On some Australian Tertiary Fossil Corals and Polyzoa.

By the Rev. J. E. Tenison-Woods, F.L.S., F.G.S., Hon. Mem. Roy. Soc. N.S.W., &c., &c.

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Last year I published in the Proceedings of this Society (vol. 11, p. 183) a description of some tertiary fossil corals from the Muddy Creek beds, Western Victoria. Since then I have found others amongst the detritus and matrix of fossils in my possession. They are of especial interest, not only from the beauty and peculiarity of their form, but also because of the new facts they contribute to our tertiary paleontology and the structure of corals generally. In the first place I am able to signalize the discovery of a *Montlivaltia* in our tertiary beds, and this is another link to that chain of facts which gives our tertiary fauna such a mesozoic aspect. I allude especially to the discovery of *Salenia* and *Belemnites* in the Aldinga beds, *Thamnastræa* in Tasmania, our simple endothecal corals generally, and *Pleurotomaria, Trigonia semiundulata*,* &c., among the mollusca. Most of these genera have probably living representatives, though they were at their highest development long before the dawn of the tertiary period. *Montlivaltia* is a similar instance. The genus was established by Lamouroux (*Expos. Méthodique des genres de l'ordre des Polypiers*, Caen, 1821, page 78) for a trochoid simple free coral found in the jurassic limestone near Caen. It includes at least a hundred species, the most of which are found in the jurassic or the chalk formations. There are about ten tertiary species known, but none living. The tertiary species are Eocene and Miocene. The forms of this coral vary very much, from conical to discoid. I cannot find that one form is more peculiar to any given period than another. The discoid corals are few in number, and it is to this kind that the fossil to which I draw attention belongs ; but it is a discoid form which is flat or even concave beneath, and that is, I believe, rare in the genus. There is a fossil form lately described by Mr. Tomes

* This *Trigonia* is a remarkable instance, as it is so different from our living species and so like some mesozoic forms.

(*Jour. Geol. Soc.*, vol. 34, p. 193) from the Lias of Warwickshire, which is very like our species, but it is attached while the present is free. The following is the diagnosis :—

Family ASTREIDÆ. Div. LITHOPHYLLIACEÆ.

MONTLIVALTIA DISCUS. *Corallum* circular, depressed, convex, but slightly depressed in the centre. *Costa* corresponding with septa, faintly visible under the epitheca, covered with rather large but faint rounded granules. *Epitheca* thick, smooth, showing scarcely any concentric lines of growth. Systems six, cycles four. *Septa* moderately thick, regularly and finely dentate, the serrations extending as ridges far along the higher orders; moderately granular. Primaries nearly always free to the centre. Tertiaries curving round and joining secondaries at about three-fifths from centre, but the secondaries are not subsequently thicker. Fourth and fifth orders curving round and joining the tertiaries, but the fifth order always nearer the centre than the fourth. Endotheca abundant, no interseptal space without one or two dissepements, thick, curved, sloping. *Base* concave, and no trace of attachment. In some cases the secondary septa of some systems curve suddenly and join the primaries close to the centre. Diameter, 6½, alt. 2 millims. Muddy Creek; not very abundant.

There is a coral described by Professor Duncan from the Australian tertiaries which is very like this species. It is named *Antillia lens*, and from the Professor's description I judge the differences to be that it has a columella, the septa do not unite in the manner here described, and the endotheca is not abundant. In all other respects they might easily be mistaken for one another.

The next fossil I have to describe is one of most singular and interesting characters. It is a combination of some of the lead ing characteristics of several families and sub-families. It is a Turbinolidian coral with pali, without a columella and a perforated wall! It is well known that the perforation and nonperforation of the walls of corals form two of the largest subsections of the MADREPORARIA. The perforated section is less diversified than the other, since it generally possesses other marked features in combination. In this fossil we have a perforated wall, but none of those features. In exterior form it is very like a *Turbinolia*, and like some members of that genus it has what seem to be deep pores between the costa. But in the true Turbinolia these pores go no further than the wall. They follow a groove between the costa and, though deep, they never go through. In the fossil I am describing they go right through the wall, in fact, as the pores are very large, the portion of the wall which separates them becomes little more than a flat transverse bar, an arrangement which reminds us of *Porites*. There are other peculiarities which I will notice in the diagnosis; it is sufficient here to call attention to the singular beauty of the design of these corals. They might be made serviceable as designs for ornamental purposes, a suggestion which has more than once been made with regard to other members of this order.

The affinities of this species are all with *Conocyathus*, a genus which, in addition to being Australian, has several fossil members in our tertiary beds. The perforation of the wall is, I think in this case, a generic feature, at least, if it should not be the representative of a family. We have in *Dasmia* a family with a single species, but others may be found for ours, as the beds in which this fossil occurs are so little explored. I propose to name the genus from its perforated aspect *Trematotrochus*, which is thus characterized:—

TREMATOTROCHUS, new genus.

Corallum free, with the visceral chambers free, the septa distinct, only united in the middle, pali present; no endotheca or synapticulæ and the wall incomplete, so as to leave large interstices at regular intervals. No epitheca. TREMATOTROCHUS FENESTRATUS. *Corallum*, a regular cone, cylindrical, finely pointed, without trace of attachment. Costa in three cycles, the third order branching off very close to the base, rather prominent, thin and closely covered with short blunt spinous granulations. Marginal edge of calice rounded. No fossa. *Septa* exsert in rounded lobes spinously granular at the edges like the costa. Systems six, cycles two. Secondaries very much smaller than the primaries. Pali before both the orders in rather stout granular processes, not rising so high as the septa. In addition the septa sometimes send out long narrow lobes such as recall the Astrangiaceæ, which join the pali. Dimensions, alt. 5, diam. of calice $2\frac{1}{2}$, of rounded base 1. Rare at Muddy Creek. Only two specimens found by me sufficiently well preserved to show details.

I am now of opinion that the coral which I described in last year's proceedings as *Conocyathus fenestratus* was no other than a very much worn specimen of the present fossil. The interstices were filled up with sediment.

It will be observed that in the case of this fossil, as in many other fossil and recent corals which are found in Australia, there is one cycle of costa more than the septa. I have figured for the plate which accompanies this a remarkable fossil from Aldinga, which has a structure which may throw a light upon this peculiarity. In *Trochocyathus heterocostatus* we have costa in cycles, and though they correspond with the septa, yet it is the higher orders (the fourth and fifth) which are continuous to the base, while the costa corresponding to the primaries and tertiaries do not appear until about half way. The fourth and fifth orders of septa are only rudimentary; so that if we found this coral in its young stage we should have no fourth cycle of septa, and no primary and secondary costa. Thus the costa would alternate with the septa. We see in this, probably, a proof that an extra cycle of costa shows that a cycle of septa to correspond with them either will appear or is aborted. It would be very interesting to learn if there are tentacles in the animal to correspond with the extra cycle of costa, or organs of any kind that will account for the irregularity. In *Trochocyathus heterocostatus*,* the primary costa at the end of the major axis are continuous to the base, and even wider than the fourth and fifth order. This shows us something of the mode of growth, which may be of interest in tracing the homology of these organs. It seems very certain that the new forms which Australian paleontology is bringing forth will hereafter throw much light on the meaning of many of those facts which an imperfect knowledge of the plan of nature has rendered apparently anomalous, and which may eventually lead to a more sound system of classification than that at present adopted.

Class, POLYZOA. Order, *Infundibulata*. Sub-order, *Cheilostomata*. Section, *Inarticulata*. Sub-section, *Bi-multiserialia*. Family, *Gemellariadæ*. Cells opposite, in pairs.

The fossil which I am about to describe is close to *Gemellaria*, wherein the cells are joined back to back, and all the pairs face the same way. But in this species the faces alternate in two ways—that is, the faces are on all four sides of the almost cylindrical branches, and they alternate in each of the opposing cells arising on the side of the centre of its alternate neighbour. This peculiarity is of generic value, and I propose the name of *Tetraplaria* for the genus. A fossil similar to this has been included in the genus *Cellaria* by A. E. Reuss.† It is a Miocene form of the Vienna basin, which the author thus describes: CELLARIA SCHREIBERSI. *C. gracillima, raro dichotoma, cellulis quadrifariis ovatis aut semi-cylindraceis, plus minusve convexis, medio punctatis apertura supera, immersa, late elliptica, poris duobus minimis lateralibus.*

The specimen figured by me differs from this in the cells being smooth and not punctate.

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* This fossil coral has been described by me in the Proceedings of the Adelaide Philosophical Society for this year, along with all the corals found by Professor Tate in the Aldinga beds.

† *Fossile Polyparien des Wiener Tertiar Beckens.* Vol. 2, p. 63, plate 8, fig. 8.

TETRAPLARIA, nov. gen.

P. with cylindrical smooth branches. Cells back to back, facing four ways, the opposite pairs of two sides alternating with the other two.

TETRAPLARIA AUSTRALIS, n. s.

P. with smooth slender branches. Cells elongately pyriform, not punctate ; aperture nearly oval.

Muddy Creek, Western Victoria.—The occurrence of a fossil form so very near the Vienna miocene species, and of a genus which, as far as I am aware, has no pliocene or living representative, is another link in the chain of evidence which fixes the age of these beds.

EXPLANATION OF PLATE.

Fig.	1a.	*Montlivaltia discus*,	enlarged.
„	1b.	Ditto	calice.
„	1c.	Ditto	base
„	2a.	*Trematotrochus fenestratus*,	much enlarged.
„	2b.	Ditto	calice.
„	3a.	*Trochocyathus heterocostatus*,	enlarged.
„	3b.	Ditto	end view, showing peculiar costa.
„	4a.	*Tetraplaria australis*,	enlarged.
„	4b.	Ditto	section.

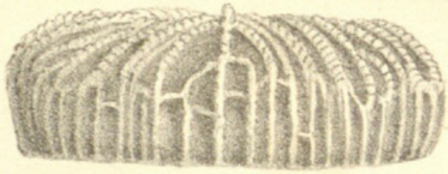


Fig 1a

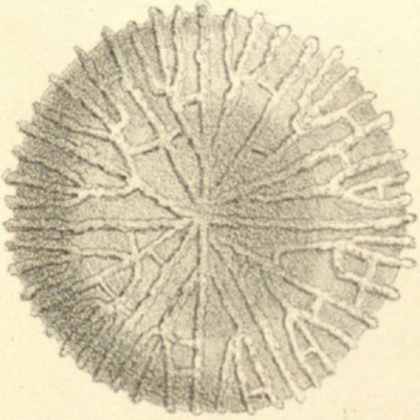


Fig 1b

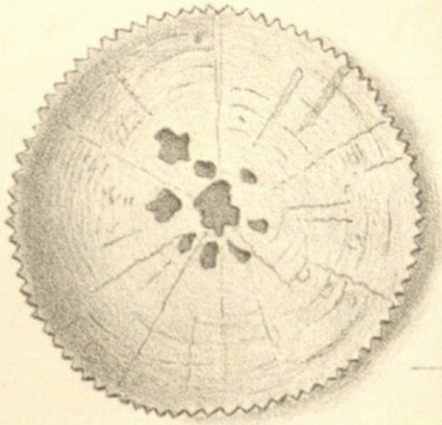
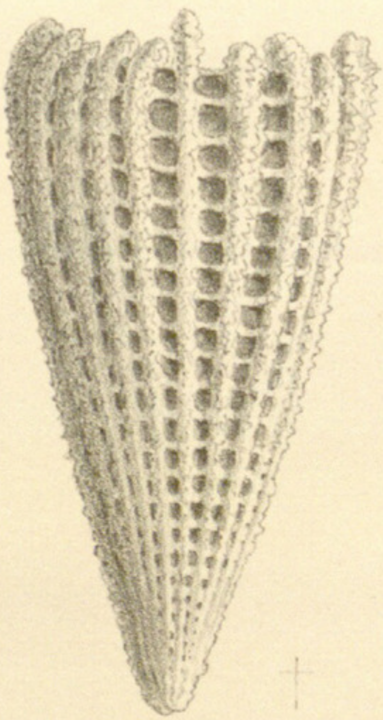


Fig 1c



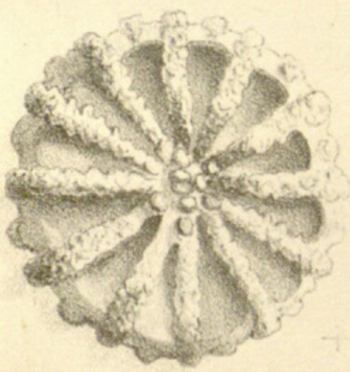


Fig 2a

Fig 2b

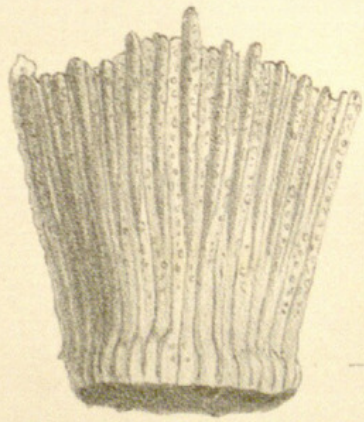


Fig 3a

Fig 4b

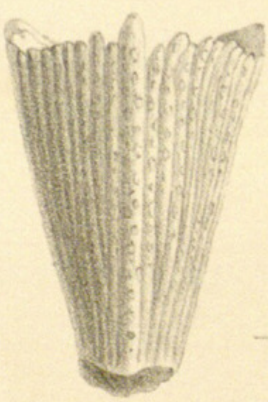


Fig 3b

Fig 4a

J. E. Tenison-Woods, Delt.

S. T. Leigh & Co Lith. Pitt St Sydney.

Fig 1a. Montlivaltia discus, (enlarged)

Fig 1b. Ditto Calice

Fig 1c. Ditto Base

Fig 2a. Trematotrochus fenestratus, (much enlarged)

Fig 2b. Trematotrochus, Calice

Fig 3a. Trochocyathus heterocostatus, (enlarged)

Fig 3b. Ditto end view showing primary costa

Fig 4a. Tetraplaria australis, (much enlarged)

Fig 4b. Tetraplaria australis Section