamellose, and well developed; loculi free.

First Tribe—MADREPORINÆ.

Visceral chambers divided into two equal parts by two of the principal septa, which are more developed than the others, and meet by their inner edge.

1. *Genus* Madrepora.

Lamarck, Hist. des Anim. sans Vert., t. xi, p. 277, 1816.

Corallum composite, forming ramified, lobate, or fasciculate masses. *Cœnenchyma* loose, and delicately echinulate. *Calices* projecting, with a thick margin. No *columella*.

Typ. sp., *Madrepora muricata*, Ellis and Solander, Zooph., tab. lvii; *Madrepora abrotanoides*, Lamarck, loc. cit., p. 280.

Second Tribe—EXPLANARINÆ.

Visceral chamber presenting at least six equally developed principal septa.

2. *Genus* Explanaria.

(*Pars*) Lamarck, Hist. des Anim. sans Vert., vol. ii, p. 254, 1816; *Gemmipora*, Blainville, Dict. des Sc. Nat., vol. lx, p. 352, 1830.

Corallum in general foliaceous. *Cœnenchyma* abundant, rather dense, and delicately echinulate. *Septa* almost all of the same size. *Columella* spongy.

Typ. sp., *Explanaria crater*, nob.; *Madrepora crater*, Pallas, Eleuch. Zooph., p. 332.

3. *Genus* Astreopora.

Blainville, Dict. des Sc. Nat., vol. lx, p. 348, 1830.

Corallum massive. *Cœnenchyma* of a loose texture, and strongly echinulated. *Septa* unequally developed. No *columella*.

Typ. sp., *Astreopora myriophthalma*, Blainville, loc. cit.; *Astrea myriophthalma*, Lamarck, op. cit., p. 260.

Family VII.
PORITIDÆ.

Corallum entirely composed of reticulate sclerenchyma. Septal apparatus well developed, but never lamellar, and composed only of series of styliform processes or trabiculæ, constituting by their junction a sort of irregular trellis. *Walls* presenting the same structure, and not distinct from the cœnenchyma. Visceral chamber containing some small dissepiments, but never divided by tabulæ.

First Tribe—PORITINÆ.

Cœnenchyma rudimentary, or not existing.

1. *Genus* Porites.

(*Pars*) Lamarck, Hist. des An. sans Vert., t. ii, p. 267, 1816 ; Milne Edw. and J. Haime, Comptes rend., t. xxix, p. 258, 1849.

Corallum composed of sclerenchyma, very irregularly reticulated. *Calices* shallow. *Septa* not numerous, rudimentary, and appearing to be represented by a circle of *pali*, the apex of which is papillose.

Typ. sp., *Porites conglomerata*, Lamarck, loc. cit., p. 269.

2. *Genus* Litharæa.

Milne Edw. and J. Haime, Comptes rend., t. xxix, p. 258, 1849.

Sclerenchyma very irregularly reticulated. *Calices* not very deep. *Columella* spongy. *Pali* rudimentary, or not existing. *Septa* well developed, particularly towards the wall.

Typ. sp., *Litharæa Websteri*, nob. ; *Astrea Websteri*, Bowerbank, Mag. of Nat. Hist., new series, vol. iv, p. 27, figs. A, B, 1840.

3. *Genus* Coscinaræa.

Milne Edw. and J. Haime, Comptes rend. de l'Ac. des Sc., t. xxvii, p. 496, 1848.

Corallum of a dense structure. *Calices* rather deep ; neither pali, nor distinct walls. *Septa* crowded, very regularly fenestrate, and with crispate edges, passing without any interruption from one visceral chamber to the adjacent one. No *epitheca*.

Typ. sp., *Coscinaræa Bottæ*, Milne Edw. and J. Haime, Ann. des Sc. Nat., 3^{me} série, vol. ix, tab. v, fig. 2.

4. *Genus* Microsolena.

Lamouroux, Exp. meth., p. 65, 1821.

Corallum differing from the preceding genus by the structure of the septa, the perforations of which are much larger than in Coscinaræa, and by the existence of a strong, common epitheca.

Typ. sp., *Microsolena porosa*, Lamouroux, op. cit., tab. lxxiv, fig. 24.

5. *Genus* Goniopora.

Quoy and Gaimard, Voy. de l'Astr., Zooph., p. 218, 1833; *Goniopora* and *Porastrea*, Milne Edw. and J. Haime, Comptes rend. de l'Acad. des Sc., t. xxvii, p. 496, 1848.

Corallum having distinct, elevated walls, of a fenestrate structure. *Calices* deep. *Columella* spongy. *Septa* well developed, and fenestrate. No *pali*.

Typ. sp., *Goniopora pedunculata*, Quoy and Gaimard, Voyage de l'Astrolabe, Zooph., tab. xvi, figs. 9-11.

6. *Genus* Rhodaræa.

Milne Edw. and J. Haime, Comptes rend., t. xxix, p. 259, 1849.

Corallum with thick walls, rather high. *Septa* rudimentary. *Pali* greatly developed, and forming a rosette in the centre of the calice.

Typ. sp., *Rhodaræa calicularis*, nob.; *Astrea calicularis*, Lamarck, Hist. des An. sans Vert., t. ii, p. 266.

7. *Genus* Poraræa.

Milne Edw. and J. Haime, Comptes rend., t. xxix, p. 259, 1849.

Walls thin, and widely fenestrated. *Septa* formed by a series of spiniform processes, which sometimes ramify towards the centre of the visceral cavity, so as to constitute a sort of spurious columella.

Typ. sp., *Poraræa fenestrata*, nob.; *Pocillopora fenestrata*, Lamarck, Hist. des An. sans Vert., t. ii, p. 275; Milne Edw. and J. Haime, Ann. des Sc. Nat., 3me série, vol. ix, fig. 1.

8. *Genus* Holaræa.

Milne Edw. and J. Haime, Comptes rend., t. xxix, p. 259, 1849.

Calices with distinct polygonal margins, rather deep. Septal apparatus composed of irregular trabiculæ, completely blended with the walls, and constituting thus a delicate spongy mass. *Columella* fasciculate and short.

Typ. sp., *Holaræa Parisiensis*, nob.; *Alveolites Parisiensis*, Michelin, Icon. Zooph., pl. xlv, fig. 10.

Second Tribe—MONTIPORINÆ.

Cœnenchyma abundant and spongy.

9. *Genus* Alveopora.

Quoy and Gaimard, Voyage de l'Astrolabe, Zooph., p. 240, 1833.

Corallum arborescent. *Cœnenchyma* very porous and echinulate, but not bearing large excrescences. Margins of the *calices* scarcely distinct. *Septa* not numerous, and formed by series of spiniform processes. No *columella*.

Typ. sp., *Alveopora rubra*, Quoy and Gaim., loc. cit., Zooph., tab. xix, figs. 11-14.

10. *Genus* Montipora.

Quoy and Gaimard, op. cit., p. 247, 1833; *Manopora*, Dana, Zooph., p. 489, 1846.

Corallum of various forms, differing from Alveopora by the existence of large projections of the cœnenchyma between the calicules. *Cœnenchyma* much more abundant, and more delicately spongy.

Typ. sp., *Montipora verrucosa*, Quoy and Gaim., op. cit., Zooph., pl. xx, fig. 11.

11. *Genus* Psammocora.

Dana, Zooph., p. 344, 1846.

Cœnenchyma somewhat compact, of a fasciculate structure, and having its surface papillose. *Calices* very shallow, confluent, and without distinct walls. *Septa* thick, and formed by strong spiniform processes.

Typ. sp., *Psammocora obtusata*, Dana, loc. cit., p. 345; *Pavonia obtusangula*, Lamarck, Hist. des An. sans Vert., t. ii, p. 240.

Sub-order 3.

ZOANTHARIA TABULATA.

Corallum essentially composed of a well-developed mural system, and having the visceral chambers divided into a series of stories by complete transverse tabulæ or diaphragms. Septal apparatus rudimentary.

The principal character of this sub-order is founded on the existence of the lamellar diaphragms that close the visceral chamber of the corallites at different heights, and differ from the dissepiments of the Astreidæ by not being dependent on the septa, and forming as many complete horizontal divisions extending from side to side of the general cavity.

instead of occupying only the one or two loculi. It is also to be remembered that the septal apparatus, although more or less rudimentary, has the same general mode of arrangement as in the preceding sub-orders, and never presents the crucial character which we shall find in *Zoantharia rugosa*.

This section comprises four families: Favositidæ, Milleporidæ, Seriatoporidæ, and Thecidæ.

Family VIII.
MILLEPORIDÆ.

Corallum principally composed of a very abundant cœnenchyma, distinct from the walls of the corallites, and of a tubular or cellular structure. *Septa* not numerous; tabulæ numerous, and well formed.

1. *Genus* Millepora.

(*Pars*) Lamarck, Syst. des An. sans Vert., p. 373, 1801; *Palmipora*, Blainville, Dict. des Sc. Nat., t. lx, p. 356, 1830.

Corallum of various forms, but more or less foliaceous. *Cœnenchyma* extremely abundant, of an irregular subtubular structure. *Calices* of very different dimensions in the same corallum. No distinct septa. *Tabulæ* horizontal.

Typ. sp., *Millepora alcicornis*, Lamarck, loc. cit.; Milne Edw., Atlas du Règne Anim. de Cuvier, Zooph., tab. lxxxix, fig. 1.

2. *Genus* Heliopora.

(*Pars*) Blainville, Dict. des Sc. Nat., vol. lx, p. 357, 1830; Dana, Zooph., p. 539, 1846.

Corallum lobulate, somewhat massive, and differing from Millepora by the regular tubular structure of the cœnenchyma, and the existence of small but distinct septa.

Typ. sp., *Heliopora cærulea*, Blainville, loc. cit., p. 357.

3. *Genus* Heliolites.

Dana, Zooph., p. 541, 1846; *Palæopora*, M'Coy, Ann. and Mag. of Nat. Hist., 2d series, vol. iii, p. 129, 1849; *Geoporites*, D'Orbigny, Prodr. de Palæont. stratif. Univers., t. i, p. 49, 1849.

Corallum sub-globose. *Cœnenchyma* regularly tubular. Septal radii advancing almost to the centre of the visceral chamber on the upper surface of the tabulæ, which are horizontal.

Typ. sp., *Heliolites pyriformis*, Dana, loc. cit., p. 542; *Heliolite pyriforme*, etc., Guettard, Mem. sur les Sc. et les Arts, vol. iii, pl. xxii, figs. 13, 14.

4. *Genus* Fistulipora.

M'Coy, Ann. and Mag. of Nat. Hist., 2d series, vol. iii, p. 130, 1849.

Corallum with vesicular cœnenchyma; thick walls and infundibuliform tabulæ.

Typ. sp., *Fistulipora minor*, M'Coy, loc. cit., figs. *a*, *b*.

5. *Genus* Plasmopora.

Milne Edw. and J. Haime, Comptes rend., t. xxix, p. 262, 1849.

Corallum free, sub-hemispheric, with a basal plate covered with an epitheca presenting concentric folds. *Calices* immersed. *Septa* rudimentary. *Tubulæ* horizontal. *Walls* thin. *Cœnenchyma* composed of large, vertical, radiate laminæ, united by smaller horizontal plates, and resembling much the costal cœnenchyma of the Astreidæ.

Typ. sp., *Plasmopora petaliformis*, nob.; *Porites petaliformis*, Lonsdale, in Murchison, Sil. Syst., pl. xvi, fig. 4.

6. *Genus* Propora.

Milne Edw. and J. Haime, Comptes rend., t. xxix, p. 262, 1849.

Corallum differing from the preceding genus by the calices having exsert margins; the septa being more developed, and extending outwards so as to constitute small costæ.

Typ. sp., *Propora tubulata*, nob.; *Porites tubulata*, Lonsdale, Sil. Syst., pl. xvi, figs. 3, 3^a, 3^b (cæteris exclusis).

7. *Genus* Axopora.

Corallum composite, incrusting, and forming thin expansions, which are often superposed. *Cœnenchyma* abundant, and forming irregular ridges between the calices, which are small and deep. *Septa* rudimentary. *Columella* well developed, fasciculate, and expanding at its passage through each of the tabulæ.

Typ. sp., *Axopora pyriformis*, nob.; *Geodia pyriformis*, Michelin, Icon., tab. xlvi, fig. 2.

8. *Genus* Lobopora.

Corallum having the same structure as in the preceding genus, but forming large, thick, foliaceous expansions, the two surfaces of which are covered with calices.

Typ. sp., *Lobopora Solanderi*, nob.; *Palmipora Solanderi*, Michelin, op. cit., tab. xlv, fig. 9.

Family IX.
FAVOSITIDÆ.

Corallum essentially formed by lamellar walls, with little or no cœnenchyma. Visceral chambers divided by numerous and well-developed complete tabulæ.

First Tribe—FAVOSITIDÆ.

Corallum massive. *Walls* perforated. *Septa* rudimentary. No *cœnenchyma*.

1. *Genus* Favosites.

Lamarck, Hist. des An. sans Vert., vol. ii, p. 204, 1816; *Calamopora*, Goldfuss, Petref. Germ., vol. i, p. 77, 1826-30.

Corallum composed of basaltiform corallites, and having a basal plate covered with an epitheca, and no radiciform appendices. *Calices* at right angle with the axis of the corallite, and in general hexagonal. *Walls* perforated in a very regular manner. *Tabulæ* horizontal, and very regularly superposed. No *cœnenchyma*.

Typ. sp., *Favosites Gothlandica*, Lamarck, loc. cit., p. 206.

2. *Genus* Michelinia.

De Koninck, Descr. des Anim. foss. des Terr. houilliers de la Belgique, p. 30, 1842-44.

Corallum having a basal plate with radiciform prolongations. *Tabulæ* very irregular, and subvesicular. The other characters as in Favosites.

Typ. sp., *Michelinia tenuisepta*, De Koninck, loc. cit., pl. c, fig. 3 *a*, *b*.

3. *Genus* Koninckia.

Milne Edw. and J. Haime, Comptes rend., t. xxix, p. 260, 1849.

Corallum resembling Favosites, but having the walls larger and less regular, and the septa constituted by series of distinct and spiniform processes, interrupted at certain distances by the tabulæ, which are horizontal.

Typ. sp., *Koninckia fragilis*, Milne Edw. and J. Haime, loc. cit.

4. *Genus* Alveolites.

(*Pars*) Lamarck, Syst. des An. sans Vert., p. 375, 1801; Steininger, Mem. Soc. Géol. France, vol. i.

Corallum composed of superposed strata of corallites very similar to those of Favosites,

but much shorter, and terminated by an oblique semicircular or subtriangular calice, the edge of which projects on one side.

Typ. sp., *Alveolites spongites*, Steininger, Mém. de la Soc. Géol. de France, vol. i; *Calamopora spongites*, Goldfuss, Petref. Germ., pl. xxviii, figs. 1^a, 1^b, 1^c.

Second Tribe—CHÆTETINÆ.

Corallum massive. *Walls* not perforated. Neither septa nor cœnenchyma.

5. *Genus* Chætetes.

Fischer, Oryct. du Gouv. de Moscou, p. 159, 1837.

Corallum glomerate. *Corallites* very long, basaltiform, and in general more or less bent. *Calices* polygonal. *Tabulæ* independent, not connected in the adjoining corallites nor placed on the same level throughout the corallum.

Typ. sp., *Chætetes radians*, Fischer, loc. cit., pl. xxxvi, fig. 6.

6. *Genus* Dania.

Milne Edw. and J. Haime, Comptes rend., t. xxix, p. 261, 1849.

Corallum having most of the characters of Chætetes, but with the tabulæ connected through the different corallites so as to constitute a series of common plates, and to divide the whole mass into a great number of parallel strata.

Typ. sp., *Dania Huronica*, Milne Edw. and J. Haime, loc. cit.

7. *Genus* Stenopora.

(*Pars*) Lonsdale, Geol. of Russia and Ural Mount., vol. i, p. 631, 1845.

Corallum very similar to Chætetes, but having small styliform processes at the angles of the calices.

Typ. sp., *Stenopora spinigera*, Lonsdale, loc. cit., pl. A, fig. 2.

8. *Genus* Constellaria.

Dana, Zooph., p. 537, 1846.

Third Tribe—HALYSITINÆ.

Corallum composed of corallites constituting vertical laminæ or fasciculi, but more or less free laterally, and united by means of connecting tubes or mural expansions. *Walls* well developed, and not porous. *Septa* distinct, but small.

8. *Genus* Halysites.

Fischer, Zoognosia, 3d edit., vol. i, p. 387, 1813; *Catenipora*, Lamarck, Hist. des An. sans Vert., t. ii, p. 206, 1816.

Corallites extremely long, arranged in a single series, and united laterally, so as to constitute large flabelliform expansions, which remain free laterally, but often meet, and thus form a lacunous mass. *Epitheca* very thick. *Septa* almost rudimentary, but very distinct in perfect specimens. *Tabulæ* horizontal.

Typ. sp., *Halysites escharoides*, Fischer; *Catenipora escharoides*, Lamarck, loc. cit., p. 207.

9. *Genus* Harmodites.

Fischer, Notice sur les Tubipores fossiles, 1828; *Syringopora*, Goldfuss, Petref. Germ., vol. i, p. 75, 1826-33.

Corallum fasciculate. Corallites irregularly cylindrical, very long, and united by horizontal connecting tubes. *Tabulæ* infundibuliform.

Typ. sp., *Harmodites ramulosa*, nob.; *Syringopora ramulosa*, Goldfuss, loc. cit., pl. xxv, fig. 7.

10. *Genus* Thecostegites.

Milne Edw. and J. Haime, Comptes rend., t. xxix, p. 261, 1849.

Corallites cylindrical, short, and united by strong mural expansions situated at various heights. *Tabulæ* horizontal.

Typ. sp., *Thecostegites Bouchardi*, nob.; *Harmodites Bouchardi*, Michelin, Icon. Zooph., pl. xlviii, fig. 3.

Fourth Tribe—POCILLOPORINÆ.

Corallum massive, gibbous, or subdendroid, with thick imperforated walls, forming, towards the surface, an abundant compact cœnenchyma. *Septa* quite rudimentary.

11. *Genus* Pocillopora.

(*Pars*) Lamarck, Hist. des An. sans Vert., t. ii, p. 273, 1816; Dana, Zooph., p. 523, 1846.

Calices shallow, and presenting, at their bottom, a transverse, thick, projecting ring, resembling a columella.

Typ. sp., *Pocillopora acuta*, Lamarck, loc. cit., p. 274; Milne Edw., Atlas du Règne Animal de Cuvier, Zooph., pl. lxxxi, fig. 3.

Family X.
SERIATOPORIDÆ.

Corallum arborescent or bushy, with an abundant compact cœnenchyma. Visceral chambers filling up by the growth of the columella and the walls, and showing but few traces of tabulæ.

1. *Genus* Seriatopora.

Lamarck, Hist. des An. sans Vert., vol. ii, p. 282, 1816.

Corallum arborescent, with echinulated branches. *Calices* arranged in ascending series. *Septa* scarcely visible. *Columella* large and compact.

Typ. sp., *Seriatopora subulata*, Lamarck, loc. cit., p. 282.

2. *Genus* Dendropora.

Michelin, Icon. Zooph., p. 187, 1845.

Corallum arborescent, with very delicate smooth branches. *Calices* distant, and surrounded by a narrow, obtuse margin. *Septa* small, but distinct.

Typ. sp., *Dendropora explicita*, Michelin, op. cit., pl. xlviii, fig. 6.

3. *Genus* Rhabdopora.

Milne Edw. and J. Haime, Comptes rend., t. xxix, p. 262, 1849.

Corallum with prismatic echinulate branches. *Calices* arranged in series. *Septa* very distinct.

Typ. sp., *Rhabdopora megastoma; Dendropora megastoma*, M'Coy, Ann. and Mag. of Nat. Hist., 2d series, vol. iii, p. 129.

Family XI.
THECIDÆ.

Corallum massive, with an abundant, compact, spurious cœnenchyma, produced by the septa becoming cemented together laterally. *Tabulæ* numerous.

Genus Thecia.

Milne Edw. and J. Haime, Comptes rend., t. xxix, p. 263, 1849.

Septal system highly developed. *Calices* shallow, with a very small deep fossula.

Typ. sp., *Thecia Swinderniana; Agaricia Swinderniana*, Goldfuss, Petref. Germ., pl. xxxviii, fig. 3; *Porites expatiata*, Lonsdale, ap. Murchison, Sil. Syst., p. 678, tab. xv, fig. 3.

Sub-order 4.

ZOANTHARIA RUGOSA.

Corallum simple or composite, with a septal apparatus never forming six distinct systems, as in all the preceding Zoantharia, but appearing to be derived from four primary elements. Sometimes this disposition is rendered manifest by the existence of four well-characterised primary septa, or of an equal number of depressions occupying the bottom of the calice, and assuming a crucial appearance: in other cases only one of these primary septa or excavations is well developed so as to interrupt the radiate form of the system; and in others, again, no trace of septal groups can be discovered, and the whole apparatus is represented by numerous equally developed radiate striæ rising on the surface of the tabulæ, and extending up the inner side of the walls. The corallites are always perfectly distinct, and are never united by means of a cœnenchyma; nor do they ever form linear series, which is often the case in the preceding sections. They multiply by gemmation, and the reproductive buds are in general developed on the surface of the calices of the parents: this often arrests the growth of the latter, and gives rise to a superposition of generations. It is also to be noted that the septa, although in general very incomplete, are never porous, and never bear synapticulæ, but that the visceral chamber is in general filled up from the bottom by a series of transverse tabulæ, or by a vesicular structure, which often constitutes the principal part of the corallum.

Family XII.

STAURIDÆ.

Corallum with well-developed septa, extending without any interruption from the bottom to the top of the visceral chamber, united by lamellar dissepiments, and arranged in four systems, characterised by an equal number of large primary septa.

1. *Genus* Stauria.

Corallum composite, massive, astreiform, and increasing by calicular gemmation. *Corallites* united by their walls, or free in part, and not presenting any *costæ*. *Septa* large, and with undivided edges, united along the axis of the visceral chamber. No *columella*.

Typ. sp., *Stauria astreiformis*, nob.

2. *Genus* Holocystis.

Lonsdale, in the Quarterly Journal of the Geol. Soc. of London, vol. v, part i, p. 83, 1849.

Corallum composite, massive, astreiform, and increasing by extra-calicular gemmation. *Corallites* united by means of well-developed *costæ*. *Columella* styliform.

Typ. sp., *Holocystis elegans*; *Cyathophora elegans*, Lonsdale, loc. cit., tab. iv, figs. 12, 13, 14, 15.

Family XIII.

CYATHAXONIDÆ.

Corallum with well-developed, complete *septa*, which extend without interruption from the bottom to the top of the visceral chamber, and not forming a regular radiate circle: those of the primary cyclum not much larger than the others, and not forming a four-branched cross, as in the Stauridæ; one well-characterised septal fossula. No dissepiments nor tabulæ.

Genus CYATHAXONIA.

Michelin, Icon. Zooph., p. 258, 1846.

Corallum simple. *Calice* deep. *Columella* styliform, strong, and very prominent. *Septa* extending to the columella; the place of one of them occupied by a deep depression or septal fossula.

Typ. sp., *Cyathaxonia cornu*, Michelin, loc. cit., p 258, pl. lix, fig. 9.

Family XIV.

CYATHOPHYLLIDÆ.

Corallum with incomplete *septa*, that do not extend from the bottom to the top of the visceral chamber, in the form of uninterrupted laminæ; those of the primary cyclum similar to the others, and not forming a central four-branched cross. Septal fossulæ varying in number and in size. Visceral chamber divided by a series of superposed tabulæ.

First Tribe—ZAPHRENTINÆ.

A single septal fossula, well developed, or replaced by a sulcus or a crestiform process, and occasioning more or less irregularity in the radiate arrangement of the septal apparatus. The corallum is simple, and free in all the known species.

1. *Genus* ZAPHRENTIS.

Rafinesque and Clifford, Ann. des Sciences physiques de Bruxelles, vol. v, p. 234, 1820; *Caninia*, Michelin, Dict. des Sc. Nat., Supplém., vol. i, p. 485; *Siphonophyllia*, Scouler, in M'Coy's Carbonif. Foss. of Ireland, p. 187, 1844.

Corallum simple and trochoid. *Calice* deep. Septal fossula strongly developed, and occupying the place of one of the septa. No *columella*. *Tubulæ* moderately developed, and bearing on their upper surface a series of septa, which extend from the wall to the centre of the visceral chamber, and are denticulate all along their calicular edge.

Typ. sp., *Zaphrentis patula*; *Caninia patula*, Michelin, Icon. Zooph., tab. lix, fig. 4.

2. *Genus* Amplexus.

Sowerby, Miner. Conchol., vol. i, p. 165; *Amplexus* and *Cyathopsis*, D'Orbigny, Prodrome de Paleontol., vol. i, p. 105, 1850.

Corallum resembling Zaphrentis, excepting that the *septa* do not extend to the centre of the visceral chamber, and leave the upper surface of the tabulæ naked and smooth in that part. The *septal fossula* well characterised in the upper portion of the corallum, but not so on the lower floors. *Tabulæ* highly developed.

Typ. sp., *Amplexus coralloides*, Sowerby, loc. cit., tab. lxxii.

3. *Genus* Menophyllum.

Corallum resembling Zaphrentis, excepting that a small septal fossula is situated on each side of the large one, and that one half of the central part of the calice is occupied by an elevated, smooth portion of the tabula, which resembles a crescent.

Typ. sp., *Menophyllum tenui-marginatum*, nob.

4. *Genus* Lophophyllum.

Corallum resembling Zaphrentis, excepting that a crestiform *columella* occupies the centre of the calice, and is in continuity by one of its ends with a small septum, placed in the middle of the septal fossula, and by the other end with the opposite primary septum.

Typ. sp., *Lophophyllum Koninckii*, nob.

5. *Genus* Anisophyllum.

Corallum resembling Zaphrentis, excepting by the great development of three primary *septa*, one of which is placed facing the septal fossula; this *fossula* extending much towards the centre of the visceral chamber, and ceasing there to be distinct from the bottom of the calice.

Typ. sp., *Anisophyllum Agassizi*, nob.

6. *Genus* Baryphyllum.

Corallum very short. *Calice* quite superficial. A slightly developed septal fossula, corresponding to one of the branches of a cross, the three other branches of which are constituted by well-developed primary septa. The younger septa not arranged in a regular radiate circle, but inclined obliquely towards the primary ones.

Typ. sp., *Baryphyllum Verneuilanum*, nob.

7. *Genus* Hallia.

Corallum tall, turbinate. *Septa* highly developed, and extending to the centre of the tabulæ. No *columella*. One remarkably large primary septum occupying the place of the septal fossula, and the neighbouring septa directed towards it, so as to assume a pinnate arrangement; the septa belonging to the two other systems presenting the usual regular radiate position.

Typ. sp., *Hallia insignis*, nob.

8. *Genus* Aulacophyllum.

Corallum resembling Hallia by the mode of arrangement of the septa, but having the septal fossula not replaced by a primary septum, and affecting the form of a narrow groove, at the bottom of which the septa of the two adjoining systems meet, and even cross each other.

Typ. sp., *Aulacophyllum sulcatum*; *Caninia sulcata*, D'Orbigny, Prod. de Paléont., vol. i, p. 105.

9. *Genus* Trochophyllum.

Corallum simple, trochoid. *Calice* rather shallow. Septal fossula rudimentary, and occupied by a small septum. The other *septa* thick, not denticulate, presenting a regular radiate mode of arrangement, and extending almost to the centre of the visceral chamber, where a small tabula is visible.

Typ. sp., *Trochophyllum Verneuili*, nob.

10. *Genus* Hadrophyllum.

Corallum short. *Calice* superficial. One very large septal fossula, and three small ones, representing a cross. The radiate arrangement of the septa somewhat irregular.

Typ. sp., *Hadrophyllum Orbignyi*, nob.

11. *Genus* Combophyllum.

Corallum presenting the general form of a Cyclolites. A single septal fossula. *Septa* exsert, and regularly radiate.

Typ. sp., *Combophyllum osismorum*, nob.

Second Tribe—CYATHOPHYLLINÆ.

Septal apparatus regularly radiate, and uninterrupted, or equally divided into four groups by four superficial septal fossulæ. No true *columella*, but sometimes a spurious one formed by the inner edge of the septa.

12. *Genus* Cyathophyllum.

Goldfuss (in parte), Petref. Germ., vol. i, p. 54, 1826.

Corallum simple or composite. No *costæ*. *Septa* well developed, extending to the centre of the calice, and twisted together so as to produce the appearance of a small columella. *Tabulæ* occupying only the centre of the visceral chamber; the outer portion of which is filled up with numerous vesicular dissepiments. A single wall, situated exteriorly, and provided with a complete epitheca.

Typ. sp., *Cyathophyllum helianthoides*, Goldfuss, loc. cit., tab. xx, fig. 2.

13. *Genus* Pachyphyllum.

Corallum composite, and increasing by lateral gemmation. *Corallites* united in their lower portion by means of the great development of the costæ and the exotheca, and not delimitated by an individual epitheca. *Tabulæ* well characterised.

Typ. sp., *Pachyphyllum Bouchardi*, nob.

14. *Genus* Campophyllum.

Corallum simple, very tall, and protected by an epitheca. *Septa* well developed. *Tabulæ* very large, and smooth towards the centre. Interseptal loculi filled with small vesiculæ.

Typ. sp., *Campophyllum flexuosum*; *Cyathophyllum flexuosum*, Goldfuss, Petref. Germ., vol. i, tab. xvii, fig. 3.

15. *Genus* Streptelasma.

Hall, Palæont. of New York, p. 17, 1847.

Corallum simple, and differing from Cyathophyllum by the structure of the wall, which is destitute of epitheca, and covered with sublamellar costæ.

Typ. sp., *Streptelasma corniculum*, Hall, loc. cit., tab. xxv, fig. 1.

16. *Genus* Omphyma.

Rafinesque and Clifford, in Ann. des Sc. Phys. de Bruxelles, vol. v, p. 234, 1820.

Corallum simple, turbinate. Wall provided with a rudimentary epitheca, and producing radiciform appendices. *Septa* very numerous, equally developed, and divided into four groups by an equal number of shallow septal fossulæ. *Tabulæ* well developed, and smooth towards the centre.

Typ. sp., *Omphyma turbinata*; *Madrepora turbinata*, Lin. Amœn. Acad., vol. i, tab. iv, fig. 2.

17. *Genus* Goniophyllum.

Corallum simple, and affecting the form of a quadrangular pyramid. *Calice* deep and square. *Septa* thick and well developed. *Tabulæ* central, and but little developed.

Typ. sp., *Goniophyllum pyramidale ; Turbinolia pyramidalis*, Hisinger, Lethæa Suecica, tab. xviii, fig. 12.

18. *Genus* Chonophyllum.

Corallum simple, and constituted principally by a series of infundibuliform *tabulæ*, superposed and invaginated, the surface of which presents numerous septal radii equally developed, and extending from the centre to the circumference. No *columella* nor *walls*.

Typ. sp., *Chonophyllum perfoliatum ; Cyathophyllum perfoliatum*, Goldfuss, tab. xviii, fig. 5.

19. *Genus* Ptychophyllum.

Strombodes (pars), Lonsdale, Sil. Syst., p. 691, 1839 (not Schweigger.).

Corallum simple, and organized as in the preceding genus, but having the septal radii strongly twisted towards the centre of the tabulæ, so as to constitute a spurious *columella*.

Typ. sp., *Ptychophyllum Stokesi*, nob.; C. Stokes, Trans. of the Geol. Soc., 2d series, vol. i, tab. xxix, fig. 1. (N.B. The second figure bearing this number, but not the first.)

20. *Genus* Heliophyllum.

Hall, in Dana, Zooph., p. 396. 1846.

Corallum simple. Septal apparatus well developed, and producing lateral lamellar prolongations, which extend from the wall towards the centre of the visceral chamber, so as to represent ascending arches and to constitute irregular central *tabulæ*, and which are united towards the circumference by means of vertical dissepiments.

Typ. sp., *Heliophyllum Halli*, nob.; *Strombodes helianthoides*, Hall, Geol. of New York, No. 48, fig. 3 (not *S. helianthoides* of Phillips).

21. *Genus* Metriophyllum.

Corallum simple, turbinate. *Septa* well developed, slightly twisted, and extending to the centre of the visceral chamber, through well-developed *tabulæ*.

Typ. sp., *Metriophyllum Bouchardi*, nob.; *Cyathophyllum mitratum*, Michelin, Icon. Zooph., tab. xlvii, fig. 7 (not *C. mitratum* of Schlotheim).

22. *Genus* Clisiophyllum.

(*Pars*) Dana, Exploring Exped., Zoophytes, p. 361, 1846.

Corallum simple, turbinate. *Septa* well developed, and rising towards the centre of the calice so as to form a spurious *columella*, but not twisted.

Typ. sp., *Clisiophyllum Danianum*, nob.

23. *Genus* Aulophyllum.

Corallum simple. *Septa* well developed. A double mural investment; the interior wall dividing the visceral chamber into two portions—one central and columnar, the other exterior and annular. No *columella*. *Tubulæ* but little developed.

Typ. sp., *Aulophyllum prolapsum*; *Clisiophyllum prolapsum*, M'Coy, in Ann. and Mag. of Nat. Hist., 2d series, vol. iii, p. 3.

24. *Genus* Acervularia.

Schweigger, Handb. der Naturg., p. 418, 1820.

Corallum composite, increasing by calicular gemmation. *Corallites* provided with a double mural investment; the inner wall disposed as in the preceding genus. Septal apparatus well developed between the outer and the inner walls, but much less so in the central area. No *columella*. *Tubulæ* not well developed.

Typ. sp., *Acervularia Rœmeri*; *Astrea Hennahi*, Rœmer, Verst. der Hartzgeb., tab. ii, fig. 13 (not Lonsdale).

25. *Genus* Strombodes.

(*Pars*) Schweigger, Handb. der Naturg., p. 418, 1820; Goldfuss, Petref. Germ., vol. i, p. 62, 1826; *Acervularia*, Lonsdale, Sil. Syst., p. 689, 1839; *Arachnophyllum*, Dana, Zooph., p. 360, 1846; *Strombodes* and *Actinocyathus*, D'Orbigny, Prod. de Paléont. stratigr., vol. i, p. 107, 1849.

Corallum composite, increasing by calicular gemmation. *Corallites* constituted principally by a series of superposed, invaginated, infundibuliform *tabulæ*, united by ascending trabiculæ, so as to form a columnar mass. *Calices* pentagonal, well circumscribed, and completely covered with the septal radii. *Outer walls* not well developed; the inner mural investment rudimentary.

Typ. sp., *Strombodes pentagonus*, Goldf., Petref. Germ., vol. i, tab. xxi, fig. 3.

26. *Genus* Phillipsastrea.

D'Orbigny, Note sur des Polypiers fossiles, p. 2, 1849.

Corallum composite, resembling Strombodes, but differing from them by the septal

or costal radii of the neighbouring corallites, being confluent, and consequently the calices not being definitely circumscribed. No exterior *walls;* the interior mural investment well characterised. The centre of the *tabulæ* presenting a columellarian tubercle.

Typ. sp., *Phillipsastrea Hennahi*, D'Orbigny, loc. cit.; *Astrea Hennahi*, Lonsdale, in Geol. Trans., 2d series, vol. v, tab. lviii, fig. 3.

27. *Genus* Eridophyllum.

Corallum composite, and increasing by lateral gemmation. *Corallites* tall, cylindroid, and provided with a thick epitheca, which gives rise to a vertical series of short and thick subradiciform productions that extend to the next individual and unite them together. *Tabulæ* well developed, and occupying the central area circumscribed by the inner wall. Septal apparatus occupying the annular area situated between the outer and inner mural investment, but not extending into the inner or central area.

Typ. sp., *Eridophyllum seriale*, nob.

Third Tribe—LITHODENDRONINÆ.

Axis of the visceral chamber of the corallites occupied by a styliform or lamellar columella.

28. *Genus* Lithodendron.

Phillips, Geol. of Yorkshire, vol. ii, p. 200, 1835 (but not *Lithodendron* of Schweigger, which is not an admissible genus); *Siphonodendron*, M'Coy, in Ann. and Mag. of Nat. Hist., 2d series, vol. iii, 1849.

Corallum composite, arborescent, or massive. *Corallites* cylindrical or prismatic. *Columella* styliform, compact. *Septa* well developed, but not reaching to the columella. *Tabulæ* well developed. Interior wall rudimentary.

Typ. sp., *Lithodendron irregulare*, Phillips, loc. cit., pl. ii, figs. 14, 15.

29. *Genus* Nematophyllum.

Nematophyllum and *Stylaxis*, M'Coy, loc. cit., 1849.

Corallum composite, massive. *Corallites* prismatic, with a well-developed interior *wall*. *Columella* lamellar. *Septa* well developed, and united by transverse dissepiments, which extend to the columella, but do not constitute true tabulæ. Exterior area vesicular.

Typ. sp., *Nematophyllum arachnoideum*, M'Coy, loc. cit., p. 16.

30. *Genus* Lithostrotion.

(*Pars*) Fleming, British Animals, p. 508, 1828; *Strombodes* and *Lonsdaleia*, M'Coy, in Ann. of Nat. Hist., 2d series, vol. iii, pp. 10, 11, 1849.

Corallum resembling *Nematophyllum*, but having the *columella* formed by a fasciculus of twisted bands, and the *septa* subvesicular exteriorly, and joining the columella along their inner edge.

Typ. sp., *Lithostrotion floriforme*, Fleming, loc. cit., p. 508.

31. *Genus* Axophyllum.

Corallum simple, trochoid, and resembling Lithostrotion by its structure.

Typ. sp., *Axophyllum expansum*, nob.

32. *Genus* Syringophyllum.

Sarcinula, Dana, Zooph., p. 363, 1846 (not *Sarcinula*, Lamarck).

Corallum composite, astreiform. *Corallites* provided with strong *walls*, and much developed costæ. *Septa* large. *Tubulæ* but little developed. *Columella* styliform.

Typ. sp., *Syringophyllum organum*; *Madrepora organum*, Linnæus, Syst. Nat., ed. xii, vol. i, p. 1278.

Family XV.

CYSTIPHYLLIDÆ.

Corallum essentially composed of a vesicular tissue, and presenting little or no traces of septa or radiate striæ.

1. *Genus* Cystiphyllum.

Lonsdale, in Murchison's Silurian Syst., p. 691, 1839.

Corallum simple, turbinate; the visceral chamber filled with small vesicular laminæ. *Calice* shallow. *Walls* vesicular.

Typ. sp., *Cystiphyllum Siluriense*, Lonsdale, loc. cit., tab xvi bis, fig. 1 (but not fig. 2).

Sub-order 5.

ZOANTHARIA CAULICULATA.

Antipathacea, Dana, Zooph., p. 574.

Polypi supported on a *sclerobasis* or epidermic stem-like corallum.

The general form of the corallum is similar to that of the Isis, Gorgonia, &c., in the order of Alcyonaria; but may be distinguished from these by its surface being spinulous or smooth, whereas it is always sulcated in Alcyonaria.

Family ANTIPATHIDÆ.

Gray, Synop. of the Brit. Mus., p. 135, 1842; Dana, Zooph., p. 574, 1846.

1. *Genus* Antipathes.

(In parte) Pallas, Elench. Zooph., p. 209, 1766.

Corallum arborescent; its surface spinulous.

Typ. sp., *Antipathes myriophylla*, Ellis and Solander, Zooph., tab. xix, figs. 11, 12.

2. *Genus* Cirrhipathes.

De Blainville, in Dict. des Sc. Nat., vol. lx, p. 475, 1830.

Corallum not arborescent, and having the form of a simple cylindrical stem; its surface spinulous.

Typ. sp., *Cirrhipathes spiralis*, Blainv., loc. cit.; *Antipathes spiralis*, Ellis and Soland., Zooph., tab. xix, fig. 1.

3. *Genus* Leiopathes.

Gray, Synops. of the Brit. Mus., p. 135, 1842.

Corallum arborescent; its surface smooth.

Typ. sp. *Leiopathes glaberrima; Antipathes glaberrima*, Esper, Pflanz., Antipathes, tab. ix.

ZOANTHARIA INCERTÆ SEDIS.

1. *Genus* Heterophyllia.

M'Coy, Palæozoic Corals, in Ann. and Mag. of Nat. Hist., 2d series, vol. iii, p. 126, 1849.

Corallum composed of a tall, subcylindrical, irregularly fluted, stem (or tube), containing a few laminæ, irregularly branching and coalescing, but not presenting a radiate appearance.

Typ. sp., *Heterophyllia grandis*, M'Coy, loc. cit., figs. A, B.

2. *Genus* Mortieria.

De Koninck, Anim. foss. du Terr. carbon. de Belgique, p. 12, 1842.

Corallum having the form of a bi-concave disc, presenting a radiate structure and numerous costæ.

Typ. sp., *Mortieria vertebralis*, De Koninck, loc. cit., pl. B, fig. 3.

3. *Genus* Cyclocrinites.

Eichwald, Uber das Silurische Schichten-System in Esthland, p. 192, 1840.

Corallum composite, astreiform. *Calices* hexagonal and shallow. *Septa* well characterised, but not extending to the centre of the visceral chamber, which appears to be occupied by small tabulæ. (?)

Typ. sp., *Cyclocrinites Spaskii*, Eichwald, Die Urwelt Russlands durch abbildungen erlaeutert, p. 48, tab. i, fig. 8, 1842.

Order 11.

ALCYONARIA.

Alcyoniens, Audouin and Milne Edwards, Recherches sur les Anim. sans Vertèbres faites aux iles Chausay, Ann. des Sc. Nat., 1st series,, vol. xv, p. 18, 1828; *Zoophytaria*, Blainville, Manuel d'Actinologie, p. 496, 1834; *Zoophyta asteröidea*, Johnston, Brit. Zooph., p. 164, 1838; *Alcyonaria* Dana, Exploring Expedition, Zooph., p. 586, 1846; *Anthozoa asteröidea*, Johnston, Brit. Zooph., 2d edit., p. 138, 1847.

Polypi with bi-pinnate tentacula, and only eight perigastric membranaceous laminæ, containing the reproductive organs.

Alcyonaria have, in general, their dermal tissue consolidated by isolated spiculæ or nodular concretions only, and very rarely present a vaginal polypidom similar to that of the Zoantharia; but even when that is the case, the visceral chamber is never subdivided by any longitudinal septa, and consequently the calice never presents any appearance of radii. In general, the corallum is entirely composed of epidermic tissue, (or basal secretion, Dana,) and constitutes a sort of stem or axis in the centre of the compound mass formed by the gemmation of the Polypi. This sclerobasis is always covered by soft dermic tissue, and increases by the addition of concentric layers.

This order is far from being as numerous as the preceding division of Corallaria, and comprises three natural families,—Alcyonidæ, Gorgonidæ, and Pennatulidæ.

Family I.

ALCYONIDÆ.

Polypi adherent and not provided with an epidermic sclerenchyma.

In this family, the dermic tissue is usually consolidated by a great number of sclerenchymous spicula imbedded in its substance, and constitutes sometimes a tubular corallum, but there is never any trace of a central stem or axis, like that which is constituted by the sclerobasis in Gorgonidæ and in most of the Pennatulidæ.

First Tribe—CORNULARINÆ.

Polypi simple or segregate, and produced by gemmation on creeping stolons, or basal membranaceous expansions, and having no lateral buds or connecting appendices.

1. *Genus* Cornularia.

Lamarck, Hist. des An. sans Vert., vol. ii, p. 111, 1816.

Polypi rising by gemmation from creeping filiform stolons, and provided with a tough or subcorneous tubiform polypidom, the surface of which is not costulated.

Typ. sp., *Cornularia cornucopiæ*, Cuvier; *Tubularia cornucopiæ*, Cavolini, Mem. per Servire alla Storia de Polipi Marini, tab. ix, figs. 11, 12; *Cornularia rugosa*, Lamarck, loc. cit.

2. *Genus* Clavularia.

Quoy and Gaimard, ap. Blainville, Dict. des Sc. Nat., vol. lx, p. 499, 1830; *Actinantha*, Lesson, Zool. de la Coquille, Zooph., p. 89, 1831.

Polypi resembling Cornularia, but having their tubular polypidoms costulated and incrustated with long spicula.

Typ. sp., *Clavularia viridis*, Quoy and Gaim., Voyage de l'Astrolabe, Zooph., tab. xxi, fig. 10.

3. *Genus* Rhizoxenia.

Ehrenberg, Corall. Roth. Meer., p. 55, 1834.

Polypi resembling those of the preceding genus, but not retractile.

Typ. sp., *Rhizoxenia thalassantha*, Ehr.; *Zoantha thalassantha*, Lesson, Voyage de la Coquille, Zooph., tab. i, fig. 2.

4. *Genus* Sarcodictyon.

E. Forbes ap. Johnston, Brit. Zooph., 2d ed., p. 179.

Polypi rising from creeping, filiform, anastomosing stolons, distant, uniserial, and appearing verruciform (not tubular) when retracted. Differ from Cornularia by the shortness of the polypidoms.

Typ. sp., *Sarcodictyon catenatum*, Forbes, loc. cit., tab. xxxiii, figs. 4, 7.

5. *Genus* Anthelia.

Savigny, ap. Lamarck, An. sans Verteb., vol. ii, p. 407, 1816.

Polypi not retractile, and rising from a thin fleshy incrustating plate.

Typ. sp., *Anthelia glauca*, Savigny, Egypte, Polypes, tab. i, fig. 7.

6. *Genus* Sympodium.

Ehrenberg, Corall., p. 61, 1834.

Polypi resembling Anthelia, but being retractile.

Typ. sp., *Sympodium fuliginosum*, Ehrenb., Savigny, Egypte, Polypes, tab. i, fig. 6.

7. *Genus* Aulopora.

Goldfuss, Petref. Germ., vol. i, p. 82.

The fossil corals forming this genus greatly resemble Cornularia and Sarcodictyon, but differ from all the preceding genera by their thick, calcareous polypidom.

Typ. sp., *Aulopora serpens*, Goldfuss, loc. cit., tab. xxix, fig. 1.

8. *Genus* Cladochonus.

M'Coy, in Ann. and Mag. of Nat. Hist. 1st series, vol. xx, p. 227.

Corallum resembling Aulopora, but composed of cup-shaped calices, arranged in a regularly alternate manner, and bent in nearly opposite directions.

Typ. sp., *Cladochonus tenuicollis*, M'Coy, loc. cit., tab. xi. fig. 8.

Second Tribe—TUBIPORINÆ.

Polypi fasciculate, and provided with independent tubular polypidoms, united at various heights by means of horizontal connecting plates, the surface of which produces the reproductive buds.

9. *Genus* Tubipora.

Lamarck, Hist. des Anim. sans Verteb., vol. ii, p. 207, 1816.

Typ. sp. *Tubipora musica*, Lamarck, loc. cit., p. 209.

Third Tribe—TELESTHINÆ.

Polypi segregate and multiplying by lateral gemmation, so as to form arborescent tufts.

10. *Genus* Telestho.

Lamouroux, Polypiers Flexibles, p. 232.

Polypidom composed of ramified tubes of a subcalcareous structure.

Typ. sp., *Telestho aurantiaca*, Lamouroux, loc. cit., tab. vii, fig. 6.

Fourth Tribe—ALCYONINÆ.

Polypi aggregate and multiplying by lateral gemmation, so as to constitute a ramified, lobate or simple mass.

11. *Genus* Alcyonium.

Pallas, Elenchus Zooph., p. 342, 1766; *Lobularia*, Savigny, ap. Lamarck, Hist. des Anim. sans Verteb. vol. ii, p. 412, 1816.

Polypi retractile, and united by a thick tough common tissue, so as to form gibbose or subramified masses.

Typ. sp., *Alcyonium digitatum*, Lin. Solander and Ellis, op. cit., p. 175.

12. *Genus* Xenia.

Savigny, Egypte, Atlas and op., Lamarck, op. cit., vol. ii, p. 629, 1816.

Polypi forming subramified masses, as in Alcyonium, but not retractile, and not having a thick coating of spiculæ at the basis of the tentacula.

Typ. sp. *Xenia umbellata*, Savigny, Egypte, Polyp., tab. i, fig. 3.

13. *Genus* Nephthya.

Savigny, Atlas de l'Egypte; Blainville, Manuel d'Actinol, p. 523; *Spoggodes*, Lesson, Illustr. de Zoologie, 1831.

Polypi forming arborescent masses, incompletely retractile, and having the borders of the calice thick and incrustated with large navicular spiculæ.

Typ. sp., *Nephthya Chabroli*, Audouin, ap. Savigny, Egypte, Pol. tab. ii. fig. 5.

14. *Genus* Paralcyonium.

Alcyonidia, Milne Edwards, Ann. des Sc. Nat. 2d series, vol. iv, p. 323.

Polypi resembling Nephthya, but being completely retractile, and having the lower part of the common mass incrustated with a thick coating of long navicular spiculæ, but the upper part membranaceous and retractile.

Typ. sp., *Paralcyonium elegans*; *Alcyonidia elegans*, Milne Edwards, loc. cit., tab. xii and xiii.

15. *Genus* Sarcophyton.

Lesson, Zoologie du Voyage de la Coquille, Zooph., p. 92, 1831.

Differs from the genus Alcyonium by the great abundance and the peculiar structure of the common tissue, the cells of which are tubular, and arranged with great regularity in fasciculi, perpendicularly to the upper surface of the mass.

Typ. sp., *Sarcophyton plicatum*, Valenciennes MSS.; *Sarcophyton lobulatum*, Lesson, loc. cit.; *Alcyonium plicatum*, Lamarck, Hist. des An. sans Verteb., vol. ii, p. 395.

16. *Genus* Cespitularia.

Valenciennes MSS.

Polypi non-retractile, arranged in fasciculi, and united in the greatest part of their length by a dense, tough, common tissue, as in Alcyonium.

Typ. sp., *Cespitularia multipinnata*, Valen.; *Cornularia multipinnata*, Quoy and Gaimard, Voyage de l'Astrolabe, Zooph., tab. xxii, figs. 1-4.

17. *Genus* Distichopora?

Lamarck, loc. cit., p. 197.

This singular zoophyte appears to have more affinity to Alcyonium than to any other form of polypi; but the place belonging to it in a natural system of classification is as yet very uncertain. It is characterised by a calcareous, dendroid corallum, composed of long tubular cells, that present no traces of septa or tubulæ, and are disposed in a flabellate manner, so as to constitute a vertical plane, the two sides of which are covered with a thick and compact cœnenchyma, and the edge assumes the appearance of a calicular groove, limited laterally by two rows of circular pores. Nothing is known concerning the structure of the soft parts.

Typ. sp., *Distichopora violacea*, Lamarck, op. cit., p. 305. (For the structure of the Corallum, see Milne Edwards, Atlas du Regne Animal de Cuvier, Zooph., tab. lxxxv, fig. 4.)

Family II.

GORGONIDÆ.

Polypiers corticiferes, Lamarck, Hist. des Anim. sans Verteb. vol. ii, p. 288, 1816; *Polypes corticaux*, Cuvier, Regne Animal, vol. iv, p. 78, 1817; *Corallia*, Blainville, Manuel d'Actinologie, p. 501, 1834; *Cerato-corallia*, Ehrenberg, Corall. des Roth. Meeres, 1834; *Coralliadæ*, Gray, Synop. Brit. Mus. p. 134; *Gorgoniadæ*, Johnston, British Zooph., p. 182, 1838; *Gorgonidæ*, Dana, Exploring Expedition, Zooph., p. 637, 1846; *Gorgoniadæ*, Gray, List of British Anim. of the British Museum, p. 55, 1848.

Polypi provided with a thick, suberous cœnenchyma, surrounding a central stem that is adherent to an extraneous body by its basis, and is formed of epidermic sclerenchyma.

First Tribe—GORGONINÆ.

Gorgonia, Pallas, Elenchus Zoophytorum, p. 160, 1766; Cuvier, Regne Animal, 1st ed., vol. iv, p. 80; Lamarck, Hist. des Anim. sans Verteb., vol. ii, p. 309; *Gorgoninæ*, Dana, Exploring Expedition, Zooph., p. 641, 1846.

Common axis inarticulate, horny or fasciculate, but not calcareous.

1. *Genus* Gorgonia.

Pallas, loc. cit., (in parte.)

Axis corneous. *Calices* disposed irregularly round the ramified cylinders formed by the cœnenchyma, and not encircled by imbricated squammæ. *Polypi* retractile.

Typ. sp., *Gorgonia tuberculata*, Esper. Pflanz., Gorg., tab. xxxvii.

2. *Genus* Pterogorgia.

Ehrenberg, Corall. des Rothen Meeres, p. 144, 1834; Dana, op. cit., p. 647, 1846.

Differs from Gorgonia by the polypi being bifarious.

Typ. sp., *Pterogorgia anceps*, Ehrenb., loc. cit., p. 145.

3. *Genus* Bebryce.

Philippi, Zoologesche Beobachtungen, in Archiv. fur Naturgeschichte, von Erichson, vol. viii, p. 35, 1842.

Arborescent compound polypi, resembling Gorgonia by their corneous sclerobasis, but differing from the preceding genera by not being retractile.

Typ. sp., *Bebryce mollis*, Philippi, loc. cit.

4. *Genus* Phyllogorgia.

Differs from Gorgonia by the cœnenchyma not constituting a cylindrical sheath around the ramifications of the sclerobasis, but extending between them so as to constitute large foliaceous, frondiform laminæ, the two surfaces of which are studded with the calices of the individual polypi.

Typ. sp., *Phyllogorgia dilatata; Gorgonia dilatata*, Esper, Pflanz. Gorg. tab. xli.

5. *Genus* Phycogorgia.

Sclerobasis flabelliform, divided into digitated lobes, and composed of delicate corneous fibres united into laminæ, the two sides of which are covered with the cœnenchyma, and densely studded with numerous non-prominent calices.

Typ. sp., *Phycogorgia fucata; Gorgonia fucata*, Valenciennes, Voyage de la Venus, tab. xi, fig. 2.

6. *Genus* Muricea.

Lamouroux, Exposit. Method. des Polyp. p. 36, 1821.

Differs from Gorgonia by the calices being surrounded with imbricated squammulæ, but not supported on long, verruciform, moveable appendices, as in Primnoa.

Typ. sp., *Muricea spicifera*, Lamouroux, op. cit., tab. lxxi, figs. 1, 2.

7. *Genus* Primnoa.

Lamouroux, Hist. des Polypiers Flexibles, p. 440, 1816.

Differs from the preceding genus by the polypi constituting long verruciform subpedi-culated appendices, which are capable of motion at their bases.

8. *Genus* Solanderia.

Duchassaing and Michelin, in Guerin's Revue Zoologique, June, 1846.

Differs from Gorgonia by the suberous texture of the sclerobasal axis, which resembles the non-calcified joints of Melitæa.

Typ. sp., *Solanderia gracilis*, Duchassaing and Michelin, loc. cit.

9. *Genus* Briareum.

Blainville, Manuel d'Actinologie, p. 520, 1830.

Axis soft, suberous, or composed of spicula. This genus is intermediate between Alcyonium and Gorgonia.

Typ. sp., *Briareum gorgonoideum*, Blainv.; *Gorgonia briareus*, Lin.; Ellis and Solander, tab. xiv, figs. 1, 2.

The genus Hyalonema established by M. Gray, ('Proceed. of the Zool. Soc.' 1835, p. 63,) is also referred by some zoologists to the tribe of Gorgoninæ; but the recent observations of M. Valenciennes tend to establish that the fasciculi of siliceous threads, which constitute the axis of this singular production, belong to the class of Spongidæ, and the polypi which we have observed in a dried state on different parts of the axis appear to be parasites, belonging to the order of Zoantharia.

Second Tribe—ISINÆ.

Dana, Exploring Exped., Zooph., p. 677, 1846.

Common axis articulated, or composed of segments, the structure of which differ alternately.

10. *Genus* Isis.

Linnæus, Syst. Nat., 12th ed., p. 1287, 1767.

Axal sclerobasis composed of joints, alternately corneous and calcareous; branches proceeding from the calcareous joints.

Typ. sp., *Isis hippuris*, Lin., loc. cit.

11. *Genus* Mopsea.

Lamouroux, Polyp. Flex., p. 466, 1816.

Axis presenting the same structure as in the preceding genus, but with the branches proceeding from the corneous joints.

Typ. sp., *Mopsea dichotoma*, Lamouroux, loc. cit., p. 467.

12. *Genus* Melitæa.

Lamouroux, Polyp. Flex., p. 461, 1816.

Axis composed of joints, which are alternately calcareous and suberous.

Typ. sp., *Melitæa ochracea*, Lamouroux, loc. cit., p. 462.

Third Tribe—CORALLINÆ.

Dana, loc. cit., p. 639, 1846.

Common axis inarticulate, solid and calcareous.

13. *Genus* Corallium.

Lamarck, Hist. des Anim. sans Vert., t. ii, p. 295, 1816.

Typ. sp., *Corallium rubrum*, Cavolini, Mem. per Servire all. Hist. des Polypi Marini, tab. ii.

Family III.

PENNATULIDÆ.

Pennatula, Linnæus, Syst. Nat., 10th ed., p. 818; Pallas, Elen. Zooph., p. 362, 1766; *Polypi natantes*, Lamarck, op. cit., p. 415; *Pennatulidæ*, Fleming, Brit. Animals, p. 507, 1828; *Pennatularia*, Blainville, Manuel, p. 512, 1830; *Calomides*, Latreille, Fam. du Reg. Anim. p. 543; *Pennatulina*, Ehrenberg, loc. cit., p. 63, 1834; *Pennatulidæ*, Johnston, Brit. Zooph., p. 175; Dana, Explor. Exped. p. 587, 1846.

Polypi aggregate, and having a common peduncle, the centre of which is occupied by a peculiar cavity, and usually contains a solid axis; this sclerobasis styliform, and never expanding at its under extremity, so as to adhere to extraneous bodies. The polypi mass is consequently free.

1. *Genus* Pennatula.

(In parte.) Linnæus, Syst. Nat., 10th ed., p. 818, 1760; Lamarck, Syst. des An. sans Vert., p. 380, 1801.

Polype mass plume-shaped, with the shaft composed of contractile common tissue, containing a short subosseous axis, and bearing on each side of its upper part a series of large spreading pinnules, on the upper edge of which, the retractile exhalic portion of the polypi protudes. The axis is cylindrical at its upper part, and more or less quadrangular towards its lower end; its structure is somewhat fibrous, and its tissue is not very brittle.

Typ. sp., *Pennatula setacea*, Esper, Pflanz., Pennat. tab. vii.

2. *Genus* Virgularia.

Lamarck, Hist. des Anim. sans Verteb. vol. ii, p. 429, 1816.

Differs from Pennatula by the length of its shaft and the shortness of its pinnules, which assume the form of lunate lobes, or simple transverse striæ. Axis cylindrical, calcareous, very long, slender, tapering, and presenting in its transverse section a radiate structure.

Typ. sp., *Virgularia mirabilis*, Lamk.; *Pennatula mirabilis*, Müller, Zool. Danica, vol. i, tab. xi.

3. *Genus* Pavonaria.

Cuvier, Regne Animal, vol. iv, p. 85, 1816; *Funicularia*, Lamarck, op. cit., p. 423, 1816.

Polype mass virgate; the polypi not retractile, arranged on one side of the stem. Axis quadrangular, long, and very tapering.

Typ. sp., *Pavonaria quadrangularis*, Cuv.; *Pennatula antennina*, Lin.; Johnston, Brit. Zooph., tab. xxxi.

4. *Genus* Graphularia.

Corallum styliform, straight, very long, cylindroid towards the lower extremity, subtetrahedral at the upper part, and presenting on one side a broad shallow furrow. Transverse section showing the existence of a thin coating, and a radiate structure in the body of the coral.

Typ. sp., *Graphularia Wetherelli*, nob.; *Pennatula*, Sowerby and Wetherell, in Geol. Trans. 2d series, vol. v, part i, p. 136, tab. viii. fig. 2.

5. *Genus* Umbellularia.

Cuvier, Regne Animal, vol. iv, 1807.

Resembling Pavonaria, but having all the polypi collected in a terminal bunch at the extremity of the stem. Axis quadrangular and twisted.

Typ. sp., *Umbellularia Groenlandica*, Cuv.; *Hydra Marina arctica*, Ellis, Corallines, tab. xxxvii.

6. *Genus* Veretillum.

Cuvier, Regne Animal, vol. iv.

Resembling Pennatula, but not having any lateral pinnules, with the polypi arranged all round the upper part of the stem. Axis rudimentary, and of a form almost navicular.

Typ. sp., *Veretillum cynomorium*, Cuvier; *Pennatula digitiformis*, Ellis.

7. *Genus* Lituaria.

Valenciennes MSS., Cat. of the Zoophytes in the Museum of Paris.

Resembling Veretillum, but having a long well-developed axis, quadrangular and tapering towards its lower part, inflated, claviform, pitted and echinulate at its upper end.

Typ. sp., *Lituaria phalloides*, Valenciennes, loc. cit.; *Pennatula phalloides*, Pallas, Miscel. Zool., tab. xiii.

8. *Genus* Cavernularia.

Valenciennes, loc. cit., MSS.

Resembling Veretillum, but having in its centre a large fibrous tube divided longitudinally into four cavities, and not containing any calcareous or horny axis.

Typ. sp., *Cavernularia obesa*, Valenciennes MSS.

9. *Genus* Renilla.

Lamarck, Hist. des Anim. sans. Verteb., vol. ii, p. 428, 1816.

Polyp-mass explanate, unifacial, reniform, with a short, slender peduncle, containing a central cavity as in Pennatula, but not having any solid axis.

Typ. sp., *Renilla Americana*, Lamarck; *Pennatula reniformis*, Ellis and Solander, p. 67; Shaw, Miscel. iv, tab. cxxxix.

The genus Graptolithus (Linnæus, *Iter Scan.* 1751,) appears to have more affinity with Virgularia than with any other recent zoophyte. The polype mass is slender, virgate, and often becomes bifurcate by the progress of growth. The axis projects at the inferior extremity of the stem, and is often bifurcate.

Example, *Graptolithus ramosus*, Hall, Palæont. of New York, tab. lxxiii, fig. 3.

The genus Websteria, nob. appears to be very similar to Graptolithus by its general structure, but offers also a certain resemblance to some Sertularidæ and to certain Bryozoa. In the present state of our knowledge, the natural affinities of these fossil zoophytes are indeed so obscure, that we hesitate to place them in any of the preceding zoological divisions, and prefer leaving them in the *incertæ sedis*.

Typ. sp., *Websteria Crisioïdes*, nob., tab. vii, fig. 5.

Order 3.

PODACTINARIA.

Polypi having the gastric cavity surrounded by four vertical membranaceous *septa*, at the upper end of which are placed four pairs of intestiniform reproductive organs. The tentacula discoidal, pedunculated, not tubular as in Zoantharia and Alcyonaria, but organized much in the same way as in Echinoderma. The mouth proboscidiform, and the fauces surrounded by numerous internal, filiform, contractile appendices.

The genus LUCERNARIA is the only known representative of this zoological type, and comprises no coralligenous polypi.

Sub-class 2.

HYDRARIA.

Polypes sertulariens, Audouin and Milne Edwards, Recherches sur les Anim. sans Verteb., faites aux îles Chausay, in Ann. des Sc. Nat., 1st series, vol. xv, p. 18, 1828, ap. Lamarck, Hist. des An. sans Verteb. 2d ed., vol. ii., p. 105; *Sertulariaceæ* (*in parte*), Blainville, Manuel d'Actinologie, p. 465, 1834; *Zoocorallia oligactinia*, Ehrenberg, Coral. Roth. Meeres, p. 67, 1834; *Zoophyta Hydroida*, Johnston, in Mag. of Zool. and Bot., vol. i, p. 447, 1837; *Polyparia*, Gray, Synop. Brit. Mus.; *Nudibranchiata*, Farre, on the Structure of Polypi, Phil. Trans. 1837; *Hydrozoa*, R. Owen, Lectures on the Comp. Anat. of the Inverteb. Animals, p. 82, 1843; *Hydroidea*, Dana, Exploring Expedition, Zooph. p. 685, 1846; *Anthozoa Hydroidea*, Johnston, British Zooph, 2d ed. p. 5, 1847.

Polypi with a simple, non-lamelliferous, digestive cavity. No internal generative organs. Tentacula filiform and subverrucose.

The naked, fresh-water zoophytes of the genus HYDRA constitute the type of this group, and till very lately were considered as being closely allied to Sertularia, Campanularia, &c.; but the recent observations of divers zoologists tend to establish that all the coralligenous animals of this form belong to the class of Medusa. Till this question is decided, it would therefore be idle to make any modifications in the systematic arrangement of these problematic polypi, and it will suffice for us to refer the reader to Dr. Johnston's valuable work on 'British Zoophytes,' for the characters of the generic divisions generally adopted.

Chapter I & II removed

CHAPTER III.

CORALS OF THE UPPER CHALK.

The fossil Corals found in the Upper Chalk of England are not numerous; they belong principally to the section of simple Eusmilinæ, and appear to be peculiar to the British Fauna. One species, it is true (the *Parasmilia centralis*), has been mentioned by different geologists as existing also in the Chalk of Beauvais and in the north-west of Germany, but we have great reason to think that these fossils are not specifically identical. It is also worthy of notice, that even no species corresponding to those met with among the Corals of the Upper Chalk of England have as yet been seen in the Chalk of Meudon, and that a great difference exists between the predominant generical forms in the first of these formations, and in the Chalk of Maestricht. In the latter some Cyathininæ nearly allied to that of England are met with; but the Diploctenium, the Cyclolites, and the aggregate Astreidæ of Maestricht are represented by no corresponding forms in this part of the British fossil Fauna, and the organic remains found in these two cretaceous deposits have consequently a very different aspect. We must add, that the fossil Corals of the Chalk of Faxoe are equally distinct from the British species, and that none of the latter have been met with in the Lower Chalk Formations of England.

Order ZOANTHARIA (p. ix).

Family TURBINOLIDÆ (p. xi).

Tribe CYATHININÆ (p. xii).

Genus Cyathina (p. xii).

Cyathina lævigata. Tab. IX, figs. 1, 1*a*, 1*b*, 1*c*, 1*d*.

Cyathina levigata, *Milne Edwards* and *J. Haime*, Monogr. des Turbinolides; Ann. des Sc. Nat., 3me série, vol. ix, p. 290, 1848.

Monocarya centralis (*pars*), *Lonsdale*, in Dixon's unpublished work on the Chalk Formations and Tertiary Deposits of Sussex, tab. xviii, figs. 12, 12*a*, (perhaps also fig. 5, but not the other figures bearing the same name, which are *Parasmilia* and probably *Cœlosmilia*).

Corallum simple, elongated, adherent, cylindro-turbinate, straight, and in general much contracted just above the basis, which is broad. *Walls* quite smooth, and polished

towards the basis, but presenting towards the calice slightly-marked *costæ*, which are closely set, glabrous, or very delicately granulated, and almost equal in size. *Calice* circular, or sometimes rather oval, shallow. *Columella* moderately developed, not projecting in the centre of the calicular fossula, composed of six or eight twisted, vertical processes, and terminated by an equal number of papillæ. *Septa* forming four cycla, the last of which is in general incomplete; the septa of the fourth and fifth orders not existing in one half of three of the systems or even of all six of these, so that the number of these radiate laminæ is reduced to 42, or even to 36; sometimes, however, four of the systems are complete, and the number of the septa then amounts to 48. These septa are well developed, closely set, thin, but slightly granulated, rather exsert, and almost equal; the principal ones are, however, a little thicker than the others. The *pali* are narrow, but very thick, prominent, and terminated by a curved edge; they all correspond to the tertiary septa, and in the specimens where the fourth cyclum is complete, they exist in front of all the septa of the penultimate cyclum, and are therefore twelve in number; but they are never so numerous when the fourth cyclum remains incomplete, and never correspond to tertiary septa that are not separated by septa of the fourth cyclum. As mentioned above, these latter septa are often wanting in one half of three of the systems, and in that case there are consequently no pali corresponding to the tertiary septa of these incomplete half systems, so that the number of pali is reduced to nine; two belonging to each of the three complete systems, and one to each of the incomplete ones. The same rule also holds good when all the six systems are deficient of the septa of the fourth cyclum in one of their halves; the tertiary septa of the complete halves are the only ones having corresponding pali, so that the number of these organs is only six. The height of the corallum varies between one inch and one inch and a half; in the tall specimens the diameter of the calice is about four lines; in the short and broad ones it is sometimes five lines.

This species is easily distinguished from the *Cyathina Cyathus*,[1] *C. Smithii*,[2] and *C. pseudoturbinolia*,[3] by its never having a fifth cyclum of septa. *C. Guadulpensis*[4] and *C. arcuata*[5] differ from the above-described fossil by the existence of distinct costæ down to the basis of the walls, and by the large size of the pali. *C. lævigata* most resembles *C. Koninckii*,[6] *C. Bowerbankii*,[7] *C. Debeyana*, *C. Bredæ*, and *C. cylindrica*,[8] and it may

[1] See our Monograph of Turbinolidæ, Ann. des Sc. Nat., 3me série, vol. ix, p. 287, tab. iv, fig. 1.

[2] Loc. cit., p. 288. [3] Loc. cit., p. 289, tab. ix, fig. 1. [4] Loc. cit., p. 290.

[5] Loc. cit., p. 290. [6] Loc. cit., p. 290. [7] Loc. cit., p. 292.

[8] The three last-mentioned species were not known to us when we published our Monograph of Turbinolidæ, and in order to render the comparison between the *T. lævigata* and the rest of the genus more complete, it appears to us advisable to give a description of them here.

CYATHINA CYLINDRICA, nob. Corallum fixed by a broad basis, regularly cylindrical, straight, and not very tall. Costæ equal, flat, straight, closely set, not very broad, and very indistinct, especially towards the basis. Calice circular, having a thick edge, and the fossula rather shallow. Columella very small, and reduced to two or three small, almost indistinct, tubercles. Septa forming four complete cycla, very closely

not be unworthy of notice that these five species are as yet the only representations of the genus Cyathina that have been met with in the Chalk Formation. At first sight they appear very similar, but by an attentive examination, constant and well-defined characteristic differences are found between all. In *C. Koninckii*, the corallum is always shorter, and more regularly turbinate; the pali are thicker, and the columella is reduced to two or three thick, twisted processes. In *C. Bowerbankii*, on the contrary, the pali are much thinner, and the surface of the walls appears granulous. *C. cylindrica* and *C. Bredæ* differ from it by a very peculiar character, which exists also in *C. Koninckii*, but which is not met with in any other species of the same genus, and is indeed quite an exception to the family of Turbinolidæ, the pali being only six in number, although the four cycla of septa be complete, and corresponding to the septa of the antepenultimate cyclum, whereas they usually correspond to those of the penultimate cyclum. The thin, elongate form of *C. Bredæ* and the quite cylindrical form of *C. cylindrica*, will also help to distinguish them from *C. lævigata*, which differs also from *C. Debeyana*, by the latter having a well-marked epithecal fold near the calice, a small columella, and thinner pali.

Cyathina lævigata is found in the Upper Chalk at Dinton, in Wiltshire; specimens may be seen in the collections of the Geological Society, of Mr. Bowerbank, and of the Museum at Paris.

set, and having stronger lateral granulations near the inner edge. The primary ones larger and rather thicker than the others, but differing very little from the secondary ones; the tertiary ones are thinner and smaller; those of the fourth cyclum are distinct, but very small. Pali prominent, extremely thick, narrow, strongly granulated laterally, and corresponding to the secondary septa. Height of the corallum about six lines; diameter of the calice three lines. Fossil from the Chalk of St. Peter's Mountain, at Maestricht; specimens exist in the Museum of Natural History of Paris, and in the Tylerian Museum at Haarlem.

Cyathina Bredæ, nobis. This fossil corallum, which we dedicate to Professor Van Breda, is adherent by a rather broad basis, contracted immediately above, elongate, slender, much bent, and cylindrical towards its upper part. The costæ are not well marked, and the walls are almost smooth, but present sometimes slight horizontal folds. Calice circular; fossula shallow. Columella but little developed, and sometimes reduced to a single twisted process. Septa forming four complete cycla; but those of the last cyclum rudimentary though distinct; the primary ones rather thick, especially towards the inner edge; the secondary ones resembling those of the first cyclum, but rather narrower; the others very thin. The granulations on the sides of the septa are conical, and very prominent. The pali corresponding to the secondary septa, well developed, prominent, narrow, and appearing very thick, because they are flexuous. Height, seven or eight lines; diameter of the calice, two lines and a half. This species is also found in the fossil state in the Chalk of St. Peter's Mountain, at Maestricht; specimens exist in the collections of MM. Van Riemsdyck and Bosquet, at Maestricht; of M. Van Breda, at Haarlem; and of the Museum at Paris.

Cyathina Debeyana nob. Corallum cylindrical, elongate, slightly curved, and presenting near the calicular margin a small but well-marked circular band, representing an incomplete epitheca. Calice circular; fossula not deep. Septa unequal, closely set, somewhat exsert, rather thick externally, but thin towards the inner edge, and forming four complete cycla; the secondary ones almost as large as those of the first cyclum. Pali rather narrow, and not very thick. Height, one inch; diameter of the calice, three lines; depth of the fossula, one line. Fossil from the Chalk of Aix-la-Chapelle, discovered by M. Debay.

Family ASTREIDÆ (p. xxiii).

Tribe EUSMILINÆ (p. xxiii).

1. *Genus* PARASMILIA (p. xxiv).

1. PARASMILIA CENTRALIS. Tab. VIII, figs. 1, 1*a*, 1*b*, 1*c*.

MADREPORITE, *Parkinson*, Organ. Remains of a FormerWorld, vol. ii, tab. iv, figs. 15, 16, 1820.
MADREPORA CENTRALIS, *Mantell*, Geol. of Sussex, p. 159, tab. xvi, figs. 2, 19, 1822. (Correct figures.)
CARYOPHYLLIA CENTRALIS, *Fleming*, British Animals, p. 509, 1828.
— — *Mantell*, Trans. of the Geol. Soc., 2d series, vol. iii, p. 204, 1829.
— — *Phillips*, Illust. of the Geol. of Yorkshire, part i, p. 119, tab. i, fig. 13, 1829; 2d edit., p. 91.
— — *S. Woodward*, Synoptic Table of Brit. Org. Remains, p. 6, 1830.
CARYOPHYLLIA, *R. C. Taylor*, in Mag. of Nat. Hist., vol. iii, p. 271, fig. *f*, 1830.
LITHODENDRON CENTRALE, *Ch. Keferstein*, Die Naturgesehichte des Erdkorpers, vol. ii, p. 789, 1824.
TURBINOLIA EXCAVATA (?), *Hagenow*, in Leonard's und Bronn's Jahrbuch für Mineral., p. 229, 1839.
— CENTRALIS, *Fred. Adolph Rœmer*, Verstein. des Norddeutschen Kreidegebirges, p. 26, 1840.
— — *Bronn*, Index Paleontologieus, p. 314, 1848.
PARASMILIA CENTRALIS, *Milne Edwards* and *J. Haime*, Monogr. des Astreides, Ann. des Sc. Nat., 3^{me} série, Zool. vol. x, p. 244, 1848.
MONOCARYA CENTRALIS (*in parte*), *Lonsdale*, in Dixon's unpublished work on the Chalk Formations of Sussex, tab. xviii, figs. 1, 3, 7, 7 *a*, 9 (cæteris exclusis).

Corallum simple, cylindrico-turbinate, fixed by a rather broad basis, above which it is much contracted, elongate, irregularly bent in various directions, and presenting a series of unequal contractions and circular dilatations. *Costæ* closely set, and distinct from the calicular margin down to the basis, where they are the most prominent; those corresponding to the primary and secondary septa are rather larger than the others towards the basis; but the tertiary ones soon become almost similar to the former, and at the upper part of the wall all these large costæ alternate with smaller ones belonging to the fourth cyclum. All are covered with delicate granulations, which are most prominent towards the lower part of the costæ of the fourth cyclum, where they form simple series. *Calice* circular, with the fossula less shallow than usual in this genus. *Columella* well developed, somewhat prominent and crispate. *Septa* forming six equally developed systems and four complete cycla; closely set, very unequal, broad, thin, slightly exsert, straight, or

very slightly flexuous, and presenting laterally a few large granulations. *Dissepiments* simple, almost horizontal, and few in number; about three from the top to the bottom of each principal septum, as may be seen by means of a vertical section. Height varying from one to two inches; diameter of the calice, four lines; depth of the fossula, two lines.

The genus Parasmilia, circumscribed within the limits assigned to it in the Introduction to this Monograph, only contains seven species, all of which belong exclusively to the upper beds of the Chalk Formations. Three of them (*P. centralis*, *P. Gravesiana*, and *P. elongata*) have already been described in our Monograph of the Astreidæ,[1] and the four others (*P. Mantellii*, *P. Fittonii*, *P. cylindrica*, and *P. serpentina*) will be made known in the present work. They all differ but little from each other, and in order to recognise them, it is necessary that they should be compared together with attention. *P. centralis*, which may be considered as the type of this small generic group, differs from *P. Gravesiana*, *P. elongata*, *P. cylindrica*, and *P. Mantellii*, by its costæ being always straight, rather thick and never sub-lamellous, and rather flexuous, as in the four last-mentioned species; it is also to be remarked, that its costæ are rather more prominent near the basis than higher up, whereas the contrary is seen in the *P. Gravesiana*, and that the loculi are never subdivided by small dissepiments, as is the case in *P. elongata*, *P. cylindrica*, and *P. Mantellii*. *P. serpentina*, which bears more resemblance to it, is characterised by the septa forming only three cycla, and the costæ being very delicate, and rather indistinct towards the basis. But it is with *P. Fittonii* that *P. centralis* is most closely allied; the former, however, is of a thicker form, its tertiary costæ are more developed and more delicately granulated, and its columella is much larger, and terminated by a sub-papillose surface.

The specimens of *P. centralis* which we had the opportunity of examining were found in the Upper Chalk at Northfleet, near Gravesend, and at Norwich. Mr. Phillips mentions the existence of the same fossil at Dane's Dike;[2] and Dr. Mantell has met with it at Brighton, Lewes,[3] Steyning, and Heytesbury.[4] Mr. Graves also alludes to it as being found in the Chalk Formation of the Parisian basin at Beauvais;[5] but we have much reason to think that the species observed by that geologist is not the one here described, and must be referred to our *P. Gravesiana*. M. Rœmer and other authors equally apply the name of *C. centralis*[6] to a fossil found in the north-west of Germany, but we have not been able as yet to verify the propriety of this determination, not having seen any of the specimens discovered in that part of the Continent.

[1] The species described in that work under the names of *Parasmilia poculum*, *P. Faujasii*, and *P. punctata*, must now be referred to our genus *Cœlosmilia*, which is characterised by the entire absence of the columella.

[2] Op. cit., part i, p. 119.

[3] Illust. of the Geol. of Sussex, p. 160.

[4] Geol. Trans., 2d series, vol. iii, p. 204.

[5] Geogn. de l'Oise, p. 701.

[6] Versteinerungen des Norddeutschen Kreidebirges, p. 26.

We must also remark that, in a note just published, our able friend M. Alcide d'Orbigny[1] refers to the *Caryophyllia* or *Parasmilia centralis* as the type of a new genus, designated under the name of *Cyclosmilia*, and characterised in the following terms: "Cyclosmilia are Parasmilia, in which the loculi are but very little divided by dissepiments, the growth of the corallum is intermittent, the calice circular instead of being oval, and the external costæ distant from each other." Now, with the exception of this last peculiarity, which is not even met with in *P. centralis*, all these characters may be seen in every species belonging to our genus Parasmilia, and we therefore can find no reason for separating from it this new generic division.

2. Parasmilia Mantelli. Tab. VIII, fig. 2, 2 *a*.

We have as yet seen but one specimen of this species, which appears to be very distinct from all others. It is a small corallum, nearly straight, adherent by a broad basis, regularly turbinate, and not very tall; but being in all probability susceptible of increasing much in height by progress of age, as is the case with the other species belonging to the same genus. The *costæ* are narrow, sublamellar, closely set, distinct down to the basis of the corallum, very echinulate, and somewhat crispate. Those of the primary and secondary cycla are equally developed, and rather more prominent than the others, especially towards the basis and the calicular margin; the tertiary ones also extend on the basal expansion of the corallum, but are smaller; and those of the fourth cyclum begin at a short distance above the basis, and are very narrow at their lower part. The intercostal furrows are broad, deep, and divided by small transverse dissepiments, formed by rudiments of an exotheca. *Calice* circular; fossula not deep. *Columella*, as far as we can judge by the specimen here described, very similar to that of *P. centralis*. *Septa* forming four complete cycla; well developed, thin, straight, closely set, rather unequal, and presenting well-marked striæ on their lateral surfaces. Height, seven or eight lines; diameter of the calice, nearly five lines.

This fossil differs from the other species belonging to the same genus, and more especially from *P. centralis* and *P. Fittoni*, by its costæ, which are equally prominent and subcrispate, whereas in the latter they are smooth and never sublamellar. It resembles more closely *P. Gravesiana*, *P. cylindrica*, and *P. elongata*; but it differs from them by the strong granulations of the costæ. In *P. serpentina* the basis is almost smooth, and the septa do not form so many cycla.

Parasmilia Mantelli was met with in the upper chalk at Bromley in Kent, by our friend Mr. J. S. Bowerbank.

[1] This paper, bearing the title of 'Note sur des Polypiers Fossiles,' and published on the 10th of October, 1849, contains the exposition of the characters of a series of new genera proposed by M. d'Orbigny. The author assigns to most of these divisions the date of 1847, a period at which he appears to have adopted them in the arrangement of his private collection; but in referring to them here or elsewhere, we have considered it proper to quote the year of their publication, which is the only authentic date that could be made use of if any question of priority should arise concerning them.

3. Parasmilia Cylindrica. Tab. VIII, fig. 5.

It is not without some hesitation that we inscribe this species in the list of our Parasmilia, for the specimen about to be described is extremely incomplete; but it does not present the specific characters of any other species, and although very nearly allied to *P. elongata* and *P. Mantelli*, it appears to differ from both in some essential points. The fragment here alluded to is deficient both in the basis and in the calice, but it appertained to a tall, nearly cylindrical corallum, that was somewhat bent. The *costæ* are almost equal, extremely thin, sublamellar, but not very prominent, subflexuous, very slightly granulated, and divided at short intervals by circles of small dissepiments, formed by rudiments of an exotheca. The intercostal furrows are broad, rather shallow, almost destitute of granulations, and presenting sometimes in the middle a small rudimentary costa. *Columella* well developed. *Septa* forming four complete cycla, not very closely set, somewhat flexuous, and slightly granulate; those of the first and second cycla equally developed, and rather thick; the tertiary ones smaller and thinner; those of the fourth cyclum very small, although the costæ corresponding to them are as large as those of the other cycla. Length, above two inches; diameter, about six lines.

This fossil much resembles the *Parasmilia elongata* found at Ciply, but differs from it by the unequal development of the septa belonging to the first two and to the last two cycla, a mode of structure which does not exist in *P. elongata*. It differs from *P. centralis*, *P. Fittoni*, and *P. serpentina*, by the delicacy and almost lamellar form of the costæ, and bears greater resemblance to *P. Mantelli* and *P. Gravesiana*, from which it may, however, be easily distinguished by the breadth of its intercostal furrows.

The specimen here described belongs to the Palæontological collection of Mr. J. S. Bowerbank, and was found in the upper chalk at Norwich. Another fossil, which we consider as belonging to the same species, exists in the Poppelsdorf Museum at Bonn, and was found in the upper chalk at Darup, in Westphalia.

4. Parasmilia Fittoni. Tab. IX, fig. 2, 2 *a*, 2 *b*.

Corallum stout, adherent by a somewhat broad basis, immediately above which it in general becomes very narrow; elongate, much bent, and presenting at intervals circular constrictions. *Costæ* broad, closely set, not very prominent, excepting near the basis, down to which they are quite distinct, rather unequal alternately, and covered with very numerous and small granulations. *Calice* circular; fossula large and rather shallow. *Columella* well developed, but very slightly prominent, of a spongy structure, and terminated by a broad subpapillose surface. *Septa* forming four complete cycla, rather thin, straight, not very closely set, slightly exsert, and having but few granulations on their lateral surfaces.

Those of the second order are nearly as large as those of the first set, and thus produce the appearance of twelve tertiary systems. Height, from one to two inches; diameter of the calice five lines; its depth, two lines.

This species is easily distinguished from all the other Parasmilia by the great development of its columella, which occupies nearly half the diameter of the calice, and by the spongy structure of this organ. It most resembles *P. centralis*, from which, however, it differs also by its thick form and the greater development of the tertiary costæ towards its basis. The breadth and delicate granulations of the costæ may equally serve to distinguish it from *P. Gravesiana*, *P. elongata*, *P. cylindrica*, and *P. Mantelli*. It differs from *P. serpentina* by having an additional cyclum of septa, and by its basis not being smooth, as is the case in the latter.

This fossil is found in the upper chalk of Norwich, and exists in the collections of the Geological Society, of the Geological Survey, and of the Museum at Paris. It appears probable that it has often been confounded with *P. centralis*, and that some of the figures referred to that species may in reality belong to it; but the engravings here alluded to are not correct enough to enable us to decide this question.

5. Parasmilia (?) serpentina. Tab. VIII, fig. 3, 3 *a*, 3 *b*.

It is not without some doubts that we place this fossil in the genus Parasmilia, for in the unique specimen that has come under our observation, the calice was in so bad a state of preservation that it was impossible to decide whether the papillæ seen near the centre of that part were fractured septa or remains of pali, or even trabiculæ belonging to the columella. However, the first hypothesis appears most probable, and the general appearance of the corallum is also very similar to that of all the other Parasmilia.

This fossil is almost cylindrical, slender, much elongated, and bent; it presents some strongly marked circular constrictions, indicative as usual of a certain intermittence in the progress of its growth. The *costæ* are narrow, straight, rather unequal alternately, scarcely distinct near the basis, but more prominent towards the upper part of each inflated ring and near the calice; the *calice* is circular. The *septæ* form three complete cycla and are rather closely set, exsert, and somewhat dilated exteriorly. The *columella* is well developed. Length, one inch, seven lines. Diameter of the calice, two lines and a half.

This coral, belonging to Mr. Bowerbank's collection, was found in the upper chalk at Bromley, in Kent.

It is the only species of Parasmilia in which the fourth cyclum of septa does not exist; it is also characterised by its basis not being costulated.

2. *Genus* Cœlosmilia (p. xxv.)

Cœlosmilia laxa. Tab. VIII, fig. 4, 4 *a*, 4 *b*, 4 *c*.

Corallum simple, turbinate, slightly bent, rather intermittent in its growth, and appearing to have been adherent. *Costæ* distinct from the basis to the calice, very distant from each other; those belonging to the first three cycla subcrestiform; those of the last cyclum flat and scarcely visible, delicately granulated and crossed by small horizontal striæ. *Calice* circular; fossula narrow and rather deep. No *columella*. *Septa* forming four complete cycla; but those of the last cyclum almost rudimentary. The six systems equally developed. The septa very unequally developed, broad, very exsert; thin, but rather less so near the inner margin, presenting a few round granulations on their lateral surfaces. Those of the first and second cycla united along the lower part of their inner edge. Height, from one inch to one inch and a half; diameter of the calice, seven lines.

We have given the generic name of *Cœlosmilia* to a certain number of Eusmilinæ which we formerly placed in our genus *Parasmilia*, but which are characterised by the absence of the columella and the rudimentary state of the endotheca. *Parasmilia poculum*, *P. Faujasi*, and *P. punctata*[1] belong to this group, and differ from *C. laxa* by their costæ being flat and granulated near the calice, whereas in the above-described fossil these parts are subcrestiform. It is also to be remembered that in *Cœlosmilia poculum* and *C. Faujasi* the septa form five complete cycla, and that in the last-mentioned species, as well as in *C. punctata*, the principal septa are much thicker than in *C. laxa*. M. Alcide d'Orbigny has lately discovered in the white chalk of Césanne a new species which he designates by the name of *Cœlosmilia Edwardsiana*, and which differs from *C. laxa* by its costæ being rudimentary and its septa thinner.

[1] See our Monograph of the Astreidæ (Ann. des Scien. Nat. 3me serie, vol. x). It is possible that our *Cœlosmilia punctata* may be only a young form of *C. Faujasi*, but we have not as yet seen a sufficient number of specimens to be able to decide the question.

CHAPTER IV.

CORALS FROM THE LOWER CHALK.

The number of British Corals known to belong to this formation is as yet so very small, that it would be premature to speculate on their mode of distribution. We have seen but two species, one appertaining to the family of Oculinidæ, the other to that of Eupsammidæ; both appear to be peculiar to the lower chalk of England.

Family OCULINIDÆ (p. xix).

Genus SYNHELIA (p. xx).

SYNHELIA SHARPEANA. Tab. IX, fig. 3, 3 *a*.

Corallum composite, dendroid, with thick, erect branches, forming acute angles with each other, and presenting on their surface large, non-exsert, circular calices, which are not closely set, and are united by rather indistinct, small costal striæ. *Calices* quite superficial, and presenting scarcely any central depression. *Columella* assuming the appearance of a small, obtuse tubercle. Three complete cycla of *septa*, and in one half of each system two quaternary septa, of which no homologues exist in the other half. The septa are thick, very closely set, almost straight, and unequally developed, but those of the second order differ but little from the primary ones. The upper edge of all is horizontal, and closely denticulated; towards the columella the denticulations are rather larger than towards the calicular margin, and we have not been able to decide whether some of them do not constitute pali. The lateral surfaces of the septa present oblong transverse granulations, which much resemble incomplete synapticulæ, but they are not prominent enough to meet those of the adjoining septa, and to subdivide the interseptal loculi. The height of the specimen here described is about two inches and a half, and the diameter of the calices two lines.

We are as yet acquainted with but two other species that can be referred to our genus *Synhelia;* one is the *S. gibbosa*, which was first described by Goldfuss under the name of

Lithodendron gibbosum,[1] and which belongs also to the lower Chalk formation, but is found at Bochum, in Westphalia, and at Blaton, near Mons, in Belgium. It differs from *S. Sharpeana*, by its calices being more closely set; rather oblong, with a more prominent margin, and twenty-four nearly equal, very thick septa, separated by an equal number of rudimentary ones. The other is the *Madrepora Meyeri*, found by MM. Koch and Dunker in the Jurassic formation at Elligser-Brinke; it has deep calices.[2]

The unique specimen here described appears to have been found in the lower chalk near Dover, and was kindly communicated to us by Mr. Daniel Sharpe.

Family EUPSAMMIDÆ (p. li).

Genus STEPHANOPHYLLIA (p. liii).

STEPHANOPHYLLIA BOWERBANKII. Tab. IX, fig. 4, 4 *a*, 4 *b*, 4 *c*.

STEPHANOPHYLLIA BOWERBANKII, *Milne Edwards* and *J. Haime*, Monogr. des Eupsammides, in Annales des Sciences Naturelles, 3^me^ serie, Zool. vol. x, p. 94, 1848.

Corallum simple, resembling, in its general form, a plano-convex lens. *Wall* discoidal and horizontal. *Costæ* numerous, delicate, nearly equal, closely set by pairs, and formed by a simple series of granulations, which become the most distinct near the outer edge of the mural disc. Twenty-four of these costæ begin near the centre of the corallum, and soon after bifurcate; the forty-eight costæ thus produced soon divide again, in the same manner, and near the edge of the disc the number of these radiate ridges amounts to ninety-six. The mural pores are small, not very distinct, and arranged in series in the intercostal furrows. *Calice* quite circular, and appearing to be regularly convex, excepting towards the centre, where there is a slightly-marked, shallow fossula. *Columella* almost rudimentary, and formed only by two or three trabiculæ, which are often scarcely distinct from the edges of the *septa*. These last-mentioned organs arise from the upper surface of the mural disc, and are thin, especially outwards, closely set, and covered laterally with large, prominent granulations. They form five complete cycla, and represent six well-characterised and equally-developed systems. The primary and secondary septæ are straight, and extend to the columella; their upper edge is arched, or slightly angular. The tertiary septa are also much developed, and bend towards the secondary ones, to which they become united by their inner edge, near the columella. The septa of the fourth and fifth orders, constituting the fourth cyclum, are united in a similar way to the tertiary septa, at about half way from the margin of the mural disc to the columella, but not exactly at the same point, those of

[1] Petref. Germ., vol. i, tab. xxxvii, fig. 9.

[2] Beiträge zur Kenntniss des Norddeutschen oolithgebildes, p. 55, tab. vi fig. 11, 1837.

the fifth order being rather longer than those of the fourth order. The septa of the fifth cyclum are small, thin, low, and unite to the neighbouring principal septa; those of the sixth order join the primary ones; those of the seventh order adhere by their inner and upper edge to the secondary ones, and those of the eighth and ninth orders to the tertiary septa; or, in other words, each element of this fifth cyclum joins the eldest of the two septa between which it is placed. Independently of these junctions, which are normal, and always take place along the inner edge of the septa, the interseptal loculi are irregularly divided in some places by the projecting lateral granulæ of two neighbouring septa meeting, and becoming cemented together. By this character, as well as by its general form, this species tends to unite the family of Eupsammidæ with the Fungidæ.

Height of the corallum, one and a half or two lines; diameter, three or four lines. Some specimens, which were probably not adult, were only two lines and a half in diameter.

This delicate little Coral differs from *Stephanophyllia elegans*, *S. imperialis*, and *S. discoides*[1] by the form of the septa, which do not appear to be angular and lacerated, as in the three latter species. *Stephanophyllia astreata*[2] differs from it by having a large fossula and a well-developed columella. It most resembles *S. succica*;[3] but in this species the two tertiary septa of each system unite below the columella and the secondary septa, which consequently do not extend to the centre of the calice; whereas in *S. Bowerbankii* these tertiary septa, as we have already stated, adhere to the secondary septa, and these last-mentioned septa extend to the columella. The Fossil Coral figured by M. von Hagenow, under the name of *Fungia clathrata*,[4] and found by that geologist in the chalk formation of Rugen, is evidently very nearly allied to the British species here described; but as far as we can judge of it by M. von Hagenow's engraving, it appears to differ from it by its more elevated form, by the strongly-marked concentric striæ visible on the mural disc, and by its basis being more prominent.

We must also remark, that the section of the genus Stephanophyllia, to which this species belongs, and to which we applied the name of *Lenticular Stephanophyllia*,[5] has of

[1] See our Monograph of the Eupsammidæ, Ann. des Sc. Nat., 3me série, vol. x.

[2] *Fungia astreata*, Goldfuss, Petref. Germ., vol. i, p. 47, tab. xiv, fig. 1 (where it is by mistake designated under the name of *Fungia radiata*). This species not having been, as yet, well characterised, we think it may be useful to give a short description of it here. Corallum simple, very short, and having the form of a plano-convex lens. Calicular fossula circular, and well developed. Costæ very delicate and not closely set. Septa forming five complete cycla, and appearing to be thin and strongly granulated. Size very variable; in the adult, diameter three lines, height about one line. Fossil found at Aix-la-Chapelle, in Westphalia, and existing in the Museums of Bonn and Paris. All the specimens yet found are in a very bad state of preservation.

[3] Monogr. of the Eupsammidæ, loc. cit., p. 94.

[4] In Leonhard and Bronn's Jahrbuch für Mineralogie, 1840, p. 684, tab. ix, fig. 3.

[5] Monogr. of the Eupsammidæ, loc. cit., p. 94, 1848.

late been considered by M. Aleide d'Orbigny as deserving to be elevated to the rank of a genus, and has been named by that author *Discopsammia*;[1] but M. d'Orbigny has not pointed out any new characters in addition to those on which this separation was primitively established in our Monograph, and consequently we see no reason for altering the classification previously adopted.

Stephanophyllia Bowerbankii is found in the lower chalk near Dover, and does not appear to differ from some corals which one of us[2] has lately met with in a bed of chlorited chalk at Orcher, near le Havre. The specimens here described belong to the collections of Mr. Bowerbank, Mr. D. Sharpe, and the Geological Society.

[1] Note sur les Polypiers Fossiles, p. 10, 1849.

[2] M. Jules Haime.

CHAPTER V.

CORALS FROM THE UPPER GREENSAND.

The class of Polypi had not, in all probability, numerous representatives in the seas where the Upper Green Sand was deposited, for we have as yet seen only four British species belonging to that formation, and the English geologists do not appear to have met with many more. Most of these fossils belong to the family of Astreidæ, and have been found at Haldon, at Blackdown, or at Warminster. One of these British species appears to be identical with a coral described by Goldfuss, and found in the chalk formation of Essen; and Mr. Morris has pointed out two others as being referable to species found in the chalk of Maestricht, but we have not had an opportunity of recognising the specific identity of these last-mentioned fossils.

Family ASTREIDÆ (p. xxiii).

Tribe EUSMILINÆ (p. xxiii).

1. *Genus* Peplosmilia (p. xxv).

Peplosmilia Austeni. Tab. X, fig. 1, 1 *a*, 1 *b*.

Corallum simple, fixed by a broad basis, cylindrical, and surrounded from top to bottom by a membraniform epitheca, presenting some slight transverse folds. *Calice* circular, or somewhat oval; fossula shallow, narrow, and elongated. *Columella* well developed and lamellar. *Septa* appearing to form four well-developed cycla, and a fourth rudimentary one. The primary and secondary ones equal, and differing but little from the tertiary ones; they are all thick, broad, closely set, slightly exsert, not quite straight, those on one side inclining to the right near the columella, and those of the other side bending in an opposite direction. A vertical section of this Coral (fig. 1 *b*) shows that the septa are granulated on their lateral surfaces, especially near their inner edge, which joins the columella, and that these granulations form closely-set radiate rows. *Dissepiments* vesicular, and rather abundant. Height of the coral, one inch and a half; diameter of the calice, above an inch.

This species is as yet the only known representative of our genus Peplosmilia,[1] and is easily distinguished from the other true Eusmiliæ, either by its lamellar columella or its complete epitheca; it may be considered as a Montlivaltia, having a lamellar columella. We have seen but one specimen of this fossil; it was found in the Greensand at Haldon, and presented to the Geological Society by Mr. R. H. C. Austen.

2. *Genus* Trochosmilia (p. xxiv).

Trochosmilia (?) tuberosa. Tab. X, fig. 2, 2 *a*.

Turbinolia compressa, (?) *Morris*, Cat. of Brit. Foss., p. 46, 1843.

Corallum simple, compressed, even at its basis, cuneiform, subpedunculated, and presenting on each of its lateral edges, at a short distance above the basis, a broad but not very prominent tuberosity. *Costæ* delicate, straight, not prominent, but very distinct from the basis upwards, closely set and somewhat unequal. *Calicc* elliptic and horizontal; its small axis only half the length of the long axis. Fossula narrow, rather shallow, and elongated. No *columella*. *Septa* forming five complete cycla; very thin, straight, closely set, and delicately granulated laterally; those of the first and second cycla nearly equal in size and larger than the others, so as to produce the appearance of twelve systems; those of the fifth cyclum very small. Height, seven lines; diameter of the calice, eight lines by four.

The above-described specimen was found in the Greensand of Blackdown by our able friend Mr. J. S. Bowerbank. We have not, as yet, been able to ascertain the existence of dissepiments in the interseptal loculi, and consequently are not quite sure that it belongs to the genus Trochosmilia; if these parts do not exist it must be referred to the family of the Turbinolidæ, but we have not had the materials necessary for deciding that question. We shall therefore only add here, that this coral differs from the other species of Trochosmilia described in our 'Monograph of the Astreidæ' by the existence of the lateral tuberosities, and the basis presenting scarcely any traces of adherence.

It is probably this fossil which Mr. Morris referred to the *Turbinolia compressa* of Lamarck, and mentioned as existing in the Greensand of Blackdown. *T. compressa* belongs also to our genus Trochosmilia, and is found in the Greensand at Uchaux in the South of France, but differs from *T. tuberosa* by its general form.

[1] The fossil described by M. Michelin under the name of *Anthophyllum detritum* (Icon. Zooph., tab. x, fig. 1) might at first sight be supposed to belong to this genus, for it presents some appearance of a lamellar columella; but that is owing to the presence of some extraneous matter adhering to the specimen figured by M. Michelin, and although the epitheca does no longer exist in this fossil, we have no doubt that it is in reality a Montlivaltia.

Tribe ASTREINÆ (p. xxxi).

Genus PARASTREA (p. xliii).

PARASTREA STRICTA. Tab. X, fig. 3, 3 *a*.

Corallum composite, forming a mass not very tall, and slightly convex on its upper surface. *Calices* seldom circular, in general oblong or irregularly polygonal, projecting very little, and having always distinct margins. *Costæ* delicate, closely set, nearly equal, almost horizontal, nearly straight or slightly bent, and united by their extremity to those of the neighbouring corallites, which, however, remain circumscribed by a small furrow. *Calicular fossula* shallow. *Columella* of a dense tissue, subpapillose, and not much developed. *Septa* thin, broad, closely set, terminated by a series of calicular dentations, the last of which (towards the columella) appears to be more developed than the others; the number of these septa seldom exceeds forty, and they are rather unequal. *Walls* thin, but well developed. Diameter of the calices, usually between two lines and two lines and a half; distance between the calices, at least half a line.

This species, found in the Greensand at Blackdown, is characterised from a specimen belonging to the Geological Society; it differs from all the previously described Parastrea by the approximation and delicate structure of the septa.

Mr. Morris mentions, in his 'Catalogue of British Fossils,'[1] two other species which have been found by M. Austen in the Greensand at Haldon, and which belong to the family of Astreidæ. M. Austen considers the one as being identical with the Maestricht fossil coral described by Goldfuss under the name of *Astrea elegans*,[2] and he refers the other to the *Astrea escharoides*[3] of the same author[4]. We regret not having had an opportunity of examining these fossils.

[1] Loc. cit., p. 31.

[2] Petref. Germ., vol. i, tab. xxiii, fig. 6.

[3] Goldfuss, op. cit., tab. xxiii, fig. 2; fossil from Maestricht.

[4] Austen, on the Geol. of the South-east of Devonshire, Trans. of the Geol. Soc., Second Series, vol. vi, p. 452.

Family FUNGIDÆ (p. xlv).

Genus MICRABACIA (p. xlvii).

MICRABACIA CORONULA. Tab. X, fig. 4, 4 *a*, 4 *b*, 4 *c*.

CYCLOLITES, *W. Smith*, Strata identified by Organic Fossils, p. 12; Greensand, p. 15, 1816.
FUNGIA CORONULA, *Goldfuss*, Petref. Germ., vol. i, p. 50, tab. xiv, fig. 10, 1826.
— — *F. A. Rœmer*, Die Verstein. des Norddeutschen Kreidegebirges, p. 25, 1840.
— — *Morris*, Cat. of Brit. Fossils, p. 38, 1843.
FUNGIA CLATHRATA (?) *Geinitz*, Grundriss der Versteinerungskunde, tab. xxiii, fig. 2, 1849.

Corallum simple, lenticular, short; its under surface horizontal or slightly concave; its upper surface somewhat convex. Mural disc completely naked and regularly perforated by small intercostal pores. *Costæ* closely set, almost straight, equally narrow, not prominent, and but slightly echinulated; only twelve of them arise in the centre of the disc, but these soon bifurcate, and the twenty-four costæ so formed soon divide again; at about half the distance from the centre to the circumference of the disc each costa bifurcates once more, and the two terminal costæ so formed are grouped two by two towards the periphery of the disc. The granulations which form all these costæ are not very distinct, and are arranged in single lines. *Calicular fossula* small and not very deep, but well marked and rather elongated laterally. *Columella* very small, oblong, and subpapillose. *Septa* forming five complete cycla, and corresponding to the intercostal spaces; those of the last cyclum quite rudimentary; the others tall, thin, straight, and united by sub-spiniform trabiculæ. Those of the first cyclum larger than the others, and augmenting slightly in thickness towards the middle; the secondary ones almost as large; all delicately denticulated along their upper edge, and much thinner towards their outer and inferior angle than in any other part. Diameter, three or sometimes four lines; height, one line and a half.

The above-described fossils were found in the Greensand at Warminster, in Wiltshire, and according to William Smith, who was the first author that mentions this fossil, are also met with at Chute Farm and Puddle Hill, near Dunstable.

By an attentive comparison with the specimens described by Goldfuss, and belonging to the Poppelsdorff Museum at Bonn, we have ascertained the specific identity of this British Coral with the *Fungia coronula* found in the chalk of Essen. Specimens exist in Mr. Bowerbank's cabinet, and in the collections belonging to the Geological Society, the Museum of Paris, the Museum of Bonn, and M. Defrance at Sceaux, who has designated it by the unpublished name of *Fungia dubia*.

CHAPTER VI.

CORALS FROM THE GAULT.

The Fossil Corals contained in the Gault are more numerous than those imbedded in the upper greensand and the lower chalk. Most of them belong to the family of Turbinolidæ, and the principal localities where they have been met with in England are Folkstone and Cambridge.

Family TURBINOLIDÆ (p. xi).

Tribe CYATHININÆ (p. xii).

1. *Genus* Cyathina (p. xii).

Cyathina Bowerbankii. Tab. XI, fig. 1, 1 *a*, 1 *b*.

Cyathina Bowerbankii, *Milne Edwards* and *J. Haime*, Monogr. Turbin., in Ann. des Sc. Nat., 3me série, vol. ix, p. 292, 1848.

Corallum simple, elongated, turbinate, very narrow, and slightly bent near the basis, which does not appear to have expanded much. *Wall* quite naked. *Costæ* almost flat, distinct from the basis, or nearly so, covered with small granulations, nearly equal, and showing a slight tendency to form binary groups. *Calice* circular. *Columella* not much developed, and composed of twisted blades. *Septa* forming four complete cycla; very thin, but slightly granulated, and rather unequal. Those of the last cyclum very little developed, and the tertiary ones rather thickened towards the inner edge. *Pali* corresponding to the penultimate cyclum of septa, and rather broad. Height of the coral, eight or nine lines; diameter of the calice, three lines and a half.

This fossil was found in the Gault at Folkstone, by our friend Mr. Bowerbank. All the specimens that we have seen were very incomplete, but some showed all the principal characters represented in the figures which we have given.

C. Bowerbankii is easily distinguished from *C. Smithii* and *C. pseudoturbinolia*, by not having a fifth cyclum of septa. It differs also from *C. arcuata* by the delicacy of its septa, and from *C. Guadalpensis* by the circular form of its calice, and its round columella.

C. cylindrica, *C. Bredæ*, and *C. Koninckii*, have only six large *pali*, whereas in *C. Bowerbankii* the number of these organs amounts to twelve. *C. lævigata*[1] differs from the above-described species, by the pali being narrow, and very thick, and *C. Debeyana* by the existence of a well-marked epithecal band near the calice.

M. Alcide d'Orbigny has, in a recent publication,[2] referred to this species as the type of his new genus *Amblocyathus*, which he defines as being *Cyathina*, with a circular calice and a round columella. He adds that Amblocyathus is a lost genus, and contains three fossil species belonging to the Neocomian and Albian[3] strata. We must, however, beg leave to remark, that the two above-mentioned characters are met with in almost every species of our Cyathina, and most especially in *C. cyathus*, which is the type of the genus *Cyathina*, and is actually living in the Mediterranean sea. Only two of the species referred to the genus Cyathina in our 'Monograph of the Turbinolidæ' present a slightly oval calice and a transversal columella—*C. pseudoturbinolia* and *C. Guadulpensis*. In *C. Smithii* the columella is oblong, but the calice is circular, or nearly so. If it be considered necessary to separate the Cyathina with a circular calice from those that have an oval calice, it would therefore be more proper to give a new generic name to the latter, and not to change the denomination of the group containing the very species for which Ehrenberg first established the genus Cyathina. But this innovation, proposed by M. d'Orbigny, appears to us as being in every respect unnecessary, for the slight deformation of the calice and the columella which forms the sole basis of the new generic division, can hardly be considered as characters of sufficient value; species that differ in no other respect are often found to vary in this way, and even specimens belonging to the same species sometimes differ much in the form of the calicular margin. Thus, although the calice is circular, or nearly so, in most specimens of *C. cyathus* and *C. Smithii* that are met with, we have seen some that were compressed, and had the calice as oval as in *C. pseudoturbinolia* and *C. Guadulpensis;* similar deviations from the normal form are also to be met with in the columella; in *C. Smithii*, for example, this organ is sometimes quite circular, although it is in general oblong. Differences of this kind, when not more marked than is the case among the various species of Cyathina, can therefore scarcely be deemed important enough to characterise generic divisions; and, as in the present case, they do not appear to coexist with any other structural peculiarity, we see no reason for admitting the new genus *Amblocyathus*.

[1] Tab. ix, fig. 1.

[2] Note sur des Polypiers Fossiles, Paris, 1849.

[3] M. d'Orbigny employs the name of *Albian* formation to designate the *Gault*.

2. *Genus* Cyclocyathus (p. xiv).

Cyclocyathus Fittoni. Tab. XI, fig. 3, 3 *a*, 3 *b*.

Corallum simple, discoidal, short; mural disc horizontal, or slightly concave, and presenting in its centre a small, irregular cicatrix, indicative of its primitive adherence. *Epitheca* very thin, presenting some slight concentric striæ, and not preventing the radiate costæ from being visible. These are straight, and not very prominent; but those of the first and second order are well marked. The edge of the mural disc is thin, and slightly prominent. The upper or *calicular surface* of the corallum is rather convex externally, and concave towards the centre. The fossula is shallow, but large, and well marked. *Columella* fasciculate, well developed, and terminated by a broad, papillose surface. *Septa* forming four complete cycla. The six fundamental septal systems distinct, but the septa of the second order not differing much from those of the first order. All the septa well developed, straight, rather thick exteriorly, arched above, and granulated laterally; their outer edge somewhat crenulated, granulose, slightly concave near the mural disc, and projecting a little towards the upper part. *Pali* well developed, very distinct from the septa, and corresponding to those of the third cyclum. Height of the corallum, two or three lines; diameter, in general not more than five or six lines.

This fossil is the only known species of the genus *Cyclocyathus;* its form renders it very remarkable. It has been found in the Gault at Cambridge, Drayton, West Malling, and Folkstone, but appears to be most abundant in the last-mentioned locality. The specimens here described belong to the collections of the Geological Society, of Mr. Bowerbank, and of Mr. D. Sharpe.

3. *Genus* Trochocyathus (p. xiv).

1. Trochocyathus conulus. Tab. XI, fig. 5, 5 *a*.

Caryophyllia conulus, (?) *Phillips*, Illust. of the Geol. of Yorkshire, tab. ii, fig. 1, 1829. (A rough figure without any description.)

— — *Michelin*, Mém. de la Soc. Géol. de France, vol. iii, p. 98, 1838.

Turbinolia conulus, *Michelin*, Icon. Zooph., p. i, pl. i, fig. 12, 1840.

Trochocyathus conulus, *Milne Edwards* and *J. Haime*, Monogr. des Turbin., Ann. des Sc. Nat., 3me série, vol. ix, p. 306, 1848.

Corallum simple, turbinate, rather elongate, straight or slightly bent, and pedicellated. *Wall* presenting in general some slight traces of an incomplete epitheca. *Costæ* simple, distinct from the basis, closely set, delicately granulated, not very prominent, and alternately

of unequal size towards the calicular edge. *Calice* almost circular, or somewhat oval and shallow. *Columella* fascicular, well developed, not prominent at its apex, and terminated by ten or fifteen papillæ of equal size. *Septa* forming four complete cycla and six well-marked, equally developed systems, in which, however, the secondary ones differ but little from those of the first cyclum. The septa are slightly exsert, closely set, unequal, and rather thicker outwards than towards the columella. *Pali* narrow and unequal; those corresponding to the tertiary septa broad and rather stout; the others, and most especially those corresponding to the primary septa, narrow and thinner. Height of the corallum, seven or eight lines; diameter of the calice, almost seven lines.

This species belongs to the first section of the genus Trochocyathus (*T. simplices*), and differs from *T. impari-partitus*[1] and *T. Bellingherianus* by not having a fifth cyclum of septa; its general form distinguishes it from *T. mitratus*,[2] *T. crassus*, *T. simplex*, and *T. costulatus*, which are all short, broad, and curved; and from *T. elongatus*, *T. Koninckii*, and *T. gracilis*, which are much elongated, curved, and very narrow towards the basis. It appears to resemble most, especially by its general form, *T. cupula*,[3] which is also conical and straight, but this last-mentioned species differs from it by the thickness and strong granulations of the septa, and by the breadth of the basis.

Trochocyathus conulus appears to have been very widely spread in the seas where the Gault formations were deposited. The specimens which we most particularly studied were

[1] See our Monograph of Turbinolidæ, loc. cit., p. 307.

[2] Since the publication of our Monograph of the Turbinolidæ (in 1848) we have recognised that the fossils from Tortona, which M. Michelotti designates under the name of *Turbinolia plicata*, do not differ specifically from the specimens existing in the Poppelsdorf Museum under the name of *Turbinolia mitrata*, Goldfuss. As we already expected, the latter specific name must therefore be substituted for the one employed by M. Michelotti, and M. Michelin.

[3] This new species, designated under the name of *Turbinolia cupula*, by M. Alex. Rouault, (Bulletin de la Soc. Géol. de France, 2^{me} série, vol. ix, p. 206, 1848), was found by that geologist at Bos d'Arros, in the department of the Lower Pyrennees, and does not appear to differ from a fossil which exists in the collection of M. Nyst, and was found in the Eocene formation at Lacken, near Brussels. *Trochocyathus cupula* belongs to the first section of our genus Trachocyathus, and presents the following characters:

Corallum straight, or almost so, subturbinate, but short, and having a broad peduncle, but not remaining adherent in the adult state. *Costæ* distinct from the basis, straight, unequally developed alternately, rather prominent, especially near the calice, granulated and striated transversely; rudimentary costæ, that do not correspond to any septa, are seen in the intercostal furrows. *Calice* circular; fossula not deep. *Columella* crispate, well developed. *Septa* forming three complete cycla, and in general a fourth incomplete cyclum in one half of three of the systems; exsert, rather unequal, strong, and presenting on their lateral surfaces large prominent granulations, which are arranged in lines nearly parallel to the upper edge. *Pali* thick, strongly granulated, and unequal; those corresponding to the tertiary septa the largest in the half systems where the septa of the fourth cyclum exist, and those corresponding to the secondary septa most developed in the other part of the calice. Height of the corallum, three lines; diameter of the calice almost as much. By the strong granulations of the septa, and the breadth of its basis, this species tends to establish a transition between the genus *Trochocyathus* and the genus *Paracyathus*.

found near Cambridge, in England; at Gatis de Gerodot, Dienville, near Brienne (department of the Aude), and Etrepy (department of the Marne), in France. Other specimens, which in all probability belong also to this species, are designated in M. Michelin's collection as having been found at Novion-en-Porcien; at Macheromenil, in the Ardennes, and at the Perte du Rhone, in the department of the Ain; but we suspect that some mistake may have been made in the labelling of the specimen which is designated in the same collection as belonging to the chalk of Tournay, in Belgium. We must also add, that the fossil designated by Professor J. Phillips under the name of *Turbinolia conulus* was found by that eminent geologist at Speeton, in Yorkshire; but its characters are not sufficiently well known for us to be able to identify it with the above-described species, specimens of which exist in the collections of the Geological Society, of the Museum at Paris, and of MM. d'Orbigny, Michelin, and Milne Edwards.

M. Al. d'Orbigny has lately given the name of *Aplocyathus*[1] to those species of our genus Trochocyathus in which the calice is circular. If this new generic division was adopted, the species here described would be referred to it; but that is not, in our opinion, advisable. The calice, which is quite circular in a great many species of our genus Trochocyathus, becomes slightly elongated in some, quite elliptical in others, and not only would the line of separation be difficult to establish between these different forms, but certain species which are evidently most closely allied by all their other organic characters, would be separated generically in the classification proposed by M. d'Orbigny. We cannot, therefore, adopt his views in this respect; but, in justice to that distinguished palæontologist, we must remark that the species[2] chosen by him as the type of his genus *Aplocyathus* differs much in its general aspect from most species of our genus Trochocyathus, and, when more completely known, may be found to present characters of sufficient value to authorise the establishment of a separate generic group, which must then be so defined as not to comprehend *T. conulus*, nor most of the other species that have a circular calice.

2. Trochocyathus Harveyanus. Tab. XI, fig. 4, 4 *a*, 4 *b*.

Trochocyathus Harveyanus, *Milne Edwards* and *J. Haime*, Monogr. des Turbinolides, in Ann. des Sc. Nat., 3me série, vol. ix, p. 314, 1848.

Corallum simple, straight, short, almost hemispherical, and terminated by a very short peduncle, the basal surface of which is concave. *Costæ* distinct from the basis, and delicately striated transversely; the primary and secondary ones very prominent and sharp; those of the third cyclum well developed along the upper half of the wall, but those of the fourth cyclum very small and obscure. *Calice* circular and flat; fossula shallow. *Columella* well developed and papillose. *Septa* forming four complete cycla; exsert, thin,

[1] Note sur des Polypiers Fossiles, p. 5, 1849.

[2] The *Trochocyathus armatus*.

broad, straight, granulated laterally, unequally developed, but not differing much in the first and second cycla. *Pali* corresponding to the septa of the first three cycla, rather narrow, and unequally developed in an inverse ratio to the corresponding septa; no pali in the radii of the septa belonging to the fourth cyclum. Height of the corallum, three lines; diameter of the calice, four lines.

This species belongs to the fourth section of our genus Trochocyathus (*T. breves*), and consequently its characters need not be compared with those of the various species belonging to the sections of the *T. simplices*, *T. cristati*, and *T. multistriati*, the description of which may be found in our 'Monograph of the Turbinolidæ.' It differs from *T. obesus*, *T. armatus*, and *T. perarmatus*,[1] by not having any costal spines, and from *T. Michelini* by the costæ being distinct down to the basis, and by its general form being less depressed. It appears to be most closely allied to the fossil which we shall next describe under the name of *Trochocyathus* (?) *Konigi*, but is of a more slender form.

T. Harveyanus was found in the Gault at Folkstone, the birthplace of the illustrious physiologist to whom we have dedicated this species. The specimens here described belong to the collections of Mr. Bowerbank and Mr. D. Sharpe.

3. Trochocyathus (?) Konigi.

Turbinolia Konigi, *Mantell*, Illust. of the Geol. of Sussex, p. 85, tab. xix, figs. 22, 24, 1822.
— — *Fleming*, British Animals, p. 510, 1828.
— (trochocyathus?) Konigi, *Milne Edwards* and *J. Haime*, Monogr. des Turb., in Ann. des Sc. Nat., 3me série, vol. ix, p. 335, 1848.

The specimens of this fossil figured by Mr. Mantell, and those which we have seen in the collections of MM. d'Orbigny and Michelin, are in a very bad state of preservation,

[1] This species, which has been lately designated under the name of *Turbinolia perarmata* by M. Talavignes, but has not yet been described, and has been given to us by that geologist, was discovered at Fabresan, in the department of the Aude. M. Alex. Rouault has since then met with the same species at Bos d'Arros in the Lower Pyrennees. (See Bull. Soc. Géol., 2me série, vol. v, p. 206.) It may be recognised by the following characters:

Corallum very short, subdiscoidal; its under surface flat and almost smooth; sometimes adhering to a small shell. *Costæ* distinct near the calice, projecting very little, closely set, almost equal, and delicately granulated; those of the first cyclum not differing much from the others, but bearing, at a short distance from the calicular edge, a strong spiniform appendix, which is rather compressed, extends outwards, and presents, on its under edge, a small pointed tubercle. *Calice* circular. *Septa* forming four complete cycla and six equally developed systems; closely set, rather exsert, thin, and unequally developed; but those of the second cyclum differing very little from the primary ones. *Pali* narrow and rather thick. Height of the corallum, one line and a half; diameter of the calice, two lines and a half. Fossil from the Nummulitic formation at Fabresan and Bos d'Arros.

and have lost their walls; we are, therefore, unable to characterise the species with any degree of precision, and it is with much doubt that we refer it to the genus Trochocyathus, for we are not as yet sufficiently satisfied as to the existence of pali. M. Michelin is of opinion that these fossils are merely specimens of *Trochocyathus conulus* with their basis worn away. They are of a conico-convex form, and are broader in proportion than *T. Harveyanus*, to which they bear, however, great resemblance. Their height is about four lines, and their diameter a little more. We have not considered it necessary to give a new figure of these corals, for the specimens in our possession do not show anything more than those represented in Dr. Mantell's plates.

The specimens that we have had an opportunity of examining were found in the Gault at Folkstone, in the environs of Boulogne-sur-Mer, at Wissant, at Les Fiz, near Chamounix, and at the Perte du Rhone, in the department of the Ain. According to Dr. Mantell the same species is met with at Lewes in Sussex, and Godstone in Surrey, at Malling in Kent, in Cambridgeshire,[1] at Ringmer, and at Bletchingley.[2]

Trochocyathus (?) Warburtoni.

We are inclined to think that a cast found in the Gault of Cambridgeshire by Mr. H. Warburton, and presented by that gentleman to the Museum of the Geological Society, must belong to a distinct species of Trochocyathus. It is about six lines in height, and seven in diameter; the number of septa is forty-eight. For the sake of convenience we have given a specific name to it, but we are not able to characterise it.

4. *Genus* Bathycyathus (p. xiii.)

Bathycyathus Sowerbyi. Tab. XI, fig. 2, 2 *a*.

Bathycyathus Sowerbyi, *Milne Edwards* and *J. Haime*, Monogr. des Turbinolides, Ann. des Sc. Nat., 3me serie, vol. ix, p. 295, 1848.

Corallum simple, adherent by a broad basis, straight, tall, compressed, and having its lateral edges somewhat prominent. *Wall* delicately granulated. *Costæ* not very distinct in the lower half of the corallum, but becoming rather prominent higher up, especially those of the first and second orders. *Calice* elliptical and horizontal, the relative length of its long and short axis varying much (in one specimen = 100 : 170, and in another = 100 : 250). *Fossula* narrow, and appearing to be deep, but completely filled up with extraneous matter in all the specimens that we have seen, so as not to enable us to obtain any knowledge respecting the columella and the pali. It is therefore with some uncertainty that we refer this species to the genus Bathycyathus, and in doing so we have been guided

[1] Geol. of Sussex. [2] Trans. of the Geol. Soc., s. 2, vol. iii, p. 210.

only by characters of secondary value, which agree, however, very well with those of the other Corals belonging to the same generical division. *Septa* forming four complete cycla; exsert, thick exteriorly, but thin inwardly, and presenting but few granulations on their lateral surfaces. Those of the second cyclum almost as large as the primary ones; the tertiary ones but little developed, although they correspond to large costæ, and not as tall as those of the last cyclum, which are grouped very closely on each side of the primary and secondary ones. Height of the corallum, one inch two or three lines; great diameter of the calice, six or seven lines.

The genus *Bathycyathus* contains two other species, which are both recent: *B. Chilensis*[1] and *B. Indicus*,[2] which differ from *B. Sowerbyi* in having an additional cyclum of septa, the calice arched, and the costæ more developed near the basis. We have seen but two specimens of this fossil; one, belonging to the collection of Mr. D. Sharpe, is catalogued as having been found in the Gault near Folkstone; the second, belonging to the museum of the Geological Society, is referred with doubt to the upper greensand of Kidge, in Wiltshire.

Family ASTREIDÆ (p. xxiii).

Tribe EUSMILINÆ (p. xxiii).

1. *Genus* Trochosmilia (p. xxiv).

Trochosmilia sulcata. Tab. XI, fig. 6, 6 *a*, 6 *b*.

Corallum simple, turbinate, straight, tall, much compressed, subpedicellate, and appearing to be free. *Wall* presenting on each side two deep longitudinal furrows. *Costæ* distinct from the basis, slightly prominent, closely set, and unequal, especially towards their upper end. *Calice* elliptical, sublobulated, and slightly arched; its long and short axis in the proportion of 100 : 200. *Fossula* very narrow, elongated, and not very deep. No *columella*. *Septa* forming four cycla or more, rather unequal, closely set, thin, and slightly exsert. *Dissepiments* not numerous. Height of the corallum, nearly one inch; diameter of the calice, six or seven lines by three; depth of the fossula, two lines and a half.

We have seen but one specimen of this fossil, which, although somewhat weather-worn, appeared sufficiently distinct from all other species to authorise us in giving it a peculiar specific name. It differs from *Trochosmilia didyma*[3] by its calice being straight, and not

[1] See our Monograph of Turbinolidæ, tab. ix, fig. 5.

[2] Loc. cit., tab. ix, fig. 4.

[3] *Turbinolia didyma*, Goldfuss, Petref. Germ., vol. i, tab. xv, fig. 11.

bent in two; from *T. Boissyana*, *T. Patula*,[1] *T. cernua*, and *T. crassa*,[2] by being subpedicellated, and not adherent in the adult state; from *T. irregularis*, *T. corniculum*, *T. Faujasii*, *T. Gervillii*, and *T. uricornis*,[3] by being strongly compressed quite down to the basis; and from *T. Saltzburgiensis*, *T. cuneolus*, *T. compressa*, *T. complanata*, *T. Basochesii*, and *T. tuberosa*, by the existence of the above-mentioned four deep mural furrows. By their general form, all these corals much resemble many species belonging to the division of Cyathininæ, but differ from them, and from all other Turbinolidæ, by having interseptal dissepiments.

This fossil was found in the Gault at Folkstone, by Mr. Bowerbank.

The LITHODENDRON GRACILE, Goldfuss,[4] is mentioned by Mr. Morris[5] as having been found in the Gault of Kent, but as yet we have not met with any specimens of that species in any of the British palæontological collections.

[1] See our Monogr. des Astreides, Ann. des Sc. Nat., 3^{me} serie, vol. x, p. 236.

[2] We here designate, under the name of *Trochosmilia crassa*, the fossil described by M. Michelin under the name of *Turbinolia cernua*, Goldfuss, and by ourselves as *Trochosmilia cernua*; for, on comparing it with the specimens previously described by Goldfuss under the name of *Turbinolia cernua*, we have ascertained that they are not specifically identical.

The species which must retain the name first applied by Goldfuss presents the following characters:

Corallum pedicellated and strongly compressed quite from the basis. *Costæ* thin, alternately unequal; the larger ones rather prominent and somewhat lamellar. *Calice* arched and elongated in the proportion of 100 : 230. *Septa* thin, very closely set, and presenting on their lateral surfaces a great number of granulations arranged somewhat regularly in convex lines parallel to the upper edge. Forty-eight principal septa, separated by an equal number of small ones; some indications of an additional rudimentary cyclum. Height of the corallum, one inch and a half; long diameter of the calice, twelve lines; short axis, five lines. (The figure given by Goldfuss, tab. xv, fig. 8, is not quite accurate.)

[3] Monogr. des Astreides, loc. cit.

[4] Petref. Germ., vol. i, tab. xiii, fig. 2.

[5] Catalogue of British Fossils, p. 40.

CHAPTER VII.

CORALS FROM THE LOWER GREENSAND.

The remains of true Polypi are very rare in this part of the British geological strata; the fossil which Mr. Lonsdale has lately described under the name of *Choristopetalum impar*,[1] and which was found in the lower greensand at Atherfield, does not appear to us to belong to this class, and is, in our opinion, a Bryozoon. We have as yet met with but one species of Zoantharia, which can be referred with any degree of certainty to this formation.

Family STAURIDÆ (p. lxiv).

Genus Holocystis (p. lxiv).

Holocystis elegans. Tab. X, fig. 5, 5 *a*, 5 *b*.

Astrea, *Fitton*, On the Strata below the Chalk, in Geol. Trans., s. 2, vol. iv, p. 352, 1843.
Astrea elegans, *Fitton*, in Quarterly Journ. Geol. Soc., vol. iii, p. 296, 1847.
Cyathophora (?) elegans, *Lonsdale*, Proceed. of the Geol. Soc., vol. v, part i, p. 83, tab. iv, fig. 12, 15, 1849.

Corallum complex, astreiform, constituting a convex mass, and augmenting by extra calicular gemmation; the young individuals being produced at the point of junction of the surrounding calices. *Corallites* somewhat prismatic, and cemented together laterally, either by the direct union of their walls, or by means of the costæ, which are thick, and in general pretty well developed. *Calices* subpolygonal, separated in general by a simple but thick mural ridge; sometimes by walls that remain distinct, and are in their turn separated by a small intermural furrow. *Fossula* deep. *Columella* very small, and appearing to be styliform. *Septa* forming three complete cycla, and four well-characterised systems. The four primary ones much more developed than the others, reaching almost to the centre of the fossula, and giving to the calice a crucial character, which is never met with in Astreidæ, Oculinidæ, Turbinolidæ, &c. The septa are slightly exsert, closely set, thick exteriorly, and very slightly granulated laterally; they appear to have undivided edges, and they differ much in size, according to the cycla to which they belong. The interseptal *dissepiments* are simple, horizontal, or slightly convex, and placed at the same level in the different loculi,

[1] Proceedings of the Geol. Soc., vol. v, part i, p. 69, tab. iv, figs. 5 to 11, 1849.

so as to constitute by their union a series of complete tabulæ, subdivided by the primary septa, and distant from each other about one fifth of a line. Exothecal dissepiments much resembling the preceding ones. Diameter of the calices, and depth of the fossula, about one line and a fourth.

Fossil from the lower greensand at Redhill cutting, Atherfield, in the Isle of Wight, and at Peasemarsh.

The specimens here described belong to the Museum of the Geological Society, and had been named by Mr. Lonsdale. The propriety of establishing a new generical division for this remarkable coral, was very judiciously pointed out by that indefatigable palæontologist; but, guided by reasons which we do not quite understand, he refers, with a sign of doubt, this same species to the *Cyathophora* of M. Michelin, a genus which, in our opinion, does not differ from true *Stylina*. The genus *Holocystis* differs from our genus *Stauria* by its extra calicular gemmation, and its costulated walls. It is the most modern representative of the great division of Zoantharia rugosa, which becomes predominant in the Palæozoic formations, and is principally characterised by the tendency to a quadrate arrangement of the constitutive parts of the Corallites, whereas in the other sections of Zoantharia, six is the fundamental number of the radiate organs.

Table I-VII removed

TAB. VIII.

CORALS FROM THE UPPER CHALK.

PARASMILIA CENTRALIS (p. 47).

Fig. 1. A young specimen; natural size.

1 *a*. The same, magnified to show the structure of the wall.

1 *b*. Vertical section, magnified, so as to show the structure of the columella, the dissepiments, &c.

1 *c*. Calice, magnified; 1, septa of the first cyclum; 2 secondary septa; 3, septa of the third cyclum; 4, 5, septa of the fourth and fifth orders, constituting the fourth cyclum.

1 *d*, 1 *e*. Specimens remarkable by their great length.

PARASMILIA MANTELLI (p. 49).

Fig. 2. Side view of the corallum; natural size.

2 *a*. The same, magnified.

PARASMILIA SERPENTINA (p. 51).

Fig. 3. Side view of the corallum; natural size.

3 *a*. Calice, magnified.

3 *b*. Portion of the wall, magnified.

CŒLOSMILIA LAXA (p. 52).

Fig. 4. Side view of the corallum; natural size.

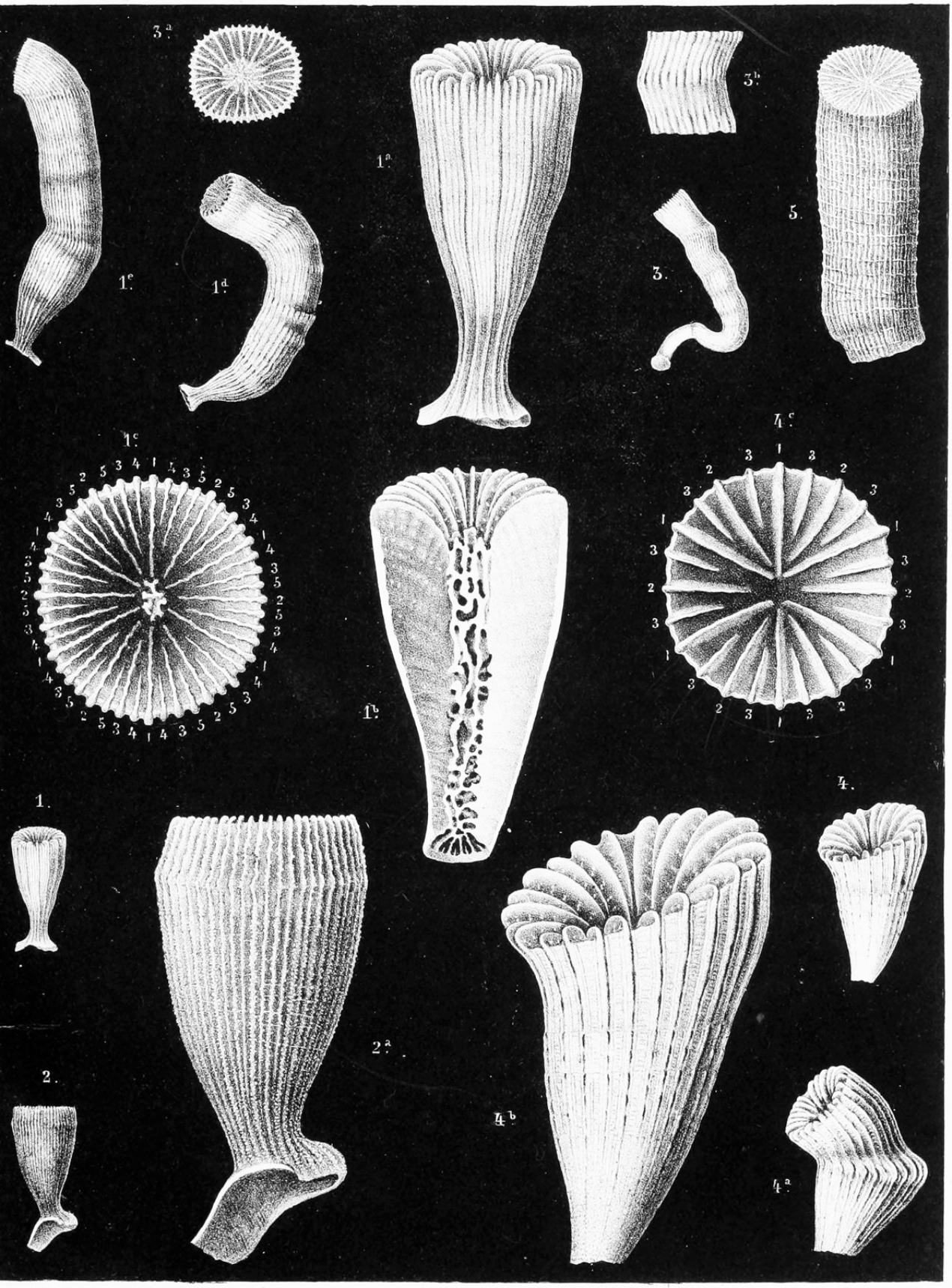
4 *a*. A specimen, the growth of which has been intermittent; natural size.

4 *b*. The specimen No. 4, magnified, to show the structure of the wall.

4 *c*. Calice, magnified.

PARASMILIA CYLINDRICA (p. 50).

Fig. 5. Side view of the corallum; natural size.



Dickmann del.

Day & Son. lith.

TAB. IX.

CORALS FROM THE UPPER CHALK.

CYATHINA LEVIGATA (p. 44).

Fig. 1, 1 *a*, 1 *b*. Specimens of different forms; natural size.

1 *c*. Calice of the specimen fig. 1, magnified. It is to be remarked that in this specimen there are only nine pali; these organs not existing in the half systems, where the septa of the fourth cyclum are not developed.

1 *d*. Calice of the specimen fig. 1 *b*, magnified, and showing the twelve pali and the complete fourth cyclum of septa.

PARASMILIA FITTONI (p. 50).

Fig. 2. Side view of the corallum; natural size.

2 *a*. Specimen of a different form, magnified to show the structure of the wall.

2 *b*. Calice, magnified.

CORALS FROM THE LOWER CHALK.

SYNHELIA SHARPEANA (p. 53).

Fig. 3. A branch of this compound corallum; natural size.

3 *a*. Portion of the same magnified.

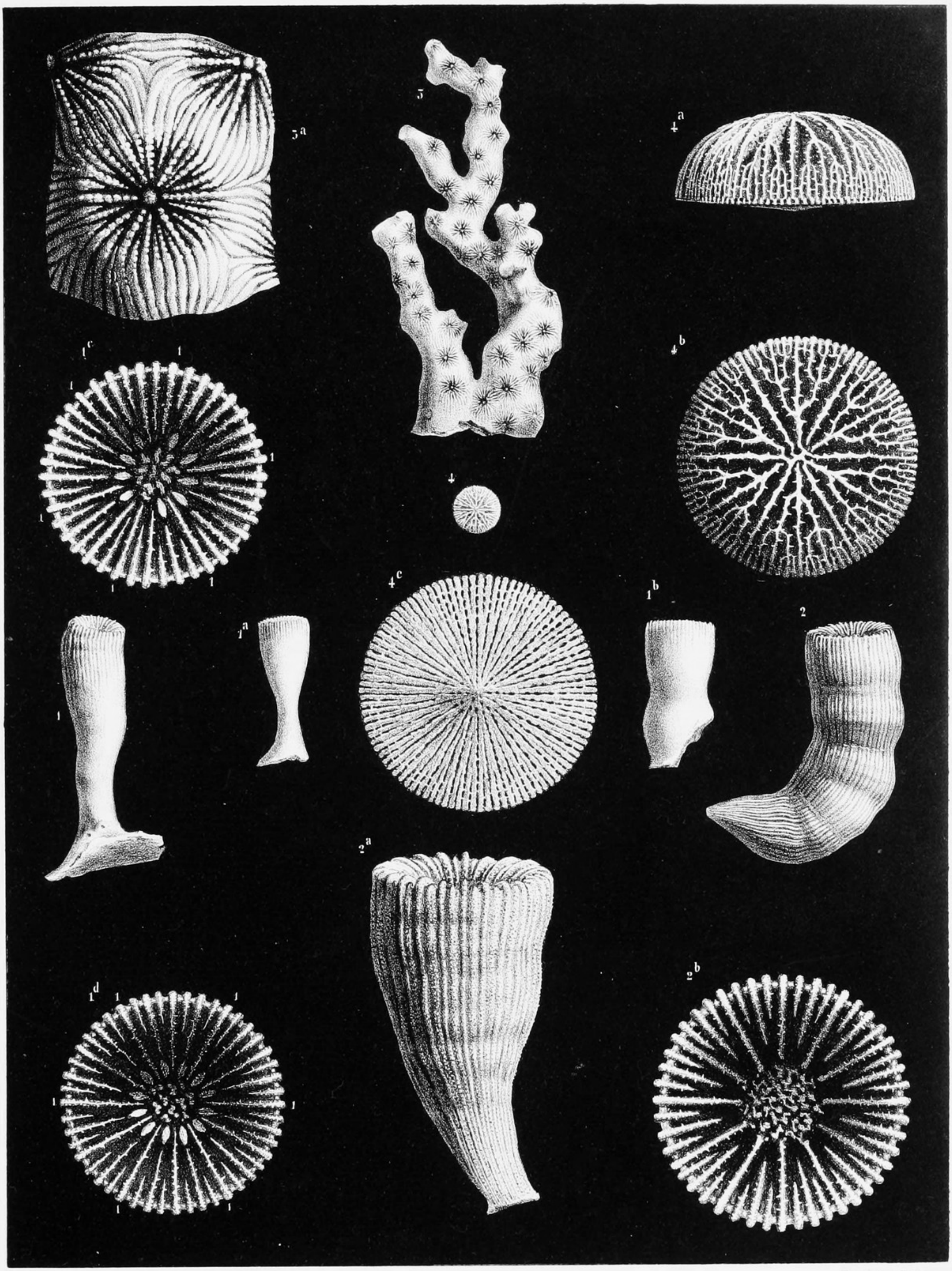
STEPHANOPHYLLIA BOWERBANKII (p. 54).

Fig. 4. Calicular surface; natural size.

4 *a*. Side view of the same, magnified.

4 *b*. Calice, magnified.

4 *c*. Mural disc, magnified.



J. Delarue del.   Day & Son, lith.

TAB. X.

CORALS FROM THE UPPER GREENSAND.

PEPLOSMILIA AUSTENI (p. 57).

Fig. 1. Restored figure of the corallum; natural size.

1 *a*. Calice; natural size.

1 *b*. A broken specimen, showing part of the epitheca, the columella, and the structure of the septa.

TROCHOSMILIA TUBEROSA (p. 58).

Fig. 2. Side view of the corallum; natural size.

2 *a*. Calice, magnified.

PARASTREA STRICTA (p. 59).

Fig. 3. A mass of this compound corallum; natural size.

3 *a*. Portion of the calicular surface, magnified.

MICRABACIA CORONULA (p. 60).

Fig. 4. Calicular surface; natural size.

4 *a*. Side view, magnified

4 *b*. Calice, magnified.

4 *c*. Mural disc, magnified.

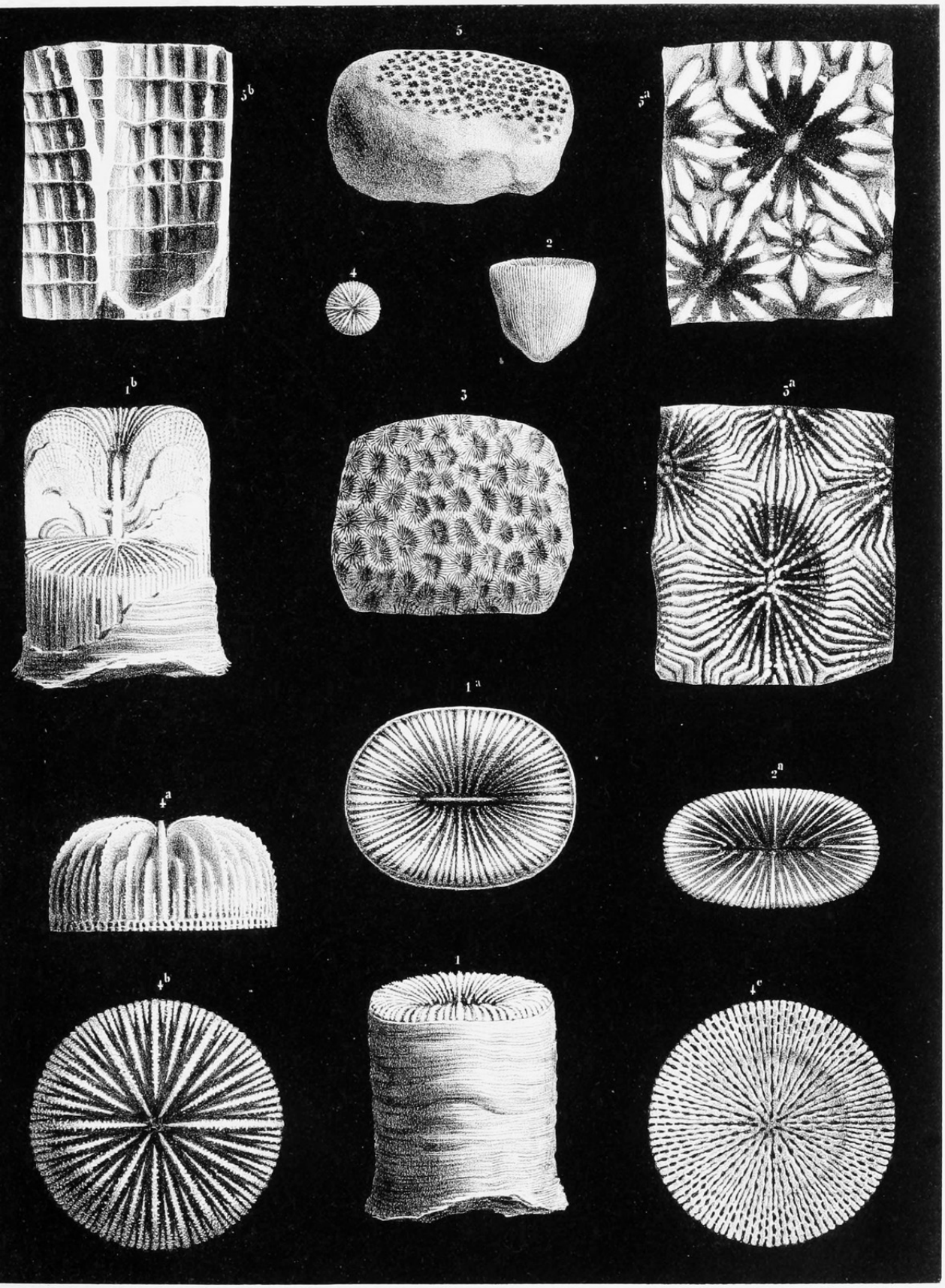
CORALS FROM THE LOWER GREENSAND.

HOLOCYSTIS ELEGANS (p. 70).

Fig. 5. A globose mass of this compound corallum; natural size.

5 *a*. Portion of the calicular surface, magnified.

5 *b*. Vertical section, magnified, of the visceral chambers in which the septa have been partly cut away, in order to show the tabular arrangement of the dissepiments.


5
5b
5a
4
2
1b
3
5a
1a
4a
2a
4b
1
4c

TAB. XI.

CORALS FROM THE GAULT.

CYATHINA BOWERBANKII (p. 61).

Fig. 1. A weather-worn specimen; natural size.

1 *a*. A specimen showing the wall, but not the calicular margin.

1 *b*. Horizontal section made near the calice, and magnified, to show the position of the pali, &c.

BATHYCYATHUS SOWERBYI (p. 67).

Fig. 2. Side view of a specimen, magnified, so as to show the structure of the wall. The line placed on the side shows the natural size of the corallum.

2 *a*. Calice magnified; the upper half is represented in its natural state, but in the under half the septa have been cut down; the centre is clogged up with extraneous matter.

CYCLOCYATHUS FITTONI (p. 63).

Fig. 3. Side view of the corallum, magnified. The line placed below shows the natural size of the specimen.

3 *a*. Calicular surface, magnified.

3 *b*. Under surface, or mural disc, magnified.

TROCHOCYATHUS HARVEYANUS (p. 65).

Fig. 4. Side view of the corallum; natural size.

4 *a*. Calicular surface, magnified.

4 *b*. Under surface, magnified.

TROCHOCYATHUS CONULUS (p. 63).

Fig. 5. Side view of the corallum; natural size.

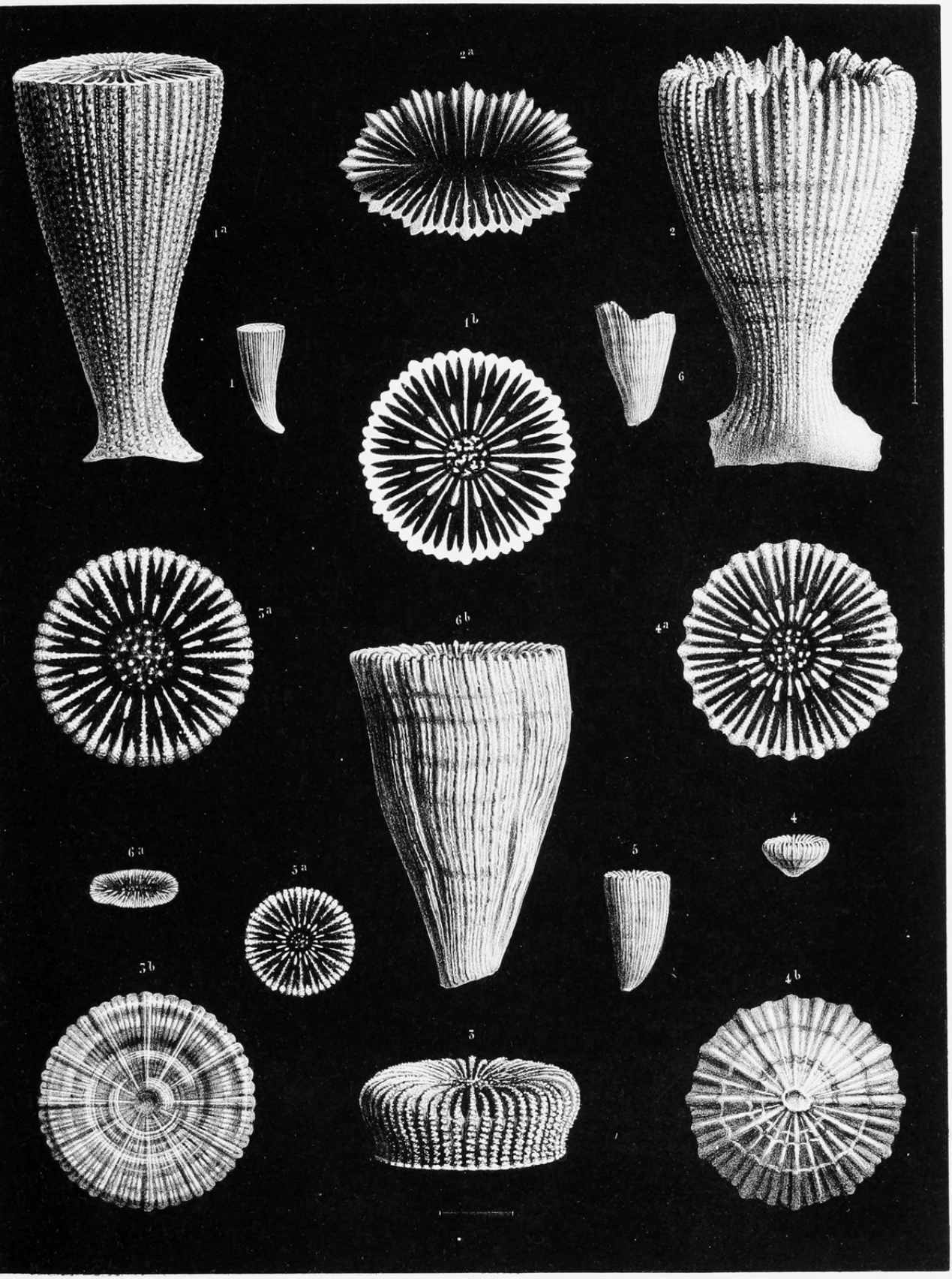
5 *a*. Calice, magnified.

TROCHOSMILIA SULCATA (p. 68).

Fig. 6. Side view of a specimen, the upper part of which is broken on one side; natural size.

6 *a*. Calice, magnified.

6 *b*. A restored specimen, magnified.



J. Delarue del.

Dark Smith lith.

TABLE

OF THE

BRITISH FOSSIL CORALS

DESCRIBED AND FIGURED IN THIS WORK.

CRAG.

LONDON CLAY.

UPPER CHALK.

LOWER CHALK.

UPPER GREEN SAND.

DEVONIAN FORMATION.

SILURIAN FORMATION.

GENERAL INDEX.[1]

[1] The names printed in *italics* are those adopted in this work, the others are those quoted as synonyms.

D.

G.

H.

M.

R.

S.