existing vegetation of Australia, nor any having been found in a fossil state previously in this part of the globe, although South-Eastern Australia and New Zealand possess—as well-known—the co-ordinal genus Fagus. This announcement of the occurrence of an Alder in the Tasmanian Travertin is all the more to be appreciated, as Mr. Johnston was fortunate enough to detect a fruit, amentum of this plant; a fact like this should encourage Tasmanian geologists to persevere in further searches after carpologic specimens in the rich and very accessible beds of fossils in their island. Schimper in 1872 enumerated 30 fossil species of Alnus, but only seven of these were any amenta procured by the several finders, the rest were described from leaves alone, and must therefore remain doubtful as regards generic and specific limits.

The prospect of Dr. Barnard settling professionally in his native city, holds out much additional hope for revelations in the fossil flora of the vicinity, after that talented gentleman has aided already so much in elucidating the pliocene vegetation of Gulgong.

It remains to confirm the systematic position now given to the above-mentioned Tasmanian pliocene plants by searching for fruit traces, irrespective of the likelihood of future investigations, proving that in Tasmania, as in many other parts of the world, the pliocene vegetation to which Alders were immixed, was also one of great richness in specific forms, few of them as yet known to us.

NOTES OF A CRITICAL EXAMINATION OF THE MOLLUSCA OF THE OLDER TERTIARY OF TASMANIA, ALLEGED TO HAVE LIVING REPRESENTATIVES.

By Professor Ralph Tate, F.G.S., F.L.S., Etc., Corr. Memb.

[*Read June* 9, 1884.]

Mr. R. M. Johnston, in Proc. Roy. Soc., Tasmania, 1880, p. 31, gives a list of Table Cape fossils, which have been referred to existing species. As I think that some of them have been incorrectly identified I am desirous to give explanatory reasons for the adoption of other names. Before doing so, I may remark that in my presidential address to the Royal Society of South Australia, vol. ii., p. lvi., 1879, I gave a list of 24 living species of various classes which existed in the Australian

seas during Eocene and Miocene times, five of the molluscs are included in Mr. Johnston's list; moreover, I stated that "other fossils have been referred to living species—to *Trivia Europœa*, *Leiostraca subulata*, *Lima subauriculata*, *Liotia lamellosa*, etc., but competent authorities have not confirmed these identifications." The references in the above quotation chiefly concern the Tasmanian geologist, and, as regards the first three species, I have the testimony of Mr. Gwyn Jeffreys, F.R.S.,—a specialist in European conchology—that the Tasmanian fossils do not belong to the existing species to which they have respectively been referred. He writes, "I have carefully compared these fossil specimens with recent ones bearing similar names from different parts of the European seas. I regret that I cannot acquiesce with Mr. Woods' identifications."

In the accompanying table I have set side by side the Table Cape fossil species and the recent forms with which some of them have been confounded; the names of the fossil species represented in living creation are printed in italic. It must not be supposed that seven species only are in common between the older tertiary fauna of Australia and the recent one, as a much greater amount of material awaits elaboration than has already been scrutinised, and which may presumably yield a few species having living identities.

FOSSIL SPECIES.	RECENT SPECIES WITH WHICH THEY HAVE BEEN CONFOUNDED.
1. Ancillaria mucronata—*Sow.*	Ancillaria australis—*Quoy.*
2. Triviaa vellanoides—*McCoy.*	Trivia Europœa—*Mont.*
3. Leiostraca Johnstoniana—*Tate.*	Leiostraca subulata —*Donov.* sp.
4. *Syrnola bifasciata—Woods.*	
5. *Crossea labiata—Woods. (?)*	
6. Liotia lamellosa—*Woods.*	Liotia subquadrata—*Woods.*
7. Liotia Roblini—*Johnston.*	
8. Natica polita—*Woods.*	Natica Beddomei—Johnston.
9. Fissurellidæ malleata—*Tate.*	Fissurella concatenata—*Crosse.*
10. Cylichna Woodsii—*Tate.*	Bulla arachis—*Quoy.*
11. *Dentalium lacteum — Deshayes.*	
12. Lima Jeffreysiana—*Tate.*	Lima subauriculata—*Mont.*
13. *Limopsis aurita.*	
14. *Limopsis Belcheri.*	
15. *Pectunculus laticostatus—Quoy.*	
16. Cucullaea Corioensis—*McCoy.*	Cucullaea concamerata—*Reeve.*
17. Corbula ephamilla—*Tate.*	Corbula sulcata—*Lamarck.*
18. *Rhynchonella squamosa—Hutton.*	

Ancillaria australis.

A. australis of Tenison-Woods, from the Table Cape beds, is certainly not Sowerby's species of that name. It should bear the cognomen *A. mucronata*, under which it is catalogued as a Table Cape fossil, by Tenison-Woods, in Proc. Roy. Soc., Tasmania, for 1875, p. 17, and as "one of the very few forms surviving in the present series," but in his census of the Marine Shells of Tasmania, loc. cit., 1878, p. 30, he corrects that statement, remarking that "*A. mucronata*, Sowerby, in Thes. Conch., Anc., p. 63, t. 211, fig. 11, is believed to have been described from the Lower Cainozoic beds at Table Cape. . . . Mr. Legrand informs me that he has never found it but as a fossil."

The differences between *A. australis* and *A. mucronata* are apparently trifling, but they are constant. Comparing them at the size represented by a length of about 25 millimetres:—*A. mucronata* has an ovate outline of an uniform width throughout, gradually tapering to a subtruncate mammillary apex; the pullus is concentrically costate-granulate. In *A. australis* the outline is ovate-fusiform, rapidly tapering to a subacute apex; the last whorl is relatively much enlarged. With a length of about 40 millimetres the differences are not so obvious, though *A. mucronata* is a narrower shell and shows traces of a mucronate apex.

Here are the various dimensions in millimetres of a large example of each species:—

	A. mucronata.	*A. australis.*
Total length	38	39
Length of aperture	20	25
Breadth of aperture	8	8
Greatest breadth...	18	19
Length of spire	19	17

Localities.—Table Cape, *R. M. Johnston.* Muddy Creek, near Hamilton, Victoria; and "Gastropod-bed" in the River Murray Cliffs, near Morgan, South Australia, *R. Tate.*

Trivia Europæa,

Believed by Tenison-Woods to occur at Table Cape as a fossil (loc. cit., 1877). This identification is based upon young or dwarfed examples of the widely distributed Australian fossil, *T. avellanoides, McCoy*—the distinctive characters of which have been fully pointed out by the author of the species in his definition of it. Most particularly are the ribs sharper in this fossil cowry than in *T. Europæa.*

Tenison-Woods figures an early stage of growth of this species as *T. minima* in Proc. Linn. Soc., N.S.W., vol. iv., t. 1, f. 8, 1879, relying for a differential character on the absence of a dorsal division between the ridges. He judged, more-

over, the shell to be an adult because of the thickened lips, overlooking the fact that *Trivia*, unlike *Cyprœa*, exhibits no shell-metamorphosis.

An examination of many small examples of *T. avellanoides* permits me to state that the smooth dorsal area does not begin to develope until the shell has reached a length of about eight millimetres.

Localities.—Table Cape, *Johnston.* Balcombe Bay and Muddy Creek, Victoria; River Murray Cliffs, near Morgan; Aldinga Cliffs; and bore-hole at Adelaide, *R. Tate.*

Syrnola bifasciata.

Reference.—Tenison-Woods, Proc. Roy. Soc., Tasmania, 1875, p. 145.

This recent Tasmanian gastropod-shell has been identified by the author of the species as a fossil in the Table Cape beds (loc. cit., 1876, p. 99). The species is unknown to me.

Eulimella subulata.

This name was applied by Tenison-Woods to a fossil from the Table Cape beds, an example of which, received from Mr. R. M. Johnston, I forwarded to Mr. Gwyn Jeffreys for comparison, who most authoritatively states it to be a different species, and which I propose to name *Leiostraca Johnstoniana.*

Natica polita.

Reference.—Tenison-Woods, Proc. Roy. Soc., Tasmania, 1875, p. 23.

Originally described as a Table Cape fossil. It has since been found living off the Tasmanian coast (loc. cit., 1877, p. 32). I have not seen recent examples of this species.

Crossea labiata.

Reference.—Tenison-Woods, Proc. Roy. Soc., Tasmania, 1875, p. 151.

This living Tasmanian shell has been recognised as a Table Cape fossil by Mr. R. M. Johnston (op. cit., 1880, p. 41). I have not seen a fossil specimen, but an allied species occurs fossilised at Adelaide, River Murray Cliffs, and Muddy Creek; it is much larger and the outer lip is simple, not varicosed as in *C. labiata.* If the Table Cape specimen be immature, or have a mutilated aperture, its identification cannot be reliable.

Liotia lamellosa.

Reference.—Tenison-Woods, Proc. Roy. Soc., Tasmania, 1876, p. 96.

This species was described from a Table Cape fossil, but the author appended a note, that a living example had been dredged off the Tasmanian coast.

Having had the opportunity of comparing recent and fossil specimens I found differential characters to obtain such as are set forth in Proc. Linn. Soc., N.S.W., 1878, p. 236, wherein Mr. Woods has applied the name of *L. subquadrata* to the living species.

Liotia discoidea.

The species so named by Reeve is living on the coast of the Philippines, and extends to Tasmania. It has been quoted by Tenison-Woods as a Table Cape fossil, but Mr. Johnston gives valid reasons for rejecting that identification and has described the fossil under the name of *L. Roblini* in Proc. Roy. Soc., Tasmania, 1880, p. 39.

L. Roblini is abundant in the Muddy Creek beds, and a few examples have been collected by me from the "gastropod-bed" in the River Murray Cliffs, near Morgan.

Imperator (Australium) imperialis.

This recent New Zealand species is included, with a doubt, in the list of Table Cape fossils, by Mr. R. M. Johnston, in Proc. Roy. Soc., Tasmania, 1876, p. 90.

Fissurella concatenata.

The Rev. Tenison-Woods referred a Table Cape fossil to Crosse's species from South Australian waters, but which appears to be conspecific with *Fissurellidœa malleata*, mihi, in Trans. Roy. Soc., S. Aust., vol. v., p. 146, 1882.

Dentalium lacteum.

"Living in the Indian Seas. This is a doubtful identification. The fossil is very common, and may be a variety only." Tenison-Woods in Proc. Roy. Soc., Tasmania, 1875, p. 17.

I have not seen a Table Cape specimen of this species, but a Dentalium common in the Muddy Creek beds agrees well with the figure, measurements, and description given by Deshayes in his monograph of the genus.

Cylichna arachis.

"Still living in Tasmania and Australia, and not uncommon in the Table Cape beds." Tenison-Woods in Proc. Roy. Soc., Tasmania, 1876, p. 102. The same author, in dealing with another species from the Miocene deposits at Muddy Creek, refers to it as "one of those specimens which may, perhaps, be identified with Quoy and Gaimard's shell," and then pro-

ceeds to compare the one with the other, designating the Muddy Creek fossil as *C. exigua*. But the Table Cape fossil is neither *C. exigua* nor *C. arachis*, and for it I propose the name of *C. Woodsii*.

Arca trapezia.

This living species, which is so abundantly fossilised in the Pleistocene deposits on the coast of South Australia and on the islands in Bass' Straits, is included by Mr. R. M. Johnston in his list of Table Cape fossils (Proc. Roy. Soc., Tasmania, 1879, p. 41).

Judging from Mr. Johnston's unpublished drawing of the only specimen said to have been found in the Older Tertiary deposits, I think there cannot be a doubt as to the correctness of the identification, but grave suspicions attach to the habitat, which cannot now be cleared up by an appeal to the condition of the fossil, or to the nature of the matrix, as the specimen has been lost. Mr. Johnston writes me: "I am in doubt whether the specimen may not have been taken from some of the fallen masses in which possibly an old worn living shell had got mixed up. . . . We must consider this shell doubtful for the present."

Cucullæa concamerata

Is quoted by Tenison-Woods, *loc. cit.*, 1875, p. 15, and by Johnston, *id.*, 1879, p. 31, as a Table Cape fossil, yet the latter author, in a former paper, refers frequently to *C. Corioensis*, making no mention of *C. concamerata*. It is true that McCoy, in his earlier reports, gives *C. concamerata* as a fossil in the Older Tertiary of Victoria, but the name was subsequently abandoned for *C. Corioensis*, which is described by him as a new species, closely related to the living one. The two names have doubtlessly been used interchangeably by the Tasmanian geologists, especially as Mr. Johnston informs me that there is only one form at Table Cape.

Limopsis aurita.

This living species has been identified in the Victorian tertiary deposits by McCoy; but I very much question, if the large, thick, and smooth shell, which is so characteristic of the oldest of the Australian tertiary series at Adelaide and Aldinga in South Australia and which can be traced up from the smaller shells figured by McCoy, can find a compeer among the European examples of *L. aurita*, either living or fossil. For it Sowerby's name of *L. insolita* should be used until conclusive evidence is adduced of the applicability of Sacchi's name to our fossil. Sowerby described his *L.*

insolita in Darwin's "Geology of South America," wherein it is reported from the Eocene of Chili. Zittel records it from the Eocene of New Zealand. The Tasmanian fossil agrees with *L. aurita* as figured and described by McCoy.

Limopsis belcheri.

This living species was originally scientifically made known from specimens taken off Cape of Good Hope, but it is now known in Australian waters from St. Vincent Gulf to Portland, and has been recognised as an Older Tertiary shell by McCoy and by Tenison-Woods in the Table Cape beds.

Pectunculus laticostatus.

I do not acquiesce in Mr. R. M. Johnston's rejection of the above name for the species so common in the Table Cape deposits, which he names *P. McCoyii.* (Proc. Roy. Soc., Tasmania, for 1879, p. 41.) An allied species is plentiful in the River Murray Cliffs, near Morgan, but it has more resemblance to the Australian species, *P. flabellatus* of Tenison-Woods, than to the New Zealand *P. laticostatus.*

Corbula sulcata.

"This species is still living on the west coast of Africa as Prof. McCoy (Ann. Mag. Nat. Hist., 1866) has pointed out. It is very characteristic of the Australian Lower Cainozoic," so writes Tenison-Woods in Proc. Roy. Soc., Tasmania, 1874, p. 16. I have no means of ascertaining what amount of reliance is to be placed on McCoy's determination; but so far as regards the Table Cape shell, which has been quoted under the above name, I find that it bears no resemblance to any of the figures of the Lamarckian species that I have been able to compare it with. It seems, however, to be closely related to *C. fortisulcata* (Smith in Proc. Zool. Soc., 1878, t. 50, f. 23, p. 819), from Port Essington, and for it I propose the specific name of *ephamilla.*

Limatula subauriculata.

"This shell is a common fossil at Table Cape, at least I can discover no difference in size, shape, markings," etc. Tenison-Woods in Proc. Roy. Soc., Tasmania, 1876, p. 113.

Specimens of the fossil species from Table Cape and some South Australian localities were forwarded to Mr. Gwyn Jeffreys for comparison with the European shell. He not only alleged its specific distinction, but forwarded me examples of *L. subauriculata* and other allied living species. The differences justify a distinct appellation for our fossil, and I have pleasure in associating Mr. Jeffrey's name with it.

Trigonia acuticostata.

This, the earliest discovered of the Tertiary species of the genus, was described by McCoy from specimens obtained from the Muddy Creek beds in Victoria, probably on the same geological horizon as those at Table Cape in which it has not yet been found. It has, however, in latter years, been reported by McCoy as living on the south-eastern coast of Australia, and it also occurs in Newer Tertiary strata at Mordialloc; Hobson's Bay; River Murray Cliffs, at the Nor'-West Bend; and at Aldinga Bay, St. Vincent's Gulf.

Rhynchonella squamosa.

This palliobranch, common to the Older Tertiary of South Australia, Victoria, Tasmania and New Zealand, must now be catalogued among recent species, as I have no doubt that *R. nigricans, var. pixydata*, Davidson, in "Brachiopoda of the Challenger Expedition, t. 4, f. 14, p. 59, 1880," is its living representative.

The differential characters of the so-called variety *pixydata* are the more numerous scaly ribs (40 to 46), and the less transverse and comparatively more convex shell, characters upon which Hutton founded the species *R. squamosa* As the differences are not mere individual variations, they must be regarded as of specific value, so largely supported by the facts of the present and past distribution of the two species.

R. squamosa, as an existing species, is known only in deep water off south of Kerguelen Island, and as a fossil in the Older Tertiary of South Australia, Victoria, Tasmania and New Zealand. *R. nigricans* extends in time from the oldest Tertiary formation to the recent epoch in New Zealand, and has not been found in association with *R. squamosa*, except in the Oamaru formation in New Zealand.

ON THE COMMUNITY OF SPECIES OF AQUATIC PULMONATE SNAILS BETWEEN AUSTRALIA AND TASMANIA.

By Professor Ralph Tate, F.E.S., F.L.S., Corr. Memb., Etc.

[*Read June* 9, 1884.]

Limnaea Huonensis *(Tenison-Woods)*.

Tenison-Woods, in his paper on the freshwater shells of Tasmania (Proc. Roy. Soc., Tasmania, for 1875), describes four species of the genus *Limnaea;* but, subsequently (loc. cit., 1878, p. 72), he writes that "*L. Hobartensis* of my monograph, I find, on comparison, to be quite undistinguishable