PROCEEDINGS

OF THE

Royal Society of Victoria.

VOL. XIV. (New Series).

PART I.

Edited under the Authority of the Council.

ISSUED AUGUST, 1901.

(Containing Papers read before the Society during the months of May and June, 1901).

THE AUTHORS OF THE SEVERAL PAPERS ARE SEVERALLY RESPONSIBLE FOR THE SOUNDNESS OF THE OPINIONS GIVEN AND FOR THE ACCURACY OF THE STATEMENTS MADE THEREIN.

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FORD & SON, PRINTERS, DRUMMOND STREET, CARLTON.

AGENTS TO THE SOCIETY:

WILLIAMS & NORGATE, 14 HENRIETTA STREET, COVENT GARDEN, LONDON.

To whom all communications for transmission to the Royal Society of Victoria, from all parts of Europe, should be sent.

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CONTENTS OF VOLUME XIV.—Pt. I.

Art. I.—*A Revision of the genus Gymnorhina.*

By ROBERT HALL.

[Read 16th May, 1901.]

The warrant for the acceptance of the species of this genus appears to be as follows:—The white-backed species is different from the black-backed species in the region of the back. The Lesser white-backed species is said to be smaller than the white-backed. The long-billed species is said to have a longer and slenderer bill than any other of this genus. Thus, briefly, we have the leading characters of the four species of this Australian genus.

Just as G. tibicen, Lath., of the interior of New South Wales, is found to be smaller than the representatives of the same species along the coast of that colony, so does G. hyperleuca, Gld., of Tasmania, compare with G. leuconota, Gld., which is defined by Dr. Gadow[1] as a smaller race of the mainland species. G. tibicen I make a variety of G. leuconota, as intermediate links exhibited will show, or to place it in the way suggested above, G. leuconota is the larger and more developed race of G. tibicen. This latter species appears to me to be the intermediate phase between an extinct piping-crow, and the present whole-white-backed piping-crow or magpie.

In dimensions, certain specimens of G. leuconota show the bill and body to have the same measurements as those of G. hyperleuca on the one side, and of G. dorsalis, Campbell, on the other. Although the slender bill of G. dorsalis, and the shorter one of G. hyperleuca may stand as leading characters in a large number of specimens, they fail to do so in a small number. There are numerous specimens of G. tibicen and G. leuconota that will not answer to any key to the species of Gymnorhina yet given. Each appears to show reversion or hybridism upon the back for the one part and want of agreement with recognised measurements on the other, and this is especially so in the case of the

[1] Brit. Mus. Cat. Bds., vol. viii., p. 93 (1883).

bill. In reality, as I see it, the specimens of G. tibicen show an advance in plumage development by losing nearly all of the black saddle in favour of a "white-back," while certain of those of G. leuconota have undergone reversion, in part, to the present day "black-back." Specimens by measurement connect the two. It is particularly interesting to see in specimens of the fledglings of G. dorsalis, the nearest approach to what appears to me as the original uniform black type.

The principal plumage-phases of all the Gymnorhinae appear in G. dorsalis.

(1). We have the fledgling shewing two phases—one, apparently a relic of an early ancestor of the various existing magpies, with the back almost black, or more or less slightly pied, from the nape to the upper tail coverts, both of these narrow regions being pure white; and the second with a very small amount of black upon a nearly pure white back.

(2). The saddle-back of G. tibicen, slightly greyer in colour, is shewn in an immature male bird found to be breeding.

(3). A pure white-back in the adult of each sex.

At Bacchus Marsh, Victoria, the hybrid-like birds of G. leuconota are plentiful, as Messrs. C. C. and T. A. Brittlebank have observed; while at Western Port, Victoria, they are less so. At Horsham, Victoria, the hybrid-like phase of G. tibicen is plentiful, while whole white-backs are found breeding in the same district and have been shot from the same flocks. Just as a black-backed phase of G. dorsalis has been observed in Western Australia, by the writer, to be mated with a whole white-back, so has the same been noted with G. tibicen and G. leuconota (judging by the backs alone) in the Wimmera. One female bird procured at Essendon, Victoria, referred to later, I can only place as a probable specimen of G. leuconota. In Central Australia specimens were collected by Mr. Keartland on the Horn Expedition, and marked by Mr. North as belonging to G. tibicen. The "saddles" are feebly represented (narrow and disjointed) and belong to birds shewing reversion if G. leuconota, "development" if G. tibicen, or hybridisation.

It is generally thought that G. tibicen and G. leuconota occupy different sides of the Great Dividing Range of Victoria. To an extent only that is so. Each of their young has been found upon the other's so-called ground. While it may be proved some day that certain birds are hybrids to the north of the Divide in Victoria, it will not be easy to prove that the so-called hybrids in such a district as Western Port are hybrids. Special attention has been given to the magpies of this latter district by Mr. G. E. Shepherd, with the result that he has never seen other than G. leuconota. Of birds shot at Somerville, examples shew partial reversion to G. tibicen rather than hybridisation. That G. leuconota is always larger than G. tibicen is not so. Specimens shew the same dimensions.

Examples of G. dorsalis handed to me by Mr. A. J. Campbell have slenderer bills, but others collected by the writer near the same locality (Kojonup, W.A.) have bills as deep as those of G. leuconota, while one bill of G. leuconota is as slender and long as in G. dorsalis. Mr. Campbell now believes that the bird described[1] by himself as a typical adult female of G. dorsalis was a peculiar immature female, certainly it is not a typical adult female. Possibly it would not have developed beyond the second stage (saddle-back), in which case we would have a permanent black-back mated with a white-back in Western Australia.

Although Mr. Gould believed there was sufficient difference between the western bird and G. tibicen to form a new species, an examination of specimens by Dr. Ramsay led him to retain the bird in his Tabular List (1888) as G. leuconota.

The bulk of the black-backed birds appear to occupy the central part of the continent, while the white-backed occupy coastal positions on the eastern and western wings. Reversion, but mostly plumage development from a black to white back, I take it, works in all.

The various phases of G. dorsalis strongly support G. leuconota as being at the moment our standard magpie, and in placing G. tibicen as a phase of it, it is to be remarked the broad band on the back for one or more generations in some nesting-families remains persistent. The tendency of the fledgling is just as strong to shew a whole white back as it is in other cases to go through the second stage of showing a black band on the back,

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[1] Proc. Roy. Soc. Vict. 1895, p. 206.

or to persist in agreeing with what appears to be the old type in being nearly uniformly black upon the dorsal surface.

The following are measurements of the principal parts of specimens of each so-called species :—

G. LEUCONOTA, Gld.

	Culmen.	Wing.	Tail.	Tarsus.
	inches.	inches.	inches.	inches.
a^1 Ad. ♂ and ♀. British Museum specimens - - - -	2	10·2	6	2·3
b^1 Labelled ad. ♂. Morwell, Victoria	2·1	11·25	6·75	2·4
c^1 Adult ♂. Somerville, Victoria, 10/6/98 - - - - -	2·1	11	6·75	2·4
d^1 Adult ♀. Box Hill, Victoria, 1/12/99 - - - - - -	1·9	11	6·25	2·3
e^1 Adult ♀. Box Hill, Victoria, 7/9/00 - - - - - -	1·7	10	6	2·1

Specimens in the National Museum, Melbourne, shew the length of culmen to be in :—

(a) ♂ - - - 1·9 inches.
(b) ♂ - - - 1·9 inches.
(c) ♀ - - - 2·25 inches.
(d) ♂ - - - 2·2 inches.

While (*a*) is a male with a culmen less than 2 inches, (*c*) is a female with a culmen considerably more than 2 inches.

Specimen b^1 is an example of a phase having an appearance about the back that neither definitely indicates an adult female nor a hybrid. The soft brown mark appearing as if beneath the surface of the back are not those of a female bird, yet the adult male should have a clear white back as this nearly is. The marks are ancestral in appearance. The Brit. Mus. Cat. Birds, vol. viii., p. 93, refers to a similar specimen as "a bird in fully adult plumage with the middle of its back still mottled with pale silvery grey."

Specimen c^1 is a large male shewing a narrow "saddle" on the back (1 inch in diameter), and on the head, tail and sides of it a number of light brownish marks. In a district where there do not appear to be any living specimens of G. tibicen, these marks are most likely ancestral.

Of many specimens seen by Mr. G. E. Shepherd to shew variation in the district named, one was recorded in the Victorian Naturalist, Vol. XII., p. 68, as a probable new species or a hybrid. Mr. A. J. North[1] commented upon it and said, because of the great variation in the width of this band, which in some specimens is reduced to a narrow line of black feathers, the possibility of it being a species is precluded, but it may be due to atavism. This latter, however, is not Mr. North's view of the matter, "as no Tasmanian specimen is yet to hand shewing a marked deviation."

G. TIBICEN.

	Culmen.	Wing.	Tail.	Tarsus.
	inches.	inches.	inches.	inches.
A. Adult ♂. Murtoa, Victoria, 1898	2	10·25	6	2·2
B. Adult ♂. Murtoa, Victoria, 1898	2	10	6	2·2
C. Adult ♂. Murtoa, Victoria, 1898	2	10·5	6·25	2·2
D. Adult ♂. Murtoa, Victoria, 1898	2	10	6	2·15
E. Adult ♂. Victoria - - -	2·2	10	6	2·15
F. Adult ♂ and ♀. British Museum specimens - - -	2·1	10·6	6·5	2·3
G. Adult ♂ and ♀. British Museum specimens - - -	2·2	10·8	6·8	2·4
H. Adult ♂. Victoria, 1893 - -	1·8	10	6·25	2·1

Two specimens in the National Museum, Melbourne, have their culmens 1·85 inches in length, while others, described in the Zoologist, June 1900, by Mr. E. Degen, range between 1·8 and 2·25 inches.

The most important point of interest in the above specimens is in the series of different sized "saddles," ranging from the more ordinary one (3·65 inches in diameter) to the less ordinary one, 0·9 inch. Other recorded specimens have their saddles represented by scattered feathers that are not solid enough to form even a narrow solid "saddle." Some of the "saddle" feathers of specimen D are edged with white, which is not uncommon in places at least 1000 miles apart, and which are on the out parts of two of four boundaries (Southern Victoria and Central Australia).

[1] Report of the Horn Exp. Cent. Aust., Zool., p. 70 (1896).

Essendon, Victoria, is thought to be stocked with G. leuconota alone, yet the specimen marked J is a nearly mature female of a bird that could only be doubtfully marked G. tibicen, and preferably G. leuconota. It has a narrow "saddle" with a diameter of 0·9 inch, and carries the leading characters of two species, *i.e.*, the female back of G. leuconota and the female saddle of G. tibicen. There is nothing whatever to say it is not G. leuconota in the reversional stage. The dimensions are: culmen, 1·8 in.; wing, 10in.; tail, 6in.; tarsus, 2·25in.

Mr. A. McGregor, to whom I am indebted for the Murtoa skins, has shot the pure "white-backs" among the flocks of "black-backs." This tends partly to the theory of hybridism, but it does not support it by the results noted at Essendon, Morwell and Somerville, where an isolation of species appears to exist.

G. HYPERLEUCA, Gld.

	Culmen.	Wing.	Tail.	Tarsus.
	inches.	inches.	inches.	inches.
a^{11} Adult ♂ and ♀. British Museum - - - - -	1·7	9·3	5·8	2·1
b^{11} Sk. ♀. National Museum - -	1·8	10	6·5	2

Specimens in the Australian Museum led Dr. Ramsay to consider this bird not a good species (Tab. Hist. Aust. Birds, 1888).

G. DORSALIS, Campbell.

	Culmen.	Wing.	Tail.	Tarsus.
	inches.	inches.	inches.	inches.
a^{111} Adult ♂. Kojonup, W.A. -	2	10	6	2·1
b^{111} Adult ♂. Kabanning, W.A., 6/10/99 - - - - -	2	10	6	2·1

Mr. Campbell[1] gives the measurement of the longest culmen as 2·31 inches.

The bird referred to by Gould in his Tabular List (Folio, Bds. Austr.) as a doubtful specimen of G. tibicen doubtless is an

1 Proc. Roy. Soc. Vict., N.S., vol. vii., 1895.

immature specimen of G. dorsalis, agreeing with one of my skins. It is a bird that, on first sight and without a knowledge of such a phase, might easily be mistaken for G. tibicen.

In the matter of comparison of the young with the adults, Gould says in his folio work that "the young of G. tibicen assume the plumage of the adult from the nest, and no change takes place from age or season."

The Brit. Mus. Cat. Bds., vol. viii., p. 92, remarks that (*a*) is a specimen of G. tibicen, with a back blackish, narrowly-tipped with grey; that (*b*) is a specimen of G. tibicen, with its neck patch not so well defined; the feathers of the hinder part of the neck being mottled with black; the feathers of the back, white-edged; rump feathers with white tips only, producing a mottled appearance. One of these juvenile skins is labelled Queensland, the other Australia. In one of my fledgling skins of G. leuconota there is a tendency to shew very little white, and that where it usually appears, on the neck and rump. The above facts alone are enough to shew that the fledglings and young of the eastern species are inconstant, like those of the western form, though to a more limited extent, judging by the small amount of material we have noted.

G. dorsalis shews its fledglings to be either almost wholly white-backed or black-backed, with phases varying between the extremes, while the immature birds, in certain cases, have distinct, though narrow, blackish "saddles." I should venture to say this phase is the bird referred to by Gould and Ramsay as G. tibicen, and altered (Tab. Lists) later by Dr. Ramsay to G. leuconota. It seems to me that the black-backed variety of Western Australia has not been able to hold its own, failing to become a species, and now merging, if not already so, into G. leuconota. In Central Australia the "black-back" exists, but with varieties and "white-backs," through the interior and on three sides of it. Whether the black-backed variety, at present strongly posted in the south-east of the continent, will fail to survive and become a species seems to me uncertain. On the extreme south-east of Australia and Tasmania the "white-backed" variety, as in Western Australia, has proved itself to be the fittest. Between Southern Victoria and Central Australia the law of natural selection is strongly working to make the black-backed variety a species by keeping the amount of black in a large number of specimens a constant quantity.

At the present time it is very variable, almost giving way to a uniform white back, while the known white-backs in the same breeding paddocks appear to revert to and shew the same quantity of black saddle as in these small saddle-backs of the recognised black-backed species. From Minyip, Victoria, Mr. J. P. Eckert has forwarded the following note to me: "To your question whether the black-backed and white-backed magpies mate together, I reply, emphatically, yes. In fact, the greatest percentage of magpies in this district consist of what I consider cross-breds. An instance of this kind has been under my notice for several years. As mentioned above, a pair of black-backed magpies have been in the habit of rearing their young on trees near my house for upwards of ten years. A few seasons back a white-backed cock appeared on the scene rather late in the year and drove away the black-backed male. The nest had already been made and the hen bird commenced laying shortly afterwards and hatched a brood of three. When the young were about a week old, I found them one morning on the ground and dead. At first I thought that the banished mate might have taken revenge and destroyed the brood, but on second thought, knowing quite well how jealously all magpies guard their nest, I was positive that such a thing was almost impossible. Having found elsewhere young magpies thrown out the nest, and, as Mr. J. A. Hill, my friend, had made the same observation, I put it down to the scarcity of food on account of the drought in that season. The old birds might have killed their young to preserve their own life. The following season *that same pair*, the black-backed female and the white-backed male hatched two young, one a *cross-bred* and one a *perfect white-back.* The white-back was thrown out of the nest and killed. Last year this same pair again built a nest quite close to the house and hatched a brood of four, three *black-backs* and one *white-back.* By some accident the white-backed male was killed, and the black-backed returned immediately to his former spouse, but next morning I found the white-backed young bird, which was all but fledged, thrown out. I replaced it again, but it was no time before it was out again. Seeming to be all right, I placed it underneath the tree where the nest was, but the old birds took no notice of it. What puzzles me in this case is breeding true to colour in such cross-mating? Had the colours been mixed, explanation would not be difficult. What are we to call the offspring in such a case, pure-breds or cross-breds?"

If the case of the black and grey crows of the Old World is one of dimorphism, this is one of polymorphism, because of the bills and backs and dimensions other than those of sexual characters.

The position of the genus, as I see it, is represented by one species only, G. leuconota, Gld., with one variety, namely, that having a black back, at present known as G. tibicen, Lath. Where the variety begins and ends with the series of specimens exhibited, one cannot well say.

Art. II.—*Further Notes on the Igneous Rocks of South Western Victoria.*

By J. DENNANT, F.G.S., F.C.S.

[Read 13th June, 1901.]

(With Plate I.).

In the present paper I propose to supply a few additional details concerning some of the volcanic rocks described in a general manner a few years ago.[1]

Before doing so I wish to clear away a misapprehension which has arisen owing to the scheme of shading adopted in the map accompanying my former article. Both the olivine basalts and the typical sanidine-bearing series of rocks are there similarly shaded, not because I regarded them as identical, but simply because my researches were too imcomplete to enable me to define with even approximate accuracy their respective boundaries. As a fact, these two classes of rocks are so intimately associated in certain portions of the area that their separation can only be attempted on maps drawn to a large scale.

Since I drew attention to these rocks in 1893, the geology of the district has been reported upon by Mr. Ferguson, of the Geological Survey, who discovered a glacial deposit in the neighbourhood of Coleraine. Still later, Mr. E. G. Hogg has given a fuller account of the same deposit, and has besides examined the sanidine-bearing rocks with the result that he classes them as trachytes.

The first rock referred to by him occurs at Mounts Adam and Eve, and is described as light colored and porphyritic. It is of course a highly altered rock, and I gather from Mr. Hogg's subsequent remarks that his real type of the trachyte is the green, fresh-looking rock close at hand. Unaltered examples of such rocks are as a rule found only in the deeper quarries, since they weather readily and to a considerable depth from the

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[1] Aust. Assoc. Adv. Sci., Adelaide, 1893.

surface. An extreme example of a decomposed trachytic rock is afforded by a hill locally called "The Giant Rock" which is, as I stated previously, now little more than a mass of kaolin, with occasional light colored, but still hard bands in the deeper seated portions. Near this, and undoubtedly an outlier of it, a huge stone, many tons in weight, outcrops, and is known to residents as "The Little Rock." The latter is hard, rough, brown in color, and similar both in macroscopic and microscopic characters to the rock from the Mount Eve quarry. The outlines of the larger crystals of sanidine are still preserved, but they are no longer clear and pellucid, as in less altered rocks. An analysis which I made of a sample from "The Little Rock," gave the following result:—

SiO_2	- - - -	68·22 per cent.
Al_2O_3	- - - -	16.89 ,,
Fe_2O_3 / FeO	- - - -	2·75 ,,
CaO / MgO	- - - -	traces
K_2O	- - - -	4·47 ,,
Na_2O	- - - -	5·30 ,,
Loss on ignition	- -	·95 ,,
Total	-	98·58 ,,

These two rocks are situated a few miles to the north of Mounts Adam and Eve on the Brit Brit Road. From a quarry not far distant I gathered the fissile, green, fresh-looking rock alluded to in my former paper as emitting a ringing sound when struck with the hammer. No chemical analysis has been made of it, but under the microscope it shews numerous lath-shaped sanidine crystals, with some tabular ones.

An excellent illustration of the changes effected in these trachytoid rocks by weathering was afforded some years ago, when an unusually deep as well as extensive quarry was opened near the Coleraine flour mill. Deep down, the rocks are greenish-black and much like a fine grained basalt in appearance, but above the weather line they become almost suddenly light grey or brown, and then might easily be mistaken for a metamorphic sandstone. The microscopic structure of the unweathered rock at the base of the quarry has been previously given. Although this is undoubtedly a tolerably well preserved rock, I do not consider it typical of the trachytoid masses which cover so large an area to the north and west of Coleraine. The majority of my slides have been prepared from the rocks at Carapook, which is midway between Coleraine and Casterton. A quarry was opened here about 14 years ago to get stone for building a bridge over the creek, and the glistening crystals shewing on the clean cut surfaces of the blocks as they lay in a pile ready for use arrested my attention. This rock I traced to the quarry mentioned, which is situated on a rise about 1½ miles north of Carapook, and in a line with the Den Hills outcrop a few miles to the east. In hand specimens it is dark green, fissile, almost smooth to the touch, and speckled by the light colored sanidine pervading it. Macroscopic crystals of sanidine are not only abundant in the rock, but they are usually so perfect that when extracted whole, which can frequently be done, the two cleavages parallel to P and M become plainly visible. Owing to the number and size of the macroscopic crystals in the rock, I was able to separate a sufficient weight of them from the matrix for a complete chemical analysis, which gave the following result:—

Sanidine Crystals, Carapook.

SiO_2	63·87	per cent.
Al_2O_3	22·82	,,
FeO	2·40	,,
CaO	·28	,,
MgO	·01	,,
K_2O	4·49	,,
Na_2O	6·16	,,
Loss on ignition	·57	,,
Total	100·60	,,

With this may be compared the following analysis of the rock in mass.

CARAPOOK ROCK.

SiO_2 - - - -	63·37	per cent.
Al_2O_3 - - - -	16·47	,,
Fe_2O_3 - - - -	4·45	,,
FeO - - - -	1·21	,,
CaO - - - -	1·27	,,
MgO - - - -	·51	,,
K_2O - - - -	5·57	,,
Na_2O - - - -	5·88	,,
H_2O (direct weighing) -	·76	,,
Total -	99·49	,,

Sp. gr. 2·67.

Only 6·2 per cent. of the finely powdered rock is soluble in cold and 8·36 per cent. in hot hydrochloric acid.

The excess of soda over the potash in the sanidine crystals is noteworthy. As a similar result is obtained in the analysis of the rock in mass, it may be concluded that the large proportion of soda present in the latter is derived, mainly at least, from the sanidine, and not from any nepheline overlooked in the microscopic slides.

Nearly all the larger crystals embedded in the rock are thin-tabular, and usually shew only the face $\infty P \grave{\infty}$ (010), though I have also noticed faces in the zone oP (001)—$\infty P \bar{\infty}$ (100). They vary in size, but seldom exceed 4 or 5 mm. in length. The predominating clinopinacoidal faces are traversed by a number of irregular cracks which are sometimes curved, but generally roughly parallel to the orthopinacoid. These cracks are often filled with fine dusty matter of a brownish hue. Owing to the two easy cleavages respectively parallel to the base and clinopinacoid, as well as to the cracks just mentioned, very fine laminae sometimes separate when a slice of the rock with a crystal at the extreme edge is mounted: between crossed nicols such laminae extinguish nearly parallel to the most perfect cleavage. One of my Carapook slides shews a large porphyritic crystal twinned on the Carlsbad type, which, under polarized light, is very similar in appearance to the sanidine twin in the phonolite from Wolf's Rock, Land's End, England, figured by Rosenbusch in Fig. 2, Plate XXIII. of his "Microscopic Physiography." Several of the cracks parallel to T, characteristic of sanidine, are conspicuous in each half of the twin and meet on the twinning line at an angle of about 150°. The cleavages parallel to P are only faintly visible, the section not being thin enough to shew them well. The separate halves of the twin extinguish at an angle of 8° with the twinning line and on the opposite side of it, the angle between the two extinctions being thus 16°. The smaller crystals of sanidine, which constitute in reality the mass of the rock, are usually broad and do not present well marked outlines.

In addition to the all pervading sanidine, a large number of columnar-shaped prisms of a green monoclinic mineral are scattered irregularly over the surface of the rock. Where the section is thinnest the green color is often discharged and the prisms then become brownish or almost colorless. They are practically without action upon polarized light, and, from their evident shelly structure, I am inclined to regard them as augite. Scattered throughout, there are also numerous minute grains of magnetite, usually rounded, but sometimes presenting sharp angles.

A few other outcrops of rocks with a generally trachytic aspect may be briefly noticed.

Nareen.—Amongst about a dozen slides prepared from the rocks of this locality, I find that the sanidines are mostly lath-shaped, rarely tabular, and exhibit fluxion structure. The rocks are, however, principally remarkable for the occurrence in them of opal, which appears to fill tolerably large spaces formerly occupied by other minerals, and mainly, I think, by the felspars. Usually it is without action on polarized light, but occasionally polarizes vividly in slender fibres radiating from a centre. This phenomenon is explained by Michel Lévy and Fouqué as due to contraction. Included in the opal there appear to be flakes, or rather nests, of tridymite, but on this point I am not certain. In hand specimens the rock is dark grey, and, though undoubtedly weathered, is still hard and tough. It is used locally as a building stone. The specific gravity of the rock is 2·44; the percentage of silica is 57·89 and of water 3·49. The other ingredients have not been finally estimated.

A similar rock, also with opaline enclosures, occurs in a creek at the foot of Den Hills, a few miles to the west.

Wando Dale.—Between Konong Wotong and Wando Dale there are three successive hills, or, rather, low ranges, over which the road passes. For some time they puzzled me as I drove across them, but a search revealed small outcrops of the usual trachytic rocks on all of them. Though the rocks themselves are certainly somewhat decomposed, the porphyritic sanidine crystals, which glisten on their surfaces, are of good size and very perfect. At the top of one of the hills blocks of brick red kaolin have been dug out and attract the attention of the curious. Close to Wando Dale Station the trachytic rocks rest directly on the crystalline schists, which are strongly developed in the bed of the River Wando, just below Mr. William Moody's house. On one occasion I travelled in a northerly direction from Phoines, near Carapook, through the romantic rocky scenery of Killiecrankie to Wando Dale, and for nearly the whole distance, about 13 miles, the trachytic rocks were in sight.

Phoines.—In his "Geology and Physical Geography of Victoria," Mr. Reginald Murray refers to a dark-colored and dense greenstone which is exposed in the bed of McPherson's Creek. In outward appearance it much resembles the rocks from the neighboring locality of Carapook, though less fissile and perhaps even fresher looking. In microscopic slides it shows much sanidine, generally in lath-shaped, and, rarely, tabular crystals; the latter, however, when they occur, are exceptionally clear and pellucid. There is also abundance of brown, and a very little green augite. Other minerals may be present, but I have not had time to study this interesting rock as closely as it deserves.

With regard to the geological age of the trachytoid series of rocks in this district I have little to add to what I said before. The tuff containing *Otozamites*, mentioned in my former paper, accompanies a dense rock, which, though it certainly contains some sanidine, departs a good deal from the Carapook type of volcanic rocks. Its specific gravity, viz., 2·87, is, besides, high for a trachyte, and suggests rather a basalt which may belong to a later date than the more acid rocks herein discussed. The latter, if really younger than the mesozoic strata, which I doubt, must have covered them in some part of the area. Certainly, volcanic rocks, as widely spread as these have been shewn to be, cannot have consisted of dykes only, but must also have flowed out in sheets. In certain places, as at Nareen, Wando Dale, Grit Jurk, Carapook, and Killiecrankie, the underlying rocks are of course visible, and consist either of granite or the fundamental crystalline schists of the area.

EXPLANATION OF PLATE I.

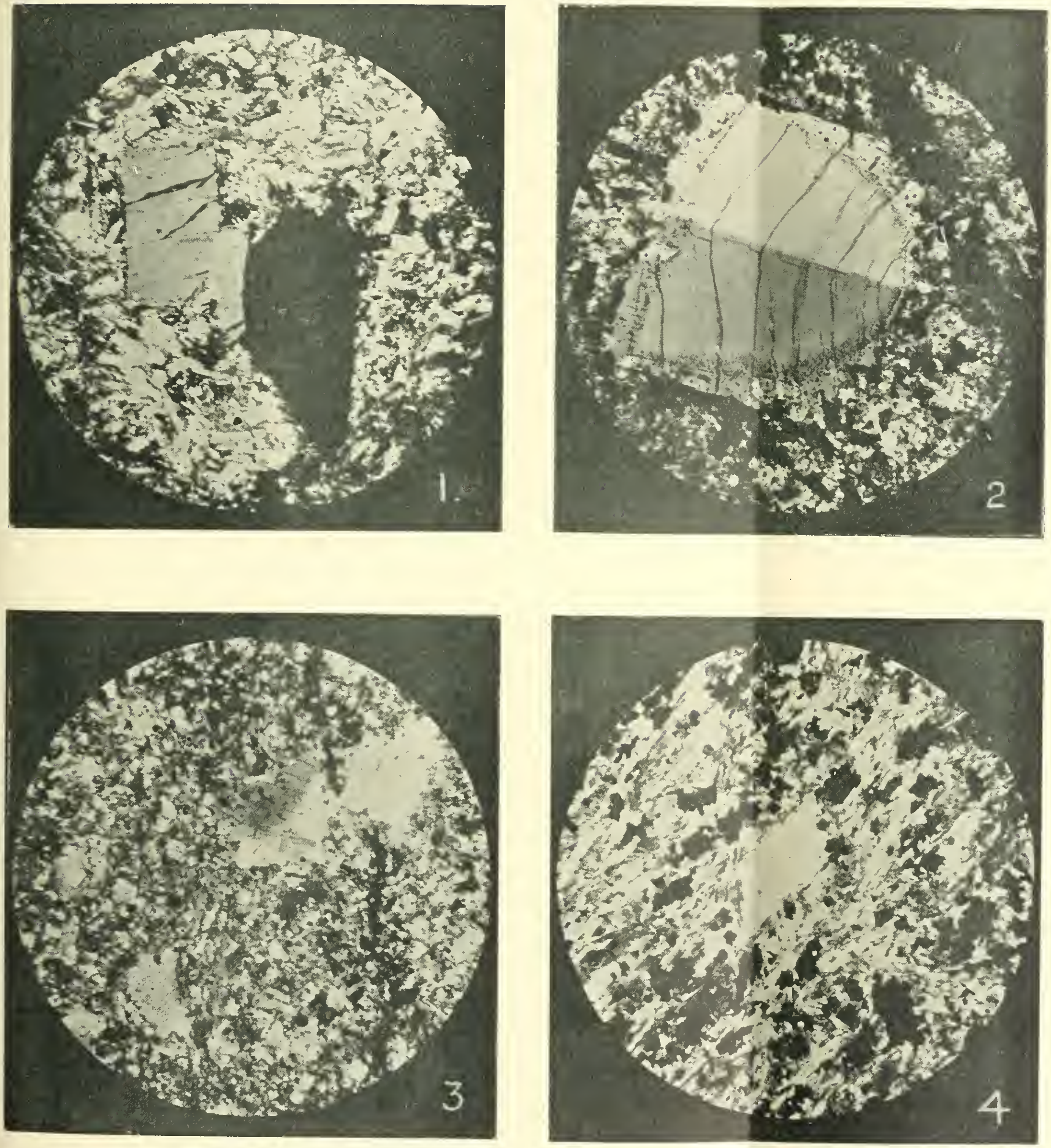
Fig. 1.—A slice from Little Rock, Brit Brit, shewing a mass of small sanidine crystals with large macroscopic ones in the centre of the field. Polarized light, nicols crossed.

Fig. 2.—Typical trachytic rock from Carapook with a porphyritic twin crystal of sanidine. Polarized light, nicols crossed.

Fig. 3.—Typical trachytic rock from Carapook. The main mass of the rock is sanidine, and scattered through it are columnar crystals of probably augite. Ordinary light.

Fig. 4.—Trachytic rock from Phoines, near Carapook, with sanidine and brown augite. Ordinary light.

All magnified 28 diameters.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Art. III.—*Growth stages in modern Trigonias, belonging to the section Pectinatae.*

By T. S. HALL, M.A.

[Read 13th June, 1901].

The molluscan genus Trigonia Bruguière, has been divided into a series of sections which, though well marked, yet merge into one another so that Lycett considered it inadvisable to erect them into genera or even sub-genera.[1] The living Australian species, he says, are a group apart, and to the section formed by them the name Pectinatae or Pectinidae has been applied. Lycett refers T. subundulata, Jenkins (=T. semiundulata, McCoy), to the same group. The resemblance of this fossil form to the members of the section Costatae had previously been called attention to, but Lycett points out that it differs from that group in that its valves are equal and similar in ornament, whereas in the Costatae a separate description for the two valves is required. It would then appear justifiable to refer all our modern Australian Trigonias to the same group.

The question of the discrimination of our recent species is one of difficulty, for considerable variation is shown both in the shape of the shells and in their ornament, and, probably, the last has not been heard on the question. Four species seem to be generally accepted—T. strangei, T. lamarckii, T. margaritacea, and T. uniophora. To these McCoy added T. acuticostata which he originally described as a fossil, and Tenison Woods described a variety of T. lamarckii to which he applied the name reticulata.[2] Whether this variety is distinct from McCoy's acuticostata and whether that is or is not a variety of a living species I am not prepared to say.

The species from our tertiary beds are: T. subundulata, Jenkins; T. intersitans, Tate (=T. tatei, Pritchard); T. tubulifera, Tate;

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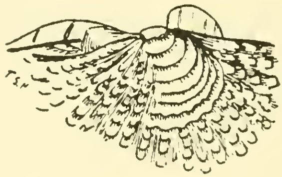
1 Palæontographical Society, 1872.
2 Proc. Linn. Soc. N. S. Wales, vol. ii., 1877, p. 125.

T. acuticostata, M'Coy; T. howitti, McCoy, and T. murravica, Tate, the latter being very closely allied to T. howitti.[1]

The recent species are all characterised by the possession of radial ornament alone, concentric ridging being absent, and this feature also occurs in the more recent of the fossil forms, namely T. acuticostata, T. howitti and T. murravica. The remainder, the older members of the group, have a discrepant ornament, radial ridging appearing on the posterior third of the shell and concentric on the anterior part. It is this discrepant ornament which seems to ally them with the more ancient fossil forms, more particularly with Jurassic ones. A close alliance, however, as we have seen, is denied by Lycett, who grouped one of the most typical of those with discrepant ornament, namely, T. subundulata, with the modern radially ribbed Pectinidae. Since Lycett wrote, our other two older tertiary species have been added to the list and belong to the same group.

An examination of the young shells of several of the radially ribbed species shows the justness of Lycett's grouping, for, in all that I have been able to examine, discrepant ornament occurs.

In T. margaritacea the prodissoconch measures 0·2 mm. in breadth, and is smooth.



Trigonia margaritacea, umbonal portion of right valve of a young specimen.

This stage is marked off from the succeeding one, the brephic, by a margining ridge. From this till the shell is about 1 mm. in breadth it has discrepant ornament. On the anterior half of the shell a series of concentric ridges is developed, which are sharp, almost lamellar, marked off by broad, shallow, concave grooves, and separated from one another by some four or five times the width of the ridges. Of these ridges some eight or nine occur.

[1] Trans. Roy. Soc. South Australia, vol. xix., 1895, p. 262.

The posterior slope has four or five radiating ridges, which at first are smooth, but soon become nodulose, the most posterior ones being the first to assume this character. As growth proceeds, additional radiating ridges or costulae are intercalated at varying distances from the prodissoconch. The concentric ridges or costae on the anterior part of the shell eventually become broken up into nodules, which later become radially confluent and assume the character of the radiating nodulose ridges of the adult, soon taking on their specific form.

A usually strongly marked feature of the genus is the presence of distinct ridge running from the umbo to the lower posterior angle of the shell, and known as the marginal carina. In the adults of the recent species this marginal carina is comparatively inconspicuous, but in the brephic stage of the present species, T. margaritacea, its position is distinctly marked by a bold radial ridge, which is more pronounced than those posterior to it.

Just as the most dorsal of the posterior radiating ridges are the first to assume the nodulose character of the adult, so the concentric ridges give place to radial ones beginning with their posterior ends, and the ancestral character of discrepant ornament persists longest in the more anterior part of the shell.

Carrying our observations a step further and passing by the adult or ephebic stage—"the period of full development of the individual, when all specific characters are clearly recognizable" —we reach the gerontic stage of Messrs. Buckman and Bather, or the senile of other authors, when "changes take place which are due to a gradual failure of powers." In T. margaritacea the nodules on the radiating ridges become more crowded and less prominent, till finally they disappear among the increasingly rugose lines of growth, while the radiating ridges themselves also fade away and vanish. These signs of failing powers are first shown in the siphonal area, and are here most strongly marked; while towards the anterior the nodules and ridges persist much longer.

In T. lamarckii the stages are similar, the brephic stage showing discrepant ornament.

In T. acuticostata the prodissoconch is like that of T. margaritacea, but the concentric ridges of the brephic stage persist till the shell has attained a breadth of 1·5 mm., and are about twelve in number. The longer persistence of this character in the fossil is of interest, but my series is too small to say whether we have here a constant difference from T. lamarckii, the species to which it is said to be most closely allied.

Though I have a fairly large number of specimens of T. howitti all have abraded umbos, but a specimen in the cabinet of Rev. A. W. Cresswell shows that, like its congeners it also had discrepant ornament in its youth.

I was anxious to find out if the remaining recent species exhibited the same characters, and, as our Melbourne Museum did not contain the material, I wrote to Mr. C. Hedley, of Sydney, asking him to supply my deficiencies. It appeared that recently Mr. Hedley's attention had been turned to the same point, but he informed me that, as far as he had been able to find out, the facts had not been recorded, and he generously urged me to publish my results.

The drawing is from a young specimen of T. margaritacea given me by Mr. J. H. Gatliff, and to his kindness I also owe an example of T. lamarckii, and the opportunity of examining a series in his cabinet.

If we assume, as seems probable, that concentric ornament is the more archaic form, and due to the accentuation of the incremental lines, and that radial sculpture originated as a breaking up of these lines, then we find, in the Pectinatae, the archaic sculpture persisting longer in the anterior region of the shell, and the more modern first appearing towards the posterior. In the older members of the group, as typified by T. subundulata, this archaic ornamentation persists throughout life towards the anterior end, while in the more modern members it disappears at the close of the brephic stage, being entirely replaced by the more modern form of sculpture. Similarly, in the posterior region the signs of old age first make their appearance, and from thence gradually pass towards the front.

In the older members of the Pectinatae some interesting variations occur. Thus, in T. subundulosa some individuals even from the same stratum, show that the radial lines have transgressed beyond the marginal carina and appear as grooves crossing the concentric costae, thus breaking up the costae into oblong, flattened nodules. The extent to which this occurs is very variable in different individuals. It may be absent, scarcely discernible, or well marked. In T. intersitans the character is much more advanced, though even here great individual variation occurs. As regards the only other of our species with discrepant ornament, T. tubulifera, I am unable to speak in this respect. The species is small and closely beset with tubular spines, so that the matrix is apt to adhere closely. Pofessor Tate in his original description speaks of one specimen in which the discrepant ornament was scarcely traceable, while in another it was well marked.

SUMMARY.

The recent species, T. margaritacea, T. lamarckii, and the miocene species, T. acuticostata and T. howitti, which are all radially ribbed, show ancestral characters in the discrepant ornament of the brephic stage. The older members of the group Pectinatae, namely, T. subundulosa and T. intersitans, show, in some individuals, a progress towards the ornamentation of the more modern forms. The whole of the facts support the justice of assembling all the species into the single group known as Pectinatae.

Art. IV.—*Contributions to the Palaeontology of the Older Tertiary of Victoria.*

Lamellibranchs.—Part II.

By G. B. PRITCHARD,

Lecturer on Geology, etc., Working Men's College, Melbourne.

(With Plates II. and III.).

[Read 16th May, 1901].

The present paper includes a few interesting species from some of our more important sections, but it is with regret that I am at present unable to include some promised remarks on some of our common Crassatellites and Chiones, there is a good deal of material at present in hand, but I do not yet feel confident enough on certain details to express a definite opinion.

Ostrea hyotis, Linnaeus.

1758. Mytilus hyotis, Linnaeus. Syst. Nat., ed. 10, p. 707.

1899. Ostrea hyotidoidea, Tate. T.R.S. S.A., vol. xxiii., pt. ii., p. 268.

Locality.—Mornington Clays.

Observations.—This shell was originally determined by Professor Tate as O. hyotis, Linnaeus, and this identification has evidently been accepted by Mr. Harris, of the British Museum, in his Catalogue of Australasian Tertiary Mollusca (see p. 299), as he remarks that "The general contour of the shell (which, however, is extremely variable in regard to details) is that of the living O. hyotis, and it has the characteristic foliaceous scales of that species." Now, Professor Tate, as indicated above, regards our species as distinct, and notes the following points for the distinction: "The fossil species is more depressed, more irregular in outline, the radial ridges less elevated and obtuse, whilst the foliaceous scales very rarely develop into tubular spines." Not having examples of the living species, I am not at present in a position to express a definite opinion.

Arca capulopsis, sp. nov. (Pl. II., Figs. 1, 2).

Description.—Shell elongate, trapeziform, with a very straight hinge, and a strikingly marked hinge area, umbo somewhat conically elevated obliquely, and forwardly directed towards the anterior end. The hinge area extends the full length of the hinge, and occupies a relatively large space between the hinge and umbo, is slightly concavely excavated towards the umbo, the latter being a little elevated above the hinge line from the internal aspect, the hinge area is smooth but for a number of lineations parallel to the hinge, and is strongly angularly marked off from the remainder of the shell.

Posteriorly the shell is again angularly keeled from the umbo to the extreme extension of the posterior margin, the space between this keel and the angulation of the hinge being rather strongly radially ridged, the number of strong ridges being usually about five, and these are crossed by close lamellae parallel to the lines of growth giving rise to frills. The convexity of the umbo is indented medially, the indentation broading somewhat towards the distinct sinus in the otherwise slightly convex ventral margin. Anterior margin slightly convex, posterior somewhat obliquely truncated to the hinge line.

Surface ornamented with closely packed radial ridges, all of which do not reach the umbonal region, the short ridges being usually noticeable towards the anterior end, the ridges are crossed by close lamellae parallel to the lines of growth, the latter occasionally showing as more elevated and irregular ridges.

Internally the anterior margin is a little crenulate.

Dimensions.—Type specimen, antero-posterior diameter, 10 mm.; dorso-ventral diameter posterior to the umbo, 5 mm.; anterior to the umbo, 3·5 mm. Larger specimens give antero-posterior diameter, 15 mm.; and dorso-ventral, posterior 7 mm., anterior, 5·5 mm.

Localities.—Eocene clays of Grice's Creek, Mornington; Type, Eocene clays of Orphanage Hill, Geelong (T. S. Hall); Eocene sandy clays of Corio Bay, Geelong; Miocene sandy clays of Forsyth's section, Grange Burn, probably derived (T. S. Hall).

Limopsis morningtonensis, sp. nov. (Plate II., Fig. 6A).

Description.—Shell roundly quadrate, depressed, slightly oblique, with a small, but prominent acute and incurved umbo. Hinge line somewhat straight or very slightly curved, being about half as long as the greatest antero-posterior diameter, with a well-marked triangular pit immediately under the umbo, with from 5 to 9 anterior teeth, and 4 to 7 posterior teeth of unequal size, the medial ones of each series being strongest. Anteriorly the shell is shorter than posteriorly, with the margin more convexly rounded; posteriorly there is a tendency to angulation at the junction between the margin and the hinge, and again at the junction with the ventral margin. Occasional specimens show greater posterior obliquity, and a somewhat stronger keel from the umbo to the posterior margin. Internally there is a broad flattened margin, with the concavity finely radially striate. Externally the surface is strongly concentrically ridged, the ridges being of unequal strength, some fine, some broad and flattened; a very close, regular and fine radial striation is noticeable under a lens, though it is not, as a rule, visible to the unaided eye, crossing the concentric ridges.

Dimensions. — Type specimen, antero-posterior diameter, 14 mm.; umbo-ventral diameter, 12·5 mm. Other specimens range for the above measurements respectively from 7 mm. by 6·5 mm., 10 mm. by 9 mm., 10 mm. by 10 mm., 13 mm. by 12 mm., up to 18 mm. by 15 mm.

Localities.—Eocene clays near old Cement Works, Balcombe's Bay, Mornington, also Grice's Creek. Eocene clays over Polyzoal Rock, Filter Quarries, Batesford; section near Griffin's Farm, Moorabool River; and Orphanage Hill, Geelong. Eocene, Muddy Creek, Western District. Eocene clays of Gellibrand River, coast section below Curdie's Steps (Type). Eocene, Fishing Point, River Aire.

Observations.—This shell seems sufficiently distinctive to warrant specific designation, and should be easily separated from our other species. It is possible that this is one of the forms that has been confused with the European shell Limopsis auritā, Brocchi, but there is very little difficulty in making out many important distinctive features. Upon comparison with actual specimens of the European shell it may be noted that the latter is a thicker, more robust and tumid shell, with a narrower hinge, coarser umbo, and trigonal shape, the hinge characters are also distinct, and the external sculpture gives further evidence for separation.

The present species is somewhat analagous to our very common radially ribbed species, but is not as a rule so oblique in form, and has its concentric ridging as a marked feature of contrast, apart from other details. The late Sir F. McCoy identified the common species of this genus from the lower beds of the Spring Creek section near Geelong, as, without doubt identical, on a comparison of actual specimens from English and German localities, with Limopsis aurita, Brocchi, and there is no doubt a very close resemblance in that instance, but I am not yet prepared to make any more definite statement even in this case. The mistake apparently made by Sir F. McCoy, if my interpretation be correct, was in the inclusion of the Mornington fossil as identical with the common Spring Creek form.

Modiola praerupta, sp. nov. (Plate II., Figs. 3, 4).

Description.—Shell elongate-oval, markedly tumid, with terminal umbo, and a remarkably steep slope to the ventral margin.

Anterior end narrow, about half the greatest width of the shell, about the middle line strongly convex and rapidly ascending from the anterior margin for a little more than one-third the length of the shell, thence gradually sloping to the posterior margin, spreading out and becoming flattish post-dorsally.

Ventral margin very straight, anterior margin somewhat rounded, dorsal margin straight for a little less than half the length of the shell, thence slightly convexly rounded to the posterior, then more suddenly convex to the ventral margin. Greatest convexity ranging from the umbo obliquely across the shell to about the junction of the posterior and ventral margins, dorsally from this somewhat deeply excavated anteriorly but rapidly shallowing out posteriorly. Surface with fine and very close lines of growth, also with more or less defined undulations parallel to the lines of growth, the latter being most noticeable posteriorly, fine radial striations are also just discernible in the neighbourhood of the greatest convexity and on the posterior slope.

Dimensions.—Antero-posterior diameter, 65 mm.; greatest breadth about 35 mm. from anterior margin, about 30 mm.; thickness through one valve, 16 mm.

Locality.—Eocene Septarian Limestones, near the Old Cement Works, Balcombe's Bay, Mornington.

Observations.—Only one species of this genus has hitherto been described amongst our fossils, but this by no means fairly represents the actual occurrences. The species at present described is entirely distinct from M. adelaidensis, Tate, from the Adelaide bore.

Modiola pueblensis, sp. nov. (Pl. III., Fig. 1).

Description.—Shell of medium size, oval-oblong, somewhat tumid, with very prominent, tumid, and incurved umbo, which projects forwards little short of the narrow, convexly rounded, anterior margin. Ventral margin with a slight sinus situated in front of the median portion of the shell, the sinus rapidly shallowing out in its ascent to the greatest convexity of the shell. Shell excavated posterior to and anterior to the umbo, the greatest convexity is at about the anterior third, and the greatest breadth a little posterior to the median line. The margin posterior to the umbo is straight, and rapidly ascends to the region of greatest breadth, thence the descent is convexly rounded, wedging somewhat posteriorly to join the ventral margin.

The surface is marked by slightly irregular, close, flat ridges, conforming to the growth of the shell, the grooves between being much narrower than the ridges, the growth folds interfering somewhat with the regularity of this sculpture ; the ridges are most marked anteriorly tending to be less distinct where the convexity of the shell is greatest.

Dimensions. — Type specimen, antero-posterior diameter, 32 mm.; greatest breadth, 17 mm.; breadth at anterior end, about 8 mm.; another specimen, slightly deformed by crushing but showing both valves in contact, and sufficiently well preserved to give the following: Antero-posterior diameter, 37 mm.; greatest breadth, 18 mm.; greatest thickness through both valves, 16 mm.

Locality.—Eocene, lower beds of the Spring Creek or Bird Rock Bluff, near Geelong.

Observations.—Apparently closely related to M. adelaidensis, Tate, from the Adelaide bore, but differs in relative dimensions, and amongst other features the presence of the ventral sinus, and surface sculpturing serve as features of distinction.

Leda acuticauda, sp. nov. (Pl. III., Figs. 4, 4A).

Description.—Shell small, ovate-subtrigonal, anterior end convexly rounded and shorter than the posterior, the latter being drawn out into a very acutely pointed end.

Umbo prominent and inflated, apparently smooth, and directed slightly towards the posterior, in paired valves the umbones are in contact. The anterior hinge makes, with the posterior hinge, an angle of about 104°, each carrying about twelve to fourteen angular teeth. The posterior hinge line is rather remarkably straight or very slightly concave, while the anterior is slightly convex. Behind the hinge on the posterior slope from the umbo the valve is characteristically flattened, causing a marked posterior keel. Internally the ventral margin is broadly bevelled. The angulation made by the posterior margin with the ventral margin is about 50°, but the junction is so pointed as to appear more acute. Externally the valves are very finely concentrically striate, and usually show irregular growth folds.

Dimensions.—Type specimen, antero-posterior diameter, 7 mm.; umbo ventral diameter, 4 mm.; thickness through both valves, 3 mm.; other specimens range from this to 6 mm. by 4 mm. down to small young examples which measure 3 mm. by 2 mm.

Localities.—Eocene clays of Grice's Creek, and from the clays near the old Cement Works, Balcombe's Bay, Mornington.

Observations.—This species might at first sight be mistaken for L. apiculata, Tate, but upon examination many points of distinction can be readily made out. The present species has a different hinge angulation, a more marked posterior keel, and sharper posterior termination, a broader and more marked bevelled margin, and lacks the regular concentric threads which mark the whole of the external surface, forming a characteristic of the abovementioned species. It is also closely related to a fairly abundant species from the Lower Spring Creek beds, near Geelong, but it seems advisable to make distinction between the two, and I therefore include the following particulars on the Spring Creek shell.

Leda fontinalis, sp. nov. (Pl. III., Figs. 3, 3A.)

Description.—This species is very similar to the foregoing, and many points in that description apply well to the present form, but the anterior of the shell is not so regularly convexly rounded, having a tendency to be somewhat angled on account of the sudden junction with a very straight ventral margin, and the posterior end of the shell is more acute for the same reason. The valves are deep, so that pairs in conjunction give a very tumid shell for the size ; on account of the greater inflation the keeling is more marked and there is a broader flattened area behind the umbones. The hinge teeth are smaller, closer, and slightly more numerous, there being about 15.

Umbones smooth, and earlier portion of the shell with no specially distinct marking, then fairly regular incised concentric grooves, with broad flat spaces between become prominent, with occasional growth folds at irregular distances.

Dimensions. — Type specimen, antero-posterior diameter, 6·5 mm.; umbo-ventral diameter, 4 mm.; thickness through both valves, 4 mm.; another specimen of the same size shows slightly less inflation, being a little under the 4 mm. in thickness ; other examples range in their diameters, 6 mm. by 3·5 mm., 5½ mm. by 3·5 mm., and 4·5 m.m. by 3 mm.

Locality.—Eocene, lower beds of the Spring Creek or Bird Rock Bluff Section, near Geelong.

Observations.—This is probably the species referred to under the manuscript name of L. embolos, by Professor Tate.

Carditella regularis, sp. nov. (Pl. II., Fig. 5).

Description.—Shell small, rotund, and convex, with prominent incurved anteriorly directed umbo, and a small but well-defined deeply excavated lunule. Umbo convexly rounded, and running out to an acute point just above the cardinal area. Outline of the shell very regularly rounded, but for the slight interruption in the neighbourhood of the lunule. Inner margin crenulated from the lower margin of the lunule to the posterior end of the hinge in accordance with the external radial ridges. External surface sculptured with fine close radial ridges, the interspaces being narrower than the ridges, but widest on the posterior slope, and widening towards the margin; ridges number about 28 to 30, and are very regularly and finely beaded, the beads being more rounded in the neighborhood of the umbo, then becoming more oval, and then more oblong towards the ventral margin. Interspaces apparently smooth, but under a good lens show fine concentric markings.

Dimensions.—Antero-posterior diameter, 5 mm.; umbo-ventral diameter, 5 mm.; thickness through one valve, about 2 mm.

Localities.—Type from the Eocene clays of Grice's Creek; also from the clays near the Old Cement Works, Balcombe's Bay, Mornington.

Observations.—The present form appears entirely distinct from any of the five species of this genus already described by Professor Tate, and may be said at first sight to somewhat recall Cardita delicatula, Tate, but its hinge characters are exactly those of Carditella, and at the same time it is smaller on the average, more rotund, more convex, and with finer sculpture, than that species.

Modiolaria balcombei, sp. nov. (Pl. III., Fig. 2).

Description.—Shell small, oblong-oval, very tumid, especially at the umbo and about the umbonal ridge, maximum convexity about the median portion of the shell, thin and nacreous internally.

Umbo very prominent, strongly incurved, and terminal; anterior margin only slightly convex to the ventral margin; the latter showing a distinct sinus, dorsally the margin is convexly rounded, inclined to angulation with the posterior margin, on account of oblique truncation, and again, slightly angled where the umbonal ridge runs out. The whole of the inner margin finely crenulated. The embryonic shell is well marked, apparently smooth and shining, though very small; the remainder of the shell is finely radially ridged, the ridges being very close, and, as a rule, broader than the intervening spaces, as the shell increases in size fresh ridges make their appearance in the interspaces, at first only thin, but soon reaching the dimensions of the others, so that marginally the ridges are much more numerous; the radial ridges are crossed by concentric growth lamellae, giving rise to a more or less regular cancellation.

Dimensions.—Type, greatest length, 5 mm.; greatest breadth, a little over 3 mm.; greatest convexity, about 2 mm. Other examples give about the same dimensions, save that in some the breadth is a good 3·5 mm.; smaller examples range, length, 3 mm.; breadth, 2 m.m.

Locality.—Eocene clays from the Old Cement Works, Balcombe's Bay, Mornington.

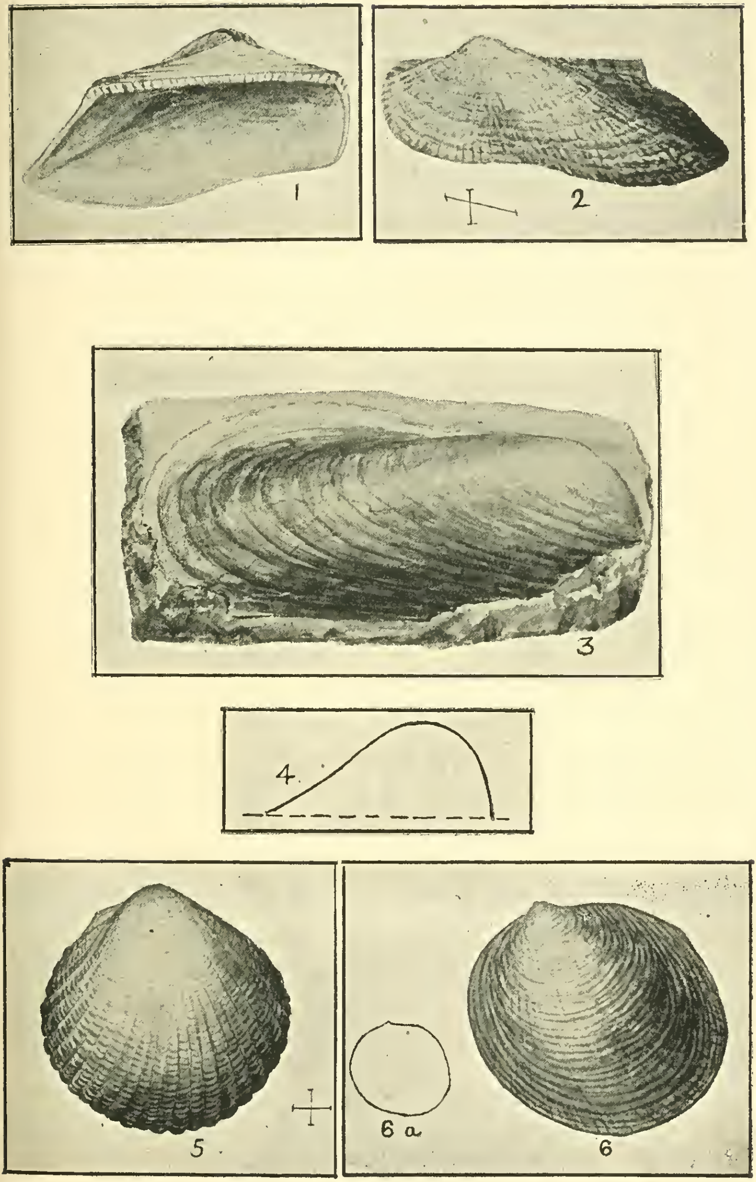
Observations.—Apparently this species is somewhat related to Modiolaria corioensis, Tate, but may be distinguished by being more tumid, and differently sculptured.

Verticordia excavata, sp. nov.

Description.—Shell small, thin, oblong-ovate, with a prominent produced anterior, umbo prominent and incurved anteriorly a little short of the hinge. Shell only slightly convex, somewhat depressed towards the ventral margin, also to the anterior and posterior; deeply excavated immediately in front of the umbo, giving rise to a distinct lunule. Inner margin of valve delicately crenulated, and interior of shell nacreous, with a relatively large anterior adductor muscular impression. Externally the surface is sculptured by narrow acutely angular radial ridges, the interspaces being about twice as broad as the ridges, and very finely transversely striate, ridges number about twenty-eight, and their crests are extremely finely and closely lamellose transversely, the latter feature being most noticeable on the anterior slope, the lamellae apparently being erect.

Dimensions.—Antero-posterior diameter, 6 mm.; umbo-ventral diameter, 5 mm. (incomplete).

Locality.—Eocene clays from near the old Cement Works, Balcombe's Bay, Mornington.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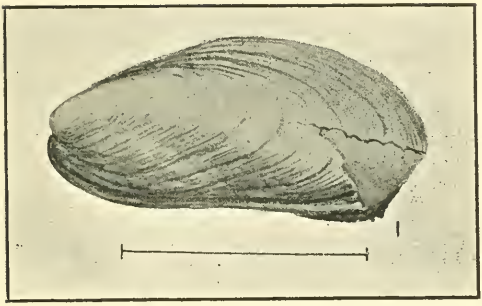
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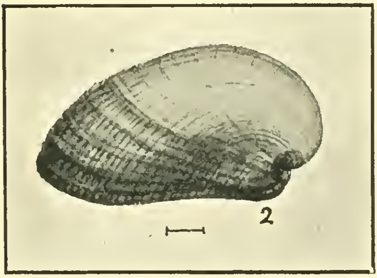
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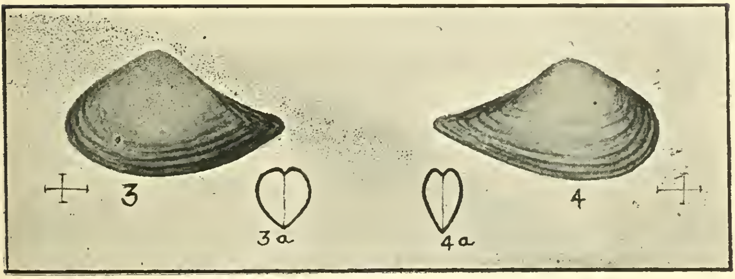
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Observations.—A figure of this species is held over for the present on account of the slightly broken ventral margin. It appears closely related to V. rhomboidea, Tate, but is less inflated, more equilateral, and more finely sculptured.

I am again indebted to Mr. F. E. Grant for the figures with which he has so kindly illustrated this paper.

EXPLANATION OF PLATES.

Plate II.

Fig. 1.—Arca capulopsis, sp. nov.
,, 2.—Arca capulopsis, sp. nov.
,, 3.—Modiola praerupta, sp. nov., sectional view from anterior aspect.
,, 4.—Modiola praerupta, sp. nov.
,, 5.—Carditella regularis, sp. nov.
,, 6.—Limopsis morningtonensis, sp. nov.
,, 6a—Limopsis morningtonensis, sp. nov.

Plate III.

Fig. 1.—Modiola pueblensis, sp. nov.
,, 2.—Modiolaria balcombei, sp. nov.
,, 3.—Leda fontinalis, sp. nov.
,, 3a.—Leda fontinalis, sp. nov., sectional view.
,, 4.—Leda acuticauda, sp. nov., sectional view.
,, 4a.—Leda acuticauda, sp. nov.

Art. V.—*Some Sections illustrating the Geological Structure of the Country about Mornington.*

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AND

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(With Plate IV.)

[Read 16th May, 1901.

Previous Work.

Dr. A. R. C. Selwyn, in 1854, (1) gave a sketch of the geology of the Mornington Peninsula. He compares the blue clay series, both lithologically and as to fossils with the beds of the London and Hampshire basins. The basalt of the coastal sections he refers to dykes, a conclusion from which we dissent. The other formations are described and compared with those of localities outside the area under immediate discussion, a proceeding due to the fact that he was as yet only at the beginning of his work in Victoria, and a rapid examination of the Castlemaine district was almost all he had done. His coloured sections run from Cape Schanck to Mount Martha, from Hawthorn to the Saltwater River near Flemington, and a diagrammatic one illustrates the position of the gold drifts, then a much debated question. Another section, on a scale of about two miles to an inch, runs from near Mornington to the Powlett River, while another is drawn across the Yarra estuary, and is compiled from the results of borings. Finally we have another—a diagrammatic one—across the colony from the Grampians to the Alps. The coloured map shows the the whole of the eastern side of Port Phillip, from the Yarra mouth to the Heads and extending to the eastward nearly as far as Cape Patterson; the scale being two miles to an inch.

Two years later Selwyn (2) published a much fuller report on the district, accompanied by a map on the same scale, but showing greater detail. The section is instructive, but does not touch the area under consideration. It extends from near Somerton to Mount Corhanwarabul (Mount Observatory), and the distance of thirty miles was chained, levelled and drawn to true horizontal and vertical scale, the scale being six inches to a mile. In dealing with the tertiaries twenty-two genera of mollusca are mentioned as occurring in the Mornington clays.

These old reports of Selwyn's, buried as they are in a mass of Parliamentary papers, are not often referred to, but contain a large amount of interesting information. Subsequent explorations have somewhat modified, as is natural, a few of his conclusions, but they still form a safe basis on which we can build, and show how soon he gained a clear insight into the geological structure of Victoria.

Shortly after this, Dr. Selwyn (3) presented a suite of fossils from Mornington to the Royal Society of Tasmania, and the collection is described as showing a close resemblance to forms found at Table Cape.

In 1857 Sir F. M'Coy (4), in his evidence before the Coal Commission, alludes to the small area of "carboniferous deposit" near Schnapper Point, and says that all that area between the granite and the sea was found to be traversed at a little depth by a "sort of dyke" of igneous rock or trap, similar to that which occurs in the Cape Patterson beds on the coast, and similar to that found at a depth of nearly 200ft. in the two more northern borings. Dr. Selwyn, in his evidence before the same commission, said, in reference to Schnapper Point and the shores of Port Phillip Bay, "In this district 200ft. of coal strata have been bored through, and in that thickness no seam more than 3 inches thick has been discovered. If any available coal deposit exists in this neighborhood, it can only be under the waters of Port Phillip. Inland the coal strata are most undoubtedly and completely cut off by being faulted against older rock. This line of fault extends in a direct line from Frankston to Arthur's Seat, parallel to the coast; beyond the latter point, the coal rocks, if existing, are overlaid by such a thickness of newer tertiary deposits as to render them of no practical value."

Two bores were put down, Selwyn says, one near Mordialloc, and after passing through 238ft. of soft sand and clay of the tertiary series, bottomed on a very hard, dense, black rock, or basalt. The second was commenced near Frankston, on the Nine-Mile Beach, and has been carried to a depth of 172ft. Of this, 165ft. was again through clay and sand, and the last 7ft. was partly in sandstone of the old Silurian series, and the remainder again in the dark, very hard trap. Of the bore mentioned as being put down in the "coal strata," we can find no record. Subsequently to this many brief references were made to the fossils and age of the blue clays, chiefly by M'Coy, who at first called them Upper Eocene, and then, accepting the new term Oligocene as its equivalent, changed his references to the age to this.

In 1893 Messrs. Tate and Dennant (5) published a list of about 130 described species of mollusca from Mornington, and referred the beds to Eocene age; while numerous references to the fossils and additional records occur in other papers of these authors, as well as in several of our own.

In 1900 Mr. A. E. Kitson (6) wrote a report on the geology of the district, accompanied by a map and sections. In this paper there is a large amount of detailed description of the exposed sections, and the age of the various beds is discussed, but the consideration of many interesting points is deferred.

Early in the present year Mr. E. G. Hogg published a paper (7) on our Victorian granites, in which the granite rocks of this area were described.

More than ten years ago we began paying attention to the geology of the district, and, besides collecting largely from the various outcrops, have made numerous traverses, while for many years past we have taken students over the ground and discussed the more important sections with them. The puzzling nature of several of the sections, owing to faulting and to landslips, delayed our earlier publication, but, as we believe that we can add some useful information to that already supplied by Mr. Kitson, we venture on the present paper. The scope of Mr. Kitson's communication renders it unnecessary for us to do much more than to discuss a few of the sections displayed on the coast or in the gullies, and to supply a list of the fossils known to us to occur.

Considerable confusion appears to exist as to the names of the small creeks or gullies which run down to the Bay, and we use the local names as far as we have been able to ascertain them. As a matter of fact many of them are too small to have widely recognised ones, and generally bear the name of the owner of the land through which they run, and to these facts is due the deviations which Mr. Kitson's map shows from local usage.

The Sections.

Frankston Brickyard.

In the yard of the Frankston Brick Company, south of the pier, the succession is—

Red sands, grits and white clay
Basaltic clay
Conglomerate (?)
Granite rock.

The granitic rock was reached in a well put down for water and the spoil heap appears to show the presence of the conglomerate. Considerable slipping has taken place at some spots. A shaft was put down a few years ago in search for coal at about low tide mark, slightly to the north of this spot, but all traces have now been washed away.

Sweetwater Creek.

The road cutting near the mouth of Sweetwater Creek (Naringalling Creek of Mr. Kitson) is through a landslip, but the true succession can easily be made out on the hill. We get :—

Red sands, grits and white clay
Basalt
Conglomerate
Granite rock.

In places there is considerable displacement by slipping, and apparently the whole face has come down without, however, much disturbing the order of the beds. About 25 years ago, according to Mr. B. Baxter, a local resident, a considerable fall took place, which completely blocked the traffic, and fragments of the basaltic rock are still to be seen on the beach, evidently derived from this or previous landslips.

Oliver's Point.

This is the first high cliff south of Frankston. The section shows—

Ferruginous grits and sands passing up into white sands (Eocene) - -	45 feet.
Decomposed basalt - - - -	10 ,,
Grits with overlying conglomerate - -	10 ,,
Granite [1] - - - - - -	27 ,,
Total - - - - - -	92 feet.

The ferruginous grits have not as yet yielded fossils at this locality.

Landslip Point. (Fig. 1).

The succession is the same as at Oliver's Point, and the thickness of the beds is practically the same. An interesting point about the section is the occcurrence of a band, a few inches thick, full of casts of fossils at about 20 feet above the top of the basalt, the occurrence of which was first detected by Mr. Kitson, and which was referred by Mr. Dennant to Eocene age.

The fossiliferous band is much softer than the thick-bedded, well-jointed, hard ironstone grits which underlie it, and blocks of which thickly strew the beach below. At the date of our last visit, in December of last year, pieces of the fossiliferous rock were common on the beach owing to a rockfall which took place during the winter, but owing to their soft condition they will probably soon be broken up by the hard shingle. The determination of the Eocene age of the ferruginous grits which mantle the surface of the district up to about 400 feet above the sea, is of considerable interest. Hitherto, in the absence of fossils, these beds have generally been considered as to the same age as those displayed in the Beaumaris cliffs.[2] When, however, the fossils of the two localities are compared, it will be seen that they are entirely distinct, and that those from the grits of this

1 See Hogg, E.G. (**7**).

2 The Beaumaris beds have frequently been referred to by authors as at Brighton, Cheltenham or Mordialloc. In each case the same short cliff section is meant, and the small settlement which has of late years sprung up at the spot bears the name which we use.

district show a close agreement with those of the grey clays of Balcombe's Bay, and there is little but a lithological distinction to separate them.

South of Landslip Point.

Mr. Kitson figures and describes a section running south along the coast from Landslip Point, which displays some rather puzzling features. The conclusion that we have arrived at is that the beds owe their present position entirely to landslips. At one time we were inclined to call in the agency of faulting to explain the fact that the basalt and granitite abutted against one another with a vertical wall, but recent examination shows that there is between the two igneous rocks a seam of conglomerate in the upper part of the northern occurrence. This conglomerate also overlies both granitite and basalt, and, as it is the slate conglomerate, which in all the neighbouring sections underlies the basalt, its anomolous position was commented upon by Mr. Kitson, who suggested slipping as an explanation. We are, however, inclined to go further than he does, and ascribe the position of the basalt to the same cause.

Grice's Creek. (Figs. 2 to 5).[1]

At the mouth of the creek the relations of the beds are, at first sight, not easily determined, but by observing the sequence shown in other places in the neighbourhood, become sufficiently clear. Beginning from the sea coast we find the grey, Eocene clays with limestone bands showing a high dip, the figures being, N. 5°, W. at 28°, and gradually increasing to N. 20°, W. at 58°. A few yards further and a reversal takes place, the direction and amount being, W. 10°, N. at 72°, this giving place almost immediately to the slightly lower dip of 67° in the same direction. The beds are then succeeded by basalt, which occupies the bed of the stream for nearly a chain, and over which the ascent is steep. An outcrop of granitite (?) then occurs for 30 feet, when a small patch of basalt again appears. At a height of 45 feet above sea

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[1] This locality is referred to by M'Coy in his Prodromus of the Palaeontology of Victoria and elsewhere, as the Mount Eliza beds, a fact for which we are indebted to Mr. J. A. Kershaw, curator of the National Museum.

level, and about a quarter of a mile from the coast a section (Fig. 3) shows :—

Basalt - - - - - - -	5 feet.
Sands - - - - - - -	15 ,,
Conglomerate - - - - -	2 ,,
Granitic rock - - - - -	4 ,,

The dip of the conglomerate floor, on which the basalt rests, is W. 30°, N. at 10°. It is clear that the conglomerate and basalt occupy a small trough in the granitic rock, as a few yards further down the creek the base of the conglomerate rises gradually to 10 feet above the bed, while going up stream we ascend to 60 feet above the sea before we again find basalt on the floor, its base rising more rapidly than the stream bed. At about half a mile from the mouth the creek bed is 80 feet above sea level, and a good section (Fig. 4) shows a cliff of 30 feet of basalt overlying the granitic rock without the intervention of the sands and conglomerates. From this point upwards the course of the stream for some distance has a very gentle fall, granitic rock occupying the bed for the whole distance. At 90 feet above the sea the section displayed (Fig. 5) shows 15 feet of granitic rock overlain by 20 feet of a conglomerate, chiefly composed, as are the others under the basalt here, of pebbles of slate and quartzite. The surface of the granitite (?) is uneven, and, at a height of 120 feet, we find decomposed basalt in the creek bed, which is again succeeded, as we ascend the valley, by the granitic rock.

At about 180 yards from the road, and at a height of 160 feet, we reach the top of the last granitic outcrop, and between this and the road, at a height of 230 feet, we find only ferruginous grits. The top of the granitic rock is much weathered, and, as the base of the grits much resembles it, an exact line of separation cannot be drawn. The ferruginous grits, at an elevation of 190 feet, have yielded obscure plant remains.

South of Grice's Creek.

On passing southwards from the mouth of Grice's Creek we find the Marine Eocene dipping south at about 25°, but a change of direction to the north soon takes place, and the calcareous bands can be seen striking out to sea in a westerly direction along the beach floor. We then find basalt, and under it on the beach olive shales with Angiopteridium spathulatum (syn. Taeniopteris daintreei) and Thinnfeldia odontopteroides. Abutting on these Jurassic beds is the granitic rock, capped and masked by ferruginous sands. The fact that the Jurassic series owes its position to being faulted down against the plutonic rock was, as mentioned above, long ago stated by Selwyn, and a mile and a half inland the latter rock still rises to a height of over 500 feet.

Balcombe's Bay.

Near the northern end of the shallow indentation known as Balcombe's Bay is the well-known fossiliferous outcrop of Eocene clays and limestones.[1]

The limestone strings and bands were formerly used for making cement, and the ruins of the works are still to be seen. As is shown by the limestone bands, the clays are somewhat disturbed; in one place, north of the cement works, the dip is—E., 25° N, at 16°, but changes rapidly in amount and direction, and occasional sigmoidal curvature of the outcrop, shows the existence of slight contortion, with a dip of from 15° to 20°. Close to the cement works, the beds dip steadily towards the south-west. If this dip held, they would pass under the extension of the basalt which forms the base of the small point to the south; but, judging by what we see elsewhere, they do not.

On rounding this point, the character of the beds is entirely changed, and from sea level to a few feet above high-water mark, we find grits and light conglomerates, with pebbles of quartz and slate, and interspersed with bands of lignite and carbonised tree-trunks. Dicotyledonous leaves are plentiful, and no trace of Jurassic plants is to be seen. The strata are fairly horizontal, but current-bedded. Over these beds, and not apparently separable by an unconformity from them, occurs a series of strata of different character. These are lavender-coloured and yellow sandy clays, with a considerable amount of gypsum and copia-

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1 Like many of our longer known geological localities, which were found when geographical names were not so thickly scattered as they are now, this outcrop is known by many designations, such as Schnapper Point, Mornington, Mount Martha, or even Hobson's Bay, though the Bay is thirty miles away. Probably "near the mouth of the River Yarra" also refers to this spot, and was near enough when it was written.

pite (?). We have never been able to find any undoubted fossils in the cliffs about here, though we have frequently searched for them. The general appearance and character of the beds resembles that of the marine Eocenes at various localities, and the amount of gypsum present suggests its derivation from calcareous organisms. We see no reason why these beds should not be classed with the blue clays which, in all probability, they succeeded. About a quarter of a mile south of the point mentioned above, and at which the lignitic conglomerates appear, we find another peculiar section (Fig. 6). The grits and conglomerates can be traced passing under a small mass of basalt, which shows well-developed tabular jointing. The base of the basalt, where it rests on the underlying beds, is vesicular, or rather, amygdaloidal, and becomes denser as we ascend. It abuts against the cliff, which is formed of variegated sands and clays, passing up into ferruginous beds near the top of the cliff. The actual junction of the basalt with the undisturbed strata of the cliff is masked, but the beds can be readily traced along the cliff to the northward, where, as we just stated, they overlie the lignitic series, with no clear break, and without any trace of the basalt being intercalated between them. In fact, there is no basalt shown along the cliffs, though a couple of islets and a small patch visible on the beach at low water connect the two points, which are preserved by their basaltic sea-fronts. The fact that the lignitic beds underlie the basalt, and can be traced horizontally till they underlie the gypsiferous sandy clays to the north, puts faulting out of the question, though, at first sight, the nearly straight line which the shoreward edge of the basalt shows suggests it. There remain two other possible explanations of the section. One is that we are dealing with a narrow flow of lava which has passed down an eroded valley which cut through the upper sandy beds till the lignitic series was reached.

The objections to this view are, firstly, that the cliff above the tabular basalt rises steeply, and the bedding is distinct and fairly horizontal, and we cannot suppose such a valley-wall to have persisted in incoherent material from the time when the basalt was poured out, for the basalt precedes the blue Eocene clays with fossils. The other objection is that if, as we suppose, the sandy beds represent the marine eocene, then they should be subsequent to the basalt.

The alternative explanation is that there really was a considerable lapse of time between the deposition of the lignitic series and the overlying beds, and that the basalt represents a denuded portion of a sheet which has almost entirely disappeared, and that, after its partial removal, the sandy beds were laid down, partly on the lignitic series and partly on the basalt. The passage of the beds in this case would be only apparent, and due to the fact that the first-formed portion of the upper beds was derived from the waste of the lower. This explanation is the one we adopt.

Succession of the Rocks.

We give the following as, in our opinion, the sequence of the beds :—

Bleached sands, clays and alluvium	Eocene to Recent.
Ferruginous grits, sands and clays	Eocene.
Blue and grey clays and gypsiferous sands	
Basalt	
Slaty conglomerate and lignitic beds	? Eocene.
Shales and sandstones	Jurassic.
Granitic rocks.	
Slates, &c.	? Silurian or Ordovician.

Silurian or Ordovician ?

The series of highly-inclined rocks is clearly antecedent to the granitic rock, as small dykes and sills of the latter occur in the Moorooduc quarry. Hitherto we have been unable to find any fossils in these rocks *in situ.* The coarse conglomerate which underlies the basalt in many places appears to be, in the main, derived from the older paleozoic sedimentary rocks of the district and from the granitic series. In two places, namely, in the first cutting on the coast road south of Frankston, and near the first outcrop of granitic rock south again from this place, on the shore we have found a few graptolites in slate pebbles. They are very indistinct, and, beyond saying that they are species of Diplograptus, we do not at present care to venture. Their evidence, then, leaves the age of the rocks still open.

Granitic Rocks.

Mr. E. G. Hogg, as already mentioned, has described some of these rocks, and calls the Frankston ones granitites and the Mount Martha ones syenites, hornblende being present.

Jurassic.

The presence of Angiopteridium spathulatum and Thinnfeldia odontopteroides at the outcrop on the beach south of Grice's Creek appears to correlate these beds with those of Bellarine, which are exposed less than twenty miles off, across Port Phillip Bay. These are generally referred to Jurassic age.

The occurrence of faulting to account for the present position of the beds has already been referred to, and no other outcrop of the series is known in the area with which we are dealing.

Slaty Conglomerate and Lignitic Series.

The character of the conglomerates and sands underlying the basalt has been described in detail by Mr. Kitson, and there is little to add to it.

The lignitic series, or leaf beds, exposed to the south of the blue, marine, fossiliferous clays of Balcombe's Bay are of a similar character. Fragments of slate and indurated sandstone, quartz, both black and white, and sand of granitic origin are equally in evidence in the two sets of strata, and, as we have shown, the lignitic beds pass beneath the vesicular base of the basalt. For these reasons we regard the lignites and conglomerates as of the same age. The thick sheets of leaves contain many that are clearly dicotyledonous, while small fruits or seeds are not uncommon; but, so far, nothing has been done with them. It would appear, from the sections displayed in Grice's Creek, that considerable denudation had taken place in these beds before the outpouring of the basalt, for we find them in some places forming a thick deposit of conglomerate and sand. In other places, again, and that in close proximity, they are only a few inches thick, or even may be absent, and in that case we find the basalt reposing directly on the granitic rock. The basalt itself was also much denuded before the subsidence which resulted in the deposition of the marine series upon it. It is, of course, possible that, as the basalt flowed over the uneven surface of the ground, some localities were left uncovered, and the denudation may be more apparent than real, and that absence of the rock does not imply removal. There is no evidence, for instance, that it ever covered Mount Eliza, which is about 500 feet high, and the probability is that it merely flowed round it, and sent prolongations up the valleys. In one instance, however, we have described what we believe to be a clear instance of denudation of the basalt before the deposition of the marine Eocene, and this is where we described it as overlying the lignites in Balcombe's Bay.

These periods of denudation clearly indicate a lapse of time, and, in the absence of critical palæontological evidence, the age of the conglomerates must be left undecided, for we are, as yet, unable to estimate the time which elapsed between their deposition and that of the marine Eocene. They may be Eocene or they may be Cretaceous, though in our table we class them as Eocene, but with hesitation.

Basalt.

No petrological examination of the basaltic rock has yet been made, so that its exact nature is still uncertain. The basalt is probably of Eocene age.

Blue Clays, &c.

The exact relation of the blue clays to the gypsiferous sandy clays which lie to the south of the cement works is not quite clear. These latter beds pass up into the ferruginous strata which cap the cliffs, whereas the line of demarcation between the ferruginous beds and the blue or yellow clays with fossils is, as a rule, sharp, and, till we examined the fossils of Landslip Point, we were of the opinion that they are of different ages. It seems advisable to regard the beds as mere local modifications of sedimentation, the oxidised condition of the iron being due to greater porosity of the sands. What applies to the ferruginous sands applies with equal force to the gypsiferous sandy clays. In fact, there seems to be some evidence that these do actually overlie the blue clay in Balcombe Bay, for just north of the cement works gypsiferous sands, of a very similar appearance to those to the south, occur, and, like the beds to the south, are almost, if not entirely, without fossils. It is unfortunate that just at this critical spot, where so much that is of interest could be settled, the whole cliff-face should be scarred with grass and scrub-covered landslips. Possibly the clays were deposited in a spot sheltered from the inroads of sand by a basaltic reef or ridge.

At Grice's Creek, again, there is some difficulty in determining the succession. The blue or grey clays, rich in marine fauna, here dip at a high angle towards the basalt, and then at a still higher angle off it, and upstream the igneous rock rises some distance above sea level, while the base of the clays is hidden below sea level at the Creek mouth. It is evident that we are dealing either with a fault or with a landslip. Close at hand the fault which lets down the mesozoic rock to sea level runs parallel with the coast-line, so that, at first sight, step-faulting might be called to our aid in seeking an explanation. But if the main fault were post-Eocene, we should expect to find some traces of the Jurassics on the upthrow side. But the clear gully section shows no trace of them, so that the presumption is that they were denuded before the Eocenes were laid down, or, in other words, that the faulting did not take place in post-Eocene times. Besides this, the amount of disturbance in the marine Eocene seems to suggest the absence of a great thickness of cover when the movement took place, and to suggest a superficial disturbance rather than a fault. The cliffs in the neighbourhood are much masked, and at present there are not the necessary outcrops to test the question fully. According to our view, then, the present relations of the basalt and the marine clays at Grice's Creek are due merely to landslips, and here, as elsewhere, the clays are younger than the basalt.

Ferruginous Grits.

Ferruginous sands and clays mantle over a great part of the area, and their age is shown to be Eocene by the fossils obtained at Landslip Point. It is, of course, quite within the bounds of possibility that future investigation may show that some of the beds are younger than this; but, in the meantime, we seem justified in referring the ferruginous grits of this district all to the one age.

The character of the beds has been described sufficiently fully by Mr. Kitson, and though, for convenience, we call the beds ferruginous, yet the superficial portions, as is usual in such strata, are bleached more or less completely, and much of the district is covered by a sandy loam.

Post-Eocene.

Since the surface does not seem to have been submerged since Eocene or, possibly, Miocene times, the classification of the subaerially-formed beds is an academic rather than a practical one. The valleys are mostly short and steep on the western slopes, so that any recent alluvium is of small extent. Towards the west and north the low-lying ground is often swampy, and here the beds are of recent age. Mr. Kitson has arrived at the same conclusion, and is content to map a large area as "Eocene? to Holocene," and his map is of great use to anyone wishing to further explore the locality.

It is clear that the western boundary, facing Port Phillip, owes its abrupt rise in the main to the fault which let down the Jurassic freshwater beds. Whether the eastern side of the long, narrow ridge, of which Mount Eliza forms the granitic nucleus, is due to the same cause is not so evident, though quite possible. The descent of the surface is more gradual, except about Moorooduc, and here a small creek, flowing south to enter the sea at Mount Martha, working along the strike of the eastward-dipping palæozoic beds is evidently the cause of the scarp.

The absence of clear sections in many of the critical localities, and the difficulty of interpreting many of the exposures, is due, we believe, to extensive landslips of the soft tertiary beds down the steep western slope towards the Bay. Had the questions involved in a discussion of the geology of this area been easy of solution, an adequate account would long ago have been written. As it is, our interpretation of some of the points at issue may not be the correct one, but it is better to have some definite basis for future work.

We have to thank Messrs. J. A. Kershaw, F. E. Grant, and E. O. Thiele for the gift or loan of fossils which have added several important forms to our list.

LIST OF FOSSILS.

Note.—In this list Mornington means the cement works section, and Frankston the ferruginous beds at Landslip Point, and all the identifications it contains have been checked by ourselves.

	Mornington.	Grice's Creek.	Frankston.
LAMELLIBRANCHIATA.—			
Ostrea hyotis, Linnaeus	X		
Dimya dissimilis, Tate	X	X	
Placunanomia sella, Tate	X		X
Pecten murrayanus, Tate	X	X	
,, dichotomalis, Tate	X	X	X
,, sturtianus, Tate	X	X	
,, yahliensis, T. Woods	X	X	
,, foulcheri, T. Woods	X		
,, lucens, Tate	-	X	
Amusium zitteli, Hutton	X	X	X
Lima bassii, T. Woods	X	X	X
,, linguliformis, Tate	X		X
Limatula jeffreysiana, Tate	X	X	
Limea transenna, Tate	X	X	
Spondylus pseudoradula, McCoy	X	X	X
Philobrya bernardi, Tate	X	-	-
Septifer fenestratus, Tate	X	X	X
Modiola praerupta, Pritchard	X	-	-
Modiolaria singularis, Tate	X	-	
,, balcombei, Pritchard	X	-	
Crenella globularis, Tate	X	-	
Nucula tenisoni, Pritchard	X	X	X
,, atkinsoni, Johnston	X		
,, morundiana, Tate	X		
Leda obolella, Tate	X	X	
,, huttoni, T. Woods	X	X	
,, apiculata, Tate	X	X	
,, acuticauda, Pritchard	X	X	
,, vagans, Tate	X	X	X
,, praelonga, Tate	X	-	
,, leptorhyncha, Tate	X	-	
Poroleda lanceolata, Tate	-	X	

	Mornington.	Grice's Creek.	Frankston.
Limopsis belcheri, Adams & Reeve - -	X	X	
,, morningtonensis, Pritchard- -	X	X	
Glycymeris cainozoicus, T. Woods - -	X		
,, laticostatus, Quoy & Gaimard-	X	X	X
Arca capulopsis, Pritchard - - -	-	X	-
Barbatia crustata, Tate - - - -	X	X	
,, celleporacea, Tate - - -	X	X	X
,, simulans, Tate - - - -	X	X	
Plagiarca cainozoica, Tate - - -	X	X	
Cucullaea corioensis, McCoy - - -	X	X	X
Trigonia tubulifera, Tate - - - -	X	X	
Crassatellites communis, Tate - - -	X	X	
,, dennanti, Tate - - -	X	X	
Mytilicardia alata, Tate - - - -	X	X	
Cardita polynema, Tate - - - -	X	X	
,, delicatula, Tate - - - -	X	X	X
,, scabrosa, Tate - - - -	X	X	
Carditella regularis, Pritchard - - -	X	X	
Diplodonta subquadrata, Tate - - -	X	X	
Chama lamellifera, T. Woods - - -	X	X	X
Verticordia excavata, Pritchard - -	X	-	-
Cardium hemimeris, Tate - - -	X	X	X
,, cuculloides, Tate - - -	X		
Chione cainozoica, T. Woods - - -	X	X	X
Meretrix eburnea, Tate - - - -	X	X	
,, tenuis, Tate - - - -	-	X	
Tellina cainozoica, T. Woods - - -	-	X	
Psammobia aequalis, Tate - - -	X	-	
Semele vesiculosa, Tate - - - -	X	X	
,, krauseana, Tate - - - -	X	X	
Hemimactra howchiniana, Tate - -	X	-	
Myodora tenuilirata, Tate - - -	X	X	
Myochama trapezia, Pritchard - - -	X	X	
Corbula ephamilla, Tate - - - -	X	X	
,, pixidata, Tate - - - -	X	X	X
Cuspidaria subrostrata, Tate - - -	X	-	
Saxicava arctica, Linn. - - - -	-	X	
Capistrocardia fragilis, Tate - - -	X	X	
GASTROPODA.—			
Murex velificus, Tate - - - -	X	X	

	Mornington.	Grice's Creek.	Frankston.
Murex rhysus, Tate	X		
,, eyrei, T. Woods	X	X	
,, amblyceras, Tate	X	X	
,, lophoessus, Tate	X	X	
,, hamiltonensis, Tate	X	X	
,, wallacei, Pritchard	X	X	
,, trochispira, Tate	X	X	
Muricidea camplytropis, Tate	X	X	
,, asperulus, Tate	X	X	
,, polyphyllus, Tate	X	X	
*Typhis disjunctus, Tate	X		
,, acanthopterus, Tate	X	X	
,, laciniatus, Tate	X	X	
Trophon didymus, Tate (Murex)	X	X	
Rapana aculeata, Tate	X	X	
Concholepas antiquata, Tate	X	-	
Argobuccinum maccoyi, Pritchard	X	X	X
Lotorium gibbum, Tate	X	X	
,, cyphum, Tate	X		
,, woodsi, Tate	X	X	
,, textile, Tate	X	X	
,, tortirostre, Tate	X	X	X
,, tumulosum, Tate	X		
,, protensum, Tate	X	X	
,, annectans, Tate	X	X	
,, pratti, T. Woods	X		
Colubraria tenuicostata, T. Woods	X	X	
,, turrita, Tate	X	X	
,, texturata, Tate	X	X	
Fusus dictyotis, Tate	X	X	
,, simulans, Tate	X		
,, senticosus, Tate	X	X	
Clavella bulbodes, Tate	X	X	
Latirofusus aciformis, Tate	X		
,, exilis, Tate	X	X	
,, hexagonalis, Tate	X	X	
Siphonalia longirostris, Tate	X	X	
,, tatei, Cossmann	X		

* Typhis maccoyi, T. Woods, I have collected from the Eocene deposits of the next creek nearer to Frankston than Grice's, but have not hitherto seen even a fragment from Mornington or Grice's Creek.—G. B. P.

	Mornington.	Grice's Creek.	Frankston.
Siphonalia styliformis, T. Woods - -	X	X	
Tritonofusus crebrigranosus, Tate - -	X		
Solutofusus carinatus, Pritchard - -	X	X	
Fasciolaria cryptoploca, Tate - - -	X	X	
,, decipiens, Tate - - -	X	X	
,, concinna, Tate - - -	X		
,, cristata, Tate - - - -	X	X	
,, rugata, Tate - - - -	X		
,, lamellifera, Tate - - -	X		
,, tenisoni, T. Woods - - -	X ?		
Latirus linteus, Tate - - - -	X	X	
,, murrayanus, Tate - - -	-	X	
,, succinctus, T. Woods - - -	X	X	
,, interlineatus, Tate - - -	-	X	
,, subundulosus, Tate - . - -	-	X	
Euthria ino, T. Woods - - - -	X	X	
,, cingulata, Tate - - - -	X	X	
Leucozonia micronema, Tate - - -	X		
,, staminea, Tate - - -	X		
,, tumida, Tate - - - -	X		
Eburna aulocoessa, Tate - - - -	-	X	
Zemira praecursoria, Tate - - -	-	X	
Phos tardicrescens, Tate - - - -	X	X	
Loxotaphrus variciferus, Tate - - -	X	X	
Nassa tatei, T. Woods - - - -	X	X	X
Voluta hannafordi, McCoy - - -	X	X	
,, macdonaldi, Tate - - - -	X		
,, ancilloides, Tate - - - -	X	X	
,, hamiltonensis, Pritchard - -	-	X	
,, maccoyi, T. Woods - - -	X	X	
,, ellipsoidea, Tate - - - -	-	X	
,, sarissa, Tate - - - -	X	X	
,, pseudolirata, Tate - - -	X	X	
,, antiscalaris, McCoy - - -	X	X	
,, strophodon, McCoy - - -	X	X	
,, weldii, T. Woods - - - -	X	X	
,, crassilabrum, Tate - - -	X	-	
Volutoconus limbatus, Tate - - -	X	X	
,, conoidea, Tate - - -	-	X	
Lyria harpularia, Tate - - - -	X	X	X
Mitra alokiza, T. Woods - - - -	X	X	

	Mornington.	Grice's Creek.	Frankston.
Mitra uniplica, Tate	X		
,, paucicostata, Tate	X		
,, leptalea, Tate	X	X	
,, semilaevis, Tate	X	X	
,, conoidalis, Tate	X	X	
,, atractoides, Tate	-	X	
Conomitra ligata, Tate	X	X	
,, othone, T. Woods	X	X	
Marginella propinqua, Tate	X	X	X
,, inermis, Tate	X	X	
,, micula, Tate	X	X	
,, wentworthi, T. Woods	X	X	X
,, winteri, Tate	X		
Ancilla semilaevis, T. Woods	X	X	
,, pseudaustralis, Tate	X	X	
Harpa pulligera, Tate	X	X	
,, spirata, Tate	X		
,, lamellifera, Tate	X		
,, tenuis, Tate	X	X	
Columbella funiculata, T. Woods	X		
,, crebricostata, T. Woods	X	X	
,, cainozoica, T. Woods	X		
,, (?) semicostatus, T. Woods	X	X	
Cancellaria varicifera, T. Woods	X	X	
,, laticostata, T. Woods	X	X	
,, exaltata, Tate	X	X	
,, caperata, Tate	X		
,, calvulata, Tate	X		
,, gradata, Tate	X	X	
Terebra platyspira, Tate	X	X	
Pleurotoma salebrosa, Harris	X		
,, trilirata, Harris	X	X	X ?
,, septemlirata, Harris	-	X	
,, optata, Harris	X	X	
,, clarae, T. Woods	X	X	
,, murndaliana, T. Woods	X	X	
Bathytoma rhomboidalis, T. Woods	X	X	X
,, decomposita, Tate	X ?	X	
Drillia integra, T. Woods	X ?		
,, vixumbilicata, Harris		X	
,, oblongula, Harris	X	X	

	Mornington.	Grice's Creek.	Frankston.
Asthenotoma consutilis, T. Woods - -	X		
Cordiera conospira, Tate - - - -	X		
Clathurella bidens, T. Woods - - -	X	X	
,, obdita, Harris - - -	X	X	
Buchozia hemiothone, T. Woods - -	X	X	
Mitromorpha daphnelloides, T. Woods -	X		
Daphnella tenuisculpta, T. Woods - -	X		
Teleochilus gracillimum, T. Woods - -	X	X	X
Bela sculptilis, Tate - - - -	-	X	-
Columbarium acanthostephes, Tate - -	X	X	
,, foliaceum, Tate - - -	X	X	
,, craspedotum, Tate - -	X	X	
Conus cuspidatus, Tate - - - -	X	X	X
,, complicatus, Tate - - - -	X	-	
,, pullulescens, T. Woods - - -	X	-	
,, ligatus, Tate - - - - -	X	X	
,, heterospira, Tate - - - -	X	X	
,, ralphi, T. Woods - - - -	X	-	
,, acrotholoides, Tate - - -	X	-	
,, dennanti, Tate - - - -	X	X	
,, hamiltonensis, Tate - - -	X ?	X	
Cypraea gigas, McCoy - - - -	X	X	
,, gastroplax, McCoy - - -	X	-	-
,, platypyga, McCoy - - -	X	-	
,, leptorhyncha, McCoy - - -	X	X	
,, ampullacea, Tate - - - -	X	-	
,, eximia, McCoy - - - -	X	X	
,, contusa, McCoy - - - -	X	X	
,, pyrulata, Tate - - - -	X	X	
,, subpyrulata, Tate - - -	X	X	X
,, brachypyga, Tate - - -	X	X	
,, murraviana, Tate - - -	X	X	
,, subsidua, Tate - - - -	-	X	
,, scalena, Tate - - - -	X	-	
,, dorsata, Tate - - - -	X	-	
Trivia avellanoides, McCoy - - -	X	X	X
Erato minor, Tate - - - - -	X		
,, morningtonensis, Tate - - -	X	X	
,, australis, Tate - - - -	X		
Semicassis sufflata, T. Woods - - -	X	X	
Morio gradata, Tate - - - -	X	X	

——	Mornington.	Grice's Creek.	Frankston.
Natica hamiltonensis, T. Woods	X	X	X
,, subnoae, Tate	-	X	
,, perspectiva, Tate	X	X	
,, polita, T. Woods	X	X	
,, limata, Tate	X	X	
,, subinfundibulum, Tate	X	X	
Calyptraea undulata, Tate	X	X	
Crepidula unguiformis, Lamarck	X	X	
,, dubitabilis, Tate	X	-	-
Xenophora tatei, Cossmann	X	-	-
Solarium acutum, T. Woods	X	X	X
Heliacus wannonensis, T. Woods	X	-	-
Scala foliosa, Tate	X		
,, transenna, Tate	X		
,, pleiophylla, Tate	X		
Crossea princeps, Tate	X		
Turritella platyspira, T. Woods	X	X	
,, conspicabilis, Tate	X	X	
,, acricula, Tate	X	X	
,, murrayana, Tate	X	X	X
Tenagodes occlusus, T. Woods	X	X	X
Thylacodes conohelix, T. Woods	X	X	
,, cratericulus, Tate	X		
,, asper, Tate	X		
Eulima danae, T. Woods	X	X	
,, acutispira, T. Woods	X	X	
Niso psila, T. Woods	X	X	
Chileutomia subvaricosa, Tate & Cossmann	X	-	
Mathilda transenna, T. Woods	X	X	
Streblorhampus obesus, Tate & Cossmann	X		
Cerithium apheles, T. Woods	X	X	
Newtoniella cribarioides, T. Woods	X	X	
,, eusmilia, T. Woods	X	-	
Colina apicilirata, Tate	X	X	
Triforis wilkinsoni, T. Woods	X	X	
,, sulcata, T. Woods	X	X	
,, planata, T. Woods	X		
Liotia roblini, R. M. Johnston	X	X	
Delphinula aster, T. Woods	X	X	
Fissurellidaea malleata, Tate	X		
Subemarginula occlusa, Tate	X	X	

	Mornington.	Grice's Creek.	Frankston.
Emarginula wannonensis, Harris - -	X	X	
Scaphander tenuis, Harris - - -	X	X	X
Ringicula tatei, Cossmann - - -	X		
,, tenuilirata, Cossmann - -	X		
Bulinella altiplica, Cossmann - - -	X	X	
,, aratula, Cossmann - - -	X	X	
,, infundibulata, Cossmann - -	X	X	
,, exigua, T. Woods - - -	-	X	
Roxania scrobiculata, Tate & Cossmann -	X	X	
Semiactaeon microplocus, Cossmann - -	X		
Umbraculum australe, Harris - - -	X		
Limacina tertiaria, Tate - - - -	X		
Styliola rangiana, Tate - - - -	X		
Vaginella eligmostoma, Tate - - -	X	X	X
SCAPHOPODA.—			
Dentalium aratum, Tate - - - -	X	X	X
,, mantelli, Zittel - - -	X	X	
,, subfissura, Tate - - -	X	X	
,, lacteum, Deshayes - - -	X	X	
CEPHALOPODA.—			
Aturia australis, McCoy - - - -	X		

SUMMARY.

Mornington - - - 271 species
Grice's Creek - - 207 ,,
Frankston - - - 36 ,,

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2. *Selwyn, A. R. C.*—"Report on the Geological Structure of the Colony of Victoria, the Basin of the River Yarra, and part of the Northern, North-Eastern, and Eastern Drainage of Western Port Bay," with plan and sections. Votes and Proceedings of the Legislative Council of Victoria, 1855-6, vol ii.
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6. *Kitson, A. E.*—"Report on the Coast Line and Adjacent Country between Frankston, Mornington and Dromana." Geological Survey of Victoria. Monthly Progress Report, March, 1900, with map and sections.
7. *Hogg, E. G.*—"The Petrology of certain Victorian Granites." Proc. Roy. Soc. Vic., N.S., vol. xiii., pp. 214-224.

EXPLANATION OF PLATE IV.

Note—The Scale is 1in. = 50ft.

1. Section at Landslip Point.
2. Section at Grice's Creek. The line representing the surface is the creek bed.
3. Section in Grice's Creek, at 45ft. above the sea.
4. Section in Grice's Creek, at 80ft. above the sea.
5. Section in Grice's Creek, at 90ft. above the sea.
6. Section at Point, a quarter of a mile S. of the Cement Works, at Balcombe's Bay.

END OF VOL. XIV., PART I.

[Published August, 1901.]

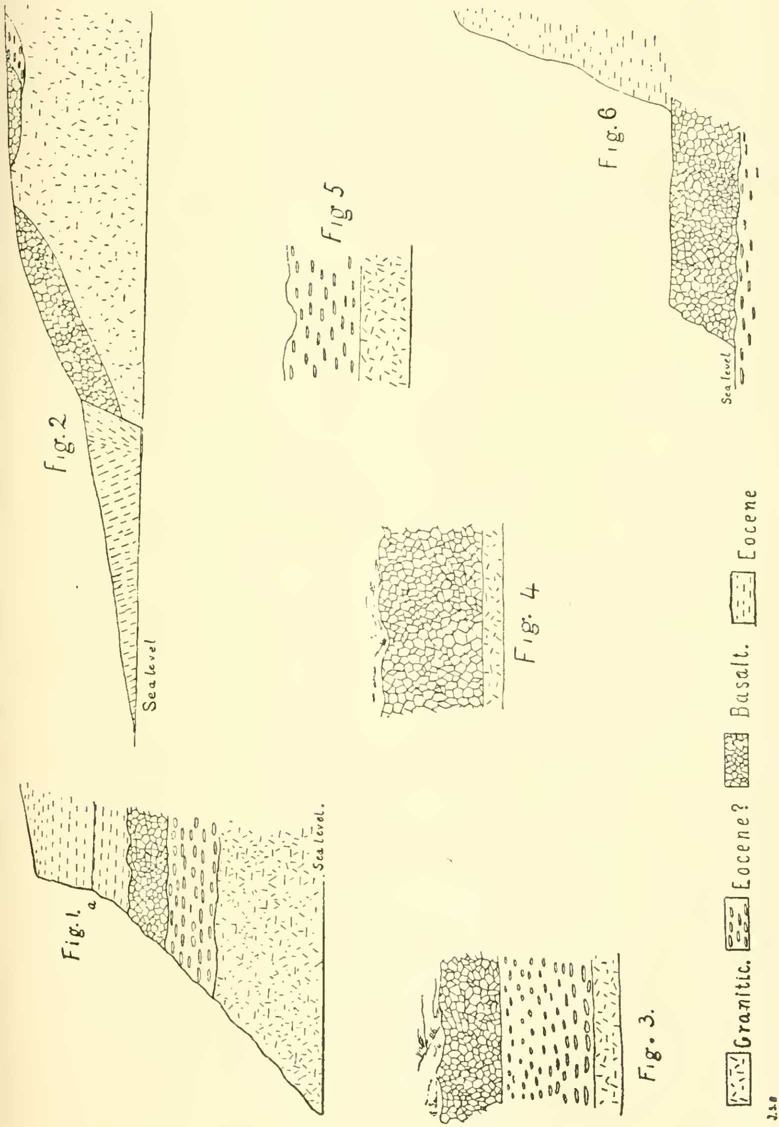
Fig. 1.
a
Sea level.
Fig. 2
Sea level
Fig. 3.
Fig. 4
Fig 5
Fig. 6
Sea level
Granitic.
Eocene?
Basalt.
Eocene

Publications of the Royal Society of Victoria, and of the Societies amalgamated with it.

VICTORIAN INSTITUTE FOR THE ADVANCEMENT OF SCIENCE.

Transactions. Vol. 1. 1855.

PHILOSOPHICAL SOCIETY OF VICTORIA.

Transactions. Vol. 1. 1855.

These two Societies then amalgamated and became:—

PHILOSOPHICAL INSTITUTE OF VICTORIA.

Transactions. Vols. 1–4.

The Society then became:—

ROYAL SOCIETY OF VICTORIA.

Transactions and Proceedings (Vol. 5, *entitled* Transactions). Vol. 5–24.

Transactions. Vol. 1, 2, 3 (part one only), 4. 1888–95.

Proceedings (New Series). Vol. 1——. 1888——.

MICROSCOPICAL SOCIETY OF VICTORIA.

Journal (Vol. 1, Pt. 1, *entitled* Quarterly Journal). Vol. 1 (Pts. 1 to 4), 2 (Pt. 1), title page and index [*all published*]. 1879–82.

[*The Society then combined with the* ROYAL SOCIETY OF VICTORIA.]

NOTE.—*Most of the volumes published before 1890 are out of print.*

PROCEEDINGS

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CONTENTS OF VOLUME XIV.—Pt. II.

Art. VI.—*Some little known Victorian Decapod Crustacea with Description of a New Species.*

By S. W. FULTON and F. E. GRANT.

(With Plate V.)

[Read 8th August, 1901].

Although considerable attention has been paid to the carcinological fauna of the more tropical coasts of Australia, little has so far been done on the marine crustacea of Victoria.

A paper by Dr. Kinnahan,[1] read before the Royal Dublin Society in 1858, recorded the existence of sixteen species from Port Phillip, but these were apparently overlooked by Professor Haswell[2] in his Catalogue of Australian Crustacea in which his records of Victorian habitats are by no means adequate. Professor McCoy[3] has also described and figured a few of our well-known marine forms, and in the Report of the Voyage of the "Challenger,"[4] a number of other species which were dredged in the vicinity of our shores are noted. With these exceptions, however, there has been no attempt at serious work on our marine Decapoda, and we hope that at some subsequent date we may be able to give some additional notes which will be of assistance in an endeavour to make up a census of this part of our fauna.

Tribe—*Cyclometopa.*

Family—*Portunidae.*

Carcinus maenas, Linn.

Linnaeus. Fauna Suecica, p. 492.
Pennant. Brit. Zool. iv., p. 3., pl. iii., fig. 5.

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1 Journal of the Royal Dublin Society, vol. i., 1858.
2 Catalogue of the Australian Stalk- and Sessile-eyed Crustacea, 1882.
3 Prodromus of the Zoology of Victoria, 1878-1890.
4 Reports of the Scientific Results of the Exploring Voyage of H.M.S. "Challenger."

1853. Bell. History of the British Stalk-eyed Crustacea, p. 76.

1899. Alcock. Journal of the Asiatic Society of Bengal, vol. lxvii., pt. ii., p. 13.

1900. Fulton and Grant. Victorian Naturalist, vol. xvii., p. 147.

Dr. A. Alcock, in his valuable paper quoted above, in referring to the distribution of the well-known European Shore Crab, states that in addition to its usual habitat, it "has been reported from the Hawaiian Islands, from the Bay of Panama, and though there is doubt about this locality—from Australia."

In a short paper read by us before the Victorian Field Naturalists' Club in November, 1900, and before were were aware of Dr. Alcock's reference, we had recorded its establishment in the waters of Port Phillip. We cannot learn, however, of its occurrence at any other points on the Australian Coast and there seems little doubt that it has been introduced here in the shipping. In confirmation of this we would point out that although exceedingly abundant now, special reference is made to its absence from our fauna in a paper by Dr. Kinnahan, published by the Royal Dublin Society, vol. i., p. 111, in 1856, entitled "Remarks on the Habits and Distribution of Marine Crustacea, on the Eastern shores of Port Phillip, Victoria, Australia, with descriptions of undescribed Species and Genera."

In the after discussion on our paper by the members, Consul Gunnersen suggested that it found its way here from Europe through the medium of the old lumber ships attracted to our Port in the early 50's, on the discovery of the goldfields—many of these vessels were far from seaworthy and had been patched up with false bottoms which had become riddled with Teredo navalis and were fouled with marine growths, affording ample shelter for the fry and young crabs on their long voyage, which would leave the ship on her coming to anchor. This theory might also account for the scattered distribution of this species as indicated by Dr. Alcock.

The Rev. T. R. Stebbing in his "History of the Crustacea," in the International Scientific Series, p. 98, refers to an analagous case of the introduction of species of "Plagusia," to the Mediterranean on the bottom of an iron vessel from Pondicherry, *via* the Cape of Good Hope, in 1873.

Carcinus maenas is exceedingly abundant on the coasts of Europe.

TRIBE—*Brachyura anomala.*

FAMILY—*Dromiidae.*

Platydromia, gen. nov.

Carapace much flattened, subpentagonal, pubescent.

Front bilobed, the lobes divided by a deep sulcation—above this the carapace rises into a prominent arcuate ridge divided into lobes and forming a false front.

Second antennae long and fine.

The fourth pair of ambulatory legs equal the chelae in length. The third pair are very short. The last two pairs of legs are turned up above the first two pairs, but not over the carapace. The penultimate joints of the last four legs are truncate. The dactyli are short and curved.

Abdomen, in both sexes, with seven segments. The sternal sulci of the female terminate between the bases of the first pair of pereipoda in prominent raised ridges which meet in the centre.

Platydromia thomsoni, sp. nov. (Plate V., Figs. 1, 2, 3, 4).

All parts of the carapace are covered with a short harsh tomentum.

Carapace much flattened, and pentagonal in outline—the length from the tip of the frontal processes to the posterior margin equalling the width between the lateral angles. The regions are faintly defined. The "linea amourica" are not present.

The front is formed by two prominent and nearly horizontal teeth, the external edges of which are smooth and turned upwards leaving a large bay between them.

The anterior fifth of the carapace is deeply concave, and terminates posteriorly in a prominent, acute, arcuate ridge, which extends across its greatest breadth and is terminated at each end by the lateral angles which are not spinose. This ridge is slightly thickened and granulate, and is divided into four equal and prominent lobes by three short V shaped sulci, filled with hairs. Immediately behind the lateral angles there is a slight concavity.

On removal of the hairs from the carapace the surface is polished, with a few small pits, but without granules.

The inner part of the pterygostomian region is membranous in consistency.

The *external maxillipeds* are operculiform and covered with a dense pubescence. The ischium is crossed by an oblique elevation which is continued on the hepatic region of the carapace by a prominent crescent-shaped ridge which does not quite reach the posterior lateral margin. The palp is articulated at the antero-lateral angle of the ischium.

The *palate* is well delimited from the epistome. The efferent branchial canals are defined by a distinct ridge.

The *epistome* is triangular and terminates anteriorly in a short ridge which is continuous to the angle formed by the junction of the two lobes of the front.

The *orbits* are well defined posteriorly and terminated anteriorly by the antennulary fossae. The infraorbital margin ends in a prominent ridge which is turned slightly downward—beyond this no teeth are present.

The *first antennae* are short, entirely retractile into pits beneath the lobes of the front, and not visible when viewed from above.

The *second antennae* have a short peduncle which does not extend beyond the orbital margin, and carries a long and fine flagella.

The *eyes* are small and entirely retractile within the orbits.

Legs. The chelipeds are shorter than the first and second pairs of ambulatory legs, and are entirely covered with a dense tomentum, with the exception of the tips of the fingers which are naked. The meros is triangular in section and fringed along its upper edges. The upper surface is flattened with its edges prominent. The hand, which is not robust, is obscurely longitudinally cristate on its outer surface. The fingers are strongly toothed and have between them an open space at their base when closed.

The first and second ambulatory legs have the meros markedly triangular in section—the third and fourth less so—while the carpos and propodos are in all cases quadrangular. All of these joints are slightly dilated and truncated at their distal extremities.

The dactyli are short and curved—those of the last pair being turned forwards, while the others are turned backwards. The first pair are the longest but are nearly equalled by the second, the third are short and rudimentary, and lie above the bases of the second, and the fourth are turned backwards along the sides of the carapace and over the first pair, which they nearly equal in length—all are covered with a dense tomentum except on the tips of the dactyli—and the angles of the joints are fringed with hairs.

The *abdomen* in both sexes is seven jointed—the first, second, and part of the third joints being visible when viewed from above, and bears a median convex ridge.

The abdomen of the male is acutely triangular in shape, but the terminal joint is rounded and obtuse.

The sternal sulci of the female do not meet, but end on the posterior part of the first segment of the sternum and between the bases of the first pair of legs. Each is terminated by a raised curved convolute ridge, excavate behind, the two prominences meeting in the central line.

DIMENSIONS OF TYPE. ♂.

Greatest beadth of carapace	- -	10 mm.
Greatest length of carapace	- -	10 ,,
Length of chela	- - - -	16 ,,
Length of 1st ambulatory leg	- -	18 ,,
Length of 2nd ambulatory leg	- -	17 ,,
Length of 3rd ambulatory leg	- -	10 ,,
Length of 4th ambulatory leg	- -	15 ,,

The female specimen (which is imperfect) is slightly larger than the male.

Habitat.—Our specimens were dredged by Mr. J. Gabriel, in Western Port.

Observations.—This species differs so markedly from any others of which we have been able to obtain specimens or to compare the descriptions, that we have been compelled to create a new genus for its reception. Its nearest alliance is with the genus *Dromia*, Fabr., but it does not fall into any of the sub-genera as defined by Dr. Alcock (Journal of the Asiatic Society of Bengal, vol. lxviii., pt. ii., No. 3, 1899). Its distinctive features are the arcuate ridge which crosses the carapace between the lateral angles—and the long pair of fifth legs which lie immediately over the second pair, but cannot be raised above the carapace, and the form and position of the female sulci.

We have much pleasure in dedicating the species to Mr. G. M. Thomson, F.L.S., of Dunedin, from whom we have received much assistance and advice in our work on the Crustacea.

The types have been deposited with the National Museum.

Tribe—*Thalassinidea.*

Family—*Axiidae.*

Axius plectrorhynchus, Strahl. (Plate V., Figs. 7, 8).

1861. Strahl. Monatsbericht der k. preuss. Akad., p. 1055.
1862. Strahl. Ann. and Mag., Nat. Hist. (3). vol. ix., p. 387.
1884. Miers. Zool. Collection of H.M.S. "Alert," p. 283.

This species was originally described by Strahl, from a single specimen taken at Luzon—and was subsequently identified by Miers as occurring in Torres Straits, a single mutilated specimen being in the collection made by H.M.S. "Alert." We have found it to be plentiful in the crevices of the rotten sandstone reef about 100 yards from the shore at Beaumaris, and about 3 to 4 fathoms below tide mark.

The armature of the carapace appears to be very variable and while we have specimens agreeing closely with both Strahl's and Miers' specific descriptions, we have also others taken with them under circumstances leaving no question as to their belonging to the same species, which differ in many details. This is particularly noticeable in the number of spinules on the front—typically there are eleven of these, but we have specimens with four on one side and six on the other, some have thirteen in all, while a few only agree with the type.

Another feature worthy of note is the presence on the upper surface of the flattened rostrum (in some of our specimens) of two rows of three small flattened tubercles, which are not referred to in the specific descriptions of either of the authors quoted.

The species does not appear to have been previously figured, and we take this opportunity to do so.

TRIBE—*Thalassinidea..*

FAMILY—*Callianassidae.*

Upogebia simsoni, Thomson. (Plate V., Figs. 5, 6).

G. M. Thomson, Proc. Roy. Soc. Tasmania, 1892, p. 49, pl. 1, figs. 3-5.

This species, which was described by Mr. G. M. Thomson in 1892, from a single specimen collected on the east coast of Tasmania, we have found to be fairly plentiful, burrowing under stones resting on a muddy bottom, below low water mark, inside "Black Head," Flinders, Western Port.

The detailed description given by the author left some doubt in our minds as to the identity of our specimens, and the figure given was of little assistance. Through the kindness of Mr. G. M. Thomson we have, however, been permitted to compare the Victorian examples with the type with which they are in close accord. In case other workers should be confronted with the same difficulties, we have ventured to redescribe the species and figure one of our specimens. The various details mentioned in our description appear to be persistent, little deviation being observed when a series is examined.

We revert to the generic name Upogebia for this species in place of the more usually accepted Gebia, the former name appearing to have undoubted priority.[1]

The *cephalothorax* is laterally compressed, regularly narrowed anteriorly, and somewhat more abruptly posteriorly. It terminates anteriorly in three conspicuous lobes, the median one forming a flattened rostrum. The cervical groove is well marked and two lateral grooves define the position of the branchiae.

The *front* is divided into three parts by two deep grooves

1 Stebbing, History of the Crustacea, p. 185.

which extend backwards and outwards to the margin at the second third of the length of the cephalic region, forming the three lobes above mentioned. The mesial portion forms a somewhat prominent concave rostrum armed on its outer margin with a row of rounded tubercles interspersed with stiff hairs, and reaching almost to the distal end of the first joint of the second antennae. About half-way from the apex a second row of similar tubercles and hairs commences, and as it mounts the cephalothorax these rows become irregular nearly forming a third line. The lateral lobes of the front, which reach about half way to the point of the rostrum, have their margin armed with a single row of tubercles and hairs. Below this on the hepatic region there is a diagonal line of 3 to 4 small tubercles.

Behind the cervical groove the carapace is quite unarmed, but is fringed with hairs on its posterior margin.

The *abdomen* is without epimeral thickenings. The 3rd, 4th, 5th and 6th segments are strongly fringed, but are unarmed above. The 6th segment is subquadrate, and slightly broader than long. It is the longest of the segments, as is typical of the genus.

The *first antennae* which are short, and each furnished with two flagellae—are unarmed and do not bear a basal scale—the flagellae reach slightly beyond the peduncle of the second pair.

The *second antennae* have the second joint of the peduncle armed with two spines on their upper and one on their lower distal margin. The next two joints are clothed above at their distal end with a number of long stiff hairs. The flagellae, which are almost equal in length to the first pair of legs, are armed with long scattered hairs at each articulation.

The *eye stalks* are small, and the eyes are of moderate size.

The *outer maxillipedes* are pediform.

First leg.—The basos has two irregular tubercles near to its distal extremity. The arm is furnished with an acute tooth on its upper border, and with 3 to 5 prominent spines on its lower posterior border. The surface is smooth, with the exception of a few long hairs on the upper border round the spines.

The wrist is carinate, with two prominent sharp spines at its upper, and one at its lower distal extremity, the carina terminating with the inner of the two upper spines.

The hand is large, smooth and flattened, with a few irregular punctations on its lower outer surface. Two large depressions are situated on either side of the articulation of the mobile finger, and are filled with a long, coarse brush of hairs. The upper margin is strongly keeled, the keel is clothed with longitudinal rows of scattered hairs and ends somewhat abruptly at its distal extremity in an acute flattened tooth. The lower margin is armed posteriorly with a series of small, flat, forwardly-projecting teeth, and is somewhat hairy. Its lower distal extremity is extended into a strong, short, rudimentary, inferior finger, which is toothed on its upper margin for its posterior half. The mobile finger is three-fourths as long as the palm. It is slightly curved, flattened and somewhat excavate above, and is triangular in section, with the upper edges strongly denticulate and fringed on the sides with strong hairs, ending in a smooth horny point.

The *second leg*, which is monodactyle, is somewhat larger than the succeeding ones, and is flattened. The arm is clothed with a row of long coarse ciliated hairs. The wrist has its lower distal margin ending in a small tooth, and with the hand and dactylos, is fringed with long hairs. The last two joints are without teeth.

The *third and fourth* legs are more slender than the second, they are not armed with spines or teeth, nor so heavily clothed with hairs.

The *fifth leg* is slender and subchelate, the immobile finger being short spoon-excavate and finely toothed along its upper margin. The last two joints are densely clothed with long hairs, which somewhat conceal the subcheliform structure of the legs.

The *telson* is broadly rounded, medially sulcate, and fringed with stiff hairs.

Uropods.—The uropods are furnished with a bifurcating median ridge, having a sharp tooth at the point of bifurcation and a similar tooth behind it on the preceding joint. The endopod bears a strong rib on its upper margin, and also a single median rib. Both are strongly fringed with hairs.

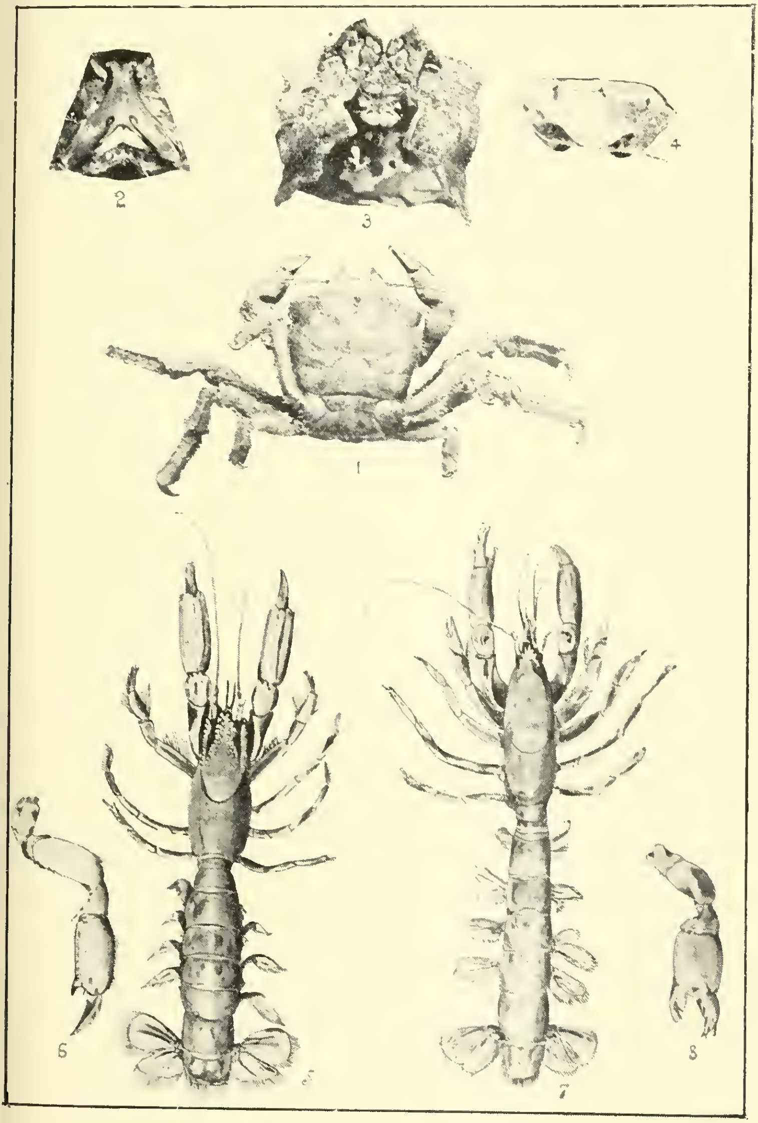
Colour.—Cream-yellow shading to pale pink.

Dimensions.

From point of rostrum to end of telson	21·4 mm.
Length of cephalothorax	8·4 ,,
Length of abdomen	13·0 ,,
Length of anterior legs	12·0 ,,
Breadth of cephalothorax	4·0 ,,
Breadth of abdomen	4·0 ,,

DESCRIPTION OF PLATE V.

Fig. 1.—Platydromia thomsoni, sp. nov., adult male ♂, × 2·5.
,, 2.—The same, ♀, sternum, showing sulci, × 2.
,, 3.—The same, ♀, cephalic region, × 2.
,, 4.—The same, anterior view of frontal region, showing form of frontal lobes, and false frontal ridge, × 2·5.
,, 5.—Upogebia simsoni, Thomson, adult ♂, × 1·8.
,, 6.—The same, side view of chelipede, × 1·8.
,, 7.—Axius plectrorhynchus, Strahl, adult ♂, × 2·3.
,, 8.—The same, side view of chelipede, × 2·3.



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Art. VII.—*Further Descriptions of the Tertiary Polyzoa of Victoria.—Part VII.*

By C. M. MAPLESTONE.

(With Plates VI., VII. and VIII.).

[Read 12th September, 1901.]

Schizoporella nitidissima, n. sp. (Pl. VII., Fig. 1).

Zoarium encrusting. Zooecia oval, convex; surface rugose, with a row of pores on the margin. 6–8 stout spines on distal end. Thyrostome arched above, proximal margin straight with a narrow sinus. An avicularium on a rugose stem on one side of the zooecia near the base; mandible very acute, with a bar and a semicircular cavity. Primary cell circular, with twelve stout spines round the edge; opening circular, with two denticles probably the points of the attachment of the operculum.

Locality.—Mitchell River (J. Dennant).

A single specimen, and a most interesting one, as it is a young zoarium, and has, what I have never seen recorded in fossil polyzoa, a primary cell; the spines are very short and thick, and probably are the bases of longer spines; the avicularia are also peculiar in having stems.

Schizoporella vigilans, Waters. (Pl. VII., Fig. 2).

I have several specimens of this species which is somewhat variable; some agree with the original description, in having elongated pores all over the surface, others have a single row round the edge and the zoarium is not always quadrilateral, but is always in vincularia form. One specimen bears ooecia, which have not hitherto been described or figured. They are globose and covered with small shallow pits and granulations.

Localities.—Aire Coastal Beds (Hall and Pritchard); Cape Otway (J. Dennant); Curdies Creek (A. W. Waters).

Schizoporella terebrata, n. sp. (Pl. VII., Fig. 3).

Zoarium encrusting. Zooecia undefined ; surface slightly granulated, with irregularly disposed pores of various sizes, but occasionally they are in a row, indicating the margin of the zooecia. Thyrostome with a long sinus in the proximal margin. Large raised avicularia, with long acute mandibles, on one side below the thyrostome and in a similar position, sometimes one, occasionally two very narrow slender avicularia with the mandible pointing downwards. Ooecia small, globose, partially immersed, surface rough.

Locality.—Mitchell River (J. Dennant).

In this species the sinus is unusually long and in addition to the avicularia above described, there is, in the portion figured (near the top) a semi-elliptical avicularium with a small projecting plate at one end, and two small pores at the other, sometimes the long narrow ones are reduced in length, and elongated oval in shape.

Schizoporella convexa, McG. (Pl. VII., Fig. 4).

I have specimens of this species from the Mitchell River deposits, which bear ooecia. They are subglobose, adnate upon the ooecia above, with a bordered area in front bearing radiating lines, surrounded distally with a narrow cross-ribbed depressed area and they are remarkably like those of Microporella diadema.

Schizoporella ovalis, n. sp. (Pl. VII., Fig. 5).

Zooecia irregularly hexagonal, ventricose ; a row of pores (sometimes two) round the margin, sometimes absent. Thyrostome small, subtriangular, with a very narrow sinus. Avicularia elongated oval, slightly raised, with mandibular cavity pointing distally.

Locality.—Mitchell River (J. Dennant).

In the place of the ooecia in this species there are suborbicular smooth concave areas with raised margins which probably represent the dorsal walls of orbicular ooecia, but as they are perfectly smooth it is possible they may be deeply immersed ooecia: therefore, as it is uncertain which they are, I have not included them in the specific description.

Schizoporella mamillata, n. sp. (Pl. VII., Fig. 6).

Zooecia elongated, oblong, flat; surface covered with large mamillæ, between which are a few minute perforations. Thyrostome arched above, proximal margin with a long narrow sinus slightly contracted in the middle. A small oval avicularium, furnished with a bar, below and close to the thyrostome on one side of some zooecia.

Locality.—Jimmys Point, Reeves River (J. Dennant).

The zooecia vary considerably in size, but the species may be easily distinguished by the large and uniform size of the mamillae.

Schizoporella pulvinata, n. sp. (Pl. VII., Fig. 7).

Zooecia small, oval; the central part with a large raised oval area, the centre of which has a longitudinal cleft or depression; some zooecia are perforated with a few small pores. Thyrostome small, arched above, with a very small sinus in the lower lip; a small hemispherical umbo sometimes present above it. Ooecia globose.

Locality.—Clifton Bank, Muddy Creek (T. S. Hall).

This is a very curious specimen, it is adherent on the interior of a bivalve shell, and the large oval elevated area occupies almost the whole front of the zooecia, obscuring in almost every case the proximal part of the thyrostome. The two perfect ooecia figured have their opercula in sitû.

Schizoporella hispida, n. sp. (Pl. VII., Fig. 8).

Zoarium encrusting. Zooecia oval, ventricose; covered with rough irregular tubercles. Thyrostome arched above, with a narrow sinus in the lower margin. Ooecia globose, subimmersed, very rugose.

Locality.—Muddy Creek (H. Butler).

I do not know which bed this came from. I received it many years ago when at Portland. It is remarkable for the very rough irregular tubercles all over the surface and very difficult to represent.

Schizoporella subgranulata, n. sp. (Pl. VII., Fig. 9).

Zooecia broad, hexagonal, with smooth small regular granulations. Thyrostome arched above; rather shallow sinus in lower margin. A very small oval avicularium on a raised rounded base immediately below the thyrostome.

Locality.—Cape Otway (J. Dennant).

A single specimen with four perfect zooecia.

Schizoporella flabellata, n. sp. (Pl. VIII., Figs. 10, 10*a*.)

Zoarium flabellate. Zooecia oval or vasiform; surface punctured. Thyrostome orbicular, sinus moderate.

Locality.—Jimmys Point, Reeves River (J. Dennant).

This species is remarkable for the very elegant flabellate form of the zoarium. The zooecia are regularly arranged on both sides of a calcareous lamina, on the margins of which are narrow ridges, presumably the first part formed of the young zooecia. The zooecia on this specimen are much worn, but there was a small fragment with zooecia perfect from which Fig. 10*a* is drawn.

Schizoporella fenestrata, Waters. S. profunda, McG. (Pl. VIII., Fig. 11).

Dr. MacGillivray described and figured in his Monograph of the Tertiary Polyzoa of Victoria (p. 83, pl. xi., Fig. 14.) S. profunda, and gives as a synonym "? S. fenestrata, Waters," but does not mention any particulars in which his species differs from that of Mr. Waters. A comparison of the descriptions (Mr. Waters gives no figure) seems to show that they are not identical, the principal character in common being the great depression in which the thyrostome is placed, but the specimen from which Fig. 11 is drawn enables me to reconcile the differences. In this specimen the zooecia are "indistinct," as described by Mr. Waters[1] (S. fenestrata), but I have others in which they are "separated by narrow raised lines" (S. profunda). There are very large avicularia "between the zooecia" (S. fenestrata) and also on the "extreme lateral zooecia" (S. profunda). In the description of S. fenestrata no mention is made of any spines

[1] Q.J.G.S., vol xxxvii., p. 339.

above the thyrostome, and S. profunda is said to have about five. Generally there are none, but I have found traces of them in some of the infertile zooecia of the specimen figured, but had I not specially looked for them they would not have been noticed. The great depression in which the thyrostome is placed is a most conspicuous feature in all the specimens, and in worn ones it is the only characteristic visible. The ooecia are not mentioned by either Dr. MacGillivray, or Mr. Waters.

My specimen is from the Gellibrand River deposits. It is in very good preservation, about half an inch long, broadly ligulate in form, with a bifurcation, the zooecia are on both sides. There are many large avicularia both between the zooecia and on the margin of the zoarium: these have a longitudinally curved mandible 0·5 mm. long, a crossbar with a central ligula and sometimes two lateral ones also. The semicircular area behind the crossbar is divided into two parts by another slightly curved crossbar; these, when broken, are probably what Mr. Waters refers to as the large avicularia with "numerous denticles." The oval avicularia have also a crossbar with a central ligula. There are also a small circular avicularia scattered over the surface. The ooecia are large, globose and smooth.

I have described the points in which S. profünda, and S. fenestrata agree, and in which they differ at some length, because without explanation their identify would not be perceived, for my figure differs greatly from that given by Dr. MacGillivray; his does not show any avicularia, nor is the great depression in which the thyrostome is placed apparent. An examination of specimens of S. profunda in the National Museum, confirms my conclusions; consequently that species must lapse.

Schizoporella variabilis, n. sp. (Pl. VIII., Fig. 12).

Zoarium ligulate, apparently in short internodes. Zooecia on both faces. Zooecia irregularly oval, surface either rugose or mamillated. Thyrostome depressed, orbicular, with a rounded sinus; margin raised. Large avicularia situated below, or on one side of the thyrostome; occasionally a small oval avicularium near the proximal part. Ooecia globose, subimmersed.

Locality.—Aire Coastal Beds (Hall and Pritchard).

The dorsal surfaces of the ooecia only are visible, the front has broken away. The species is very variable, in some specimens the surface of the zooecia is simply somewhat irregular, in others covered with large mamillae completely obscuring the shape of the zooecia, and leaving the thyrostomes and dorsal surface of the ooecia much depressed.

Schizoporella chlithridiata, n. sp. (Pl. VIII., Fig. 13).

Zooecia oval, distal extremity overlapping; surface faintly ribbed horizontally, the centre portion below the thyrostome raised into a long smooth process; on the rest of the surface are a few small scattered pores or minute papillae. Thyrostome arched above, broad curved sinus in lower lip. Avicularia vicarious, with well-defined pores in more or less regular rows; mandibular cavity chlithridiate. Ooecia subglobose, immersed, with a longitudinal umbo.

Locality.—Clifton Bank, Muddy Creek (T. S. Hall).

A colony on a small bivalve shell. The great peculiarity of this species is the vicarious avicularium and its chlithridiate mandibular cavity. The ooecia are generally more produced distally into a prominent umbo than the one figured, but the portion illustrated was chosen as it shows three of the avicularia.

Schizoporella ambigua, n. sp. (Pl. VIII., Fig. 14).

Zooecia large, hexagonal; margins raised; surface covered with large perforations. Thyrostome arched above; lower margin with a very wide shallow sinus. Ooecia large, globose, slightly immersed, perforated; with a large acute avicularium, on the distal part on one side, with the mandible pointing proximally.

Locality.—Mitchell River (J. Dennant).

This is a very striking species, as it has avicularia on the ooecia. On one zooecium there is on one side of the thyrostome a hemispherical avicularium, with a semicircular mandibular opening. The thyrostome has a very wide shallow sinus, and on this account I think this species should, with others having similar thyrostomes, be relegated to a new genus, as they differ so much from the typical forms with a narrow sinus.

Gemellipora auriculata, n. sp (Pl. VIII., Fig. 15).

Zooecia oval, ventricose. Thyrostome longer than broad, with a deep, pointed triangular sinus on the proximal margin. A comparatively large ear-shaped raised avicularium on one side of the zooecia.

Locality.—Mitchell River (J. Dennant).

This is near *G. elegantissima*, McG., but the avicularia are much larger, and the surface of the zooecia is smooth, not perforated. The avicularia are sometimes absent, and on one (broken) zooecium on another specimen there are two avicularia (Fig. 15*a*).

Aspidostoma airensis, n. sp. (Pl. VIII., Fig. 16, 16*a*).

Zoarium robust, in vincularia form. Zooecia very large, elongate, produced beyond the thyrostome as a more or less acute, concave process ; a small acute avicularium on one side of the zooecia. Thyrostome arched above ; proximal margin with a very broad projecting lip, leaving a narrow opening or sinus at each lower angle. Ooecia globose, with a large flat area in front surrounded by a narrow ridge.

Locality.—Aire Coastal Beds (T. S. Hall).

This is a very large celled species, the acute distal prolongation of the zooecia is very characteristic. On the zooecium which bears an ooecium the concave prolongation is represented by a long round rough spine on the side of the thyrostome. The surface of the proximal margin of the zooecia is slightly turned up in very regular small square crenulations—an ornamentation of a character I have not before seen in polyzoa. I have some fragments from Cape Otway in which the zoarium has zooecia on one side only, and they are not produced distally into a point, although they protrude somewhat ; they are probably imperfect specimens of this species.

Cellaria incudifera, n. sp. (Pl. IX., Fig. 17, 17*a*).

Zoarium large, cylindrical. The zooecia vary in shape. In the ordinary zoarial form some are battledore-shape, some diamond-shape ; but in the stouter zoaria they are elongated hexagonal with distal and proximal margins horizontal ; all have raised borders. Thyrostome oval, or subquadrate, higher than wide, with an anvil-shaped process growing in a proximal direction from the distal margin.

Locality.—Spring Creek (T. S. Hall).

This species is at once recognised by the peculiar anvil-shaped process projecting from the distal end over the thyrostome. In the larger form, with the hexagonal zooecia, there is a very large opening above the thyrostome; these openings are probably ovarian pores of a similar character as, but much larger than, those of *C. cucullata*, McG., their occurrence on the larger form only supports this opinion.

Fig. 17*b* is an end view of an internode showing three pores through which the chitinous connecting cords passed.

Cellaria robusta, n. sp. (Pl. IX., Fig. 18).

Zoarium robust. Zooecia large and broad, somewhat diamond-shaped or hexagonal with angles at distal and proximal ends; margins raised and curved so that the sides often do not show any lateral angles. Thyrostome suborbicular with two small denticles projecting from the proximal margin, and a plate showing two small denticles projecting from the distal margin. Avicularian cell with aperture arched above; lower margin incurved.

Locality.—Spring Creek (T. S. Hall).

Of this species I have found only a few small fragments. The avicularian cell has an opening very little larger than the thyrostome of the zooecia, and might be mistaken for one, but it has no denticles, and has an incurved lower margin; there is a small hemispherical umbo above it.

Micropora carinata, Maplestone. (Pl. IX., Fig. 19).

This species was described by me in my last paper.[1] I have since found a specimen bearing ooecia, which I now figure. They are large, globose, broader towards the distal end; smooth, with four small clefts on the distal border.

Locality.—Mitchell River (J. Dennant).

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[1] Proc. Roy. Soc. Vic., vol. xiii., pt. ii., p. 207.

? Lepralia bisinuata, n. sp. (Pl. IX., Fig. 20).

Zooecia quadrate, flat, with a row of large pores round the margin which is narrow and slightly raised. Thyrostome horse-shoe-shaped with a projection on each side near the lower margin, the centre of which is incurved, forming a sinus in each lower angle. A small oval avicularium, with a bar, below the thyrostome.

Locality.—Mitchell River (J. Dennant).

A single specimen. In two of the zooecia figured the avicularium is perfect, in one it is only partly developed, and in the fourth it is absent. This I at first supposed to be a Smittia near S. reticulata ; on further examination the form of the thyrostome, as shown on a larger scale in Fig. 20*a*, was found to be Lepralian of a type similar to L. cleidostoma, Smitt., but the inward curvature of the lower or proximal margin forming a sinus in each corner is peculiar, it simulates the "lyrula" found in most of the Smittiae, but that is always internal or below the level of the thyrostome, this is part of the margin itself, it may require a new genus for its reception near Smittia, distinguished therefrom by the double sinus.

Trypocella, nov. gen.

Zooecia elongate, flat. Thyrostome orbicular, with an acute sinus in the proximal margin formed by the incomplete junction of the cell wall. No peristome.

Trypocella excavata, n. sp. (Pl. IX., Fig. 21).

Zooecia elongate, irregularly hexagonal, with a row of large pores round the margin. Central portion concave. Thyrostome orbicular with a very acute sinus. A large circular pore on each side a little below the thyrostome.

Dorsal surface with large pores.

Locality.—Spring Creek (T. S. Hall).

A single specimen in good preservation. I cannot assign this species to any of the existing genera of the Escharine group on account of the very peculiar structure of the thyrostome, which is without any raised margin or peristome ; it appears as though the calcification of the front wall of the cell proceeded from the margins to the centre and did not quite coalesce at the centre of the proximal margin of the thyrostome forming the sinus, and the depressed area below it may be owing to a low degree of calcification. The two large circular pores below the thyrostome are very conspicuous, and probably are either avicularian or vibracularian.

EXPLANATION OF PLATES VI., VII. AND VIII.

1.—Schizoporella nitidissima, n. sp.
2.—S. vigilans (ooecia), Waters.
3.—S. terebrata, n. sp.
4.—S. convexa, M'G. (ooecia).
5.—S. ovalis, n. sp.
6.—S. mamillata, n. sp.
7.—S. pulvinata, n. sp.
8.—S. hispida, n. sp.
9.—S. subgranulata, n. sp.
10.—S. flabellata, n. sp. (zoarium). *a.* zooecia.
11.—S. fenestrata, Waters.
12.—S. varabilis, n. sp. *a.* ooecia.
13.—S. chlithridiata, n. sp.
14.—S. ambigua, n. sp.
15.—Gemellipora auriculata, n. sp.
16.—Aspidostoma airensis, n. sp. *a.* ooecium.
17.—Cellaria incudifera. n. sp. *a.* hexagonal zooecia. *b.* end of zoarium.
18.—Cellaria robusta, n. sp.
19.—Micropora carinata, Maplestone (ooecium).
20.—? Lepralia bisinuata, n. sp. *a.* outline of thyrostome.
21.—Trypocella excavata, n. g. et. n. sp.

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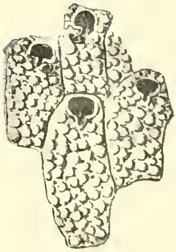

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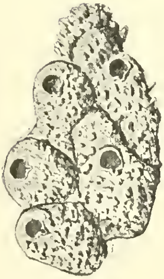

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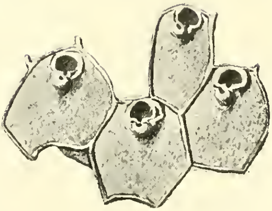

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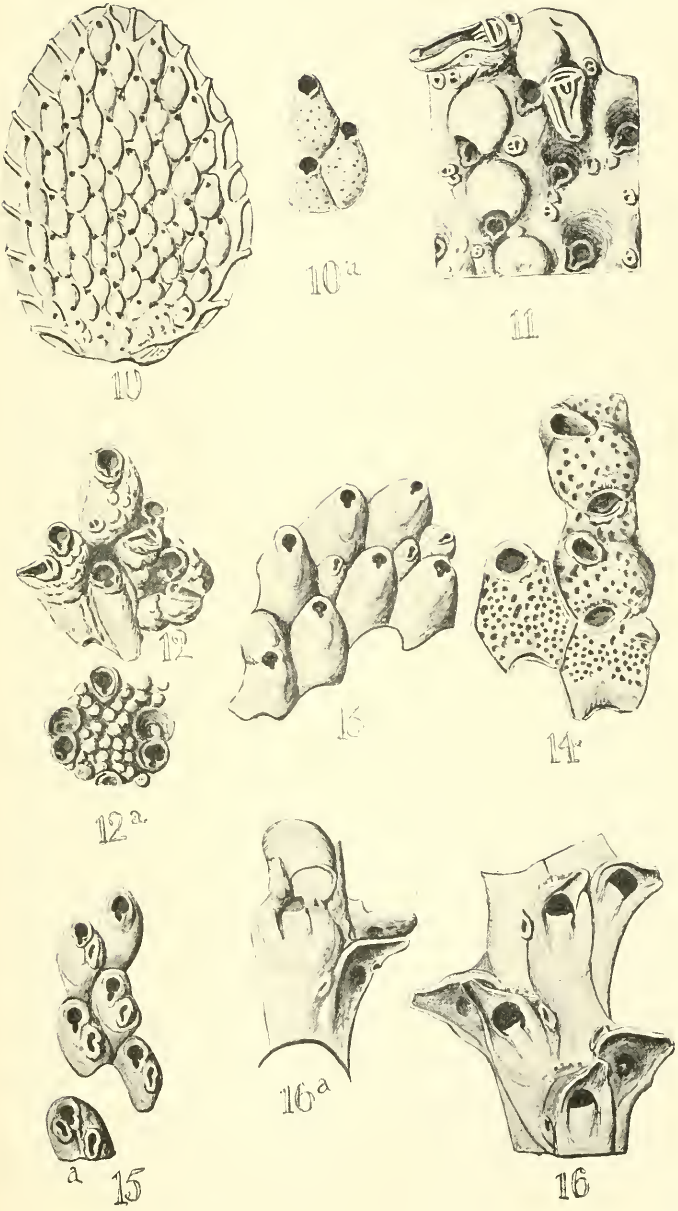

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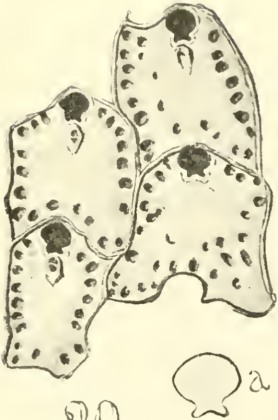

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Art. VIII.—*A Suggested Nomenclature for the Marine Tertiary Deposits of Southern Australia.*

By T. S. HALL, M.A., and G. B. PRITCHARD.

[Read 10th October, 1901.]

The confusion that has existed and still exists as to the age of the various members of the Tertiary series of Southern Australia makes it impossible for anyone who is not familiar with the history of the subject to understand what beds are referred to when the terms Eocene, Miocene, or Pliocene are used. It will probably be long before complete unanimity exists among workers in various parts of the globe as to the ages to which our subdivisions are to be referred, and meanwhile fossils are being described and recorded as Eocene or Miocene and the confusion is rapidly becoming worse. Moreover, with the progress of time the ideas of authors as to the age of certain beds change and their Eocene of to-day is not their Eocene of say ten years ago.

One familiar with even the outlines alone of our Tertiary Geology has only to glance at the brief notices which modern English text books give of our Cainozoic series to see confusion in the minds of geologists elsewhere. The fault lies at our own door and we should amend our ways and not pillory those who cannot understand us. We ourselves know without any difficulty what Duncan meant when he said "Miocene" and what M'Coy meant by Oligocene. We know what beds Professor Tate, Mr. Dennant and ourselves mean by these terms, but it is surely too much to ask anyone to so familiarize himself with the kaleidoscopic changes of our Tertiary controversy that he has to recollect the date of the paper he is reading and the particular views of the author at that date in order to remember the fauna associated with a newly described fossil.

Perhaps two examples will show the condition into which we have drifted and the urgent need of reform. There is a short section exposed near the hamlet of Beaumaris on the shores of Port Phillip Bay which, before closer settlement had filled in our maps with locality names, was referred to as the Mordialloc, Cheltenham or Brighton beds. The age to which the beds are to be referred is the subject of very diverse views, as the following statement will show.

They were referred to :—

Older Pliocene -	by McCoy - - - -	1875
Miocene - - -	by Hall and Pritchard -	1897
Miocene (?) - -	by Tate - - - - -	1888
Oligocene (?) - -	by Tate - - - - -	1899
Eocene - - -	by Tate and Dennant -	1893
Eocene - - -	by Pritchard - - -	1892

Similarly a series of beds at Spring Creek, south of Geelong, was held by M'Coy to range from Upper Miocene to Oligocene. Messrs. Tate and Dennant at one time considered the whole series Eocene, but at a later date Professor Tate referred it to Oligocene, while we are of opinion that the series as a whole is older than the Mornington series called Eocene by Messrs. Tate and Dennant as well as by ourselves.

Correlation of Australian strata with those of the Old World and with America is a task of great importance, and problems of interest connected with the place of origin of certain forms of life can only be solved when this task shall have been fulfilled. Hitherto the question of correlation has not received very detailed investigation at the hands of geologists of the northern hemisphere, for the question is one of extreme difficulty. The conclusions of Australian geologists have been provisionally accepted with a more or less open expression of doubt. But the time for this is passing away and we shall no longer be allowed to settle the question alone as best we can. American geologists are turning their attention to the Patagonian Tertiaries, which they assert have, as we should expect, an undoubted close relationship to ours. By the time scale they deduce they will judge the age of the mammalian fauna there, and as far as has yet been announced they will refer the marine beds to a younger age than we do. Probably if this be so we shall not give way without a struggle, but, with our present nomenclature, we must use terms which imply the acceptance of a theory. As a great amount of work for many years to come will be concerned with the local correlation of our beds and the elaboration of our subdivisions it seems to us advisable to employ local names for the main subdivisions of our strata. This plan is of world-wide use, and by its adoption we should be making no retrograde step, but would be clearing the way for a detailed consideration of two problems, namely the correlations of our strata between themselves, and a correlation with strata elsewhere. If the main types have these names applied to them there will no longer be any need to say whose views one is following, as we need to now when speaking of certain beds as Eocene or Miocene. The important question as to the relative position of the different formations can be put on one side and need not be forced into consideration in every line of a paper dealing with some small local set of strata.

Recognising then the advisability of such a change, it remains to consider what are the principles which should actuate us in our choice. These seem to be few and simple. Firstly, any series of strata with a fauna differing appreciably in its constituents from others should receive a distinctive name. Secondly, the name should be taken from a locality where there is no chance of confusion between the contents of beds of distinct ages. Thirdly, we should not use names which are used in other parts of the world as names of formations. In the fourth place, it should be understood that the names given are given to a particular set of strata and are irrespective of the correctness or otherwise of the subsequent correlation of other beds with them.

Bearing these provisos in mind we may consider their application to our Tertiary strata and discuss the appropriateness of the following names which we suggest.

Werrikooian.

The Limestone Creek beds on the Glenelg River are in the Parish of Werrikoo, in the County of Follett. They have been referred to Pleistocene and to Pliocene. There is another Limestone Creek, near the head of the Murray, in Victoria, which yields Palaeozoic fossils, and a third in the County of Heytesbury, with Older Tertiary fossils.

Kalimnan.

The beds at Jimmy's Point, near the mouth of the Gippsland Lakes, are near the township of Kalimna. They were referred to Older Pliocene by Sir F. M'Coy, and by Mr. Dennant to Miocene. There are two other deposits in Victoria with rich faunas, which were considered Older Pliocene by M'Coy, namely, the Upper beds at Muddy Creek, near Hamilton, and the Beaumaris beds.

The former is called Miocene by Messrs. Tate and Dennant and ourselves, but, as it immediately overlies beds belonging to our older Tertiary series, a name received from this locality is unsuitable. The Beaumaris beds, again, are considered by ourselves to belong to the same series, but are quoted as older by Professor Tate, so that they are out of court.

Balcombian.

The clays and limestones of Balcombe's Bay contain another distinct fauna. The beds are sometimes spoken of as at Mornington, but the locality we give is more exact. The Lower Beds at Muddy Creek and the Orphanage Hill beds at Fyansford, near Geelong, are approximately equivalent to the Balcombe's Bay Beds, but the exact separation of the two sets of beds at Muddy Creek is not yet sufficiently clear, and a name from that locality would lead to confusion. The beds are called Eocene by Messrs. Tate and Dennant and ourselves. Sir F. M'Coy considered them Oligocene.

Jan Jucian.[1]

The section near Spring Creek, on the coast of Bass Strait, south of Geelong, is in the main in the Parish of Jan Juc, and its fauna differs greatly from that of Balcombe's Bay. The confusion about the age of these beds has been referred to above. The township near Spring Creek is called Torquay, but the use of this name in England renders another advisable. The older name for Torquay was Puebla, but the employment of this name, again, would lead to confusion with certain American strata.

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1 The "c" is sounded like "k."

The name Jan Juc remains, and is referred to by M'Coy as the locality whence several of his fossils came.

Aldingan.

The term Aldingian has been used by Professor Tate in speaking of the section at Aldinga, but we should prefer the spelling we give. In the cliff sections, as described by Messrs. Tate and Dennant, "Miocene" overlies "Eocene," and the term Aldingian as used by them includes both sets of strata. If it be confined to the lower series only, it might perhaps be employed, though it violates the principle that a name should not be given from a locality where two distinct series are in contact. As we differ from the views of Messrs. Tate and Dennant on the question as to its equivalence or otherwise with the Spring Creek series, a type name may be thought advisable, for the present at any rate, though our own views are opposed to its use.

We should like once more to emphasise the point that the names we give are given in the first place to the beds displayed at the localities from which the names are derived, and we are thus able to fix a top and a bottom to each formation. There can be no doubt, except in our opinion in the case of Aldingan and Jan Jucian, of the distinctness of the faunas they typify.

CORRELATION.

We now come to consider the different sets of beds to be ranged under these names, for series of strata agreeing palæontologically must be grouped with them. About some there is at present unanimity of opinion, but in other cases diverse views are held. These points we shall indicate as far as we can, though, owing to the fact that no very detailed lists of comparable localities have been published by Messrs. Tate and Dennant, it is possible that their views may not always be correctly represented. The list we give is practically that published by one of us (G. B. P.) in the Report of the Brisbane Meeting of the Australasian Association for the Advancement of Science in 1895.

Werrikooian.

Limestone Creek.

Kalimnan.

Jimmy's Point, Gippsland. Upper beds of the Murray River Cliffs. Upper beds at Aldinga. Upper beds at Muddy Creek. Upper beds at Shelford. With these we would associate the Marine Sands of the Dry Creek and Croydon bores, South Australia, which were regarded by Prof. Tate as intermediate in age between the Limestone Creek and the Jimmy's Point beds. To this series we also refer the Upper beds at Beaumaris, which were correlated by Professor Tate with the Spring Creek series, the latter being, in our opinion, older than Balcombian.

Balcombian.

Balcombe's Bay and Grice's Creek, Mornington. Lake Connewarre. Southern Moorabool Valley. Upper beds at Maude. Altona Bay. Gellibrand. Camperdown. Murgheboluc. Shelford, lower beds. Bairnsdale. Corio Bay. Curlewis. Belmont. Fishing Point, Aire River.

Jan Jucian.

Spring Creek. Table Cape, Tasmania. Waurn Ponds. With these we include the lower beds at Maude, which Professor Tate and Mr. Dennant considered to show much closer relationship to the lower beds of Muddy Creek. We also refer to the same series the lower (*i.e.* "Eocene") beds at Aldinga, the Aire Coastal series and the Cape Otway beds. In the association of the Aldinga, Aire Coastal and Cape Otway beds together we are apparently in agreement with the views of Messrs. Tate and Dennant, but, as will be seen on referring to the earliest parts of this paper, their association with the Spring Creek and Table Cape series is strongly opposed to the view of the same authors. But as has been already pointed out the correctness of all the details of this correlation is not a necessary preliminary to the use of the terms suggested. It is open to those who differ to separate any of the members, and, where possible, to group them similarly under other appropriate names.

There still remains a number of localities which we have not grouped with any of the formations. With regard to these we consider the published evidence or our own knowledge to be insufficient for the expression of a definite opinion.

THE SEQUENCE AND AGE.

As an addendum to the main part of this note we may as well consider the different views which have existed as to the sequence and age of the beds to which we have attached names.

	M'Coy.	Tate & Dennant.	Hall & Pritchard.
Werrikooian	—	Pleistocene (Tate) Pliocene (Dennant)	Pliocene
Kalimnan	Older Pliocene	Miocene	Miocene
Balcombian	Oligocene	Eocene	Eocene
Jan Jucian	Miocene to Oligocene	Oligocene (?) (Tate) Eocene	Eocene
Aldingan	—	Eocene (in part)	Eocene (in part)

We thus have not only differences of opinion as to the ages of the beds but also as to the sequence of the component formations.

To put the matter in another way, the sequence according to the various authors would be—in descending order.

M'Coy.	Tate & Dennant.	Hall & Pritchard.
—	Werrikooian	Werrikooian
Kalimnan	Kalimnan	Kalimnan
Jan Jucian	Jan Jucian	Balcombian
Balcombian	Balcombian	Jan Jucian and Aldingan (in part)
	Aldingan (in part)	

Art. IX.—*Newer Pliocene Strata on the Moorabool River.*

By J. F. MULDER.

(Communicated by J. Dennant, F.G.S., F.C.S.).

[Read 10th October, 1901.]

A paper read by Messrs. Hall and Pritchard in June, 1897, before this Society, was the cause of several excursions to the Moorabool River, in the neighbourhood of the Viaduct, by members of the Geelong Field Naturalists' Club, the object being to find the Miocene outcrop therein described. The search, as we afterwards found, was on the wrong side of the river, but on the opposite, or eastern bank, a new fossil bed was discovered, which is so interesting that I have asked permission to bring it under the notice of the Royal Society. This deposit consists of a layer of sandy gravel, about 20 feet thick, directly underlying the basalt which tops the hills on both sides of the river. The gravel bed is nearly on a level with the Viaduct, and is full of calcareous casts of fossils. In the light of Mr. Pritchard's identifications of the fossil casts in the ironstone near at hand, we at first thought the deposit to be a Miocene one, but, as will be shewn presently, this is not the case. To prove definitely whether the shells lie actually under the basalt, or simply rest against it on the side of the hill, we followed the river up for about 40 chains until we came to a road running at right angles to the river as well as to the above-mentioned deposit higher up the bank. This road leads right up to the basaltic plain, and, in following it from the river, we first came to rotten limestone with a few fragments of Eocene shells (the basal bed), and on climbing still higher we encountered the continuation of the same gravel bed, with calcareous casts of shells, as that previously mentioned, and with basalt also resting upon it. I obtained photographs of these two sections and shewed them to Mr. T. S.

Hall, who at once said that they represented a new bed and not the one he and Mr. Pritchard had described, which is on the west side of the river. The shell casts were submitted to Mr. Dennant last year, who said that they appeared to consist of living species rather than of those proper to the Miocene, and recommended me to send them to Professor Tate for definite determination. This was done, and, with his usual good nature, the Professor, whose recent death must be deplored by all of us, wrote to me at some length upon the material forwarded. I give Professor Tate's remarks in his own words :—"The majority of the mollusca are in the state of pseudomorphs after calcite, and the fine ornament in the majority of cases is obliterated ; this renders critical comparison hardly possible. At a first glance it seemed that the collection might belong to any period, from Miocene to Recent. However, selecting the species shewing the most determinate characters, I proceeded to ascertain their species names, and, after comparison with related species, recent and fossil, I arrived at the conclusion that I had essentially a modern fauna to deal with. This gave me a clue to the determination of the obscure forms, though in their case, as with the others, all available sources of comparison were utilised. The result is that of 13 species, to which approved names have been given,[1] 12 are recent species, and are to be found as cast-up shells on the beaches of Southern Australia. The extinct species is Pecten antiaustralis, which, however, extends from its commoner habitat of Miocene to Older Pliocene ; it is one of the very few which pass up from the Older Tertiary to just within touch of the Recent.

In conclusion, (1) The faunula is essentially recent, and, though one out of thirteen is not actually known living, it would be misleading to apply the percentage test on such low figures as an index to age, and it is not improbable that, if the list were extended to a hundred, 99 per cent. would be recent. The deposit is synchronous with that of Limestone Creek described by Mr. Dennant, and if from that faunula we subtract the species

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1 Four others were subsequently named by Professor Tate, and the list now contains 17 named species.

of extraneous origin the general results are identical. The time horizon may be indicated by Older Pleistocene.[1]

(2) The faunula belongs to shallow water, not absolutely littoral, but the depth indicated by the species was not beyond the influence of wave disturbance in rough weather.

(3) The mineralization of the fossils must not be regarded as evidence of greater antiquity than the corresponding deposit at Limestone Creek, wherein the tests are unaltered."

Professor Tate's determinations are the following:—

Purpura textiliosa, Lam.
Siphonalia tasmaniensis, Adams and Angas
Nassa lyrella, Beck
Nassa fasciata, Lam.
Batillaria cerithium, Quoy
Turritella clathrata, Kiener
Natica plumbea, Lam.
Risella plana, Quoy
Ostrea angasi, Sow.
Ostrea mordax, Gould
Pecten antiaustralis, Tate
Mytilus magellanicus, Lam. (?)
Mytilus planulatus, Lam.
Meretrix alatus, Reeve
Corbula scaphoides, Hinds
Barnea australasiae, Sow.
Teredo tube.
Magellania flavescens, Lam.
Balanus, sp.

A very important conclusion follows from the fossil evidence here produced, namely, that the age of the superincumbent basalt is brought still nearer to our own times; it cannot be older than Newer Pliocene, and may even be Pleistocene.

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[1] The Limestone Creek beds are by Mr. Dennant assigned to the Newer Pliocene, the extraneous origin of some shells in the deposit being, he says, a surmise only, and not demonstrable from an examination of the sections. Following him, I call the Moorabool bed Newer Pliocene.

Art. X.—*Catalogue of the Marine Shells of Victoria.*

Part V.

By G. B. PRITCHARD and J. H. GATLIFF.

[Read 14th November, 1901].

The present paper refers to one hundred and thirty two species contained in the following families:—Cerithiidae (in part), Planaxidae, Litiopidae, Littorinidae, Neritidae, Liotiidae, Cyclostrematidae, Rissoidae, Turbinidae, and Trochidae. The previous papers, Parts I. to IV., dealt with 287 species, so that, with this part, the total number of species now dealt with amounts to 419.

We would take this opportunity of drawing attention to a very useful and valuable paper just published in the July number of this year of the Proceedings of the Malacological Society of London by C. Davies Sherborn, F.Z.S., and B. B. Woodward, F.L.S., on the dates of publication of Kiener's "Species General," etc. We have long felt the want of this piece of work, and are heartily thankful to the authors for their labours. We think it would also be a very good thing if the same reliable workers could be persuaded to undertake a similar task for the different parts of Philippi's Conchylien Cabinet. As an instance of the trouble with this work we might indicate the genus Trochus, which, in the bound copy in the Public Library, Melbourne, is dated on the title page 1846, but some of the parts were evidently later than this, as references are included for descriptions in Zeits. f. Malak., 1848; again, in the case of Trochus ochroleucus there is only the date of the title page as above indicated, but Tryon states the date as after 1853. It seems pretty evident that the paper covers on the separate parts as issued should have been bound up with the parts, in order to preserve the dates of issue, and where this has not been done, trouble has naturally arisen.

For the range of many of our Victorian species along the New South Wales coast, Mr. Hedley's valuable contributions entitled

"Studies on Australian Mollusca," now appearing in the Proceedings of the Linnaean Society of New South Wales, should be consulted.

Family CERITHIIDAE.

Genus **Triforis**, Deshayes, em. 1824 (Triphoris).

TRIFORIS ANGASI, Crosse and Fischer.

1865. Triphoris angasi, Crosse and Fischer. Jour. d. Conch., p. 46, pl. 1, f. 12, 13.

1873. Cerithium minimus, Hutton. Cat. N.Z. Moll., p. 27.

1880. Triphoris angasi, Hutton. N.Z. Moll., p. 75.

1887. Triforis angasi, Tryon. Man. Conch., vol. ix., p. 179, pl. 37, f. 93.

Hab.—Coast generally.

Obs.—This is the commonest of our species, and tends to show some variation in its colour markings.

TRIFORIS PFEIFFERI, Crosse and Fischer.

1865. Triphoris pfeifferi, Crosse and Fischer. Jour. d. Conch., p. 47, pl. 1, f. 14, 15.

1887. Triforis pfeifferi, Tryon. Man. Conch., vol. ix., p. 182, pl. 38, f. 9.

Hab.—Western Port; Sorrento; Puebla Coast.

TRIFORIS FASCIATUS, T. Woods.

1879. Triforis fasciata, T. Woods. P.R.S. Tas., p. 34.

1887. Triforis fasciatus, Tryon. Man. Conch., vol. ix., p. 190.

Hab.—Western Port.

TRIFORIS TASMANICA, T. Woods.

1876. Triforis Tasmanica, T. Woods. P.R.S. Tas., p. 28.

1887. Triforis tasmanica, Tryon. Man. Conch., vol. ix., p. 184, pl. 38, f. 31.

Hab.—Western Port; Sorrento; Puebla coast.

Note.—We have at least six other species of this genus as yet undetermined.

Family PLANAXIDAE.

Genus **Planaxis**, Lamarck, 1822.

PLANAXIS MOLLIS, Sowerby.

1822. Planaxis mollis, Sowerby. Gen. of Shells, vol. ii., pl. 219, f. 2.
1822. Buccinum brazilianum, Lamarck. Anim. S. Vert., vol. vii., p. 272.
1828. Buccinum laevigatum, Wood. Index Test. sup., p. 13, pl. 4, f. 29*a*.
1839. Planaxis mollis, Lamarck. Anim. S. Vert. (3rd ed. Deshayes and Edwards), vol. iii., p. 585, No. 6.
1842. Planaxis mollis, Reeve. Conch. Syst., vol. ii., p. 238, pl. 270, f. 2.
1850. Planaxis pigra, Forbes. P.Z.S. Lond., p. 273, pl. xi., f. 5.
1851. Planaxis fulva, A. Adams. P.Z.S. Lond., p. 271.
1876. Planaxis brasilianus, Reeve. Conch. Icon., vol. xx., pl. 5, f. 35.
1887. Planaxis (Hinea) mollis, Tryon. Man. Conch., vol. ix., p. 279, pl. 52, f. 34, 35.

Hab.—Otway Coast, between Ryan's Den and Moonlight Head (Mr. P. J. Fulton).

Family LITIOPIDAE.

Genus **Diala**, A. Adams, 1861.

DIALA MONILE, A. Adams.

1862. Alaba monile, A. Adams. A.M.N.H., vol. x., 3rd ser., p. 296, No. 17.
1875. Diala tesselata, T. Woods. P.R.S. Tas., p. 147.
1887. Diala monile, Brazier. T.R.S. S.A., vol. ix., p. 122.
1887. Litiopa (Diala) monile, Tryon. Man. Conch., vol. ix., p. 283.

Hab.—Common in Port Phillip, particularly along the western shores; enormous numbers to be obtained at Portarlington, Outer Geelong Harbour, Corio Bay, and Altona Bay. Also from Western Port. Portland (Maplestone).

Obs.—The type of this species was originally obtained from Port Lincoln, South Australia. Professor Tate states that the types are immature and that D. tesselata, T. Woods, better exemplifies the species than the commoner form in South Australian waters.

Diala lauta, A. Adams.

1862. Diala lauta, A. Adams. A.M.N.H., vol. x., 3rd ser., p. 298, No. 5.

1875. Diala punctata, T. Woods. P.R.S. Tas., pp. 147, 148.

1887. Diala lauta, Brazier. T.R.S. S.A., vol. ix., p. 122.

1887. Litiopa (Diala) lauta, Tryon. Man. Conch., vol. ix., p. 282, pl. 53, f. 83.

Hab.—A common associate with the previous species, especially in Port Phillip and Western Port.

Obs.—The type of this species originally came from Port Adelaide. It is somewhat variable in dimensions and in the depth of the suture.

Diala phasianella, Angas.

1867. Alaba phasianella, Angas. P.Z.S. Lond., p. 113, pl. 13, f. 18.

1886. Alaba (Diala) phasianella, Watson. Chall. Zool., vol. xv., p. 567.

1887. Litiopa (Diala) phasianella, Tryon. Man. Conch., vol. ix., p. 283, pl. 53, f. 84.

Hab.—Western Port.

Obs.—This may only be a thin delicate form of Diala monile, it is a form which we usually obtain in Western Port, where the muddy nature of its habitat may possibly account for its variations, as against the stout robust forms from the more sandy parts of Port Phillip.

Diala magna, Tate.

1891. Diala magna, Tate. T.R.S. S.A., vol. xiv., pt. ii., p. 259, pl. 11, f. 9.

Hab.—Deep water, Port Phillip Bay (J. B. Wilson).

Obs.—Professor Tate states that this species is at once distinguished by its size, its furrowed suture, and the flat distant ribs on the base, at the same time he notes that its nearest ally is Diala lauta, A. Adams. We must remark that for our own part we feel somewhat dubious about the validity of this species, and are somewhat inclined to regard it as an exceptionally large specimen of Diala lauta.

DIALA PAGODULA, A. Adams.

1862. Alaba pagodula, A. Adams. A.M.N.H., vol x., 3rd ser., p. 297.

1887. Litiopa (Alaba) pagodula, Tryon. Man. Conch., vol. ix., p. 282.

Hab.—Common in Port Phillip.

Obs.—Rissoina St. Clarae, Tenison Woods, P.R.S. Tas., 1877, p. 154, No. 67, is, we think, from the description, the above species; it most certainly is a Diala.

DIALA PULCHRA, A. Adams.

1862. Alaba pulchra, A. Adams. A.M.N.H., vol. x., 3rd ser., p. 296, No. 15.

1887. Litiopa pulchra, Tryon. Man. Conch., vol. ix., p. 282.

Hab.—Port Phillip; Western Port.

Obs.—The type of this species is recorded as from Port Adelaide, and is noted as being a handsomely painted species with the whorls nodosely plicate at the sutures. We have shells which apparently represent this species, but we are much inclined to think it is only a form of D. pagodula, A. Adams, examples of which we have strongly nodosely plicate, at the sutures, faintly nodosely plicate, and some, which appear evidently the same in all other respects entirely without any nodosities.

DIALA VARIA, A. Adams.

1861. Diala varia, A. Adams. A.M.N.H., vol. viii., 3rd ser., p. 243.

1887. Litiopa varia, Tryon. Man. Conch., vol. ix., p. 282.

Hab.—Western Port; Puebla Coast.

Obs.—This species is run into Alaba semistriata, Philippi, by Tryon, but we are not satisfied that this is correct. The shell we have as representing the above species appears closely related to D. lauta, A. Adams, but is usually a thin translucent dark coloured and smaller form, and may, as a rule, be picked out from small examples of D. lauta. In the original description it is recorded as not uncommon in the Korea and Japan.

Family Littorinidae.

Genus Littorina, Férussac, 1821.

Littorina mauritiana, Lamarck.

1822. Phasianella mauritiana, Lamarck. Anim. S. Vert., vol. vii., p. 51.

1827. Litorina unifasciata, Gray. King's Survey of Australia, vol. ii., App. p. 483.

1833. Littorina diemenensis, Quoy and Gaimard. Astrolabe, vol. ii., p. 479, pl. 33, f. 8-11.

1839. Phasianella mauritiana, Lamarck. Anim. S. Vert. (3rd ed. Deshayes and Edwards), vol. iii., p. 587, No. 9.

1841. Phasianella mauritiana, Delessert. Recueil de Coquilles décrites par Lamarck, pl. 37, f. 14.

1843. Phasianella mauritiana, Lamarck. Anim. S. Vert. (ed. Desh.), vol. ix, p. 244, No. 9.

1843. Litorina acuta, Menke. Moll. Nov. Holl., p. 9, No. 24.

1857. Littorina unifasciata, Reeve. Conch. Icon., vol. x., pl. 17, f. 100.

1857. Littorina laevis, Reeve (non Philippi). *Id.*, pl. 17, f. 95.

1857. Littorina africana, Reeve (non Philippi). *Id.*, pl. 8, f. 37.

1865. Littorina unifasciata, Angas. S.A. Moll., P.Z.S. Lond., p. 172, No. 101.

1867. Littorina unifasciata, Angas. Port Jackson Moll., P.Z.S. Lond., p. 209, No. 139.

1873. Littorina diemenensis, Hutton. Cat. N.Z. Moll., p. 27.

1878. Littorina unifasciata, T. Woods. P.R.S. Tas., 1877, p. 36.

1880. Littorina caerulescens, Hutton (non Lamarck). N.Z. Moll., p. 79.

1882. Litorina unifasciata, Weinkauff. Conch. Cab. (ed. Küster), p. 97, sp. 111, pl. 14, f. 4.

1882. Litorina diemensis, Weinkauff. Conch. Cab. (ed. Küster), p. 18, pl. 2, f. 23, 24.

1884. Litorina unifasciata, E. A. Smith. Alert Zool., p. 60, No. 62.

1886. Litorina mauritiana, Watson. Chall. Zool., vol. xv., p. 574, No. 2.

1887. Littorina mauritiana, Tryon. Man. Conch., vol. ix., p. 247, pl. 44, f. 71, 72, 73, and 75 (non 70 and 74).

1887. Littorina unifasciata, Tryon. *Id.*, p. 247.

Hab.—Coast generally, very common on the rocks at and above high water mark.

Littorina novaezealandiae, Reeve.

1857. Littorina novaezealandiae, Reeve. Conch. Icon., vol. x., pl. 14, f. 74.

1873. Littorina novaezealandiae, Hutton. Cat. N.Z. Moll., p. 28.

1880. Littorina novaezealandiae, Hutton. Man. N.Z. Moll., p. 79.

1887. Littorina novaezealandiae, Tryon. Man. Conch., vol. ix., p. 249, pl. 47, f. 76 (non f. 77).

Hab.—Coast generally. Particularly fine examples to be obtained along the Back Beach, Williamstown.

Obs.—This appears undoubtedly to be the name that should be applied to our species, though many mis-identifications have been already made on this form L undulata, T. Woods (non Gray), in the Tasmanian List for 1877, is probably the same as the above. In Mr. Gatliff's List of Victorian Mollusca published in the Victorian Naturalist, 1887, this same species is recorded as L. philippi, Carpenter, on the identification of Mr. Brazier; and in a recent List of Tasmanian Shells by Miss M. Lodder we also note the record of L. philippi, Carpenter.

Littorina paludinella, Reeve.

1857. Littorina paludinella, Reeve. Conch. Icon., pl. 16, f. 84.

1878. Littorina paludinella, T. Woods. P.R.S. Tas., for 1877, p. 36.

1887. Littorina paludinella, Tryon. Man. Conch., vol. ix., p. 255, pl. 46, f. 36.

Hab.—Port Phillip; Back Beach, Sorrento; Puebla Coast; C. Otway.

Note.—There are two other small species of this genus represented, but, as yet, we have been unable to identify them.

Genus **Risella**, Gray, 1840.

Risella melanostoma, Gmelin.

1781. Trochus in fauce nigerrimus, Chemnitz. Conch. Cab., vol. v., pl. 161, f. 1526 *a*, *b*.

1789. Trochus melanostomus, Gmelin. Syst. Nat., p. 3581, No. 90.

1822. Trochus nanus, Lamarck. Anim. S. Vert., vol. vii., p. , No. 67.

1834. Trochus auratus, Quoy and Gaimard. Astrolabe, vol. iii., p. 276, pl. 62, f. 15-19.

1834. Trochus nanus, Quoy and Gaimard. *Id.*, p. 273, pl. 62, f. 5-7.

1834. Trochus planus, Quoy and Gaimard. *Id.*, p. 274, pl. 62, f. 13, 14.

1834. Trochus luteus, Quoy and Gaimard. *Id.*, p. 271, pl. 62, f. 8-11.

1839. Trochus nanus, Lamarck. Anim. S. Vert., (3rd ed. Deshayes and Edwards), vol. iii., p. 555.

1839. Trochus melanostomus, Lamarck. *Id.*, p. 557.

1839. Littorina australis, Gray. Beechey's Voy. Zool., p. 141.

1841. Trochus nanus, Delessert. Recueil de Coquilles décrites par Lamarck, No. 67, pl. 36, f. 3 *a*, *b*, *c*.

1843. Trochus nanus, Lamarck. Anim. S. Vert. (ed. Deshayes), vol. ix., p. 150.

1843. Trochus melanostomus, Lamarck. *Id.*, p. 157.

1846. Bembicium melanostomum, Philippi. Zeits. f. malak., p. 130.
1846. Bembicium nanum, Philippi. *Id.*, p. 131.
1846. Bembicium pictum, Philippi. *Id.*, p. 132.
1846. Bembicium planum, Philippi. *Id.*, p. 131.
1846. Bembicium vittatum, Philippi. *Id.*, p. 131.
1858. Risella lutea, H. and A. Adams. Genera, vol. i., p. 318, pl. 33, f. 5.
1858. Risella melanostoma, H. and A. Adams. *Id.*, p. 318, pl. 33, f. 5*c*.
1858. Risella nana, H. and A. Adams. *Id.*, p. 318.
1858. Risella plana, H. and A. Adams. *Id.*, p. 318.
1858. Risella vittata, H. and A. Adams. *Id.*, p. 318.
1860. Risella nana, Chenu. Man. de Conch., vol. i., p. 302.
1864. Risella melanostoma, Crosse. Jour. de Conch., p. 229, pl. xi., f. 1.
1864. Risella aurata, Crosse. *Id.*, p. 233.
1864. Risella nana, Crosse. *Id.*, p. 234.
1864. Risella plana, Crosse. *Id.*, p. 236, pl. xi., f. 2.
1864. Risella bruni, Crosse. *Id.*, p. 239, pl. xi., f. 3.
1864. Risella vittata, Crosse. *Id.*, p. 241.
1877. Risella aurata, T. Woods. P.L.S. N.S.W., vol. i., p. 245.
1877. Risella nana, T. Woods. *Id.*, p. 247.
1887. Risella lutea, Tryon. Man. Conch,, vol. ix., p. 262, pl. 49, f. 3.
1887. Risella aurata, Tryon. *Id.*, pl. 49, f. 6.
1887. Risella plana, Tryon. *Id.*, pl. 49, f. 10, 11, 12.
1887. Risella nana, Tryon. *Id.*, pl. 49, f. 13.
1887. Risella melanostoma, Tryon. *Id.*, p. 262.

Hab.—Very common between tide marks on all rocky parts of our coast.

Obs.—Being one of our commonest species, enormous numbers can be very easily collected from various localities for the study of the marked variations shown in the species. The paper given by the Rev. J. E. T. Woods before the Linnean Society of New South Wales in 1876 shows that gentleman to have possessed a clear grasp of the variations existing. There seems very little doubt but that the most satisfactory treatment is to regard all the forms indicated above as variations of but one species. Although this will no doubt be somewhat perplexing to the young collector at first, he will eventually see the necessity for such treatment as he completes his series. As a rule it is very easy to pick out the form *R. nana* as a good variety, although the same cannot always be said of the forms under the names of *R. aurata* and *R. plana.*

Genus **Fossarina**, Adams and Angas, 1863.

FOSSARINA PETTERDI, Crosse.

1870. Fossarina petterdi, Crosse. Jour. de Conch., p. 303.

1871. Fossarina petterdi, Crosse. *Id.*, p. 323, pl. 12, f. 1.

1876. Fossarina simsoni, T. Woods. P.R.S. Tas., pp. 149, 150.

1881. Fossarina simsoni, T. Woods. T.R.S. Vic., vol. xvii., p. 81.

1887. Fossarina petterdi, Tryon. Man. Conch., vol. ix., p. 275, pl. 52, f. 20, 21.

1887. Fossarina simpsoni, Tryon. *Id.*, p. 275.

1900. Minos petterdi, Lodder. Cat. Tas. Shells, P.R.S. Tas., p. 12 (of reprint).

Hab.—Port Phillip; Sandringham; Frankston; Mornington; Sorrento.

Obs.—Tryon misspells T. Woods' species as F. simpsoni, and he also states that Hutton remarks that this species has the dentition and operculum of the Trochidae and not of the Littorinidae, and that it may possibly be an Adeorbis. T. Woods himself in the Transactions of the Royal Society of Victoria, after dealing with the description of F. funiculata, states that this shell closely resembles F. simsoni, nobis, which is identical with F. petterdiana, Crosse, a prior name.

FOSSARINA BRAZIERI, Angas.

1871. Fossarina brazieri, Angas. P.Z.S. Lond., p. 18, pl. 1, f. 24.

1881. Fossarina funiculata, T. Woods. T.R.S. Vic., vol. xvii., p. 81. pl. , f. 6, 7.

1887. Fossarina funiculata, Tryon. Man. Conch., vol. ix., pp. 275, 276, pl. 52, f. 18, 19.
1887. Fossarina brazieri, Tryon. *Id.*, p. 275, pl. 52, f. 17.
1900. Minos funiculata, Lodder. Cat. Tas. Shells, P.R.S. Tas., p. 12 (of reprint).

Hab.—Port Phillip; Frankston; Sorrento.

Obs.—The type of F. funiculata is in the National Museum, Melbourne, and is located in a case of New South Wales shells, but, judging by T. Woods' paper, the shell was collected in Victoria by Mr. J. F. Bailey.

Family Neritidae.

Genus **Nerita**, Adamson, 1757.

Nerita melanotragus, E. A. Smith.

1842. Nerita nigra, Gray (non Chemnitz). In Dieffenbach's New Zealand, vol. ii., p. 240.
1855. Nerita atrata, Reeve (non Chemnitz, nec Deshayes). Conch. Icon., vol. ix., pl. 4, f. 16.
1865. Nerita atrata, Angas. P.Z.S. Lond., p. 175.
1867. Nerita atrata, Angas. *Id.* p. 212.
1873. Nerita atrata, Hutton. Cat. N.Z. Moll., p. 29.
1880. Nerita atrata, Hutton. Man. N.Z. Moll., p. 89.
1883. Nerita atrata, Sowerby. Thes. Conch., pts. 39, 40, p. 110, pl. 465 (3 Gen.), f. 41.
1884. Nerita melanotragus, E. A. Smith. Alert collection Zool., p. 69, No. 82.
1884. Nerita saturata, Hutton. P.L.S. N.S.W., vol. ix., pt. ii., p. 354.
1886. Nerita punctata, Watson (non Quoy and Gaimard). Chall. Zool., vol. xv., p. 132, No. 4.
1888. Nerita atrata, Tryon. Man. Conch., vol. x., p. 26, pl. 8, f. 40.
1900. Nerita melanotragus, Hedley. P.L.S. N.S.W., vol. xxv., pp. 500-502.

Hab.—Coast generally where rocky.

Obs.—This is a very widely distributed species in Australia, and a considerable amount of confusion has existed as to the correct name to be applied to it. Mr. C. Hedley has entered very fully into this subject recently, and shows that at any rate N. punctata cannot stand for our shell, a conclusion with which we fully agree. Considerable trouble surrounds the names of N. nigra and N. atrata, and the simplest way out of the difficulty was in the introduction of a new name by E. A. Smith as N. melanotragus. The same course suggested itself to Hutton about the same time, and, thanks to Mr. Hedley, it has been shown that Smith's name has priority, its date being 1st August, 1884, whereas Hutton's was August 19th of the same year.

Family Liotiidae.

Genus **Liotia**, Gray, 1842.

Liotia australis, Kiener.

1839. Delphinula australis, Kiener. Icon. Coq. Viv., vol. x., p. 8, pl. 4, f. 7.

1843. Delphinula australis, Reeve. Conch. Icon., vol. i., pl. 4, f. 20.

1853. Delphinula australis, Kiener. Conch. Cab., Delphinula, p. 18, No. 23, pl. 5, f. 13.

1888. Liotia (Liotina) australis, Tryon. Man. Conch., vol. x., p. 112, pl. 36, f. 18, 19.

1899. Liotia australis, Tate. T.R.S. S.A., vol. xxiii., pt. ii., p. 225.

Hab.—Port Phillip; Western Port; Puebla Coast; Sorrento, Back Beach; Lorne; Portland.

Liotia subquadrata, T. Woods.

1878. Liotia subquadrata, T. Woods. P.L.S. N.S.W., vol. ii., p. 236.

1899. Liotia subquadrata, Tate. T.R.S. S.A., vol. xxiii., pt. ii., pp. 227, 228.

Hab.—Western Port; Puebla Coast; Apollo Bay; Otway Coast, between Ryan's Den and Moonlight Head (Mr. P. J. Fulton).

Obs.—Professor Tate, at the place above quoted, refers to T. Woods' wrongful identification of a living Tasmanian species with a fossil form from Table Cape under the name of L. lamellosa, and this mistake was rectified by its author in his description of L. subquadrata, but the former authority also includes in his synonymy Cyclostrema immaculata, T. Woods.

Liotia tasmanica, T. Woods.

1865. Liotia siderea, Angas (non Reeve). P.Z.S. Lond., p. 178.

1876. Liotia tasmanica, T. Woods. P.R.S. Tas. for 1875, p. 153.

1893. Liotia siderea, Adcock (non Reeve). Hand List Aq. Moll., S.A., p. 7, No. 284.

1895. Liotia tasmanica, Hedley. P.L.S. N.S.W., vol. ix., pp. 464, 465, three figures.

1899. Liotia tasmanica, Tate. T.R.S. S.A., vol. xxiii., pt. ii., p, 226.

Hab.—Flinders, Western Port; Cowes (T. S. Hall). Dredged alive off Rhyll, from about 5 fathoms (Gatliff and Gabriel).

Obs.—Professor Tate, in his remarks on the Australian Liotidae, states that he has satisfied himself that the South Australian shell, under the name of L. siderea, is distinct from Reeve's species by an actual comparison with Reeve's type in the British Museum. Mr. Hedley's fine figures of this species render it easy of identification.

Liotia annulata, T. Woods.

1878. Liotia annulata, T. Woods. P.R.S. Tas. for 1877, p. 121.

1884. Liotia compacta, Petterd. Jour. of Conch., Lond., p. 135.

1888. Liotia annulata, Tryon. Man. Conch., vol. x., p. 111, pl. 36, f. 20.

1899. Liotia annulata, Tate. T.R.S. S.A., vol. xxiii., pt. ii, pp. 225, 226, pl. 6, f. *7a*, *7b*.

Hab.—Corio Bay (J. Mulder); Port Phillip; Flinders, Western Port.

Obs.—Although the descriptions of the two above species do not exactly agree with one another, Professor Tate seems satisfied that they represent but one species, and as he appears to have had Petterd's type of L. compacta in his possession, and as he also figures the type shell, he should be in the best position to judge.

LIOTIA HEDLEYI, Pritchard and Gatliff.

1899. Liotia hedleyi, Pritchard and Gatliff, P.R.S. Vic., vol. xii., n.s., pt. i, p. 105, pl. 8., f. 8, 9, 10.

Hab.—Flinders, Western Port (J.H.G.); Sorrento; Puebla Coast (G.B.P.).

LIOTIA MAYANA, Tate.

1878. Liotia discoidea, T. Woods (non Reeve). P.R.S. Tas., 1877, p. 39.

1899. Liotia mayana, Tate. T.R.S. S.A., vol. xxiii., pt. 2, p. 227, pl. 6, f. 5*a*-5*c*.

Hab.—Victoria (R. Tate).

Obs.—On this species Professor Tate remarks that in size and general appearance it is similar to L. subquadrata, T. Woods, but its suture is not so excavated, the aperture not so explanulately thickened, and its columella-margin is detached from the umbilical rim. He further makes out a closer affinity for this species with L. clathrata, Reeve, based upon actual comparison with examples of the latter species.

Family CYCLOSTREMATIDAE.

Note.—In his recent revision of the Australian Cyclostrematidae and Liotiidae, Professor Tate remarks that the limits of the genera Cyclostrema and Liotia are not so exact as to permit in all cases of a safe reference to one or the other. The same authority states that "the conchological characters largely relied on for Cyclostrema are a thin vitreous test, entire, simple non-varicosed aperture, and a multi-spiral operculum. For Liotia, a stout perlaceous test, last whorl descending at the front, aperture variced and entire, operculum spiral and covered with calcareous granules." Hence we have Liotia angasi, Crosse, Liotia lodderae, Petterd, and Liotia minima, T. Woods, referred to the above family Cyclostrematidae, the first being referred to under the generic title of Pseudoliotia, and the second and third under the generic name of Lodderia.

Genus Cyclostrema, Marryatt, 1818.

CYCLOSTREMA CAPERATUM, Tate.

1899. Cyclostrema caperatum, Tate. T.R.S. S.A., vol. xxiii., pt. ii., pp. 216, 217, pl. 7, f. 1*a*, 1*b*.

Hab.—Lakes Entrance, Gippsland, in shell sand (Dr. Pulleine).

Obs.—Mr. C. Hedley refers this species to the section Solariorbis of Teinostoma, as defined by Dall. Professor Tate himself indicates that he is not satisfied that the above shell belongs even to the Cyclostrematidae, let alone the genus Cyclostrema.

CYCLOSTREMA BRUNIENSIS, Beddome.

1883. Cyclostrema bruniensis, Beddome. P.R.S. Tas., 1882, p. 168.

1899. Skenea (?) brunniensis, Tate. T.R.S. S.A., vol. xxiii., pt. ii., p. 224.

Hab.—Western Port; Sorrento, Port Phillip.

Obs.—Professor Tate remarks that he has received an authentic example of Beddome's species from Mr. May, of Tasmania, that he does not think it has the aspect of a Cyclostrema, but that he is unable to locate it generically. This species was identified for Mr. Gatliff by the late Mr. C. E. Beddome.

CYCLOSTREMA WELDII, T. Woods.

1877. Cyclostrema weldii, T. Woods. P.R.S. Tas., 1876, p. 147.

1877. Cyclostrema susonis, T. Woods. *Id.*, p. 147.

1877. Cirsonella australis, Angas, P.Z.S. Lond., p. 38, f. 16.

1888. Cyclostrema (Tubiola) weldii, Tryon. Man. Conch., vol. x., p. 95, pl. 33, f. 11.

1888. Cyclostrema (Tubiola) susonis, Tryon. *Id.*, p. 95, pl. 33, f. 10.

1888. Teinostoma (Cirsonella) australis, Tryon. *Id.*, p. 107, pl. 35, f. 83, 84.

1899. Cyclostrema australe, Tate. T.R.S. S.A., vol. xxiii., pt. ii., pp. 219-221.

Hab.—Sorrento, Port Phillip; Western Port.

Obs.—Professor Tate enters fully into the discussion of the identity of the above species in his revision, but gives, apparently on insufficient grounds, priority to the name applied by Angas; T. Woods' paper being read in August, 1876, while the volume containing it did not appear till 1877.

Cyclostrema angeli, T. Woods.

1877. Rissoa angeli, T. Woods. P.R.S. Tas., for 1876, pp. 153, 154.

1878. Rissoa angeli, T. Woods, *Id.*, for 1877, p. 122.

1899. Cyclostrema (Tubiola) angeli, Tate. T.R.S. S.A., vol. xxiii., pt. ii., pp. 218, 219.

Hab.—Western Port.

Obs.—The shell from Tasmania figured and mentioned in Tryon as Rissoa angeli, T. Woods, is not that species, as has already been pointed out by Professor Tate. The latter describes and figures this other species under the name of Cyclostrema crebresculptum, a species which we have not as yet collected from our shores.

Cyclostrema contabulatum, Tate.

1899. Cyclostrema contabulatum, Tate. T.R.S. S.A., vol. xxiii., pt. ii., p. 222, pl. 7, f. 6.

Hab.—Western Port.

Obs.—Professor Tate remarks that this species is related to C. micron, but is narrowly umbilicated, and the whorls are shouldered. Our representatives of this species are not quite typical, in that the shouldering of the whorl is not distinct, but Professor Tate himself regards our shells as a variation of his species.

Cyclostrema harriettae, Petterd.

1884. Cyclostrema harriettae, Petterd. Jour. of Conch., p. 141, No. 24.

1899. Cyclostrema harriettae, Tate. T.R.S. S.A., vol. xxiii., pt. ii., p. 215.

Hab.—Western Port; Sorrento; Puebla Coast.

Cyclostrema charopa, Tate.

1884. Cyclostrema micra, Petterd (non Woods, 1877). Jour. of Conch., p. 139.

1899. Cyclostrema charopa, Tate. T.R.S. S.A., vol. xxiii., pt. ii., p. 217, pl. 7, f. 2*a*-2*c*.

Hab.—Dredged of Rhyll, Western Port.

Obs.—Tate records this species from South Australia and Tasmania, and states that he has compared his figured example, which was obtained from Tasmania, with Mr. Petterd's type, and though a little larger he regards them as conspecific.

Cyclostrema mayii, Tate.

1899. Cyclostrema mayii, Tate. T.R.S. S.A., vol. xxiii., pt. ii., p. 218, pl. 6, f. *4a*-*4c*.

Hab.—Dredged off Rhyll, Western Port.

Obs.—The type of this species was obtained in Tasmania.

Cyclostrema micra, T. Woods.

1877. Cyclostrema micra, T. Woods. P.R.S. Tas., p. 147.

1888. Cyclostrema (Tubiola) micra, Tryon. Man. Conch., vol. x., p. 95, pl. 33, f. 13.

1899. Cyclostrema micron, Tate. T.R.S. S.A., vol. xxiii., pt. ii., p. 221.

Hab.—Dredged off Rhyll, Western Port.

Note.—There are two additional unidentified species of this genus.

Genus **Lodderia**, Tate, 1899.

Lodderia lodderae, Petterd.

1884. Liotia lodderae, Petterd. Jour. of Conch., Lond., p. 135, No. 2.

1899. Liotia lodderae, Hedley. P.L.S. N.S.W., vol. xxiii., p. 802, three figures.

1899. Lodderia lodderae, Tate. T.R.S. S.A., vol. xxiii., pt. ii., p. 222.

Hab.—Flinders, Western Port; Puebla Coast.

Lodderia minima, T. Woods.

1878. Liotia minima, T. Woods. T.R.S. Vic., vol. xiv., p. 58.

1899. Lodderia minima, Tate. T.R S. S.A., vol. xxiii., pt. ii., p. 222.

Hab.—Brighton, Port Phillip; Western Port.

Obs.—The type of this species is in the National Museum, Melbourne, and on its label is indicated as having been found at Brighton.

Genus **Pseudoliotia**, Tate, 1898.

PSEUDOLIOTIA MICANS, A. Adams.

1850. Cyclostrema micans, A. Adams. P.Z.S. Lond., p. 43.
1864. Cyclostrema micans, Sowerby. Thes. Conch., p. 250, pl. 255, f. 7, 8, 27.
1864. Liotia angasi, Crosse. Jour. de Conch., p. 343, pl. 13, f. 4.
1871. Liotia speciosa, Angas. P.Z.S. Lond., p. 19, pl. 1, f. 26.
1874. Cyclostrema micans, Reeve. Conch. Icon., vol. xix., pl. 2, f. 9.
1874. Liotia gowllandi, Brazier. P.Z.S. Lond., p. 672, pl. 83, f. 1, 2.
1888. Cyclostrema micans, Tryon. Man. Conch., vol. x., p. 88, pl. 31, f. 17, 18.
1888. Liotia angasi, Tryon. *Id.*, p. 110, pl. 36, f. 4
1888. Liotia speciosa, Tryon. *Id.*, p. 110, pl. 36, f. 5.
1888. Liotia gowllandi, Tryon. *Id.*, p. 110, pl. 36, f. 7, 8.
1897. Cyclostrema micans, Tate. T.R.S. S.A., vol. xxi., p. 43.
1898. Cyclostrema micans, *var.* gracilior, Tate. *Id.*, vol. xxii., p. 71.
1899. Pseudoliotia micans, Tate. *Id.*, vol. xxiii., pp. 222, 223.
1899. Pseudoliotia micans, *var.* gowllandi, Tate. *Id.*, p. 223.

Hab.—Hobson's Bay (Nat. Mus.); St. Kilda, Sandringham, Sorrento, Port Phillip; Flinders, Western Port.

Obs.—Professor Tate appears to accept Pseudoliotia gowllandi as a good variety of this species, and records it from Western Port. He remarks that it is a micromorph with only two keels on the upper portion of the body whorl, with a tendency to fusion of the two peripheral keels and to obliteration of the basal rib.

Family RISSOIDAE.

Genus **Rissoa**, Fréminville, 1814.

RISSOA SALEBROSA, Frauenfeld.

1867. Rissoa salebrosa, Frauenfeld. Novara, p. 11, pl. 2, f. 15.

1887. Rissoia salebrosa, Tryon. Man. Conch., vol. ix., p. 327, pl. 66, f. 44.

1899. Rissoia salebrosa, Tate. T.R.S. S.A., vol. xxiii., p. 232.

Hab.—Western Port.

Rissoa incidata, Frauenfeld.

1867. Rissoa incidata, Frauenfeld. Novara, p. 13, pl. 1, f. 19.

1887. Rissoia (Sabanaea) incidata, Tryon. Man. Conch., vol. ix., p. 339, pl. 63, f. 65.

1899. Rissoia (Sabanaea) incidata, Tate. T.R.S. S.A., vol. xxiii., p. 232.

Hab.—Western Port; Puebla Coast.

Rissoa bicolor, Petterd.

1884. Rissoa bicolor, Petterd. Jour. of Conch., Lond., vol. iv., No. 5, p. 137, No. 10.

1899. Rissoia (Sabanaea) bicolor, Tate. T.R.S. S.A., vol. xxiii., p. 232.

Hab.—Portsea, Port Phillip.

Obs.—Our representatives of this species from the above locality are narrower and more elongate than the usual Tasmanian form.

Rissoa olivacea, Dunker.

1867. Rissoa olivacea, Dunker. Novara, p. 11, pl. 2, f. 14.

1884. Rissoa diemenensis, Petterd. Jour. of Conch., Lond., vol. iv., No. 5, p. 138, No. 13.

1887. Rissoia (Amphithalamus) olivacea, Tryon. Man. Conch., vol. ix., p. 339, pl. 66, f. 43.

1899. Rissoia (Amphithalamus) olivacea, Tate. T.R.S. S.A., vol. xxiii., p. 232.

Hab.—Sorrento, Port Phillip; Puebla Coast.

Rissoa petterdi, Brazier.

1884. Rissoa pulchella, Petterd (non Risso, 1826). Jour. of Conch., Lond., vol. iv., p. 138, No. 14.

1894. Rissoia (Amphithalamus) Petterdi, Brazier. P.L.S. N.S.W., p. 697.

1899. Rissoia (Amphithalamus) petterdi, Tate. T.R.S. S.A., vol. xxiii., p. 232.

Hab.—Western Port; Sorrento, Portsea, Port Phillip; Puebla Coast.

RISSOA CYCLOSTOMA, T. Woods.

1877. Rissoa cyclostoma, T. Woods. P.R.S. Tas., p. 153, No. 60.

1887. Rissoia (Cingula) cyclostoma, Tryon. Man. Conch., vol. ix., p. 344, pl. 71, f. 8.

1899. Rissoia (Amphithalamus) cyclostoma, Tate. T.R.S. S.A., vol. xxiii., pp. 232, 233.

Hab.—Western Port; Cape Schanck; Sorrento, Port Phillip; Puebla Coast.

RISSOA WOODSI, *nom. mut.*

1877. Rissoa cyclostoma, *var.* rosea, T. Woods (non Deshayes, nec Hutton). P.R.S. Tas., p. 154.

Hab.—Western Port; Port Phillip; Puebla.

Obs.—We regard this as a distinct species, and as Rissoa rosea cannot be accepted, as it is already twice pre-occupied, in the first place by Deshayes in 1863, and subsequently by Hutton in 1873, we propose to call it Rissoa woodsi.

RISSOA VERCONIS, Tate.

1884. Rissoa badia, Petterd (*non* Adams, 1861). Jour. of Conch., Lond., vol. iv., p. 138, No. 12.

1899. Rissoia (Amphithalamus) verconis, Tate. T.R.S. S.A., vol. xxiii., p. 233.

Hab.—Western Port; Puebla Coast.

RISSOA CONTABULATA, Frauenfeld.

1867. Rissoa (Anabathron) contabulata, Frauenfeld. Novara, p. 13, pl. 2, f. 20*a*.

1887. Rissoia (Anabathron) contabulata, Tryon. Man. Conch., vol. ix., p. 341, pl. 69, f. 51.

1899. Rissoia (Anabathron) contabulata, Tate. T.R.S. S.A., vol. xxiii., p. 233.

Hab.—Flinders, Cowes, Western Port; Sorrento, Port Phillip.

Obs.—Figure 20*b* of Frauenfeld and figure 50 of Tryon apparently represent a distinct species.

Rissoa tenisoni, Tate.

1876. Cingulina australis, T. Woods (*non* G. B. Sowerby). P.R.S. Tas., p. 146.

1878. Rissoa (Cingulina) australis, T. Woods. *Id.*, p. 151.

1898. Rissoa (Onoba) australis, Suter. Proc. Malac. Soc., p. 4.

1899. Rissoia (Onoba) tenisoni, Tate. T.R.S. S.A., vol. xxiii., pp. 233, 234.

1900. Rissoa tenisoni, Hedley. P.L.S. N.S.W., vol. xxv., pt. iii., p. 505, pl. 25, f. 4.

Hab.—Coast generally.

Obs.—This is our commonest species of this genus, and is very easily recognised, being a small white shell with strong spiral ridges. It has been figured for the first time only recently by Mr. C. Hedley.

Rissoa atkinsoni, T. Woods.

1877. Rissoa (Cingula) atkinsoni, T. Woods. P.R.S. Tas., p. 153.

1887. Rissoia (Microsetia) atkinsoni, Tryon. Man. Conch., vol. ix., p. 354, pl. 71, f. 10.

1889. Rissoia (Setia) atkinsoni, Tate. T.R.S. S.A., vol. xxiii., p. 234,

Hab.—Dredged off Rhyll, Western Port; Puebla coast.

Rissoa atropurpurea, Dunker.

1867. Rissoa atropurpurea, Dunker. Novara, p. 13, pl. 2, f. 21.

1887. Rissoia (Microsetia) atropurpurea, Tryon. Man. Conch., vol. ix., p. 355, pl. 71, f. 1.

1889. Rissoia (Setia) atropurpurea, Tate. T.R.S. S.A., vol. xxiii., p. 234.

Hab.—Dredged off Rhyll, Western Port.

Rissoa nitens, Dunker.

1867. Rissoa nitens, Dunker. Novara, p. 13, pl. 2, f. 22.

1887. Rissoia (Microsetia) nitens, Tryon. Man. Conch., vol. ix., p. 355, pl. 71, f. 100.

1889. Rissoia (Setia) nitens, Tate. T.R.S. S.A., vol. xxiii., p. 234.

Hab.—Dredged off Rhyll, Western Port.

Rissoa sophiae, Brazier.

1882. Rissoa (Setia) flamia, Beddome. P.R.S. Tas., p. 169, No. 16.
1883. Rissoia (Setia) sophiae, Brazier, mss.
1887. Rissoia (Setia) flamia, Tryon. Man. Conch., vol. ix., p. 359.
1894. Rissoia (Setia) sophiae, Henn and Brazier. P.L.S. N.S.W., vol. ix., 2nd ser., p. 174, No. 74.
1895. Rissoia (Setia) flamia, Brazier. *Id.*, p. 697.
1899. Rissoia (Setia) beddomei, Tate. T.R.S. S.A., vol. xxiii., p. 234.

Hab.—Western Port.

Obs.—Brazier, in the Proceedings of the Linnean Society of New South Wales, volume ix., n.s., p. 698, states that this is "a minute turbinated shell, white, with red diagonal flames, and about one of the most common species we have. A large number were sent to Mr. Angas as far back as 1876, with other species; about the time I named this in MS. I received sea-worn specimens from Mr. Petterd; having Mr. Beddome's types before me the matter is now at rest." That is, Brazier was satisfied to drop his name and accept Beddome's. Professor Tate regards Beddome's name as an orthographical blunder, and apparently thinks it should have been spelt flammea. On referring to Beddome's paper, it may be readily noticed that there are several printers' errors, apparently showing that the proof-sheets were never corrected, and, in view of this, it seems very likely that flammea may have been meant. If this be so, it is then found that R. flammea has already been pre-occupied by Dunker in 1866, and Professor Tate has proposed the new name of R. beddomei. It seems to us, however, that if flamia cannot be accepted as a name for this species, the name that should stand would be R. sophiae, Brazier.

Rissoa melanochroma, Tate.

1877. Rissoa melanura, T. Woods (non Adams, 1850). P.R.S. Tas., p. 153, No. 62.
1887. Rissoia (Cingulina) melanura, Tryon. Man. Conch., vol. ix., p. 358, pl. 71, f. 7.

1899. Rissoia (Cingulina) melanochroma, Tate. T.R.S. S.A., vol. xxiii., p. 234.

Hab.—Flinders, Cowes, Western Port; Sorrento, Port Phillip.

RISSOA HULLIANA, Tate.

1876. Dunkeria fasciata, T. Woods (non Requien, 1848). P.R.S. Tas., p. 146.

1877. Rissoa (Alvania) fasciata, T. Woods. *Id.*, p. 152.

1893. Rissoa (Alvania) hullii, Tate. Adcock's Hand List of S.A. Moll., p. 7.

1899. Rissoia (Alvania) hulliana, Tate. T.R.S. S.A., vol. xxiii., p. 235.

Hab.—Fairly common, Port Phillip and Western Port, also well distributed along the coast.

RISSOA STRANGEI, Brazier.

1884. Rissoa lineata, Petterd (non Risso, 1826). Jour. of Conch., Lond., vol. iv., p. 137, No. 8.

1894. Rissoia (Apicularia) strangei, Brazier. P.L.S. N.S.W., vol. ix., p. 173, pl. 14, f. 11.

1895. Rissoia (Apicularia) strangei, Brazier. *Id.*, p. 695.

1899. Rissoia (Alvania), strangei, Tate. T.R.S. S.A., vol. xxiii., p. 235.

Hab.—Western Port; Puebla coast.

RISSOA CHEILOSTOMA, T. Woods.

1873. Rissoa plicata, Hutton (non Deshayes, 1838). Cat. N.Z. Moll., p. 29.

1877. Rissoa (Alvania ?) cheilostoma, T. Woods. P.R.S. Tas., p. 152, No. 58.

1877. Alvania elegans, Angas (non Adams, 1851). P.Z.S. Lond., p. 174, pl. 26, f. 15.

1878. Rissoa (Oina) australis, Sowerby. Reeve Conch. Icon., vol. xx., pl. 13, f. 123.

1880. Rissoina plicata, Hutton. Man. N.Z. Moll., p. 80.

1885. Eglisia plicata, Hutton. P.L.S. N.S.W., vol. ix., p. 939.

1887. Rissoia (Alvania) cheilostoma, Tryon. Man. Conch., vol. ix., pp. 366, 392, pl. 68, f. 91.

1887. Rissoia (Alvania) elegans, Tryon. *Id.*, p. 364, pl. 66, f. 46.

1898. Rissoia (Alvinia) plicata, Suter. Proc. Malac. Soc. Lond., vol. iii., p. 6.

1899. Rissoia (Alvinia) cheilostoma, Tate. T.R.S. S.A., vol. xxiii., p. 235, 236.

Hab.—Port Phillip; Western Port.

Rissoa perexigua, Tate and May.

1878. Rissoina minutissima, T. Woods (non Michelin). P.R.S. Tas., p. 122.

1900. Rissoia perexigua, Tate and May. T.R.S. S.A., vol. xxiv., p. 100.

Hab.—Western Port.

Obs.—This species was identified for us by Mr. May, who stated that he had examined T. Woods' type in the Hobart Museum.

Rissoa mariae, T. Woods.

1876. Rissoa (Cingula) mariae, T. Woods. P.R.S. Tas., p. 147.

1887. Rissoia (Microsetia) mariae, Tryon. Man. Conch., vol. ix., p. 354, pl. 71, f. 9.

Hab.—Western Port; Cape Schanck; Port Phillip; Puebla Coast.

Obs.—Professor Tate in his paper on the Rissoidae, 1899, excludes this species, as he regards it as Diala varia. We do not agree with him.

Rissoa tasmanica, T. Woods.

1876. Eulima tasmanica, T. Woods. P.R.S. Tas., p. 29.

Hab.—Port Fairy.

Obs.—T. Woods states that he only doubtfully refers this species to Eulima. We have a shell from Port Fairy which appears to answer well to T. Woods' description, but we prefer to regard it as a Rissoa.

Rissoa approxima, Petterd.

1884. Rissoa approxima, Petterd. Jour. of Conch., Lond., vol. iv., p. 138, No. 11.

1899. Rissoia (Microsetia) approxima, Tate. T.R.S. S.A,, vol. xxiii., p. 234.

Hab.—Western Port.

Rissoa simsoni, Tate and May.

1900. Rissoia (Amphithalamus) simsoni, Tate and May. T.R.S. S.A., vol. xxiv., p. 100.

Hab.—Port Fairy (Rev. T. Whan).

Note.—We have at least eight unidentified species of Rissoas, about which we hope to be able shortly to give some account.

Genus Rissoina, d'Orbigny, 1840.

Rissoina gertrudis, T. Woods.

1876. Rissoina gertrudis, T. Woods. P.R.S. Tas., p. 146.

1887. Rissoina gertrudae, Tryon. Man. Conch., vol. ix., p. 372, pl. 55, f. 39.

1899. Rissoina gertrudis, Tate. T.R.S. S.A., vol. xxiii., p. 237.

Hab.—Victoria (Tate).

Rissoina hanleyi, Schwartz.

1860. Rissoina hanleyi, Schwartz. Familie Rissoiden, p. 64, pl. 4, f. 28.

1887. Rissoina hanleyi, Tryon. Man. Conch., vol. ix., p. 370, pl. 55, f. 21.

1899. Rissoina hanleyi, Tate. T.R.S. S.A., vol. xxiii., p. 237.

Hab.—Victoria (Tate).

Rissoina nivea, A. Adams.

1851. Rissoina nivea, A. Adams. P.Z.S. Lond., p. 265.

1880. Rissoina lirata, Angas. P.Z.S. Lond., p. 417, pl. 40, f. 11.

1887. Rissoina lirata, Tryon. Man. Conch., vol. ix., p. 373, pl. 54, f. 10.

1887. Rissoina (Schwartziella) nivea, Tryon. *Id.*, p. 379, pl. 55, f. 24.

1899. Rissoina nivea, Tate. T.R S. S.A., vol. xxiii., pp. 237, 239, 240.

Hab.—Victoria (Tate)

Rissoina d'orbignyi, A. Adams.

1851. Rissoina d'orbignyi, A. Adams. P.Z.S. Lond., p. 265.

1878. Rissoa d'orbignyana, Reeve. Conch. Icon., vol. xx., pl. 1., f. 7.

1887. Rissoina (Morchiella) spirata, Tryon (non Sowerby). Man. Conch., vol. ix., p. 388, pl. 58, f. 28.

1889. Rissoina spirata, Tate (non Sowerby). T.R.S. S.A., pp. 237, 239, 240.

Hab.—A common species, generally distributed.

Rissoina variegata, Angas.

1867. Rissoa variegata, Angas. P.Z.S. Lond., p. 113, pl. 13, f. 19.

1878. Rissoa variegata, Reeve. Conch. Icon., vol. xx., pl. 8, f. 64.

1887. Rissoina variegata, Tryon. Man. Conch., vol. ix., p. 370, pl. 56, f. 43-46.

1899. Rissoina variegata, Tate. T.R.S. S.A., vol. xxiii., p. 237.

Hab.—Point Roadknight.

Rissoina elegantula, Angas.

1880. Rissoina elegantula, Angas. P.Z.S. Lond., p, 417, pl. 40, f. 10.

1887. Rissoina striata, Tryon (non Quoy and Gaimard). Man. Conch., vol. ix., p. 385, pl. 58, f. 13.

1899. Rissoina (Zebinella) elegantula, Tate. T.R.S. S.A., vol. xxiii., pp. 238, 242.

Hab.—Port Phillip; Western Port; Barwon Heads; Puebla Coast.

Rissoina crassa, Angas.

1871. Rissoina crassa, Angas. P.Z.S. Lond., p. 17, pl. 1, f. 16.

1878. Rissoa crassa, Reeve. Conch. Icon., vol. xx., pl. 8, f. 70.

1887. Rissoina (Rissolina) rissoi, Tryon (non Audouin). Man. Conch., vol. ix., p. 378, pl. 55, f. 20, and pl. 68, f. 6.

1899. Rissoina (Rissolina) crassa, Tate. T.R.S. S.A., vol. xxiii., pp. 238, 243.

Hab.—Western Port; Puebla Coast.

RISSOINA FLEXUOSA, Gould.

1861. Rissoina flexuosa, Gould. Proc. Boston Soc., Nat. Hist., vol. vii., p. 400.

1867. Rissoa turricula. Angas. P.Z.S. Lond., p. 114, pl. 13, f. 20.

1872. Rissoina angasi, Pease. Amer. Jour. Conch., vol. vii., p. 20.

1878. Rissoa turricula, Reeve. Conch. Icon., vol. xx., pl. 8, f. 69.

1878. Rissoa flexuosa, Reeve. *Id.*, pl. 11, f. 97.

1885. Rissoina flexuosa, Weinkauff. Conch. Cab., p. 88, pl. 15*d*, f. 13.

1887. Rissoina (Schwartziella) flexuosa, Tryon. Man. Conch.. vol. ix., p. 380, pl. 68, f. 1, 2.

1899. Rissoina (Rissolina) flexuosa, Tate. T.R.S. S.A., vol. xxiii., pp. 243, 244.

Hab.—Coast generally.

Family TURBINIDAE.

Genus Phasianella, Lamarck, 1804.

PHASIANELLA AUSTRALIS, Gmelin.

1788. Buccinum australe, Gmelin. Syst. Nat., p. 3490, No. 173.

? 1788. Buccinum tritonis, Chemnitz. Conch. Cab., vol. ix., pt. ii., p. 38, pl. 120, f. 1033, 1034.

1822. Phasianella bulimoides, Lamarck. Anim. S. Vert., vol. vii., p. 52.

Phasianella varia, Lamarck. Encyc. Meth., pl. 449. f. 1*a*, *b*, *c*.

1834. Phasianella bulimoides, Quoy and Gaimard. Astrolabe Zool., vol. iii., p. 235, pl. 59, f. 1-7.

1839. Phasianella bulimoides, Lamarck. Anim. S. Vert., (3rd ed. Deshayes and Edwards), vol. iii., p. 586.

1853. Phasianella australis, Philippi. Conch. Cab. (ed. Küster), p. 2, pl. 1, f. 1-7, and pl. 2, f. 1.
1859. Phasianella decorata, Chenu. Man. de Conch., vol. i., p. 343, f. 2530.
1862. Phasianella australis, Reeve. Conch. Icon., vol. xiii., pl. 1, f. 1, and pl. 2, f. 1.
1862. Phasianella venusta, Reeve. *Id.*, pl. 2, f. 2.
1877. Phasianella pulchella, T. Woods (non Recluz). P.R.S. Tas., p. 141.
1878. Phasianella delicatula, T. Woods. *Id.*, p. 38.
1884. Phasianella australis, Sowerby. Thes. Conch., vol. v., p. 149, pl. 475, f. 2-6.
1888. Phasianella australis, Tryon. Man. Conch., vol. x., p. 164, pl. 37, f. 22-28, and pl. 38, f, 46.
1888. Phasianella australis, *var.* subsanguinea, Pilsbry in Tryon. Man. Conch., vol. x., p. 165, pl. 38, f. 52.

Hab.—Common in Port Phillip where weed and sand are associated, Corio Bay and Sorrento may be specially mentioned; Western Port; Puebla Coast; Lorne; Warrnambool; Port Fairy.

PHASIANELLA VENTRICOSA, Quoy and Gaimard.

1834. Phasianella ventricosa, Quoy and Gaimard. Astrolabe Zool., vol. iii., p. 237, pl. 59, f. 8, 9.
1839. Phasianella solida, Deshayes in Lamarck. Anim. S. Vert. (3rd ed. Deshayes and Edwards), vol. iii., p. 588.
1843. Phasianella perdix, Gray in Menke. Moll. Nov. Holl., p. 12, No. 43.
1843. Phasianella brevis, Menke. *Id.*, No. 45.
1853. Phasianella turgida, Philippi. Conch. Cab., p. 5, pl. 2, f. 7-10, and pl. 5, f. 4.
1859. Phasianella delesserti, Chenu. Man. de Conch., vol. i., p. 343, f. 2526.
1862. Phasianella sanguinea, Reeve. Conch. Icon., vol. xiii., pl. 3, f. 3*a*, *b*, *c*.
1862. Phasianella zebra, Reeve. *Id.*, f. 4.
1862. Phasianella venosa, Reeve. *Id.*, f. 5*a*, *b*, *c*.

1862. Phasianella ventricosa, Reeve. *Id.*, f. 6*a*, *b*.
1862. Phasianella reticulata, Reeve. *Id.*, f. 7.
1884. Phasianella zebra, Sowerby. Thes. Conch., vol. v., p. 149, pl. 475, f. 9.
1884. Phasianella reticulata, Sowerby. *Id.*, p. 150, pl. 475, f. 1.
1884. Phasianella ventricosa, Sowerby. *Id.*, p. 151, pl. 476, f. 18.
1884. Phasianella venosa, Sowerby. *Id.*, f. 24.
1884. Phasianella sanguinea, Sowerby. *Id.*, f. 33.
1888. Phasianella ventricosa, Tryon. Man. Conch., vol. x., p. 165, pl. 38, f. 39, 40, 41, 42, 43, 45.

Hab.—Relatively uncommon in Port Phillip. Abundant in Western Port. Puebla Coast; Warrnambool; Port Fairy; Portland.

Obs.—Amongst the species of this genus described by Menke in his Mollusca of New Holland, are two under the names of P. preissi and P. lehmanni, which are described as being somewhat solid shells, and we are therefore inclined to think that they may also be synonyms of P. ventricosa, but not of the P. australis, which can hardly be described as of that character. Adcock's Hand List of the South Australian Shells includes these two names amongst the synonyms of P. australis, but with this we cannot agree.

PHASIANELLA VARIEGATA, Lamarck.

1822. Phasianella variegata, Lamarck. Anim. S. Vert., vol. vii., p. 53.
1839. Phasianella variegata, Lamarck. Anim. S. Vert. (3rd ed. Deshayes and Edwards), vol. iii., p. 578, No. 3.
1841. Phasianella variegata, Delessert. Recueil de coq., pl. 37, f. 10.
1847. Phasianella unifascialis, Kiener. Icon. Coq. Viv., p. 7, pl. 4, f. 2.
1862. Phasianella nivosa, Reeve. Conch. Icon., vol. xiii., pl. 4, f. 8*a*, *b*, *c*.
1862. Phasianella fulgurata, Reeve. *Id.*, f. 9.

1864. Phasianella angasi, Crosse. Jour. de Conch., p. 344, pl. 13, f. 5.

1884. Phasianella fulgurata, Sowerby. Thes. Conch., vol. v., p. 150, pl. 476, f. 22.

1884. Phasianella angasi, Sowerby. *Id.*, f. 27.

1888. Phasianella variegata, Tryon. Man. Conch., vol. x., p. 179, pl. 39, f. 97, 98. P. nivosa, pl. 38, f. 49. P. fulgurata, pl. 38, f. 55.

1888. Phasianella angasi, Tryon. *Id.*, p. 180, pl. 39, f. 67, 68.

1888. Phasianella unifascialis, Tryon. *Id.*, p. 179, pl. 39, f. 96.

1897. Phasianella variegata, Tate. T.R.S. S.A., vol. xxi., p. 43.

Hab.—Port Phillip; Western Port.

Obs.—P. jaspidea, Reeve, P. lentiginosa, Reeve, and P. grata, Philippi, have been given as synonyms of this species, but we have been unable to determine upon what grounds, as they appear to us to be entirely distinct from our form.

PHASIANELLA ROSEA, Angas.

1867. Eutropia (Tricolia) rosea, Angas. P.Z.S. Lond., p. 114, pl. 13, f. 24.

1888. Phasianella (Tricolia) rosea, Tryon. Man. Conch., vol. x., p. 174, pl. 39, f. 92.

Hab.—Western Port; Cape Schanck; Puebla Coast; Cape Otway; Moonlight Head.

Genus TURBO, Linnaeus, 1758.

TURBO UNDULATUS, Martyn.

1784. Limax undulatus, Martyn. Univ. Conch., vol. i., f. 29.

1786. Limax anguis, Martyn. *Id.*, vol. ii., f. 70.

1788. Turbo undulatus, Chemnitz. Conch. Cab., vol. x., p. 296, pl. 169, f. 1640, 1641.

1834. Turbo undulatus, Quoy and Gaimard. Astrolabe Zool., vol. iii., p. 221, pl. 60, f. 9-14.

1839. Turbo undulatus, Lamarck. Anim. S. Vert. (3rd ed. Deshayes and Edwards), vol. iii., p. 570, No. 13.

1846. Turbo anguis, Philippi. Conch. Cab., p. 70, No. 34, pl. 16, f. 8.
1846. Turbo undulatus, Philippi. Conch. Cab., pp. 40, 41, pl. 10, f. 5, 6.
1848. Turbo undulatus, Reeve. Conch. Icon., vol. iv., pl. 1, f. 3*a*, *b*.
1867. Lunella undulata, Angas. P.Z.S. Lond., p. 213, No. 171.
1873. Turbo undulatus, Hutton. Cat. N.Z. Moll., p. 34.
1880. Turbo undulatus, Hutton. Man. N.Z. Moll., p. 91.
1888. Turbo undulatus, Pilsbry in Tryon. Man. Conch., vol. x., p. 216, pl. 42, f. 40.
1888. Turbo anguis, Pilsbry in Tryon. *Id.*, index, p. 272: said to equal T. porphyrites, Martyn.
1893. Turbo (Marmorostoma) undulatus, Brazier. P.L.S. N.S.W., 2nd ser., vol. viii., pt. i., p. 112.

Hab.—One of our commonest littoral species in all rocky localities.

Obs.—Mr. Brazier states that, in his opinion, Mr. Pilsbry has evidently made a mistake in regarding T. anguis, Martyn, and T. porphyrites, Martyn, as identical.

Turbo stamineus, Martyn.

1784. Limax stamineus, Martyn. Univ. Conch., vol. ii., f. 71.
1788. Turbo torquatus, Gmelin. Syst. Nat., p. 3597, No. 106.
1788. Turbo torquatus, Chemnitz. Conch. Cab., vol. x., p. 293, vign. 24, f. *a*. *b*.
1822. Turbo torquatus, Lamarck. Anim. S. Vert., vol. vii., p. 40.
1834. Turbo torquatus, Quoy and Gaimard. Astrolabe Zool., vol. iii., p. 222, pl. 60, f. 15-18.
1839. Turbo torquatus, Lamarck. Anim. S. Vert. (3rd ed. Deshayes and Edwards), vol. iii., p. 568, No. 3.
1842. Turbo staminea, Gray. App. to Dieffenbach's N.Z., vol. ii., p. 236, No. 67.

1843. Turbo torquatus, Lamarck. Anim. S. Vert. (Deshayes ed.), vol. ix., p. 187, No. 3.

Turbo lamellosus, Broderip. Zool. Jour., vol. v., p. 331, sup. pl. 49, f. 2.

? 1846. Turbo torquatus, Philippi. Conch. Cab., p. 39, pl. 10, f. 1, 2.

? 1846. Turbo lamellosus, Philippi. *Id.*, p. 69, pl. 16, f. 6.

1848. Turbo torquatus, Reeve. Conch. Icon., vol. iv., pl. 6, f. 26.

1854. Ninella staminea, Adams. Genera, vol. i., p. 396, pl. 44, f. 1, *a*, *b*, *c*.

1865. Ninella staminea, Angas. P.Z.S. Lond., p. 177, No. 134.

1873. Turbo torquatus, Fischer. Icon. Coq. Viv., p. 15, sp. 7, pl. 4, f. 1.

1886. Turbo (Ninella) staminea, Watson. Chall. Zool., vol. xv., p. 127, No. 6.

1888. Turbo (Ninella) stamineus, Tryon. Man. Conch., vol. x., p. 212, pl. 42. f. 38, and pl. 49, f. 46.

Hab.—Polwarth Coast.

TURBO GRUNERI, Philippi.

1846. Turbo gruneri, Philippi. Zeits. f. Malak., p. 98, No. 6.

? 1846. Turbo gruneri, Philippi. Conch. Cab., p. 52, pl. 12, f. 7, 8.

1848. Turbo circularis, Reeve. Conch. Icon., vol. iv., pl. 10, f. 46.

1854. Senectus circularis, H. and A. Adams. Genera, vol. i., p. 392.

1865. Senectus circularis, Angas. P.Z.S. Lond., p. 177.

1873. Turbo circularis, Fischer. Icon. Coq. Viv., p. 99, pl. 42, f. 1.

1877. Turbo (Senectus) circularis, T. Woods. P.R.S. Tas., p. 38.

1885. Turbo circularis, Sowerby. Thes. Conch., vol. v., p. 203, sp. 42, pl. 4, and pl. 496, f. 37.

1887. Turbo gruneri, Brazier. T.R.S. S.A., vol. ix., p. 125.

1888. Turbo circularis, Tryon. Man. Conch., vol. x., p. 214, pl. 41, f. 24, and pl. 56, f. 82.

1893. Turbo gruneri, Brazier. P.L.S. N.S.W., vol. viii., pt. i., p. 110.

Hab.—Sorrento, Port Phillip; Balnarring, Flinders, San Remo, Western Port; Cape Schanck; Anderson's Inlet.

Genus **Leptothyra**, Carpenter in Dall, 1871.

LEPTOTHYRA ROSEA, T. Woods.

1876. Monilea rosea, T. Woods. P.R.S. Tas., p. 154.

1880. Collonia roseo-punctata, Angas. P.Z.S. Lond., p. 417, pl. 40, f. 8.

1888. Leptothyra roseo-punctata, Tryon. Man. Conch., vol. x., p. 258, pl. 57, f. 54, 55.

1889. Monilea (Minolia) rosea, Tryon. Man. Conch., vol. xi., p. 264.

Hab.—Sorrento, Port Phillip; Western Port.

LEPTOTHYRA JOSEPHI, T. Woods.

1877. Cyclostrema josephi, T. Woods. P.R.S. Tas., p. 147.

1888. Cyclostrema (Tubiola) josephi, Tryon. Man. Conch., vol. x., p. 95, pl. 33, f. 9.

1899. Collonia josephi, Tate. T.R.S. S.A., vol. xxiii., p. 224.

Hab.—Western Port.

LEPTOTHYRA, n. sp.

Hab.—Dredged off Rhyll, Western Port.

Genus **Astralium**, Link, 1807.

ASTRALIUM SQUAMIFERUM, Koch.

Trochus squamiferus, Koch. Abbild. und Besch., neuer Conch., pl. 4, f. 9.

1822. Trochus fimbriatus, Lamarck. Anim. S. Vert., vol. vii., p. 12.

1839. Trochus fimbriatus, Lamarck. *Id.* (3rd ed. Deshayes and Edwards), vol iii., p. 546, No. 8.

1843. Trochus fimbriatus, Lamarck. *Id.* (Deshayes ed.), vol. ix., p. 125.

1855. Carinidea fimbriata, Swainson. P.R.S. Van Diemen's Land, p. 39, pl. 6, f. 3, 4.
1861. Trochus squamiferus, Reeve. Conch. Icon., vol. xiii., pl. 11, f. 60.
1876. Trochus fimbriatus, Fischer, Kiener. Icon. Coq. Viv., pl. 32, f. 2*a*, 2.
1888. Astralium fimbriatum, var. squamiferus, Tryon. Man. Conch., vol. x., p. 240, pl. 54, f. 52.
1888. Astralium (Cyclocantha) fimbriatum, Tryon. *Id.*, p. 239, pl. 54, f. 46, 48, 49.

Hab.—Cape Schanck; Warrnambool. Dredged off Rhyll, Western Port.

Astralium aureum, Jonas.

1844. Trochus aureus, Jonas. Zeits. f. Malak., p. 168.
1855. Carinidea granulata, Swainson. P.R.S. Van Diemen's Land, vol iii., p. 40, pl. 6, f. 5, 6.
1861. Trochus aureus, Reeve. Conch. Icon., vol. xiii., pl. 11, f. 58, 59.
1877. Carinidea tasmanica, T. Woods. P.R.S. Tas., p. 142.
1888. Astralium (Cyclocantha) aureum, Tryon. Man. Conch., vol. x., p. 240, pl. 64, f. 52-54.

Hab.—Rather common in Port Phillip and Western Port, also occurring along the coast generally.

Obs.—Regarding Carinidea tasmanica, T. Woods states that he had always regarded this as a young variety of Trochus aureus, Jonas, but the form is so constant and so very distinct that he decided to describe it as new. We, however, feel pretty sure that his first opinion was correct. Regarding Liotia incerta, T. Woods, Professor Tate remarks that Petterd regarded this shell as an immature Astralium tasmanicum, but that such opinion cannot be correct. We are inclined to agree with Professor Tate, for the description of L. incerta does not enable us to regard it as a synonym of the above, but a specimen labelled L. incerta, in the Tasmanian case in the old National Museum, certainly is the young of A. aureum. This specimen may perhaps have been obtained from Mr. Petterd. Professor Tate inclines to the opinion that T. Woods' species incerta is a Liotia, but probably an immature L. tasmanica.

Family TROCHIDAE.

Genus **Clanculus**, Montfort, 1810.

CLANCULUS LIMBATUS, Quoy and Gaimard.

1834. Trochus limbatus, Quoy and Gaimard. Astrolabe, vol. iii., p. 245, pl. 63, f. 1-6.

1848. Trochus morum, Philippi. Zeits. f. Malak., p. 109.

?1846. Trochus morum, Philippi. Conch. Cab., p. 265, pl. 39, f. 5.

?1846. Trochus limbatus, Philippi. *Id.*, p. 212, pl. 31, f. 10–12.

1851. Trochus variegatus, A. Adams (non Auton). P.Z.S. Lond., p. 160, No. 27.

1876. Trochus limbatus, Fischer. Icon. Coq. Viv., p. 214, pl. 71, f. 2.

1889. Trochus (Clanculus) limbatus, Tryon. Man. Conch., vol. xi., p. 50, pl. 11, f. 39, 40.

1889. Trochus (Clanculus) variegatus, Tryon. *Id.*, p. 50, pl. 14, f. 19.

1889. Trochus (Clanculus) morum, Tryon. *Id.*, p. 55, pl. 14, f. 31, 32.

Hab.—Port Fairy; Cape Schanck; Back Beach, Sorrento; San Remo and Flinders, Western Port.

Obs.—There can be very little doubt about the identification of this species, for the figures supplied by Quoy and Gaimard are good. Our shell agrees well with Adams' original description, but not with the figure representing it given by Tryon. In general habit our species agrees closely with C. omalomphalus, A. Adams, from New South Wales, but amongst other features it may be noted that ours is larger and more coarsely marked. From the species we have identified as C. flagellatus, Philippi, the above differs in its more conical habit, flatter whorls, and details of ornament.

CLANCULUS FLAGELLATUS, Philippi.

1848. Trochus flagellatus, Philippi. Zeits. f. Malak., p. 105.

?1846. Trochus flagellatus, Philippi. Conch. Cab., p. 267, pl. 39, f. 9.

1889. Trochus (Clanculus) flagellatus, Tryon. Man. Conch., vol. xi., p. 55, pl. 19, f. 3, 4.

Hab.—Coast generally.

Obs.—This species has apparently been confused with T. anus, Philippi, and there are many resemblances between the two, but the latter has distinctive apertural and umbilical characters. It has been identified, and we think probably correctly, as C. conspersus, A. Adams. P.Z.S. Lond., 1851, p. 163, No. 46.

Clanculus personatus, Philippi.

1846. Monodonta ringens, Philippi (non Menke). Zeits. f. Malak., p. 99.

? 1846. Trochus personatus, Philippi. Conch. Cab., p. 78, No. 78, pl. 14, f. 7.

1889. Trochus (Clanculus) personatus, Tryon. Man. Conch., vol. xi., p. 56, pl. 14, f. 29, 30, and pl. 19, f. 91, 92.

Hab.—San Remo; Lorne.

Clanculus undatus, Lamarck.

Monodonta undata, Lamarck. Encyc. Meth., pl. 447, f. 3*a*, *b*.

1822. Trochus undatus, Lamarck. Anim. S. Vert., vol. vii., p. 28, No. 61.

1828. Trochus smithii, Wood. Index Test., sup., p. 17, pl. 5, f. 20*a*.

1839. Trochus undatus, Lamarck. Anim. S. Vert. (3rd ed., Deshayes and Edwards), vol. iii., p. 554, No. 61.

? 1846. Trochus undatus, Philippi. Conch. Cab., p. 221, No. 276, pl. 33, f. 4.

1859. Trochus (Clanculus) undatus, Chenu. Man. de Conch., vol. i., p. 357, f. 2648.

1876. Trochus undatus, Fischer. Icon. Coq. Viv., p. 168, pl. 58, f. 2.

1889. Trochus (Clanculus) undatus, Tryon. Man. Conch., vol. xi., p. 65, pl. 40, f. 1.

Hab.—Sorrento, Port Phillip; Cape Schanck; Flinders; Western Port; Kilcunda; Anderson's Inlet; Airey's Inlet; Lorne.

CLANCULUS MAUGERI, Wood.

1828. Trochus maugeri, Wood. Index Test. sup., p. 220, pl. 5, f. 27*a*.

?1846. Trochus maugeri, Philippi. Conch. Cab., p. 240, No. 305, pl. 36, f. 9.

1876. Trochus maugeri, Fischer. Icon. Coq. Viv., p. 218, pl. 72, f. 1.

1878. Clanculus maugeri, T. Woods. P.R.S. Tas., p. 40.

1889. Trochus (Clanculus) maugeri, Tryon. Man. Conch., vol. xi., p. 64, pl. 10, f. 25-27.

Hab.—Victoria (T. Woods).

CLANCULUS ALOYSII, T. Woods.

1876. Clanculus aloysii, T. Woods. P.R.S. Tas., p. 155.

1876. Clanculus philomenae, T. Woods. P.R.S. Tas., p. 155.

1889. Trochus (Clanculus) aloysii, Tryon. Man. Conch., vol. xi., p. 59, pl. 14, f. 20-23.

1889. Trochus (Clanculus) philomenae, Tryon. *Id.*, p. 61.

Hab.—Port Phillip; Western Port; San Remo; dredged alive off Point Cooke, from 5 fathoms.

Obs.—Having a good series of representatives of this species, we note considerable variation in form, the keeling of the body whorl being noticeable in this respect, being very prominent sometimes, and almost absent at others, as also the sutural channelling. We have thus been unable to make any specific distinction between the two species of Tenison Woods.

CLANCULUS DUNKERI, Koch.

1843. Trochus (Monodonta) dunkeri, Kock. In Philippi, Abbild. und Besch. neuer Conch., vol. i., pt. iii., p. 67, pl. 2. f. 5.

?1846. Trochus dunkeri, Philippi. Conch. Cab., 2nd ed. p. 237, No. 300, pl. 36, f. 5.

1865. Clanculus rubens, Angas. P.Z.S. Lond., p. 178, No. 144.

1876. Trochus dunkeri, Fischer. Icon. Coq. Viv., p. 361, pl. 96, f. 2.

1878. Clanculus rubens, T. Woods. P.R.S. Tas., p. 40.

1886. Trochus (Clanculus) dunkeri, Brazier. P.R.S. Tas., p. 202.

1887. Trochus (Clanculus) dunkeri, Brazier. T.R.S. S.A., vol. ix., pp. 121, 122.

1889. Trochus (Clanculus) dunkeri, Tryon. Man. Conch., vol. xi., pp. 61, 62, pl. 14, f. 26, 27, and pl. 15, f. 57, 58.

Hab.—Western Port.

Obs.—Mr. Brazier in a paper entitled the "Trochidae and other genera of Mollusca from Tasmania with their synonyms," in the Proc. Roy. Soc. Tas., for 1886, p. 203, makes the following remarks on this species:—"Mr. Angas always returned this species named as Clanculus rubens of A. Adams. There was no such species as Clanculus rubens ever described by A. Adams. Mr. Angas was the first who published the name in the P.Z.S. London, 1865, p. 178."

CLANCULUS PLEBEIUS, Philippi.

? 1846. Trochus plebeius, Philippi. Conch. Cab., p. 326, pl. 46, f. 10.

1851. Trochus plebeius, Philippi. Zeits. f. Malak., p. 41.

1851. Clanculus nodoliratus, A. Adams. P.Z.S. Lond., p. 163.

1876. Trochus plebeius, Fischer. Icon. Coq. Viv., p. 243, pl. 83, f. 2, 2*a*.

1877. Gibbula multicarinata, T. Woods. P.R.S. Tas., p. 142, No. 30.

1877. Clanculus angeli, T. Woods. *Id.*, pp. 144, 145.

1880. Clanculus nodoliratus, T. Woods. *Id.*, p. 70.

1889. Trochus (Clanculus) plebeius, Tryon. Man. Conch., vol. xi., p. 79, pl. 10, f. 19–22, and pl. 13, f. 1, 2.

1889. Trochus (Clanculus) angeli, Tryon. *Id.*, p. 60.

Hab.—Coast generally. Obtained alive in rock pools at low tide, and dredged alive from three to five fathoms.

Obs.—This is by far the commonest species of this genus and may be obtained in great numbers at almost any part of our coast.

CLANCULUS OCHROLEUCUS, Philippi.

? 1853. Trochus ochroleucus, Philippi. Conch. Cab., p. 243, pl. 36, f. 16.

1889. Trochus (Clanculus) ochroleucus, Tryon. Man. Conch., vol. xi., p. 57, pl. 13, f. 95, 96.

Hab.—Balnarring Coast, Western Port; Puebla Coast.

Genus **Monodonta**, Lamarck, 1799.

s. g. **Austrocochlea**, Fischer, 1885.

AUSTROCOCHLEA CONSTRICTA, Lamarck.

1822. Monodonta constricta, Lamarck. Anim. S. Vert., vol. vii., p. 36.

1829. Monodonta zebra, Menke. Verg. Malak. Conch. Samml., p. 17.

1834. Trochus taeniatus, Quoy and Gaimard. Astrolabe, vol. iii., p. 249, pl. 63, f. 15-17.

1834. Trochus constrictus, Quoy and Gaimard. *Id.*, p. 251, pl. 63, f. 23-27.

1839. Monodonta constricta, Lamarck. Anim. S. Vert. (3rd ed. Deshayes and Edwards), vol. iii., p. 565.

1841. Monodonta constricta, Delessert. Recueil, pl. 36, f. 11.

1843. Monodonta constricta, Menke. Moll. Nov. Holl., p. 13, No. 49.

1843. Monodonta constricta, Lamarck. Anim. S. Vert., (Desh. ed.), vol. ix., p. 180.

? 1846. Trochus constrictus, Philippi. Conch. Cab., p. 159; pl. 26, f. 2*b*, 3.

? 1846. Trochus zebra, Philippi. Conch. Cab., p. 160, pl. 26, f. 4.

1851. Labio porcatus, A. Adams. P.Z.S. Lond., p. 179.

1859. Trochocochlea multicarinata, Chenu. Man. de Conch., vol. ii., p. 360, f. 2678.

1876. Trochus constrictus, Fischer. Icon. Coq. Viv., p. 178, pl. 59, f. 2, and pl. 60, f. 4.

1876. Trochocochlea multicarinata, Fischer. *Id.*, p. 184, pl. 60, f. 3.

1876. Trochus extenuatus, Fischer. *Id.*, p. 330, pl. 103, f. 1.

1889. Monodonta (Austrocochlea) constricta, Tryon. Man. Conch., vol. xi., p. 90, pl. 20, f. 6, 7.

1889. Monodonta (Austrocochlea) zebra, Tryon. *Id.*, pl. 20, f. 20; *var.* porcata, pl. 20, f. 10, 11; multicarinata, pl. 20, f. 12.

Hab.—All rocky portions of coast line.

Obs.—This is one of the commonest, if not the commonest species inhabiting our coast, and has also a very wide Australasian range. In consequence of its enormous numbers, very considerable variation in habit, keeling, and colouring, may be noted, but there is usually no difficulty in identifying the species.

AUSTROCOCHLEA STRIOLATA, Quoy and Gaimard.

1828. Trochus concamerata, Wood. Index Test. Sup., pl. 6, f. 35.

1834. Trochus striolatus, Quoy and Gaimard. Astrolabe, vol. iii., p. 253, pl. 63, f. 18-22.

1851. Labio fuligineus, Adams. P.Z.S. Lond., p. 180.

1876. Trochus striolatus, Fischer. Icon. Coq. Viv., p. 187, pl. 61, f. 3.

1886. Trochus fuligineus, Watson. Chall. Zool., vol. xv., p. 67, pl. 4, f. 11.

1889. Monodonta (Neodiloma) striolatus, Tryon. Man. Conch., vol. xi., p. 99, pl. 19, f. 97, 98.

Hab.—Port Phillip; Point Nepean to Flinders; Western Port; Puebla, and a few other rocky parts, but much less common than the preceding species. As no description was given of T. concamerata, Wood, we have followed other conchologists in not adopting that name.

Diloma, Philippi, 1845.

DILOMA ODONTIS, Wood.

1828. Trochus odontis, Wood. Index Test. Sup., p. 17, pl. 6, f. 37.

?1846. Trochus odontis, Philippi. Conch. Cab., p. 144, No. 174, pl. 24, f. 7.

1854. Diloma odontis, H. and A. Adams. Genera, vol. i., p. 420.

1865. Diloma odontis, Angas. P.Z.S. Lond., p. 182.

1887. Trochus (Diloma) odontis, Brazier. T.R.S. S.A., vol. ix., p. 119.

1889. Monodonta (Chlorodiloma) odontis, Tryon. Man. Conch., vol xi., p. 111., pl. 62, f. 66, 67.

Hab.—Common on the rocks at low water in Port Phillip and Western Port, but ranges also along the coast in less abundance.

Diloma adelaidae, Philippi.

?1846. Trochus adelaidae, Philippi. Conch. Cab., p. 140, No. 168, pl. 24, f. 1.

1876. Gibbula depressa, T. Woods. P.R.S. Tas., p. 154.

1876. Trochus adelaidae, Fischer. Icon. Coq. Viv., p. 210.

1877. Diloma australis, T. Woods. P.R.S. Tas., p. 145, No. 37.

1881. Gibbula tesserula, T. Woods. T.R.S. Vic., vol. xvii., p. 81, pl. 1, f. 3-5.

1887. Trochus (Diloma) adelaidae, Brazier. T.R.S. S.A., vol. ix., p. 120.

1889. Gibulla depressa, Tryon. Man. Conch., vol. xi., p. 234, pl. 40, f. 36, 37.

1889. Monodonta (Chlorodiloma) adelaidae, Tryon. *Id.*, p. 111, pl. 35, f. 22, 23.

1889. Gibbula tesserula, Tryon. *Id.*, p. 234, pl. 32, f. 66, 67, 68.

Hab.—Port Phillip; Western Port; Puebla Coast; Lorne; Warrnambool; Anderson's Inlet.

Obs.—The description of young specimens of the above species no doubt accounts for the peculiarity of the synonymy, as several features are noticeable in the young that are not always readily picked out in the adult form.

Genus **Phasianotrochus**, Fischer, 1885.

Phasianotrochus rosea, Lamarck.

1822. Monodonta rosea, Lamarck. Anim. S. Vert., vol. vii., p. 38, No. 22.

1822. Monodonta lineata, Lamarck. *Id.*, No. 23.

1828. Trochus badius, Wood. Index. Test., sup., pl. 6, f. 46.

1834. Trochus australis, Quoy and Gaimard. Astrolabe, vol. iii., p. 248, pl. 63, f. 13, 14.

1841. Monodonta rosea, Delessert. Recueil, No. 22, pl. 37, f. 3*a*, *b*, *c*.

1841. Monodonta lineata, Delessert. *Id.*, No. 23, pl. 37, f. 4*a*, *b*.

1846. Trochus roseus, Philippi. Conch. Cab., p. 134, No. 156, pl. 23, f. 7.

1846. Trochus peronii, Philippi. *Id.*, p. 135, No. 158, pl. 23, f. 9.

1846. Trochus quoyi, Philippi. *Id.*, p. 139, No. 165, pl. 23, f. 17.

1846. Trochus badius, Philippi. *Id.*, p. 137, No. 162, pl. 23, f. 14.

1859. Elenchus fulmineus, Chenu. Man. de Conch., vol. i., p. 360, f. 2671.

1889. Cantharidus (Phasianotrochus) badius, Tryon. Man. Conch., vol. xi., p. 131, pl. 45, f. 57, 58.

1889. Cantharidus (Phasianotrochus) peroni, Tryon. *Id.*, p. 132, pl. 34, f. 12-14.

Hab.—Western Port; Anderson's Inlet; Puebla Coast; Warrnambool; Port Fairy.

Obs.—While looking into the synonymy of this species, it seems pretty obvious that rosea should be accepted in preference to lineata. Mr. C. Hedley has kindly drawn our attention to a recent note by Mr. Pilsbry in the "Nautilus" for May 1901, in which he states that he believes it has not been noticed that Bulimus eximius, Perry, Conchology, plate 30, figure 2 (1811), is identical with Cantharidus badius, Wood; and Bulimus carinatus, Perry, f. 1, is C. peronii, Philippi. We have not yet had an opportunity of seeing Perry's work, and are therefore unable to express an opinion on the matter, except that carinatus is the name that should stand for this species if Pilsbry be correct.

Phasianotrochus irisodontes, Quoy and Gaimard.

1834. Trochus irisodontes, Quoy and Gaimard. Astrolabe, vol. iii., p. 246, pl. 63, f. 7-12.

1843. Monodonta virgata, Menke. Moll. Nov. Holl., p. 15, No. 59.

1846. Trochus iriodon, Philippi. Conch. Cab., p. 136, No. 159, pl. 23, f. 10, 11, 13.

1846. Trochus virgulatus, Philippi. *Id.*, p. 136, No. 160, pl. 23, f. 12.

1876. Trochus iridon, Fischer. Icon. Coq. Viv., p. 160, pl. 52, f. 3.

1889. Cantharidus (Phasianotrochus) irisodontes, Tryon. Man. Conch., vol. xi., p. 133, pl. 46, f. 64-66.

Hab.—Coast generally, a very common species.

Phasianotrochus apicinus, Menke.

1843. Monodonta apicinus, Menke. Moll. Nov. Holl., p. 15, No. 58.

1846. Trochus apicinus, Philippi. Conch. Cab., p. 133, pl. 23, f. 5.

1889. Cantharidus (Phasianotrochus) apicinus, Tryon. Man. Conch., vol. xi., p. 134, pl. 34, f. 6, 7.

Hab.—Portland; Port Fairy.

Phasianotrochus bellulus, Dunker.

1845. Trochus bellulus, Dunker. Abbild., vol. ii., pt. 2, pl. 7, f. 6.

1846. Trochus bellulus, Phillippi. Conch. Cab., p. 134, No. 157, pl. 23, f. 8.

1876. Trochus bellulus, Fischer. Icon. Coq. Viv., p. 154, pl. 51, f. 1.

1889. Cantharidus (Phasianotrochus) bellulus, Tryon. Man. Conch., vol. xi., p. 133, pl. 34, f. 5.

Hab.—Portland.

Genus **Bankivia**, Krauss, 1848.

Bankivia fasciata, Menke.

1830. Phasianella fasciata, Menke. Syn. Meth. Moll., pp. 51, 141.

1830. Phasianella fulminata, Menke. *Id.*, p. 141.

1830. Phasianella undatella, Menke. *Id.*, p. 141.

1848. Bankivia varians, Krauss. Sudafric. Moll., p. 105, pl. 5, f. 7.

?1846. Bankivia varians, Philippi. Conch. Cab., p. 33, pl. 5, f. 1-5.

1851. Bankivia purpurascens, A. Adams. P.Z.S. Lond., p. 171.

1851· Bankivia major, A. Adams. *Id.*, p. 171.

1851. Bankivia nitida, A. Adams. *Id.*, p. 172.

1854. Bankivia varians, Adams. Genera., vol. i., p. 425, pl. 48, f. 6.

1859. Bankivia varians, Chenu. Man. de. Conch., vol. i., p. 360, f. 3674-3675,

1867. Bankivia varians, Angas. *Id.*, p. 216.

1886. Trochus (Bankivia) fasciatus, Watson. Chall. Zool., vol. xv., p. 64, No. 22.

1889. Cantharidus (Bankivia) fasciatus, Tryon. Man. Conch., vol. xi., p. 139, pl. 40, f. 28-33.

Hab.—Portland to Warrnambool; Anderson's Inlet; Kilcunda (W. H. Ferguson).

Genus Leiopyrga, H. and A. Adams. 1863.

LEIOPYRGA PICTURATA, H. and A. Adams.

1863. Leiopyrga picturata, H. and A. Adams. A.M.N.H., 3rd ser., vol. xi., p. 19.

1865. Leiopyrga picturata, Angas. P.Z.S. Lond., p. 181.

1867. Leiopyrga picturata, Angas. *Id.*, p. 216.

1884. Bankivia (Leiopyrga) picturata, E. A. Smith. Alert Zool., p. 75, pl. 6, f. *c*.

1886. Trochus (Leiopyrga) picturata, Watson. Chall. Zool., vol. xv., p. 65.

1889. Bankivia (Leiopyrga) picturata, Tryon. Man. Conch., vol. xi., p. 140, pl. 45, f. 46-48.

Hab.—Portland.

LEIOPYRGA OCTONA, Tate.

1891. Leiopyrga octona, Tate. T.R.S. S.A., vol. xiv., pt. 2, pp. 260, 261, pl. 11, f. 5.

Hab.—Port Fairy (Rev. W. T. Whan).

Genus Thalotia, Gray, 1847.

THALOTIA CONICA, Gray.

1827. Monodonta conica, Gray. King's Austr. Survey, App., vol. ii., p. 479, No 28.
1828. Trochus pictus, Woods. Index Test., Sup., p. 17, pl. 5, f. 28.
1843. Monodonta turrita, Menke. Moll. Nov. Holl., p. 15, No. 57.
1847. Thalotia conica, Gray. P.Z.S. Lond., p. 145.
?1846. Trochus conicus, Philippi. Conch. Cab., p. 130, No. 150, pl. 23, f. 1.
1851. Thalotia picta, A. Adams. P.Z.S. Lond., p. 172, No. 1.
1854. Thalotia conica, H. and A. Adams. Genera, vol. i., p. 420, pl. 48, f. 1.
1876. Trochus conicus, Fischer. Icon. Coq. Viv., p. 135.
1878. Thalotia conica, T. Woods. P.R.S. Tas., p. 41.
1878. Thalotia dubia, T. Woods. P.R.S. Vic., vol. xiv., p. 58.
1881. Thalotia conica, Tate. P.L.S. N.S.W., vol. vi., p. 394.
1887. Trochus (Thalotia) conicus, Brazier. P.R.S. Tas., p. 197.
1887. Trochus (Thalotia) conicus, Brazier. T.R.S. S.A., vol. ix., p. 117.
1889. Cantharidus (Thalotia) conicus, Tryon. Man. Conch., vol. xi., p. 141, pl. 46, f. 73.
1900. Thalotia conica, Gatliff. V.N., vol. xvii., No. 6, p. 112, two figures.

Hab.—Port Phillip; Western Port; Puebla; Warrnambool; Port Fairy.

Obs.—The type of Thalotia dubia, T. Woods, is in the National Museum collection, Meldourne, and was originally obtained from Clark's Island, Bass Strait. Examination of the type shows, undoubtedly, that it must be regarded as the same as Thalotia conica, Gray, its young growth for about four whorls being identical, but after that a distorted abnormal growth begins and then follows a much greater convexity of the whorls than is usually found in that species. This type shell was figured by one of us in the "Victorian Naturalist" last year.

Genus **Cantharidus**, Montfort, 1810.

Cantharidus pulcherrimus, Wood.

1828. Trochus pulcherrimus, Wood. Index Test., Sup., p. 18, pl. 6, f. 45.

1843. Trochus preissii, Menke. Moll. Nov. Holl., p. 17, No. 69.

1845. Trochus pulcherrimus, Philippi. Abbild. Besch. n. Conch., vol. ii., pt. ii., pl. 7, f. 1.

? 1846. Trochus pulcherrimus, Philippi. Conch. Cab., p. 132, No. 153, pl. 23, f. 4, and pl. 43, f. 11.

1865. Thalotia pulcherrima, Angas. P.Z.S. Lond., p. 179, No. 151.

1876. Trochus pulcherrimus, Fischer. Icon. Coq. Viv., p. 137, pl. 46, f. 4, 4*a*.

1878. Thalotia mariae, T. Woods. T.R.S. Vic., p. 58.

1881. Thalotia pulcherrima, Tate. P.L.S. N.S.W., vol. vi., p. 396.

1887. Trochus (Cantharidus) pulcherrimus, Brazier. P.R.S. Tas. p. 196.

1887. Trochus (Cantharidus) pulcherrimus, Brazier. T.R.S. S.A., vol. ix., pp. 118, 119.

1889. Cantharidus pulcherrimus, Tryon. Man. Conch., vol. xi., p. 125, pl. 46, f. 78, 79.

Hab.—Coast generally.

Obs.—One of our commonest and most widely distributed species. The type of Thalotia mariae, T. Woods, is in the Australian Museum, Sydney.

Cantharidus ramburi, Crosse.

1822. Phasianella elegans, Lamarck (non Gmelin). Anim. S. Vert., vol. vii., p. 53, No. 4.

1843. Phasianella elegans, Lamarck. *Id.*, Deshayes, 2nd ed., vol. ix., p. 243.

1843. Trochus lehmanni, Menke (non Kiener). Moll. Nov. Holl., p. 18, No. 70.

1845. Trochus lehmanni, Philippi. Abbild. Besch. n. Conch., vol. ii., p. 37, pl. 7, f. 2.

?1846. Trochus pictus, Philippi (non Wood). Conch. Cab., p. 139, No. 166, pl. 23, f. 18, 19.

1851. Thalotia lehmanni, A. Adams. P.Z.S. Lond., p. 172, No. 4.

1854. Thalotia lehmanni, H. and A. Adams. Genera, vol. i., p. 420.

1864. Trochus ramburi, Crosse. Jour. de Conch., p. 342, pl. 13, f. 3.

1876. Trochus lesueuri, Fischer. Icon. Coq. Viv., pp. 129, 420.

1877. Thalotia picta, T. Woods. P.R.S. Tas., p. 41.

1887. Trochus (Cantharidus) lesueuri, Brazier. P.R.S. Tas., p. 194.

1887. Trochus (Cantharidus) lesueuri, Brazier. T.R.S. S.A., vol. ix., p. 116.

1889. Cantharidus lesueuri, Tryon. Man. Conch., vol. xi., p. 126, pl. 45, f. 52-54, and pl. 34, f. 9, 10.

1889. Cantharidus ramburi, Tryon. *Id.*, pp. 127, 469, pl. 45, f. 40.

Hab.—Coast generally, usually an associate with the preceding species.

Genus **Gibbula**, Risso, 1826.

GIBBULA TIBERIANA, Crosse.

1863. Trochus tiberianus, Crosse. Jour. d. Conch., p. 381, pl. 13, f. 2.

1864. Cantharidus decoratus, Adams and Angas. P.Z.S. Lond., p. 37.

1867. Cantharidus tiberianus, Angas. P.Z.S. Lond., p. 215.

1876. Gibbula aurea, T. Woods. P.R.S. Tas., p. 153.

1876. Trochus tiberianus, Fischer. Icon. Coq. Viv., p. 408, pl. 120, f. 2.

1877. Thalotia tesselata, T. Woods. T.R.S. Vic., vol. xiv., p. 58.

1889. Thalotia tesselata, Tryon. Man. Conch., vol. xi., p. 151.

1889. Cantharidus decoratus, Tryon. *Id.*, p. 153.
1889. Gibbula tiberiana, Tryon. *Id.*, p. 222, pl. 32, f. 53.
1889. Gibbula aurea, Tryon. *Id.*, p. 237.

Hab.—Generally distributed around Port Phillip, dredged alive from about 5 fathoms off Point Cooke; dredged alive on weed from 5 to 8 fathoms off Rhyll, Western Port; Flinders; Cape Schanck; Puebla.

Obs.—The type of Thalotia tesselata, T. Woods, is in the National Museum, Melbourne.

GIBBULA COXI, Angas.

1867. Gibbula coxi, Angas. P.Z.S. Lond., p. 115, pl. 13, f. 26.
1876. Trochus coxi, Fischer. Icon. Coq. Viv., p. 339, pl. 105, f. 3.
1889. Gibbula coxi, Tryon. Man. Conch., vol. xi., p. 231, pl. 31, f. 34, 35, and pl. 32, f. 69.

Hab.—Western Port.

GIBBULA PREISSIANA, Philippi.

1848. Trochus preissianus, Philippi. Zeits. f. Malak., p. 123.
?1846. Trochus preissianus, Philippi. Conch. Cab., p. 177, pl. 28, f. 3.
1851. Gibbula porcellana, A. Adams. P.Z.S. Lond., p. 186.
1876. Trochus preissianus, Fischer. Icon. Coq. Viv., p. 245, pl. 83, f. 3.
1877. Gibbula weldii, T. Woods. P.R.S. Tas., p. 143.
1889. Minolia preissiana, Tryon. Man. Conch., vol. xi., p. 261, pl. 41, f. 29.
1889. Gibbula weldii, Tryon. *Id.*, p. 236.

Hab.—Point Roadknight.

GIBBULA SULCOSA, A. Adams.

1851. Gibbula sulcosa, A. Adams. P.Z.S. Lond., p. 186.
1889. Gibbula sulcosa, Tryon. Man. Conch., vol. xi. p. 243.

Hab.—Point Roadknight.

Gibbula legrandi, Petterd.

1879. Fossarina legrandi, Petterd. Jour. of Conch., vol. ii., p. 104.

Hab.—A rather common little species widely distributed along our coast.

Note.—We have another small species of this genus hitherto unidentified.

Minolia, A. Adams, 1860.

Minolia philippensis, Watson.

1881. Trochus (Solariella) philippensis, Watson. J.L.S. Lond., vol. xv., p. 92.

1886. Trochus (Solariella) philippensis, Watson. Chall. Zool., vol. xv., p. 73, pl. 6, f. 10.

1889. Minolia philippensis, Tryon. Man. Conch., vol. xi., p. 271, pl. 36, f. 15, 16.

Hab.—Off the entrance to Port Phillip, 33 fathoms, sand (Challenger).

Minolia tasmanica, T. Woods.

1877. Margarita (Minolia) tasmanica, T. Woods. P.R.S. Tas., p. 143, No. 33.

1878. Minolia vectiliginea, var. (?), T. Woods. T.R.S. Vic., vol. xiv., p. 59.

1889. Minolia tasmanica, Tryon. Man. Conch., vol. xi., p. 263, pl. 61, f. 38, 39, 40.

Hab.—Port Phillip.

Obs.—The Victorian specimens of this species are usually considerably larger than the Tasmanian type. The incorrect spelling and naming of Menke's species by T. Woods is worthy of note, and in his paper to the Royal Society of Victoria he regarded the Victorian shell as a probable variety. This and other species dealt with by him were presented to the National Museum, Melbourne, and this no doubt accounts for the fact that this shell is labelled type in that institution. We are perfectly satisfied that Menke's shell, M. vitiliginea, though of similar aspect from above, differs in its umbilical characters and in its more solid development. We have examples of Menke's species before us from Western Australia.

Genus **Calliostoma**, Swainson, 1840.

Calliostoma meyeri, Philippi.

1848. Trochus meyeri, Philippi. Zeits. f. Malak., p. 101.
1849. Trochus meyeri, Philippi. Conch. Cab., p. 279, No. 362, pl. 41, f. 4.
1854. Trochus levis, Hombron and Jacquinot. Voy. au Pole Sud, vol. v., Zool., p. 56, mollusca, pl. 14, f. 17, 18.
1863. Zizyphinus armillatus, Reeve. Conch. Icon., vol. xiv., pl. 3, f. 19.
1876. Trochus meyeri, Fisher. Icon. Coq. Viv., p. 76, pl. 17, f. 2.
1887. Trochus (Zizyphinus) meyeri, Brazier. T.R.S. S.A., vol. ix., p. 121.
1888. Calliostoma meyeri, Tryon. Man. Conch., vol. x., pl. 41, f. 35.
1889. Calliostoma meyeri, Tryon. *Id.*, vol. xi., p. 336.

Hab.—Commonest in Western Port; also Puebla; Warrnambool; Portland (Maplestone); Anderson's Inlet (W. H. Ferguson).

Calliostoma tinctum, Watson.

1886. Trochus (Zizyphinus) tinctus, Watson. Chall. Zool., vol. xv., p. 63, No. 20, pl. 17, f. 2.
1889. Calliostoma tinctum, Tryon. Man. Conch., vol. xi., p. 353, pl. 16, f. 11, 11a.

Hab.—Off East Moncoeur Island, Bass Strait, 38 fathoms, sand (Challenger).

Calliostoma poupineli, Montrouzier.

1854. Zizyphinus comptus, A. Adams (non Philippi). P.Z.S. Lond., p. 38.
1863. Zizyphinus comptus, Reeve. Conch. Icon., vol. xiv., pl. 7, f. 48.
1875. Trochus (Zizyphinus) poupineli, Montrouzier. Jour. d. Conch., p. 40, pl. 4, f. 6.
1876. Trochus poupineli, Fischer. Icon. Coq. Viv., p. 387, pl. 116, f. 3.

1889. Calliostoma poupineli, Tryon. Man. Conch., vol. xi., p. 350, pl. 17, f. 41.

1894. Calliostoma purpureo-cinctum, Hedley. P.L.S. N.S.W., vol. ix., pt. 1, p. 35.

Hab.—Western Port.

CALLIOSTOMA ALLPORTI, T. Woods.

1876. Trochus (Zizyphinus) allporti, T. Woods. P.R.S. Tas., p. 155.

1889. Calliostoma allporti, Tryon. Man. Conch., vol. xi., p. 351, pl. 66, f. 22.

Hab.—Off Rhyll, Western Port, dredged from about six fathoms; Puebla Coast.

CALLIOSTOMA INCERTUM, Reeve.

1863. Zizyphinus incertus, Reeve. Conch. Icon., vol. xiv., pl. 5, f. 28.

1875. Zizyphinus incertus, T. Woods. T.R.S. Tas., p. 41.

1889. Calliostoma incertum, Tryon. Man. Conch., vol. xi., p. 351, pl. 17, f. 37, and pl. 65, f. 83.

Hab.—San Remo, Western Port.

CALLIOSTOMA LEGRANDI, T. Woods.

1876. Zizyphinus legrandi, T. Woods. P.R.S. Tas., p. 154.

1889. Calliostoma legrandi, Tryon. Man. Conch., vol. xi., p. 350, pl. 66, f. 23.

Hab.—Off Rhyll, Western Port, dredged from about five fathoms.

CALLIOSTOMA NOBILE, Philippi.

(?) 1846. Trochus nobilis, Philippi. Conch. Cab., p. 86, pl. 15, f. 6, and pl. 38, f. 1.

1863. Zizyphinus nobilis, Reeve. Conch. Icon., vol. xiv., pl. 2, f. 10.

1876. Trochus nobilis, Fischer. Icon. Coq. Viv., p. 309, pl. 98, f. 2.

1878. Zizyphinus nobilis, Brazier. P.L.S. N.S.W., vol. ii., p. 44.

1889. Calliostoma nobile, Tryon. Man. Conch., vol. xi., p. 349, pl. 15, f. 47, 48.

Hab.—West Head, Western Port.

Calliostoma, n. sp.

Hab.—Western Port.

Genus **Astele**, Swainson, 1855.

Astele subcarinata, Swainson.

1854. Astele subcarinata, Swainson. P.R.S. Van Diemen's Land, vol. iii., p. 36, pl. 6, f. 1, 2.

1863. Eutrochus perspectious, A. Adams. P.Z.S. Lond., p. 506.

1877. Astele subcarinatus, T. Woods. P.R.S. Tas., p. 39.

1889. Calliostoma (Eutrochus) adamsi, Pilsbry. Man. Conch., vol. xi., p. 402.

1893. Astele subcarinata, Brazier. P.L.S. N.S.W., 2nd ser., vol. viii., pt. 1, pp. 107-110. Figured in text by C. Hedley.

Hab.—Western Port, San Remo.

Genus **Euchelus**, Philippi, 1847.

Euchelus baccatus, Menke.

1843. Monodonta baccata, Menke. Moll. Nov. Holl., p. 14, No. 51.

1846. Trochus aspersus, Koch. Zeits. f. Malak., p. 103, No. 23.

? 1846. Trochus baccatus, Philippi. Conch. Cab., p. 173, No. 208, pl. 27, f. 13.

1851. Monodonta baccata, A. Adams. P.Z.S. Lond., p. 174, No. 9.

1865. Euchelus baccatus, Angas. P.Z.S. Lond., p. 179, No. 147.

1867. Euchelus baccatus, Angas. *Id.*, p. 215, No. 180.

1876. Trochus baccatus, Fischer. Icon. Coq. Viv., p. 292, pl. 94, f. 2, and pl. 115, f. 1.

1886. Trochus (Euchelus) baccatus, Watson. Chall. Zool., vol. xv. p. 53, No. 7.

1889. Euchelus baccatus, Tryon. Man. Conch., p. 435, pl. 62, f. 72, 73.

Hab.—Moderately common all along the coast.

Obs.—This species shows variation in form and coarseness of sculpture, occasional very elongate or even scalariform specimens being obtainable.

Euchelus scabriusculus, Angas.

1867. Euchelus scabriusculus, Angas. P.Z.S. Lond., p. 215, No. 181.

1876. Trochus scabriusculus, Fischer. Icon. Coq. Viv., p. 374, pl. 114, f. 2.

1889. Euchelus (Herpetopoma) scabriusculus, Tryon. Man. Conch., vol. xi., p. 435, pl. 48, f. 12.

Hab.—Sandringham, Sorrento, Port Phillip.

Obs.—Tryon states that there was no description accompanying the name given by Messrs. Adams and Angas, and we have not been able to find any either. In Angas' list of 1867 in P.Z.S., this species is numbered 181, and marked with an asterisk, which meant that the species had been described from specimens in his own collection. Presumably this refers to the few brief particulars given by himself in the list, yet he gives the name E. scabriusculus, A. Adams and Angas, M.S., in Cuming Collection. Angas's own brief description is "a very small species differing from E. baccatus in its cancellated sculpture, and being umbilicated. Under stones, Port Jackson. Length, 2 lines."

Euchelus tasmanicus, T. Woods.

1876. Euchelus tasmanicus, T. Woods. P.R.S. Tas., p. 152.

1877. Fossarus tasmanicus, T. Woods. P.R.S. Tas., p. 148.

1880. Fossarus tasmanicus, T. Woods. P.R.S. Tas., p. 70.

1889. Euchelus tasmanicus, Tryon. Man. Conch., vol. xi., p. 436.

Hab.—Cape Schanck; Western Port; Puebla.

Obs.—T. Woods admits his own mistake as above indicated.

Euchelus atratus, Gmelin.

?1789. Turbo atratus, Gmelin. Syst. Nat., vol. xiii., p. 3601, No. 53.

1822. Monodonta canaliculata, Lamarck. Anim. S. Vert., vol. vii., p. 37, No. 20.

1888. Euchelus atratus, Tryon. Man. Conch., vol. x., pl. 41, f. 25.

1889. Euchelus atratus, Tryon. *Id.*, vol. xi., p. 439.

Hab.—Portland (Mrs. A. Kenyon).

Obs.—Our shell agrees exactly with f. 25 given by Tryon, but the other figures given by him are not so satisfactory.

Art. XI.—*Some remains of an extinct Kangaroo in the Dune-Rock of the Sorrento Peninsula, Victoria.*

By J. W. GREGORY, D.Sc.

(Professor of Geology, Melbourne University).

[Read 11th July, 1901.]

Port Phillip Bay is nearly closed to the south by two lines of sand dunes, of which the eastern is known, after the principal settlement upon it, as the Sorrento Peninsula.

The peninsula is formed entirely of sand dunes, which extend for twenty miles, from Point Nepean on the west, to Cape Schanck on the east. The dune belt is broadest at the east, where, with its associated alluvial deposits, it is seven miles in width.

The only direct stratigraphical evidence as to the age of the Sorrento dune series is that, near Cape Schanck, it abuts against the "older volcanic" basalts, which are certainly the earlier in age.

The thickness of the dune series is considerable. A dune known as St. Paul's rises 176 feet above the sea. West of Sorrento is another to which the Admiralty Chart assigns the height of 225 feet. At Fowler's Cove the highest dune is 130 feet.[1] Wells have been sunk to the depth of three or four feet below sea level, where a plentiful supply of water has rendered further sinking unnecessary. There is, therefore, no direct evidence as to the full thickness of the dune formation in the Sorrento Peninsula. The minimum is 360 feet; and the fact that the beaches on the sea front are formed of pebbles of the dune sandstones and limestones shows that no other rocks are exposed for some depth below low tide line.

Throughout the body of this thick mass of dune formation no determinable fossils have yet been recorded. They may have been abundant; but all the calcareous material has been

[1] This is the height as determined trigonometrically by Mr. Fowler; the Admiralty Chart gives it at 117 feet.

dissolved and redeposited as the dune limestones, or in concretions around plant roots.[1] M'Coy[2] has recorded the occurrence of the extinct species *Arctocephalus williamsi* M'Coy, and *Phascolomys pliocenus*, M'Coy, and of the living Tasmanian *Sarcophilus ursinus* (Harris), at Queenscliff, on the western side of Port Phillip entrance, in the "sandy beds intercalated with the Pliocene Tertiary limestone." These fossils probably came from the western dune series.[3]

The dune series is strongly falsebedded. The dominant false dip is to the north and north-east. This fact suggests that the dune material drifted from the south and south-west, and that what are now the southern cliffs were formed on the northern slope of the dunes. The drift of the sand at present is still eastward and north-eastward. The sand patch in front of Mr. Fowler's house has, he tells me, travelled eastward for 20 yards during the last fifteen years.

The limestones also have a general slope downward to the north, having been deposited along the natural drainage plains. That the stratification is due to false bedding is shown by the vertical position of most of the concretions in places where the bedding is inclined.

A typical section of the dune series is shown at Fowler's Cove. At the top are three feet of sand supported by thin horizontal layers of limestones; then follow five feet of sands with abundant stem and root concretions; the dip in this bed increases in the lower part. At the base are fifteen feet of strongly falsebedded sands, dipping as much as 30° to the north-east.

The existence of stacks of dune limestone along the foreshore also shows that marine denudation has pushed back the coast-line, and the dunes must at one time have extended some hundreds of yards further to the south than they do at present. This marine advance may have been due either to a subsidence of the land or a local rise in sea level; but a relatively greater elevation of the dune belt in recent geological times is almost certain.

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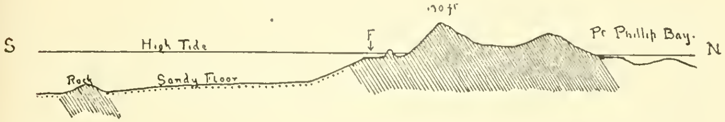
1 A description of these fossil-like cylindrical concretions has been recently given by Mr. T. S. Hall, Vict. Nat. (1901) p. 47.

2 Prod. Pal. Vict., dec. v. (1877) p. 8, and dec. vii. (1882) p. 12.

3 Fragments of fossils have been recorded from the Otway dunes by Mr. R. Etheridge, Jnr. "Observations on the Sand Dunes of the Coast of Victoria." Trans. Roy. Soc. Vict., vol. xii. (1876), p. 3.

A transverse section across the dune belt showing the shore platform, and the position of the line of submerged rocks is given below. The fossil described in this note came from the position marked F.



In the absence of fossils we have only the scanty stratigraphical evidence as to the age of the dune series. On this ground Mr. Murray in his "Victoria. Geology and Physical Geography" (1895, p. 100), assigns the dunes to the "Post-Tertiary age, some of them being of comparatively ancient and others of quite recent date, or even now in process of formation." This conclusion is certainly correct for the later limit of the series; for aboriginal kitchen-middens are being buried by the dunes. These kitchen-middens consist of layers of shells, all of edible mollusca; the spiral gastropods have been broken at the mouth, so that the body could be extracted; the fractures are due to direct blows and not to abrasion; the shells, moreover, are embedded in a soil containing fragments of burnt wood and charcoal.

That the Sorrento dunes are therefore, in part, of recent date, admits of no doubt; but the age at which their formation began is uncertain. Hence the discovery of a vertebrate fossil in the lowest exposed part of the dune series is of interest.

This fossil was discovered independently by Mr. T. W. Fowler and Mr. C. S. Price in 1900. A broken tooth of it was extracted by Mr. T. S. Hall, and is now in the National Museum. The fossil was exposed at low tide on the surface of the shore platform at Fowler's Cove, about three miles from Sorrento. As the platform is being planed down by the surf, Mr. Fowler feared that the fossil would be destroyed and he kindly invited me to examine it with a view to securing it for the University collection. I accordingly visited the locality in March, 1901, with Mr. Fowler, Mr. D. Le Soeuf, and Mr. F. J. Spry. The specimen proved to be the remains of a kangaroo, for it included the characteristic innominate bone. Unfortunately the specimen was very incomplete. There was no trace of the skull, and the only relics of limbs was a broken femur. The rest of the fossil consisted of part of the vertebral column with the remains of about ten ribs, and fragment of a scapula. The bones were brittle and fragile, and they were imbedded in a hard, tough, sandy limestone. Owing to the limited time during which the fossil was exposed above the sea, its complete extraction would have been impossible, even had it been thought worth while to quarry out the whole of the five foot slab of limestone over which the bones were scattered.

Accordingly we devoted our attention to the pelvis, which was skilfully quarried out by Mr. Spry. We obtained also the best of the vertebrae, a fragment of a scapula, and some parts of ribs.

That the pelvis belongs to a kangaroo is obvious. The part shewn is the inner surface of the right innominate; most of the ilium is preserved, but the fore-end is broken off. The hinder-end of the ischium and nearly all the pubis are lost, but enough of the obturator foramen is shewn to enable its outline and size to be approximately determined. A photograph taken by Mr. Fowler some time before our visit showed most of the pectineal process and the outline of the proximal part of the pubis.

The following dimensions show the relative sizes of the fossil with the largest pelvis of *Macropus giganteus*, Zimm., in the University Biological Museum, and in the largest *Macropus* pelvis in the National Collection, which have been kindly shown me by Mr. T. S. Hall, and Mr. J. A. Kershaw, respectively.

	Fowler's Cove Fossil.	*Macropus giganteus*, Univ. Coll.	*Macropus* sp., Nat. Mus.	Owen's *Palorchestes*
From base of pectineal process to back of ilium -	68 mm.	36 mm.	46 mm.	59 mm.
Thickness (dorso-ventral) of base of ilium - -	48 mm.	23 mm.	29 mm.	47 mm.
Width of ischium opposite middle of obturator foramen - - -	54 mm.	24·5 mm.	30 mm.	50 mm.

It is therefore not probable that the fossil kangaroo is a *Macropus giganteus*. The Great Red Kangaroo (*M. rufus*, Desm.) is somewhat larger than the Great Grey Kangaroo. Lydekker gives the following measurements of the two species.[1]

	M. giganteus.	*M. Rufus.*
Length of head and body -	60 in. -	65 in.
Length of tail - - -	36 in. -	42 in.

The large pelvis in the National Museum may belong to *M. rufus*. But these measurements, as well as those of the skeleton given by Owen, show that *M. rufus*, the largest of living kangaroos, was much smaller than the fossil.

We must, therefore, turn to the great extinct kangaroos for comparison with the Fowler's Cove fossil.

From the general resemblance of the pelvis to that of *Macropus giganteus* it is natural first to compare the specimen with *M. titan*, Owen. This species is admittedly a close ally of *M. giganteus* and it has been suggested may be only a variety thereof. Its size was not much greater than that of even *M. rufus*. Owen's figures and measurements show the relative sizes of the two species. Thus the width of the distal end of the femur is 72 mm. in *M. titan*,[2] and 62 mm. in *M. rufus*.[3] Comparing the dentition, the length of the last molar in *M. rufus* is shewn by Owen's figure to be 15·5 mm.; that of *M. titan* is 27 mm. The length of the last four upper molars is 50 mm. in *M. rufus*,[4] 59 mm. in *M. titan*.[5] Hence *M. titan* did not exceed *M. rufus* by nearly as much as this fossil did.

Owen has figured[6] part of an innominate, which he referred to *Palorchestes azael*. The measurements are given in the fourth column on p. 142. They show that the Fowler's Cove fossil is even larger than in the giant *Palorchestes*. The characters of the innominates however, so far as the data are comparable, agree so closely that they no doubt belong to the same species.

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1 Lydekker. Handbook to the Marsupialia and Monotremata (1896), pp. 15, 23.

2 Owen. On the Fossil Mammals of Australia, pt. x. Phil. Trans. vol. clxvi. (1876), pl. xxvii.

3 *Ibid.*, p. 203.

4 Owen. On the Fossil Mammals of Australia, pt. viii. Phil. Trans., vol. clxiv. (1874), pl. xxi. fig. 2.

5 *Ibid*, pl. xxi., fig. 1.

6 Owen, *op. cit.* (1876), pl. xxii.

But what name should be given to the species is a little doubtful. Owen unhesitatingly referred his innominate, which came from the Darling Downs, Queensland, to *Palorchestes azael.* But Lydekker in his "Catalogue of the Fossil Mammalia in the British Museum,"[1] has declined to accept Owen's specific, or even generic determination of the great series of Macropodid bones in that collection. He says there is no reason why they should be placed in one genus more than in another. *Palorchestes* was founded on the characters of the skull, and at present there is no evidence to correlate scattered skeleton bones, except their size. Mr. Oldfield Thomas remarked during a discussion at the Zoological Society that he found dimensions one of the most useful characters in the identification of mammals. Hence there is no reason to doubt that Owen was right in assigning his innominate to *Palorchestes* rather than to *Macropus*, but as he has himself[2] remarked some species of *Procoptodon eg.*, *P. goliah* (Owen) rivalled *Palochertes* in bulk ; hence size alone will not help us to separate these two genera.

The only evidence on this point is that of the teeth. A broken tooth of the Fowler's Cove specimen was collected by Mr. Hall and is now in the National Museum. Mr. Hall has identified it, no doubt correctly, as a piece of lower incisor. It is 34 mm. long, 16 mm. broad, and 7 mm. thick. In *Procoptodon* the lower incisors are subcylindrical. They have, says Owen, "a full elliptic section;" the diameters of the transverse section, according to Owen's measurements, are 6 lines (12·75 mm.) vertically, and 5 lines transversely. In *Palorchestes* on the other hand the lower incisors are spatulate. Hence the evidence of this tooth shows that the fossil cannot be a *Procoptodon.* It is, therefore, in all probability, a *Palorchestes azael*, and justifies Owen's identification of the innominate figured by him in 1876.

Accordingly the lower exposed part of the Sorrento dunes dates back to the time of the extinct giant kangaroos, the age of which is described as late Pliocene or lower Pleistocene.

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1 Pt. v. (1887), p. 239.

2 Owen, *op. cit.*, pt. ix. Phil. Trans., vol. clxiv. (1874), p. 800.

Art. XII.—*On the Fossil contents of the Eocene Clays of the Altona Coal Shaft.*

By E. O. THIELE and F. E. GRANT.

[Read 12th December, 1901.]

In a paper read by Messrs. T. S. Hall and G. B. Pritchard before this Society in September, 1896,[1] reference was made to a bore put down at Altona Bay to prospect for coal, and a list was given of the fossils met with. Their list was drawn up from the material supplied by the drill cores which was all that was then obtainable, and it was necessarily imperfect.

A shaft was subsequently sunk, and, although coal was won, the works were abandoned owing to the inflow of water. The waste tip from the sinking of this shaft is now available for collection, but is being rapidly dissipated by the tramping of stock, and by wind and rain. As the deposits passed through were highly fossiliferous, it has appeared to us desirable that a more adequate list of their contents should be published, as an assistance to a correlation of our Marine Tertiary beds.

The stratified deposits passed through before coal was reached, and their relation to one another, as judged from their position in the spoil heap, were as follows :—

(1). A coarse ferruginous grit apparently represents the uppermost part of the beds. In this we have failed to find any traces of fossils.

(2). A cream coloured sandy clay with nodules of yellow limestone occurs next. This deposit is very full of foraminifera (largely of the genus *Operculina*) and contains a fair number of brachiopods, but few gastropods or lamellibranchs. We have not included the brachiopods in our list, but they appear to be forms occurring in other typical Eocene formations.

(3). By far the largest amount of the spoil heap consists of blue and grey clays, with nodules of limestone. This material is rich in fossils, and bears a close lithological resemblance to the

1 Proc. Roy. Soc. Vic., vol. ix. (New Series), p. 218.

deposits at Mornington and Grice's Creek, on the opposite side of Port Phillip, with which horizon its fossil contents correlate it. Out of 203 species of molluscs identified by us, only 26 (which are marked in our list with a dagger) are not included in the lists relating to the Mornington beds by Messrs. Hall and Pritchard in the last volume of this Society's Proceedings.[1]

(4) These blue clays become finally mixed with a coarse water worn quartz gravel, and cease to be fossiliferous.

We are indebted to Messrs. Pritchard and Hall for assistance in the identification of some of the molluscs and to Mr. J. Dennant, F.G.S., for naming the corals. We have also to thank Mr. Coop, of North Williamstown, for having placed at our disposal a small collection of some of the larger forms which have added a few useful names to our list.

So far as possible we are depositing the specimens on which our identifications are based (including those given by Mr. Coop) with the National Museum. Other specimens have been lodged with the Geological Museum of the University. We have in addition a very large number of other forms which we are unable to identify as named species.

Lamellibranchiata.

Dimya dissimilis, Tate.
Pecten murrayanus, Tate.
,, dichotomalis, Tate.
Amusium zitteli, Hutton.
Lima bassii, T. Woods.
Limatula jeffreysiana, Tate.
Limea transenna, Tate.
Spondylus pseudoradula, McCoy.
Modiolaria singularis, Tate.
Crenella globularis, Tate.
Nucula tenisoni, Pritchard.
,, atkinsoni, Johnston.
,, morundiana, Tate.
Leda obolella, Tate.
,, huttoni, T. Woods.
,, apiculata, Tate.

[1] Proc. Roy. Soc. Vic., 1901, vol. xiv. (New Series), part i, p. 46.

Leda acuticauda, Pritchard.
,, vagans, Tate.
† ,, woodsi, Tate.
,, leptorhyncha, Tate.
Limopsis belcheri, Adams and Reeve.
,, morningtonensis, Pritchard.
† ,, multiradiata, Tate.
Glycimeris laticostatus, Quoy and Gaimard.
Barbatia crustata, Tate.
,, celleporacea, Tate.
,, simulans, Tate.
Plagiarca cainozoica, Tate.
Cucullaea corioensis, McCoy.
Trigonia tubulifera, Tate.
Crassatellites communis, Tate.
Cardita delicatula, Tate.
Cardita scabrosa, Tate.
† ,, tasmanica, Tate.
Carditella lamellata, Tate.
Chama lamellifera, T. Woods.
Cardium hemimeris, Tate.
Chione cainozoica, T. Woods.
Meretrix eburnea, T. Woods.
,, tenuis, Tate.
Tellina cainozica, T. Woods.
† ,, albinelloides, Tate.
† ,, aequilatera, Tate.
Semele vesiculosa, Tate.
,, krauseana, Tate.
Corbula ephamilla, Tate.
,, pixidata, Tate.
Cuspidaria subrostrata, Tate.
Capistrocardia fragilis, Tate.

Gastropoda.

Murex velificus, Tate
,, rhysus, Tate.
,, eyrei, Tate.
,, amblyceras, Tate.

Murex lophoessus, Tate.
,, trochispira, Tate.
Muricidea camplytropis, Tate.
,, asperulus, Tate.
† Typhis evaricosus, Tate.
,, acanthopterus, Tate.
,, laciniatus, Tate.
Rapana aculeata, Tate (?).
Argobuccinum maccoyi, Pritchard.
Lotorium woodsi, Tate.
Lotorium textile, Tate.
† ,, oligostirum, Tate.
† ,, gemmulatum, Tate.
,, protensum, Tate.
,, annectans, Tate.
Colubraria tenuicostata, T. Woods.
Fusus dictyotis, Tate.
,, senticosus, Tate.
Latirofusus aciformis, Tate,
,, exilis, Tate.
,, hexagonalis, Tate.
Siphonalia longirostris, Tate.
Tritonofusus crebrigranosus, Tate.
Solutofusus carinatus, Pritchard.
Fasciolaria rugata, Tate.
,, cristata, Tate.
Latirus interlineatus, Tate.
Euthria cingulata, Tate.
,, ino, T. Woods.
Leucozonia micronema, Tate.
Phos tardicrescens, Tate.
Loxotaphrus variciferus, Tate.
Nassa tatei, T. Woods.
Voluta ancilloides, Tate.
,, hannafordi, McCoy.
,, maccoyi, T. Woods.
,, sarissa, Tate.
,, pseudolirata, Tate.
,, antiscalaris, McCoy.

Voluta strophodon, McCoy.
„ weldii, T. Woods.
Lyria harpularia, Tate.
Mitra alokiza, T. Woods.
„ leptalea, Tate.
„ atractoides, Tate.
Conomitra ligata, Tate.
„ othone, T. Woods.
Marginella propinqua, Tate.
„ inermis, Tate.
„ micula, Tate.
„ wentworthi, T. Woods.
Ancilla semilaevis, T. Woods.
† „ hebera, Hutton.
„ pseudaustralis, Tate.
Harpa lamellifera, Tate.
Columbella crebricostata, T. Woods.
Cancellaria varicifera, T. Woods.
„ platypleura, Tate.
„ exaltata, Tate.
„ capillata, Tate.
„ gradata, Tate.
† Terebra leptospira, Tate.
Pleurotoma salebrosa, Harris.
„ trilirata, Harris.
„ septemlirata, Harris.
„ optata, Harris.
„ clarae, T. Woods.
„ murndaliana, T. Woods.
† „ samueli, T. Woods.
† „ paracantha, T. Woods.
† „ subconcava, Harris.
Bathytoma rhomboidalis, T. Woods.
Drillia integra, T. Woods.
„ vixumbilicata, Harris.
„ oblongula, Harris.
Cordiera conospira, Tate.
Clathurella bidens, T. Woods.
„ obdita, Harris.

Buchozia hemiothone, T. Woods.
Mitromorpha daphnelloides, T. Woods.
Teleochilus gracillimum, T. Woods.
† Bela crassilirata, Tate.
Columbarium acanthostephes, Tate.
,, foliaceum, Tate.
,, craspedotum, Tate.
Conus cuspidatus, Tate.
,, pullulescens, T. Woods.
,, ligatus, Tate.
,, heterospira, Tate.
,, dennanti, Tate.
Cypraea leptorhyncha, McCoy.
,, eximia, McCoy.
† ,, sphaerodoma, Tate.
,, contusa, McCoy.
,, pyrulata, Tate.
Trivia avellanoides, McCoy.
Erato minor, Tate.
,, australis, Tate.
Semicassis sufflata, T. Woods.
Morio gradata, Tate.
Natica hamiltonensis, T. Woods.
,, subnoae, Tate.
,, perspectiva, Tate.
,, polita, T. Woods.
,, subinfundibulum, Tate.
Solarium acutum, T. Woods.
Heliacus wannonensis, T. Woods.
† Collonia parvula, T. Woods.
† Scala lampra, Tate.
Crossea princeps, Tate.
Turritella platyspira, T. Woods.
,, conspicabilis, Tate.
,, acricula, Tate.
,, murrayana, Tate.
† ,, tristira, Tate.
Tenagodes occlusus, T. Woods.
Thylacodes conohelix, T. Woods.

† Thylacodes actinotis, Tate.
Eulima danae, T. Woods.
,, acutispira, T. Woods.
Niso psila, T. Woods.
Chileutomia subvaricosa, Tate and Cossmann.
Mathilda transenna, T. Woods.
Cerithium apheles, T. Woods.
† Ataxocerithium concatenatum, Tate.
Newtoniella cribarioides, T. Woods.
Triforis wilkinsoni, T. Woods.
,, sulcata, T. Woods.
,, planata, T. Woods.
Fissurellidea malleata, Tate.
Emarginula wannonensis, Harris.
Scaphander tenuis, Harris.
Ringicula tatei, Cossmann.
,, tenuilirata, Cossmann.
Bulinella aratula, Cossmann.
,, infundibulata, Cossmann.
,, exigua, T. Woods.
† ,, cuneopsis, Cossmann.
Roxania scrobiculata, Tate and Cossmann
† Acteon distinguendus, Cossmann.
† ,, olivellaeformis, Tate and Cossmann.
† Acteon funiculifer, Cossmann.
Semiacteon microplocus, Cossmann.
Umbraculum australe, Harris.
Limacina tertiaria, Tate.
Styliola rangiana, Tate.
Vaginella eligmostoma, Tate.

Scaphopoda.

Dentalium aratum, Tate.
,, mantelli, Zittel.
,, subfissura, Tate.

Actinozoa.

Flabellum victoriae, Duncan.
,, gambierense.
Placotrochus deltoideus, Duncan.

Placotrochus elongatus, Duncan.
Sphenotrochus australis, Duncan.
,, alatus, T. Woods.
Trematotrochus fenestratus, T. Woods.
Deltocyathus viola, Duncan.
Conosmilia elegans, Duncan.
,, anomola, Duncan.
Bathyactis lens, Duncan.
Balanophyllia armata, Duncan.
Notophyllia gracilis, Dennant.

Art. XIII.—*Observations on the Geology of Mount Mary and the Lower Werribee Valley.*

By A. E. KITSON, F.G.S.

[Read 12th December, 1901.]

On Quarter-sheet No. 8 S.W. of the Geological Survey of Victoria, published in 1864, a prominent hill, shaped like a double horseshoe, attracts notice. This is Mount Mary, known also as Green Hill. It has an explanatory note by the late Mr. Daintree, who surveyed the area included in the sheet, which reads:—"Blocks of white and yellow argillaceous sandstone containing Miocene Tertiary fossils are imbedded in the scoriaceous lava of Mount Mary, proving the extension of the Miocene strata to this point under the lava of the plains, these being ejected blocks during the eruption."

This induced me to make a few visits to the place extending over a period of several years.

The geology of the district is interesting, and necessitates so much careful observation that sufficient information has not yet been collected to admit of any definite conclusions being formed regarding certain of the rocks occurring along the Werribee River. It is, therefore, with some diffidence that I submit these few observations, perhaps somewhat prematurely, but brought forward now as opportunities for further examination of the locality may not present themselves within a reasonable time.

On referring to the Quarter-sheet mentioned, it is seen that the whole of the area included therein, except a fringe of alluvium along the Werribee River, has been marked as of volcanic origin. These volcanic rocks comprise basalts, scoriae and tuffs, and are of considerable thickness, representing the products of several eruptions from Mounts Mary and Cotterill, and unnamed points of eruption on the east and west of Mount Mary.

The summit of Mount Mary, apparently the highest point in the locality, is somewhere about 500 feet above sea level. The mount is of more than geological interest as it is the north-western termination of the base line from Werribee, upon which the geodetic survey of Victoria has been founded. It lies due west of Melbourne, at a distance of 24 miles in a direct line.

The shape of the mount is not quite as shown on the Quarter-sheet. Instead of the unbroken rim on the south it has a distinct sloping hollow there in addition to that shown on the north, indicating ruptures of the rim of the old crater through which the lava flowed away in both directions when the volcano was in its expiring stage. The volcanic rocks visible comprise vesicular and dense basalts of light to dark bluish-grey and drab-grey colours; reddish-brown and chocolate decomposing scoriae; and yellow and grey consolidated tuffs. Some of the scoriae weathers into brick red soil. In parts the basalt is very tough and vesicular, and contains a little hyalite; and again it is fine-grained and splinters into fragments. Some portions of the scoriae are exceedingly friable, and occasional blocks show embedded pieces and fragments of basalt. On the northern slope great numbers of masses and blocks of vesicular basalt, scoriae, and consolidated tuffs occur. Some of the latter contain pieces of originally fossiliferous clays now turned into dense rock like porcelain-jasper, and other pieces altered only to a moderate extent. An interesting feature, shown by a few small pieces found at one place, is the intimate mixture of small fragments of scoriae with the altered clays showing casts of fossils. Owing to the absence of any natural or artificial sections here the nature of the rocks forming the mass of the mount can be determined only so far as the broken blocks will admit.

The fossiliferous blocks referred to occur near the summit on the north-western and western slopes of the mount. No blocks were noticed near the foot of the slopes, the lowest found being about 175 feet below the summit on the southern side. They consist of altered clays and fine sandy and gritty clays of brown, red, grey, yellow, and white colours. There is an entire absence of carbonate of lime from the fossiliferous pieces obtained, while in one or two cases a little silica was noticed, forming a coating on the casts of fossils. In the more altered pieces the fossils have been completely destroyed so far as determination is concerned, and consist merely of badly defined lines and blotches, indicating, apparently, the worm-like appearance of scaphopods, and the coarser stems of bryozoa. Among the less altered pieces, however, the casts of many of the fossils are still sufficiently well-preserved to admit of generic determination, and in a few cases specifically also. Doubtless, long and careful searching would disclose quite a number of determinable species.

The following list represents those sufficiently distinct to mention :—

Pteropoda.

Vaginella eligmostoma, Tate

Gastropoda.

Bathytoma angustifrons, Tate
Clathurella sp.
Cancellaria sp.
Marginella sp.
Siphonalia sp.
Murex sp.
Turritella sp.
Natica sp.

Lamellibranchiata.

Placunanomia ? sp.
Spondylus pseudoradula, McCoy
Lima ? sp.
Pecten sturtianus, Tate, prob.
Amussium zitteli, Hutton
Septifer ? sp.
Glycimeris laticostatus, Quoy and Gaimard
Leda huttoni, T. Woods.
Trigonia subundulata, Jenkins
Cardita sp.
Corbula ephamilla, Tate ?

Actinozoa.

[1] Sphenotrochus alatus, T. Woods

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[1] This Coral, of which two examples were obtained, has been kindly identified by Mr. J. Dennant, F.G.S., F.C.S., to whom I am also indebted for determining several other fossils in the list.

Brachiopoda.

Magellania sp.

Bryozoa.—Several species.

Foraminifera.—Several species.

The preceding list appears to indicate an Eocene age for the fossils, and they are herein provisionally referred to that age. This agrees with the note on the Quarter-sheet referring to them as Miocene fossils, the Miocene of the old survey being, as is now generally acknowledged by palaeontologists, either Eocene or Oligocene. There seems no reason to doubt that the beds from which these fossiliferous blocks were torn form portion of those beds of Eocene age occurring at Newport and Altona, near the western shore of Port Phillip.[1] These deposits have been proved by bores and shafts to there underlie the volcanic rocks of the Werribee plains.

On the summit of the mount, a small shallow excavation shows the occurrence of whitish clay, probably a large ejected block. This clay has evidently been used as a pigment by aboriginals as the excavation shows no evidence of being a natural one, and small pieces and flakes of the clays are found in the immediate vicinity. Along the summit also, and almost exclusively at the western end, flakes and "cores" of various rocks—both local and foreign to the locality—are fairly plentiful. The local ones comprise the ejected clays from those only slightly altered to those which are practically porcelain-jaspers. The absence at the surface of greater numbers of blocks of this rock is probably due to the fact that the aboriginals have used for their implements and other purposes nearly all the material observable on the mount. The foreign flakes are of red and white quartz, quartzites, hornstones, and the indurated sandstones which are found among the pebbly gravels of the Werribee Valley. Several hammers and axes in the rough, together with a ground

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1 "A Contribution to our Knowledge of the Tertiaries in the Neighborhood of Melbourne." T. S. Hall, M.A., and G. B. Pritchard. Proc. Roy. Soc. Vic., vol. ix., n.s. 1896.

"Report of the Secretary for Mines Victoria, for year 1894."

"Report on boring for Coal at Newport." Jas. Stirling. Prog. Rep. Geol. Sur. Vic., No. ix.

"Report on the Brown Coals and Lignites of Victoria." Jas. Stirling. Prog. Rep. Geol. Sur. Vic., No. x., pp. 80-2.

one, were found here, and numbers of pebbles of quartz, either intact, or more or less flaked. Few flakes were noticed away from the summit, or high up along the sides, thus indicating that the aboriginals used the mount as a look-out and rendezvous. It gives a most extensive view across the country in every direction, especially over the treeless Werribee Plains, and towards the Brisbane Ranges and the You Yangs.

The only trees on the mount are a few sheoaks, and an occasional lightwood, though a few eucalypts grow in the vales below, and fine specimens of them may be seen along the Werribee River, where, also, there are several other kinds of trees, conspicuous among them being the native laurel.

On examination of the natural sections, and the road cuttings at the bridge over the Werribee, one and a half miles east of Mount Mary, it is seen that at least two flows of basalt are present, separated by thin beds of tuff and lapilli; while along the river, near the sharp bend in the N.E. corner of Allot. 25B, parish of Werribee, as shown in the Quarter-sheet, a fine natural section is visible in the cliffs. The following note thereon describing this section, is as follows :—"28 feet hard scoriaceous basalt, laminated and jointed; 24 feet soft friable basalt, with hard imbedded nodules; 9 feet volcanic ash; 13 feet thin laminae of soft decomposing scoriaceous basalt; 30 feet soft friable basalt, enclosing nodules and irregular bands of augitic basalt."

These tuffs consist of a firmly cemented fragmentary rock, comprising a mass of subangular and rounded grains of sand, and fragments of basalt, scoriae, and tachylite, up to the size of grains of sand through which are distributed larger pieces of scoriae and vesicular basalt. The scoriae fragments are mostly decomposed into yellow clay.

Interbedded with these are thin bands of very fine material—volcanic dust—which forms a coherent rock, while along bedding and joint planes and exposed places, a thin crust of carbonate of lime has been deposited. This gives the rock a pretty, white appearance, noticeable from a long distance. The coherent nature of these tuffs seems to indicate that they were mixed with a considerable quantity of water prior to deposition and were not accumulations of dry material.

The sections shown by the aforementioned road cuttings are of interest, especially that on the eastern side of the river. Taking that one—which is some 420 feet long—in detail, we find the following succession, commencing at the eastern end :—

A.—Red and greyish-red soil with small pieces of decomposing basalt, and masses of greyish-white carbonates of lime and magnesia. This has a basin-shaped appearance, taking the section between the surface and the slope of the road, and in the middle is about 5 feet thick, gradually tapering off to the surface as traced west, and overlying B. Its length is about 60 feet.

B.—Dense and partly vesicular dark bluish basalt, full of blebs and patches of carbonate of lime. The rock is considerably jointed, changing, in the lower part, into laminated and nodular basalt. The material in the interstices and portions between the nodules is quite decomposed. This basalt is about 14 feet thick in the thickest part, and extends for about 150 feet along the cutting, terminating steeply near its western end, thus overlying C for nearly the whole way.

C.—Very vesicular basalt, weathering in a ragged semi-columnar manner, and greatly jointed, quite different in general appearance from the laminated structure of the immediately overlying basalt. It shows a length of about 210 feet, sloping off very gradually on the east, but more steeply on the west. It is about 6 feet thick in the middle.

The basalt in this section seems to have been derived from Mount Mary, and consists of at least two flows. The old surface of C appears to have been a very irregular one, probably due to unequal cooling of the surface of the flow, and the jutting prominences of ragged blocks torn from the parent mass.

In one or two places there are pieces of C wedged *in situ* into the lower portion of B. At the western end of the cutting the lower portion of B consists of a band of dense dark blue basalt, the upper portion of decomposing nodular and laminated basalt.

The western end of C shows the ropy structure of strained viscous lava, and at one place on the south side of the cutting a pear-shaped piece may be seen.

In the lowest visible portion the rock is a decomposing finely nodular and laminated basalt—the laminations simulating current bedding in their diverse dips. This, also, is perhaps due to strain before solidification.

On the northern side in this lowest portion is an included block of altered mudstone or clay, about 5 feet above the road level. It appears to have been torn from its original bed and carried along by the lava flow, or, on the other hand it may be an ejected block similar to those on Mount Mary. I think, however, that the former is the more probable, as the general appearance of the vicinity does not convey the impression that an old crater had existed there.

Near this included mass there is a nearly vertical thin band of hard vesicular basalt, which may be a small dyke, or a harder portion of the main flow, as, though there is a sharp break in the western side between it and the containing decomposing nodular basalt, it seems to merge gradually into the decomposed rock on the eastern side.

Section on Road on Western Bank of Werribee River.

This section runs north and south, parallel with the stream. It is only about 100 feet long. The lowest portion consists of nodular, decomposed, massively-jointed basalt, with patches of hard, vesicular basalt at the northern end, and nodules of harder basalt at the southern end. At this end it is about 28 to 30 feet thick, thinning considerably towards the north.

Immediately overlying is a bed varying from 2 feet 6 inches to 3 feet 6 inches of friable tuff and lapilli, having an uneven appearance, as if sprinkled in a dry state over a surface showing considerable inequalities, due to irregular cooling and solidification of the flow. The lapilli bed contains a great quantity of medium-sized grains of quartz, as if portions of a coarse, sandy, or gritty bed had been torn from the walls of the crater, absorbed by the volcano, and later on spread over the adjacent country, mixed with fragments of scoria and volcanic mud.

The tuff and lapilli bed has a considerable amount of carbonate of lime occurring as a coating along the bedding and joint planes. Harder and firmer vesicular basalt, very laminated in places, and considerably decomposed, rests on this bed. It runs to the surface, and varies in thickness from some 20 feet at the southern to 30 feet at the northern end.

The general appearance of these sections when viewed from the north up the Werribee gives one the impression that the flows originated at Mount Mary, as they appear to be at a slightly lower level on the eastern than on the western side of the river.

The nearest point of eruption of any size—other than Mount Mary—to this place is a hill shown in Allot. 23c, parish of Tarneit, on Quarter-sheet 8 S.E., and described thereon as a "Volcanic hill—red scoriaceous basalt." This hill rises to a height of less than 100 feet above the plain, and the summit on the northern, eastern, and southern sides shows a rising succession of fairly well-defined rims, one inside the other, of scoriaceous and partially laminated dense basalt of light and dark grey colour. On the north-western and western sides the slope is gradual and regular on to the hollow part of the adjoining plain, as if the final flow from the point had run off in this direction, while simply welling up and solidifying in that position on the northern and eastern sides. On the southern and south-western sides the slope is gradual, but along a low rise. There are present numerous aboriginal stone flakes and occasional implements and pebbles of the same kinds of rocks as on Mount Mary, with the exception of the altered clays. Of these one small piece only, of what has somewhat the appearance of this clay, was found. The absence of this rock seems to prove either the absence of these clays underlying at a depth, as in the case of Mount Mary, or that the volcanic forces here were not strong enough to break away the walls of the crater and eject such broken blocks, or even to distribute tuffs in the vicinity; thus being no more than sufficient to cause the molten rock to quietly well forth and flow away, and this even only on the north-western side.

Taking the country generally, we find that volcanic products represented by basalt, scoria, tuff and lapilli cover nearly the whole of the district, overlain in the depressions and along the Werribee and tributary creeks by alluvium, and towards the north by pebbly drift—to be mentioned later—and a covering of varying thickness of clays of obscure origin.

The Werribee has cut for itself a deep gorge through these volcanic rocks, and though not examined the whole way from Mount Mary Bridge to that at Exford, still, wherever inspected at various points along the valley, no other deposits than those and recent drift and alluvium were noticed. The river cliffs in some places exceed 130 feet in height, and for a long way up stream from the Mount Mary Bridge beds similar in appearance and position to the tuff beds occur on the eastern side of the river, and doubtless on the western side also.

Now, turning to that portion of the Werribee Valley near Exford, the following geological features may be seen :—In the upper portion of the first gully on the western side of the river below the bridge on the Melbourne-Ballarat Road, we find a thick capping of drift, consisting of pebbles from the size of a man's head to that of a pea, mixed with gravel, sand, and large pebbles of vesicular basalt, resting on the basaltic sheet of the plains. These pebbles have probably been derived from Ordovician rocks, and comprise quartz, quartzites, indurated sandstones, etc.

As the gully is followed down towards its junction with the river, this pebbly drift is seen to occur on both slopes, and shows in small section directly overlying the vesicular basalt. It has here a thickness of something like 50 feet.

Underlying the vesicular basalt directly is a deposit of fine, sandy mudstone, of light grey and fawn colours, with a few pebbles like those seen at the Werribee Bridge at Exford—to be mentioned later. This is underlain by a sharply defined bed, 3 feet thick as far as visible, of medium-sized pebbly gravels of indurated sandstones, quartz, and quartzites. These, again, lie on dense, dark, laminated, and irregularly-jointed basalt.

The succession of rocks in descending order is thus :—

A.—Coarse pebbly drift lying on the eroded flank and surface of B.

B.—Vesicular scoriaceous basalt of the Werribee Plains containing pieces of tachylite.

C.—5 feet of mudstone, with few pebbles, underlain sharply by 3 feet of pebbly gravels. (These gravels are probably thicker, but the section precludes more from being seen).

D.—Dense, dark, laminated, and irregularly-jointed basalt, with small crystals of a glassy felspar?, showing in bed of gully where alluvium masks the surface.

I was not enabled to examine the river cliffs near here, so cannot say anything more with respect to the succession of rocks.

At the Werribee Bridge at Exford, again, in the road cutting on the western bank, the following succession is noticeable, beginning at the highest :—

A.—A few inches to 6 feet of drift consisting of pebbles of rocks similar to those referred to in the gully section.

B.—Vesicular and scoriaceous basalt, in part decomposing in laminations. Layers of white carbonate of lime occur in this basalt; also a considerable amount of white clay, containing decomposing amygdules of a brownish colour and soapy nature.

C.—Very finely sandy clays of white, brownish-yellow and reddish colours, containing fine subangular grains of quartz, and numerous small pebbles of quartz, and dense slightly vesicular basalt in the higher portion; but full of such pebbles in the lower portion.

From this point to the river level—about 30 feet below—the rock is masked by material washed down the slope, but almost without doubt basalt occurs beneath, as at the junction of Toolern Creek with the Werribee River, about 200 yards below the bridge, basalt can be seen down to the water level in the eastern cliffs.

This sandy clay has rather a peculiar appearance, and may not entirely owe its present location to transportation by water. It may perhaps be a mixture of water-transported material, and that directly derived from a volcanic source.

In the explanatory sheet of notes published with Quarter-sheet No. 12 N.E. (Bacchus Marsh), Messrs. R. Daintree and C. S. Wilkinson, who surveyed the area included therein, make the following notes :—Note 15, "Section at head of small ravine, showing 30 feet vesicular basalt, and 4 feet volcanic ash, mixed with a little white quartz sand resting on red ferruginous sand with fine quartz pebble drift." Note 19, "A thin layer of rounded quartz pebble drift occurs here between the Miocene Tertiary and Upper Volcanic. It is probably the continuation southwards of the Older Pliocene auriferous drift underlying the basaltic tableland about six miles north of Bacchus Marsh. . . ."

These notes refer to deposits occurring in the cliffs along the Parwan Creek, some seven miles to the north-west of Exford, and they apply to a certain extent to the sections at and near Exford.

The former note quoted indicates a combined volcanic and ordinary sedimentary origin for these Parwan Creek beds as may be the case regarding the finer beds near Exford. In some places here this bed of fine material appears to have been altered by the covering basalt, being slightly hardened and of a reddish-pink colour. To test the probability of this I took a piece of the greenish-yellow rock and first roasted, then burnt it. The result was a rock very similar in hardness, colour and general appearance to that in question, which points towards its alteration by heated contact.

The surface pebbly drift may also be seen at the following places:—On the top of the flat ridge between the Toolern Creek and the Werribee River; on the top of, and stretching back from, the cliffs on the east and west of the Werribee for some distance south of the Melbourne Road; at the junction of the Bacchus Marsh and Ballan Roads in the south-west corner of Allotment 18B, parish of Mooradoranook. It probably extends along from here to the Werribee Bridge at Exford, but this portion was not examined.

It can also be seen along the railway between Melton and Bacchus Marsh, covering large areas on the north of the railway, as shown in Quarter-sheet 12 N.E. This is probably the main mass of which the portions herein specially described are the attenuated southern remnants.

We find, therefore, that the locality near the Exford Bridge shows that there are at least two flows of basalt, with an intercalated bed of pebbly drift, overlain by a thin bed of very fine gritty mudstone or clay; while overlying the upper of these two flows of basalt is a bed of varying thickness of coarse to fine pebbly drift.

This surface drift appears too extensive to be attributed to fluviatile action alone, and I am inclined to regard it as of combined fluviatile and littoral origin, especially as it shows evidence of having been subjected to a great deal of attrition, whereby all the softer rocks, such as argillaceous slates and shales, have been worn completely away, and only the harder siliceous rocks left. This refers of course to that portion of the drift which comprises sedimentary rocks foreign to the locality, thus excluding local basalts.

It would, therefore, appear as if the surface drift had been laid down along the shore of a shallow sea, the bed of which consisted of hard basalt while this basalt itself had flowed over a thin bed of coarse and fine sediments, which also had been deposited along a shore line, but in deeper water.

This suggests the probability that a shallow sea existed in the locality at a former period, in which Mounts Mary and Cotterill, as well perhaps as some other high points, stood as islands in a state of fairly energetic eruption; that their lava flows, running in a northerly and westerly direction respectively, were poured over a sea-floor, and thus were submarine flows which gradually shallowed the sea; that during cessations in eruptions or deviations in flows from these stated directions, the deposits of siliceous pebbles were brought down by a large river from the Ordovician highlands above Bacchus Marsh; that the finer sediment on the upper portions of this intercalated bed, which consists of an intimate mixture of rounded and sub-angular fine quartz grains embedded in a rather harsh, greenish-yellow clay, is possibly partly of sedimentary and partly of volcanic origin; that another lava flow spread itself over this one, advancing probably nearer to the shore line than the former one; that cessation or deviation again took place long enough for a thicker deposit of pebbly gravels to be formed; that during the whole of this time the coast line was gradually rising, and now came above the surface while the volcanic forces were gradually becoming extinct; that as the land continued to rise and the sea to recede the latter carried away the outer margin of the littoral deposits, and continued to do so at the same relative rate as the land was rising, thus precluding the probability of any patches of it being left on the normal level of the underlying basalt.

There appears to be conclusive evidence that the land around Port Phillip has risen considerably since late Tertiary times, and assuming this to be so, and, also, that the tentative theory just advanced is the correct one, the age of this pebbly drift is probably late Pliocene or Pleistocene.

Art. XIV.—*On some Features of the Ordovician Rocks at Daylesford; with a comparison with similar occurrences elsewhere.*

By T. S. HART, M.A., B.C.E.

[Read 12th December, 1901.]

The Ordovician or Lower Silurian Rocks occupy the surface or occur at no great depths over the whole area around Daylesford. Numerous natural and artificial sections show that the rocks are much folded. The general strike is between north and north-west. Mr. F. M. Krausé[1] states that the general strike of the beds in the latitude of Wombat Hill is 16° to 22° west of north, approaching further north more and more to the magnetic meridian. In my own observations several localities further south show a strike much more to the west of north. The dip varies from 45° to vertical. The Ordovician age is indicated by the graptolites found in several localities. Mr. T. S. Hall[2] has correlated a portion of them at least with the lowest parts of the Castlemaine series.

No granitic areas or other extensive plutonic rocks occur anywhere near Daylesford.

The area to the north of Daylesford forms Quarter-sheet 16 N.E., mapped by the late Mr. Norman Taylor, and published 1893; that to the south (16 S.E.) has been mapped by Mr. S. Hunter, published 1895. I propose in this paper to notice certain minor features connected with the folding of the rocks, and to compare them with similar occurrences elsewhere.

An interesting section, presenting unusual features, is seen in the railway cutting at Italian Hill, on the Daylesford-Ballarat Railway, Quarter-sheet 16 S.E., immediately north of the lake (the lake is formed by damming the stream marked Wombat Creek on the map). There is another Italian Hill some miles

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1 Progress Report of the Geological Survey of Victoria, No. 5.

2 Proc. Royal Society of Victoria, vol. vii., New Series.

north-west of Daylesford, which must not be confused with this.

The direction of the railway cutting close to the lake is about N. 25° W., the strike of the rocks N. 40° W., dip south-westerly at 50°. The eastern or inner face of the cutting, about 40 feet high, is thus taken out almost on the bedding planes, or follows them for some distance. The outer low western bank, about 12 feet high, is a cross section of the beds, almost at right angles to the bedding, but the slight angle between the strike and the direction of the cutting allows the same beds to be seen on both sides. The railway turns a little more northerly and produces a deceptive appearance of a twist of the rocks on their strike.

A considerable surface on the inner slope parallel to the beds presents an appearance suggestive of ripple marking. A series of undulating ridges run across it, approximately parallel and nearly horizontally at intervals of 3 or 4 inches. Their upper slope is more steeply inclined to the general direction of the surface than their lower, and they are crossed obliquely, especially on their downward slope, by smaller ridges, also roughly parallel to one another and undulating. The rock is a micaceous sandstone.

Shallow curved depressions also appear, and a little further on the exposed surface of a hard sandstone is crowded with peculiar pits or pockets. These are hollows of various shapes and sizes, one, about 2 feet 6 inches across, reached a foot below the general surface of the bed. They are bounded by curved surfaces, and are generally steeper on one side, meeting the gently undulating surface of the bed, or of another pocket at a considerable angle. Often a number of the pockets are confluent. The sides of the pockets are frequently marked by curved ridges parallel to one edge and ending abruptly with the surface on which they appear. The pockets are usually empty, but sometimes filled by a softer sandstone, or by cleaved and jointed slate. Pockets filled with slate at one place form a prominent line running obliquely up the side of the cutting in a position which would correspond to the outcrop of a thin bed of slate, but the slate is discontinuous. On the opposite side of the cutting a disconnected slate patch is noticeable in about a corresponding position. The largest slate patch exposed on the east slope measured 16 inches by 12 inches, on the other side one was noticed in cross section measuring

22 by 9, the long direction roughly parallel to the beds. On the western slope also patches of softer sandstone can be detected in the sandstone. They are comparable in shape and position with the pockets, and their upper surface, sometimes at least, is also curved though not so strongly as their lower. Slate in the pockets in the sandstone is not, however, confined to the one band, others also occur, and it is probable that more of the pockets were once occupied by slate. It is said that when first exposed the sandstone in the pockets was hard. The hard sandstone in which the pockets occur softens near the surface and presents an appearance very like that in the pockets.

On the western side the chief point of interest is the form of the softer beds intervening between the sandstones. Sandstones greatly predominate at the south end of the cutting, and at first the slate beds vary slightly in thickness from point to point, the boundaries of the beds undulating and the upper and lower surfaces of the slates not corresponding. Further on, a thicker bed of slate occurs, which is very much contorted internally. At first the laminae of the upper portion are contorted and overfolded, further on a fracture crosses the bed obliquely, accompanied by a number of minor parallel fractures, all of which, as regards the laminae, present the appearance of thrust planes, but the contacts with the adjacent sandstones above and below are only deeply curved and not faulted. The result of this is a considerable thickening of the slate at this part.

In another slate bed a long wedge of sandstone is seen to project into the slate. This wedge measures about 8 feet in length on the exposed surface.

Further north there occur slate beds of very irregular character. One isolated patch of slate is of very irregular form, but with its longest diameter parallel to the beds, and a crack with slate fragments, continues in the same direction. Below it is a band of much broken slate mixed with coarse sandstone and of very irregular thickness. This continues north and takes the form of fairly continuous slate beds, with coarse sandstone between. An oblique hollow occurs in the underlying sandstone, into which a mixture of slate and course sandstone enters. The lower slate band subsequently divides, a small portion continues on its natural course for a short distance, but a more prominent oblique band of slate crosses the sandstone, about 3 feet thick, almost to the slate bed below. The sandstones above and below this band differ somewhat in texture, and numerous apparently detached slate fragments occur below the slanting band. Following this, the sandstone is largely cut away by local faults, and a hollow formed, which is filled by a confused mass of slate and sandstone fragments, the bed above also entering the hollow and being highly contorted, this contortion extending beyond the limits of the hollow. Beyond this the sandstone seems to resume a texture similar to that before the slanting band of slate. In the southern end of the band, and the mixture which enters the hollow in the sandstone below, the appearance presented is that of a conglomerate of slate fragments in sandstone, though many of the apparently isolated fragments of slate are no doubt really united.

A number of slate fragments enclosed in sandstone can be seen in the next cutting towards Daylesford, somewhat angular in outline and up to 9 by $2\frac{1}{2}$ inches in size.

At first sight the explanation might be suggested that the whole of the results might be due to deposition of somewhat plastic clay lumps with the coarse sand, accompanied by contemporaneous erosion of the underlying beds. A more detailed examination at once shows this to be untenable. One of the most conglomeratic patches is in the hollow of the sandstone below, which could not have remained open unsupported. It also fails to explain the gradual change to parallel bands of slate and sandstone. The alternative is that this is a pseudo-conglomerate, formed by breaking up of once continuous beds, and subsequent examination revealed all that was necessary to support this view.

Unequal thickening and thinning of slate beds between sandstones may be noticed in almost any railway cutting in the Ordovician rocks in this district. Slate beds are seen to be often completely interrupted on the exposed face. The variation in thickness and interruption is often connected with the jointing and other cracks in the neighbouring sandstone, and occasionally with small local faults. Sometimes the slate gradually thickens and abruptly stops at a joint or fracture in the sandstone. Contortion of the laminae is noticed in some of these cases.

The squeezing out of the slate goes so far as sometimes to show only occasional slate patches along a definite line of junction of two other beds. The connection with joints and fractures and contortion sometimes noticed, as well as the irregularity of the occurrence, indicates this as squeezing out, not thinning out.

The tendency of more plastic beds to thicken in the curves of a highly folded series and to squeeze out from the flanks of the folds is well known. If we look at the ordinary folds of the Ordovician rocks here we will find that a large portion of any bed is approximately a plane between the more sharply curved portions. If we have then a plastic bed whose thickness is comparable with the minor irregularities and small displacements of the more rigid beds alongside, it will be completely squeezed out irregularly, and patches will be left which have no passage by which they can move towards the folds, so that, in the extreme case we should expect a slate bed not to be completely squeezed into the folds, but to be represented by a number of more or less isolated remnants.

Even if no considerable area of the beds was near a plane, the boundary of the area from which the slate was removed would be irregular, and a section passing anywhere near this boundary would show more or less discontinuity in the slate.

The squeezing out would not necessarily take place especially at the places where the strata were most steeply inclined.

Again, the material of the more plastic beds is frequently seen to enter cracks in the adjoining sandstone, and this is most common when the cracks make an angle with the bedding considerably less than a right angle. By the gradual widening of this crack, either by bending of the bed or by the pressure forcing the more plastic material into it, we thus obtain a wedge of slate in a sandstone, and a corresponding wedge of sandstone in the slate. If such a wedge is cut transversely it may appear as an isolated fragment of slate in sandstone near to the main slate bed; but it may also appear as an isolated sandstone fragment included in slate. Examples of this are seen in various sizes up to that instance at Italian Hill. In an extreme case a considerable portion of a slate bed may appear as isolated fragments. As the irregular folding and yielding of the beds must result in frequent readjustments of the strains, it may often happen that a crack which once tended to open again tends to close, and a slate fragment may be thus pinched off from the bed. Numerous cases were noticed of slate fragments isolated in sandstone, but with a crack running to a neighbouring slate bed, and to the place where such a bed might have been. Some of these may not unlikely be wedges, but some really isolated.

This method of mixing of slate and sandstone may take place wherever the cracking of the sandstone occurs, and the slate is under pressure tending to squeeze it out. It may easily occur at anticlines even, if only the packing of slate is sufficiently complete. Its final stages may appear completely conglomeratic in section.

These depend essentially on the fact that one material is more plastic than the other, and are likely to be more marked the greater the difference ; hence the occurrence of the most conglomeratic appearance with the coarsest sandstone. But in a case like that at Italian Hill, when a slate is associated with a thin coarse sandstone, and all is between thicker sandstones, the mixed series will retain some plasticity even after the breaking up has begun, as long as slate is fairly continuous, hence the squeezing of the mass into the crack in the underlying sandstone. Its squeezing out between the sandstones at its south end may also be partly due to this.

In a mixed slate and sandstone series between thicker sandstones, the sandstones may be cracked across, and the slate squeezing into the cracks become continuous right across the sandstone. This may be seen both at Leveret's cutting (107 to $107\frac{1}{2}$ miles), and at the big Wombat cutting ($101\frac{1}{2}$ to 102 miles) Ballarat-Daylesford Railway.

The direction of the longer axis of slate fragments in the sandstone is variable, the cracks which contribute to their formation may or may not belong to some regular series of divisional planes.

At Bald Hills Creek near the locality of Note 12, on Quarter-sheet 16 N.E., occur slates with interlaminated hard sandy beds to quarter-inch thick. These can be seen as regular parallel beds, then becoming variable in thickness, then as nearly or quite disconnected lenticular patches, and at places the thin beds are bent into sharp folds, and the sandy beds are often interrupted, portions of them appearing as isolated fragments on a slaty base. But in a series in which sandstone predominates such effects traceable to contortion were not distinctly noticed.

A band of slate patches and strings passing into a continuous band of slate occurs near the above at Bald Hills Creek. The slate fragments being mostly angular this might be called a breccia, but as such isolated slate fragments more usually are to some degree rounded, and in extreme cases appear well rounded at all edges, the term pseudo-conglomerate seems preferable for the more marked development at Italian Hill, and in some instances mentioned below.

The surfaces of slate fragments enclosed in sandstone have often a satiny lustre, probably due to development of a film of sericite. This may be helped by sliding at the contact during or subsequent to the isolation of the fragment.

Conglomerates have been recorded elsewhere in the Ordovician rocks of Victoria, some of which are analogous to that at Italian Hill.

At Bendigo, Mr. E. J. Dunn[1] records the occurrence of a conglomerate "in several mines and at different horizons" of "rounded often flattish fragments of black slate, very soft, and the spaces between are filled with coarse-grained sandstone." His explanation is that the shaly material appears to have been deposited, torn up while scarcely firmer than clay and redeposited almost in situ with coarse sand. I visited the typical locality of the conglomerate at the Golden Pyke Mine It occurs close to and at an anticline. The slates are much contorted internally and contortion is also visible in some slate fragments in the conglomerate. Irregular thickening and thinning of the slates occurs, and they are frequently squeezed into cracks in the adjoining sandstones. The conglomerate is not always clearly marked off from the adjoining sandstone. The general arrangement of the slate is parallel to the bedding; both the sandstone and slate are sometimes continuous for some little distance. Sandstones greatly predominate in this part of the mine.

Near Chewton, Mr. T. S. Hall[2] describes a similar conglom-

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1 Report, No. 1, on the Bendigo Goldfield, 1892.

2 Proc. Royal Society of Victoria, vol. vii., New Series.

erate occurring in three localities. One locality is a little to the Melbourne side of the 73 mile post. The sandstone here in which slate fragments appear embedded is of coarser texture than others in the vicinity, though fine compared with what might be expected in a conglomerate with fragments of the size seen. Near the 72 mile post slate bands and fragments are again seen in coarse sandstone, the general direction of the slate being parallel to the beds, and their arrangement might at one place be due to contortion. Through the cuttings from Chewton to the Elphinstone tunnel irregular thickening of slate, sometimes at joints and cross fractures in the sandstone, interruption of slate beds and squeezing of slate into cracks were frequently noticed, and apparently detached slate fragments. At one place beds of sandstone up to 11 inches in thickness are broken and the intervening slates come together.

A conglomerate of somewhat different character occurs under the down distant signal post at Chewton. The exposed surface shows subangular and rounded sandstone fragments in a slaty paste, the slate between the sandstone sometimes shows contortion ; slaty material also enters the cracks in the sandstone, the thickest sandstone bar runs for about four feet with a varying thickness to three inches, but most of the sandstone appears fragmentary. This occurrence might represent the extreme stage of contortion such as that at Bald Hills Creek, but at Chewton the sandstone is in greater proportion and contortion not so clear. It approaches closely to the other conglomerates, except that the slate predominates and appears therefore as the more continuous matrix, the sandstone appearing fragmentary.

The catalogue of the rocks of Victoria in the Technological Museum records a conglomerate of fine grained, often micaceous sandstone, enclosing rounded pieces of slate from Section 50, parish of Spring Plains, Quarter-sheet 13 N.E. I find no note of this on the Quarter-sheet, but oblique lamination of slates and sandstone (to be referred to later) and contortion are frequently recorded near this point and elsewhere on this sheet.

On Chinaman's Creek, north-west of Castlemaine, Quarter-sheet 14 S.E., a note records fragments of slate embedded in a surface of sandstone.

In the railway cuttings south of Creswick were noticed isolated slate patches, probably due to both causes of squeezing out and pinching off. Wedges of slate projecting into sandstone were also noticed.

Quartz was noticed associated with these conglomerates at the Golden Pyke Mine and near Elphinstone tunnel, but not affected by the breaking up. It is clearly of subsequent date.

Conglomerates are also recorded in the Ordovician Rocks at several patches near Lauriston, where the note probably refers to some overlying rock, the areas being outlined, but not coloured differently to the Ordovician.

At Coimaidai there is a true conglomerate of small extent described by Messrs. Officer and Hogg.[1]

On the Keilor Plains, Quarter-sheet 7 S.E., several bands of conglomerate are noticed. These are true conglomerate, but their Ordovician age is not certain.

An analogous mixing of beds of different character is noticed by Professor David and Mr. Pittman near Tamworth, N.S.W. "Though as a rule the tuff beds are regularly and evenly interbedded with the radiolarian clay shales, instances are not infrequent where these rocks are confusedly intermingled together." A reproduction of a photograph shows disturbed masses of radiolarian shale enclosed and entangled in a thick bed of submarine tuff. The two views figured are described as "laminated and contorted Radiolarian chert in submarine acidic Tuff" and "Radiolarian chert with submarine Tuff crushed into them."[2]

Mr. Pittman describes certain conglomeratic rocks at Lyndhurst[3] in which the included fragments of claystone are exceedingly angular, and appear to be the remains of claystone which have been intruded and broken up by the tuffaceous matrix through which they are now scattered. The disturbance is ascribed to injection of steam and other gases.

The breccia from Maldon, in the Technological Museum, is clearly due to brecciation of a rock subsequent to its formation.

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1 Proc. Royal Society Victoria, vol. x., New Series.
2 Q.J.G.S., lv., 1899.
3 Records G.S. N.S.W., vol. vii.

An appearance of ripple marks has been before noticed as occurring at Italian Hill. Ripple marking is also seen at Bald Hills Creek in the sandstone, and at Jim Crow Creek, below Spring Creek, in a series of slates in which faulting parallel to the beds has occurred on three different beds.

"Ripple marks" have been frequently noticed in the Ordovician Rocks of Victoria.

I find only one mention of ripple marks on the Quarter-sheets, near Metcalfe (13 S.E.) "nearly vertical contorted mudstone and shales, some of the beds are ripple marked." Oblique lamination and cross-grained sandstone (to be referred to below) are also noticed near here.

Ripple marks are described by Mr. Dunn as common at Bendigo at many localities, and horizons, and regarded as true ripple marks.[1]

Mr. T. S. Hall, however, referring to similar occurrences at Castlemaine, suggests that there and at Bendigo they are the result of crumpling during folding.

Mr. C. C. Brittlebank[2] says of the rocks at the Werribee Gorge, "contortion and pseudo-ripple markings are well developed, the latter appear more extensively in localities which have been subjected to the greatest strain and pressure."

Mr. G. W. Lamplugh, writing of crush conglomerates in the Isle of Man, says:—"Where packing has taken place, the lines of stratification are confused in a series of wrinkles, which emerge on the bedding planes, as small parallel folds closely resembling ripple marks;" to these he applies the term pseudo-ripple marking.[3]

Mr. E. R. Faribault, of the Geological Survey of Canada, describing saddle reefs in Nova Scotia, where, however, the folding has not proceeded nearly so far as at Bendigo, states, "the corrugations and crumplings are more pronounced in the slate and quartz, and owe their origin to the sliding of thick beds of quartzite over one another, between which the softer bands curve and buckle in a wonderful manner."[4]

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1 Report on Bendigo Goldfield, No. ii., 1896.
2 Vic. Naturalist, vol. xviii.
3 Q.J.G.S., li.
4 Austr. Mining Standard, Oct. 29, 1899.

We may notice also that in the Daylesford cuttings joints occasionally show a somewhat wavy surface in sandstone (in slate they are much smoother) and that there is a slight rippling of the surface of the pockets at Italian Hill.

A consideration of the effect of the crumpling on the junction of two dissimilar rocks will lead to the conclusion that it is highly improbable that such a surface, if originally even, should remain so at any place when packing has taken place in one of the rocks, and the inequalities would be likely to assume some linear arrangement, as the folds within the crumpled bed do. The fact that the main ridges of the apparent ripple marks at Italian Hill are nearly parallel to the strike agrees with this.

At Daylesford, Bendigo and Chewton, and probably at most other places, in the Ordovician rocks in Victoria the evidence of movements and packing in the slates is so definite and widespread that the existence of apparent ripple marking has an adequate explanation in this, and is, at least, no evidence of original ripple marking.

The pockets in the sandstone at Italian Hill do not appear to be a common feature. They can be seen also in the by-wash of the Lake, where some might at first sight be mistaken for potholes, but their form is easily recognised and they are revealed by slight slipping in the solid bank. They are probably in the same beds as appear in the cutting. They are also seen at the north end of Leveret's cutting and at the Breakneck, north of Hepburn, and possibly at Chewton.

It is possible for sand to be deposited with an extremely uneven surface in rough water (as I noticed in sludge from sluicing deposited among rocks in Jim Crow Creek), but here there is no evidence of such currents and the edges of the pockets are too definite. The band of slate fragments filling some of them suggests that they are the hollows which have once been occupied by the fragmentary remnants of a squeezed-out slate bed, but others contain sandstone and are not on any evident line of a slate bed. If, however, a slate bed were to be squeezed into isolated patches the neighbouring sandstones being at places in contact this would tend to the production of very irregularly distributed strains in the sandstone, and hence might set up irregular curved fractures and irregular consolidation producing different weathering. The surfaces of the pockets do not differ from the sandstone any more than is common in joint surfaces and other fractures in such sandstone. At Leveret's cutting in one pocket a banded arrangement of strings of quartz and limonite was noticed, but here the whole rock was irregularly traversed by such strings, and at the typical instance at Italian Hill no concretionary action was noticed.

The sandstone beds at many localities contain a series of more or less undulating and usually discontinuous thin bands of fine grained material containing mica. Sometimes these are nearly parallel to the stratification, sometimes nearly parallel to the cleavage or to joints. In the large railway cutting near Wombat, a stepped junction with the neighbouring slate bed is noticed, as if a slight slipping had taken place on these planes. Near here it is possible to get clear observations of dip of strata, cleavage, these micaceous bands, and three sets of joints. These bands here agree most nearly in direction with one set of joints.

At Bald Hills Creek they are well developed, and form the "oblique stratification" mentioned in the note to the Quarter-sheet. The junction with the neighbouring argillaceous beds on both sides is somewhat indefinite, and the sandstone between them turns and forms lenticular patches in these beds nearly parallel to their general direction. They are parallel in several sandstone beds, but afterwards change their direction. Mr. N. Taylor's sketch shows the actual point at which the change takes place, which, however, I did not see. That they are not really stratification is clearly seen by their relation to the next beds, and their great regularity of development would also be against current bedding.

South of Creswick in a railway cutting they are well developed, standing out somewhat in the friable sandstone (probably owing to the mica flakes giving them some firmness, though soft). Here they may be seen to curve considerably and become less definite on approaching the slate beds from one side, but on the other side they continue unaltered to the slate. Their direction is near that of the cleavage.

Mr. E. J. Dunn notices a similar structure at Bendigo under the name of "fissuring," and regards it as a coarse development of cleavage.[1] He ascribes the finer material to the rubbing together under great pressure of the opposite faces of the "fissure," and the difference of direction from the cleavage he regards as "probably the result of torsion in the sandstone." A radial arrangement around the anticlines and synclines is noticed, and the fact that movement has taken place on these lines is seen by the notched boundary with the slate. One side of such notches I noticed to be often parallel to the "fissuring." But at the Golden Pyke Mine, where it and the cleavage are well developed, I noticed no corresponding change of cleavage direction with the change of direction of the "fissuring" round the anticline.

An exactly similar arrangement is well marked at Chewton, with the same notched boundary of the slate. It is described by Mr. T. S. Hall as jointing. I noticed it well developed at two synclines between Chewton and the tunnel. Its strike is about the direction of the syncline, and it is not affected in its radial arrangement by the fact that the axial plane of one of these synclines is considerably inclined.

At another place in these cuttings similar lines were seen in a direction more nearly horizontal than vertical.

The same structure is probably referred to by the term "oblique lamination," used by Mr. Norman Taylor in Quarter-sheets 13 N.E. and S.E. I do not find it noticed on the other Quarter-sheets. These surfaces, then, appear to have no constant relation either to the cleavage or jointing. The finer material on them might result from crushing or from grinding, the arrangement of the mica flakes being in the one case at right angles to the pressure and in the other parallel to the motion. But their discontinuity in most cases and their curved form, sometimes pronounced, agree best with crushing under pressure. Their regular arrangement at the anticlines and synclines, and their variable development, both in direction and degree of definiteness and continuity, seem more likely to be connected with the distribution of the strain within the individual beds than with the forces acting on the mass as a whole. If the strata were being folded under the pressure of superincumbent

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[1] Report on Bendigo Gold Fields, No. II.

strata, both anticline and syncline might crush under their load as arches, and produce radial surfaces of crushing, unless the packing of the argillaceous beds were sufficiently rapid to prevent it.

In the straighter portions of the folds the direction of the pressure might approximate to that of the general pressure; that is, these surfaces might approach the cleavage direction, or it might tend to be at right angles to the beds, in which case these surfaces would approach the direction of stratification.

The fact of actual movement on these surfaces in many cases would then be the the result of yielding by slight slipping on planes of weakness already established. Their curving to the slate beds, as at Creswick, would probably be due to a yielding by a viscous shear along these more plastic beds. At Bald Hills Creek both of these have very likely taken place, and this may contribute to the abnormal strike 13° east of north, though further north, at a short distance, where this structure had disappeared, a normal strike N. 11° W. had been resumed.

The series of phenomena described all seem to indicate that in examining the effects of folding on a mixed series of rocks of different character due attention must be given to the differences of rigidity and probably compressibility of the different beds, and their manner of yielding under the strains to which they have been subjected.

Art. XV.—*On Some New Species of Victorian Mollusca, No. 5.*

By G. B. PRITCHARD and J. H. GATLIFF.

(Plates IX., X.).

[Read 12th December, 1901].

The present paper includes descriptions and figures of the following species:—

Mangilia (?) incerta, sp. nov.
Terebra inconspicua, sp. nov.
Leptothyra arenacea, sp. nov.
Calliostoma hedleyi, sp. nov.
Haliotis granti, sp. nov.

We have to thank Mr. S. W. Fulton for photographs of some of the species, and Mr. F. E. Grant for the drawings of the remainder.

Mangilia (?) incerta, sp. nov. (Pl. IX., Fig. 1).

Shell small, narrow, somewhat solid, fusiform, composed of five and a half slightly convex whorls, with a well impressed suture. Embryonic portion consists of a whorl and a half, smooth and slightly swollen from the dorsal aspect, and apparently with an exsert tip.

The penultimate and spire whorls relatively strongly ornate, with close narrow costae traversed by a few strong spiral threads; on the penultimate whorl itself there are twelve or thirteen costae which are broader than the interspaces, and there are about five spiral threads, the median one being the coarsest.

The costae gradually fade out on the body whorl, but there are numerous (about fifteen) more or less irregular spiral threads, the strongest being situated at about the shoulder.

Aperture elongate-ovate, a little less than half the length of the shell, with a very broad anterior canal; columella smooth, slightly excavated medially, and with a gentle twist towards the anterior end.

The shell is of a uniform light brown colour.

Dimensions.—Length, 4 mm.; breadth, 1·5 mm.; length of aperture, 1·75 mm.; breadth of aperture, ·5 mm.

Locality.—Off Rhyll, Phillip Island, Western Port, obtained from shell-sand dredgings (J. H. Gatliff).

Type in Mr. Gatliff's collection.

Terebra inconspicua, sp. nov. (Pl. IX., Fig. 2).

Shell small, not solid. of $9\frac{1}{2}$ whorls, regularly and tapering. Apex blunt. Nucleus of $1\frac{1}{2}$ smooth whorls. Whorls telescopically arranged, slightly convex with numerous faint ribs crossing the whorls at almost regular intervals, the only other sculpture being faint transverse striae, visible under the lens. Suture well-defined, and on account of the overlapping of the whorl a slight shouldering is caused. Colour sordid white, irregularly, longitudinally streaked with brown.

Dimensions.—Length, 12 mm., greatest breadth, 3·5 mm.

Locality.—Dredged five to six fathoms off Rhyll, Phillip Island, Western Port (J. H. Gatliff).

Observations.—This shell may be readily distinguished, owing to its slight sculptural characters.

Type in Mr. Gatliff's collection.

Leptothyra arenacea, sp. nov. (Pl. IX., Fig. 3).

Shell small, turbinate, solid, umbilicate, whorls four to five convex, the two nuclear whorls smooth, the rest spirally ridged, these ridges being well-developed and numbering about eleven to thirteen around the mouth on the last whorl ; space between the ridges wider than the ridges, aperture circular. Umbilicus deep, and extends at the back of the columella to the anterior of the aperture, and is occasionally margined by a strong thread. Base round. Lip thick. Sordid white.

Dimensions.—Diameter, 2 mm. ; height, 2 mm.

Locality.—Dredged 5 to 6 fathoms off Rhyll, Phillip Island, Western Port (J. H. Gatliff).

Type in Mr. Gatliff's collection.

Calliostoma hedleyi, sp. nov. (Pl. IX., Fig. 4).

Shell conical, imperforate, apex acute. Whorls eight, convex, often tumid below the suture on the lower whorls, suture well-defined. Embryonic whorl smooth, the sculpture on the two following whorls is clathrate, and on the remainder consists of spiral, irregularly granular threads, of unequal size, and varying in number, usually six on the antepenultimate, and by the gradual division of some of them, increasing to eight on the penultimate whorl, and twelve on the body whorl above the periphery at the outer lip, and there are from twelve to sixteen on the base, these latter are often spotted with red on alternate threads, granulations on base flattened, space between threads narrow.

Base convex, umbilical region narrowly impressed. Aperture subrhomboidal. Outer lip thin, smooth inside. Inner lip, pillar oblique, smooth, rounded, somewhat excavately flattened at its base from within, not toothed.

Colour, yellowish-brown, with reddish markings, either in maculations or spots.

Dimensions of Type.—Diameter, 14 mm., height, 15 mm., other specimens measuring, 14 by 17 mm., and 14 by 12 mm.

Locality.—Dredged 5 to 7 fathoms off Rhyll, Phillip Island, Western Port (Gatliff); San Remo, Puebla Coast, Airey's Inlet, Lorne, Portland (Maplestone).

Observations.—As in many other Trochids the sculpture in this species varies considerably. By Australian conchologists it has generally been wrongfully identified as Trochus fragum, Phillipi, but reference to the original description and figure show that species to be a more acutely conical shell, with flatter whorls and larger granules. We agree with Mr. C. Hedley in his remarks at page 19 Proc. Lin. Soc. N. S. Wales, 1901, that T. fragum is a synonym of T. decoratus of the same author, the latter name having priority. Hitherto we have not found this species on our coast.

We have named the shell after Mr. C. Hedley, Conchologist to the Australian Museum, Sydney, as it is greatly owing to his critical remarks above referred to that we have been prevented from following the errors of others.

Type in Mr. Gatliff's collection.

Haliotis granti, sp. nov. (Pl. X.).

Shell strong, broadly ovate.

Dorsal aspect.—Spiral portion of the whorls well defined and elevated. Body whorl somewhat flatly convex, and from the outer lip, for about one-half of the whorl, radiately ruggedly ridged; ridges following the contour of the lip, and being six or seven in number; these are crossed by numerous irregular, comparatively fine, spiral ridges, which are closely scaled. Perforations strongly produced, tubiform; five open, and another half formed on the lip. The perforated ridge is followed outwardly by a broad concave area, then there is a well defined ridge, having on its under side two minor ridges; base sharply angled.

The spire is white, with irregular radiating bands of brown, with green shading, which gradually coalesce; the outer portion of the body whorl being of a uniform dull olive brown.

Basal aspect.—The inner lip is somewhat broad and concave; and from about its centre to the outward termination gradually tapers off in width.

The iridescence of the nacre is richly tinted, the predominating colours being rose and green.

Dimensions.—Greatest diameter, 140 mm.; smallest diameter, 110 mm.; altitude, 43 mm.

Locality.—Shoreham Beach, Western Port (J. H. Gatliff).

Observatcons.—This species in broadness of form and tubular production of the perforations is allied to H. cunninghamii, Gray, but is more rugged in sculpture, excepting in the spiral ridges, which are finer. It is nearly related to H. naevosa, Martyn, but is much broader, the spiral whorls are more elevated, the body whorl flatter and the projections of the perforations are much larger; the base of the inner lip tapers more gradually, and it is broader from the columella outwards; and the coil of the shell is more circular; the iridescent coloration is very much richer.

Type in Mr. Gatliff's collection.

We have much pleasure in naming this shell after Mr. F. E. Grant, who has assisted us in our work by his skilful drawings of many of our new species.

DESCRIPTION OF PLATES.

Plate IX.

Fig. 1.—Mangilia incerta, n. sp.
,, 2.—Terebra inconspicua, n. sp.
,, 3.—Leptothyra arenacea, n. sp.
,, 4.—Calliostoma hedleyi, n. sp.

(All much enlarged).

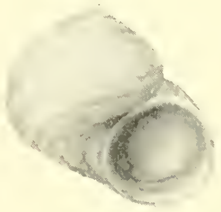
Plate X.

Haliotis granti, n. sp. × 2.

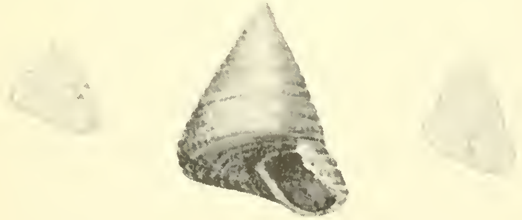
(About half natural size).

1

2



3



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Art. XVI.—*The Geology of Mount Macedon, Victoria.*

By J. W. GREGORY, D.Sc., F.R.S.,

Professor of Geology in the University of Melbourne.

(With Plates XI.-XVII.).

[Read 18th July, 1901].

I.—Introduction.

Mount Macedon is an isolated mountain ridge which, though seen at a distance of 40 miles, is one of the most conspicuous features in the views from Melbourne. Its hummocked crest rises abruptly from the broad basalt plains at its foot; and its outline stands boldly on the skyline above the level plains and dissected plateaux, which combine with it to form the northern and western rim of the great Melbourne basin.

The interest of the appearance of Mount Macedon is heightened to a geologist by the uncertainty as to its age and structure expressed on the maps of the Geological Survey of Victoria. The rocks are described as "Trap or Hypogene," and in the official geological handbook to the State, its age is suggested as probably late Palaeozoic, though on admittedly inadequate grounds.

This uncertainty is unfortunate, for a short acquaintance with the geology of the Melbourne area shows that Macedon is one of a series of similar igneous blocks, whose age and stratigraphical relations must be determined before the volcanic history of Victoria can be satisfactorily written.

In my first visit to Mount Macedon I had the privilege of the guidance and company of Mr. H. R. Hogg and Professor Spencer. I have also to express my thanks for much assistance in a subsequent visit to Mr. H. J. Grayson, who has prepared the photographs of the rock sections, as well as the sections themselves. I am indebted to Professor Orme Masson and Mr. R. J. Lewis for analyses of two Macedon Rocks; to Mr. H. C. Jenkins, A.R.S.M., for the analyses of allied rocks from the Dandenongs and Blacks' Spur; and to Mr. A. Everett for some advice as to the geographical nomenclature. Mr. E. T. Prior, of the Mineralogical Department of the British Museum, has very kindly examined some rock sections and given me the benefit of his opinion on some doubtful points, which is of especial value owing to his careful study of the allied rocks of Abyssinia.

II.—The Geographical Features.

Mount Macedon was discovered by Hume and Hovell in 1824. They saw it from Mount Disappointment, and named it Wentworth, after the distinguished champion of Australian liberty. The mountain was, however, first visited by Sir Thomas Mitchell, during his memorable journey from Sydney through Australia Felix. He ascended the mountain on 30th

September, 1836, in order to connect his route in northern Victoria with the southern coast. From the summit he saw Port Phillip, and, neglectful of Hume and Hovell's priority, he adopted for the mountain a new name suggested by that view. Mitchell explains, "I gave it the name of Mount Macedon with reference to that of Port Phillip" (12, vol. ii., p. 283). He adds that "Geboor is the native name of this hill, as since ascertained by my friend, Captain King, and is a much better one."[1]

Mount Macedon consists geographically of one long ridge, which on the west, south and north rises abruptly from the surrounding country. The ridge stands on a platform of Ordovician rocks, which are exposed beneath the Macedon series on all sides except the north-west. There, according to Aplin's map, the "traps" sink below the basalts of the "upper volcanic series"—the "Pliocene" basalts of the Geological Survey.

The "traps" of the Macedon group are represented on the survey map as covering an approximately rectangular area, the sides facing the cardinal points. The margins, however, are irregular, as inlets of Ordovician rocks are exposed on the floor of the deeper valleys. The main Macedon ridge runs obliquely across the area from the south-western corner to the eastern side. It is about five miles long and has three main summits. The name of Mount Macedon is often restricted to the south-western shoulder of the main ridge; this point is marked by the cairn of the Trigonometrical Survey. The height is 3325 feet. To the north-east of the trigonometrical station the crest descends slowly; it rises again to a central hummock, known as the Camel's Hump.[2] Hence the ridge descends again to another saddle, rising slightly to the eastern shoulder, the third conspicuous point in the view from Melbourne. The eastern shoulder is less abrupt than the south-western; beyond it a lower ridge continues towards the the east, where Macedon ends at the peak of Mount Eliza.

The northern face of the ridge is steep and comparatively unbroken. The southern side is a long slope, which has been

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1 This name is given as a synonym on Arrowsmith's Map of S.E. Australia. Parl. Pap. Gt. Brit., 1852-3, vol. xvi., p. 97.

2 The exact height of the Camel's Hump is doubtful; it is generally regarded as slightly higher than the south-western shoulder.

cut by a series of deep valleys into several spurs running southward from the main ridge. The most westerly of these spurs begins at the Camel's Hump and lies between the Turritable Creek to the west and the Willimigongong Creek to the east; it may be called the Upper Macedon Spur, as that village is situated upon it. The second spur is on the eastern side of the Willimigongong, and its most conspicuous feature is its southern shoulder, Mount Towrong (2820 feet); it may be called the Towrong Spur. Eastward again is the valley of Baringo Creek. Then follows the third spur, which leaves the main ridge at the height of 2720 feet at "Mahoney's Corner" and runs through Cherokee's to Mount Robertson; it may be called the Cherokee Spur. The eastern side of this spur is formed by the "Running Creek," a small stream which rises near Kerr's Mill, and flows through a gap between Mount Teneriffe to the south and Mount Charlie to the north, and joins the Bolinda Creek. These two hills are capped by Kerrie conglomerates and geologically are not part of the Macedon group. To the north of them is Mount Eliza, which forms the eastern end of the main ridge.

On the plain to the north of the main ridge are several hills, which belong geologically to Mount Macedon. They are the Hanging Rock; Dryden's Hill or the Jim-Jim, north-west of Newham; Brock's Monument, north-east of the eastern shoulder; and several unnamed hillocks. The ridge south of Mount William is mapped as "Hypogean Trap" on the Geological Survey maps, but the rock in question has no connection with the Macedon series.

The general topography of the mountain, with the nomenclature adopted, is shown on the accompanying shetch map (Fig. 1). The nomenclature of the peaks is somewhat confused, but I have adopted the names used locally. The Camel's Hump is marked as Mount Diogenes on the parish map and on the Geological Survey map, whereas on the Index map of the Geological Survey the name Alexander's Crown is apparently given to this peak. The Hanging Rock is called Mount Diogenes on the parish map of Newham, Dryden's Rock and the Hanging Rock being given as synonyms. The name Dryden's Hill is now generally accepted for the ridge to the north-west of Newham Hotel; it is thus marked in the county map of Dalhousie. This hill is also known as the Jim-Jim.

Brock's Monument is named Alexander's Head on Skene's[1] Map of Victoria and the Index map of the Geological Survey.

III.—Geological Literature on Macedon.

The list of geological literature on Mount Macedon is brief. The first reference is that of Mitchell, according to whom the mountain is formed of "syenite so whitened with the weather as to resemble sandstone."[2]

The next important contribution to the geology of the mountain is the map prepared by C. d'O. Aplin under the direction of Dr. A. R. C. Selwyn (1). This map, which is on the scale of two inches to the mile, shows the boundaries of the Macedon igneous rocks, but gives little information as to their relations and variations. The whole series is represented by one colour, and is described as "trap or hypogene"; a note on the Camel's Hump states that the rock there is a porphyritic felspar trap, while the rock of the south-western shoulder (the Mount Macedon of the map) is said to be a non-porphyritic felspar trap. The only interruption in the area of the "traps" is the occurrence of a granite dyke on the western flank of the mountain.

After the publication of the Geological Survey Map, brief descriptions of some of the Macedon rocks were given in Selwyn's Catalogue (No. 19, pp. 12, 13, 65, 94, 95). The rocks of the Camel's Hump, the Hanging Rock, Brock's Monument, and the eastern flank of Macedon were all classed as plutonic rocks and were named "felspar porphyry." The most important information about the Macedon rocks given in this Catalogue is an analysis of the "Camel's Hump" rock, which is returned as having the high soda percentage of 10·17. The interest of this determination was, however, apparently overlooked.

In 1894 there was a proposal partially to adopt Mitchell's original name for the Macedon rock; for Cosmo Newbery, in his "Descriptive Catalogue of Victorian Rocks" (15, p. 26), described Brock's Monument as composed of syenite porphyry containing hornblende and very glassy looking orthoclase.

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1 Everett's Edition of Skene's 8 miles to the inch Map. Surv. Geol. Vict.

2 The determination of the rock as syenite is due to Lonsdale. Cat. Aust. Rocks in Coll. Geol. Soc., Parl. Pap., Gt. Brit., 1852-3, vol xvi., p. 433. Lonsdale also determined the rock at the base of the north side of the mountain as a "decomposed gneiss."

In 1895 Mr. R. A. F. Murray (14, pp. 22-23) accepted the name of syenite porphyry and advanced the view that this rock is intimately associated with the granites which occur below it.

The last contribution to the geology of Mount Macedon is a paper by Mr. E. G. Hogg (5, pp. 93-96), in which the rocks of the Turritable Creek waterfall, the Camel's Hump, the Hanging Rock and Brock's Monument are determined as trachyte. Hogg expressed the opinion that the age of the Macedon rocks is almost certainly post-Silurian, and probably later than the Permo-Carboniferous, owing to their absence from the glacial conglomerates of that period.

IV.—The Petrography of the Macedon Rocks.

Most of the Mount Macedon ridge is covered by gum forest, thick scrub, and a mantle of deep, rich soil. Rock exposures are scanty and small; accordingly a detailed geological map is impossible, and the determination of the relations of the various rocks by field evidence is disappointingly difficult. Hence it will be convenient to reverse the normal order of procedure, and describe the petrography of the Macedon rocks before dealing with their relations in the field.

The igneous rocks of Mount Macedon may be divided into six groups :—

1. Grano-diorites
2. Geburite-dacites
3. Trachy-phonolites
4. Sölvsbergites
5. Andesites
6. Agglomerates and Ashes.

The rocks of the last five groups are those properly belonging to Mount Macedon; the association of the rocks of the first group is accidental, as they belong to the underlying Palaeozoic platform.

The following descriptions of the rocks are limited to features of geological significance. An account of the mineral constituents I hope to issue subsequently.

1. The Plutonic Rocks of the Palaeozoic Platforms.

Aplin's map marks the occurrence of three outcrops of "granite" in the Macedon area. The largest exposure lies along the south-eastern border of the Macedon series. An outlier occurs to the north of this main outcrop, and it also is on the boundary between the eruptive rocks and the Ordovician. The third exposure is low in the western slope, where a "granite" dyke is marked two and a half miles east-south-east from Woodend.

The south-eastern "granite" is well exposed on a ridge crossed by the road from Riddell's Creek to Cherokee's. The rock continues from the State school reserve at Mount Teneriffe on the south, to a low saddle half a mile south of Cherokee's. The rock is also well exposed on the ridge between the head of Kerr's Creek, (or Running Creek) and the Cherokee Road.

The rock, as Aplin remarked, varies considerably in character. A specimen from the ridge three-quarters of a mile south-west from Kerr's Mill, at the head of Running Creek, shows the following characters. The rock is of medium grain and holocrystalline. It consists of quartz, plagioclase and biotite. The quartz is in large blebs and some idiomorphic crystals; some of them have solidified before the biotite. The plagioclase is mostly oligoclase and belongs to two periods of consolidation; the crystals often consist of a worn, decomposed nucleus, restored by re-growth with the outer zones in optical continuity with the central part. The material of the nucleus has decomposed into an irregular granular aggregate, with numerous minute microlites of zoisite.

Biotite is usually abundant; it occurs in large well defined crystals, and in microliths, some of which occur in zones round the idiomorphic crystals of quartz and plagioclase.

The specific quartz of this rock is 2·8.

As a second example of the rock forming the south-eastern plutonic outcrop may be taken a specimen from the south-western margin at Hamilton's. The quartz is somewhat more abundant, but is all allotriomorphic. The predominant felspar is oligoclase, mostly occurring in irregular aggregates. There are also some larger, simply twinned felspar grains referable to orthoclase. The biotite at this locality is often decomposed into chlorites.

In some varieties of the rock from this plutonic mass hornblende is present, and it sometimes wholy replaces the biotite. The hornblende occurs in patches, in some of which it is fairly abundant. In the rock as a whole, however, the presence of hornblende is exceptional.

This plutonic rock was mapped by Aplin as granite, an identification supported by Selwyn, who described (19, p. 7, No. 51) it as a "binary granite." But the rock is allied to the diorites by the abundance of plagioclase and the scarcity of orthoclase. It is a typical member of that series of Vicorian plutonic rocks that have been described by Howitt (*e.g.*, 7, p. 31) and accepted by Rosenbusch (17, vol. i., p. 231) as quartz-mica-diorites. The rock is sometimes a quartz-amphibole-diorite.

The rocks of this series differ from the typical European quartz-mica-diorites, *e.g.*, that of the Val Camonica, in the nature of the felspar. The alkali felspar is far more abundant than in the true diorites, which are characterised by the predominance of the basic felspar. The Victorian rocks are intermediate between the normal granites and diorites. We may therefore conveniently adopt for them the name of grano-diorite, which has recently been widely used in America for the similar rocks of the Sierra Nevada.

The preceding description of this grano-diorite is necessary, because a passage from it to the "traps" of the Macedon series has been generally maintained. Murray, for example, states (14, pp. 22, 23) that "in all these instances [*i.e.*, Macedon, Dandenong, and Healesville] there seem to be no clearly defined lines of demarcation between the rocks classed as trap and the adjacent granites, while in some places a gradual passage from one to the other, as regards mineral composition, is observable, and the different forms appear to blend with one another as though they were simply rocks of varying mineralogical structure belonging to the same general mass."

However, I could find no trace of passage from the plutonic to the eruptive rocks. Half a mile south of Cherokee the two rocks can be seen close together. Both present their normal characters up to the junction. The comparatively coarse grained quartzose rock underlies the compact dark green Macedon rock, and neither Mr. Grayson nor myself could find any intermediate variety.

The relations of the two rocks can be best explained by the Macedon rock covering the surface of an older plutonic rock.

Petrographically there is nothing especially to connect the grano-diorites and the rocks of the Macedon eruptive series. Most probably the grano-diorite was intrusive into the Ordovicians, and is simply part of the old Palaeozoic platform. The grano-diorite, therefore, belongs to a much earlier period than the Macedon eruptions.

This view, however, would be refuted if Aplin's map be correct as to the "granite" dyke on the western flank of the mountain. This dyke is marked as running from the south-eastern corner of allotment No. 22, almost due south-east toward the summit of the south-western shoulder of Macedon. The dyke is $2\frac{1}{2}$ miles east-south-east from Woodend. In a short search for this granite I failed to find any plutonic rock; but, in what appeared to me the corresponding position, is an unusually coarse-grained variety of the Macedon dacites. The occurrence of a granite dyke cutting through the traps would certainly prove that the "granites" (in Aplin's sense of the term) were later than the Macedon eruptive rocks. But, unless I failed to find Aplin's dyke, the rock has no connexion with the grano-diorites exposed on the eastern flanks of Macedon.

2. The Rocks of Mount Macedon Series.

The rocks of the Macedon series may be divided into five groups: (1) a series of hypersthene-dacites, which for reasons related on p. 202 are described as geburite-dacites; (2) trachy-phonolites; (3) sölvsbergites; (4) alkaline-andesites; (5) agglomerates and ash.

a. The Geburite Dacites.

The main bulk of Macedon is formed of a fine-grained rock which, when fresh, is tough and varies in colour from dark green to black speckled with grey or pinkish spots. The rock weathers brown or pinkish-red. Examined microscopically the rock shows two main varieties; the first ranges in structure from granulitic to pilotaxitic; the second variety is hyalopilitic.

As types of this series of rocks we may take the following :—

1. Willimigongong Type.

Neighbourhood of Upper Macedon.

(a) Willimigongong Creek, near junction with the Ordovicians ; opposite Cheniston (No. 25).

This rock is seen, when examined microscopically, to be porphyritic, consisting of well developed, abundant phenocrysts in a hypidiomorphic, granulitic base. The phenocrysts consist of plagioclase and pyroxene.

The plagioclase phenocrysts are usually irregular and corroded ; but in some the outline is regular and the angles are sharp. The twinning is coarse and is on the albite type, often combined with the carlsbad type. Zonal growth is commonly shown, but no undulose extinction. Basal cleavage fragments show extinction of 22° on the edge 001/010 ; but in one case the extinction angle was 28° ; hence the plagioclase phenocrysts include members of the bytownite series.

The pyroxene phenocrysts are mostly of hypersthene, which shows the typical pleochroism. The mineral is abundant and often has regular crystal outlines. The crystals are smaller than the larger bytownites. A few corroded crystals of monoclinic pyroxene occur.

Ilmenite is abundant and occurs in well developed crystals, often as large as the hypersthenes.

The base of the rock is partly a granulitic mosaic of felspar and quartz and partly a pilotaxitic mixture of the same constituents. The separation of the two minerals in the granulitic patches is difficult, but the presence of quartz is shown by the uniaxial character of some of the granules. The larger plagioclase microliths show simple or multiple twinnings, and have straight extinctions. The majority are oligoclase. Small biotite crystals occur in zones around some of the larger felspars in the base, and some of it is scattered irregularly through the base.

An analysis of this rock is given on page 201. The specific quartz is 2·78.

(b) Cheniston. On the south-eastern slope of Mr. H. R. Hogg's house at Macedon is an outcrop of a similar rock. The base is granulitic; there is no trace of fluxion structure; plagioclase laths in the base are scarce. The phenocrysts are more crowded than in the rock previously described; they include quartz in small corroded crystals. Biotite is more abundant and is often altered to chlorite.

(c) South of the Schoolhouse. A rock (No. 26) similar to the last variety occurs a couple of hundred yards south of the Upper Macedon schoolhouse.

(d) Mount Towrong Spur. The rock exposed along this Spur agrees in the main with the Willimigongong variety, but has more crowded phenocrysts and more abundant quartz. The rock at the summit of Mount Towrong has many broken phenocrysts with the angles of the fragments sharp and unworn. The quartz contains many apatite needles; the ilmenite is in large hexagonal plates. The hypersthenes are often deeply corroded by the granulitic base.

This spur ends to the north in a platform beside the source of the Willimigongong south of the Camel's Hump. A branch track runs eastward to Lady Carnarvon's Tree from the main track between the Creek and the Camel's Hump. The rock exposed near the junction of the two tracks has several interesting features. Parts of slides cut from it appear almost brecciated from the abundance of angular, fragmentary phenocrysts. The hypersthenes are large and include plagioclase microliths. The ilmenite is sometimes surrounded by an aureole of biotite. Some of the larger biotites are partially altered to chlorite. The base is granulitic, and has no trace of fluidal structure.

(e) North face of Macedon. The Willimigongong type may be seen at many localities on the north face, especially around Braemar; at the foot of the north-

eastern buttress and along the road between the last-named point and the foot of the ridge south of the Hanging Rock.

A variety of the dacites intermediate between the Willimigongong and the merocrystalline types occurs at the southern end of the Upper Macedon Spur. It is exposed on the slope between Mr. H. R. Hogg's house, Cheniston, and the Willimigongong. The rock is holocrystalline and porphyritic with phenocrysts of plagioclase and hypersthene, and some quartz. The base under a low power in ordinary light appears glassy with an incipient fluidal structure due to the banded distribution of minute greenish microliths. The largest of these microliths are hypersthene; the remainder are probably also hypersthene, but they are too small to show pleochroism or admit of certain identification. The rest of the base is doubly refracting and consists of a felt of plagioclase laths with granules of quartz and plagioclase.

The main difference between the Cheniston and the Willimigongong types is that the former shows a passage from a granulitic to a pilotaxitic structure.

A second representative of this type is the rock (38) at Cherokee's, near the junction with the grano-diorites. In this case an incipient fluidal structure is due to the flakes of biotite. This mineral also occurs in radial tufts around the ilmenite and is more abundant than in most of the Macedon rocks. The base is granulitic, passing in patches to pilotaxitic.

2. *The Cheniston Type.*

Associated with the granulitic Willimigongong dacites is a rock that weathers light brown and greyish, and then appears tuff-like, owing to the occurrence of angular felspar fragments in a light earthy base.

As an example of this rock may be quoted that exposed on the roadside by the entrance to the carriage drive at Cheniston.

When examined microscopically this rock is seen to have a hyalopilitic structure. The phenocrysts are irregular aggregates of bytownite granules and of corroded isolated crystals of the same material. The hypersthene has been altered and is stained with limonite. Chlorite is present as an alteration product after the hypersthene. The base has a well developed fluidal structure shown by the arrangement of the plagioclase laths; it contains patches of material of an earlier consolidation in which the structure is pilotaxitic or subgranulitic.

Hence this rock agrees in composition with the Willimigongong type and began to solidify under the same conditions; but its final consolidation occurred after it had undergone a definite flow.

b. The Trachy-Phonolites.

The rock (No. 28) that crosses the valley of the Turritable Creek and forms the waterfall a little to the west of the State school at Upper Macedon is the most convenient type of the trachy-phonolites.

The rock is dark green in colour, and is porphyritic, with large phenocrysts of anorthoclase, showing the typical minute twinning of that species. The base is full of fluidally arranged felspar laths, which are either simply or repeatedly twinned. They also are probably anorthoclase. Sparsely scattered through the rock are small crystals of aegerine, which show the typical pleochroism of green and greenish yellow; they are about as long as the longer felspar laths in the base. Between the laths is a somewhat altered green glass, which in places is arranged in vermiculitic growths and elsewhere occurs as radial globules, which show a black cross under crossed nicols. An isotropic mineral, which gives some hexagonal sections, and the green glass both give gelatinous silica when treated with hydrochloric acid. Evaporation of acid that has acted on this mineral. Mineral yields a few gypsum crystals, so that it is no doubt nosean. Ilmenite in large flakes is sparsely scattered, but in places it occurs in clots.

This rock has been analysed by Mr. R. J. Lewis; the analysis (No. 2, p. 201) in conjuction with the microscopic evidence shows that the rock is a trachy-phonolite.

Another exposure of this rock (No. 33) occurs in a small quarry to the south of the waterfall and near the junction with the underlying Ordovicians. The rock is porphyritic and hyalopilitic in structure. It contains phenocrysts of anorthoclase showing marked undulose extinction and extremely fine twinning. Some green glass, a little nosean, and abundant ilmenite also occur. The fluxion structure is well developed and there are a few vesicles filled with green-stained silica.

c. The Sölvsbergites.

The third member of the Macedon rock series forms the Camel's Hump and two outliers in the plain to the north.

The rock of the Camel's Hump is the best known geologically, as it was analysed by Newbery, and is the type of the "felspar porphyry" or "syenite porphyry" of the Geological Survey.

The rock is greyish brown in colour, and consists, in the main, of large phenocrysts of anorthoclase, set in a fluidally arranged series of lath-shaped felspars, which may be either soda-sanidine or anorthoclase. Some of the phenocrysts have been fractured, and the edges are quite sharp and uncorroded; hence the rock probably became thick and semi-viscous before consolidation, and has not flowed far from its vent. In the interspaces between the felspars are mossy patches and groups of small crystals of aegerine and riebeckite. The aegerine is more abundant and occurs in larger crystals than the riebeckite; the latter is, however, conspicuous from its fine blue colour and strong pleochroism.

Similar in form to the riebeckite, but in smaller and rarer patches, is a dark brown to opaque mineral, which Mr. Prior has kindly identified as cossyrite. It is strongly pleochroic and the grains are angular or subangular.

The rock on the southern side of the Camel's Hump is somewhat fresher. The aegerine, riebeckite and cossyrite, though minute, are often idiomorphic; but in places these minerals are moulded on the felspars. Ilmenite, including small zircons, occurs. The biotite is sometimes intensely corroded, and some zones have been changed to chlorite.

The Hanging Rock, which rises from the plain at the northern foot of the Macedon ridge is closely allied to the rock of the Camel's Hump; but the fluidal structure is less defined. The felspar laths of the ground mass tend, moreover, to occur in short broad prisms rather than in long laths. The interspace between the felspars is occupied by a granular felspar mosaic.

Aegerine is abundant in small angular grains and prisms, which are crowded round the anorthoclase phenocrysts. The riebeckite is in larger crystals than in the rock of the Camel's Hump.

Nosean, in corroded crystals and biotite, also occur, though sparingly; the crystals of the latter are fringed with aegerine prisms.

d. The Andesites.

On the plains to the north and north-west of Mount Macedon are occasional exposures of weathered rock containing numerous black specks in an earthy grey base. The best exposure is in a small quarry on a hillock in allotment No. 84 in the north-eastern corner of Woodend. The rock is included on the Geological Survey Map as a member of the Cainozoic basalts. As, however, the rock (No. 35) contains anorthoclase, some altered nosean and altered olivine, it is a member of the Macedon series and not of the later basalts. I have not yet succeeded in getting fresh specimens of this rock, and postpone a fuller account of it until better material is available.

e. Agglomerates and Ashes.

Exposures of pyroclastic rocks are rare on Mount Macedon. Denudation has probably removed most of them, and what remain now occur in depressions between the more resisting dykes and lavas.

The best example of agglomerates that I have yet found occurs at Upper Macedon on the roadside leading from the lodge at Government Cottage to Mr. Justice Hood's house near the State Nursery. The best section is at the height of about 400 feet above the Turritable Creek and a little below some land that belonged to the late Sir F. McCoy. Here occurs a band of agglomerates with blocks of the geburite-dacites up to 4 feet in diameter included in fine ash. Further up the road is an exposure of volcanic ash traversed by a ten-foot dyke of geburite-dacite.

Well developed tuffs occur in other parts of the Macedon range, as *i.e.*, at Cherokee.

V.—Chemical Composition.

Three analyses of the Mount Macedon rocks have been prepared. The sölvsbergite from the Camel's Hump was analysed by Newbery. By the kind permission of Professor Orme Masson, analyses of the Willimigongong dacite and the trachy-phonolite of the Turritable Waterfall have been made by Mr. R. J. Lewis in the University Laboratory. The analyses are given on page 201. For comparison with them are given analyses of dacites from Dandenong and the Black Spur, and of a granodiorite, also from Dandenong, for which I am indebted to the Government Metallurgist, Mr. H. C. Jenkins, A.R.S.M. To show the differences between the geburite-dacite and the dacite of Dacia Doelter's analysis of the latter is quoted in column No. 13 In comparison with the trachy-phonolite of the waterfall may be quoted vom Rath's analysis of the rock from Scarrupata in Ischia.

Prior's analysis of a sölvsbergite from Abyssinia is given in column No. 11.

	Macedon.					2 Miles N. of Dandenong Township.							
	Sölvsbergite, Camel's Hump.	Trachy-phonolite, Turritable Waterfall.	Geburite-Dacite. Willimigongong.	Dandenong Dacite.	Black Spur Dacite.	Porphyrite.	Porphyrite.	Grano-diorite.	Grano-diorite, Omeo.	Orthophyre, Omeo.	Sölvsbergite. Eddi Gijorgis, Abyssinia.	Trachy-phonolite. Scarrupata, fschia. vom Rath.	Dacite. Doelter.
	1	2	3	4	5	6	7	8	9	10	11	12	13
SiO_2 -	65·97	62·72	64·38	67·25	65·80	64·0	65·05	63·38	65·59	69·04	63·74	65·75	66·32
Al^2O_3 -	18·11	16·27	13·62	16·38	16·87	19·11	10·04	17·36	17·46	18·14	17·86	17·87	14·33
FeO -	4·82			1·30	1·08	2·80	5·14	1·98	·10		·30	4·25	·25
Fe_2O_3 -	trace	6·83	9·17	4·62	3·97	2·22	8·47	1·61	4·21	·53	4·27		5·53
FeS -						1·58	1·35	3·38					
MnO -				·33	trace						·19		
CaO -	·98	1·06	1·99	3·05	3·16	5·13	4·80	4·18	1·03	·44	·83	1·33	4·64
MgO -	trace		2·18	1·76	1·76	2·17	trace	1·80	2·35	·27	·10	·52	2·45
K_2O -	trace	4·99	3·51	1·36	2·54	·14	·02	·31	2·89	5·10	5·19	3·48	1·61
Na_2O -	10·17	8·47	6·28	2·56	3·45	1·12	3·39	4·07	4·10	7·12	7·23	5·67	3·90
H_2O -	·56			·30	1·05	1·01	·56	·54	1·98	·35	·83	·78	1·13
CO_2 -				1·56		1·71	1·53	1·13					
	100·61	100·34	101·13	100·47	99·68	101·19	100·35	99·74	99·71	100·99	100·54	99·65	100·16

VI.—The Relations of the Macedon Rocks.

After the foregoing account of the rocks of the Macedon series, we may proceed to consider their general petrographic relations. In the first place it is clear that the rocks, excluding the grano-diorite, are part of one petrographic series, having been formed by differentiation from one magma. They all belong to the intermediate group, and are characterised by a high percentage of soda. The three rocks that have been analysed vary from 62·7 to 65·9 % of silica, and from 9·79 to 13·46 % of alkalies. The soda varies from 6·28 % in Mr. Lewis's analysis of the Willimigongong rock to 10·1 % in Newbery's analysis of the rock of the Camel's Hump. The microscopic examination, showing the predominance in the superficial member of the series of anorthoclase, aegerine, nosean, riebeckite and cossyrite (aenigmatite), agrees with the chemical analysis, and shows the abundance of soda in the rock.

That the grano-diorites are not members of the Macedon series is shown by the absence of passage rocks, and of the typical minerals of the Macedon group from the diorites. The Macedon effusive rocks are not those that would have been formed by eruption from the grano-diorites that underlie them on their south-eastern margin. The plutonic representative of the Macedon lavas is probably a nepheline-diorite, which has not been found in Victoria.

The member of the Macedon series which originated at the greatest depth is the Willimigongong type of dacite. It occurs in big intrusive dykes or masses along the Willimigongong, at Cheniston, Towrong, Braemar, Cherokee, etc.; in fact wherever denudation has cut at all deeply into the Macedon block.

The microscopic examination of this rock at first suggests for it the name of hypersthene-andesite, as hypersthene and a fairly basic plagioclase are the two most striking constituents. The abundance of free quartz in some sections, however, necessitates its inclusion among the dacites. The term hypersthene-dacite would, however, alone be inadequate. The facts that the rock is holocrystalline and that it occurs in intrusive dykes are not final objections, for Rosenbusch accepts (17, vol. i., p. 450) a group of holocrystalline dacites. The most serious objection is that the normal dacites contain an excess of alkaline earths over alkalies, and far less alkali than the Macedon rock. Thus Doelter's analysis of the typical Dacite of Transylvania gives 66 % of silica, 7·1 % of lime and magnesia, and only 5·5 % of soda and potash. The Macedon rock contains 64·3 % of silica, 4·1 % of lime and magnesia, and 9·8 % of soda and potash. A comparison of the mean molecular composition of the dacites quoted by Loewinson Lessing (11, p. 449) with that of the Macedon rock is shown by the following table, which also gives the nearest analysis to the latter.

——	SiO_2	Al_2O_3	Fe_2O_3 and FeO	CaO	MgO	K_2O	Na_2O
Dacite (mean of twelve analysis	1·123	0·158	0·042	0·068	0·035	0·020	0·071
Willimigongong Creek	1·086	0·133	0·057	0·035	0·054	0·037	0·101
Teolo, Euganean Hills	1.111	0.137	0·079	0.029	0·003	0·034	0·127

In Rosenbusch's series of analyses of Dacites, no rock is given with so high a percentage of alkalies as we find at Macedon. In his sixteen analyses (18, p. 286) the highest percentage of soda and potash together is 7·95, in the rock to which he gives the precise but lengthy name of "quarzbiotithronzitaugitporphyrit"; the highest percentage of soda is 4·06 against 6·28 in the rock from Willimigongong.

The name dacite alone is unsuitable, for the dacites are eruptive members of the quartz-diorite group and this Macedon rock is certainly part of a sequence of which the best developed lava is a member of the tinguaite group. The name, moreover, would be locally inconvenient, for normal dacites appear to be extensively developed in Victoria, and it would be inadvisable to include the two rocks under one name. Hence I propose to refer to the fundamental rock of the Macedon range as geburite-dacite, Gebur being the native name of Mount Macedon.

The geburite-dacites may be defined as intrusive or effusive dacites, distinguished from the normal dacites by the rarity of quartz and the great excess of alkalies, especially of soda. The

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The geburite-dacites may be defined as intrusive or effusive dacites, distinguished from the normal dacites by the rarity of quartz and the great excess of alkalies, especially of soda. The predominating structure of the ground mass is granulitic; hypersthene is the most abundant ferro-magnesian constituent.

The typical geburite-dacites form thick dykes. The effusive rocks of Macedon may be divided into four main groups. The first is the geburite-dacite, with hyalopilitic structure, such as occurs around Cheniston. The second group may be called trachy-phonolites; they are characterised by the abundance of anorthoclase, and the replacement of hypersthene by aegerine; they probably also occur as dykes. The rock at the Turritable Waterfall is the best type of this group. The rocks of the next group are hyalopilitic with well developed fluxion structure. The minerals are anorthoclase, riebeckite, cossyrite and aegerine, and the rocks may be identified as sölvsbergites. Newbery's chemical analysis of the Camel's Hump rock agrees with that of the typical sölvsbegites.

To the last rock of the Macedon series I feel at present doubtful about applying a definite name, not having secured a fresh specimen. The rock is exposed in a shallow quarry at the north-eastern corner of Woodend. It was included by Aplin among the basalts of the Newer Volcanic Series. The rock is no doubt more basic than the other members of the Macedon series, for it contains what appears to be altered olivine. The rock may be left for the present as an alkali-andesite.

The rock sequence at Mount Macedon, therefore, ranges from holocrystalline dykes of geburite-dacite to a series of effusive rocks including trachy-phonolite, sölvsbergite and alkali-andesite.

The order of the minerals in this rock sequence is well marked. The geburite-dacites contain abundant hypersthene, and some corroded phenocrysts of bytownite. In the trachy-phonolites the hypersthene has been replaced by aegerine, and the basic plagioclase by anorthoclase. In the sölvsbergites the abundance of soda is expressed by the development of the riebeckite and cossyrite in addition to the soda minerals of the trachy-phonolite. The last stage in the series is marked by the occurrence of what is probably altered olivine in the andesites of the northern margin of the Macedon series.

The foreign rocks most nearly allied to those of Macedon are not found among the dacites, but in the series of rocks from the Kristiania district made famous by Brögger's searching investigation. The Macedon sölvsbergites, though resembling those of Southern Norway, have not been derived from the same magma. The Kristiania sölvsbergites have been formed by differentiation from laurdalite, a plutonic rock composed of anorthoclase, cryptoperthite, elaeolite, lepidomelane, and a monoclinic pyroxene. In spite of the very varied series of rocks that has been developed from the laurdalit magma, it does not include any equivalent of the soda-hypersthene-dacite, which is the lowest exposed rock at Macedon.

A second series of allied rocks occurs in Abyssinia. The rocks have been described in a valuable paper by Mr. E. T. Prior; but these rocks are said to be a dyke series, and there is no close ally of the geburite-dacites.

VII.—The Geological Structure of Mount Macedon.

The dense forest growth that covers Mount Macedon obscures the mutual relations of its rocks. Nevertheless, by piecing together the evidence of many parts of the area the general arrangement can be determined.

The best idea of the structure of Mount Macedon can be obtained by a traverse north and south across the ridge from the township of Macedon on the south over the Camel's Hump and thence through Hanging Rock to the village of Newham on the north.

In such a traverse we find the first exposures of igneous rocks on the northern side of a branch of the Saltwater River and to the north-east of Macedon cemetery. Here the geburite-dacites rest on the Ordovicians. The igneous rocks are exposed in a small quarry, in occasional hummocks in the forest, and in the bed of the Turritable and Willimigongong Creeks. The dacites have a well-developed fluxion structure where they rest on the Ordovicians; but in the main mass of the eruptive rock the structure is holocyrstalline and granulitic. On the lower slopes of this part of Macedon there are dykes of trachy-phonolite and geburite-dacites; but the field relations of these dykes are not clearly shown. Continuing the ascent towards the main ridge we pass over some agglomerate and ash traversed by dykes, and then over thick effusive masses, as well as some apparently intrusive bands of geburite-dacites. On the platform immediately south of the Camel's Hump there are exposures of geburite-dacites of the Willimigongong type, upon which rests the hummock of the Camel's Hump sölvsbergite. This rock is jointed and weathers spheroidally. It appears to be part of a sheet that flowed southward. But there is no trace of the vent, for the rock is abruptly cut off by the steep northern face, which, below the sölvsbergite, consists of geburite-dacite. At the foot of the northern face is the valley of the Five Mile Creek; the floor is covered by alluvium. Beyond this is the Hanging Rock, a hill of sölvsbergite, which rises 360 feet above the surrounding plain. The rock is very coarsely jointed and is in places irregularly columnar; it has been worn into great hollows by the ready decomposition of the soda silicates and the removal of the insoluble residue by the wind.

The Hanging Rock is probably part of a sheet discharged from a vent a little to the south; but the vent may be hidden under the site of the hill. North of the Hanging Rock is a plain of andesite, which in places rises into hills such as the Jim Jim or Dryden's Hill. The andesite is covered in places by the basalts; and the line of demarcation between these rocks is indefinite, although the country is open. The apparently intimate field relations of the Macedon andesites and the basalts suggests that there is no very great difference in age between them.

It was from the supposed great antiquity of the Macedon rocks that they were called "traps." According to Page's[1] definition, the word "is now employed by geologists to embrace all the multifarious igneous rocks that belong to the Palaeozoic and Secondary epochs, as distinct from the more ancient granites on the one hand and recent volcanic rocks on the other."

It was apparently in this sense, and not in the original meaning of a number of sheets of igneous rocks forming a succession or steps (*trappa*, a step), that the word trap was adopted by the Victorian Survey; for the English Survey thus used the term in its work in North Wales, where Selwyn received so much of his training.

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1 Page, Handbook Geological Terms, 1865, p. 442.

The Macedon rocks were therefore called traps, because they were regarded as forming a palaeozoic plutonic massif; although it was recognised that their aspect was not typically plutonic.

The theory that Mount Macedon is a plutonic massif is disproved by the absence of contact metamorphism and of disturbance in the adjacent Ordovician rocks. There are traces of contact alteration in the district; but they may be due to the intrusion of the grano-diorites. In several places the Ordovician rocks may be seen close to the junction with the Macedon series. Yet there is neither contact alteration nor disturbance of strike; and both changes must have happened had so great an igneous mass as Macedon been directly intruded into a series of sediments.

The relations of the geburite-dacites to the underlying Palaeozoic platform may be illustrated by the two following cases:

1. *Upper Macedon Spur.*

The Macedon township ridge which lies between the Turritable and the Willimigongong Creeks, ends to the south below a band of alluvium along one of the western branches of the Saltwater River. On the northern bank of this stream the Ordovicians can be seen outcropping below the geburite-dacites and trachyphonolites. The sedimentary beds can be traced along the southern margin of the Macedon rocks and up the courses of the Willimigongong as far as Cheniston, and for a short distance along a branch of the Saltwater a little to the west of the Turritable Creek. The Ordovician beds show no contact metamorphism and their strike is not disturbed. The junction of the sedimentary and igneous beds along the south is from the level of 1600 to 1625 feet. On the eastern side of the Macedon township ridge the Ordovician beds run further to the north to a height of 1940 feet in the "Knoll" near Cheniston.

The relations of the two rock series show that a lobe of geburite-dacite has flowed quietly southward from a vent to the north over an irregular surface of the Ordovicians.

This conclusion is in agreement with the evidence of other parts of the Macedon margin. A mile and a half to the east of the Hanging Rock is an inlier of the Ordovicians running along the continuation of the north-eastern buttress of the main ridge. The Ordovicians outcrop here as denudation has exposed the summit of an old ridge of grits and sandstones. The Ordovicians are flanked on both sides and on the south by geburite-dacites; on the sides the dacites are at a lower level than the Ordovicians (Fig. 3.) At the northern end of this inlier the Ordovicians are covered by a boss of basalt which forms a bare hump (2200 feet high) crossed by the main road between paddocks Nos. 9 and 17 on the parish map of Newham.

The Ordovician rocks are neither altered nor disturbed by the dacites.

The relations of the two series may be best explained by a flow of dacites from the south having buried a meridional ridge of Ordovicians.

The evidence of these two cases shows that Mount Macedon is not a plutonic massif. The second explanation that suggested itself was that the mountain might be a laccolite, a view supported by the apparent absence of tuffs and the general form of the igneous mass. I could find no definite evidence in favour of this view, and finally the discovery of beds of pyroclastic rocks traversed by dykes show that this explanation was unnecessary.

This evidence leaves no doubt that Mount Macedon is the worn stump of a great volcano. There is no trace of a crater, and the superficial beds of ash have been removed by denudation. The fragmentary material was probably never very abundant, for lavas formed most of the volcanic pile. Like the phonolite domes of Europe, the richly alkaline lavas of Macedon probably welled forth quietly with only occasional explosions. The eruption therefore formed a dome-shaped hill of lava with but few interstratified ash beds. The first eruptions were of geburite-dacite, which forms the main mass of the mountain. The sölvsbergites and trachy-phonolites were then discharged from secondary vents on the flanks and probably also from the main crater. The soda-andesites of the north-western flanks were then erupted. Finally the Macedon eruptions ceased and the volcanic forces found vent in the discharge of the basalts that now cover the surrounding plains.

The section (Fig. 4) shows a transverse section across Mount Macedon; but owing to the denseness of the forest and scrub only a diagrammatic section is at present possible.

The original crater must have been far above the present summit of the mountain, which may once have risen 5000 feet above the underlying Palaeozoic platform. It is now only the basal stump of a volcano, in which all traces of the crater have been lost, but which has not yet been sufficiently dissected to show the rock of the central core.

VIII.—Allied Eruptive Centres in Victoria.

Before considering the place of Mount Macedon in the volcanic history of Victoria it will be convenient to refer to the distribution of allied igneous rocks in the State.

Rocks rich in soda are widely distributed here both in time and place. Mr. Howitt has described (6, p. 38) an orthophyre from Omeo with 7·12 % of soda; the rock is assigned to the middle palaeozoic.

Petrographically the Victorian rocks most closely related to the geburite-dacites are some dykes traversing the Ordovician beds at Bendigo. They were originally described as limburgites, and have been referred by Mügge to the monchiquites. I have not been able to see the slides described by Mr. Howitt, from the 180 Mine; but some dykes collected at the Eaglehawk Mine are monchiquites, though in places rendered abnormally acid by the infiltration of secondary silica. The only certain fact as to the age of these dykes is that they are post-Ordovician; but Mr. Howitt has suggested that they are in all probability connected with the Cainozoic basalts. Petrographically it is probable they are of the same age as the Macedon eruptions.

The Victorian rocks with which the Macedon series is most allied geologically are the great eruptive masses of the Upper Yarra and the southern tributaries of the Goulburn. The masses in question are formed of dacites and constitute the mountains of Dandenong, the Cerberean Range, the Blacks' Spur, near Healesville, and possibly an independent centre between Mount Arnold and Warburton.

A description of a few of these rocks will illustrate their affinities to the Macedon series.

Mount Dandenong consists of a hypersthene-biotite-dacite. The quartz is more abundant and occurs in larger phenocrysts than in the geburite-dacite. Biotite is also more abundant. Hypersthene occurs in large corroded phenocrysts, and there are rare crystals of augite. The predominant felspar is apparently andesine. The base is granulitic. I have not found any trace of aegerine or riebeckite in this or any other of the Dandenong rocks examined. An analysis prepared by Mr. Jenkins shows that the rock is normal in alkalinity. This rock appears to form the main mass of the Dandenong hills, and it is associated with tuffs of the same mineral composition.

The Blacks' Spur, between Healesville and Narbethong, is another dacite dome. A specimen from the summit of the ridge has been analysed by Mr. Jenkins, and the results show that the rock has a very similar composition to the Dandenong dacite. The microscope shows that the petrographic characters are practically identical.

At the northern foot of the Blacks' Spur the dacites rest on grano-diorite. In order to test whether there be any passage rocks between the two, I have examined the rocks nearest to the junction that I could find.

A small quarry at the bend of the road close by the gateway to Mr. Lindt's house, the Hermitage, is the most convenient type of the dacites near the grano-diorites. The rock is much decomposed. It consists of abundant quartz phenocrysts, which are deeply embayed by the ground mass; there are numerous flakes of biotite altered to chlorite, and of a pyroxene broken up into chloritic aggregates. The base is a weathered glass, which shows well marked fluxion structure. That the rock was flowing in a thick viscous condition is indicated by the fragments of fractured crystals remaining close together.

The rock is a weathered lava and is in no way intermediate between the dacite of the summit of the Blacks' Spur and the grano-diorite.

The Cerberean Range is also composed of dacite. I have only been able to examine the north-western edge of this mountain; but there it consists of dacites resting on an irregular surface of the Silurian and apparently also on the Cathedral sandstones. The rock is marked on the Survey Map as granite. But it is merocrystalline, and the base shows well marked fluxion. Quartz is abundant, and so also is biotite. There is no hypersthene. The felspar in part shows the minute twinning of anorthoclase.

In this respect, as in some others, the Cerberean rock is more nearly allied to the Macedon than to the Dandenong dacites. But, speaking generally, the dacites of the Upper Yarra and the Upper Goulburn differ from those of the geburite series by their lower alkalinity and the absence of the minerals riebeckite, aegerine, and nosean.

These different dacite masses appear to have similar stratigraphical relations. The Dandenongs, for example, rise above the plain of the Yarra as Macedon rises above its Palaeozoic platform. The dacites have not metamorphosed the sedimentary rocks which they overlie. For instance, the Silurians can be seen close to the dacite near the landslip on the road from Mooroolbark to the summit of Dandenong; the Silurian rocks appear quite unaltered.

It is true that in some places the Silurians are altered near the junction with the dacite; but there is no proof that it is the dacite that has wrought the change. It is more likely that the alteration has been caused by intrusions of grano-diorites and porphyrites, which have been injected into the Palaeozoic series.[1]

Mr. Ferguson has stated[2] that there is a gradual change from the "granites" to the "Dandenong traps"; but I have failed to find evidence of this, and Mr. T. S. Hart, who examined the sections on the Gembrook railway, tells me that wherever the two rocks could be seen together they were both greatly decomposed. He says there was no sign of a passage between the two rocks. This evidence is consistent with the view that the diorites and the dacites belong to different dates and had independent origins.[3]

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[1] Mr. Victor Stirling, it should be noted, has suggested that the alteration of the Silurian rocks at Lilydale is due to the traps. (No. 21, p. 10.)

[2] He states (3, p. 58) that where the trap and granite join "the one rock merges into the other without a break, the granite gradually getting more and more trappean in character till one rock gives place to the other."

[3] Since the paper was read I have examined the sections in question, and agree with Mr. Hart's conclusions.

Mr. Stirling (20, p. 29) may also be quoted in support of the view that the Dandenong rocks, which he calls mica-diorites, are much later than the underlying plutonic rocks.

IX.—The Age of Mount Macedon.

The stratigraphical evidence as to the age of the Macedon volcano is very incomplete. It was post-Ordovician; and it was earlier than the adjacent basalts, which belong to some part of the Upper Cainozoic. That is all that the available evidence positively proves.

The Geological Survey have regarded the mountain as Palaeozoic. But as Mr. E. G. Hogg has remarked (5, p. 96), no fragment of the Macedon rocks has been recognised in the glacial conglomerates of Bacchus Marsh and Heathcote. This negative evidence suggests that Macedon is later than the glacial series, which at the earliest is Upper Palaeozoic.

The thick Kerrie conglomerates which occur on the south eastern flanks of Macedon are considered by Mr. Hart (9, p. 66) to be probably earlier than the glacial series. No fragments of the Macedon rocks have been found in these beds, so that the dacites are probably later than the Kerrie conglomerates.

The only Cainozoic rocks with which the Macedon series is in contact are the basalts.

Mr. Knox, M.H.R., tells me that it has been suggested that some of the deep leads at Malmsbury originally flowed southward over the present site of Mount Macedon. I know of no direct evidence which renders this view either probable or impossible. The suggestion, however, is of interest, as showing that its author understood that Macedon is not a plutonic mass, and that it is not of Palaeozoic age. If this hypothesis be correct then Macedon is later than the beginning of the deep lead series of Central Victoria, and is at the earliest, according to current terminology, of "Miocene" age.

At present we can only conclude that Macedon is certainly post-Ordovician, most probably post-Palaeozoic, and certainly earlier than the upper Cainozoic. It may belong to any part of the Mesozoic or Lower Cainozoic. If the dacite series be Lower

Mesozoic, we may hope to find fragments of the Dandenong dacites in the South Gippsland coal measures. If it be found that there is no trace of the dacites in these deposits then the eruptions of the Macedon-Dandenong series are probably later than the Lower Mesozoic.

At present the evidence that gives the most plausible suggestion as to the approximate age of the Macedon eruptions is the association of the dacites and the basalts.

The basalts are now divided into two groups. The Newer Volcanic Series, the Pliocene of the Geological Survey, is Upper Cainozoic, and probably lasted till the human occupation of Victoria. The Older Volcanic Series, the "Miocene" of the Geological Survey, is probably Lower Cainozoic, and according to Messrs. Hall and Pritchard may have begun in the Cretaceous.

The great dacite eruptions are probably connected with the beginning of the Older Volcanic series. Some of the rocks which Aplin mapped as Pliocene basalts belong to the group which he mapped as Palaeozoic traps. To get an independent opinion on this point I showed Mr. E. T. Prior a thin section of the rock from the quarry north-east of Woodend, telling him it was mapped by the Victorian Survey as basalt. After a brief examination he expressed the opinion that the rock was evidently related to the Macedon series and was not a basalt.

I had come to this opinion in the field, and have not yet been able to determine the line of separation between the lavas of the Macedon series and the basalts. This close field association, therefore, suggests that the two igneous series are not so remote in age from one another as was thought.

It is probable that Mount Macedon was formed at the beginning of the great series of eruptions which ended in the formation of the great basalt plains of Victoria. It is not uncommon for a great period of volcanic activity to begin with the formation of lofty piles of lava belonging to the intermediate group and to end with the discharge of broad sheets of either acid or basic rocks. The volcanic history of the Yellowstone Park furnishes a classical illustration of this sequence. As Professor Iddings (10) has shown, a long period of quiet sedimentation, which lasted through the Palaeozoic and Mesozoic, was followed by the outburst of volcanic activity at the end of the Cretaceous. Domes of andesites—one of which, Crandall Volcano, was 13,500 feet high—were then piled up at intervals along a line 170 miles in length; then followed a short rest, during which the andesitic cones were denuded; finally came a period of fissure eruptions discharging sheets of basalt and rhyolite. The volcanic history of British East Africa shows the same general sequence, from the great dome of the kenytes to the basalts and trachytes of Laikipia and the Athi.

The volcanic history of Victoria may be found to have passed through the same stages. During the Palaeozoic there were periods of great volcanic activity, especially in the Devonian system. Then followed a long period of quiescence, succeeded, probably in the late Mesozoic or early Cainozoic, by a renewal of volcanic activity. Great dacite domes were formed at several centres—Macedon, Dandenong, the Cerberean Ranges, and the Blacks' Spur. After they became extinct the surrounding lowlands were devastated by the eruption of the basalts of the plains.

Hence it is not improbable that Mount Macedon is one of the volcanic piles that mark the beginning of the great period of volcanic activity, of which the last eruptions built up still existing craters, and are recorded in the legends of the Victorian aborigines.

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EXPLANATION OF PLATES XI.-XVII.

Plate XI.

Fig. 1.—Sketch map of Mount Macedon.

,, 2.—Sketch map of southern end of Upper Macedon Spur.

,, 3.—Sketch map of northern end of north-eastern buttress.

Plate XII.

Fig. 1.—Geburite-Dacite. Track to Lady Carnarvon's tree, south of the Camel's Hump. Ord. light. × 28 dia.

,, 2.—Geburite-Dacite, with broken quartz-crystal. Track to Lady Carnarvon's tree, Mount Macedon. Ord. light. × 70 dia.

Plate XIII.

Fig. 1.—Geburite-Dacite, with large hypersthene. Summit of Mount Towrong. Ord. light. × 28 dia.

,, 2.—Geburite-Dacite, from a narrow dyke on the west bank of Turritable Creek, near allotment of the late Sir F. McCoy. Ord. light. × 26 dia.

Plate XIV.

Fig. 1.—Sölvsbergite, with patches of riebeckite. The Camel's Hump. Ord. light. × 28 dia.

,, 2.—Sölvsbergite, with riebeckite, cossyrite and anorthoclase. Hanging Rock. Ord. light. × 35 dia.

Plate XV.

Fig. 1.—Geburite-Dacite. Ash from the road on west side of Turritable Creek, near allotment of late Sir F. McCoy. Ord. light. × 26 dia.

Fig. 1.

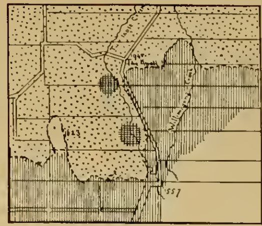
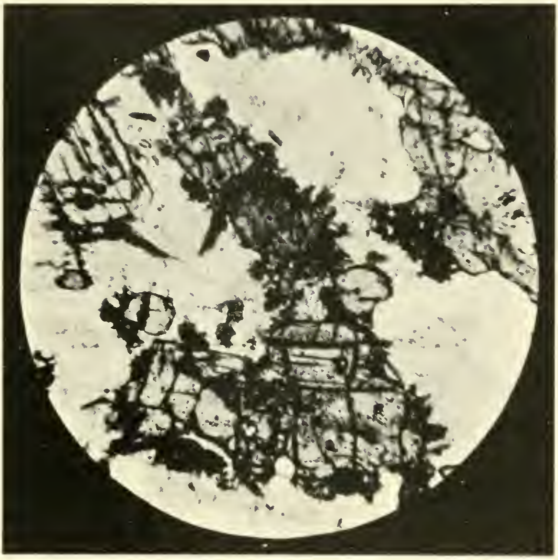


Fig. 2.

Fig. 3.



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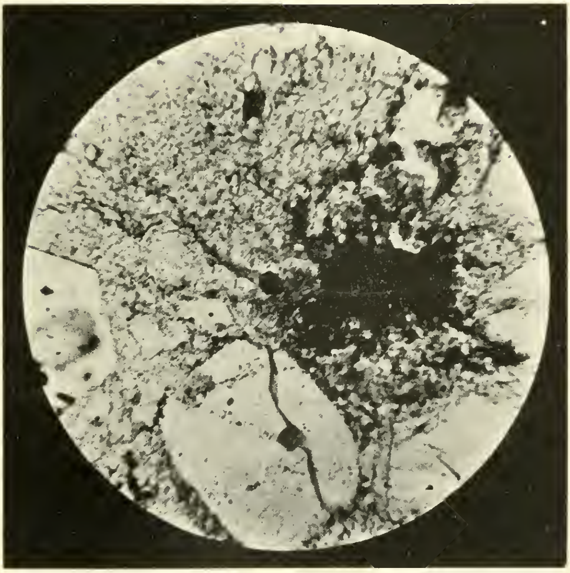
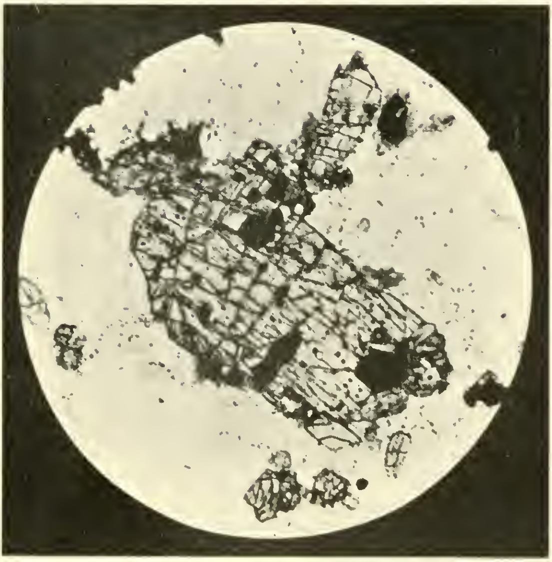


Fig. 2. H. J. Grayson, Photo.



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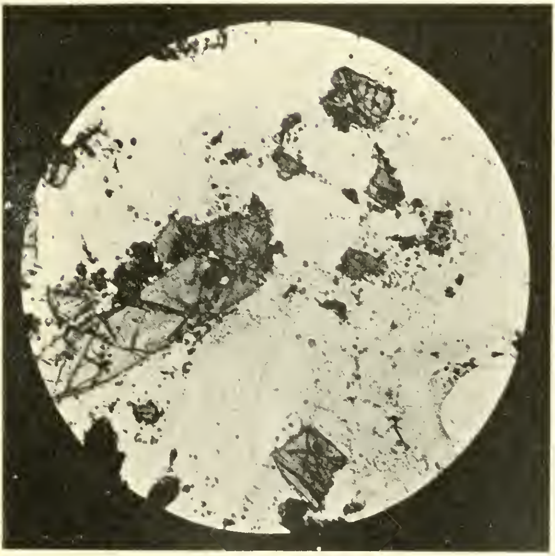

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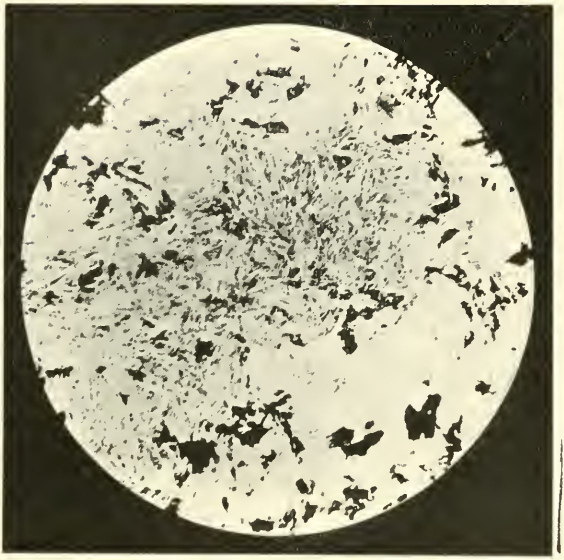

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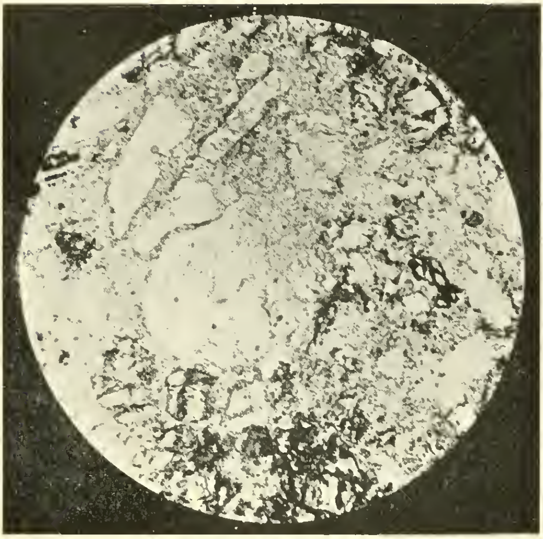

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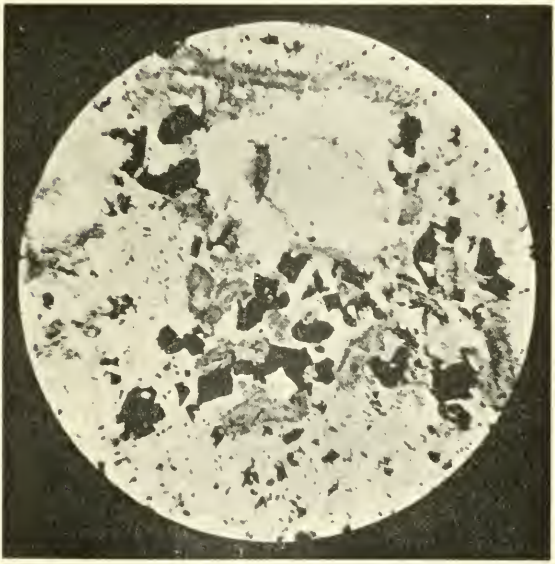

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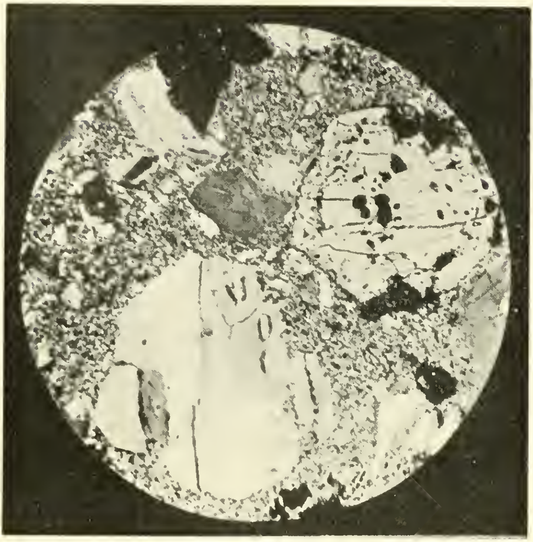

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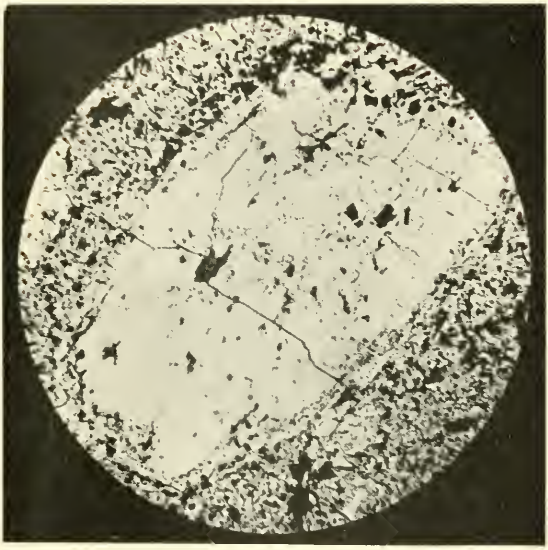

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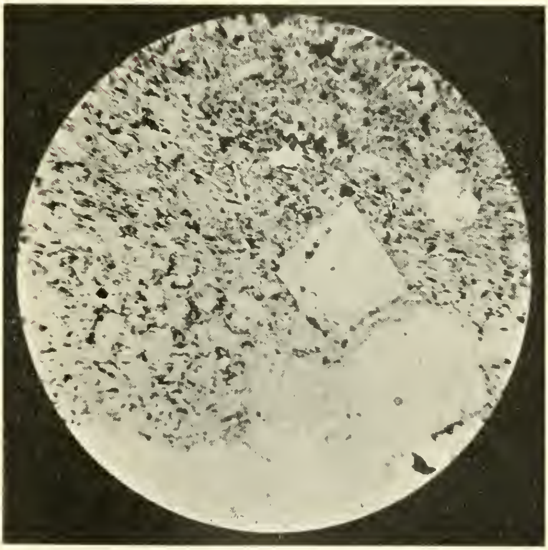


Fig. 2.   H. J. Grayson, Photo.

Fig. 2.—Alkaline-andesite, with altered olivine. Quarry in north-eastern corner of parish of Woodend. Ord. light. × 28 dia.

PLATE XVI.

Fig. 1.—Hypersthene-biotite-dacite. Near the Landslip, northern face of Mount Dandenong. Crossed nicols. × 26 dia.

„ 2·—Hypersthene-biotite-dacite, with broken and corroded quartz crystal. Mount Dandenong. Ord. light. × 15 dia.

PLATE XVII.

Fig. 1.—Trachy-phonolite. Turritable Waterfall, Macedon. Ord. light. × 28 dia.

„ 2.—Sölvsbergite. Southern side of Camel's Hump. Ord. light. × 25 dia.

APPENDIX.

Specific Gravities of the Felspars of the Macedon Area.

BY H. J. GRAYSON.

1.	Geburite-Dacite	Willimigongong Creek, compact var.	3·58-2·60
2.	Trachy-phonolite	Turritable Waterfall-tuff like	2·59-2·60
3.	Andesite	Hill, North-west of Newham	2·59-2·60
4.	Sölvsbergite	Camel's Hump	2·58
5.	Geburite-Dacite	Cherokee-Roadside Boulder	2·62
6.	Sölvsbergite	South side of Camel's Hump	2·51-2·52
7.	Sölvsbergite	Hanging Rock, hard type	2·58-2·59
8.	Geburite-Dacite	Summit of Mount Towrong	2·68
9.	Trachy-phonolite	Turritable Waterfall, compact var.	2·58-2·59
10.	Sölvsbergite	Hanging Rock, soft type	2·57-2·59

The specific gravities were determined with the Thoulet solution of mercuric and potassium iodides. The crystals in the case of Nos. 1, 3, 4 and 9 were clear, compact and free foreign matter. Nos. 2, 5, 6, 7, 8 and 10 were in some instances weathered or more or less affected by impurities.

Art. XVII.—*A New Genus of Phreatoicidae.*

By O. A. SAYCE.

(With Plates XVIII., XIX.).

[Read 14th November, 1901.]

Through the kindness of Professor W. A. Haswell, of Sydney, I recently received a few specimens of a new blind Isopod of the interesting and peculiarly Australian family Phreatoicidae. They were lately received by him from Tasmania, and were found in the burrows of the land crayfish *Engaeus cunicularius*.

In all fundamental characters this new species agrees with the genus *Phreatoicus*, but has differences in degree sufficiently marked to prohibit its inclusion in that genus; nor can it be considered congeneric with either of the other two genera of this family *(Phreatoicopsis* and *Phreatoicoides)*, so that it is necessary to establish another one to receive it.

The family characters are defined by Dr. Chilton, of New Zealand, as follows:—

"Body subcylindrical, more or less laterally compressed. Mandibles with a well developed appendage. Legs distinctly divided into an anterior series of four and a posterior series of three. Pleopoda broad and foliaceous and branchial in function, but not protected by an operculum. Pleon large, of six distinct segments. Uropoda, styliform."

The representatives of the family are mostly blind. Some inhabit subterranean waters, others surface waters, often on the summits of our highest mountains, and one species beside the present one is terrestrial. None are known of marine habit. They appear to be a very ancient family, and structurally widely separated from other known forms, and so far are only recorded from Australia, Tasmania, and New Zealand. It would be of interest to know if they exist in South America, for one is justified in thinking that they might be found there.

Gen. Hypsimetopus, gen. nov.

Generic Characters.—Very like *Phreatoicus* as to the general form of the body and the structure of the mouth-parts and several appendages. The cephalon, however, is relatively larger, being higher in front, and also deeper than the succeeding segment, to which it is freely articulated; the infero-lateral corners are produced forwards as an angular projection along the sides of the first joint of the lower antennae; the inferior margins, at about two-thirds of the length of the head from the front, curve upwards and slightly forwards to mark off on each side a large area (cheek), which, however, does not project outwards. The epistome forms a conspicuous transverse ridge below the base of the lower antennae.

First segment of pereion about as long as the succeeding segment, with its antero-lateral corners produced forwards. Pleon relatively rather shorter than in *Phreatoicus*, but not so short as in *Phreatoicoides*, the side-plates only slightly produced, and the vertically suspended pleopods almost entirely exposed.

First appendage of pereion in the male with enormous subchelate hand.

Remarks.—This new genus may easily be distinguished from *Phreatoicus* and *Phreatoicopsis* by the shape of the head, and also by the longer first segment of the trunk, with which it is very movably connected; this is not the case in the other two genera. In these characters, except in the relative length of the first segment of the trunk, it is in close agreement with *Phreatoicoides*, but, besides other differences, it fundamentally differs from that genus by the possession of an epipodite on each of the last three pairs of pleopoda, agreeing in this respect with the two first-mentioned genera. The name is suggested by the relatively high forehead in comparison with *Phreatoicus*.

Hypsimetopus intrusor, sp. nov.

Specific Characters.—Form of body rather slender, surface smooth. Eyes not formed. First four segments of pereion of subequal length. Pleon only a little deeper than the pereion, its length measuring 45 as compared with the cephalon and pereion combined as 100; terminal segment with which the telson is amalgamated a little longer than the preceding one, narrowing somewhat distally and constricted above into a small truncated telson, which, however, does not project beyond the extremity, and is almost hidden in lateral view; this bears on its upper surface two transversely placed stout spines and many long setae; below this piece on each side is a stout marginal spine, and the margins thence curve downwards and forwards to the base of the uropoda, and are fringed by a single rather stout spine, and several spinules and setae.

The inferior margin in front of the uropoda, curves evenly upwards and bears a series of two stout and about four finer simple spines. Uropoda with rami shorter than the basal joint, inner one slightly the longer, its upper surface swollen at the middle area and bearing two stout spines, outer ramus with one spine on the upper surface.

Upper antennae not reaching to the extremity of the fourth joint of the lower antennae, peduncle short, flagellum of about seven joints. Peduncle of lower antennae long, possessing few setae, the fifth joint longer than the fourth; flagellum multi-articulate (length unknown).

Gnathopoda of male with hand very large and powerful, sub-triangular, narrow at the insertion of the finger, palm oblique, concave, margin entire, and fringed with long spineform setae, meeting the posterior border in a clearly defined obtuse angle; anterior and posterior margins evenly convex. Finger a little shorter than the palm, impinging against the inner side of the hand beyond the palmar edge, its inner surface near the middle tumified.

Colour.—Spirit specimens, creamy white.

Length.—Male, 15·5 mm.

Habitat.—Near Zeehan, Tasmania, in burrows of *Engaeus cunicularius.* (Received fron Professor W. A. Haswell.)

Supplementary Description.

I received three specimens, and each appears to be a male, in consequence of having a large hand agreeing precisely with each other. The largest one measured 15·5 mm. in length, and the other two about 12 mm.; one of these latter I dissected; it was a male, and the following description is taken from it.

Body.—The surface of the body has very few setae upon it, except the terminal segment, which possesses a fair number on the back as well as on the hind margin, which also possesses some spines and spinules. The side-plates of the pleon are fringed on the inferior and posterior margins with a few long filamentous setae, and the epimera of the last three segments of the pereion have the posterior angle of each tufted with a few spinules. The front margin of the head has also a few setae just above the base of the lower antennae, in front of the place where the eyes in allied forms are situated.

Upper Antennae.—The first three joints which form the peduncle are of subequal length, and conjointly scarcely reach beyond the second joint of the lower antennae, the basal joint is somewhat stouter than the succeeding one, the others become a little narrower. The flagellum has seven joints, and, as in *Phreatoicus*, towards the end is slightly swollen; the first joint is half the length of the preceding one (third joint of peduncle), but scarcely any narrower.

Lower Antennae.—None of the specimens possessed any that were unbroken at the ends, so that their length is unknown. The peduncle is relatively rather long and has very few setae; the first joint transverse, its lower margin longer than the upper, the second almost square, third as long as the two basal joints combined, proximally narrow and bent a little upwards, fourth a little longer, fifth considerably longer than the fourth. In the longest, but broken flagellum I counted 33 articuli.

Mouth parts.—The mouth parts are of normal form.

Anterior Lip.—Much broader than long, very thick at the base, evenly rounded distally with the centre slightly produced. Near the base of the lip (epistome) thère is a distinct transverse ridge projecting outwards and thickly furred.

Mandibles.—The mandibles have no marked difference in shape from the other allied forms. The most noticeable characteristic is a rather stouter palp, the terminal joint being fully half as broad as its length. The *left* mandible has the outer cutting edge divided into four, and the inner into three teeth; between these and the molar expansion there is a secondary process (spine row) and this bears on its summit about 14 pectinated spines which are disposed in two parallel rows, which diverge from one another on each side. The molar expansion is large and its end broad and concave.

The *right* mandible has but a single cutting edge which is divided into four teeth; between the base of this plate and the molar expansion there is a secondary process which bears a single row of about six slightly pectinated spines, and between this process and the cutting-edge there is a single stouter simple spine. The molar expansion is longer than the left-hand one, and its surface is larger and convex.

The mandibular palp has the first joint short, being as broad as it is long, the second fully three times as long, and the third fully half as broad as its length, which is less than the second; each bears many long setae, those at the apex of the terminal joint being curved, and faintly feathered.

Posterior Lip.—The posterior lip is very thick at the base, and divided into two rather broad lobes which are irregularly rounded distally and fringed with long setae.

First Maxillae.—The outer lobe of the first maxillae has the end obliquely truncated and crowded with 10 spines, some of which are more or less pectinated. The inner lobe is considerably shorter than the outer one, the end set very obliquely and clothed as follows:—A single spine at the outer extremity, at the base of which arises a long plumose setae of identical form to those so-called auditory, then follow a row of five stout setae, which are slightly curved and a little pectinated near the ends on their outer face, and ciliated along the same face lower down.

Second Maxillae.—In the allied forms, except Phreatoicopsis, there is a pretty close agreement in this organ. The present form presents no peculiarities of its own. The inner lobe is relatively long and extends to the level of the two outer twin lobes.

Maxillipedes.—These are comparatively rather slender. The epipodite is somewhat small and narrow, and the distal margin angular, with the apex rounded off. The basis, ichium, and merus are without any special differences to other forms; the plate of the basis extends to the distal extremity of the merus, and bears three curved coupling spines on the right and two on the left-hand sides. The carpus is rather long and slender, and the outer distal angle is not produced. The propodus is of equal length to its breadth, and of almost circular outline; the dactylus is longer than the preceding joint and narrower, and the extremity rounded.

First Appendage of Pereion.—Not having seen a female I can only speak of the male form. The basis is short, being only a little longer than its greatest breadth, narrow at the neck, front margin almost straight and hind margin deeply convex. Ichium rather broader than long, posterior margin converging outwards from each end to meet in the middle length of the joint as a sharply defined angle; opposite margin convex. Merus very short, twice as wide as long; anterior margin squarely produced forward. Carpus rather narrowly jointed to the merus; hind margin convex; front margin abruptly curving outwards to form a wide union with the propodus. The remainder of the appendage has been sufficiently described.

Second, Third and Fourth Appendages of Pereion.—These agree in general shape with *Phreatoicus australis*, but do not bear nearly so many spines and setae, only the penultimate and antipenultimate joints bear any spines, and these are along the posterior margin. The last joint has beside the terminal nail a tooth on the inner margin, which agrees with each of the known members of the family, but is very small in *Phreatoicopsis*. (In my remarks following *P. shephardi*, I stated that the dactyli of the legs did not have a secondary unguis; this only applies to the three last pairs, for the second, third and fourth have a secondary nail or tooth.) The merus of the second pair is rather more expanded than the third and fourth. The fourth is shorter than the third and exhibits no sexual differentiation in the two last joints as in *Phreatoicus*.

Fifth, Sixth, and Seventh Appendages of Pereion.—These are similar to each other in form, and each succeeding pair gradually increase in length, the fifth being equal to the fourth. The dactyli of each is long with the margin entire.

Pleopoda.—These possess all the characteristics of *Phreatoicus*; relatively they are broader, and the exopodite which the last three pairs possess is larger and fringed with long setae.

First pair with protopodite narrow; exopodite twice as long as broad, jointed to protopodite near its inner margin; outer margin entire, curving upwards and outwards, then downwards in an even curve to the inner distal margin. Inner margin almost straight. Outer margin fringed with setae, those at the distal extremity being plumose. The inner margin is unclothed in this pair, but is thickly fringed with setae in each of the others. The endopodite is as long as the exopodite, but narrower, and except for two or three plumose setae at the extremity is unclothed. The *second pair* is of the same shape as the first pair, except that the inner margin near the end is excavated to receive a small triangular secondary joint, which is narrowly articulated close to the inner margin, and hangs only a very little below the extremity of the primary joint. The endopodite is broader than the first pair, and the "penial filament," which is borne by this joint, is short, elbowed at the base, and pointing upwards. The *third pair* is of similar length to the second, but the exopodite and epipodite are each broader, and the protopodite has a long, narrow-ovoid lobe (epipodite) jointed to its outer face. The structure of this lobe is thicker than the exopodite and very vesicular, being similar to the endopodite except that margin is fringed with long simple setae set some distance apart. The *fourth* and *fifth pairs* agree in all respects with the third, except in size, the fourth being a little shorter and the fifth much shorter, so much so as to be almost as broad as long, and the hind margin forming a full half circle.

DESCRIPTION OF PLATES.

A.—*Hypsimetopus intrusor*—Side view of the whole animal, a male of 15·5 mm.

B.—Cephalon and adjacent parts except buccal mass.

C.—Extremity of body with uropod attached.

L^1.—Anterior lip.

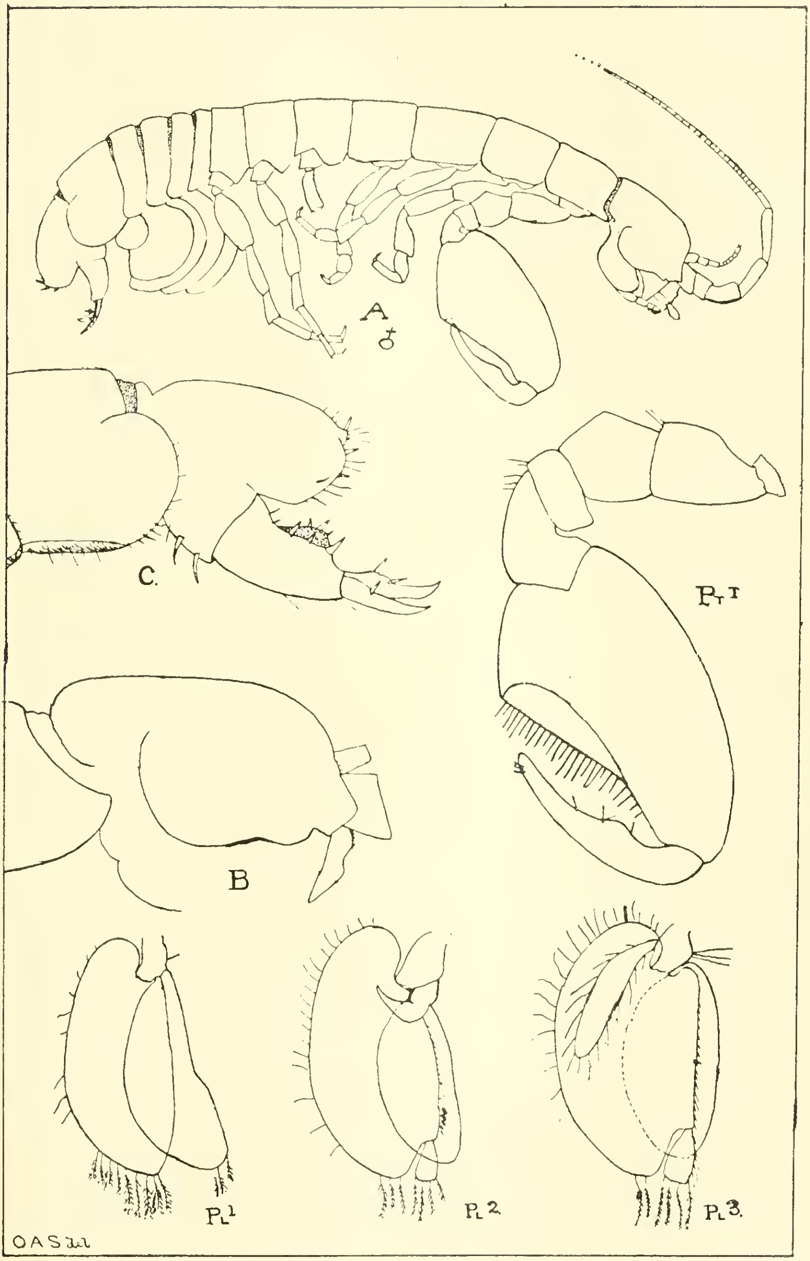
M^R and M^L.—Right and left mandibles.

L^2.—Posterior lip.

Mx^1 and Mx^2.—First and second maxilla.

M.P.—Maxillipedes.

Pr, 1, 2, 4, 7.—Pereiopods, numbered respectively.



A ♂
C.
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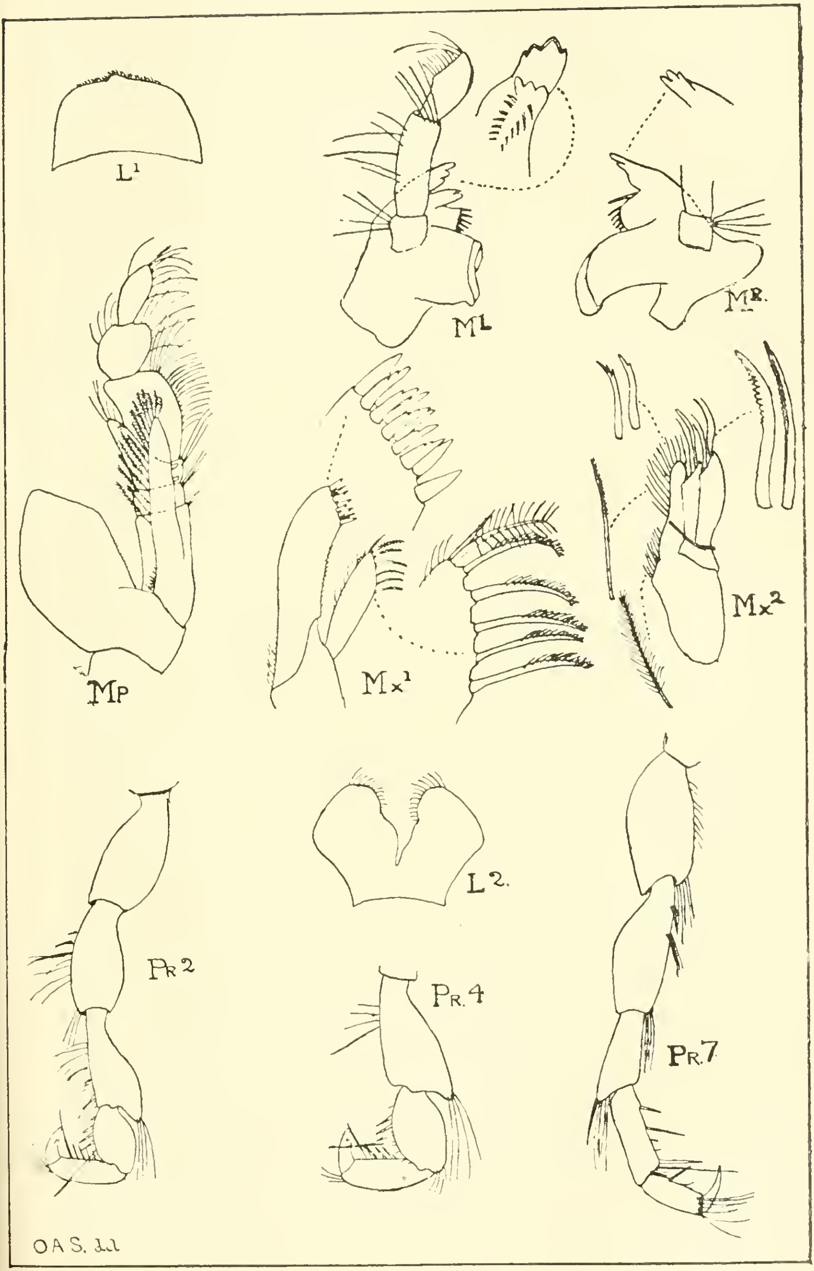
L¹
Ml
MR.
Mp
Mx¹
Mx²
L 2.
Pr 2
Pr. 4
Pr. 7
OAS. 11

ANNUAL REPORT OF THE COUNCIL

FOR THE YEAR 1900.

The Council of the Royal Society herewith presents to the Members of the Society the Annual Report and Balance Sheet for the year 1900.

The following Meetings were held :—

March 8.—*Paper :* "A contribution to our Knowledge of the Spiders of Victoria; including some New Species and Genera," by H. R. Hogg, M.A.

April 19.—*Papers :* 1. "Notes on the Plumage Changes of Petroeca phoenicea (Gould) Pachycephala gutturalis (Latham); and Microeca fascinans (Latham)," by Robert Hall. 2. "Further Descriptions of the Tertiary Polyzoa of Victoria, Part IV.," by C. M. Maplestone. 3. "Further Descriptions of Victorian Earthworms, Part I.," by Professor Baldwin Spencer. 4. "Phreatoicus shephardi, a New Genus of Fresh-water Isopoda from Victoria," by O. A. Sayce. *Exhibit :* An Aboriginal Stone Implement, by C. C. Brittlebank.

May 10.—*Papers :* 1. "Janirella, a New Genus of Isopoda from Fresh-water, Victoria," by O. A. Sayce. 2. "Hysteresis," by Professor T. R. Lyle, M.A. *Exhibits :* Rare Birds of Paradise :—Paradisornis rudolphi, Astrachia stephaniae, Amblyornis macgregori, Amblyornis subalaris, Loria loriae, by J. A. Kershaw, on behalf of the Trustees of the National Museum. Some Type Specimens of recently described Victorian Tertiary Sponges, by T. S. Hall, M.A.

June 14.—At the Natural Philosophy School, Melbourne University. *Papers :* 1. "Catalogue of the Marine Shells of Victoria, Part IV.," by G. B. Pritchard and J. H. Gatliff. 2. "On some New Species of Victorian Mollusca, No. 4," by G. B. Pritchard and J. H. Gatliff. *Lecturette :* "The Application of Crookes Tubes to Alternate Current Measurement, with

Experiments," by Professor T. R. Lyle, M.A. *Exhibits:* 1. The Wehnelt Interrupter, by Professor T. R. Lyle, M.A. 2. A New Mammal from the Older Tertiary of Tasmania, by Professor Baldwin Spencer.

July 12.—*Exhibits:* 1. Crustacea preserved by a New Process, by O. A. Sayce. 2. An Old Map of Africa, by Professor J. W. Gregory, D.Sc. Mr. White gave an account of the methods employed for determining the position of Ships at Sea.

August 9.—*Lecturette:* "The Weather," by P. Baracchi. *Exhibit:* Glaciated Stones from Ashford, N. S. Wales, by E. J. Dunn, F.G.S.

September 13.—*Papers:* 1. "Two New Victorian Frogs," by Professor Baldwin Spencer. 2. "The Reputed Cinnabar from Western Victoria," by T. S. Hart, M.A. *Lecturette:* "Some Egyptian Antiquities," by Rev. E. H. Sugden, M.A., B.Sc. *Exhibits:* 1. Egyptian Antiquities, by R. H. Walcott, on behalf of the Trustees of the Public Library. 2. The Specimen of Reputed Cinnabar from Western Victoria, which Analysis showed to be Red Lead and Oil, by T. S. Hart, M.A.

October 11.—*Papers:* 1. "A Classification of Australian Aboriginal Stone Implements," by A. S. Kenyon and D. L. Stirling. 2. "Cyphaspis spryi, a New Victorian Trilobite," by Professor J. W. Gregory, D.Sc. 3. "Note on Underground Temperatures," by H. C. Jenkins, A.R.S.M. *Exhibits:* 1. Photographs of Columnar Basalt, near Sydenham, by J. Shephard and by R. Hall. 2. A collection of about 200 Stone Implements in illustration of their paper, by A. S. Kenyon and D. L. Stirling. 3. Cyphaspis spryi, by Professor J. W. Gregory, D.Sc.

November 8.—*Paper:* "Further Descriptions of Tertiary Polyzoa from Victoria, Part V.," by C. M. Maplestone. *Lecturette with Experiments:* "High Temperature Measurements," by H. C. Jenkins, A.R.S.M.

December 13.—*Papers:* 1. "Description of some New Victorian Fresh-water Amphipoda," by O. A. Sayce. 2. "Petrological Notes on the Granites of Victoria," by E. G. Hogg, M.A. 3. "Additions and Corrections to the Census of Victorian Minerals," by R. H. Walcott, F.G.S. 4. "Geological Notes on the Yarra Improvement Works and the

Vicinity," by A. E. Kitson, F.G.S. 5. "Vittaticella, a new name for the Genus Caloporella, MacGillivray," by C. M. Maplestone.

During the year the Society has lost four members, one country member, and one associate, and gained five members and three associates.

The following publications have been issued: "Proceedings," Vol. XII., Pt. 2; Vol. XIII., Pt. I.

The Librarian reports that 1202 additions have been made to the Library during the year, and points out that additional shelving will have to be provided as the present cases are now overcrowded. Additional funds for binding are still urgently needed.

The Honorary Treasurer in Account with the Royal Society of Victoria.

Dr.	£	s.	d.	Cr.	£	s.	d.
To Balance from 28th February, 1900 ...	£67	7	3	By Printing and Stationery	£169	19	9
Government Grant—				Rates	5	10	0
Vote, for 1899-1900	£100	0	0	Gas and Fuel	6	3	9
1st Instalment of Vote for 1900-1901	50	0	0	Salary of Assistant-Secretary	25	0	0
Subscriptions—				Custodian	6	0	0
Members	£99	15	0	Collector's Commission	12	19	8
Country Members	11	11	6	Insurance	4	10	0
Associates	34	2	6	Postages	14	15	5
Arrears	87	3	0	Furniture and Repairs	2	5	6
Rent of Rooms	6	15	0	Books and Periodicals	3	15	6
Interest	3	15	0	Freight	4	11	0
				Refreshments	3	16	5
				Incidentals	3	16	11
				Sewerage Connections	2	3	2
				Balance (28th February, 1901) ...	195	2	2
	£460	9	3		£460	9	3

PUBLISHING AND RESEARCH FUND.

Dr.	£	s.	d.	Cr.	£	s.	d.
To Fixed Deposit in Bank	£200	0	0	By Fixed Deposit in Bank of Australasia	200	0	0
Interest	3	15	0	Interest transferred to General Account	3	15	0
	£203	15	0		£203	15	0

Compared with the Vouchers, Bank Pass-Book and Cash-Book, and found correct,

H. MOORS,
JAMES E. GILBERT, } *Auditors.*

JAMES JAMIESON,
Hon. Treasurer.

6th March, 1901.

The Royal Society of Victoria.

1901.

LIST OF MEMBERS,

WITH THEIR YEAR OF JOINING.

Patron.

His Excellency Sir John Madden, K.C.M.G.	1895

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Parker, A., Footscray 1897
Potts, H. W., F.C.S., Department of Agriculture, Melb. 1899

Rosales, Henry, F.G.S., "Alta Mira," Grandview Grove, Armadale 1880

Sargood, Sir Frederick, K.C.M.G., M.L.C., Elsternwick 1883
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Sweet, George, F.G.S., Wilson-street, Brunswick ... 1887

Walcott, R. H., F.G.S., Technological Museum, Swanston-street 1897
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Wilkinson, W. Percy, Govt. Analyst's Laboratory, Swanston-street, Melbourne 1894

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McDougall, Duncan, Maryborough, Victoria 1897

Oddie, James, Dana-street, Ballarat, Victoria 1882

Officer, C. G. W., B.Sc., "Glenbervie," Orrong-road, Toorak 1890
Officer, Sidney, Maryvale, Edenhope 1890

Powell, Walter D. T., Cape Moreton Lighthouse, Brisbane, Queensland 1886

Tipping, Isaac, C.E., Ballarat, Victoria 1892

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Howes, Professor G. B., LL.D., F.R.S., Royal College of Science, S. Kensington, England 1898

Lucas, A. H. S., M.A., B.Sc., Sydney Grammar School, Sydney, N.S.W. 1895

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Booth, John, M.C.E., 62 Drummond-street, Carlton ... 1872
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Fison, Rev. Lorimer, M.A., Essendon, Victoria ...	1889
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Lambert, Thomas, Bank of New South Wales, Collins-street, Melbourne	1890
Le Souëf, D., C.M.Z.S., Royal Park, Melbourne ...	1894
Lidgey, E. A., 41 Burke Crescent, Geelong	1894
Luly, W. H., Department of Lands, Treasury, Melbourne	1896
Maclean, C. W., "Bronte," Strand, Williamstown ...	1879
Mahony, D. J. "Laremont," Bruce-street, Toorak ...	1901
M'Ewan, John, 70 Swanston-street	1898
Melville, A. G., Mullen's Library, Collins-street east, Melbourne	1889
Murray, Stuart, C.E., Department of Water Supply, Melbourne	1874
Phillips, A. E., Box 396, G.P.O., Melbourne ...	1883
Pritchard, G. B., Mantell-street, Moonee Ponds, Victoria	1892
Rosenhain, Walter	1896
Sayce, O. A., Harcourt-street, Hawthorn	1898
Schäfer, R., Union-street, Windsor, Victoria	1883

Shaw, Alfred C., Bond-street, Abbotsford, Victoria	...	1896
Smith, F. Voss, Trinity College, Melbourne ...	...	1901
Smith, G. P., Trinity College, Parkville ...	...	1901
Stephen, Rev. R., M.A., Trinity College, Parkville	...	1901
Stewart, C., Oxford Chambers, Bourke-street, Melb.	...	1883
Thiele, E. O., 219 Osborne-street, Williamstown	...	1898
Tisdall, H. T., 7 Washington-street, Toorak ...	...	1883
Wedeles, James, 231 Flinders-lane, Melbourne	...	1896

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(*The names of new genera and species are printed in Italics*).

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The Society then became:—

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Proceedings (New Series). Vol. 1——. 1888——.

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