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TWO UNDESCRIBED PELECYPODA FROM THE LOWER CRETACEOUS OF QUEENSLAND IN THE COLLECTION OF THE AUSTRALIAN MUSEUM.

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(Plates xxxiv. – xxxv., and Fig. 21).

1. FURTHER EVIDENCE OF *Teredo*.

THE presence of *Teredo*-like tubes in our Lower Cretaceous Series, has been known for some time, but until the specimens about to be described came under notice, the existence of this boring Mollusc was not thought to be as plentiful as now proves to be the case.

The first record of *Teredo* in Australian Mesozoic beds is due to the late Mr. Charles Moore, who described a shell, forming one of a colony, as *T. australis*,[1] from the Oolite of West Australia. This had been previously recorded by the late Rev. W. B. Clarke as a *Pholas*.[2] Some years subsequent to Moore's description, I recorded the presence of *Teredo* in limited quantity in both our Upper and Lower Cretaceous—impressions of tubes in the grit of the Croydon Goldfield,[3] and shelly tubes in limestone,[4] brought under my notice by the late Rev. J. E. T. Woods, with, in one instance, a portion of the valves remaining. *Teredo*-bored wood was also collected from the Rolling Downs Formation by Mr. G. Sweet,[5] at Hughenden and the Walsh River.

Amongst many other interesting Lower Cretaceous fossils collected and presented to the Trustees by Mr. W. H. Blomfield are fourteen blocks of variable size, either representing or forming parts of tree-trunks, riddled with the shelly tubes of *Teredo*, many of large size.

Some of the blocks represent portions of trunks preserved in the round, others divided longitudinally, and some in pieces only. The following measurements of the two former conditions were noted:—

	Length (direction of growth).	Breadth (right angles to direction of growth).	Circumference or girth.
	′ ″	′ ″	′ ″
a	1 3 ...	1 0 ...	2 5
b	0 8 ...	1 0½ ...	2 10
c	0 9 ...	0 11½ ...	2 9
d	1 1 ...	0 10 ...	2 4

They indicate a fairly uniform size.

1 Moore—Quart. Journ. Geol. Soc., xxvi., 1870, pp. 230 and 253, pl. xii., f. 11.
2 Clarke—*Ibid.*, xxiii., 1867, p. 8.
3 Etheridge, Junr.—Geol. Pal. Queensland, etc., 1892, p. 572, pl. xliii., fig. 11.
4 Etheridge, Junr.—*Loc. cit.*, f. 12.
5 Etheridge, Junr.—*Loc. cit.*, p. 573.

The *Teredo* tubes penetrate the wood both parallel and at right angles to the direction of growth of the trees, and in either case are more or less parallel and contiguous to one another, or twisted and interlaced in a very confused manner, contorted and even returned on themselves, or crumpled in the form of the letter S. A similar variability in the direction of the tubes is described by Mr. J. Griffith in the great Sumatran *Kuphus*,[6] during life. In one instance, at least, where half the trunk is preserved transversely, the tubes extend to the very centre. According to the direction of penetration, the tubes are seen in transverse section, longitudinal section, or on the outsides of trunks in the round. The anterior closed ends of the tubes or caps are convex or round, and the diminution in diameter towards the posterior is very slow. The average diameter of the largest tubes at the anterior end is one inch, but a few have been measured as much as one and a quarter inches, and in a single instance the cross section was one and a half inches. These diameters dwindle at the posterior ends to two-eighths and five-sixteenths of an inch. The total length is unknown, but the longest portion measured was six inches. None of the tubes, so far as can be ascertained, are perfect, neither was I fortunate enough to discover in any of the natural sections the valves at the anterior ends, or the forking and septal lamellæ towards the posterior terminations.

The walls are very variable in thickness, some presenting a mere knife-like edge in cross-section, others being stout and thickened, up to as much as two millimetres.

The surface, where exposed in the round, seems to be quite devoid of sculpture. The tube walls are composed of calcedony, with here and there a calcite infilling. It follows that great alteration and replacement must have gone on subsequent to the original fossilisation; this is borne out by the condition of the wood, to be referred to later. The late Dr. Gwyn Jeffreys says[7] the sheath or tube of *Teredo* in the recent state is destitute of anything like true structure, and only composed of minute calcareous particles agglutinated together. In the great *Kuphus arenarius*, on the other hand, the sheath exhibits a prismatic crystalline structure, and in a figure given by Mr. J. Griffith[8] the prisms are seen to be arranged in concentric rings. Dr. G. Johnston says[9] the prisms are short and perpendicular to the surface.

Similar large *Teredo*-like tubes have been described from Cretaceous rocks. Stoliczka figures one, *T. crassula*,[10] from the Ootatoor

6 Griffith—Phil. Trans. for 1806, pt. 2, p. 270.
7 Jeffreys—Brit. Conchol., iii., 1865, p. 156.
8 Griffith—*Loc. cit.*, pl. x., fig. 4.
9 Johnston—Introd. to Conchol., 1850, p. 431.
10 Stoliczka—Pal. Indica: Cretaceous Fauna S. India, iii., pts. 1 - 4, 1870, p. 16, pl. i., f. 2.

Group, boring wood, but in this case the valves of the shell were discovered, an advantage I have not possessed.

Another species, larger than Stoliczka's *T. crassula* is the huge *T. pugetensis*, White,[11] from the Puget Group of Western America, probably of uppermost Cretaceous age. This was also found in wood, and although the valves were not seen, every probability exists that it is a true *Teredo*, closely akin to the Queensland form. The sheath diameter of the two is almost the same.

In an excellent article on *Teredo* and its work, by Mr. A. M. Snow,[12] the latter says, speaking of course of the living forms:—"The largest diameter ever noticed by the author measured $1\frac{1}{8}$ ins. . . . After the Teredo has penetrated the wood for a little distance, the diameter remains about constant." He adds that a large size indicates a warm climate.

The Queensland fossil may be known as *Teredo vastitas*.[13]

An examination of the wood by means of thin sections prepared for the microscope, has not yielded the satisfactory results expected. In the first place two facts are established—(1) The wood had clearly undergone long maceration in water previous to fossilisation, producing a half rotten condition; (2) the trunks also underwent considerable lateral pressure, as evinced by the broken up state of the tissues. The latter are impregnated with iron oxide and some silica. All that I can venture to affirm at present is the Coniferous nature of the wood, but whether Araucariform or Cupressiniform must remain for future and better material to decide. The evidence obtainable from transverse and tangential sections is sufficiently conclusive on the first point, but the radial sections do not afford sufficient data to warrant the drawing of a hard and fast conclusion on the second. In transverse sections, notwithstanding the disabilities already mentioned, the walls and cavities of the woody fibres are exhibited in regular quadrangular spaces, with a one-inch objective, also the medullary rays and some resin ducts. In tangential sections, the vertical walls and spaces of the woody fibres are quite apparent, and so are the transverse sections of groups of medullary rays, with the parenchymatous cells uniserial and variable in number in the different groups, the latter being very abundant. All my radial sections, and many have been made, are a failure from an anatomical point of view for reasons already given; all that can be distinguished is a mass of badly preserved and crushed woody fibre. So much depends on the radial section in the differentiation of Coniferous woods, that I am afraid I can do no more than suggest that, granting a Coniferous nature, this wood may be either Araucariform or

11 C. A. White—Bull. U.S. Geol. Survey (Powell's), No. 51, 1889, p. 62, pl. viii.

12 A. M. Snow—Trans. Am. Soc. Civil Engineers, xl., No. 837, 1898, p. 189.

13 *Vastitas*, an empty place, waste, or desert, in allusion to the locality.

Cupressiniform. I had hoped in connection therewith to have solved a problem that has been before me for some time. It is this:—In 1883, the late Baron F. v. Mueller[14] described wood from the auriferous Pliocene drifts of Haddon, Victoria, and assumed it to be that of his previously described fruits, *Spondylostrobus smythii*, simply because the latter were believed by him to be Cupressiniform, and found in the same deep-lead drifts as the wood in question. Subsequently Von Mueller seems to have forwarded to Leipzig, Cupressiniform wood from the auriferous drifts of Ballaarat.[15] This Schenk figured under the name of *Phyllocladus mülleri*. Now, are these woods one and the same? Schenk says that in *Phyllocladus* the large oval pores on the parenchyma cells of the medullary rays are inclined to the left, but in Von Mueller's figure of the supposed *Spondylostrobus* wood the same pores are represented as circular, but no special reference is made to them in the text. Have we one or two Cupressiniferous woods in our Pliocene or Miocene Gold-drifts? Neither of these woods has ever been traced to its original source *in situ*, with any degree of certainty. Still, there is the bare possibility, now that we know definitely of the existence of Coniferous wood in Lower Cretaceous times in Australia, that the logs found in the gold drifts of Upper Tertiary age may be a remnant of Cretaceous denudation.

Finally, it may not be amiss to offer a few conclusions that the discovery of these trunk blocks lead to:—(1) The existence of a vigorous growth ef Coniferous trees in Eastern Australia during Cretaceous times; (2) the existence of an arm of the sea with such trees flourishing on its shores, or a river or water-way down which they were floated; (3) immersion for a lengthened period under such conditions as would allow the necessary degree of salinity to exist in the water concomitant with the life of *Teredo*; (4) existence of a warm climate.[16]

Scattered pieces of wood have been found at different times throughout the Rolling Downs Formation, and recorded, whilst a fairly vigorous growth of vegetation may also be inferred from the occurrence at various localities of thin seams of coal—as for instance on the Upper Flinders River, near Hughenden; on Ayrshire Downs; at Winton; Malta, near Tambo; head of Bungeworgorai Creek, near Mitchell; and at Dulbydilla.[17] These are all localities in the Lower Cretaceous of Queensland.

The blocks were collected by Mr. W. H. Blomfield.

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14 Von Mueller—Geol. Survey Vict., Obs. Veg. Foss. Aurif. Drifts, Dec. ii., 1883, p. 22, pl. xx.

15 Schenk—Zittel's Handb. Pal., ii. Abth., Palæophytologie, pp. 872-874, f. 424-425. The usual havoc is played with our geography, for Ballaarat is said to be in New South Wales!

16 Snow says that a large size in *Teredo* is due to a warm climate (*loc. cit.*, p. 188).

17 R. L. Jack—Geol. Pal. Queensland, &c., 1892, pp. 392 and 406.

For the microscopic sections of the wood I am indebted to Messrs. P. Crawford and H. Gooch, of the Geological Laboratory, University of Sydney.

2. The Occurrence of *Pholadomya*.

Genus Pholadomya, *G. B. Sowerby*, 1823.
(Genera of Shells, No. 19).

Pholadomya terra-reginæ, *sp. nov.*
(Fig. 21).

Sp. Char.—Cast transversely elongate, oblique, inequilateral in the extreme, apparently equivalve, attenuating in thickness posteriorly. Cardinal margins straight, with a short circumscribed

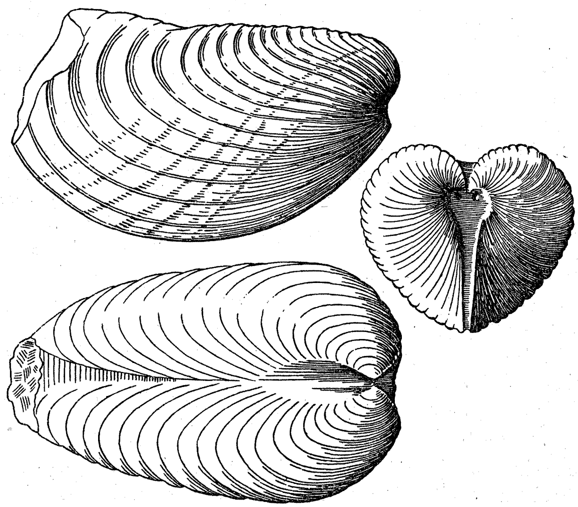

Fig. 21.

false area. Ventral margins obliquely rounded from beneath the umbones downwards, swelling out at a point slightly posterior to the middle. Anterior ends practically absent. Posterior ends (imperfect in specimen), but probably narrow and obtusely pointed, judging by the lines of growth; greatest convexity of the valves immediately posterior to the umbones; posterior slopes somewhat flattened; diagonal ridges rounded. Umbones absolutely anterior, terminal, incurved, contiguous, and depressed. Sculpture of concentric rugæ bearing finer parallel lines, the former separated by valleys of equal width, the valves crossed diagonally, in the centre only, from the umbones to the ventral margins by a few equal and regular costæ, the points of intersection with the rugæ showing signs of small tubercles or nodes.

Obs.—The previous occurrence of *Pholadomya* in our Continental Secondary rocks depends on the identification by the late Mr. Charles Moore[18] of a European species (*P. ovulum*, Ag.), in the Oolite of Western Australia, and a debatable form figured by Mr. R. Etheridge[19] from the Cretaceous of Gordon Downs, Queensland, without specific name.

The present species is of a very peculiar type, what with its transversely elongated outline, depressed beaks, straight cardinal margin, and want of an anterior end. The absence of an anterior end, strictly speaking, and the oblique antero-ventral outline are features seen in such *Pholadomyæ* as *P. læviuscula*, Ag., *P. decorata*, Ag., *P. cancellata*, Ag., and so on. Strange to say, although *P. terra-reginæ* is undoubtedly from our Cretaceous beds, the outline is far more like two Infra-Liassic species—*P. lagenalis*, Schafh., and *P. lariana*, Stop.,[20] than it is to the generality of Cretaceous forms. In the two species figured by Stoppani, the anterior end appears to be wanting, as in our fossil, but the valves are devoid of costæ. To some extent there is a likeness to *P. rostrata*, Matheron, as figured by Zittel,[21] from the Gosau series, and *P. depacta*, Hamlin,[22] from the Syrian Cretaceous, but in both instances an anterior end, more or less, exists, and the entire surface is costate. Dr. M. A. Blanckenhorn figures another Syrian species to which *P. terra-reginæ* is somewhat allied—*P. pedernalis*, Roemer,[23] in so far as the absence of an anterior end and the presence of nodulated costæ on the centre of the valves, but lacking the longitudinal extension of the valves seen in our species. In form and obliquity the British Lower Greensand species, *P. martini*, Forbes,[24] is allied, but again differs in the presence of an appreciable anterior end.

The cardinal or dorsal aspect of our specimen is worn, but I believe a circumscribed area of limited extent existed.

The specimen was collected and presented by Mr. W. H. Blomfield.

The sketches are by Mr. C. Hedley.

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18 Moore—Quart. Journ. Geol. Soc., xxvi., 1870, pp. 231-232.

19 Etheridge—*Ibid.*, xxviii., 1872, p. 347, pl. xxv., f. 6.

20 Stoppani—Pal. Lombarde, 3e Série, p. 43, pl. iii., f. 1-3, and p. 44, pl. iii., f. 4-7.

21 Zittel—Bivalven Gosaugebilde Nordöst. Alpen, 1864, 1 Theil, pl. ii., f. 2 *a-c*.

22 Hamlin—Mem. Mus. Comp. Zool. Harvard, x., 3, 1884, pl. vi., f. 6 *a-b*; Blanckenhorn—Beiträge zur Geol. Syriens: Entwickelung Kreid. Mit.-Nord-Syrien, 1890, pl. v., f. 12 *a-b*.

23 Blanckenhorn—*Loc. cit.*, p. 94, pl. v., fig. 13.

24 E. Forbes—Quart. Journ. Geol. Soc., i., 1845, p. 238, pl. ii., f. 3.

EXPLANATION OF PLATE XXXIV.

Teredo vastitas, Eth. fil.

Mature individuals boring wood.

About two-fifths natural size.

~~T. WHITELEGGE, Photo.~~

H. BARNES, Junr., Photo.

Australian Museum.

EXPLANATION OF PLATE XXXV.

Teredo vastitas, Eth. fil.

Young individuals boring wood.

About two-fifths natural size.

~~T. WHITELEGGE, Photo.~~
H. BARNES, Junr., Photo.

Australian Museum.