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NOTES ON TESTACEA FROM THE PLEISTOCENE MARL OF MOWBRAY SWAMP, NORTH-WEST TASMANIA.

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(Plates I., II.)

The object of the present note is to record one or two additions to the list of mollusca given by Dr. F. Noetling*, and to describe the occurrence of some Ostracoda new to Tasmania. For the opportunity of examining a sample of this marl from the Mowbray Swamp I am indebted to Dr. T. S. Hall, M.A., and Mr. T. Stephens, M.A. From this deposit the remains of a giant marsupial, the *Nototherium tasmanicum* of Mr. H. H. Scott†, were obtained, whilst Dr. Noetling has dealt generally with the characters of the mud deposit.

Quoting from Dr. Noetling (loc. cit., p. 125), "The Mowbray Swamp is about 12 miles west of Smithton, and, apparently, fills up a shallow depression of the surface. Probably it represents an old river course, which once had an outlet to the sea, but which subsequently became blocked up by sand. At present the 'swamp' is divided from the sea by a narrow strip of sand, on which low dunes are rising towards the coast. There is hardly any natural fall from the swamp to the sea, and the vegetabilic mould, or, better said, peat, which fills up the depression, is completely waterlogged. The thickness of the peat layer is not exactly known yet, but along the edge of the swamp, where drainage work has been extensive, it reaches about 25 feet to 30 feet. To me it seems very probable that the deepest point of the firm bottom on which the peat rests, is below sea level, and this would account in some way for the sluggishness of the fall."

The material here examined, chiefly for ostracoda, of which, by the way, no species have yet been recorded, is a pale yellowish-grey marl, of a loose, pulverulent nature.

The mollusca met with in the present sample are:—

Sphærium tasmanicum, T. Woods sp.
Pisidium tasmanicum, T. Woods.
Bythinella nigra, Quoy and Gaimard sp.
Assiminea tasmanica, T. Woods.
Bulinus tasmanicus, T. Woods sp.
Amphipeplea subaquatilis, Tate sp. var. *neglecta*, Petterd.
Vitrina milligani, Pfeiffer.

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* Proc. R. Soc. Tas., 1911, pp. 124–133. List of mollusca on p. 128.
† Tasmanian Naturalist, vol. ii., No. 4, 1911, p. 64.

Of these, *Assiminea tasmanica* and *Amphipeplea subaquatilis*, var. *neglecta*, are not recorded by Dr. Noetling. The genera *Assiminea* and *Bythinella* are strong indications of the presence of tidal influence in this swamp. This bears out Noetling's conclusions, since he states that "Probably it represents an old river course which once had an outlet to the sea." (loc. supra cit.).

The ostracoda are new to this locality and deposit. They are referable to—

Candona lutea, King, and
Limnicythere mowbrayensis, sp. nov.

NOTES ON THE MOLLUSCA.

PELECYPODA.

Sphærium tasmanicum, T. Woods sp.

Cyclas tasmanica, T: Woods, 1876, Proc. R. Soc., Tasm., for 1875, p. 82. *Sphærium macgillivrayi*, E. A. Smith, 1881, Proc. Linn. Soc., Lond., Zool., vol. XVI., p. 305, pl. VII., fig. 34.

Tenison Woods gives the length of the type shell as 9mm.; whilst the largest of our fossil form is only 4mm. The general colour of the shell, and the silvery bands mentioned by that author, are still visible on the fossil specimens.

As regards the synonymy of the species, there is no doubt of the identity of Mr. Edgar Smith's species with the earlier *S. tasmanicum*. This conclusion is based not only on a comparison of the description of both shells and the figures of *S. macgillivrayi*, but also from an examination of many examples from different localities in Victoria and Tasmania, in the Dennant collection. Moreover, the young of *S. tasmanicum*, from Lake Connewarre, near Geelong (labelled in the Dennant collection as a *Pisidium*, is identical with our Pleistocene fossils from the Mowbray Swamp. Further than this, the *Sphærium tasmanicum* is the only species known from Tasmania, and has been previously identified by Dr. Noetling from that locality.

Pisidium tasmanicum, T. Woods.

Pisidium tasmanicum, T. Woods, 1876, Proc. R. Soc., Tasm., for 1875, p. 81.

The length of the shell in this species, according to T. Woods, is from 2–4mm. The fossil examples are about 1.75mm. in length. In the original description of this species, there is no mention of other surface-ornament than the concentric striæ. The present specimens, however, show numerous very fine radial striæ crossing the concentrics, when viewed under the microscope by oblique incident light. This species has been recorded from the same locality by Dr. Noetling.

GASTEROPODA.

Bythinella nigra, Quoy and Gaimard sp.

Paludina nigra, Quoy and Gaimard, 1834, Voyage Astrolabe, vol. III., p. 174, pl. LVIII., figs. 9-12.

Bythinia legrandi, T. Woods, 1876, ibid for 1875, p. 76.

B. tasmanica, T. Woods, 1876, ibid, p. 77.

Bythinella exigua, T. Woods, 1878, ibid, for 1877, p. 71.

Potamopyrgus nigra, Quoy and Gaimard sp., Petterd, 1889, ibid, for 1888, p. 69, pl. III., figs. 2-8.

Bythinella nigra, Quoy and Gaimard sp., Noetling, 1912, ibid, for 1911, p. 129.

The above species is the commonest mollusc in the Mowbray Swamp deposit. It agrees with the normal form figured by Quoy and Gaimard, and only slightly varies in height of spire and tumidity of whorls. None of the specimens show any variation towards the varieties *legrandiana*, Brazier*, or *unicarinata*, T. Woods†.

This species has been recorded by Dr. Noetling from the same locality as above.

Assiminea tasmanica, T. Woods.

Assiminea tasmanica, T. Woods, 1876, Proc. R. Soc., Tas., for 1875, p. 79.

Rissoa (Setia) siennæ, T. Woods, 1877, p. 153.

Assiminea tasmanica, T. Woods, Petterd, 1889, Proc. R. Soc., Tas., for 1888, p. 77, pl. II., fig. 2.

A. tasmanica, T. Woods, Gatliff, 1905, Vict. Nat., vol. XXII., p. 15.

The present specimens agree with the original description by Tenison Woods, and, to some extent, with Petterd's figure referred to above. The latter, however, does not do justice to the shell in showing the characteristic acute spire and sub-angularity of the last whorl. Some examples of the species from Port Albert, Victoria, which I have been enabled to examine through the kindness of Mr. C. J. Gabriel, have, however, a decidedly inflated outline. The figure of *A. tasmanica* given by Mr. Hedley‡ is suggestive of *A. brazieri*, T. Woods, in its obtuse spire, sub-globose shell with rounded whorls, and colour bands. These colour bands are absent from typical examples of *A. tasmanica*, as also from our fossil specimens, which, when moistened, show all other colouration originally present.

The present genus and species does not appear in Dr. Noetling's list.

Genus Bulinus, Adamson, 1757.

Note on the genus.—The common Australian sinistral pond-snails have been variously ascribed to *Physa*, *Bulinus*, *Isidora*, and *Aplexa*. Under the genus-name *Bulinus*, Prof. R. Tate has made

* Proc. Zool. Soc. Lond., 1871, p. 698. "*Paludestrina legrandiana*."
† Proc. R. Soc. Tas. (for 1875), 1876, p. 77. "*Bythinia unicarinata*."
‡ Proc. Linn. Soc. N.S. Wales, vol. xxx., 1905, p. 527, pl. xxxii., fig. 27.

the following observations regarding this group* :—"The sinistral spiral pond-snails of Australia have been placed (incorrectly so, I believe) in the genus *Physa*. The thick periostracum of most of them, which in many of them is prolonged into cilia or bristles, is incompatible with a largely reflexed mantle. I have not examined all the Australian so-called *Physæ*, but in no instance have I found those distinctions which characterize *Physa* as separable from *Bulinus*. . . . . The mantle margin is neither expanded nor digitate, in *B. tenuistriata*, however, it has three small serratures on the columella side."

In looking into this question of the generic position of our sinistral pleistocene fossils the present writer has examined two typical living Victorian species, namely, *Bulinus bullatus*, Sow. sp.†, and *B. crebreciliatus*, T. Woods sp.‡, with the following results :—

The edge of the mantle in both these species is slightly reflected and undulate (Pl. I., figs. 1-3), but is not divided into numerous distinct angular tags, as in *Physa* (see also Pelseneer§). This Australian type of shell would, therefore, naturally fall into the genera *Bulinus* or *Aplexa*, but that the latter has a polished shell.‖ The relationship was then tested by the structure of the radula. *Aplexa* in being placed with *Physa* in the *Physidæ* gives no evidence of relationship with the Australian specimens I have examined. In *Bulinus proteus*, Sow. sp., the radula, on the contrary, shows its relationship to be with the *Planorbidæ* (Pl. I., figs. 4*a–c*), in which family *Bulinus* is placed by Pelseneer. The centrals and laterals of the lingual ribbon in *B. proteus* are only slightly modified from a radula such as *Planorbis corneus*, Linne¶, the three cusps being a constant character of the free edges of the teeth**.

Bulinus tasmanicus, T. Woods sp.

(Plate I., Figs. 5, 5a.)

Physa tasmanica, T. Woods, 1876, Proc. R. Soc., Tas., for 1875, p. 74.

It was of this species that Tenison Woods remarked (*op. supra cit.*, p. 74) that it "is the common *Physa* of the country, and is found in all the inland streams. It is, however, so closely allied to the *Physa fontinalis* which is diffused over Great Britain and Europe, that we may well doubt if it be distinct††. If not, has it

* Trans. R. Soc. S. Austr., vol. v., 1882, p. 51.

† "*Physa bullata*," Sowerby, in Reeve, 1874, Con. Icon., fig. 97.

‡ "*Physa crebreciliata*," T. Woods, Proc. R. Soc. Vict., vol. xiv., 1878, p. 63.

§ Treatise on Zoology, pt. 5, Mollusca, Oxford, 1906, p. 186.

‖ See Fischer, P., Manuel de Conchyliologie, 1887, p. 511.

¶ Op. supra cit., p. 504.

** Since writing the above, Mr. C. J. Gabriel has kindly drawn my attention to an important paper by the Rev. A. H. Cooke (Proc. Zool. Soc., Lond., for 1889, pp. 136–143), "On the Generic Position of the so-called *Physæ* of Australia," in which the structure of the radula is fully discussed. The conclusions arrived at are in exact agreement with the above investigations, that the Australian *Physæ* are really sinistral Limnæids, but in their radulæ nearer to *Planorbis* than to *Limnæa*.

†† *Physa fontinalis* is a shorter form with a less acuminate spire.

been introduced ?" In discussing the question of the importation of this shell, on the grounds of its determination as *Physa*, Dr. Noetling* points out that the association of the remains of a giant marsupial goes to prove that it is indigenous. The present determination, that it is a distinct type from *Physa*, although outwardly resembling it, affords another instance of convergence of external form in different organisms.

Two minute specimens of *Bulinus* were also found accompanying the shells of *B. tasmanicus* in this deposit; and these were at first thought to represent a new specific type, on account of the few whorls and exceptionally globose protoconch. On comparing the latter characters, however, in a series of *B. tasmanicus* a great range of variability was found in regard to the form of the apex; and the natural conclusion is, that these specimens represent the embryonic shells of *B. tasmanicus*. This species, by the way, appears to connect *B. nitida* and *B. eburnea*, the former having a short shell with a large aperture; the latter a shell with the aperture narrow, ovate, and shorter than the spire.

Dr. Noetling also records this species from the above locality.

Amphipeplea subaquatilis, Tate, var. *neglecta*, Petterd.

Limnæa subaquatilis, Tate, var. *neglecta*, Petterd, 1889, Proc. Roy. Soc., Tas., for 1888, p. 66, pl. II., fig. 13.

This interesting little species is here represented by two specimens, typical in all points but that of size, the length of the larger example being 3mm., against 7mm. in Petterd's specimen. It differs from the European *L. peregrer*, Draparnaud, in the less expansive aperture and more slender form of the shell.

Vitrina milligani, Pfeiffer.

Vitrina milligani, Pfeiffer, 1852, Monographia heliceorum viventium, vol. III., p. 4. Cox, 1868, Mon. Austr. Land Shells, p. 82, pl. XIV., figs. 2, 2*a*.

A bleached and somewhat imperfect shell of the above occurs in the marl. The species has already been recorded by Dr. Noetling from the same locality.

OSTRACODA.

Genus Candona, Baird.

Candona lutea, King.

(Plate II., Figs. 6 *a*, *b*, 7.)

Candona lutea, King, 1855, Proc. R. Soc., Tas., vol. III., pt. I., p. 67, pl. X., fig. K.

C. lutea, King, Brady, 1886, Proc. Zool. Soc., Lond., p. 92, pl. VIII., figs. 10, 11, pl. X., figs. 7, 8.

Observations.—This species is excessively common in the Mowbray Swamp deposit. There is a fair amount of variation in the carapaces

* Proc. Roy. Soc. Tasmania for 1911, 1912, p. 128.

some having the postero-dorsal angle obtuse, as in a typical *Candona*, although the majority are more evenly rounded than usual in that genus. A young individual is here figured, which goes to show the identity of the specimen from the Tweed River, New South Wales, figured by Dr. Brady as doubtfully belonging to this species (*loc. supra cit.*, pl. VIII., figs. 10, 11); since graduated examples linking both forms may be found here. The living examples previously recorded were all from New South Wales.

The carapaces of some examples in the present series are so well preserved as even to show remains of the dried animal within, though in a powdery condition, whilst the dull yellow colour of the original shell is evident in most of the specimens.

Genus Limnicythere, G. S. Brady.

Limnicythere mowbrayensis, sp. nov.

(Plate II., Figs. 8, *a–c.*)

Description.—Carapace very minute; measuring ·46mm. in length, ·27mm. in greatest height (in the anterior third), and ·17mm. in the thickness of the carapace. Seen from the side, subrectangular; dorsal margin almost straight; ventral edge with a broad median re-entrant angle; anterior border rounded, truncately so on the dorsal region; posterior boldly rounded. There are three rounded tubercles situated a short distance from the dorsal margin in the antero-median area, and one large, prominent tubercle near the middle of the ventral border directed dorsally. Anterior border finally crenulate; post-ventral area with a border of minute aculeations. Anterior margin compressed and flange-like. Surface of carapace finely sculptured with a thread-like reticulated or areolate ornament.

Observations.—This form, although distinct from any species known to me, approaches the type of *Limnicythere inopinata*, Baird sp.; a form common in ditches, lakes, and running streams in Sweden, Holland, and Great Britain; and also occurring as a pleistocene fossil in Scotland and England. It is especially related to that variety of *L. inopinata* known as var. *compressa**, which occurs in Whitefield Loch, Wigtonshire, Scotland. That variety differs in the absence of the quadruple tuberculation and in the general contour of the carapace in edge view.

Limnicythere mowbrayensis is common in the marl deposit of the Mowbray Swamp, Tasmania. This appears to be the first record of the genus *Limnicythere* in Australasia.

In conclusion, my best thanks are due to Mr. C. J. Gabriel for valued assistance in the literature of the mollusca discussed; to Mr. J. Wilson for kindly allowing me to examine his slides of molluscan radulæ; and to Mr. W. L. May, for some valuable notes on the local forms.

* Brady and Norman. Trans. R. Dubl. Soc., ser. 2, vol. iv., 1889, p. 170, pl. xvii., figs. 18, 19.

SUMMARY.

1. The sinistral molluscs generally referred to *Physa*, *Isidora*, and *Aplexa*, are here shown to belong to *Bulinus*, as already held by Prof. Tate, on account of the more or less entire character of the margin of the mantle, and the structure of the lingual teeth which closely approach those of *Planorbis*.
2. Two species of ostracoda are newly recorded from Tasmania. One of these is an entirely new species, and extremely interesting in view of the occurrence of a closely related form in Europe, found similarly in Pleistocene deposits. This opens up a question regarding the transportation of lacustrine or fluviatile organisms within moderately recent geological time.
3. The conclusion as to the age of the Mowbray Swamp deposit is significant, for it shows that the first marsupial associated with these remains cannot date very far back in Pleistocene times, as seen in the comparatively fresh condition of some of the mollusca and the ostracoda, many of which have their original colour markings still preserved. This evidence gives further support to Dr. Noetling's previously recorded conclusions, based on an examination of the mollusca alone.

EXPLANATION OF PLATES.

Plate I.

Fig. 1.—Part of body of *Bulinus crebreciliatus*, T. Woods sp., showing the non-digitate mantle. Living. Sandringham (Nat. Mus. Coll.) × 2.

Figs. 2, 3.—Borders of the mantle in *Bulinus bullatus*, Sow. sp.; showing the sinuate margin. Living. Goulburn Valley, Viet. × 2.

Fig. 4.—Lingual teeth of *Bulinus proteus*, Sow. sp. (*a*) central teeth; (*b*) lateral teeth; (*c*) marginal tooth. Living. Meredith, Viet. × 380.

Fig. 5.—*Bulinus tasmanicus*. An embryonic specimen. Pleistocene. Mowbray Swamp, Tasmania. 5*a*, protoconch. × 26.

Plate II.

Fig. 6.—*Candona lutea*, King. (*a*) side view; (*b*) ventral view. Pleistocene. Mowbray Swamp, Tasmania. × 26.

Fig. 7.—*C. lutea*, King. A young example. Pleistocene. Mowbray Swamp. × 52.

Fig. 8.—*Limnicythere mowbrayensis*, sp. nov. (*a*) side view; (*b*) ventral view; (*c*) end view. Pleistocene. Mowbray Swamp, Tasmania. × 52.

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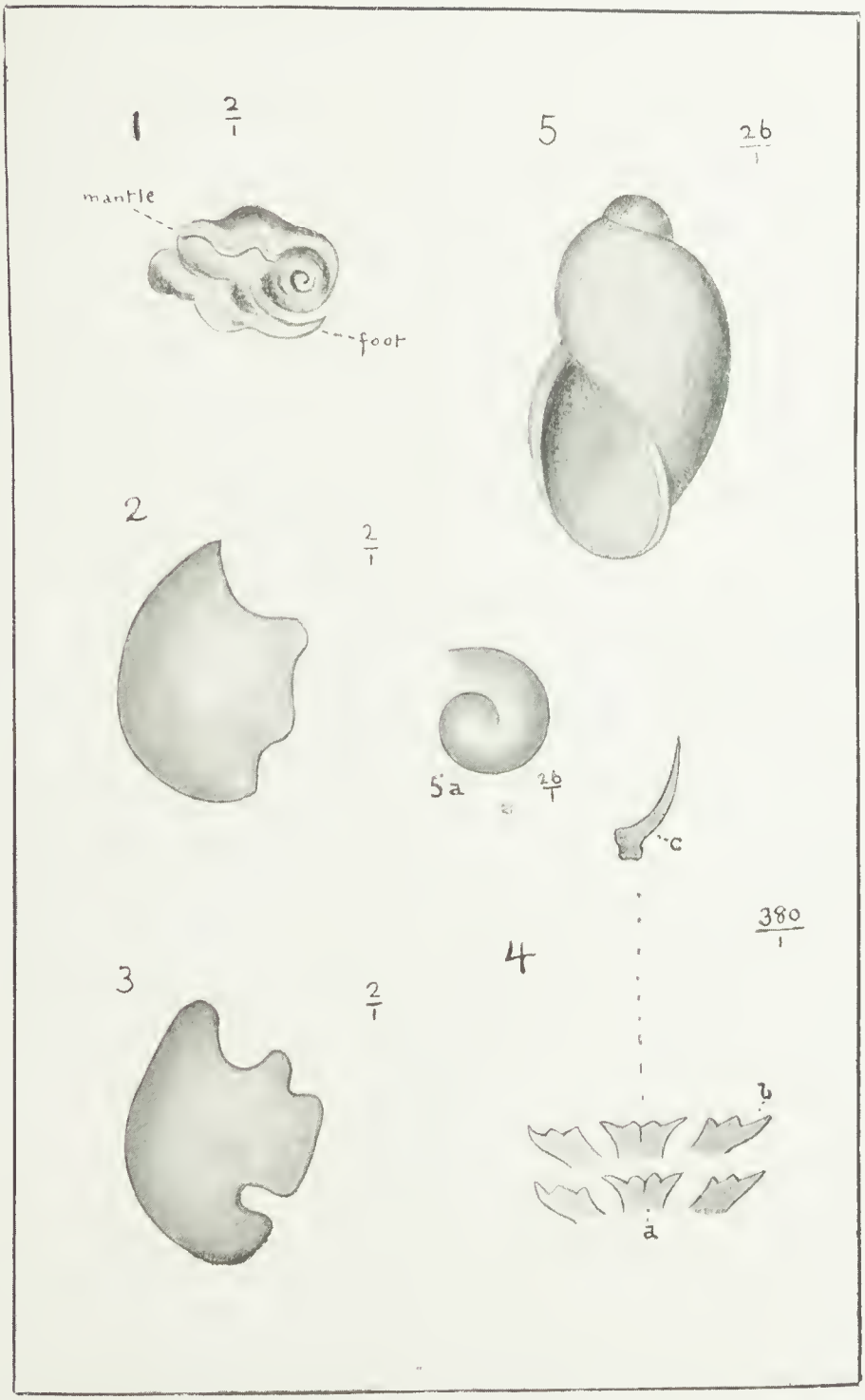

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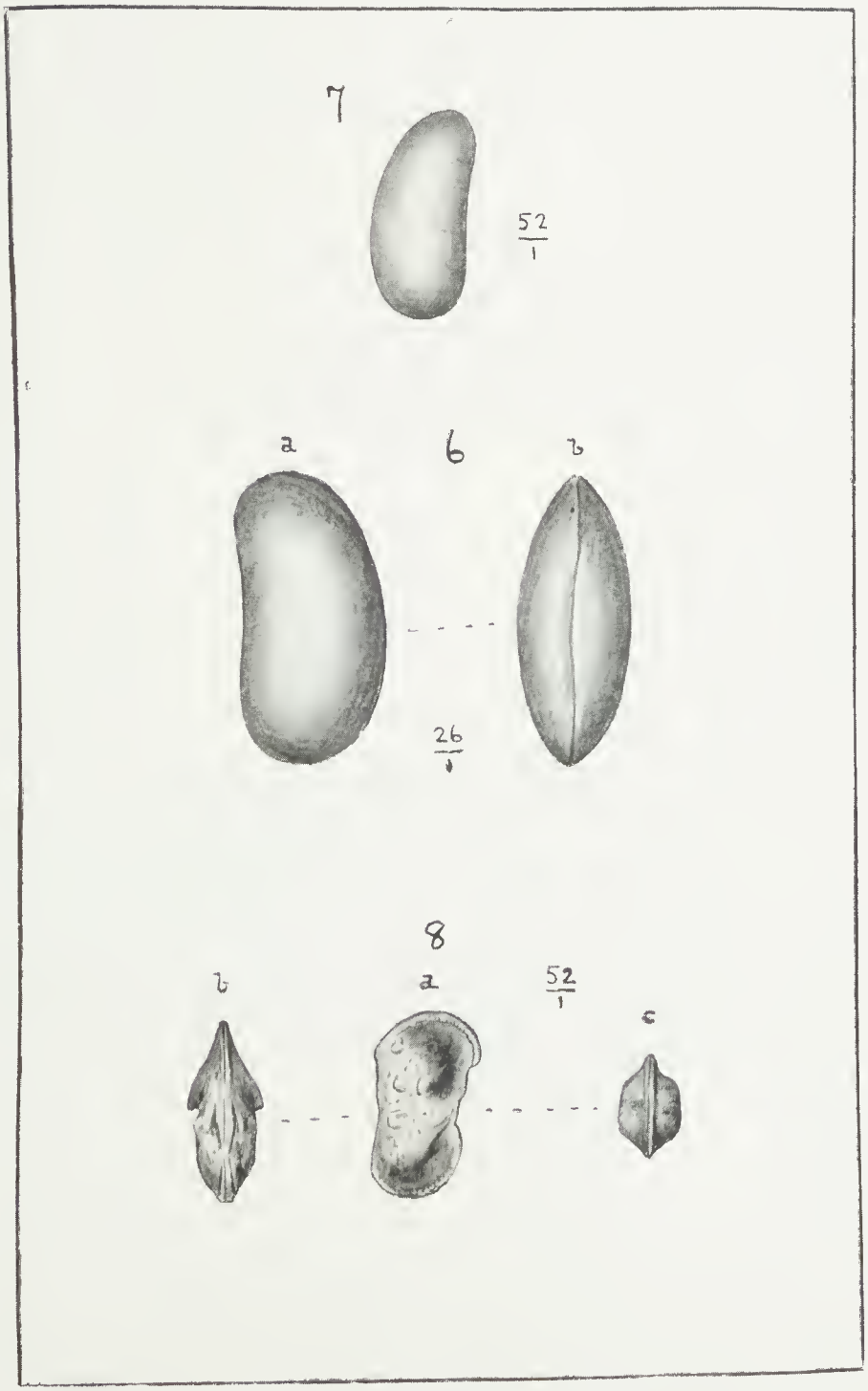
Structure in Bulinus.



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Pleistocene ostracoda, Mowbray Swamp, Tasmania