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On some Mesozoic Fossils from the Palmer River, Queensland.

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

[*Read before the Royal Society of N.S.W., 4 October, 1882.*]

At one time it was believed that there were no mesozoic rocks in Australia, and this, coupled with the existence of many mesozoic forms of animal and vegetable life on our continent, induced many to think that most of its area had existed as dry land since palæozoic times. But as early as 1844 Leichhardt records some mesozoic fossils in Queensland, and Sir Thomas Mitchell, in 1846, found a *Belemnite* at Mount Abundance, in the same Colony.* The Rev. W. B. Clarke also recorded that, between the years 1851 and 1853, he had received a portion of an *Ammonite* from the Clarence River. In 1861 Mr. F. T. Gregory found *Trigoniæ*, *Ammonites*, &c., in strata on the Moresby Range, Western Australia, as mentioned by him in a paper to be cited presently. In the Journal of the Geological Society of London for 1862 (vol. xviii, p. 244) Mr. Clarke published a paper on the occurrence of Mesozoic and Permian Fauna in Eastern Australia, in which he announced the discovery of a large series of fossils of secondary age on the Fitzroy Downs in Queensland.

The first announcement that *Cretaceous* fossils existed in this country was made by Professor M'Coy, of Melbourne, who, in 1865, read a paper before the Royal Society of Victoria on certain organic remains brought down by Messrs. Carson and Sutherland from the western bank of the Flinders River, at the base of Walker's Table Mountain, in latitude 21°13′, longitude 143°. The matrix of these fossils was an olive-coloured marl of lime and clay. The specimens included, besides the vertebræ of a very large teleosteus fish, which was indeterminable, two species of *Inoceramus* with very thick, coarse, fibrous shells, Ammonites, with a few other remains, which taken together enabled Professor M'Coy to announce for the first time with certainty that a cretaceous

* See Proc. of the Roy. Soc., Tasmania, 1878, p. 18, where there is a very interesting paper by R. Etheridge, jun., on the re-discovery of this fossil in the collection of the British Museum.

formation existed in Australia. Previous to this Mr. A. Gregory had, in a paper read before the Geological Society of London,* doubtfully indicated cretaceous fossils in latitude 30°15′.

Other papers announcing further discoveries, written by the same author, will be found in the "Annals of Natural History for 1867," p. 355, and the "Transactions of the Royal Society of Victoria for 1868," p. 41; 1869, part 2, p. 77. In 1870 Mr. Moore read a paper before the Geological Society of London (see vol. xxvi, for 1870, p. 226), on Australian Mesozoic Geology and Palæontology. In this paper many species were described and figured, and it is undoubtedly the most valuable contribution to the palæontology of Australian mesozoic rocks that has yet been made. In 1872 Mr. R. Daintree published in the same Society's Journal, vol. xxvii, p. 271, a very lengthy report on the geology of Queensland. In the appendix to this paper Mr. R. Etheridge described and figured a number of Cretaceous fossils from various parts of the interior of the Colony. In February, 1880, Mr. R. Etheridge, jun., read before the Royal Physical Society of Edinburgh (see Proceedings for that year) a paper on a collection of fossils from North Queensland. In this essay there are full descriptions and figures of many palæozoic fossils, besides figures and description (plate 17, figs. 55 to 58) of a new Cretaceous *Crioceras* (*C. jackii*) which was found by Mr. Jack in the mountain sources of the river Tate, not very far from the Herberton tin-field. In July, 1880, Professor Tate read before the Royal Society of South Australia a description of a new species of *Belemnite* from the mesozoic strata of Central Australia. (See Proc., vol. iii, p. 104.) In the Southern Science Record for 1881 I announced the discovery of a new bed of cretaceous fossils on the Burnett River in Queensland. This list includes all the palæontological literature on the mesozoic rocks known to me.

There is one circumstance connected with most of the fossils described as Cretaceous in the foregoing papers, which is that the beds in which they occur are rarely described. This has arisen partly from the fact that the specimens have been collected by those who knew little of geology, and they have frequently passed through two or three hands before reaching the geologist who described them. But there is another reason for this. In the mountain ranges on the eastern side of the table-land Cretaceous fossils occur in drifted nodules in the beds of the creeks, and entirely unconnected with any beds or strata. This is the case, I believe, with the fossils found in the Tate River. In the case of those now to be described from the Palmer River, about 180 miles north of the Tate, the same thing is observed. In the course of the stream, which runs through granite and palæozoic rocks overlaid by recent trap and Desert Sandstone, large nodules of bluish clay are found. They vary in size and shape, but are generally rounded, and about 6 to 10 inches in diameter. A good many of them are septaria, which, when divided and polished, are of great beauty. Others, when carefully divided, reveal fossils in a more or less perfect state of preservation. I have no doubt we have in these instances the remains of what have been extensive mesozoic beds connected with those in the great mesozoic basin of the interior. They have been broken up at the upheaval of the table-land and denuded away, and these nodules scattered on the watercourses all over the most elevated portions of the plateau testify to their former extent. Possibly, however, undisturbed portions of the strata will still be found. In nearly every case the remains preserved are those of Cephalopoda, the only exception being Mytilidæ, some very imperfectly preserved brachiopoda, which cannot be determined. It is no unusual thing to find fossils of only one or two kinds preserved in strata. Thus, in the eocene rocks of Mount Gambier only brachiopoda, bryozoa, pectens, urchins, with a few of the corals of compact tissue (Oculinaceæ) are found. All other remains have been removed, and show their former presence as casts and cavities in the rocks. The explanation of this has been given by the able researches of Mr. H. C. Sorby, F.R.S., and has been already referred to by me in a former paper. It appears that the carbonate of lime which occurs in shells is in a chemical, not an organic form, and is either aragonite or calcite. The former is an unstable compound, easily decomposed and lost, the stable compound calcite, on the other hand, resisting decomposition. Now it is found that those organisms in which only casts are found belong to genera in which the carbonate of lime exists as aragonite, and therefore easily perishing, while the preserved shells are those in which the carbonate of lime has existed in the form of calcite. But this explanation will not meet the case of the mesozoic fossils preserved in these nodules, because, first, the matrix is bluish clay, and not lime—in fact, there seems to be very little lime in it; secondly, the Cephalopoda are precisely those in which the carbonate of lime exists in the form of aragonite. Possibly these larger shells have in their deposition and consequent decomposition of the animal tissue concreted large masses of clay around, which has better resisted decomposition, and they owe their preservation entirely to their large size. This is borne out by the facts, because only large shells are seen, I am informed, at Hughenden, and those are not restricted to cephalopoda, but include *inoceramus*. The exception to this is a thin bed of limestone, about 4 inches thick, full of *Avicula hughendensis*, Ether. The rest of the fossils were obtained from horizontal calcareo-argillaceous beds. About 20 miles beyond this locality hundreds of belemnites are strewn over the surface of two ridges, but they are rarely found in the soft

* Quart. Jour. Geol. Soc., Lond., vol. xvii, 1861, p. 475.

shales, says Mr. Daintree, which crop up under the Desert Sandstone. Amongst the fossils with which I have to deal are three or perhaps four species of Cephalopoda all from the Palmer River, and found in nodules as described.

The first is the phragmacone of a belemnite which I recognize as very closely resembling one described but not named by Professor John Phillips. In Mr. C. Moore's essay already referred to (p. 258), a note is added by Professor J. Morris on the *Belemnites.* He says :—" Of three species which are in the Australian collection sent me by Mr. C. Moore, the first, a large phragmocone typical of the oolitic system (meaning by this the whole series of beds from the middle lias to the Kimmeridge clay inclusive), is 5·5 inches long, its greatest diameter 1·75; the section nearly circular. Above forty septa can be counted, and the whole number must have been fifty without counting the last chamber. The septa are a little oblique, advancing in the dorsal and retiring a little on the ventral face, with a slight lateral flexure. Depth of the chambers about one-sixth of the diameter. Siphuncle clearly internal, its section rather elliptical. The phragmacone is nearly straight, with an angle of 18°. Of the guard only a slight indication of a subcentral axis can be recorded. I cannot at present assign its distinctive characters." From Wollumbilla. In many particulars our fossil corresponds with the above, but the difference will be seen from the following diagnosis :—

Belemnites selheimi, n.s. Pl. 7, fig. 1. Phragmacone extending at an angle of 17°, circular, broken at each end ; 100 millim. long, 45 millim. at broad end and 15 millim. at narrow end. Chambers —twenty-five in number, slightly oblique, advancing a little on the dorsal face, and retiring on the ventral, with slight lateral flexure. An obscure carina on the dorsal face, with a distinct shallow groove for the whole length. Siphuncle partly covered with matrix, and not very visible. The fragment is shorter than that of Professor Phillips, and the chambers are relatively deeper, as there are fewer by fifteen in very nearly the same length. The dorsal keel and obscure shallow groove are also very distinctive features. I have given the species the name of its discoverer, Mr. Selheim, at present acting as Warden and Police Magistrate at Charters Towers. Mr. Selheim has made most valuable observations and collections in geology and zoology on the Palmer River. All my Cretaceous specimens from the Palmer River were obtained from him.

Ammonites olene, n.s. Front view, Pl. 7, fig. 2 ; side view, Pl. 8, fig. 1.—Fossil much compressed, periphery narrowed to an acute angle, whorls 8½ probably, but the umbilicus, which is apparently narrow, is covered by the matrix ; surface crossed by rather broad obtuse sigmoid ribs, which are rather acutely bent in the middle.

Some few bifurcate, about from forty to fifty in the last whorl ; diameter (taken across from extreme visible edge of last whorl), 103 millim. ; thickness, 17 millim. ; diam. of flexuous costæ, from 5 to 7 ; sutures very indistinct, apparently seven, much divided, rounded lobes on each side. The specific name is derived from the elbow-like bend of the ribs.

This ammonite is very near the *A. biflexuosus*, D'Orb., of the Great Oolite, except perhaps that the keel is not so acute, but a very satisfactory comparison cannot be made, in consequence of the extent to which the fossil is covered by matrix. Any attempt to liberate it only imperilled the whole specimen, as it was exceedingly brittle, so I have been obliged to leave many points without a satisfactory solution. The species is, however, easily distinguished from all others described from Australia by (1) its acute periphery, (2) its broad sigmoid ribs. Eight species of ammonites have been described from Australia. Four by Moore, viz. :—*A. aalensis*, var. *moorei*, Lycett. ; *A. radians*, Rein ; *A. brocchii*, Sow. ; *A. macrocephalus*, Schloth. None of these have any resemblance to this species. In all the shell is not acute at the periphery, and the ribs are close and numerous. Three species are described by Etheridge, namely :—*A. beudanti*, Brongn, var. *mitchelli*, Ether. ; *A. daintreei*, Ether. ; *A. sutherlandi*, Ether. *A. daintreei* has rather a rounded back and the ribs are close. *A. sutherlandi* is closely ribbed and thicker, with no acute keel. *A. beudanti* is the almost smooth shell, with fine striæ, which Mr. Etheridge regarded as represented by a variety (*A. mitchelli*). But this was already described by Professor McCoy under the name of *A. flindersi*, he noting at the same time that he regarded it only as a variety of *A. beudanti*. In reality, then, we have but seven ammonites, only two of which can be claimed as peculiar to the Australian deposits. If the present species is distinct it will make a third, but I hardly think that it is.

Crioceras irregulare, n.s. Pl. 8, fig. 2.—Shell loosely and irregularly coiled, whorls, 1½, quite free, but the distance irregular, much compressed at the sides, tuberculate, in sixteen rows. The first six obsolete, tubercles, three on each side, conical, short, close on the sides, but at an interval on the dorsal edge, then disappearing except that a faint row, seen near the end of the fragment after a long interval. Costæ of two sizes, the tuberculate ones large, and separated from one another by simple, narrow, round, undulating ribs, which vary in number between the tubercles from two to thirteen.

This species differs from the typical form of the genus in the loose irregular coiling, in which it combines something of *Ancyloceras* and *Toxoceras*, the latter especially, as the coils can scarcely be said to be complete. The nucleolar portion of the whorl is quite blunt. M. Astier*, a great authority on the genus, is of opinion that all species of *Crioceras* become *Ancyloceras* in their adult state, and that in the former genus we never find the perfect mouth of the adult shell. Again, Pictet† states with regard to *Toxoceras* that, from certain facts he had observed amongst the fossils of Switzerland and Savoy, he believed that the *Toxoceras* form and *Ancyloceras* form entirely depended on mode of growth. This was even in the same species so variable that one specimen might be referred to a *Toxoceras* and another was so unrolled as to be an *Ancyloceras*. In the present species the first whorl as far as the termination of the tubercular ribs is clearly of the *Toxoceras* form, and if found in that stage of its growth would be referred to that genus. Subsequently, from impressions on the matrix, the shell seems to have straightened out and become an *Ancyloceras*.

Two species of *Crioceras* have been previously recorded from Australia. One is figured and described in Moore's paper already referred to. The other is by R. Etheridge, jun., in the Proc. of the Royal Physical Society of Edinburgh (*loc. cit.*, p. 43). Mr. Moore's species, *C. australe*, will be dealt with presently. *Crioceras jackii*, Ether, is quite a different shell from ours. The whorls are regularly coiled; the smaller ribs are proportionately larger, and the tubercles are in fewer rows, only two at each end, and are blunt or flatly truncate. Professor M'Coy, in the Annals of Natural History, 1867, vol. XIX, p. 356, describes an *Ancyloceras* from the head of the Flinders River, as follows:—"A gigantic species of *Ancyloceras*, exceeding the *A. gigas* of the Isle of Wight in size, and differing by having the transverse ribs larger, forking on the side, and a row of large compressed tubercles on each side of the back. It most resembles the *A. zaberelli* of the French Lower Greensand. I name it *A. flindersii*." I need not point out that this is entirely different from our species.

Crioceras australe, Moore, Pl. 10, figs. 5 and 6.—I believe that the specimen found with the last species is a fragment of the above, which is thus described:—"Shell very large, discoidal, whorls rounded, incurved, the inner whorls rather closely fitting, but separate. In the younger state, as seen in the reduced figure, the shell possesses regular, rounded, slightly curved ribs, with intervening rounded sulci, which increase in width with the age of the shell. In the adult shell the ribs become widely separated, the largest chamber measuring 3½ inches at the back, and they possess very acute ridges, with two depressed bosses on each side, the depressions between the ribs being regularly concave. The block containing the last five chambers of the shell is slightly compressed on the back, and though it is not complete the

* Catal. descrip. des Ancyloceras de l'Etage Néocom. Lyon. 1851.
† Traité de Paléontologie, vol. ii, p. 706.

mouth measures 7½ inches in depth by 7 inches in breadth. The siphuncular tube is small, and situated immediately under the back of the shell. There appears no reason to doubt that the larger chambers belong to the smaller whorls, though the connecting portions are wanting. When complete it is probable the shell attained nearly twice the dimensions of the *C. bowerbankii* of the lower greensand. Its ornamentation is proportionably much smaller than in that species. On the interior of the shell are attached bryozoa, serpulæ, and other remains identical with those on the interior of the *Cytherea clarkei*, previously noticed, from which there appears no doubt that that shell and the *Crioceras* are identical in age, and as no example of *Crioceras* has yet been obtained out of the Neocomian period, it is reasonable to infer that they represent it on the Australian continent. It is from the district of the Upper Maranoa."

My specimen is only a fragment of one of the inner whorls, with indications of the others which show that they were detached, and that the complete shell was of huge size. The siphuncle and ribs correspond with the above description, but there are no traces of the bosses referred to; nevertheless, I believe that the species are the same. There are fragments of what may be another species of *Crioceras* or the above *C. jackii*, Eth., which it resembles in not being compressed, and in the tubercular ribs having only two distant tubercles at the side. But there is only one such rib preserved. Fragments of the inner coil can be seen showing the whorls to be detached, regular, and close, as in the species referred to.

Mytilus inflatus, Moore, Pl. 10, fig. 7.—"Shell smooth, slightly inequivalve, curved, both valves inflated, margins close set, umbones terminal, acute, anterior, hinge-line extended and oblique, posterior margin and front rounded, dorsal surface smooth, with irregular concentric bands of growth. This pretty little shell is to be distinguished by its very inflated appearance, its more extended hinge-line and terminal umbones. Its test still retains some colour. Two examples are in the Australian collection, both of which are from Wollumbilla."

The above diagnosis corresponds very exactly with two specimens I have, which are, however, more than double the size of that figured by Moore, who describes also three other species from the same beds. A large *Mytilus* has also been described by me from somewhere in the neighbourhood of the Barcoo.* This is noted for its large size, and has been named in consequence *M. ingens*. It is evident that some of the fossils here described are identical with Oolitic species, and in the matrix of the *Mytilus*

* See Proceedings Linnæan Society, New South Wales, vol. vii, part 3, September meeting.

the oolitic appearance of the rock is most striking. The marked character of the *Ammonite* is even older. But, on the other hand, the species of *Crioceras*, the shelly matter having nearly disappeared, are fossils of quite another horizon, probably like those of the Flinders River. Neocomian or Lower Cretaceous: The matrix has a different aspect, and the shells are fresh and new-looking. How are we to account for this mixed fauna? If the fossils were associated in the same strata, it would be very puzzling. Seeing, however, that they are found as nodular masses in the beds of creeks, there is no difficulty in explaining their association. Both are derived from beds of different age, which have been broken up and denuded away during the upheaval of the table-land or during its subsequent subaerial history. It is not at all improbable that we shall in the course of time meet with other and more interesting relics. I could have procured many more but for the difficulty of carrying them on horseback over many miles of most difficult country. But the remains are so extensively distributed that large collections will surely soon find their way to our museums and learned Societies.

List of fossils described in this paper :—

1. BELEMNITES SELHEIMI, N.S.
2. AMMONITES OLENE, N.S. vel var.
3. CRIOCERAS IRREGULARE, N.S.
4. C. AUSTRALE (?), Moore.
5. C. JACKII (?), Etheridge.
6. MYTILUS INFLATUS, Moore.

EXPLANATION OF PLATES.

Plate VII. Fig. 1. *Belemnites selheimi.* Phragmacone with matrix formed of nodular clay. Fig. 2. Front view of *Ammonites olene.*

Plate VIII. Fig. 1. *Ammonites olene*, side view. Fig. 2. *Crioceras irregulare.*

Plate X. Figs. 5 and 6. Two views of *Crioceras australe*, with part of the adherent clay matrix of nodule. Fig. 7. *Mytilus inflatus.*

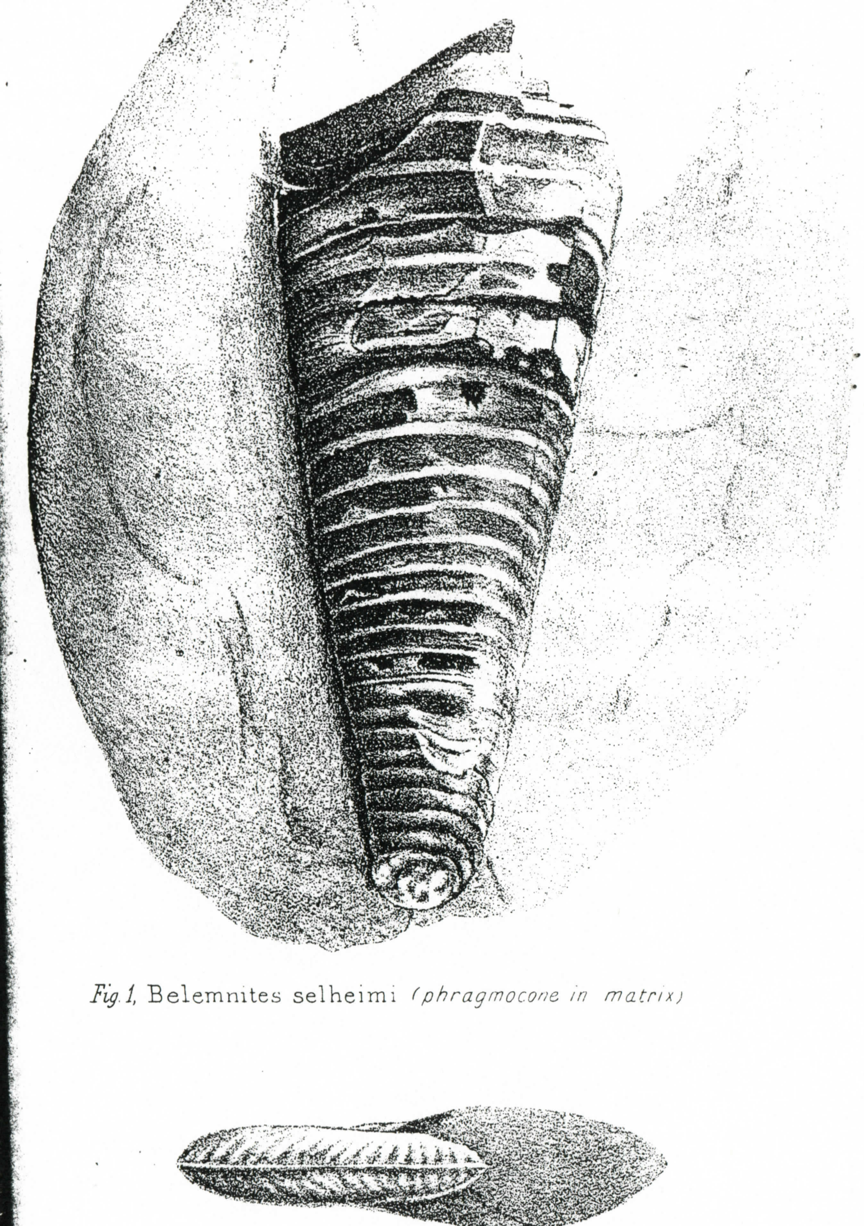


Fig. 1, Belemnites selheimi (phragmocone in matrix)

Fig. 2, Ammonites olene. (front view)

J.E. Tenison-Woods. del. S.T. Leigh & Co, lith., Sydney

PLATE X.

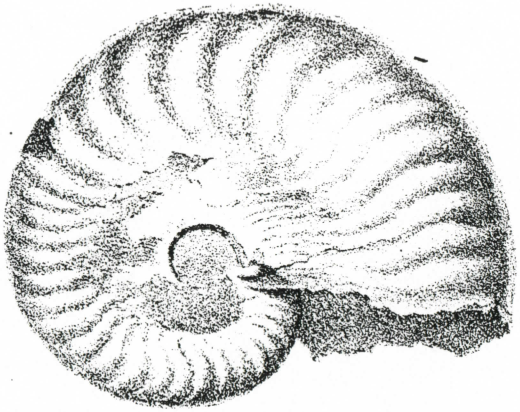


Fig.1, Ammonites olene

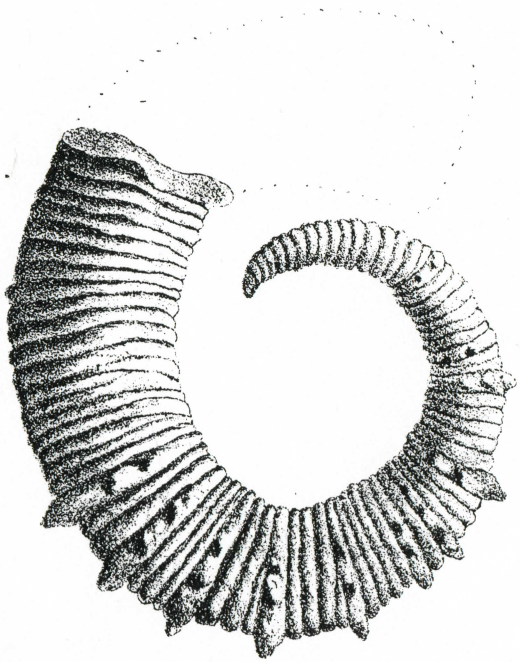
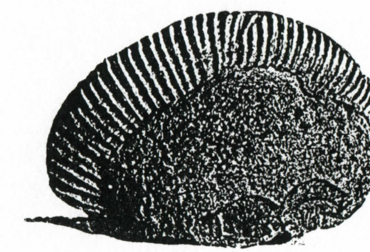


Fig.2, Crioceras irregulare

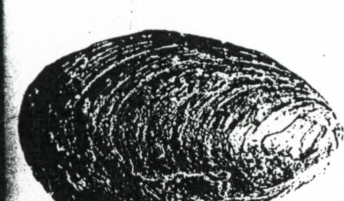
(4.)
Aphanaia mitchelli—*De Kon.*,
half natural size.

(5.)
Ditto, side view.

(6.)
Crioceras australe—*Moore*,
front view, one-third natural size.



(7.)
Ditto, back view.



(8.)
Mytilus inflatus—*Moore*,
two-thirds natural size.

(9.)
Sanguinolites tenisoni—*De Kon.*,
natural size.

...ods, del.

S T Leigh & Co. lith., Sydney.