On some Australian Tertiary Corals.

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[*Read before the Royal Society of N.S.W., 7 November,* 1877.]

THE subject of the Australian fossil corals has occupied much attention among geologists of late years. Deep-sea dredging has brought them into prominent notice, for not only have several missing links of past palæontological history been thus discovered, but our fossils have been found to possess remarkable features of their own and remarkable affinities with fossils in remote places. It was in 1865 that attention was first drawn to them by Prof. Duncan, at present holding the honorable position of President of the Royal Geological Society of London. In the year referred to he published in the *Annals of Nat. History* the results of his examination of a small parcel of corals sent by me to him, from the tertiary beds of Muddy Creek in Western Victoria. It was supposed at the time that some of them came from Mount Gambier, but this was not the case. The Mount Gambier limestones are singularly destitute of corals, though they are wonderfully rich in Polyzoa. They all came from the bed of argillaceous limestone which underlies the basalts at Muddy Creek about 5 miles from Hamilton in Western Victoria. The result of Prof. Duncan's examination was that seven or eight new species were added to science, all of which possessed features of singular interest, with the usual array of Australian "*abnormalities*" as they are called. The relations were mostly with Miocene forms, and the living species among them were Australian but tropical. Prof. Duncan's researches were followed up by a very elaborate monograph in the *Proc. of the Geological Society of London* for 1870, in which he not only gave a complete review of all the species known to him and several new ones which he added, but he exhaustively dealt with their affinities and entered largely into the whole question of Australian Tertiary geology. By this means we became acquainted with many new species and two new genera, including *Flabellum*, *Placotrochus*, *Sphenotrochus*, *Conotrochus*, *Trochocyathus*, *Deltocyathus*, *Caryophyllia*, *Palæoseris*, *Amphehelia*, and *Balanophyllia*. Subsequently I was enabled to examine the fossils of Table Cape, Tasmania, a parcel of corals from which yielded many of the Australian forms, and Prof. Duncan was enabled to add two entirely new species of genera not hitherto found, namely, *Dendrophyllia* and *Thamnastræa*. What gave especial interest to these forms were, that they were reef-builders, whereas all the other species described were small pedicellate solitary corals (with the exception of *Amphihelia*) living at moderate depths at the bottom of the ocean.

Up to this time I have always been enabled to send to the learned Professor Duncan all my collections in this particular department, and here am glad to acknowledge with what courtesy and painstaking industry he has always addressed himself to their examination. I regret that I am not now able to avail myself of his aid. But latterly I have found in various public and private museums specimens which I am unable to send away for determination, and therefore am obliged, though fully aware of my own deficiencies for such a task, to undertake their investigation and description. I think it due to science to state that I feel my insufficiency, and the great help I shall receive from what my predecessor in this matter has done, without which I would not undertake it at all.

I must here state, for the information of my readers in Australia, that this branch of Natural History, the Corals, has been very carefully worked out of late years. The great standard authority of the subject is the *Hist. Nat. des Corallaires, by Milne Edwards and Jules Haime* (3 vols. 8vo., with atlas), but the student must also receive large help from the various elaborate essays in the *Annales des Sciences Naturelles* (from 1848 upwards) by the same authors, and their monograph in the publications of the Palæontographical Society on British Fossil Corals. There is also a most complete treatise on the stony corals, by Prof. Duncan, in a late number of same Society's Monographs, which contains drawings and definitions of the various organs and terms in use. These leave but little to be desired, and with the aid of them determination of genera and species becomes a comparatively easy task. The literature of the Corals is very rich, including as it does the valuable researches of Peyssonel, Pallas, Savigny, Lamarck, and Lamouroux, and our own countryman Ellis, whose work (*Essay towards a Natural History of Corallines, London*, 1754) may still be consulted with advantage. I am glad to add that there are copies of these rare volumes in the Museum Library and in that of Mr. Macleay. It was not however until 1828 that any attempt at classification was made, founded upon the anatomy. This was commenced by Messrs. Milne Edwards and Audouin. They were the first to separate from the corals proper the more highly organized polyzoa and the much lower class of sponges. M. Cuvier about the same time showed the close relation between the actinæ or jelly-fish and the corals. Of late years, a great development has been given to all previous investigations by the labours of the eminent American naturalist Dana, whose work on the Zoophytes of Wilkes's United States Exploring Expeditions (1*vol.* 4*to.*, *Philadelphia*, 1846; *atlas fol.*, 1849) forms an epoch in the science. It may be as well to mention, for the information of students, that many important extracts from this work are given in *Silliman's American Journal of Sciences.*

My object in referring to the history of the classification of this order, is for the purpose of pointing out the modifications which an extended knowledge of Australian corals is likely to introduce. The complete work of Messrs. M. Edwards and Haime forms now the basis of the received systems in arranging the genera and families of corals; and though it is really a wonderful monument to the industry and sagacity—I may add genius—of the authors, yet I think most naturalists feel how artificial and arbitrary the system is. This must be the case with all systems, and in the corals, where we have so little to go upon—so few features upon which to erect generic and specific differences—it must be always felt. The difficulty that occurs to me is in determining the presence or absence of organs upon which generic distinctions are made to rest. Thus, in the *Turbinolidæ*, we have sub-family distinctions built on the presence or absence of pali, and this again made of generic value by their number, the presence or absence of a columella, its form, the costæ, &c. In the next group we have the first great divisions made upon the presence or absence of an epitheca, then comes the form of the columella, the adherence, &c. Now, in some of these particulars the Tertiary corals of Australia, and some of the recent forms which I am describing, unite the characters of two or three genera (*Conosmilia* &c.), or show gradations in structure which make the line of divisions exceedingly difficult to draw. Then again, we find peculiarities of structure which belong to a certain genus, though not essentially forming a basis for classification, reappearing in other genera which are remote in our present system. Take, for instance, the costal features. In the *Turbinolidæ* we find a very peculiar structure in five or six species. There are only three cycles of septa, while on the outside there is a very regular development of costæ, exactly like modified septa, only that there is one cycle more than the septa of the calice, and consequently we have a rib or septum on the outside without any septum on the inside to correspond with it. This will appear the more extraordinary if we call to mind what is the doctrine with regard to the costæ, and I must be pardoned for making an extract from Messrs M. E. and H.'s work (*Nat. Hist. des Cor.*, vol. 1, p. 58). "The *wall* not only gives origin to centripetal prolongations which we call septa, but bears also in most cases projections or laminæ analogous to the septa, which develop themselves in a contrary direction, and which we call costæ. These parts are susceptible of the same modifications as the septa, and are in fact only the exterior continuation of them, which is easily seen by examining the *Turbinolidæ*, *Phyllangia americana*, *Heliastræa Forskaliana*, and many other corals simple and compound. All that has been said of the septa, therefore, is true of the costæ as to their relative positions and modes of multiplication. Nevertheless, in certain rare cases, *Stephanophyllia* and *Micrabacia*, the costæ alternate with the external edge of the septa as if the two leaves which compose the edge of these were divided exteriorly from one another to unite with the external leaf of the neighbouring septum. On the other hand, in *Dasmia* one single rib corresponds with three septa. But these facts are exceptional, and nearly always the costæ are only distinguishable from the septa by their position outside the wall."

Now in our Australian corals we find that a very large proportion form an exception to this rule. The costæ do not correspond with the septa, but exceed them in number. If this took place in one genus alone, as it does in *Turbinolidæ*, we might not wonder so much, but it appears in remote genera. Thus we have this feature manifested in a marked manner in our living *Conocyathus sulcatus*, and, as I shall show in a species now to be described, it occurs in another species, and in a *Ceratotrochus*. In this case it seems as if the coral animal had its support on the outside. The existence of the septa is intimately connected with tentacles of the animal, and their number coincides exactly with those appendages. It is not known, or has it I believe been studied, what relation the costæ bear to the living animal. Fortunately there is one form yet surviving where the peculiar structure to which I refer can be seen, and naturalists of Sydney may make it well worth their while to ascertain the anatomical structure of *Conocyathus sulcatus*, which is so common at the mouth of the harbour.

I cannot however help raising the question as to the importance of the costæ in the matter of classification. It seems to me that where costæ predominate over the cycla, that in itself is a natural feature in the *Turbinolidæ* which should override minor details of the columella and so forth. We should thus group together corals whose living habits would probably be found to correspond, and we should not see, as we do now, corals which are closely united in one conspicuous feature distributed through three or four different genera. Distinctions founded on the columella and pali are most unsatisfactory: in very many cases it is impossible to distinguish between pali and a fasciculate columella; in others it depends much upon our fancy whether we describe the coral as without pali but with deeply lobed septa, or with pali attached to the septa. I make these remarks with the utmost diffidence, and not attempting to cause any confusion by creating new divisions, only let it be borne in mind that they are of importance, when we remember how badly preserved and how worn fossils often are from which new species and genera are created. A little wearing down may make a world of difference, when the classification rests on slight details. This department of Natural History still awaits its Linnæus to found a system that all would accept. We have not it is true those definite organs with ascertained functions that botanists possess, and probably we shall not have until the living animals are better understood. For most of our corals we must resign all hope of any further study than that which the stony portion will furnish, as the majority have flourished as past beauties of the earth's history, and are only known now as fossils. But light, and much light will come from those which still live, and probably for this we must wait. In the meantime I have drawn attention to these points, that abler and more learned naturalists may follow up.

I now proceed to describe the new species which I have to bring under the notice of the Society. They are all from Muddy Creek, near Hamilton, Western Victoria. I made a visit to that locality in December of last year, but was unfortunately taken ill while at the hospitable station of Mr. S. P. Winter of the Wannon, and so was obliged to content myself with two small boxes of clay from the edge of the creek which Mr. Winter's brother brought to me. These have been most industriously searched and sorted by Mr. Ramsay, the learned and zealous Curator of the Museum, and they have yielded many novelties. The corals were few, except the well known so called *Caryophyllia viola*, Duncan, which was very abundant, and which with a few specimens of a new species were the only *Caryophyllaceæ* present. The other genera were *Conocyathus*, *Sphenotrochus*, *Smilotrochus*, and *Conosmilia*, all of new and remarkable forms. I have been obliged to place in another genus, Prof. Duncan's *Caryophyllia*, and some other species since discovered, for reasons which will appear.

MADREPORARIA APOROSA. *Fam.* TURBINOLIDÆ.

Genus CERATOTROCHUS. *Edw. & Haime*, 1848.

Corallum, simple, free in adult state. Columella highly developed and fascicular; septa large and exsert; wall without any epitheca, presenting costæ which are distinct to the base, the principal being ornamented. Fossil only and tertiary—Miocene of Italy, Pliocene of Tuscany, Eocene of India. This genus was erected for species, all of which are highly ornamented with spines and crests, which is imperfectly represented in a worn specimen of doubtful character, the diagnosis of which I reserve for examples in better preservation.

Genus CONOCYATHUS. *D'Orb.*, 1849.

Corallum, simple, trochoid, straight, free, without trace of adherence, septa exsert, very granular, costæ prominent, no columella, pali before penultimate cycle.

We have only had one fossil species of this genus in the Miocene of Europe, but which has lately been found living at Port Jackson. I believe it to be distinct, and this opinion is strengthened by the curious discovery of two other species in our Miocene deposits.

CONOCYATHUS CYCLOCOSTATUS, N. S.—Corallum, cuneiform, very much compressed at the base, which is roundly or bluntly pointed and without trace of adherence. Costæ numerous, forming four cycla closely set, rounded but scarcely projecting, and without trace of ornament, the secondary ones beginning at the base and being with the first thicker at their origin, becoming thin higher up.. Tertiary costæ begin also a short distance from the base, but those of the fourth order at about a third, and the fifth near the edge of the calice; intercostal spaces narrower than the costæ, not deep, and between the higher orders furnished with a single series of faint pits, calice broadly elliptical. There is no calicular fossa, as the six stout pali unite in the centre at the summit of the corallum; septa in six systems of three cycla, all equal, exsert, reaching to the pali but slightly united with them; the primaries very flexuous at the inner edge and all highly granular; pali very conspicuous, forming six very flexuous large irregular rounded lobes. There are no septa to correspond with the fourth cycle of costæ, but the wall bends outward from each septum so as to form the rib. In very young specimens the first order of the fourth cycle of costæ is not visible, in which case the wall bends outwards the fourth. Alt., 6; maj. axis of calice, 3; min., 2 millim. Not very common.

CONOCYATHUS FENESTRATUS. N. S. Corallum, conical, the transverse section being perfectly circular. Costæ in three cycla, primaries undivided to the base, prominent, very granular and subspinous; second and third orders dividing near the base, intercostal spaces deep, marked with a regular series of deep pits, by transverse processes from the costæ sometimes reaching from side to side; septa in two cycla of six systems, exsert granular, primary and secondary equal, two only continuous with the exterior costæ, pali small, papillary, inconspicuous. Alt. 7, min.; 3 millim. Very rare.

Genus PLACOTROCHUS. *Ed. & Haime*, 1848.

Corallum, simple, free, but often with traces of adherence, straight and compressed, calice elliptical, with a straight lamellar columella, crenulate, extended in the direction of the major axis; septa very slightly exsert, either smooth, papillose, or granulous, costæ covered with a thin pellicular epitheca.

Placotrochus elegans.—Corallum, minute, broadly wedge-shaped, laterally compressed, elliptical, major axis of summit not much exceeding the base, while the minor is nearly equal throughout; base convex, with a salient angle almost tubercular at each side; sides regularly convex, white, smooth, and shining; costæ corresponding to the septa; the primaries and secondaries of equal width, broad and smooth, ending in a broad point at the calice and continuing to the base, only slightly narrowing; tertiaries inserted between, arising about a third from the base, narrow and ending in a point, giving the calicular margin a regularly serrated edge with large and small teeth alternating. Calicular fossa narrow and deep; septa of three cycla in six systems, slightly exsert, very granular, primaries and secondaries equal, with a tortuous entire edge which stops short two-thirds from the centre, leaving a deep fossa in which the thin straight columella is very conspicuous, though it does not rise to the level of the septa. Alt., 3; maj. axis, 3, min., 1½; diam. of base, 2 millim. Rare. (*Plate I, fig.* 1 *and fig.* 1*a*.)

Genus Sphenotrochus. *Mil. Ed. & H.*, 1848.

Corallum, simple, free, without trace of adherence, straight, and cuneiform; columella and septa like *Placotrochus; no epitheca;* costæ generally distinct and simple, granular, or crisped.

Sphenotrochus variolaris, n.s. Corallum, wedge-shaped, short, very much compressed inferiorly, and the base has two obtusely angled shallow notches dividing it into three equal parts. The section of the summit is elliptical, the major axis being more than twice the diameter of the minor. There are no costæ, but instead the whole surface has a finely spongy texture of irregular papillæ and pores. The calice is deep, and lower at both ends. Septa in six systems of three cycla, the primaries and secondaries smaller than the tertiaries and the systems at the ends incomplete. Columella finely laminar and very distinct; the primaries and some of the secondaries uniting with it simply. All the laminæ granular, and the granules arranged at the exsert rounded edges of the primaries, in radiating lines. Alt., 9; maj. axis, 7; min., 3. Not very common.

This fossil derives special interest from the fact that it still exists on the east coast, some fine specimens having been dredged by Mr. Macleay off Port Stephens at a depth of 70 fathoms. M. Milne Edwards remarks that the Sphenotrochi whose costæ are crisped or papillary are peculiar to the Eocene formation, while of the species which have smooth costæ one belongs to the present period, three to the Miocene, and only one in the older beds. This species has the costæ distinct and papillary in the young state, but as it gets older the papillæ get worn off, and become pitted, depressed, or like worm-eaten holes. (*Plate II, fig.* 4.)

The alliances of this species are therefore Eocene or older tertiary, and had it not been found living would have tended to swell the evidence in favour of the greater age of the deposits to which it belongs,—a kind of evidence, however, which this instance shows must be received with great caution, and not at best possessing much weight.

Sphenotrochus variolaris is remotely allied to *S. australis*, Dunc., of Muddy Creek and Geelong, but differing in the absence of costæ and the form of the base. The arrangement of the septa is near to *S. australis*, in very many peculiarities, but the base is very different. The costæ and twelve of the septa unite with the columella, but in *S. variolaris* only ten. In the young specimens the exterior is quite covered with fine papillary projections, and there is no laminary columella, but only a loose reticulated mass. From this we must conclude that the columella is not essential or does not rise from the base.

Genus SMILOTROCHUS. Milne Edward and Haime, 1851. Corallum, simple, straight, cuneiform, free and without a trace of adherence. No columella, septa finely granular, slightly exsert and touching by their inner edge. Wall naked, with simple costæ distinct to the base. (*Plate II, fig.* 2 *and fig.* 2*a*.)

All the specimens known to Edwd. and H. belong to the Cretaceous formation; and the discovery of the present form, though slightly aberrant from the type, is one more link which binds our tertiary beds to the upper secondary of Europe. The differences in this species are, that the internal edges of the septa are not united, and there are fewer cycles than the Mesozoic forms.

SMILOTROCHUS VACUUS, N.S. Corallum, very small, spear-shaped, very much compressed at the base and finely pointed, presenting at each side of the centre an elongated swollen tuberosity which tapers off slightly above, but is produced into a very finely pointed margin at each side of the base. Costæ corresponding to the septa, fine, straight, separated at the calicular margin, becoming fainter below, disappearing about the centre, and finally reappearing at the base. Calice shallow, narrowly elliptical, rounded and depressed at the ends. Septa in six systems of four cycla, but those of the 4th and 5th orders wanting in the two central systems, granular, not much exsert, rather thick, the three first nearly equal, not united at their inner edge, and the place of the columella represented by a conspicuous central vacuity. Alt., 5; maj. axis, 3; min., $1\frac{1}{2}$ millim. Very rare.

Sub. Fam. CARYOPHYLLINÆ.

1*st Group.* TROCHOCYATHACEÆ (many circles of pali).

Genus DELTOCYATHUS. *Mil. Ed. & H.*, 1848.

Corallum, simple, conical, free, no trace of adherence, calice nearly circular, and shallow, columella ending in a rounded multipartite surface. Septa straight, large, exsert, and granular, and the higher orders generally well developed. Pali highly developed, unequal, penultimate largest and turned towards antepenultimate, so as to form chevrons or deltas. Costæ *highly developed*, distinct to the base, with many granulations.

I separate these corals from *Caryophyllia* because that genus was erected for adherent simple corals with only rudimentary costæ, which were never tubercular, crested, or spinous. The Australian species identified with Caryophyllia all depart from that type, so that I consider a different genus is necessary for their reception. It will include the present species, and one to be described by me shortly in the Linn. Soc. N.S.W. Proceedings, and *Caryophyllia viola*, Duncan and Woods. It must be observed that adherence or non-adherence are held of themselves to be of generic value, and form the essential differences between *Smilotrochus* and *Desmophyllum;* the form of the base also is a distinguishing character between *Platytrochus* and *Ceratotrochus*. When Prof. Duncan described his *Caryophyllia viola* he had only very few specimens, and these, from his descriptions and from the state in which they left my hands, I conclude were worn and deprived of some of their characteristics. Since then I have paid great attention to this fossil, and have now before me twenty-six well preserved specimens, so that I am enabled to correct his diagnosis in some important respects, as will appear from the following details.

DELTOCYATHUS VIOLA (*Turbinolia viola*, nobis, MS., 1860; *Caryophyllia viola*, Duncan, *Ann. Nat. Hist.*, 1865). Corallum, in the form of a somewhat laterally compressed cone; the angle being about 50, and the sides very slightly convex towards the middle, and the apex obtuse. The calice is shallow and elliptical, the major and minor axis being as 7½ to 5½. The septa are somewhat delicate; the three first orders exsert and rounded, the primaries the longest, all having lateral spiny granules in radiate lines. There are four cycla in six systems; the first and second are equal in thickness, the first reaching the columella; the *second reaching about two-thirds of the way; the tertiaries, thinner and approaching one another so as to join the pali in front of the secondaries; the fourth and fifth orders are thin, with very wavy margins, and only reaching about a third of the distance from the margin.* Pali, thin rounded lobes in front of the *three first orders, and very granular. The primaries tall and thin, the tertiaries bending or inclining so as to meet or nearly* meet in front of the secondaries, which *thus exclude their pali. Secondary opposite pali often uniting in short bilobate papillæ right in the centre of the calice.* In worn specimens the pali seem like one rounded broad lobe in front of the secondaries only. Columella *thick, solid,* and ending in two or three neat rounded compact lobes. Costæ visible to the base, rounded, *straight, sharp, and roughly granular ;* in four cycla, and corresponding to the septa, primaries, and secondaries, arising from the base ; tertiaries almost immediately above ; fourth and fifth orders, a fourth of the height from the base. Intercostal grooves rather wider than costæ, and showing at the edge a very thin wall. Alt., 10 to 12 ; maj. diam., 7½ to 9 ; min., 5½ to 7 millim. In young specimens (alt., 4 millim) the columella is not distinguishable, and the pali are rudimentary like twisted laminæ before the first three orders. The *Italics* indicate where my diagnosis differs from Prof. Duncan's. (*Plate II, fig.* 3.)

Deltocyathus excisus (*Sphenotrochus excisus*, Duncan, Quart. Jour. Geol. Soc., 1870, p. 298). Corallum, somewhat large, high, cuneiform, much compressed inferiorly and narrowed, base with a curved notch, the sides being prolonged into acute short points ; summit broadly elliptical ; costæ few, broad, flat, finely granular, persistent from edge of calice to the base, and regularly alternating with the septa ; intercostal spaces regularly subspinously granular. Septa usually in six systems of three cycla, but specimens with one system aborted as in the figure not uncommon ; primaries and secondaries equal, very much exsert, and ascending in high rounded crests above the edge of the calice, covered with short, stout spines ; tertiaries projecting about half as much as the others, and reaching half way to the columella, all the septa very thick at their origin. Pali moderately broad and high, but not so high as the septa, to which they âre united lower down to the 1st and 2nd cycle only. Columella, not distinguishable from the pali in the centre. Calicular fossa, shallow. Alt., 10 ; maj. axis of calice, 5½ ; min. axis, 4 ; height of exsert septa above edge, 2 ; length of base, 2 millim. Common. The type specimen of this species was sent to England by me in 1864 to Prof. Duncan ; but it was unfortunately young and imperfect, and was more like a *Sphenotrochus* than a *Deltocyathus*, as there were only very faint indications of pali, and the columella was of a doubtful character. It was regarded as a *Sphenotrochus* by the learned Professor, who gave the following diagnosis—*Quart. Jour. Geol. Soc., loc. cit.* "*Sphenotrochus excisus.* The coral is much compressed, especially inferiorly, where two lateral processes give a notched or emarginate appearance to the base. Superiorly the relation of the long to the short axis is as 2 to 1. The coral is short and broad, the base is nearly as wide as the calice is long. The costæ are large and plain and are separated by well marked lines ; the costæ of the appendices are the largest, they pass upwards to the calice, and are all more or less wavy, the centre widening out near the calicular margin. The calice is shallow and elliptical. The columella is not long, and from being joined to the primary and secondary septa by processes which are rounded above is confused in appearance. The septa are in six systems of three cycles, they are wider at the wall than elsewhere and granular, and those of the third cycle are much smaller than the others. All the septa correspond to the depressions between the costæ. Alt., ¼ inch; tot., $\frac{3}{10}$ inch. Hamilton, Victoria." Prof. Duncan gives one admirable figure of the fossil, but as the specimen is young the septa and pali were not developed. I have figured an abnormal specimen with only five systems, owing to a deformity on the side of the corallum which is not shown in the figure. The septa also are more exsert in this instance than usual and the base narrower, but it is the same species. (*Plate I, fig.* 3*a*, *and plate II, fig.* 1.)

Family ASTRÆIDÆ. *Sub-family* EUSMILINÆ. *Division* TROCHOSMILIACEÆ.

Genus CONOSMILIA. *Duncan*, 1870.

Coral, simple, pedicellate, conical. Columella formed of one or more twisted laminæ which extend from the base upwards. Endotheca scantily developed. Septa apparently with simple margins, and variable in regard to the number of the primary.

This very remarkable genus was erected by Professor Duncan for some Australian Tertiary corals of very abnormal form. They are simple, with pellicular epitheca having a peculiar zigzag or "herring-bone" ornamentation, an essential twisted columella with endothecal dissepiments and plain septa, sometimes in six and sometimes in eight systems. These irregular septal arrangements occur in some genera of the Lower Greensand and Oolitic periods. The species I have to bring under notice has only two cycles in six systems.

CONOSMILIA BICYCLA, N.S. Coral, small, curved, slightly tapering, tall, pedicellate, base half the size of calice, costæ only traceable by the faint line which separates them, "herring-bone" pattern scarcely discernible. Columella large and strong, and is formed of one twisted lamella, and does not occupy much space. Septa arising between the costæ and are in six systems of two cycla; the primary reach the columella and are attached to it by processes, and are very wavy, uneven, and of equal thickness throughout. The secondary are very small, not reaching a fourth of the distance to the columella, curved and twisted. All are sparely studded with long spiniform granules. Endotheca sparely developed. Wall very thin, calice nearly circular. Alt., 12; diam. base, 2½; diam. calice, 3 millim. Rare.

The following is a synopsis of the species already known:—

Systems 8, cycles 3:

Pedicel large, costæ prominent and granular. *C. elegans.*

Pedicel small, costæ faint, calice elliptical. *C. anomala.*

Pedicel very small, costæ very faint-marked with prominent rings of growth. *C. lituolus.*

Systems 6, cycles 3:

Costæ very broad and flat, with wavy lines. *C. striata.*

Systems 6, cycles 2:

Costæ faint, coral curved and horn-shaped. *C. bicycla.*

The following is a list of all the known Australian Tertiary Corals corrected in accordance with the present paper:—

Conocyathus cyclocostatus. Tenison-Woods.
Conocyathus fenestratus. „
Trochocyathus meridionalis. Duncan.
„ *victoriæ.* „
Deltocyathus viola. T. Woods and Duncan.
„ *italicus.* M. Ed. and Haime.
„ *excisus.* Duncan.
Sphenotrochus variolaris. Tenison-Woods.
„ *australis.* Duncan.
Conotrochus McCoyi. „
„ *typus.* Sequenza.
Smilotrochus vacuus. Tenison-Woods.
Flabellum candeanum. M. Ed. and H.
„ *distinctum.* „
„ *victoriæ.* Duncan.
„ *gambierense.* „
„ *Duncani.* Tenison-Woods.
Placotrochus elongatus. Duncan.
„ *deltoideus.* „
Amphihelia incrustans. „
Heliastræa tasmaniensis. „
Thamnastræa sera. „
Palæoseris Woodsi. „
Cycloseris tenuis. „
Conosmilia elegans. „
„ *lituolus.* „
„ *anomala.* „
„ *striata.* „
„ *bicycla.* Tenison-Woods.
Balanophyllia campanalata. Duncan.
„ *seminuda.* „
„ *armata.* „
„ *tubuliformis.* „
„ *fragilis.* „
„ *australiensis.* „
„ *Selwyni.* „
„ *cylindrica* (variety) „
„ *Ulrichi* „
Dendrophyllia epithecata „
„ *Duncani.* Tenison-Woods.

The results of the observations contained in the foregoing paper are :—

1. That we have no *Caryophyllia* living or fossil in the Australian seas or rocks.

2. That we have three well marked and peculiar forms of *Deltocyathus*.

3. That we have two species of *Sphenotrochus*, one of which is still existing.

4. That we have two fossil analogues of our living *Conocyathus sulcatus*, which latter is supposed to be identical with a European Miocene form.

5. That we have a fossil form of the Cretaceous genus *Smilotrochus* in our Miocene rocks.

6. Also a new species of *Conosmilia* with only two cycles.

I may add also that, in a monograph I am preparing of our Australian living corals, I shall have occasion to describe two new species of *Deltocyathus*, one very similar to *D. viola*, and several species of *Paracyathus*, *Balanophyllia*, *Eupsammia*, *&c.*

Explanation of Plates.

Plate I.

Fig. 1.—*Placotrochus elegans*.
Fig. 1*a*.—Ditto, calice.
Fig. 2.—*Conocyathus cyclocostata*.
Fig. 2*a*.—Ditto, calice.
Fig. 3.—*Deltocyathus excisus*.
Fig. 3*a*.—Ditto, calice, with only five systems and distorted pali.

Plate II.

Fig. 1.—Normal calice of *Deltocyathus excisus*.
Fig. 2.—*Smilotrochus vacuus*.
Fig. 2*a*.—Ditto, calice.
Fig. 3.—Calice of *Deltocyathus viola*.
Fig. 4.—*Sphenotrochus variolaris*.
Fig. 4*a*.—Ditto, calice.
Fig. 4*b*.—Ditto, young calice.

Note.—The figure of *Conocyathus fenestratus* is unavoidably held over for a future paper.

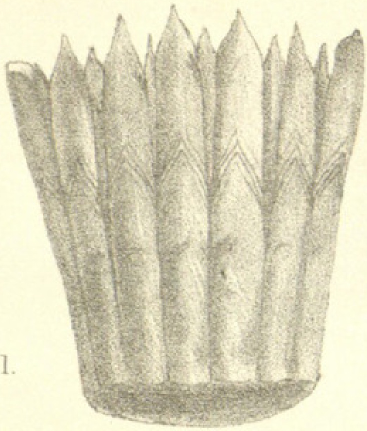

Fig. I.

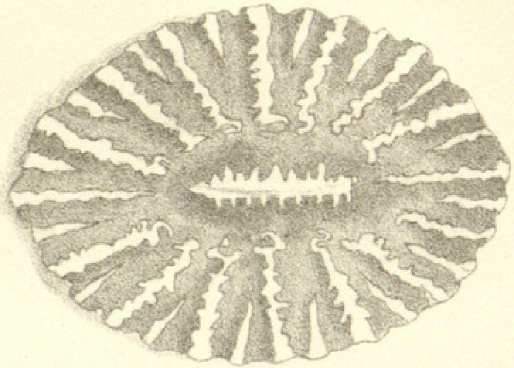

Fig. Ia.

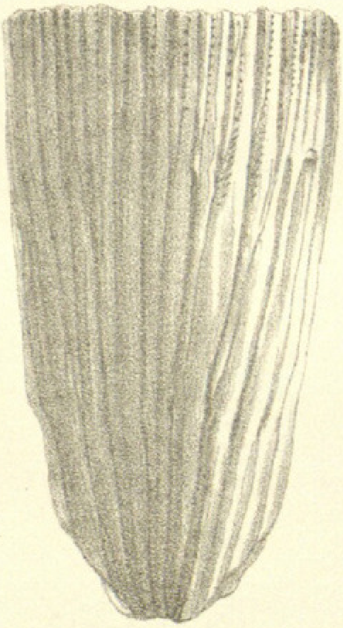

Fig. II.

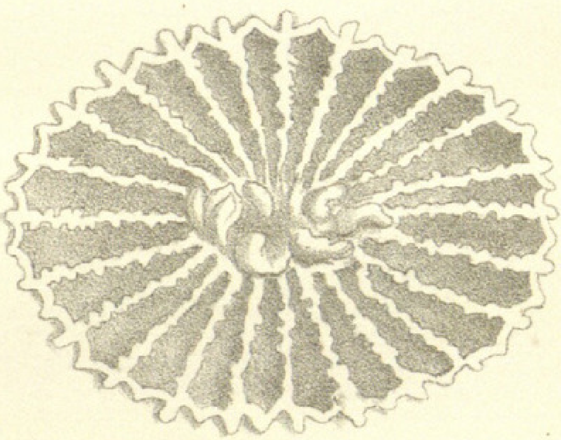

Fig. IIa.

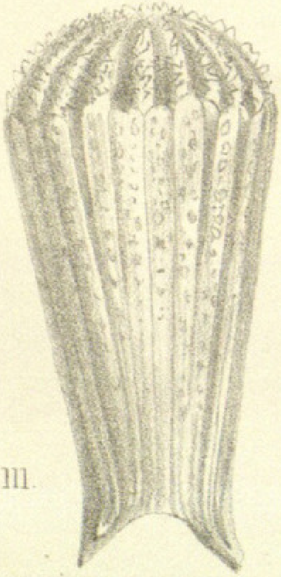

Fig. III.

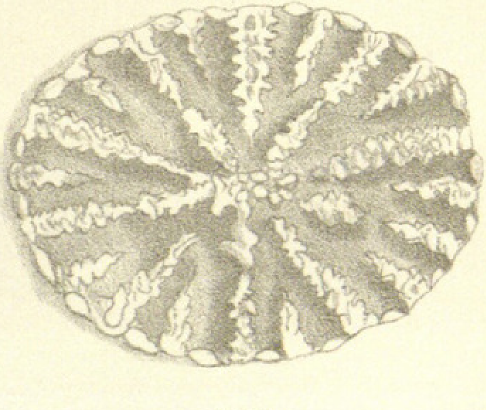

Fig. IIIa.

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I. Placotrochus elegans
Ia. Calice
II. Conocyathus cyclocostatus
IIa. Do. Calice

III. Deltocyathus excisus
IIIa. Do. Calice with only five systems & aborted pali.

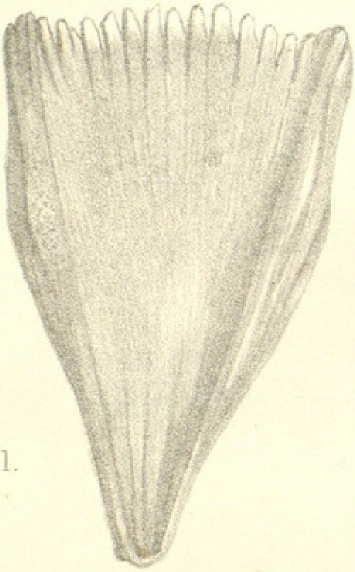

Fig. II.

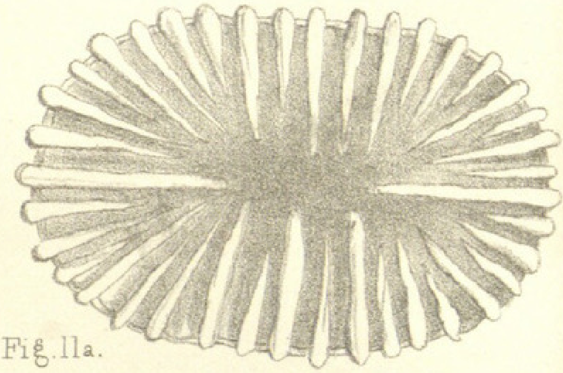

Fig. IIa.

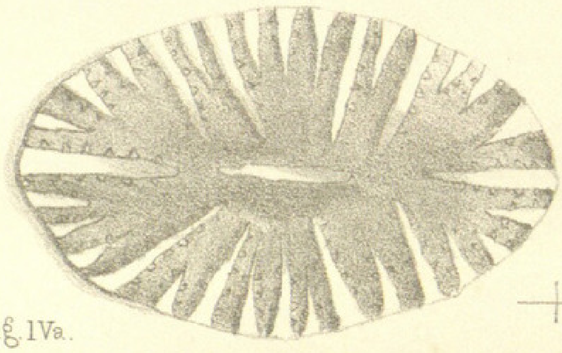

Fig. IVa.

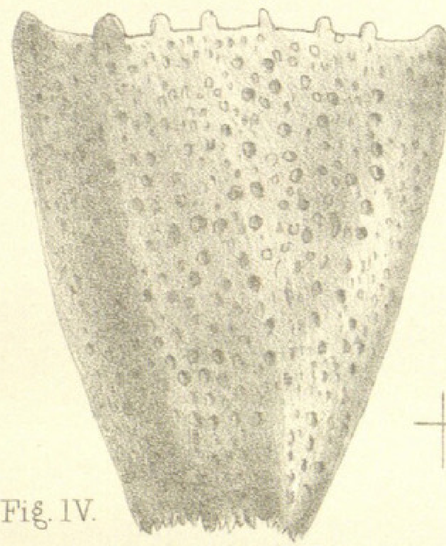

Fig. IV.

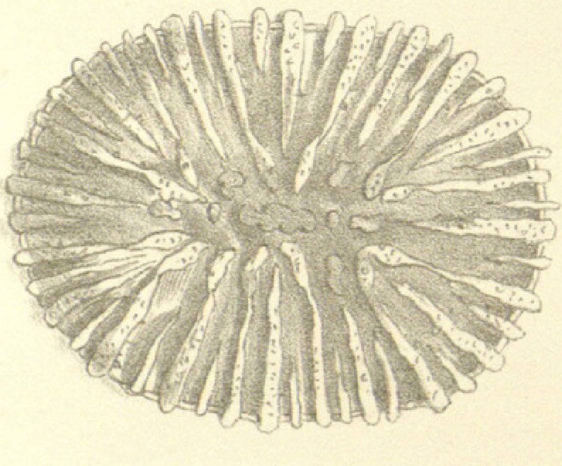

Fig. III.

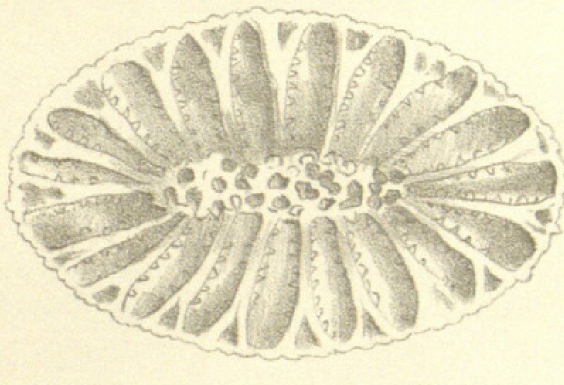

Fig. IVb.

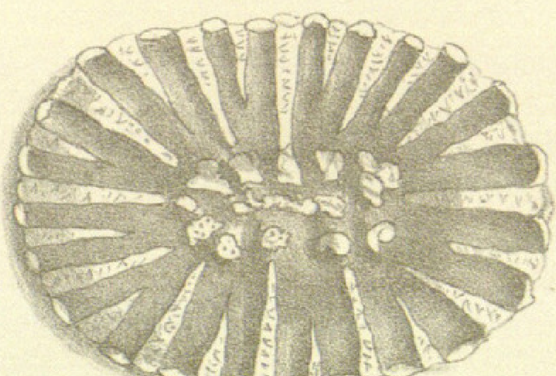

Fig. I.

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I. Normal Calice of D. excisus
II. Smilotrochus vacuus
IIa. Calice
III. Calice of Deltocyathus viola
IV. Sphenotrochus variolaris.
IVa. Do. Do. Calice
IVb. Young Calice