TRANSACTIONS AND PROCEEDINGS

AND

REPORT

OF THE

ROYAL SOCIETY of SOUTH AUSTRALIA

(INCORPORATED).

VOL. XXXIII.

[WITH TWENTY-NINE PLATES AND FOURTEEN FIGURES IN THE TEXT.]

EDITED BY WALTER HOWCHIN, F.G.S.

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CONTENTS (continued).

APPENDICES.

ERRATA.

Page 103, seventeenth line from the bottom, *for* Chamberlain, *read* Chamberlin.

Page 105, eleventh line from the top, *for* uplight, *read* uplift.

Page 111, nineteenth line from the top, *for* refracture, *read* refractive.

Page 117, seventh line from the bottom, *for* falspar, *read* felspar.

Page 119, ninth line from the bottom, *for* No_2O, *read* Na_2O.

Page 130, second line from the bottom, *for* fig. 8, *read* fig. 9.

Page 131, second line from the bottom, *for* fig. 9, *read* fig. 10.

Page 134, second line from the top, *for* fig. 9, *read* fig. 8.

The Scattering of the β Rays of Radium.

By J. P. V. Madsen, D.Sc. (Adel.), B.E. (Syd.), Lecturer in Electrical Engineering, University of Adelaide.

Preliminary Account read before the Australasian Association for Advancement of Science, Brisbane, January 13, 1909.

[Read April 6, 1909.]

I.

Introductory.

In a paper by the author upon the secondary γ rays (1) it was shown that in passing through matter the γ rays were scattered and softened. The scattered radiation showed a distinct lack of symmetry about a plane perpendicular to the direction of the original stream, more scattered radiation moving on in the direction of the original stream than was turned back. The distribution of the scattered radiation was found to depend upon the quality of the incident radiation and also upon the nature of the medium in which the scattering occurred.

As the results arrived at in that investigation were used as an argument in support of the material theory of γ rays proposed by Professor Bragg, and as J. A. Crowther (2) has recently shown that the β rays are subject to scattering by even very thin layers of material, it became of special interest to see whether any parallel could be drawn between the effects of scattering in the case of the material β particles and the γ rays.

It will be seen from the present paper that the parallel is very close in many respects, the differences being such as might reasonably be expected on the theory that the γ ray is a neutral pair.

At the same time it is hoped that some of the results to be described may help to clear up some of the difficulties which have arisen in the study of the absorption of β rays.

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(1) Trans. Roy. Soc., S.A., vol. xxxii. (1908).

(2) Proc. Roy. Soc., Sec. A., vol. lxxx. (1908).

§ II.

Apparatus.

The apparatus used in these experiments is shown in fig. i. The radium contained in a small conical hole cut in a piece of Al was covered by a sheet of Cu foil ·002 cm. thick. The β rays passed up through a conical hole cut in a block of wood, portions of the block being removed as shown to allow of the introduction of the screens in different positions as at A, B, C. The ionization chamber was hemispherical and made of wood, with the inner surface covered with very thin Al foil. The electrode connecting to the electrometer

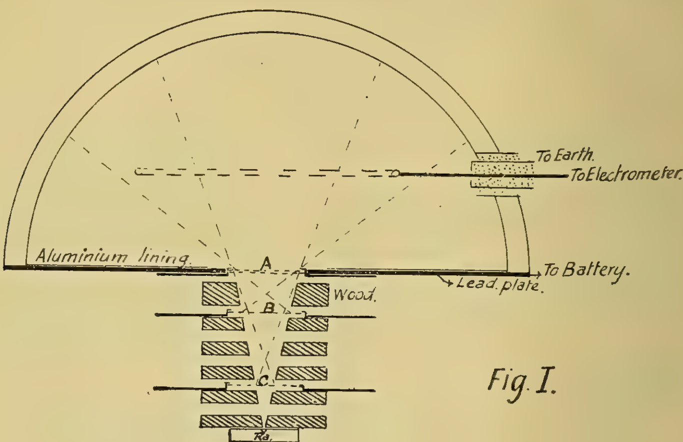

Fig. I.

was in the form of a circular ring of wire, suitably protected by the usual methods. The hemispherical chamber rested upon a circular plate of Pb, above which was laid a sheet of Al. A circular hole cut centrally in the Pb and Al plates enabled the screen to be placed in the position A. In this position practically all the emergent scattered radiation was able to produce its effect to the same extent as the rays in the main stream, all rays having the same length of path in which to produce ionization, and the complications of secondary effects being reduced by having the walls of the chamber wood.

If we may for the present neglect any alteration in speed of the scattered radiation and consider the original stream of rays more or less homogeneous, the current may be taken approximately as a measure of the number of β particles which enter the chamber, no matter what their direction, proper correction being made for the effect produced by γ rays.

By subtracting the readings taken with a screen at A and at C a measure is obtained of the amount of radiation which has been turned out of its original path or scattered by that screen. Another reading with the screen at B enabled the distribution of the emergent scattered radiation to be followed out.

To obtain a measure of the returned, or incident, scattered radiation the apparatus shown in fig. ii. was used.

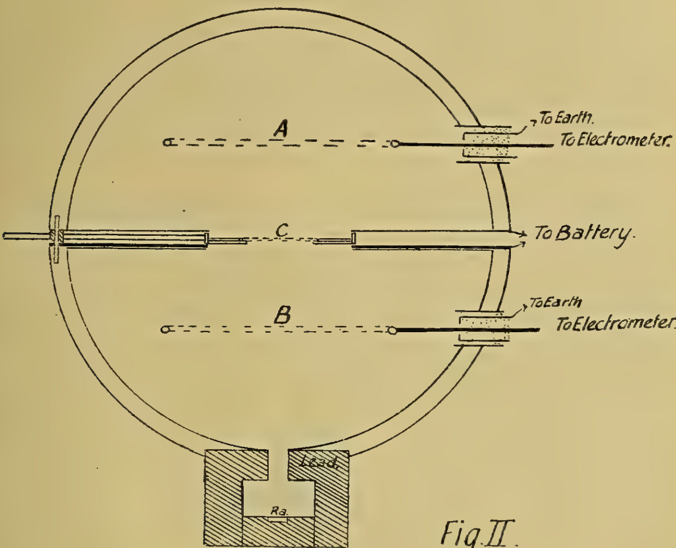

Fig. II.

The top chamber, A, was the one already described, and a similar hemispherical chamber, B, was placed as shown with the Ra outside, contained in a Pb block provided with an opening through which the β rays could pass, impinging on screens placed in the position C. A stronger sample of Ra, kindly lent by Dr. Hermann Laurence, was used in these experiments, but care was taken to cover it with Cu foil, as in the first set of experiments. Either of the electrodes A or B could be connected to the electrometer, and as the chambers were made as nearly as possible alike no appreciable change in capacity was introduced, using either chamber separately. It was necessary to use a balance chamber, as

A 2

the initial effect was so large compared with that which was to be measured. By placing a thin Al foil at C and then a thick Pb plate, a measure was obtained of the incident and of the maximum return radiation for that substance, from the effects measured separately in the chambers A and B. This enabled the readings for the incident scattered radiation to be reduced to their correct values relatively to those of the emergent rays, using the maximum return radiation from Pb as a standard of reference.

§ III.

Results of Experiments.

Fig. iii. shows the results of experiments performed with the apparatus of fig. i., using Al screens.

Curves D and E give the currents for different thicknesses of screen, with the screens in the positions A and C respectively. The abscissæ represent grammes per square cm. from which the thickness of screen may be immediately deduced, knowing its density.

Curve C is obtained by subtracting the values of D and E corresponding to any screen, and is a measure of the total amount of emergent scattered radiation.

It will be seen from fig. i. that the whole of the scattered radiation is not quite included, as the effects are somewhat interfered with by geometrical conditions. When, for example, the screen was brought nearer the Ra than C a slight rise was observed in the reading. The intensity of the radiation falling on the screen was slightly increased owing to some of the more oblique rays from the Ra being now able to fall upon the screen.

Curves A and B represent the results of subtracting readings with the screen at B and C and A and B respectively (fig. i.), and are measures of the amount of radiation slightly deflected, and of that which has suffered much larger deflection.

Curve F represents the returned radiation from aluminium screens of different thicknesses. Similar curves to the above are shown in fig. iv., for Au screens.

§ IV.

Discussion of Results.

In fig. iii., from curve C, it is seen that the total emergent scattered radiation increases rapidly to a maximum, and then steadily decreases as the thickness of screen is increased. The maximum occurs at about ·013 cm.

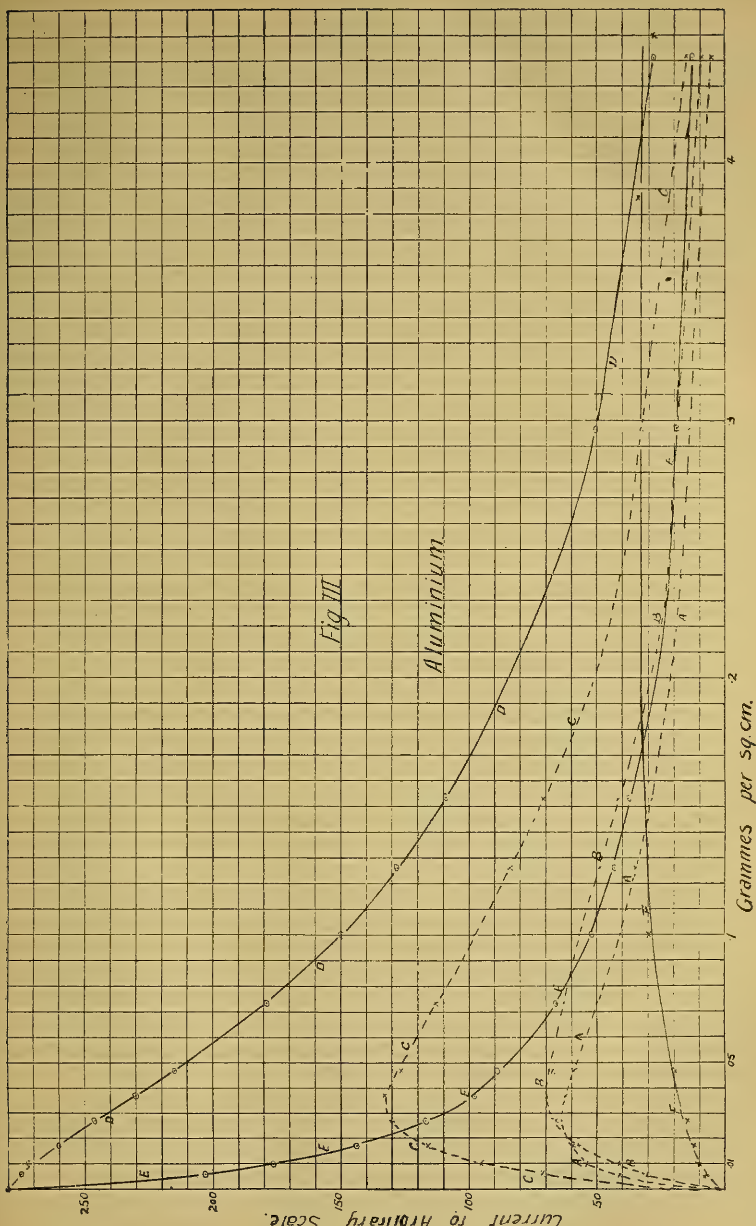
Fig III
Aluminium
Grammes per sq.cm.
Current to Arbitrary Scale.
250
200
150
100
50
·01
·05
·1
·2
·3
·4

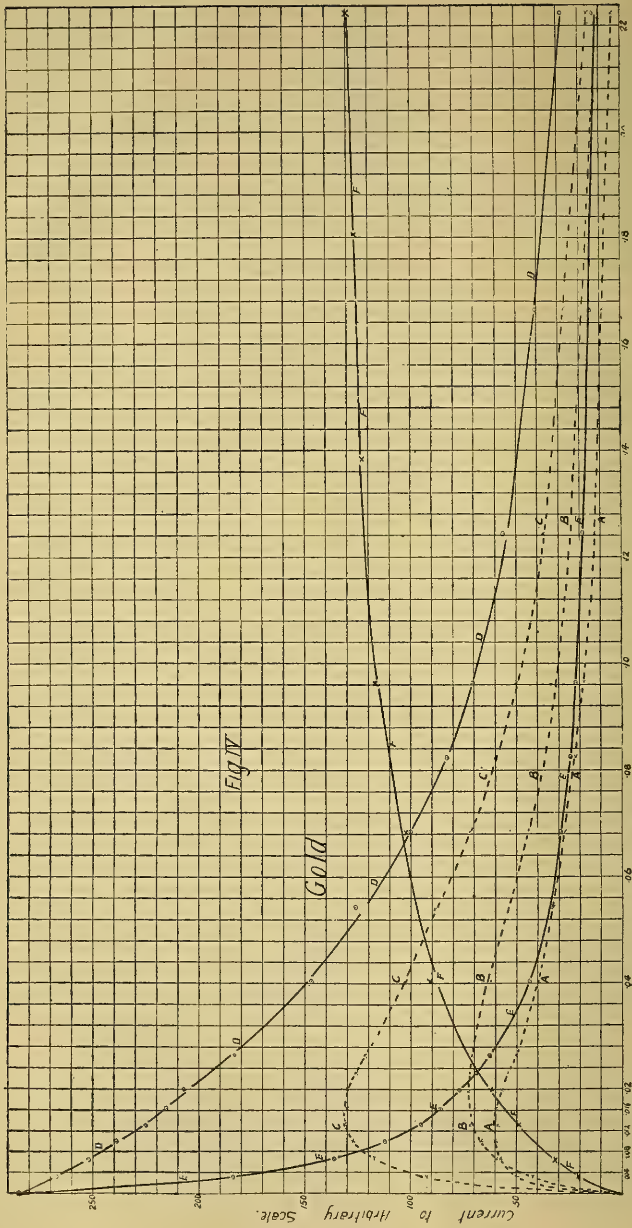
Fig IV
Gold
Grammes per sq. cm.
Current to Arbitrary Scale.

Comparing the curves C and F, it is seen that for thin screens the emergent is much greater than the incident scattered radiation. The greatest value of the ratio is about 9:1.

Comparing the similar curves for Au, fig. iv., it is again seen that a considerable lack of symmetry exists between emergence and incidence radiation, though not so marked. In this case the greatest value of the ratio is about 4·5 : 1. The maximum for the emergence radiation is reached at about ·0008 cm.

The effects of scattering in the case of β rays are thus very similar to those observed for γ rays, a material of high atomic weight being able to turn back in the process of scattering more of the original radiation than a material of smaller atomic weight.

Comparing curves A and B, it is observed that A reaches a maximum sooner than B. A more careful examination of A and B for smaller thicknesses of screen has shown that the ratio of A to B is practically constant until about one-third of the maximum reading is reached, after which the ratio gradually decreases. It would appear that while the ratio remains constant we are concerned with only a single collision of any β particle, that as the screen is further thickened it becomes possible for a β particle to suffer more than one collision before emerging, thus making the emergent beam appear to gradually swing round from its original direction, a greater thickness of screen being required to produce the maximum intensity for very oblique rays than for those corresponding more nearly with the direction of the original stream.

A fuller consideration of the effects of scattering and absorption for very thin films will be reserved for a future paper.

A theory of scattering similar to that proposed by Sir J. J. Thomson in "Conduction of Electricity through Gases" seems capable of explaining the observed results. The nearness of approach of a β ray to a constituent of an atom will determine the amount and nature of the deflection experienced, the speed of the β ray and the constitution of any particular atom being also necessary factors.

Until a β ray is subject to more than one collision the distribution is approximately constant for a given material, the intensity of the radiation deflected by an angle θ from the original direction being a function of that angle for any one material and with rays of a given quality.

We are to consider this function of θ as being different for the different atoms.

The lack of symmetry in the distribution of scattered X-rays has been shown by Professor Bragg,[3] and assuming, as seems reasonable on many grounds, that X- and γ rays are of the same nature, it appears from that investigation that the softer radiation shows less want of symmetry when falling on a given material than does the harder.

Now although the lack of symmetry shown by the scattered β rays is much greater than that found for γ and X-rays, even though the former are less penetrating, the general nature of the effect has been shown to be much the same in the case of all three, and the difference in magnitude may possibly be explained by the difference in distribution of the fields of the rays concerned.

Curves similar to C, figs. iii. and iv., have been obtained for Ag and paper; they show the same general characteristics. It is remarkable, however, that the maximum value of the curve C is very nearly the same for all the substances tested.

In a recent paper by McClelland [4] an account is given of the distribution of the returned β radiation from plates of different substances when the incident beam of radiation is inclined to the plate. The results seem capable of explanation, in view of the effects which have just been described, upon a theory of scattering without the need of introducing the idea of a true secondary radiation proceeding from the atoms affected by the incident β rays.

The general effect observed by McClelland is that the distribution of the returned radiation is more uniform for Pb than for Al. This is to be expected in view of the nature of distribution of the scattered rays from thin films of such substances as Au and Al, which has been described in the present paper.

From the results shown in figs. iii. and iv. it is at once seen that the effects of scattering may considerably modify the results obtained in the usual form of absorption experiment with β rays. The shape of the ionization chamber and the positions of the screen and active material relatively to the chamber and to each other may produce considerable modifications in the results.

Again, in studying the absorption of β rays it would seem necessary to deal with very thin screens as is necessary in observing the effects of scattering; for thicker screens the results are likely to become considerably complicated.

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(3) Trans. Roy. Soc., S.A., vol. xxxii. (1908).

(4) Proc. Roy. Soc., Series A, vol. lxxx.

It would seem almost better to replace the name of "absorption coefficient," as it is usually employed, by that of "transmission coefficient," reserving the former as a measure of effects which, as has been explained, can probably be obtained only from a study of very thin screens.

If the interpretation of the foregoing experiments be correct it seems that the β particle in traversing a thick screen may suffer many collisions and deflections.

Now it has been shown by Allen ("Phys. Review," Aug., 1906) that the secondary or reflected β radiation consists of electrons moving on the whole with a somewhat slower speed than the original radiation.

As the experiments described in the present paper indicate that in some cases these reflected electrons have suffered many collisions before emerging, it would appear that the loss of energy due to a single collision is as a rule not very great, even though the effect of the collision may have produced a considerable change in the direction of motion of the electron. It is not surprising, then, that some of the returned rays have been found to have practically the same speed as some of the original rays; they would appear to be electrons which have suffered only one collision of sufficient violence to cause them to reverse their original direction of motion, or several minor collisions leading to the same result.

From the curves shown in figs. iii. and iv. it is seen that for small thicknesses of screen, before much actual absorption has occurred, the number of β rays turned back may be large, so that many of the original rays would appear to lose their energy gradually, rather than by a very sudden stoppage and complete absorption. Since the cathode rays behave in many respects like the β rays, it seems difficult to understand how the whole of the energy of the X-rays can be derived from the stoppage of the cathode particles, for, as pointed out by Professor Bragg,(5) the stoppage must be very sudden for this to be the case.

Summary.

Experiments with the β rays of radium support the results previously obtained by Crowther, using uranium, upon the scattering of the rays by thin films of materials.

The distribution of the scattered β rays is unsymmetrical, about a plane at right angles to the direction of the original stream.

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(5) Trans. Roy. Soc., S.A., vol. xxxi. (1907).

A close parallel thus exists between the scattering of β rays and that of γ and X-rays.

The shape of the so-called absorption curve may be modified by the shape of the ionization chamber and the position of the screen and active material relatively to the chamber and to each other.

Absorption of a beam of β rays, combined with the effects of scattering and softening, seem sufficient to account for observed effects without the introduction of the idea of a true secondary radiation proceeding from the atoms affected by the primary stream of rays.

An electron appears to be able to suffer collisions, producing considerable change in its direction of motion, without any great loss of energy.

In conclusion, I wish to express my best thanks to Professor Bragg for the suggestions he has kindly given me from time to time during this investigation.

University of Adelaide, January 5, 1909.

Notes on the Orchids of Kangaroo Island, together with a Description of Two New Species.

By R. S. Rogers, M.A., M.D.

[Read November 3, 1908.]

Plate I.

In view of the great public attention which has recently been directed to this Island, it becomes of paramount importance that an exhaustive study should be made of its flora before settlement renders this impossible.

Amongst the first plants to disappear before the advance of the pastoralist will be the orchids, which, on account of their succulence, will be eagerly sought as dainty morsels by sheep and other stock.

The number of species recorded from Kangaroo Island has hitherto been exceptionally small. In 1881 I paid a botanical visit to this interesting place, and on that occasion added two to the few representatives of the order which were then known to bloom there. These were included by the late Professor Tate in those important contributions of his (the outcome of a personal visit) on "The Botany of Kangaroo Island," read before this Society in 1883. The following year, 1884, he further recorded six more species which had been forwarded to him by local residents. The total number of recorded species on that date stood at fourteen.

From that time until the present year our records have been silent with regard to Kangaroo Island plants of this order. At our last meeting, however, Mr. J. H. Maiden, F.L.S. (Government Botanist of New South Wales), in his valuable paper, "Contributions to the Flora of South Australia," mentioned a fifteenth which I sent him in a parcel of plants from Cape Borda last year. During the last quarter of a century I have paid very many visits to the Island, and have privately greatly augmented the known species.

The most fruitful of these visits was made in September of this year, when, accompanied by my wife, we collected in the single trip 35 species, two of which are new to science. We travelled by land from Kingscote along the north coast by way of Stokes Bay, Middle River, Western River, and Snug Cove to Cape Borda. With that point as our centre we explored the surrounding country, including Harvey's Return, Ravine Reserve, Parrot Creek, and the Ravine de Casoars. Our route was afterwards south and south-east, within easy distance of the West Coast, through the "Lighthouse Reserve" (67 square miles) across Ravine Creek, West Bay Creek, Breakneck River, and Rocky River to May's station. From thence we made an unforgettable journey to Cape de Couedic and back again. Thence by way of the South Coast across the Sou'-West River, the Stun'sail Boom, the Harriet, and the Eleanor to Mount Pleasant station. Skirting Lake Ada, we travelled north-east across Timber Creek and returned to Kingscote by way of Birchmore's and Retta's lagoons. The other plants collected on this trip are now in the hands of Mr. J. H. Maiden; the census of orchids, together with a few collected on other occasions, follows these introductory remarks. It includes 42 species, two of which are new. Species found also in Tasmania are indicated by the letter T; and those already recorded by the letter R:—

R, T. 1. *Thelymitra longifolia* (Forster) — Uncommon. Dudley Peninsula. Blooms October, November.

2. *T. pauciflora* (R. Br.)—Kingscote, Ravine de Casoars Creek. Blooms September.

T. 3. *T. aristata* (Lindl.) — Hog Bay River (South Coast). Blooms September, October.

4. *T. grandiflora* (Fitz)—Ironstone Hill, near Western River. Numerous in this locality with exceptionally large leaves. In bud at end September. Bloomed early in October when transplanted to Adelaide.

5. *T. leuteocilium* (Fitz)—Kingscote, Birchmore Lagoon. A swamp form. Blooms September.

T. 6. *T. flexuosa* (Endl.)—Widely distributed on the tableland between Ravine Creek and Tin-hut (Mr. Hubert Griffiths). Blooms October.

R, T. 7. *T. antennifera* (Hooker)—Widely distributed. Stokes Bay, Stun'sail Boom River, Western River, Sou'-West River, Harriet River, Timber Creek, Dudley Peninsula. Blooms September, October.

8. *T. fusco-lutea* (R. Br.)—Ironstone Hill, near Western River; Cape Borda. Blooms November.

9. *Calochilus Robertsoni* (Bent)—Middle and Western Rivers, Cape Borda. Blooms November.

R, T. 10. *Diuris longifolia* (R. Br.)—The only representative of the genus which I have so far found on the Island. It is extraordinarily prolific, and is to be found in vast quantities from one end of the Island to the other. Blooms September, October.

R, T. 11. *Prasophyllum elatum* (R. Br.)—Snug Cove, Harvey's Return, Cape Borda, Dudley Peninsula. Almost black in colour. Locally known as the "Blackboy." I have not so far met the lighter-coloured forms which are found on the mainland. Blooms October, November.

T. 12. *P. fuscum* (R. Br.)—Kingscote. In bud in September. Blooms early in October.

T. 13. *P. patens* (R. Br.)—Kingscote, Dudley Peninsula. Blooms October.

T. 14. *P. nigricans* (R. Br.)—I had long surmised that the smaller species of *prasophyllum* would probably be represented on the Island, especially as this genus has a small representative on Yorke Peninsula. I was fortunate enough to find a single late bloom in May when on a visit to Harcus Camp, on the tableland south-west of the Kohinoor Mine. It was not the Peninsula species, however. This year we found it in seed at Kingscote in September.

R, T. 15. *Microtis porrifolia* (R. Br.)—Dudley Peninsula, Kingscote, Cygnet, Salt Creek, Stokes Bay, Western River. Blooms October, November.

T. 16. *Corysanthes pruinosa* (Cunng.)—Swamp near Harvey's Return (Mrs. R. S. Rogers). Late bloom in September. Blooms July, August.

R, T. 17. *Pterostylis nana* (R. Br.)—Widely distributed throughout the Island. Blooms August, September.

T. 18. *P. nutans* (R. Br.)—Ravine de Casoars Reserve, Cape Borda. A few good blooms last week in September.

R, T. 19. *P. barbata* (Lindl.)—Hog Bay River, Sou'-West River, Harriet River, Eleanor River. Blooms September, October.

R, T. 20. *P. præcox* (Lindl.)—Dudley Peninsula, Antechamber Bay, Hog Bay. Late blooms with very small flowers in September at Ravine Creek. Blooms June, July.

21. *P. reflexa* (R. Br.)—Harvey's Return (Mrs. R. S. Rogers). Blooms June, July, August.

T. 22. *P. obtusa* (R. Br.)—Ravine Creek in moist, shady ground. Half a dozen withered specimens found end of September, 1908 (Mrs. R. S. Rogers). Blooms probably July and August. This species has been recorded only once in South Australia (Port Victor district), and it is not represented among our orchids in the "Tate" collection. These are the first specimens I have ever seen collected in this State. The plants are very small and slender when compared with specimens from the eastern States.

T. 23. *P. furcata* (Lindl.)—Late blooms found in January near Karatta (on (Stun'sail Boom River). I described this orchid as a species new to the State in Trans. Roy. Soc., S.A. (1907), vol. xxxl., page 125, plate xxii.

T. 24. *P. longifolia* (R. Br.)—This plant bears rather a striking contrast to our mainland form, the flowers being smaller (galea 5 lines or even less) and the habit exceedingly slender. The height varies from 4 to 13 in. Late blooms found at Kingscote in September.

T. 25. *P. vittata* (Lindl.)—Widely distributed throughout the Island. Blooms June, August.

T. 26. *Acianthus caudatus* (R. Br.) — DeMole River. Blooms September.

T. 27. *A. exsertus* (R. Br.)—Hog Bay River, Kingscote, Harvey's Return. Blooms May, June, July.

R, T. 28. *Cyrtostylis reniformis* (R. Br.)—Dudley Peninsula, Harvey's Return, Ravine de Casoars Creek. Blooms July to September.

T. 29. *Lyperanthus nigricans* (R. Br.)—Hog Bay River, Stoke Bay, Harriet River, Eleanor River, Mount Pleasant, Retta Lagoon, and Cygnet River. Blooms September, October.

T. 30. *Eriochilus autumnalis* (R. Br.)—I have found this species at Harcus Camp in seed in May. Probably it has a much wider distribution, but has not been recorded owing to its early time of blooming.

31. *Leptoceras fimbriata* (Lindl.)—Leaves fairly numerous at Stoke Bay and Rocky River. Should be looked for in May and June.

32. *Caladenia Cairnsiana* (F. v. M.)—Kingscote, Ravine de Casoars, Rocky River, near Cape de Couedic, Stun'sail Boom River, Harriet River. Blooms September.

33. *C. reticulata* (Fitz.)—Cygnet River, Mount Pleasant, Eleanor River. Blooms September.

T. 34. *C. Menziesii* (R. Br.)—Stoke Bay, Cape Borda, Ravine de Casoars, Harvey's Return. Blooms September, October.

R, T. 35. *C. filamentosa* (R. Br.)—This beautiful dark-crimson form is widely distributed throughout the Island. I know only of one locality on the mainland where it is to be found, *viz.*, Monarto, near Murray Bridge. It has struck me as an interesting fact that "*C. tentaculata*," a closely-allied light-coloured species, so common around the northern and western sides of the Gulf, does not occur on the Island. I have found both forms at Monarto. Blooms September, October.

R, T. 36. *C. dilatata* (R. Br.)—Dudley Peninsula, Kingscote, Ravine de Casoars. Blooms September, October.

R, T. 37. *C. Patersoni* (R. Br.)—This species has so long been considered a legitimate dumping-ground for divergent forms that perhaps no apology is required for placing still another under this heading. The Kangaroo Island form may conveniently be placed here for the present, although it seems to me a very distinct type. So far I have been unable to discover the presence on the Island of the forms which are so prevalent on the contiguous mainland, *e.g.*, Yorke Peninsula. As in the case of *C. filamentosa*, the only place in the State in which I have known the Kangaroo Island form of *C. Patersoni* to occur is Monarto, where I have collected it at about the same time of the year. It has a narrow leaf, varying from linear-lanceolate to oblong-lanceolate. The flower is usually solitary, the general colouring being yellow with red markings. The latter are shown by a red line running down the middle of each perianth segment, by the strongly-marked red clavate points of each sepal, and by the red tip of the labellum. There are four rows of calli, and the margins of the labellum are denticulated, though not deeply so. The caudæ are comparatively short and not hairy, as in the typical forms of *C. Patersoni*. Next to *C. filamentosa*, this is the most prevalent "spider" west of Kingscote.

R, T. 38. *C. latifolia* (R. Br.)—Kingscote, Harvey's Return, Ravine de Casoars Creek, and very common on Dudley Peninsula. Blooms September.

R, T. 39. *C. carnea* (R. Br.)—Not common, but widely distributed. I have found it on Dudley Peninsula, Kingscote, Rocky River, vicinity of Cape de Couedic, Sou'-West River, Harriet River. Blooms September.

R, T. 40. *C. deformis* (R. Br.)—This probably shares the place of honour with *Diuris longifolia* in being the most common orchid on the Island, some parts being literally converted into blue carpets in September, when it is at its best. It became scarcer as we skirted the Western Coast, but is represented everywhere.

41. *C. ovata* (sp. nov.). Pl. i., figs. 1 to 5—I first collected this orchid two years ago, but hesitated to name it on account of a superficial resemblance which it bears to *C. leptochila* (Fitz.). The labellum, however, is so entirely distinct and characteristic in the two forms that it seems to me the time has come for separating them. *C. leptochila* does not seem to occur on the Island. I have not seen the new species on the North Coast, but have found it in considerable numbers on the South Coast about Wilson River and the Eleanor. I have never met it on the mainland. It blooms in September and October. *Description.*—A slender species from 4 to 9 in. in height. Leaf from 1-2½ in., hairy, narrow-lanceolate or oblong-lanceolate. Stem slightly hairy with narrow lanceolate bract about the middle, and another subtending the flower. Flowers usually solitary, rarely two, very rarely three, reddish-yellow. Lateral sepals about 1 in., clavate, proximal half dilated, caudæ short and fine. Dorsal sepal about ¾ in., erect or slightly incurved over column, clavate, narrow-lanceolate. Lateral petals lanceolate, not clubbed, rather shorter and wider than dorsal sepal. Labellum ovate on a short claw, reddish-yellow, with dark-red tip, moderately recurved, with dark, divergent lines; margin entire. Calli very inconstant, as frequently in two as in four rows, sometimes represented by a few minute irregularly-placed bossings, occasionally entirely absent; generally small mammillary, except for a few short clavate ones near hinge, rarely extending much beyond the middle of labellum. Column less than ½ in., rather incurved, more winged in its upper than lower half; two prominent yellow basal glands. Anther point distinct

but short. Stigmatic surface oval just below anther.

42. *C. bicalliata* (sp. nov.)—A single specimen of this dainty little orchid was found by Mrs. R. S. Rogers near Kingscote on September 20, 1908. It was growing in rather sandy soil near the roadside on the margin of the scrub. *Description.*—Plant not quite 4 in. high. Leaf linear-lanceolate, 2½ in., hairy. Stem slender, hairy, a small lanceolate bract about the middle and an ovate-lanceolate subtending the flower. Flower solitary, cream-coloured, with red veinings. Segments of the perianth are very similar to each other, being expanded in the proximal part and then suddenly contracted into rather coarse, cylindrical hairy caudæ; each has a dark-red line running down the middle on outer side. The sepals are of equal length (9 lines), and the lateral petals slightly shorter. In the case of the dorsal sepal one-third is dilated; in the case of the other segments, one-half. The dorsal sepal is slightly incurved over the column, the lateral sepals spreading, the lateral petals divergent. Labellum 3½ lines, marked divergent red veins, recurved, clawed, point rather blunt, margins (except of the erect part) serrated; calli golf-stick-shaped, in two well-defined rows, extending to within about a line of the tip. Column incurved, widely winged in upper third, narrowly below. Anther point absent in my specimen; basal glands also appear to be absent. Stigmatic surface just below the anther.

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DESCRIPTION OF PLATE I.

Fig. 1. *Caladenia ovata* (sp. nov.), general view of plant and leaf (natural size).
,, 2. ,, ,, proximal part of labellum and claw, showing divergent veinings and calli.
,, 2*a*. ,, ,, basal clavate calli (magnified × 2).
,, 3. ,, ,, side view of labellum (magnified × 2).
,, 4. ,, ,, front view column, showing basal glands, anther, and wings (magnified × 2).
,, 5. ,, ,, side view of column (magnified × 2).

Further Notes on Australian Coleoptera, with Descriptions of New Genera and Species. No. XXXIX.

By the Rev. T. Blackburn, B.A.

[Read May 4, 1909.]

LAMELLICORNES.

SERICIDES.

Diphucephala.

In the tabulated statement of the distinctive characters of species of this genus in Tr. R.S., S.A., 1906, the following correction is required:—On page 268, line 48, and 269, line 1, for "elytra" read "prothorax." Also transfer the name "ignota, *Macl.*," from line 3 on page 269 to line 49 on page 268.

D. ignota, Macl.
D. nitens, Macl.
D. rufipes, Macl.
} These three species are affected by the correction notified above.

SERICOIDES.

Heteronyx (continued).

Group III.

The hitherto published names that can confidently be assigned to species of this group are 17 in number, and there are also 4 species the descriptions of which indicate their place as being in either this or the following group—that is to say, they have the labrum below the level of the clypeus, and antennæ of 9 joints, while there is no record of their claw structure. Two of them are Tasmanian species, described by Erickson *(præcox* and *tempestivus)*, which I think I know as members of Group IV., although I have not seen the types. It is worthy of note here that scarcely any Tasmanian *Heteronyces* known to me have bifid claws. One of the remaining two *(laticeps)* was described by Burmeister and attributed to "Australia." I am afraid that *laticeps* could be identified only by examination of the type, not only through want of information regarding its claws but on account of there being some flaw in the description, the species being said to be somewhat larger than "*die vorigen arten*," while the size is given as smaller than of one of the preceding species, and the wording of the comparison seems quite inconsistent with its referring to the immediately preceding *H. granum* (*e.g.*, the size is given as more than three times that of *granum*). The general character of the description indicates resemblance to some of the species in Group IV., and not much resemblance to any species known to me of the present group. The last of these four doubtful species (*pilosellus*, Blanch.) is almost certainly, I think, a member of the first subgroup of Group IV.; its large size and the nature of its sculpture and pubescence point strongly in that direction. It should be borne in mind, however, that in the absence of definite information of claw structure, there is a bare possibility of any or all of the four appertaining to this group. Outside the 21 names referred to above, I believe it may be asserted confidently that no name as yet applied to a *Heteronyx* represents a species of this group, unless it be among those few names to which there is no description attached mentioning any character that identifies its subject with any group at all, of which I propose to furnish a list at the end of this Revision.

Of the 17 identifiable names referred to above, two are synonyms, namely, *breviceps*, Blackb., and *fissiceps*, Blackb., the former of which is identical with the type of *H. rufopiceus*, Macl., in the Macleay Museum, and the latter with the specimen (almost certainly a type or co-type) of *H. (Melolontha) chlorotica*, Gyll., in the same Museum. Neither of these two could have been identified by the description. Thus I recognize 15 already described species of *Heteronyx* as members of this group, and to them I have now to add 19 more species, making a total of 34.

The only group with which any members of the present group could possibly be confused is Group IV., but it must be admitted that there is a small number of species concerning which doubt is possible as to whether their claws should be called appendiculate or bifid. Separate notes on those species seem necessary since I have treated them as having appendiculate claws of which the inner apex of the basal piece is somewhat abnormally prolonged, and it is possible that their names might be looked for in the tabulation of this present group where of course they would not be found. They are as follows:—

H. *holosericeus*, Macl. The inner apex of the basal piece of the claws is scarcely less than half the size of the apical prolongation, and I should perhaps place the species in Group III. were it not for its close alliance with species of the first subgroup of Group IV., which consists of the most naturally associated species known to me in the genus. Among the insects which I have placed in Group III. there is none resembling *holo-*

sericeus in the conspicuous characters of being of large size and also having elytra very finely and closely punctulate. A careful examination of the claws of *holosericeus* indicates that they are really appendiculate, and that the hinder process, although longer than usual, is nothing but a slender prolongation of the apex of the basal piece of the claw, notably more slender than the apical piece; whereas the corresponding process in a claw which I account bifid is (I think in every species whose claws could possibly be confused with those of *holosericeus* and a few others with like claws) a compressed more or less triangular tooth which from the right point of view (*i.e.*, with its compressed face opposite the observer) is seen to be at least as wide and stout as the apical process.

H. Coatesi, Blackb The above comments on *H. holosericeus* apply also to this species.

H. severus, Blackb. The claws of this species are of the same kind as those of *H. holosericeus*, although the hinder process is perhaps scarcely long enough to be likely to cause any doubt of the claws being appendiculate.

H. relictus, Blackb. The claws of this species are not quite simply appendiculate, the apical piece being smaller than usual and the long basal piece being distinctly produced at its inner apex, so that from a point of view making the apical piece appear foreshortened the claw has a bifid appearance: but looked at so that the outline of the compressed face of the claw is wholly opposite the observer, the apical piece is seen to be much longer than the projection at the inner apex of the basal piece.

Among the species that I have placed in this group I do not think there is any whose claws could be regarded as other than bifid. In a few of them the hinder process of the claw is situated exceptionally far back on the claw, but in these species this hinder process is so evidently of well-defined compressed triangular form that it does not seem capable of suggesting any difficulty.

In dealing with this the first large group of *Heteronyces* it seems desirable to remark on the fact that I am somewhat at a disadvantage (in having written an earlier series of papers, founded on a much smaller number of species, before the enormous extent of the genus had become apparent), insomuch as species that came near to each other in my former paper are now in many instances separated by a considerable number of subsequently discovered intermediate species requiring a more scrupulously exact description of sculpture, etc., and also involving a readjustment of classification, an investigation and use of characters that did not seem essential for mention among a much smaller number of species, and the discovery in the case of some characters that they are less useful for purposes of tabulation than they appeared in dealing with less numerous forms. I do not think that my former papers contained more than a very small number of actual errors; these, however, will be corrected under the heading of the species affected by them (*e.g.*, *H. insignis*, Blackb.). But it is possible that here and there slight discrepancies of terms may be found between some of the descriptions in my former paper and those used now (such as "fine" or "not very fine" in respect of sculpture), arising from species now being grouped among many that were formerly not known to me, and to obviate confusion from that inevitable difficulty I have in this present Revision indicated by an approximate counting of punctures exactly what is meant in each case by such terms as "close," "sparse," "fine," *vel cet.*

Tabulation of the distinctive characters of *Heteronyces* of Group III.:—

A. Front of clypeus not having a deep excision.
  B. Labrum not visible (head viewed obliquely from behind).
    C. Hind femora not having a tooth before the apex.
      D. Hind femora wide with 2 conspicuous rows of punctures between which is a wide, almost unpunctured space.
        E. Hind row of punctures on hind femora widely spaced and not more than about 10.
          F. Front of clypeus truncate or lightly sinuate.
            G. Sides of prothorax straight behind middle, hind corners genuinely (though not sharply) rectangular ... ... piceo-niger, *Macl.*
            GG. Sides of prothorax more or less arched behind middle, hind corners not rectangular.
              H. Elytra (outside subsutural stria) non-striate.
                I. Elytral puncturation squamose ... ... corpulentus, *Macl.*
                II. Elytral puncturation non-squamose.
                  J. Basal edging of pronotum strong and conspicuous ... ... protervus, *Blackb.*

JJ. Basal edging of pronotum extremely fine, except at its ends ... ... rufopiceus, *Macl*

HH. Each elytron with about 6 striæ clearly indicated.

I. Prothorax (viewed from above) with strongly defined hind angles.

J. Pronotum at hind angles extremely strongly flattened out ... ... Oodnadattæ, *Blackb.*

JJ. Hind angles of pronotum much less strongly flattened out.

K. Puncturation of elytra strongly seriate (size at least 4½ l.) ... merus, *Blackb.*

KK. Puncturation of elytra not seriate (size about 3 l.) ... ... declaratus, *Blackb.*

II. Hind angles of prothorax quite rounded off ... ... Beltanæ, *Blackb.*

FF. Front of clypeus evenly rounded.

G. Front face of labrum (viewed from in front) arched.

H. About 15 punctures across an elytron. Clypeal suture very little arched ... ... tarsalis, *Blackb.*

HH. About 20 punctures across an elytron. Clypeal suture strongly arched ... ... Griffithi, *Blackb.*

GG. Front face of labrum (viewed from in front) not arched ... ... suavis, *Blackb.*

EE. Hind row of punctures on hind femora closely packed (about 15-20 in number).

F. Basal joint of hind tarsi considerably longer than 3rd joint.

G. Punctures of pronotum acervate and sparse (10 or 12 in length of the segment).

H. Punctures of frons very large and not very close ... ... tropicus, *Blackb.*

HH. Punctures of frons much finer and closer ... solidus, *Blackb.*

GG. Punctures of pronotum not acervate (about 16 in length of the segment).

H. Elytra with the actual derm strongly rugulose ... rugosipennis, *Macl.*

HH. Elytra not exceptionally rugulose ... ... tenebrosus, *Blackb.*

FF. Basal joint of hind tarsi not or scarcely longer than 3rd joint.

G. Elytra non-granulate, their punctures not squamose.

H. The punctures of the elytra much larger than those of the pronotum ... ... incomptus, *Blackb.*

HH. Punctures of pronotum and of elytra scarcely different in size ... ... umbrinus, *Blackb.*

GG. Elytra conspicuously granulate, their punctuation strongly squamose ... arcanus, *Blackb.*

DD. Hind femora (less wide) with numerous punctures in the space between the two rows.

E. Basal edging of pronotum strongly defined and preceded by a conspicuous smooth gutter ... ... dux, *Blackb.*

EE. Base of pronotum not as E.

F. Puncturation of pronotum not both very close and strongly rugulose.

G. The front of the frons not perpendicular.

H. Elytra closely and finely punctured (considerably more than 20 punctures across an elytron).

I. The sculpture of the clypeus is subconfluent rugulosity ... ... æqualiceps, *Blackb.*

II. The sculpture of the clypeus is coarse, well spaced punctuation ... ... firmus, *Blackb.*

HH. Elytra punctured not closely (20 punctures or less across an elytron).

I. Hind coxæ much longer than 2nd ventral segment ... ... Frenchi, *Blackb.*

II. Hind coxæ scarcely longer than 2nd ventral segment ... ... darlingensis, *Blackb.*
GG. The front of the frons perpendicular ... ...
H. Clypeus strongly truncate ... ... Leai, *Blackb.*
HH. Clypeus evenly rounded ... ... Callabonnæ, *Blackb.*
FF. Puncturation of pronotum both very close and strongly rugulose.
G. Puncturation of elytra coarse and not close (less than 20 punctures across an elytron) ... ... variegatus, *Blackb.*
GG. Puncturation of elytra much finer and closer ... imitator, *Blackb.*
CC. Hind femora with a strong tooth near apex ... ... femoralis, *Blackb.*
BB. Labrum visible (the head being viewed obliquely from behind).
C. The ends of the labrum project as small, sharp processes ... ... granum, *Burm.*
CC. The ends of the labrum not prominent ... ... luteolus, *Blackb.*
AA. Front of clypeus with an extremely deep excision.
B. Head strongly punctulate.
C. Labrum on middle line not exserted from perpendicular front of clypeus ... ... asperifrons, *Blackb.*
CC. Labrum on middle line considerably exserted from perpendicular front of clypeus.
D. Elytra closely and finely punctulate (10 punctures from suture not nearly reaching middle) ... ... chlorotica (Melolon- [tha), *Gyll.*
DD. Elytra with large, sparse punctures (10 punctures from suture reach middle) ... ... queenslandicus, [*Blackb.*
B. Head (even clypeus) scarcely visibly punctulate ... ... læviceps, *Blackb.*

H. Oodnadattæ, sp. nov. Elongato-ovatus; sat nitidus; castaneo-brunneus, antennarum flabello dilutiori; supra pilis sparsis brevibus suberectis vestitus; subtus sparsim pilosus; clypeo crebre sat grosse ruguloso, antice late leviter sinuato; labro summo clypei planum haud attingenti; fronte grosse nec crebre punctulata; fronte clypeoque planum fere continuum efficientibus; antennis 9-articulatis; prothorace quam longiori ut 12 ad 7 latiori, antice minus fortiter angustato, supra sparsim acervatim puncturis inæqualibus (sat grossis et magis subtilibus) impresso (puncturis circiter 14 in segmenti longitudine), lateribus sat arcuatis, angulis anticis vix acutis sat productis posticis (superne visis) sat rectis sat fortiter deplanatis, basi modice bisinuata, margine basali ad latera paullo magis elevato; elytris fortiter seriatim (minus æqualiter) minus crebre punctulatis (trans elytron puncturis circiter 15), striatis, interstitiis leviter convexis; pygidio sparsim fortiter punctulato; coxis posticis quam metasternum sat brevioribus quam segmentum ventrale 2^{um} sat longioribus; tibiis anticis extus dentibus 2 inferioribus permagnis et dente superiori parvo; femoribus posticis dilatatis, biseriatim punctulatis, seriei posticæ puncturis circiter 8, inter series area lævi; tarsorum posticorum articulo basali quam 2^{us} sat (quam 3^{us} paullo) breviori; unguiculis bifidis. Long., $6\frac{1}{2}$-7 l.; lat., $3\frac{1}{5}$-$3\frac{2}{5}$ l.

Somewhat close to *H. piceoniger*, Macl., but differing in colour, in its smaller head, in the sides of its prothorax considerably more arched, and in the less close and more seriate puncturation of its elytra. Also near *merus*, Blackb., but differing from that species by, *inter alia*, the better defined and considerably more expanded hind angles of its pronotum.

Central Australia; Oodnadatta.

H. declaratus, sp. nov. Minus elongatus; minus nitidus; obscure brunneus; supra pilis brevibus adpressis sparsim vestitus; subtus sparsim pilosus; clypeo crebre ruguloso, antice late leviter sinuato; labro summo clypei planum haud attingenti; fronte sat grosse ruguloso-punctulata; fronte clypeoque ut plana disparia visis (sutura clypeali cariniformi); antennis 9-articulatis; prothorace quam longiori ut 7 ad 4 latiori, antice sat angustato, supra sparsius subtiliter punctulato (puncturis circiter 16 in segmenti longitudine), lateribus sat arcuatis, angulis anticis minus acutis minus productis posticis (superne visis) sat rectis, basi leviter bisinuata, margine basali subtilissimo; elytris crebre subtilius punctulatis (trans elytron puncturis circiter 30), striatis, interstitiis vix convexis; pygidio coriaceo sparsim subtilius punctulato; coxis posticis quam metasternum multo brevioribus, quam segmentum, ventrale 2^{um} sat longioribus; tibiis anticis extus tridentatis; femoribus posticis sat dilatatis, biseriatim punctulatis, seriei posticæ puncturis circiter 10, inter series area fere lævi; tarsorum posticorum articulo basali quam 2^{us} vix breviori, quam 3^{us} paullo longiori, unguiculis bifidis. Long., 3 l.; lat., $1\frac{3}{5}$ l.

A very isolated species, which seems out of place among the species with which its structural characters associate it. Its hind femora considerably dilated, with their front outline quite strongly arched and the space between their series of punctures bearing only one or two fovea-like impressions, appear to me a strong mark of alliance with *corpulentus*, Macl., and its allies; and its short, wide clypeus with front margin widely sinuate points in the same direction. *Corpulentus*, etc., are, however, large species with coarse, sparse sculpture and different vestiture.

North Queensland (Mr. Perkins).

H. tarsalis, sp. nov. Modice elongatus, postice vix dilatatus; sat nitidus; castaneus vel brunneus; supra fere glaber; subtus sparsim pilosus; clypeo sat crebre minus rugulose sat grosse punctulato, antice late rotundato; labro summo clypei planum haud attingenti; fronte vix crebre sat grosse nec rugulose punctulata; fronte clypeoque planum sat continuum efficientibus; antennis 9-articulatis; prothorace quam longiori ut 5 ad 3 latiori, antice sat angustato, supra minus fortiter minus crebre punctulato (puncturis circiter 16 in segmenti longitudine), lateribus leviter arcuatis, angulis anticis subacutis modice productis posticis (superne visis) sat rectis, basi leviter bisinuata, margine basali subtili sat æquali; elytris leviter sparsim subseriatim punctulatis (trans elytron puncturis circiter 15), manifeste striatis, interstitiis nonnihil convexis; pygidio sparsim minus fortiter punctulato; coxis posticis quam metasternum multo brevioribus quam segmentum ventrale 2um sat longioribus; tibiis anticis extus tridentatis; femoribus posticis sat dilatatis, biseriatim punctulatis, seriei posticæ puncturis circiter 6, inter series area fere lævi; tarsorum posticorum articulo basali quam 2us multo (quam 3us manifeste) breviori; unguiculis bifidis. Long., 3-5 l.; lat., $1\frac{3}{5}$-$2\frac{3}{5}$ l.

The most conspicuous superficial characters of this species seem to be the sparse, subseriate, lightly impressed puncturation of its elytra and the shortness of the basal joint of its hind tarsi. Its head is small and narrow as compared with that of some of its allies (*e.g.*, *H. corpulentus*, Macl.). It is easily identified by the characters assigned to it in the tabulation. It varies greatly in size, the small specimens being, I think, males. The hinder tooth of the hind claws is situated far back—not much in front of the middle of the claw.

North-West Australia.

H. Griffithi, sp. nov. Sat elongatus, postice parum dilatatus; sat nitidus; obscure brunneus, antennarum flabello testaceo; supra fere glaber; subtus sparsim pilosus; clypeo sat crebre sat grosse nec rugulose punctulato; labro summo clypei planum haud attingenti; fronte sparsim vix grosse punctulata; fronte clypeoque ut plana manifeste disparia visis; antennis 9-articulatis; prothorace quam longiori ut 12 ad 7 latiori, antice modice angustato, supra subtilius minus crebre punctulato (puncturis circiter 18 in segmenti longitudine), lateribus parum arcuatis, angulis anticis sat acutis sat productis posticis (superne visis) acute rectis, basi subfortiter bisinuata, margine basali modico ad latera paullo magis elevato; elytris concinne sat fortiter subcrebre nonnihil subseriatim punctulatis (trans elytron puncturis circiter 20), manifeste striatis, interstitiis leviter convexis, pygidio sparsius minus fortiter punctulato; coxis posticis quam metasternum sat brevioribus quam segmentum ventrale 2^{um} multo longioribus; tibiis anticis extus dentibus 2 inferioribus permagnis et dente superiore parvo; femoribus posticis dilatatis, biseriatim punctulatis, seriei posticæ puncturis circiter 10, inter series area lævi; tarsorum posticorum articulo basali quam 2^{us} multo (quam 3^{us} manifeste) breviori; unguiculis bifidis. Long., $5\frac{1}{2}$ l.; lat., $2\frac{4}{5}$ l.

The sides of the prothorax are less arched than in most of the allied species, and the point where they begin to be roundly convergent is nearer to the front margin, making the segment appear less transverse than it really is. The front of the clypeus is much more strongly reflexed than in *H. tarsalis*, Blackb. (which the species resembles in respect of its small head and tarsal structure), the clypeal suture is very much more strongly arched, the pronotum is notably more finely punctulate, the punctures of the elytra are smaller, deeper, and closer, and the hinder process of the hind claws is nearer to the apical process.

Northern Territory of South Australia (Mr. Griffith).

H. suavis, sp. nov. Minus elongatus, postice leviter dilatatus; sat nitidus; castaneus vel brunneus; supra fere glaber; subtus sparsim pilosus; clypeo sat crebre sat grosse nec rugulose punctulato; labro clypei planum haud attingenti, in parte summa antica haud transversim convexo; fronte vix crebre subgrosse nec rugulose punctulata; fronte clypeoque ut plana leviter disparia visis; antennis 9-articulatis; prothorace quam longiori ut 12 ad 7 latiori, antice modice angustato, supra subfortiter vix crebre punctulato (puncturis circiter 18 in segmenti longitudine), lateribus parum arcuatis, angulis anticis sat acutis sat productis posticis (superne visis) rectis (vix acute), basi minus fortiter bisinuata, margine basali modico ad latera vix magis elevato; elytris concinne sat fortiter subcrebre nonnihil subseriatim punctulatis (trans elytron puncturis circiter 20), manifeste striatis, interstitiis parum convexis; pygidio sparsius minus fortiter punctulato; coxis pedibusque ut *H. Griffithi*, Blackb. Long., $4\frac{1}{2}$-$5\frac{3}{5}$ l.; lat., $2\frac{1}{5}$-3 l.

This species is closely allied to *H. Griffithi*, Blackb., differing by its pronotum less finely punctulate, with hind angles (viewed from above) blunter, and especially by the structure of its labrum. In *Griffithi* (and most other *Heteronyces* of the first four groups) that organ is longitudinally concave, so that if it be looked at from in front its front face is seen as an arch having its convex outline curved upward towards the clypeus, while in the present species the labrum is quite flat, so that when looked at from in front its outline appears perfectly straight transversely. As I have examined four specimens of *H. suavis* (evidently —from their ticketing—taken in company) I am able to say that this is a reliable character.

North Queensland; Gulf of Carpentaria (Mr. Koebele).

H. tropicus, sp. nov. Minus elongatus, postice parum dilatatus; sat nitidus; piceo-ferrugineus, antennis dilutioribus; supra fere glaber, capillis nonnullis erectis exceptis; clypeo confertim sat fortiter ruguloso, antice late leviter sinuato; labro summo clypei planum haud attingenti; fronte crebrius grosse punctulata; fronte clypeoque ut plana sat disparia visis (illa sat convexa); antennis 9-articulatis; prothorace quam longiori ut 15 ad 8 latiori, antice sat fortiter angustato, longitudinaliter subtiliter subcanaliculato, supra sparsim acervatim puncturis inæqualibus (sat grossis et magis subtilibus) impresso (puncturis circiter 10 in segmenti longitudine), lateribus minus arcuatis, angulis anticis acutis sat productis posticis (superne visis) rectis, basi modice bisinuata, margine basali ad latera perspicue magis elevato; elytris fortiter minus crebre punctulatis (trans elytron puncturis circiter 20); pygidio sparsius sat fortiter punctulato, exempli typici basin versus carinato apicem versus longitudinaliter concavo; coxis posticis quam metasternum sat brevioribus quam segmentum ventrale 2^{um} sat longioribus; femoribus posticis dilatatis, biseriatim punctulatis, seriei posticæ puncturis circiter 15, inter series area lævi; tibiis anticis extus tridentatis; tarsorum posticorum (his sat brevibus) articulo basali 2^{o} sat æquali, quam 3^{us} multo longiori; unguiculis bifidis. Long., 7 l.; lat., $3\frac{3}{5}$ l.

The hind series of punctures on the hind femora of this and a number of following species not only consists of many more punctures than in the preceding species, but also differs in that the punctures, from a certain point of view, appear to be situated behind and against a continuous serrate finely raised line, an appearance which seems to be caused by the punctures being more deeply impressed at their front than at their hind end. I suspect that the slight canaliculation of the pronotum in the type may not be a constant character.

North Queensland (Mr. Perkins); also Thursday Island.

H. tenebrosus, sp. nov. Latus, sat brevis, postice dilatatus; sat nitidus; nigro-piceus, palpis antennisque rufis; supra capillis erectis vestitus; clypeo fortiter sat crebre nec rugulose punctulato antice late leviter sinuato-truncato; labro summo clypei planum haud attingenti; fronte grosse subcrebre nec rugulose punctulata; fronte clypeoque ut plana valde disparia visis (illa convexa); antennis 9-articulatis; prothorace quam longiori ut 15 ad 8 latiori, antice sat angustato, supra subfortiter vix crebre punctulato (puncturis circiter 16 in segmenti longitudine) lateribus minus arcuatis, angulis anticis sat acutis sat productis posticis (superne visis) rectis, basi sat fortiter bisinuata, margine basali ad latera vix magis elevato; elytris granulatis subsquamose fortiter crebrius punctulatis (trans elytron puncturis circiter 22); pygidio crebrius fortius punctulato; coxis posticis quam metasternum paullo brevioribus quam segmentum ventrale 2^{um} multo longioribus; femoribus posticis dilatatis, biseriatim punctulatis, seriei posticæ puncturis circiter 20, inter series area lævi; tibiis anticis extus tridentatis (dentibus inferioribus 2 permagnis); tarsorum posticorum articulo basali quam 2^{us} vix breviori quam 3^{us} sat longiori; unguiculis bifidis. Long., 6-7 l.; lat., $3\frac{1}{5}$-$3\frac{4}{5}$ l.

A very robust, solid-looking species, of very dark colour. It is readily distinguishable among its allies by the characters indicated in the tabulation.

North-West Australia; Roebuck Bay.

H. incomptus, sp. nov. Sat elongatus, postice dilatatus; sat nitidus; ferrugineus; supra capillis erectis elongatis minus sparsim vestitus; clypeo crebre vix grosse ruguloso, antice rotundato; labro summo clypei planum haud attingenti; fronte fortiter rugulose sat crebre punctulata; fronte clypeoque ut plana valde disparia visis (illa convexa); antennis 9-articulatis; prothorace quam longiori ut 7 ad 4 latiori, antice sat fortiter angustato, supra fortiter minus crebre punctulato (puncturis circiter 15 in segmenti longitudine), lateribus modice arcuatis, angulis anticis sat acutis modice productis posticis (superne visis) sat rectis, basi parum sinuata, margine basali ad latera paullo magis elevato; elytris subgrosse subrugulose sat crebre punctulatis (trans elytron puncturis circiter 20); pygidio puncturis setiferis sparsius impresso; coxis posticis quam metasternum sat brevioribus, quam segmentum ventrale 2^{um} sat longioribus; femoribus posticis dilatatis, biseriatim punctulatis, seriei posticæ puncturis circiter 17, inter series area fere lævi; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2^{us} multo (quam 3^{us} nonnihil) breviori; unguiculis bifidis. Long., 7 l.; lat., $3\frac{2}{5}$ l.

The very long pilosity—which is not very sparse—of this species renders it easily recognizable among its near allies, even disregarding the characters indicated in the tabulation. The area on the hind femora between the two series of punctures bears four or five large punctures near to the base of the femora.

New South Wales; Inverell (Mr. Musson).

H. umbrinus, sp. nov. Sat elongatus, postice vix dilatatus; minus nitidus; obscure brunneus, antennis palpisque dilutioribus; supra pilis adpressis brevibus (nonnullis longioribus erectis intermixtis) sat sparsim vestitus; clypeo confertim minus grosse ruguloso, antice late rotundato; labro summo clypei planum haud attingenti; fronte fortiter minus crebre punctulata; fronte clypeoque ut plana nonnihil disparia visis; antennis 9-articulatis; prothorace quam longiori ut 12 ad 7 latiori, antice leviter angustato, supra sat fortiter sat sparsim nonnihil acervatim punctulato (puncturis circiter 12 in segmenti longitudine), lateribus sat arcuatis, angulis anticis sat acutis minus productis posticis (superne visis) obtusis bene determinatis, basi parum sinuata, margine basali sat æquali; elytris concinne sat fortiter sat crebre punctulatis (trans elytron puncturis circiter 20); pygidio fortius minus crebre punctulato; coxis posticis quam metasternum multo brevioribus, quam segmentum ventrale 2^{um} sat longioribus; femoribus posticis dilatatis, biseriatim punctulatis, seriei posticæ puncturis circiter 15, inter series area lævi; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2^{us} sat breviori, 3^{o} sat æquali; unguiculis bifidis. Long., 6 l.; lat., $2\frac{4}{5}$ l.

Easily recognizable by the characters cited in the tabulation.

North Queensland (Mr. Perkins).

H. dux, sp. nov. Minus elongatus, postice parum dilatatus; sat nitidus; brunneus, antennis palpisque dilutioribus;

supra pilis adpressis brevibus (nonnullis longioribus erectis intermixtis) sat sparsim vestitus; clypeo crebre fortiter parum rugulose punctulato, antice rotundato; labro summo clypei planum haud attingenti; fronte fortiter minus crebre nec rugulose punctulata; fronte clypeoque planum fere continuum efficientibus; antennis 9-articulatis; prothorace quam longiori ut 15 ad 8 latiori, antice sat angustato, supra minus fortiter minus crebre punctulato (puncturis circiter 15 in segmenti longitudine), lateribus leviter arcuatis, angulis anticis sat acutis modice productis posticis (superne visis) sat acute rectis, basi parum sinuata, margine basali sat æquali pone sulcum manifestum sito; elytris granulatis subsquamose sat crebre punctulatis (trans elytron puncturis circiter 20); pygidio granulis setiferis minus crebre instructo; coxis posticis quam metasternum multo brevioribus, quam segmentum ventrale 2^{um} paullo longioribus; femoribus posticis sat dilatatis, biseriatim punctulatis, seriei posticæ puncturis circiter 20, inter series area confuse sparsim punctulata; tibiis anticis extus fortiter tridentatis; tarsorum posticorum articulo basali quam 2^{us} multo vel paullo (quam 3^{us} vix vel haud) breviori; unguiculis bifidis. Long., $6\frac{2}{5}$-7 l.; lat., $3\frac{1}{5}$-$3\frac{3}{5}$ l.

This species is distinctly intermediate between those preceding it and those following it in the tabulation, being (like the former) of large size and having dilated hind femora, but having (like the latter) the space on the hind femora between the seriate punctures impressed with confused puncturation. It is remarkable for a more than usually well-marked sexual character in the hind tarsi, the basal joint being in one sex (I take it to be the male) quite distinctly longer than in the other sex. It may be noted that the pronotum in this species is punctured considerably more finely than the head and the elytra. There is a remarkable agreement in the present insect with the description of *H. rugosipennis*, Macl., but the type in the Australian Museum differs in numerous characters passed over in the description, being smaller, differently coloured, with elytra more rugulose and less closely punctulate, the hind femora non-punctulate between the series, etc., etc.

Queensland (Mr. F. M. Bailey).

H. firmus, sp. nov. Minus elongatus, postice leviter dilatatus; sat nitidus: obscure brunneus, corpore subtus antennis palpis pedibusque plus minusve dilutioribus; supra pilis brevibus adpressis sat sparsim vestitus; clypeo (hoc antice sinuato-truncato) fronteque grosse minus crebre sat æqualiter punctulatis; his planum fere continuum efficientibus; labro clypei planum haud attingenti; antennis 9-articulatis; prothorace quam longiori ut 7 ad 4 latiori, antice leviter angustato, supra sat fortiter sat crebre punctulato (puncturis circiter 23 in segmenti longitudine), lateribus sat fortiter arcuatis, angulis anticis sat acutis modice productis posticis (superne visis) obtusis bene determinatis, basi parum sinuata, margine basali subtilissimo sat æquali sed in media parte summa fere obsoleto; elytris substriatis, crebre sat fortiter punctulatis (trans elytron puncturis circiter 30); pygidio sat crebre minus fortiter punctulato; coxis posticis quam metasternum multo brevioribus, quam segmentum ventrale 2um vix longioribus; femoribus posticis minus dilatatis, sparsim confuse punctulatis, seriebus parum conspicuis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2us sat breviori, 3o sat æquali; unguiculis bifidis. Long., $3\frac{3}{5}$ l.; lat., $1\frac{4}{5}$ l.

This species is easily distinguishable from all others known to me of this group by the characters cited in the tabulation. It is a species of decidedly robust facies.

New South Wales; Mount Kosciusko (from Mr. Lea).

H. Frenchi, sp. nov. Minus elongatus, postice leviter dilatatus; minus nitidus; brunneus antennis palpisque dilutioribus; supra pilis brevibus suberectis minus sparsim vestitus; clypeo confertim ruguloso, antice in media parte leviter emarginato; labro summo clypei planum haud attingenti; fronte grosse sat crebre punctulata; fronte clypeoque ut plana disparia visis, illa convexa; antennis 9-articulatis; prothorace quam longiori ut 3 ad 2 latiori, antice fortiter angustato, supra subgrosse sat crebre punctulato (puncturis circiter 15 in segmenti longitudine), lateribus pone medium dilatato-rotundatis, angulis anticis leviter obtusis haud productis posticis valde obtusis (fere rotundatis), basi sat fortiter bisinuata, margine basali subtilissimo (in media parte obsoleto); elytris fere ut pronotum sed nonnihil rugulose punctulatis (trans elytron puncturis circiter 16); pygidio sat grosse sat crebre punctulato; coxis posticis quam metasternum paullo brevioribus quam segmentum ventrale 2um sat longioribus; femoribus posticis minus dilatatis, inter series confuse sparsius punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali, 2o sat æquali, quam 3us paullo longiori; unguiculis bifidis. Long., $3\frac{1}{5}$ l.; lat., $1\frac{3}{5}$ l.

This species can be distinguished quite easily by the characters indicated in the tabulation, as well as by other characters cited in the above description, especially the form of its prothorax and the coarse, somewhat uniform puncturation of its dorsal surface.

North-West Australia (Mr. French).

H. Leai, sp. nov. Sat elongatus, postice sat dilatatus; sat nitidus; ferrugineus; supra pilis perbrevibus erectis sparsim vestitus; clypeo fortiter sparsius nec rugulose punctulato, antice truncato fortiter reflexo; labro summo clypei planum haud attingenti; fronte fortiter minus sparsim nec rugulose punctulata; fronte clypeoque ut plana valde disparia visis, illa antice abrupte declivi; antennis 9-articulatis; prothorace quam longiori ut 7 ad 4 latiori, antice minus angustato, supra subtilius minus crebre punctulato (puncturis circiter 20 in segmenti longitudine, lateribus modice rotundatis, angulis anticis sat obtusis modice productis posticis obtusis minus rotundatis, basi modice bisinuata, margine basali subtili sat æquali; elytris fortiter (fere subgrosse) punctulatis (trans elytron puncturis circiter 20), nonnihil substriatis; pygidio crebre minus profunde punctulato; coxis posticis quam metasternum multo brevioribus quam segmentum ventrale 2um sat (nec multo) longioribus; femoribus posticis haud dilatatis, inter series confuse nec crebre punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2us vix breviori, 3o sat æquali; unguiculis bifidis. Long., $3\frac{4}{5}$ l.; lat., $1\frac{4}{5}$ l.

A little intermediate in the form of its frons in respect of the front declivity, which is not so abruptly perpendicular as in the following species (*H. Callabonnæ*). From a certain point of view (obliquely from the side) it appears to be perpendicular, but viewed slightly obliquely from in front is seen not to be so in reality. It could not, however, be placed in respect of this character among the preceding species that are its nearer allies in other respects, for they have no indication whatever of such structure in the frons. Among them, however, it would fall beside *H. darlingensis* in the tabulation, from which it differs by, *inter alia multa*, the finer and closer puncturation of its pronotum. In this species the pronotum is punctured very much more finely than the elytra.

New South Wales; Galston (Mr. Lea).

H. Callabonnæ, sp. nov. Minus elongatus, postice parum dilatatus; modice nitidus; ferrugineus, antennarum flabello pallido; supra pilis perbrevibus adpressis sparsim vestitus; clypeo crebre ruguloso antice rotundato; labro summo clypei planum haud attingenti;

fronte fere ut clypeus sculpturata; fronte clypeoque ut plana valde disparia visis, illa antice perpendiculari; antennis 9-articulatis; prothorace quam longiori ut 9 ad 5 latiori, antice fortiter angustato, supra minus fortiter sat crebre punctulato (puncturis circiter 20 in segmenti longitudine), lateribus pone medium sat dilatato-rotundatis, angulis anticis acutis sat productis posticis (superne visis) obtusis (subrotundatis), basi vix sinuata, margine basali subtili sat æquali; elytris subfortiter sat crebre punctulatis (trans elytron puncturis circiter 25); pygidio puncturis setiferis sparsius impresso; coxis posticis quam metasternum sat brevioribus quam segmentum ventrale 2^{um} sat longioribus; femoribus posticis parum dilatatis, inter series confuse nec crebre punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2^{us} sat breviori, 3^{o} sat æquali: unguiculis bifidis. Long., $4\frac{1}{5}$ l.; lat., 2 1-10 l.

Easily identified among its near allies by the perpendicularly declivous front margin of its frons. From *H. Leai*, Blackb., which approaches it in this respect, it differs by, *inter alia multa*, the evenly-rounded front margin of its clypeus.

Central Australia; Lake Callabonna (Mr. Zietz).

H. imitator, sp. nov. Minus elongatus, postice sat dilatatus; modice nitidus; ferrugineus, capite prothoraceque obscurioribus; his capillis elongatis (elytris pilis brevibus suberectis) sat dense vestitis; clypeo sat crebre ruguloso, antice rotundato; labro summo clypei planum haud attingenti; fronte fere ut clypeus sculpturata; fronte clypeoque ut plana minus disparia visis; antennis 9-articulatis; prothorace quam longiori ut 5 ad 3 latiori, antice parum angustato, supra crebre sat fortiter punctulato (puncturis circiter 18 in segmenti longitudine), lateribus sat arcuatis, angulis anticis sat obtusis minus productis posticis (superne visis) obtusis; basi modice bisinuata, margine basali minus subtili sat æquali; elytris crebre sat fortiter sat rugulose punctulatis (trans elytron puncturis circiter 20), substriatis; pygidio crebre minus fortiter punctulato; coxis posticis quam metasternum parum brevioribus, quam segmentum ventrale 2^{um} multo longioribus; femoribus posticis parum dilatatis inter series sparsim punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2^{us} nonnihil breviori, quam 3^{us} paullo longiori; unguiculis bifidis. Long., 2 l.; lat., 1 l.

This very small species illustrates remarkably the difficulty of grouping the *Heteronyces* in natural aggregates. On a casual inspection one would have no hesitation in placing it near *H. jubatus*, Blackb., and its allies (which fall into Group VIII., having the front outline of the head trilobed and the claws appendiculate), but it has the head and claws of Group III.

Western Australia; Mount Barker (Mr. Lea).

H. femoralis, sp. nov. Modice elongatus, postice parum dilatatus; sat nitidus; ferrugineus, antennarum flabello dilutiori; supra pilis brevissimis adpressis sparsim vestitus; clypeo brevi sat crebre ruguloso, antice late sinuato-emarginato; labro summo clypei planum haud attingenti; fronte fere ut clypeus rugulosa; fronte clypeoque ut plana valde disparia visis (illa antice subito perpendiculari); antennis 9-articulatis; prothorace quam longiori ut 8 ad 5 latiori, antice sat fortiter angustato, supra subfortiter minus crebre nec grosse punctulato (puncturis circiter 15 in segmenti longitudine), lateribus pone medium sat dilatato-rotundatis, angulis anticis subacutis minus productis posticis (superne visis) obtusis sat bene determinatis, basi nonnihil bisinuata, margine basali sat æquali; elytris crebre minus fortiter punctulatis (trans elytron puncturis circiter 22), vix perspicue substriatis; pygidio sat crebre minus fortiter punctulato; coxis posticis quam metasternum multo brevioribus, quam segmentum ventrale 2^{um} paullo longioribus; femoribus posticis haud dilatatis, inter series sparsius sat fortiter punctulatis, postice ante apicem dente acuto sat magno armatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali 2^{o} sat æquali, quam 3^{us} manifeste longiori; unguiculis bifidis. Long., $3\frac{4}{5}$ l.; lat. $1\frac{4}{5}$ l.

The hind femora bear a strong acute tooth of considerable size placed at about $\frac{4}{5}$ of their length from the base. I know no other *Heteronyx* presenting such a character.

Western Australia; Coolgardie.

H. granum, Burm. The small South Australian *Heteronyx* which I believe to be this species is one of the most difficult of the genus to place satisfactorily in association with other species, on account of the very peculiar structure of its labrum. The summit of that organ rises quite fully to the level of the clypeus, and is visible when the head is viewed obliquely from behind; but the sides (as viewed from above) are not parallel, but converge hindward, so that the labrum from that point of view narrows hindward and its front angles are prominent. Hence from the point of view from which most *Heteronyces* with a visible labrum present a trilobed outline in this species, there is seen to be a tooth-like process projecting between each of the lateral lobes and the middle lobe. Consequently this species does not fit satisfactorily into either of the primary sections into which I have divided the genus, having the labrum well in view when the head is viewed obliquely from behind; nevertheless the term "trilobed" is not applicable to the outline. On the whole the insect appears to me least out of place if regarded as an aberrant member of the section in which the labrum is not ordinarily visible from above, and if that view of it be accepted there can be no hesitation about referring it to Group III.; otherwise it would have to be placed in Group VII.

H. luteolus, sp. nov. Minus elongatus, postice leviter dilatatus; modice nitidus; luteus, antennarum flabello testaceo; supra pilis brevibus adpressis sparsim vestitus, clypeo crebre ruguloso, antice haud marginato, late nec fortiter emarginato; labro clypei planum fere attingenti, antice (capite a tergo oblique viso) leviter concavo; fronte grosse rugulose punctulata; clypeo fronteque ut plana valde disparia visis; antennis 9-articulatis; prothorace quam longiori ut 9 ad 5 latiori, antice leviter angustato, supra fortiter vix crebre punctulato (puncturis circiter 15 in segmenti longitudine), lateribus (superne visis) sat fortiter rotundatis, angulis anticis vix acutis parum productis posticis (superne visis) rotundatis, basi leviter bisinuata, margine basali subtili sat æquali; elytris minus fortiter minus crebre punctulatis (trans elytron puncturis circiter 20); pygidio sparsim sat grosse punctulato; coxis posticis quam metasternum multo brevioribus quam segmentum ventrale 2^{um} paullo longioribus; femoribus posticis inter series sparsim minus fortiter punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2^{us} paullo breviori quam 3^{us} paullo longiori; unguiculis bifidis. Long., 3 l.; lat., $1\frac{1}{2}$ l.

This little species is easy to identify by the characters cited in the tabulation. The comparatively coarse puncturation of its head and pronotum is very distinctive; the punctures of the latter, though not very numerous when counted, are somewhat crowded together by reason of their being individually large.

North-West Australia (exact locality not known).

H. asperifrons, sp. nov. Modice elongatus, postice vix dilatatus; minus nitidus; brunneo-testaceus, pedibus corporeque subtus magis rufis; supra pilis minus brevibus adpressis sat sparsim vestitus; clypeo crebre sat grosse ruguloso-punctulato, antice profunde exciso; labro summo clypei planum haud attingenti, in media parte a capite haud exstanti; fronte confertim subtilius rugulosa; fronte clypeoque fere planum continuum efficientibus; antennis 9-articulatis; prothorace quam longiori ut 12 ad 7 latiori; antice sat angustato, supra sat crebre minus fortiter punctulato (puncturis circiter 18 in segmenti longitudine), lateribus pone medium sat dilatato-rotundatis, angulis anticis sat acutis sat productis posticis (superne visis) rotundatis, basi haud sinuata, margine basali sat subtili sat æquali; elytris crebre subfortiter subrugulose punctulatis (trans elytron puncturis circiter 25); pygidio subtilius sat crebre punctulato; coxis posticis quam metasternum sat brevioribus, quam segmentum ventrale 2^{um} sat longioribus; femoribus posticis subcrebre fortius punctulatis, seriebus parum perspicuis, tibiis anticis extus tridentatis; tarsorum posticorum articulo basali 2^{o} sat æquali, quam 3^{us} sat longiori; unguiculis bifidis. Long., 4 l.; lat., $1\frac{4}{5}$ l.

The labrum of this species is very peculiar, being extremely deeply emarginate and projecting from the perpendicular front face of the clypeus considerably at its ends, while its middle part is in contact with the front face of the clypeus and distinguishable only by a suture. The ciliæ fringing the prothorax and elytra are longer and closer than in most species of *Heteronyx*.

Western Australia; Swan River (Mr. Lea).

H. queenslandicus, sp. nov. Minus elongatus, postice vix dilatatus; sat nitidus; obscure ferrugineus; supra pilis brevibus suberectis sat sparsim vestitus; clypeo (hoc antice profunde emarginato) fronteque æqualiter sat grosse rugulosis, ut plana sat disparia visis; labro clypei planum haud attingenti, in media parte a capite exstanti; antennis 9-articulatis; prothorace quam longiori ut 12 ad 7 latiori, antice fortiter angustato, supra sat fortiter minus crebre punctulato (puncturis circiter 16 in segmenti longitudine), lateribus (superne visis) pone medium sat fortiter rotundato-dilatatis, angulis anticis sat acutis parum productis posticis (superne visis) rotundato-obtusis, basi haud sinuata, margine basali subtili æquali; elytris fortiter sat sparsim punctulatis (trans elytron puncturis circiter 16); pygidio longitudinaliter fortiter carinato, sat crebre sat fortiter punctulato; coxis posticis quam metasternum multo brevioribus, quam segmentum ventrale 2^{um} haud longioribus; femoribus posticis inter series sparsim subfortiter punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2^{us} (maris vix, feminæ manifeste) breviori, quam 3^{us}, paullo longiori; unguiculis bifidis. Long., $3\frac{1}{5}$ l.; lat., $1\frac{3}{5}$ l.

There are four specimens of this species before me among which I do not find any sexual differences, except the basal joint of the hind tarsi a little shorter in one example (probably a female) than in the others. This insect is readily distinguishable among its near allies by the strong and comparatively sparse puncturation of the whole of its dorsal surface.

Queensland; Cunnamulla (Mr. Lea).

Group IV.

This group consists of a larger number of species than any of the preceding groups. A small number of its members can be satisfactorily separated from the rest into a distinct aggregate of species evidently allied among themselves, and presenting characters that are not found in combination elsewhere in the group; thus—

A. Clypeus evenly rounded in front. Joint 3 of antennæ at least as long as joint 2 and considerably longer than joint 4. Basal joint of hind tarsi not shorter than joint 3. Hind coxæ not or scarcely shorter than metasternum ... Subgroup I.

AA. Not presenting the above characters in combination ... ... Subgroup II.

Subgroup I.
(Of Group IV.)

The species which I refer to this subgroup form perhaps in *Heteronyx* the subgroup that best merits the name "natural" as an aggregate. They are all of large (or at least moderate) size, and also resemble each other in having their dorsal surface very closely punctulate and their clypeal outline regularly rounded. They are somewhat closely allied *inter se*, and in order to form them into small groups for tabulation it has seemed necessary to rely upon apparently slight characters, but slight though they are, those characters seem to be constant. The form of the labrum presents a valuable character, the upper and lower planes of that organ being, in the four species that I have placed at the beginning of the subgroup, particularly distinct from each other, and meeting (their planes more or less at right angles) in a suture-like stria or fine line; while in the three other species the upper and lower planes of the labrum are not sharply limited, but meet in a more or less rounded manner. The defined line of meeting between the upper and lower planes of the labrum in the former species is, of course, quite distinct from the suture in which the upper plane of the labrum meets the more or less perpendicular front face of the clypeus.

In all the species of this subgroup the hind femora are confusedly punctulate between the two series of punctures.

The vestiture of the body beneath consists of the somewhat thinly-scattered pilosity that is found on the majority of *Heteronyces*, and it would appear needless repetition when it is of ordinary character to record its presence in the separate descriptions of species.

The basal piece of the claws of the hind tarsi in all the members of this subgroup shows a decided tendency at the inner apex to spiniform prolongation which in two species (*holosericeus*, Macl., and *Coatesi*, Blackb.) is sufficiently pronounced to suggest a possible doubt whether the claws ought not to be considered bifid.

It is not improbable that *H. pilosellus*, Blanch., appertains to this group, but in the absence of information regarding the claw structure of that insect its place can only be conjectured. If its claws are appendiculate it is quite possibly identical with one of those described in the following pages, but the description is too vague, in any case, for confident identification.

Tabulation of the distinctive characters of *Heteronyces* of Group IV. (Subgroup I.):—

A. Upper plane of labrum separated from lower plane by a defined ridge or sulcus.	
B. Form very short and wide; width of elytra notably more than $\frac{2}{3}$ of their length.	
C. Elytra punctured very conspicuously less closely than pronotum	ponderosus, *Blackb.*
CC. Elytra punctured not less closely than pronotum	spissus, *Blackb.*
BB. Form normal; width of elytra not more than $\frac{2}{3}$ of their length.	
C. Apex of elytra normal	piceus, *Blanch.*
CC. Apex of elytra bearing a line of conspicuous granules which emit strong bristles	horridus, *Blackb.*
AA. Upper and lower planes of labrum meet roundly.	
B. Apex of elytra with a row of granules bearing stiff bristles	sexualis, *Blackb.*
BB. Apex of elytra normal	
C. Puncturation of elytra confluent ...	holosericeus, *Macl.*
CC. Puncturation of elytra notably less close	Coatesi, *Blackb.*

H. ponderosus, sp. nov. Robustus, sat late subovatus; sat nitidus; ferrugineus; supra pilis adpressis perbrevibus sat sparsim vestitus; clypeo fronteque crebre nec grosse rugulosis, planum fere continuum efficientibus, illo antice rotundato; labro summo clypei planum haud attingenti, illius plano superiori ab inferiori per striam vel costam subtilem distincto; antennis 9-articulatis, articulo 3° quam 2^us manifeste (quam 4^us multo) longiori; prothorace quam longiori ut 7 ad 4 latiori, antice modice angustato, supra crebre subtilius punctulato (puncturis circiter 30 in segmenti longitudine), lateribus sat rotundatis, angulis anticis minus acutis minus productis posticis (superne visis) obtusis, basi leviter bisinuata, margine basali ad latera paullo magis elevato; elytris quam latioribus ut 11 ad $8\frac{1}{2}$ longioribus, concinne subtilius sat crebre punctulatis (trans elytron puncturis circiter 35), pygidio subtilius sat crebre punctulato; coxis posticis quam metasternum haud brevioribus quam segmentum ventrale 2^um valde longioribus; tibiarum posticarum parte apicali ad apicem quam ad basin sat latiori; tibiis anticis fortiter tridentatis; tarsorum posticorum articulo basali 2° sat æquali, quam 3^us sat longiori; unguiculis appendiculatis. Long., $6\frac{2}{5}$ l.; lat., $3\frac{3}{5}$ l.

This species differs from all its near allies by the puncturation of its elytra notably less close than of its pronotum, and consisting of isolated, even punctures entirely non-squamose and non-rugulose. It also differs from them all except *H. spissus* by its short, broad form and the more strongly-rounded sides of its prothorax.

New South Wales; Goulburn (Mr. Froggatt; his nums. 35).

H. spissus, sp. nov. Robustus, sat late ovatus; sat nitidus; ferrugineus; supra pilis adpressis perbrevibus sat sparsim vestitus; clypeo fronteque creberrime minus fortiter rugulosis, planum fere continuum efficientibus, illo antice rotundato; labro summo clypei planum haud attingenti, illius plano superiori ab inferiori per striam vel costam subtilem distincto; antennis 9-articulatis, articulo 3° quam 2^us et quam 4^us sat longiori; prothorace quam longiori ut 16 ad 9 latiori, antice sat angustato, supra subtilius sat confertim punctulato (puncturis circiter 35 in segmenti longitudine), lateribus sat rotundatis, angulis anticis sat acutis sat productis posticis (superne visis) obtusis, basi leviter bisinuata, margine basali ad latera vix magis elevato; elytris quam latioribus ut $12\frac{1}{2}$ ad 10 longioribus, subtilius sat confertim punctulatis (trans elytron puncturis circiter 50); pygidio sat crebre subfortiter punctulato; coxis posticis quam metasternum haud brevioribus quam segmentum ventrale 2^um valde longioribus; tibiarum posticarum parte apicali ad apicem quam ad basin sat latiori; tibiis anticis extus fortiter tridentatis; tarsorum posticorum articulo basali 2° sat æquali, quam 3us sat longiori; unguiculis appendiculatis. Long., 7 l.; lat., 4 l.

A somewhat close ally of the preceding species *(H. ponderosus)*, but easily distinguished from it by the very much closer puncturation of its elytra as well as by various other characters that will be noticed by comparing the descriptions.

New South Wales; Queanbeyan (Messrs. Griffith and Lea).

H. piceus, Blanch. I have before me a considerable number of specimens (from various localities in New South Wales and South Australia) which present the combination of characters that in the preceding tabulation refer them to this species. I am of opinion that they include several closely allied species differing, *inter se*, in respect of puncturation, of the form of the hind tibiæ, and in several other respects. There is little doubt that *H. piceus*, Blanch., is among them, but the description of that insect might well have been founded on any one of them. Under these circumstances I am not prepared to risk error—the type of *H. piceus* not being available for inspection—by assigning the name to one rather than another, and I adopt this course the more willingly because they are really very closely allied species which it would be extremely difficult to differentiate intelligibly in words. When I redescribed *H. piceus* (P.L.S., N.S.W., 1888, p. 1341) I had before me two of these forms—which I then regarded as identical—and although my description was drawn up from inspection of one specimen in particular, it does not happen (fortunately I think) to mention any of the slight details of structure which an examination of numerous specimens has since led me to think differentiate the form described from the other form then regarded by me as identical. In a subsequent memoir (P.L.S., N.S.W., 1889, p. 1228) I mentioned another specimen which I thought could hardly be separated from *H. piceus*, but which I am now disposed to regard as distinct but for the reasons stated above I do not propose to describe it under a new name, it being quite possibly the true *piceus*. It is worthy of note that in the Macleay Museum *H. piceus*, Blanch., is represented by two species, one of which is certainly not *piceus* while the other is identical with one of the forms before me when I redescribed the species.

H. sexualis, sp. nov. Sat robustus, modice elongatus; minus nitidus; ferrugineus; supra pilis adpressis perbrevibus sat sparsim vestitus; clypeo confertim ruguloso, antice rotundato; labro (hoc transversim rotundato) summo clypei planum haud attingenti; fronte confertim subrugulose punctulato; clypeo fronteque planum fere continuum efficientibus; antennis 9-articulatis, articulo 3º quam 2us parum (quam 4us paullo magis) longiori; prothorace quam longiori ut 16 ad 9 latiori, antice sat angustato, supra subtilius confertim punctulato (puncturis circiter 38 in segmenti longitudine), lateribus leviter arcuatis, angulis anticis acutis sat productis posticis (superne visis) obtusis, basi manifeste bisinuata, margine basali sat æquali; elytris subtiliter confertim nonnihil squamose punctulatis (trans elytron puncturis circiter 50), ad apicem granulis setiferis fimbriatis; pygidio minus crebre minus fortiter punctulato; coxis posticis quam metasternum haud brevioribus quam segmentum ventrale 2um valde longioribus; tibiis anticis extus fortiter tridentatis; tarsorum posticorum articulo basali 2º sat æquali, quam 3us sat longiori; unguiculis appendiculatis. Long., $6\frac{1}{5}$-8 l.; lat., $3\frac{1}{5}$-4 l.

Maris segmento ventrali 4° postice aream opacam ferenti, hac confertim subtiliter strigata.

Easily distinguished from all the preceding species of the subgroup by the labrum having its upper and lower planes meeting roundly instead of in a defined line or stria. From all the following species it is easily distinguished by the fringe of setiferous granules at the apex of its elytra. It seems to be widely distributed in all the interior regions of Australia. I have seen specimens from the eastern parts of Western Australia, the northern (but not tropical) parts of South Australia, and from Western Queensland. A form from tropical Queensland closely resembling it presents some differences of sculpture—especially on the head—and is likely to be specifically distinct; but as I have only a single specimen it is better to regard it provisionally as a possibly abnormal example of this insect. It should be noted that the sculpture of the dorsal surface is a trifle closer in the female of this species than in the male.

Central Australia; very widely distributed.

H. Coatesi, sp. nov. Modice elongatus, postice parum dilatatus; sat nitidus; testaceo-brunneus; supra pilis brevibus sparsius vestitus; clypeo crebre ruguloso, antice rotundato; labro (hoc transversim rotundato) summo clypei planum haud attingenti; fronte crebre (parum vel modice rugulose) punctulata; clypeo fronteque planum fere continuum efficientibus; antennis 9-articulatis, articulo 3º quam 2us vix (quam 4us sat) longiori; prothorace quam longiori ut 11 ad 7 latiori, antice sat angustato, supra crebre subtilius punctulato (puncturis circiter 35 in segmenti longitudine), lateribus leviter arcuatis, angulis anticis sat acutis sat productis posticis (superne visis) obtusis, basi leviter bisinuata, margine basali sat æquali; elytris crebre subtilius vix (femina quam mas paullo magis) squamose punctulatis (trans elytron puncturis circiter 35); pygidio maris sparsius subtilius (feminæ magis crebre magis fortiter) punctulato; coxis posticis quam metasternum haud brevioribus, quam segmentum ventrali 2um valde longioribus; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali 2o sat æquali, quam 3us sat longiori; unguiculis appendiculatis (formam bifidam nonnihil simulantibus). Long., $4\frac{1}{2}$-6 l.; lat., $2\frac{2}{5}$-3 l.

This species resembles *H. holosericeus*, Macl., in general appearance and in most of its structural characters, but is easily distinguished from it by the much less close punctuation of its elytra, that of *holosericeus* being quite as close as of *sexualis*, Blackb. The punctures of the dorsal surface of the sex that I believe to be the male are slightly larger and stronger than of the other sex, and consequently are a trifle more crowded together.

Queensland; Brisbane (Coates); sent by Mr. Lea.

Subgroup II.

(Of Group IV.)

This subgroup contains a large number of species, 30 hitherto described being confidently, and 3 doubtfully, referable to it (these last not included in the tabulation), and 35 more being described in the following pages, making a total of 68. I have not been able to convict any of the names employed for the above species of being mere synonyms. There can be no hesitation in attributing to this subgroup any of the species which I have tabulated as composing it except two or three of the last six or seven, which are somewhat intermediate between Groups IV. and VIII. *H. simius*, Blackb., is a species which also seems to be on the border line between Groups IV. and VIII., its labrum being visible, and concave in outline, when the head is viewed obliquely from behind, but as its labrum rises above the level of the clypeus I have regarded it as an aberrant member of Group VIII.

In the following pages will be found—*(a)* a tabular statement of the distinctive characters of the species known to me of this subgroup; *(b)* notes on the species not known to me, but more or less probably belonging to the subgroup; *(c)* notes on some of the already described species; *(d)* descriptions of new species.

Tabulation of the distinctive characters of *Heteronyces* of Group IV. (Subgroup II.):—

A. Labrum not visible (the head being viewed obliquely from behind).
B. Clypeus rounded in front or lightly sinuately emarginate.
C. Elytra not set with long erect hairs, at most having short suberect pubescence.
(1) D. Front of frons not perpendicularly declivous.
E. Pronotum punctured much more finely and closely (confluently) than any other dorsal part. Size large ... ... grandis, *Blackb.*
EE. Not presenting the characters of E.
F. Hind coxæ not longer than 2nd ventral segment, leaving 1st ventral segment widely exposed.
G. Elytra studded with distinct small granules.
H. Prothorax (viewed obliquely from side) with defined obtuse hind angles and dilatation.
I. Pronotum not very closely punctulate ... ... tasmanicus, *Blackb.*
II. Pronotum confluently punctured ... ... quæsitus, *Blackb.*
HH. Prothorax (viewed obliquely from side) quite rounded off at hind angles and not dilated ... ... Randalli, *Blackb.*
GG. Elytra not granulate ... ... satelles, *Blackb.*
FF. Hind coxæ not as F.
G. Pronotum smoothly punctured, non-rugulose.
H. Elytra not perpendicularly declivous slightly in front of apex.
I. Prothorax less than twice as wide as long.
(2) J. Punctures of pronotum less numerous, not more than 18 punctures in its length.
K. Basal lobe of prothorax not particularly large.
L. Apical piece of hind claws about as long as basal piece.
M. Sides of prothorax strongly rounded ... ... unicus, *Blackb.*
MM. Sides of prothorax very lightly arched.

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(1) In *H. æqualis* (which is placed under "DD.") the perpendicular declivity of the frons is only slightly developed.

(2) *H. socius* is on the border line between this aggregate and JJ.

N. Basal joint of hind tarsi longer than 3rd joint ... Froggatti, *Macl.*
NN. Basal joint of hind tarsi shorter than 3rd joint Perkinsi, *Blackb.*
LL. Apical piece of hind claws considerably shorter than basal piece.
M. Base of pronotum bisinuate; size moderate (4. l. or more).
N. Prothorax wide in front ... ... viator, *Blackb.*
NN. Prothorax much narrower in front.
O. Prothorax nearly twice as wide as long ... ... mundus, *Blackb.*
OO. Prothorax notably less than twice as wide as long.
P. Sides of prothorax almost evenly arched ... Victoris, *Blackb.*
PP. Sides of prothorax much dilatate-rotundate behind middle ... ... socius, *Blackb.*
MM. Base of pronotum not sinuate; size small (3 l.) metropolitanus, *Blackb.*
KK. Prothorax behind a line joining the hind angles quite half as long as in front of it ... ... lobatus, *Blackb.*
JJ. Punctures of pronotum more numerous (20 or more punctures in its length).
K. Puncturation of pronotum excessively fine and close (more than 30 punctures in length).
L. Puncturation of elytra excessively fine and close (as in *H. elongatus*) ... ... ciliatus (Melolontha), *Boisd.*
LL. Puncturation of elytra notably less fine and close ... tempestivus, *Er.*
KK. Puncturation of pronotum not as K.
L. Elytra closely punctulate, 10 punctures from suture not nearly reaching middle.
M. Base of prothorax bisinuate.
N. Basal edging of pronotum distinctly more raised at its ends.
O. Sides of prothorax (viewed from above) lightly evenly arched.

P. Form normal, prothorax only moderately narrow in front.

Q. Hind femora between the series not strongly and closely punctulate.

R. Elytral punctures subconfluent ... ... ingratus, *Blackb.*

RR. Elytral punctures well isolated.

S. Punctures of pronotum not larger than of elytra.

T. Lateral edging of pronotum considerably more raised close to front angles than in middle.

U. Elytra non-striate ... ... hothamensis, *Blackb.*

UU. Elytra distinctly substriate ... Alpicola, *Blackb.*

TT. Lateral edging of pronotum not distinctly more raised in front than in middle. ... ... debilicollis, *Blackb.*

SS. Punctures of pronotum distinctly larger than of elytra ... ... tæniensis, *Blackb.*

QQ. Hind femora between the series quite strongly and closely punctulate ... ... punctipes, *Blackb.*

PP. Form notably long and narrow, prothorax much narrowed in front ... ... elongatulus, *Blackb.*

OO. Sides of prothorax (viewed from above) distinctly rotundate-dilatate behind middle ... eremita, *Blackb.*

NN. Basal edging of pronotum not more raised at ends ... ... nigrescens, *Blackb.*

MM. Base of prothorax without any sinuation.

N. Labrum (viewed from above) very deeply concave testaceus, *Blackb.*

NN. Labrum (viewed from above) almost truncate simplicicollis, *Blackb.*

LL. Elytra less closely punctulate, 10 punctures from suture reaching middle.

M. Lower plane of labrum punctureless and very nitid affinis, *Blackb.*

MM. Lower plane of labrum closely rugulose ... ... nubilus, *Blackb.*

II. Prothorax fully twice as wide as long ... ... præcox, *Er.* (?)
HH. Elytra perpendicularly declivous slightly before apex ... ... elytrurus, *Blackb.*
GG. Sculpture of pronotum rugulose or granular, especially near hind angles.
H. Hind coxæ much (half again or thereabouts) longer than 2nd ventral segment.
I. Lateral outline of prothorax (viewed from side) sinuous.
J. Puncturation of dorsal surface not particularly fine (less fine than in *jubatus*).
K. Colour black ... ... gracilipes, *Blackb.*
KK. Colour brown or castaneous brown ... ... copiosus, *Blackb.*
JJ. Puncturation of dorsal surface very fine (finer than in *jubatus*). terrenus, *Blackb.*
II. Lateral outline of prothorax (viewed from side) straight ... incognitus, *Blackb.*
HH. Hind coxæ only very slightly longer than 2nd ventral segment ... ... orbus, *Blackb.*
(3) DD. Front of frons perpendicularly declivous.
E. Surface of frons not sulcate.
F. Basal two joints of hind tarsi about equal in length ... ... æqualis, *Blackb.*
FF. Basal joint of hind tarsi notably shorter than 2nd joint.
G. Basal edging of pronotum well defined and strong ... ... severus, *Blackb.*
GG. Basal edging of pronotum extremely fine ... ... interioris, *Blackb.*
EE. Frons with a deep transverse sulcus ... ... sulcifrons, *Blackb.*
CC. Elytra set with long, erect hairs.
D. Hind femora dilated and between the series non-punctulate.
E. Ventral segments normally punctulate ... ... striatus, *Blackb.*
EE. Ventral segments all but non-punctulate (the very conspicuous setiferous series disregarded).
F. Labrum (viewed from in front) very lightly arched ... ... salebrosus, *Blackb.*
FF. Labrum (viewed from in front) very strongly arched ... ... seriatus, *Blackb.*

(3) In *H. æqualis*, Blackb., this character is not strongly developed

DD. Hind femora conspicuously punctulate between the series and usually narrower.
  E. Hind femora opaque, with close, fine asperity ... ... insignis, *Blackb.*
  EE. Hind femora nitid, with conspicuous puncturation.
    F. Pronotum closely rugulose, its puncturation lost in the rugulosity.
      G. A distinct sharp projection at apex of basal piece of hind claws pubescens, *Er.*
      GG. Basal piece of hind claws not produced at apex.
        H. Elytra quite coarsely rugulose ... ... deceptor, *Blackb.*
        HH. Elytra finely punctulate, scarcely rugulose ... ... Carteri, *Blackb.*
    FF. Pronotum scarcely rugulose, its punctures (though close) isolated and conspicuous ... ... comans, *Blackb.*

BB. Middle of clypeus deeply excised.
  C. Elytra not clothed with long, erect hairs.
    D. Punctures of elytra large and sparse (12 from suture reach at least to middle).
      E. Hind angles of prothorax (viewed from above) sharply rectangular ... occidentalis, *Blackb.*
      EE. Hind angles of prothorax (viewed from above) obtuse ... ... exectus, *Blackb.*
    DD. Punctures of elytra very much smaller and closer ... ... simulator, *Blackb.*
  CC. Elytra clothed with long, erect hairs ... ... pygidialis, *Blackb.*

(4) AA. Labrum visible as part of outline (head being viewed obliquely from behind).
  B. Basal joint of hind tarsi nearly twice length of 2nd joint ... ... setifer, *Blackb.*
  BB. Basal joint of hind tarsi much shorter.
    C. Clypeus deeply excised (not less so than in *obesus*).

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(4) This character is not strongly marked in *H. intermedius*, Blackb., and *H. thoracicus*, Blackb. They have the clypeus deeply excised.

D. Punctures of pronotum excessively fine and close (about 35 in length) ... excisus, *Blackb.*
DD. Punctures of pronotum notably less close (30 or less in length) ... ...
E. Width of prothorax distinctly less than twice length.
F. Labrum all but reaches level of clypeus.
G. Subsutural interstice flat ... ... obesus, *Burm.*
GG. Subsutural interstice strongly convex ... ... monticola, *Blackb.*
FF. Labrum considerably below level of clypeus ... ... intermedius, *Blackb.*
EE. Width of prothorax quite fully twice length ... ... thoracicus, *Blackb.*
CC. Clypeus truncate or very lightly emarginate.
D. Hind coxæ nearly covering 1st ventral segment, much longer than 2nd ventral segment.
E. Punctures of elytra large and not close (12 from suture reach middle) additus, *Blackb.*
EE. Punctures of elytra much smaller and closer (12 from suture not nearly reaching middle).
F. Base of prothorax bisinuate ... ... quadraticollis, *Blackb.*
FF. Base of prothorax not sinuate ... ... sydneyanus, *Blackb.*
DD. Hind coxæ not or scarcely longer than 2nd ventral segment (basal ventral segment widely exposed).
E. Hind corners of prothorax quite rounded off.
F. Pronotum brightly nitid, about 12 punctures in its length ... ... blandus, *Blackb.*
FF. Pronotum dull, about 20 punctures in its length ... ... prosper, *Blackb.*
EE. Prothorax with well defined hind angles.
F. Elytral punctures sparse (10 from suture reach middle) ... ... proditor, *Blackb.*
FF. Elytral punctures not sparse (10 from suture not nearly reach middle) ... ... relictus, *Blackb.*

H. planatus, Burm., is probably a member of this subgroup or of Group III., according as its claws are bifid or appendiculate. I cannot identify it with any insect known to me.

H. (Silopa) præcox, Er. Blanchard, in his Cat. Col. Ent., p. 112, separated this species from *Heteronyx* altogether, under the name *Hostilina*, on account of the structure of its labrum, and also stated that its antennæ consist of only 8 joints. M. Lacordaire's remark on the insufficiency of the distinctive characters of *Hostilina* seems to be well founded; and it would appear, moreover, that if *Silopa præcox*, Er., is generically distinct from *Heteronyx*, Erickson's generic name ought to be retained for it. I have not seen any insect that I can identify with Blanchard's *Hostilina*, and I may add that *S. præcox*, Er., was not among the type specimens of *Heteronyx* from Erickson's collection sent from Berlin for my inspection (*vide* Tr. R.S., S.A., 1901, p. 15) some years ago, which perhaps points to the probability that the type is not in existence. I am, however, of opinion that Blanchard was mistaken in his identification of *præcox*, as there is a common Tasmanian *Heteronyx* (found also in South Australia and New South Wales, and no doubt in Victoria) which agrees so well with Erickson's description, though it is certainly not Blanchard's *Hostilina*, that I call it "*H. præcox*, Er. ?" I think the "?" scarcely necessary. It is easily recognizable in Group IV. by its prothorax fully twice as wide as long in combination with labrum (viewed from above) very strongly emarginate and very short basal joint of hind tarsi.

H. australis, Guér, from the description and figure together seems to be *certainly* a member of this subgroup, the entire absence of description of the nature of the punctuation rendering it, however, quite incapable of further identification without an examination of the type. M. Blanchard is certainly wrong in identifying it with *H. hepaticus*, Er. The description of the two are quite irreconcilable, and the great difference in size and habitat renders identity most improbable.

H. laticeps, Burm., is possibly a member of this subgroup, and has already been discussed under Group III.

H. Froggatti, Macl. This species is not represented in my collection. The characters attributed to it in my tabulation have been ascertained by examination of the type in the Macleay Museum.

H. (Melolontha) ciliatus, Boisd. My identification of this species is founded entirely on the existence in the Macleay Museum at Sydney of a specimen ticketed in the hand-writing of Mr. W. S. Macleay "*Sericesthis ciliata*, McLeay, N.S.W." It is a fair assumption that this is the type of the insect which Boisduval described as *Melolontha ciliata*, McLeay, or at any rate the specimen which Macleay—if he sent the type to Boisduval—retained as in his opinion identical. Boisduval gives merely "New Holland" as the habitat and does not mention the size or any character indicative of genus. It must be admitted that the Sydney specimen does not agree well with Boisduval's description such as it is, for Boisduval calls the head and prothorax "rugose-punctate" and the elytra "punctate striate," while in the Sydney specimen there is no "rugulosity" except on the head, and the elytra have only feeble indications of the pseudo-striation that occurs much more conspicuously on many *Heteronyces*. Boisduval's phrase "interstitiis (elytrorum) punctatissimis" fits the Sydney specimen very well and expresses a character that is not extremely common in the Australian *Sericoides*. Blanchard (as previously noted by me, Tr. R.S., S.A., 1906, p. 295) catalogues *Melolontha ciliata*, Boisd., as *Haplonycha* (section with 8-jointed antennæ) without indicating his reason for doing so. The probability, however, of the Sydney specimen being at least a co-type justifies me, I think, in claiming for it the name *ciliata*, Boisd., until some more definite contrary evidence shall be forthcoming. I may add that I have in my own collection a badly-damaged specimen taken in South Australia which seems to be identical with that in the Macleay Museum.

H. tempestivus, Er. It is well to notify that I have not seen the type of this species, and that my identification of it is founded on the description. I do not think, however, that there is much doubt about the Tasmanian species to which I apply the name being correctly identified.

H. Alpicola, Blackb. It will be well to mention here that this species (the only previously described one of the group of closely associated species discussed under the heading of *H. tæniensis*) differs from all the others of that group by the very evidently larger punctures of its elytra, of which there are only about 22 in the width of an elytron. The punctures of its pronotum are very much smaller.

H. testaceus, Blackb., resembles the species that I have called "*H. præcox*, Er. ?" in the form of its labrum and hind tarsi and in general appearance, but differs by its less transverse prothorax as well as by the evidently less fine punctuation of its dorsal surface, especially its pronotum.

H. gracilipes, Blackb. This species and *H. copiosus*, Blackb., are closely allied, but are certainly distinct. I do not like the use of colour distinctions for tabulation, but in this case it is probably reliable. I have seen a good many specimens of both species and do not find the colour variable. Other differences, unfortunately, do not lend themselves to tabulation. *H. gracilipes* is evidently of narrower form than *copiosus* and of more convex build, and its elytra have little or no trace of granulation, their punctures, moreover, very manifestly larger and less closely placed. The specimen from Kangaroo Island mentioned (in my notes on the original description) as being of a somewhat ferruginous tone of colour is in bad condition and evidently immature, and I think there is no doubt that its dorsal surface not being black is altogether due to its immaturity.

H. incognitus, Blackb. This species is of narrow elongate form like *H. terrenus*, Blackb., and differs from that species, *inter alia*, by its larger size and the notably larger and less closely placed punctures of its dorsal surface. The character mentioned in the tabulation, *viz.*, the straightness of the lateral margin of its prothorax when viewed from the side no doubt results from that segment being notably less narrowed in front than is the same segment in the allied species with the lateral margin sinuate when similarly viewed.

H. severus, Blackb. The type of this species is a female. Since I described it I have received from the same locality in Central Australia a male *Heteronyx*, which I regard, not without hesitation, as specifically identical. It is larger than the type (long., 5 l.) and differs from the type by characters that certainly are not usually sexual in *Heteronyx*, especially the considerably finer punctures of its pronotum, the sides of which are distinctly less strongly arched, and the lighter colour of its dorsal surface (the males are usually the darker in colour where there is a sexual colour difference). The frons of this example is perpendicular in front as in the type, but is not carinate above the declivity. The middle of each of its basal three ventral segments bears two quite distinct (but not sharply-defined) tubercles, and I find in the type similar, though much feebler, unevenness on the corresponding segments. It is the presence in both of this last-named very peculiar character which hinders me from regarding them as two species. It is so frequent a circumstance to find peculiar characters in the insects of Central Australia that it seems to me probable that this is a species in which sex has defined itself in an unusual way.

H. æqualis, Blackb. The presence of exceptional characters on the frons is too useful a character (in distinguishing species) to be passed by, but unfortunately the species presenting that character unmistakably are so linked on by at least one intermediate form to those in which it is absent that its value for purposes of tabulation is diminished. Of the four species which I have grouped together on this character in the present group, three of them have the front of the frons not only decidedly perpendicular but strongly so (*i.e.*, the height of the perpendicular face considerable, about equal to the thickness of a palpus), but in *æqualis* the face of the frons though undoubtedly perpendicular is of very little height and not very conspicuous. If the frontal character were disregarded *æqualis* would stand in the tabulation beside *debilicollis*, Blackb., which has a perfectly normal frons and also differs from *æqualis* by, *inter alia*, its prothorax more narrowed in front and its elytra evidently more strongly punctulate. I do not think any species which I have tabulated as not presenting the frontal peculiarity of *severus*, etc., could possibly be regarded as presenting it unless possibly *terrenus*, Blackb. (in which there is a suspicion of the frontal character), but it is easily distinguishable from nearly all others of this subgroup by belonging to the small aggregate, having the pronotum conspicuously asperate or granulate.

H. setifer, Blackb. The extraordinary length of the basal joint of the hind tarsi in both sexes of this species is, so far as I know, unique in *Heteronyx*. The male is smaller than the female, and has longer tarsi (especially the intermediate pair). The basal piece of the hind claws is distinctly produced at its inner apex, but the projection is very much smaller than the apical piece. This species occurs in Western Australia as well as near Adelaide, but seems to be a rare insect. The apical part of the elytra is abruptly and somewhat widely depressed, almost as in *H. occidentalis*, Blackb.

H. insignis, Blackb. Attention should be given to a note on this species in Tr. R.S., S.A., 1908, pp. 383, 384.

H. deceptor, Blackb. In my former revision of *Heteronyx* I drew attention to the curious superficial resemblance between this species and *H. torvus*, Blackb., to which it is not at all closely allied structurally. In respect of structure its closest ally is *pubescens*, Er., from which it differs in numerous superficial characters not lending themselves to tabulation, *e.g.*, its nearly black elytra and dark piceous antennæ, its less nitid appearance, the notably finer and closer rugulosity of its pronotum. Its claws furnish, however, a definite character by which it can be at once distinguished, those of its hind tarsi having their basal piece not in the least produced at the apex, while the corresponding piece in *pubescens* terminates in a perfectly distinct small spine-like projection on the inner side.

H. pubescens, Er. I have before me numerous examples that I feel no doubt are this species, which seems to be common and widely distributed in Tasmania. It varies considerably in size (long., $4\frac{1}{2}$-6 l.) and also in colouring. The elytra seem to be constantly brown (more or less *dark* brown), but the pronotum and head of some specimens are nearly black. The long erect hairs are fairly close in fresh examples but seem to be somewhat easily rubbed off, so that it is not unusual to find very few of them left. The small dark specimens are evidently males, and they also differ from the females in having less rugulose puncturation (very noticeable on the pygidium) and conspicuously longer and more slender tarsi.

H. tasmanicus, sp. nov. Minus elongatus, postice sat dilatatus; sat nitidus; obscure ferrugineus; supra pilis brevibus sparsius vestitus; clypeo crebre ruguloso, antice late rotundato; labro summo clypei planum haud attingenti; fronte fortiter crebre rugulose punctulata; clypeo fronteque ut plana manifeste disparia visis; antennis 9-articulatis, articulo 3^o quam 2^{us} multo breviori; prothorace quam longiori ut 9 ad 5 latiori, antice leviter angustato, supra sat crebre subfortiter punctulato (puncturis circiter 23 in segmenti longitudine), lateribus sat arcuatis pone medium leviter dilatato-rotundatis, angulis anticis vix acutis minus productis posticis (superne visis) obtusis, basi leviter bisinuata, margine basali ad latera vix magis elevato; elytris subtiliter granulatis sat crebre subfortiter subsquamose punctulatis (trans elytron puncturis circiter 26); pygidio subtiliter sparsius punctulato; coxis posticis quam metasternum multo brevioribus, segmento ventrali 2^o longitudine sat æqualibus; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2^{us} nonnihil (quam 3^{us} etiam magis) longiori; unguiculis appendiculatis. Long., 5 l.; lat., $2\frac{3}{5}$ l.

This species is easily distinguishable from almost all its near allies by its extremely short hind coxæ. In the female the puncturation is a little more decidedly squamose than in the male and a trifle closer and less defined.

Tasmania; from Mr. Simson.

H. quæsitus, sp. nov. Modice elongatus, postice sat dilatatus; sat nitidus; obscure ferrugineus; supra pilis adpressis brevibus minus sparsim vestitus; clypeo confertim ruguloso antice rotundato; labro summo clypei planum haud attingenti; fronte fortiter crebre rugulose punctulata; clypeo fronteque ut plana manifeste disparia visis; antennis 9-articulatis, articulo 3^o quam 2^{us} multo breviori; prothorace quam longiori ut 18 ad 11 latiori, antice sat angustato, supra confertim squamose punctulato (puncturis circiter 28 in segmenti longitudine), lateribus sat arcuatis, angulis anticis parum acutis posticis (superne visis) obtusis, basi bisinuata, margine basali sat æquali; elytris sat crebre granulatis crebre squamose subtiliter punctulatis (trans elytron puncturis circiter 32); pygidio subtilius minus sparsim punctulato; coxis posticis quam metasternum multo brevioribus, segmento ventrali 2° longitudine sat æqualibus; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2^us^ nonnihil (quam 3^us^ etiam magis) longiori; unguiculis appendiculatis. Long., 5 l.; l., $2\frac{1}{2}$ l.

Not much different from *H. tasmanicus* structurally, but very differently sculptured. The puncturation of the pronotum is exaggeratedly squamose, so that the punctures appear confluent (or almost so) and thickly studded with small granules (especially in the front part). The puncturation of the elytra is much finer and closer than in *tasmanicus*.

Victoria; Dividing Range.

H. Perkinsi, sp. nov., Mas. Minus elongatus, postice leviter dilatatus; sat nitidus; dilute ferrugineus; supra fere glaber (corpore subtus sparsissime piloso); clypeo crebre subrugulose punctulato, antice late rotundato et (præsertim in medio) late reflexo; labro summo clypei planum haud attingenti, fronte sat crebre sat fortiter vix rugulose punctulata; fronte clypeoque ut plana disparia visis (illa convexa); antennis 9-articulatis, articulo 3° quam 2^us^ vix breviori; prothorace quam longiori duplo latiori, antice sat angustato, supra minus crebre sat fortiter punctulato, exempli typici parte mediana anguste sublævi, (puncturis circiter 16 in segmenti longitudine), lateribus minus arcuatis, angulis anticis acutis sat fortiter productis posticis (superne visis) sat rectis; basi parum sinuata, margine basali sat æquali; elytris fortiter minus crebre subseriatim punctulatis (trans elytron puncturis circiter 18), costulis obtusis circiter 3 obscure instructis; pygidio opaco, minus crebre leviter ruguloso; coxis posticis quam metasternum sat brevioribus, quam segmentum ventrale 2^um^ sat longioribus; tibiis anticis extus tridentatis; tarsorum posticorum (his elongatis et nonnihil incrassatis) articulo basali quam 2^us^ multo (quam 3^us^ manifeste) breviori; unguiculis appendiculatis, parte basali quam apicalis vix longiori. Long., $4\frac{2}{5}$; lat., $2\frac{2}{5}$ (vix).

Structurally a very isolated species except that it is closely allied to *H. unicus*, Blackb., and *Froggatti*, Macl.

My unique specimen is a male, and my two examples of *unicus* are females. Specifically they are certainly distinct; *inter alia multa*, the prothorax of *Perkinsi* having well-defined hind angles, and sides only feebly arched—so that the lateral outline viewed from the side appears quite straight; while the prothorax of *unicus* has hind angles rounded off, and sides quite strongly rounded—so that the lateral outline viewed from the side appears strongly arched downward. It is probable, however, that the following differences are sexual and distinguish the sexes of all these three species—*viz.*, pygidium much less nitid, tarsi stouter and much longer, basal joint of hind tarsi notably longer, in the male than in the female. I have not a specimen of *Froggatti* before me, but have notes made when I inspected the type, which, however, do not mention the sex. The prothorax of *Froggatti* resembles that of *Perkinsi* in outline, but the dorsal surface is considerably less closely punctulate in all parts and the basal joint of the hind tarsi is not shorter than the 3rd joint, which is extremely unlikely to be the case in the female of *Perkinsi*, the male (in all instances known to me of sexual difference in the hind tarsi of *Heteronyx*) having the longer basal joint. The elongate hind claws appendiculate almost exactly in the middle of their length are common to these three species, and are unusual in *Heteronyx*.

North Queensland (Mr. Perkins).

H. mundus, sp. nov. Modice elongatus, postice sat dilatatus; sat nitidus; ferrugineus, supra pilis perbrevibus suberectis minus crebre vestitus; clypeo confertim ruguloso antice rotundato; labro summo clypei planum haud attingenti; fronte fortiter crebre rugulose punctulata; clypeo fronteque ut plana sat disparia visis; antennis 9-articulatis, articulo 3^{o} quam 2^{us} sat breviori; prothorace quam longiori ut 15 ad 8 latiori, antice fortiter angustato, supra sat fortiter minus crebre punctulato (puncturis circiter 16 in segmenti longitudine), lateribus modice arcuatis, angulis anticis sat acutis modice productis posticis (superne visis) obtusis, basi nonnihil bisinuata, margine basali sat forti sat æquali; elytris sat fortiter minus crebre punctulatis (trans elytron puncturis circiter 22), costulis 2 obtusis vix manifestis instructis; pygidio subopaco granulis setiferis sparsius instructo; coxis posticis quam metasternum multo brevioribus quam segmentum ventrale 2^{um} paullo longioribus; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali 2^{o} sat æquali quam 3^{us} sat longiori; femoribus posticis inter puncturarum series haud punctulatis; unguiculis appendiculatis. Long., $4\frac{4}{5}$ l.; lat., $2\frac{2}{5}$ l.

A species of neat, sharply-punctured general appearance with a somewhat unusually narrow and elongate head. It is closely allied with *H. viator*, Blackb., *Victoris*, Blackb., and *socius*, Blackb., differing, *inter alia*, from *viator* by its head distinctly longer and narrower and by its prothorax considerably more narrowed in front and having better-defined hind angles: from *Victoris* by its broader form, its much more transverse prothorax, and the puncturation of its elytra coarser and more sparse: and from *socius* by its evidently more transverse prothorax and the distinctly sparser puncturation of its elytra. The unique type is, I think, certainly a female. It should be noted that in this species and the other three just mentioned the hind coxæ, though much shorter than the metasternum and not very much longer than the 2nd ventral segment, yet cover the 1st ventral segment.

Western Australia.

H. socius, sp. nov. Sat elongatus, postice leviter dilatatus; sat nitidus; obscure brunneus, antennis palpis pedibusque dilutioribus; supra pilis brevibus suberectis subcrebre vestitus; clypeo confertim ruguloso antice rotundato; labro summo clypei planum haud attingenti; fronte fortiter crebre rugulose punctulata; clypeo fronteque ut plana sat disparia visis; antennis 9-articulatis, articulo 3° quam 2^us sat breviori; prothorace quam longiori ut 15 ad $9\frac{1}{2}$ latiori, antice sat fortiter angustato, supra fortius subcrebre punctulato (puncturis circiter 18 in segmenti longitudine), lateribus pone medium sat dilatato-rotundatis, angulis anticis minus acutis minus productis posticis (superne visis) obtusis, basi leviter bisinuata, margine basali sat æquali; elytris sat fortiter sat crebre punctulatis (trans elytron puncturis circiter 25); pygidio granulis setiferis instructo; coxis posticis quam metasternum multo brevioribus, quam segmentum ventrale 2^um paullo longioribus; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2^us vix (quam 3^us sat) longiori; unguiculis appendiculatis. Long., $4\frac{1}{5}$-$4\frac{3}{4}$ l.; lat., 2-$2\frac{1}{4}$ l.

As noted above (under *H. mundus*), this species is closely allied with three others. Its nearest ally is *H. Victoris*, Blackb., from which it differs (disregarding colour; the dorsal surface of the unique type of *H. Victoris* is nearly black), *inter alia*, by its prothorax notably more transverse and less narrowed in front, with sides considerably rotundate-dilatate behind the middle. The prothorax of *H. Victoris* is among the least transverse and most strongly narrowed forward of any in the genus. *H. socius* is difficult to place in my tabulation of this subgroup, because the puncturation of its pronotum makes it somewhat intermediate between the aggregates with the pronotum sparsely and closely punctulate. I count 18 punctures in the length of the majority of the specimens I have seen, but in one I make 19 punctures and in another 20. Of course the number of punctures may vary slightly in two examples of a species, but I may say that in the other species which I have placed under "I." normal specimens have less than 18 punctures in the length of the prothorax, and I have not counted more than 18 in any of them. In the females of this insect the puncturation of the dorsal surface is a trifle coarser than in the males.

Western Australia; Swan River (Mr. Lea).

H. metropolitanus, sp. nov. Minus elongatus, postice sat dilatatus; sat nitidus; brunneo-testaceus; supra pilis brevibus suberectis sat crebre vestitus; clypeo (hoc antice rotundato) fronteque fortiter sat crebre minus rugulose punctulatis, ut plana sat disparia visis; labro summo clypei planum haud attingenti; antennis 9-articulatis, articulo 3° quam 2us multo breviori; prothorace quam longiori ut 11 ad 6 latiori, antice leviter angustato, supra subtilius subcrebre punctulato (puncturis circiter 17 in segmenti longitudine), lateribus sat arcuatis, angulis anticis sat acutis minus productis posticis (superne visis) rotundato-obtusis, basi haud sinuata, margine basali æquali sat subtili; elytris subtilius sat crebre concinne punctulatis (trans elytron puncturis circiter 24); pygidio (maris sparsim, feminæ crebre) punctulato; coxis posticis quam metasternum parum brevioribus, quam segmentum ventrale 2um multo longioribus; tibiis anticis extus dentibus 2 inferioribus magnis et altero subobsoleto armatis; tarsorum posticorum articulo basali maris 2° sat æquali (feminæ nonnihil breviori), quam 3us maris sat (feminæ paullo) longiori; unguiculis appendiculatis. Long., 3 l.; lat., $1\frac{3}{5}$ l.

This species, like *H. socius*, Blackb., has the closeness of puncturation of the pronotum somewhat on the dividing line between the preceding and the immediately following aggregates. The puncturation of its head is of a type not very usual, and the extreme feebleness of the uppermost tooth of its front tibiæ is notable. The slightly more pronounced puncturation of the dorsal surface noticeable in the females of many *Heteronyces* is in this species very conspicuous on the pygidium. All the specimens that I have seen are of a very pale-brown colour.

New South Wales; Sydney (Mr. Lea, etc.).

H. ingratus, sp. nov. Minus elongatus, postice leviter vel vix dilatatus; minus nitidus; obscure brunneus, antennis palpis pedibusque rufis; supra pilis brevibus suberectis crebrius vestitus; clypeo crebre ruguloso antice late rotundato; labro summo clypei planum haud attingenti; fronte crebre nonnihil rugulose punctulata; clypeo fronteque ut plana sat disparia visis; antennis 9-articulatis, articulo 3º quam 2us manifeste breviori; prothorace quam longiori ut 7 ad 4 latiori, antice leviter angustato, supra crebre sat fortiter punctulato (puncturis circiter 26 in segmenti longitudine), lateribus leviter arcuatis, angulis anticis vix acutis modice productis posticis (superne visis) obtuse-rectis, basi leviter bisinuata, margine basali sat forti ad latera magis elevato; elytris sat manifeste substriatis, crebre minus fortiter subaspere punctulatis (trans elytron puncturis circiter 30); pygidio minus fortiter sat crebre punctulato; coxis posticis quam metasternum sat brevioribus, quam segmentum ventrale 2um multo longioribus; femoribus posticis inter series sparsius subtilius punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2us vix breviori, quam 3us puallo longiori; unguiculis appendiculatis. Long., $3\frac{1}{2}$-4 l.; lat., $1\frac{4}{5}$-2 l.

A dull-brown, obscure-looking species, its most characteristic features being the comparatively great width of its prothorax in front (which gives the segment a subquadrate appearance) and the close asperate and by no means fine puncturation of its elytra. I think I have both sexes before me, scarcely distinguishable except by the male being a little smaller than the female and of narrower build.

New South Wales; Blue Mountains.

H. hothamensis, sp. nov. Minus elongatus, postice leviter dilatatus; sat nitidus; ferrugineus, antennarum flabello testaceo; supra pilis brevibus suberectis crebrius vestitus: clypeo confertim rugulose punctulato, antice late rotundato; labro summo clypei planum haud attingenti; fronte crebre sat rugulose punctulata: clypeo fronteque ut plana sat disparia visis; antennis 9-articulatis; articulo 3º quam 2us breviori; prothorace quam longiori ut 7 ad 4 latiori, antice modice angustato, supra crebre sat fortiter punctulato (puncturis circiter 24 in segmenti longitudine), lateribus leviter arcuatis, angulis anticis vix acutis modice productis posticis (superne visis) obtuse-rectis, basi leviter bisinuata, margine basali ad latera paullo magis elevato; elytris sat crebre minus fortiter sat concinne punctulatis (trans elytron puncturis circiter 26); pygidio crebre subtilius punctulato; coxis posticis quam metasternum paullo brevioribus, quam segmentum ventrale 2um multo longioribus; femoribus posticis inter series sparsim sat subtiliter punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2^{us} sat breviori, quam 3^{us} vix longiori; unguiculis appendiculatis. Long., 4 l.; lat., 2 l.

I believe my two examples of this insect to be females. The species is somewhat close to the preceding *(H. ingratus)*, but certainly distinct. Its most noticeable distinctive characters are in its elytral puncturation (the punctures well defined and isolated one from another, without rugulosity) and in the very evidently greater length of the 2nd joint of the hind tarsi, as compared with the basal joint, in the same sex. It is likely that the tarsal distinction is less pronounced in the male.

Victorian Alps; Mount Hotham.

H. debilicollis, sp. nov. Minus elongatus, postice leviter dilatatus; nitidus; testaceo-ferrugineus; supra pilis brevibus adpressis crebrius vestitus; clypeo (hoc antice rotundato) fronteque crebre ruguloso, ut plana sat disparia visis; labro clypei planum haud attingenti, antennis 9-articulatis, articulo 3^{o} quam 2^{us} breviori; prothorace quam longiori ut 13 ad 6 latiori, antice minus angustato, supra crebre minus fortiter punctulato (puncturis circiter 24 in segmenti longitudine), lateribus modice arcuatis, margine laterali antice quam in media parte haud plane magis elevato, angulis anticis sat rectis parum productis posticis (superne visis) rotundato-obtusis, basi bisinuata, margine basali subtili ad latera paullo magis elevato; elytris sat crebre minus fortiter paullo inequaliter punctulatis (trans elytron puncturis circiter 26), latera versus vix manifeste substriatis; pygidio minus crebre minus fortiter punctulato; coxis posticis quam metasternum paullo brevioribus, quam segmentum ventrale 2^{um} multo longioribus; femoribus posticis inter series sparsim minus fortiter punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali 2^{o} sat æquali quam 3^{us} parum longiori; unguiculis appendiculatis. Long., $3\frac{2}{5}$ l.; lat., 1 7-10 l.

Among its near allies this species is best characterized by the lateral edging of its pronotum, which is scarcely perceptibly more elevated at the front angles than at its middle. This character separates it strongly from *H. ingratus*, *hothamensis*, *alpicola*, and *punctipes*, and less strongly from *elongatulus*, *eremita*, and *nigrescens*. Compared with *elongatulus* it is of less elongate build, more nitid, with the punctures of the pronotum distinctly less fine and those of the elytra very evidently less close and larger. Compared with *eremita* it is notably more nitid, with the lateral outline of its prothorax different and the puncturation of its elytra very evidently less close. Compared with *nigrescens* it differs strongly (disregarding colour) by the basal edging of its pronotum and by the roundly obtuse hind angles of its prothorax (viewed from above), the last-mentioned character separating it also, more or less strongly, from all the other species named above.

Tasmania; Launceston (Mr. Lea).

H. tæniensis, sp. nov. Minus elongatus, postice sat dilatatus; sat nitidus; ferrugineus; supra pilis brevibus adpressis crebrius vestitus; clypeo crebre ruguloso, antice late rotundato; labro clypei planum haud attingenti; fronte fortiter subrugulose (vel vix rugulose, ? maris) punctulata; clypeo fronteque ut plana sat disparia visis; antennis 9-articulatis, articulo 3° quam 2us paullo breviori; prothorace quam longiori ut 12 ad 7 latiori, antice parum angustato, supra sat crebre minus fortiter punctulato (puncturis circiter 22 in segmenti longitudine), lateribus (superne visis) leviter arcuatis, angulis anticis subacutis parum productis posticis (superne visis) obtusis, basi leviter bisinuata, margine basali ad latera paullo magis elevato; elytris vix manifeste substriatis, crebre minus fortiter punctulatis (trans elytron puncturis circiter 26); pygidio subtilius sat crebre punctulato; coxis posticis quam metasternum paullo brevioribus, quam segmentum ventrale 2um multo longioribus; femoribus posticis inter series fere lævibus; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali 2° sat æquali, quam 3us paullo longiori; unguiculis appendiculatis. Long., 4 l.; lat., 2 l.

This species is another near ally of the group of closely associated species referred to in the notes of the preceding (*H. debilicollis*). It differs from them all in having the punctures of its pronotum distinctly larger than of its elytra. The increased elevation of the lateral margins near the front angles of its pronotum also distinguishes it from *debilicollis*, and the feeble hind angles of its prothorax from *ingratus*, *Alpicola*, *punctipes*, *elongatulus*, *eremita*, and *nigrescens*. It is nearest to *hothamensis*, compared with which species its prothorax is less narrowed in front, its elytra have traces of substriation, the hind angles of its prothorax are decidedly more rounded off, and its hind femora are all but punctureless between the two series of punctures. In one of the specimens before me (which I believe to be a male) the puncturation of the frons and pygidium is a little less strong and rugulose than in the others which are probably females, their ventral segments being more convex.

New South Wales; Forest Reefs (Mr. Lea).

H. punctipes, sp. nov. Minus elongatus, postice leviter dilatatus; sat nitidus; ferrugineus, antennarum flabello testaceo; supra pilis brevibus suberectis crebrius vestitus; clypeo sat crebre ruguloso, antice subtruncato vix manifeste sinuato; labro summo clypei planum haud attingenti; fronte sat crebre sat grosse rugulose punctulata; clypeo fronteque ut plana sat disparia visis; antennis 9-articulatis, articulo 3º quam 2ᵘˢ sat breviori; prothorace quam longiori ut 12 ad 7 latiori, antice modice angustato, supra crebre minus fortiter punctulatis (puncturis circiter 24 in segmenti longitudine), lateribus parum arcuatis, angulis anticis vix acutis parum productis posticis (superne visis) rectis, basi parum bisinuata, margine basali ad latera summa paullo magis elevato; elytris crebre minus fortiter nec rugulose punctulatis (trans elytron puncturis circiter 32); pygidio sat crebre minus fortiter punctulato; coxis posticis quam metasterum paullo brevioribus, quam segmentum ventrale 2ᵘᵐ multo longioribus femoribus posticis inter series sat crebre fortius sat æqualiter punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali 2º sat æquali, quam 3ᵘˢ sat longiori; unguiculis appendiculatis. Long., 4 l.; lat., 2 l.

The affinity of this species to those placed near it in the tabulation is fairly close. Its most distinctive features among them seem to be the form of its prothorax and the sculpture of its hind femora. The sides of its prothorax are only very lightly arched; the segment (viewed from above) is not or scarcely wider in front of than at the hind angles, and the hind angles themselves (viewed from above) are well-defined right angles. The close, even, and somewhat coarse sculpture of the hind femora is very different from the corresponding sculpture in allied species. The puncturation of the elytra is about as close as in *H. ingratus*, but is not asperate. I believe the unique type to be a male, the female if distinguishable having probably elytral sculpture not quite as smooth and the basal joint of the hind tarsi a trifle shorter.

New South Wales; Galston.

H. elongatus, sp. nov. Sat elongatus, postice sat dilatatus; vix nitidus; ferrugineus, antennarum flabello testaceo; supra pilis brevibus suberectis crebrius vestitus; clypeo crebre ruguloso, antice rotundato; labro summo clypei planum haud attingenti; fronte sat crebre rugulose punctulata; clypeo fronteque ut plana minus disparia visis;

antennis 9-articulatis, articulo 3° quam 2^us breviori; prothorace quam longiori ut 3 ad 2 latiori, antice sat fortiter angustato, supra sat crebre minus fortiter punctulato (puncturis circiter 22 in segmenti longitudine), lateribus leviter arcuatis, angulis anticis sat obtusis parum productis posticis (superne visis) rectis, basi leviter bisinuata, margine basali subtili ad latera paullo magis elevato; elytris sat manifeste substriatis, crebre minus fortiter subaspere punctulatis (trans elytron puncturis circiter 30); pygidio crebrius subtiliter punctulato; coxis posticis quam metasternum paullo brevioribus, quam segmentum ventrale 2^um multo longioribus; femoribus posticis inter series sparsius minus subtiliter punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2^us nonnihil breviori, quam 3^us paullo longiori; unguiculis appendiculatis. Long., $3\frac{3}{5}$ l.; lat., $1\frac{3}{5}$ l.

Another species somewhat close to *H. punctipes* and its allies. It is distinguishable among them by its narrow elongate form and its prothorax strongly narrowed in front. The hind angles of its prothorax are well-defined right angles (viewed from above) as in *punctipes*. The sculpture of the elytra is near that of *H. ingratus*, but is finer and less strongly asperate. The unique type is almost certainly a male.

Victoria; near Harrietville.

H. eremita, sp. nov. Modice elongatus, postice leviter dilatatus; sat nitidus; ferrugineus, antennarum flabello testaceo; supra pilis brevibus suberectis crebrius vestitus; clypeo crebre ruguloso, antice rotundato; labro summo clypei planum haud attingenti; fronte rugulose sat crebre punctulata, clypeo fronteque ut plana parum disparia visis; antennis 9-articulatis, articulo 3° quam 2^us breviori; prothorace quam longiori ut 9 ad 5 latiori, antice modice angustato, supra sat crebre minus fortiter punctulato (puncturis circiter 22 in segmenti longitudine), lateribus (superne visis) pone medium sat dilatato-rotundatis, angulis anticis vix acutis minus productis posticis (superne visis) obtuse rectis, basi leviter bisinuata, margine basali sat subtili ad latera paullo magis elevato; elytris manifeste substriatis, crebre minus fortiter subaspere punctulatis (trans elytron puncturis circiter 30); pygidio subtilius minus crebre punctulato; coxis posticis quam metasternum paullo brevioribus quam segmentum ventrale 2^um sat longioribus; femoribus posticis inter series sparsius subtilius punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2us parum breviori, quam 3us sat longiori; unguiculis appendiculatis. Long., $3\frac{2}{5}$ l.; lat., $1\frac{2}{5}$-$1\frac{1}{2}$ l.

This is another species with close affinity to *H. punctipes* and its allies. Among them it is of smaller size than those placed before it in the tabulation, differs from them all in the sides of its prothorax (viewed from above), very distinctly rotundate-dilatate between the middle and the base. The sculpture of its dorsal surface differs very little from that of *H. elongatulus*, but is a trifle more decidedly asperate. I think that I have both sexes before me, but if so there is scarcely any difference between them except in the female being of wider build and more dilated in the hinder part of the elytra.

Victoria; Dividing Range.

H. nigrescens, sp. nov. Minus elongatus, postice sat dilatatus; sat nitidus; niger, capite prothoraceque nonnihil picescentibus, antennis palpis pedibusque obscure ferrugineis; supra pilis brevibus suberectis crebrius vestitus; clypeo (hoc antice rotundato) fronteque crebre rugulose punctulatis, ut planum fere continuum visis; labro clypei planum haud attingenti; antennis 9-articulatis, articulo 3° quam 2us breviori; prothorace quam longiori ut 9 ad 5 latiori, antice modice angustato, supra sat crebre minus subtiliter punctulato (puncturis circiter 22 in segmenti longitudine), lateribus modice arcuatis, angulis anticis vix acutis minus productis posticis (superne visis) rectis, basi leviter bisinuata, margine basali sat subtili absolute æquali; elytris obsolete substriatis, crebre minus fortiter vix subaspere punctulatis (trans elytron puncturis circiter 27); pygidio sat crebre sat subtiliter punctulato; coxis posticis quam metasternum sat brevioribus quam segmentum ventrale 2um sat longioribus; femoribus posticis inter series sparsius minus subtiliter punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2us paullo breviori quam 3us sat longiori; unguiculis appendiculatis. Long., 3 l.; lat., $1\frac{1}{3}$ l.

The unique type (which I believe to be a female) of this species differs from *H. punctipes* and its allies chiefly in its black colouring (perhaps a variable character), and in the basal edging of its pronotum fine and even in its whole length—without any dilatation or increase of elevation even at the hind angles of the segment. In respect of the latter character it is nearest to *H. eremita* in which the lateral accentuation of the basal edging, though quite distinct, is not very strong. The lateral outline of the prothorax, however, of this species is very different from the corresponding outline in *H. eremita*.

Victoria; Nelson.

H. simplicicollis, Blackb. Modice elongatus, postice sat dilatatus; sat nitidus; brunneo-testaceus, capite prothoraceque rufescentibus; supra pilis brevibus suberectis sat crebre vestitus; clypeo (hoc antice rotundato, in media parte nonnihil subtruncato) fronteque subgrosse sat crebre ruguloso-punctulatis, ut plana multo disparia visis; labro clypei planum haud attingenti; antennis 9-articulatis, articulo 3° perbrevi quam 2^{us} multo breviori; prothorace quam longiori ut 9 ad 5 latiori, antice minus angustato, supra sat subtiliter vix crebre punctulato (puncturis circiter 20 in segmenti longitudine), lateribus leviter arcuatis, angulis anticis vix acutis minus productis posticis rotundato-obtusis, basi æqualiter rotundata, margine basali subtili ad latera vix magis elevato; elytris lineis 2 subcostuliformibus vix perspicue instructis, subfortiter vix crebre nec aspere punctulatis (trans elytron puncturis circiter 23); pygidio (maris sparsim, feminæ magis crebre) subtilius punctulato; coxis posticis quam metasternum perspicue brevioribus, quam segmentum ventrale 2^{um} multo longioribus; femoribus posticis inter series sparsim subtiliter punctulatis; tibiis anticis extus tridentatis (dente supremo parvo); tarsorum posticorum articulo basali quam 2^{us} sat breviori, 3° sat æquali; unguiculis appendiculatis. Long., $3\frac{1}{5}$ l.; lat., $1\frac{1}{2}$-$1\frac{3}{5}$ l.

The hind margin of the prothorax evenly rounded without any sinuation distinguishes this species from nearly all its near allies. *H. testaceus*, Blackb., resembles it in this respect and in general appearance, but is easily separated from it by having, *inter alia*, an exceptionally wide prothorax and a labrum of unusual shape. *H. metropolitanus*, Blackb., also considerably resembles it, but differs not only in the larger and less numerous punctures of its pronotum but also, *inter alia*, in the basal joint of its hind tarsi very evidently longer in both sexes as compared with the 2nd joint.

Victoria; Australian Alps (about 6,000 ft. elevation).

H. affinis, sp. nov. Modice elongatus, postice sat dilatatus; modice nitidus; obscure brunneus, antennis palpis pedibusque dilutioribus; supra pilis adpressis sparsim vestitus; clypeo (hoc antice late rotundato) fronteque sat crebre fortiter rugulosis, ut plana sat disparia visis; labro nitido vix perspicue punctulato, clypei planum haud attingenti; antennis 9-articulatis, articulo 3° quam 2^{us} breviori; prothorace quam longiori ut 15 ad 8 latiori, antice sat angustato, supra sat fortiter vix crebre punctulato (puncturis circiter 20 in segmenti longitudine), lateribus (superne visis) sat rotundatis, angulis anticis sat acutis leviter productis posticis (superne visis) subrectis, basi leviter bisinuata, margine basali ad latera vix magis elevato; elytris vix perspicue substriatis, subcrebre sat grosse punctulatis (trans elytron puncturis circiter 20); pygidio subtilius vix crebre punctulato; coxis posticis quam metasternum paullo brevioribus, quam segmentum ventrale 2^{um} multo longioribus; femoribus posticis inter series sparsim subtilius punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2^{us} perspicue breviori, quam 3^{us} parum longiori; unguiculis appendiculatis. Long., 5 l.; lat., $2\frac{1}{2}$ l.

This species differs from *H. nubilus* in respect chiefly of characters that do not lend themselves very readily to a tabular statement. It is notably larger and not nearly so dark in colour, and its dorsal surface is distinctly more coarsely punctulate. It can be readily separated, however, by the very different sculpture of its labrum (mentioned in the tabulated statement above).

Victoria; Dividing Range.

H. nubilus, sp. nov. Modice elongatus, postice sat dilatatus; sat nitidus; niger, antennis palpis pedibus et nonnullorum exemplorum corpore subtus plus minusve rufis; supra pilis brevibus adpressis et in capite prothoracisque marginibus nonnullis longioribus sparsim vestitus; clypeo (hoc antice late rotundato) fronteque sat crebre rugulosis, ut plana sat disparia visis; labro postice crebre ruguloso clypei planum haud attingenti; antennis 9-articulatis, articulo 3° quam 2^{us} breviori; prothorace quam longiori ut 7 ad 4 latiori, antice sat angustato, supra crebre subfortiter punctulato (puncturis circiter 22 in segmenti longitudine), lateribus (superne visis) leviter arcuatis, angulis anticis subacutis modice productis posticis (superne visis) rectis, basi leviter bisinuata, margine basali ad latera magis elevato; elytris manifeste substriatis, fortiter vix crebre punctulatis (trans elytron puncturis circiter 20); pygidio subfortiter minus crebre punctulato; coxis posticis quam metasternum sat brevioribus quam segmentum ventrale 2^{um} sat longioribus; femoribus posticis inter series sparsim subtilius punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2^{us} subbreviori quam 3^{us} sublongiori; unguiculis appendiculatis. Long., $3\frac{1}{2}$-4 l.; lat., $1\frac{4}{5}$-2 l.

I have seen numerous specimens of this insect, and find the colour of the dorsal surface black in all of them. Those with the body reddish beneath I believe to be more or less immature. I do not observe any good sexual characters, beyond that the males seem to be a trifle smaller and of more parallel form than the females. The species is somewhat unusually nitid among the *Heteronyces*. It bears much resemblance to *H. satelles*, Blackb., which, however, *inter alia*, has very much shorter hind coxæ.

South Australia; common at times in the neighbourhood of Adelaide.

H. elytrurus, sp. nov. Minus elongatus, postice sat dilatatus; sat nitidus; piceo-niger, antennis palpis tibiis tarsis et (nonnullorum exemplorum) elytris rufis; supra pilis brevibus suberectis crebrius vestitus; clypeo (hoc antice rotundato) fronteque crebre rugulosis, ut plana sat disparia visis; labro clypei planum haud attingenti; antennis 9-articulatis, articulo 3° quam 2us multo breviori; prothorace quam longiori ut 5 ad 3 latiori, antice sat angustato, supra fortius minus crebre punctulato (puncturis circiter 19 in segmenti longitudine), lateribus (superne visis) sat arcuatis, angulis anticis subacutis minus productis posticis (superne visis) rectis, basi bisinuata, margine basali ad latera nonnihil magis elevato; elytris manifeste substriatis, fortius minus crebre subrugulose punctulatis (trans elytron puncturis circiter 20), paullo ante apicem subito depressis; pygidio sparsius minus fortiter punctulato; coxis posticis quam metasternum paullo brevioribus, quam segmentum ventrale 2um sat longioribus; femoribus posticis inter series sparsim minus subtiliter punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2us sat breviori, 3° sat æquali; unguiculis appendiculatis. Long., $2\frac{3}{5}$ l.; lat., $1\frac{2}{5}$ l.

In general appearance and sculpture this insect looks like a dwarf of *H. Alpicola*, Blackb., but differs *inter alia* in its prothorax evidently less transverse, its colouring, and especially in the peculiar structure of its elytra, which become suddenly depressed a short distance before the apex, looking when viewed from above as if the extreme apical part became abruptly less thick than the rest of the elytra. I believe my two examples of this species to be male and female, the elytra of the female reddish-brown, those of the male nearly black. I do not find any notable sexual difference (unless that of colour be sexual) except in the evidently flatter abdomen of the male.

Victoria; Mount Hotham (elevation 6,000 ft.).

H. copiosus, sp. nov. Minus elongatus, postice sat dilatatus; sat nitidus; brunneus, antennis palpis pedibusque rufis;

supra pilis brevibus suberectis sat dense vestitus; clypeo (hoc antice rotundato) fronteque crebre rugulosis, fere ut planum continuum visis; labro clypei planum haud attingenti; antennis 9-articulatis, articulo 3° quam 2us breviori; prothorace quam longiori ut 12 ad 7 latiori, antice sat angustato, supra crebre rugulose nec grosse punctulato (puncturis circiter 32 in segmenti longitudine), lateribus (superne visis) leviter arcuatis, angulis anticis sat acutis modice productis posticis (superne visis) obtuse rectis, basi bisinuata, margine basali ad latera nonnihil magis elevato; elytris minus perspicue substriatis, subtiliter granulatis, crebre squamose minus fortiter punctulatis (trans elytron puncturis circiter 40); pygidio subtilius nec crebre punctulato; coxis posticis quam metasternum sat brevioribus, quam segmentum ventrale 2um sat longioribus; femoribus posticis inter series fortius minus sparsim punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali 2° sat æquali, quam 3us paullo longiori; unguiculis appendiculatis. Long., $5\frac{1}{2}$-6 l.; lat., $2\frac{1}{2}$-$3\frac{1}{5}$ l.

In general appearance suggestive of some of the members of the preceding subgroup, this species is at once distinguishable from them by the short 3rd joint of its antennæ and by the outline of its clypeus forming an even curve to the point of actual contact with the eye (a frequent character in this 2nd subgroup). It is rather close to *H. gracilipes*, Blackb., from which it differs (disregarding colour), *inter alia*, by the squamose and closer puncturation of its elytra. The female differs from the male in being more robust and wider, with hind tarsi shorter and stouter. I have a single example of small size (long., $4\frac{1}{2}$ l.) and pale castaneous colour, from the Blue Mountains, and one from Victoria of normal size and colour, but with elytra a little less closely punctulate than the form described, which may represent two closely allied species, but in the absence of more numerous specimens of these latter it seems best to regard them provisionally as local varieties.

New South Wales; Forest Reefs (Mr. Lea).

H. orbus, sp. nov. Minus elongatus, postice sat dilatatus, sat nitidus; brunneus, antennis palpisque rufis: supra pilis brevibus suberectis vestitus; clypeo crebre ruguloso, antice rotundato; labro clypei planum haud attingenti; fronte rugulose subgrosse crebre punctulata, clypeo fronteque ut plana sat disparia visis; antennis 9-articulatis, articulo 3° quam 2us breviori; prothorace quam longiori ut 12 ad 7 latiori, antice sat angustato: supra fortiter sat crebre sat rugulose punctulato (puncturis circiter 22 in segmenti longitudine), lateribus (superne visis) pone medium dilatato-rotundatis, angulis anticis sat acutis sat productis posticis (superne visis) rotundato-obtusis, basi nonnihil bisinuata, margine basali ad latera vix magis elevato; elytris crebre fortiter punctulatis (trans elytron puncturis circiter 22); pygidio subtilius minus crebre punctulato; coxis posticis quam metasternum multo brevioribus, quam segmentum ventrale 2^{um} paullo longioribus; femoribus posticis inter series fortius minus sparsim punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2^{us} paullo breviori, quam 3^{us} paullo longiori; unguiculis appendiculatis. Long., $4\frac{2}{5}$ l.; lat., $2\frac{1}{5}$ l.

The shortness of the hind coxæ of this species is suggestive (in the tabulation) of association with *H. tasmanicus* and its allies, but although the coxæ themselves are not much longer than in some of those species they almost cover the 1st ventral segment. The punctures of the dorsal surface are not very numerous when counted, but nevertheless being large they are decidedly closely packed. The insect is not very close to any other known to me. I believe the unique type to be a male.

New South Wales; probably Mulwala (Mr. Sloane).

H. interioris, sp. nov. Modice elongatus, postice minus dilatatus; sat nitidus; castaneus; supra pilis brevibus adpressis sat sparsim vestitus; clypeo crebre ruguloso, antice rotundato; labro clypei planum haud attingenti; fronte grosse rugulosa antice perpendiculari et carinata; clypeo fronteque ut plana valde disparia visis; antennis 9-articulatis, articulo 3° quam 2^{us} breviori; prothorace quam longiori ut 9 ad 5 latiori, antice minus angustato, supra subfortiter minus crebre punctulato (puncturis circiter 19 in segmenti longitudine), lateribus (superne visis) leviter arcuatis, angulis anticis vix acutis minus productis posticis (superne visis) obtusis, basi leviter bisinuata, margine basali subtili ad latera paullo magis elevato; elytris minute granulatis, crebre sat subtiliter squamose punctulatis (trans elytron puncturis circiter 30); pygidio sat crebre minus fortiter punctulato; coxis posticis quam metasternum sat brevioribus quam segmentum ventrale 2^{um} sat longioribus; femoribus posticis inter series sparsius subtilius punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2^{us} breviori, quam 3^{us} paullo longiori; unguiculis appendiculatis. Long., $4\frac{2}{5}$ l.; lat., $2\frac{1}{10}$ l.

The perpendicular front of its frons distinguishes this species from nearly all the others of the group. The perpendicular face is smooth and nitid and its height is about equal to the thickness of one of the palpi. The species is nearest (but not very near) to *H. severus*, Blackb., from which it differs, *inter alia*, by the extremely fine basal edging of its pronotum, by the very much finer and closer puncturation of its elytra (on which the punctures are much finer and closer than those of the pronotum), and by the puncturation also very much finer on the ventral segments.

Central Australia.

H. sulcifrons, sp. nov. Modice elongatus, postice minus dilatatus; sat nitidus; castaneus; supra pilis brevibus suberectis subcrebre vestitus; clypeo crebre ruguloso, antice late rotundato; labro clypei planum haud attingenti; fronte grosse sparsim punctulata, antice perpendiculari et carinata, postice transversim sat profunde sulcata; clypeo fronteque ut plana valde disparia visis; antennis 9-articulatis, articulo, 3° quam 2ᵘˢ breviori; prothorace quam longiori ut 9 ad 4 lateriori, antice sat angustato, supra sat fortiter minus crebre punctulato (puncturis circiter 15 in segmenti longitudine), lateribus (superne visis) pone medium sat dilatato-rotundatis, angulis anticis fere rectis haud productis posticis (superne visis) rotundato-obtusis, basi vix sinuata, margine basali subtili ad latera haud magis elevato; elytris fortius minus crebre punctulatis (trans elytron puncturis circiter 20); pygidio fortius subcrebre punctulato; coxis posticis quam metasternum sat brevioribus; quam segmentum ventrale 2ᵘᵐ sat longioribus; femoribus posticis inter series fere lævibus; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2ᵘˢ manifeste vel vix breviori, 3° sat æquali vel nonnihil longiori; unguiculis appendiculatis. Long., $2\frac{1}{5}$-$2\frac{3}{5}$ l.; lat., $1\frac{1}{5}$-$1\frac{3}{10}$ l.

Easily distinguishable in the subgroup by the remarkable sculpture of its frons, also by its small size, etc. The sexes seem to be scarcely distinguishable except by the basal joint of the hind tarsi a trifle longer in comparison to the next two joints in the sex which I take to be the male.

Western Australia; Lake Austin and Murchison River (Mr. French, etc.).

H. striatus, sp. nov. Minus elongatus, postice vix vel modice dilatatus; sat nitidus; rufo-ferrugineus; supra pilis sat elongatis et nonnullis brevioribus erectis sparsim vestitus; clypeo crebre ruguloso, antice late rotundato vel (? maris) in medio leviter sinuato; labro clypei planum haud attingenti, leviter arcuato; fronte sat crebre sat grosse ruguloso-punctulata; clypeo fronteque ut plana sat disparia visis; antennis 9-articulatis, articulo 3°

quam 2^{us} breviori; prothorace quam longiori ut 12 ad 7 latiori, antice modice angustato, supra sparsim sat grosse nonnihil acervatim punctulato (puncturis circiter 12 in segmenti longitudine), lateribus (superne visis) leviter arcuatis, angulis anticis sat acutis sat productis posticis (superne visis) obtusis fere rectis, basi bisinuata, margine basali ad latera paullo magis elevato; elytris striatis sparsim granulatis, sparsim subgrosse nonnihil subseriatim punctulatis (trans elytron puncturis circiter 14); pygidio sparsissime punctulato; coxis posticis quam metasternum sat multo brevioribus, quam segmentum ventrale 2^{um} minus longioribus; segmentis ventralibus minus sparsim confuse subfortiter (præsertim latera versus) punctulatis; femoribus posticis sat dilatatis, inter series lævibus; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2^{us} sat breviori 3° sat æquali vel subbreviori; unguiculis appendiculatis. Long., 5-5$\frac{3}{4}$ l.; lat., 2$\frac{1}{2}$-3 l.

This species and the next two illustrate conspicuously the tendency in *Heteronyx* to strongly marked structural differences in combination with close superficial resemblance, inasmuch as they are extremely like in general appearance to some species of Group III. (*H. merus*, Blackb., etc.), which have strongly bifid claws, while the claws of these are typically appendiculate. I have two specimens of *H. striatus*, evidently male and female—the male notably smaller and narrower than the female and presenting the unusual (in *Heteronyx*) sexual character of a distinctive clypeal outline (unless it be an accidental peculiarity of an individual specimen). The striation of the elytra is unusually well defined, but, as usual in *Heteronyx* when present, has no relation to the punctures, which are scattered indiscriminately on striæ and interstices.

New South Wales; Emu Plains (Mr. Sloane).

H. salebrosus, sp. nov. Minus elongatus, postice leviter dilatatus; sat nitidus; rufo-ferrugineus; ut *H. striatus*, Blackb., vestitus; capite ut *H. striati* (clypeo antice late rotundato); prothorace fere ut *H. striati*, sed supra minus grosse sat magis crebre nec acervatim punctulato (puncturis circiter 17 in segmenti longitudine); elytris manifeste striatis, quam *H. striati* magis crebre punctulatis (trans elytron puncturis circiter 18), sparsissime vix granulatis; cetera fere ut *H. striati*, sed segmentis ventralibus sublævibus (seriebus puncturarum setiferarum exceptis). Long., 5$\frac{3}{4}$-6 l.; lat., 3-3$\frac{1}{5}$ l.

This species and *H. striatus* and *H. seriatus* form an aggregate so easily identifiable in *Heteronyx* that it seems sufficient to describe one of them completely and then specify the characters that distinguish the others from it. It may be noted that the present species is of evidently less convex form than *H. striatus*. I have two specimens, both of which are, I think, females. The less coarse, more evenly distributed, and much more numerous punctures of the pronotum separate *salebrosus* quite readily from *striatus*. On the ventral segments of the former there are only a few fine punctures besides the transverse series of larger setiferous punctures, while on those of *striatus* (especially on the lateral part) there is fairly close quite strong puncturation among which the transverse series are scarcely distinguishable as series.

North Queensland; Diamantina (Mr. Koebele).

H. seriatus, sp. nov. Sat elongatus, postice vix dilatatus; subdepressus; minus nitidus; ferrugineus; supra ut *H. striatus*, Blackb., vestitus; capite fere ut *H. striati* (clypeo exempli typici antice subtruncato), sed labro fortiter arcuato), clypeo fronteque fere planum continuum efficientibus; prothorace fere ut *H. striati* sed antice paullo minus angustato, lateribus (superne visis) manifeste minus arcuatis, margine basali ad latera quam alibi vix magis elevato; elytris fere ut *H. striati* sed puncturis paullo minoribus nonnihil magis crebre (trans elytron circiter 16) magis seriatim impressis; segmentis ventralibus sublævibus (seriebus puncturarum setiferarum exceptis). cetera ut *H. striati*. Long., $5\frac{1}{2}$ l.; lat., $2\frac{1}{2}$ l.

This species is notably less nitid, narrower, more elongate, more parallel than either *H. striatus* or *H. salebrosus*, and is distinctly of more depressed form. Other distinctions from *H. striatus* are enumerated above. The form of the labrum is worthy of especial notice; looked at from in front it is seen to be strongly arched, while in its two allies the arch of the labrum is quite feeble, resembling that of *H. jubatus*. The unusually seriate arrangement of the elytral puncturation is also a distinctive character. I believe the unique type to be a male. The puncturation of the dorsal surface (especially of the pronotum) is very considerably more sparse than in *H. salebrosus*.

North Queensland; Gulf of Carpentaria (Mr. French).

H. Carteri, sp. nov. Minus elongatus, postice vix dilatatus; minus nitidus; obscure ferrugineus, corpore subtus picescenti; supra pilis erectis minus elongatis confertim (nonnullis multo longioribus intermixtis) vestitus; clypeo (hoc antice late rotundato) fronteque crebre rugulosis, ut plana sat disparia visis; labro clypei planum haud attingenti; antennis 9-articulatis, articulo 3° quam 2us breviori; prothorace quam longiori ut 11 ad 7 latiori, antice sat angustato, supra creberrime subtilius ruguloso (granulis circiter 35 in segmenti longitudine), lateribus (superne visis) leviter arcuatis, angulis anticis parum acutis minus productis posticis (superne visis) obtuse rectis, basi bisinuata, margine basali ad latera haud magis elevato; elytris crebre subtiliter vix rugulose punctulatis (trans elytron puncturis circiter 40); pygidio sat nitido subtilius sat crebre punctulato; coxis posticis quam metasternum sat brevioribus, quam segmentum ventrale 2um sat longioribus; femoribus posticis inter series crebrius subtilius punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2us paullo breviori, quam 3us paullo longiori; unguiculis appendiculatis. Long., $5\frac{3}{4}$ l.; lat., 3 l.

Easily distinguishable from all allied species known to me except *pubescens*, Er., by the very close erect pilosity of its elytra. From *pubescens* it differs by the character specified in the tabulation, and also by, *inter alia*, the much finer and less rugulose puncturation of its dorsal surface and its wider clypeus, which is evidently less rounded in outline. *H. deceptor*, Blackb., is much less pilose, with elytra more rugulose even than those of *H. pubescens*. The close pilosity of its elytra makes this species appear less nitid than it really is, and renders it difficult to count the punctures. The punctures of the pronotum are scarcely distinct among the granule-like rugulosity of their interstices.

Victoria; Mount Hotham (Mr. H. J. Carter).

H. comans, sp. nov. Modice elongatus, postice leviter dilatatus; sat nitidus; niger, elytris postice vel totis rufescentibus, nonnullorum exemplorum pedibus rufescentibus; supra pilis perlongis erectis vestitus; clypeo (hoc antice late rotundato) fronteque crebre rugulosis, fere planum continuum efficientibus; labro clypei planum haud attingenti; antennis 9-articulatis, articulo 3° quam 2us breviori; prothorace quam longiori ut 10 ad 6 latiori, antice sat angustato, supra ante medium in medio impresso, crebre subtilius vix rugulose punctulato (puncturis circiter 24 in segmenti longitudine), lateribus (superne visis) leviter arcuatis, angulis anticis acutis minus productis posticis (superne visis) sat rectis, basi bisinuata, margine basali ad latera haud magis elevato; elytris substriatis, subfortiter crebre sat rugulose punctulatis (trans elytron puncturis circiter 25); pygidio sat fortiter sat crebre punctulato; coxis posticis quam metasternum sat brevioribus quam segmentum ventrale 2um sat longioribus; segmentis 3° 4° que (? maris solum) ventralibus pilis perlongis seriatim transversim vestitis;

femoribus posticis inter series sat crebre minus fortiter punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali maris quam 2^{us} paullo breviori quam 3^{us} paullo longiori, feminæ quam 2^{us} sat multo breviori 3° sat æquali; unguiculis appendiculatis. Long., $3\frac{3}{5}$-4 l.; lat., $1\frac{4}{5}$-2 l.

I have seen 7 examples of this insect, of which only one is a female; it is without the long, erect ventral hairs of the male, but is an abraded specimen; also its tarsi are distinctly shorter and stouter than those of the male. The impression on the middle of the front part of the pronotum is traceable in all the specimens, but is much larger and deeper in some than in other individuals. In general appearance this species seems to be near *H. jubatus*, Blackb., which however belongs to Group VIII., having the labrum elevated and forming a trilobed outline of the head.

Tasmania; Hobart and Mount Wellington (Mr. Griffith).

H. erectus, sp. nov. Modice elongatus, postice parum dilatatus; sat nitidus; ferrugineus; supra fere glaber; clypeo crebre ruguloso, antice late profunde subquadratim exciso; fronte crebre sat rugulose punctulata; labro clypei planum haud attingenti; clypeo fronteque ut plana valde disparia visis; antennis 9-articulatis, articulo 3° quam 2^{us} breviori; prothorace quam longiori ut 16 ad 9 latiori, antice fortiter angustato, supra subtiliter minus crebre punctulato (puncturis circiter 22 in segmenti longitudine), lateribus (superne visis) sat arcuatis, angulis anticis vix acutis parum productis posticis (superne visis) obtusis, basi leviter bisinuata, margine basali ad latera vix magis elevato; elytris sat fortiter minus crebre punctulatis (trans elytron puncturis circiter 22), ad apicem transversim depressis; pygidio granulis minutis setiferis minus crebre instructo; coxis posticis quam metasternum sat brevioribus, quam segmentum ventrale 2^{um} sat longioribus; femoribus posticis inter series sat crebre subtilius punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2^{us} multo (quam 3^{us} vix) breviori; unguiculis appendiculatis. Long., 5 l.; lat., $2\frac{1}{2}$ l.

Structurally this species is somewhat close to *H. occidentalis*, Blackb., from which however it differs by many superficial characters. Its labrum looked at from in front is of unusual shape, the upper and lower planes being placed at right angles to each other and are very nitid, the upper plane appearing as an equilateral triangle. The emargination of the clypeus looks as if a piece almost in the form of a parallelogram had been cut out. The puncturation of the pronotum is conspicuously finer than in *occidentalis* and the hind angles of the prothorax are considerably blunter. The depression at the apex of the elytra is much feebler. I believe the unique type to be a male.

Western Australia; Swan River (Mr. Lea).

H. monticola, Blackb., sp. nov. Sat elongatus, postice leviter dilatatus; sat nitidus; ferrugineus; supra pilis brevissimis sparsim vestitus; clypeo crebre ruguloso, antice profunde arcuatim emarginato; labro clypei planum vix attingenti, antice (capite oblique a tergo viso) manifesto concavo; fronte minus crebre vix fortiter punctulato; clypeo fronteque ut plana disparia visis; antennis 9-articulatis, articulo 3° quam 2us breviori; prothorace quam longiori ut 9 ad 5 latiori, antice modice angustato, supra minus crebre minus fortiter punctulato (puncturis circiter 18 in segmenti longitudine), lateribus (superne visis) leviter arcuatis antice sat fortiter deplanatis, angulis anticis sat acutis sat productis posticis (superne visis) rectis, basi bisinuata, margine basali ad latera perspicue magis elevato; elytris subfortiter sat crebre punctulatis (trans elytron puncturis circiter 25), interstitio subsuturali sat fortiter convexo; pygidio sat crebre minus fortiter punctulato; coxis posticis quam metasternum multo brevioribus, quam segmentum ventrale 2um sat longioribus; femoribus posticis inter series subtiliter sat sparsim punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2us manifeste breviori, 3° sat æquali (vel vix longiori); unguiculis appendiculatis. Long., $5\frac{3}{5}$ l.; lat., $2\frac{3}{5}$ l.

Structurally near *H. obesus*, Burm., but of much narrower and more elongate build, with the subsutural interstice of the elytra quite strongly convex (in *obesus* that interstice is unusually flat), also with puncturation of elytra closer, etc. I think both sexes are before me, judging by the flatter ventral segments of what I take to be the male, which also has tarsi a little longer and more slender. The strong expansion of the lateral margin of the pronotum at the front angles is a striking character (which however is present in *H. obesus* also). The pilosity of the elytra is very little noticeable except in quite fresh specimens.

Tasmania; Mount Wellington (Mr. Griffith).

H. intermedius, sp. nov. Modice elongatus, postice parum dilatatus; sat nitidus; ferrugineus; supra pilis brevibus adpressis sat crebre vestitus; clypeo (hoc antice profunde arcuatim emarginato) fronteque crebre rugulosis, fere ut planum continuum visis; labro clypei planum nullo modo attingenti, antice (capite a tergo nonnihil oblique viso) manifesto concavo; antennis 9-articulatis, articulo 3°

quam 2^{us} breviori; prothorace quam longiori ut 27 ad 14 latiori, antice minus angustato, supra crebre subtiliter punctulato (puncturis circiter 30 in segmenti longitudine), lateribus (superne visis) minus arcuatis, angulis anticis sat acutis sat productis posticis (superne visis) obtuse rectis, basi leviter bisinuata, margine basali ad latera paullo magis elevato; elytris minute granulatis, confertim subtiliter squamose punctulatis (trans elytron puncturis circiter 40); pygidio subtilius sat crebre punctulato; coxis posticis quam metasternum sat brevioribus, quam segmentum ventrale 2^{um} sat longioribus; femoribus posticis inter series fortius sat crebre punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2^{us} sat breviori, 3° fere æquali; unguiculis appendiculatis. Long., $4\frac{2}{5}$ l.; lat., $2\frac{1}{5}$ l.

The structure of the labrum in this species renders it somewhat intermediate between the aggregates A and AA (in the tabulation), being visible as part of the outline of the head if regarded from behind only a little obliquely, but invisible from further back. It differs from all the other species (of AA), having the clypeus deeply emarginate, except *excisus*, Blackb., by its very much finer and closer puncturation. Compared with *excisus* it is smaller, with the pronotum considerably less closely (and the elytra considerably more finely) punctulate. I believe the unique type to be a male. The prothorax is not much but very distinctly narrower than that of the next species, from which however it differs widely by characters noted below.

New South Wales: Blue Mountains.

H. thoracicus, sp. nov. Modice elongatus, postice parum dilatatus; sat nitidus; ferrugineus; supra pilis brevibus fere adpressis vestitus; clypeo crebre ruguloso, antice profunde arcuatim emarginato; labro clypei planum nullo modo attingenti, antice (capite a tergo nonnihil oblique viso) manifesto concavo; fronte fortiter sat crebre punctulata; clypeo fronteque fere planum continuum efficientibus; antennis 9-articulatis, articulo 3° quam 2^{us} breviori; prothorace quam longiori duplo latiori, antice parum angustato, supra subtilius sat crebre punctulato (puncturis circiter 18 in segmenti longitudine) lateribus (superne visis) minus arcuatis, angulis anticis sat acutis sat productis posticis (superne visis) rectis, basi vix sinuata, margine basali ad latera haud magis elevato; elytris crebre subtiliter punctulatis (trans elytron puncturis circiter 28); pygidio minus crebre minus fortiter punctulato; coxis posticis quam metasternum sat brevioribus, quam segmentum ventrale 2^{um} modice longioribus; femoribus posticis inter series subtilius minus sparsim punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2^{us} sat multo (quam 3^{us} vix) breviori; unguiculis appendiculatis. Long., $3\frac{4}{5}$ l.; lat., $1\frac{4}{5}$ l.

The structure of the clypeus and labrum is as in *H. intermedius*, Blackb. From it however this species differs in many characters. It is notably smaller, its prothorax is quite fully twice as wide as long, with the front much less narrowed, and the base all but non-sinuate, and the whole dorsal surface is much less closely punctulate. I believe the two specimens before me to be males.

New South Wales; exact locality not known.

H. additus, sp. nov. Minus elongatus, postice leviter dilatatus; sat nitidus; ferrugineus; supra pilis brevibus suberectis sat crebre vestitus; clypeo crebre ruguloso, antice late leviter emarginato; labro clypei planum vix attingenti, antice (capite a tergo oblique viso) truncato (vel nonnihil concavo); fronte fortius sat crebre punctulata; clypeo fronteque ut plana sat disparia visis; antennis 9-articulatis, articulo 3° quam 2^{us} breviori; prothorace quam longiori ut 7 ad 4 latiori; antice vix angustato; supra fortius vix crebre punctulato (puncturis circiter 18 in segmenti longitudine), lateribus (superne visis) sat arcuatis, angulis anticis sat acutis sat productis posticis (superne visis) sat rectis, basi leviter bisinuata, margine basali ad latera sat magis elevato; elytris fortiter vix crebre punctulatis (trans elytron puncturis circiter 22); pygidio fortius sat crebre punctulato; coxis posticis quam metasternum sat brevioribus quam segmentum ventrale 2^{um} sat longioribus; femoribus posticis inter series subtilius sparsissime punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2^{us} multo (quam 3^{us} nonnihil) breviori; unguiculis appendiculatis. Long., $4\frac{1}{2}$ l.; lat., $2\frac{1}{4}$ l.

The form of the labrum renders this species intermediate between the two main divisions of *Heteronyx*. It cannot be said that when the head is viewed obliquely from behind the outline is not trilobed in a sense, but the middle division (*i.e.*, the outline of the labrum) appears as a straight line or might almost be called faintly concave, and moreover the labrum does not quite reach the level of the clypeus. A few difficult species such as this is are, I fear, inevitable in the grouping of any large number of allied species. The prothorax almost as wide in front as at the base, and at its widest in the middle distinguishes the present insect from most of its congeners. The unique type is probably a male.

Western Australia; Swan River (Mr. Lea).

H. blandus, sp. nov. Modice elongatus, postice vix dilatatus; nitidus; pallide ferrugineus; supra pilis brevibus adpressis sparsim vestitus; clypeo crebre ruguloso, antice late subemarginato; labro clypei planum vix attingenti, antice (capite a tergo oblique viso) truncato (vel nonnihil concavo); fronte grosse sat sparsim punctulata; clypeo fronteque ut plana sat disparia visis; antennis 9-articulatis, articulo 3° quam 2us breviori; prothorace quam longiori ut 16 ad 9 latiori, antice sat angustato, supra fortius sat sparsim punctulato (puncturis circiter 12 in segmenti longitudine), lateribus (superne visis) sat rotundatis, angulis anticis vix acutis parum productis posticis (superne visis) rotundatis, basi vix manifeste bisinuata, margine basali subtili ad latera vix magis elevato; elytris sparsius minus fortiter punctulatis (trans elytron puncturis circiter 20); pygidio subtilius sat crebre punctulato; coxis posticis quam metasternum maxime (quam segmentum ventrale 2um nonnihil) brevioribus; femoribus posticis inter series sparsim subtilius punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2us parum breviori 3° sat æquali; unguiculis appendiculatis. Long., $2\frac{2}{5}$ l.; lat., $1\frac{1}{5}$ l.

The notes on the labrum of *H. additus*, Blackb., may be applied to this species also. The front of the clypeus, however, is much less emarginate—in fact, it might be called subtruncate, but from a certain point of view seems to be feebly emarginate. It is easily recognizable by the characters cited in the tabulation. I have seen several specimens, but have not detected any characters likely to be sexual.

South Australia; Tailem Bend (Mr. Griffith).

H. prosper, sp. nov. Modice elongatus, postice vix dilatatus; sat nitidus; obscure ferrugineus; supra pilis brevibus suberectis sat crebre vestitus; clypeo (hoc antice leviter late emarginato) fronteque crebre rugulosis, fere planum continuum efficientibus; labro clypei planum vix attingenti, antice (capite a tergo oblique viso) concavo; antennis 9-articulatis, articulo 3° quam 2us breviori; prothorace quam longiori ut 13 ad 7 latiori, antice leviter angustato, supra crebre minus fortiter punctulato (puncturis circiter 21 in segmenti longitudine), lateribus (superne visis) sat rotundatis, angulis anticis sat rectis parum productis posticis (superne visis) rotundatis, basi nonnihil bisinuata, margine basali subtili ad latera haud magis elevato; elytris granulatis crebre minus fortiter punctulatis (trans elytron puncturis circiter 24); pygidio sat crebre minus fortiter punctulato; coxis posticis quam metasternum multo brevioribus, quam segmentum ventrale 2um vix longioribus; femoribus posticis inter series minus subtiliter minus sparsim punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali 2° sat æquali, quam 3us longiori; unguiculis appendiculatis. Long., $3\frac{1}{2}$ l.; lat., $1\frac{3}{4}$ l.

This species is easily recognizable by the characters cited in the tabulation. The labrum (viewed as part of the outline of the head) is so decidedly concave that there can be no hesitation about referring the insect to Group IV. rather than to any of those groups having the outline of the head trilobed. The female is a little more strongly punctured than the male.

Western Australia; Geraldton, etc.

H. relictus, sp. nov. Modice elongatus, postice vix dilatatus; sat nitidus; ferrugineus; supra pilis brevibus adpressis sat sparsim vestitus; clypeo crebre ruguloso, antice late leviter emarginato; labro clypei planum fere attingenti, antice (capite a tergo oblique viso) concavo; fronte grosse minus crebre punctulata, antice subperpendiculari; hac clypeoque ut plana valde disparia visis; antennis 9-articulatis, articulo 3° quam 2us breviori; prothorace quam longiori ut 11 ad 6 latiori, antice sat angustato, supra minus fortiter minus crebre punctulato (puncturis circiter 17 in segmenti longitudine), lateribus (superne visis) sat rotundatis, angulis anticis vix acutis minus productis posticis (superne visis) obtusis bene definitis, basi nonnihil bisinuata; margine basali sat æquali; elytris granulatis, sat crebre vix fortiter punctulatis (trans elytron puncturis circiter 26); pygidio sparsim grosse punctulato; coxis posticis quam metasternum multo brevioribus, quam segmentum ventrale 2um parum longioribus; femoribus posticis inter series sparsius sat fortiter punctulatis; tibiis anticis extus tridentatis; tarsorum posticorum articulo basali quam 2us nonnihil breviori, quam 3us vix longiori; unguiculis appendiculatis (nonnihil subbifidis). Long., $3\frac{1}{4}$ l.; lat., $1\frac{3}{5}$ l.

The claws of this species are somewhat intermediate between appendiculate and bifid; a note regarding them will be found under Group III. In Group IV. it is quite easily recognizable by the characters cited in the tabulation. If its claws were regarded as bifid it would stand in the tabulation of Group III. beside *H. granum*, Burm., from which, *inter alia multa*, its very different labrum separates it widely.

South Australia; Noarlunga (Mr. Griffith).

RUTELIDES.

Saulostomus.

I propose to substitute the name *Saulostomus* (?) *collaris* for *Aneurystypus collaris*, Blackb. The reasons for this change will be found set forth below under the name *A. collaris*.

DYNASTIDES.

Pseudoryctes.

P. monstrosus, Blackb. After an interval of fifteen years a second specimen of this magnificent insect has come before me, and has been presented to me by Mr. French. It was captured in the same region (North-West Australia) as the type. There is an unfortunate *lapsus calami* in my note following the description (Tr.R.S., S.A., 1895, p. 40). The Latin diagnosis correctly indicates the colour of the head elytra and pygidium as "black," but in the notes I have referred to the "black head, prothorax, and pygidium." Therefore the following correction is required (*loc. cit.*, line 8): for "prothorax" read "elytra."

Aneurystypus.

A. collaris, Blackb. I have acquired some specimens taken at Eucla of the insect which I described under this name. The original type had lost its claws, and now the examination of these fresh specimens reveals the fact that the claws are unequal and that therefore the species is a *Rutelid*. Its resemblance to *Aneurystypus* (*e.g.*, *A. calvus*, Blackb.) is really very remarkable, the claws being disregarded and also characters of the labium, etc., which are difficult to see without treatment that is undesirable in the case of a unique specimen. Its divergence from *Aneurystypus* in having its pronotum unarmed I referred to in describing it. I think it must be regarded as representing an undescribed *Rutelid* genus, but it is so close to *Saulostomus* that it will perhaps be best to refer it to that genus provisionally. Its tarsi are evidently longer and more slender than those of *S. villosus*, Waterh. (the type of the genus), but this appears to be the case also in some species which have been attributed to *Saulostomus* by Ohaus. I have dissected the mouth organs of a specimen and find that the pointed apical part of its labrum is bent down and concealed as in *S. villosus*, and the apex of its labium is slightly produced in a very wide open angle. This character is perhaps hardly sufficient to justify a new generic name, and I do not find any other except that of the tarsi already referred to. It is possible that the greatly elongated flabellum of the antennæ (considerably longer than the preceding joints together) may separate this insect from *Saulostomus*, but unfortunately Mr. Waterhouse's description of *Saulostomus* does not refer to the antennæ, and my specimen of *S. villosus* has lost its antennæ. The genus *Homotropus* (unknown to me except by description) seems to have similar antennæ but different mouth organs.

A. pauxillus, sp. nov. Brunneo-ferrugineus; subtus dense longe fulvo-hirsutus; capite sat crebre, prothorace inæqualiter sat subtiliter (hujus lateribus æqualiter modice arcuatis, basi haud marginata, angulis posticis rotundatis), pygidio ad latera sat crebre dupliciter in medio sparsim minus subtiliter, elytris (his plus minusve striatis) sat seriatim sat fortiter, punctulatis; mento antice fortiter compresso elevato, antennarum flabello quam articuli ceteri conjuncti vix longiori; prothorace antice impresso, margine antico in medio acute elevato; tibiis anticis extus tridentatis. Long., 5-6 l.; lat., $3\frac{1}{5}$-$3\frac{2}{5}$ l.

This species is at once separable by its pronotum not margined at the base from all its known congeners except *A. Richardsæ*, Blackb., with which, however, it is somewhat closely allied. It is considerably smaller than that species and of darker colour, the punctures of the dorsal surface in general evidently deeper and less fine, and the elytra more definitely striate. The outline of the prothorax is considerably different, the lateral margins being lightly arched in a continuous curve from base to apex, whereas in *Richardsæ* these margins are more like two curves meeting almost subangularly slightly in front of the middle of the segment. If the prothorax of *Richardsæ* be viewed from directly above the sides appear almost straight and parallel from base to beyond middle and then converging in a strong curve to the front margin, while from a similar point of view they appear as a continuous curve in *pauxillus*. The hind angles viewed from above are bluntly rectangular in *Richardsæ* and quite rounded off in *pauxillus*. The front part of the mentum is more compressed and elevated than in any other *Aneurystypus* known to me. In *A. calvus*—the type of the genus—the mentum is longitudinally concave (although the concavity does not reach the front margin), but in other species the concavity is only very near the base with the front part becoming more or less compressed, and in *pauxillus* the compressed prominence is very strong and begins to rise almost from the hind margin of the mentum. One of the specimens before me has tarsi a little shorter and pygidium less convex than the others; it is probably a female, though I should have expected much more disparity between the sexes.

Queensland; Cunnamulla (Mr. Hardcastle, sent by Mr. Lea).

Complete Analysis of the Mount Gambier Basalt, with Petrographical Descriptions.

By Evan R. Stanley, Student of the University of Adelaide.
(Communicated by W. Howchin, F.G.S.)

[Read May 4, 1909.]

Plate II.

Contents.

I.—Introduction.

Mount Gambier is situated in the South-Eastern portion of South Australia, in the Hundred of Blanche, about 305 miles from Adelaide by rail. The township is about 140 ft. above sea-level, but Mount Gambier proper is about 600 ft. higher, and is situated south of the town. It includes four distinct lakes, namely, the Blue Lake, Leg-of-Mutton Lake, Valley Lake, and Brown Lake, the latter probably being the site of the crater.

This paper, which represents the first of a series, has been written with the object of describing certain typical volcanic rocks occurring at Mount Gambier.

The geology of the South-East, including Mount Gambier, has been described and published by the Rev. J. E. Woods in his "Geological Observations in South Australia," 1862.

Professor R. Tate refers to the South-Eastern district of South Australia in his presidential address before the Philosophical Society of Adelaide in 1879.

H. Y. L. Brown,[1] Government Geologist of South Australia, reports on the temperature, depth, and geology of the principal lakes in the Mount Gambier district.

(1) Parliamentary Papers, South Australia, 1883-4. No. 256.

The Eocene limestone, which occurs immediately below the basalt, has been described by Tate and Dennant.(2)

Geological Notes on the extinct volcanoes of Mount Gambier and Mount Schank have been published by the Rev. W. Howchin, F.G.S.(3)

T. S. Hall, M.A., mentions the bedded tuffs of Mount Gambier in his "Note on the Deposition of Bedded Tuffs." (4)

A type of basalt from Mount Gambier has been briefly described by J. C. Moulden.(5)

Chas. Chewings (6) describes a basalt, from the same locality, containing phenocrysts of felspar, and represents a special type of lava.

The present paper includes a complete analysis of the Mount Gambier vesicular olivine basalt, with petrographical descriptions of several varieties of allied rocks. Certain important differences are to be found in the lavas at that locality, their structures varying from glassy to holocrystalline, and from a very vesicular variety to a more or less compact rock. A detailed petrographical description has been made on the olivine nodules occurring in the ash-beds, with interesting results described hereafter.

II.—Vesicular Olivine Basalt.

Rock 1.

This rock was selected from the central portion of the lava band, above the boathouse, on the northern extremity of the Blue Lake. It represents the general type of specimen usually met with.

Macroscopic Characters.

In hand specimens the rock is dark-grey in colour. It is fine-grained, containing many small visible phenocrysts of olivine about two millimetres in length. Phenocrysts of augite are also present, but are very difficult to see, even with the aid of a lens. Vesicular structure is a prominent feature of the rock, the vesicules varying from a few millimetres up to a centimetre or more in diameter in the compact varieties, and they contain little or no crystalline material. There is no apparent decomposition in the rock.

The specific gravity of the rock is 3·01 at 16·4° C.

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(2) Trans. Roy. Soc., S.A., 1896.

(3) Trans. Roy. Soc., S.A., vol. xxv., 1901, p. 54.

(4) Proc. Roy. Soc., Vic., vol. xx., 1907, p. 21.

(5) Trans. Roy. Soc., S.A., vol. xix., p. 70.

(6) Geologie Süd- und Central-Australiens. Inaugural-Dissertation zur Erlangung der Doktorwürde—1894.

Miscroscopic Characters.

Crystallinity hypocrystalline, with a hyalopilitic groundmass containing porphyritic crystals of olivine and augite. There is a notable quantity of a dark-brown glass present, which, under a high-power objective, is found to contain a considerable quantity of magnetite dust. One of the most interesting features about the glass is that it contains delicately-branched rods or skeleton crystals of magnetite which are probably of the second generation.

The microlitic components of the base are chiefly plagioclase felspar, and grains of augite and olivine, with a more or less idiomorphic outline developed in the former.

The felspar microlites make up the greater part of the groundmass, and in places show a slight fluxional arrangement. In crossed nicols they show twinning, mostly after the Albite type, although the Carlsbad type is not uncommon.

The refractive index was found to be greater than canada balsam on the edge of the section where it was measured by Becké's bright-line method. Symmetrical extinctions up to 36° were obtained, the greater number of extinctions being between 21° and 36°, thus indicating labradorite.

Most of the microlites contain inclusions, usually gaseous or liquid, and less frequently small crystals of apatite, but they do not show any zonal arrangement.

The augite components of the base are in elongated prisms with a yellowish-green colour. The high extinction angle and refractive index are characteristic of augite. There is also a fairly good prismatic cleavage developed. Besides this type of crystal there are stumpy crystals and grains of the same mineral showing traces of the (100), (010), and ($\bar{1}$11). The grains frequently show two good cleavages intersecting in angles of about 90°.

The olivine of the base is present in small grains, with irregular cracking. It is not so plentiful as the augite, but can be differentiated from augite by its strong double refraction.

The phenocrysts of the rock are olivine and augite, the former being the more abundant, and in the majority of cases larger than the augite phenocrysts. The olivine phenocrysts have been partially absorbed by the magma, although some possess an idiomorphic outline. Decomposition has not taken place to any great extent, which is proved by the fact that very little serpentine is found in the cracks. They are about 2 mm. to 3 mm. in length, and are perfectly colourless. A fair cleavage is shown paralled to the (001) in some phenocrysts, whereas in others an indistinct cleavage is shown parallel to the (010). The refractive index and double refraction are characteristic of olivine. The traces of the (010), (011), and (100) are seen in different crystals. In convergent polarized light, a section perpendicular to the optic axis gives a slightly curved brush. The dispersion shows $\rho < \nu$. The (010) face in some phenocrysts is largely developed. Spheroidal cracking has gone on to a marked degree. The principal inclusions are glass and magnetite grains, and in one or two instances inclusions of liquid and gas occur.

The augite phenocrysts show rather well-defined outlines. Sections parallel to the (100) and (010) are the most common, and occasionally sections showing the two cleavages intersecting at about 90°. Frequently, sections parallel to the (100) show the trace of the ($\bar{1}$11) face. Twinning has taken place parallel to the (100), and in a few instances the effect on the outline of the crystal is seen in sections parallel to the (010). In addition to this, a few interpenetration twins are noticeable in sections parallel to the (100), and more rarely a cruciform twin is to be seen, in which case twinning has taken place on the (101). A prismatic cleavage is fairly well developed in sections parallel to the (100), (010), and (110), the plane of the cleavage being parallel to the (110) and ($\bar{1}$10). Only a few sections show the ($\bar{1}$10) and (110) cleavages intersecting at 90°. Besides the isolated phenocrysts it is not uncommon to find that the augite crystals have arranged themselves into rosettes, some of which interpenetrate. These rosettes are about half the size of the olivine phenocrysts, and usually have a fair to imperfect cleavage developed, which is probably the trace of the (110) or ($\bar{1}$10). Such rosettes are usually found to be sections parallel to the (100). The augite phenocrysts, unlike the olivine phenocrysts, have a pale-brownish-yellow colour, and although the colour is so feeble a pleochroic scheme was with difficulty made out.

$\mathfrak{a}$ = Very light-brownish-yellow.

$\mathfrak{b}$ = Very light-brownish-green.

$\mathfrak{c}$ = Very light-greenish-yellow.

From this it is evident that the absorption is very slight

The principal inclusion in the augite is magnetite, and occasionally a few crystals with rather a low double refraction, which is probably apatite. No apparent decomposition has taken place in the augite.

There is one feature which is only occasionally exhibited, and that is a glomero-porphyritic [7] aggregate of augite and olivine.

Idiomorphic grains of magnetite are present in notable quantities. There are other similar undecomposed grains and crystals of a dark, opaque mineral, which is probably ilmenite. It has a dark, semi-glistening surface when seen by reflected light, but not so intense as the magnetite. It is difficult to ascertain which is magnetite and which is ilmenite; only a few grains exhibit the white decomposition product (leucoxene), which is characteristic of ilmenite or titaniferous magnetite.

Order of Consolidation.

a. Magnetite and ilmenite ... ————
b. Olivine ... ... ——————
c. Augite ... ...————...
d. Labradorite ... ... ————
e. Augite ... ... —————
f. Magnetite ... ... —————
g. Glass ... ... —————

III.—Chemical Composition.

A chemical analysis of the rock was made by the author in the laboratory of the University of Adelaide, by the kind permission of Professor Rennie.

The rock selected was a typical representative of the compact variety of basalt occurring in the Blue Lake.

The methods of analysis were those commonly employed by Washington and Hillebrand.

Evaporations were made in porcelain dishes, where platinum dishes were unavailable.

The Laurence Smith method for the alkalies and the colourometric method for titanium were employed, and the usual corrections made in each case.

Sulphur was not determined, for there was very little evidence of the occurrence of pyrites in the rock.

Barium and strontium were not separated from the lime.

The mean of three very concordant analyses has been taken, and is represented by the column marked A. The analyses marked B, C, D, E have been inserted for comparison.

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(7) Judd, Q.J.G.S., vol. xlii., pt. i.

Results of Analyses.

	A	B	C	D	E
SiO_2 ...	46·95	43·31	43·39	41·10	47·02
Al_2O_3 ...	14·37	16·68	16·67	14·82	12·52
Fe_2O_3 ...	1·37	2·31	3·47	2·35	4·81
FeO ...	9·52	9·00	8·80	10·38	5·83
MgO ...	9·74	10·56	7·30	9·43	9·92
CaO ...	10·04	7·95	8·79	10·56	8·38
Na_2O ...	3·49[8]	2·94	3·30	3 94	3·23
K_2O ...	1·53[8]	0·97	2·17	1·28	3·23
H_2O + ...	0·52	0·88	0·29	0·39	0·69
H_2O − ...	0·10	1·72	2·67	2·31	0·70
CO_2 ...	nil	0·03	0·39	0·26	—
TiO_2 ...	2·04	2·20	2·20	3·20	2·60
P_2O_5 ...	0·46	0·65	0·41	0·19	1·26
SO_3 ...	—	0·05	0·19	0·09	nil
Cl ...	—	0·02	0·02	trace	trace
S (soluble)	—	trace	—	—	—
Cr_2O_3 ...	—	0·11	trace	trace	—
Ni Co O ...	—	trace	trace	trace	—
Mn O ...	—	0·43	0·19	0·14	0·12
Ba O ...	n. sep.	trace	0·02	0·06	—
Sr O ...	n. sep.	—	trace	trace	—
Li_2O ...	—	trace	present	present	—
Totals ...	100·13	99·81	100·27	100·50	100·31

A. Vesicular olivine basalt. Mount Gambier.

B. Basalt (9) from the capping on "Woodlands." Inland districts of New South Wales.

C. Analcite basalt (10), Bondi, New South Wales, near Sydney.

D. Analcite basalt (11), Fern Hill.

E. Basalt (12), Old Racecourse Hill, Woodend, north-east of Mount Macedon, Victoria.

(8) Mr. A. H. Scarfe, of the University of Adelaide, obtained similar results for soda and potash.

(9) Journal and Pro. Roy. Soc., N.S.W., vol. xxxvii.

(10) Records of the geological survey of N.S.W., 1902, vol. vii., pt. 2, pp. 93-101, plate 26.

(11) Ibid.

(12) This rock was analysed by P. G. Wykeham Bayly, A.S.A.S.M., Government Metallurgical Chemist, Melbourne.

Molecular Ratios.

	Per cent.	M.R.	Ilm.	Ap.	Orth.	Albite	Neph.	Anorth.	Mag.	Diop.	Oliv.
SiO_2 ...	46·95	782	—	—	96	174	54	138	—	196	122
						29	27				
Al_2O_3	14·37	141	—	—	16	56		69	—	—	—
Fe_2O_3 ...	1·37	9	—	—	—	—	—	—	9	—	—
FeO	9·52	132	25	—	—	—	—	—	9	28	70
MgO	9·74	243	—	—	—	—	—	—	—	70	173
CaO	10·04	179	—	12	—	—	—	69	—	—	—
						29	27				
Na_2O	3·49	56	—	—	—	56		—	—	—	—
K_2O	1·53	16	—	—	16	—	—	—	—	—	—
H_2O + ...	·52	28	—	—	—	—	—	—	—	—	—
H_2O − ...	·10	6	—	—	—	—	—	—	—	—	—
TiO_2	2·04	25	25	—	—	—	—	—	—	—	—
P_2O_5	·46	4	—	4	—	—	—	—	—	—	—
MnO	n.d.	—	—	—	—	—	—	—	—	—	—
BaO	n.d.	—	—	—	—	—	—	—	—	—	—
SrO ...	n.d.	—	—	—	—	—	—	—	—	—	—
SO_3	n.d.	—	—	—	—	—	—	—	—	—	—
CO_2	nil	—	—	—	—	—	—	—	—	—	—
	Total, 100·13										

The columns marked B, C, D, and E resemble, in some respects, the column A. The silica in B, C, and D is noticeably lower than that in A and E, and hence are slightly more basic. The alumina in B and C is higher, and that in E lower, than that in A and D, which are very nearly the same. The ferric iron in B, C, D, and E is noticeably greater than that in A, and ferrous iron is lower in E, whilst it is fairly constant in A, B, C, and D. The magnesia varies slightly, being lowest in C. The lime varies a little, being high in A and D, and fairly consistent in B, C, and E. The total alkalies are approximately constant in A, C, and D, but higher in E and lower in B. The percentages of titanium dioxide in B, C, D, and E are, to a small extent, higher than that in A.

It will be noticed that basalts similar to the Mount Gambier type in composition occur in the Pinto Mountains, Uvalde County, Texas, described by W. Cross,[13] which is quoted by Washington in the "Chemical Analyses of Igneous Rocks." Washington also quotes an analysis of a basalt from Hünenberg, Bl., Melsungen, Prussia, which also approximates the composition of the basalt described in this paper.

Calculation of the Norm.

Orthoclase	16	×	556	=	8·90
Albite	29	×	524	=	15·20
Nephelite	27	×	284	=	7·67
Anorthite	69	×	278	=	19·18
Diopside	98	×	116	=	11·37
	70	×	100	=	7·00
	28	×	132	=	3·70
Olivine	173	×	140	=	12·11
	70	×	204	=	7·14
Magnetite	9	×	232	=	2·09
Ilmenite	25	×	152	=	3·80
Apatite	4	×	310	=	1·24
Water				=	0·62
					100·02

[13] B.U.S.G.S., 168, p. 61, 1900.

The minerals orthoclase and nephelite, appearing in the norm, are absent in the rock.

Classification.

Felspars F.	= 43·28	}	50·95 = Salic.
Lenads L.	= 7·67		
Pyroxene P.	= 22·07	}	48·45 = Femic.
Olivine O.	= 19·25		
Mag. and Ilm. M.	= 5·89		
Apatite A.	= 1·24		

$$\frac{\text{Sal}}{\text{Fem}} = \frac{50{\cdot}95}{48{\cdot}45} < \tfrac{5}{3} > \tfrac{3}{5} = \textit{Class III. Salfemane}$$

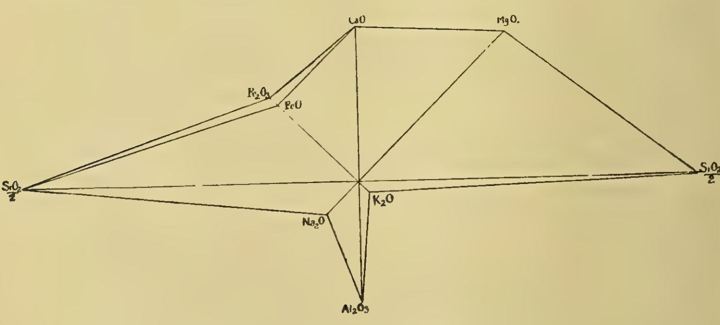
$$\frac{\text{L}}{\text{F}} = \frac{7{\cdot}67}{43{\cdot}28} < \tfrac{3}{5} > \tfrac{1}{7} = \textit{Order 6 Portugare}$$

$$\frac{K_2O + Na_2O}{CaO} = \frac{72}{69} < \tfrac{5}{3} > \tfrac{3}{5} = \textit{Rang. 3 Limburgase}$$

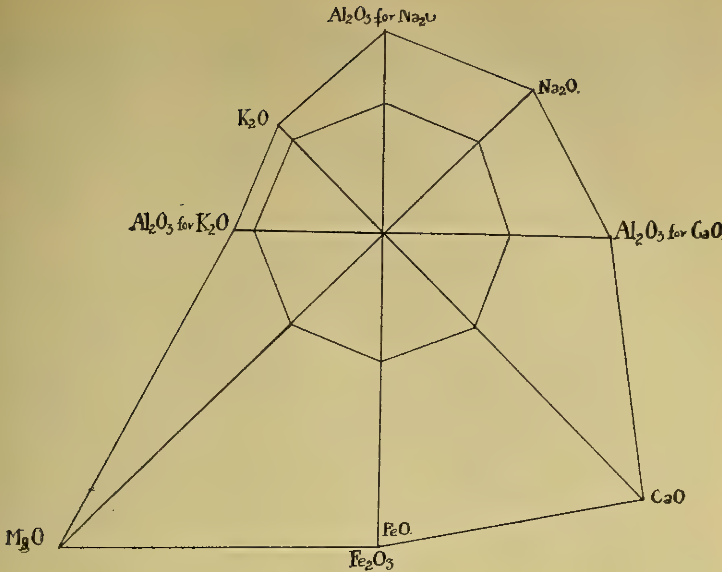
$$\frac{K_2O}{Na_2O} = \frac{16}{56} < \tfrac{3}{5} > \tfrac{1}{7} = \textit{Sub-rang. 4 Limburgase}$$

Chemical Diagrams.

To facilitate the comprehension of the chemical analysis the following graphical constructions have been employed by the author. They are respectively the Brögger and Mügge diagrams.



THE BRÖGGER DIAGRAM.



THE MÜGGE DIAGRAM.

In the former the relative quantities of oxide components, expressed molecularly, are plotted on four lines intersecting in angles of 45°. The silica is plotted on the horizontal axis, half to the right and half to the left of the origin. The other components are plotted on the other axes as shown. It will be noticed that the oxides of iron are plotted in the order FeO and Fe_2O_3 added.

In the Mügge diagram the silica is divided equally into eight parts, and plotted on the axes from the origin, thus forming an octagon when joined up. The other components are plotted outside this area on particular axes by adding their values to the silica already plotted. The alumina is divided into three parts—an equal molecular proportion to potash on the left, an equal molecular proportion to soda on the vertical, and the remainder plotted on the right horizontal for lime.

IV.—Slaggy and Vitrophyric Types of Lava.

In the north-western corner of Brown Lake there is an extensive outflow of slaggy and ropy lava. The nature of the mass varies from a very fine visicular type to a coarse and slaggy variety. Some of the iron-bearing constituents have undergone oxidation, thereby imparting a reddish colour to some portions of the rock.

V.—Vesicular Vitrophyric Olivine Basalt.

Rock 2.

Near the base of the outflow in Brown Lake.

Macroscopic Characters.

In hand specimens the rock is dark-brown to black in colour, with a subvitreous lustre and uneven fracture. It shows strong evidences of having flowed, also that cooling had taken place rather rapidly. In cross-section two layers are seen, the external layer possessing a great many cracks and fractures, whilst the internal, which had taken longer to cool, is only slightly vesicular, having no cracks. It is evident from this that the internal portion continued to flow after the exterior layer had solidified, the strain being sufficiently great to crack this hard layer transversely. The rock is tachylytic in parts, containing a few small scattered phenocrysts of olivine.

Microscopic Characters.

The rock has a distinct vitrophyric structure. The groundmass is dark-brown in colour—in fact, some of the sections were so dark that practically no light was transmitted, except in the cases where phenocrysts occurred. The glass is densely charged in places with magnetite dust in the form of "cumulites," rendering those particular portions almost opaque, whilst in other places only a few scattered grains occur. It is highly vesicular, but the vesicules are exceedingly small. The microlites have a distinct fluxional arrangement, being more or less parallel to one another.

The microlitic components of the base are a few crystals of augite and probably a few grains of olivine, with a very small proportion of felspar. The augite is by far the most abundant component in the glass, and generally idiomorphic. The principal forms developed are sections parallel to the (100), and more rarely those parallel to the (010) and ($\bar{1}11$). Several cruciform twins are to be seen besides the more common twin on the (100) plane. Small rosettes are also seen, in which case sections parallel to the (100) are developed.

The next component in abundance is the felspar. These gave symmetrical extinctions up to 35°, and in all cases proved to have the same characteristics as the plagioclase in rock 1.

The olivine of the base exists in the form of isolated grains, with practically no idiomorphic outline. The proportion of olivine to augite is very small.

The inclusions in the augite and olivine are magnetic, and a few gas cavities. The principal inclusion in the felspar is apatite, in the form of lath-like crystals.

The phenocrysts of the rock are olivine and augite, the former being by far the most abundant. The olivine, in part, possesses an idiomorphic outline, showing traces of the (010), (011), and (100), but a great deal of the crystal has been absorbed by the base. A fair cleavage is developed parallel to the (001), but is often obliterated by irregular cracks, which have been partly opened and filled with the glassy base. Slight decomposition has gone on, owing to the presence of a small proportion of serpentine. Some sections, particularly those parallel to the (010), show spheroidal cracking. The olivine, which is perfectly colourless, contains numerous inclusions of magnetite and probably some ilmenite, there being present a few idiomorphic grains of a mineral, not so glistening as the magnetite; glass is also included.

The augite phenocrysts vary greatly in size and shape. They show traces of the (100), (010), and $(\bar{1}11)$. The colour is a light-greenish-brown, and the pleochrium is noticeable but very weak, and therefore the absorption cannot be indicated. Twinning has gone on principally in sections parallel to the (100), but owing to the small proportion of augite present there is not very much to choose from. They are very much smaller than the olivine phenocrysts, and show a gradual diminution in size, even down to the dimensions of the microlitic components of the base, so that the consolidation of the augite may have started after the olivine, and kept on crystallizing after the felspars were formed.

Magnetite occurs usually as small grains or dust, and in a few cases as larger idiomorphic grains round the edges of the olivine.

Order of Consolidation.

Magnetite ...	——————
Olivine	——————————...
Augite	......——————————......
Labradorite	———————
Glass	———————

VI.—Vesicular Olivine Basalt (slaggy type).

Rock 3.

On the ridge of the flow in the north-western corner of Brown Lake.

Macroscopic Characters.

The rock is dark-brown in colour, but when freshly broken is practically black, possessing many vesicules of small dimensions. The rock has picked up foreign particles during its period of flow, as is indicated by the presence of rounded grains of quartz. There are a few visible phenocrysts of olivine scattered throughout. The rock shows lines of flow, possesses a very rough and slaggy surface, and is tachylytic in character.

Microscopic Characters.

Not unlike rock 2, but very much more vesicular. The most distinguishing feature is the predominance of augite in the base, over the felspar microlites, which are very few in number. Flow structure is not developed to the extent that it is in rock 2. The glass is dark-brown in colour, containing a great amount of magnetite dust. The microlitic components are, in order of abundance—augite, both with crystalline outline and in grains; olivine occurring principally in grains; and a few scattered microlites of plagioclase felspar. The augite, which is light-green in colour, exists in the form of short tabular crystals possessing a noticeable cleavage. Small rosettes occur less frequently, besides a few cross twins. The principal inclusion is magnetite, in the form of small grains, and also a few long irregular inclusions of glassy base.

The olivine of the base can be recognized only by its high polarization tints, the grains being very small.

Of the few scattered plagioclase microlites only one or two gave symmetrical extinctions up to 26°, the others being unsuitable for determination. In one or two cases a distinct ophitic structure is noticeable, the augite including the plagioclase microlites.

The phenocrysts of the rock are olivine and augite. The olivine is by far the most abundant, although a great deal of it has been absorbed by the magma. A great deal of the olivine possesses no sign of idiomorphism, being usually in curved and irregular crystals, which has probably been due to extraneous causes, together with diffusion. They contain a great many inclusions of magnetite of fairly large dimensions, and more rarely glassy base. Cracking and decomposition have gone on to a small extent.

The augite phenocrysts are rare, and in the majority of cases have undergone decomposition to serpentine. They contain many inclusions of magnetite and glass, and is ophitically intergrown with the plagioclase felspar. Glomeroporphyritic aggregates of augite and olivine are to be seen in some sections, but this structure is rare.

VII.—Vesicular Basalt.

Rock 4.

Leg-of-Mutton Lake.

Although this specimen was not found *in situ*, yet it represents the usual type of rock found in the vicinity of this lake, and to a smaller extent in the Valley Lake.

Macroscopic Characters.

In hand specimens the rock is steel-grey in colour, containing many vesicules of variable dimensions. Some of the vesicules contain small crystals of aragonite, others a thin layer of calcium carbonate or lime, with a small amount of foreign matter included. A few small visible phenocrysts of olivine are seen scattered through the rock. Tachylytic structure is not developed to the same degree in this rock as it is in the others of the same group.

Microscopic Characters.

Hypocrystalline porphyritic and medium-grained rock, containing phenocrysts of olivine in a groundmass of plagioclase felspar, with granules of augite, magnetite, and a little glass.

This rock is particularly rich in microlite felspar of large dimensions, which are fairly well preserved, giving symmetrical extinctions up to 32°, which suggests that it is a medium labradorite. They are fairly well twinned, and in a great many instances are arranged into radiating aggregates. Many of the microlites are obscured by the numerous inclusions of magnetite in the form of minute grains, and apatite.

The granules of augite, which are brown in colour, are in close association with the felspar laths, but they have undergone a great deal of decomposition and are partially obliterated with minute granules of magnetite, ilmenite, and some glass, otherwise an intersertal structure would be developed.

The glassy interstitial material is dark-brown in colour and crowded with numerous granules of magnetite, which, in part, renders it quite opaque.

The only phenocryst of the rock is olivine, which has undergone partial decomposition to serpentine, and is partially absorbed by the magma.

The crystals are quite clear, but cracked about a great deal. They contain fairly large grains of magnetite and irregular inclusions of brown glass.

Owing to the absence of phenocrysts of augite and the predominance of moderately large plagioclase microlites, the rock is not so fine-grained as the usual type of basalt, but approximates to an anamesite, intermediate between dolerite and basalt.

VIII.—Lherzolite.

Rock 5.

Brown Lake.

Occurrence.

This rock occurs in the form of nodules in the ash-beds which overlie the basaltic flow. They vary in size from a few centimetres up to perhaps thirty centimetres in diameter. The majority of the nodules have been enclosed in a thin layer of tachylyte, and in some cases with vesicular olivine basalt. The specimens collected were selected from the most concentrated zone that could be found, *viz.*, in a layer of nodules in the ash-beds about 200 ft. above the water-level at the southern boundary of Brown Lake. Many fragments and nodules of bomb-like appearance occur, both as erratics and in isolated layers in the ash-beds. They are certainly of deep-seated origin, but the outer layer or coating is purely volcanic.

Macroscopic Characters.

In hand specimens the rock is olive-green in colour, even-grained, but coarse, containing allotriomorphic fragments of rhombic pyroxene, which are dark-olive-green in colour, light-green particles of diallage, and a light-coloured olivine, which occurs in greater abundance than the former two minerals and makes up the greater bulk of the rock. Occasionally dark, glistening opaque grains are to be found, which were proved to contain chromium when tested qualitatively, hence, as in most other peridotites, are probably chromite or picotite. The rock is extremely friable, and the constituent minerals can be separated very easily with the hand.

The specific gravity of the rock is 3·33.

Microscopic Characters.

Owing to the extreme friability of the rock a microscopic section was with difficulty prepared. The rock is hypidiomorphic, even-grained, composed of olivine, enstatite, diallage, and picotite. The pyroxene grains are only slightly idiomorphic and moderately large, and in some cases are imbedded in the olivine, giving it a pseudo-porphyritic appearance.

The olivine occurs in great abundance, being the principal constituent of the rock. It has a high refractive index and a strong double refraction. It is traversed by many irregular cracks, and shows evidence of slight decomposition to serpentine. There is also indications of the trace of the (001) cleavage. In convergent polarized light good interference figures were obtained. It was also noticed that the dispersion was $\rho < \nu$. The principal inclusions were grains of magnetite and a few liquid and gaseous inclusions, with little or no zonal arrangement.

The mineral next in abundance is the rhombic pyroxene enstatite, which is almost transparent, possessing a light-brownish-green colour, slightly idiomorphic, and enclosed by the olivine. The double refraction and refractive index are noticeably less than olivine. Some of the sections are broken into parallel plates along the well-developed cleavage, namely, the (110). Some sections exhibit two fairly good cleavages intersecting at 88°, and more rarely a fair cleavage at 45°. A small amount of alteration has gone on, especially in the vicinity of the cracks, the resulting alteration product being a fibrous mineral, probably "bastite." The rare polysynthetic twinning is very clearly seen between crossed nicols in the larger sections. In convergent polarized light a biaxial interference figure with a large optical axial angle is seen. The optical sign is positive, and there is a slight dispersion, $\rho < \nu$, which is an indication that the mineral is low in iron. The principal inclusions are liquid or gaseous, sometimes zonally arranged. Magnetite is present in a small degree.

The diallage, which is light-green in colour, is slightly pleochroic. There are two distinct cleavages intersecting at 89°, and sometimes traversed by a third. The extinction angle, unlike the enstatite, which is straight, is oblique, being identical with augite. In convergent polarized light, good interference figures are obtained, the optical axial angle being small, the two axes just skirting the edge of the field. The optical sign is positive and $\rho < \nu$. The principal inclusion is magnetite in the form of grains. Decomposition has gone on to a noticeable extent, the products of decomposition being serpentine and epidote.

The brown isotropic mineral, picotite, is not infrequently met with, being in the form of small rounded grains and irregular masses. They are traversed by cracks and contain a few inclusions.

Order of Consolidation.

Picotite ... ... ————
Enstatite ... ... ——————
Olivine ... ...——————......
Diallage ... ... ————

The tachylytic coating consists essentially of a light-brown glass crowded with magnetite grains, rendering it almost opaque. A few partially-absorbed grains of olivine and augite are scattered about with little or no felspar.

From the above considerations the rock is evidently plutonic and allied to the enstatite peridotites.

With regard to the mode of origin of nodules such as these, there appears much controversy in geological literature.

R. A. Daly (14) attributes the origin of a great number of igneous rock types to a differentiation of a parent olivine basalt. He points out that fractional crystallization is one of the important factors in the formation of these rocks, and that the phenocrysts of olivine, augite, and magnetite sink in the magma to certain levels whilst in the conduit. Here they may be redissolved, increasing the basicity in the lower, hotter part of the lava column, which on crystallization produces peridotites, or, following extrusion, develops picritic and limburgitic rocks. The probability is, however, that the olivine nodules, occurring in the ash-beds at Mount Gambier, have been formed in a similar way. At Mount Gambier there appears a first stage, when olivine basalt was erupted, and later a huge deposition of fragmentary material containing the lherzolite nodules, and then small eruptions of slaggy and glassy lava. If this be the case, the injected ultrabasic rock beneath, in the conduit, has been erupted, and during its passage through the conduit has become coated and caught up in the glassy basalt, and ejected at the surface as fragments. However, in this theory it is difficult to account for the association of minerals with a large variation in specific gravity. We have to account, not for the formation of a nodule containing olivine, enstatite, or picotite, but of olivine, enstatite, and picotite, with specific gravities of 3·4, 3·2, and 4·1-4·5 respectively.

Another view which probably accounts for the inclusions in the basalt, and as isolated fragments coated with basalt, is discussed by Lacroix.(15) He holds that the basic minerals separate out first from the magma, forming an ultra-basic border zone, and, successively, more acid rock types are developed within. If just after the crystallization of the outer crust eruption occurred, the basalt, less basic now than the original magma, would contain ultra-basic inclusions only. Moreover, it is not necessary to suppose that the heavy basic

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(14) Journal of Geology, vol. xvi., No. 5, July-August, 1908. pp. 401-420.

(15) Lacroix, A., Les Enclures des Roches Volcaniques.

crystals will always sink, for if they are deposited on the magma chamber walls, they will be supported by them just as a heavy salt will crystallize on the side of a beaker, not necessarily falling to the bottom.

It is difficult to suggest a probable theory explaining the origin of these nodules of lherzolite. At Mount Gambier the ash-beds, which are of considerable thickness, contain an abundance of these nodules in irregular layers, together with large fragments of limestone, dolomite, and sand. It seems likely that, after the outflow of lava, a subsequent eruption shattered the crust down to the hypothetical peripheral layer of peridotite, and the ejectamenta was deposited on the top of the olivine basalt.

In his appendix to "Notes on the Volcanic History of Mount Shadwell,"[16] Victoria, by J. T. Jutson,[17] A. Chapman, A.L.S., describes a volcanic bomb or nodule and an olivine-bearing rock; the former contains olivine, diopside, and bronzite, and the latter essentially fayalite.

W. H. Twelvetrees, F.G.S., and W. F. Petterd, C.M.Z.S.,[18] figure and describe a lherzolite near the Waratah-Corinna Road, Hazlewood District, Tasmania. It occurs in the form of an intrusive dyke, and contains olivine, enstatite, and monoclinic pyroxene.

There is a lherzolite described and figured by Teall,[19] from Vicdessoo, in the Pyrenees, which approaches the one described in this paper. It contains chrome-diopside and green spinel, whereas the Mount Gambier type replaces the former constituent with diallage. A further occurrence was noted by A. Lacroix [20] from the tuff-beds in the Pyrenees. The peridotite exists in the form of friable nodules or bombs. The only point of difference between this peridotite and the one described is that the diopside is replaced by diallage, and the latter rock is much lighter in colour than the former. Another type of peridotite is described from Halival,[21] Isle of Rum, containing olivine, a bright-green augite, probably diopside, a pleochroic rhombic pyroxene, hypersthene, and chromite and picotite. The rock is dark-brownish-green in colour, unlike the Mount Gambier variety.

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(16) Mount Shadwell is situated in the Hampden District in Western Victoria.

(17) Victorian Naturalist, vol. xxii., No. 1, May, 1905, p. 8.

(18) Papers and Proc. Roy. Soc., Tas., 1897.

(19) Teall, J. J. H., British Petrography, plate i., fig. i.

(20) Lacroix, A., Minéralogie de la France, p. 187.

(21) Judd, Prof. J. W., Tertiary and Older Peridotites of Scotland, p. 392.

IX.—Remarks.

The distribution of tertiary basalts in South Australia is confined to the South-Eastern portion of the State and the Menzies district of Kangaroo Island. The principal localities in the South-East are Mounts Gambier, Schank, Burr, McIntyre, Leake, and Muirhead; beyond this there is no other report of the occurrence of tertiary volcanoes or outflows. There is a probability that the basaltic outflows of Western Victoria are connected with the Mount Gambier occurrence, but at present no definite analytical or petrographical work has been done in that direction, except what has already been mentioned in this paper.

X.—Conclusion.

I am indebted to Professor Rennie for permission to use the chemical laboratory, and to Dr. Cooke for information and advice in connection with the analyses.

My thanks are especially due to Mr. D. Mawson, B.Sc., B.E., for his loyal support, and to Mr. Benson, B.Sc., and Mr. Howchin, F.G.S., for their kind assistance and help in the preparation of this paper.

I also extend my thanks to Mr. P. G. Wykeham Bayly, A.S.A.S.M., and Mr. F. Chapman, F.L.S., A.R.M.S., for information concerning the Victorian basalts, and to Messrs. Senior and Foorde, residents of Mount Gambier, for their many kindnesses and advice as to routes.

EXPLANATION OF PLATE II.,

Fig. 1. Vesicular olivine basalt, showing a dosette of augite and phenocrysts of olivine containing magnetite inclusions, in a microlitic groundmass of plagioclase, augite, and olivine, with dark-brown glass and magnetite. (×20)

Fig. 2. Vesicular olivine basalt containing a phenocryst of olivine showing spheroidal cracking. (×20)

Fig. 3. Vesicular basalt rich in felspar microlites containing many inclusions of magnetite. (×20)

Fig. 4a. Vesicular vitrophyric olivine basalt. The flow structure is indicated by the parallel arrangement of the microlites. (×24)

Fig. 4*b*. Vesicular olivine basalt (slaggy type) containing a great many vesicules of varying dimensions. (×24)

Fig. 5. Lherzolite showing predominant olivine, enstatite, diallage, and a dark grain of picotite. (×16)

Fig. 6. Lherzolite showing partial absorption of the olivine and diallage in the black glass. The glass also contains a few small grains of olivine. (×16)

Petrographical Notes on Certain Pre-Cambrian Rocks of the Mount Lofty Ranges, with Special Reference to the Geology of the Houghton District.

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[Read November 3, 1908.]

Plates III. to V.

Introduction.

The dominant feature of South Australian geology is the occurrence of an immense series of lower Cambrian rocks. These are most typically developed on the western flanks of the Mount Lofty Ranges, and their stratigraphy has been ably demonstrated by Mr. W. Howchin, F.G.S.[1] He has also shown that beneath them there lies a Pre-Cambrian complex of schists, gneisses, and plutonic intrusive rocks.

The present writer has made a detailed study of these in the Houghton district, and more cursorily at other points in a line seventy miles long on the western edge of the Mount Lofty Range.

It is the purpose of this paper to show that in these localities the sedimentary rocks have a marked petrological relationship with each other, and that the intrusive granites, diorites, and syenites present the closest similarities in all points, and are obviously all derived from a single Pre-Cambrian magma, for convenience termed the Houghton magma. An examination of the published descriptions of rocks in other portions of the State shows the similarity of many of these to those derived from the Houghton magma, and points to the probability of South Australia being a petrographical province (in Judd's sense), in which the chief characteristic is the presence of a large amount of titanium and to a less degree the rather high soda percentage.

These chemical features give rise to unusual rock types in the form of pegmatites, and diorites with very acid plagioclases; these are described in detail.

The Houghton district has been geologically mapped, the Cambrian features being chiefly based on the work of Mr. Howchin, to whom I am greatly indebted for very much valuable information and assistance during the preparation of this paper.

(1) Trans. Roy. Soc., S.A., 1904, 1906.

Physiography, etc.

Houghton is thirteen miles from Adelaide along the Gumeracha-Mount Pleasant Road. It is situated on the western edge of the plateau or peneplain that forms the main part of the Mount Lofty Ranges, and above which the higher peaks—Mount Lofty, Mount Barker, Mount Gawler, and others—rise as monadnocks. This area had been reduced partially to sea-level during the early tertiary period, but in comparatively recent times it has been elevated with a slight easterly tilt, considerable block-faulting, and possibly slight corrugation.

The Torrens Valley appears to antedate this uplift. Mature near its source, it gradually becomes enclosed in an ever-deepening canyon, till it leaves the ranges near the Weir in the form of a fairly young valley, though one in which there is sufficient gradation to allow comparatively long pools between the rapids. The Torrens must, then, have cut its way down, keeping pace with the gradual elevation of the land. The river is therefore an entrenched meander,(2) a conclusion strongly supported by the winding course of the river, and its independence of the geological structure of the country. Except in minor details (3) it is not influenced by the variation in the hardness of the different strata through which it passes. Its tributary creeks, however, often are so. A striking example of this is Deep Creek, running from Highercombe to near the junction between Sixth Creek and the Torrens. It has cut down in the soft lower phyllite formation, while a subtributary that enters it from the east has been hung up by the hard Pre-Cambrian schist, and falls into the valley over a fine waterfall a hundred feet or more in height.

The Little Para River rises just near the edge of the Torrens Valley, and flows north-westerly across the Pre-Cambrian intrusion, and is then deflected by the Cambrian quartzites, which it follows for a couple of miles. Finally breaking across these it strikes westerly in a deep valley, entering more level country near Golden Grove, only to again pass into a young valley, emerging on the coastal plain near Salisbury. It is by the Little Para that most of the sculpturing of the Houghton district has been performed.

The area between Golden Grove and Salisbury is portion of a triangular area running from near One Tree Hill at Gawler down to North Adelaide. This, like the Blackwood-

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(2) Compare Professor Tate, Trans. Roy Soc., S.A., viii., 1884-5, p. 57.

(3) *e.g.*, its sharp deflection by the quartzite just west of the weir.

Happy Valley level, is best explained as a fault-block, which has slipped off from the western face of the range in the settlement following on its elevation, or possibly may never have been elevated to the same height as the main peneplain. Such areas are bounded on two sides by sharp fault-scarps (*e.g.*, Tapley Hill, Mitcham Hill, or Anstey Hill), and have a general inclination towards the south.

Geology of Houghton District.

The scheme of the geological history of the Mount Lofty Ranges has been so clearly demonstrated by Mr. Howchin that it will suffice to state very briefly the nature of the occurrences in this area.

The *Pre-Cambrian* [4] rocks consist of schists and an intrusive plutonic series. The schists are sedimentary, mainly quartzose mica schists, often with considerable felspar and sericite. In one place it is strongly calcareous, while included in the plutonic mass is a lens-shaped area of hæmatite schist rather titaniferous. It might be here remarked that the presence of titanium is quite a marked feature, even of the mica schists. The boundary between these and the Cambrian-beds follows the Torrens down to Deep Creek, and then strikes north up that gully past Highercombe, through Houghton, and thence along the Little Para, and keeping in the same direction beyond the bend in that river. To the east they extend into the Hundred of Para Wirra.

These rocks are intruded by a series of plutonic rocks which, on the field classification adopted by Salisbury and Chamberlain, or by the authors of "The Quantitative Classification of Igneous Rocks," would be classed as syenites on account of the predominance of felspar. Microscopical investigation, however, shows that in the majority of cases the predominant felspar is an acid plagioclase, so that the rock is, strictly speaking, a diorite. In some instances orthoclase or microcline is in excess, and the rock is a syenite. The ferromagnesian silicate is a uralitized diopside. The most noticeable mineralogical feature is the abundance of ilmenite. Epidote is a common secondary mineral. In grainsize the rocks vary considerably. Generally they are fine-grained (diameter of grain 1 mm., and at times much finer), while on the other hand they sometimes reach about 5 mm. in coarseness. Usually the rock is distinctly banded, the lighter and darker minerals segregating into parallel layers which have an easterly dip at varying angles. With these rocks there often occur

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[4] See W. Howchin, Trans. Roy. Soc., S.A., 1906, p. 256.

lenticles and bands of a peculiar pegmatite. As no variety of pegmatite, described in Rosenbusch's "Mikroscopische Physiographic der Massigen Gesteine" (1908), appears to resemble this rock to any extent, I have ventured to suggest for it the name *Yatalite*, from its occurrence in the Hundred of Yatala, and to describe it hereunder as a new variety of pegmatite. It consists of a coarse-grained aggregate of actinolite (after diopside), titaniferous magnetite, albite, sphene, apatite, and quartz.

This intrusion appears on the road between Houghton and Inglewood, and continues thence for a couple of hundred yards beyond the Inglewood Hotel. It runs northwards from this line till it is cut out by the Cambrian series along the Little Para River. It runs southwards from Houghton with a slightly easterly trend, crossing the Torrens River about a mile above its junction with Kangaroo Creek, and just south of the river it disappears beneath the Cambrian basal beds. It is thus over four miles in length, with an average width of perhaps half a mile. It sends out a vein which leaves the main intrusion about a mile south of Inglewood, and ends near the main Gumeracha Road after crossing the Little Para. Isolated areas of the rock occur both to the east and west of the main intrusion, and these may present rather different though related rock types.

Besides the yatalite pegmatite a little normal granite pegmatite is to be found, especially to the west of the intrusion, as, for instance, in the quarry by Houghton schoolhouse. This has a strongly gneissic appearance.

Along the western side of the intrusion are certain highly-altered rocks, probably a result of contact alteration produced by the intrusion. These apparent schists are probably altered syenites. The line of demarcation between these and the true sedimentary schists is by no means clear.

As to the age of these schists there is little evidence to offer. They are not here very highly metamorphosed, and are thus to be referred to the Algonkian period rather than to the Archæan. Dr. Woolnough has proposed the name Barossian for the augen gneisses and related rocks of the Barossa Ranges,[5] and as will be shown later the Houghton schists are petrologically closely related to these. It seems, then, quite admissible to apply the term Barossian as indicating vaguely an Algonkian period to the rocks of Houghton and the other areas of the same type.

The age of the intrusion is also Algonkian. It is, of course, quite impossible to fix with any certainty its date in

(5) Trans. Roy. Soc., S.A., 1908, p. 132.

terms of any subdivision of the Algonkian proposed in other areas, but as directly above the ilmenite-bearing intrusive there lie the grits containing ilmenite derived from the former, it would appear probable that after the intrusion of the plutonic rock it had been bared by erosion during the uplift and cycle of erosion that gave rise to the Cambrian series. Whether plutonic activity ceased with the Algonkian era, or whether products of the Houghton magma have subsequently been injected into Cambrian strata, is not certain; but the probability is that the latter is the case.

Cambrian.—Upon the uplight and dissection of the Pre-Cambrian complex a series of Cambrian strata was laid down, beginning with a gritty sandstone or angular-grained felspathic rock, often rich in ilmenite, derived from the intrusive rock. The ilmenite content of this basal grit varies greatly. At one spot it is very abundant, the rock often showing false bedding marked by black streaks of ilmenite; at another point the rock appears to be quite free from it. This perhaps indicates that the formation of the ilmenite grits was in valleys in the old range bordering the Cambrian sea. One such would be represented by the ilmenite grits near the junction of Deep Creek with the Torrens. The dip of the Cambrian beds is here radial from the Pre-Cambrian to the south along the Torrens Valley and to the west along Deep Creek. As the average dip of the Pre-Cambrian schists is to the east, well-marked unconformities occur, particularly noticeable in the Torrens Valley.

Above these grits comes the series of the lower phyllites and Torrens limestones, the Mount Lofty or thick quartzites, and above these the thick slates with their included blue metal limestones. The general occurrence of each of these beds is described by Mr. Howchin.(6) The map (plate v.) as regards Cambrian details is based partly on his descriptions and partly on observations of my own. A generalized section showing the relationship of the rocks exposed along the Torrens Valley is given in fig. 1 (p. 106).

The general dip of the Cambrian series is, in the southern portion of the Map, radially outwards from the Pre-Cambrian rocks, but to the northern portion the dip is easterly towards the Pre-Cambrian. Heavy faulting has taken place. The Torrens limestone is cut out by a fault near Highercombe, and does not reappear to the north of this in the present Map (though found several miles north of this, as near Sampson's Flat, and at the South Para (7)). Faulting also considerably

(6) Trans. Roy. Soc., S.A., 1906, pp. 239, 242, 246.

(7) W. Howchin, *op. cit.*, p. 248.

interferes with the occurrence of the thick quartzite along the ridge of Anstey Hill, cutting out the formation entirely to the south, and, according to Mr. Howchin, repeating the whole formation in a band which runs in front of the Torrens Weir northwards along the face of the range. In this portion the rock is very twisted, dips to the west being recognizable, though those to the east predominate. This long fault line to the east of the quartzite is sharply marked by difference of vegetation for three or four miles from the Torrens since the shale has been cleared, while the quartzite remains scrubbily timbered. A small quarry in Water Gully below the Anstey Hill road shows the fault rather well marked. The quartzite does not continue south of the Torrens, but bends to the west, or is terminated by a cross-fault. The Torrens bends round the southern end of the quartzites.

Fig. 1.—Generalized section across southern portion of Houghton district, showing approximate profile and stratigraphical relationships. 1, newer gravels; 2, older gravels; 3, thick slates; 4, bluemetal limestones; 5, thick quartzites; 6, lower phyllites; 7, Torrens limestones; 8, basal grits; 9, dioritic intrusive; 10, syenite dyke; 11, Barossian schists; *f*, fault; f_1, f_2, suggested faults.

To the north-west of the map there are two cross-faults displacing and tilting the strata as shown. It seems exceedingly probable that the junction between Cambrian and Pre-Cambrians is here along a fault line.

The blue metal limestones run from the Torrens Valley northwards to the Teatree Gully Road, and occur again on the Little Para on Section 5568, Hundred of Yatala, where they dip to the east at 65°.

Tertiary.—After lower Cambrian times no age has left a record till we come to late Tertiary. Here two series of gravels were formed. One occurs capping the hills that overlook the Torrens. It is a hard ferruginous gravel with rounded quartz pebbles. Its occurrence is quickly recognized by the poor Xanthorrhœa vegetation which it supports. It forms quite the highest land about. It is continuous with and doubtless belongs to the same series of gravels as those of Barossa.

Flanking the scarp of the range and running north from Anstey Hill to beyond Teatree Gully is another series of gravels referred by Professor Tate to the Upland Miocene.[8] They consist of coarse gravels and sands. On physiographical grounds it seems difficult to regard them as Miocene, for they are bedded against the side of a scarp produced by a most recent uplift. It seems more likely they were produced by a river which flowed down the fault-block before described and along the foot of the scarp. They are probably of more recent origin than the high-level gravels mentioned above. This gravel is covered by the usual "Upland Miocene" flora and soil.

Summary.—It will be seen from the above that there have been in the history of the Mount Lofty Ranges, as revealed by the Houghton geology, at least three periods of great earth movement:—

(a) The Pre-Cambrian, contorting and modifying the schists, and possibly consequent on the plutonic intrusion.

(b) The Post-Cambrian, but (from evidence in the southern portion of the range) early Palæozoic period of crust-folding brought about by an overthrusting pressure from the east. Except in minor details the movements of the strata have not influenced the present topography, but are revealed chiefly by stratigraphical dislocations. These may then be termed the periods of stratigraphical faulting.

(c) It is the folding and faulting during the late Tertiary period that has so profoundly influenced the present topography, forming miles of fault scarps or wide areas of tilted peneplains. To the faulting of this period the term physiographic faulting may well be applied, for it is on physiographical data almost entirely that the faults are recognized.

It is worthy of note that in each of these three periods of crust movement the axis of folding or faulting was almost a meridional one.

Brief Notes on Other Areas in which Pre-Cambrian Rocks have been noted similar to those of Houghton.

Barossa and Humbug Scrub.—A large area here, partly overlain by the "Upland Miocene" gravels that carry the alluvial gold, is made up of an augen gneiss whose "eyes" are crystals of potash felspar. In working up the creeks that flow westerly from these hills a gradual increase in the size

(8) Presidential Address, Phil. Soc., S.A., 1878-9.

Fig. 2.—Sketch Map of the country about Adelaide, showing localities mentioned in this paper and area geologically mapped.

of these porphyroblasts may be noted. A good example of this is to be found in the creek which flows from the Lady Alice Mine down past the Humbug Scrub Post Office. Microscopical examination shows the essential similarity of these rocks with the schists of Houghton. They are more highly metamorphosed, and the felspar is perhaps derived from plutonic solutions, but the augen structure is here a metamorphic structure. The rocks are not crushed granite-porphyries.

Aldgate.—The occurrence in this area has been described at some length by Mr. Howchin.(9) Schists of a nature similar to those of Houghton are intruded by plutonic rocks closely similar to those which occur at the latter locality. These rocks are exposed typically at the corner of the main Adelaide road about 200 yards from Aldgate Railway Station; they are here very fine in grain. On the hillside to the north they are coarser, but then disappear beneath Cambrian rocks, reappearing in Sections 1118 and 1133 of the Hundred

(9) *Op. cit. sup.*, p. 251.

of Onkaparinga. The rock here is coarser in grain, and on microscopical examination proves to be a uralite diorite. Ilmenitic quartz veins occur, and near the Stirling East schoolhouse a graphic quartz tourmaline vein.

Yankalilla.—On the suggestion of Mr. Howchin I made a collection of rocks from the hill on Sections 1186 and 1187 of the Hundred of Yankalilla, a mile to the east of Yankalilla township. They were epidotized diopside granites and syenites, containing sphene and magnetite, probably titaniferous. It is rather gneissic. Bands of gneissic aplite and granite pegmatite occur, the latter often containing ilmenite. Rather gneissic biotite granite also is present. The whole series intrudes and has strongly silicified a mass of quartz schist. To the east of the intrusion, however, a mica schist occurs rather more like the Houghton-Barossa schist. The extent of this Pre-Cambrian area is not yet proved. To the west it is hidden below Permo-Carboniferous till. To the south-west about five miles it occurs again. Four miles south of Normanville the road to Cape Jervis turns sharply from the coast up a narrow gorge in mica schists and augen gneisses. My attention was first directed to this locality by a specimen presented to the Geological Museum of the University by Dr. Woolnough, which was macroscopically identical with the Houghton rocks. In the gorge the typical features of the titaniferous magma rocks were fully developed. They intruded the schists, and occurred in abundance in boulders by the roadside and in the creek. Coarse-grained ilmenite in quartz veins, a pegmatite composed of quartz felspar and ilmenite, in roughly equal amounts, hornblende uralite granodiorite diorite, and hornblende diorite, the last a melanocratic rock, were observed. As usual, epidote was a common secondary mineral. The gneissic rocks on microscopical examination prove to be closely similar to those of Barossa.

The stratigraphic relationship of this area was not traced, but it should be remarked that a continuation of these schists along their direction of strike (south-west) for four miles would bring them below Second Valley, where there is a series of phyllites (including a white marble) overlain by a quartzite of great thickness, all dipping easterly. The marble may prove to be the limestone in the River Torrens series; the other formations would tally well with the lower phyllites and the thick quartzite. Their lithological unconformity with gneisses at the gorge is most marked.

Moonta.—I learn from Mr. Mawson that the country rock of the Wallaroo and Moonta Mines is an actinolite pegmatite, not unlike the yatalite.

Olary.—Behind Olary and near King's Bluff is a series of granite rocks discovered by Mr. Howchin and described by Dr. Woolnough.(10) They are very gneissic in appearance and shattered in microscopical section. Their two chief distinguishing characteristics are *(a)* acidity of the plagioclases and *(b)* presence of much titanium. These two features are among the most noteworthy of the Houghton rocks. An unusual form of aplite, containing large crystals of titaniferous iron, I found in a creek about half a mile to the north of King's Bluff, and is described in the petrological portion of this paper.

At Radium Hill, near Olary, Mr. Mawson (11) has found the highly-titaniferous mineral davidite, in a pegmatite vein intruding Pre-Cambrian quartzite, and containing other titaniferous iron minerals, with vanadium mica and quartz.

Jamestown.—In the collection of the Sydney University is a boulder found in the Cambrian till at Jamestown. It is a quartzose felspar porphyry, which on microscopical examination is closely related to the Houghton magma rocks, and must be regarded as an effusive product of that magma.

These instances far removed from Adelaide of rocks similar to the Houghton rocks show the probability of the wide extent of the Houghton magma. Though they may not all be of Pre-Cambrian age, it does not affect their corelation, for even in the Mount Lofty Ranges it is by no means certain that the titaniferous products of this magma are Pre-Cambrian.(12)

PART II.

Petrographical Descriptions of the Pre-Cambrian Rocks.

A. The Igneous Rocks.

i. Inglewood District.

As conveying a better general idea of the intrusive mass in the Inglewood district, it has been thought advisable to describe collectively the mineralogical and structural features noted in the examination of a large number of slides before attempting the descriptions of the rock types.

a. Mineralogical Features.

On account of their predominance the group of felspars is treated first.

(10) Trans. Roy. Soc., S.A., xxviii., 1904, p. 181 *et seq.*

(11) Trans. Roy. Soc., S.A., 1906, p. 188.

(12) W. Howchin, Trans. Roy. Soc., S.A., xxx., 1906, p. 254.

Plagioclase.—This type of felspar is developed to a greater extent than any other mineral in this series of rocks. In different rocks there is some variety in the composition of the plagioclase developed, the range being from albite to basic oligoclase.

In the type of pegmatite peculiar to this district, and for which the name *yatalite* has been suggested, the felspar is a true *albite*. It forms subidiomorphic crystals up to an inch in diameter and of a pale-pink colour. Cleavage flakes parallel to (001) show that albite twinning is developed with very fine lamellæ, of which one set is always narrower than the other; the extinction angle from the twinning plane is 3° for one set, 5° for the other. Scattered about the section are small patches of microcline of irregular outline, but frequently elongated parallel to (010), and with one set of its twin lamellæ parallel to those of the host, the other set being perpendicular to the first. The refractive index and birefringence of the albite is distinctly higher than that of the microcline. Of higher refracture index than the albite and (in this position) of lower double refraction are small, irregular, or round grains of quartz with many liquid inclusions.

Cleavage flakes parallel to (010) show an extinction angle referred to the trace of (001) of $+17°$. This measurement, together with that on (001), indicates that the composition of the felspar is near to Ab_{95} An_{5}. The refractive index is less than that of Canada balsam. The position of emergence of the acute bisectrix on the (010) is slightly oblique; the optical sign is positive. Carlsbad and pericline twinning was not observed. The felspar is somewhat decomposed, being dusted with kaolin or paragonite, and a great deal of epidote has been introduced. Liquid inclusion of a very small size is also developed, and apparently is elongated parallel to the vertical axis of the crystal.

Oligoclase is the dominant species in the main mass of the intrusion. It forms anhedrons of a grey or greenish white colour, rarely more than 3 mm. in diameter, and varies down to a tenth of that length; while in the fine intergranular material, felspar of a much smaller size is recognizable. The twinning is almost entirely on the albite law. Pericline twins sometimes occur, but twinning after other laws has not yet been observed. In most cases intergrowths with microcline are present, as described above, one set of the microcline laminæ being always parallel to those of the plagioclase. These intergrowths are generally recognizable in ordinary light by the more advanced kaolinization of the plagioclase and its higher refractive index. In polarized light the higher birefringence of the plagioclase is most noticeable.

The composition of the oligoclase varies, and in most cases it is very acidic. The extinction angles in the zone perpendicular to ∢(010) rise to 10°, with refractive index distinctly below Canada balsam; this indicates the variety oligoclase-albite with a composition of Ab_{90} An_{10}. In other rocks maximum extinction angles perpendicular to (010) were 6° or 4°, giving an approximate composition of Ab_{85} An_{15}, and in a few slides even greater basicity was noted. The angles in the same zone were 10°, while the refractive index was distinctly higher than that of Canada balsam, facts which indicated that the composition was Ab_{70} An_{30}, a species intermediate between oligoclase and andesine. Rarely two sets of felspar are indicated. In one slide about half the readings of extinction angles in the zone perpendicular to (010) approached 4° (Ab_5 An_1), while the remainder lay between 4° and 9° (Ab_9 An_1). The texture of the rock, however, though but little affected by crushing, gave no sign of two epochs of crystallization, nor did individual crystals appear to be zoned. Absence of zoning, it may be remarked, is a common, if not universal, feature of the plagioclases of these rocks.

Straining and crushing have often induced rather shadowy extinctions, and bent or faulted lamellæ are sometimes seen. Marginal granulation is very frequent.

Alteration.—The kaolinization of the oligoclase and position of the liquid inclusions are in every way similar to that described for albite.

Microcline is another very abundant felspar. It forms white or greenish crystals and anhedrons, rarely recognizable macroscopically. It must be regarded as soda-bearing, for the composition of the rock does not show the percentage of potash that would be present were the microcline a pure potash felspar. The soda content is present, either included in the microcline as an albite molecule or as albite microperthitically intergrown with the microcline. Sections suitably oriented for optical investigation show that the microcline does not depart from the normal type. The extinction angle of 15°-16° is plainly observable on (001) sections, and sections perpendicular to the acute bisectrix show a negative biaxial figure, whose axial points lie near the edge of the field of view, with an objective whose angular aperture is 134°. Such sections have an extinction angle of 5°.

Besides its occurrences in the plagioclase as described above, the microcline is noteworthy for its inclusion microperthitically of thin, colourless strips, whose birefringence and refractive index are both greater than those of its host, making their recognition easy in polarized or ordinary light. These intergrowths so closely resemble the figures and descriptions given by Rosenbusch of the microline-albite intergrowths that the narrow bright strips are referred to that mineral, though it was impossible to obtain determinative readings of their extinction angles. Such readings were rendered uncertain by the narrowness of the lamellæ; the angles, such as were obtainable, were generally small, though one reading gave 18°.

On the whole, the microcline is very free from kaolinization; dusting with epidote and rutile (?) is, however, not unusual.

Microcline occurs in a variety of forms. In the gneissic aplite near the school-house it is present in large amount as irregular grains, and with much albite intergrowth. It is the predominant mineral in the rock that occurs to about a mile south of Inglewood, but becomes merely an accessory mineral in rocks further to the north. In these it is usually present interstitially, though occasionally forming large squarish but anhedral crystals.

Orthoclase is not so common as either of the preceding felspars, whilst nearly every rock contains some potash felspar. It is most usually in the form of microcline, particularly where the rocks give most sign of having undergone heavy strain. It is a well-recognized fact that orthoclase may assume the microcline structure under strong pressure.(13) The presence in these rocks of strained orthoclase assuming a moiré appearance, and finally taking on a true "gitter mikroklin," is not an unusual feature.

Orthoclase forms in white anhedrons varying in size up to 2 mm. in diameter. Where still unaltered to microcline, as in parts of the gneissic aplite, it may be full of microperthitically intergrown stripes of albite. In a granite that occurs in the Torrens Gorge just west of the main intrusion, but certainly a product of it, orthoclase is almost as abundant as plagioclase. In the syenite near Mr. Scrymonger's it is the predominant mineral. In the gorge and to the east of the intrusion is a monzonitic rock, in which orthoclase is present also in large amount, Carlsbad twinned and somewhat kaolinized. In the rock occurring in the Houghton Cemetery Reserve it is present in small amount, forming in small and fairly fresh grains, while it occurs in large untwinned grains in the rocks of the eastern vein on the Gumeracha Road.

The alterations undergone by orthoclase are quite normal.

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(13) Rosenbusch, Microscopical Physiography of Rock-forming Minerals, Idding's Trans., Fourth Edition, p. 320.

In general the investigation of the felspar in this group of rocks is rendered somewhat difficult, especially when the crystals are untwinned, by the presence between the different grains of their films of chlorite or other secondary material which obscures the bright line test for relative refractive indices, while in most cases every felspar present has a refractive index below that of Canada balsam.

Following the felspars the most important mineral is a *pyroxene*. It occurs in oval, oblong, or less regular grains, up to 5 mm. in length, sometimes also idiomorphically, the elongation of the grains being usually roughly parallel to the general direction of banding of the rock. In colour the mineral is a pale-green; by transmitted light, however, it is almost colourless and non-pleochroic. It is in only a few specimens that the pyroxene remains in its primary state. It is then a diopside with an extinction angle c' to $\mathfrak{c}$ of 40°. Chemically it must be chiefly magnesian, iron being present in but small amount. Generally, however, the diopside has been changed to uralite. This change takes place along the cleavage of the diopside grains, the amphibole fibres being parallel to the vertical axis of the pyroxene crystals. The colour changes to a light or rarely a strong green with a faint or marked pleochroism, namely—

$\mathfrak{a}$ light-yellowish green

$\mathfrak{b}$ green

$\mathfrak{c}$ green

absorption $\mathfrak{a} < \mathfrak{b} \leqq \mathfrak{c}$

while the extinction angle falls to 22°. This indicates that actinolite is the amphibole developed. Basal sections of the uralite are generally rather confused, but appear to show a pyroxene cleavage net still remaining.

That the change to amphibole is not a true example of paramorphism is indicated by the presence in the altered rocks of much secondary epidote and some highly refracting colourless grains, probably calcite.

In the process of change there is an increase in volume, and outgrowths frequently occur of actinolite fibres parallel to those in the place of the original crystals, but extending beyond their boundaries.

The diopside and uralite often occur in association with the titaniferous magnetite or ilmenite; sometimes there is a dusting of secondary ilmenite included in them. In general, however, the primary iron ore appears to have crystallized after the pyroxene.

Uralite, such as described above, is present in most of the rocks of the main intrusion. In the "yatalite" pegmatite in these rocks it occurs in very large subidiomorphic crystals up to 2 in. in length. It is an actinolite of a very deep green, and includes poikilitically much titaniferous magnetite sphene quartz, and smaller uralite grains of different orientation. Primary hornblende may also be present. There is no doubt but that the actinolite crystals are uralitic from their mode of occurrence and their pyroxenic cleavage net, when viewed in basal section; moreover, they contain residual patches of unaltered diopside, almost colourless, and of a higher extinction angle. By weathering, the uralite has given rise to the formation of limonite, which frequently greatly obscures the crystals.

Primary *hornblende* occurs, however, both in the "yatalite" and in a few of the specimens examined of the main rockmass. It is easily distinguished from the secondary amphibole by its brown colour, stronger pleochroism, and clear amphibolitic cleavage net. Though generally allotriomorphic, subidiomorphic crystals appear, and sometimes perfect six-sided basal sections are observable. In only one rock is it a notable constituent, occupying about 12 per cent. of the area of the section.

Biotite is rare among rocks of the main intrusion, though appearing along its western margin. It is in its usual flaky form, the plates being roughly parallel to the banding of the rock. The pleochroism is normal, frequently obscured by partial chloritization, accompanied by a separation of iron oxides, magnetite, and limonite. In one section taken from the eastern vein on the Gumeracha Road biotite occurs in small amount in the cleavage plates of the uralite.

Titaniferous iron occurs in a varying but generally an unusually large amount. Chemically it varies from an ilmenite, which, though containing a good deal of $Fe_2 O_3$, is very insoluble in acids, to a magnetite strongly attracted by a magnet, but in which titanium is shown to be present by the formation of leucoxene and the faint violet colour given in reduction tests. Such titaniferous magnetite occurs in the variety of pegmatite found in these rocks, forming there large subidiomorphic crystals 2 in. in length, and irregular grains included poikilitically in the uralite. In the main body of the rock it occurs in composition more nearly that of theoretical ilmenite, in crystalline plates roughly idiomorphic, or in irregular masses, but in all cases with the longer axes parallel to the banding of the rock. Where banding is marked ilmenite is generally segregated into bands. The mode of alteration into leucoxene or titanomorphite is quite normal.

Apatite is a fairly common accessory. Macroscopically it is greenish-white in colour, forming granular aggregates of a pale-greenish colour and up to an inch in diameter in the pegmatite. It is microscropically a pale-grey-brown in colour with faint absorption $E > O$. Its determination was confirmed by grinding a little with nitric acid and ammonium molybdate, when the characteristic yellow phosphomolybdate was formed in abundance. In the rock of the main intrusion it occurs in irregular or oval grains with a fairly well-marked basal parting. It is often faintly pleochroic in tints from grey-violet to grey-brown. It would in general appear to have crystallized before the ilmenite. Secondary epidote sometimes surrounds the grains.

Sphene occurs in a few of the slides cut from Houghton rocks. The pegmatite for which the name "yatalite" has been suggested contains a considerable amount of this mineral. Macroscopically it is present in pale-green to brownish-green crystals, with irregular outlines, but with two good cleavages. Microscopically it is light-brown by transmitted light. In convergent light the optical axial angle is seen to be in general unusually small. Some crystals, however, occur whose axial angles are of the normal size, and show the great dispersion well. The mineral is positive optically and weakly pleochroic. In yatalite is occurs in grains up to $\frac{1}{2}$ in. in diameter, or smaller grains included poikilitically in the actinolite. In the rock of which an analysis is given below it occurs in rounded to subidiomorphic grains with the usual prism cleavages and traces of another cleavage. In one or two instances polysynthetic twinning is developed.

Quartz occurs irregularly, generally interstitially. It nearly always shows strain efforts, and contains liquid inclusions. Very thick sections appear sometimes to be twinned.

Epidote is generally present in most instances. It is usually recognizable in hand specimens by its characteristic yellow-green colour. Microscopically it occurs in large irregular grains in the uralite and dusting over the felspar. It is formed during the decomposition of the former and by its interaction with the latter. Cleavage is rarely well developed.

Scapolite occurs in a single specimen, and its peculiar nature is described later (p. 124).

Siderite is an accessory in one specimen, and is also described later on (p. 118).

ii. Texture.

Considerable variety of texture is presented both macroscopically and microscopically by the intrusive rocks of this district. In some instances, particularly in the case of those rocks which form the eastern vein on the Gumeracha Road, the texture is coarse and granitic, the grain being between 3 and 5 mm. in diameter and the various constituents evenly distributed. Other rocks are much finer in grain, the size being only 1 or 2 mm., or even less. The majority of the rocks, however, has a marked gneissic banding, the coloured constituents being concentrated into parallel bands, which may be from several centimetres to only a millimetre in width. Examined microscopically the white bands (felspar) show little or no parallelism of grain disposition, either crystalloblastically or in optical orientation. The coloured minerals, however, show a strong parallelism, the vertical axes of the pyroxenes and uralites, the longer diameter of the sphene grains, and the elongation of the irregular ilmenite masses, as well as the plates of crystallized ilmenite, being in general parallel to the general direction of banding. This banding direction varies a great deal on the field, but roughly is parallel to the schistosity of the Pre-Cambrian rocks, dipping easterly and striking generally slightly west of north.

The effects of pressure are to be seen in the shadowy extinctions of the felspars and quartzes, the bending and occasional faulting of the plagioclase lamellæ, and, chiefly, in the presence of a finely granular mixture of felspar and sometimes quartz that surrounds the grains of those minerals. This marginal crushing is present in most, though not in all, of the rocks examined. The finely granular aggregate has taken on a structure resembling the granoblastic structure of Grubenmann, and the rockmass, being of a slightly altered granite texture, may be said to possess the blasto-granitic structure defined by that author.(14) In some cases, however, the relict texture is so slightly developed as to render the simple term granitic texture more applicable than blasto-granitic.

In the gneissic aplite which occurs in the quarries just behind the Houghton school-house (Yatala, Section 5519), the texture shows most clearly the effect of recrystallization under pressure. Here the falspar and quartz, much strained, are disposed in long parallel lines clearly visible macroscopically. These bands are not due to original graphic intergrowth merely, as the lines extend beyond the boundaries of individual felspar crystals. Rather, it must be taken as an effect of rock flowage, the "schistose by crystallization" (Krystallizationschieferung structure of Grubenmann).(15)

(14) Die Krystallinen Schiefer, Bd. i., p. 83.

(15) *Op. cit. sup.*, p. 88.

iii. Petrographical Descriptions of the Various Types of Intrusive Rock in the Houghton District.

NOTE.—The slide numbers refer to the numbers in the catalogue of the "Collection of Slides" of the Adelaide University.

581. *Locality.*—In Torrens Gorge west of main intrusion (Section 5521, Hundred of Yatala). *Texture.*—Hypidiomorphic granular grainsize, rather uneven, averaging about 2·5 mm. *Minerals present in decreasing order of abundance.*—Plagioclase rather decomposed, and an oligoclase whose extinction angles in the zone perpendicular to (010) vary up to 8°. Orthoclase, in amount almost equal to the plagioclase, in large or small rounded or irregular grains, often twinned. It shows shadowy extinction. Quartz is included in rounded grains, and around these and along the borders of the felspar grains kaolinization has commenced and is proceeding inwards. It contains among the kaolin (or muscovite) small, scattered flakes of biotite, probably secondary. Biotite is present in brown-green plates, bent and frayed, and partially chloritized. Small patches occur of an aggregate of quartz and biotite grains recrystallized under pressure. Quartz is present in considerable amount, much strained, though recrystallized crush areas show much less straining. Some, from its association with secondary carbonates, appears to have been introduced. Siderite is present in irregular patches, with characteristic cleavage and occasionally outline, negative uniaxial optical character, and weak pleochroism. Its strong birefringence being noticeable without, the analyzer can observe the difference in the relief of the surface of a grain as it is rotated above the polarizer. Some large ragged crystals of magnetite, probably primary, are present, and smaller dusty particles in the bitotite and siderite are most probably secondary. A little apatite is present. *Name.*—Epi-granite.

613. *Locality.*—In the Torrens Gorge to the east of the main intrusion. A section of a dark band of rock in the gneissic mass. *Texture.*—Hypidiomorphic granular. The predominant *mineral* is an acid plagioclase, with extinction angles of 12° in sections perpendicular to (010) indicating that it has a composition of Ab_{12} An_1. Almost equalling it in amount is orthoclase in rounded untwinned grains, while closely following it in the order of relative abundance are pale-green faintly pleochroic uralite and flaky biotite, green to brown. The determination of the felspars is rendered very difficult by the presence of a fine network of secondary epi-

dote prisms all over the rock, but particularly over the colourless minerals, and work on the felspars is still more obscured by some secondary mica. Quartz is present in fair amount, and ilmenite, with leucoxene, also occurs. Apatite forms in prisms. *Name.*—Diopside-biotite granodiorite.

A very beautiful type of syenite is to be found in a small vein about 500 yards to the west of Mr. Scrymonger's homestead on the hills overlooking the Torrens (Section 3240, Hundred of Yatala). *Macroscopically* it is a medium-grained rock with pink-grey felspars and biotite flakes. *Microscopically* (see plate iii., fig. 1) the predominant mineral is an orthoclase perthite. The ripple-like nature of the perthitic intergrowth is beautifully marked. It is a fine example also of the passage of orthoclase into microcline. The straining of the rock has given rise to a moiré appearance on all the orthoclases, and in some faintly, and in others clearly, the outline of the "gitter mikroklin" appears. The orthoclase forms irregular grains, averaging about 2 mm. in diameter. Plagioclase other than the albite of the perthite is quite subordinate; it forms subidiomorphic grains about ·5 mm. in diameter and acid oligoclase in composition. It is twinned on the albite and pericline laws. The ferromagnesian silicate is a brown, slightly-chloritized biotite in irregular flakes ·7 mm. in length, and often clouded with secondary magnetite. A very little diopside is present in small grains. A great deal of magnetite is present passing into deep-red translucent hæmatite, with a little clouding of leucoxene. Rutile grains are present, and apatite is an accessory. The rock has been rather shattered and altered. Between each grain and fringing each fragment of iron-ore is a little fringe of colourless mica, with fine-grained quartz and rarely a little orthoclase and oligoclase. It is a little difficult to say whether the quartz is entirely secondary. Some grains strongly suggest a primary origin, while the mode of occurrence of the majority with mica in intergranular openings and filling in cracks in fractured felspar crystals is surely indicative of its secondary nature. The percentages of alkalies in this rock are No_2O, 5·02; K_2O, 4·78. *Name.*—Biotite syenite.

576. *Locality.*—Occurs in Sections 562, 563, 572, of the Hundred of Yatala. *Macroscopically* it shows the gneissic banding developed rather strongly. The predominant mineral is a white felspar, but there are green crystals of uralitic pyroxene about 3 mm. in length. A few grains of ilmenite are recognizable. *Microscopically* the texture is hypidiomorphic granular, though with a markedly parallel arrangement of the longer axes of the grains or aggregates of grains of

the coloured constituents. Microcline is quite the predominant mineral, in rounded or irregular grains about a millimetre in diameter. It is characteristically developed and is microperthitically intergrown with albite lamellæ. It is quite free from decomposition. Second in order of abundance is uralite after diopside. It is actinolite, faintly pleochroic, and in irregular grains dusted with epidote. Almost equal in amount to the uralite is plagioclase in irregular grains of composition, $Ab_6\ An_1$. Ilmenite is present in small amount, largely changed to titanomorphite, and a few rounded grains of sphene, of a pale-bronze colour and very pleochroic, appear also to be titanomorphite derived from ilmenite, being clouded with reddish-white leucoxene. Quartz with gaseous inclusions occur in small amount intersertally. *Name.*—Microcline diopside syenite. The microphotograph (plate iii., fig. 2) is of a section closely similar to this rock.

608. *Locality.*—From the eastern vein in Sections 580 and 575, of the Hundred of Para Wira. *Macroscopically* medium-grained; predominantly composed of white felspar with a smaller amount of pink orthoclase. Large hornblende crystals occur rather fibrous in character, but with a good cleavage. *Microscopically.*—Texture hypidiomorphic granular, grainsize even, about 3 mm. The predominant mineral is an acid oligoclase, closely followed by orthoclase occurring in large irregular grains and showing straining. The chief ferromagnesian mineral is uralite, in large anhedrons, which are green and faintly pleochroic, associated with and sometimes including crystals of pale-brown-green; strongly pleochroic hornblende. Titaniferous magnetite also is present in primary grains, and probably secondary magnetite occurs in the cleavages of the hornblende and uralite. Biotite flakes occur in a couple of grains of hornblende as very small patches in the cleavages. *Name.*—Hornblende diorite approaching monzonite.

Locality.—Portion of the large eastern extension of the intrusion in Sections 581 and 573, of the Hundred of Para Wirra. *Macroscopically.*—The grainsize is unusually large white felspar grains up to 3 mm., with large diopside grains showing fair cleavage ·5 mm. in diameter. A little magnetite is noticeable. *Microscopical characters.*—Texture hypidiomorphic granular, with no sign of marginal crushing of the grains, though the felspar lamellæ are occasionally bent and faulted. Plagioclase ($Ab_5\ An_2$) is the predominant mineral, and a little orthoclase is present as well. The chief coloured constituent is a pale-green diopside, but primary hornblende is present in some amount, forming strongly pleochroic brown anhedrons. Titaniferous magnetite also occurs in large amount among the ferromagnesian minerals, and these with magnetite and apatite are concentrated into parallel bands. A few grains of titanomorphite (secondary sphene) occur. The apatite is a grey-brown in colour; it shows the basal parting well, the prism cleavage slightly. *Name.*—Diopside-hornblende-diorite.

580. *Locality.*—Small quarry in Cemetery Reserve on the back road from Houghton to Inglewood, Portion 5657, Hundred of Yatala. *Macroscopically* an even-grained rock; dominantly felspar with diopside and ilmenite. Colour, an apple green. *Microscopically* (see plate iii., fig. 3).—Fabric hypidiomorphic granular, with a small amount of marginal crushing. Grainsize fairly even, about 2 mm. The predominant mineral is a basic oligoclase, the composition of which is about Ab_{70} An_{30}. The grains vary in size, the largest being about four times the diameter of the smallest, not considering the finely-crushed material. While often anhedral, the grains approximate to a prismatic habit. Albite twinning only is developed. The plagioclase is but slightly kaolinized. Microcline is present in small amount, included in or intergrown with the plagioclase, and also occurring interstitially and among the shattered grains. Orthoclase is also present in small amount. Diopside follows plagioclase in order of relative abundance. It is light-green in colour and has not become uralitized to any extent. It occurs in small terminated prisms and sometimes in ragged grains. It includes a little magnetite primarily, and in its cracks limonite may form. A very little epidote also occurs. Titaniferous magnetite is present in large amount. It is very fresh, having no trace of leucoxene. It is aggregated into roughly lenticular patches, and these, with sphene and diopside, give the rock a slightly gneissic appearance. Sphene occurs characteristically and in considerable amount, while apatite is present also in some abundance, forming rather large irregular or hexagonal grains. The rock would be best termed a diopside diorite.

Before the examination of the rocks microscopically was thoroughly complete, this rock was selected for analysis as being the least altered of any of the Houghton rocks, for the diopside was not uralitized and epidote was present in only very small amount. It is unfortunate, however, that it should also be the rock with most basic felspar, so that it represents not an average composition but one unusually basic. Nearly every other rock in the field would probably have a higher percentage of alkalies and silica and a less amount of lime and iron. The analysis with the norm calculated therefrom is as under:—

SiO_2	56·85	Orthoclase	11·12
Al_2O_3	14·76	Albite	45·06
Fe_2O_3	4·48	Anorthite	10·84
FeO	1·21	Diopside	14·69
MgO	3·84	Hypersthene	2·80
CaO	7·91	Sphene	3·92
Na_2O	5·34	Ilmenite	2·89
K_2O	1·91	Hæmatite	4·48
H_2O +	·12	Apatite	1·34
H_2O −	·08	Quartz	2·54
CO_2	Abs.		
TiO_2	3·11		99·68
ZrO_2	Trace		
P_2O_5	·51		
SO_3	Abs.		
Cl_2	Trace		
F_2	·04		
Cr_2O_3	Abs.		
MnO	·12		
$NiCoO$	·05		
BaO	Abs.		
SrO	·01		
Li_2O	Abs.		
	100·34		
O for F	·02		
	100·32		

Classification—
II. 5. 3. 4.

Magmatic Name—Tonalose.

The unusual feature of this analysis lay in the highly refractory nature of the ilmenite. Much of this mineral remained still undecomposed after attack by sulphuric and hydrofluoric acids in the manner described by Washington and Hildebrandt, though repeated trials were made. Mitscherlich's method of treatment in closed glass tube with sulphuric acid was tried as a last resource, and gave figures of 1·23 per cent. and 1·31 per cent. FeO. Professor Rennie, however, kindly suggested the regrinding and retreatment of the undecomposed residue, a method which afterwards appeared in a paper by Hildebrandt.(16) This gave on treatment by Washington's rapid method, and after three regrindings, only 1·00 per cent., considerable oxidation having occurred.

(16) Chemical News, October 23 and 30, 1908.

Two estimations in a Cooke apparatus, solution being complete after two grindings, gave 1·21 per cent., which was taken as correct. It will be seen from this that there is considerable hæmatite in the norm which enters the modal ilmenite, the composition of that mineral being according to the figures derived from the calculation of the norm: Fe_2O_3, 62 per cent.; FeO, 17 per cent.; TiO_2, 19 per cent.; MnO, 2 per cent.; Ni, Co O, 1 per cent.—a composition not unusual for this mineral, except in the presence of Ni, Co O. These, however, may be present modally in the pyroxenes.

Again, the analysis confirms the determination of the pyroxene as a diopside very poor in ferrous iron. The plagioclase of the norm is more acid than that of the mode, which is very suggestive of the presence of considerable soda in the potash felspars. It is obvious also that the formation of epidote would render the modal plagioclase more acid, as it involves the subtraction from the felspar of some of the anorthite molecules. The little normative quartz and hypersthene has not been noticed modally. With these minor exceptions the rock may be said to possess a very normative mode. The classification shows the close affinity between this rock and the tonalites.

An interesting type of rock (slide 542), an alteration product of the intrusive mass, was obtained from a road-metal heap just outside Inglewood (see plate iii., fig. 4). It is to be regretted that this was not obtained *in situ*, but it is probable it came from one of the quarries that lie about a mile south or south-east of the Inglewood Hotel. What adds an especial interest to this rock is that it is clearly identical with the scapolite-amphibolite described by Dr. Woolnough from Blakiston.[17] I have examined sections of his rock and he of mine, and the similarity is very striking. The occurrence of very pale-green actinolite and of scapolite in poikiloblastic areas is common to both, so that I quote here Dr. Woolnough's description of the Blakiston rock as applied with modifications to the Inglewood specimen:—"The rock consists essentially of actinolite and scapolite. The structure answers admirably to the description of poikiloblastic structure given by Grubenmann. Actinolite is the most abundant constituent. At first sight it appears to be irregularly scattered about in stumpy rods, here and there aggregated into masses and irregularly bounded poikiloblastic areas. The masses are, however, crystal grains, and the surrounding rods are in optical continuity with them. The optical orientations of adjacent areas are quite independent, and in no way influ-

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(17) Trans. Roy. Soc., S.A., 1908, p. 136.

enced by the schistosity of the rock. The scapolite is perfectly colourless, and forms a base in which the actinolite is scattered. It is optically continuous over wide areas, whose boundaries are extremely irregular. [The diablastic structure of Grubenmann.] The refractive index is notably greater than that of Canada balsam, and the double refraction is quite strong. The mineral is uniaxial and negative. [Not infrequently the cleavage is very sharply marked.] Biotite pleochroic in red-brown to light-yellow tints occurs locally in the rock, forming in little rounded or irregular flakes. [Pale-brown sphene occurs in small fusiform grains.] Fine iron-ore is scattered through the rock, particularly in the actinolite."

There are to be noted, however, certain striking differences. The most important feature, and one which confirms the conclusion drawn from macroscopic evidence—that the Inglewood scapolite-amphibolite is an alteration of the Inglewood intrusion—is the occurrence of a considerable amount of microcline. This microcline also forms rather large poikiloblastic areas, including actinolite and scapolite. The occurrence of this potash felspar may be explained thus:—Scapolite is an alteration product of plagioclase felspars, as is the actinolite of pyroxene. Microcline is the altered form of orthoclase. The Blakiston rock is then to be regarded as the alteration of the dioritic form of the intrusion, *i.e.*, that form which is poor in potash felspar. The Inglewood amphibolite is an alteration of a rock more nearly allied to monzonite, in which potash felspar occurs in considerable amount. Such extremes are found well represented in the main intrusion.

Another feature not found in the Blakiston rock is the occurrence of areas of diopside in colourless but very dusty grains in optical continuity. It has just commenced to be uralitized, and this process is preceded, as is often the case in these rocks, by the formation of much dusty material not unlike kaolin. Sections perpendicular to an optic axis show that the axial angle is not far from 90°.

Along the western boundary of the intrusion occur rocks at first sight easily mistaken for schists. Two typical specimens are here described, the first occurring in the gorge of the Torrens and the second on the main road from Teatree Gully to Inglewood, just below the Recreation-ground. They are dark-green rocks, containing a great deal of quartz and felspar, but with bands of sericite and black mica giving the rock a schistose appearance. The grainsize is about 1 mm.

The Torrens Gorge rock is syenite, consisting chiefly of moiré orthoclase, occasionally passing into microcline; a little albite also occurs irregularly, often a little strained.

Considerable quartz is present, but is apparently largely secondary, being aggregated in long bands and filling cracks in felspar crystals. It often occurs in areas with a slight lepidoblastic arrangement, associated with biotite. The scaly arrangement is often perpendicular to the schistosity of the rock. Biotite occurs in some amount, some primary, some secondary. The latter occurs in the quartz aggregates between the felspar grains. A great deal of magnetite is present in irregular grains and crystals. A little secondary muscovite has been formed from the felspar. The rock may be classed as an epi-syenite.

The Recreation-ground schist is rather similar macroscopically, but under the microscope is seen to contain considerable acid plagioclase and sericite bands, in which occur also biotite and magnetite. A great deal of the smaller flakes of biotite may be secondary, and considerable quartz is present, which also is most probably secondary. This also is an epi-syenite.

548. Gneissic aplite. *Locality.*—From the quarry behind the Houghton School, Section 5519, Hundred of Yatala. *Macroscopically* white and cloudy, with parallel narrow bands of quartz and spotted with a little red hæmatite. *Microscopically* (see plate iii., fig. 5) it is seen to be composed of long parallel bands of quartz, considerably strained, among rounded or irregularly-shaped grains of felspar, chiefly microcline-microperthite, together with some orthoclase and a little plagioclase, probably acid oligoclase. A single rod or plate of ilmenite is also present, and some irregular grains. The hæmatite has been secondarily introduced; it was not formed from the grains of iron-ore in the slide, as these are quite fresh. A very little muscovite is present, apparently primary.

This type of aplite is quite common in other places to the west of the intrusion, and also occurs associated with the rocks of the titaniferous magma at Yankalilla.

"Yatalite," a new type of pegmatite.

In general every type of plutonic rock may have associated with it a pegmatite, which may be said to reflect in exaggerated form the distinguishing features of the parent magma. Granite pegmatite, for instance, is composed of the minerals most characteristic of granite quartz and acid felspar; it may contain also the ferromagnesian minerals typical of the granite, but usually it contains in increased amount the apatite, fluorite, and rare earth minerals that are present in but small amount in the main granite mass; or, again, the syenites of the gib rock near Mittagong, in New South Wales, have their distinguishing features accentuated in their peculiar pegmatite, which has been described under the name of bowralite by Mr. Mawson, B.Sc., B.E.[18] Here we have in the Houghton rocks, occurring in small lenses in the main intrusion, a type of pegmatite which has the chief characteristics of the Houghton intrusive, *i.e.*, high titanium content, acid plagioclase, original presence of diopside (now actinolite), and considerable apatite. For this pegmatite the name yatalite has been suggested. (See plate iv., fig. 11.)

Fig. 3.—Key to photograph, plate iv., fig. 11, of a specimen of Yatalite.

Yatalite is a coarse-grained pegmatite, composed of uralitic actinolite (after diopside), albite containing microcline, titaniferous magnetite, sphene, and quartz. The actinolite is the predominant mineral, occurring in large subidiomorphic paramorphs after diopside, poikilitically including the magnetite and sphene. Magnetite, rather less abundant, occurs in large crystals and smaller grains; albite is in large idiomorphic crystals, sphene and apatite are less important, and quartz occurs interstitially. The mineralogical features of each of these components have been described above (pp. 110 *et seqq.*).

(18) Proc. Linn. Soc., N.S.W., 1906, p. 606.

iv. Rocks Related to those of the Houghton Intrusion occurring near Aldgate.

Near Aldgate Railway Station there is an occurrence of granite rocks in a small creek, as recorded by Mr. Howchin.[19] A couple of hundred yards up the hill to the east of this there is an outcrop of rather fine-grained rock 0·3 mm., rather dark in colour, which *microscopically* has a hypidiomorphic to allotriomorphic granular texture, and very even grainsize. It is composed predominantly of orthoclase in very irregular grains, including a large amount of quartz in small clear grains; a considerable, though smaller, amount of plagioclase is also present, an acid oligoclase in composition. The grains of plagioclase are in general less irregular in shape than the orthoclase. Smaller, prismatic or oval, green diopside is present. It is hardly noticeably pleochroic, and its high extinction angles prove that it is not uralitized. Nevertheless, it is completely surrounded by a fine dusty mass of epidote. Quartz is present in some amount in clear, rounded, or irregular grains. It appears to have formed unusually early, often crystallizing before the felspar. Irregular to idiomorphic titaniferous magnetite is present in rather large grains. There is no sign of gneissic banding. *Name.*—Diopside quartz syenite.

The rock thrown out on to the mullock heap of the old mine a hundred yards north of here is of rather peculiar nature. In hand specimen it is greyish-green, rather schist-like, and obviously much sericitized, possibly due to the action of ore-forming solutions. *Microscopically* (slide 607) it is seen to consist of felspar and magnetite, with but little biotite, the only ferromagnesian silicate present. The felspar is acid oligoclase and orthoclase in approximately equal proportions. Sericite runs through the slide in strings and wisps. Quartz occurs in small amount and interstitially. *Name.*—Syenite, inclining to aplite.

Another type of rock outcrops on the bend of the Aldgate to Adelaide main road by the Pound (Reserve No. 2, Hundred of Noarlunga), by the granitic outcrop before mentioned. It is a fine-grained grey rock with brownish streaks often running through it. *Microscopically* (No. 602) it consists of felspar, uralite, magnetite, quartz, with accessories. The predominant felspar is orthoclase, occurring in large to small untwinned crystals, sometimes full of inclusions of irregular grains of other minerals; the orthoclase appears to have been the last mineral to crystallize, and large areas of it occur in optical continuity, in which the grains of the

(19) *Op. cit.*, p. 250.

earlier-formed constituents are imbedded. Subordinate to the orthoclase in amount, plagioclase is present, an acid oligoclase, generally in grains of a roughly prismatic outline, but often in large poikilitic patches like the orthoclase. Microcline is fairly abundant, occurring both interstitially and in the orthoclase. In the plagioclase some also occurs, but the twinning-plane of the microcline is not necessarily parallel with that of its plagioclase host, as was the case in the Houghton rocks. A few grains of microperthite are present. Diopside was originally present, but has now become a pale uralite, whose fibres extend far beyond the limits of the original crystal. The alteration was accompanied by the formation of very fine epidote, which considerably clouds the mineral. Idiomorphic crystals of magnetite are present in large amount, and appear quite fresh, though hæmatite occurs as a cementing material in parts of the slide, giving rise to the brownish streaking of the rock. Quartz occurs in small amount. Ilmenite is indicated by numerous oval patches of titanomorphite. *Name.*—Diopside quartz syenite.

A very interesting type of syenite was found included in a pegmatite vein near the track leading down to Mr. Smith's homestead (Section 1133, Onkaparinga). It is grey in hand specimen and obviously sericitic. *Microscopically* (slide 555) it appears to be related to the rock that occurred near Mr. Scrymonger's by the Torrens(see page 119). It is much clouded with sericite. The predominant mineral is microperthite, occasionally microcline-microperthite, the microcline lamellæ, however, being very small. Biotite occurs in a small amount, forming rather large flakes and intergrown with muscovite. Included in the biotite are grains of ilmenite considerably leucoxenized. In one instance sphene was present in a biotite grain, probably secondary. A few grains of quartz occur interstitially. *Name.*—Mica syenite.

Opposite Mr. Melrose's house on (or near) Section 1133, Hundred of Onkaparinga, there is another occurrence of plutonic rock intruding the Pre-Cambrian schists,[20] but absent from the overlying ilmenite grits. This is composed predominantly of oligoclase, occurring in granular anhedrons rather kaolinized, and with the formation of a great deal of secondary mica, probably paragonite, in between the grains. Orthoclase is present also, but is quite subordinate. The femic silicate is a biotite almost completely changed to chlorite, with the separation of secondary magnetite. Titaniferous magnetite is present in irregular grains fairly fresh, while rounded, clouded grains of titanomorphic occur. A

[20] W. Howchin, *op. cit.*, p. 252.

few small grains of apatite were noticed. The rock must be classed as a mica diorite.

Perhaps the most unusual type of rock in Aldgate is represented by a specimen obtained from a vein near the road leading up to the Stirling East schoolhouse. It is composed entirely of quartz and tourmaline in a kind of graphic intergrowth. (See plate iii., fig. 6.) The tourmaline occurs quite anhedrally, is violet-brown, and very strongly pleochroic. The quartz grains are rounded, somewhat strained, and very full of cavities, which are often clouded by the deposition of a red material, probably hæmatite. The clear cavities by their comparatively low relief would be probably filled with water. This rock would be best classed as a tourmaline quartz pegmatite.

Mr. Howchin informs me he has found other instances of it in the erratics in the Permo-Carboniferous glacial deposits at Black Swamp, a new locality for glacial beds of this age, between Strathalbyn and Goolwa.

v. Yankalilla.

The Yankalilla rocks of this series occur in Sections 1186 and 1187, of the Hundred of Yankalilla. They vary to a large extent in character, but though only a few slides have been examined, there is little doubt of their origin from the parent magma of the Aldgate-Houghton rocks.

Slide No. 588 is of a granite composed originally of diopside, quartz, orthoclase, plagioclase, sphene, apatite, and magnetite, probably titaniferous. It has now suffered various alterations. The quartz is very strained and partially shattered. The diopside has become partly uralitized and faintly pleochroic, but in the main its change is to epidote in large green grains, present in very large amount. The magnetite is slightly altered to hæmatite. The texture is granitic, slightly altered by crushing.

Slide 598 is composed of orthoclase and microcline, with diopside partially uralitized, epidote, quartz, sphene, and apatite, together with a sprinkling of hæmatite. This is obviously a syenite.

Other sections from this locality are in general similar to 598, differing only in the occurrence of leucoxene and the presence of a few plagioclase crystals.

vi. The Gorge, South of Normanville.

Several specimens were obtained of rocks of the Aldgate-Houghton magma, which may be briefly described.

No. 596 is a granodiorite, containing as the predominant mineral very dusty albite, together with a much smaller amount of orthoclase. Strongly pleochroic brown-green hornblende is the predominant femic silicate, uralite edged with very small epidote grains being present in but small amount. A fair amount of quartz is present. Titanium is present in ilmenite, slightly leucoxenized, and sphene, both of which are plentiful; while apatite is present in grains and prisms up to ⅓ mm. in length.

No. 590 differs from the above in the abundance of the uralite. The felspar is an acid plagioclase, and is the predominant mineral. Pericline twinning is often well developed. It is very full of liquid inclusions, which run in bands through the crystal irregularly, or is concentrated in rows parallel to the twinning plane (010) and the basal cleavage. The uralite is a pale-grassy-green, with noticeable pleochroism. The whole surface of uralite is dotted with tiny epidote grains, giving it a very roughened appearance, while a strong border of epidote has formed all round the uralites and apatites. A little limonite sometimes occurs in the uralite. Brown-green hornblende is subordinate to the uralite, and is quite fresh; while ilmenite, apatite, and quartz are the accessories in order of relative abundance.

No. 594 is remarkable for the predominance of the femic constituents. Hornblende is present in greatest abundance in idiomorphic to irregular grains, often twinned. Diopside was present in almost equal amount. It has become to a large extent changed to a pale-green uralite, becoming along the edges of the grains blue-green and strongly pleochroic. The uralite has been somewhat chloritized, and the fibres of chlorite do not remain parallel to the vertical axis of the diopside crystals. Of the felspar present, in amount nearly equal to the coloured silicates, plagioclase is distinctly the predominant. Its refractive index is slightly above that of Canada balsam, and is a basic oligoclase. It shows some pericline twinning, slightly developed. The orthoclase is quite untwinned. Both felspars are almost free from kaolinization, though a little is developed along cleavage planes. The characteristic accessories of the rocks of the Houghton magma—ilmenite and apatite—are typically developed. Epidote occurs in small amount. (See plate iv., fig. 7.) *Name.*—Diorite.

vii. Boulder from Cambrian Till, Jamestown.

Macroscopical.—Aphanitic pale-green translucent rock with phenocryst of felspar up to 5 mm. in diameter and cubes 1 mm. in diameter, of black-lustrous, weakly magnetitic, slightly titaniferous iron-ore. *Microscopical* (see plate iv., fig. 8).—Porphyritic, with phenocrysts of oligoclase-albite, fairly idiomorphic, and showing pericline twinning. It is in general rather fresher than the orthoclase, which occurs in large allotriomorphic grains, untwinned, and full of dusty inclusions. Both felspars are full of inclusions of uralite, magnetite, etc., and have somewhat decomposed with the production of kaolin. Quartz also occurs in smaller irregular crystals. The base is finely granulitic. It consists of quartz and orthoclase, the latter recognizable by its low refractive index, irregularity of outline, and slight decomposition—the former, which is predominant by its more rounded outline, greater clearness, and, where large enough, by its unaxial figure. It is difficult to say whether or not plagioclase is present in the base. One would expect it to occur, but the absence of twinning, so common in granulitic plagioclase, smallness of size, and the fact that the refractive index is nearly equal to that of quartz (certainly greater than Canada balsam) makes identification very difficult, though some grains suggest plagioclase rather than quartz. Uralite, after diopside, is the predominant ferromagnesian silicate, and occurs in the same manner as in slide 604 (Aldgate), though much smaller. With it is associated a good deal of magnetite, and the distribution of the two minerals indicates slightly the schistosity of the rock. Mica occurs both as muscovite and as biotite, the former in comparatively large, clear plates, the latter in small pleochroic brown plates. Small-rounded grains of rutile and a little apatite, as well as the secondary minerals hæmatite and leucoxene, are also present. *Name.*— —Quartzose felspar porphyry.

In three particulars this rock shows itself allied to those of the Houghton magma:—

(a) Acidity of the plagioclase.

(b) Nature, mode of occurrence, and alteration of the predominant ferromagnesian silicate.

(c) Presence of titanium.

For these reasons it seems justifiable to consider this rock as an effusive product of the Houghton magma, so that not only was the Houghton magma active in producing Pre-Cambrian plutonic intrusions, but also volcanic lavas were produced. There is at present no evidence of the seat of this volcanic activity, though it was probably south of Jamestown, the drift of the Cambrian till-forming ice being apparently northerly.[21]

viii. Olary.

The aplite referred to previously is figured on plate iv., fig. 9. It is pink in colour, with a grainsize of about 2 mm., quartz felspar and muscovite being recognizable *macroscopi-*

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(21) W. Howchin, Q.J.G.S. (lxiv.), 1908, p. 258.

cally. The latter often encrusts large crystals 10 to 15 mm. across of magnetite, which forms in rough, almost cubical masses. It has a good cleavage, and contains a little titanium, as shown by colouration of the sulphuric acid solution with hydrogen peroxide. Its specific gravity is 4·93. *Microscopically* it is composed chiefly of acid plagioclase, the grains often containing grains of quartz. Orthoclase is less abundant, and a great deal of magnetite is scattered about in grains and idiomorphic sections. A little muscovite occurs, and some intergranular limonite.

B. PETROLOGY OF THE SEDIMENTARY ROCKS.

Only a few of the sedimentary rocks have been sectioned from the districts described. These were collected almost at random, and are very different macroscopically. Microscopically, however, most of them show the closest relationship, and can hardly be other than portions of a single Pre-Cambrian sedimentary series. The exceptions are of interest as showing other formations than the one mostly represented occurring in the Pre-Cambrian rocks.

In the Houghton district in a small quarry on Sections 560 and 3420, Yatala, there occurs a green fine-grain sericitic schist, which *microscopically* is composed of a fine granoblastic groundmass of quartz, in which are imbedded small irregular porphyroblasts of quartz and microcline. These porphyroblasts are considerably strained, and appear to have suffered to some extent a marginal granulation, indicative of a return to mass-mechanical conditions after the mass-static conditions under which the predominant structure was produced. The quartz has suffered most from the straining. The microcline, being more elastic, has to a large extent escaped granulation. Occupying the greater part of the slide is a mass of sericite in very small flakes, among which are larger partially chloritized biotites, very irregular in outline. These micas give to the rock its dominant structure (the lepidoblastic structure described by Grubenmann), the texture being the lamellæ texture as defined by the same author. Magnetite partially altered to hæmatite and a few rutile needles are also present.

Somewhat similar to this is the schist occurring in the creek opposite the Pound near Aldgate Station. It is composed of angular grains of quartz about $\frac{1}{5}$ mm. in diameter set in a groundmass of colourless mica and larger flakes of biotite. It is impossible in the slide to get a flake of the mica large enough to determine by its axial angle whether the mica be muscovite or sericite. The latter appears to be the more probable. Scattered all through the micaceous groundmass are numerous short colourless prisms, with occasional cross fracture, high refractive index and birefringence. The extinction angles are in general very small, but sometimes nearly 30°. The prisms are often terminated by prism faces. These are most probably cyanite. There are also areas of brownish material, which on close examination appear to consist of highly-refractive short crystals set in a brownish-cloudy material. These are rutiles, after ilmenite. Rutile occurs separately in single crystals, brown in colour and strongly pleochroic.

Similar to the last rock, but more closely allied to the Houghton rock described previously, is the schist intruded by rocks of the Pre-Cambrian titaniferous series at Yankalilla. It consists of angular grains of quartz, with a subordinate amount of microcline, whose general outline indicates a certain schistosity set in a groundmass quite subordinate to the larger grains of mica sericite and biotite, with fine granulitic quartz. Both this slide and the last appear to present an approach to the blastopsammitic structure of Grubenmann.

From the hill above the gorge on the road from Normanville to Second Valley (Section 1103, Hundred of Yankalilla) there occurs a number of beautiful gneisses, very different in macroscopic appearance from those described above, but microscopically plainly related to them. The Yankalilla rock was very siliceous in nature—almost a quartzite—and showing only to a small extent its schistose character. The rock from the gorge is a dark-green, and showing a strongly schistose "augen" structure, the "eyes" of pink felspar or quartz being several millimetres in diameter. Its base consists of quartz and mica in alternate narrow layers. *Microscopically* it is completely schistose, the quartz occurring in long lenses of granulitic structure between long bands of fine sericite and biotite. The quartzes are somewhat strained, and the mica lamellæ bent. The eyes are porphyroblasts of quartz and microcline, the latter predominating. Both are considerably granulated at the edges. The microcline contains perthitic inclusions of albite, the host being oriented apparently without reference to the schistosity plane of the rock. The quartz would appear to have recrystallized before the microcline, or to have exerted stronger power of crystallization, as wherever the two minerals are in contact as porphyroblasts the quartz intrudes the felspar. A few crystals of magnetite are present, arranged in parallel bands. Some oval grains of rutile occur also. The structure of the rock as a whole may be defined as porphyroblastic, with a lepidoblastic groundmass.

No. 592, which also occurs at the hill above the gorge, is *microscopically* a very handsome rock (plate iv., fig. 9). It contains the same minerals as 593, but the micas are present in much smaller amount. The structure is thoroughly schistose. The predominant mineral is quartz, occurring chiefly in long-drawn-out patches, with a most irregular outline, while between the streaks of crystal the small amount of groundmass is almost granulitic. The quartz is highly strained, so that two portions of one and the same grain may have their vibration directions as much as 60° apart. Small crystals of microcline, somewhat less strained, also occur in the groundmass. Increase of size of the irregularly-bordered quartzes would give rise to an augen structure with regard to quartz, but in the present rock its blastoporphyritic growth has not proceeded as far as this. This augen structure is induced by the presence of large crystals of microcline forming eyes slightly lenticular, the diameter perpendicular to the schistosity, being much smaller than that in the parallel position. The ratio is about 3 to 5. (That of the quartz patches is nearer 1 to 6.) The microcline is plainly blastoporphyritic. It is not marginally granulated to any extent, and includes quartz grains and portions of sericite still arranged in the position of schistosity, which is due to a growth of pseudo-porphyritic grains (blastoporphyritic of Grubenmann) *after* the formation of a schistose structure in the rock by metamorphosis under mass-mechanical conditions. That mechanical conditions have been present after the formation of the blastophenocrysts is shown by the cracking of these and the formation in them of granulitic quartz veins. Microcline in considerable amount also occurs in smaller grains in the groundmass of the rock. The characteristic twinning is often much obscured (moiré); it is moulded on quartz, sometimes taking on almost a blastopoikilitic structure. Sericite and biotite form strings passing in a roughly parallel direction through the rock, bending to one side or the other around the phenocryst, though sometimes passing through it. Rutile grains also occur. Slightly oxidized titaniferous magnetite is also present.

There are also in other Pre-Cambrian areas schists closely related to these. In the Humbug Scrub there is a large area of augen gneiss. As one works up the creek running westward from the Princess Alice Mine, for instance, the schists are noticed to get gradually more and more metamorphosed, and eyes of pink felspar appear till at the mine the rock is a perfect augen gneiss, the eyes being more than an inch in diameter. Facts so far learned are insufficient to decide how far these "eyes" are porphyroblasts developed with change of chemical composition of the rock or are the result of pegmatization in the manner described by Mr. Howchin. Between these eyes are long bands of quartz and brown mica, with smaller eyes of quartz. *Microscopically* it is almost identical with 593 (the Normanville Gorge rock). The quartz "eyes" are about 5 mm. in length and half that in width, but their outline is very irregular. They are generally, however, composed of one grain only, usually very highly strained. Inclusions of liquids in small cavities are exceedingly common; of felspar and sericite rarer. The felspar "eyes" are up to 2 cm. in diameter, and are of microcline. They are also somewhat strained, and contain inclusions of quartz. They have been broken, and fine-grained quartz has recrystallized in between the broken portions. An excellent example of this is shown in fig. 4. The ground-

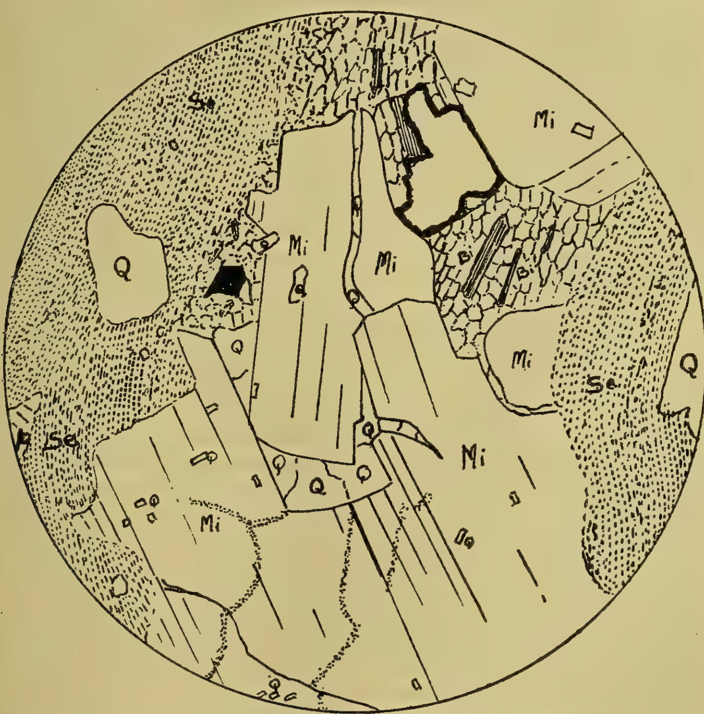

Fig. 4.—Quartz crystallizing between the nortions of a fractured porphyroblast of microcline, which also contains quartz poikilitically. Mi, microcline; Q, quartz; Se, sericite; Bi, biotote; p, perthite.

mass of the rock is a fine-grained mass of lepidoblastic quartz and biotite, largely obscured by bands of sericite. Ilmenite is present in large grains, partly leucoxenized. It generally occurs included in a sericitic band. In these bands are often flakes of dark-green biotite, dusted with secondary titaniferous magnetite.

A type of rock quite different from these is found in the Little Para just below Inglewood. It is a dull-green in colour and silky or greasy to the touch. It is chiefly composed of pale-yellow-green weakly pleochroic actinolite, whose somewhat feathery arrangement makes the structure of the rock approximate to the nematoblastic structure defined by Grubenmann. Fairly idiomorphic cross sections of the amphibole occur, however. The groundmass of the rock is made up of fine-grained granoblastic quartz, with a little poikiloblastic orthoclase and an occasional idioblast of albite. The groundmass is quite subordinate, however, to the actinolite. The feature of the rock, however, is the occurrence of a large amount of calcite, either in single grains among the actinolite or aggregated into bunches. It is generally granular. There seems little doubt that the calcite is primary, and that the rock represents a very impure limestone that has been altered probably in the lower part of the upper or metamorphism zone, as limited by Grubenmann. The conditions there were inducive of a crystalloblastic other than a katablastic structure. It should be mentioned that magnetite also occurs distributed through the rock in roughly parallel bands.

Just in front of the Houghton schoolhouse is a pale-green schist which is composed *macroscopically* of larger grains of quartz, a few large muscovite flakes, some irregular brown grains, and some black with metallic lustre, all set in a very pale-green sericitic groundmass. *Microscopically* the rock contains large irregular highly-strained quartz grains in a groundmass of granoblastic quartz. Large bent mica plates occur, and brown to purple tourmaline in irregular grains. Magnetite is present in some amount. Covering most of the quartz of the aggregate is an aggregate of very small flakes of muscovite in radiate or feathery groups. An occasional grain of rutile occurs. This does not seem to be derivable from the same sediment as the Houghton, Barossa, and Yankalilla schists, but it is doubtless a member of the same Pre-Cambrian series. The tourmaline is certainly secondary.

Another type of rock occurs just opposite the Inglewood Hotel. It is a hæmatite schist, forming in a small area in the intrusive rock. *Microscopically* its schistose texture is well marked, the rock being made up of parallel small flakes of iron-ore, with black to reddish-black metallic lustre, and deep-yellow-brown, or quite opaque when examined by transmitted light. It contains a very little quartz in small angular grains. Chemically examined, it is found to be soluble to some extent in hydrochloric acid, and upon addition of tin to the solution the violet colour shows the presence of titanium. There seems to be little reason to regard this rock as other than a sediment, such intercalations of schistose iron-ores being not infrequent in areas of ancient and metamorphosed sedimentary rocks.

Conclusion.

Below the lower Cambrian series in the Mount Lofty Ranges there lies unconformably a complex of schists and gneisses. In the several localities in which they have been examined they present varying degrees of metamorphism, ranging from sericite schists to augen gneisses; but on structural feature and mineralogical composition they appear to be all members of a single sedimentary series. In Houghton district other types of schist are also developed, notably an altered impure limestone. The evidence is insufficient for determination of their age by correlation with any of the Pre-Cambrian systems adopted outside Australia. They are generally insufficiently altered to place them in the Pre-Algonkian division.

Dr. Woolnough has suggested the very convenient name "Barossian" for the South Australian Pre-Cambrian series, and these rocks here described, being so closely related to the augen gneiss of Barossa, may fairly be held to be included in that series.

Intruding these, and typically developed in the Houghton district, though also at Aldgate, Yankalilla, and Normanville, is a series of igneous rocks, to which, on account of their felspathic nature, the term syenite would be applied by a user of the field classifications of the American authors. On microscopical investigation, however, the rocks are found to vary considerably in the relative quantities of their contained felspar. Usually plagioclase predominates, giving a diorite; while less commonly the orthoclase is predominant, giving syenite. Granites and granodiorites also occur.

The characteristic features of these intrusions are their richness in titanium as ilmenite or sphene, the acidity of the plagioclases, and the presence of diopside (now uralite). This gives rise to most unusual rock types, *e.g.*, ilmenite-diopside-diorites, ilmenite-sphene-actinolite pegmatites, ilmenite-felspar quartz pegmatites, and ilmenite quartz veins. Other localities further afield present rocks with some affinities to the Houghton magma rocks, *e.g.*, the felspar porphyry of the Jamestown erratic, containing acid plagioclase and diopside, and the acid plagioclase and titaniferous magnetite of the Olary aplites, and other rocks in that locality. In an Appendix to this paper a list of certain other rocks is given similar in some ways to the Houghton rocks.

All this tends to show the truth of the thesis outlined in the Introduction, namely, that so widespread are the rocks of this type throughout South Australia that the State may be considered as a petrographical province, the characteristic feature of which is the high percentage of titanium acid, to a less degree the abundance of soda. At present our knowledge of South Australian petrology is insufficient to show whether later igneous intrusions are so markedly titaniferous as the Pre-Cambrian or early Palæozoic derivatives of the Houghton magma. The igneous rocks of earlier date than these were certainly also titaniferous, for rutile and ilmenite are present in unusual amount in the Algonkian schists derived from them by denudation and sedimentation. The ilmenite in Cambrian ilmenite grits was derived from the denuded Houghton magma intrusions.

It is perhaps noteworthy in this connection that high titanium content is a dominant feature of the rocks of the alkaline province of Eastern Australia.(22)

Acknowledgments.

I desire to express my warmest thanks to Mr. W. Howchin, F.G.S., for the interest he has shown in the progress of this work, and the great assistance he has rendered me on every occasion in giving me most useful local geological information. I am deeply indebted, also, to Professor Rennie for allowing me to have the use of his private laboratory, apparatus, and chemicals for rock analysis; and to both Professor Rennie and Dr. W. T. Cooke for much advice and assistance. Dr. W. G. Woolnough has been kind enough to examine several of my slides and to give me the benefit of his opinion thereon.

Postscript, added October, 1909.

While the foregoing was passing through the press I received from Mr. Howchin a specimen of an intrusive into the Pre-Cambrian rocks at Mount Compass, some fifteen miles north-east of Yankalilla. Mr. Howchin states that the rock is associated with a large ilmenite vein, about a quarter of a mile long. The rock is clearly a product of the Houghton

(22) H. I. Jensen, D.Sc., Proc. Linn. Soc., N.S.W., 1908, p. 601.

magma, and its occurrence here forms another link in the chain of Pre-Cambrian intrusions. *Macroscopically* the rock is chiefly composed of pale-pink felspar, with light-green pyroxene, large and small masses of ilmenite, chiefly aggregated into lenses. Brown sphene can be distinctly seen with the aid of a handglass. *Microscopically* the felspar is orthoclase, in irregular, often interlocking, areas, sometimes perthitic, sometimes passing into microcline. Acid plagioclase is also very abundant, and occurs either as large areas poikilitically enclosing potash felspar, or in small subidiomorphic prisms. Diopside is present, almost colourless, though rather clouded. On the periphery it passes into pale, weakly pleochroic amphibole. Ilmenite is present in large amount in irregular grains and aggregates. It was one of the first minerals to crystallize. Sphene is present in small amount, in pale-brown, rounded grains. Quartz is a minor accessory. Yellow-green epidote is scattered about. The texture does not appear to be primary. Rather it suggests a recrystallization, in which the ilmenite became aggregate in layers; the plagioclase, poikiloblastic; and the potash felspar, diablastic.

Name.—Diopside syenite.

It is scarcely necessary to point out the close mineralogical affinity of this rock with those described above.

APPENDIX.

List of rocks occurring in South Australia which have been petrologically described and which show points of similarity to rocks of the Houghton magma:—

Granites.—Palmer (ilmenite and sphene present)—C. J. Moulden, Trans. Roy. Soc., S.A., vol. xix., p. 76. Kaiserstuhl, like that of Palmer, but crushed—C. J. Moulden, *loc. cit.*, p. 77.

Many others contain magnetite, but it is not reported whether or not this is titaniferous.

Pegmatite. — Everard Ranges, with irregular secretions of magnetite—H. Basedow, Trans. Roy. Soc., S.A., vol. xxix., p. 77.

This rock (if the magnetite is titaniferous) is very like the ilmenite pegmatites of Yankalilla and the Grey Spur.

Quartz Syenite.—Neale River, accompanied by magnetite—J. J. East, Trans. Roy. Soc., S.A., vol. xii., p. 39.

If the magnetite is titaniferous this may possibly belong here.

Syenite porphyry.—Yarden, Gawler Ranges, augite phenocrysts with soda orthoclase in the groundmass—C. J. Moulden, *loc. cit.*, p. 75.

Diorite.—Hall River, 23·40 S., contains hornblende, plagioclase, epidote, augite, secondary quartz, apatite, and sphene; the rock has become crushed, as indicated by a tendency to become schistose—C. J. Moulden, *loc. cit.*, p. 74.

Other titaniferous rocks in which the similarity is not so close are: —

Norite.—South Black Hill (near), contains ilmenite—Dr. Chewings, Inaugural Dissertation, Beitrage zur Kenntniss der Geologie des Süd- und Central-Australiens, Petrographischer Anhang, Heidelberg, 1894.

Amphibolite (after Diabase).—Mt. Pleasant, secondary hornblende, plagioclase, and titanite—C. Chewings, *op. cit.*

Uralitic Diabase.—Port Elliot, hornblende paramorphs, lathy felspar, biotite magnetite, and ilmenite—C. Chewings, *op. cit.*

Epidote Rock.—Mt. Zeil, MacDonnell Ranges, coarse-grained epidote, with sphene quartz and sagenitic rutile—C. Chewings, *op. cit.*

DESCRIPTION OF PLATES.

Plate III.

Fig. 1. Syenite. Locality, Section 3240, Hundred of Yatala. Note the large crystal of moiré orthoclase-perthite, also biotite, magnetite, and diopside. Polarized light. Magnification, 32 diams.

,, 2. Microcline syenite similar to that in Section 563, Hundred of Yatala. Note also uralite and sphene. Polarized light. Magnification, 32 diams.

,, 3. Ilmenite diopside diorite. Section 5657, Hundred of Yatala. Note also plagioclase, sphene, and apatite. Ordinary light. Magnification, 16 diams.

,, 4. Scapolite amphibolite. Inglewood. Note actinolite, large grain of scapolite, and much diablastic scapolite, microcline, and sphene. Polarized light. Magnification, 29 diams.

,, 5. Gneissic aplite. Section 5519, Hundred of Yatala. Note quartz and microcline. Polarized light. Magnification, 15 diams.

,, 6. Tourmaline-quartz pegmatite. Stirling East, near Aldgate. Note graphic nature of intergrowth. Ordinary light. Magnification, 13 diams.

Plate IV.

,, 7. Diorite. The Gorge, south of Normanville. Note felspar hornblende, dark-edged uralite, and magnetite. Ordinary light. Magnification, 16 diams.

,, 8. Augen schist. Normanville Gorge. Note moiré orthoclase, perthite, and quartz lenticles. Polarized light. Magnification, 26 diams.

,, 9. Quartzose felspar porphyry. A boulder in Cambrian till. Jamestown. Note phenocrysts of felspar and fine-grained nature of base. Polarized light. Magnification, 17 diams.

,, 10. Aplite. Olary. Note black cuboids of titaniferous magnetite.

,, 11. Yatalite vein with portion of diorite attached. For key see fig. 3, p. 126.

Plate V.

Geological Map of district around Houghton.

NOTES ON THE GEM-BEARING GRAVELS AT BAROSSA.

By D. Mawson, B.E., B.Sc.

[Read September 7, 1909.]

Plate VI.

Amongst a sample of gravel and pebbles obtained from the auriferous wash in the Barossa Ranges, and recently submitted to me, I found several saleable gem-stones, in addition to a large variety of valueless chips. A record of these latter is serviceable, as indicating their occurrence *in situ* amongst the crystalline schists and gneisses of the district.

This find is specially noteworthy, as having yielded the largest gem-quality ruby and the largest rough sapphire yet definitely recorded in South Australian territory.

Gem-stones of various kinds have been reported (1) widely distributed in this State, though little of commercial value has yet come to light.

Some of the more important of these are the following:— *Beryl*, variety *Aquamarine*,(2) occurs in the form of crystals embedded in quartz reefs and coarse quartz felspar reefs in the Mount Lofty Ranges, notably in the Barossa District. More recently I unearthed an important occurrence at Albegudina Creek, on Bimbowrie Station, about twenty miles north of Olary. There the crystals occur embedded in white quartz reefs, and were found measuring up to 5 in. in diameter and 1 ft. 6 in. long. In all these occurrences the beryl is light coloured, and usually so much flawed as to be useless. However, good cuttable aquamarine and more deeply-coloured stones have been got from the workings near Williamstown. Small crystals only about $\frac{1}{8}$-in. in diameter of the variety emerald occur embedded in a tourmaline-bearing aplitic granite on the south bank of the South Para River, south-east of Williamstown.

Translucent *tourmaline* of excellent quality has been found in coarse granite pegmatite, notably on Kangaroo Island,(3) where both *rubellite* and *indicolite* have been mined.

An extensive formation of *corundum* schist carrying the coloured varieties has been reported by Mr. H. Y. L. Brown from Mount Paynter,(4) but so far this locality has yielded no cuttable stones.

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(1) *Vide* "Record of the Mines of South Australia," 4th ed., 1908, p. 358, by H. Y. L. Brown, Government Geologist. Published by authority.

(2) *Vide ibid*, also "A Catalogue of South Australian Minerals," by T. C. Cloud. Trans. Roy. Soc., S.A., vol. 6, p. 72.

(3) *Ibid*, p. 360.

(4) *Ibid*, p. 358.

Fragments of gem-stones have been reported widely distributed amongst the river gravels. Notable amongst these is the occurrence of *diamonds* in the gold-bearing gravels of Echunga. Fifty or more saleable diamonds were got from this field, some embedded in a hard cement at the base of the wash, others in the softer gravels above.

Abundance of almandine *garnets*,(5) locally called Australian rubies, have been got from the river gravels, notably from the MacDonnell Ranges. These are excellent stones when cut, and would be much more in vogue were they not so abundant.

Mr. H. Y. L. Brown has reported small fragments of a variety of gem-stones from the auriferous gravels at Daw's Diggings, Kangaroo Island.

They include the following:—*Oriental ruby*, *sapphire*, *amethyst*, and *white sapphire;* also *cyanite*, *zircon*, and *tourmaline*—*monazite* and *rutile* are present also.

Sapphire and *cyanite* have been reported in gravels from the vicinity of Mount Crawford, in the Barossa Ranges, and from the Echunga field, but no exact and detailed information is published.

The gravel, from which were isolated the stones specially referred to in this paper, was obtained as a refuse product from puddling operations at the Gordon Reward Claim, about one and a half miles south of Williamstown. The property has been worked for gold and rutile. Numerous shafts sunk on it show the depth to vary from *nil* to 30 ft. Only the lower foot or two has been found profitable to work.

The extent of this placer has been delineated by the Geological Survey Deartment,(6) and it is referred to as Tertiary in age. In general these gravels are to be correlated with the late Tertiary and recent auriferous gravels of Eastern Australia.

At the Gordon Reward Claim the placer formation occupies ten acres or less, and forms a flat capping (see plate vi., figs. 1 and 2) on steeply-dipping schists. The flat top is part of a once continuous base level, since then much dissected by the South Para River and its tributaries. Other fragmentary relics of the high-level alluvial occur in the vicinity, and are figured in the official map.

The underlying schists are either Pre-Cambrian or part of the lower Cambrian series highly metamorphosed, which latter have been traced in the vicinity by Mr. W. Howchin.

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(5) Note specially, "On some So-called South Australian Rubies," by Professor E. H. Rennie, Trans. Roy. Soc., S.A., vol. xi., p. 17.

(6) "Geological Map of the Tertiary Deposits of the Hundred of Barossa," by H. Y. L. Brown, 1889. Published by authority.

Nearer Mount Crawford are cyanite and rutile schists, and occasional reefs containing beryl, from which, no doubt, some of the gem fragments in the gravel originated.

The placer formation contains rounded pebbles and boulders of quartz, some of which are brilliant, clear, and flawless. The finer material consists of gravel containing rounded grains and pebbles up to 2 in. in diameter of rough blue corundum (sapphire), much crystal rutile, and coarse gold, besides small fragments of a variety of gem-stones, as detailed below. The whole is bound together by a tough clay.

Corundum.—About 6 lb. weight of waterworn pebbles of *sapphire* were examined. These are much cracked, and not of gem quality. In microscope section they are shown to be composed entirely of corundum, though many individuals contribute to the aggregate. A strong tendency is shown for the individuals to arrange themselves parallel in the direction of their hexad axes. The cornflower-blue colouring is strongest on the periphery of the crystals and decreases within, the centres being frequently colourless. One specimen is portion of a large crystal, $\frac{3}{4}$-in. in diameter, and shows deep-blue edges bordering a light-pink coloured centre.

Small gem-quality fragments of both the sapphire and the light-pink variety were also found. Several specimens of these latter are specially good. The best stone found weighed just over one carat, and is of a pale-rose-pink colour. This pale variety of ruby is sometimes called *female ruby*, to distinguish it from the masculine ruby of deep pigeon-blood-red colour. Similar stones, one weighing half-carat and four others of less size, were isolated. All show waterworn outlines. The specific gravity of the several types of corundum is remarkably uniform, being 3·8.

A flat cleavage chip was found, about 1-16 in. thick and $\frac{5}{8}$ in. in diameter, with hexagonal outline, and divided into sectors by bluish lines radiating from the centre. This feature leads to the production of asterism.

Topaz.—Small fragments of *golden topaz;* none, however, suitable for cutting. About forty of these, averaging quarter-carat, were examined. Several were useful fragments of *clear white topaz*, one of which weighed one carat. This latter is particularly good stone. They have waterworn surfaces.

Aquamarine.—About fourteen fragments of small size up to one-third carat, of a pale-blue colour. They show a splintery surface.

Chrysoberyl occurs abundantly as small fragments of a honey-yellow colour. These exhibit a sharp, fractured surface. They were met with up to about half-carat in weight.

The specific gravity, determined by Mr. W. S. Chapman, Analyst to the Mines Department, varies slightly in the vicinity of 3·6. Many of the chips examined under polarized light exhibit the usual twinning. They scratch topaz readily.

CYANITE of a blue colour occurs abundantly, but the waterworn flakes are too small to be of value.

SAGENITE.—Small waterworn grains and fragments, sometimes as much as two carats in weight, of a golden-coloured mineral resembling *tigers-eye* are abundantly distributed through the gravel. Under the microscope the effect is seen to be produced by very numerous parallel hairs of rutile traversing quartz.

One small pebble of clear quartz shows several hairs of rutile crossing it, after the manner of *Venus's hair stone.*

AVENTURINE.—One waterworn fragment.

AMETHYST.—Several pebbles of pale-coloured amethyst.

ROCK CRYSTAL.—Many of the waterworn, crystal-clear quartz pebbles are as brilliant, and appear similar to, the white topaz. Indeed, the miners call it topaz. It is, however, easily distinguished by the use of heavy solutions, though the absence of basal cleavage is not easily detected in waterworn specimens.

HYACINTH.—One fragment, about $\frac{3}{16}$ in. in diameter, with specific gravity about 4·2, of a clear orange-yellow mineral, has been isolated by Mr. W. S. Chapman. This fragment has a hardness of 7·5, and agrees in other ways with the gem quality of zircon.

TOURMALINE.—Abundance of small waterworn particles of an opaque-black worthless quality.

MONAZITE.—Several small grains of a light-yellow heavy mineral, resembling monazite.

RUTILE.—Abundance of crystal rutile up to $\frac{1}{2}$ in. in diameter, with the edges more or less waterworn. The crystals appear dark-coloured, though the powder is of a very light-yellow colour.

GOLD.—Coarse waterworn fragments and colours.

Specimens of the female ruby, topaz, topaz-like rock crystal, and tigers-eye have been cut, and form handsome stones.

EXPLANATION OF PLATE VI.

Fig. 1.—Photograph taken about 500 yards north looking towards the Gordon Reward placer, which forms the flat-topped hill in the distance occupying from the centre to the right of the picture.

Fig. 2.—Photograph taken in a side gully looking east, again showing the characteristic flat top of the placer. In the foreground are heaps of white quartz pebbles, accumulated as refuse during the puddling of the wash.

Descriptions of Australian Curculionidæ, with Notes on Previously Described Species.

By Arthur M. Lea.

Part VII.

[Read May 4, 1909.]

SUBFAMILY OTIORHYNCHIDES.

Myllocerus niveus, Lea.

Two specimens from North-Western Australia differ from the types in having the scales somewhat dingy (probably from age) and the elytral setæ less conspicuous.

Myllocerus carinatus, Lea.

There is a specimen of this species in the Macleay Museum from the Tweed River.

Myllocerus cinerascens, Pasc.

There are two specimens of this species in the Macleay Museum labelled "Interior S. Aust."

Myllocerus canalicornis, n. sp.

Dark-reddish-brown, sometimes black; antennæ and legs more or less diluted with red. Densely clothed with white or whitish scales. In addition with rather indistinct setæ.

Head almost flat between eyes; these large and rather strongly convex. Rostrum slightly longer than wide; sublateral carinæ strongly and suddenly incurved at middle, but normally almost concealed; with a fine median but normally concealed carina. Antennæ (for the genus) not very thin; scape narrowly grooved on its lower surface; first joint of funicle slightly longer than second. *Prothorax* more convex than usual, not much wider than long, sides strongly and evenly rounded, base moderately bisinuate, apex very feebly incurved to middle and almost as wide as base, with rather small and more or less concealed punctures. *Elytra* much wider than prothorax, almost parallel-sided to beyond the middle; striate-punctate, striæ distinct before abrasion, punctures fairly large, but normally almost concealed; interstices feebly separately convex. *Femora* feebly dentate. Length, 5-5½ mm.

Hab.—North-Western Australia (Macleay Museum).

Rather close to *abundans*, but smaller and with different clothing, prothorax more regularly rounded and narrower at the base, apex less noticeably incurved, and elytra considerably narrower.

The scape is sometimes almost black, and is usually darker than the funicle and club. On the elytra the setæ at a glance usually appear to be altogether absent, but on examination they may be seen pressed flat amongst the scales. From certain directions the second joint of the funicle appears to be as long as the first, or even slightly longer. On abrasion the prothoracic punctures are seen to be rather small and not dense, but round and very sharply defined.

Mylloceras foveiceps, n. sp.

Reddish-brown or black, antennæ and legs more or less reddish. Densely clothed with whitish scales, and in addition with whitish setæ.

Head gently concave between eyes; these large and strongly convex. Rostrum slightly longer than wide, sides feebly incurved, sublateral carinæ strong and rather feebly incurved; median carina absent. Antennæ thin; first joint of funicle slightly shorter than second and third combined, second slightly shorter than third and fourth combined. *Prothorax* almost as long as wide, base strongly bisinuate, apex truncate and slightly narrower than base, sides gently rounded on apical half and very feebly incurved towards base; punctures normally almost concealed. *Elytra* rather narrow, distinctly wider than prothorax, sides very feebly dilated to beyond the middle, striate-punctate; striæ feeble but distinct before abrasion, punctures of moderate size, but normally almost concealed. *Femora* feebly dentate. Length, 5 mm.

Hab.—North-Western Australia (Macleay Museum).

The incurvature of the sides towards base of prothorax is somewhat as in *mirabilis*, but the base itself is considerably narrower, and there are no depressions on its surface, the antennæ are decidedly thinner, the elytral setæ are much less conspicuous, and the rostrum is very different.

There are but two specimens before me, one of which has the derm reddish-brown, whilst in the other it is black, but the colour of the derm in *Myllocerus* seldom appears to be constant. On the elytra the setæ are fairly stout, and form a single row on each interstice, but they appear to be absent at first as (except on the posterior declivity, where they are feebly elevated) they are placed flat amongst the scales. On complete abrasion a fairly large interocular fovea appears, and the rostrum is seen to be concave along the middle, with its sublateral carinæ continued to about the middle of the eyes.

Myllocerus incurvus, n. sp.

Black; antennæ (the club lightly infuscate) and legs reddish. Densely clothed with green scales, sometimes vaguely spotted with brown, and occasionally with a coppery gloss in parts; under surface and legs with whitish or whitish-green scales. Prothorax with stout setæ not rising above general level; elytra with stout decumbent setæ, forming a single row on each interstice.

Rostrum about as long as wide, sides very feebly incurved; depressed along middle; with three carinæ, of which the median one is almost concealed, the others almost parallel-sided on their hind half, but strongly curved about the pits of the scrobes. Antennæ long; scape moderately curved; first joint of funicle almost as long as second and third combined. *Prothorax* about twice as wide as long, base strongly bisinuate and considerably wider than apex, the latter very distinctly incurved to middle; punctures of moderate size but normally concealed. *Elytra* very little wider than prothorax, parallel-sided to near apex; striate-punctate, punctures fairly large but more or less concealed. Length (including rostrum), 5-6 mm.

Hab.—North-Western Australia (Macleay Museum and Taylor Bros.).

In the table previously given by me should be placed next to *Bovilli*, but the incurvature at apex of prothorax is not so deep, the prothorax itself is longer and less flat, and the rostrum is longer and stouter. The prothorax is shorter and flatter than in *abundans*, apex more noticeably incurved, rostrum of different shape, eyes more conspicuous, elytral setæ less noticeable, etc.

The elytral setæ, although fairly stout, are indistinct from most directions. The scales are usually of a bright-green, but on the elytra there are occasionally brown spots, occasionally some of the scales have a slight coppery gloss, or a single scale here and there may be of a fiery golden colour. On the head and prothorax of one specimen most of the scales are bluish. On one specimen before me (and I have seen others) the whole of the scales are of a dull white. The femora at a glance appear to be edentate, but on close examination an exceedingly small tooth may generally be seen on each, but it is quite invisible from most directions.

Myllocerus Taylori, n. sp.

Black; tibiæ and tarsi reddish, the antennæ and femora somewhat darker. Densely clothed with pale-green scales, becoming paler along the middle of the under surface and on the legs. Prothorax with numerous whitish setæ, usually slightly raised above general level; elytra with scarcely raised setæ, forming one or two very irregular rows on each interstice, but more numerous on the hind half of the suture.

Eyes larger and more convex than usual. Rostrum just perceptibly wider than long, sides lightly incurved, depressed along middle, with an impunctate and shining median line; sublateral carinæ rather distant, and parallel except in front. Antennæ rather long; scape moderately curved; first joint of funicle slightly stouter but scarcely longer than second. *Prothorax* about once and one half as wide as long, base considerably wider than apex, the latter rather lightly but distinctly incurved to middle; punctures of moderate size, round and deep, but normally concealed. *Elytra* and *femora* as in the preceding species. Length (including rostrum), 7 mm.

Hab.—North Queensland (Taylor Bros.).

Differs from a species which I believe to be *aphthosus* by its absence of black spots on the elytra, and by the rostrum having an impunctate line instead of a median carina; the under surface of the rostrum also appears to be separated from the head by a short, deep groove, somewhat as in *mirabilis;* but it has not the backwardly projecting process of that species. In my table it should be placed next to *abundans*, from which it differs in its wider rostrum, much more prominent eyes, narrower elytra, scape not grooved on its lower surface, etc. From some directions the scales appear to have a faint coppery gloss; and also the second joint of the funicle appears to be slightly longer than the first.

Myllocerus castor, n. sp.

Black; antennæ and legs more or less reddish. Densely clothed with greyish-white scales, thickly interspersed with small brown spots on the elytra; the prothorax usually with two irregular and widely-separated brown stripes. Prothorax with distinct setæ, slightly raised above general level; elytra with thin semi-upright setæ, usually confined to a single row on each interstice.

Rostrum longer than wide, sides rather strongly incurved, with three distinct carinæ, of which the sublateral ones are parallel except in front. Antennæ long; scape moderately curved and rather stout; first joint of funicle slightly longer than second. *Prothorax* about once and one half as wide as long, base strongly bisinuate and distinctly wider than apex, the latter lightly incurved to middle; punctures large, but more or less concealed. *Elytra* considerably wider than prothorax, parallel-sided to beyond the middle; striate-punctate, striæ distinct, punctures rather large but more or less concealed. *Femora* stout, minutely dentate. Length (including rostrum), $5\frac{3}{4}$-$6\frac{1}{2}$ mm.

Hab.—Queensland: Brisbane (A. J. Turner), Blackall Ranges (H. Hacker).

In some respects close to *modestus*, but rostrum thinner, antennæ stouter, prothorax increasing in width to base and there considerably wider, and clothing different. Sides of prothorax less rounded than in *cinerascens*, second joint of antennæ different, eyes more prominent, rostrum wider, setæ different, etc. The femoral teeth, although small, are quite distinct from certain directions.

MYLLOCERUS POLLUX, n. sp.

Black; legs and antennæ more or less obscurely diluted with red. Densely clothed with greyish scales, thickly interspersed with small brown spots on the elytra; the prothorax with or without an obscure stripe towards each side. Setæ of prothorax not raised above general level, those on the elytra rather stout and decumbent.

Rostrum and antennæ as in the preceding species. *Prothorax* about once and one half as wide as long, base strongly bisinuate and much wider than apex, the latter very feebly incurved to middle, with large but more or less concealed punctures. *Elytra* very little wider than prothorax, but otherwise as in the preceding species. *Femora* rather feebly dentate. Length (including rostrum), $6\frac{3}{4}$-$7\frac{1}{4}$ mm.

Hab.—Queensland: Cooktown (H. Hacker), Endeavour River (C. French).

In the table previously given by me this species should be placed with *cinerascens*, from which it differs in being narrower, in the rostrum wider, antennæ more distant at their bases, two basal joints of funicle shorter and stouter, eyes more convex and prominent, and prothorax with different punctures. In general appearance it is close to the preceding species, and the femora are much the same, but the prothorax decidedly wider at the base, where its width is almost equal to that of elytra, and the elytral setæ much less distinct, although apparently the same in number and disposition. The club, on the three specimens before me, is paler than the rest of the antennæ, instead of being darker as is usually the case. The femora are darker than the tibiæ and tarsi. The elytra of one specimen are of a dull red.

PROXYRODES VIRIDIPICTUS, n. sp.

Black; antennæ (club somewhat infuscate) and legs of a rather bright-red. Densely clothed with bright-green scales, of which a few have a slight golden gleam; under surface and legs mostly with whitish or greyish scales.

Head rather convex. Eyes more rounded on their inner than their outer sides. Rostrum very short (very decidedly wider than long), feebly depressed along middle; at apex without a triangular plate, but with a semi-circular impression, the hind margin of which is formed by an acute carina. Antennæ thin; scape moderately curved; first joint of funicle almost as long as second and third combined. *Prothorax* about once and one fourth as wide as long, sides strongly rounded, base truncate and distinctly narrower than apex, the latter lightly but distinctly incurved to middle; punctures apparently large, but more or less concealed. *Elytra* scarcely wider than middle of prothorax; parallel-sided to beyond the middle; striate-punctate, striæ distinct but punctures more or less concealed. *Femora* stout and acutely dentate. Length (including rostrum), 4½ mm.

Hab.—Queensland: Cape York (H. Elgner).

Agrees in all details with the description of this genus;(1) but the clothing of a very different nature to that noted for *maculatus*, and the prothorax not bisinuate at base and otherwise different. The upper surface from most directions appears to be entirely without setæ; but a few may be seen on the elytra from the sides.

TIMARETA PUNCTICOLLIS, n. sp.

Of a pale- or dark-reddish-brown, sometimes almost black; appendages paler. Densely clothed with whitish scales often feebly mottled with pale-brown, and frequently with a rosy or golden gloss. With dense, fine, white setæ.

Eyes not very prominent. Scrobes fairly distinct from above. Antennæ apparently extending to base of prothorax; scape thickened and curved at apex; two basal joints of funicle subequal in length. *Prothorax* distinctly transverse, sides strongly and regularly rounded, median line absent; with fairly numerous and clearly-defined punctures of moderate size, and which are not entirely concealed before abrasion. *Elytra* ovate; striate-punctate, punctures fairly large, becoming smaller posteriorly; interstices wide, gently and regularly convex, and with small and dense punctures. *Under surface* with rather smaller punctures than on prothorax;

(1) Mr. Blackburn states that *Proxyrodes* differs from all allied genera, except *Proxyrus*, by its dentate femora; but several species of *Myllocerus*, both Australian and foreign, have dentate femora.

middle of basal segment of abdomen gently concave in male, convex in female. *Tibiæ* curved and at apex inflated, front pair flattened at apex and with a strong inner hook. Length, 4-6 mm.

Hab.—Tasmania: Nubeena (at roots of plants close to seabeach, A. M. Lea).

The pale-brown markings of the upper surface are never strongly defined, and consist of small spots on the elytra and traces of three stripes (confined to the base) on the prothorax; but they are often absent. The golden gloss may be almost general, confined to a few scattered scales, or absent. Scales, except at the sides of metasternum and abdomen, are almost absent from the under surface. The elytral punctures on the basal half can be traced before abrasion. The prothorax is without traces of granules.

Readily distinguished from other species of *Timareta* by the regular and clearly-defined prothoracic punctures, which can be seen to a certain extent (unless the specimens are greasy) even before abrasion. The metallic or rosy gloss which many of the scales have is also a distinctive feature, but in this they agree to a certain extent with *pilosa* (Blackb.), which, however, has very different hind tibiæ in the male. The eyes are less conspicuous than in *subterranea*, the scape is longer, thinner, and more curved. Specimens tend to get greasy with age, and when greasy the metallic gloss is often lost.

This species and the three following ones are so closely allied, and their clothing is so variable, that before abrasion it is difficult to point out any very satisfactory distinguishing features; after abrasion, however, they are fairly easily distinguished by the punctures, etc., of the prothorax. To render this clearer I give a table of the species, including with them *subterranea* from King Island. They are all to be taken in abundance at the roots of beach-growing plants.

Prothorax without traces of granules.	
Prothorax with clearly defined punctures of moderate size	*puncticollis.*
Prothorax with moderate punctures scattered amongst very small ones ...	*intermixta.*
Prothorax at least with traces of granules.	
Median line distinct	*Swanseaensis.*
Median line absent or almost so.	
With a smoky spot in middle of base of head	*inconstans.*
Without such a spot	*subterranea.*

Timareta intermixta, n. sp.

Eyes small and prominent. Scrobes very distinct from above. Antennæ apparently slightly passing base of prothorax, scape slightly thinner than in the preceding. *Prothorax* with numerous minute punctures, and a few of moderate size scattered about; median line just traceable in places. *Under surface* with punctures the size of the larger ones on prothorax. Length, 4-6½ mm.

Hab.—Tasmania: Ulverstone (A. M. Lea).

This and the two following species also vary from a pale-reddish-brown almost to black, and their setæ are much the same. The clothing is also of the same density, although variable in pattern. I have compared them with the above description of *puncticollis*, and the features in which they agree exactly have been omitted.

The dark mottling of the scales is more noticeable than in the other species here described. On almost all the specimens before me there is a large subquadrate patch of smoky scales occupying the greater portion of the prothorax, this being bounded by a whitish stripe on each side; on the elytra the white scales are often in a minority, the bulk of the scales being slightly infuscated or subochreous, with darker spots (sometimes appearing as short stripes) scattered about.

Timareta inconstans, n. sp.

Eyes, scrobes, and antennæ as in the preceding species. *Prothorax* densely and minutely punctate, and with traces of numerous feeble granules; median line almost absent. *Abdomen* with small dense punctures, and with larger ones on basal segments. Length, 5-6 mm.

Hab.—Tasmania: Hobart (A. M. Lea).

The bulk of the scales are whitish, or with a tinge (sometimes a very decided one) of blue, with a very faint rosy gleam in places on an occasional specimen. On the prothorax there is always a more or less distinct smoky interrupted line along the middle, and the line is continued on to the head; but when greasy it is less distinct; there is also occasionally a short smoky line on each side of he base; on the elytra there are usually (especially in the males) fairly numerous smoky spots, and which are more numerous towards the suture than the sides.

Timareta Swanseaensis, n. sp.

Eyes and scrobes almost as in *puncticollis*. Scape somewhat thinner, but not straighter. *Prothorax* with dense and minute punctures, and with a row of larger punctures forming a distinct median line; with very indistinct traces of granules. Length, 5-7 mm.

Hab.—Tasmania: Swansea (A. M. Lea).

The bulk of the scales are whitish, but with large patches of very pale-ochreous ones, and on the elytra (especially in the males) with very feeble smoky spots. On the prothorax there is often a large subquadrate patch, somewhat as in *intermixta*, but much less clearly defined, or traces of this may remain as three very feeble lines. There is usually a fairly distinct spot of whitish scales on the third interstice at the base. Not infrequently, however, the only markings are very feeble mottlings of pale-ochreous. The traces of granules on the prothorax are much less distinct than on the preceding species, but the abdominal punctures are much the same.

TIMARETA NODIPENNIS, n. sp.

Black, appendages more or less red. Densely clothed with light-brown or slaty-grey feebly-mottled scales; each side of prothorax with a stripe of subochreous scales. With stout, semi-decumbent, whitish setæ scattered about.

Head with minute, normally-concealed punctures. Rostrum about as long as its greatest width; apex glabrous and with numerous small punctures; with a narrow, normally-distinct median carina. Antennæ rather long and thin; scape lightly curved; two basal joints of funicle rather long, subequal in length. *Prothorax* moderately transverse, sides rather strongly rounded, base about one-fourth wider than apex; median line distinct; with numerous rather large, flattened, partially-concealed granules. *Elytra* subovate; with series of large, partially-concealed punctures in rather feeble striæ; suture third and fifth interstices raised and granulate about summit of posterior declivity. *Legs* moderately long; front coxæ large, not quite touching; front femora stout; front tibiæ denticulate below. Length, $5\frac{3}{4}$-7 mm.

Hab.—Western Australia: King George Sound (Macleay Museum and E. W. Ferguson), Mount Barker (R. Helms).

The male differs from the female in being smaller, the prothorax wider, the elytra narrower, with considerably larger punctures, the two basal segments of abdomen depressed in middle, and the legs longer.

Readily distinguished from all other described species of the genus by the sculpture of the elytra. The specimens from the Macleay Museum were given to me under the unpublished name of *Asceparnus nodipennis*, Pasc.

An occasional specimen has the whole of the derm diluted with red. The tarsi (except the claws) and antennæ appear to be always reddish; the tibiæ are generally more or less distinctly diluted with red; the femora are also sometimes reddish, but are usually black. The mottling of the scales is usually more noticeable *on* and about the posterior declivity than elsewhere. On some specimens most of the setæ are stramineous instead of white. Each of the prothoracic granules on abrasion is seen to have numerous small punctures, with a rather larger central one. The elytra have a peculiarly rough appearance about summit of posterior declivity, although the granules there are not very large: on the third interstice the series of granules is suddenly interrupted, so that a distinct depression appears: the apex of the fifth (some distance before the apex of the elytra) is marked by a small tubercle, or some small conjoined granules. There are also a few feeble granules towards the sides.

Timareta duplicata, n. sp.

Black or dull-brown, appendages more or less diluted with red. Rather densely clothed with light-brown or fawn-coloured scales, feebly mottled with darker brown; under-surface with paler and sparser clothing than elsewhere. With stramineous or whitish setæ scattered about, and mostly formed into a single row on each elytral interstice.

Head with minute partially-concealed punctures. Rostrum with sides scarcely visibly incurved to middle, inter-antennary space rather lightly narrowed hindwards so that at its base it is about two-thirds the width of its apex; carina rather feeble, but normally distinct throughout. Antennæ rather thin; scape rather lightly curved; two basal joints of funicle moderately long, subequal in length. *Prothorax* almost as long as wide, sides moderately rounded, base not much but distinctly wider than apex; median line feeble; with dense small, partially-concealed granules. *Elytra* subovate; with rather large partially-concealed punctures, in rather feeble striæ; interstices gently convex, the third, fifth, and seventh scarcely visibly raised. Front *coxæ* touching at exact middle; front femora stout; front tibiæ moderately denticulate below. Length, $4\frac{3}{4}$-$6\frac{1}{2}$ mm.

Hab.—New South Wales: Galston (D. Dumbrell), National Park (A. M. Lea), Blue Mountains (H. J. Carter).

The male differs from the female in being smaller, the elytra narrower, and with larger punctures, and the legs slightly longer with stouter femora.

In general appearance remarkably close to some forms of *granicollis*, but the rostrum wider with the inter-antennary space much less narrowed behind, and the scrobes considerably deeper.

Of the six specimens before me most of the derm of the head, rostrum, prothorax, and under surface is black, but the elytra are sometimes diluted with red: one specimen has the derm entirely red. Four have the legs (except the claws) entirely red, two have the femora almost entirely black, and one of these has the tibiæ almost black. The clothing is but feebly variegated, and to the naked eye appears to be of a dull-muddy-grey.

TIMARETA XANTHORRHŒÆ, n. sp.

Dull-red, claws black. Rather densely clothed with greyish-white or bluish-white scales, with feeble light-brown markings; under-surface with rather sparse subsetose clothing. With numerous erect whitish setæ.

Head with minute, normally-concealed punctures. Rostrum short, parallel-sided, inter-antennary space strongly narrowed hindwards. Antennæ thin; scape moderately curved; basal joint of funicle stouter and slightly longer than second. *Prothorax* almost as long as wide, sides rather strongly rounded; with rather small punctures and obsolete granules, both normally almost or quite concealed; median line very indistinct. *Elytra* subovate or subcordate; with series of rather large, partially-concealed punctures, in feeble striæ; interstices gently convex, not alternately raised. Front *coxæ* not quite touching; femora stout, especially the front pair; front tibiæ with several stout setæ or spines, but not denticulate below. Length, $3\frac{1}{3}$-$4\frac{1}{2}$ mm.

Hab.—Western Australia: Darling Ranges (A. M. Lea).

The male differs from the female in being smaller, the elytra narrower and with larger punctures, the two basal segments of abdomen flat (instead of gently convex) in middle, and the legs slightly longer.

A comparatively small, narrow species not very close to any other known to me. The setæ are very conspicuous, especially on the elytra. On the prothorax the light-brown markings form three feeble longitudinal stripes, of which the outer ones are sometimes not continuous to the apex. On the elytra there is generally a patch of the light-brown scales obliqely bounded close to the summit of the posterior declivity, by pale scales, but often continued along the suture and sometimes feebly dilated about the apex. On an occasional specimen the elytra appear to have numerous small whitish spots. Occasionally the clothing is of a uniform dull grey. Numerous specimens were obtained from a species of *Xanthorrhœa*.

SUBFAMILY LEPTOPSIDES.

CATASARCUS OVINUS, Pasc.

There are numerous specimens before me which I refer to this species. They differ from *opimus* in being somewhat narrower, and with the elytral punctures rather less conspicuous, but in particular by the intermediate carinæ of the head being of normal form, although rather closer together than usual. The clothing is very readily abraded, but on the prothorax is fairly dense; frequently, however, owing to partial abrasion, there appears to be a feeble median nude line; in the elytral punctures it varies from greyish-white to golden. The length varies from 8 to 12 mm.

One specimen has the peculiar varnish that appears liable to occur in any species of this genus.

My specimens are from Western Australia (Albany, Mount Barker, and Swan River); the type was recorded from Queensland, but this I believe to be an error, as I do not think that any species of the genus *Catasarcus* occurs in Queensland, and recent experience with specimens from various European museums has shown me that wrong localities are frequently attached to insects from Australia.

Catasarcus ceratus, Pasc.

Of the type of this species Mr. Gahan wrote to me:—"The basal joint of the funicle is slightly longer than the second joint." This is in contradiction to the original description.

Catasarcus granulatus, n. sp.

Black; appendages (knees, tarsi, and tips of tibiæ excepted) dark-red.

Head with lateral carinæ strong and almost parallel-sided, the median ones short, with a deep impression between them; behind the impression a feeble subtriangular elevation. Rostrum with median carina shining and more conspicuous than the lateral ones, which are sparsely but rather strongly punctured. First joint of funicle scarcely once and one-half the length of second. *Prothorax* strongly transverse; with small, irregular, transversely-arranged wrinkles, and with small scattered punctures. *Elytra* large, subhumeral tubercle almost obsolete; with rows of fairly large but rather shallow punctures: interstices much wider than punctures, and with numerous small granules. Length (excluding rostrum), 13½-19 mm.

Hab.—Western Australia: Geraldton (A. M. Lea).

The clothing, which consists of whitish scales and setæ, is very sparse on the three specimens before me, and is probably never very dense. On the prothorax and elytra it appears to be confined to the punctures, and on the head and rostrum to the grooves; on the lower surface it is irregularly distributed. But in all species of *Catasarcus* the clothing is very readily abraded. On the prothorax at the sides there are fairly numerous but irregular granules, but on the disc the feeble transverse folds are seldom broken up into granules. On the elytra the granules are frequently so arranged as to form feeble rings around the punctures; between puncture and puncture there is often a feeble ridge (depressed in its middle), apparently formed by conjoined granules.

In appearance much like *rufipes*, but the elytral punctures surrounded with isolated granules, and the carinæ on the head somewhat different.

CATASARCUS MOLLIS, n. sp.

Black, appendages red; basal half of antennæ infuscate, claws and club black.

Head with small, dense punctures, and with a few scattered ones of slightly larger size; with four strong and very decidedly curved carinæ. Median carina of rostrum comparatively narrow, but very distinct to where it extends into the apical triangle, lateral carinæ with coarse and somewhat irregular punctures. First joint of funicle about once and one-half the length of second. *Prothorax* strongly transverse; with small, dense, and more or less angular granules; with dense, minute punctures, and with some larger ones, but still small, scattered about. *Elytra* large; subhumeral tubercle stout and slightly curved; with rows of large and rather deep punctures, becoming small posteriorly; interstices somewhat wrinkled, with sparse, small punctures, and with still smaller but somewhat denser ones. Length, 14½-16 mm.

Hab.—Western Australia: Mount Barker and Albany (R. Helms).

On the two specimens before me the clothing is much as on the preceding species, except that it has a slight golden tinge; this, however, is probably not a constant distinction. One of the specimens has the knees very slightly infuscated. The carinæ on the head are at about equal distances apart where they terminate in front, but about their middle the space between the two median ones is fully half the total space between the two outer ones. The elytral interstices on the basal half appear to be sinuous and narrower than the punctures, but posteriorly they are wider than the punctures and less sinuous. From certain directions they appear to be covered with very feeble granules.

The carinæ on the head are as described in *pollinosus*, but the elytral punctures are larger than usual, instead of small and remote. In his description of *pollinosus* Pascoe assumed that "the peculiar waxy appearance is not an exudation to be rubbed off, but is a part of the tegument itself."

This I believe to be an error.[2] In appearance it somewhat resembles *maculatus*, but is wider, median ridges of head curved and widely separated, and the derm soft. In most species of the genus the derm is hard, but in the present species it is quite soft and thin, although there is nothing from the outside to indicate that it is not of normal hardness. *Opimus* is another species which has the derm rather fragile, but the two species have little else in common. In some respects it is close to *foveatus*, but is considerably larger, and seventh joint of funicle no longer than the fourth.

Catasarcus durus, n. sp.

Black; appendages (club and claws excepted) of a very dark-red.

Head, rostrum, antennæ, and prothorax much as in preceding species, except that the carinæ on the head are almost parallel-sided on their basal two-thirds, but curve rather strongly round at the apex, with the space between the middle of the two median ones distinctly less. *Elytra* much the same, but rather shorter, subhumeral tubercle slightly smaller, and punctures somewhat smaller. Length, 14-16 mm.

Hab.—Western Australia: Mount Barker (A. M. Lea).

The three specimens before me, except for the legs, are almost entirely glabrous, but as some scales are to be seen in a few side punctures of the elytra (where rubbing is least likely to take place) this would appear to be due to abrasion.

In appearance very close to the preceding species, but carinæ on the head somewhat different, elytral punctures smaller, and derm of normal hardness; the interstices, although their punctures and practically obsolete granules are exactly as in the preceding species, are wider in proportion to the rows of punctures. In some respects it is close to the description of *efflorатus*, but is larger, and elytral punctures different.

Catasarcus carinaticeps, n. sp.

Black; appendages (club and claws excepted) dark-red.

Head with minute punctures and with a few larger (but still small) ones scattered about; lateral carinæ parallel-sided almost to apex, median carinæ parallel-sided and close together. Median carina of rostrum very distinct, the lateral ones with distinct punctures. First joint of funicle fully once and one-half the length of second. *Prothorax* strongly transverse; with dense punctures and dense granules, the

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(2) I have previously commented on the varnishing of species of this genus; see Proc. Linn. Soc., New South Wales, 1897, p. 593.

latter frequently conjoined to form small transverse ridges, especially in the middle. *Elytra* large; subhumeral tubercle small but subconical; with rows of large punctures, becoming smaller posteriorly; interstices in some parts narrower than punctures, with small and more or less obsolete granules. Length, 12-14 mm.

Hab.—Western Australia: Esperance Bay (W. W. Froggatt and C. French).

On one specimen the club is very little darker than the rest of the antennæ, but on the others it is black; the tarsi and tips of the tibiæ are sometimes infuscated. On one specimen the grooves on the head are densely filled with flavous scales, the grooves on the rostrum having as dense but paler scales. On its elytra all the punctures are filled with flavous scales, and flavous and white scales are rather dense on parts of the under-surface. On other specimens, however, the clothing is much sparser.

In appearance somewhat close to the two preceding species and to *maculatus*, but median carinæ on head close together and parallel, the space between them being only about one-fifth of the total space between the two outer ones. They are even more closely together than in *ovinus*, from which species it also differs in being larger and narrower, elytral punctures larger, and prothorax much rougher. The general appearance is much like *Hopei*, but that species also has the median carinæ more distant.

Two specimens from the Swan River differ in being smaller (11-12 mm.), with the prothoracic granules less numerous, and with a less noticeable tendency to become conjoined across the middle.

Leptops fasciatus, n. sp.

Black; parts of antennæ and of legs obscurely diluted with red. Very densely clothed with soft round scales, varying from white to dark-brown, but mostly of a pale-brown on the upper surface, and whitish on the lower. Upper surface with moderately dense setæ, longer on the elytra than the prothorax; denser on the under surface and still denser on the legs.

Head with dense, concealed punctures. Rostrum comparatively long and thin; with a fine but distinct median carina, on each side of which is a rather shallow groove; sublateral sulci lightly curved, closed at both ends; scrobes shallow on posterior third. Antennæ rather thin; scape rather suddenly thickened at apex. *Prothorax* along middle as long as wide, but longer at sides, sides strongly rounded; with small, regular, flattened tubercles or large granules, and large punctures, but both more or less concealed by clothing; with a rather feeble median line. *Elytra* ovate-cordate; at base scarcely wider than base of prothorax, widest at about basal third; with regular rows of large, but partially-concealed punctures; interstices gently convex, the odd scarcely more noticeably raised than the even ones, without traces of granules or tubercles. Length, 8-9½ mm.

Hab.—Queensland: Gympie (R. Illidge).

On the elytra there is a feeble stripe of more or less whitish scales, commencing on each shoulder, curving round and conjoined on suture about the middle; although not sharply defined it is quite distinct. The posterior declivity (except on the suture) and parts of the sides of the elytra are regularly clothed with dark-brown scales; similar scales clothe the head and rostrum, and parts of the antennæ and of the legs. On the prothorax of one specimen they form a vague line down the middle, and on another on each side as well. Owing to the thickened apex of the club partially concealing the base of the first joint of funicle, that joint from most directions appears to be slightly shorter than the second, but when its entire length can be seen, it is noticed to be slightly longer than it.

In the table given in Ann. Soc. Ent., Belg., 1906, p. 314, this species should be placed next to *regularis*, from which it differs in having the rostrum thinner, with a more noticeable carina, scape thinner, eyes with coarser facets, elytra wider, and with a curved fascia of pale scales, etc. In appearance it is somewhat close to *Peripagis densus*, but is much narrower across shoulders, eyes narrower, and with coarser facets, ocular lobes much more conspicuous, etc.

A specimen from Port Denison in the Macleay Museum differs from the types in having the scales almost entirely greyish or white, the dark-brown scales being entirely absent, and the elytra with the curved fascia scarcely traceable. Its setæ also are rather more numerous.

Mandalotus.

This genus when well worked out will probably be found to contain a larger number of species than any other Australian genus of weevils. At present (including the species described below) it stands second only to *Talaurinus*.(3) But as the species of that genus are large and conspicuous, whilst those of *Mandalotus* are all small and of retiring habits (many being subterranean and others living in moss), it follows that species of *Talaurinus* have been obtained by almost

(3) Excluding known synonyms and varieties—*Talaurinus* 95, *Mandalotus* 71.

every naturalist who has looked for insects in Australia; whilst the species of *Mandalotus* as a rule are obtained only by entomologists who are well acquainted with insects having similar hiding-places or habits. As a matter of fact, very few localities in Australia have been systematically explored for them.

At a glance the species appear to be remarkably alike and difficult to distinguish, and this is certainly the case with the females. But the males of the majority have remarkable secondary sexual characters. These have been made use of in the table previously given by me,[4] but some other remarkable ones occur in the species described below; in the prosternum, meso- and meta-sternum and coxæ. There is also a specimen of an undescribed species in the National (Melbourne) Museum, with a conical tubercle on each of the front coxæ. It seems probable, therefore, that many other remarkable features exist in the species which have still to be described.

Unfortunately these masculine features are confined to the under surface and legs, so that to see them clearly it is necessary to have the specimens mounted on their sides or backs.

To bring the males of the species described below into line with those in the table previously given by me, the following letters, etc., may be of use:—

AA. 1. Prothoracic sculpture transversely arranged ... ... *mesosternalis*, n. sp.
2. Prothoracic granules not so arranged.
c.
3. Space between middle and front coxæ almost equal ... *rudis*, n. sp.
4. Space between middle coxæ much greater than between front coxæ ... ... *crudus*, Er.
cc.

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AAA. 1. Prosternum tuberculate.
* Tubercle in front of coxæ and notched ... ... *armipectus*, n. sp.
** Tubercle behind coxæ and conical ... ... *prosternalis*, n. sp.
2. Prosternum not tuberculate.
B.

———

AAAA. Mesosternum with a process which is notched at apex ... *incisus*, n. sp.

———

BB. 1. Metasternum bituberculate ... *metasternalis*, n. sp.
2. Metasternum not bituberculate ...
C.

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[4] These Transactions, 1907, pp. 131-135.

GG. *v*.

1. With subhumeral projections — *herbivorus*, n. sp.
2. Without such projections.
   3. Base of rostrum suddenly raised above head ... ... *ammophilus*, n. sp.
   4. Base not so raised.

vv.

———

KK. *e*.

1. Prothorax on abrasion with conspicuous granules ... ... *coxalis*, n. sp.
2. Prothorax without such granules.
   3. Metasternum and abdomen with golden clothing *muscivorus*, n. sp.
   4. Without such clothing ... *maculatus*, Lea.

ee.

MANDALOTUS SCABER, Lea.

In this species, of which I have seen but one male, there is a blunt-tipped process, slightly longer than the trochanter, projecting backwards from each of the middle coxæ.

MANDALOTUS AMPLICOLLIS, Lea.

In the original description of this species I spoke of the depression on the abdomen being bounded behind by a distinct ridge on the second segment. The second segment, however, has not really a ridge, but has a small tubercle on each side of its middle; in the type these two tubercles (owing to scales and a small amount of mud) appeared conjoined so as to form a ridge, but on a second specimen being examined their true nature was discerned. In the table given by me (in Trans. Roy. Soc., S. Aust., 1907, pp. 131-135) it should be placed in C; and *e* should be altered to read:—

Abdomen bituberculate.
Tubercles on basal segment ... ... *geminatus*.
Tubercles on second segment ... ... *amplicollis*.

MANDALOTUS NIGER, Lea.

Dr. E. W. Ferguson has recently taken the sexes of this species on the Blue Mountains. The male has the intercoxal process of the mesosternum laminated, and in my table the species should be removed from E. *r*. to A. *aa*.; from the two species (*hoplostethus* and *simulator*) placed there it differs in being more than twice the size; the process is shaped somewhat as in *simulator*, except that it is flatter, but the prothorax is larger in proportion, more rounded, and with numerous flattened and rather conspicuous granules; the front tibiæ are also without granules. In size and general appearance the body, but not the limbs, approaches that of *mirabilis*.

Mandalotus simulator, Lea.

A specimen from the Blue Mountains differs from the types in being larger (6 mm.), with the front tibiæ inflated towards the base, and with a conspicuous row of granules when viewed from some directions (in the types the tibiæ are less inflated and the granules are much less conspicuous); the mesosternal process, in addition to its curvature, appears also to be slightly concave on its apical two-thirds.

Mandalotus campylocnemis, Lea.

♂. In the male of this species the basal segment of the abdomen should not have been described as transversely depressed. Although the depression is wider at the base than it is long down the middle, it is certainly a longitudinal one, and rearwards just perceptibly encroaches on the second segment. In front it is joined on to a large depression on the meta- and meso-sternum, that is bounded on each side by the coxæ. The middle coxæ in consequence are strongly elevated above the middle of the mesosternum. Their inner walls are obliquely flattened, and each has a short conical projection in line with its trochanter: they are very widely separated (almost as widely as the hind pair), and the suture between them is deeply impressed. The front coxæ are also widely separated, but the space between them is hardly more than half that between the middle pair: the space between them is also somewhat irregular. The front tibiæ have a strong flange-like extension near the apex, so that the apex itself appears somewhat V-shaped.

Mandalotus incisus, n. sp.

♂. Black; antennæ dull-red, most of scape darker, tarsi reddish-castaneous. Densely clothed with muddy-brown or sooty scales, feebly variegated on the under surface and legs. With stout, dark recurved setæ.

Rostrum with a narrow carina, visible throughout. Scape moderately stout, regularly increasing in thickness to apex. *Prothorax* (from above) almost circular in outline; with large, round, somewhat flattened granules, traceable through, but completely covered by, clothing. *Elytra* conjointly arcuate at base, with a comparatively strong subhumeral tubercle, disc somewhat uneven; feebly tuberculate about summit of posterior declivity; with large, round, normally almost concealed punctures. *Mesosternum* with a rather short intercoxal process, which is distinctly notched at its apex. Abdomen strongly depressed near base. Front *coxæ* rather widely separated. Length, 4½-5½ mm.

♀. Differs in having the prothorax smaller, elytra larger and wider, mesosternum simple, abdomen flat at base, and legs shorter.

Hab.—New South Wales: Blue Mountains (E. W. Ferguson).

Readily distinguished from all other species of the genus (many of which it strongly resembles) by the intercoxal process of mesosternum of male, this being produced and notched at apex, instead of laminated as in A of my table, or conical as in AA.

MANDALOTUS MESOSTERNALIS, n. sp.

♂. Black; antennæ dull-red, scape darker, tarsi reddish-castaneous. Densely clothed with stout muddy or sooty-brown scales, more or less variegated with paler scales. With stout slightly-curved setæ, similar in colour to the scales amongst which they are placed.

Rostrum with a narrow carina, visible throughout. Scape moderately short and stout. *Prothorax* truncate in front, rounded at base and sides; with numerous strong, transverse, or oblique carinæ, interrupted in middle, and quite distinct before abrasion. *Elytra* conjointly arcuate at base; with a moderately strong subhumeral tubercle; disc even; with rows of large, normally almost concealed punctures; alternate interstices slightly raised. *Under surface* with dense punctures and sparse minute granules, both normally concealed. Mesosternum with a strong, conical, intercoxal process. Basal segment of abdomen somewhat depressed in middle. Front *coxæ* lightly but distinctly separated; four hind tibiæ strongly notched near apex. Length, $3\frac{1}{2}$-5 mm.

♀. Differs in having the elytra larger and wider, mesosternum simple, basal segment of abdomen convex in middle, and legs shorter, with thinner femora and simple tibiæ.

Hab.—New South Wales: National Park (H. J. Carter), Sydney (E. W. Ferguson).

In my table would be placed in AA, from all of which it is distinguished by the much longer mesosternal process (in length this is about equal to each of the front coxæ), and by transverse carinæ replacing the usual prothoracic granules.

One specimen has all the legs obscurely diluted with red. The paler scales appear to be variable: on one female they form very feeble stripes on the prothorax, clothe each shoulder, form a small spot on the third interstice at base, and a fairly distinct curved fascia at summit of posterior declivity. On another female they clothe the sides almost regularly from apex of prothorax to apex of elytra: on this specimen also most of the elytral scales are brownish. On a male the only scales that are variegated are some on the femora. The notch near apex of each of the four hind tibiæ of the male is very strong, but from some directions practically invisible.

MANDALOTUS RUDIS, n. sp.

♂. Black, in places obscurely diluted with red; antennæ dull-red, scape darker; tarsi reddish-castaneous. Densely clothed with muddy-brown or sooty scales, interspersed with very stout depressed setæ.

Rostrum without a visible carina. Scape for the genus rather long and thin. *Prothorax* large, feebly transverse, sides strongly and evenly rounded, apex distinctly narrower than base; median line traceable before abrasion; with numerous, rather large, round, somewhat flattened granules, more or less traceable before abrasion. *Elytra* scarcely conjointly arcuate at base; shoulders projecting, with a rather feeble subhumeral tubercle, disc uneven and obsoletely tuberculate, especially about summit of posterior declivity; with rows of large, normally-concealed punctures. *Mesosternum* with a wide, feebly conical intercoxal process. Metasternum and basal segment of abdomen feebly conjointly concave in middle. Front *coxæ* widely separated; hind tibiæ with an inner row of granules, invisible from most directions. Length, 6 mm.

Hab.—Queensland: Cairns (E. Allen).

In the table given by me this species would be placed next to *crudus*, which in fact it very strongly resembles, but it differs in having the prothorax larger, with more conspicuous granules, the front coxæ more widely separated (the distance between them is almost equal to that separating the middle tibiæ, instead of less than half as in *crudus*), and the mesosternal process less acute, although of about the same length. The abdomen also is without the conspicuous granules of *crudus*.

The setæ are unusually stout, and most of them are quite flat amongst the scales.

MANDALOTUS ARMIPECTUS, n. sp.

♂. Colour as described in preceding species. Densely clothed with muddy-grey scales, sometimes variegated with sooty. With moderately stout semi-erect setæ.

Rostrum with a narrow carina. Scape feebly curved, apex rather suddenly thickened. *Prothorax* moderately transverse, sides strongly rounded, apex much narrower than base, which is almost truncate; median line distinct; surface uneven. *Elytra* trisinuate at base, subhumeral projection distinct; with rows of large, partially-concealed punctures; alternate interstices moderately raised. *Prosternum* with a suddenly raised process just in front of and between coxæ, flat on top, and slightly notched in middle. Metasternum and basal segment of abdomen conjointly feebly concave in middle. Front *coxæ* separated slightly more than middle pair. Length, 4-4½ mm.

♀. Differs in having elytra larger and wider, prosternum simple, basal segment of abdomen gently convex in middle, and the femora not quite so stout.

Hab.—New South Wales: Shoalhaven (E. W. Ferguson).

The prosternal process of the male will readily distinguish from all previously described species, many of which it strongly resembles.

On most of the specimens before me the scales are of a uniform muddy-grey, but on two males there are sooty scales forming vermiculate patches on both prothorax and elytra. On several specimens the rostral carina is quite distinct, but on others it is concealed before abrasion, this probably being due to disarrangement of the clothing. Before abrasion the prothorax appears to be covered with ordinary granules, but on abrasion these are seen to be flat, and more or less joined together, with irregular punctures or spaces between, giving the whole a vermiculate appearance. Dr. Ferguson informs me that all the specimens were "taken after very heavy rain clinging to grass stems in pools of water."

Mandalotus prosternalis, n. sp.

♂. Of a dingy-red, tarsi paler. Densely clothed with muddy-grey, feebly-variegated scales. With numerous comparatively long suberect setæ.

Rostrum without visible median carina, rather more strongly narrowed to base than usual. Antennæ rather short. *Prothorax* and *elytra* as described in *mesosternalis*. *Prosternum* with a strong conical process projecting backwards from between the coxæ; these moderately separated. Length, 3½ mm.

Hab.—New South Wales: Gosford (H. J. Carter).

The only other described species having a prosternal process is the preceding, but in that one the process is in front of instead of behind the coxæ, and is also of very different shape. The sculpture of the prothorax and elytra (although not the colour or clothing) is exactly as in *mesosternalis*, but that species has the mesosternum armed.

Mandalotus metasternalis, n. sp.

♂. Colour as described in *rudis*. Densely clothed with sooty-brown, feebly-variegated scales. With stout, more or less curved setæ, varying from almost white to sooty. *Rostrum* without visible carina. Scape lightly curved and rather thin. *Prothorax* distinctly transverse, sides strongly rounded, base almost truncate and considerably wider than apex; median line distinct. *Elytra* trisinuate at base; subhumeral tubercle prominent; disc uneven and obsoletely tuberculate; with rows of large but almost concealed punctures. *Metasternum* with a small conical tubercle on each side, close to hind coxæ, and almost touching abdomen; and, in conjunction with basal segment of abdomen, with a moderate depression in middle. Front *coxæ* very widely separated; hind tibiæ with an inner row of granules on basal half and strongly emarginate on apical half, front tibiæ strongly curved at apex. Length, 4 mm.

Hab.—New South Wales: Gosford (H. J. Carter).

The type is damaged, having lost several of its legs and parts of both antennæ, but I have not hesitated to describe it, as the metasternal tubercles readily distinguish it from all previously described species; the tubercles are so placed that at a glance it is difficult to see whether they are on the coxæ, abdomen, or metasternum. From the under surface most of the clothing is missing, and there are seen to be a few minute granules scattered about, and a row of large punctures at base and apex of prosternum, one across metasternum, and another on intercoxal process of abdomen. Before abrasion no granules are traceable on the prothorax, and after abrasion they are seen to be quite absent from most of the surface, although an irregular puncture here and there suggests the vermiculate appearance of *armipectus*.

Mandalotus ammophilus, n. sp.

♂. Dark-reddish-brown, sometimes almost black, antennæ paler, tarsi still paler. Densely clothed with whitish-grey scales. Upper surface with short setæ, scarcely raised above the general level; middle of metasternum and of basal segment of abdomen with dense, fine, setose pubescence; femora towards base and tibiæ with rather long and thin setæ.

Head somewhat flattened, and with a narrow median impression between eyes. Rostrum stout, its upper surface suddenly raised above head; median carina concealed but traceable throughout. Scape lightly curved and very thick. *Prothorax* moderately transverse, sides strongly rounded; median line lightly impressed; with numerous round, flattened granules, somewhat confluent in places and fairly distinct before abrasion. *Elytra* oblong-ovate, shoulders rounded, without subhumeral projections; with regular rows of (for the genus) rather small punctures, appearing very small before abrasion; interstices even. Basal segment of *abdomen* very gently convex in middle. Front *coxæ* touching; claws subsoldered together at base. Length, 4-5 mm.

♀. Differs in being a little wider, with the abdomen more noticeably convex and without pubescence, and the legs with sparser thin setæ.

Hab.—New South Wales: Sydney (H. J. Carter, E. W. Ferguson, and A. M. Lea), Wollongong (Lea).

In my table this species would be associated with *crassicornis*, to which in shape and in the enormously inflated scape it bears a strong resemblance, but the clothing is of uniform or almost uniform colour, and the rostrum is very different on its upper surface.

The scales are occasionally variegated with very pale-brown. The rostrum from the side is somewhat suggestive of *Ethemaia sellata*, but is not so strongly and abruptly elevated above the head as in that species. The ocular lobes are very feeble, but traceable. Numerous specimens were obtained at the roots of beach-growing plants.

Mandalotus herbivorus, n. sp.

♂. Reddish-brown, tarsi paler. Densely clothed with more or less variegated scales. Upper surface with numerous more or less curved and rather thin setæ; middle of metasternum and of basal segment of abdomen with somewhat golden setose pubescence; lower surface of tibiæ and femora with rather long, similarly coloured hair or cilia.

Rostrum stout, almost parallel-sided; median carina normally concealed but traceable throughout. Scape distinctly curved and very stout; funicle shorter than usual, first joint twice the length of second. *Prothorax* moderately transverse, sides widest near apex; with large, round, flattened, frequently confluent granules, traceable before abrasion. *Elytra* oblong-ovate, base feebly conjointly arcuate; with a moderately strong subhumeral projection; with rows of moderately large, partially-concealed punctures; alternate interstices feebly raised. *Under surface* with a shallow depression, common to middle of metasternum and two basal segments of abdomen. Front *coxæ* almost touching, each tibia with an inner row of granules. Length, $4\frac{3}{4}$-$5\frac{1}{4}$ mm.

♀. Differs in having the prothorax smaller, elytra larger and more ovate, abdomen convex and without golden clothing, either there or on legs, the legs are also shorter, with the femora less stout, and the tibial granules absent.

Hab.—New South Wales: Sydney.

In my table would be placed with *crassicornis*, from which and the preceding species it may be distinguished by the subhumeral projections.

The general colour of the derm appears to vary from a dark- to a pale-reddish-brown. The bulk of the scales vary from a dingy-fawn or sooty-brown to sooty, but paler on the under than on the upper surface; on the elytra there are sometimes conspicuous pale markings, consisting of a spot on third interstice at base, and on each subhumeral projection, and an interrupted fascia just before summit of posterior declivity. On the prothorax there are sometimes two pale spots on each side. But the clothing is sometimes of a sooty-brown, with obscure patches of dingy-fawn. The six specimens before me were all taken by Mr. H. J. Carter—four on grass in his garden and two close to a seabeach.

Mandalotus muscivorus, n. sp.

♂. Reddish - brown, appendages paler. Moderately clothed with scales varying from yellowish-green, with a slight golden gloss, to grey or greenish-grey. Upper surface with thin fine setæ; under surface of tibiæ and femora with golden hair or cilia, similar but shorter and denser clothing on middle of metasternum, and of two basal segments of abdomen.

Rostrum almost parallel-sided; median carina narrow and distinct throughout. Antennæ rather long and thin for the genus. *Prothorax* moderately transverse, flat, sides strongly rounded and wider near apex than near base, but apex itself slightly narrower than base; with numerous small and rather feeble granules, not much more distinct after than before abrasion; surface generally with numerous punctures. *Elytra* oblong-ovate, without subhumeral tubercles; with regular rows of large, partially-concealed punctures; interstices even. *Metasternum* and basal segment of abdomen with a large and rather shallow depression common to both; third and fourth segments of abdomen with deep and wide sutures. Front *coxæ* touching. Length, 3-3½ mm.

♀. Differs in being larger, wider, and more convex, elytra ovate-cordate, and with smaller punctures, abdomen convex, and femora not quite so stout.

Hab.—Tasmania: Waratah (A. M. Lea).

In my table would be associated with *maculatus* and *inusitatus;* from the former it differs somewhat in shape, in the metasternum and basal segment of abdomen of male having rather dense pubescence, and in the prothoracic sculpture. From the latter (to which in shape it is closer) in having the club no darker than the rest of the antennæ, in the clothing of the under surface and tibial ciliation; in the female this is very feeble instead of being almost as distinct as in the male (as in *inusitatus*). An occasional specimen has the derm nowhere black, and in the table this would associate it with *pallidus*, but it is much smaller than that species, and of different shape, with the prothoracic granules traceable before abrasion.

The green or golden scales are sometimes very conspicuous, but on most specimens the metallic lustre is absent. Numerous specimens were obtained from moss.

Mandalotus coxalis, n. sp.

Dark-reddish-brown, antennæ somewhat paler, tarsi still paler. Upper surface very densely clothed with muddy-grey scales; lower surface and legs with somewhat setose clothing. With moderately numerous and fairly stout setæ all over.

Rostrum without traceable median carina. Antennæ rather thin. *Prothorax* moderately transverse, sides strongly rounded; with not very numerous and rather small but very distinct and strongly convex granules, usually quite concealed before abrasion. *Elytra* ovate, base trisinuate; without subhumeral projections; sides strongly rounded, disc uneven; with very large, but normally quite concealed punctures. Basal segment of *abdomen* flat in middle. Front *coxæ* almost touching and each with a shining black granule on the inner surface. Length, $3\frac{1}{2}$-$3\frac{3}{4}$ mm.

Hab.—Queensland: Mulgrave River (Henry Hacker).

In my table would be associated with *maculatus*, from which it differs in being larger and more robust, with both the prothorax and elytra differently sculptured.

There are three specimens before me, two of which have the abdomen flattened and front coxæ granulate, these probably being males; the other specimen has the abdomen more convex and the coxal granules absent, this probably being a female. The clothing is so dense that the upper derm is everywhere concealed, even the large elytral punctures and strongly convex prothoracic granules not being traceable before abrasion.

SUBFAMILY ATERPIDES.

Rhinaria granulosa, Fhs.

costata, Er.

I believe the above synonymy to be correct. The species is a fairly common one in New South Wales, Victoria, and Tasmania.

RHINARIA CONVEXIROSTRIS, Lea.

This species is close to *tibialis*, but differs in being somewhat narrower, with the base of the rostrum feebly convex in the middle instead of distinctly carinated, and with the prothoracic punctures larger and more conspicuous.

In some specimens of *tibialis* the elytra have somewhat similar markings to this species; although in the majority of them the markings are much more obscure.

RHINARIA SIGNIFERA, Pasc.

This appears to be a fairly common Queensland insect. Two specimens from Port Denison differ from the normal form in having the median markings of elytra conjoined at suture and somewhat ochreous instead of white.

RHINARIA GRANDIS, n. sp.

Black. Densely covered with variegated scales, and with setæ scattered about.

Head with four large conjoined tubercles between eyes, the hind ones larger than the others, the space between the tubercles deeply hollowed out. Rostrum glabrous and concave along middle; at base deeply concave, distinctly impressed along middle towards apex and less noticeably towards the sides; scrobes extended almost to mandibles, and open in front. First joint of funicle about once and one-half the length of second. *Prothorax* about as long as wide, sides strongly rounded; closely covered with round and almost regular tubercles, many of which are capped with a small shining granule. *Elytra* rather long, each shoulder with a strong conical granulated tubercle; with rows of large but more or less concealed punctures: interstices with numerous granules, especially on the third, fifth, and seventh. Length (excluding rostrum), 15½-16½ mm.

Hab.—New South Wales: Sydney (on "cutting grass," G. Masters, on *Xanthorrhœa*, sp., H. J. Carter), Blue Mountains (E. W. Ferguson).

The strong humeral and cephalic tubercles and variegated clothing easily render this the finest known species of the genus. The scales almost everywhere conceal the derm. They are mostly of a muddy-brown or ochreous-brown colour, with on the elytra a wide V-shaped darker patch about the middle, traces of another V towards the base, and an irregular triangle on each side of the posterior declivity. On each elytron there is also a round, rusty-red spot on each side of the humeral tubercle, an irregular one before the middle, and a large irregular spot on the posterior declivity.

On the prothorax there is a conspicuous median line of white scales, which is sometimes continued on to the scutellum. On the scutellum, however, the scales are sometimes of a rusty-red, and similar scales are sometimes on each side of the prothorax at the base. On the head the scales are variable, but appear to be usually paler on the tubercles and middle of the forehead than elsewhere. The abdomen (more especially the three apical segments) is conspicuously striped.

A specimen belonging to Dr. Ferguson was sent to me as the female. It differs from the others in being smaller (13 mm.), the tubercles on the head much smaller (but still rather large), the rostrum obtusely carinated along middle, the prothorax longer than wide, with tubercles smaller and legs regular. Elytra with humeral tubercles very feeble (no more than a few conjoined granules), the interstices with less conspicuous granules, the third and seventh noticeably raised posteriorly. The under surface with more noticeable punctures and the abdomen very feebly striped. The specimen is very muddy, and the elytra are without markings save for a rusty-red patch on each side of the posterior declivity; this being almost the sole reason for my belief that Dr. Ferguson is correct in his identification of the sexes.

Ethemaia Griffithi, n. sp.

Black; antennæ and tarsi diluted with red. Densely clothed with sooty scales, sometimes variegated with patches of whitish or muddy-brown scales. With setæ scattered about, mostly dark on the upper surface and mostly pale on the under surface and legs.

Head flat between eyes; with dense concealed punctures. Eyes briefly ovate, prominent, and entire. Rostrum slightly longer than front tarsi, with three (or more probably five) partially-concealed carinæ; wider in male than in female. Scape as long as funicle; first joint of funicle stouter and slightly longer than second. *Prothorax* as long as wide in female, slightly transverse in male; sides very feebly rounded, base very little wider than apex; with very large but partially-concealed punctures or foveæ. *Elytra* almost twice as wide as prothorax, almost parallel-sided to one-third from apex; third interstice with four tubercles, of which the largest overhangs the posterior declivity, fifth interstice with four, a few feeble ones towards each side; with rows of large but partially-concealed punctures. *Under surface* with dense partially-concealed punctures. Length (excluding rostrum), 5½-6 mm.

Hab.—Tasmania: Geeveston (H. H. D. Griffith), Hobart, Mount Wellington (A. M. Lea).

A deep-black species, in appearance like *funerea*, but much larger, elytral tubercles more prominent and rostrum longer, with more conspicuous sculpture. In build it is much like *vagans*, but, apart from the very different clothing, the elytral tubercles are different, and the rostrum is somewhat stouter. The eyes are much more prominent than in *adusta*, which is also distinctly narrower and with different tubercles.

On one of the five specimens before me the scales of the upper surface are entirely black. On the second there are two feeble muddy-brown stripes on each side of the prothorax. On the third there is a distinct but very irregular patch of whitish scales on each side of the elytra beyond the middle. On the fourth these patches are just traceable. On the fifth muddy-brown scales clothe almost the whole of the prothorax, form a patch on each side of the elytra beyond the middle, and a distinct fascia just before summit of posterior declivity, extending to the fifth interstices. The femora each have a ring of whitish scales, except that on the front pair they are sometimes very feeble or even absent.

SUBFAMILY ERIRHINIDES.

Meriphus tuberculatus, n. sp.

Reddish-castaneous; head, prothorax (base and apex excepted), and scutellum deeply infuscate or piceous; funicle and club, some spots on elytra and some vague spots on under surface and femora more lightly infuscate. Moderately clothed with pale-yellowish or greyish setæ and forming four very feeble lines on prothorax; elytra in addition with sparse suberect setæ.

Head slightly longer than wide. Rostrum thin, moderately curved, distinctly longer than head and prothorax combined; with five narrow carinæ on basal two-thirds; apical third with fine punctures. Antennæ thin; two basal joints of funicle elongate, first distinctly longer than second. *Prothorax* distinctly transverse, sides rounded and diminishing in width from base to near apex, and then slightly inflated. *Elytra* scarcely twice the width of prothorax, sides feebly diminishing in width from shoulders; striate-punctate, punctures not very large and rather shallow; interstices with a few granules, some of which are almost black, third with a strong, elongated, granulated tubercle at its middle. *Femora* stout and strongly dentate, especially the hind pair; hind tibiæ very strongly curved. Length (excluding rostrum), 3 mm.

Hab.—New South Wales: Wollongong (A. M. Lea).

With the exception of *guttatus* (rendered very distinct by its clothing) this species is the most distinct one known to me, and rendered so by its tubercles.

ERISTUS BICOLOR, Blackb.

There are three specimens from Tasmania before me which appear to belong to this species, but they have not the antennæ entirely dark; on one of them the scape is pale, and on the others the first two joints of the funicle as well. Two of them have the sides of the prothorax stained with piceous.

The very feeble carina between the eyes and on the base of the rostrum appears to be confined to the male.

DESIANTHA MALEVOLENS, Lea, var. VEGRANDIS, Lea.

This species is widely distributed and variable. In addition to the types, there are now before me specimens from North-Western Australia, Queensland, and New South Wales.

Apparently there is always a whitish spot on the third interstice just beyond the middle, and this is frequently the only pale spot on each elytron. On specimens from the North-West there are frequently numerous similar spots towards the sides, sometimes alternated with darker spots, whilst the spot on the third interstice is sometimes extended to the second and even to the suture; on many of these specimens also the dark sutural marking is absent, or broken up into irregular spots or a feeble stripe on each side of, but not on, suture.

On many of the specimens from Queensland and New South Wales the dark sutural marking is altogether absent, and many of the elytral scales have a faint greenish tinge. On these specimens also the spot on the third interstice, although always traceable, is frequently indistinct.

The depression of the metasternum and abdomen is confined to the males; in the female the space so occupied in the male is quite flat.

I am now convinced that the form described as *vegrandis* is but a small variety of this species.

DESIANTHA NOCIVA, n. sp.

Reddish-brown, antennæ and tarsi paler; prothorax black. Prothorax and elytra densely clothed with soft, rounded, pale-muddy-brown, feebly-variegated scales; and in addition with numerous stout, brown, semi-erect setæ. Head, rostrum, under surface, and appendages with dense stramineous setæ or coarse pubescence.

Head with dense more or less concealed punctures. Rostrum stout, increasing in width from base almost to apex; with three strong carinæ from base almost to apex, and with finer (usually concealed) intermediate ones; with dense, normally-concealed punctures; each side at base suddenly and deeply notched. First joint of funicle almost as long as second and third combined; second almost as long as third and fourth combined. *Prothorax* moderately transverse, angles rounded, base much narrower than apex, middle of apex raised; with dense, round, normally-concealed punctures. *Elytra* not much wider than apex of prothorax, parallel-sided to near apex, base conjointly arcuate; with regular rows of large almost entirely concealed punctures; interstices convex, with small concealed punctures. *Under surface* with dense but rather small punctures. *Legs* moderately long; tibiæ denticulate below. Length, 7-8 mm.

Hab.—Victoria.

Sent by Mr. C. French, jun., as being very destructive to the tomato, cabbage, and other vegetables. The colour of the derm of the upper surface is usually entirely concealed, but that of the lower surface is visible before abrasion. The knees are generally infuscated. There are no sharply-defined markings on any of the 25 specimens before me, but they all have a very feeble transverse fascia of paler scales about summit of posterior declivity; the fascia extends slightly forwards on each side (covering about five interstices on each) so as to be shaped like a very wide V. The median line of the prothorax and the preapical callosities are also usually marked by paler scales. The elytral setæ are in regular rows. Some specimens are narrower than others, but I can find no distinct sexual differences.

The only other species known to me having the rostrum similarly notched at the base is *præmorsa*, from which it differs in being larger, with softer scales and more erect elytral setæ; the claws also are more widely separated. The shape of the prothorax is much as in *Exithius capucinus*.

SUBFAMILY ATTELABIDES.

Euops suturalis, Lea.

At the time this species was described I had seen but one specimen; there are now fifteen before me, of which six were taken in company on a eucalyptus sapling by Mr. Hacker.

The species is a very variable one, as indicated by the following forms.

1. As the type, ♂, ♀.
2. Like the type, but without a dark blotch about scutellum, and abdomen diluted with red along middle, ♀.

3. Entirely dark except for a large reddish blotch (towards the base and side) on each elytron.(5) Prothorax with a purplish gloss, ♂, ♀.

4. Like 3, but knees and rostrum reddish, and head and prothorax with a very decided greenish gloss, ♀.

The male differs from the female in having the front femora stouter and the front tibiæ longer and strongly curved.

EUOPS RUDIS, n. sp.

♂. Black; tibiæ, tips of femora, tarsi (third joint excepted), muzzle, and sometimes the basal joint of antennæ dull-red.

Head with coarse punctures, but at base transversely strigose. Eyes almost touching. Rostrum bent downwards at basal third; with rather dense punctures but much smaller than on head. *Prothorax* with very dense, round, and rather coarse punctures. *Elytra* subquadrate, widest across shoulders, about one-third wider than prothorax; with rows of large, coarse punctures, and a short subsutural and two short sublateral rows; interstices much narrower than rows of punctures towards sides, and each with a distinct row of punctures; towards middle with irregular punctures, and subequal in width with large punctures. *Under surface* with very dense punctures. Front *femora* longer than prothorax; front tibiæ long, thin, strongly curved, longitudinally striated, under surface finely serrated. Length, 6 mm.

♀. Differs in having the head and rostrum shorter, front legs much shorter, with the tibiæ of different shape and abdomen convex, instead of concave, along middle; and with the normal (6) female clothing.

Hab.—New South Wales: Ben Lomond, 4,500 ft. (A. Jefferis Turner).

In some lights the base of the prothorax and parts of the elytra appear to be very obscurely diluted with red. The punctures at the sides of the abdomen appear to be placed obliquely, this being due to a feeble oblique striation.

Allied to *falcata*, but opaque, body almost entirely black, and the eyes not quite touching. In size and coarseness of punctures there are specimens of *falcata* before me that decidedly approach the present species, although the average specimens of that species are much smaller, with much smaller punctures and differently coloured.

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(5) It seems possible that *pulchella*, Pasc., may have been described from such a form, in which case, of course, *suturalis* will have to take rank as a variety only.

(6) A double transverse series of short hair or pubescence on the middle of the first, second, and third segments.

EUOPS EFFULGENS, n. sp.

♂. Coppery-purple, in places with a golden or greenish gloss. Femora purplish, rest of the legs black; antennæ black, in places feebly diluted with red.

Head with fairly dense but somewhat irregular punctures; base transversely strigose. Eyes close together, but distinctly separated. Rostrum short, not suddenly bent over at basal third; with numerous rather small punctures. Antennæ unusually close together at base. *Prothorax* strongly convex; with numerous rather small punctures. *Elytra* subquadrate; striate-punctate, striæ rather feeble, punctures of moderate size, becoming smaller posteriorly; interstices feebly rugose and with numerous minute punctures. *Metasternum* with dense and coarse punctures; side pieces of mesosternum with sparse and coarse punctures. Abdomen obliquely strigose and with numerous punctures, coarser at sides than in middle, but all smaller than on sterna. Front *femora* no longer than prothorax, front tibiæ (for the genus) rather stout and feebly curved, under surface feebly serrated. Length, $3\frac{3}{4}$ mm.

♀. Differs in colour and in having the head and rostrum slightly shorter, the front legs shorter (the tibiæ although distinctly shorter than those of the male are less noticeably so than usual), and the abdomen convex (instead of concave) along middle; and with normal female clothing.

Hab.—South Australia (types in Macleay Museum).

In build somewhat resembling *eucalypti*, but the front tibiæ of the male considerably shorter. The only male before me is almost entirely of a brilliant coppery-purple. The only female is of a dark metallic green, with some coppery reflections on the elytra.

EUOPS LATERALIS, n. sp.

♂. Deep-blue, inclining to purple on the elytra, and glossed with green on the head and scutellum; antennæ dull-red, club darker.

Head almost impunctate on upper surface, but with fairly coarse punctures on sides; base transversely strigose. Eyes touching. Rostrum moderately bent over at basal third; with numerous rather small punctures. *Prothorax* with sparse and minute punctures on disc, becoming rather dense and coarse on sides. *Elytra* about two-fifths wider than prothorax, widest across shoulders, rather strongly diminishing in width to apex; with rows of punctures of medium size at base, becoming much smaller posteriorly; interstices smooth and impunctate. Side pieces of *mesosternum* almost impunctate: of metasternum with marginal punctures only. Abdomen minutely obliquely strigose, and with rather small punctures, larger at sides than elsewhere. Front *femora* longer than prothorax; front tibiæ slightly longer than femora, thin, moderately curved, lower surface finely serrated. Length, $2\frac{3}{4}$ mm.

♀. Differs in having the head and rostrum shorter, front legs much shorter and abdomen convex (instead of concave) along middle; and with the normal female clothing.

Hab.—Queensland: Cairns (types in Macleay Museum).

The rows of punctures on the elytra are not in striæ except towards the sides, but there is a distinct sutural impunctate stria.

In build somewhat resembling *clavigera*, but club shorter, and prothorax and shoulders without coppery-green markings.

Euops impuncticollis, n. sp.

♂. Purple, elytra purplish-blue, pronotum blackish, head with a greenish gloss; antennæ dull-red.

Head impunctate, except immediately behind eyes. Eyes almost touching, more convex than usual. Rostrum rather short: with numerous rather small punctures. *Prothorax* without punctures except a few small ones in the transverse subbasal impression. *Elytra* of the same shape and with punctures (except that they are smaller) and striæ as in the preceding species. Outer side pieces of mesosternum each with a single row of small but noticeable punctures. Side pieces of metasternum with rather small marginal punctures. Abdomen very finely strigose, with distinct punctures only at sides. *Legs* as in the preceding species. Length, $2\frac{3}{4}$ mm.

♀. Differs from the male as in the preceding species.

Hab.—Queensland: Cairns.

In general appearance close to the preceding species, but without coarse punctures at sides of prothorax and the elytral punctures considerably smaller. I have seen but two specimens—the male in the Macleay Museum, the female in my own collection.

Euops flavomaculata, n. sp.

♂. Purple, scutellum and shoulders of a brilliant green or coppery-green, a similar green on parts of the under surface and legs, head and rostrum glossed with green; each elytron with a small, round, median, flavous spot.

Head with coarse punctures on sides and immediately behind eyes, elsewhere almost impunctate; base transversely strigose. Eyes touching. Rostrum with numerous rather small punctures. *Prothorax* with sparse and minute punctures on disc, becoming rather dense and fairly large on sides. *Elytra* of the same shape and with punctures and striæ as in *lateralis*. *Under surface* and *legs* also as in *lateralis*. Length, 2 mm.

Hab.—Queensland: Cairns (Macleay Museum).

Readily distinguished from all previously described Australian species by the two flavous spots on the elytra. There are three specimens before me, all males.

SUBFAMILY MAGDALINIDES.

Magdalis mamillatus, n. sp.

Brownish-red; head, base, and tip of rostrum, scutellum and under surface black or blackish. Densely clothed with whitish pubescence, but absent from two spots on each elytron and the greater portion of rostrum.

Head with dense but more or less concealed punctures. Rostrum about two-thirds the length of prothorax, rather wide, moderately curved; punctures at base as on head, elsewhere smaller and sparser but clearly defined. Antennæ inserted two-fifths from apex of rostrum; scape the length of five basal joints of funicle, and slightly longer than club. *Prothorax* moderately transverse, apex slightly incurved to middle; densely punctate; with a feeble median subcarinated line. *Elytra* very little wider than prothorax; with narrow, obtusely punctate striæ, interstices granulate. *Femora* acutely dentate; third tarsal joint wide. Length (excluding rostrum), $4\frac{3}{4}$-$5\frac{1}{2}$ mm.

Hab.—Tasmania: Stonor, Frankford (A. M. Lea); Victoria (C. French).

There are three specimens before me, all apparently females. On one of them the pubescence is decidedly whitish, on a second it is stained with yellow, whilst on the third it is almost golden (this specimen also has the club black). On each elytron it is absent from a spot extending from the second to the fourth interstice just beyond the middle, and to a less degree from the preapical callus. On the basal two-thirds of the prothorax it is so directed as to appear to form two breast-like swellings, with all the hairs directed to the centre of each swelling; but this appearance seems to be readily altered by abrasion. The prothorax would perhaps be better described as densely granulate instead of punctate. The elytral interstices are covered with small obtuse granules, placed more or less transversely.

Magdalis inermis, n. sp.

♂. Black; scape, funicle, and tarsi red. Under surface and base of rostrum with sparse, whitish pubescence.

Head with small dense punctures. Eyes large, almost touching. Rostrum stout, not half the length of prothorax, with dense punctures, concealed towards base. Scape shorter than funicle, the latter shorter than club. *Prothorax* about as long as wide, sides comparatively strongly rounded, front angles rounded, hind ones acute, base decidedly bisinuate; median line distinct and inflated towards but terminating before apex; with dense, clearly-defined punctures. *Elytra* parallel-sided to near apex; punctate-striate; interstices with small granules, the fifth with a few larger and more distinct ones (but still small) in addition; suture feebly depressed, except at base, where it is rather strongly so. *Under surface* with fairly dense punctures, larger on metasternum than elsewhere. *Femora* comparatively thin, edentate; third tarsal joint wide. Length, $2\frac{1}{2}$-$2\frac{3}{4}$ mm.

Hab.—New South Wales: Jenolan (J. C. Wiburd), Forest Reefs; Tasmania: Hobart (A. M. Lea).

The absence of pubescence from the prothorax and elytra may not be constant, although uniform in the three specimens before me. The scape is thinner than in males of other species, but it is of normal stoutness.

Although in size and colour much like many specimens of *rufimanus*, it has (apart from the edentate femora, which will distinguish it from all other species here noted) the prothorax more decidedly bisinuate at the base, the scutellum at the base of a decided impression, fifth interstice granulate, and the eyes even more closely together.

MAGDALIS STENOTARSUS, n. sp.

♂. Black; scape, funicle, and parts of tarsi of a dull-red. Upper surface sparsely, under more densely pubescent.

Head with dense shallow punctures. Eyes decidedly separated. Rostrum stout, half the length of funicle; with punctures as on head. Antennæ stout, scape dilated to apex and shorter than club; the latter the length of six preceding joints combined. *Prothorax* subquadrate, front angles rounded, hind acute; median line distinct but scarcely subcarinate; densely punctate. *Elytra* subcylindrical; punctate-striate; interstices with numerous small granules, the third in addition with some larger ones (but still small) about the middle. *Under surface* with dense but usually concealed punctures. *Femora* stout, acutely dentate; third tarsal joint comparatively narrow, the fourth strongly exserted. Length, $3\frac{1}{2}$-$3\frac{3}{4}$ mm.

Hab.—New South Wales: Sydney (A. M. Lea).

The clothing of the elytra consists of fine, sparsely-distributed pubescence, on the prothorax the angles are more densely but still rather sparsely clothed, the pubescence being more or less whitish. In general appearance close to many specimens of *rufimanus*, but the eyes separated even more than in the female of that species (although not widely separated). But readily distinguished from the species here noted by the tarsi; of these the third joint, although decidedly bilobed, is not much wider than the second (in *rufimanus* it is slightly longer than the second and almost twice the width), and the claw joint is exserted for fully two-thirds of its length. As in *mamillatus* it would perhaps be better to describe the prothorax as granulate instead of punctate; whilst in *rufimanus* the punctures (at any rate on the disc) are evident. In a second specimen the scape is as dark as the club.

SUBFAMILY BALANINIDES.

Balaninus niveopictus, n. sp.

♂. Deep-black, rostrum (base and tip excepted), antennæ, and legs dull-red. Moderately clothed with black scales and with patches or stripes of snowy-white ones.

Head with small dense punctures. Rostrum almost evenly curved; with a few small distinct punctures about base. Antennæ inserted slightly nearer base than apex of rostrum; first joint of funicle about once and one-half the length of second. *Prothorax* with dense, partially-concealed punctures, and with remnants of a very feeble median carina. *Elytra* not much longer than their greatest width (which is near the base), shoulders produced and clasping base of prothorax; striate-punctate, punctures rather large but partially concealed. *Legs* rather long; femora stout, strongly and acutely dentate. Length, 3 mm.; rostrum, 2 mm.

♀. Differs in being larger, rostrum much longer, somewhat differently curved, and with the antennæ inserted much more closely to the base. Length, $3\frac{1}{2}$ mm.; rostrum, $3\frac{1}{2}$ mm.

Hab.—Queensland: Mulgrave River (Henry Hacker).

A beautiful species with the sharply-defined black and white markings of *amœnus*, although differently disposed. There is a small spot of snowy scales between the eyes, on the prothorax they mark each angle, the hind ones being produced so as almost to meet in the centre of the base; clothe the scutellum, form a cross on the elytra (the transverse fascia is almost exactly median), and are dense on most of the under surface. They also clothe the under surface, but not so densely as elsewhere. On three specimens the sutural stripe of white scales is interrupted for a short distance beyond the transverse fascia; but on the fourth it is continuous; this specimen also has a few white scales at the base, about the shoulders, and forming a feeble subapical spot on each elytron. All the white sutural clothing towards the apex is mixed with some yellowish setæ. The rostrum of the female on measurement proves to be the exact length of the body, but to the eye it seems considerably longer.

SUBFAMILY TYCHIIDES.

Agestra, Pasc.

This genus was stated by Pascoe to be nearer *Dorytomus* (7) than to any other. In his table of the *Erirhinides* he placed it in the "*Erirhinides vrais*" between *Nedyleda* and *Eniopea*. Two species were referred by him to the genus—*rubiginea* and *suturalis*, both from Western Australia. Subsequently Blackburn referred a South Australian species, *punctulata*, to the genus.

Thinking it possible that the genus belonged to the *Tychiides*, I wrote to the British Museum for information as to the types, and Mr. C. J. Gahan wrote me that "the claws are what I should call bifid, 'fendus' of Lacordaire. In *A. rubiginea* the inner division is shorter than the outer. In *A. suturalis* it is almost as long as the outer. I cannot be quite sure that all the claws are of this character, as the specimens are carded, and most of the claws covered with gum." Mr. Gahan also sent diagrams of the claws by which it would appear that the claw-joint in *suturalis* is terminated by four almost equal claws, and in *rubiginea* by somewhat similar claws, but the inner ones rather shorter. It is evident, therefore, that *Agestra* belongs to the *Tychiides*, and not to the *Erirhinides*. It is also evident by Blackburn's notes (in Proc. Linn. Soc., New South Wales, 1890, p. 584) that *punctulata* really belongs to the *Erirhinides*, and not to *Agestra*, and that he was misled by Pascoe's faulty location of the genus.

Elleschodes basipennis, n. sp.

Head, rostrum, and scutellum black; under surface more or less infuscate or black; appendages (the femora sometimes stained in parts with black) reddish. Rather densely clothed with whitish pubescence, somewhat paler and sparser on the under than on the upper surface.

Rostrum thin, distinctly longer than prothorax, lightly curved; behind antennæ with a feeble median carina and remnants of others; in front of antennæ with punctures only, and feebly diminishing in width to apex. Antennæ thin, inserted nearer apex than base of rostrum. *Prothorax* about

(7) A genus not recorded from Australia, and unknown to me.

once and one-third as wide as long; with dense and round but normally-concealed punctures. *Elytra* cordate, nowhere quite parallel-sided; with series of fairly large punctures, in rather feeble striæ, both punctures and striæ more noticeable towards base and sides; interstices scarcely separately convex, with rather numerous and small but more or less concealed punctures. *Abdomen* with fairly dense but partially-concealed punctures, apical segment transversely impressed in middle. *Femora* rather stouter than usual, front pair almost edentate, middle pair moderately, the hind pair acutely dentate. Length, $2\frac{1}{4}$-$2\frac{1}{3}$ mm.

Hab.—Western Australia: Swan River (A. M. Lea).

On the two specimens before me (both apparently of one sex) the prothorax is of a dingy-red, but infuscated in parts; the elytra are also of a rather dingy-red, and infuscated about the base, suture, and sides; but the basal portion (although not sharply defined) is somewhat triangular in shape, its outer line extending from each shoulder to the suture at about its basal third. In one of them the legs are almost entirely red, but in the other all the femora are rather deeply stained with black.

The clothing is somewhat as in *inconstans*, but is denser and slightly longer, the prothorax and elytra are somewhat differently proportioned, the femora are stouter, and the rostrum is entirely black, with distinct punctures in front of the antennæ.

SUBFAMILY CRYPTORHYNCHIDES.

Melanterius legitimus, n. sp.

Black; antennæ, tarsi, and tibial hooks reddish. Under surface and legs with rather sparse whitish setæ.

Head with clearly-defined but comparatively small punctures. Separation of eyes the exact width of rostrum at base. Rostrum moderately thin, distinctly curved, just passing middle coxæ; behind antennæ with a narrow median carina and with dense punctures, in front of antennæ with smaller but not much sparser punctures. Antennæ (for the genus) not very thin, inserted about one-third from apex of rostrum; first joint of funicle distinctly longer than second, and second longer than third. *Prothorax* with dense, clearly-defined punctures, becoming smaller towards apex, and nowhere confluent; without a median line. *Elytra* closely applied to and not much wider than prothorax, with regular rows of large, distant punctures; interstices acutely carinated throughout, and each with a row of rather small punctures on each side; suture carinated only on posterior declivity. *Under surface* with dense punctures; larger than elsewhere on metasternum and two basal segments of abdomen, but forming a single row on each side piece of metasternum, and on each of the third and fourth abdominal segments. *Femora* strongly and acutely dentate; and each with a small supplementary tooth or granule in emargination. Length, 4-4½ mm.

Hab.—Victoria (C. French).

The small size of this species will readily distinguish it from all others in which the femora are bidentate.

Melanterius compositus, n. sp.

Black; antennæ, tarsi, and tibial hooks red, rostrum feebly diluted with red. Under surface and legs with sparse whitish setæ; a very feeble seta in each prothoracic puncture.

Head with dense and rather small but clearly-defined punctures. Separation of eyes about half the width of rostrum at base. Rostrum (for the genus) rather stout, the length of prothorax, lightly curved; behind antennæ with a feeble median carina, and with dense punctures in feeble rows, in front of antennæ with small and rather dense punctures. Antennæ inserted about two-fifths from apex of rostrum; first joint of funicle distinctly longer than second, second slightly longer than third, the others transverse. *Prothorax* with dense, clearly-defined punctures, becoming smaller towards apex and nowhere confluent; without a median line. *Elytra* rather elongate, closely applied to prothorax, shoulders oblique; with rows of rather large but not uniformly shaped punctures; interstices not uniform. *Under surface* with rather large punctures, except on three apical segments of abdomen (the third and fourth of these have each a single row of punctures), and on side pieces of metasternum (each of which also has a single row of punctures). *Femora* acutely dentate. Length, 4 mm.

Hab.—South Australia: Adelaide (H. H. D. Griffith).

The suture, second, and third interstices are carinated on the posterior half only, the fourth and fifth are also feebly carinated there; elsewhere the interstices are either flattened or feebly rounded; the punctures are not placed at even distances between the interstices, but so that the wall of each interstice almost overhangs a row of punctures, and is distant from another row; towards the base the punctures appear to be larger than elsewhere, owing to rather feeble striation.

In the table previously given by me the species should be close to *porosus*, from which it differs in being smaller, in its metasternum and second abdominal segment having larger and sparser punctures, elytra rather more noticeably striate on the basal half, with the punctures in the striæ and on the interstices less noticeable, rostrum thinner, etc. In size and general appearance (except that its upper surface is glabrous) it is much like *aratus*.

Melanterius persimilis, n. sp.

Black; antennæ, tarsi, and tibial hooks red. Under surface and legs with sparse whitish setæ, a very indistinct seta in each prothoracic puncture.

Head with dense, clearly-defined punctures. Separation of eyes about half the width of rostrum. Rostrum (for the genus) rather stout, moderately curved, the length of prothorax: with dense punctures throughout; behind antennæ with three distinct carinæ. Antennæ inserted about two-fifths from apex of rostrum; first joint of funicle distinctly longer than second, second slightly longer than third, fifth-seventh transverse. *Prothorax* with dense, clearly-defined punctures, nowhere confluent, but becoming smaller towards apex: with a very feeble median line. *Elytra* closely applied to prothorax, shoulders rounded; with series of large and somewhat distant punctures; suture with small and irregular punctures, carinated posteriorly; all the other interstices acutely carinated throughout, and with a row of feeble punctures on each side. *Metasternum* (each side piece with a single row of small punctures) and two basal segments of abdomen with large punctures; apical segment with dense punctures; third and fourth each with a single row of punctures, but with a few irregular ones at sides. *Femora* acutely dentate. Length, $3\frac{3}{4}$-4 mm.

Hab.—New South Wales: Maitland (T. Blackburn).

The second segment of the abdomen is somewhat shorter than the third and fourth combined; but regarding it as of equal length, in the table previously given by me, it should be placed next to *unidentatus*, from which it differs in being much smaller, rostrum shorter and stouter, prothoracic punctures somewhat smaller, and elytral interstices quite sharply carinated to the base. In *unidentatus*, although the interstices are carinated to the base, they are somewhat rounded and interrupted by punctures near the base itself.

Melanterius conspiciendus, n. sp.

Black; antennæ, tarsi, and tibial hooks red. Under surface and legs with very sparse whitish setæ.

Head with shallow but clearly-defined punctures. Separation of eyes less than half the width of rostrum at base. Rostrum long and thin, lightly curved, passing middle coxæ; behind antennæ with rows of punctures, between which are apparently feeble carinæ; in front of antennæ with small, dense punctures. Antennæ thin, inserted about two-sevenths from apex of rostrum; two basal joints of funicle subequal in length, third distinctly shorter, sixth and seventh transverse. *Prothorax* more dilated posteriorly than usual, with minute and rather distant punctures. *Elytra* unusually wide; with series of very large and somewhat distant punctures or foveæ; interstices (except on shoulders) carinated throughout, and in places somewhat undulating, each with a row of very minute punctures on each side; suture flattened on basal half, somewhat rounded elsewhere. *Metasternum* with rather large but irregularly-distributed punctures, each side piece with a row of minute punctures. *Abdomen* with rather large punctures on basal segment; second with a row of rather large punctures at extreme base and small ones elsewhere; third and fourth each with a row of minute punctures across middle, but with a few irregular ones at sides. *Femora* acutely dentate. Length, 5 mm.

Hab.—Queensland: Cairns, Mossman River (Macleay Museum).

A very robust species. The minute prothoracic punctures in conjunction with the unusually large elytral ones render very distinct from all species of the allied genera known to me. The second abdominal segment is unusually small for *Melanterius*, being scarcely longer than either of the following ones, but at its sides it is drawn backwards, and is there noticeably longer.

MELANTERIOSOMA COSTATUM, Lea, TASMANIENSE, n. var.

Two specimens from Tasmania (New Norfolk and Hobart) differ from the typical form in having the prothorax no darker than the elytra, and with the suture very slightly infuscated only. The elytra also have the third, fifth, and seventh interstices much less acutely costate, with the costa of the third entirely absent from the basal half.

LYBÆBA AMPLICORNIS, n. sp.

Dull-reddish-brown. Moderately clothed with stramineous scales having a faintly-spotted appearance on the elytra, and becoming rather long on the metasternum and abdomen.

Rostrum slightly shorter than prothorax, moderately curved, parallel-sided except for a slight incurvature in front of antennæ; with small but distinct punctures in front, becoming larger and more or less confluent towards base, but at base itself partially concealed. First joint of funicle distinctly longer than second, second as long as third and fourth combined, fourth longer than third, but shorter than fifth, sixth strongly, the seventh very strongly dilated, and the width of club; this large and somewhat ovate. *Prothorax* not much wider than long; with dense, round, partially-concealed punctures. *Elytra* elongate-cordate; with rows of rather large and somewhat quadrate or oblong punctures; interstices densely and rather coarsely punctate, fifth feebly, the sixth, seventh, eighth, and ninth rather acutely carinate. *Abdomen* with dense punctures; first segment slightly shorter than second and third combined, second slightly shorter than third along middle, but produced at sides, third and fourth combined distinctly longer than fifth. *Femora* strongly dentate. Length, 5-5¼ mm.

Hab.—Victorian Alps (C. French).

In general appearance not very close to any species of *Lybœba* known to me, although it somewhat resembles *Melanterius amplipennis*. The peculiar antennæ and abdomen should prevent it from being confused with any other species.

LYBÆBA BLACKBURNI, n. sp.

Reddish-brown; prothorax somewhat darker than elytra. Densely clothed with white scales; having, on the elytra, a feebly-spotted appearance.

Rostrum slightly shorter than prothorax, moderately curved, parallel-sided except for a slight dilation at base; with small punctures in feeble rows behind antennæ, almost impunctate elsewhere. First joint of funicle about as long as second and third combined; second about as long as third and fourth combined. *Prothorax* not much wider than long; with dense, round, more or less concealed punctures. *Elytra* elongate-cordate; striate-punctate, striæ rather narrow, punctures rather large but more or less concealed; interstices with dense but normally-concealed punctures; four of the lateral ones acutely carinated. *Abdomen* with dense punctures; second segment slightly shorter than third and fourth combined. *Femora* strongly dentate; tibiæ dilated at apex, the four front ones each with a long but not conspicuous apical spine. Length, 5 mm.

Hab.—South Australia: Flinders Peninsula (T. Blackburn).

The spine at the apex of each of the four front tibiæ commences at the upper portion of the dilated apex, and slightly diverges from the apex itself, which is oblique. Its length is about equal to that of the first tarsal joint, but owing to its position it is apt to be overlooked unless searched for. The only specimen I have seen is probably a female.

There is another (at present undescribed) South Australian species in general appearance remarkably close to this one, but with normal tibiæ; unfortunately the only specimen of it before me is headless. In the table previously given by me the present species should be placed with *tantilla* and *subfasciata*, from which it is readily distinguished by its much larger size and curious tibiæ.

Poropterus prodigus, Pasc.

There is absolutely nothing in the description of this species to distinguish it from the common *conifer*, Er. (which occurs in Victoria and New South Wales as well as in Tasmania), and (in Proc. Linn. Soc., New South Wales, 1897, p. 506) I recorded it as a synonym of that species. At the time I was unaware that the Rev. T. Blackburn had also (*l. c.*, 1889, p. 1273) regarded it as a synonym.

There is now before me a specimen from Mr. Hacker (who informs me that he has two other identical specimens from Mount Tambourine, in Queensland) which is probably *prodigus*, but it differs from *conifer* in having the large conical tubercles on the elytra larger and distinctly diverging, instead of almost parallel. It is certainly a form well deserving of a varietal name, although it does not appear to be really distinct.

At a glance the specimen looks like some forms of *Jekeli*, but the large elytral tubercles are not at the apex itself (although from above they appear to be there), but some distance above it, as can be readily seen from the sides.

Although this specimen agrees exactly with Pascoe's description, there is still the possibility that his *prodigus* was the ordinary form of *conifer*.

Poropterus sulciventris, n. sp.

Black; antennæ and tarsi reddish. Clothed with black upright scales, and with small spots of ochreous or flavous scales.

Rostrum short and stout; with coarse but more or less concealed punctures, even towards the apex. Antennæ inserted slightly nearer apex than base of rostrum; scape shorter and stouter than usual: first joint of funicle slightly stouter and shorter than second, second as long as third and fourth combined, third to seventh transverse. *Prothorax* rather flat, slightly longer than wide, basal two-thirds parallel-sided, then rather strongly narrowed to apex; with large, round, somewhat irregularly distributed punctures. *Scutellum* absent. *Elytra* not thrice the length of prothorax and at base scarcely wider, shoulders produced, suddenly, but not largely dilated near the base, and then almost parallel-sided to beyond their middle, then suddenly narrowed, but apex itself fairly wide; tuberculate beneath fascicles; with very large punctures, irregular on disc, but in regular rows on sides; a few small granules on suture. *Under surface* with coarse irregular punctures; basal segment of abdomen with a strong median groove, which is continued on to base of second. *Legs* stout; four hind femora distinctly grooved, hind pair not extending to apex of abdomen. Length, 6-6½ mm.

Hab.—Australia (A. Bovie); Victoria: Dandenong Ranges (C. French).

The deep groove on the abdomen denotes quite plainly that the species is allied to *rubeter*, but from that species it differs in being considerably smaller and narrower, prothorax of different shape, and with much larger punctures, elytra of different shape, antennæ stouter, and clothing very different. The density of the clothing in places and its total absence in others is somewhat as in *inusitatus*, but the two species have little else in common.

The black scales form four lines on the prothorax from its apex to its base, but across the middle they are interrupted by four small flavous spots (of these, however, the outer ones are sometimes very indistinct). On each elytron they form rather large but irregular fascicles, of which there is an elongated one on the third interstice near base, and a rounded one about middle; the summit of the posterior declivity is crowned with irregularly-conjoined fascicles, extending from the second interstice to about the seventh, midway between these and the apex are several small fascicles, and at the apex itself there are two fascicles, but these are sometimes conjoined; black scales are scattered about elsewhere and occasionally formed into feeble fascicles. Just before the middle (sometimes extending almost to the middle, or even to near the base) there is an irregular patch of flavous or ochreous scales, and similar scales may be singly scattered elsewhere. On the legs the flavous (or ochreous) scales are irregularly distributed in spots and bands. On the under surface most of the scales are black. There is a small spot of pale scales close to each eye.

Poropterus valgus, n. sp.

Black; antennæ and tarsi of a rather bright red. Rather densely clothed with elongate brick-red scales; but somewhat variegated on the elytra.

Rostrum moderately stout; with dense but not very large punctures on apical half, concealed on basal half. Antennæ inserted one-third from apex of rostrum; first joint of funicle as long as second and third combined, second as long as third and fourth combined. *Prothorax* convex, feebly transverse, sides strongly rounded, with dense, fairly large, and almost regular granules. *Scutellum* very distinct. *Elytra* not thrice the length of prothorax and at base no wider, sides regularly dilated to beyond the middle and then regularly diminishing in width to apex; with rows of large but more or less concealed punctures. *Under surface* with dense and rather coarse punctures; mesosternal receptacle shorter and less elevated than usual. *Legs* rather long; hind femora just passing elytra; tibiæ thinner than usual, the front pair distorted at apex. Length 5 mm.

Hab.—Tasmania: Mole Creek (A. M. Lea).

At a glance apparently belonging to the *lithodermus* group, and in size and general appearance much like *foveatus*, but the scutellum unusually distinct, it is round and slightly raised above the level of the elytra, and on the type is covered with a greyish exudation. The front tibiæ of the type (which is probably a male) are strongly curved round at the apex, with the tarsi inserted at the outer apex; they are somewhat suggestive of *Polyphrades tibialis*. On account of its scutellum it may be referred to the *antiquus* group.

On the prothorax, except for a feeble cluster on each side of apex, the scales are not condensed into fascicles; but there appear to be numerous feeble ones on the elytra, consisting usually of the brick-red scales, but sometimes with a few darker central ones. There are also on the elytra some paler scales that in places are condensed into feeble spots; at a glance also there appear to be numerous spots of black scales, but these spots are really due to the derm showing through the clothing.

Poropterus montanus, n. sp.

Black; antennæ and tarsi more or less reddish. Irregularly clothed with stout scales, varying from pale-ochreous to a sooty-brown, and condensed in places into fascicles.

Rostrum moderately stout, sides distinctly incurved to middle; apical half with small and dense punctures, towards base with much larger but more or less concealed punctures. Antennæ inserted two-fifths from apex of rostrum; first joint of funicle slightly stouter, and (if anything) slightly shorter than second, second as long as three following combined. *Prothorax* convex, about as long as wide, sides strongly rounded, base and apex subequal, with moderately large and irregularly-distributed punctures; tuberculate beneath fascicles; without a median carina. *Scutellum* apparently absent. *Elytra* strongly convex, not thrice the length of prothorax, widest about the middle, posterior declivity long; with rows of very large punctures, regular only on sides; third interstice with three tubercles of which the largest is at summit of posterior declivity, fifth with two rather small tubercles, a tubercle on each shoulder; with small shining granules on suture. *Under surface* with (for the genus) rather small punctures. *Legs* rather long; hind femora lightly but distinctly passing elytra; third tarsal joint wide and deeply bilobed. Length, 8 mm.

Hab.—Tasmania: Mount Wellington (A. M. Lea).

Belongs to the *succisus* group, but more densely squamose than any of the members of that group, elytra shorter and deeper, with different tubercles, posterior femora passing elytra, and tibiæ shorter and stouter. The only specimen before me was taken in moss, but was probably there by accident.

On the prothorax there are six fascicles in the usual positions. On the elytra all the tubercles are crowned with them, the one on the shoulder having paler scales than the others; similar scales also are dense on parts of the posterior declivity, especially about the suture. On the legs and under surface the clothing is feebly variegated. The tubercles crowning the posterior declivity are very conspicuous.

Poropterus humeralis, n. sp.

Black; antennæ and tarsi obscurely reddish. Irregularly clothed with pale more or less muddy-brown scales.

Head wider and flatter than usual. Rostrum less curved than usual, very stout and wide in male, but much less so in female; with dense but more or less concealed punctures, especially in male. Antennæ inserted about one-fourth from apex of rostrum in male, two-fifths in female; second joint of funicle much longer than first, and as long as three following joints combined. *Prothorax* almost flat, sides strongly rounded and strongly lessened to apex, which is obtusely pointed; punctures concealed by clothing. *Scutellum* absent. *Elytra* about twice and one-half the length of prothorax; sides with large regular punctures, elsewhere very irregular; with numerous fairly large and more or less rounded tubercles, seven forming a row on each side of suture, of which the basal one is at the base itself and closer to its fellow than are the others, the fourth is small and not always present, the last one is about half-way down the posterior declivity (which is regular); there are three tubercles of medium size on the position of the fifth interstice, and a strongly-produced and subconical one on each side of base: the other tubercles are all rather small. Punctures of *under surface* normally concealed. Hind *femora* extending to apex of abdomen;

tibiæ rather long and thin, especially the hind pair; third tarsal joint very little wider than second and very feebly bilobed. Length, 11-12 mm.

Hab.—Queensland: Cairns (Macleay Museum).

Belongs to the *exitiosus* group. From *exitiosus* itself it is distinguished by the greater number of its elytral tubercles, especially in the subsutural row; the rostrum also is shorter in both sexes. From *variabilis* it differs in having no tubercles at tip of elytra and the others somewhat differently disposed; for instance, there are not four forming a transverse row just below summit of posterior declivity.

On the prothorax the derm is quite concealed in fresh specimens, apparently by a muddy kind of indumentum; amongst which stout scales are thickly placed; these also form four small but moderately distinct fascicles across middle (with traces of a second series close to them). The apex itself (which appears to be feebly bifurcated) can scarcely be regarded as fasciculate, although there are rather numerous scales there. On the elytra the scales are irregularly distributed, and, although rather more numerous on the tubercles than elsewhere, could scarcely be regarded as forming fascicles. On the under surface and legs the scales are more elongate than elsewhere, but they are also mixed with the indumentum. On the head and rostrum the scales are rather short and stout. The hind angles of the prothorax are obtusely rounded, and partially concealed by the projecting shoulders.

Poropterus carinicollis, n. sp.

Black; antennæ and tarsi feebly diluted with red. Densely clothed with more or less reddish-brown scales and forming fascicles on the tubercles; in addition the derm is almost everywhere covered with a muddy-red kind of indumentum.

Head with the interocular fovea very distinct. Rostrum stout, sides rather strongly incurved to middle; densely and coarsely punctate, punctures more or less concealed on basal half. Antennæ stout, inserted almost in middle of rostrum; scape not passing apex; first joint of funicle stouter and distinctly shorter than second, second almost as long as three following combined, seventh apparently belonging to club. *Prothorax* strongly convex, slightly longer than wide, base wider than apex; deeply constricted near apex, the constriction interrupted by a strong median carina, which is continuous from apex to base, and overhangs the position of the scutellum; sides vermiculately impressed; with six tubercles, a feeble one on each side of apex, and four rather large ones across middle, of these the outer ones are more regular than and slightly in advance of the others. *Scutellum* absent. *Elytra* not much wider than prothorax, and almost thrice the length along suture; third interstice with a rather large tubercle at summit of posterior declivity, a small one between it and apex; fifth interstice with three tubercles, one at basal fifth, the others near the large one on third; seventh interstice with a conical and laterally-projecting tubercle at basal fourth, and a small one about the middle; with very large punctures, regular only on sides. *Under surface* with small dense and normally-concealed punctures. *Legs* rather long; hind femora just passing apex of elytra; third tarsal joint not much wider than second, and obtusely bilobed. Length, 15 mm.

Hab.—Queensland: Mount Tambourine (R. Illidge).

In appearance like a rather small and narrow specimen of *rubus*, but elytra without small conical tubercles at the apex, the subsutural row of tubercles different, and the tarsi not truly linear, the third joint being slightly bilobed, although very little wider than the second. *Intermedius* and *idolus* each have a pair of conjoined tubercles near summit of posterior declivity; *verres* has the elytral tubercles different and the prothorax not conspicuously keeled. It is not likely to be confused with any other species.

On each elytron there is an elongated fascicle on the third interstice, extending from the base to near the middle, but slightly curved; most of the scales of which it is composed are darker than the others. On the type (which is probably a male) there are two shining granules on each elytron near the base—one at the base of the long fascicle, and one half-way between it and the suture.

DECILAUS SERIATOPUNCTATUS, n. sp.

Black; rostrum and legs (and sometimes part of the elytra) dull-reddish-brown; antennæ and tarsi paler. Clothed with long setose scales varying from snowy-white to black.

Head with dense punctures, fairly large in front but much smaller posteriorly. Rostrum lightly but distinctly curved; with numerous punctures concealed only at extreme base. Scape rather thin, inserted about two-fifths from apex of rostrum, not much shorter than funicle; club very briefly ovate. *Prothorax* about once and one-third as wide as long; widest near base, thence strongly diminishing in width to apex; with dense, round, deep, and fairly large punctures. *Elytra* subcordate, base almost truncate; with series of large suboblong punctures, the interstices scarcely raised. Two basal segments of *abdomen* with large and fairly dense punctures, apical segment with denser and smaller ones. *Femora* stout. Length, $1\frac{3}{4}$-$2\frac{1}{4}$ mm.

Hab.—Western Australia: Vasse (A. M. Lea).

A small briefly ovate species at a glance rather close to *hispidus*, but the setose scales or setæ are much shorter and stouter than the wiry-looking hairs of that species, being little more than half their length. But probably if a specimen of each was entirely abraded it would be difficult to distinguish them. The clothing on the upper surface is longer and more variegated than on the lower surface and legs; on the elytra it is sometimes condensed into loose spots or fascicles, of which there are two rather conspicuous white ones on the posterior declivity. It only partially conceals the derm, so that to describe the sculpture there is no need for abrasion. The elytral punctures do not appear to be in striæ, with regularly-raised interstices, but each seems as if separately sunk at its position.

MECHISTOCERUS CANCELLATUS, n. sp.

Black; antennæ dull-red, apical half of rostrum and tibiæ and tarsi more or less diluted with red. Rather densely clothed with muddy-brown scales, interspersed with stout semi-decumbent setæ.

Head with dense punctures, partially concealed only between eyes; interocular fovea appearing as a deep, narrow impression. Rostrum long and moderately curved, basal half with coarse punctures, becoming seriate towards base, and leaving three feeble carinæ on basal third; apical half with fine punctures. First joint of funicle stouter and slightly longer than second, four apical joints the length of club. *Prothorax* almost as long as wide, basal two-thirds parallel-sided, apical third strongly narrowed, with dense, round punctures, and with a short and very feeble median carina. *Elytra* about one-third wider than prothorax; with series of large, deep, oblong punctures, becoming smaller posteriorly. Side pieces of *metasternum* each with a single row of conspicuous punctures. Two basal segments of *abdomen* convex, with numerous small punctures, but the first with a row of very large ones at base; second larger than usual, its suture with first distinctly curved; third and fourth each with a row of setose punctures across middle, their sides and apical segment with dense punctures. Four front *femora* strongly, the hind pair very strongly dentate. Length, 6-8 mm.

Hab.—Queensland: Cape York (H. Elgner), Cairns (A. Solari).

In the table previously given by me should be placed next to *Mastersi*, from which it differs in being smaller and much narrower, elytra without a pale V, etc. In general appearance, however, it is much closer to *punctiventris* and *duplicatus*, from which it may be readily distinguished by the curved suture between the two basal segments of abdomen, and the much stronger femoral dentition. On the elytra of one specimen the clothing is uniform, but on the other it exhibits a feeble tendency to become fasciate.

SUBFAMILY COSSONIDES.

Cossonus vicarius, n. sp.

Red; head and apical half of elytra black, knees and base of femora infuscate.

Head with dense and rather small punctures; interocular fovea fairly large. Rostrum rather wide at base, suddenly and strongly inflated in front, with a short median impression; with dense punctures, rather smaller than on head. *Prothorax* flat, base feebly bisinuate; with dense and moderately small punctures, towards middle becoming larger (but not very large) and sparser; middle itself with a feeble impunctate line. *Elytra* with regular rows of large punctures, becoming smaller posteriorly, the interstices each with a row of very minute punctures. Length, 7 mm.

Hab.—New South Wales: Sydney.

In general appearance remarkably close to *præustus*, but prothoracic punctures much smaller and less uneven at the base; the elytral punctures are also considerably smaller, although similarly disposed. It should possibly be treated as a variety of *præustus*, but I have seen no intermediate forms.

The elytra of the type are quite black at the apex, but where the two colours join (slightly nearer base than apex) the black becomes less intense, so that the two colours are not sharply defined. The rostrum and antennæ, although red, are slightly darker than the prothorax, but this also is darker at the apex than elsewhere.

A smaller specimen (5 mm.) differs from the type in having the prothorax black, the black on the elytra slightly advanced towards the base, and quite sharply defined, and the side pieces of the mesosternum blackish, but I can find no structural differences between it and the type.

Cossonus nigroapicalis, n. sp.

Of a rather bright-red, head and apical half of elytra black; apex of prothorax, knees, and base of femora slightly infuscate.

Head smooth and almost impunctate; interocular fovea rather large. Rostrum smooth and convex, without a median line, suddenly and strongly inflated in front of antennæ; with small, sparse, and irregularly-distributed punctures. *Prothorax* not very flat; with dense and not very small punctures; with an impunctate median line (appearing almost like a carina), on each side of which are some coarse punctures that become larger and more crowded towards the base. *Elytra* with regular rows of large punctures, becoming smaller posteriorly; the interstices apparently without punctures. Length, 4-5 mm.

Hab.—Queensland: Cairns (H. Hacker).

In general appearance very close to *præustus* and the preceding species; but readily distinguished therefrom by the rostrum and prothoracic punctures.

Cossonus Hackeri, n. sp.

Black; appendages dark-reddish-brown.

Head with rather dense and not very small punctures, smaller and sparser on forehead than in front; interocular fovea very shallow and indistinct. Rostrum wide at base, and almost regularly increasing in width to apex, with denser and coarser punctures than on head; very shallowly depressed along middle. First joint of funicle slightly, all the others strongly, transverse; club rather short, continuous with funicle. *Prothorax* depressed, base rather strongly bisinuate, with dense and not very small punctures, becoming sparser towards middle, middle itself with an irregular impunctate space (not a line). *Elytra* feebly convex, no wider than widest part of prothorax; with regular rows of fairly large (but for the genus decidedly small) punctures; the interstices each with a row of very distinct punctures, but at base each row increasing to two, three, or four in number, and very irregular. *Under surface* with moderately dense and not very small punctures, sparser and smaller in middle than at sides. Metasternum shorter than two following segments combined, these with a rather narrow depression common to both. *Femora* very stout, tibiæ short, with a fairly strong subapical tooth in addition to the terminal hook. Length, 5⅓-7 mm.

Hab.—Queensland: Coen (H. Hacker).

A rather aberrant species, but I have not considered it advisable to propose a new genus for its reception. The rostrum is no wider at the apex than in many other species, but is much wider at the base and is not suddenly inflated at the antennæ, so that it appears to increase almost regularly in width from base to apex. The scrobes are rather abruptly turned under the rostrum and almost meet, and the lower surface of the head (when viewed from the sides and with the antennæ removed) appears to be separated from the rostrum by a notch.

The strong rows of punctures on the elytral interstices, and the comparatively small ones in the regular rows, readily distinguish the species from all previously-described ones from Australia.

A Critical Review of South Australian Prasophylla together with a Description of Some New Species.

By R. S. Rogers, M.A., M.D.

[Read June 1, 1909.]

Plates VII. to XIII.

The genus *Prasophyllum* is admittedly the most difficult and perplexing one in the whole of the Orchideæ. Not only are the flowers frequently of very small size, but there are so many intermediate forms that almost every species may be said to blend insensibly into another. Even on the same spike considerable variations are often to be found among the individual flowers. A field observer who has paid special attention to this group rarely has difficulty in assigning any specimen to a particular species, but when it becomes necessary to record those salient points which definitely serve to distinguish one species from another his troubles begin. Constant characters are not easy to find, and it becomes necessary for differential purposes to depend upon the preponderance of certain characters rather than on their fixity.

For the formation of his primary sections of this genus Bentham relies upon the mode of attachment of the labellum to the column, a character too fickle to form a good basis for classification. Even cohesion of lateral sepals on which much of his ultimate analysis depends can be regarded only in a general way. In *P. elatum*, where this is perhaps a more constant feature than in any other prasophyllum, I have occasionally found the sepals free. Excessively dry and hot weather is often responsible for this, and in some species there is a tendency for separation to take place in advanced maturity, though the sepals may be connate in the younger flowers. In the contrary way I have sometimes found the lateral sepals united in species where these segments are usually free.

The study of this genus cannot be conducted by means of herbarium specimens alone, as even when such specimens are softened in the usual way, the observer may be still very much in doubt on many important points. Fresh specimens and careful observations in the field are absolutely essential to a right understanding.

Flowers belonging to plants of the same species vary a great deal in size according to the conditions under which they grow, but the relative proportion between the petals and lateral sepals seems (within narrow limits) to be fairly constant. I have taken advantage of this to form a *lateral index*, a measurement which I have found useful in differential diagnosis.

In order to estimate it the total length of the petal is used to form the numerator of a vulgar fraction, and the length of the lateral sepal the denominator. This fraction is then reduced to two places of decimals, and the result is the lateral index. For example, suppose the length of the petals to be $4\frac{1}{8}$ lines and that of the lateral sepals $4\frac{1}{2}$, the resulting fraction is $\frac{4\frac{1}{8}}{4\frac{1}{2}}$, and the lateral index is 92.

In order to diminish error it is advisable (when specimens permit) to estimate the index in three plants, and then to take the average.

The lateral indices of species growing in this State are approximately as follow:—

P. rotundiflorum, Rogers	96
P. elatum, R. Br.	95
P. odoratum, Rogers	95
P. album, Rogers	92
P. Australe, R. Br.	91
P. pruinosum, Rogers	87
P. gracile, Rogers	76
P. occidentale, Rogers	76
P. constrictum, Rogers	76
P. patens, R. Br.	75
P. Fitzgeraldi, Rogers-Maiden ...	69
P. fuscum, R. Br.	64
P. nigricans, R. Br.	64
P. Tepperi, Mueller-Rogers	56

Bidentation of the tips of the lateral sepals, or some trace of it, is almost invariably to be found in all but a few of our species, although, curiously enough, with regard to this Bentham makes the following comment:—"The lateral sepals in two or three instances have been described as 2-dentate. I have never found them so, and believe the error to have arisen either from a slip of the pen, referring to lateral sepals instead of lateral appendages of the column, or the writer to have meant the lip composed of the two combined lateral sepals." ("Flora Aust.," vol. vi., p. 335.) I have before me as I write two specimens of *P. patens*, both examined by Bentham, and in one at least of these there is distinct evidence of bidentation. The incurving of the rostellum towards the labellum is a feature which is sometimes mentioned in descriptions as having a specific significance. In the unfertilized flower the rostellum is invariably erect. The incurving is the first step towards fertilization. Thereby begins the tugging on the caudicle which eventually results in the liberation of the pollen-masses from the anther-case —a process fully described later on in this paper (*vide* fertilization of *P. nigricans*).

Another point which may be emphasized while dealing with the rostellum is that its height is lessened after the removal of the pollen-masses owing to the loss of the caudicle-disc which fits into its apex.

"Anther-point recurved" is another expression frequently met with in descriptions of members of this genus. While admitting that this condition may occasionally be of some slight diagnostic importance, it sometimes involves a fallacy which should be borne in mind. The function of the anther-point, so far as I have been able to ascertain it, is to keep the disc moist, to protect it from the drying influence of the air. When the rostellum "incurves" the disc is drawn away from close contact with the hitherto horizontal anther-point, which then undergoes the process of drying and frequently becomes "recurved." This at any rate is the progress of events in some species which I have observed..

In the immature flower the caudicle in all our Prasophylla lies closely and snugly between the back of the rostellum and the front of the pollinia, being usually attached from about the middle of the masses to their conjoined apices. This situation of the caudicle has an important bearing upon the process of fertilization. Each pollen mass shows evidence of longitudinal bilobing.

The shape of the lateral appendages of the column was utilized by Robert Brown to form his two fundamental divisions, *viz.*:—

I. "Columnæ laciniæ laterales apice integræ," and
II. "Columnæ laciniæ laterales [apice] bifidæ."

There can be no question that the morphological differences between lateral appendages are of great diagnostic importance, and now that plants with bifid tips to their lateral appendages have so greatly increased in number, I think that Brown's comprehensive primary subdivision of Continental Prasophylla might be reverted to with advantage. So far as this State is concerned, nine out of our fourteen species show comparatively unimportant variations in the lateral appendages—the other five are distinctive.

Only two—*P. nigricans* and *P. Tepperi*—fall under Brown's second group ("[apice] bifidæ"); all the rest have undivided tips, but are provided with a posterior basal lobe of varying size and shape, the notch between the two lobes being the vestigial remains of the former bifid apex. This basal lobe is rudimentary in some specimens of *P. Australe*, while in the case of *P. rotundiflorum* it is separated from the anterior part of the appendage by a singular finger-like process, a feature which readily serves to distinguish that species from all other known forms.

In the great majority of our species the stigmatic surface is reniform, with the hilum towards the rostellum, although this shape is sometimes departed from, as in the case of *P. Australe* and *P. nigricans*.

Fitzgerald is probably correct when he says that all members of this genus are fertilized by insects. Wherever I have had the opportunity to cultivate specimens under conditions such as would exclude insects, fertilization did not take place. In the case of *P. Australe*, however, the mechanism is such that self-fertilization might conceivably occur, although I have not yet been able to determine whether it is ever effected in this particular way. The small members of the genus are frequently visited by minute forms of Staphylinidæ and other small insects; while insects large and small frequent the larger flowers. I have in the latter case actually observed the fertilization of the plant by bees.

The disposition of the callous portion of the labellum as to area, abruptness, or otherwise of termination, degree of elevation above the membranous part, is important from a diagnostic standpoint. These features are far more constant than one might *a priori* suppose. On the other hand, the degree of flexion of the labellum in different individuals of *P. patens* varies exceedingly.

The angle of attachment which the flower makes with the vertical axis of the spike is a feature that seems to have escaped attention, except perhaps in some of the very minute forms in which the flowers are deflexed. In some cases the angle thus made is very small, the flower lying almost in apposition with the axis. In others the flower diverges considerably, the angle being comparatively large. The outstanding flowers of *P. fuscum* and *P. Fitzgeraldi*, for instance, afford a ready means of distinguishing them in the field from their respective allies, *P. patens* and *P. pruinosum*.

With all due deference to Bentham, who seems to hold a different view ("Flora Aust.," vol. vi., p. 340), some diagnostic importance must be attached to odour. The strong, delightful odour of the tiniest specimen of *P. Fitzgeraldi* would as surely distinguish it from *P. fuscum* and *P. pruinosum* as that of a magnolia from its inodorous allies.

Colour *per se* is unreliable, but taken in conjunction with other characteristics it often serves to strengthen or even to clinch a diagnosis.

The leaf when present can hardly be said to be helpful in differentiation of forms. The shape is almost uniform for all species, and the length varies greatly, even in plants of the same species. In our two small Autumnal forms (*P. nigricans* and *P. Tepperi*) the leaf is congenitally absent or at most represented by a small bract; while in the Spring forms it is an attractive tit-bit for insects, and is removed in this way with annoying frequency before the plant reaches the vasculum of the collector.

The time of blooming forms a ready means of group separation in our Prasophylla. *P. nigricans* and *P. Tepperi* appear in Autumn (April and May). *P. Australe* and *P. elatum* are Summer forms blooming in the hot months of November and December. The rest may be called the Spring forms, blooming in September and October (rarely a straggling specimen may be found early in November). There are no Winter species. I have not observed that any of our species bloom exclusively at certain altitudes, for although a few of the new species have so far been found only in the Mount Lofty Ranges, I have little doubt that a more extended search will discover them also at the lower levels. Even *P. Australe*, which I had long regarded as a mountain form, has recently been found on Kangaroo Island almost at sea-level.

There seems to be a definite predilection in the case of most of our species for a more or less sandy soil, less marked perhaps in the case of *P. patens* and *P. fuscum* than in some of the others. *P. Australe* would appear to be an exception to the rule, as I have never found it anywhere except in very wet places such as swamps or watercourses.

For reasons not difficult to understand much confusion has existed in South Australia with regard to this genus. In Tate's Flora six species are mentioned as occurring in this State, *viz.*:—

1. *P. nigricans*, R. Br.
2. *P. despectans*, Hooker.
3. *P. Australe*, R. Br.
4. *P. elatum*, R. Br.
5. *P. patens*, R. Br.
6. *P. fuscum*, R. Br.

A seventh species, *P. Tepperi*, stands as a *nomen nudum* in F. v. Mueller's first "Census of Australian Plants" (p. 140), but was afterwards withdrawn by him in favour of *P. nigricans*. He recognized this Peninsular form (*Tepperi*) as distinct from the species growing in the Mount Lofty Ranges, but believed the latter to be identical with *P. despectans*. This is not the case. The plant in the neighbourhood of Adelaide is certainly not *P. despectans* (which has still to be recorded for this State), but is undoubtedly Brown's *P. nigricans*. For this reason I have deleted *P. despectans* from the list and reinstated *P. Tepperi*. Still another *nomen nudum* appears under the authority of Tate in the Transactions of this Society (vol. xix., p. 82) as *P. Fitzgeraldi* (Deane). I wrote Mr. Henry Deane, of Sydney (a friend of the late R. D. Fitzgerald), for information regarding this matter, but found him unable to assist in any way towards the identification of this plant. The name, however, has since been rescued from oblivion. With a view of continuing Fitzgerald's monumental work on "Australian Orchids," Mr. J. H. Maiden (Sydney) was last year looking through the materials left by its author, when he came across a plate not yet published, containing an illustration, but no description, of *P. Fitzgeraldi*.

I had no difficulty in recognizing it as a form with which I was perfectly familiar, and which I had put aside for purposes of this paper. Its description now appears for the first time under our joint names.

The name *P. patens* has been applied to at least three very distinct forms in this and, I believe, in other States. The individuality of these must in future be recognized. I have retained the original name for the widely-distributed Port Jackson type, whence Brown derived his first specimen. The other two I have named *P. odoratum* and *P. album* respectively.

These alterations, together with certain other new forms described in this paper, will leave the genus represented in South Australia by fourteen recorded species. I have reason to believe that this number will be still further increased before long.

Sec. I.

Tip of lateral appendages bifid; flowers minute—
- Labellum with recurved pointed tip; no glands on tip of lateral petals ... ... *P. nigricans* 1
- Labellum quite blunt at tip; pedicellated glands on tips of lateral petals *P. Tepperi* 2

Sec. II.

Tips of lateral appendages undivided; flowers over 4 lines—
- A. Lateral index over 90.
  - *(a)* Lateral sepals connate.
    - Flowers over 8 lines. Membranous part of labellum greatly exceeding callous part *P. Australe* 3

Callous part greatly exceeding the membranous	*P. elatum* 4
(*b*) Lateral sepals free.	
Flowers over 9 lines	*P. odoratum* 5
Flowers under 9 lines.	
Supplementary process between basal lobe and anterior part of lateral appendage	*P. rotundiflorum* 6
Supplementary process absent	*P. album* 7
B. Lateral index over 80, but not exceeding 90	*P. pruinosum* 8
C. Lateral index over 70, but not exceeding 90	
(*a*) Lateral sepals connate, or partly so.	
Labellum with marked constriction at anterior third.	
Labellum on rather long claw; flowers large and yellowish-green	*P. gracile* 9
Labellum sessile; flowers medium size and prune-coloured	*P. constrictum* 10
Labellum without marked constriction, sessile. Flowers small (under 6 lines), yellowish-green	*P. occidentale* 11
(*b*) Lateral sepals free	*P. patens* 12
D. Lateral index over 60, but not exceeding 70.	
(*a*) Basal lobe of lateral appendage relatively large; labellum relatively narrow; flowers yellowish-green, without characteristic odour	*P. fuscum* 13
(*b*) Basal lobe only about ½ total height of appendage; labellum relatively wide; flowers prune-coloured, with powerful magnolia odour	*P. Fitzgeraldi* 14

The following table indicates the approximate length of the flower (including ovary without pedicel):—

	Lines.
P. elatum	10
P. odoratum	10
P. Australe	9
P. gracile	9
P. patens	7
P. album	7
P. pruinosum	7
P. constrictum	7
P. Fitzgeraldi	6½
P. rotundiflorum	6
P. fuscum	5
P. occidentale	5
P. nigricans	2—2½
P. Tepperi	1½—2

As regards size of flower, it will be seen that *P. odoratum* is a rival of *P. elatum*, and, it may be added incidentally, it falls very little short of it in point of height. It was a matter for regret that in the splitting up of *P. patens* it was not possible to retain the old name for this beautiful species instead of the insignificant form with which it will in future be associated.

1. **Prasophyllum nigricans**, R. Br. Pl. vii.A, figs. 1 to 8.

In reference to this plant Fitzgerald writes thus:—"*P. nigricans* is one of the forms that are ever puzzles to the botanist. So close does it come to some others that no description can separate them without the aid of drawings or specimens, and even with both these there is constant hesitation whether the distinctions are real or constant. The descriptions do not agree as given by different authors, and even the specimens can hardly be said to be consistent with themselves."

Professor Ewart, referring to specimens in the National Herbarium, Melbourne, writes thus:—"Most of our specimens have been given the name *P. rufum*, etc., and subsequently corrected. One has the following note—'*P. nigricans* may be right, but I have never seen an authentic specimen of it' (Lindley in litt., 1853). We have Milligan's Oyster Cove specimen seen by Bentham."

A letter from the Royal Botanic Gardens, Kew, informs me that the original specimen is in the British Museum. "The three specimens besides the original one cited by Bentham are presumably in the Mueller Herbarium." This is unfortunately not the case, nor have I been able to trace them. I am indebted to Professor Ewart for the opportunity of examining a specimen seen by Bentham, and also to Miss Bentham, who on a recent visit to England procured for me from Kew Herbarium a copy of the analytical drawings of the type specimen (No. 5551) in the British Museum. I was interested to learn that the latter institution acquired the type only in 1876. Brown's original description in the "Prodromus" (p. 319) is quite inadequate for identification, since it would include several allied forms discovered since it was written. Bentham ("Flora Aust.," vol. vi., p. 343) and Fitzgerald ("Aust. Orchids") both refer to glands on the tips of the lateral sepals. Such glands do not exist on the type specimen, nor have I ever seen them on any member of this species collected in this State. They are very well marked, however, in Bentham's specimen in the Melbourne National Herbarium, the plant being otherwise identical with our own. An obvious error occurs in Bentham's description where the petals are stated to be longer than the lateral sepals. The reverse is the case, and the error should be corrected. Fitzgerald lays much diagnostic stress upon the strap-shaped stigmatic surface. This surface is oval in the original type, and it is ovate or oval in some hundreds of fresh specimens which I have examined in this State.

A minute leafless plant, usually from 2 to 5 in. high; fibrous sheath at the base; single globular tuber, with the remains of previous year's bulb adhering to it; stem glabrous, with one small sheathing bract a little below the spike.

Spike from $\frac{1}{2}$ to 1 in. long, consisting of from 7 to 20 minute dark-purple (rarely green) flowers, each flower being shortly stalked, deflexed, and subtended by a tiny clasping bract. Flowers expand on the spike uniformly from below upwards.

Lateral sepals free, about $1\frac{1}{2}$ lines, green, cylindrico-lanceolate, widely spreading, concave on labellar side, not particularly gibbous at base. Dorsal sepal rather broadly hooded, with short recurved apical point, greenish or purplish, somewhat shorter than lateral sepals, about $1\frac{1}{4}$ lines, and about same length as labellum.

Lateral petals slightly shorter than dorsal sepal, about 1 line, and much shorter than lateral sepals, triangular-lanceolate, purplish.

Lateral index about 64.

Labellum dark-purple and very glandular, about same length as dorsal sepal ($1\frac{1}{4}$ lines), somewhat oblong in shape though gradually widening from its proximal to its distal end, where it abruptly narrows to a short recurved apex; attached to extended base of column by a semi-circular movable claw; margins entire in posterior two-thirds, minutely toothed, or crenulated in anterior third; callous portion oblong, slightly raised above the membranous and occupying rather more than half the upper surface, reaching nearly to apex and slightly channelled.

Lateral appendages of column purplish, almost as long as the petals, chelate, the anterior claw being generally much longer than the posterior, which varies much in length, being occasionally nearly as long as anterior, but sometimes blunt, notched, or rudimentary; reaching to level of anther-point and not incurved as in *P. despectans*.

Anther incurved, mucronate, the point at first soft and rather long, and covering disc of caudicle, but later hardening and rising to a more vertical position. Portion of column below anther considerably longer than anther itself.

Pollinia 2, attached by caudicle to rostellum by a single ovate disc.

Rostellum with cup-shaped depression in apex for disc, rather shorter than anther.

Stigma oval or ovate just below rostellum.

Ovary plano-convex, reflexed on dorsal sepal.

Fertilization does not occur when the flowers are developed under bell-jars or out of reach of insects. In the newly-opened flower the two pollinia lie immediately behind the erect rostellum, the caudicle, which is a little more than half their length, being attached adnately along the rostellar side of their groove of union and fastened by a single ovate disc to the top of the rostellum. As the flowers get older the rostellum curves forward, the disc which has hitherto been protected by the soft anther-point becomes exposed and contracted, and the pollen-masses are drawn slightly out of the anther-case. This latter movement produces an angular space between the back of the rostellum and the pollinia, with the result that the caudicle, which has hitherto been kept moist between these two surfaces, now becomes exposed to the air. The caudicle dries, and as it does so an upward movement takes place in it and the pollinia, the latter being gradually raised vertically above the rostellum. This movement continues until they are carried forward and projected horizontally towards the labellum. The disc can now be readily detached from the rostellum, and the flower is ready for fertilization by visiting insects.

The usual time of blooming in this State is the beginning of April, although it may be hastened by early rains. I have found it in the middle of March, and one season it appeared in February.

Robert Brown must have collected his first specimens at Port Lincoln between February 26 and March 6, an unusually early time for blooming, accounted for by the fact that the Port Lincoln season is somewhat in advance of our own (Adelaide).

Distribution: Mount Lofty Ranges, Meadows and district, Myponga, Yankalilla, Victor Harbour district, Goolwa, Kangaroo Island.

2. **P. Tepperi,** Mueller-Rogers, *sp. nov.* Pl. vii.B, figs. 1 to 8.

This appears as a *nomen nudum* in F. v. Mueller's first "Census of Australian Plants" (p. 140), but is omitted from the second census. A reference is made to it in Transactions of this Society, 1880 (p. 32), in "Plants about Ardrossan," by Mr. Tepper (its discoverer). No botanical description has hitherto appeared.

Plant 3 to 7 in. high, with fibrous basal sheath and a more or less globular bulb often compressed vertically. Fibrous remains of previous year's bulb still in contact with new bulb. Stem rather fleshy, thicker, and more robust than *P. nigricans*. Leaf-like bract just below spike.

Spike varies from ½ to 1½ in.; expansion of flowers rather irregular, beginning at base and ascending upwards, but often in a spiral manner. Flowers rather crowded, 9 to 26, green or yellowish-green, with very dark labella, sessile, each subtended by a minute ovate bract.

Lateral sepals green, free, lanceolate, labellar surface concave throughout, 1½ lines, not widely diverging.

Dorsal sepal, 1½ lines, green, widely lanceolate, hooded, with recurved point.

Lateral petals green, with reddish mesial stripe, linear-lanceolate, tipped with small pediculated glands, about 1 line.

Labellum varies considerably in shape, even in flowers on the same spike, more so than in any other Prasophyllum which I have examined. It is sometimes quadrangular, sometimes oblong, sometimes elliptical; but the following description is the net result of an examination of a very large number of specimens:—Dark-reddish-brown, a little over 1 line long, oblong-ovate, very blunt, on a movable hinge, tip slightly recurved, margins almost entire; callous part reaching nearly to tip, equal to membranous part with mesial groove; membranous part unusually thick; not nearly so recurved as in *P. nigricans*: upper surface very glandular, convex antero-posteriorly.

Lateral appendages of column reddish-brown, triangular-lanceolate, with chelate tip, the posterior claw nearly or quite equal to anterior in length; higher than anther or rostellum.

Anther-point extremely short.

Pollinia 2; caudicle about as long as pollinia. Portion of column below stigma equal in length to pollinia.

Stigmatic surface circular, just below rostellum.

Arrangement of rostellum and method of fertilization as in *P. nigricans*.

Ovary about 1½ lines, ellipsoidal, in apposition with dorsal sepal.

Lateral index about 56.

Diagnosis from *P. nigricans*:—Plant is more robust, and the stem bract larger and more leafy. Flowers not nearly so dark, being generally green with exception of labellum. Spike more crowded. Lateral sepals less spreading, with extremities fluted and not conical as in *P. nigricans.* Petals much narrower (linear-lanceolate as contrasted with triangular-lanceolate in the other form), and very constantly with well-marked pedicellated glands at their extremities. Labellum much blunter, shorter, membranous portion much thicker. Lateral appendages relatively longer, exceeding the level of rostellum and anther, the two claws equal or nearly equal, whereas in *P. nigricans* the anterior claw is generally much longer than the posterior. Anther-point extremely short or almost absent, whereas it is well marked in the other species. It grows at sea-level, and yet blooms later than *P. nigricans* at a considerable elevation. Flowers expand generally in a spiral manner from below upwards, whereas in *P. nigricans* they expand uniformly from below.

Blooms late in April or early in May.

It has been recorded only from Yorke Peninsula, where it is very numerous, growing in sandy soil, sometimes quite in the open, sometimes under shade of mallee or dry brushwood.

3. **P. Australe,** R. Br. Pl. viii., figs. 1 to 7.

This species is adequately described by Bentham. In Fitzgerald's work, however, the name is attached to the illustration of a remarkable Prasophyllum, which its author claims to represent the first specimen of this species found in New South Wales. The plant illustrated is quite unfamiliar to me, and is evidently a new species. The two leaf-like bracts on the stem, the labellum, and column are wholly unlike *P. Australe.* A fairly satisfactory illustration of this species is to be found in Hooker's "Fl. Tas.," vol. ii., pl. 110, under the title of *P. lutescens.* In this plate, however, the lateral appendages are shown without any evidence of a basal lobe. This is not quite correct, for although the basal lobe is often rudimentary, being sometimes represented by 2 or 3 crenulations on the lower posterior border of the appendage, they are always in evidence and sometimes reach a fair size. The removal of the disc from the top of the rostellum makes a considerable difference in the height of the latter, as the disc is unusually large and fleshy in this species. It is received into a triangular depression in the anterior aspect of the top of the rostellum, in the upper border of which is a notch through which the caudicle passes to the pollinia. The caudicle is rather long. In older flowers it is often found curled forward like a watchspring, with its polliniar end pointing close to the stigma. I can conceive that self-fertilization would be quite possible in this plant, although on account of the relative positions of the column and labellum every facility is also afforded for fertilization by insects. The stigmatic surface in *P. Australe* is large, prominent, and somewhat pentagonal in shape.

The flowers are sweet-scented, and the lateral index is about 91.

It blooms in this State in December.

The distribution of this species seems to be very localized. It is invariably found in swampy or wet ground, and has been recorded so far only from the swamp country around Myponga, Mount Compass, and Mylor; from Grunthal, Glenelg River, and Kangaroo Island. In the latter place it was found growing in the damp ground in the bed of the Harriet River.

4. **P. elatum,** R. Br. Pl. viii., figs. 8 to 15.

This species calls for little comment. I have known it to reach a height of 4 ft., which is considerably higher than mentioned in Bentham. All shades of colour are to be met with in the flowers, from a pale-green to a dark-purple or almost black. The latter colour prevails in the Kangaroo Island variety, which is locally known as the "black-boy."

Occasionally in very hot, dry weather I have found the lateral sepals free. The caudicle in this species is long, white, and strap-shaped. The stigmatic surface is large and triangular-ovate.

Lateral index about 95.

It blooms in November, and is distributed widely throughout the Mount Lofty Ranges, Victor Harbour district, and Kangaroo Island.

5. **P. odoratum,** Rogers, *sp. nov.* Pl. ix.B, figs. 1 to 9.

This plant has hitherto been regarded as a mere variety of *P. patens*, from which, however, it differs in habit, scent, and many important particulars.

Plant usually tall and robust, from 1 to 3 ft. high, stem often pinkish towards the base.

Ovary turgid, lying close to or diverging but slightly from the axis of the spike, very shortly stalked, subtended by a small ovate-lanceolate bract.

Fistula $1\frac{1}{2}$ to 2 in. below the spike, lamina of leaf of varying length, often reaching beyond the spike.

Spike not crowded; flowers, from 5 to 20.

Flowers pink and white, strongly and sweetly scented.

Lateral sepals free, about 5 lines, green or pinkish, dilated at base, concave on the top with cylindrical points, very divergent.

Dorsal sepal about 5 lines, greenish or pinkish, ovate-lanceolate, often very recurved in very old flowers, incurved in younger ones.

Lateral petals about $4\frac{1}{2}$ lines, pinkish with white tips, or white with brownish mesial stripe, linear-lanceolate.

Labellum about 5 lines, on very short claw, oblong-lanceolate; sharply reflexed about the middle, tip looking between lateral sepals; erect portion rather gibbous, its margin almost entire; anterior part bluntly triangular with very crenulated margins; membranous part white, greatly exceeding the callous part, ending abruptly just beyond the bend.

Lateral appendages falcate, with rounded basal lobe; not quite so high as rostellum.

Rostellum triangular with bifid apex, slightly higher in the fresh flower than the lateral appendages, and much higher than the anther-case.

Anther-case without a point; reddish-brown, much lower than rostellum.

Caudicle strap-shaped, about as long as anther-case.

Stigmatic surface reniform, just below rostellum, occupying whole breadth of middle lobe of column and reaching below to about the middle of the column.

Pollinia 2, large, each markedly bilobed; total length of pollinia about 1 line.

Lateral index about 95.

This species blooms rather later than *P. patens*, generally throughout November.

It is widely but not numerously distributed throughout the State.

6. **P. rotundiflorum,** Rogers, *sp. nov.* Pl. X.B, figs. 1 to 5.

This species is chiefly remarkable for the peculiar structure of its lateral appendage.

Plant about 7 in. in height.

Flowers about 7 in a spike, presenting a somewhat globular form owing to the tendency for sepals and petals to converge together to a point; yellowish-white; sessile with small ovate bract.

Lateral sepals quite free, lanceolate, curving upwards on each side of the labellum, yellowish-green in colour, about $3\frac{1}{2}$ lines, nearly same length as dorsal sepal and lateral petals.

Dorsal sepal concave, acuminate, converging towards the points of the lateral sepals.

Petals bluntly linear, white with pinkish stripe, incurved, embracing dorsal sepal and erect portion of labellum.

Labellum sessile, sharply reflexed about its middle, apex protruding between lateral sepals; white with a large crenulated membranous portion; callous part relatively small and not very thick, extending only a short distance beyond the bend.

Column prune-coloured.

Lateral appendages lanceolate-falcate, about as high as rostellum with a short rounded lobe at the base.

From the angle where the basal lobe is given off there proceeds a finger-like process which incurves towards the caudicle.

Caudicle about ½ length of pollinia.

Lateral index about 96.

Blooms September and October.

Recorded only from Cherry Gardens and Blackwood.

7. **P. album,** Rogers, *sp. nov.* Pl. x.A, figs. 1 to 9.

This is usually a smaller plant than *P. odoratum*, and with smaller flowers, but with similar colouring, except that there are fewer pink tints.

The flowers are not scented.

Lateral sepals about 4 lines, free, pinkish, lanceolate with cylindrical tips, concave upper surface, and rather dilated base.

Dorsal sepal nearly 4 lines, not recurved.

Petals, 3½ lines, linear-lanceolate.

Labellum on a short claw, obovate-lanceolate, margin of erect portion entire. Otherwise similar to but smaller than *P. odoratum*.

Lateral appendages quadrangular-falcate, with ovate-lanceolate basal lobes reaching about halfway up.

Anther-case much shorter than rostellum, pointless.

Stigma and caudicle as in *P. odoratum*.

Lateral index about 92.

Recorded from Victor Harbour and Grunthal.

8. **P. pruinosum,** Rogers, *sp. nov.* Pl. xi.B, figs. 1 to 8.

A rather slender species about a foot high.

Fistula about 2 in. below spike. Lamina of leaf usually shorter than spike, but sometimes exceeding it.

Spike 3 to 4 in. long. Flowers about 7 lines, 15 to 20, crowded, and placed more closely to axis of spike than in *P. Fitzgeraldi*, light prune-coloured, not scented.

Lateral sepals slender, a little over 4 lines, free, greenish-yellow, parallel or slightly converging fluted on upper surface.

Dorsal sepal about 3 lines, narrowly ovate-lanceolate, greenish with faint pink lines much recurved in mature flower.

Labellum sessile, pale-prune colour, recurved but not sharply so, margins entire but slightly undulate; callous portion green or yellowish-green, concave on top, narrow, slightly raised at sides but merging gradually into membranous part near the bend; membranous part pale-pink, narrow-triangular, much exceeding callous portion in area.

Lateral appendages parallel, not quite as high as rostellum, bluntly linear-falcate, with narrow basal lobe reaching about halfway up.

Rostellum triangular rather higher than lateral appendages.

Stigmatic surface reniform, placed about the middle of the anterior surface of column.

Anther-case reddish-brown; point short, blunt, recurved.

Pollinia granular; each mass vertically grooved.

Ovary slender about 2 lines, close to axis of spike.

Lateral index about 87.

Differential Diagnosis.

	P. pruinosum.	*P. Fitzgeraldi.*
Plant	Somewhat slender ...	Rather sturdy
Flowers	Close to axis, rather crowded, not scented	Standing out from axis; not crowded strongly, and sweetly scented
Ovary	Short and slender ...	Longer and turgid
Perianth ..	Segments slender... ...	Segments stouter
Lateral sepals ...	Rather long and slender...	Short and stout
Dorsal sepal ...	Narrow, *much* recurved ...	Wider, not markedly recurved
Petals	Longer, widely spreading, slender	Short, not widely spreading, rather wide
Labellum ...	Membranous portion much greater than callous part; narrow-triangular	Callous part greater than membranous; widely triangular
Column	Lateral appendages narrow, falcate	Lateral appendages widely quadrangular
Stigma	Reniform	Almost rectangular

Begins to bloom about the middle of October.

Found growing in alluvial soil at Blackwood and National Park.

9. **P. gracile.** Rogers, *sp. nov.* Pl. xii.A, figs. 1 to 11.

A graceful species rather more than a foot in height. Fistula $\frac{3}{4}$ inch below spike. Leaf reaching to within an inch of top of spike.

Spike $4\frac{1}{2}$ inches, not crowded; flowers 30, rather large, yellowish-green, each subtended by small ovate-lanceolate bract and standing well out from axis of spike.

Ovary slender, stalked.

Lateral sepals between 5 and 6 lines long, connate in their proximal third, concave on top; with subulate, recurved, bidentate points; narrow, parallel.

Dorsal sepal nearly 5 lines long, ovate-lanceolate, incurved.

Petals about $4\frac{1}{2}$ lines, linear-lanceolate, tips incurved so as to meet each other and also the tip of the dorsal sepal.

Lateral index about 76.

Labellum on a well-marked claw, recurved near the middle; erect portion deeply concave with entire margins; the part in front of bend narrow-triangular with sharp point, slightly undulating margin and marked constriction (or lateral pinch) about one-third of the distance beyond the bend; membranous portion white and glandular, nearly equal in extent to callous portion; callous part raised just in front of bend, ending abruptly just beyond the constriction, but not reaching the tip.

Lateral appendages shorter than rostellum and anther-case, hardly falcate, with blunt tip and a rather narrow basal lobe reaching to about the middle.

Anther-case with short, erect point, about same height as rostellum.

Pollinia 2; each longitudinally furrowed.

Caudicle of medium length and usual attachment.

Stigmatic surface reniform.

Found late in October at Sandergrove.

10. **P. constrictum,** Rogers, *sp. nov.* Pl. xiii.B, figs. 1 to 5.

Plant about a foot or less in height.

Lamina of leaf about 5 in. long, extending beyond spike; fistula about $1\frac{1}{2}$ in. below spike.

Spike about $3\frac{1}{2}$ in., with about 20 rather crowded flowers. Flowers sessile, prune-coloured, with small ovate bract clasping the proximal end of ovary.

Lateral sepals stout, connate to their middle, markedly bidentate, nearly 4 lines, inner surface fluted.

Dorsal sepal broadly-lanceolate with gland at tip, inflexed over column, $3\frac{1}{2}$ lines.

Petals rather spreading, narrow-lanceolate, $3\frac{1}{4}$ lines.

Lateral index about 76.

Labellum sessile, prune-coloured, nearly 3 lines long; posterior two-thirds ovate, contracted at base, with undulate or almost entire upturned margins; anterior third separated from posterior portion by a sharp constriction (or lateral pinch) as in *P. gracile*. Callous part not exceeding membranous, crossing constricted neck between anterior and posterior portions, not quite reaching the tip, but sharply raised as it approaches it.

Lateral appendages nearly as high as rostellum, linear with oblique or bifid upper margins, and rounded basal lobe about half the height of the appendage.

Anther on a level with rostellum; no anther-point.

Rostellum same height as anther-case, bifid when disc is removed, but in the young flower ending in a well-marked globular disc.

Stigma large, reniform just below rostellum, occupying whole width of column.

Caudicle rather short.

Ovary ellipsoidal, with some antero-posterior flattening.

Found blooming early in October at Tailem Bend.

11. **P. occidentale,** Rogers. Pl. xii.B, figs. 1 to 9.

A description of this Orchid appeared in the Transactions of this Society (vol. xxxii., p. 11). The few specimens on which I based it were mostly seeding, and one or two points will bear modification after subsequent examination of a large number of specimens:—

"Lateral sepals . . . united in distal fourth" should be modified as follows:—Lateral sepals generally more or less connate but sometimes quite free, especially in mature flowers or in very hot weather. On every spike there are always some flowers with connate sepals.

The labellum is very shortly stalked, its flexion is rather sharp; the erect portion is gibbous with entire margins; the callous portion is slightly raised, ending abruptly midway between the bend and the tip.

The lateral appendages are bluntly linear and the stigmatic surface is crescentic in shape.

Lateral index about 76.

12. **P. patens,** R. Br. Pl. ix.A, figs. 1 to 9.

A common plant varying from a few inches to about 2 ft. in height.

Flowers subtended by small ovate bract, green, greenish, or brownish, the membranous part of the labellum sometimes white, or whitish with a tinge of green, yellow, or light prune, never the pure white of *P. odoratum* or *P. album*. Ovary more slender than in *P. fuscum*, and not outstanding from the axis of the spike as in that species.

Lateral sepals about 4 lines, free, lanceolate, generally slightly bidentate, narrowing gradually to tip; not inflated at base as in *P. odoratum* and *P. album;* parallel, not diverging widely as in those species.

Dorsal sepal rather less than 4 lines, ovate-lanceolate, generally moderately recurved in the mature flower, especially in hot weather.

Petals rather less than 3 lines, linear, spreading (sometimes markedly so).

Lateral index about 75.

Labellum very shortly stalked (almost sessile), ovate-lanceolate, varying in degree of flexion from an obtuse to a right angle, not acutely flexed as in *P. odoratum* or *P. album;* protruding slightly between lateral sepals; margins slightly crenulated; membranous portion greater than callous but not so markedly so as in *P. odoratum* and *P. album*.

Lateral appendages broadly-linear with minute rounded basal lobe, nearly but not quite as high as rostellum.

Rostellum considerably higher than anther-case, bifid when disc is removed.

Anther-case with very short point, dark-brown, much shorter than rostellum.

Disc narrow-triangular.

Stigmatic surface reniform, occupying entire width of middle lobe of column just below rostellum.

Caudicle strap-shaped, of medium length, attached in usual way.

Pollinia 2, of usual form and attachment.

It blooms in September and October, and is widely distributed on plains and hills and also on Kangaroo Island.

13. **P. fuscum**, R. Br. Pl. xiii.A, figs. 1 to 9.

The following is a description of this variable species in this State:—

Plant of slender habit, from 9 to 18 in. high; fistula opening considerable distance below spike, often as much as 5 in. Lamina slender, reaching well up spike or beyond it.

Spike not crowded, flowers about 13 to 24.

Ovary (shown rather small in plate) relatively large in comparison with the flower, shortly stalked, cuneate.

Flowers generally green, sometimes greenish-yellow, standing well out from axis of spike.

Lateral sepals about 3¼ lines, quite free, parallel, lanceolate, with cylindrical slightly bidentate points, concave on the upper surface.

Dorsal sepal nearly 3 lines, not recurved.

Petals about 2 lines, bluntly linear, not spreading.

Lateral index very low, about 64.

Labellum ovate-lanceolate, sessile: erect part rather bulging with entire margins; distal part with slightly crenulated margins; callous portion occupying a relatively large part of the surface, extending much beyond the bend and reaching nearly to the tip.

Lateral appendages about same height as rostellum, wide, almost quadrangular, with blunt free end, and relatively large basal lobe reaching considerably beyond the middle.

Anther-case pointless, nearly as high as rostellum.

Stigmatic surface reniform, occupying full breadth of middle lobe of column, just below rostellum.

Comparative Measurements of *P. fuscum*, *P. patens*, *P. odoratum*, and *P. album*.

Part.	*P. fuscum.*	*P. patens.*	*P. odoratum.*	*P. album.*
Lateral sepals ...	3¼ lines	4 lines	5 lines	4 lines
Dorsal sepal ...	3 lines	3¾ lines	5 lines	4 lines
Petals	2 lines	2¾ lines	4½ lines	3½ lines

In *P. fuscum* and *P. odoratum* lateral sepals longer than dorsal sepal.

In *P. odoratum* and *P. album* the sepals are equal.

In *P. fuscum* and *P. patens* lateral sepals exceed petals by 1¼ lines.

In *P. odoratum* and *P. album* lateral sepals exceed petals by ½ line.

P. fuscum blooms in September and October.

It is widely distributed on plains and hills and also on Kangaroo Island.

14. **Prasophyllum Fitzgeraldi**, Rogers-Maiden, *sp. nov.*
Pl. xi.A, figs. 1 to 8.

A fairly stout species from about 7 to 18 in. in height.

Leaf of varying length, sometimes extending beyond the top of the spike.

Spike from $1\frac{3}{4}$ to nearly 5 in., flowers 10 to 24, not crowded, about 7 lines long, sweet-scented, with prune-coloured labella. Expansion of flowers begins in the middle of spike, extending upwards and downwards.

Lateral sepals, 3 to $3\frac{1}{4}$ lines, free in mature flower (they are shown too far apart in Fitzgerald's plate), dull-green, lanceolate, concave, and with incurved margins at the top.

Dorsal sepal about 3 lines, greenish, broadly lanceolate, flat, spreading, and recurved at the top in mature flower.

Lateral petals 2 to $2\frac{1}{2}$ lines, green with dark-red longitudinal stripe, rather bluntly linear, divergent (though not markedly so) in mature flower.

Lateral index about 69.

Labellum prune-coloured, sessile, slightly contracted at base; an erect, rather gibbous portion with entire margins; and a broadly triangular laminar portion with crenulated edges passing forward almost at a right angle to the erect portion; callous portion deep-prune-coloured, raised pubescent, ending abruptly near the tip; membranous portion of lighter hue and rather smaller in area than callous part.

Lateral appendages of column membranous, widely quadrangular with rounded angles, as high as rostellum, with wide rounded basal lobe reaching to about the middle.

Anther-case reddish-brown with rather blunt anther-point (recurved after removal of pollinia).

Pollinia 2; vertically bilobed.

Rostellum triangular with shallow bifid apex for reception of disc.

Stigmatic surface just below rostellum, wide, almost rectangular, with wide transverse opening into pollen tube.

Caudicle rather short, attached in the usual way to the rostellum side of the conjoined pollinia.

Ovary about $3\frac{1}{2}$ lines, rather turgid, standing well out from the axis of the spike.

Found blooming in alluvial soil in October and early November in National Park, and other parts of the Mount Lofty Ranges.

A distinct but rare form.

DESCRIPTION OF PLATES.

Plate VII.a.

Fig. 1. Side view of flower, ×4: *l s*, lateral sepals; *d s*, dorsal sepal; *l p*, lateral petals; *l*, labellum; *l ap*, lateral appendage of column; *o*, ovary.

,, 2. Dorsal view, ×4: lettering as in fig. 1.

Fig. 3. Side view of column, ×6: *a*, anther; *l ap*, lateral appendage of column.
,, 4. Front view of column: *s*, stigma; other lettering as in fig. 3.
,, 5. Three-quarter profile of labellum, ×6: *unshaded*, proximal end of lower surface; *shaded*, shows callous and membranous parts of distal end of dorsal surface.
,, 6. Top view of labellum, ×6: showing central callous portion and lateral membranous portions.
,, 7. Front view of flower, ×4: showing, *inter alia*, ventral surface of labellum with point of dorsal sepal showing just above; lettering as in fig. 1.
,, 8. Three-quarter view of flower, ×4: lettering as in fig. 1.
,, 9. Pollen masses *(p)*, ×8: *c*, caudicle; *d*, disc.

Plate VII.b.

Fig. 1. Side view of flower, ×4: *l s*, lateral sepal; *d s*, dorsal sepal; *l p*, lateral petal; *l*, lateral appendage of column; *l*, labellum; *o*, ovary.
,, 2. Dorsal view of flower, ×3: *col*, column: other lettering as in fig. 1.
,, 3. Side view of column, ×6: *a*, anther; *l ap*, lateral appendages of column.
,, 4. Front view of column, ×6: *s*, stigma; *r*, rostellum; other lettering as in fig. 3.
,, 5. Side view of labellum, ×6: *l*, labellum; *h*, hinge.
,, 6. Upper view of labellum showing callous central portion and lateral membranous portion, ×6: *l*, labellum; *h*, hinge.
,, 7. A lower view of labellum, ×6: lettering as in figs. 5 and 6.
,, 8. Front view of flower, ×4: lettering as in fig. 1. This view shows well the small glands *(g)* at the tips of lateral petals.

Plate VIII.

Fig. 1. (Lower left-hand corner of plate.) Three-quarter side view, ×1½: *l s*, lateral sepals; *d s*, dorsal sepal; *l p*, lateral petals; *l*, labellum; *ov*, ovary.
,, 2. Column from side, ×6: *r*, rostellum; *a*, anther-case; *l ap*, lateral appendages, *b l*, basal lobe (often abortive).
,, 3. Column from front, ×6: *r* and *l ap*, as in fig. 2; *st*, stigma.
,, 4. Column from back, ×6: lettering as in fig. 2.
,, 5. Labellum from side, ×6: *c p l*, callous portion; *m p l*, membranous portion; *e p l*, erect or gibbous portion.
,, 6. Labellum from top, ×6: *c p l*, callous portion; *m p l*, extensive membranous part.
,, 7. Showing connate lateral sepals, ×3: these are occasionally quite free; often free at tip.
,, 8. Side view of flower, ×1½: *l s*, lateral sepals; *d s*, dorsal sepal; *l p*, lateral petals; *m p l*, membranous part labellum; *c p l*, callous part labellum; *l ap*, lateral appendages; *a c*, anther-case; *ov*, ovary.
,, 9. Top view of flower, ×1½: *l s*, *d s*, and *l p* as in fig. 8; *l*, labellum.
,, 10. Connate lateral sepals, ×1½.

Fig. 11. Labellum from top, ×2: *m p l*, membranous portion; *f c p*, free margin of callous part.
,, 12. Labellum three-quarter side view, ×2: lettering as in fig. 11.
,, 13. Column from side, ×3: *l ap*, lateral appendage; *b l*, basal lobe of lateral appendage; *c*, caudicle detached from the pollinia and curled forward; *a c*, anther-case.
,, 14. Column from front, ×3: *l ap*, lateral appendage; *d*, disc of caudicle in position; *r*, rostellum; *st*, stigma.
,, 15. Column from back, ×3: *r* and *l ap* as in fig. 14; *a c*, anther-case; *b l*, basal lobe of lateral appendage.

Plate IX.a.

Fig. 1. Three-quarter side view of flower, ×2: *l s*, lateral sepals; *d s*, dorsal sepal; *l p*, lateral petal; *ov*, ovary; *c p l*, callous portion labellum; *m p l*, membranous ditto.
,, 2. Flower from top, ×2: lettering as in fig. 1.
,, 3. Flower from below, ×2: lettering as in fig. 1.
,, 4. Labellum from front showing very short claw *(c)*, ×4.
,, 5. Labellum three-quarter side view, ×4: *e p*, erect part; other lettering as in fig. 1.
,, 6. Labellum from top, ×4: lettering as in fig. 1.
,, 7. Column from back, ×4: *r*, rostellum; *l ap*, lateral appendage; *b l*, basal lobe; *a c*, anther-case.
,, 8. Column from side, ×4: lettering as in fig. 7.
,, 9. Column from front, ×4: *st*, stigma; other lettering as in fig. 7.

Plate IX.b.

Fig. 1. Three-quarter side view of flower, ×2: *l s*, widely separated lateral sepals; *d s*, dorsal sepal; *l p*, lateral petal; *m p l*, membranous part labellum; *c p l*, callous part; *l ap*, lateral appendages; *ov*, ovary.
,, 2. Flower from top, ×2, giving good view of labellum *(l)*: *a c*, anther-case; other lettering as in fig. 1.
,, 3. Flower from below, ×2: lettering as in fig. 1.
,, 4. Labellum from front, ×3: showing triangular contraction at base.
,, 5. Labellum from side, ×3: showing short claw *(c)* and erect portion *(l p)*; other lettering as in fig. 1.
,, 6. Labellum from top, ×3: lettering as in fig. 1.
,, 7. Column from back, ×3: *d*, disc; *c*, caudicle; *r*, rostellum; *a c*, anther-case; *l ap*, lateral appendage; *b l*, basal lobe.
,, 8. Column from side, ×3: lettering as in fig. 7.
,, 9. Column from front, ×3: *st*, stigma; other lettering as in fig. 7.

Plate X.a.

Fig. 1. Three-quarter side view flower, ×2: *l s*, lateral sepals; *d s*, dorsal sepal; *l p*, lateral petals; *m p l*, membranous part labellum; *c p l*, callous ditto; *ov*, ovary.
,, 2. Flower from top, ×2: lettering as in fig. 1.
,, 3. Flower from below, ×2: lettering as in fig. 1.
,, 4. Labellum from front, ×4: *c*, claw.
,, 5. Labellum from side, ×4: lettering as in fig. 1.
,, 6. Labellum from top, ×4: lettering as in fig. 1.

Fig. 7.—Column from behind, ×4: *r*, rostellum; *c*, caudicle; *a c*, anther-case; *l ap*, lateral appendage; *b l*, basal lobe.
,, 8. Column from side, ×4: lettering as in fig. 7.
,, 9. Column from front, ×4: *d*, disc; *st*, stigma; other lettering as in fig. 7.

Plate X.b.

Fig. 1. Plant (natural size); leaf destroyed.
,, 2. Side view (lateral petals removed), ×4: *l s*, lateral sepal; *d s*, dorsal sepal; *l*, labellum; *l ap*, lateral appendage of column; *a c*, anther-case; *r*, rostellum; *o*, ovary.
,, 3. Dorsal view (dorsal sepal and lateral petals removed), ×4: *r*, *a c*, *o*, *l ap*, and *l s* as in fig. 2; *m p l*, membranous portion labellum; *c p l*, callous portion labellum; *p m*, pollen masses (in the figure the caudicle is seen attaching them to the rostellum); *x*, finger-like process between anterior and posterior lobes of lateral appendage.
,, 4. Lateral appendage showing *(l ap)* anterior lobe; *y*, posterior lobe; and *x*, finger-like process proceeding from between the two lobes.
,, 5. Top view, ×2: *l s*, *l*, and *d s* as in fig. 2; *l p*, lateral petal. This figure is chiefly for purpose of showing the incurving of lateral petals; *ov*, ovary.

Plate XI.a.

Fig. 1. Three-quarter view of flower, ×2: *l s*, lateral sepals; *d s*, dorsal sepal; *l p*, lateral petals; *l*, labellum; *ov*, ovary.
,, 2. Front view of flower, ×2: lettering as in fig. 1.
,, 3. Flower from below, ×2: lettering as in fig. 1.
,, 4. Flower from top, ×2: lettering as in fig. 1.
,, 5. Labellum three-quarter side view, ×4: *m p l*, membranous portion labellum; *c p l*, callous portion.
,, 6. Side view column, ×4: *l ap*, lateral appendages; *b l*, basal lobe; *r*, rostellum; *a*, anther.
,, 7. Column from back, ×4: lettering as in fig. 6.
,, 8. Column from front, ×4: *r* and *l ap* as in fig. 6; *st*, stigmatic surface showing marked pollination-tube.

Plate XI.b.

Fig. 1. Three-quarter side view of flower, ×2: *l s*, lateral sepals, *d s*, dorsal sepal; *ov*, ovary; *l p*, lateral petal; *m p l*, membranous part labellum; *c p l*, callous ditto.
,, 2. Flower from front, ×2: lettering as in fig. 1.
,, 3. Flower from below, ×2: *l s*, *d s*, *l p*, and *ov* as in fig. 1; *l*, labellum from below.
,, 4. Flower from top, ×2, showing spreading petals: lettering as in fig. 1.
,, 5. Labellum three-quarter side view, ×4: *m p l*, membranous part labellum; *c p l*, callous ditto.
,, 6. Column from front, ×4: *r*, rostellum; *st*, stigma; *l ap*, lateral appendage.
,, 7. Column from side, ×4: *b l*, basal lobe; *c* and *d*, caudicle and disc; *a c*, anther-case; other lettering as in fig. 6.
,, 8. Column from back, ×4: *p*, pollinia; other lettering as in fig. 7.

Plate XII.a.

Fig. 1. Side view of flower, ×2, showing way in which apices of dorsal sepal and lateral petals tend to meet: *l s*, lateral sepals; *d s*, dorsal sepal; *l p*, lateral petals; *l*, labellum; *ov*, ovary.
,, 2. Flower from top, ×2: *m p l*, membranous part labellum; *c p l*, callous ditto; other lettering as in fig. 1.
,, 3. Side view labellum, ×4: showing *c*, claw; *m p l* and *c p l* as in fig. 2.
,, 4. Labellum from below, ×4: showing constriction *(x)* in membranous part.
,, 5. Labellum from above, ×4: showing constriction *(x)*, claw *(c)*, and other lettering as in fig. 2.
,, 6. Column from side, ×8: *r*, rostellum; *a p*, anther-point; *a c*, anther-case; *l ap*, lateral appendage; *b l*, basal lobe.
,, 7. Column from side, ×4: lettering as in fig. 6.
,, 8. Column from front, ×4: showing in addition to lettering in fig. 6 also *st*, stigma.
,, 9. Column from back, ×4: lettering as in fig. 6.
,, 10. Connate lateral sepals from side, ×2.
,, 11. Connate lateral sepals from below, ×2: showing bidentate ends.

Plate XII.b.

Fig. 1. Three-quarter side view of flower, ×3: *l s*, connate lateral sepals; *d s*, dorsal sepal; *l p*, lateral petals; *m p l*, membranous part labellum; *c p l*, callous ditto; *l ap*, lateral appendage; *ov*, ovary.
,, 2. Flower from below, ×2: showing connate lateral sepals, *l s*; other lettering as in fig. 1.
,, 3. Flower from top, ×2; lettering as in fig. 1.
,, 4. Labellum from side, ×4: *m p l*, membranous part; *l p*, erect rather gibbous part.
,, 5. Labellum from top, ×4: lettering as in fig. 1.
,, 6. Labellum from front, ×4; lettering as in fig. 1; *c*, claw (short).
,, 7. Column from side, ×4: *l ap*, lateral appendage; *b l*, basal lobe; *a c*, anther-case.
,, 8. Column from back, ×4: *r*, rostellum; other lettering as in fig. 7.
,, 9. Column from front, ×4: *st*, stigma; other lettering as in figs. 7 and 8.

Plate XIII.a.

Fig. 1. Three-quarter side view, ×2: *l s*, lateral sepals; *d s*, dorsal sepal; *l p*, lateral petals; *l*, labellum; *ov*, ovary.
,, 2. Flower from top, ×2: *br*, bract; other lettering as in fig. 1.
,, 3. Flower from below, ×2: lettering as in fig. 1.
,, 4. Labellum from front, ×4.
,, 5. Labellum from side, ×4.
,, 6. Labellum from top, ×4: *m p l*, membranous part labellum; *c p l*, callous ditto.
,, 7. Column from back, ×4: *r*, rostellum; *l ap*, lateral appendage; *b l*, basal lobe; *a c*, anther-case.

Fig. 8. Column from side, ×4: showing wide somewhat quadrangular lateral appendage *(l ap)*, with wide relatively large basal lobe *(b l)*.

,, 9. Column from front, ×4: *st*, stigma; other lettering as in fig. 7.

PLATE XIII.B.

Fig. 1. Back view, ×2: showing *d s*, dorsal sepal, with small portion of right lateral appendage showing over its border; *l p*, lateral petals; *o*, ovary.

,, 2. Front view, ×2: showing *d s* and *l p* lettering as in fig. 1; *l s*, lateral sepals; *l*, labellum, with constriction towards point; *r*, rostellum (bifid), with anterior surface column below it.

,, 3. Dorsal view, ×4: showing *d s*, *l p*, *l s*, and *r* lettering as in fig. 2; *s*, stigma; *l a p*, lateral appendage column; *m p l*, membranous portion labellum; *c p l*, callous portion labellum; *con*, constriction of labellum; *col*, column.

,, 4. Top view (dorsal sepal and lateral petals removed), ×4: *l s*, bidentate connate lateral sepals; *l*, labellum; *r*, rostellum; *a l*, anterior lobe lateral appendage; *p l*, short basal or posterior lobe lateral appendage; *a*, anther; *o*, ovary.

,, 5. Same specimen as fig. 4 seen side view, ×4: lettering as in fig. 1.

Description of Micrantheum demissum and of New Species of Solanum, Pultenæa, and Grevillea.

By J. M. Black.

[Read August 3, 1909.]

Plate XIV.

Micrantheum demissum, F. v. M. Pl. xiv.

The literary history of this plant is curious. It was first described in *The Victorian Naturalist*, vol. vii., p. 17 (1890), by Baron von Mueller from specimens supplied by Professor Tate and Mr. J. G. O. Tepper, the localities named being Encounter Bay and Kangaroo Island. Judging by the description in *The Victorian Naturalist* the specimens forwarded to Melbourne were lacking in flowers, and no notice is taken of the fact that the fruits are 2-celled, not 3-celled, as in the two other known species of *Micrantheum*, Mueller probably thinking that the specimens were abnormal in this respect. In Professor Tate's "Flora of Extratropical South Australia," published also in 1890, the only species of *Micrantheum* described is *M. hexandrum*, Hook. f. (which is apparently confined to the eastern States of Australia); but in the Proceedings of the Royal Society of S.A., vol. xiii., p 242 (1890), it is stated that the name should be altered to *M. demissum*. In 1907 several specimens were collected by Mr. H. H. D. Griffith and myself at Square Waterhole and Mount Compass, and in 1908 specimens of the small-leaved hairy variety were obtained on Kangaroo Island by Mr. Griffith. It was thus ascertained that the flowers are tetramerous and the fruit always 2-celled, the plant differing in these respects from other *Micranthea* and necessitating an extension of the generic character. As the species has never before been fully described, it seems advisable to do so here.

A dwarf shrub of 30-50 cm., with pubescent branches; leaflets arranged in 3's (rarely in 4's or 5's), subsessile, small (3-7 mm. long), oval, flat, with thickened margins and midrib prominent below; flowers minute, pink, 1-3, axillary, the males on short pedicels, perianth segments suborbicular, the 2 outer ones smaller; stamens 4, inserted at the base of the 4-lobed rudimentary ovary and opposite to the segments; female flowers sessile, with 4 subequal lanceolate segments; ovary 2-celled, with 2 broad, divergent stigmatic lobes opposite the outer perianth segments; capsule 5-7 mm. long, ovoid-tetragonous, 2-celled; seeds cylindrical-oblong, golden-brown, carunculate, with a raised line down the inner face.

The mainland form has almost glabrous leaves and capsule, while the variety found on Kangaroo Island has smaller leaves, beset, like the capsule, with short, spreading hairs.

I forwarded specimens to Melbourne for comparison with the types in Mueller's herbarium, and Professor Ewart informs me that he intends making a separate species of this plant. It is, however, to be observed that *M. demissum* has the ternate leaflets or leaves, which are characteristic of *Micrantheum*, and a difference in the number of ovary cells is admitted in several other Euphorbiaceous genera. In *Phyllanthus*, for instance, the number of cells varies from 2 to 15.

Solanum coactiliferum, *sp. nov.* Pl. xiv.

Suffrutex humilis, totus tomento stellato viridi-cinereo coactilia simulante tectus, aculeis subulatis rectis in ramis et petiolis, foliis petiolatis concavis lineari-oblongis undulatis 3-5 cm. longis, nervo medio subtus prominenti, pedicellis geminatis extra-axillaribus fructiferis elongatis deflexis, calyce campanulato inermi 4- (rarissime 5-) dentato, corollâ violaceâ 4-partitâ calyce duplo longiore, antheris 4 lanceolatis, baccâ globosâ circa 15 mm. diametro.

Port Broughton district; numerous but apparently localized: reported as useless for feed on account of the prickles.

Near *S. esuriale*, Lindl., but the dense greenish-grey felt which covers the plant gives it a very different appearance; the leaves are usually entire, but have sometimes a few shallow, obscure lobes near the base, and the margins are curved upwards, so that the leaf is concave or broadly channelled. It differs also from *S. esuriale* in the tetramerous flowers without any common peduncle. The prickles are usually numerous, but the plant varies a great deal in this respect.

Pultenæa trifida, *sp. nov.* Pl. xiv.

Frutex humilis, ramis diffusis villosis, foliis breve petiolatis parvis (4-7 mm. longis) congestis ovatis mucronatis supra concavis pubescentibus subtus cano-villosis, stipulis lanceolatis basi concretis, floribus flavo-purpureis axillaribus sed apice ramulorum in capitulis foliosis congregatis, bracteis exterioribus stipularibus, bracteolis subherbaceis trifidis juxta sub calyce insertis eumque subæquantibus lobis subulatis ciliatis apice glabris, calyce rubello villosulo dentibus acuminatis, ovario villoso stipitato.

Collected by Mr. H. H. D. Griffith at Snug Cove and on the telegraph line near Cape Borda, K.I., October 22-26, 1908.

Belongs to section iv., *Cœlophyllum*, subsection G. ("Flora Aust," vol. ii., p. 111). Differs from *P. villifera*, Sieb., by the leaves smaller and only 1-nerved below, and appears to be distinguished from all other Pultenæas by the trifid bracteoles, although the bracteoles of *P. laxiflora*, Benth., which have 2 short, stipular lobes at base, show a tendency in the same direction. The specimens are only in bud, with a few open flowers, forming, at least at this stage, terminal leafy heads at the ends of the short branches.

Grevillea quinquenervis, *sp. nov.* Pl. xiv.

Frutex erectus, ramulis angulatis cano-tomentellis, foliis subsessilibus rigidis oblongis obtusis mucronatis 2-4 cm. longis supra glabris punctulatis 3-5-nerviis subtus argenteosericeis marginibus recurvis nervo medio decurrente, racemis umbelliformibus 4-10-floris axillaribus et terminalibus canotomentosis brevissime pedunculatis, pedicellis perianthium subæquantibus, perianthio roseo angusto 7-8 mm. longo intus prope basin dense barbato, toro recto, glandulâ hypogynâ subannulari, ovario glabro stipitato, stylo glabro tenui perianthium parum superante, stigmate plano laterali nutanti suborbiculari. Fructus ignotus.

Collected by Mr. Griffith at Snug Cove, Harvey's Return, and Ravine Creek, K.I., October, 1908, and by Dr. R. S. Rogers near the same localities about a month earlier.

Belongs to section *Lissostylis*, series 2 *(Sericeæ)*, "Flora Aust.," vol. v., p. 424. Differs from *G. sericea*, R. Br., by the leaves with parallel nerves and the longer pedicels; from *G. parviflora*, R. Br., by the broader leaves, longer flowers and pedicels, and the dense, woolly beard inside the perianth segments; from *G. trinervis*, R. Br., by the larger leaves, longer pedicels, and much smaller flowers; from *G. aspera*, R. Br., by the parallel leaf-nerves, the dense racemes, and the straight torus. The underside of the leaf is shining and silky, and the nerves are usually 5, but the 2 outermost occur where the margin is curved backward, and are therefore not readily seen. The Tate herbarium contains a specimen without label, placed in a folio headed "*Grevillea aspera.*"

The Basic Rocks of Blinman, South Australia, with Notes on Associated or Allied Rocks.

By W. N. Benson, B.Sc.

[Read October 5, 1909.]

Plate XV.

In his valuable paper entitled "A General Description of the Cambrian Series of South Australia," Mr. Howchin refers to the occurrence of a large series of basic rocks in volcanic dykes and necks near Blinman, in the Flinders Ranges, some 260 miles north of Adelaide.(1) Through his courtesy I have been enabled to examine a number of these rocks, and here present the results of my studies, together with some notes on allied or adjacent rocks.

The basic rocks may broadly be divided into two groups —the melaphyres and the diabases. The melaphyres are in general fine-grained, often amygdaloidal. The diabases are coarse-grained, with recognizable white or faintly-coloured crystals of felspar in a dark-green base, sometimes determinable as pyroxene. Occasionally the rock is slightly porphyritic. In both groups, as will appear in the following notes, considerable alteration has taken place both of the felspars and of the ferromagnesian minerals.

I.—The Melaphyres.

An example of this type of rock occurs in a volcanic neck at Blinman South. It is a vesicular, light-grey rock, the cavities being filled with siderite, or ankerite, limonite, and chlorite. It is rendered porphyritic by idiomorphic felspar phenocrysts. Microscopically (see pl. xv., fig. 1) it appears probable that this rock on solidification was hypocrystalline and had a structure rather resembling the microgranulitic structure described by Judd (2), but differing by the presence of a little glass. The felspar of the phenocrysts is very much altered by the formation of white mica, so that determinative extinction angles cannot be obtained. Sometimes, also, a plagioclase crystal is broken up into small areas, the extinction directions of which are slightly inclined to one

(1) Proceedings Aust. Assocn. for the Advancement of Science xi., Adelaide, 1907, p. 418.

(2) Quart. Journ. Geol. Soc., 1885, p. 68.

another. Wherever the refractive index is measurable it is less than that of Canada balsam so that the felspar has become acid, perhaps as acid as albite. The plagioclase of the second generation occurs in the usual lath-like form. Except in a few cases, twinning is not recognizable. The refractive index is less than that of Canada balsam. Chlorite is the predominant coloured silicate, having completely replaced the original augite, though occasionally a few fibres of actinolite are recognizable. A little biotite is present among the chlorite, almost certainly of secondary origin. The chlorite occurs between the felspar laths in cloudy areas of exceedingly low birefringence. It is associated with much magnetite, and possibly hæmatite, forming a black border on nearly every felspar lath, and particularly segregated about the borders of vesicles. A number of rounded red rutile grains are present also. Quartz has been intruded into cracks in the rock in some amount, also fairly clear felspar (anorthoclase?)[3], scraps of chlorite, and a few strips of colourless mica. The vesicles are lined with matted-green chlorite, associated with quartz. Very often the centre of the vesicle is occupied by siderite or ankerite, which is markedly pleochroic. This carbonate is also present in cracks in the rock. As a rule it is accompanied by some limonite. *Name.*—Amygdaloidal melaphyre.

Allied Rocks.—Apparently belonging to the same magma and eruption period as the Blinman rock is one occurring in a dyke at the Victory Mine near Leigh Creek, a hundred miles north of Blinman. For a specimen of this I am indebted to Mr. M. W. Judell, B.Sc. It is of a light-grey colour, fine-grained, and containing a few vesicles filled chiefly with chlorite. Microscopically the fabric is slightly porphyritic, by reason of the larger size of some of the felspars, though this disparity is hardly sufficient to prove two generations of plagioclases. The texture is almost intersertal. Plagioclase is the predominant mineral, slightly dusty by decomposition. The smaller laths are rather ragged in outline. Twinning is well developed, usually on the albite law, but occasionally the Baveno law appears to be present. The species is albite, shown by the high symmetrical extinction angles (16°) and low refractive index, being in all cases lower than Canada balsam. The pyroxene is partly uralitized and partly converted to chlorite. The uralite is actinolite, often optically continuous across a break, such as a felspar lath. It is pseudomorphous after augite that was

(3) Compare E. B. Baily and G. W. Grabham. "Albitization of Basic Plagioclase Felspars," Geol. Mag., June, 1909, p. 254.

not idiomorphic but partly ophitic. Chlorite occurs in irregular patches. Ilmenite, partly changed to leucoxene, is present in large amount, and rutile needles may be found. The vesicles are lined with matter pennine (?), which is followed by a layer of fibrous radiating clinochlore (or perhaps delessite). The central portion is of epidote and quartz. This rock also is an amygdaloidal melaphyre.

From Mr. Slee, B.E., I received a specimen of a basalt occurring near Broken Hill. It is much finer in grain than the preceding rocks, is of a light-grey colour, and its few vesicles are filled with calcite and epidote. Microscopically it is also micrugranulitic. The felspar is of one generation only, is fairly fresh, and is probably oligoclase. It includes small needles of actinolite. The augite has become uralite, and its fibres extend far beyond the original limits of the grain. Magnetite is very abundant, though not so much so as in the Blinman melaphyre. It occurs in small grains and octahedra. Clear-green serpentine pseudomorphs after olivine are present in some amount, crossed and bordered by magnetite, and including small colourless epidote grains (clinozoisite). Pale- or bright-yellow epidote (pistacite) is common between the felspar laths or less regularly placed. Chlorite also is present in matted-green areas of low aggregate polarization. Calcite is present in large lenticular patches in the rock, often with pistacite. Quartz occurs sporadically, and is probably secondary. The rock is a melaphyre closely allied to the spilites.

II.—The Diabases.

The Blinman diabases can be subdivided for the purposes of this paper, on mineralogical and textural criteria, into the olivine-diabases, ophitic-diabases free from olivine, granulitic-diabases, and gabbro-diabases. Between the last three the distinction is by no means a sharp one; the textures in the freshest rock may pass gradually from one into the other, and the extreme alteration of many of the rocks makes distinction still more difficult.

Olivine-Diabases.

The dyke or neck on the west side of Blinman Mine is composed of a fine-grained compact rock, containing small crystals of felspar and a dark-green silicate. Microscopically (see fig. 2, pl. xv.) it is ophitic in texture. The predominant mineral is a pale or colourless augite, comparatively fresh, though in places it is altered in a peculiar fashion.

The mineral becomes clouded with limonite (?), beneath which it passes into uralite. This alteration appears to be connected with the proximity of the felspars, for it is most pronounced along their borders, and especially at their intersections. It seems possible that the alteration of the felspars made them more porous and thus better channels for mineral solutions, the agents in producing the change. The felspar of the rock is almost completely altered to mica, partly fibrous and partly scaly of high birefringence, but fairly low refractive index. There is some sign of mutiple twinning still preserved, perhaps by the different orientation of the mica flakes derived from alternate twin lamellæ. Epidote occurs in small colourless grains in the felspar. Brightly-coloured epidote (pistacite) is also present in a few scattered and rather large grains. Pseudomorphs after olivine occur composed of pale-green serpentine, bordered by magnetite. Ilmenite is present in considerable amount. A chemical analysis of this rock (A) is given on page 234.

The rock composing "the dyke near the gorge, on the old road five miles west of Blinman," is also an olivine-diabase. It is, however, rather different from the rock last described. It is basaltic in appearance, fine-grained, but with large grains of a dark-green ferromagnesian silicate, and small pale-green felspar phenocrysts. Microscopically the structure is porphyritic with a semi-ophitic base. The phenocrysts are augite, quite allotriomorphic, and 2-3 mm. in length. These are sometimes not all of one grain, but are aggregates of several grains, sometimes twinned and usually enclosing ophitically a few felspar laths. The olivine occurs in large idiomorphic crystals, and is entirely changed to dusty magnetite, pale-green serpentine and talc (?), the last being colourless and highly birefringent. The magnetite is present in great amount, showing the highly ferriferous nature of the original olivine. The plagioclase is largely altered to mica, but some remains, still showing the multiple twinning, which, by its extinction angle of 25° and refractive index greater than that of the balsam, is probably labradorite. Between the felspar laths, partly ophitic and partly granulitic, is titaniferous augite, quite fresh or in various stages of alteration to a deep-green uralite, changing to yellow on rotation, together with chlorite and a little epidote. Ilmenite is present in some amount. Order of crystallization:—

Olivine	————————			
Felspar		——————————		
Ilmenite		————		
Augite			———————	————————

Specimen labelled "Dyke, Blinman South." Microscopically the texture is ophitic, the grainsize small (0·5 mm.). The felspar has largely gone into parallel flakes of mica, though twinning is still visible. Determinative extinction angles are rarely obtainable, but such as there are, together with the low index of refraction, suggest oligoclase. Augite is present in large amount, though subordinate to the plagioclase; it is almost colourless (malacolite) and decomposes in a variety of ways—either to brown-green pleochroic uralite, in clear patches or much clouded with red-brown hæmatite dust; or to green pleochroic chlorite (clinochlore). Ilmenite occurs in large crystals and plates slightly altered to leucoxene. Epidote is very common in large yellow pleochroic grains, bordered by magnetite in a manner very similar to the habit of olivine. It is in this type of occurrence generally surrounded by chloritic matter. Epidote may also occur in small, rounded yellow grains scattered through the felspar, or most commonly in exceedingly minute, colourless grains in the felspar, and derived from that mineral.

"Dyke, west side, Blinman Mine." This is a dark-grey granular rock of basaltic appearance, apparently somewhat altered. Microscopically the fabric is ophitic. The predominant mineral is a plagioclase occurring in its typical lath meshwork. It is partly altered into saussurite, composed of very fine-grained clinozoisite or a more coarsely-grained growth of epidote (and zoisite ?) in a poikilitic groundmass of scapolite. The epidote and zoisite are both colourless, but the grains suspected of being zoisite have a much lower birefringence. The small amount of felspar still remaining unchanged to saussurite seems to have been converted to gibbsite or mica, but the distinction of these from scapolite is not always satisfactory. Hints of the originally twinned nature of the felspar are occasionally obtainable. Scraps of actinolite and chlorite are not uncommon in the saussurite. Augite entirely altered to uralite is the next mineral in the order of abundance. The uralite is a brownish-actinolite, rather than smaragdite. It contains also a number of fine grains of epidote with limonite and leucoxene (?), rendering it still dustier. It has been further changed into chlorite to some extent. Ilmenite in irregular grains and crystals, with the usual triangular decomposition to leucoxene, is present in abundance. Quartz occurs interstitially.

Name.—Saussuritic-diabase.

"Dyke, east of creek, Horns Camp." This is a medium-grained 1 to 1·5 mm., light-grey-green in colour, with occasionally approximately cubic phenocrysts (2 mm.) of felspar. Microscopically it is porphyritic with an ophitic to semi-ophitic groundmass. The felspars are predominant and belong to two generations. They are partly saussuritised epidote, forming in the phenocrysts along two sets of planes, inclined towards the twinning plane (possibly the basal cleavage planes), but more commonly the epidote is in the twinning plane, this latter method being universal in the tabular crystals of the base. In the phenocrysts twin lamellæ were clearly seen, and an extinction angle of 15° was recorded. In the tabular crystals of the mesh, extinctions of 19° were obtained, and wherever measurable the refractive index was distinctly less than that of Canada balsam. Secondary (?) felspar, which is water-clear, occurs in small amount, in one instance at least optically continuous with some partially-altered primary felspar. Scapolite is present in some amount, and the epidote is colourless when fine-grained, coloured and pleochroic (pistacite) when in large masses. The augite is converted chiefly to chlorite, but a small amount of uralite still remains. Ilmenite occurs in large amount completely changed to leucoxene.

GRANULITIC-DIABASES.

In these rocks the structure is hardly the normal granulitic structure as defined by Judd [4]; rather is it a transition between the semi-ophitic and gabbroid texture, in which the felspars still retain to some extent the tabular meshwork, but the interstices are occupied by a single angular grain not in optical continuity with grains beyond the mesh. Such a texture is exhibited by a specimen labelled "Dyke, 12 miles east of Blinman." It is a rather fine-grained, dark-green rock, containing grey felspar laths and large cream-coloured felspar phenocrysts, 1·5 mm. in length. Microscopically the predominant mineral is plagioclase considerably altered. Specific determination is again difficult; probably it is oligoclase. It is excessively full of secondary minerals, chiefly epidote, in yellowish crystals, often comparatively coarsely granular. Common also is the occurrence of epidote or zoisite with mica, in which the mica fibres extinguish parallel to the original twinning plane of the felspar. In some cases the felspar is entirely replaced by a mosaic of mica flakes of high birefringence. Quartz is present in clear grains, apparently primary. Pyroxene is completely changed, partly

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(4) *Loc. cit. supra.*

to a compact hornblende, strongly pleochroic but of pale colour, and partly to actinolite. A further change to blue-green chlorite is in progress. Ilmenite is very abundant, passing into leucoxene.

Another specimen labelled "5 miles west of Blinman" is of very similar texture. The felspar, as before, is probably oligoclase, and is largely altered to yellow epidote. Where this rock differs from all others is in the presence in it of much scapolite of comparatively low double refraction. In a slide, certainly unusually thin, the colours shown are rarely above the first order. The mode of occurrence, cleavage, refractive index, and optically negative character all point to its being scapolite. It is probably a variety of mizzonite. The alteration of the augite is chiefly to a compact pale-green or brown hornblende, with dark chloritic border. Actinolite is less common. Sphene occurs, but in such an association with ilmenite that it is probably titanomorphite. Ilmenite with leucoxene is rather plentiful.

GABBRO-DIABASES.

These are rocks of such coarse grain and allotriomorphic gabbroid structure that they seem to be intermediate between gabbros and diabases.

Name.—Granophyric quartz gabbro-diabase.

A specimen labelled "Dyke, west of gneiss, 1 mile west of Blinman" is best described as a granophyric quartz gabbro-diabase. Magnetite was the first mineral to crystallize, and following this felspar and augite crystallized apparently contemporaneously. This left angular spaces filled with a (probably) entectic mixture of quartz and felspar, which solidified in a granophyric intergrowth. (See microphotograph, fig. 3, pl. xv.) The felspar is completely altered to exceedingly fine saussurite, faintly pleochroic, and with little or no sign of original twinning. The expansion of the ferromagnesian minerals on alteration to chlorite has cracked the saussurite, and chlorite has formed in these cracks. The pyroxene of the original rock may have been diallage, as several minor features suggest. It is now, however, entirely converted to uralite (smaragdite), and on the periphery of the grains this has become clinochlore, with the separation of magnetite, in part hydrated to a dusty limonite. A little pistacite is also present in the felspar, uralite, or in the chlorite-filled crevices. In the angular spaces between the felspar and pyroxene crystals granophyric quartz and felspar occur, the latter having the lower refractive index. Free quartz grains are also present. For remarks on the probable chemical composition of this rock see page 235.

At Horn's camp there occurs a rather coarse-grained rock with idiomorphic felspar tabulæ, up to 3 or 4 mm. in length; the matrix is a fibrous cleavable dark-green ferro-magnesian mineral. In texture the rock appears to be intermediate between the ophitic and gabbroid types. Mineralogically it is exceedingly altered; no mineral appears to be primary. The felspar is changed to colourless finely-granular epidote, with meionite and a little quartz, together with a very little clear indeterminable secondary felspar (albite?). The epidote grains are in optical parallelism, extinguishing simultaneously over a considerable area. They are slightly pleochroic. The pyroxene has become actinolite of a pale-green colour, which does not always lie parallel to the vertical axis of the original pyroxene grain. The border of the actinolitic areas is somewhat darker in tint, being composed of finely granular chlorite. Traversing the rock is a vein filled with dark-green matter. Microscopically this is excessively fine-grained, appearing to consist of a pale-green amphibole mixed with epidote and quartz. It is far too fine-grained, however, for certain determination.

I would place among the gabbro-diabases, also, a rock labelled "12 miles east of Blinman." It is similar in a general way to the rock first described in this group, but the granophyric intergrowths of quartz and felspar are entirely absent. The felspar is largely changed to saussurite and the pyroxene to fibrous or compact hornblende, with the formation of a little secondary magnetite.

These paramorphs are often separated from the saussurite by narrow bands of scapolite (?), whose fibres or cleavages stand perpendicular to the limiting surfaces.

Chemical Notes.

This paper as originally presented contained no analyses, but on the request of Mr. Howchin and Mr. Mawson I have made the analyses given below. It is hoped that the shortness of the time available between the reading of the paper and its publication, during which I had also my official duties to perform, will be sufficient excuse for the lack of completeness of the analyses. The rocks chosen were the olivine-diabase from the west side of Blinman Mine (A), which is described on pages 228-9 and shown on pl. xv., fig. 2, and (B) a gabbro-diabase, labelled "one mile west of Blinman," but very similar to the saussuritic gabbro-diabase from 12 miles east of Blinman last described.

The analyses, norms calculated therefrom, and position in the American classification of these two rocks are given below:—

Analyses.	A.	B.	Calculated Norms.	A.	B.
SiO_2 ...	49·29	50·63	Orthoclase ...	12·23	10·01
Al_2O_3 ...	18·81	16·30	Albite	26·20	27·25
Fe_2O_3 ...	3·57	5·34*	Anorthite ...	31·14	25·20
FeO ...	7·78	6·46	Diopside ...	10·87	9·53
MgO ..	3·28	6·62	Hypersthene ...	8·34	14·46
CaO ...	9·25	7·65	Olivine	3·13	4·58
Na_2O ...	3·07	3·22	Magnetite ...	4·10	7·66
K_2O ...	2·10	1·69	Ilmenite ...	5·34	1·52
H_2O +	1·07	·89	Water	1·27	1·03
H_2O −	·20	·14			
TiO_2 ...	2·17	·80			
CO_2 ...	trace	nil			
SrO ...	n.a.	trace			
	100·59	99·74		102·62	101·24

* This high figure is due to the rock being somewhat oxidized, considerable hæmatite being present in it.

Classification.

A. II. 5. 3. 3.

Magmatic name—Shonshonose, near Andose.

B. II. 5. 3. 4.

Magmatic name—Andose.

These analyses show percentages of TiO_2 which are in no way abnormal for diabases, and it cannot then be assumed that the Blinman intrusions have any genetic connection with the South Australian titaniferous magma, whose existence is proved chiefly by its Pre-Cambrian developments.(5) The alkali content of the Blinman diabases is, however, slightly greater than usual. The wide variation in the magnesia content is very striking.

With regard to the minor and undetermined constituents a few remarks may be made. Manganese must be present only in very small amount, judging from the pale-green of the soda carbonate melt. Phosphorus is very low, as no apatite was seen microscopically. Chlorine, present in the scapolite of (B), will occur in but small amount. As there is scarcely 1 per cent. of this mineral, there cannot be more than ·03 per cent. of chlorine from this source. The most

(5) This volume, p. 101.

serious omission is sulphur; but though the rocks occur in mineral-bearing country no sulphides were visible in them.

With regard to the granophyric gabbro-diabase from one mile west of Blinman, an interesting possibility is suggested by a paper by G. W. Tyrrell on "The Petrology of the Intrusions of Kelsyth-Croy" (6) (Scotland), which came to hand just after my work for this paper had been completed. The rocks he describes are diabases occurring in dykes and laccolites, and have a granophyric base exactly similar to many carboniferous diabases in England. In endeavouring to account for this peculiar characteristic, the author finds that similar rocks are of world-wide distribution, occurring always in sills, laccolites, or dykes, intruding acid sediments or gneisses, and are often connected with normal basalts and diabases as products of the same magma. Further, the chemical composition of the granophyric rocks is remarkably constant, as may be seen from the following table:—

	A	B	C	D	E	F
$Si\,O_2$ ...	52·68	51·19	53·26	51·15	49·80	50·55
$Al_2\,O_3$ ...	14·14	15·80	15·64	15·92	17·77	15·00
$Fe_2\,O_3$ ...	1·95	3·08	·24	9·34*	2·29	2·54
$Fe\,O$ ...	9·79	11·20	7·44	2·87*	8·75	7·90
$Mn\,O$ ...	·44	trace	·11	·09	trace	—
$Mg\,O$ ...	6·38	5·63	8·64	6·48	5·67	6·25
$Ca\,O$.	9·38	9·58	12·08	10·40	8·85	7·85
$Na_2\,O$ ...	2·56	2·09	1·25	1·19	1·48	3·53
$K_2\,O$ ...	·87	·60	·58	1·61	·48	1·10
$H_2\,O$ ...	1·60	·30	·76	·11	3·66	3·69
$Ti\,O_2$ ...	—	·40	·70	·44	1·56	1·58
$C\,O_2$ ...	—	nil	·04	—	—	—
$P_2\,O_5$ ...	—	·008	—	·06	trace	—
$Fe\,S_2$ ...	—	·005	—	—	—	—
Totals ...	99·79	100·883	100·74	99·66	100·31	99·99

* Surely these figures have been transposed.

A. Diabase, Mount Holyoke, Massachusetts.
B. Diabase, dyke, Potaro River, British Guiana.
C. Dolerite (with micropegmatite), Knob Head, South Victoria Land, Antarctica.
D. "Augite diorite with micropegmatite," Seven Pagodas, Chingelput, India.
E. Granophyric-diabase, Auchinstary, Kilsyth.
F. Quartz-Gabbro, Carn Llidi, St. David's.

(6) Geol. Mag., 1909, July, p. 299; August, p. 359.

From this he is led to suggest that "the gabbro-granophyre mélange rocks owe their origin to the interaction of a normal basalt magma with a highly siliceous country rock, in the manner advocated by Dr. Daly, and that the normal granophyric-diabases, with their remarkably constant chemical composition, represent the saturation point of such a magma with silica. The excess of siliceous matter is believed to be thrown out as a separate body of material usually consolidating as granophyre in a manner analogous to the separation of the excess of a salt in a saturated solution." [7]

Remembering that the granophyric-diabase of Blinman is likely to be a little more acid than the two rocks analyzed, it seems probable that its composition would closely resemble those in the above table, the chief difference, perhaps, being a slightly greater content of alkalies and alumina.

Its association with acid gneiss or rocks of the Cambrian series, many of which are very acid, is also analogous to that described by Tyrrell as typical for such rocks. It was hoped to have had this rock analyzed for closer comparison, but unfortunately the specimen appears to have been mislaid.

There is evidently at Blinman an opportunity for an interesting investigation of this subject.

Rocks associated with Basic Dykes near Blinman.

A few notes are here appended on the rocks associated with these basic dykes near Blinman.

(1). "*Contact Rock, up the Creek from Horn's Camp.*"—A very fine-grained siliceous rock, light-grey in colour, and with parallel bands of quartz. Microscopically the texture is granoblastic. The constituent minerals are quartz, occurring in roughly equidimensional grains, small prisms of albite, with distinct multiple twinning, siderite or ankerite, dusted with limonite and magnetite in fresh irregularly-shaped grains. A few rounded grains of rutile also are present. The grainsize varies in alternate bands from ·05 mm. to ·002. Quartz and siderite occur in a small vein in the rock, the latter being idiomorphic. This rock may be termed an adinole.

(2). "*Purple Slate*," from the same locality as the previous rock.—A finely-granular vesicular rock, rather heavy and in appearance not unlike a weathered basalt. The numerous vesicles, 2 to 3 mm. in diameter, are seen on a fresh surface to be filled with a limonite paste; on exposed surfaces they are quite empty. It is quite impossible microscopically to distinguish the individual minerals of the base, so exceedingly fine-grained is the rock. It appears, however,

[7] *Op. cit.*, p. 365.

to be composed of a felspathic paste, sericite kaolin, etc., scraps of biotite, and dusty hæmatite. Set in this paste are elongated calcite crystals, angular quartz-grains, flakes of graphite (?), grains of magnetite, and (rarely) flakes of muscovite. The parallel disposition of these shows that the rock has undergone some schisting process. The limonitic segregations are merely areas of the rock, which are particularly rich in iron oxide. The angular quartzes continue right through the coloured patches, their long axes remaining in the direction of schistosity. It would appear that these limonitic patches were formed by the partial or complete replacement in these areas of the felspathic paste by iron-bearing carbonates, siderite, or ankerite, such a replacement or segregation being roughly spherical or ellipsoidal. In oxidation this passes to limonite, with the result that the segregation becomes merely loose quartz-grains in an uncemented paste of limonite, which washes out very rapidly on exposed surfaces. The alternation of densely with slightly limonitic concentric areas indicates perhaps an original alternation in concentric layers of the iron content of the carbonate, or progress weathering inwards, with slight segregation of the limonite into layers. An explanation similar to this has been advanced by Mr. R. S. Bonney for the far larger clay ironstone "nodules" of the Sydney Wianamatta shales.

GNEISSES.

Two specimens of gneiss are among Mr. Howchin's collection, labelled "1 mile west of the Blinman Mine." One is a pink felspathic rock with bands of biotite between layers of pink felspar and quartz occasionally slightly lenticular. Microscopically (see fig. 4, pl. xv.) these bands are seen to be chiefly quartz with a subordinate amount of moiré potash felspar. The biotite is slightly chloritized and clouded with limonite, while some chlorite is present in the leucocratic areas. Thin bands of muscovite are present among the quartzes. The amount and disposition of the quartzes suggest that the rock is not of igneous origin, and I would tentatively place it in Rosenbusch's subfamily of parageneisses, classing it as a conglomerate gneiss.

The other specimen of gneiss is not so suggestive of a sedimentary origin. It is more felspathic in appearance, biotite is quite subordinate, and magnetite is very common in crystals 2 mm. in diameter. Microscopically the gneissic structure is not a very well-marked feature. The predominant minerals are orthoclase and plagioclase, the latter subordinate, and both are dusted with limonite, and slightly sericitized. A great deal of granular quartz is present, with clear irregular grains of microcline. Biotite is present in small amount, much oxidized. The magnetites are octahedral idioblasts, but contain poikiloblastically so much of the groundmass that they are plainly secondary. There is little to indicate whether this rock should be placed in the ortho- or para-gneisses, except that such a peculiar arrangement of magnetite would hardly be expected in a granite-derived gneiss. There seems no reason to consider as other than a different example of the same formation as the last-described specimen.

III.—Discussions of Observations.

The basic dykes of Blinman include melaphyres, olivine-diabases, ophitic- and granulitic-diabases, and gabbro-diabases. They are all very considerably altered, and the various types of alteration present many features of interest. The occurrence of similar rocks as far afield as at Leigh Creek and the Barrier Ranges suggests the wide extent of the area of eruptions of the same basic magma.

With regard to the age of these rocks, Mr. Howchin observes:—"Two considerations seem to point in the direction that the volcanic activity belonged to a late stage of the elevation of the dome" [the geo-pericline, in the centre of which is Blinman], "and that the dykes were formed at no great depth from the present surface, *viz.*, the lava of the supposed necks is often vesicular in structure; and, secondly, whilst the slate and other rocks which have been penetrated and reduced to breccia by the intrusive dykes show contact effects, they have undergone no secondary metamorphic change in the mass which might have been expected to occur had they been brecciated at considerable depths."(8) This may be fully admitted, yet they can scarcely be newer than Palæozoic. While it is by no means an exact method, the age of an eruptive rock may be gauged from the extent and manner of its alteration. In the rocks before us the predominant alterations are the formation of uralite or other secondary amphiboles by alteration of the pyroxenes, of scapolite, epidote, and zoisite; by alteration of the felspars. The formation of epidote and uralite is usually a process of rather deep-seated alteration,(9) and though declared by Van Hise (10) to be possible at comparatively shallow depths, is

(8) Aust. Assocn. for the Advancement of Science, vol. xi., p. 418.

(9) See Rosenbusch Iddings, Micr. Physiog. of Rock-forming Minerals.

(10) Treatise on Metamorphism.

rarely the effect of normal atmospheric weathering. Scapolitization of felspar is almost always a deep-seated process.

It would be well to briefly glance at rocks the age and history of which are well known to discover in what way these microscopical criteria may be applied to determine the age of basaltic and diabasic rocks. In the Tertiary igneous rocks of Skye,(11) Harker does not appear to have found uralitization of pyroxene except where the basalts are altered by contact with gabbro. Epidote also occurs mostly in this situation.

The alteration of pyroxene to amphibole is also often observed in the Carboniferous basic eruptives, as, *e.g.*, in those of Arthur's Seat, near Edinburgh.(12) If we turn to Australian occurrences, there is not (to my knowledge) any instance of changes similar to those undergone by the Blinman rocks in the Tertiary basalts of New South Wales; but there are frequent examples of uralitization and formation of epidote in the Palæozoic andesites.(13) In the Mesozoic diabases of Tasmania there is not such metamorphism as is shown by the Blinman rocks.(14) In Victoria there is much evidence to confirm this view. In several papers Howitt has described Palæozoic diabases and basalts, and clearly distinguishes the Devonian basalts from the Tertiary basalts, by their type of alteration, chlorite, chalcedony, and carbonates being typical of the Tertiary, epidote of the Palæozoic.(15) The Tertiary type of alteration by weathering may, of course, be superimposed on the Palæozoic. To some extent also the type of alteration of the Heathcote and related diabases resembles that of Blinman in the abundance of actinolite and epidote, though there is no analogy to the Heathcote chalcedonic diabases.(16) These rocks are declared by Professor Skeats to be Lower Ordovician.(17)

Turning now to the rocks of South Australia that are in any way comparable with the Blinman rocks, we again find

(11) Geol. West-Central Skye with Soay. Harker, and Clough, Mem. Geol. Sur. of Scotland, 1904, p. 28. (The larger memoir, "The Tertiary Igneous Rocks of Skye," was not obtainable at time of writing.)

(12) S. Allport Q.J.G.S., 1874; and many writers subsequently.

(13) Numerous authorities might be cited here, chiefly Notes by G. W. Card and W. A. Anderson.

(14) Twelvetrees and Petterd, Proc. Roy. Soc., Tas., 1898-9, p. 47.

(15) Prog. Reports of Geol. Survey of Victoria, iv., 1874, p. 97.

(16) Howitt, Notes on Diabase and adjacent formations of Heathcote district; Special Rep. Dep. Mines, Victoria, 1896.

(17) Roy. Soc., Victoria, xxi., N.S., pt. 1, 1908.

them to be probably Palæozoic. The Tertiary basalts of Kangaroo Island and the Mount Gambier area have no analogy to the Blinman melaphyres, but the basic dykes of the Mount Lofty Ranges, many of which have become amphibolites and are almost certainly Palæozoic, have most distinct similarity to the rocks under consideration. For example, a specimen of the wide dyke in the gorge by the New Era Mine, near. Woodside (for which I am again indebted to Mr. Howchin), is porphyritic in character. Its base is composed of secondary amphibole, basic plagioclase felspar, quartz biotite, magnetite, and sphene; while the phenocrysts of felspar are almost entirely altered to an aggregate of epidote and scapolite. The uralite diabase of Port Elliot (18) and the dyke by Dinham's farm, Ardrossan, may also be of this series, as well as the dykes near Mount Barker and Reefton Heights (composed of basic plagioclase, secondary hornblende, and a little sphene), or that described by Dr. Chewings from Mount Pleasant. (19)

These considerations lead me to conclude that the Blinman basic igneous rocks are Palæozoic in age. Their present position, as described by Mr. Howchin, and their mineralogical metamorphism might be due to the metamorphism they had undergone under an over-burden of probably Mesozoic sedimentation, now, with the exception of the Leigh Creek area, completely stripped off. That they *all* originated near the present land surface is disproved by the gabbroid texture of some of the dyke rocks, which texture could have been induced only under almost plutonic conditions. Should any of the basic dykes by Leigh Creek be traceable up to the boundary of the Mesozoic sediments, their truncation or continuance into these will completely prove or disprove my theory, if the identity of the Leigh Creek and Blinman eruption periods be allowed. I much regret that my removal from South Australia prevents my obtaining this crucial evidence.

In conclusion, I beg to thank Mr. Howchin for the opportunity of examining these interesting rocks.

Postscript.

Mr. Howchin has forwarded to me a specimen of an amphibolite intrusive into the Pre-Cambrian area at Mount Compass, fifteen miles north-east of Yankalilla. In hand

(18) Dr. C. Chewings, Ein Beitrag zur Kenntniss Geologie Süd- und Central-Australiens, Heidelberg, 1894.

(19) *Op. cit. supra.*

specimen it is a fine-grained rock, apparently chiefly composed of amphibole with a little felspar. Microscopically it is seen to be a uralitic-diabase. The texture is diabasic, approaching the characteristic ophitic structure. Actinolitic uralite is the predominant mineral. It is dark-green and strongly pleochroic. It is slightly dusted with secondary magnetite. Brown plagioclase (labradorite) occurs in idiomorphic laths, and sometimes is slightly zoned. Angularly-bounded irregular grains of magnetite are abundant. Quartz occurs intersertally. Fine-grained epidote is abundantly scattered all through the rock.

This rock is another instance of the epi-diabases so common in southern South Australia, to which reference has been made above.

The Geological Department,
University of Sydney.

Notes on the Discovery of a Large Mass of Living Coral in Gulf St. Vincent, with Bibliographical References to the Recent Corals of South Australia.

By Walter Howchin, F.G.S., Lecturer in Geology and Palæontology in the University of Adelaide.

[Read July 6, 1909.]

Plate XVI.

In the recent preliminary survey of the seafloor for the construction of a breakwater at Glenelg, a mass of coral of unprecedented size in South Australian waters was discovered. The corallum was oval in outline (divided into three

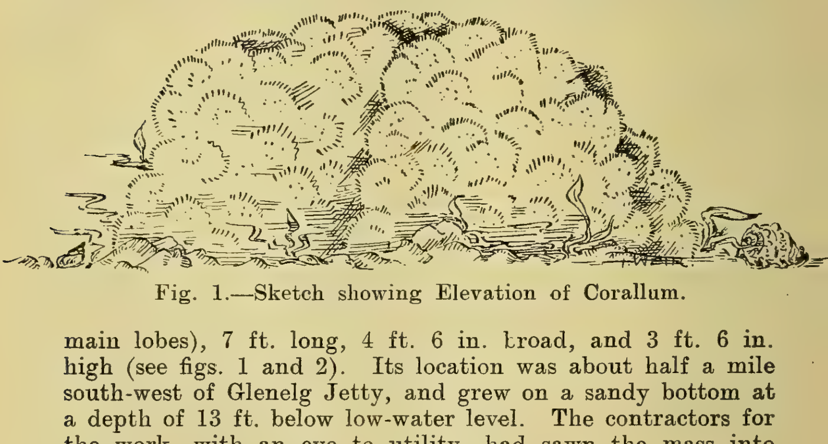

Fig. 1.—Sketch showing Elevation of Corallum.

main lobes), 7 ft. long, 4 ft. 6 in. broad, and 3 ft. 6 in. high (see figs. 1 and 2). Its location was about half a mile south-west of Glenelg Jetty, and grew on a sandy bottom at a depth of 13 ft. below low-water level. The contractors for the work, with an eye to utility, had sawn the mass into blocks with the intention of burning it for lime.

I am indebted to Mr. J. W. Jones, the Secretary of Public Works, and also to Captain Weir, the master of the s.s. "Governor Musgrave," for kindly calling my attention to this interesting discovery and supplying me liberally with specimens.

The condition of the corallum, as a whole, bore evidence of great age, and was in a state of decadence, which presaged approaching death. The greater part of the mass which came under my observation was already dead. Some portions, apparently, had been dead for a considerable time, as the calicular surface was entirely obscured by parasitic growths; and other portions, although free from such growths, were in a weathered condition. In the case of two specimens which reached me, aggregating about a foot square, the corallites contained living polyps when taken from the sea.

Until recent years little was known of the coral fauna living in South Australian waters. J. Haime and Milne Edwards in their "Histoire Naturelle des Coralliaires" (1857) mention three species only—*viz.*, *Plesiastræa urvillei*, *P. peroni*, and *Homophyllia (Isophyllia) australis*—but only the last mentioned was directly referred to South Australian waters.

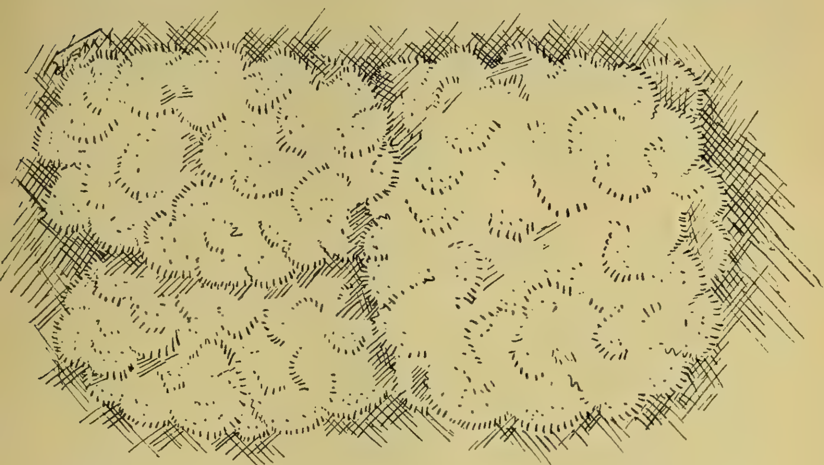

Fig. 2.—Sketch showing Plan of Corallum as seen from above.

In 1878 the Rev. J. E. Tenison-Woods published a paper in the Proceedings of the Linnean Society of New South Wales on "The Extratropical Corals of Australia," in which he was able to add only one more recent species to the South Australian fauna, *viz.*, *Cylicia rubeola*, specimens of which had been forwarded to him by the late Professor Tate, obtained at Port Adelaide.

Our present greatly-enlarged acquaintance with this interesting group is entirely due to the zealous efforts of the President of this Society (Dr. Verco), whose dredgings around our coast have brought to light many rarities of marine life. The work of elucidating the coral fauna obtained by Dr. Verco was undertaken by Mr. J. Dennant, of Melbourne, and was incomplete at the time of his much-regretted death in 1907.

Mr. Dennant published two papers on the subject, in which 22 species of South Australian recent corals are dealt with, 15 of which were new to science, 4 had been previously known by dredgings off the coast of New South Wales, 1 dredged by the "Challenger" in deep water of the Southern Ocean, and 2 (perhaps 3) were found to be identical with fossil species in the Lower Tertiary of southern Australia.

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List of Described Species of Coral Living in South Australian Waters.

Fam. TURBINOLIDÆ.

Rhizotrochus radiatus, Dennant (F), p. 2, pl. i., fig. 1.

Common at depths of 15-22 fathoms. Also occurs at Port Phillip Bay.

Holcotrochus scriptus, Dennant (E), p. 1, pl. i., fig. 1, (F), p. 3.

Was described from an Eocene fossil at Muddy Creek, Victoria. Dredged in Backstairs Passage at 22 fathoms. Rare.

H. crenulatus, Dennant (F), p. 3, pl. ii., fig. 4.

Backstairs Passage, 22 fathoms. Rare.

Platytrochus hastatus, Dennant (E), p. 257, pl. v., fig. 2, (F), p. 4.

Described from Eocene fossils at Spring Creek, Muddy Cieek, etc. Dredged in Backstairs Passage, 22 fathoms.

P. compressus, Ten.-Woods *(Conocyathus)*, sp. (D), p. 302, pl. v., fig. 1, (F), p. 4, pl. i., fig. 3.

Described from specimens dredged off Port Stephen, New South Wales, at 71 fathoms. Dredged by Dr. Verco in Gulf St. Vincent, Backstairs Passage, and Investigator Strait, at 15-22 fathoms.

Trematotrochus verconis, Dennant (F), p. 5, pl. i., fig. 4.

This genus, which is exclusively Australian, was established by Tenison-Woods for a Lower Tertiary coral of Victoria. It is interesting to find a representative of this early Tertiary genus still living in our waters. Gulf St. Vincent and Backstairs Passage, 15-22 fathoms.

Deltocyathus vincentinus, Dennant (F), p. 6, pl. ii., fig. 1.

"Examples of this coral were dredged in all but two of the fourteen stations mentioned by Dr. Verco, and generally in great abundance."—Dennant. Depths, 9-22 fathoms.

Flabellum australe, Moseley (H), p. 173, pl. vii., figs. 4, 5, (G), p. 151.

The "Challenger" specimens were taken in 120 fathoms off Twofold Bay, New South Wales. Later, it was taken in great numbers 20 miles north-east of Port Jackson, by Hedley and Petterd, at a depth of 250 fathoms. Dredged by Dr. Verco off Cape Jaffa, 90-130 fathoms, and off Beachport, 110-200 fathoms. The genus is represented by eight species in the older and newer Tertiaries of Southern Australia.

Sphenotrochus emarciatus, Duncan, var. perexigua, Dennant (I), vol. xvi., p. 2, pl. viii., fig. 2. Syn. *S. excisus*, (J), vol. xxvi., p. 298, pl. xix., fig. 86, (G), p. 151.

The specific type was obtained from the Lower Tertiary of Muddy Creek, Victoria. Dennant's variety differs only slightly from the Tertiary fossil form. Dredged east of Neptune Islands at 45 fathoms, off Cape Jaffa at 90 and 130 fathoms, and off Beachport at 49 and 150 fathoms.

Deltocyathus rotæformis, Ten.-Woods (D), p. 306, pl. v., fig. 2, (G), p. 154.

The type specimens were dredged off Port Stephens, New South Wales, from 71 fathoms, and subsequently, north-east of Port Jackson from 250 fathoms. It is a common form in South Australian waters, occurring at various depths off the Neptunes, Cape Jaffa, and Beachport, down to 200 fathoms.

Paracyathus vittatus, Dennant (G), p. 156, pl. v., fig. 3.

Only a single example of this coral has been obtained, dredged by Dr. Verco off Point Marsden, Kangaroo Island, at a depth of 17 fathoms.

Caryophyllia planilamellata, Dennant (G), p. 157, pl. vi., fig. 4.

This is an isolated coral, as it is the only example of a *Caryophyllia* known to occur in the Australian region. It is apparently plentiful in our south-eastern waters, as large numbers were dredged in a living condition off Cape Jaffa and Beachport, varying from 110 to 300 fathoms.

Dunocyathus parasiticus, Ten.-Woods (D), p. 305, pl. v., fig. 4, (G), p. 159.

The first gathering of examples of this species was obtained off Port Jackson from 45 fathoms. Dr. Verco obtained large numbers in a dredging 35 miles south-west of the Neptunes at a depth of 104 fathoms; also from off Cape Jaffa and Beachport down to 200 fathoms.

Ceratotrochus recidivus, Dennant (G), p. 159, pl. vi., figs. 1, 2.

This is an Australian Tertiary genus. The recent forms were dredged by Dr. Verco in considerable numbers off Cape Jaffa from 90 fathoms, and off the Neptunes, 104 fathoms.

Fam. ASTRÆIDÆ.

Homophyllia *(Caryophyllia)* australis, Edwards et Haime (B), ser. 3, Zool., vol. x., p. 320, pl. viii., fig. 2, (C) *(Isophyllia)*, p. 375, (D), p. 321. Ibid (as *Cylicia magna)*, p. 325, pl. iv., fig. 3, (F), p. 8, pl. ii., fig. 2.

Edwards' and Haime's type specimen was obtained from Port Lincoln. An example obtained from Gulf St. Vincent by Professor Tate was sent to Tenison-Woods, who erroneously referred it to *Cylicia*, under a new specific name. Mr. Dennant reported "eight well-grown examples" from Dr. Verco's material. It is evidently of shallow-water habit, as I have gathered beach specimens at Port Lincoln; Emu Bay, north coast of Kangaroo Island; and at Robe. It occurs also in the China Seas.

H. INCRUSTANS, Dennant (G), p. 161, pl. vi., fig. 3.

The type specimen is unique, found growing parasitically on a valve of *Venus*. It was dredged in Gulf St. Vincent and forwarded to Mr. Dennant by the late Professor Tate.

CYLICIA *(Dendrophyllia)* RUBEOLA, Quoy and Gaimard, sp. (A), p. 97, pl. xv., figs. 12-15, (D), p. 324, (F) p. 9.

The type was obtained from the Thames River, New Zealand. It is a common form in our local seas, growing in clusters. A colony of individuals was found attached to the large mass of coral discovered off Glenelg. It is also an abundant form in Port Phillip Bay. Professor Tate recorded its occurrence as a fossil in the Older Pliocene of the Dry Creek bore (Trans. Roy. Soc., S.A., vol. xiii., p. 173).

C. MAGNA, Ten.-Woods. See *Homophyllia australis*.

PLESIASTRÆA URVILLEI, Edwards et Haime (B), ser. 3, vol. x., pl. ix., fig. 2, et vol. xii., p. 117 (1850), (D), p. 323.

This coral will be referred to below.

P. PERONI, Haime et Edwards (C), p. 492, pl. D7, fig. 3, (D), p. 324.

Generally distributed in shallow water, Port Stephens and southwards, including the southern coasts of Australia. Often found as beach specimens.

P. PROXIMANS, Dennant (F), p. 9, pl. ii., fig. 3.

The species was determined on a single small example dredged in Gulf St. Vincent at a depth of 22 fathoms.

Fam. FUNGIDÆ.

BATHYACTIS SYMMETRICA, Pourtalès, sp. (H), p. 186, pl. x., figs. 1-13, (G), p. 161.

This is a cosmopolitan species dredged by the "Challenger" in all parts of the world and at depths varying from 30 fathoms to 2,900 fathoms. Dr. Verco found it very common at 35 miles south-west of Neptune Islands; was also taken off Cape Jaffa.

Fam. EUPSAMMIDÆ.

LEPTOPENUS DISCUS (?), Moseley (H), pp. 205-8, pl. xiv., figs. 1-4, pl. xvi., figs. 1-7, (G), p. 162.

The specimens on which the species was established were dredged by the "Challenger" in deep water in the southern Indian Ocean. Dredged off Port Jackson, at a depth of 250 fathoms; also by Dr. Verco off Cape Jaffa, at 90 fathoms; off Beachport, from 100 to 200 fathoms; and 35 miles south-westerly of Neptune Islands, at 104 fathoms. All the South Australian examples were imperfect.

NOTOPHYLLIA RECTA, Dennant (G), p. 163, pl. v., fig. 4.

This genus was founded by Mr. Dennant to receive three species of Tertiary fossils of Victoria. The above recent species has been dredged off Port Jackson, and by Dr. Verco off Cape Jaffa at a depth of 130 fathoms.

DENDROPHYLLIA ATRATA, Dennant (G), p. 163, pl. vi., fig. 5.

Fairly common in Gulf St. Vincent, Investigator Strait, and Backstairs Passage, at depths from 14 to 22 fathoms.

The corals in the above list, with the exception of the three species of *Plesiastrœa*, are almost exclusively simple corals, solitary in their habit of growth and in their respective genera, possessing a wide range with regard to bathymetrical and thermal conditions in their distribution. The *Plesiastreœ* are, however, coral-reef forms, and the members of the Astreidæ (the family to which they belong) are essentially coral-reef builders. Their occurrence in South Australian waters must, therefore, be regarded as a remarkable instance of a characteristically tropical type living in the low-temperature seas of southern Australia.

Edwards and Haime in their list of corals (C), pp. 489-492, enumerate four known species of living *Plesiastreœ*, two of these being Australian, one Indian Ocean, and another the locality of which was unknown to them. To these Dana (Report on Zoophytes) added four others, and Verrill one, all of which were from the Pacific Ocean, *viz.*, Tahiti, Fiji, and Society Islands. (L), pp. 328-9. Another species of *Plesiastrœa* has been determined from the Island of St. Thomas, in the West Indies.

With the exception of the last named all the *Plesiastreœ* are found either within Australian waters or in the South Pacific Ocean. The genus must, therefore, be considered as essentially Australasian in its occurrence.

The large mass of coral discovered off Glenelg is apparently identical with—

Plesiastræa urvillei, Edwards and Haime (C), p. 490.

The authors' definition of the species has been translated by Tenison-Woods as follows:—"Corallum somewhat flat with sublobed edges; epitheca on the edges rudimentary; calices very slightly salient, close but distinct, circular or sometimes a little deformed; columella rudimentary; three cycles, but a fourth in two systems where the primary equal the secondary, thus giving the appearance of eight systems of three; septa rather broad, hardly exsert, thin, finely and regulately dentate, striate, and granular; pali broad, little exsert, rather thin, the primaries the strongest. In section the exothecal dissepiments are almost horizontal, 1 mm. apart; columella of a very lax tissue, scanty and formed of lamellar processes; endothecal dissepiments extremely thin, sometimes wavy, not always parallel, sloping inwardly, $\frac{3}{4}$ mm. apart; wall compact, rather thick, seldom or only slightly united to others. Diameter of calices 4 to 5 mm. In shallow places, King George Sound." (D), p. 323.

The "Challenger" dredged "a small flattened specimen" of this species off Fiji.

The two species—*P. urvillei* and *P. peroni*—bear a close resemblance to each other. They may be distinguished by the calices of the former being slightly larger than those of *P. peroni*, also of about equal size, and are equally salient; whilst the calices of *P. peroni* are relatively smaller, more unequal in size, and unequally salient. Examples of *P. peroni*, in small, flat, or nodular masses, can occasionally be picked up on the shores of the Gulf and Kangaroo Island. The largest example found by the writer was a hemispherically-shaped specimen, $3\frac{1}{4}$ in. in diameter by $1\frac{5}{8}$ in. high, from the north coast of Kangaroo Island. Prior to the late important discovery I had obtained two beach specimens which I referred to *P. urvillei*. One of these was a cylindrical fragment, $5\frac{1}{4}$ in. long and 2 in. in diameter, picked up on the north coast of Kangaroo Island; and the second, a fragment dredged at the time of excavating the Outer Harbour, which measured $5\frac{1}{2}$ in. long, $5\frac{1}{4}$ in. broad, and $2\frac{1}{2}$ in. thick. Both fragments had been broken off from larger masses and showed no peripheral outline of the corallum from which they had been respectively detached, so that no estimate of the size of the parent mass could be made, but the fragments were regarded as of abnormal size. From the occurrence of beach specimens at widely-separated localities, it may be assumed that the large growth of coral near Glenelg is not a single instance of its kind in our Gulf.

Plesiastræa, even on the coral reefs, does not apparently grow to any large size, which makes its occurrence in our seas in huge proportions all the more remarkable, and quite unsuspected until the late discoveries were made. Tenison-Woods says:—"The only corals on the south and south-east coasts of Australia which could in any sense be called reef-building forms are one or two species of *Stylaster* and one or two of *Plesiastræa*. Both of these are littoral, and grow in tufts or small masses, but never in anything more than the merest patches. *Stylaster*, though not uncommon about Port Jackson, has not been found, as far as I am aware, on the south coast, while *Plesiastræa* seems to extend from Port Jackson right round to south-western Australia." (D), p. 295.

With respect to the distribution of the reef-building corals Tenison-Woods says:—"The reef-builders are not exactly confined to the tropics in north-eastern Australia; they extend a little beyond it, and may be found as low as latitude 28° S., or even lower. It seems to me that there was formerly a prolongation of the Barrier Reef to the south. If the map of north-eastern Australia be consulted, it will be seen that to the north of Moreton Bay there is a large island jutting out somewhat east of north. This is marked on the maps as Great Sandy Island, but is locally known as Frazer Island. It is separated from the coastline on the south by Wide Bay. The land on both sides seems to consist of immense drifts of red and yellow sand irregularly stratified. To the north the island ends in a coral reef called Break-sea Spit, and then the reefs are continued with long interruptions in islands and coral shoals, including Lady Eliot Island, Bunker Group, Capricorn Group, etc., until the Barrier Reef is reached. Strictly speaking, Wide Bay may be said to be the commencement of that inner channel which continues inside the Barrier Reef right up to Cape York, a distance of about 1,200 miles. It would be more convenient, in the study of Australian corals, to designate as belonging to the extratropical fauna all south of Break-sea spit. Of the west side I can say little or nothing. The shell fauna of Perth has certainly more of the Indian Ocean in its *facies* than Australia, and the raised beaches of Fremantle are unquestionably tropical in their fauna. I should incline to the opinion that the extratropical fauna should not be made to extend beyond the south-west cape, Cape Leeuwin." (D), p. 296.

Glenelg, where the large mass of coral was found, is on the same parallel of latitude as King George Sound, where it seems to have been in the first instance detected, and this is not far from Cape Leeuwin, which Tenison-Woods makes the dividing-line between the tropical and extratropical fauna. The South Australian examples probably migrated from the West. There is reason to think that when the sea returned to Gulf St. Vincent in Pleistocene times (after the dry-land conditions of the later Pliocene) the water had a higher temperature than at present. The raised sea beaches of southern Yorke Peninsula and other places contain many forms which are now extinct in our local waters, as, for example, *Barbatia (Arca) trapezia*, which occurs in such numbers on the raised seabed of Port Wakefield that its remains were used for ballasting the railway; *Meleagrina margaritifera*, the "pearl oyster"; and immense numbers of the large foraminifer, *Orbitolites complanata*, which has its habitat in warm seas. In Pleistocene times it is probable that the entrances to the Gulfs were more restricted than at present, which would act as a bar to the cold currents from the south and raise the mean temperature of the water in the land-locked Gulfs. The large corallum obtained from Glenelg must be of great age, and may possibly date from a period of higher thermal conditions.

Tenison-Woods named two species of *Plesiastræa* from the Miocene of South Australia—*P. St. Vincenti* from the beds at Hallett Cove, and *P. grandis* from the Bunda Plateau. Both specimens are fragments of considerable size, but give no definite evidence of the actual size of the parent mass.

For the sketches reproduced in figs. 1 and 2 I am indebted to Miss Weir, who drew them under the direction of her father, Captain Weir.

Postscript.

Subsequent to the reading of the above paper I received an interesting letter from Captain Weir, in which, *inter alia*, he says:—"It may interest you to hear that I have found another patch of coral about the same size and in rather less water than that at Glenelg. About four years ago a rock was reported off Port Parham, about 30 miles up the Gulf on the east side, and a buoy was placed to mark it. On Tuesday last I overhauled this buoy to put it in order, and being a quiet day and the water clear I could see the rock quite plainly, and noticed its general resemblance to the one off Glenelg. I dragged a grapnel across it, and it cut deeply into it, the broken part showing quite white, so that it is certainly coral. I tried very hard to pick up a specimen, but having no proper appliance and time being limited unfortunately did not succeed in doing so. Other rocks have been reported in this locality, and many of them are also probably coral. The distance is about 40 miles from Port Adelaide, 3 miles off shore, in 9 ft. at low water, and 4 or 5 ft. over the rock. The position would not be hard to find, as it is marked by a red buoy and shown on the latest charts."

I hope that these interesting observations of Captain Weir will lead to this ground being further tested. It is just possible that the large growth seen by Captain Weir will be found to be a mass of *Serpula.*

DESCRIPTION OF PLATE XVI.

From a photograph of a portion of the surface of the corallum. Natural size.

Description of an Old Lake Area in Pekina Creek, and its Relation to Recent Geological Changes.

By Walter Howchin, F.G.S., Lecturer in Geology and Palæontology in the University of Adelaide.

[Read July 6, 1909.]

Plates XVII. and XVIII.

The Pekina Creek irrigation-works are situated about 1¼ miles above the railway, which crosses the creek near Orroroo. A clay dam is being constructed across the creek at a spot where the rocky sides converge and form a narrow gap. The height of the dam will be 70 ft., and will throw the water back in a reservoir for about a mile. The clay for constructing the dam is being obtained chiefly within the area that will form the submerged portion of the proposed reservoir, the excavation of which exposed the old lake deposits about to be described.

Mr. Edgar J. Bradley, the chief officer in charge of the works, recognized the presence of fresh-water shells and the remains of *Chara*, an aquatic plant which by the secretion of calcium carbonate is often contributory to the formation of fresh-water limestones. I am indebted to Mr. Bradley for first giving me an early intimation of these interesting discoveries, and also for conducting me over the ground and pointing out the features of interest.

The prehistoric lake started from the narrows, where the present dam is being constructed, and followed the upper portions of the stream for about three-quarters of a mile, and had an average width of about 7 chains. The deposits were laid down on the eroded edges of the fine-grained argillaceous slates of the Tapley Hill series. These slates, with the associated beds, form locally a great synclinal fold, which has its eastern limb in the Mucra and Orroroo Ranges and its western in the Pekina Range. The associated limestones belong to the horizon of the Brighton, Reynella, and Hackham outcrops.

The nature of the lacustrine deposits is shown in the following section:—

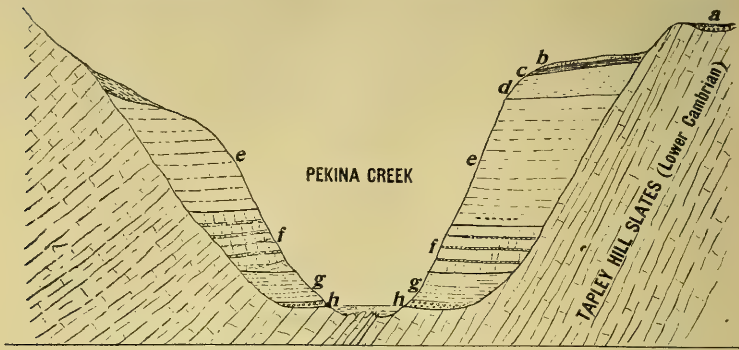

Fig. 1.

(a) High-level gravel of creek, 12 ft.
(b) Surface soil, 6 in.
(c) Good clay, 6 in.
(d) Calcareous clay, 3 ft. 6 in.
(e) Strong marly clay (makes excellent puddle), contained bones of marsupials near the bottom, 20 ft.
(f) *Chara* beds. Fine to coarse sand and clay mixed with the matted stems and fruits of *Chara* and decayed freshwater shells. Calcareous floors up to half an inch in thickness consisting almost entirely of *Chara* remains, 8 ft.
(g) Lower marly clay; sometimes carries *Chara* horizons, 5 ft.
(h) Bottom gravel, 1 ft.

Total, 50 ft. 6 in.

The present bed of the creek is only about 2 ft. below the level of the old lake bottom, which indicates the amount of erosion that the stream has accomplished at that spot since the inauguration of the lacustrine conditions and re-excavation of its aggraded material; but the time covered by these events must have been considerable.

The order of events appears to have been as follows:—

1. The corrasion of the rocks by the stream in establishing the grade, prior to the formation of the lake.
2. By some means the stream was checked in its flow and the water was thrown back on its upper course for nearly a mile.

3. A deposit of fine silt and clay was laid down by the stream in this area of arrested drainage until it reached a thickness of 50 ft. The great length of time that elapsed during this accumulation of sediment is evident, both from the fine lamination of the beds and the great thickness of *Chara* deposits, including the thin layers of fresh-water limestone.
4. An increase of the angle of grade rejuvenated the stream, and thereby increased its erosive power, by which the lake became drained; the stream cut down through the lacustrine deposits and into its rocky bed 2 ft. below its former level.

The origin, growth, and extinction of this small river lake offer several points for investigation of more than ordinary interest.

Mr. Bradley suggested to me the possibility of a landslip having occurred in the creek, blocking the channel and for a time damming the waters back, forcing the stream to take a new course over the shoulder of the spur (marked *h* in fig. 1), where a bed of gravel occupies a slight depression in the ground. This is a perfectly legitimate explanation and an event very likely to occur in a narrow gorge, but the surrounding circumstances do not seem to favour such an explanation in this case. The mass of material required to form such a dam would have to be very great, as 50 ft. of sediment has been laid down in the backwaters area. Moreover, the arrested current would speedily rise to the height of the barrier, giving a depth far too great to permit of the growth of thick forests of *Chara*, and the fineness of the sediment indicates the absence of torrential action.

Lakes arise from various causes. They mostly occur in established lines of drainage, and arise from the development of some physical barrier, which gives a temporary check to the drainage, as, for example, in the movements of land ice or by the oscillations of the earth's surface. It is the last-named cause which I think has been primarily responsible for the origin of the Pekina Creek lake.

The hydrographical features of the Orroroo district are certainly very remarkable. There is a wide valley, or rather plain, bounded by distant ranges of hills, and containing within its area isolated hills or groups of hills. The drainage of this area consists of a great number of streams and streamlets that have no relationship to each other. There is no trunk river, and the drainage is broken up into isolated fragments. The valley is there, but the river is wanting.

The underground features are as remarkable as the surface features. In 1907 a Government bore was put down on this plain, on the public road adjoining Section 64, Hundred of Walloway, and within about two miles of Orroroo. This bore, as will be seen from the following official report, penetrated alluvial sands, clays, and gravels to a depth of 591 ft. without reaching hard rock:—

Particulars of Orroroo Bore.

Description of Strata.	Thickness in feet.	Depth from Surface.
Loam	37	37
Gravel and clay	40	77
Sand and limestone ...	1 6 in.	78 6 in.
Yellow clay	10	88 6 in.
Sand	6 in.	89
Clay	68	157
Sandy clay	5	162
Various coloured clays ...	168	330
Pipeclay	20	350
Sand and clay	27	377
Clay	3	380
Soft white sandstone ...	42	422
Fine white sand	11	433
White clay	9	442
White sand	8	450
Clay—white and pink ...	52	502
Quartz sand	2	504
White clay	8	512
Quartz sand	18	530
Sand and pebbles ...	17	547
Sand, lignite, and clay ...	21	568
Quartz sand and clay ...	15	583
Sandy clay	8	591

Water was struck in the bore at 45 ft. Fresh water that rose to surface was tapped at the respective depths of 350 ft., 380 ft., and 502 ft. The choking of the bore unfortunately stopped further exploration.

This remarkable result proves that the Black Rock, Orroroo, and Walloway Plain was at one time in the line of a great artery of drainage that ran north and south, and that the old trunk river flowed, at a certain period of its history, not less than 600 ft. below the present level of the plain.

What happened to that old river that it should have been so completely wiped out of existence?

Before we answer that question there are some other facts to be taken into account. The Orroroo district is situated near the summit of the east and west water-parting of South Australia—a broad and extensive watershed which divides the inland drainage flowing to the north from the coastal drainage which flows to the south. But this country does not show the characteristic aspects of a watershed. There is no rocky ridge or headwaters of a great hydrographic basin to mark the water-parting. Indeed, the present water-parting runs athwart the main physiographical ridges of the country, and its general aspects are those of a country which has been reduced to base level rather than that of a watershed.

The only satisfactory solution of the anomaly, and one that accords with a much wider circle of evidence, is that of crust movements on a large scale, which at no very remote geological period produced an east and west ridge, or bulging of the surface, that dissected the drainage and diverted much of the water that originally came south in a reverse course towards the northern basins. This great corrugation of the earth's crust with its attendant warpings has destroyed the trunk rivers. The smaller tributaries find no confluence with other streams, and flow towards the dry valley only to be lost in its porous and deep alluvial deposits. The Walloway Creek, the Pekina Creek, the Orroroo Creek, and many others carry a considerable amount of water, but are lost within a short distance after entering the plain. In a well sunk at the mouth of the Pekina Creek a fragment of a kangaroo femur was found in the alluvial at a depth of 60 ft.

The Siccus River takes its rise to the north of Orroroo and flows into Lake Frome. This watercourse probably represents the reversed waters of the dead river of the Orroroo plains. In the process of diversion there must have been a period of arrested drainage, when the stream became sluggish and unable to carry its load. Degradation gave place to aggradation, and the watercourses became choked by a great thickness of sediment, as is shown by the Orroroo bore and the tributaries of Pekina Creek.

The old lake deposits of Pekina Creek supply an interesting phase in this chain of events. At the time when the now extinct trunk river had reached its maximum of aggradation, its bed was at a much higher level than the present plain. Its alluvial spreads along the margins of the plain on either side of the Pekina Creek and fills in the valleys of its tributary streams to a height of 100 ft. above the present level of the plain. The railway, soon after leaving Orroroo station, going north, passes by a viaduct over the Pekina Creek and then through a cutting of this high-level alluvial. The Orroroo bore on the plain is 1,287 ft.(1) above sea-level. The Orroroo railway station, situated on one of the old river terraces, is 1,380 ft. above sea-level, or 93 ft. above the bore, and the surface level of the prehistoric lake is 1,460 ft. above sea-level or 173 ft. above the bore. The lake-level must at one time have closely approximated to the main valley-level, along which the trunk river pursued a sluggish course. It was this high level of drainage—150 ft. or more above the present plain—which dammed back the waters of Pekina Creek and led to the formation of the lake above the narrows in the stream.

There has, therefore, been a lowering of the Orroroo and Walloway Plain, to the extent of at least 150 ft., since the time when the Pekina Creek was unable to transport its load in consequence of the lowness of the grade. The agent of erosion and transport by which the main valley became lowered was probably wind. The soil of the plain is a very fine silt, and in the summer-time the plain is constantly swept by duststorms.(2) This reduces the general level, leaving low hills of sand and gravel along the edges of the plain 50 ft. or 60 ft. in height. Passing up the Pekina Creek the alluvial not only caps the banks on either side, but has choked the old tributaries of the creek with accumulations of clay and gravel, and over these thick deposits of gravel waterfalls occur, the streams not having succeeded in the interval of re-excavating their beds to their former level. The elevation of the country having resulted in parting the drainage and wind-waste lowering the plain, a better grade was established, and the lateral creeks being rejuvenated thereby have incised their aggraded beds.

If our theory be correct, then at the time when the now extinct lake was created, the Pekina stream was practically on a level with the main river of the plains. The whole of the present gorge (except the excess of erosion which may have taken place subsequent to the laying down of the lacustrine deposits) was filled up with stream-wash. The currents would become increasingly weak and sluggish as the declivity was lessened, and the stream would widen out into marsh. At the site of the lake there are extensive flats be-

(1) These figures, kindly supplied by Mr. Bradley, are the latest determinations.

(2) Mr. Bradley informed me that whirlwinds were of daily occurrence on the plain during the summer. Whilst engaged surveying on the plain he has counted as many as twenty-six whirlwinds in one day.

tween the creek and the hills, and it is improbable that the present excavations have revealed the full extent of the lake deposits. A fine clay occupies the lower undulations bordering the creek over extensive areas, and this has been placed under contribution for construction of the dams. This deposit probably marks the occurrence of the shallower water around the margins of the lake, or the area that was subjected to alternating conditions of lake and dry land, determined by the variations in the rainfall.

The waters of the lake do not seem to have been richly furnished with life, or otherwise the evidences have been lost. The disappearance of the remains of aquatic plants can be easily understood. *Chara*, on account of its habit of secreting carbonate of lime, is more likely to be preserved than many others, and has left considerable deposits, but the carbonaceous matter has been largely removed from its beds. Lumps of calcified stems of reeds can be seen in many places, and a dark-coloured carbonaceous clay sometimes occurs. The porous nature of the deposit may account for the rarity of fresh-water shells. These have left, in most cases, only a few white patches of limey material difficult of determination. Bones of marsupials are not uncommon, and these also, for the most part, are very friable. The most important find was made by Mr. Bradley near the base of the thick clay-bed marked *e* in fig. 1. These bones were submitted to Professor Stirling, M.D., F.R.S., who has kindly given the following determinations:—*Macropus* (kangaroo), *Phascolomys* (wombat), and *Bettongia* (kangaroo rat), all belonging apparently to living species.

The facts now placed before you stand related to recent geological changes in South Australia, involving wider data which the author hopes at an early date to discuss.

Postscript.—Since the above paper was read I have made a second visit to Pekina Creek to investigate further discoveries by Mr. Bradley. The previous observations were limited to a long and narrow lacustrine area situated above the irrigation weir, but Mr. Bradley has been fortunate in detecting the occurrence of further lacustrine deposits a mile lower down the creek, at the back of the township of Orroroo. The position of the find is on a level with the ancient river flats, which widen out towards the plain, situated about 10 chains from the creek and 50 ft. above its present level. A small knoll is capped by a calcareous deposit, which breaks up into fragments, up to 6 in. in thickness, and consists almost entirely of the stems of *Chara* in a more or less matted condition. The beds of *Chara* in the upper portions of the lake area are compressed into thin, compact, fresh-water limestones; whilst the bed near Orroroo is a more or less open calcareous tufa. The stems, nodes, and branchlets of the *Chara* can be individually recognized, but they have been thickened by secondary deposition of carbonate of lime. It is evident that at this spot a calcifying spring drained into the lake or waterhole contemporaneously with the growth of the aquatic plants and has petrified the *Chara* as they stood in the water. On one slab a calcified patch of confervæ growths can be clearly distinguished. A number of small fresh-water shells occur with the *Chara* stems at this spot. They have been submitted to several Australian conchologists for determination, and it is believed that they belong to the genera *Potamopyrgus* or *Bythiniella*, but as no one in Australia is at present working on this group there is some uncertainty as to their true position.

This latest find is interesting as showing the extension of quiet and permanent waters on the alluvial benches facing the Black Rock and Orroroo Valley, through which it is suggested that the main river at one time flowed. The calcareous *Chara* bed occurs close to the last vestige of the old rocks in Pekina Creek before they disappear under the alluvial of the plain (fig. 2). These old rocks represent the

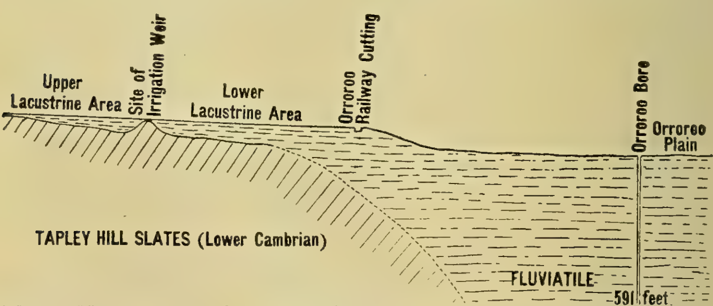

Fig. 2.

Diagrammatic section of the lower part of Pekina Creek and the Orroroo Plain, showing the deep alluvium filling the Trunk Valley and its overlap of the shelf of old rocks bordering the valley. The lacustrine areas would form the backwaters of the main river when at its maximum of aggradation.

scarp-face of a buried valley, and the running stream of Pekina Creek seldom persists more than a few yards beyond their limits, which is about half a mile above the railway bridge that crosses the creek. Except for a day or two after a great flood, the water east of that point ceases to flow at the surface and finds its way by a rapid subterranean descent through the thick alluvial that has choked the one-time main waterway. These conditions are extremely favourable for artesian water on the plains. The Orroroo bore proved that good water rose to the surface from a depth of 350 ft., and at the lower levels of 380 ft. and 502 ft. The most abundant supplies would probably be tapped at the base of the alluvial, resting on the bedrock.

W. H.

Royal Society Meeting,

October 5, 1909.

EXPLANATION OF PLATES XVII. AND XVIII.

Plate XVII.

Fig. 1.—A view in Pekina Creek, nearly a mile above the Irrigation Weir. The bed of the creek is encumbered by very large blocks of Tapley Hill slates, which were laid there before the lacustrine period. The lake-silt formerly covered these stones, remains of which can be seen forming cliffs on the left bank, the stream having washed out most of the lake deposits from its immediate channel.

Fig. 2.—A reproduction from a photograph taken about midway between the Weir and the head of the Old Lake, shown in fig. 1. Standing back from the creek, on the right bank, is a prominent ridge of lacustrine silt that has been weathered on all sides. The beds show horizontal stratification and calcified reeds, and *Chara* remains may occasionally be recognized amongst its material.

Plate XVIII.

A panoramic view of the alluvial terraces, about a mile below the Weir, near the place where the waters of the creek disappear from the surface. On exposed and sloping faces the alluvial terraces are quite bare, and the sides are cut by numberless water-channels. On the extreme left side of the picture is the terrace which is capped by a *Chara* limestone, described in the Postscript of the paper.

Thelymitra Epipactoides (F.v.M.), an Orchid New to the State.

[Read October 5, 1909.]

By R. S. Rogers, M.A., M.D.

Plate XIX.

This handsome orchid, hitherto recorded only from Victoria, has reached me at intervals during the past four years from Meningie, Myponga, Goolwa, Inman Valley, and Tailem Bend. In stature and general habit it rivals *T. grandiflora* (Fitz.), though structurally *T. ixioides* must be regarded as a nearer ally.

Description.—A robust plant, varying in height in the few specimens in my possession from 8 to 21 in. Leaf lanceolate, tubular at the base where it encloses a large leafy bract. Flowers 6-18, not spotted, large, pedicellate, racemose, *of a peculiar iridescent greyish-green colour shot with pinkish tints*, each subtended by a rather large clasping lanceolate bract. Lateral appendages of column in the form of hair-tufts turned upwards, middle lobe of hood tripartite; the central division irregularly denticulate on the top; the lateral divisions also denticulate on their oblique ends passing forwards, upwards, and inwards, at a lower level than the central one, and often interlocking like the fingers of two hands. Anther pointed, placed behind the stigma. The latter placed well below the middle of the column.

In only three other recorded species of thelymitra is the middle lobe of the hood tripartite, *viz.*, in *T. ixioides* (S.W.), *T. canaliculata* (R. Br.), and *T. media* (R. Br.). The first of these occurs in this State, the others are Western Australian forms. With this peculiar division of the hood, however, their resemblance to *T. epipactoides* practically ends. In each of these three, the central division of the middle lobe is lower than the lateral divisions, and the stigma occupies a relatively large portion of the anterior surface of the column, extending well above the middle. These features are reversed in *T. epipactoides.* Time of blooming, September and early October.

EXPLANATION OF PLATE XIX.

Fig. 1. Flower natural size.

Fig. 2. Side view of column ×6, showing divisions of hood and hair-tufts.

Fig. 3. Column from the front ×6, showing divisions of hood, hair-tufts, anther, rostellum, and stigmatic surface.

Fig. 4. Column from the back ×6.

A Synopsis of the Fishes of South Australia. Part III.

By A. Zietz, F.L.S., C.M.Z.S., etc.

[Read April 6, 1909.]

Family, SYNGNATHIDÆ *(continued from vol. xxxii., p. 299).*

70. **Hippocampus abdominalis,** Kaup.

Coorong, South Australia.
Distribution—South Australia, Victoria, Tasmania.

Family, PEGASIDÆ.

Genus, Pegasus, Linn. (1758).

71. **Pegasus lancifer,** Günth.

Spencer Gulf, dredged by Dr. J. C. Verco.
Distribution—South Australia, Tasmania.

Family, SCOMBRESOCIDÆ.

Genus, Scombresox, Lacép. (1803).

72. **Scombresox forsteri,** Cuv. and Val.

Hist. Nat., Poiss., xviii., 1846, p. 481. McCoy, Prod. Zool., Vict., dec. xiv., pl. 135, fig. 2. (Bill Fish.)

Distribution—New South Wales, Victoria, South Australia.

Genus, Hemirhamphus, Cuv. (1817).

73. **Hemirhamphus intermedius,** Cant.

Ann. and Mag., Nat. Hist., ix., 1842, p. 485. McCoy, Prod. Zool., Vict., dec. xiv., pl. 135, fig. 1. (Sea Garfish.)

South Australian coast.

Distribution—Queensland, New South Wales, South Australia, Victoria, Western Australia, Tasmania.

Genus, Exocætus, Linn. (1758).

74. **Exocætus evolans,** Linn.

Syst. Nat., ed. xii., 1766, p. 521. Day, Fish of India, pl. cxx., fig. 5. (Flying Fish.)

Gulf St. Vincent and Spencer Gulf.

Distribution—Seas of temperate and tropical zones (Günther).

Family, ATHERINIDÆ.

Genus, Atherina, Linn. (1758).

75. **Atherina pinguis, Lacép,** Günth.

Cat. Fish., iii., p. 399.

South Australian coast.

Distribution—New South Wales, South Australia.

76. **Atherina interioris** (M.S.), Zietz.

Proc. Roy. Soc., S.A. *(Description to follow.)*

Found in the overflow of the artesian water of Coward and Strangways Springs, Central Australia.

Genus, Atherinichthys, Bleek.

77. **Atherinichthys picta,** Cast.

Proc. Zool. Soc., Vict., vol. i., p. 137.

South Australia: Patawalonga Creek, Saltwater Lake near Robe, Lake Alexandrina.

Distribution—Victoria, South Australia.

78. **Atherinichthys cephalotes,** Cast.

Proc. Zool. Soc., Vict., vol. i., p. 137.

Thistle Island, in Spencer Gulf.

Distribution—South Australia, Victoria.

Genus, Rhombatractus, Gill. (1894).

79. **Rhombatractus winneckei,** Zietz.

Report Horn Scientific Expedition, p. 179, fig. 3.

River Finke, Central Australia.

80. **Rhombatractus tatei,** Zietz.

Report Horn Scientific Expedition, p. 178, fig. 2.

River Finke, Central Australia.

Genus, Neotherina, Cast.

81. **Neoatherina australis,** Cast.

Res. Fish, Aust., p. 31, 1875.

Freshwater Lake, near Robe, south-east of South Australia.

Family, MUGILIDÆ.

Genus, Mugil, Linn. (1758).

82. **Mugil peronii,** Cuv. and Val.

Hist. Nat., Poiss., xi., 1836, p. 138. Ogilby, Edible Fish, N.S.W., pl. xxxii. Stead, Edible Fish, N.S.W., pl. xiii. (Flat-tailed or Jumping Mullet.)

South Australian coast.

Distribution—Queensland, New South Wales, Victoria, South Australia.

Genus, Agonostoma, Benn. (1830).

83. **Agonostoma forsteri,** Cuv. and Val.

Hist. Nat., Poiss., xi., 1836, p. 141. Voy. Ereb. and Terr., pl. xxvi., figs. 1-4. (Fresh-water Mullet.)

Lower Murray, South Australia.

Distribution—New South Wales, South Australia, Victoria, Western Australia,(1) Tasmania.

Genus, Myxus, Günth. (1861).

84. **Myxus elongatus,** Günth.

Cat. Fish, iii., p. 466. Kner, Voy. Novara, Fish, p. 230. Macleay, Proc. Linn. Soc., N.S.W., iv., p. 426. (Sand Mullet.)

South Australian coast.

Distribution—Queensland, New South Wales, South Australia, Victoria, Lord Howe Island.

Family, SPHYRÆNIDÆ.

Genus, Sphyræna, Bl. Schn. (1801).

85. **Sphyræna novæ-hollandiæ,** Günth.

Cat. Fish, ii., 1860, p. 335. Ogilby, Edible Fish, N.S.W., pl. xxx. (Australian Pike.)

South Australian coast.

Distribution—New South Wales, South Australia, Victoria, Western Australia.

86. **Sphyræna obtusata,** Cuv. and Val.

Hist. Nat., Poiss., iii., 1829, p. 350. Günth. Fische der Südsee, pl. cxix., fig. B. (Australian Pike.)

Only one specimen from Gulf St. Vincent.

Distribution—This species is known from the Pacific Ocean, and has also been recorded from the coast of New South Wales.

87. **Sphyræna mordax,** Günth.

Ann. and Mag., Nat. Hist., 1872, vol. x., p. 183. Dinolestes, Mulleri, Klunz, Arch. f. Naturg., 1872, p. 29, tab. 3. Noesphyræna multiradiata, Cast., Proc. Zool. Soc., Vict., i., p. 96.

South Australian coast, 14 fathoms depth; 1 specimen (Mr. Alf. Searcy); a second specimen received from Mr. Ed. Daw.

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(1) In Western Australia this fish is called "Pilchard." See list of the fishes of Western Australia, published in 1902, by B. H. Woodward.

Distribution—New South Wales, South Australia, Victoria.

Sub-order, *ANACANTHINI.*

Family, MACRURIDÆ.

Genus, CORYPHÆNOIDES.

88. **Coryphænoides denticularis,** Rich.

Ereb. and Terr., pl. liii., figs. 1-3.

This species has been recorded from South Australia.

Family, GADIDÆ.

Genus, LOTELLA, Kaup. (1858).

89. **Lotella callarias,** Günth.

Ann. and Mag., Nat. Hist. (3), xi., 1863, p. 116. McCoy, Prod. Zool., Vict., dec. ii., pl. xix. (Beardy.)

Gulf St. Vincent.

Distribution—New South Wales, South Australia, Victoria, Tasmania.

Genus, PHYSICULUS, Kaup. (1858).

90. **Physiculus barbatus,** Günth.

Ann. and Mag., Nat. Hist. (3), xi., 1863, p. 116. McCoy, Prod. Zool., Vict., dec. ii., pl. xx. (Victorian Rock Cod.)

South Australian coast.

Distribution—New South Wales, South Australia, Victoria, Tasmania.

91. **Physiculus bachus,** Forst.

In Bl. Schn. Syst, Ichthy, 1801, p. 53. Rich., Voy., Ereb. and Terr., pl. xxxvii., figs. 1-2. (Red Cod.)

Only a single specimen from Gulf St. Vincent.

Distribution—New Zealand, New South Wales, South Australia.

Sub-order, *ACANTHOPTERYGII.*

Division, PERCIFORMES.

Family, BERYCIDÆ.

Genus, BERYX, Cuv. (1829).

92. **Beryx affinis,** Günth.

Cat. Fish, i., 1859, p. 13. Hutton, Ann. and Mag., Nat. Hist., 1877, xix., p. 341. Günth., Ann. and Mag., Nat. Hist., vi., vol. i., xxvi., on Austr. Fishes of the Gen. Beryx, 1888.

South Australian coast.

Distribution—New South Wales, South Australia, Tasmania, and probably New Zealand.

93. **Beryx gerrardi,** Günth.

Ann. and Mag., Nat Hist., vi., vol. i., xxvi., on Austr. Fishes of the Gen. Beryx, 1888.

South Australian coast.

94. **Beryx lineatus,** Cuv. and Val.

Cuv. and Val., iii., p. 226. Günth., Fish, i., p. 13 *(Beryx mülleri*, Klunz). S.B. Ak. Wiss. Wien (1880), lxxx., p. 359, taf. iii., fig. 1. Ann and Mag., Nat. Hist., vi., vol. i., xxvi., on Austr. Fishes of the Gen. Beryx, 1888.

Gulf St. Vincent.
Distribution—King George Sound, South Australia. (Günther).

Family, PEMPHERIDÆ.

Genus, PEMPHERIS, Cuv. (1829).

95. **Pempheris compressus,** Shaw.

In White's Voy., N.S.W., 1790, p. 267, fig. 2. (Bullseye.)

One specimen 2 in. long, Gulf St. Vincent.
Distribution—New South Wales, South Australia.

96. **Pempheris,** sp.

Gulf St. Vincent.

Two dried specimens, which were given to me by the late Mr. Jagoe, of the Semaphore, differ in many details from *P. macrolepis*, of which Waite gives an excellent plate in the Memoir iv., Austral. Mus., in the Report on the Trawling Exped. H.M.C.S. "Thetis." In our specimens the body is not so much elevated in the front, as shown in the plate, the scales being smaller, and the rays of the dorsal fin number only 2-10. The pectorals touch the first rays of the anal. The ventrals do not reach the latter, but leave a space between, about the length equal to the diameter of the eye. The abdominal opening is situated halfway between them. This could be an undescribed species.

Family, KYPHOSIDÆ.

Genus, KYPHOSUS (Lacép.) (1802), Cuv., Règne.

97. **Kyphosus sydneanus,** Günth.

Anim.. Ann. and Mag., Nat. Hist. (5), xviii., 1886, p. 368. Ogilby, Edible Fish, N.S.W., pl. xvi.

Gulf St. Vincent (late Dr. Wylde).
Distribution—New South Wales, South Australia.

Family, NANDIDÆ.

Genus, Ruppelia, Cast.

98. **Ruppelia prolongata,** Cast.

Proc. Zool. Soc., Vict., ii., p. 51, 1873. Res. Fish, Austr., p. 29.

Gulf St. Vincent.

Distribution—South Australia, Port Phillip (Victoria); type locality: Fremantle (Western Australia) (Cast.).

Family, SERRANIDÆ.

Genus, Percalates, Ramsay and Ogilby.

Proc. Lin. Soc., N.S.W. (2), 1887, ii., p. 182.

99. **Percalates colonorum,** Günth.

Ann. and Mag., Nat. Hist. (3), 1863, xi., p. 114. Cast., Proc. Zool. Soc., Vict., dec. ii., pl. xiv. Macleay, Cat. Austr. Fish, i., p. 4. Ten.-Woods, Fisher, N.S.W., p. 31, pl. i. Johnston, Proc. Roy. Soc., Tasm., 1882, pp. 59, 110. Stead, Edible Fish, N.S.W., p. 53, pl. xxii. Zietz, Fish, Lower Murray, Trans. Roy. Soc., S.A., 1902.

Lower Murray, River Glenelg (S.E.), etc.

Distribution—New South Wales, South Australia, Victoria, Western Australia, Tasmania.

Genus, Plectroplites, Gill. (1863).

100. **Plectroplites ambiguus,** Rich.

Ereb. and Terr., 1845, p. 25, pl. xix. McCoy, Prod. Zool., Vict., dec. ix., pl. lxxxiv. Stead, Edible Fish, N.S.W., p. 55, pl. xxiii. Zietz, Fish, Lower Murray, Trans. Roy. Soc., S.A., 1902. (Golden Perch.)

South Australia: River Murray.

Distribution—Mary River (Queensland), abundant in all the rivers and lagoons connected with the Murray River.

Genus, Oligorus, Günth. (1859).

101. **Oligorus macquariensis,** Cuv. and Val.

Hist. Nat., Poiss., iii., 1829, p. 58. McCoy, Prod. Zool., Vict., dec. ix., pls. lxxxv. and lxxxvi. Zietz, Fish, Lower Murray, Trans. Roy. Soc., S.A., 1902.

South Australia: River Murray (Murray Cod).

Distribution—Queensland, New South Wales, South Australia, Victoria.

Genus, Colpognanthus, Klunz.

102. **Colpognathus dentex,** Cuv. and Val.

Sitzb., Ak. Wien, lxxx., i., 1880, p. 339. Günth., Cat., i., p. 160. Rich., Voy. Ereb. and Terr., pl. lvii., figs. 3-5. (Sea Perch.)

South Australian coast.

Distribution—South Australia, Western Australian coast (King George Sound).

Genus, Gilbertia, Jord. and Eigenm.

103. **Gilbertia nigrorubrum,** Cuv. and Val.

Hist. Nat., Poiss., ii., 1828. Quoy and Gaim., Voy. Astrolobe, pl. iv., fig. i. Bull. U.S. Fish Comm., viii., 1890, p. 346.

South Australian coast.

Distribution—New South Wales, South Australia, Western Australia (King George Sound).

Genus, Cæsioperca, Cast.

104. **Cæsioperca rasor,** Rich.

Proc. Zool. Soc., 1839, p. 95. Trans. Zool. Soc., 1849, p. 73, pl. iv., fig. i. Günth., Cat., i., p. 93. Proc. Zool. Soc., Vict., i., 1872, p. 49.

South Australian coast (Barber).

Distribution—New South Wales, South Australia, Victoria, Tasmania.

105. **Cæsioperca extensa,** Klunz.

Sitzb., Ak. Wien, lxxx i., 1880, p. 339, pl. ii.

Gulf St. Vincent (one specimen).

Distribution—Hobson Bay (Victoria), South Australia.

Genus, Enoplosus, Lacép.

Hist., Poiss., iv., p. 541, 1802. Cuv. and Val., Hist. Nat., Poiss., ii., p. 133, 1828.

106. **Enoplosus armatus,** Shaw.

In White's Voy., N.S.W., 1790, p. 254, fig. 1. Lacép., Hist., Poiss., iv., p. 541. Cuv. and Val., Hist. Nat., Poiss., ii., p. 133, pl. xx. Günth., Cat. Fish, i., p. 81. Macleay, Cat. Austr. Fish, i., p. 9. Ten.-Woods, Fishes, N.S.W., p. 32, pl. ii. (Old Wife.)

South Australian coast.

Distribution—Bays and estuaries from Moreton Bay to Melbourne (Ogilby).

Genus, Histiopterus, Temm. and Schleg. (1844).

107. **Histiopterus labiosus,** Günth.

Proc. Zool. Soc., 1871, p. 658, pl. lix.

South Australia (W. Macleay).

Distribution—South Australia, Victoria, Tasmania.

108. **Histiopterus recurvirostris,** Rich.

Voy. Ereb. and Ter., p. 34, pl. xxii. Castelnau, Zool. Soc., Vict., i., p. 109. (Boar Fish.)

South Australian coast.

Distribution—South Australia, Victoria, Tasmania.

Notes on South Australian Marine Mollusca, with Descriptions of New Species.—Part X.

By Jos. C. Verco, M.D. (Lond.), F.R.C.S.

[Read June 1, 1909.]

Plates XX. and XXI.

Cyclostrema (Daronia) jaffaensis, n. sp.

Pl. xx., figs. 6 and 7.

Shell small, concentrically coiled. Whorls two, convex, uniformly increasing. Suture distinct, impressed. Aperture reniform; only a thin glaze over the preceding whorl; borders simple, thin, at the sides concavely retrocurrent near the suture, then convexly antecurrent, and in front barely concave. Umbilicus very wide and perspective, showing all the whorls; the sunken spire is similar, but not quite so deep or steep. Both depressions are bounded by a minute angulation or carinating cord, which winds round the whorl, gradually approaching the suture until it is lost in the depression at the beginning of the penultimate whorl.

Dim.—Largest diameter, 2 mm.; smallest, 1·6 mm.; width of aperture, 1 mm.

Locality.—90 fathoms off Cape Jaffa, 2 good, dead.

Obs.—The genus is provisional. *Daronia* (A. Adams), a planorbiform section, corresponds, but for the continuity of its peristome.

Xenophora tatei, Harris.

Xenophora (Tugurium) tatei, Harris, Brit. Mus. Cat. Tert. Moll., Austr., vol. i., 1897, p. 254, pl. vii., figs. 7*a* and 7*b*.

Hedley, Memoirs Austr. Mus., "Thetis Results," 1903, p. 357. "A broken shell, 30 mm. in diameter, and apparently half-grown; corresponds with actual fossil shells from Muddy Creek, with which I have compared it."

Four were dredged dead in 15 to 20 fathoms in Petrel Bay, St. Francis Island; 17·5 mm. in diameter, exclusive of accretions. They were submitted to Mr. Hedley, who wrote:—"For the purpose of this note I have again scrutinized both a Muddy Creek fossil and the New South Wales series of recent shells, and I see no difference." By courtesy of Mr. Howchin I have compared it with the fossils in the Tate Museum of the University of Adelaide. These are much larger when full-grown, and show a comparatively larger umbilicus and much more valid and very regular radial liræ on the base. But fossils of the same size as the recent shell have quite similar weak, crinkled striations.

Turbonilla brevis, Pritchard and Gatliff.

Turbonilla brevis, Pritchard and Gatliff, Proc. Roy. Soc., Vict., 1900, vol. xiii. (New Series), pt. 1, p. 135, pl. xxi., fig. 4. *Type locality*—"Off Rhyll . . . about four fathoms."

Taken in Gulf St. Vincent, depth not recorded, many examples alive and dead.

Donovania fenestrata, Tate and May.

Pl. xxi., figs. 8 and 9.

Donovania fenestrata, Tate and May, Trans. Roy. Soc., S. Austr., vol. xxiv., 1900, p. 94. *Type locality*—East coast of Tasmania (W. L. May); Tate and May, Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., p. 372, pl. xxiv., fig. 36.

Dredged in 110 fathoms off Beachport, 10 examples; in 150 fathoms 1, and in 40 fathoms 1; in 130 fathoms off Cape Jaffa 2, all dead (Dr. Verco); MacDonnell Bay beach, 1 (Dr. Torr).

Obs.—The above specimens were identified by me from examples sent by Mr. May, and later by him from his type. I had already had the figures drawn as for a new species of Trophon. The spiral liræ may be three, four, or five in different shells. The colour may be wholly translucent glistening white; or wholly light-brown, with a white protoconch; or cream-coloured, faintly tinted brown over the base. The dimensions may be—Length, 12 mm.; width, 2·9 mm. Length of body-whorl, 3·7 mm., just half as large again as the type.

Cominella torri, n. sp. Pl. xxi., figs. 10 and 11.

Shell large, solid, elongate-oval, of six whorls. Protoconch absent. Sutures distinct, broadly, flatly margined. Whorls convex, roundly shouldered above the middle. Body-whorl longer than the spire, base contracted. Aperture obliquely axially narrowly elliptical, with a moderate oblique sinistral open canal, somewhat recurved and notched; a narrow gutter at the suture, which slightly ascends. Outer lip simple, thin, rather effuse from its centre to the notch. Inner lip well marked, callous, smooth, and polished, complete from above the posterior gutter nearly to the notch, somewhat spreading, thickest about the columella; this is straight, obtusely roundly angled at its junction with the canal.

Sculpture: broad, round axial ribs, wider than the spaces, most prominent at the shoulder, not affecting the sutural margin, nearly vanishing at the periphery of the body-whorl. Four spiral equidistant narrow cords on the spire whorls; seventeen on the body-whorl; the front six below the periphery being the largest. Interstices with four to seven slightly crinkled threadlets.

Inside the aperture, at the anterior end of the columella, just above the canal, are two spiral threads, very distinct in broken shells.

The colour in the spire, from the shoulder to the lower suture, is a beautiful pinkish-salmon tint, fading towards the summits of the costæ. On the body-whorl this colouration ceases abruptly at the periphery, with a spiral line of small deep-brown articulated spots, which similarly ornament all the cords on the base. Short, wavy axial reddish-brown lines and flames crowd along the margined suture; and axial zig-zag dark-brown lines, rather more numerous than the costæ, cross the broad band on the body-whorl.

Dim.—Length, 41 mm.; breadth, 19 mm.; length of body-whorl, 29 mm. Another specimen, if whole, would be 60 mm. long and 28 mm. broad.

Locality.—St. Francis Island, 16 dead shells and fragments. No living or perfect example was obtained. It must be a large and beautiful shell. The two columellar plaits suggest *Peristernia*, but I have placed it provisionally in *Cominella*.

Typhis bivaricata, n. sp. Pl. xxi., figs. 1 and 2.

Shell imperforate, elongate-oval, rather thin; white, tinged with brown below the suture and the periphery. Whorls six, including a protoconch of nearly two smooth inflated turns. Spire-whorls, each bears four projecting tubes with a rounded aperture; between these are double varices, the more prominent leaf midway between the tubes, the other just behind a tube; each leaf is flexuous and tridentate, and ends behind in a hollow-pointed recurved spine. Body-whorl nearly as long as the spire, narrowed at the base, from which project the ends of three canals, towards each of which the two leaves of a varix converge to unite. Aperture roundly-oval, small, entire, peristome projecting, detached, simple, and sharp. Canal completely closed from the aperture to its end, wide, slightly oblique to the left, recurved. Tube long, round, curved.

Dim.—Length, 5·5 mm.; spire, 2·8 mm.; body-whorl, 2·7 mm.; tube, 2·1 mm.; breadth, 2·6 mm.

Locality.—20 examples dead in 104 fathoms, 35 miles south-west of Neptune Islands.

Diagnosis.—It differs from *T. yatesi*, Crosse, in being smaller, and in its double varices, which contain fewer and differently-shaped denticulations.

Trophon rudolphi, Brazier.

Peristernia rudolphi, Brazier, Proc. Linn. Soc., New South Wales, vol. ix., series 2, 1894, p. 166, pl. xiv., fig. 1. *Type locality* —Port Jackson.

Trophon rudolphi, Brazier, Hedley, and May, Records of Austr. Mus., vol. vii., No. 2, 1908, p. 112, from 100 fathoms. Cape Pillar, Tasmania.

Dredged in 40 fathoms off Beachport, five good specimens.

Trophon simplex, Hedley.

Trophon simplex, Hedley, Memoirs Australian Mus., vol. iv., pt. 6, 1903, p. 380, fig. 93. *Type locality*—Off Port Kembla, New South Wales, in 63 to 75 fathoms.

Dredged in 104 fathoms 35 miles south-west of Neptune Islands, thirteen examples; in 90 fathoms off Cape Jaffa, 20 examples. Identified by Mr. Hedley from his type.

Trophon longior, n. sp. Pl. xxi., figs. 5 and 6.

Shell solid, narrowly fusiform, of seven whorls. Protoconch of two and a half whorls, smoothly granular, ending by a distinct scar; first whorl with two carinæ, of which the highest continues as a sharp-corded angulation through the embryonic whorls, the lower fades out on the first whorl. Sutures distinct, barely margined. Whorls convex. Aperture obliquely oval; canal nearly as long as the aperture, directed obliquely to the left, concave to the right, slightly recurved. Outer lip thin, simple. Inner lip thin, erect anteriorly. Columella concave, obtusely roundly angled at its junction with the canal. Sculpture bold; axial costæ eleven in the penultimate, rather wider than the interspaces, round, extending from the suture which they undulate to the canal, whose varix they scale; spirals, four in the penultimate, three in the earlier whorls, nine in the body-whorl, round, crossing the axials. Colour white, just tinted with brown; deeply scorched spirally on the axial costæ near the suture, and in the body-whorl just below the periphery.

Dim.—Length, 6·4 mm.; width, 2·7 mm.; aperture, 1·5 mm.

Locality.—Type in 40 fathoms off Beachport, with one other example, good, but dead.

Diagnosis.—It resembles *Trophon rudolphi*, Brazier (taken by me and kindly identified by Mr. C. Hedley), in its striking protoconch, but is longer and narrower, and has its axials and spirals not so broad and close-set. It may be only a variant, in which case its specific name will indicate its difference from the typical form.

Trophon latior, n. sp. Pl. xxi., figs. 3 and 4.

Shell solid, ovately fusiform, of seven whorls. Protoconch of two and a half whorls, smooth, convex, ending abruptly, apex exsert. Whorls convex, the first round, the others sharply angulate above the centre. Body-whorl roundly angled at the periphery, very contracted at the base. Aperture obliquely axially oval. Canal moderate, oblique to the left, slightly concave to the right, recurved, open. Outer lip thin, simple; inner lip only a glaze. Columella nearly straight, scarcely angled at junction with the canal. Sculpture bold; axial costæ, ten in the penultimate, high, compressed, rounded, narrower than the interspaces, extending from the suture to the varix of the canal. Spirals three, the largest on the shoulder, the smallest between it and the upper suture, crossing the costæ; nine in the body-whorl. Colour horn-tinted, with a white spiral line at the angle, and a broad, brown band below the periphery, dotting the spire whorls in the spaces above the suture and fading out anteriorly. The most anterior spiral on the varix of the canal articulated brown, the one above it wholly white.

Dim.—Length, 7·2 mm.; of body-whorl, 4·7 mm.; width, 3·9 mm.

Locality.—Type in 40 fathoms off Beachport, with two other fresh specimens, all dead.

Obs.—One example is not quite so wide as the type. Its affinity is with *T. columnarius*, Hedley and May, but is shorter and wider (whence its name) and has not its axial foliations.

Voluta fulgetrum, Sowerby, *var.* **dictua**, var. nov. Pl. xxi., fig. 7.

Voluta fulgetrum, Sowerby, Catalogue of Shells in the Collection of the Earl of Tankerville, 1825; Appendix, p. 28, No. 2149, pls. iv. and v.

This variety is of the same shape and size as individuals with typical colouration. It is covered with a fine network of a light yellowish-brown tint, formed by close-set axial lines of small transverse arrowhead and reticulate markings, not unlike those of *Voluta exoptanda*, Sowerby. At the suture in the body-whorl these lines end as small blotches of deeper colour, producing a flamed articulation; and in the spire-whorls, just above the suture, are distant, transverse, oblong spots, about six in a whorl.

Taken in lobster-pots off Granite Island, Port Victor, three examples.

Philine columnaria, Hedley and May.

Philine columnaria, Hedley and May, Records Austr. Mus., vol. vii., No. 2, 1908, p. 123, pl. xxiv., figs. 25, 26. *Type locality* —100 fathoms, off Cape Pillar, Tasmania.

Dredged dead, in poor condition off Beachport in 40 fathoms, 1; in 100 fathoms, 2; in 110 fathoms, 5; in 200 fathoms, 6; off Cape Jaffa in 130 fathoms, 3. It was identified by Mr. Hedley from type.

Some specimens show two spiral bands, one about the middle of the shell, the other about halfway between this and the apex, less opaque than the rest of the shell, and are sometimes constricted along these lines and swollen between. Mr. Hedley says the Cape Pillar individuals showed the same variation.

Philine beachportensis, n. sp. Pl. xx., figs. 1, 2, and 3.

Shell milk-white, ovate. Apex sunken. Vertex with a triangular callus projecting from the inner lip; from the apex of the callus a lamina borders the back of the aperture, and a second runs round the middle of the apical pit to the outer lip, the two enclosing a gutter narrowing outwardly.

Aperture wide in front, narrow behind, with a narrow posterior sinus. Outer lip simple, thin, straightly-convex in profile; basal lip uniformly curved; columella concave: inner lip with a defined, well-spread glaze, ending behind in the callus.

Sculpture.—Crowded, flat, spiral liræ, separated by incisions, widest in the central half, more crowded towards the base, most crowded in the posterior fourth. Very crowded, fine accremental striæ cross the spirals and distinctly punctate the incisions.

Dim.—Length, 18·2 mm.; breadth, 8·1 mm.

Locality.—Type in 200 fathoms off Beachport, with 8 smaller; 130 fathoms off Cape Jaffa, 16; 300 fathoms, 5, all dead.

Philine evoluta, n. sp. Pl. xx., figs. 8 and 9.

Shell small, thin, milky-white, short, subquadrate. Vertex very little narrowed, not umbilicated, showing three-quarters of a whorl. Surface flatly convex.

Aperture very wide, widely sinused above. Outer lip thin, produced in a roundly-angular lobe above the vertex. Columella deeply and uniformly concave. Inner lip a moderately wide glaze. A minute rimate umbilicus.

Sculpture.—Numerous, flat, low spiral liræ, about one-third the width of their interspaces: at the vertex obsolete, in the middle more crowded. Subdistant accremental striæ and undulations.

Dim.—Length, 4·3 mm.; breadth, 3·5 mm.

Locality.—In 130 fathoms off Cape Jaffa, 1 dead.

Aglaja troubridgensis, n. sp. Pl. xx., figs. 4 and 5.

Shell about two and a half whorls, detached; depressed conic; apex somewhat lower than the rest; inner margin not uniformly curved, thick, opaque white to an irregular depth varying from 2 to 4 mm.; outer part thin, translucent, with a membranous edge; surface irregularly corrugated by obliquely retrocurrent folds, which roughen the inner margin. Internally somewhat rugose.

Dim.—Greatest diameter, 21 mm.; smallest, 15 mm.; height, 21 mm.

Locality.—Troubridge Island, among the rocks. Animals collected by Miss Fraser. Shells only preserved.

Obs.—Whether an *Aglaja* or a *Navanax*, an examination of the animal will decide. I have adopted Renier's generic name instead of the *Doridium* of Meckel, following Tryon.

Notes on South Australian Marine Mollusca, with Descriptions of New Species.—Part XI.

By Jos. C. Verco, M.D. (Lond.), F.R.C.S. (Eng.).

[Read October 5, 1909.]

Plates XXII., XXIII., and Part XXVI.

My paper deals with the genus *Triphora*. I have adopted this name, in accordance with the conclusion arrived at by Mr. Hedley as to Blainville's priority of publication.

Hitherto only four species have been recorded for South Australia, which furnished the type specimens of them all—*viz.*, *T. angasi*, *T. festiva*, *T. pfeifferi*, all of Crosse and Fischer, and *T. scitula*, A. Adams. Several others were known to occur here, but their identification was difficult. Mr. Hedley, in a valuable contribution to the Proc. Linn. Soc. of New South Wales, 1903 (1902), on the Triphoridæ of that State, cleared away much of the obscurity which had enveloped some already described species from Port Jackson, and added several new ones to the list. Specimens of nearly all these, kindly supplied by him, have aided considerably in unravelling the tangle of our South Australian forms. Six of his eight novelties are represented here, and four of the six species described by other authors. The task has been difficult, even with this clearance. A very large number of shells, collected during several years' dredging, furnished not only many species, but a most perplexing number and series of variants in nearly every species; and what with macromorphs and micromorphs, juveniles and adults, narrow and obese forms, differences in relative size of pearl rows, validity and invalidity of the sutural thread, rolled, bleached, or fresh shells, typical and atypical colouration, accurate specific determination at times seemed unattainable. Even now it is impossible absolutely to decide whether some of my enumerated varieties are not distinct species, and some of my newly-named species may not prove eventually to be only variants. Of the four species enumerated in Adcock's "Handlist of Aquatic Mollusca of South Australia," 1893, one has been omitted, *viz.*, *T. scitulus*, A. Adams. It was described from a Port Lincoln shell, but has not been recognized. A shell which in some respects conforms to the description has been dredged, but I refrain at present from so naming it. To the remaining three species we have been able to add nine more from other authors, and ten new forms now described, bringing the total to 22 species, with 4 varieties. Two dextral shells are very interesting, as are also three subulate species, all from comparatively deep water.

Triphora dexia, n. sp. Pl. xxii., figs. 6 to 10.

Shell dextral, elongate conical in the earlier half, cylindrical in the later; of 15 whorls, including the protoconch. This has two and a half turns, its whorls short and swollen convex, with axial costæ, valid; 12 in the first whorl, 17 in the second; the apex is a tiny smooth hemisphere lying horizontally. Spire-whorls not convex, suture distinct, impressed. The body-whorl has three openings—one a bent tube formed by the closure of the anterior canal; the second a bent tube formed by the closure of the posterior canal, and projecting just below the suture; the third by the aperture which is complete, round, much produced into a wide tube, somewhat effuse at its opening, and with a slightly irregular border.

Sculpture.—In the upper whorls is a central prominent round rather rugged spiral rib, a second smaller spiral lies immediately below the suture, and a third is just visible immediately above the suture. As the shell grows the lowest rib gradually enlarges until in the last whorl it equals the central rib. This rib, at first central, gradually moves lower and approximates the third rib. Axial ribs, 16 in the penultimate, one-fourth the thickness of their interspaces and somewhat obliquely antecurrent, extend between the sutures, validly tuberculating the central spiral and but slightly the sutural ones. A scar runs from a slight notch near the centre of the ventral border of the apertural opening to the extremity of the anterior tube, and another from near the centre of the dorsal border of the aperture to the end of the posterior tube, indicating the lines along which union between the two sides of the aperture has been effected. The base is flatly concave with the anterior tube projecting in its centre, is radially engraved with curved lines, and is surrounded by a nodular pad formed by the exaggerated lowest spiral, which with its fellow then runs between the two closed canals, and fades out on the dorsum of the apertural tube. The upper spiral vanishes at the base of the posterior tube.

Dim.—Length, 7·5 mm., including the anterior tube of 0·7 mm.; width, 1·6 mm., excluding the apertural tube of 0·6 mm. Diameter of apertural tube, 1·1 mm., including its reflected expansion.

Variations.—The adult mouth may form in a shell with only 11 whorls and 4·3 mm. long, or in 1 with 17 whorls and 7·9 mm. long.

Locality.—Type from 55 fathoms off Cape Borda, with 56 others in good condition and about 90 poor; also in 62 fathoms, 2 poor; also off Beachport in 40 fathoms, 2 good; in 110 fathoms, 4 good and 5 moderate; in 300 fathoms, 3 poor; off Cape Jaffa in 130 fathoms, 2 moderate; in 300 fathoms, 1 poor. Its habitat would therefore appear to be in 50 fathoms, extending up to 40 and down to 110.

Obs.—Although this shell is dextral it has been placed in the genus Triphora, because it has the three apertures in its body-whorl. But for this it would have been called a Cerithiopsis, and if immature it would have been placed in this genus. In the Bull. Mus. Compar. Zool. of Harvard Coll., vol. xviii., "Blake" Dredging, xxix., Report on the Mollusca, 1889, part 2, p. 242, W. H. Dall writes:—"There are probably," in Triforis, "some dextral forms, though such are apt to be referred to Cerithiopsis." This suggestion is the justification for calling my new species a Triphora. Subsequent examination of the animal may settle its final generic location.

Triphora epallaxa, n. sp. Pl. xxii., fig. 1.

Shell dextral, elongate-conical in the earlier half, cylindrical in the later. Protoconch absent. Suture indistinct, minutely appressed. Whorls 18, flat, with two spiral rows of tubercles, axially alternating, much larger in the lower row; with a faint spiral cord joining the tubercles. The last whorl has its aperture round, projecting as a free tube, with a thin expanded border, also two other tubes—one standing out from the centre of the base, the other immediately below the suture of the penultimate whorl. The base is flatly convex and is slightly margined by the lower row of tubercles, which then passes between the two tubes and fades out on the dorsum of the projecting trumpet-shaped apertural tube. The upper row of tubercles ends at the base of posterior tube.

Dim.—Length, 7·9 mm.; width, 1·7 mm.; including the projecting aperture, 2 mm.

Locality.—130 fathoms off Cape Jaffa, 2 dead.

Diagnosis.—It resembles *T. dexia* in being dextral, in its general shape, and in having three well-formed tubes, but is plainly distinguished by the two rows of alternating tubercles.

Triphora subula, n. sp. Pl. xxiii., figs. 5 and 6.

Shell sinistral, elongate-subulate-pyramidal. Protoconch of 3½ turns; the first has two high, narrow, smooth, rounded keels joining at the apex to form a tongue; the second whorl shows the beginning of a third keel, infrasutural, and distinctly smaller; the interspaces are concave and microscopically axially striate. Spire-whorls 20, with three spiral ribs; one immediately beneath the suture is the narrowest, flat on its posterior surface and nearer the middle one than is the lowest; about one-half the width of the interspaces; nodular, especially the central rib; nodules transversely elongate, fully twice as long as broad, joined in the interspaces by oblique, low, very broad, rounded axial costæ, much wider than their interspaces; faint microscopic accremental striæ. The last 6 whorls have a supra-sutural smooth thin ledge. Aperture broken. Colour uniformly light-horn tint; the posterior spiral distinctly darker.

Dim.—Length, 12 mm. (probably 14 when perfect); breadth, 1·6 mm.

Locality.—Type Gulf St. Vincent, depth unrecorded, with 2 other examples; in 55 fathoms off Cape Borda, 1 dead.

One of the co-types shows two smooth spirals on the base, a nearly oblong mouth, and an anterior canal, curved to the left, reflected and notched.

Triphora spina, n. sp. Pl. xxii., figs. 2, 3, and 4.

Shell sinistral, elongate-subulate-pyramidal. Protoconch of 4 turns, apex prominent and tongue-like, whorls smooth, centrally boldly angled, concave between the median angulations. Suture linear. Spire-whorls 17, with four ribs; the largest is the continuation of the nuclear angulation; above this is a much smaller infra-sutural rib, below it the shell wall seems thinner and less opaque; then comes a bold rib, and close below it a supra-sutural rib. They are slightly tuberculate with low transverse nodules, united by low broad oblique axial costæ, most marked between the upper two ribs, but connecting the upper three; the supra-marginal rib is smooth, and wedged in between the two adjacent ribs. Aperture roundly rhomboidal; outer lip crenulated by the spirals, antecurrent into a spur towards the front; canal nearly closed at this point, curved to the left, and reflected; back of the aperture pinched at the suture, but no sutural notch. Base smooth, with one spiral. Colour, light-amber tint.

Dim.—Length, 12·4 mm.; width, 1·9 mm.

Locality.—Type, 110 fathoms off Beachport, with 2 others perfect and 11 broken, in 150 fathoms 6 moderate, and in 200 fathoms 3 poor; in 90 fathoms off Cape Jaffa, 7 perfect and 14 broken, and in 130 fathoms 3 broken.

It differs from *T. subula* in its unicarinate protoconch, and in having the 4 ribs throughout.

Triphora spica, n. sp. Pl. xxiii., fig. 1.

Shell solid, long, narrow, upper third elongate-conical, the rest nearly cylindrical. Protoconch of 5 whorls, convex, with two central closely approximate spiral threads and numerous axial bars. Spire-whorls 17, the first three with two nodulate spiral ribs, and an infra-sutural small, smooth cord. In the fourth whorl this becomes nodulate; and getting thicker equals the other spirals in the sixth whorl. Between the twelfth and thirteenth whorls a supra-sutural thin threadlet appears and gradually enlarges and grows subnodular. The nodules in a spiral row on the penultimate are 17, transversely elliptical, and are joined spirally by a bar about one-third of their width, and vertically by obsolete bars nearly their own width. The body-whorl has three spiral ribs, a subnodulated peripheral riblet, a distinct smooth, stout, basal spiral, and an obsolete one at the base of the canal. The lip is broken. Colour, light-brown, with axial streaks of darker-brown from suture to suture; sometimes these happen to be continuous over two or more whorls, sometimes not; the protoconch is of darker brown.

Dim.—Length, 9·7 mm.; breadth, 1·55 mm.; length of protoconch, ·55 mm.

Locality.—Type, 40 fathoms off Beachport, with 4 others; 55 fathoms off Cape Borda, 10 good, many poor; 62 fathoms off Cape Borda, 1 poor; Gulf St. Vincent, under 25 fathoms, 7 poor. The habitat would appear to be in 40 to 50 fathoms.

Diagnosis.—From *T. kesteveni*, Hedley, it differs in its nodulated spirals and in its colour.

Triphora angasi, Crosse and Fischer.

Triphoris angasi, Crosse and Fischer, Jour. de Conch., 1865, p. 46, pl. i., figs. 12 and 13. *Type locality*—Gulf St. Vincent, South Australia. Hutton, 1880, Manual New Zealand Moll., 1880, p. 75, Stewart Island, 30 fathoms.

Triforis, Tate and May, Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., p. 388, Tasmania (Miss Lodder); Pritchard and Gatliff, Proc. Roy. Soc., Victoria, 1902, vol. xiv. (N.S.), part 2, p. 86, Victorian coast.

Triphora, Hedley, Proc. Linn. Soc., New South Wales, 1902, vol. xxviii., p. 610, Sydney Harbour.

Taken on the beach at Yankalilla, Gulf St. Vincent, Scales Bay, and St. Francis Island in the Great Australian

Bight. Dredged in 6 fathoms, and in 15 fathoms off St. Francis Island in poor condition; in 20 fathoms, Gulf St. Vincent and Investigator Strait, few, mostly dead; in 25 fathoms, Spencer Gulf, 1 moderate; in 40 fathoms off Beachport, 7 perfect and 19 good; in 55 fathoms, Cape Borda, 7 moderate; in 62 fathoms off Cape Borda, 1 poor; in 110 fathoms off Beachport, 2 good, but somewhat decolourized. It is not a common shell in our waters or on our beaches. Angas, in Proc. Zool. Soc., Lond., 1865, p. 172, gave its station as "deep water," Gulf St. Vincent. This would mean something less than 25 fathoms. It is found perfect as deep as 40 fathoms and moderately good up to 55 fathoms, but beyond that poor.

Hedley says, *loc. cit.*:—"No specimens examined afforded an opportunity for describing the protoconch." I may add, therefore, that it is elongate and pointed of 4½ whorls, which are convex, and have near their middle two carinæ, very close together, the lower of which enlarges and forms the lower of the two pearl rows in the first spire-whorl; the upper carina rather later deflects rather abruptly upwards and forms the upper row. The protoconch is axially closely lirate. The shell when adult may vary from 8·1 mm. to 4·1, and may when of equal length vary distinctly in obesity, and also in the roundness of the lower part of the body-whorl.

Trifora angasi, Crosse and Fischer, *var.* **leuca,** n. var.

This shell is usually longer and narrower than the average typical shell, is less rounded in the body-whorl, and has the sutural furrow rather more distinct, but in all these respects both the type and the variety vary. It is not a dead and bleached shell, but is taken quite white in a perfectly fresh condition. But some few specimens are uniformly very faintly brown, some have only the base slightly brown, some are just tinted brown over a greater or smaller vertical extent of the spire, or over the centre of the whorl for one or two turns, proving it probably only a variety.

It is taken perfect on the beach at St. Francis Island and Scales Bay on the West Coast; in 6, 15 to 20, and 35 fathoms off St. Francis Island, 14 fathoms off Ardrossan, 20 fathoms Investigator Strait, 45 fathoms off the Neptunes, 55 fathoms off Cape Borda, 40 and 110 fathoms off Cape Borda; while in poor condition it is found in 130 fathoms off Cape Jaffa, and in 150 fathoms off Beachport. My dredgings have yielded more good specimens of this variety, and to a greater depth, than of the typical *M. angasi*, Crs. and Fischer.

Triphora innotabilis, Hedley.

Triphora innotabilis, Hedley, Proc. Linn. Soc., New South Wales, 1903 (1902), part 4, p. 608, pl. xxxii., figs. 23, 24, 25. *Type locality*—Sydney Harbour.

Dredged in Gulf St. Vincent, (?) depth, 10 good, 4 moderate; in 22 fathoms, Investigator Strait, 2 perfect and fresh; in 62 fathoms off Cape Borda, 1 perfect. Taken in shell sand, Edithburgh and at Streaky Bay, good. Identified by Mr. Hedley from his type.

Triphora latilirata, n. sp. Pl. xxvi., fig. 1.

Shell sinistral, solid, elongate-conic. Protoconch of 5 whorls, smooth and round. Spire-whorls 13, flat, sloping; suture rather wider than the spaces between the spiral ribs. Spirals 3, flat, wide, nearly smooth on the surface: interstices narrow, punctated by close-set axial incisions, which also cut the sides of the liræ. Body-whorl rhomboidal, with three spiral ribs, towards the aperture the interspaces are occupied each by a short, rapidly-widening spiral; the axial incisions are more distinct towards the aperture. Base convex with a peripheral spiral, rounded, smooth keel, and a second more anterior, punctated between. Aperture roundly quadrate: outer lip sloping, straight, ascending at the suture and pinched into a tiny sinus, anteriorly circular and effuse; in profile straight, minutely retrocurrent at the suture, obliquely very slightly antecurrent anteriorly. Canal well marked, nearly closed, especially at the junction with the aperture, markedly recurved. Inner lip distinct, slightly erect. Colour, white.

Dim.—Length, 10·5 mm.; breadth, 2·5 mm.

Locality.—Type, Gulf St. Vincent, (?) depth, with 23 others moderate: in 15 to 20 fathoms off St. Francis Island, 1 moderate: in 24 fathoms off Newland Head, 1 moderate; in 55 fathoms off Cape Borda, 1 good.

Variations.—In the shell from 55 fathoms, in the antepenultimate whorl an interstitial thread arises between the middle and anterior spirals, and becomes a definite though small lira. In some large shells a thin sutural lamina is seen between the later whorls. A large broken specimen would measure 15 mm. if complete. In one individual the posterior spiral lira throughout the shell is tinged brown.

Triphora armillata, n, sp. Pl. xxii., fig. 5.

Shell solid, elongate-conic. Protoconch of 4 whorls, convex, centrally carinate, the fourth with two approximate carinæ: crowded fine axial bars, concave forward above the carinæ, straight below. Spire-whorls twelve, sloping, the first four with two spiral rows of pearls; in the fifth a lira appears between them, and becomes gradually as large as the others; the tubercles are large, about twenty in a row in the penultimate, joined by short bars transversely, and by narrower axial bars directed obliquely forwards towards the lower suture. Sutural spaces distinct, as wide as a pearl row; in the eighth a supra-sutural thread arises, which grows distinct and slightly tuberculate. Base flatly convex, with the sutural lira, and two basal liræ; the first with valid transversely oval tubercles, joined by very broad axial bands to much lower tubercles in the second, and by vanishing bands to the nearly smooth third lira. Aperture round, pinched at the suture into a sinus, and with a short well recurved canal in front; outer lip thin, simple, slightly reflected at its margin, retrocurrent at the suture, crossing the columella in front and flattened out over the base of the canal, so as to close it here. The outer lip has eight nodulous spirals on its outer surface, *viz.*, three as on the spire, the peripheral and one basal, and three others intercalated on the body-whorl. Colour, protoconch light-brown, shell white, but for the fifth and sixth whorls which are dark-brown, so as to form a sort of bracelet, whence the name.

Dim.—Length, 7·9 mm.; breadth, 2·2 mm.

Locality.—Type, Gulf St. Vincent, dredged in 20 fathoms, with many other good ones; also in 6 and in 15 to 20 fathoms off St. Francis Island, 9 good in each; in 22 fathoms, Investigator Strait, 2 good and 4 poor; in 22 fathoms, outside Backstairs Passage, 3 poor; in 40 fathoms off Beachport, 2 moderate, 3 poor; in 55 fathoms off Cape Borda, 4 poor. Also taken on the beach in Gulf St. Vincent, Venus and Scales Bay, West Coast, and many and good on St. Francis Island. It is a shallow-water species, ranging up to about 40 fathoms.

Triphora cinerea, Hedley.

Triphora cinerea, Hedley, Proc. Linn. Soc., New South Wales 1903 (1902), part 4, p. 612, pl. xxxiii., figs. 36 and 37. *Type locality*—Middle Harbour, Port Jackson. Pritchard and Gatliff, Proc. Roy. Soc., Victoria, 1906 (1905), vol. xviii. (N.S.), part 2, p. 61, Victoria.

Dredged in 14 fathoms off Ardrossan, 3 moderate; in Gulf St. Vincent, below 25 fathoms, 12 fresh, 32 moderate, 18 poor; in 40 fathoms off Beachport, 9 perfect, 22 moderate; in 55 fathoms off Cape Borda, 9 good, 7 poor; in 62 fathoms, 1 moderate; in 90 fathoms off Cape Jaffa, 16 moderate, immature, and 9 poor, broken; in 110 fathoms off Beachport, 3 moderate, broken; in 130 fathoms off Cape Jaffa, 1 poor, broken; in 300 fathoms, 5 fragments; and in 300 fathoms off Beachport, 1 poor. Taken on the beach at St. Francis Island, 5 moderate.

Obs.—This species flourishes in the medium depths, being not littoral, up to 50 fathoms, and then gets rare and poor. One taken in Gulf St. Vincent is quite white, as is one from Cowes, Victoria.

Triphora regina, Hedley.

Triphora regina, Hedley, Proc. Linn. Soc., New South Wales, 1903 (1902), part 4, p. 608. pl. xxxii., fig. 21. *Type locality*—Balmoral Beach, Port Jackson.

Hedley's unique type was "mutilated at each extremity," so I complete the description from a perfect specimen. It has a brown, elongate five-whorled protoconch, whorls convex, faintly unicarinate in their anterior third and axially finely lirate. The aperture is circular, with a rather deep, narrow posterior sinus. The inner lip is erect and solid, meeting the edge of the basal lip, which does not cross it. Canal nearly closed, reflected, notched. It appears to be a good species.

Dredged in Gulf St. Vincent, (?) depth, 1 poor; in 35 fathoms off St. Francis Island, 4 poor; in 40 fathoms off Beachport, 1 perfect, 3 good; in 45 fathoms east of North Neptunes, 1 poor; in 55 fathoms off Cape Borda, 2 moderate; in 62 fathoms north-west of Cape Borda, 1 poor; in 90 fathoms off Cape Jaffa, 1 perfect; in 110 fathoms off Beachport, 1 good; in 130 fathoms off Cape Jaffa, 4 moderate; in 150 fathoms off Beachport, 4 moderate. Taken on the beach at St. Francis Island, 6 moderate. This seems to be a deep-water form.

Triphora albovittata, Hedley.

Triphora albovittata, Hedley, Proc. Linn. Soc., New South Wales, 1902, part 4, p. 609, pl. xxxii., figs. 26, 27. *Type locality*—Balmoral Beach, Port Jackson.

Dredged Gulf St. Vincent, depth unrecorded, 1 perfect; in 35 fathoms, St. Francis Island, 1 poor; in 40 fathoms off Beachport, 1 good; in 55 fathoms off Cape Borda, 1 very good; in 90 fathoms off Cape Jaffa, 2 good. Taken at St. Francis Island on the beach, 3 perfect, 2 good.

Var. **mamillata**, var. nov.

Instead of having the elongate four-whorled protoconch of the type, it has a mamillate two-whorled apex. The first whorl is round and smooth, the second has a central carina and subdistant axial bars. Generally the second is swollen and lies somewhat out of the axis of the shell, causing the mamillate form. Rarely the first whorl may be as large as the second. This protoconch seems complete, and not the base of a spiculate protoconch, whose terminal whorls have fallen. The shell varies in shape, being short, broad, and pupæform, or long, narrow, and elongate-pyramidal.

Dredged in Gulf St. Vincent, 7 perfect and 7 poor; in 90 fathoms off Cape Jaffa, 2 good; in 150 fathoms off Beachport, 2 poor. Taken on the beach MacDonnell Bay, 1; Gulf St. Vincent, 23, in varying condition; Venus Bay, 2, good.

The very different protoconch makes me diffident about calling this a variety, inasmuch as the characters of the protoconch are generally regarded as very certain specific diagnostics; but the shells are otherwise indistinguishable.

Triphora granifera, Brazier.

Triforis graniferus, Brazier, Proc. Linn. Soc., New South Wales, 1894, vol. ix., 2nd ser., p. 173, pl. xiv., fig. 10, Port Jackson.

Triphora granifera, Brazier, Hedley, *op. cit.*, 1903 (1902), p. 610, pl. xxxii., figs. 28 and 29; Pritchard and Gatliff, Proc. Roy. Soc., Victoria, 1906 (1905), vol. xviii. (N.S.), p. 60, Western Port.

Taken on the beach from MacDonnell Bay to Scales Bay, and St. Francis Island. Dredged in 6, 14, 20, 22 fathoms in Gulf St. Vincent and off St. Francis Island, alive; in 35 fathoms off St. Francis Island, 3 poor; in 40 fathoms off Beachport, 4 good, 11 poor; in 62 fathoms off Cape Borda, 3 poor; in 110 fathoms off Beachport, 2 moderate; in 130 fathoms off Cape Jaffa, 1 moderate; in 300 fathoms off Beachport, 1 good and 1 moderate. This appears to be a littoral form, extending up to 22 fathoms: beyond that depth the shells are mostly dead and decolourized.

The length of the type is 4 mm., but it may be 5·7 mm. or 2·9 mm. Sometimes the shell has the lowest pearl row the largest, and the highest the smallest, so that the whorls are imbricating or pagoda-like. Sometimes the supra-sutural threadlet stands out as a distinct low, small pearl row. One adult micromorph has the lowest pearl row relatively very large, so as to suggest *T. pfeifferi*, Crosse, but the short, thick figure is that of *granifera*. The South Australian shells are very rarely wholly dark- or light-brown like the Sydney specimens, but are a glistening, translucent white, with brown, squarish blotches. These may be quite dark or very pale, large or small, few or many, so as to make the shell nearly white or nearly brown.

Triphora pfeifferi, Crosse and Fischer.

Triphoris pfeifferi, Crosse and Fischer, Jour. de Conch., 1865, p. 47, pl. i., figs. 14 and 15. *Type locality*—Gulf St. Vincent.

Triforis pfeifferi, Crosse and Fischer, Tryon, Man. of Conch., vol. ix., 1887, p. 182, pl. xxxviii., fig. 9; Tate and May, Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., p. 388, Tasmania; Pritchard and Gatliff, Proc. Roy. Soc., Victoria, vol. xiv. (N.S.), 1902, p. 86, Victoria.

Taken on the beach as far west as Venus and Scales Bays, and on St. Francis Island. Dredged at 6, 15, 20, 22 fathoms, alive, in Gulf St. Vincent, etc.; in 40 fathoms off Beachport, very many good: in 55 and 62 fathoms off Cape Borda, 2 perfect, 2 fresh, 5 good; in 90 fathoms off Cape Jaffa, 1 perfect, 3 poor; in 110 fathoms off Beachport, 8, all broken; in 130 fathoms off Cape Jaffa, 2 good; in 150 fathoms off Beachport, 4 poor. It is very abundant on the beach and is manifestly a littoral shell, and certainly lives up to 22 fathoms, and may live up to 90 or 100.

The authors say "the first three whorls are smooth." The protoconch is of four convex whorls, with a central carina and crowded axial liræ, and a well-marked suture. The length of an adult shell with ascending suture and completely formed mouth may be 9·5 mm. or 3·7 mm.

It varies very greatly. When the supra-sutural ledge is wide, but not projecting, the middle row of pearls is larger than usual, and the upper row smaller than usual, an imbricating or pagoda-like shape is assumed. When the supra-sutural ledge is well marked and nodulated, so as to look like a pearl row, and the highest pearl row is small, and the middle row is scarcely seen, and the lowest is very large, this may appear to be a large central row between two smaller rows, and may, as Hedley suggests (Proc. Linn. Soc., New South Wales, 1903 (1902), p. 616), be *T. scitulus,* A. Adams, which we have not been able to identify among South Australian shells. Sometimes the shell is typically nacreous-white, with the violet-brown base, and the supra-sutural ledge articulated brown and white; but it may be almost throughout of a dark-violet-brown or any intermediate tint.

The mouth in Crosse's type appears not to have been complete. The outer lip ascends beyond the supra-sutural ledge so as to touch the lowest pearl row. Here it is pinched so as to form a gutter, and retires to form a notch. It is antecurrent towards the base and somewhat effuse, and crosses the base of the canal as a spur, so as to meet an erect rather thick inner lip.

Triphora festiva, A. Adams.

Triphoris festivus, A. Adams, Proc. Zool. Soc., London, 1851, p. 278. *Type locality*—Port Lincoln (Mus. Cuming). Angas, Proc. Zool. Soc., London, 1865, p. 172.

Triforis festiva, A. Adams, Tate and May, Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., part 3, p. 387, Tasmania.

Dredged in 40 fathoms off Beachport, 1 good, albino; in 6 fathoms off St. Francis Island, 3 poor. This is a littoral form. Taken on the beach Yankalilla, Gulf St. Vincent, Spencer Gulf, many good; and at Scales and Smoky Bays, and St. Francis Island in the Australian Bight, a few good.

The type was probably an immature shell, which would have a flat base; when mature the species has a rounded base with two simple spirals, besides the supra-sutural peripheral band. It has a four-whorled, brown, acutely-conical protoconch, the first turn of which is smooth, the others unicarinate with axial bars. The shell when apex and base are perfect may be 3·5 mm. long and 1·3 mm. broad, or 6·4 mm. long and 2·1 mm. broad. In the larger forms a threadlet arises in the later whorls between the two spiral pearl rows and becomes a third smaller row.

Triphora ampulla, Hedley.

Triphora ampulla, Hedley, Proc. Linn. Soc., New South Wales, 1903 (1902), p. 615, pl. xxxii., figs. 38 and 39. *Type locality*—Watson's Bay, Port Jackson. Gatliff and Gabriel, Proc. Roy. Soc., Victoria, 1908, vol. xxi. (N.S.), part 1, p. 378, Port Phillip.

Dredged in Gulf St. Vincent, 11 poor; 14 fathoms, Ardrossan, 1 good; 55 fathoms, Cape Borda, 3 poor; 90 fathoms, Cape Jaffa, 2 perfect; 110 fathoms, Beachport, 2 poor. Taken on St. Francis Island beach, 2 poor.

This seems to be a deeper-water form than *T. festiva*. The protoconch may be brown instead of white as in the type.

Triphora maculosa, Hedley.

Triphora maculosa, Hedley, Proc. Linn. Soc., New South Wales, 1903 (1902), part 4, p. 614, pl. xxxii., figs. 32 and 33. *Type locality*—Middle Harbour, Port Jackson. Pritchard and Gatliff, Proc. Roy. Soc., Victoria, 1906 (1905), vol. xviii. (N.S.), p. 61, Victoria.

Dredged in 9 fathoms off Edithburgh, 3 good; in Gulf St. Vincent, depth unrecorded, 14 good; in 55 fathoms off Cape Borda, 1 poor; in 110 fathoms off Beachport, 1 poor. Taken on St. Francis Island beach, 22 good.

Mr. Hedley gives the length of his type as 6·7 mm., but some of my specimens reach 9·2 mm.

Triphora cana, n. sp. Pl. xxiii., figs. 2, 3, and 4.

Shell sinistral, solid, of 12 whorls, elongate-conical. Protoconch slightly mamillate, of two whorls; the second the larger, convex, with sigmoid axial bars, 16 in a whorl. Spire-whorls, the first with one nodulous carina, the second with two, the third with three, the last arising between the other two. Whorls sloping, the last three subconvex. Sutural space distinct, with a supra-sutural thread in the last six spaces, remaining nearly smooth. Tubercles close, about 18 in the penultimate, joined transversely and axially (obliquely forwards) by stout bars which lattice the surface. Aperture roundly rhomboidal, scarcely pinched behind. Outer lip slightly retrocurrent towards the suture; basal lip in contact with the erect, solid inner lip, and crossing the columella, where it closes in the short recurved notched, otherwise open canal. Base flatly convex, bounded by the nearly smooth peripheral lira, with a second smooth basal lira and a third encircling the base of the canal. The protoconch and first four spire-whorls are white, the rest light-brown.

Dim.—Length, 7·1 mm.; breadth, 2·1 mm.

Locality.—Type, Gulf St. Vincent, depth unrecorded, with 15 good and 34 moderate examples; 35 fathoms, St. Francis Island, 1 good; 40 fathoms off Beachport, 1 good and 1 poor; 55 fathoms off Cape Borda, 3 good and 5 poor; 62 fathoms off Cape Borda, 1 moderate and 3 poor; 110 fathoms off Beachport, 2 moderate; St. Francis Island beach, 5 good, 1 poor.

The species varies a great deal—

1. In colour. The first six whorls may be white, and all the rest a blackish-brown. The first three whorls (including the protoconch) may be dark-brown, and all the rest light-brown, with no white whorls. The three apical whorls may be brown, the next three white, and the rest brown, so connecting the previous shell with the type. The three apical whorls may be brown, and the seven remaining whorls quite white. The infra-sutural pearl row in the coloured portion may be dark-purple or barely tinted, the others brown, or the highest and lowest row may be purple and the central brown.

2. In shape. In most examples, though not in the type, the posterior pearl row becomes larger than the others, the pearls being greater, and consequently closer, and are somewhat axially elongate. When this is marked the whorl may be wider below the suture than above it, so as to give a more or less gradate appearance to the whorls.

Triphora gemmegens, n. sp. Pl. xxiii., figs. 7 and 8.

Shell sinistral, solid, of 12 whorls. Protoconch of three whorls, slightly deviated from the axis, swollen convex, ending abruptly, with three carinæ and obsolete axial liræ. Spire-whorls eight, subconvex, with three spiral ribs. Sutural spaces well marked, with a distinct supra-sutural thread. Base flatly convex, bordered by the supra-sutural lira, and with two broad, low, smooth spirals. Aperture roundly rhomboidal, pinched at the suture into a sinus, broken in front; inner lip erect and thick along the straight columella, outer lip ascending at the suture. Sculpture: the upper two spirals are closer than the lower, sigmoid transversely, wider than the interspaces, not gemmed (whence the name), but roughened by irregular obsolete axial liræ, which cross the interspaces, and the sutural spaces.

Dim.—Length, 7·1 mm.; breadth, 1·8 mm.

Locality.—Type in 40 fathoms off Beachport, with 2 others.

Triphora labiata, A. Adams.

Triphoris labiatus, A. Adams, Proc. Zool. Soc., London, 1851, p. 279. *Type locality*—"Sydney, under stones, low water (Mr. Strange)." Angas, Proc. Zool. Soc., London, 1867, p. 209.

Triphora labiata, A. Adams, Hedley, Proc. Linn. Soc., New South Wales, 1903 (1902), vol. xxviii., p. 617, pl. xxxiii., figs. 42, 43, 44; Pritchard and Gatliff, Proc. Roy. Soc., Victoria, 1906, vol. xviii. (N.S.), p. 60, "Western Port, Victoria."

Dredged in 62 fathoms, north-west of Cape Border, 2 poor. Taken on the beach, Gulf St. Vincent, 2 good; Venus Bay, West Coast, 11 moderate; St. Francis Island, 11 poor.

The species differs from the typical *T. angasi*, Crosse and Fischer, in its short, stout pupæform figure and its mamillate apex. But a shell from the beach at Kingston and another from the beach of Gulf St. Vincent have the same shape, but a sharp, elongate protoconch like that of *T. angasi*, and might be classed as a pupæform variety of the latter, or a spiculate variety of *T. labiata*.

Triphora tasmanica, Tenison-Woods.

Triforis tasmanica, Tenison-Woods, Proc. Roy. Soc., Tasmania, 1876 (1875), p. 28. *Type locality*—"Long Bay, Tasmania." Tryon, Man. Conch., 1887, vol. ix., p. 184, pl. xxxviii., fig. 31; Tate and May, Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., part 3, p. 388, fig. 7, text; Pritchard and Gatliff, Proc. Roy. Soc., Victoria, 1902 (1901), p. 86, "Victoria."

Triphora, Hedley, Proc. Linn. Soc., New South Wales, 1903 (1902), part 4, p. 612, pl. xxxii., fig. 22, "100 fathoms, 16 miles east of Wollongong, New South Wales."

Dredged in 40 fathoms off Beachport, 43 perfect or very good; in 55 fathoms off Cape Borda, 23 poor; in 90 fathoms off Cape Jaffa, 4 poor; in 110 fathoms off Beachport, 1 good, 4 moderate, 1 poor; in 130 fathoms off Cape Jaffa, 4 moderate; in 150 fathoms off Beachport, 1 good; in 300 fathoms off Beachport, 1 poor.

While quite a rare shell on our beach, if present at all, it is comparatively common at 40 and 55 fathoms, where it is in good condition and quite typical in sculpture and colouring. When adult the shell may vary from 9 mm. to 5·25 mm. in length. In the perfectly-formed mouth, which is rarely seen, the posterior gutter is converted into a round orifice by the forward growth of the margin of the aperture and its application to the sutural spiral beyond the sinus, and the basal part of the anterior canal is closed by contact of the projecting spur of the basal lip with the anterior part of the inner lip. The applied parts do not appear to actually coalesce, so as to form absolute tubes, but they produce three distinct apertures.

Var. **lilacina,** var. nov.

This is a very pretty variety, with a delicate lilac tint on the apex and a spiral of lilac tubercles above the suture; the rest of the shell is light-brown. That it is only a variety appears from the sculpture of the apex; the adult mouth when perfect with the three apertures, and the brown spots between the pearls of the lowest spiral. It may reach 11 mm. in length, without an adult mouth. Sometimes the lilac tint is absent and replaced by white. It is referred to by Mr. Hedley in his paper quoted above.

Dredged in Gulf St. Vincent, 10 good; in 40 fathoms off Beachport, 15 quite fresh; in 55 fathoms off Cape Borda, 12 good, 5 poor. Taken on the beach, Gulf St. Vincent, 3 good; west coast of South Australia, 3 good; St. Francis Island, 12 good.

Var. **nivea,** var. nov.

This variety is pure-white; its protoconch and sculpture are those of *T. tasmanica*, Tenison-Woods. The protoconch is well preserved, and is slightly mamillate. The first whorl begins in the centre, and has slight axial liræ leading to a row of beads, and below this is a beaded carina; in the second whorl are two beaded carinæ. There is no evidence of any earlier protoconch having broken off. In a very large number of examples of *T. tasmanica* in various stages of growth, no individual, however immature, has been observed with a pointed protoconch.

Dredged in Gulf St. Vincent, 3 good; in 40 fathoms off Beachport, 4 good; in 110 fathoms off Beachport, 1 good. Taken on the beach in Gulf St. Vincent, 2 good; in Venus Bay, 1 good; on St. Francis Island, 1 perfect, quite fresh. They are not bleached shells.

Triphora disjuncta, n. sp.

Shell solid, resembling *T. tasmanica*, Tenison-Woods, in its apex, but with rather wide sutural spaces, the three rows of tubercles equal in size, and no dark spots between the tubercles in the supra-sutural row. In these three characters it approaches *T. cinerea*, but this has a bulbous protoconch. Colour, light-brown.

Dredged in 55 fathoms off Cape Borda, 1 good; in 62 fathoms off Cape Borda, 3 good; in 110 fathoms off Beachport, 3 moderate; in 130 fathoms off Cape Borda, 5 moderate; in 300 fathoms off Beachport, 4 good.

Notes on South Australian Marine Mollusca, with Descriptions of New Species.—Part XII.

By Jos. C. Verco, M.D. (Lond.), F.R.C.S. (Eng.).

[Read October 5, 1909.]

Plates XXVI. to XXIX.

My paper contains descriptions of new species belonging to various genera, but consists chiefly of a revision of the *Pleurotomidæ*. Mr. G. F. Angas wrote a paper on the "Marine Molluscan Fauna of South Australia" in the Proceedings of the Zoological Society of London for 1865, p. 155, in which he recorded 11 species, and 6 more in another short one in 1880. In 1893 Mr. Adcock in his "Handlist of the Aquatic Mollusca of South Australia" enumerated 20 species. In 1896 I sent to Mr. Sowerby examples of all species belonging to this family, which had been dredged by me during several years in South Australian waters up to 23 fathoms. He wrote a paper on them, which appeared in Proceedings of the Malacological Society of London, vol. ii., p. 24, and created 17 new species, and revised our previous lists, and brought the number up to 33. Since then my dredging has been extended to three hundred fathoms, and material of quite a different character has been collected. This has furnished examples of several shells previously registered for Victoria, Tasmania, and New South Wales, and especially of species from the deep dredgings of Mr. Hedley and Mr. May, together with quite a number unknown hitherto. This material has been submitted to these two gentlemen and Mr. Gatliff, who have very kindly identified several species from types in their possession or in their State Museums, and have furnished very helpful suggestions, for which I record my thanks.

The group has proved very difficult, chiefly owing to a wide variation, which affects so many of the species, and also to the rather indefinite character of not a few of the genera, making one uncertain as to their limits. In a few instances only has the animal been examined, and some feature been detected by which the shell may be more surely located.

Our family has now grown to the respectable number of 79 species, with 10 named varieties.

Hemipleurotoma quoyi, Desmoulins.

Pleurotoma quoyi, Desmoulins, Actes Soc. Linn., Bordeaux, 1842, p. 61; Reeve, Conch. Icon., vol. i., 1843, pl. 16, fig. 137; *Surcula quoyi*, Desmoulins, Tryon, Man. Conch., 1884, vol. vi., p. 167, pl. xxxiv., fig. 82; *Pleurotoma (Surgula) quoyi*, Desmoulins, Weinkauff, Conch. Cab. (Ed. Küster), 1887, Bd. iv., Abt. iii., p. 101, sp. 121, taf. xxii., fig. 2; *Pleurotoma (Drillia) quoyi*, Desmoulins, Watson, Chall. Reps. Zool., vol. xv., 1886, p. 304; *Drillia quoyi*, Desmoulins, Pritchard and Gatliff, Proc. Roy. Soc., Victoria, 1900, vol. xii. (N.S.), part 2, p. 170, "Western Port, etc."; *Hemipleurotoma quoyi*, Desmoulins, Tate and May. Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., p. 368, "Tasmania."

Pleurotoma philipineri, Tenison-Woods, Proc. Roy. Soc., Tasmania, 1876 (1875), p. 136; Tryon, Man. Conch., 1884, vol. vi., p. 167, pl. xxxiv., fig. 82.

Pleurotoma monile, Valenciennes (*non* Brocchi) Icon. Coq. Viv. Mon. *Pleurotoma*, p. 52, pl. xv., fig. 3; *Claratula (Perrona) monile*, Val., Tryon, *op. cit.*, p. 232, pl. vii., fig. 96.

This shell has been placed in several sections or genera. Cossmann, in Essais de Pal coconch. Comp., Deux Livr., 1896, separates the Pleurotomidæ with an apical nucleus to their operculum in a family Pleurotominæ from the Clavatulinæ with a lateral nucleus. In the former he puts the genera *Pleurotoma* and *Drillia;* in the latter *Clavatula* and *Surcula*. This species has an apical nucleus, and is therefore a *Pleurotoma* or a *Drillia*, and not a *Clavatula* or *Surcula*. The sinus, located at the carina and not above it near the suture, makes it a *Pleurotoma* and not a *Drillia;* while the short canal places it in the section *Hemipleurotoma* (Cossmann, 1889).

Dredged alive in 17 fathoms, Investigator Strait; and in 10 and in 19 fathoms, Yankalilla Bay. It has been taken dead at all depths from 10 to 22 fathoms in Gulf St. Vincent and Spencer Gulf, and Backstairs Passage.

A variant was taken in deep water in 110, 150, and 200 fathoms off Beachport, 4 good specimens and 3 very poor, and in 130 fathoms off Cape Jaffa, all dead. It is longer and narrower, and has a less marked carina, and the spiral liræ are less unequal. The type of *P. monile*, Valenc, Kiener's Coq. Viv. Icon., p. 52, pl. xiii., fig. 3, from "the seas of Oceania, the shores of New Holland, at Western Port," shows no nodules either at the suture or at the angle. The transverse liræ are described as striæ, but the figure suggests spiral incisions, equidistant. This is very different from the South Australian form, which has well-marked nodules below the suture and on the angle, and valid spiral subdistant liræ, with two or three interstitial lirulæ between them. Shells sent me from the type locality, dredged by Mr. Gabriel, are much more typical, and confirm the figure and description, and show our shells to be variants.

Hemipleurotoma perksi, Verco.

Surcula perksi, Verco, Trans. Roy. Soc., South Australia, vol. xx., 1896, p. 224, pl. vii., fig. 3, a, b, and c. *Type locality*—"15 fathoms off Thistle Island, Spencer Gulf."

Hemipleurotoma vestalis, Hedley.

Daphnella vestalis, Hedley, Memoirs Austr. Mus., iv., part 6, 1903, p. 390, fig. 105. "Taken in 24 and 52 fathoms, off Port Stephens and Botany Bay."

Dredged in 104 fathoms 35 miles south-west of Neptune Islands, 2 good dead, 1 fragment. Identified by Hedley from his type.

As this shell has its sinus at the carina and has a short canal, it has been placed in *Hemipleurotoma*.

Hemipleurotoma mayi, n. sp. Pl. xxv., fig. 2.

Shell thin, oval, white, of 4 whorls besides a brown protoconch of 2 whorls, which are convex, apparently smooth, but under the microscope very finely spirally lirate and interstitially punctate. Spire-whorls convex medially sharply angulate with a cord, base contracted, and forming a moderately long canal, which is slightly curved to the left. Sutures distinct, finely canaliculate. Aperture obliquely oval; outer lip thin, simple, ridged outside by the spirals, with an obtuse shallow, wide triangular sinus at the angulation. Sculpture: above the angle are three spirals in each whorl, and one below it; in the body-whorl are eighteen, subdistant just below the angle, crowded towards the canal. Very fine axials, about 42 in the penultimate, run obliquely back from the suture to the angle, and then at an obtuse angle obliquely forward to the suture.

Dim.—Length, 4·6 mm.; of the body-whorl, 3·1 mm.; width, 2·4 mm.

Locality.—Type in 104 fathoms, 35 miles south-west of Neptune Islands, with 2 others dead.

Diagnosis.—*D. vestalis*, Hedley, though described as having a smooth protoconch, has it punctate spirally striate, differs in being larger, more solid, more obese, not so sharply angled, and in having a shorter canal, and fewer and more solid axials.

Variations.—One example has only one spiral above its very sharp angle, namely, a bold cord just below the suture, making this more channelled; and only one below the angle just above the suture in the second and third whorls, and seven in the body-whorl.

Drillia harpularia, Desmoulins.

Drillia harpularia, Desmoulins, Actes Soc. Linn., Bordeaux, vol. xii., p. 162; *(Pleurotoma)* Reeve, Conch. Icon., vol. i., 1843, pl. xv., fig. 124; *(Drillia)* Tryon, Man. Conch., vol. vi., 1884, p. 193, pl. xiv., fig. 99; *(Pleurotoma [Crassispira])* Weinkauff, Conch. Cab. (Ed. Küster), Bd. iv., Abt. iii., p. 97, No. 115, pl. xxi., fig. 2, a and b; *(Drillia)* Sowerby, Proc. Mal. Soc., London, 1896, vol. ii., p. 24; Pritchard and Gatliff, Proc. Roy. Soc., Victoria, 1900, vol. xii. (N.S.), p. 170, "Portland."

This is a common shell. It has been taken on the beach as far west as LeHunte Bay and St. Francis Island, and is very abundant at Sceales Bay. Dredged alive at all depths from 6 fathoms to 19 fathoms in Gulf St. Vincent and Spencer Gulf. It has not been taken alive or dead beyond 22 fathoms.

The operculum has a medio-lateral internal nucleus, and puts the shell into the subfamily Clavatulinæ and out of Pleurotominæ, and therefore out of the genus Drillia. It might be transferred to Clionella, but if *D. harpularia* is removed probably many other of our *Drillias* should be; and so I have left it with them until more of them have had their opercula examined.

Drillia exarata, Reeve.

Pleurotoma exarata, Reeve, Proc. Zool. Soc., London, 1845, p. 112; Conch. Icon., 1845, pl. xxiii., fig. 201, "habitat unknown"; *(Drillia)* Tryon, Man. Conch., 1884, vol. vi., p. 204, pl. xii., fig. 14; *(Pleurotoma [Crassispira]) exaratum,* Reeve, Weinkauff, Conch. Cab. (Ed. Küster), 1887, Band iv., Abt. iii., p. 205, No. 226, pl. xxxix., fig. 12; *(Drillia)* Sowerby, Proc. Mal. Soc., London, 1896, vol. ii., p. 24, "Gulf St. Vincent (J. C. Verco)."

Taken on the beach, St. Francis Island, 4 good. Dredged alive in 9 fathoms Port Lincoln, and in 22 fathoms in Backstairs Passage, and dead at intermediate depths off Middleton and in Gulf St. Vincent.

(?) Drillia costicapitata, n. sp. Pl. xxvii., figs. 1 and 2.

Shell solid, high, narrow, conical, blunt at the apex, roundly much contracted at the base. Protoconch mamillate, of two and a quarter whorls, with eighteen round axial ribs. Suture linear, quite inconspicuous. Spire-whorls five, straight, sloping, with two carinæ, slightly nodulated, equidistant from each other and the sutures, the lower much the larger and rounder. Other spirals arise, so that in the penultimate there are two above each carina and two below the lower; in the body-whorl there are twelve below it; they are steep behind and sloping in front. Very fine sinuous growth striæ cross them. Aperture roundly rhomboidal, canal short and open, slightly bent to the left. Outer lip thin, simple, crenulated outside by the spirals. Colour dull-creamy-white, with irregular faint-brown narrow axial flames, with a tendency to follow the curve of growth lines. The larger carinæ are more or less regularly articulated with brown.

Dim.—Length, 8 mm.; body-whorl, 4·6 mm.; width, 3·3 mm.

Locality.—Type in 40 fathoms off Beachport, with 5 others.

The protoconch is not the usual one of *Drillia;* it resembles closely that of *Fusus lincolnensis*, Crosse and Fischer, but the growth lines indicate a shallow, round sinus just below the suture, between the two carinæ, which is not found in *Fusus*. The type is immature, and the others are imperfect. A perfect adult may eventually determine the genus.

Drillia dimidiata, Sowerby.

Drillia dimidiata, Sowerby, Proc. Mal. Soc., London, vol. ii., 1896, p. 24, pl. iii., fig. 2. *Type locality*—"Backstairs Passage, 16-18 fathoms (Verco)."

It may reach a length of 14 mm. Dredged in 12 fathoms off Porpoise Head, 1 dead; in 16-18 fathoms Backstairs Passage, 1 recent; in 19 fathoms Yankalilla Bay, 1 dead; in 20 fathoms off Newland Head, 1 dead; in 22 fathoms Backstairs Passage, 2 dead; in 40 fathoms off Beachport, 3 moderate.

Drillia dulcis, Sowerby.

Daphnella dulcis, Sowerby, Proc. Mal. Soc., London, vol. ii., 1896, p. 26, pl. iii., fig. 5. *Type locality*—"Gulf St. Vincent (Verco)"; also var. *alba*.

Sowerby says in a note to his definition:—"There are no longitudinal ribs," but in the shell returned to me as the type there are very faint oblique axial plications, and in some specimens since collected these may be properly styled axial riblets. The shell may be of a dark-brown colour, with bands and flames of darker tint, or any lighter shade of brown to white, the tip being generally most coloured.

Mr. Hedley, on seeing my specimens, wrote:—"What I named as a variety of *D. haswelli*, Hedley, from Cape Pillar (Records of the Austr. Mus., vol. vii., No. 2, 1908, p. 112), is evidently your *D. dulcis*, Sow. Typical *D. haswelli* is distinct."

Dredged in 15, 16, 17, 20 fathoms in Gulf St. Vincent, Spencer Gulf, Backstairs Passage, and Investigator Strait, more than 80 alive and dead; in 15-20 fathoms off St. Francis Island, 2 very good; in 35 fathoms, 1 good and 3 poor;

in 40 fathoms off Beachport, 1 poor. Its habitat seems to be mostly under 25 fathoms.

Drillia jaffaensis, n. sp. Pl. xxvi., figs. 7, 8, and 9.

Shell turreted-oval, of 7 whorls, including the blunt protoconch of 2 smooth convex whorls, with a subimpressed suture, ending abruptly. Spire-whorls convex, angulated in the first and second below the middle, and at the middle in the fourth; with a subsutural threadlet in the first which enlarges progressively to a stout round spiral; in the second another appears midway between the angulation and the lower suture; and in the fourth another below this; in the fifth or body-whorl two fine spirals appear above the angulation, and there are thirteen below it, becoming fainter and lower anteriorly; they are much narrower than the interspaces; the spiral just below the suture, and that at the angulation are the most valid, and are well nodulated, the nodules being somewhat pliciform, directed downwards and backwards on the former, and downwards and forwards on the latter; the next two spirals are nodulated, but less so, also downwards and forwards. Axial liræ, starting from the suture, are directed downwards and backwards to the nodules on the first spiral, are then concave forwards between these and the nodules on the angulation, and then run obliquely convexly forward to the nodules on the next two spirals; on these, by intercalated liræ, the nodules are doubled in number, but are almost imperceptible on the spirals beyond. Body-whorl is rhomboidal, concavely contracted at the base. Aperture squarely oval, opening into a short, wide canal. Labrum thin, angulated at the upper fourth, slightly crinkled by the spirals, pinched in front to form the canal; in profile it has a deep trigonal sinus between the suture and the angle, is then convex, and has a shallow excavation where the aperture is pinched. Inner lip is a narrow glazed depression; columella straight. Colour white.

Dim.—Length, 8·8 mm.; of body-whorl, 5 mm.; breadth, 3·5 mm.

Locality.—Type from 130 fathoms off Cape Jaffa with 1 other; in 104 fathoms off Neptune Islands, 8 good, 25 immature or broken; in 110 fathoms off Beachport, 2 good; in 300 fathoms off Cape Jaffa, 2 very poor.

Drillia achatina, n. sp. Pl. xxvi., fig. 2.

Shell solid, elongate-fusiform, of $6\frac{1}{2}$ whorls, including the blunt protoconch, which merges into the spire insensibly. The first whorl and a half are smooth and rather flat; the next is scarcely convex, and has at first distant invalid axial angulations, which gradually become more numerous and costulate; in the next whorl they become more distant again, and remain throughout the shell as feeble axial angulations which are just visible when looking at the shell from the apex. The spire-whorls are subconvex, subangulate just below the middle, and have the upper fourth somewhat adpressed just below the simple impressed suture. Aperture oblique oblong-ovate; canal short, wide, scarcely notched; outer lip solid but sharp, with a deep round sinus separated from the ascending suture by a callus from the posterior part of the inner lip, then straightly convexly antecurrent to two shallower sinuses at the base of the canal; inner lip a complete smooth thin applied glaze, thickened behind. Spiral incisions, which begin in the second half of the first sculptured protoconchal whorl, cut the surface up into flat slightly rounded ribs, increasing to eleven in the penultimate and twenty-four in the body-whorl, the second below the suture and that at the angulation being the widest. Microscopic accremental striæ scratch the whole surface and have the sinuosities of the outer lip. A narrow white spiral, articulated with brown, ornaments the angulation; with a fainter narrower one above, and a rather wider brown spiral articulated with white runs from the back of the aperture over the dorsum nearly to the lip margin. The general colour is brown, with darker irregular spots and clouds.

Dim.—Length, 7·9 mm.; of body-whorl, 4·7 mm.; breadth, 2 mm.

Locality.—Type alive in 20 fathoms 7 miles south-west of Newland Head; in 40 fathoms off Beachport, 3 fresh and 3 poor; in 55 fathoms off Cape Borda, 1 fresh; in Gulf St. Vincent at unrecorded depth, 1 fresh.

One example shows some ten previous labral edges in the body-whorl, sinuously marked out in white, and followed by deep-brown, which gradually fades out at the next labral edge. The affinity of this species is close to *D. agrestis*, which may possibly be a rude costate variant.

Drillia agrestis, n. sp. Pl. xxvii., fig. 7.

Shell solid, rugged, elongate-fusiform, of 7½ whorls, including the protoconch of one whorl and a half, smooth, round, and blunt. Spire-whorls sloping, scarcely concave in the upper part, convex in the lower. Suture distinct, with a narrow adpressed margin. Body-whorl concavely attenuated at the base. Aperture obliquely oval, shortly contracted posteriorly; canal short, open, barely notched. Outer lip sharp, slightly ascending at the suture, with the posterior sinus deep, rather narrow, separated from the suture by a distince equal to its width, then convex, with an anterior shallow sinus at the base of the canal. Inner lip inconspicuous, applied, smooth, with a callosity at its junction with the outer lip. Sculpture: the first two whorls are closely, regularly, validly, axially costulate, the rest rudely ribbed in the anterior two-thirds; ribs oblique, rounded, rather wider than the interspaces, becoming less marked and more distant on the body-whorl, and almost absent on the base, about 14 in the penultimate; sublenticular accremental incisions. Spiral incisions are deep, irregularly slightly wavy, about 8 in the penultimate, and 20 in the body-whorl, nearly equidistant, in places alternately fine and wide. Colour uniform light-straw tint.

Dim.—Length, 8·5 mm.; of aperture, 3·25 mm.; breadth, 3 mm.; of aperture, 1 mm.

Locality.—Type in 40 fathoms off Beachport; in Gulf St. Vincent, depth unrecorded, 7 fresh and dead; in 17 fathoms Backstairs Passage, 1 alive, 2 dead.

Drillia subplicata, n. sp. Pl. xxvii., fig. 6.

Shell short, solid, narrowly oval, with a blunt apex and slightly contracted base. Protoconch of two smooth, slightly convex whorls. Spire-whorls four, sloping scarcely convex. Sutures linear. Aperture oval, slightly contracted behind, opening widely into a very short canal in front. Outer lip simple; with a shallow, round sinus near the suture, a convex profile, and a very faint sinus anteriorly. Inner lip a complete, applied narrow glaze. Columella straight, slightly bent to the left in the canal. Faint oblique axial costæ, equal to the interspaces; well-marked crowded sinuous accremental striæ: no spiral sculpture. Light-brown, with a band of lighter colour on the middle of the spire-whorls, whitish where it crosses the costæ; three light bands on the body-whorl.

Dim.—Length, 7 mm.; breadth, 3 mm.

Locality.—Type 40 fathoms off Beachport; 110 fathoms, 1 moderate; in 130 fathoms off Cape Jaffa, 1 poor.

Diagnosis.—Mr. Hedley writes:—"This is not my *D. nenia.* Yours lacks the ribbing of my shell, is broader, and more solid, the notch is shallower, and the canal shorter."

Drillia nenia, Hedley.

Drillia nenia, Hedley, Memoirs Austr. Mus. iv., part 6, 1903, p. 387, fig. 101. *Type locality*—"24 fathoms, Port Stephens"; also Records Austr. Mus. vi., part 2, p. 42.

Dredged in 200 fathoms off Beachport, 1 perfect; in 110 fathoms, 1 good.

Drillia woodsi, Beddome.

Drillia woodsi, Beddome, Proc. Roy. Soc., Tasmania, 1883 (1882), p. 167. *Type locality*—"Long Bay, D'Entrecasteaux Channel, Tasmania"; Tate and May, Proc. Linn. Soc., New South Wales, xxvi., 1901, part 3, p. 368; Hedley, Memoirs of Austr. Mus., iv., part 6, 1903, p. 388, "New South Wales coast."

Drillia howitti, Pritchard and Gatliff, Proc. Roy. Soc., Victoria, vol. xii. (N.S.), 1899, p. 101, pl. viii., fig. 2. *Type locality* —"Gippsland coast."

Mr. Gatliff has kindly identified South Australian shells as *D. howitti;* Tate and May, and Hedley, *loc. cit.*, give this as a synonym of *D. woodsi*, Bedd., and Mr. May says ours are undoubtedly *woodsi*, from comparison with a drawing he made from Beddome's type, and though I have not seen this, on trust in their determination, I have called our shell *D. woodsi*, Bedd.

Taken on Middleton Beach, solid and much rolled. Dredged in 90 fathoms off Cape Jaffa, 1 good; in 104 fathoms off Neptune Islands, 1 good and 6 broken; in 110 fathoms off Beachport, 2 good, 17 poor or broken; in 130 fathoms off Cape Jaffa, 8 very poor; in 200 fathoms off Beachport, 2 good, and 7 poor or immature; in 300 fathoms off Cape Jaffa, 1 poor.

Var. **acostata,** n. var.

This differs in having no axial costæ, and in being less solid. That it is only a variety appears from two facts—first, the validity of the costæ can be graded in a series of examples from well-marked to absent; second, some shells have the costæ valid in the earlier whorls, but they fade to extinction in the later. It may reach a length of 21·5 mm., and have 12 whorls. Some individuals show 2, 3, or 4 opaque whitish hair lines in the substance of the spire-whorls. They are frequently prettily coloured, pinkish-salmon, with three rather indistinct bands in the body-whorl, a broad one below the suture, not distinctly bounded inferiorly, a second thin median band, and the third over the base and canal. In the spire they form an infra-sutural and a supra-sutural band.

Dredged in 110 fathoms Beachport, 2 good, 3 poor, 5 immature; in 130 fathoms off Cape Jaffa, 4 good, but immature; in 150 fathoms off Beachport, 15 moderate and poor; in 200 fathoms off Beachport, 17 good, 14 poor. They seem to favour the deeper waters, and to be more numerous than the typical forms there.

Drillia coxi, Angas.

Drillia coxi, Angas, Proc. Zool. Soc., London, 1867, p. 113, pl. xiii., fig. 15. *Type locality*—"Port Jackson"; *ibid*, p. 203; Tate and May, Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., p. 368, Tasmania; Hedley, Memoirs Austr. Mus., iv., part 6, 1903, p. 388, "may be 33 mm. long. Dredged in 28 fathoms off Manning River, New South Wales."

Drillia sinensis, Hinds, Tryon, Man. Conch., 1884, vol. vi., p. 201, pl. xi., fig. 6. He gives Angas' species as a synonym, but Hedley, *loc. cit.*, dissents.

Dredged in 200 fathoms off Beachport, 2 moderate; in 100 fathoms, 1, 20·8 mm. in length.

Drillia gratiosa, Sowerby.

Drillia gratiosa, Sowerby, Proc. Mal. Soc., London, vol. ii., 1896, p. 25, pl. iii., fig. 1. *Type locality*—"Gulf St. Vincent (Verco)."

Dredged in 17 fathoms off Point Marsden, 1 decolourized; in Gulf St. Vincent, depth unrecorded, 1 alive, 1 dead, 1 broken; in 22 fathoms off Cape Willoughby, Kangaroo Island, 1 quite fresh; in 49 fathoms off Beachport, 1 large and good.

When fullgrown it may be 20 mm. long by 6·25 broad, and has a callus pad about 3 mm. long and 1 mm. high at its centre at the back of the internal lip; the posterior edge of the sinus is slightly reflected.

Drillia bednalli, Sowerby.

Drillia bednalli, Sowerby, Proc. Mal. Soc., London, 1896, vol. ii., p. 25, pl. iii., fig. 3. *Type locality*—"Gulf St. Vincent (Verco)"; Tate and May, Proc. Linn. Soc., New South Wales, vol. xxvi., 1901, p. 368, who regard it as a variety of *D. woodsi*, Beddome.

Although it varies a good deal, as Sowerby points out, it does not seem to me to grade into *D. woodsi*, but to retain a valid spiral lira midway between the angle and the suture, and some fine spiral striæ between the angle and the suture.

Dredged alive in 17, 20, and 22 fathoms in Investigator Strait; and dead at depths from 6 to 22 fathoms in Gulf St. Vincent, Spencer Gulf, in and outside Backstairs Passage. Taken on the beach, and alive in 15 to 20 fathoms, Petrel Bay, St. Francis Island.

Drillia hecatorgnia, Verco.

Drillia hecatorgnia, Verco, Trans. Roy. Soc., South Australia, 1907, vol. xxxi., p. 215, fig. 3. *Type locality*—"104 fathoms, off Neptune Island."

Drillia hedleyi, n. sp. Pl. xxvi., fig. 6.

Shell solid, narrow, elongate-fusiform, of 9 whorls, including the protoconch of 3 convex smooth whorls, with a deep impressed suture. Spire-whorls convex, roundly angled below the middle in the early whorls, above it in the later, slightly adpressed below the linear suture. Body-whorl concavely attenuate at the base. Aperture narrow elongate-oval, ending in a moderately long open canal, which expands slightly in front, bends a little to the left, and is barely recurved. Outer lip thick, sharp-edged, with a deep oblique posterior sinus of three-quarters of a circle, having a thickened reflected margin, and separated from the base of the whorl by a callous pad derived from the inner lip; then straightly convex, with a wide, very shallow excavation at the base of the canal. Inner lip complete, applied, smooth; columella long, nearly straight. Axial costæ are oblique, fading out above the angle, rounded, nearly as wide as the spaces, ten in the penultimate, absent from the base. The spiral liræ are crowded, fourteen in the penultimate, very close-set on the base, granulated by fine accremental striæ. Colour in a fresh cotype is dull-white, with faint-brown clouding between the ribs, and a faint-brown band above the suture and round the periphery of the body-whorl.

Dim.—Length, 18·6 mm.; of the body-whorl, 11 mm.; breadth, 4·5 mm.

Locality.—Type from 200 fathoms off Beachport. Dredged also in 90 fathoms off Cape Jaffa, 1 very good, 1 poor; in 104 fathoms 35 miles south-west of Neptune Islands, 10 good, immature, dead; in 110 fathoms off Beachport, 2 fresh, 3 good, 1 broken.

Drillia trophonoides, n. sp. Pl. xxvi., figs. 3 and 4.

Shell solid, white, high, narrow, conical, with a blunt apex and rounded base; of 9½ whorls, including a protoconch of 2½ convex whorls, the first two smooth, the rest faintly subdistantly axially plicate, ending abruptly. Spire-whorls convex. Sutures distinct, subcanaliculate. Body-whorl short, roundly contracted at the base. Aperture roundly oval, widest behind, roundly contracted in front, constricted at its junction with the canal. Outer lip sharp, simple, scarcely inflected, convexly retreating from the suture to form a semicircular sinus, then convexly antecurrent to a very slight anterior sinus at the constricted neck of the canal. Inner lip a thin, complete glaze; base roundly concave; columella straight, curved to the left in the canal, and slightly thickened on the outside of its anterior end. Narrow spiral cords, one-third as wide as their interspaces, increase from four in the first whorl to nine in the penultimate, and twenty-three in the body-whorl, and are minutely roughened by sublenticular accremental striæ.

Dim.—Length, 14·4 mm.; of body-whorl, 7·1 mm.; width, 5·2 mm.

Locality.—Type from 150 fathoms off Beachport, with 1 other; also taken in 55 fathoms off Cape Borda, 1 poor; in 104 fathoms off Neptune Islands, 4 good and 11 immature, all fresh; in 110 fathoms off Beachport, 2 moderate; in 130 fathoms off Cape Jaffa, 2 poor; in 200 fathoms off Beachport, 1 good.

Drillia saxea, Sowerby.

Drillia saxea, Sowerby, Proc. Mal. Soc., London, 1896, vol. ii., part 1, p. 25, pl. iii., fig. 4. *Type locality*—"Gulf St. Vincent (Verco)."

The type was a bleached dredged shell. Specimens taken since show an infrasutural spiral row of brown spots between the axial plicæ, spirally elongate. On the body-whorl are three faint continuous spiral brown bands, and very faint curved axial bands.

It is quite common as a deep-water form, and has been taken in 40 fathoms off Beachport, 31, many quite fresh and coloured; in 55 fathoms off Cape Borda, 9 coloured, 30 dead; in 90 fathoms off Cape Jaffa, 19 dead, some of them fairly fresh; in 104 fathoms off Neptune Islands, 73, a few fresh, mostly immature and opaque; in 110 fathoms off Beachport, 65, some quite fresh; in 130 fathoms off Cape Jaffa, 58, opaque or rolled; in 150 fathoms off Beachport, 16 decolourized; in 200 fathoms off Beachport, 1 fresh, 6 dead; in 300 fathoms off Cape Jaffa, 29 opaque. Their habitat seems to be from 110 to between 20 and 40 fathoms.

Drillia lacteola, n. sp. Pl. xxvi., fig. 5.

Shell thin, translucent-white, of 6 whorls, including the protoconch of 2 smooth convex whorls. Spire-whorls convex. Suture simple, narrowly margined. Body-whorl roundly contracted at the base; aperture elongate-oval, opening widely into a short canal. Outer lip simple, thin, crenulated outside; with a deep rounded posterior sinus near the suture, having a thickened and slightly erect edge, with a shallow excavation anteriorly where it is pinched to form the canal. Inner lip complete, applied, glazed, thin, thickened at the back to meet the margin of the sinus. Columella nearly straight. Spirals thin, seven in the penultimate, twenty in the body-whorl; faint accremental striæ minutely roughening the sculpture.

Dim.—Length, 4·8 mm.; of body-whorl, 3·1 mm.; breadth, 2·1 mm.

Locality.—Type from 90 fathoms off Cape Jaffa, with 22 others, good; in 130 fathoms, 21 good; also off Beachport in 110 fathoms, 34 good; in 150 fathoms, 10 good; in 200 fathoms, 2 good; in 62 fathoms north-west of Cape Borda, 10 good and 4 immature.

Mr. Hedley, to whom this species was submitted, writes:—"Mr. May and I took this in 100 fathoms off Cape Pillar. I catalogued it (Records Austr. Mus., vol. vii., No. 2, 1908, p. 112) as *Drillia haswelli*, Hedley, but on reconsideration I should regard it as new." It is narrower than *D. haswelli*, its whorls are not angulated, the body-whorl is not so pyriform, and the spirals are much more valid.

Var. **crebrespirata**, n. var.

This shell is more solid and opaque, is 5·5 mm. long, its body-whorl is 3 mm., its breadth is 2·1 mm.; it has 15 spiral liræ in the penultimate and 50 in the body-whorl, crossed by crowded accremental striæ.

Two perfect individuals were taken in 49 fathoms off Beachport.

Var. **sinusegens**, n. var.

It is just like *lacteola* in size, shape, and sculpture, but that the aperture is not pinched anteriorly to form a canal, and there is no anterior sinus in the outer lip here. One perfect example was taken in 100 fathoms off Beachport.

Drillia tricarinata, Tenison-Woods.

Drillia tricarinata, Tenison-Woods, Proc. Linn. Soc., New South Wales, ii., 1878, p. 265. *Type locality*—"45 fathoms, off Port Jackson Heads"; Hedley, Records Austr. Mus., iv., 1891, p. 23, fig. 3; Hedley, Memoirs Austr. Mus., iv., part 6, 1903, p. 389, fig. 104.

This shell varies much in shape and sculpture. There may be three sharp spirals on each of the four spire-whorls in a shell 8 mm. long, or two on the first and second spire-whorls, an intercalated third thread on the third whorl, and three on the fourth whorl. The shell may be shorter and more solid, with two very strong spirals on all the spire-whorls, and a weak intercalated thread on the fourth, with about twenty obsolete axial liræ on the second and third whorls, much less marked on the fourth. It may be short and wide, with only two spirals in the spire-whorls, but in the first and second, or first, second, and third whorls oblique axial liræ almost as valid as the spirals may cross and tuberculate these, and fade out in the later whorls. It may be a long narrow shell, only 2·5 mm. broad, with four spirals in each whorl, and with 16 oblique axial liræ like those in the previous form; or it may be a shell of 10 mm. by 3·5 mm., with two spirals in the first two whorls, three in the second two, and four in the fifth whorls, with oblique narrow axial costæ, 17 in the penultimate, as valid as the spirals, tuberculating the intersections, and mildly coronating the uppermost spiral. Several of these might be regarded as distinct species did not intermediate forms reveal a complete gradation between them.

Dredged in 90 fathoms off Cape Jaffa, 5 moderate; in 110 fathoms off Beachport, 4 good; in 130 fathoms off Cape Jaffa, 1 alive, 22 good; in 150 fathoms off Beachport, 10 good; in 200 fathoms off Beachport, 5 good, 1 poor; in 300 fathoms off Cape Jaffa, 4 good, 23 poor and broken.

Drillia dilecta, Hedley.

Drillia dilecta, Hedley, Memoirs Austr. Mus., iv., part 6, 1903, p. 387, fig. 100. *Type locality*—"Port Stephens, New South Wales"; also Records Austr. Mus., vi., part 2, 1905, p. 42, "111 fathoms off coast of New South Wales."

Mr. Hedley writes:—"Certainly *D. dilecta*, Hedley; the variation is slight; your shell is a little larger, has a spiral more, and fewer weaker intercostal radial threads. All mine have a broken lip, and I now see for the first time the deep sinus which is typical, and to be added to the diagnosis."

An infrasutural valid lira limits posteriorly the labral sinus, which is bounded anteriorly by the most valid lira on the whorl; a very fine threadlet runs nearly midway between the two; the sinus is deep and rather narrow.

Dredged in 90 fathoms Cape Jaffa, 3 good, 8 immature; in 130 fathoms, 2 perfect and 2 poor; 300 fathoms, 1 poor; in 104 fathoms 35 miles south-west of Neptune Islands, 17 good, some of them immature; in 150 fathoms off Beachport, 1 perfect, 5 poor.

Var. **parabola,** n. var.

It differs from the type in having a much wider, more open, parabolic labral sinus; in having more numerous spirals on the whorls, 6 in the penultimate and 24 on the body-whorl; and in having six liræ instead of one between those which bound the labral sinus. Only two examples were taken—one in 90 fathoms off Cape Jaffa, and one in 200 fathoms off Beachport. Other specimens may establish it as a distinct species or confirm it as a variant.

Drillia cancellata, Beddome.

Mangelia cancellata, Beddome, Proc. Roy. Soc., Tasmania, 1883 (1882), p. 167. *Type locality*—"Kelso Bay, Tamar River, 17 fathoms."

Drillia cancellata, Beddome, Tate and May, Proc. Linn. Soc., New South Wales, vol. xxvi., 1901, p. 368, pl. xxiv., fig. 27.

Drillia telescopialis, Verco, Proc. Roy. Soc., South Australia, vol. xx., 1896, p. 222, pl. vii., fig. 1, a, b, c. *Type locality*—"Backstairs Passage."

Drillia pentagonalis, Verco, *loc. cit.*, pl. vii., figs. 2 and 2*a*, 1906, p. 298; Hedley, Records Austr. Mus. vi., part iv., "80 fathoms off Narrabeen."

Mr. W. L. May, of Tasmania, writes May, 1897:—"I have had an opportunity of examining the type specimens of *Mangelia cancellata*, Beddome. There are a number of specimens in the box, and they are very variable, ranging from your *D. telescopialis* to *D. pentagonalis*. There are several intermediate forms. I should consider that *M. cancellata* came about halfway between your species, and that they all belong to one very variable species, *M. cancellata*."

Dredged in 20 fathoms Investigator Strait, 1; in 35 fathoms off St. Francis Island, 1 dead, brown colour; in 55 fathoms off Cape Borda, several good; in 90 fathoms off Cape Jaffa, 1 perfect; in 110 fathoms off Beachport, 1 perfect, 1 broken; in 130 fathoms off Cape Jaffa, 2 perfect.

Clathurella walcotæ, Sowerby.

Drillia walcotæ, Sowerby, Proc. Zool. Soc., London, 1893, p. 487, pl. xxxviii., figs. 7 and 8. *Type locality*—"Spencer Gulf"; also Proc. Mal. Soc., London, 1896, vol. ii., p. 24; var. *pallida*, "from MacDonnell Bay (Adcock)."

Dredged alive in 13 fathoms Spencer Gulf; 17 fathoms and 20 fathoms Backstairs Passage; and dead from 8 fathoms upwards; in 40 fathoms off Beachport, 3 quite fresh. Taken on the beach St. Francis Island, 2 good.

The foot is about half as long as the shell, truncated in front, pointed behind; white; the sole dotted abundantly with small orange-brown spots, larger and darker along the margins; upper-surface with brown spots as large as pins' heads, with a deep-purple-brown central dot, also at the junction with the body; muzzle dark-spotted; siphon light-brown, with small spots. Tentacles and eyes exactly like *Glyphostoma paucimaculata*, Angas. No trace of an operculum to be found; hence I have removed it from *Drillia* to *Clathurella*.

Clathurella philomena, Tenison-Woods.

Clathurella philomena, Tenison-Woods, Proc. Roy. Soc., Tasmania, (1875) 1876, p. 141. *Type locality*—"East coast of Tasmania"; Pritchard and Gatliff, Proc. Roy. Soc., Victoria, (1899) 1900, vol. xii., p. 177, "Victorian coast"; Tate and May, Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., p. 371.

Drillia atkinsoni, Tenison-Woods, Proc. Roy. Soc., Tasmania, 1876, p. 142, *teste* Tate and May, *loc. cit.*

Siphonalia pulchra, Tenison-Woods, *op. cit.*, 1877, p. 139, *teste* Tenison-Woods, *op. cit.*, (1879) 1880, p. 70.

Clathurella crassina, Angas, Proc. Zool. Soc., London, 1880, p. 416, pl. xl., fig. 6.

Mr. Sowerby in Proc. Mal. Soc., London, 1896, vol. ii., p. 28, identified South Australian shells sent to him by me as *Clathurella parvula*, Reeve. This may be, but is not certain. Mr. Hedley has suggested their identity with *Drillia denseplicata*, Dunker, Malak. Blätt., 1871, vol. xviii., p. 159, from Bass Strait, figured in Conch. Cab. Küster's Ed., Band iv., Abt. iii., No. 130, p. 107, pl. xxiii., figs. 7 and 9. This is most likely, but as it is not certain I have retained the name accepted by Tate and May and Gatliff, until the types of the two species above referred to can be compared with our shells.

These are very commonly taken in deeper water, and they vary so remarkably that they might be differentiated into about half a dozen apparently good species but for the intermediate forms. It has been taken on the beach from Robe to LeHunte Bay in the Great Australian Bight, and dredged at all depths from 6 to 300 fathoms.

The usual form has a somewhat gradate spire, and has valid axial costæ crossed by well-marked spiral liræ. The axials may be less valid in a series of specimens until they completely vanish and only spirals remain, and the angle may fade away as well, until a shell of a seemingly distinct species remains, "exactly like the form taken in 100 fathoms at Cape Pillar" by Hedley and May. It may become long and narrow, and delicate, especially in the greater depths; or on the seashore, as on St. Francis Island, it may be very short, extremely solid, and with very rough, sturdy sculpture; or, again, from the greater depths it may be very short, very gradate, and with a comparatively long body-whorl and without axials, so as to approach close to *Drillia haswelli*, Hedley, and to be recorded by him as a variety of this species in his list of mollusca from Cape Pillar in Records Austr. Mus., vol. vii., No. 2, 1908, p. 112.

Clathurella bicolor, Angas.

Clathurella bicolor, Angas, Proc. Zool. Soc., London, 1871, pl. i., fig. 20. *Type locality*—"Port Jackson"; *op. cit.*, 1880, p. 416, "recorded for South Australia"; Tryon, Man .Conch., 1884, vol. vi., p. 284, pl. xvi., fig. 61; Pritchard and Gatliff, Proc. Roy. Soc., Victoria, 1900, vol. xii., p. 179, "Western Port."

Dredged alive from 5 fathoms to 22 fathoms in Gulf St. Vincent and in Spencer Gulf; in 40 fathoms off Beachport, 2 perfect, but rolled; in 45 fathoms off Neptunes, 1 good; in 55 fathoms off Cape Borda, 1 moderate; in 110 fathoms off Beachport, 1 very poor. Taken on the beach, west along our coast to Murat Bay, and St. Francis Island. About 25 fathoms would seem to be the limit of its deeper habitat.

Clathurella lallemantiana, Crosse and Fischer.

Pleurotoma (Clathurella) lallemantiana, Crosse and Fischer, Jour. de Conch., 1865, vol. xiii., p. 423, pl. xi., fig. 5. *Type locality*—"Rapid Bay, Gulf St. Vincent"; Tryon, Man. Conch., 1884, vol. vi., p. 286, pl. xvii., fig. 86, he makes it a variety of *C. letourneuxiana*, Crosse; Sowerby, Proc. Mal. Soc., London, 1896, vol. ii., p. 28, who dissents from Tryon's opinion; Pritchard and Gatliff, Proc. Roy. Soc., Victoria, (1899) 1900, vol. xii., p. 177, "Port Phillip and Western Port"; Tate and May, Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., p. 371, "Tasmania."

Drillia incrusta, Tenison-Woods, Proc. Roy. Soc., Tasmania, (1876) 1877, p. 136. *Type locality*—"North coast of Tasmania," *teste* Sowerby, and Tate and May *loc. cit. supra.*

Dredged alive in 9 fathoms Port Lincoln; and in 5, 15, and 20 fathoms Gulf St. Vincent; in 200 fathoms off Beachport, 1 very poor. Taken on the beach Murat Bay, West Coast.

Clathurella letourneuxiana, Crosse and Fischer.

Pleurotoma (Clathurella) letourneuxiana, Crosse and Fischer, Jour. de Conch., 1865, p. 425, pl. xi., fig. 7. *Type locality*—"Sydney"; *Mangelia letourneuxiana*, Crosse, Tenison-Woods, Proc. Roy. Soc., Tasmania, (1877) 1878, p. 28, "Tasmania."

Clathurella letourneuxiana, Crosse, Tryon, Man. Conch., 1884, vol. vi., p. 286, pl. xvii., fig. 87; Pritchard and Gatliff Proc. Roy. Soc., Victoria, (1899) 1900, p. 177, "Port Phillip and Western Port"; Tate and May, Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., p. 371.

Dredged in Gulf St. Vincent, 17 quite fresh; in 110 fathoms off Beachport, 4 poor, and in 150 fathoms, 1 poor; in 130 fathoms off Cape Jaffa, 2 moderate, 1 poor. The examples from deep-water are uncoloured, the apex is not so acute (probably worn down), and the body-whorl is comparatively longer. Several specimens with the other characters typical of this species have the two revolving spirals of *C. lallemantiana*, Crosse.

Var. **cuspis,** Sowerby.

Mangilia cuspis, Sowerby, Proc. Mal. Soc., London, 1896, vol. ii., p. 31, pl. iii., fig. 17. *Type locality*—"Gulf St. Vincent."

Mr. Sowerby says on page 32 of *M. letourneuxiana*, Crosse:—"I have no evidence that this species occurs in South Australia. Specimens of *M. lallemantiana* have been mistaken for it." I am, however, disposed to think *M. cuspis* is a short-spired form of *M. letourneuxiana*, into which it seems insensibly to run, as the latter species is recognized by conchologists in Sydney, Melbourne, and Tasmania; and I am also disposed to believe Tryon is right in classing *M. lallemantiana* as a variety in the opposite direction.

Clathurella desalesii, Tenison-Woods.

Mangelia de Salesii, Tenison-Woods, Proc. Roy. Soc., Tasmania, (1876) 1877, p. 138. *Type locality*—"Long Bay, Tasmania."

Clathurella desalesi, Tenison-Woods, Tate and May, Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., p. 371, pl. xxiv., fig. 32.

Dredged in Gulf St. Vincent, 13 fresh; in 40 fathoms off Beachport, 1 good; in 110 fathoms, 2 good; in 130 fathoms off Cape Jaffa, 2 poor.

Clathurella st. gallæ, Tenison-Woods.

Mangelia st. gallæ, Tenison-Woods, Proc. Roy. Soc., Tasmania, (1876) 1877, p. 137, with var. *benedicti*. *Type locality*—"Long Bay, Tasmania"; Tate and May, Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., p. 369; Pritchard and Gatliff, Proc. Roy. Soc., Victoria, 1906 (1905), vol. xviii., p. 50, "Western Port."

Dredged in 40 fathoms off Beachport, 19 good; in 110 fathoms, 4 very good, 3 moderate; in 150 fathoms, 1 poor; in 130 fathoms off Cape Jaffa, 6 good. This species would appear to affect the deeper water.

Clathurella modesta, Angas.

Clathurella modesta, Angas, Proc. Zool. Soc., London, 1877, p. 38, pl. v., fig. 15. *Type locality*—"Port Jackson"; Tryon, Man. Conch., 1884, vol. vi., p. 285, pl. xvii., fig. 92; Sowerby, Proc. Mal. Soc., London, 1896, vol. ii., p. 28, "Gulf St. Vincent"; Pritchard and Gatliff, Proc. Roy. Soc., Victoria, (1899) 1900, vol. xii., p. 176, "Port Phillip and Western Port"; Tate and May, Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., p. 370, "Frederick Henry Bay, Tasmania."

Dredged in Gulf St. Vincent, 15 alive and dead; in 15 to 20 fathoms off St. Francis Island; in 40 fathoms off Beachport, 3 quite fresh and 2 moderate; in 55 fathoms north-west of Cape Borda, 3 moderate. Taken on the beach at Aldinga (Mr. Kimber) and at Venus Bay, West Coast.

A colour variety, with precisely the same shape and sculpture, is white with a brown spiral below the suture, and a second winding round the base and over the snout. Sometimes these spirals are represented only by distant spots. It was dredged in 40 fathoms off Beachport, 4 good; in 55 fathoms north-west of Cape Borda, 4 moderate; in 62 fathoms, 2 moderate; in 110 fathoms off Beachport, 30 fairly good; in 130 fathoms off Cape Jaffa, 17 poor. Taken on the beach at Venus Bay, 3 good; and on St. Francis Island, 4 good.

Clathurella rufozonata, Angas.

Clathurella rufozonata, Angas, Proc. Zool. Soc., London, 1877, p. 38, pl. v., fig. 13. *Type locality*—"Port Jackson."

This is the shell listed as *C. tincta*, Reeve, by Pritchard and Gatliff in Proc. Roy. Soc., Victoria, (1899) 1900, vol. xii., p. 176, for Port Phillip.

Our species was submitted to Mr. Hedley, who wrote:—"Certainly not *C. tincta*, Reeve; see Hervier's discussion of that species, Jour. de Conch., vol. xlv., p. 90." I have not been able to consult this paper, so have preferred to retain the name by which the species was recorded in Adcock's list of the Aquatic Moll. of South Austr., 1893, No. 143.

Mangilia mitralis, Adams and Angas.

Bela mitralis, Adams and Angas, Proc. Zool. Soc., London, 1863, p. 420, No. 8. *Type locality*—"Port Jackson."

Bela australis, Adams and Angas, Proc. Zool. Soc., London, 1863, p. 420, No. 9; Angas *op cit.*, 1865, p. 159, "Aldinga and Rapid Bays."

Mangilia australis, Adams and Angas, Sowerby, Proc. Mal. Soc., London, 1896, vol. ii., p. 31; Tate and May, Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., p. 370, "Tasmania, common."

Mangilia mitralis, Adams and Angas, Pritchard and Gatliff, Proc. Roy. Soc. Victoria, (1899) 1900, vol. xii., p. 173, "Victorian coast."

Taken on the beach Kangaroo Island; Pondolowie Bay, Spencer Gulf; Venus Bay and St. Francis Island, Great Australian Bight. I have not dredged it in South Australian waters; it would seem to be a specially littoral form.

Mangilia tasmanica, Tenison-Woods.

Cithara tasmanica, Tenison-Woods, Proc. Roy. Soc., Tasmania, (1875) 1876, p. 145. *Type locality*—"East coast of Tasmania."

Mangilia tasmanica, Tenison-Woods, Pritchard and Gatliff, Proc. Roy. Soc., Victoria, 1900, vol. xii., p. 175, "Port Fairy (Rev. T. Whan)"; Tate and May, Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., p. 369.

Mangelia jacksoniensis, Angas, Proc. Zool. Soc., London, 1877, p. 37, pl. 5, fig. 10. *Type locality*—"Off Port Jackson Heads in 25 fathoms (Brazier)."

Daphnella jacksoniensis, Angas, Tryon, Man. Conch., vol. vi., 1884, p. 311, pl. 22, fig. 73.

Mangelia alternata, Tenison-Woods, Proc. Roy. Soc., Tasmania, (1878) 1879, p. 39; Tate and May, Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., p. 369.

Dredged in from 14 to 26 fathoms in Gulf St. Vincent and Investigator Strait; in Encounter Bay in about 5 fathoms (W. Reed). Taken on the beach of Banks Island, Spencer Gulf.

I think, probably, *M. tasmanica* grades from a long, narrow form with sharply-angulate whorls through *M. jacksoniensis*, and then through *M. mitralis* into *M. australis*, and forms one variable species.

Mangilia adcocki, Sowerby.

Mangilia adcocki, Sowerby, Proc. Mal. Soc., London, 1896, vol. ii., p. 29, pl. iii., fig. 18; Pritchard and Gatliff, Proc. Roy. Soc., Victoria, (1899) 1900, p. 174, "Western Port, etc."; Tate and May, Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., p. 370, "North coast of Tasmania."

Mangilia bella, Adams and Angas, Proc. Zool. Soc., London, 1863, p. 419, pl. xxxvii., fig. 6 *(non* Hinds). *Type locality*—"Rapid Bay, St. Vincent Gulf."

Dredged in 14 and in 22 fathoms Investigator Strait and taken abundantly on the beach on Troubridge shoal, and of Antechamber Bay, Kangaroo Island.

Mr. Gatliff records its variations.

Mangilia gatliffi, n. sp. Pl. xxviii., fig. 9.

Shell small, white, solid, shining, elongate-oval, blunt, of 5 whorls, including a protoconch of 2 smooth convex whorls, and a very flatly convex apex. Spire-whorls sloping convex. Suture distinct, subcanaliculate, undulating, margined. Body-whorl nearly as long as the spire, slightly attenuated at the base and truncate. Aperture oval, slightly narrowed behind, wide in front, notched, without a canal. Outer lip straightly convex, with a shallow, wide sinus behind, sharp, not inflected, smooth within. Inner lip narrow, smooth, applied, free at the front, with a callus posteriorly at the junction with the outer lip. Columella subconcave, joining the body-whorl at a very open angle. Spiral sulcations equidistant, 9 in the penultimate, 17 in the body-whorl. Axial accremental striæ, distinct under the microscope, cross the spirals, sinuous, comparatively distant, especially on the body-whorl.

Dim.—Length, 5·25 mm.; of aperture, 2·25 mm.; breadth, 2·25 mm.

Locality.—Type from 17 fathoms Backstairs Passage, with 2 others; Gulf St. Vincent, 3 good; in 15-20 fathoms

St. Francis Island, 3 quite fresh; 35 fathoms, 1 dead; 55 fathoms off Cape Borda, several dead; 110 fathoms off Beachport, 2 dead.

Mangilia impendens, n. sp. Pl. xxvii., fig. 3.

Shell solid, white, of 7 whorls, including the blunt protoconch of 2 smooth depressed convex turns. Spire-whorls sloping, swollen above the linear somewhat undulating suture, and barely swollen below it. Base slightly contracted. Aperture oblong-oval, narrower behind, widely open in front, with a shallow notch. Outer lip simple, sharp, thickened by a marked varix outside, which ascends roundly at the suture and bounds a shallow, wide posterior sinus, profile convex, barely sinused anteriorly. Axial costæ roundly trigonal, sinuous, undulating the upper suture, most valid at the swelling of the whorl, half as wide as the interspaces, vanishing towards the base, and becoming obsolete towards the aperture. Very crowded spiral incisions all over, and still finer sinuous axial growth scratches, finely granulating the surface.

Dim.—Length, 6·4 mm.; of body-whorl, 4·4 mm.; breadth, 2·5 mm.

Locality.—Type dredged in Gulf St. Vincent, with 23 others: 14 fathoms off Ardrossan, 1 alive; in 24 fathoms off Newland Head, 1 dead.

Diagnosis.—It approaches *M. hexagonalis*, Reeve, but this is a longer shell, with a sharp three-whorled brown protoconch, and with straighter, narrower ribs, and much more numerous spiral incisions.

Mangilia hexagonalis, Reeve.

Pleurotoma hexagonalis, Reeve, Proc. Zool. Soc., London, 1845, p. 118; also Conch. Icon., 1845, pl. xxxii., sp. 293. *Type locality*—"Philippines."

Mangilia hexagonalis, Reeve, Tryon, Man. Conch., 1884, vol. vi., p. 251, pl. xx., figs. 1, 4; Sowerby, Proc. Mal. Soc., London, 1896, vol. ii., p. 30, "Gulf St. Vincent."

Dredged in 9, 10, 12, 14, and 20 fathoms in Gulf St. Vincent and Spencer Gulf, alive, rare. Taken on the beach at Aldinga (Kimber).

Mangilia alticostata, Sowerby.

Mangilia alticostata, Sowerby, Proc. Mal. Soc., London, 1896, vol. ii., p. 31, pl. iii., fig. 16. *Type locality*—"Gulf St. Vincent"; Hedley, Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., p. 17, "Port Jackson."

Dredged in 12, 14, 15, and 20 fathoms in Gulf St. Vincent, rather rare; taken in Wallaroo Bay (Dr. Gosse); in the Port Adelaide Creek (Tate). Dredged in 15 to 20 fathoms off St. Francis Island, 1 good; in 24 fathoms off Newland Head, 1 moderate; in 40 fathoms off Beachport, 1 moderate; in 55 fathoms off Cape Borda, 1 moderate; in 110 fathoms off Beachport, 2 very poor, and in 150 fathoms, 1 very poor.

Mangilia (Glyphostoma) paucimaculata, Angas.

Glyphostoma paucimaculata, Angas, Proc. Zool. Soc., London, 1880, p. 416, pl. xl., fig. 7. *Type locality*—"Aldinga and Holdfast Bays (Tate)"; Sowerby, Proc. Mal. Soc., London, 1896, vol. ii., p. 30; Tate and May, Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., p. 369, "Pirate's Bay, Tasmania."

Dredged in Gulf St. Vincent, alive, and in Spencer Gulf. Taken on the beach at Streaky Bay. A living individual, from 7 fathoms, dredged at the entrance to Eastern Cove, Kangaroo Island, supplied the following:—"The foot is nearly as long as the shell, narrow, truncated in front, pointed behind. A close and perfect examination revealed no operculum. The siphon is one-half the length of the foot. Minute tentacles are borne at the ends of stalks, twice as wide and four times as long as themselves. These are white, and a black eye occurs at the end of the stalk outside the base of the tentacle. The foot is variegated with translucent and opaque white, disposed in rings, and the upper part of the foot and body and siphon are ornamented with minute orange dots."

Mangilia spica, Hedley.

Mangilia spica, Hedley, Records Austr. Mus., vol. vi., part 4, 1907, p. 297, pl. lv., fig. 20. *Type locality*—"80 fathoms off Narrabeen, New South Wales"; Hedley and May, *op. cit.*, vol. vii., 1908, p. 112, "100 fathoms off Cape Pillar, Tasmania."

One good example was dredged in 40 and in 110 fathoms off Beachport, and in 90 and in 130 fathoms off Cape Jaffa.

Mangilia dyscritos, Verco.

Terebra dyscritos, Verco, Trans. Roy. Soc., South Australia, 1906, vol. xxx., p. 149, pl. iv., figs. 3, 4, 5.

Besides the localities given in the original description, it has been taken in 40 fathoms off Beachport, 5 quite fresh and 5 poor; in 55 fathoms off Cape Borda, 7 poor; and in 150 fathoms off Beachport, 4 poor. The largest specimen is 10 mm. long, and shows rusty axial flames, three in the body-whorl, and an obscure spiral of some four faint rusty blotches on the base, beginning at the middle of the inner lip. The generic and family location was doubtful when described, but the genus *Mangilia* among the Pleurotomidæ seems the most appropriate place at present.

Mangilia flaccida, Pritchard and Gatliff.

Mangilia flaccida, Pritchard and Gatliff, Proc. Roy. Soc., Victoria, 1899, vol. xii., p. 102, pl. viii., figs. 3 and 4. *Type locality*—"San Remo, Western Port"; *ibid,* 1900, vol. xii., p. 175; Tate and May, Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., p. 370, "Tasmania."

Dredged in Gulf St. Vincent, 1 perfect; in 40 fathoms off Beachport, 3 good; in 55 fathoms north-west of Cape Borda, 7 moderate. Taken on the beach at St. Francis Island, 8 good, and at LeHunte Bay, Great Australian Bight, 1 good. Identified by Mr. Gatliff.

Mangilia picta, Adams and Angas.

Mangilia picta, Adams and Angas, Proc. Zool. Soc., London, 1863, p. 419, pl. xxxvii., fig. 7. *Type locality*—"Port Jackson (and South Australia)"; Angas, Proc. Zool. Soc., London, 1867; Tryon, Man. Conch., 1884, vol. vi., p. 256, pl. xxii., fig. 72; Sowerby, Proc. Mal. Soc., London, 1896, vol. ii., p. 29; Pritchard and Gatliff, Proc. Roy. Soc., Victoria, (1899) 1890, vol. xii. (N.S.), p. 173, "Victorian coast"; Tate and May, Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., p. 370, "Tasmania."

Mangilia meredithiæ, Tenison-Woods, Proc. Roy. Soc., Tasmania, (1875) 1876, p. 142. *Type locality*—"Bass Strait."

The variations of this species make it very worrying. The typical shell is easily recognized by its colour bands, its bold ribs, and its fine spiral incisions; but the ribs may diminish to the vanishing point, the shape may vary to a short, broad form or to a long, narrow shell, and the angulation may become a rounded shoulder.

The colour markings may disappear in turn, till the shell is quite white, or may become narrow and numerous, so as to band the whole body-whorl with thin brown lines, and approach *M. insculpta,* Adams and Angas, from which the brown apex and the more decided incisions of the latter distinguish it. The most persistent ornament is that referred to by Mr. Gatliff, the colour dashes immediately below the suture, which are frequently crescentic and correspond with the contour of the sinus. Another variation is a colouration of the lower half only of the base of the body-whorl.

Dredged from 8 to 22 fathoms in Gulf St. Vincent and Spencer Gulf, and off St. Francis Island; also good in 110 fathoms off Beachport, and moderate in 200 fathoms. Taken all along the coastline westward to Fowler Bay.

Mangilia insculpta, Adams and Angas.

Mangilia insculpta, Adams and Angas, Proc. Zool. Soc., London, 1863, p. 420, pl. xxxvii., fig. 8. *Type locality*—"Gulf St. Vincent"; Angas, *op. cit.,* 1865, p. 160; Tryon, Man. Conch, 1884, vol. vi., p. 256, pl. xxii., fig. 61.

Dredged in 15 and in 20 fathoms Gulf St. Vincent, Investigator Strait, and Backstairs Passage, several; in 62 fathoms north-west of Cape Borda, 4 immature and poor. Taken on the beach at Sceales Bay and St. Francis Island.

As Mr. May writes:—"It is closely related to *M. delicatula*, Tenison-Woods, in shape, but the latter has more pronounced ribs and spirals, especially on the body-whorl."

Mangilia delicatula, Tenison-Woods.

Mangilia delicatula, Tenison-Woods, Proc. Roy. Soc., Tasmania, (1878) 1879, p. 37. *Type locality*—"Long Bay, Tasmania"; Tate and May, Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., p. 369, pl. xxiv., fig. 35; Pritchard and Gatliff, Proc. Roy. Soc., Victoria, 1907, vol. xx., p. 31, "6 to 8 fathoms Western Port."

Daphnella delicatula, Tenison-Woods, Tryon, Man. Conch., 1884, vol. vi., p. 302, pl. xxxii., fig. 29.

Dredged in 6 fathoms off St. Francis Island, 3 good, and in Gulf St. Vincent, 6 good. Taken on the beach at Aldinga (Mr. Kimber).

Mr. May confirmed my identification. The shell may be long and narrow to short and ventricose; the whole surface may be yellowish-brown, or the anterior half of the body-whorl may be light-brown, or there may be a white band just above the shoulder of the body-whorl. Tate and May give *M. cuspis*, Sowerby, as a synonym, but this is allied rather to *M. letourneuxiana*, Crosse.

Mangilia connectens, Sowerby.

Mangilia connectens, Sowerby, Proc. Mal. Soc., London, 1896, vol. ii., p. 30, pl. iii., fig. 14. *Type locality*—"Gulf St. Vincent."

Dredged in 14 fathoms off Ardrossan, 4 very good; in 20 fathoms Gulf St. Vincent, 1 alive, 1 good; in 15 to 20 fathoms off St. Francis Island, 3 dead; in 55 fathoms north-west of Cape Borda, 8 moderate.

Mangilia vincentina, Crosse and Fischer.

Mangilia vincentina, Crosse and Fischer, Journ. de Conch., 1865, vol. xiii., p. 422, pl. xi., fig. 6. *Type locality*—"Rapid Bay, Gulf St. Vincent"; Angas, Proc. Zool. Soc., London, 1865, p. 160; also 1877, p. 185, "dredged off Port Jackson Heads," etc.; Pritchard and Gatliff, Proc. Roy. Soc., Victoria, (1899) 1900, vol. xii. (N.S.), p. 174, "Victoria"; Sowerby, Proc. Mal. Soc., London, 1896, vol. ii., p. 30.

Mangilia vincentiana, Crosse, Tate and May, Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., p. 369, "King Island, Tasmania."

Daphnella vincentina, Crosse, Tryon, Man. Conch., 1884, vol. vi., p. 311, pl. xvii., fig. 91.

Mangilia alucinans, Sowerby, Proc. Mal. Soc., London, 1896, vol. ii., p. 29, pl. iii., fig. 12. *Type locality*—"Yankalilla Bay"; var. *ornata*, Sowerby, *loc. cit.*, pl. iii., fig. 13; Pritchard and Gatliff, *op. cit. supra*, p. 175, "Victorian coast"; Tate and May, *loc. cit. supra*, "Long Bay, Tasmania."

Mr. Sowerby says of *M. alucinans*:—"Shells of this species have been mistaken for *M. vincentina*, Crosse, and also for *M. lineata*, Reeve. The type of the former is a little plain brown shell, with very obscure bands of darker brown. It is more sharply angular, and the ribs are thinner than in *M. alucinans*."

Mr. Angas in P.Z.S., 1877, p. 185, records *M. vincentina* for New South Wales, and remarks:—"The figure given in the French Journal of this species is so bad, no one could recognize it. The shell is white, with a row of brown spots between the ribs a little below the sutures, and sometimes with a central band on the last whorl. Crosse figures it of a uniform brown colour." This figure seems to have excusably misled Mr. Sowerby as to the appearance of Crosse's type, and he calls it "a little plain brown shell." Crosse describes his shell as "lutescens," and Sowerby his as "straminea," both equal to "yellowish"; Angas says the former is white, and Sowerby says of the latter, "Some are nearly white." As to *M. vincentina* being a little shell, it is really described as 7 mm. long, which is half a millimetre longer than *M. alucinans*. Angas recognized Port Jackson shells as the species he had sent to Crosse from South Australia, and examples sent me from New South Wales by Mr. Hedley as *M. vincentina* are identical with the type and cotypes of *M. alucinans* returned to me by Mr. Sowerby. The type localities of the two species are practically the same, Rapid Bay and Yankalilla Bay being adjacent to each other in Gulf St. Vincent; and it is significant, too, that Mr. Sowerby says, "Among all the South Australian shells I have examined, none are quite conformable to Crosse's type of this species," and yet Angas and I dredged our specimens in almost the same spot.

In the collection of the late Professor Tate, which came into my possession, was a tray with rather more than 200 shells labelled *Mangelia vincentina*, St. Vincent Gulf. Of these nearly one-half were like Sowerby's type of *M. alucinans*, and the remainder were the stouter, more coloured form approaching his variety *ornata*. Angas in P.Z.S., London, 1880, p. 415, begins a paper thus:—"Several months ago I received from Professor Ralph Tate, of the Adelaide University, a small collection of marine shells obtained by him (mostly from shell-sand) on various beaches in St. Vincent and Spencer Gulfs." It is most probable Mr. Angas was responsible for the identification of the examples from which Professor Tate named the specimens in his cabinet. There can be little doubt, therefore, that Mr. Angas and Professor Tate regarded as *M. vincentina*, Crosse, both the forms which Mr. Sowerby has described as *alucinans*.

An examination of the type and cotypes received from Mr. Sowerby, as well as many fresh dredged and beach specimens since obtained, lead to the conclusion that *M. alucinans*, Sowerby, is conspecific with *M. vincentina*, Crosse, and may be retained to indicate a variant in which the ribs are rounder and more solid, and the spiral liræ are finer and more crowded.

The species is very variable. With the same number of whorls some adults may be twice as long as others, and when of equal length may differ much in breadth and greatly in solidity. There may be only twelve prominent spirals over the body-whorl from the angulation to the notch, and between each of these there may be as many as twenty crowded striæ, or only six. Sometimes there are twenty equal prominent threads, with fewer threadlets intervening. The striæ between the primary spirals may be all of equal size, or of three distinct sizes; secondary ones in the middle of the spaces, tertiary between them, and very fine between these. In some cases the primaries may be not marked, and in others absent, the spirals being all equal or nearly so. Nearly all these differences may be found among the cotypes themselves.

As to colour markings, the boldest, most frequent, and persistent is the spiral row above the angle, with the transverse spots in the intercostal spaces. Next one in the middle of the body-whorl, then one between this and the snout, then one between the latter two, and then one between the former two. All these below the angle are on the ribs, and interrupted by the spaces, except in a very few examples, when they form a continuous spiral line, distinctly thinner in the interspaces. Rarely some individuals are also minutely dotted with brown all over the whorls, but most abundantly just below the sutures, and the intercostal spaces below the lowest spiral may have short-curved axial brown flames.

Dredged alive in Gulf St. Vincent from 5 to 22 fathoms, many alive; in 15 to 35 fathoms St. Francis Island, several; in 45 fathoms off Neptune Islands, 4 fresh; in 55 fathoms off Cape Borda, 19 moderate; in 62 fathoms, 11 moderate; in 90 fathoms off Cape Jaffa, 1 poor; and in 110 fathoms off Beachport, 1 poor. Taken on the beach as far west as St. Francis Island and LeHunte Bay. The beach specimens are usually larger, and more solid and more fully coloured than the dredged shells. It affects the shallower waters.

Mangilia anomala, Angas.

Purpura (Cronia) anomala, Angas, Proc. Zool. Soc., London, 1877, p. 34, pl. v., fig. 1. *Type locality*—"25 fathoms outside Port Jackson Heads"; also 1880, p. 415, "South Australia"; Tryon, Man. Conch., 1884, vol. vi., p. 318.

Murex (Ocinebra) anomala, Angas, Tyron, Man. Conch., 1880, vol. ii., pp. 121 and 180, pl. xxxvi., fig. 422.

Mangilia anomala, Angas, Tate, Proc. Linn. Soc., New South Wales, 1890, vol. v., p. 131; Sowerby, Proc. Mal. Soc., London, 1896, vol. ii., p. 31; Pritchard and Gatliff, Proc. Roy. Soc., Victoria, (1899) 1900, vol. xii. (N.S.), p. 174, "Victorian coast"; Tate and May, Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., p. 369, "North coast Tasmania."

Dredged alive in 5 fathoms Gulf St. Vincent, 1; in 15 to 20 fathoms off St. Francis Island, 2; in 20 fathoms outside Backstairs Passage, 2; dead at various depths up to 22 fathoms in Gulf St. Vincent and Spencer Gulf; in 55 fathoms off Cape Borda, 1 very poor. Taken on the beach as far west as Sceales Bay. It appears not to live beyond about 25 fathoms.

Mangilia fallaciosa, Sowerby.

Daphnella (?) fallaciosa, Sowerby, Proc. Mal. Soc., London, 1896, vol. ii., p. 26, pl. iii., fig. 7. *Type locality*—"Gulf St. Vincent (Verco)."

The author says:—"It is with some uncertainty that I place this with *Daphnella*." The type was immature, with the labrum thin; when adult this has quite a marked varicose thickening close to its border, though the individual may measure only 6·7 mm. instead of the typical 10 mm. The shells may be more solid and opaque than the type, though usually they are rather thin and diaphanous. Instead of the typical feeble sinuous axial plicæ on the upper three spire whorls only, which become obsolete on the fourth, these may be quite valid on four whorls, and to the border of the labrum, fading out on the base of the whorl. The protoconch, when the shell is alive or quite fresh, may be translucent white or brown, and large irregular rusty flames, blotches, and streaks may colour the shell.

Dredged in 15-20 fathoms off St. Francis Island, 2 good; in Gulf St. Vincent, 13 quite fresh or alive; in 40 fathoms off Beachport, 5 good; in 45 fathoms off the Neptune Islands, 3 good; in 55 fathoms off Cape Borda, 5 good; in 62 fathoms, 5 good; in 90 fathoms off Cape Jaffa, 18 moderate; in 110 fathoms off Beachport, 22 good; in 130 fathoms off Cape Jaffa, 1 very good; in 150 fathoms off Beachport, 9 good, showing the brown flames; in 200 fathoms off Beachport, 11 good; in 300 fathoms off Cape Jaffa, 9 very poor.

Daphnella brenchleyi, Angas.

Clathurella brenchleyi, Angas, Proc. Zool. Soc., London, 1877, p. 37, pl. v., fig. 12. *Type locality*—"Port Stephens."

Daphnella brenchleyi, Angas, Hedley, Memoirs Austr. Mus., iv., part 6, 1903, p. 391, fig. text 106, "41-50 fathoms off Cape Three Points, New South Wales."

Var. **vercoi**, Sowerby.

Daphnella vercoi, Sowerby, Proc. Mal. Soc., London, 1896, vol. ii., p. 27, pl. iii., fig. 8. *Type locality*—"Backstairs Passage, 6 to 20 fathoms."

The type shell of this species is much more ventricose and comparatively of more delicate texture than *C. brenchleyi* from New South Wales, but shells returned to me by Mr. Sowerby as cotypes are indistinguishable from the New South Wales form in shape and sculpture, and have the same minutely spirally lirate protoconch, and grade into his type. I am compelled, therefore, to unite the two.

Dredged in 6, 9, 12, 15, 17, 20, and 22 fathoms in Gulf St. Vincent and Spencer Gulf, Investigator Strait, and Backstairs Passage.

Daphnella eburnea, Petterd.

Trophon eburneus, Petterd, Jour. Conch., 1884, vol. iv., p. 142. *Type locality*—"Tamar Heads"; Pritchard and Gatliff, Proc. Roy. Soc., Victoria, (1897) 1898, vol. x. (N.S.), p. 258, "Western Port"; also *op cit.*, (1905) 1906, vol. xviii. (N.S.), p. 41.

Tritonidea eburnea, Petterd, Adcock, Handlist of Aquatic Moll. of South Australia, 1893, p. 4, No. 48.

Cantharus eburneus, Petterd, Tate and May, Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., p. 357, text fig. 1.

Tate and May shifted this species from *Trophon* to *Cantharus*, but Pritchard and Gatliff objected to this location, yet felt doubt as to where it should be placed. I now suggest *Daphnella*. It has a closely spirally lirate protoconch like several species in this genus, the delicate lamelliform axials, which make a frill immediately below the suture, corresponding with a small round sinus there, and has fine, crowded spirals, and when alive is of delicate texture and comes close to *Daphnella brenchleyi*, and especially to var. *vercoi*, Sowerby. The objection urged to its location in *Cantharus*, which might be regarded as equally valid here, is its umbilicus; but is it not a false umbilicus? It is absent from young shells, and is only a separation of the inner lip at its tip, from the sinistral twist of the extremity of the columella.

Dredged in 17 fathoms Backstairs Passage, 4 dead, moderate. Taken on the beach at Aldinga and at Fowler Bay, and on St. Francis Island.

Daphnella diluta, Sowerby.

Daphnella diluta, Sowerby, Proc. Mal. Soc., London, vol. 2, 1896, p. 26, pl. iii., fig. 6. *Type locality*—"Backstairs Passage, 20 fathoms (Verco)."

Dredged in Backstairs Passage, 17 fathoms, 4 dead; in 20 fathoms, 2 fresh, 8 dead; in 22 fathoms, 1 alive, 3 fresh, 4 dead; in Gulf St. Vincent, depth unrecorded, 6 moderate; in 55 fathoms off Cape Borda, 1 broken.

Daphnella inornata, Sowerby.

Mangilia inornata, Sowerby, Proc. Mal. Soc., London, 1896, vol. ii., p. 30, pl. iii., fig. 15. *Type locality*—"Gulf St. Vincent."

Dredged alive in 22 fathoms Backstairs Passage; also many alive or dead in 15, 17, and 20 fathoms in Gulf St. Vincent; in 62 fathoms north-west off Cape Borda, 1 perfect, 2 good immature; in 90 fathoms off Cape Jaffa, 1 dead; in 110 fathoms off Beachport, 5 good.

I think this is a *Daphnella* from its light texture, fine cancellation, and sinus.

Daphnella fenestrata, n. sp. Pl. xxviii., figs. 6 and 7.

Shell delicate, white, of 5 whorls, including a rather blunt scarcely mamillate protoconch of 2 convex whorls, with 7 spiral liræ, ending abruptly at the first axial rib. Spire-whorls gradate, subconcavely sloping below the suture, with a sharp lira at the edge of the gradation; whorls contracting towards the lower suture; body-whorl contracted at the base; canal very short; aperture oblong-oval, outer lip thin, with ten liræ outside, which with the lip in profile project as minute spurs; sinus well marked from the suture to the angle; inner lip a narrow, opaque-white glaze: columella long, straightly convex. Sculpture bold, five spirals in the first and second whorls, including that at the angle, fourteen on the body-whorl, narrow, erect; axials, twenty in the penultimate, coronating the uppermost spiral with projecting points, and producing tiny tubercles as they cross the other spirals. Crowded axial threads, concave forwards, run from the simple suture to the angle.

Dim.—Length, 4 mm.; of the body-whorl, 2·8 mm.; breadth, 1·5 mm.

Locality.—Type in 62 fathoms north-west of Cape Borda, 10 good; in 90 fathoms off Cape Jaffa, 17 good and broken; in 104 fathoms 35 miles south-west of Neptune Islands, 3 good, 7 fragments; in 110 fathoms off Beachport, 6 good; and in 130 fathoms off Cape Jaffa, 2 good.

Variations.—There may be only three spirals in each spire-whorl, with less numerous axials. It may reach 6·5 mm. in length.

Daphnella fragilis, Reeve.

Pleurotoma fragilis, Reeve, Proc. Zool. Soc., London, 1845, p. 111, "*Habitat*—(?)"; Conch. Icon., 1845, pl. xxi., sp. 179; Angas, Proc. Zool. Soc., London, 1880, p. 416, "Aldinga Bay (Tate)"; Sowerby, Proc. Mal. Soc., London, 1896, p. 26, No. 10; Pritchard and Gatliff, Proc. Roy. Soc., Victoria, 1906, vol. xviii. (N.S.), part 2, p. 51, "Western Port, Victoria, 7 fathoms."

Pleurotoma lymneæformis, Kiener, Reeve, Conch. Icon., 1846, pl. xxxv., fig. 325.

Pleurotoma lymneiformis, Kiener, Coq. Vivantes, p. 62, pl. xxii., fig. 3; var. *fragilis*, Reeve, Tryon, Man. Conch, 1884, vol. vi., p. 300, pl. xxvi., fig. 90.

Dredged at all depths from 9 to 20 fathoms; 3 from Newland Head, westward as far as St. Francis Island, but not in deeper water.

Daphnella stiphra, n. sp. Pl. xxv., figs. 5 and 6.

Shell fragile, short, biconic. Protoconch brown, of 4½ whorls, the apical 1½ with close spiral liræ, punctate between, the rest latticed by the crossing of two sets of crowded oblique liræ, whorls convex, sutures deep. Spire-whorls four, convex, roundly angled just below the centre; sutures deep. Body-whorl tumid, contracted at the base; aperture obliquely oval; outer lip thin, simple, broken; inner lip represented by a smooth, glazed area; columella straight, barely concave; canal short, open. Sinus at the suture, round, simple.

Sculpture. — In the concave space just below the suture are crowded very fine spirals, eight in the penultimate; below a prominent thread which bounds this space are more distant and stouter liræ, two in the first whorl, three in the second, four in the third, eight in the fourth, and about forty in the body-whorl. Axial threadlets concave forwards to the prominent spiral thread, and convex forwards thence to the suture, run in the body-whorl over the base to the canal.

Dim.—Length, 8·5 mm.; breadth, 4 mm.

Locality.—Type 300 fathoms off Cape Jaffa, dead; in 15 fathoms off Wallaroo, 1 moderate.

Daphnella perplexa, n. sp. Pl. xxviii., figs. 1 and 2.

Shell delicate, elongate-oval, of 6 whorls. Protoconch of two convex whorls, each with ten valid spiral liræ; apex blunt, ending abruptly, with the first spire-whorl issuing from within it. Spire-whorls four, convex, sutures linear. Body-whorl much longer than the spire, gradually contracting at the base. Aperture oblique, elongate-oval, canal short, wide, open, deviated slightly to the left. Columella straight, forming an obtuse angle with the inner lip, which is distinct, complete, applied, and glazed. Outer lip with a finely crenulated border; in profile retrocurrent at the suture to form a shallow sinus, then uniformly curved, convex, with a shallow excavation at the contracted base. The whole surface of the shell is sculptured with spiral liræ, six in the first whorl, twelve in the second, sixteen in the third, and fifty-two in the body-whorl, granulated by very fine axial striæ which granulate the sutural margin. Colour is somewhat mottled very light-brown, with spiral equidistant white hairlines, five in the penultimate, ten in the body-whorl.

Dim.—Length, 6·3 mm.; of body-whorl, 3·9 mm.; width, 2·2 mm.

Locality—Type 22 fathoms Backstairs Passage; off Point Marsden, Kangaroo Island, 15 fathoms, 1 dead; Yankalilla Bay and Gulf St. Vincent, depth unrecorded, 10.

D. fragilis, Reeve, has its protoconch latticed by crossing liræ, has a different shape, and wider-spaced stronger axials.

The length when adult, shown by the ascending suture, may be 4·7 mm. or 7·1. The colour may be wholly white, probably from bleaching.

Daphnella legrandi, Beddome.

Drillia legrandi, Beddome, Proc. Roy. Soc., Tasmania, (1882) 1883, p. 167. *Type locality*—"D'Entrecasteaux Channel, 7 fathoms."

Clathurella legrandi, Beddome, Pritchard and Gatliff, Proc. Roy. Soc., Victoria, (1899) 1900, vol. xii. (N.S.), p. 178, "Portland"; Hedley, Proc. Linn. Soc., New South Wales, 1900, p. 225, pl. xxv., figs. 1, 2, 3.

Tate and May, in Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., p. 371, make it a synonym of *Clathurella sculptilior*, Tenison-Woods, Proc. Roy. Soc., Tasmania, (1878) 1879, p. 38. Two gentlemen claim to have provided the author with the type and to possess the cotypes. One presents examples of *D. legrandi* as the cotypes; the other, who is cited by Woods as having supplied the type, distributes *C. desalesi*, Tenison-Woods. The weight of evidence is in favour of the latter, and *D. legrandi* can scarcely be accepted. As the type cannot be found, and the shell has not been figured, it is preferable to ignore *C. sculptilior* and use the two names which are certain for the two species. Tate and May are followed by Hedley in Records Austr. Mus., vol. vi., part 4, p. 298, 1907, who calls the shell *Daphnella sculptior* [*sic*], Tenison-Woods.

Tate and May also make *Daphnella bitorquata*, Sowerby, a synonym of this shell (Proc. Linn. Soc., New South Wales, 1901, xxvi., p. 446), but it is really a variety of *Daphnella tasmanica*, Tenison-Woods.

Dredged at varying depths in Gulf St. Vincent and Backstairs Passage up to 20 fathoms, 30 dead and quite fresh; in 15 to 20 fathoms off St. Francis Island, 4 moderate, and in 35 fathoms, 1 moderate; in 40 fathoms off Beachport, 1 good and 4 poor; in 55 fathoms off Cape Borda, 4 poor; in 110 fathoms off Beachport, 5 moderate.

Daphnella bastowi, Gatliff and Gabriel.

Daphnella bastowi, Gatliff and Gabriel, Proc. Roy. Soc., Victoria, 1908, vol. xxi. (N.S.), p. 365, pl. xxi., figs. 1 to 4. *Type locality*—"Western Port."

Dredged in Gulf St. Vincent, depth unrecorded, 7 examples.

Daphnella tasmanica, Tenison-Woods.

Daphnella tasmanica, Tenison-Woods, Proc. Roy. Soc., Tasmania, (1876) 1877, p. 138, "Tasmania"; Hedley, Proc. Linn. Soc., New South Wales, (1901) 1900, vol. xxiv., p. 725, fig. 21, and xxvi., (1901) 1902, p. 700; Tate and May, Proc. Linn. Soc., New South Wales, xxvi., 1901, p. 372; Pritchard and Gatliff, Proc. Roy. Soc., Victoria, (1905) 1906, vol. xviii. (N.S.), part 2, p. 52, "Western Port, about 7 fathoms."

Var. *bitorquata*, Sowerby, Proc. Mal. Soc., London, vol. ii., 1896, p. 27, pl. iii., fig. 10, "Spencer and St. Vincent Gulfs (Adcock)."

This shell varies greatly—(1) In shape. The whorls may be quite round, or uniangulate or biangulate, depending on the strength of certain spirals. Some examples are much shorter and more ventricose than others; (2) in sculpture. The spirals may be nearly equal all over the shell, or unequal on the early whorls and equal on the body-whorl, or they may be alternately markedly large and small. The axials in some are as distant as the spirals, so as to make a square, open lattice, or very crowded, and this either on shells with equal and close or unequal and open spirals. In some the large spirals are nodulated, so that the shell, looked at from the apex, displays some ten or twelve angles, which may be opaque-white; (3) in colour. The shell may be uniformly brown, or with square, distant brown blotches below the sutures, or more or less indistinctly mottled with brown, and with opaque white spots scattered about.

Dredged in Gulf St. Vincent at depths up to 23 fathoms, 14 alive or good; in 20 fathoms off Newland Head, 1 good; in 35 fathoms off St. Francis Island, 1 good. The South Australian shells favour the *bitorquata* variety rather than the typical *D. tasmanica.*

Daphnella lamellosa, Sowerby.

Clathurella lamellosa, Sowerby, Proc. Mal. Soc., London, 1896, vol. 2, p. 28, pl. iii., fig. 11. *Type locality*—"Gulf St. Vincent (Verco)"; Hedley, Proc. Linn. Soc., New South Wales, 1900, vol. xxv., p. 725.

Mr. Hedley, *loc. cit.*, supposes it to be an immature *Daphnella tasmanica,* Tenison-Woods, but the shape of the labral sinus is quite distinctive.

Dredged in Gulf St. Vincent up to 22 fathoms, several alive and dead; in 15 to 20 fathoms off St. Francis Island, 1 dead; in 90 fathoms off Cape Jaffa, 2 perfect; in 104 fathoms 35 miles south-west of the Neptunes, 42 good and broken; in 110 fathoms off Beachport, 1; and in 130 fathoms off Cape Jaffa, 1 dead.

Daphnella triseriata, n. sp. Pl. xxviii., fig. 8.

Shell of 6 whorls, including the protoconch of 2 whorls, with an exsert apex, closely spirally lirate. When viewed from the apex, the contour of the spire-whorls is not uniformly curved, but polygonal, septangulate in the type. They have a central angulation, provided with a stout, rounded cord, and are constricted at the linear sutures. In the first and second spire-whorls a smaller secondary lira arises above the angle and another below; in the third whorl another tertiary and still smaller lira is intercalated above, and another in each interval below. In the body-whorl, below these, arising at the suture is a stout cord forming a second angulation, below which the base is markedly concavely constricted, and has about ten liræ, diminishing in size anteriorly. The aperture is obliquely oval, narrowed behind. Columella straightly convex. Outer lip thin, simple, crenulated, and toothed by the spirals; with a deep, narrow posterior sinus, bounded on one side by the sutural lira, and on the other by the nearest secondary lira; in profile the lip is convex. Very fine crowded axial striæ, corresponding with the sinuosity of the outer lip, cross the whole surface except the primary spirals.

Dim.—Length, 4·6 mm.; of the body-whorl, 2·4 mm.; breadth, 2·4 mm.

Locality.—Type 110 fathoms off Beachport, with 6 others, good; in 130 fathoms off Cape Jaffa, 3 very good, and in 90 fathoms, 6 good, but small.

Daphnella bathentoma, n. sp. Pl. xxviii., fig. 3.

Shell small, white, thin, of 5 whorls, including the prominent conical protoconch of 2 convex elate whorls, with exserted apex. Spire-whorls have a corded obtuse angulation, with a slope from the upper suture, somewhat constricted towards the lower. Body-whorl with a second angulation starting from the suture at the aperture; below this the base is rapidly concavely contracted. Aperture obliquely oval. Canal short. Outer lip thin, simple, biangulate; with a deep, narrow sinus at the suture with parallel margins; in profile slightly convex to the front angulation, then concave to the edge of the canal. Columella very long, nearly straight. When looked at from the apex the shell is faintly polygonal, with ten angles in a spiral (in a cotype these are produced into transverse sharp tubercles). A single spiral runs between the angulation and the upper suture, and in the body-whorl bounds the front of the posterior sinus. Another lies midway between the angulation and the lower suture. In the suture, the second angulation of the body-whorl may appear as a sutural cord. This bounds the back of the posterior labral sinus. Axials concave forward run from the suture to the nearest spiral, then straight and very obliquely from this to the first angle, then vertically to the next angle, and are lost on the base; they do not cross the spirals or stand erect.

Dim.—Length, 2·8 mm.; of the body-whorl, 1·8 mm.; breadth, 1·45 mm.

Locality.—Type from 104 fathoms 35 miles south-west of Neptune Islands, with 10 others good, all dead.

Daphnella minuta, Tenison-Woods.

Drillia minuta, Tenison-Woods, Proc. Roy. Soc., Tasmania, (1876) 1877, p. 136. *Type locality*—"Long Bay, Tasmania."

Daphnella minuta, Tenison-Woods, Tate and May, Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., p. 372.

Daphnella (Teres) mimica, Sowerby, Proc. Mal. Soc., London, 1896, vol. ii., p. 27, pl. iii., fig. 10. *Type locality*—"Gulf St. Vincent (Verco)"; also var. *fusca*, *loc. cit.*

Daphnella mimica, Sowerby, Pritchard and Gatliff, Proc. Roy. Soc., Victoria, (1905) 1906, vol. xviii., part 2, p. 52, "Western Port, about 7 fathoms."

Dredged in Gulf St. Vincent, under 22 fathoms, 20 alive, 9 dead; in 17 fathoms Backstairs Passage, 1 alive; in 15-20 fathoms off St. Francis Island, 1 alive; in 35 fathoms, 1 alive, 2 dead; in 45 fathoms off Neptune Islands, 1 dead; in 90 fathoms off Cape Jaffa, 2 dead, immature; in 104 fathoms 35 miles south-west of Neptune Islands, 2 good, dead.

Another variety which may be called *marmorata* is beautifully marbled with flames of white and deep blackish-brown.

Daphnella excavata, Gatliff.

Daphnella excavata, Gatliff, Proc. Roy. Soc., Victoria, 1906, vol. xix. (N.S.), p. 1, pl. i., figs. 1 and 2. *Type locality*—"Port Phillip"; Hedley, Proc. Linn. Soc., New South Wales, 1907, vol. xxxii., p. 507, "in 17-20 fathoms off Mast Head Island, Queensland"; Hedley and May, Records Austr. Mus., vol. vii., No. 2, 1908, p. 112, "in 100 fathoms off Cape Pillar, Tasmania."

Dredged in 22 fathoms outside Backstairs Passage, 11 examples. Identified by Mr. Gatliff.

Cythara compta, Adams and Angas.

Cithara compta, Adams and Angas, Proc. Zool. Soc., London, 1863, p. 419, pl. xxxvii., fig. 5. *Type locality*—"New South Wales"; 1865, p. 160, "dredged Rapid Bay, Gulf St. Vincent"; 1867, p. 204; Sowerby, Proc. Mal. Soc., London, 1896, vol. ii., p. 31; Pritchard and Gatliff, Proc. Roy. Soc., Victoria, (1899) 1900, vol. xii. (N.S.), p. 176, "Victoria"; Tate and May, Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., p. 370, "Tasmania."

Daphnella, etc., Tryon, Man. Conch., 1884, vol. vi., p. 306, pl. xxv., fig. 49.

Daphnella varix, Tenison-Woods, Proc. Roy. Soc., Tasmania, (1876) 1877, p. 10. *Type locality*—"Tamar Heads, Tasmania."

Dredged alive at all depths from 9 to 20 fathoms in Gulf St. Vincent and Spencer Gulf, and in our two Straits; only 1, and that very poor, dredged in 40 fathoms off Beachport. It is taken on the beach on St. Francis Island, and has been sent to me from Rotnest Island, in Western Australia. It is a comparatively common shell in South Australia.

Cythara kingensis, Petterd.

Daphnella kingensis, Petterd, Jour. Conch., 1879, vol. ii., p. 102. *Type locality*—"King Island, Tasmania"; Tate and May, Proc. Linn. Soc., New South Wales, 1901, vol. xxvi., p. 370; Hedley and May, Records Austr. Mus., vol. vii., No. 2, 1908, p. 112, "100 fathoms off Cape Pillar, Tasmania."

Cithara cognata, Pritchard and Gatliff, Proc. Roy. Soc., Victoria, 1899, vol. xii., p. 103, pl. viii. *Type locality*—"5 fathoms Western Port"; Tate and May, *loc. cit.*, affirm its identity.

Mangilia emina, Hedley, Records Austr. Mus. vol. vi., part 2, 1905, p. 53, fig. 20. *Type locality*—"111 fathoms off Cape Byron, New South Wales."

Mr. Hedley, who has seen my series, regards his type as a micromorph of *C. kingensis*, and withdraws his species.

It is very variable. It may be 16 mm. long, as in the type of *C. cognata*, 11 mm. as in *M. emina*, or 5·75 mm. as in some adult examples of mine. In shape it may be long and narrow, or short and broad. In sculpture it may have axial ribs, well marked, narrow, almost lamelliform, or round and solid, or low, or quite obsolete, especially on the body-whorl. The spiral liræ may be quite valid, or revealed only by a fairly high power of the microscope; generally the spirals are best marked when the axials are small. The colour may be a uniform brown tint, or there may be spiral colour bands of different widths, or the shell may be white.

Dredged in 15-20 fathoms off St. Francis Island, 1 nearly adult; in 40 fathoms off Beachport, 11 good; 55 fathoms north-west of Cape Borda, 1 good, 2 poor; in 90 fathoms off Cape Jaffa, 2 immature; in 104 fathoms 35 miles off the Neptunes, 19 good, 35 immature; in 110 fathoms off Beachport, 2 good, 3 moderate; in 130 fathoms off Cape Jaffa, 5 perfect, 5 immature; in 150 fathoms off Beachport, 3 moderate; in 200 fathoms, 6 good, 4 poor; in 300 fathoms off Cape Jaffa, 4 immature. It appears not to inhabit our shallower waters, but to be fairly evenly distributed, though rare from 40 to 300 fathoms.

Borsonia ceroplasta, Watson.

Borsonia ceroplasta, Watson, Chall. Reps. Zool., 1886, vol. xv., p. 368, pl. xviii., fig. 2, "North of Culebra Island, West Indies, 390 fathoms, *Pteropod* ooze."

Dredged in 300 fathoms off Cape Jaffa, 1 dead shell. It differs from the type in that its spire is proportionally not quite so long, and no obsolete flat spirals are visible above the suture and winding round the base. The nucleus, suture, infrasutural pad, angulation, tubercles, generic fold on the columella, canal, labral sinus (as well as can be determined from the description and figure) are identical. As only one specimen has been taken, and this immature, of six whorls only instead of eight, and a dead though well-preserved example, and as the members of the Pleurotomidæ show very wide specific variations, it is probably only a variant, and is provisionally so recorded. This is a new genus for South Australia.

Mitromorpha alba, Petterd.

Columbella alba, Petterd, Jour. Conch., vol. ii., 1879, p. 104. *Type locality*—"Blackman's Bay, Tasmania."

Mitromorpha alba, Petterd, Tate, Proc. Roy. Soc., New South Wales, 1898, p. 397; Tate and May, Proc. Linn. Soc., New South

Wales, 1901, vol. xxvi., pp. 372 and 455; Hedley, *op. cit.*, 1905, vol. xxx., p. 534; Records of the Austr. Mus., vol. vi., part 4, p. 298, "80 fathoms off Narrabeen."

M. flindersi, Pritchard and Gatliff, Proc. Roy. Soc., Victoria, vol. xii. (N.S.), p. 104, pl. viii., fig. 6, "Western Port"; *op. cit.*, vol. xviii., 1905, p. 51.

Dredged in Gulf St. Vincent, 16 good and moderate; in 40 fathoms off Beachport, 10 good, 4 moderate; in 55 fathoms off Cape Borda, 3 perfect, 17 good; in 60 fathoms off Cape Borda, 8 very poor; in 90 fathoms off Cape Jaffa, 2 very poor; in 110 fathoms off Beachport, 3 very good, 12 poor; in 130 fathoms off Cape Jaffa, 1 good, 8 very poor; in 200 fathoms off Beachport, 1 poor. It would seem to live up to about 110 fathoms. Taken on the beach St. Francis Island, good.

Some shells are much more solid and ventricose than others.

Mitromorpha alba, Petterd. *Var.* **axiscalpta,** var. nov.

It has the shape of *M. alba*, Petterd, but has crowded axial incisions granulating the spirals. It has also three spiral rows of small, square brown spots on the body-whorl; one just below the suture, but not on the first spiral as in some of the typical *M. alba;* a second starting just above the aperture and winding round to just above the middle of the labrum; a third beginning just above the two nodules on the labium and running over the back of the snout. The upper two rows appear in the spire-whorls. Sometimes the shell is flamed with very light-brown between the spots axially.

Dredged in Gulf St. Vincent, 10 good, 2 poor; in 55 fathoms off Cape Borda, 10 good, 37 poor; in 110 fathoms off Beachport, 6 poor.

Mitromorpha angusta, n. sp. Pl. xxvii., figs. 4 and 5.

Shell fusiform, narrow, of 6 whorls, including the protoconch of 2 smooth convex whorls, with simple suture. Spire-whorls convex, with simple suture; body-whorl tapering anteriorly. Aperture narrowly oval, scarcely contracted behind, widely open in front, no canal, only channelled; outer lip thin, simple, uniformly convex in profile, no distinct sinus posteriorly; inner lip slightly thickened on the straight columella, with two faint plaits or nodules. Colour white, with a spiral row of some seven brown spots, showing just above the suture, and winding to the middle of the labrum.

Dim.—Length, 5·7 mm.; of the body-whorl, 3·8 mm.; breadth, 2·1 mm.

Locality.—Type from 110 fathoms off Beachport, with 3 others very good; in 55 fathoms off Cape Borda, 3 good; in 200 fathoms off Beachport, 1 good.

It is much more attenuate than *M. alba*, Petterd, and has only the one suprasutural row of spots. It may possibly be an extreme variant.

Mitromorpha incerta, Pritchard and Gatliff.

Mangilia incerta, Pritchard and Gatliff, Proc. Roy. Soc., Victoria, 1902, vol. xiv. (N.S.), part 2, p. 181, pl. ix., fig. 1 (rather poor); *ibid, op. cit.*, 1906, vol. xviii., p. 50, "Western Port."

To the author's definition I may add that the protoconch is conical, of three whorls, subconvex, suture shallow, whorls minutely granulated in spiral rows, fifteen in the third whorl. The length is 4·1 mm.; of the body-whorl, 2·8 mm.; and breadth, 1·6 mm.

Dredged in Gulf St. Vincent and Backstairs Passage, depth not noted, 17 fresh and dead; in 15 to 20 fathoms off St. Francis Island, 2 very poor; in 35 fathoms, 2 poor; in 62 fathoms north-west of Cape Borda, 1 good and 3 poor; in 90 fathoms off Cape Jaffa, 1 poor; in 104 fathoms off Neptune Islands, 1 poor.

I have called it a *Mitromorpha* rather than a *Mangilia*, although it has no visible labial nodules or plaits, because it seems very closely allied to *M. alba*, var. *axiscalpta*, above described.

Mitromorpha axicostata, n. sp. Pl. xxviii., fig. 4.

Shell solid, elongate-oval, of 6 whorls, including the pointed protoconch of 2½ smooth convex whorls. Spire-whorls slightly convex. Suture simple, margined by a flat, narrow band. Base moderately contracted. Aperture elongate-oval, slightly constricted into a short, open canal. Outer lip thin, simple, convex in profile, with a shallow, wide depression just below the ascending suture. Inner lip complete, an applied thin glaze, callous at the suture. Columella long, nearly straight, slightly prominent at junction with concave base of body-whorl. No definite plait. Oblique rounded axial costæ, as wide as the interspaces, absent from the base, and vanishing towards the aperture. Spiral liræ flatly convex, wider than their spaces, cross the ribs, nine in the penultimate, twenty-five in the body-whorl.

Dim.—Length, 4·9 mm.; of the body-whorl, 2·4 mm.; breadth, 2·1 mm.

Locality.—Type from 104 fathoms 35 miles south-west of Neptune Islands, with 9 good and 24 poor; also in 40 fathoms off Beachport, 3 fresh; in 90 fathoms off Cape Jaffa, 1 good, 3 poor; in 110 fathoms off Beachport, 1 good, 1 poor; in 130 fathoms off Cape Jaffa, 3 moderate.

When fresh there is a walnut-coloured band over the middle third of the body-whorl, less extensive in the inter-costal spaces. This appears above the suture in the spire-whorls; the costæ are dotted above, and there are curved axial lines of dots on the liræ at the base. The size may reach to—Length, 7·3 mm.; of the body-whorl, 3·6 mm.; breadth, 3 mm. The ribs in the longer form may be much narrower, and may be obsolete before reaching the body-whorl.

This species approaches very close to *Mangilia*, and may belong to that genus.

Mitromorpha paula, n. sp. Pl. xxviii., fig. 5.

Shell, minute, solid, of 4½ whorls, including a blunt protoconch of 2 whorls, which are convex and apparently smooth, but microscopically granular, separated by a linear suture; it ends abruptly, and from within it issue the spirals of the first spire-whorls. Perfect specimens show the granules in very close-set spiral rows. Spire-whorls slightly convex, with eight spiral liræ. Sutures simple. Body-whorl large, tapering anteriorly. Aperture elongate-oval, rather widely open in front; outer lip simple, crenulated outside by the sculpture, slightly convex in profile, with a minute round, shallow sinus close to the suture; inner lip is a complete narrow glaze; there are twenty-three spiral liræ, flat-topped, half as wide as the interspaces, axially faintly incised. Colour is cinnamon-brown, lighter in a band on the prominence of the whorls.

Dim.—Length, 3 mm.; of the body-whorl, 2·1 mm.; breadth, 1·35 mm. A second example is 3·8 mm. by 1·5 mm.

Locality.—Type from Gulf St. Vincent, depth unrecorded, with 70 others in good and moderate condition; in 22 fathoms Backstairs Passage, 4 alive, 5 dead.

It is not unlike *Pleurotoma (Thesbia) eritima*, Watson, Chall. Reps. Zool., 1886, vol. xv., p. 329, pl. xxiii., fig. 2, but is larger and has spirals half, instead of twice, as wide as the grooves.

Var. **leuca**, n. var.

This is quite white, and is generally rather narrower than the type of *paula*.

Dredged in 20 fathoms Investigator Strait, 1 good; in 45 fathoms north of Neptune Islands, 1 good; in 49 fathoms off Cape Jaffa, 1 good and 1 very good, with a spiral row of distant brown spots in the spire-whorl, extending round the body-whorl; in 62 fathoms north-west of Cape Borda, 3 very good, 9 good; in 90 fathoms off Cape Jaffa, 2 good; in 104 fathoms 35 miles south-west of Neptune Islands, 3 good; in 110 fathoms off Beachport, 1 quite fresh, with some brown staining in the middle third of the outer lip; in 130 fathoms off Cape Jaffa, 1 poor.

These seem to affect deeper water than the type.

Mitromorpha paucilirata, n. sp. Pl. xxvii., figs. 8 and 9.

Shell elongate-oval, of 5 whorls, including a blunt protoconch of 2 convex whorls, apparently smooth, but microscopically minutely punctate from crowded spiral and axial liræ; the latter become more conspicuous just before the abrupt termination of the protoconch; suture simple, impressed. Spire-whorls convex, suture distinct, bounded below by a round spiral. Body-whorl oval, tapering anteriorly; base very faintly excavate. Aperture oblique, narrowly oval; outer lip thin, simple, corrugated by the spirals, convex in profile, with a shallow, round sinus near the suture; inner lip a glaze, thicker on the columella, which is straight and forms a round, open angle with the slightly concave base of the whorl. There are four spirals in the first whorl, five in the second, and seventeen in the body-whorl, becoming crowded towards the snout, about one-third the width of the concave interspaces, which are well roughened (and the spirals slightly so) by crowded fine distinct oblique axial liræ. The spirals are opaque-white in colour, and are faintly articulated with tiny brown subdistant spots; the labrum is brown-stained outside. In some examples there is a row of brown blotches in each whorl, running round the body-whorl to a little above the middle of the labrum.

Dim.—Length, 4 mm.; of the body-whorl, 2·3 mm.; breadth, 1·7 mm.

Locality.—Type dredged in 90 fathoms off Cape Jaffa, with 17 good ones and 28 moderate; in 62 fathoms off Cape Borda, 2 good; in 104 fathoms off Neptune Islands, 7 good and 8 moderate; in 110 fathoms off Beachport, 1 good.

It resembles *M. angusta*; but this is longer and has eight spirals in the penultimate and twenty-eight in the body-whorl. It differs from *M. paula*, var. *leuca*, in having fewer spirals, more convex whorls, in an excavate depression below the spiral which bounds the suture, and in the more convex whorls and deeper suture of the protoconch.

Var. **crassilirata,** n. var.

This is slightly larger, 4·5 mm. long and 1·7 mm. broad, and more solid, with the same number of spirals, but these are much stouter, the infrasutural cord being specially round and conspicuous.

Dredged in 55 fathoms off Cape Borda, 1 very good.

Mitromorpha pallidula, Hedley.

Mitromorpha pallidula, Hedley, Proc. Linn. Soc., New South Wales, 1905, vol. xxx., part 4, p. 534, pl. xxxii., fig. 26, "Manly Beach, near Sydney," also "24 fathoms off Derwent River, Tasmania"; Gatliff, Proc. Roy. Soc., Victoria, 1907, vol. xx. (N.S.), part i., p. 32, "Port Albert."

Dredged in 35 fathoms off St. Francis Island, 1 alive; in 62 fathoms off Cape Borda, 1 moderate; in 90 fathoms off Cape Jaffa, 2 poor; in 130 fathoms off Cape Jaffa, 8 good; in 110 fathoms off Beachport, 6 good.

Natica sticta, n. sp. Pl. xxix., figs. 4, 5, and 6.

Shell solid, ovately-globose, of $3\frac{1}{2}$ whorls. Spire scarcely raised, whorls flatly convex. Suture distinct, linear. Aperture semi-circular; outer lip thin, simple. Inner lip distinct, raised into a callous pad, which, with that of the straight columella, almost completely fills the large umbilicus. In young shells the umbilicus is wide, open to the apex, and with a spiral funicle winding up to the middle of the columella. Surface shining and smooth, but for sublenticular accremental scratch-lines, most marked at the border of the umbilicus. There are three spiral rows of brown marks, axially elongate, and somewhat zigzag.

Dim.—Length, 8·5 mm.; breadth, 7 mm.; height, 5·25 mm.

Locality.—Type from 130 fathoms Cape Jaffa, with many others quite fresh. Dredged also in 16 fathoms outside Backstairs Passage, 3 good; in 17 fathoms Gulf St. Vincent, 5; in 40 fathoms off Beachport, 26 good; in 45 fathoms east of North Neptunes, 4; in 55 fathoms off Cape Borda, 15 dead, also in 62 fathoms, 29 minute; in 110 fathoms off Beachport, 60; and in 150 fathoms, 1 fresh.

As no individual was taken alive to provide an operculum, the genus is not certain; but I think it will prove to be a *Natica* with a shelly operculum. Some shells have an additional ornament in a dull-brown infrasutural continuous band.

Eunaticina albosutura, n. sp. Pl. xx., figs. 10 and 11.

Shell flatly globosely obliquely oval, of 4 whorls, including a protoconch of 2 smooth, flat whorls, ending abruptly. Spire-whorls rapidly increasing; spire flatly round, apex scarcely exsert. Suture linear, slightly descending at the aperture. Aperture obliquely semi-circular. Outer lip curved, less behind than in front, thin, simple, scarcely retiring at the suture. Inner lip distinct, short, opaque-white, thick, with a marked triangular callus joining it to the outer lip, just within the margin of which is a shallow gutter running to the suture. Columella long, straight, slightly reflected over the umbilicus behind, narrower in front, curving into the basal lip at rather more than a right angle. Umbilicus very open to the apex, with a central broad, low spiral funicle running into the middle of the columella. Sublenticular, minutely wavy, axial and spiral scratch-lines. Colour light-yellowish-brown, with a central white spiral, and a gradually widening infrasutural white band, corresponding with the labial callus. Operculum horny, paucispiral, nucleus towards the inner front part. In life there is a thin epidermis; the animal can completely retract within the shell.

Dim.—Length, 18 mm.; width, 12·5 mm.; height, 9 mm.

Locality.—Type from 25 fathoms Thorny Passage; in 15 to 20 fathoms Investigator Strait, 2 recent; in Gulf St. Vincent, depth unrecorded, several alive and dead.

Diagnosis.—The species is closely allied to *Natica umbilicata*, Quoy and Gaimard, or *Naticina picta*, Reeve; but is somewhat heavier, with a rather less prominent spire, and with a much thicker callus in the back of the aperture. When lying on its base with the anterior part of the aperture towards the observer, the shell has a greater vertical slope towards the right, and does not look so round; and when the base is upwards and the apex away from the observer, the umbilicus is more largely visible.

Vanikoro denselaminata, n. sp. Pl. xxix., figs. 1, 2, and 3.

Shell small, delicate, dull-white, globosely oval of 3½ whorls. Protoconch one whorl and a half, apex exserted, with three bold spiral ribs, ending abruptly. Sutures deep. Spire-whorls convex, rapidly increasing; with erect axial lamellæ, close set and becoming progressively more crowded. No spirals. Umbilicus large, perspective, with crowded oblique axial striæ, and a bold, twisted carina winding down its whorls, and outside this a furrow which gets wider and shallower on the base of the shell. Aperture oval, truncated at the base. Inner lip a glaze on the body-whorl. Columella very long, straight. Basal lip straight, joining the columella at a right angle, and the uniformly-curved outer lip at a rounded obtuse angle.

Dim.—Length, 3·2 mm.; breadth, 2·1 mm.

Locality.—Type Gulf St. Vincent, depth unrecorded, with 2 others; Venus Bay beach, 1.

Trophon segmentatus, n. sp. Pl. xxiv., fig. 3.

Shell fusiform of 7 whorls, including a protoconch of 2 smooth convex whorls, with a deep suture. Spire-whorls boldly angled above the middle, and constricted towards the simple suture. Base gradually contracted to a moderately long snout. Aperture roundly oval, opening abruptly in front into a canal of equal length, slightly deviated to the left, and not recurved. Outer lip thin and corrugated; inner lip a complete, prominent, erect lamella. Sculpture elaborate; axial laminæ, twelve in the penultimate, rather solid, imbricating, coronating the angle with rather long, open tubiform scales, curving up and back, and frilled with recurved valid scales distributed in spiral rows as though along spiral liræ, two in each spire-whorl and ten in the body-whorl, extending over the base, and over the back of the canal. Colour white, with a narrow brown band immediately above the suture, and from behind the aperture round the base to the front part of the labrum.

Dim.—Length, 8·5 mm.; of the body-whorl, 4·6 mm.: width, 3·5 mm., excluding the long scales.

Locality.—Type in 90 fathoms off Cape Jaffa, with 27 others good; in 130 fathoms, 11 good; in 110 fathoms off Beachport, 11 good; in 150 fathoms, 4 good; in 200 fathoms, 4 good; in 104 fathoms off the Neptune Islands, 20 good, small.

Trophon plicilaminatus, n. sp. Pl. xxiv., figs. 1 and 2.

Shell thin, long, narrow, fusiform, of 8 whorls, including a protoconch of 2 smooth, convex, prominent whorls. Spire-whorls convex, swollen, and angled above the middle, contracted towards the distinct simple suture. Body-whorl convexly contracted below the angle, then concavely produced into a long, narrow snout. Aperture oval, wider behind; canal long, narrow, slightly oblique to the left, not recurved, making a faint round angle with the base of the columella. Inner lip a thin applied glaze. Axial lamellæ, fifteen in the penultimate, from suture to suture, erect and imbricating, projecting at the angle in long, open tube-like upward-curving scales, and below this folded in two spiral lines. In the body-whorl are four of these spiral foldings, progressively decreasing in size towards the base of the shell, in front of which the lamellæ are crenulate as they run along the snout, which they cross to the right further and further forward as they approach the aperture.

Dim.—Length, 13·9 mm.; of body-whorl, 9·8 mm.; width, 5·3 mm.

Locality.—Type in 150 fathoms off Beachport; in 200 fathoms, 2 good.

Trophon recurvatus, n. sp. Pl. xxiv., figs. 7 and 8.

Shell fairly solid, elongate-conical, of 7 whorls, including a prominent conical protoconch of 2½ smooth, convex turns, separated by a deep suture, and with a curious acute exsert apex. Spire-whorls short, wide; with very oblique simple sutures; swollen, sharply angulate just above the middle, below which in the body-whorl the base is rapidly contracted. Aperture roundly oval; canal about as long as the aperture, slightly deviated to the left, forming an open angle with the columella, markedly recurved. Outer lip thickened, equidistantly biangulate; inner lip inconspicuous. The sculpture consists of axial lamellæ, thirteen in the penultimate, which are folded into prominent scales at the angle; and in the body-whorl, at a spiral cord (which starts at the suture from the back of the aperture, runs round the base, and angulates the outer lip); and then crenated run over three obsolete spirals winding round the base, and finally bend in turn to the right over the back of the canal. It is of a uniform light-horn colour.

Dim.—Length, 6·7 mm.; of the body-whorl, 3·6 mm.; width, 3 mm.

Locality.—Type in 200 fathoms off Beachport.

The recurved short canal distinguishes it from *T. plicilaminatus*.

Mitra arnoldi, n. sp. Pl. xxiv., fig. 6.

Shell solid, elongate-oval, of 7 whorls, including a blunt brown protoconch of 2 convex smooth whorls. Spire-whorls convex in the upper half, nearly straight in the lower. Suture distinct, very narrowly tabulate. Base moderately roundly contracted. Aperture elongate-oval. Outer lip simple, thin, profile slightly sinuous, with numerous spiral plicæ in the throat. Columella nearly straight, slightly cut away to the left in front, with four stout oblique plaits; notch with a narrow reflected edge. Wide, round, low axial ribs, much wider than the interspaces, thirteen in the penultimate, undulating the suture, vanishing on the base of the body-whorl and towards the aperture. Articulated with infrasutural large irregular blackish-brown blotches, about nine in the body-whorl; and with two similar approximate spiral rows, the upper the larger, winding round the base from the back of the aperture, below which are dark maculations. A spiral of close-set axial, narrow, brown hair-lines covers the lower third of each spire-whorl, and runs between the two rows of larger articulations on the body-whorl.

Dim.—Length, 12 mm.; body-whorl, 6·25 mm.; width, 5 mm.

Locality.—Type, beach Petrel Bay, St. Francis Island, many; MacDonnell Day, rare.

It is named after Master Francis Arnold, of St. Francis Island, who was of great help to me when collecting on that island, made historic by the visits of Matthew Flinders and Mons. Baudin.

Mitra bellapicta, n. sp. Pl. xxv., fig. 1.

Shell elongate-oval, of 7 whorls, including a blunt protoconch of 2 smooth, convex whorls. Spire-whorls convex, fullest just below the middle. Sutures linear, impressed. Base roundly contracted. Aperture obliquely narrowly oval. Canal wide, very short, slightly recurved, scarcely notched. Columellar plaits four, strong, the lowest very small. Outer lip thin and simple. Axial costæ, twelve in the penultimate, six in the body-whorl, vanishing towards the base and towards the aperture; three spiral cords wind over the dorsum of the base, above, and smaller than the columellar plaits.

Colour pinkish-brown. The spire-whorls have a white band just below the middle, bounded above and below by a line of opaque-white spots, and outside this by a fine broken brown hair-line. There is a row of small brown spots below the suture. In the body-whorl is also an articulated spiral of closely-set, axially-curved white and brown spots, commencing just within the back of the aperture. Obscure white and brown maculations tint the front of the base.

Dim.—Length, 9·6 mm.; body-whorl, 5·5 mm.; width, 5·1 mm.

Locality.—Type from 40 fathoms off Beachport, with 12 others in moderate condition.

This may be a variety of *M. vincta*, A. Adams *(volutomitra)*, close to *M. weldii*, Tenison-Woods.

Mitra retrocurvata, n. sp. Pl. xxiv., figs. 4 and 5.

Shell fusiform, of 8 whorls, including a prominent protoconch of 2 smooth, well-rounded whorls, with a blunt apex. Spire-whorls convex, with deeply-impressed sutures. Body-whorl large, roundly contracted at the base into a snout, well curved dorsally and to the left. Aperture oblong-elliptical, opening gradually into an open canal with a wide, shallow notch. Outer lip thin and simple. Inner lip a complete very thin applied glaze. Columella very long and convexly curved, with four oblique plaits, the highest rather distant. Valid axial ribs, from suture to suture, twenty-one in the body-whorl, concave forwards, trigonal, with widely-sloping sides, vanishing rapidly below the periphery of the body-whorl. Under the microscope a few obsolete narrow spirals are detectible. Over the base are sixteen oblique spirals, issuing from beneath the inner lip, most valid in front and gradually vanishing upwards; among them are the larger columella plaits. The accremental striæ are fine, most marked on the back of the canal, where they validly cross the oblique spirals. Colour yellow-brown, with a white central broad band divided by a narrow colour band; the base is indistinctly axially flamed with white.

Dim.—Length, 16·5 mm.; body-whorl, 10·75 mm.; width, 6·25 mm.

Locality.—Type from 110 fathoms off Beachport, with 7 others; in 150 fathoms, 4 moderate.

The special character is the arched canal. In some of the cotypes the axial ribs fade out on the third whorl, and in others on the fourth.

Olivella (?) adiorygma, n. sp. Pl. xxv., figs. 3 and 4.

Shell small, solid, obliquely elongate-oval, smooth and white: apex blunt; whorls four, sloping convex. Suture linear, not canaliculate. Aperture oval, narrowed behind, widely open in front, notched; outer lip ascending at the suture, simple, bevelled inside; inner lip a glaze over the columella, which has no plaits.

Dim.—Length, 5·2 mm.; of body-whorl, 3·35 mm.; width, 2·3 mm.

Locality.—Type from Backstairs Passage, 17 fathoms, with 1 other specimen; Gulf St. Vincent, depth unrecorded, 2, all dead.

Diagnosis.—It differs from *Olivella* in the absence of a canaliculate suture, and from the Volutidæ in its smooth columella. Its generic location is not known to me.

Olivella solidula, n. sp. Pl. xxv., figs. 7 and 8.

Shell small, solid, shining-white, smooth, obliquely elongate-oval. Apex blunt, four whorls, sloping convex, suture well channelled. Aperture oval, contracting gradually to a linear gutter posteriorly, widely open in front, and notched; outer lip simple, smooth; inner lip is a narrow, thick glaze over the base to the suture, slightly spreading over the columella.

Dim.—Length, 6 mm.; of body-whorl, 4 mm.; width, 2·3 mm.

Locality.—**Type from 55 fathoms off Cape Borda, with 1 other; Backstairs Passage,** 22 fathoms, 3 specimens: Gulf **St. Vincent, (?) depth,** 3, none alive; Venus Bay beach, 1.

Diagnosis.—It differs from *O. triticea*, Duclos, in having fewer whorls, being more solid, not so contracted anteriorly, and in not having a wide callus winding from the inner lip over the front of the dorsum; from *O. exquisita*, Angas, which it closely resembles, in being smaller, narrower, and pure-white.

Ancilla beachportensis, n. sp. Pl. xxiv., fig. 9.

Shell solid, oval, of 4 whorls. Apex markedly papillate. Spire completely covered with callus, almost obliterating the sutures, which are indicated by shallow furrows, between which over each whorl are some three low, broad spiral ridges. Aperture triangularly-oval, narrow behind, widely open in front, truncated, and widely notched. Outer lip simple, thin, with a callous thickening in its upper sixth, and with a tooth near its anterior end. Inner lip a thick callus, extending beyond the aperture, and up over the spire, where it recedes in steps just above each sutural groove. Columella nearly straight, truncate, with six oblique curved plaits in front. The body-whorl has two approximate grooves, winding round its base from above the middle of the aperture, the upper one to the labral tooth, the lower to just above the notch; a third lies above a band of callus extending from just above the columellar plaits to the left pillar of the notch; another groove bounds, at its lower edge, the spiral callus which spreads down from the suture and thickens the back of the outer lip. The body-whorl between these grooves has sublenticular axial and spiral scratchings, and has a faint-bluish-grey tint, whereas the callus is milk-white.

Dim.—Length, 20·5 mm.; of the aperture, 12 mm.; width, 9·5 mm.

Locality.—Type from 110 fathoms off Beachport, with 9 others.

Philippiella rubra, Hedley.

Philippiella rubra, Hedley, Proc. Linn. Soc., New South Wales, 1904, part 1, p. 207, pl. x., figs. 44 to 47. *Type locality*—"Eagle Hawk Neck, Tasmania," also "Long Bay, New South Wales"; Pritchard and Gatliff, Proc. Roy. Soc., Victoria, 1906, vol. xviii. (N.S.), part 2, p. 69, "7 fathoms, Western Port, etc., Victoria"; May, Proc. Roy. Soc., Tasmania, 1908, p. 55.

MacDonnell Bay, shell-sand (Dr. Torr).

EXPLANATION OF PLATES.

Plate XX.

Fig. 1. *Philine beachportensis*, Verco, dorsal view.
,, 2. ,, ,, ,, ventral view.
,, 3. ,, ,, ,, posterior end.
,, 4. *Aglaja troubridgensis*, Verco, interior.
,, 5. ,, ,, ,, exterior.
,, 6. *Cyclostrema jaffaensis*, Verco.
,, 7. ,, ,, ,,
,, 8. *Philine evoluta*, Verco, exterior.
,, 9. ,, ,, ,, interior.
,, 10. *Eunaticina albosutura*, Verco.
,, 11. ,, ,, ,,

Plate XXI.

Fig. 1. *Typhis bivaricata*, Verco, protoconch.
,, 2. ,, ,, ,, dorsum.
,, 3. *Trophon latior*, Verco.
,, 4. ,, ,, ,, protoconch.
,, 5. ,, *longior*, Verco, protoconch.
,, 6. ,, ,, ,,
,, 7. *Voluta fulgetrum*, Sowerby, var. *dictua*, Verco.
,, 8. *Donovania fenestrata*, Tate and May.
,, 9. ,, ,, ,, ,, ,, protoconch.
,, 10. *Cominella torri*, Verco.
,, 11. ,, ,, ,,

Plate XXII.

Fig. 1. *Triphora epallaxa*, Verco.
,, 2. ,, *spina*, Verco.
,, 3. ,, ,, ,, mouth.
,, 4. ,, ,, ,, protoconch.
,, 5. ,, *armillata*, Verco.
,, 6. ,, *dexia*, Verco.
,, 7. ,, ,, ,, protoconch.
,, 8. ,, ,, ,, mouth.
,, 9. ,, ,, ,, mouth.
,, 10. ,, ,, ,, mouth.

Plate XXIII.

Fig. 1. *Triphora spica*, Verco.
,, 2. ,, *cana*, Verco.
,, 3. ,, ,, ,, protoconch.
,, 4. ,, ,, ,, mouth.
,, 5. ,, *subula*, Verco.
,, 6. ,, ,, ,, protoconch.
,, 7. ,, *gemmegens*, Verco.
,, 8. ,, ,, ,, protoconch.

Plate XXIV.

Fig. 1. *Trophon plicilaminatus*, Verco.
,, 2. ,, ,, ,,
,, 3. ,, *segmentatus*, Verco.
,, 4. *Mitra retrocurvata*, Verco.
,, 5. ,, ,, ,,
,, 6. ,, *arnoldi*, Verco.
,, 7. *Trophon recurvatus*, Verco.
,, 8. ,, ,, ,,
,, 9. *Ancilla beachportensis*, Verco.

Plate XXV.

Fig. 1. *Mitra bellapicta*, Verco.
,, 2. *Hemipleurotoma mayi*, Verco.
,, 3. *Olivella* (?) *adiorygma*, Verco.
,, 4. ,, ,, ,,
,, 5. *Daphnella stiphra*, Verco.
,, 6. ,, ,, ,, protoconch.
,, 7. *Olivella solidula*, Verco.
,, 8. ,, ,, ,,

Plate XXVI.

Fig. 1. *Triphora latilirata*, Verco.
,, 2. *Drillia achatina*, Verco.
,, 3. ,, *trophonoides*, Verco.
,, 4. ,, ,, ,, protoconch.
,, 5. ,, *lacteola*, Verco.
,, 6. ,, *hedleyi*, Verco.
,, 7. ,, *jaffaensis*, Verco.
,, 8. ,, ,, ,, protoconch.
,, 9. ,, ,, ,, aperture.

Plate XXVII.

Fig. 1. *Drillia costicapitata*, Verco.
,, 2. ,, ,, ,, protoconch.
,, 3. *Mangilia impendens*, Verco.
,, 4. *Mitromorpha angusta*, Verco.
,, 5. ,, ,, ,, protoconch.
,, 6. *Drillia subplicata*, Verco.
,, 7. ,, *agrestis*, Verco.
,, 8. *Mitromorpha paucilirata*, Verco.
,, 9. ,, ,, ,, protoconch.

Plate XXVIII.

Fig. 1. *Daphnella perplexa*, Verco.
,, 2. ,, ,, ,, protoconch.
,, 3. ,, *bathentoma*, Verco.
,, 4. *Mitromorpha axicostata*, Verco.
,, 5. ,, *paula*, Verco.
,, 6. *Daphnella fenestrata*, Verco.
,, 7. ,, ,, ,, protoconch.
,, 8. ,, *triseriata*, Verco.
,, 9. *Mangilia gatliffi*, Verco.

Plate XXIX.

Fig. 1. *Vanikoro denselaminata*, Verco.
,, 2. ,, ,, ,,
,, 3. ,, ,, ,, protoconch.
,, 4. *Natica sticta*, Verco, young.
,, 5. ,, ,, ,, adult.
,, 6. ,, ,, ,, ,,

ABSTRACT OF PROCEEDINGS

OF THE

Royal Society of South Australia

(Incorporated)

FOR 1908-9.

Ordinary Meeting, November 3, 1908.

The President (J. C. Verco, M.D., F.R.C.S.) in the chair.

Exhibits.—Mr. J. G. O. Tepper, F.L.S., exhibited a piece of jarrah bored by beetles *(Botrychidæ)*, also some crystals of Chiastolite, a variety of Andalusite. Mr. A. H. C. Zietz, F.L.S., a collection of Lampreys *(Petromyzoutidæ)* from South Australia. Among these were *Geotria australis*, Gray, *Mordacia mordax*, and a *Caragola*, this last specimen supposed by Mr. Zietz to be *M. mordax* in an earlier stage of development. It was stated that the ovaries of those found in the rivers were not developed. The Lamprey is found in the Torrens, Onkaparinga, and Glenelg Rivers.

Papers.—"Notes on the Orchids of Kangaroo Island," by R. S. Rogers, M.A., M.D. Dr. Rogers gave a short résumé of his paper, at the same time showing on a plan of Kangaroo Island the route followed by himself and Mrs. Rogers. Referring to the reserve asked for on the Island, he stated that large portions of that part sought to be reserved had been alienated for pastoral and agricultural purposes. "Petrographical Notes on Certain Pre-Cambrian Rocks, with Special Reference to those of Houghton," by W. Noel Benson, B.Sc.

Motion.—Mr. Samuel Dixon proposed and Professor Rennie seconded: "That the Council of the Society be requested to protest against the action taken by the Government in alienating certain portions of the area which the Premier had promised should be reserved on Kangaroo Island for the purposes specified." Carried.

Ordinary Meeting, April 6, 1909.

The President (J. C. Verco, M.D., F.R.C.S.) in the chair.

Exhibits.—Mr. J. G. O. Tepper, F.L.S., exhibited a piece of mallee tunnelled by the larvæ of minute *Ptinidæ* or *Cioidæ* between the bark and wood—both larvæ and perfect insect live on the woody fibre; a *Locusta vigentissima*, McCoy, the largest locust of South Australia; a spectre insect from the South-East, probably the male of *Podacanthus wilkinsoni*, Macleay. Mr. TEPPER also exhibited an *Aphodius howitti*, Hope, a beetle that made its appearance in great numbers in February last at Mount Gambier. This insect is well known in Eastern Australia, but has not before been reported from South Australia. The larvæ and insect live in and feed on manure, as does *A. granarius* and *A. lividus*. These beetles are not injurious. Mr. TEPPER exhibited a large fungus from a *Eucalyptus* and the insects (*Necrobia rufipes*) which destroy it. THE PRESIDENT (Dr. Verco) exhibited specimens of travertine, deeply grooved, from St. Francis Island, Nuyt Archipelago. The grooves or scratchings are said by the islanders to be produced by penguins, numbers of which birds are found there, running up the face of the rock. Mr. HOWCHIN stated that these grooves, which he pointed out had a radial tendency, are very commonly found in limestone rocks, and are caused by the slightly acidulated rainwater running down their sloping faces. A specimen thus scored was shown by Mr. HOWCHIN that had been brought from Flinders Ranges. A piece of shelly limestone from Denial Bay, sent to Mr. HOWCHIN by Dr. ABBOTT, was shown. This, Mr. HOWCHIN considered, had been consolidated above sea-level, but was now, he stated, dredged up from the sea-bottom. This would seem to indicate oscillations in the land-levels.

PATRON.—It was proposed by THE PRESIDENT and seconded by Mr. RUTT "that His Excellency Sir DAY HORT BOSANQUET be requested to become Patron of the Society." Carried.

PAPERS.—"Scattering of the Beta Rays of Radium," by J. P. V. MADSEN, D.Sc. "Synopsis of the Fishes of South Australia," Part III., by A. H. C. ZIETZ, F.L.S., C.M.Z.S.

ORDINARY MEETING, MAY 4, 1909.

THE PRESIDENT (J. C. Verco, M.D., F.R.C.S.) in the chair.

NOMINATIONS.—Charles F. Johncock, teacher, Orroroo, as a Corresponding Member; Edgar J. Bradley, civil engineer, as a Fellow.

EXHIBITS.—Mr. J. G. O. TEPPER, F.L.S., exhibited a parasitic plant from the lower Coorong, belonging to the Order *Convolvulaceæ*, new to South Australia. This plant is found growing on a small bush, is leafless, and is named *Cuscuta tasmanica*, found, as the name would seem to indicate, in Tasmania, but so far not known in Victoria. Mr. TEPPER also showed the eggs of a *Phasma*. Mr. A. H. C. ZIETZ, F.L.S., C.M.Z.S., exhibited four species of mullet—*Mugil peronii*, *M. dobulus*, *Agonostoma diemanensis*, and *Myxus elongatus*. The first of these, the jumping or flat-tailed mullet, is found in estuarine waters, and is sometimes mistaken for *M. dobulus* or sea mullet, which has not been found on the South Australian coast. The fresh-water mullet is found in Lake Alexandrina and the lower Murray. A mullet is also found in the Patawalonga Creek. THE PRESIDENT (Dr. Verco) exhibited a young mutton bird *(Nectris brevicaudus)* from the West Coast, and a bottle of oil taken from several of these young birds. The oil, which is of a bright-pink colour, had been strained through muslin. The young bird, after being fed by the parent birds, is distended into a globular shape. Dr. VERCO estimated that an ounce and a half of oil could be obtained from each chick. The crop of a mature bird was found to contain bits of seaweed and broken pieces of the carapaces of crustaceans; to the latter he was disposed to attribute the colour of the oil.

LIBRARY.—THE PRESIDENT called the attention of members to the notice on the agenda-card requesting that all library books might be sent in.

PAPERS.—"Further Notes on Australian Coleoptera, with Descriptions of New Genera and Species," No. xxxix., by the Rev. Canon BLACKBURN, B.A.: "Description of Australian Curculionidæ," etc., by A. M. LEA, Government Entomologist, Tasmania: "Analysis of Mount Gambier Basalt, with Petrographical Descriptions," by EVAN R. STANLEY, communicated by W. HOWCHIN, F.G.S. Mr. STANLEY, having been introduced by Mr. HOWCHIN, by the consent of the meeting, read his paper and exhibited rock specimens.

ORDINARY MEETING, JUNE 1, 1909.

THE PRESIDENT (J. C. Verco, M.D., F.R.C.S.) in the chair.

BALLOT.—Charles F. Johncock, teacher, Orroroo, was unanimously elected a Corresponding Member, and Edgar J. Bradley, civil engineer, a Fellow.

EXHIBITS.—Dr. VERCO exhibited the head of a penguin, and showed the peculiar structure of the tongue and beak. The tongue and palate are covered with barbs pointing backwards. These barbs, conjointly with longitudinal grooves along the edges of the beak, enable the penguin to firmly grip the fish it preys. Dr. PULLEINE exhibited the nest of a trap-door spider found at Myponga. This spider, in addition to the usual entrance door, has another movable door so little distance down the hole. The second door, which i formed of a lump of clay, is secured to the side of the nest by a web lining, and when open is drawn back into a recess in the side. Diagrams upon the blackboard were drawn by THE PRESIDENT and Dr. PULLEINE, illustrating other kinds of spider nests which showed various devices for excluding the natural enemies of the spider. Dr. ROGERS, Dr. PULLEINE, and Professor RENNIE testified to the dangerous nature of bites by some spiders.

PAPERS.—"Notes on South Australian Marine Mollusca, with Descriptions of New Species," Part x., by J. C. VERCO, M.D. Dr. VERCO selected from his paper some interesting details of the habits and structures of certain molluscs which he illustrated by shells and drawings of shells. Among the former were two specimens of the carrier *(Xenophorus)*, with their load of rock and shell fragments firmly embedded in the tests. Volutes, Trophons, a Doridium, etc., were also exhibited by Dr. VERCO. "A Critical Review of South Australian Prasophylla, together with a Description of Some New Species," by R. S. ROGERS, M.A., M.D.

ORDINARY MEETING, JULY 6, 1909.

THE PRESIDENT (J. C. Verco, M.D., F.R.C.S.) in the chair.

EXHIBITS.—Professor R. W. CHAPMAN exhibited a washer which had been bent, and which in the bending had developed a remarkable series of geometrical lines, known as "Luder's lines," on its surface; also steel bars, which had been subjected to a severe longitudinal strain. He showed the effect of a small hole drilled in such a bar when subjected to tension. Mr. D. MAWSON, B.Sc., B.E., tabled specimens obtained during the Antarctic Expedition—a form of lava from Mount Erebus; kenite, a mineral which is found only in one other part of the word, at Mount Kenia, in Central Africa; ice-polished pebbles; red fungus from fresh-water lakes; black and yellow lichens, the only forms of vegetation found on the Antarctic continent. THE PRESIDENT took the opportunity of congratulating Mr. Mawson on his participation in an undertaking which had achieved such important discoveries as Shackleton's British Antarctic Expedition, and on the excellent work which he had been able to accomplish as a member of the party. He assured Mr. Mawson of the pleasure with which all those who were present greeted him on his safe return.

PAPERS.—"Note on a Remarkable Growth of Coral in Gulf St. Vincent," by W. HOWCHIN, F.G.S. Mr. HOWCHIN showed samples of the coral which was found during the preparation for the breakwater at Glenelg, and was by far the largest mass of coral hitherto discovered in our waters. He referred the corallum to *Plesiastræa urvillei*. "Description of an Old Lake Area in Pekina Creek, and its Relation to Recent Geological Changes," by W. Howchin, F.G.S. Mr. Howchin exhibited samples of the lacustrine deposits from Pekina Creek, including bands of fresh-water limestone entirely composed of the matted stems of *Chara*.

Ordinary Meeting, August 3, 1909.

The President (J. C. Verco, M.D., F.R.C.S.) in the chair.

Mr. Selway, referring to the Minutes, called the attention of the meeting to a report in the daily Press of coral having been found at another part of the Gulf than that mentioned in Mr. Howchin's paper. Mr. Howchin stated that probably the rock there alluded to was not coral, but a mass of serpula, and showed from a letter received from Captain Weir, who discovered the rock, that none of it had been brought to the surface. Its position is opposite Port Parham, about five miles out.

Papers.—"Descriptions of *Micrantheum demissum*, F. von M., and of New Species of *Solanum Pultenæa* and *Grevillea*," by J. McC. Black. "Note on *Cordylophora* and its Occurrence in South Australia," by W. B. Poole:—"It belonged to the Order *Hydromedusa*, Family *Clavidæ*, Allman. Allman in his 'Monograph on the Hydrozoa' (Ray Society) established a new genus for this hydroid, as its form of life was exceptional, being found in fresh-water. *Description.*—Stem well developed, branching, rooted by a filiform stolon; the whole of the cœnos are invested by a chitinous polypary; polypites fusiform, developed from the extremities of the branches, with scattered filiform tentacula; reproduction sporosacs, borne on the stem, never on the polypites (Huicks). *Cordylophora* was first found in the Grand Canal, Dublin, in 1844: since then in the London Docks, several localities in Europe, and at Newport Harbour, U.S.A. Descriptions of these from the above localities have been published. All the descriptions harmonize and agree in the main with *Cordylophora lacustris* of Allman. In Australia, Lendenfeld (Trans. Linn. Soc., of New South Wales, 1884) says representatives of this group are known to occur in Australia. In 1885 T. Whitelegge (Trans. Linn. Soc., of New South Wales, 1885) exhibited specimens from the Parramatta River, and Von Lendenfeld thought it might be a new species. I have heard that years ago a specimen was taken from a pond in the Botanical Gardens, Melbourne, near the Yarra. This pond has been filled up, and there appears to be no record of its having been found since. In South Australia *Cordylophora* is plentiful. I have taken it from the Patawalonga Creek in both brackish-water and fresh-water; Lake Alexandrina; the Murray, at Murray Bridge; Mannum; and the Hope Valley Reservoir." Mr. Baker stated that he had found this hydroid in saturated saline ponds in the Patawalonga Creek.

Ordinary Meeting, September 7, 1909.

The President (J. C. Verco, M.D., F.R.C.S.) in the chair.

Exhibits.—Mr. J. G. O. Tepper, F.L.S., the branch of an artistically-dwarfed plant brought from Japan; Mr. D. Mawson, B.Sc., B.E., a new mineral from the Central Mine, Broken Hill, consisting of zinc-blende and galena; a number of pebbles from gem-bearing gravels, Williamstown. The gold associated with these gems had been removed. What remained was mostly rutile (an oxide of titanium). Other gems found in these gravels are beryl, topaz, corundum, tourmaline, kyanite, etc.

Papers.—"Notes on South Australian Marine Mollusca, with Descriptions of New Species," Part xi., by J. C. Verco, M.D. "Notes on the Gem-bearing Gravels of Barossa," by Douglas Mawson, B.Sc., B.E.

The Annual Meeting, October 5, 1909.

The President (J. C. Verco, M.D., F.R.C.S.) in the chair.

The annual report and balance-sheet were read and confirmed.

Election of Officers.—J. C. Verco, M.D., F.R.C.S., was unanimously elected President: Professor E. H. Rennie, M.A., D.Sc., F.C.S., and W. Rutt, C.E., Vice-Presidents; W. B. Poole, Hon. Treasurer; R. H. Pulleine, M.B., B.S., Hon. Secretary; J. S. Lloyd and Howard Whitbread, Auditors; Rev. Canon Blackburn, Edwin Ashby, and G. G. Mayo, Members of Council. The retiring Treasurer (Walter Rutt, C.E.), who had held the office for twenty-five years, received a hearty vote of thanks. The retiring Secretary was also thanked.

Exhibits.—Mr. W. Howchin, F.G.S., exhibited photographs of the extinct lake area in Pekina Creek and also a panoramic view of the lake deposits a mile lower down the creek than the area previously described, and in relation to which it is a new locality, or an extension of the old lake deposits; also calcified remains of *Chara* in large matted masses, forming limestone blocks, and consisting chiefly of stems and spore cases of this fresh-water plant. The bed was consolidated by calcium carbonate carried in solution by water from a limestone spring in the neighbourhood, and flowing through a forest of *Chara*. One specimen also showed calcified confervæ scum. A large obsidianite was also exhibited by Mr. Howchin from Kangaroo Island. Mr. Howchin considers the origin of these obsidianites to be not volcanic but meteoric, and explains their characteristic form as produced by the pressure exerted on a plastic mass in passing through air. Chemically, obsidianites are allied to the felspars. They are very widely distributed in Australia, and are sometimes found many feet below the surface. The aborigines are often found with obsidianites in their possession, which they use as charms and sometimes chip them into the form of scrapers. Mr. W. B. Poole exhibited large teeth found at Shoreham, Philip Island, Victoria; probably dugong teeth *(Halicornis australis)*. Dr. Rogers exhibited *Thelymitra epipactoides*, F. von M., new to South Australia; Dr. Verco some mutton bird oil, and commented on its colour. This gave rise to a discussion on the colour of the flesh of animals as influenced by their diet.

Papers.—"Basic Rocks of Blinman, S.A., with Notes on Associated or Allied Rocks," by W. Noel Benson, B.Sc.; "Description of *Thelymitra epipactoides*, F. von M., new to South Australia," by R. S. Rogers, M.A., M.D.; "Notes on South Australian Marine Mollusca, with Descriptions of New Species," Part xii., by J. C. Verco, M.D., F.R.C.S.

ANNUAL REPORT, 1908-9.

The Council has pleasure in reporting that the work of the Society has been carried on successfully during the past year.

His Excellency Sir Day Hort Bosanquet, K.C.B., G.C.V.O., has been pleased to accept the position of patron of the Society.

Mr. W. Howchin, F.G.S., was re-elected to represent the Society on the Board of Governors of the Public Library, etc.

Library.—Towards the end of last year the President urged the Superintendent of Public Buildings to place shelving in our rooms similar to that which the Government had erected for the reception of the York Gate Library. The work was put in hand, and has since been carried out in a thoroughly satisfactory manner.

In March last a Binding Committee consisting of the President, the Editor, and Professor Rennie was appointed to select books for binding and to call for tenders. Subsequently a contract was accepted, and the work of binding will now proceed continuously. All books have been called in so that the library may be arranged and classified. For the carrying out of this work the services of Mr. T. W. Idle have been secured. Mr. Idle, who has had large experience in the arrangement of books and cataloguing in England and America, has been temporarily placed in charge of the library, and Mr. Clucas, the Librarian of the Adelaide University, has undertaken to continue indexing the Society's publications as they appear.

Mr. C. F. Johncock, of Orroroo, and Mr. Herbert Basedow, now in Germany, who have at various times contributed valuable papers to the Transactions, have been elected Corresponding Members.

Mr. Douglas Mawson, B.Sc., B.E., Lecturer on Mineralogy and Petrology, University of Adelaide, who accompanied Lieutenant Shackleton on his hazardous expedition to Antarctica in the capacity of scientific observer, was on his return warmly welcomed by the President and members.

Membership.—Fellows, 63; Corresponding Members, 7; Hon. Fellows, 9; Associate, 1.

Obituary.—Stirling Smeaton, B.A., for many years in the Engineering Department of the Civil Service, died during the past year after a long illness. Mr. Smeaton, like his father, the late Thos. D. Smeaton, was deeply interested in natural science, and was at various times Chairman of Sections and President of the Photographic Society.

Mr. W. J. Vandenbergh, barrister and solicitor, a Fellow of the Society, died in New Zealand in May, 1909.

Jos. C. Verco, *President.*
G. G. Mayo, *Hon. Secretary.*

October 5, 1909.

ROYAL SOCIETY OF SOUTH AUSTRALIA (INCORPORATED).

Revenue and Expenditure for 1908-9.

Dr.	£ s. d.	£ s. d.
To Balance, Oct. 1, 1908		487 5 9
,, Subscriptions—		
Royal Society	76 13 0	
Field Naturalists' Section ...	21 15 0	
Malacological Section ...	2 10 0	
		100 18 0
,, Grants from Government—		
On Subscriptions	78 19 8	
For Printing Reports on Scientific Investigations in South Australia	150 0 0	
		228 19 8
,, Sale of Transactions		0 18 0
,, Interest—		
On S.A. Government Stock (Endowment Fund) ...	75 0 0	
Savings Bank	8 2 6	
		83 2 6
,, Donation Towards Illustrating Transactions		20 0 0
		£921 3 11

Cr.	£ s. d.	£ s. d.
By Transactions—		
Printing	107 3 5	
Illustrating	63 0 7	
Publishing	9 13 8	
		179 17 8
,, Memoirs—Illustrating		79 7 9
,, Grants—		
Field Naturalists Section ...	20 0 0	
Malacological Section ...	3 0 0	
		23 0 0
,, Library—		
Cataloguing, etc.	28 13 2	
Carriage of Books	0 16 10	
Binding	1 15 0	
Shelving	52 5 6	
		83 10 6
,, Caretaking and Lighting ...		11 5 6
,, Printing, Postage, and Stationery		9 9 1
,, Advertising		3 5 6
,, Labour, Removing		0 11 0
,, Exchange on Cheques		0 2 3
,, Bank Accounting Charge ...		0 10 0
,, Transferred to Endowment Fund		5 0 0
,, Balance, Sept. 30, 1909 ...		525 4 8
		£921 3 11

Examined and found correct—

J. S. Lloyd, F.I.A.S.A., \
Howard Whitbread, } Auditors.

Walter Rutt, Treasurer.

October 4, 1909.

ENDOWMENT FUND.

Dr.	£	s.	d.
To Donations as per Statement, Sept. 30, 1908	2,000	10	0
,, Donations Transferred from Current Account	5	0	0
,, Donation Received, 1908-9	0	10	0
	£2,006	0	0

Cr.	£	s.	d.	£	s.	d.
By £2,000, S.A. $3\frac{3}{4}$ per cent. Inscribed Stock at par (Certificates with Secretary) ...	2,000	0	0			
Less Commission Returned ...	2	10	0			
				1,997	10	0
,, Balance				8	10	0
				£2,006	0	0

Examined and found correct—
J. S. Lloyd, F.I.A.S.A., }
Howard Whitbread, } Auditors.

Walter Rutt, Treasurer.

October 4, 1909.

SUMMARY OF BALANCES.

	£	s.	d.
Revenue and Expenditure Account	525	4	8
Endowment Fund	8	10	0
	£533	14	8

	£	s.	d.	£	s.	d.
In Bank of Australasia	245	14	9			
Less Outstanding Cheque No. 30 ...	1	12	0			
				244	2	9
In Savings Bank				265	14	11
In Treasurer's Hands				23	17	0
				£533	14	8

Examined and found correct—
J. S. Lloyd, F.I.A.S.A., }
Howard Whitbread, } Auditors.

Walter Rutt, Treasurer.

October 4, 1909.

DONATIONS TO THE LIBRARY

For the Year 1908-09.

TRANSACTIONS, JOURNALS, REPORTS, ETC.

Presented by the respective Editors, Societies, and Governments.

AUSTRALIA.

Australasian Association for the Advancement of Science. Report. Eleventh meeting, Adelaide, 1907. Adelaide, 1908.

Royal Anthropological Society of Australasia. Journal: The Science of Man. Vol. x., Nos. 6-12; vol. xi., Nos. 1-5. Sydney, 1908-09.

NEW SOUTH WALES.

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LIST OF FELLOWS, MEMBERS,

ETC.,

OCTOBER, 1909.

Those marked with an asterisk have contributed papers published in the Society's Transactions.

Any change in address should be notified to the Secretary.

Date of Election

HONORARY FELLOWS.

1893. *COSSMAN, M., Rue de Maubeuge, 95, Paris.
1897. *DAVID, T. W. EDGEWORTH, B.A., F.R.S., F.G.S., Prof. Geol., Sydney University.
1890. *ETHERIDGE, ROBERT, Director of the Australian Museum of New South Wales, Sydney.
1905. GILL, THOMAS, I.S.O., Under-Treasurer, Adelaide.
1905. *HEDLEY, CHAS. H., Naturalist, Australian Museum, Sydney.
1892. *MAIDEN, J. H., F.L.S., F.C.S., Director Botanic Gardens, Sydney, New South Wales.
1898. *MEYRICK, E. T., B.A., F.R.S., F.Z.S., Thornhanger, Marlborough, Wilts, England.
1894. *WILSON, J. T., M.D., Prof. of Anatomy, Sydney University.

CORRESPONDING MEMBERS.

1881. BAILEY, F. M., F.L.S., Colonial Botanist, Brisbane, Queensland.
1907. *BASEDOW, HERBERT, Breslau University, Germany. (Fellow from 1901.)
1880. *FOELSCHE, PAUL, Inspector of Police, Palmerston, N.T.
1909. *JOHNCOCK, C. F., Orroroo.
1893. STRETTON, W. G., Palmerston, N.T.
1905. THOMSON, G. M., F.L.S., F.C.S., Dunedin, New Zealand.
1908. *WOOLNOUGH, WALTER GEORGE, D.Sc., F.G.S., Lecturer on Geology in the University of Sydney. (Fellow from 1902.)

FELLOWS.

1895. *ASHBY, EDWIN, Royal Exchange, Adelaide.
1902. *BAKER, W. H., F.L.S., Glen Osmond Road, Parkside.
1908. *BENSON, W. NOEL, B.Sc., University of Adelaide.
1907. *BLACK, J. MCCONNELL, Alfred Street, Norwood.
1887. *BLACKBURN, Rev. Canon THOMAS, B.A., Woodville.
1909. BRADLEY, EDGAR J., Civil Engineer, Adelaide.
1886. *BRAGG, W. H., M.A., F.R.S., Prof. of Physics, University of Leeds, England.
1883. BROWN, H. Y. L., F.G.S., Gov. Geologist, Adelaide.
1893. BRUMMITT, ROBERT, M.R.C.S., Gilberton.
1904. BRUNKSKILL, GEORGE, Semaphore, S.A.
1906. BUNDEY, MISS ELLEN MILNE, 148, Molesworth Street, North Adelaide.
1907. *CHAPMAN, R. W., M.A., B.C.E., Prof. of Engineering, University, Adelaide.

1879. *CLELAND, W. L., M.B., Ch.M., J.P., Colonial Surgeon, Resident Medical Officer Parkside Lunatic Asylum, Lecturer in Materia Medica, University of Adelaide.
1895. CLELAND, JOHN B., M.D., Perth, Western Australia.
1907. *COOKE, T. W., D.Sc., Lecturer, University, Adelaide.
1907. DARLING, JOHN, Kent Terrace, Norwood.
1887. *DIXON, SAMUEL, Bath Street, New Glenelg.
1902. EDQUIST, A. G., Hindmarsh.
1904. GORDON, DAVID, Gawler Place, Adelaide.
1880. *GOYDER, GEORGE, A.M., F.C.S., Analyst and Assayer, Adelaide.
1896. GREENWAY, THOS. J., Adelaide.
1904. GRIFFITH, H., Hurtle Square, Adelaide.
1896. HAWKER, E. W., F.C.S., Calcanina, Clare (Gladstone Chambers, Pirie Street, Adelaide).
1899. *HIGGIN, A. J., F.I.C., Assistant Lecturer on Chemistry, School of Mines, Adelaide.
1891. *HOLTZE, MAURICE, F.L.S., Director Botanic Gardens, Adelaide.
1883. *HOWCHIN, WALTER, F.G.S., Lecturer in Geology and Palæontology, University, Adelaide.
1902. ILIFFE, JAS. DRINKWATER, B.Sc., Prince Alfred College, Kent Town.
1893. JAMES, THOMAS, M.R.C.S., Moonta.
1897. *LEA, A. M., Gov. Entomologist, Hobart, Tasmania.
1884. LENDON, A. A., M.D. (Lond.), M.R.C.S., Lecturer on Forensic Medicine and on Chemical Medicine, University, Adelaide, and Hon. Physician, Children's Hospital, North Adelaide.
1856. LLOYD, J. S., Alma Chambers, Adelaide.
1888. *LOWER, OSWALD B., F.E.S. (Lond.), Broken Hill, New South Wales.
1908. *MADSEN, J. P. V., D.Sc., B.A., Lecturer, University of Sydney, New South Wales.
1905. *MAWSON, DOUGLAS, B.Sc., B.E., Lecturer in Mineralogy and Petrology, University, Adelaide.
1874. MAYO, GEO. G., C.E., 116, Franklin Street, Adelaide.
1907. MELROSE, ROBERT THOMSON, Mount Pleasant.
1897. *MORGAN, A. M., M.B., Ch.B., Angas Street, Adelaide.
1907. MUECKE, HUGO, C.E., Grenfell Street, Adelaide.
1884. MUNTON, H. S., North Terrace, Adelaide.
1886. POOLE, W. B. (Hon. Treasurer), Savings Bank, Adelaide.
1908. POPE, WILLIAM, Solicitor, Adelaide.
1907. PULLEINE, R. H., M.B. (Hon. Secretary), North Terrace, Adelaide.
1907. PURDUE, R. F., Mining Agent, Launceston, Tasmania.
1885. *RENNIE, EDWARD H., M.A., D.Sc. (Lond.), F.C.S., Professor of Chemistry, University of Adelaide.
1905. *ROGERS, R. S., M.A., M.D., Flinders Street, Adelaide.
1869. *RUTT, WALTER, Chief Assistant Engineer, Adelaide.
1891. SELWAY, W. H., Treasury, Adelaide.
1893. SIMSON, AUGUSTUS, Launceston, Tasmania.
1871. SMITH, ROBERT BARR, Adelaide.
1881. *STIRLING, EDWARD C., C.M.G., M.A., M.D., F.R.S., F.R.C.S., Professor of Physiology, University of Adelaide, Director of S.A. Museum.
1906. SNOW, F. H., Mutual Chambers, Adelaide.
1907. SWEETAPPLE, H. A., M.D., Park Terrace, Parkside.

1904. TAYLOR, WILLIAM, St. Andrews, North Adelaide.
1886. *TEPPER, J. G. O., F.L.S., Entomologist, S.A. Museum. (Corresponding Member since 1878.)
1897. *TORR, W. G., LL.D., M.A., B.C.L., Brighton, South Australia.
1894. *TURNER, A. JEFFERIS, M.D., Wickham Terrace, Brisbane, Queensland.
1889. VARDON, SENATOR JOSEPH, J.P., Gresham Street, Adelaide.
1878. *VERCO, JOSEPH C., M.D., F.R.C.S., Lecturer on the Principles and Practice of Medicine and Therapeutics, University of Adelaide.
1883. WAINWRIGHT, E. H., B.Sc. (Lond.), McLaren Vale.
1878. WARE, W.L., J.P., Adelaide.
1859. WAY, RIGHT HON. SIR SAMUEL JAMES, Bart., P.C., D.C.L., Chief Justice and Lieutenant-Governor of South Australia, Adelaide.
1907. WEBB, NOEL A., Barrister, Waymouth Street, Adelaide.
1904. WHITBREAD, HOWARD, Currie Street, Adelaide.
1886. *ZIETZ, A. H. C., F.L.S., C.M.Z.S., Assistant Director South Australian Museum, Adelaide.

ASSOCIATE.

1904 ROBINSON, MRS. H. R., "Las Conchas," Largs Bay, South Australia.

APPENDICES.

FIELD NATURALISTS' SECTION

OF THE

Royal Society of South Australia (Incorporated).

TWENTY-SIXTH ANNUAL REPORT OF THE COMMITTEE

For the Year Ended September 21, 1909.

ANNUAL MEETING.

At the annual meeting on September 22, 1908, the following officers were elected for the year:—*Chairman*, Mr. W. H. Selway; *Vice-Chairmen*, Mr. J. M. Black and Dr. R. Pulleine; *Hon. Secretary*, Mr. E. H. Lock; *Hon. Treasurer*, Mr. S. S. Stokes; *Minute Secretary*, Miss E. Hocking; *Committee*—Mrs. J. F. Mellor, Mrs. R. S. Rogers, Dr. R. S. Rogers, and Messrs. J. G. O. Tepper, F.L.S., A. R. Errey, M. S. Clark, F. R. Zietz, and J. W. Mellor. Later in the season Mr. Zietz retired from the Committee, and Mr. J. Willmott was elected to the vacancy. *Fauna and Flora Committee*—Dr. R. S. Rogers, Dr. M. R. Smith, and Messrs. E. Ashby, M. S. Clark, S. Dixon, E. H. Lock, J. W. Mellor, A. Zietz, W. H. Selway, J. M. Black, and A. G. Edquist. The retiring Chairman (Mr. J. M. Black) read the annual address, taking as his subject "Botanical Researches in South Australia." The paper was published in full in the daily Press.

Monthly Meetings.

October 20, 1908.—Mr. J. M. Kimber gave an address upon "Shells," dealing particularly with the two classes of Cephalopods and Gastropods.

November 25.—This was the twenty-fifth anniversary of the Section, and was celebrated by holding a reunion of members and friends in the Royal Society's rooms. The Chairman (Mr. W. H. Selway) gave a brief résumé of the history of the Society, which was established by resolution of the Royal Society on September 4, 1883. On the programme which was printed for the occasion appeared the names of ten of the foundation members who were still on the membership roll. During the evening a number of photographs and living exhibits were shown on a screen by means of the episcope.

After the usual summer recess the next monthly meeting was held on April 20, 1909. Mr. F. W. Giles gave an address upon his journeyings over the western end of Kangaroo Island. Mr. Giles exhibited a large number of curiosities he had gathered from out-of-the-way places on the Island.

May 18.—Dr. W. Ramsay Smith gave an interesting lecture on "Some Notes of a Naturalist in the South Seas." He dealt with the life, habits, customs, and physique of the South Sea Islanders, and mentioned many objects of interest from a natural history standpoint.

June 15.—Dr. R. Pulleine gave an address upon "Spiders," illustrating his remarks by a large number of lantern slides. He dealt chiefly with the anatomical structure of the web-spinners and the construction of webs. The trapdoor, hunting, and nest-building spiders were also referred to.

July 30.—Mr. E. R. Stanley gave an instructive and descriptive address upon "Crystals." By means of blackboard drawings and exhibits the lecturer explained the classification and formation of crystals.

August 17.—Mr. W. J. Kimber continued a previous lecture upon "Shells," taking particularly the section of Gastropods, giving much interesting information with specimens to demonstrate his remarks.

The attendance at the evening meetings was well maintained, and the exhibits tabled by members showed that a keen interest in field work is kept up by a number of collectors.

An event of interest during the year was the welcome cablegram forwarded to Mr. Douglas Mawson on his return from the South Pole Shackleton Expedition. Mr. Mawson had been an active member of the Committee for some time and had several journeys with the Section in their field work.

The membership of the Section has steadily increased, and the total now stands at 130.

Excursions.

September 26, 1908, Blackwood; October 20, Belair; October 24, Horsnell Gully; October 28, Summertown;

March 13, 1909, Marine Excursion; May 15 and 22, Glenelg; June 12, Stonyfell; July 24, Botanic Gardens; August 21, Blackwood; September 1, Houghton.

With the exception of the excursion to Glenelg all the engagements for field work were well attended.

In reviewing the work done by the Section during the year it may be fairly claimed that the evening meetings and the field excursions have not only been well attended, but that collectors in the various branches of work have been rewarded for their efforts, and much pleasure gained.

W. H. Selway, Chairman.
E. H. Lock, Hon. Secretary.

TWENTY-FIRST ANNUAL REPORT OF THE NATIVE FAUNA AND FLORA PROTECTION COMMITTEE OF THE FIELD NATURALISTS' SECTION OF THE ROYAL SOCIETY OF SOUTH AUSTRALIA FOR THE YEAR ENDED SEPTEMBER, 1909.

The Kangaroo Island Reserve.

In view of the Commonwealth taking over the lighthouse the Committee anticipates that the promises made by the late Hon. Thomas Price to the deputation on August 7, 1906, will be carried out on the lines of the scheme drawn up at his desire. The necessity arises from the spread of foxes on the mainland of Australia destroying the native birds and the threatened extinction of the indigenous kangaroo of the island. Although nominally protected by law for a great many years, large numbers have been killed and their skins forwarded for sale concealed in bundles of sheepskins. The Proclamation under which they had been protected was renewed at the request of the Committee in October, 1908, but, unfortunately, in excluding the settled portions of the Island a loophole was left for further destruction. In all parts of the civilized world more stringent measures are being taken to protect and save from extinction the native fauna, and certainly posterity will greatly blame this generation if what is left of the animal which gave its name to the Island is the name only. The Committee hopes that some of the present-day politicians will, by dedicating for public use the 300 miles originally asked for, emulate the late Sir John Robertson, who will be remembered in far-distant times as the original dedicator of the magnificent

New South Wales properties—the National Park, south of Sydney, and the Kuringai Chase, south of Broken Bay and the Hawkesbury.

Dangerous Reef, The Pages, and Casuarina Island.

In January last a communication from the Crown Lands Office was received asking the Committee's views regarding a request from the Ornithological Association that Dangerous Reef (near Port Lincoln) and other uninhabited islands should be totally reserved as breeding-grounds for birds, and that persons be forbidden to visit them. The Secretary wrote in reply supporting the request and urging upon the Commissioner the desirability of protecting the birds and seals upon Dangerous Reef and also upon The Pages and Casuarina Island, near the coast of Kangaroo Island. In *The Gazette* of May 9, 1909, these islands were proclaimed bird-protected districts.

There would appear to be no power under existing legislation to extend the protection of seals beyond the terms of the close seasons provided in each year under the Game Act.

A Model Game Bill.

A request from the Australasian Ornithologists' Union having been made to the Government to appoint a representative to join in the discussion of this matter at the annual meeting held in Melbourne, in November last, the Secretary, in response to a communication from the Commissioner of Crown Lands, wrote to him recommending Mr. J. W. Mellor, who subsequently took part in the Conference and made many valuable suggestions.

Reported Destruction of Pelicans.

A paragraph referring to the destruction of a number of pelicans by the vice-regal party on a journey down the Murray during last month having been published in *The Register*, the Secretary caused enquiries to be made, and received a letter from the Private Secretary stating that the paragraph was written more as a joke than as an accurate account, and that it was in consequence not to be taken too literally.

Saml. Dixon, Chairman.

M. S. Clark, Hon. Secretary.

September 21, 1909.

FIELD NATURALISTS' SECTION OF THE ROYAL SOCIETY OF SOUTH AUSTRALIA (INCORPORATED).

Statement of Receipts and Expenditure for the Year ended September 16, 1909.

Dr.	£	s.	d.
September, 1908—Credit Balance	0	8	4
October—Grant from Royal Society	10	0	0
August, 1909—Grant from Royal Society ...	10	0	0
Bank Interest	0	2	8
Subscriptions for 1908-9	22	10	0
	£43	1	0

Cr.	£	s.	d.	£	s.	d.
Stamps				4	10	0
Printing				4	16	0
Envelopes				0	7	0
Subscriptions paid to Royal Society				21	15	0
Twenty-fifth Celebration Expenses				6	3	6
Lecture-room and Lantern				1	7	3
Cable to D. Mawson, B.Sc.				0	5	3
Balance in Savings Bank	2	19	4			
Interest	0	2	8			
				3	2	0
Cash in hand				0	15	0
				£43	1	0

	£	s.	d.
September 16, 1909—Balance in General Account	3	17	0
Balance in Excursion Account	4	3	1
	£8	0	1

Audited and found correct,

J. S. Lloyd
Walter D. Reed } Auditors.

MALACOLOGICAL SECTION

OF THE

Royal Society of South Australia (Incorporated).

ANNUAL REPORT FOR THE YEAR 1908-9.

Nine meetings were held during the past year, at which the average attendance was good. There are now thirteen members on the roll. The work during the past year comprised a revision of the Pleurotomidæ and Marginellidæ. Dr. J. C. Verco recorded from St. Francis Island about 600 species of shells, which he and Dr. Torr collected during a recent visit to the Island. Amongst twenty-four species of Tasmanian mollusca, dredged in 100 fathoms off Cape Pillar, and described by Messrs. Hedley and May, fourteen species have been found to occur also in our waters, and these have been added to the list of South Australian shells. During the year two papers on South Australian mollusca have been contributed to the Royal Society by Dr. J. C. Verco. The three electric table-lamps which were purchased by the Section at the beginning of the year have made a marked improvement in the lighting, as the minute shells which comprised the chief portion of the families revised last year cannot be properly examined without a good light.

Receipts and Expenditure for the Year 1908-9.

Receipts.

	£	s.	d.
To Credit balance	1	1	11
,, Grant from Royal Society	2	0	0
,, Subscriptions	2	10	0
	£5	11	11

Expenditure.

	£	s.	d.
By Postages and Duty Stamp	0	5	10
,, 3 Electric Table-lamps	2	15	0
,, Subscriptions to Royal Society	2	10	0
,, Balance in hand	0	1	1
	£5	11	11

F. R. Zietz, Hon. Sec. and Treas.

MICROSCOPICAL SECTION

OF THE

Royal Society of South Australia (Incorporated).

ANNUAL REPORT FOR THE YEAR 1908-9.

Officers.—Chariman, Mr. W. Fuller; *Vice-Chairman*, Mr. W. B. Poole; *Hon. Secretary*, Mr. H. W. H. Hale; *Committee*, Messrs. D. Gordon and D. Mawson, B.Sc.; *Auditors*, Messrs. A. G. Rendall and H. Whitbread.

Your Committee has to report that the Sixth Session of this Section of the Royal Society has shown continued progress. The attendance at the meetings has been good, with an average of fifteen members, and the natural history contributions have been of varied interest.

On September 29, 1908, the President (Mr. W. Fuller) delivered a presidential address on "Some Recent Additions to our Knowledge of the Structure of the Cell." Some valuable observations were made and much information was afforded of the remarkable developments in the science of Cytology.

During the year we learned with deep regret of the death of Mr. W. P. Dollman, whose exquisite work in photo-micrography and interest in general microscopy made him always a tower of strength to us, while his genial personality endeared him greatly to all members.

A development of the year has been the establishment of an additional meeting per month, which is devoted to practical microscopy.

In March we heard with gratification of the splendid achievements of the British Antarctic Exploration, among whose more distinguished members our committeeman, Mr. D. Mawson, B.Sc., held a place. An enthusiastic telegram was sent to Mr. Mawson on his arrival at Lyttelton, New Zealand, expressing congratulations and delight at his achievements.

During the recess Mr. H. A. Whitehill, the joint Hon. Secretary, left this city to take up duties elsewhere. His resignation was accepted with regret.

During the year the following meetings have been held:

September 29, 1908.—Annual general meeting. President's address, "Some Recent Additions to our Knowledge of the Structure of the Cell." Preparations of microscopical objects were exhibited, among which worthy of special mention was a mount by Mr. H. Showell, of Renmark, of 250 varieties of the Diatomaceæ, which were prepared and mounted by himself. Resolution passed of sympathy with Mr. W. P. Dollman in his illness.

October 27.—The death of Mr. W. P. Dollman was reported by the Chairman. Veterinary-Surgeon Desmond exhibited mounts of various species of Bacteria, including specially interesting slides of *B. anthracis*. He also exhibited some fine stereo-micrographs. The Chairman exhibited a selection of slides from the collection of the late Mr. Smeaton.

November 29.—Mr. H. W. H. Hale reported that the executors of the late W. P. Dollman had presented to the Section a valuable collection of stereo-micrographs, prepared by the late member. The Secretary was instructed to write a letter to the executors expressing appreciation of their kindness. A suitable stereoscope was presented by Mr. A. W. Marshall.

March 30, 1909.—A resolution was passed congratulating Mr. D. Mawson, B.Sc., and comrades upon their splendid achievements in Antarctica, and the Secretary was instructed to convey same by telegram. Mr. H. A. Whitehill's resignation was announced by the President, who intimated that the secretarial duties would be carried out by Mr. Hale. A resolution expressing the thanks of the Section to Mr. Whitehill was passed. Mr. Fuller exhibited a new model Bausch and Lomb Microscope, showing remarkable features and high excellence for a comparatively low-priced instrument.

April 27.—The Secretary read a letter conveying fraternal greetings from the Microscopical Society of Victoria. He was instructed, in reply, to convey to the Victorian Society the appreciation of the sentiments expressed in its letter. The President announced that Mr. E. H. Matthews had presented to the Section a valuable gift, *viz.*, a copy of Mr. Saville Kent's "Manual of the Infusoria." Hearty thanks were accorded Mr. Matthews for his most acceptable donation. Series of microscopical slides of interest were exhibited by Mr. H. W. H. Hale.

May 26.—The Secretary reported inauguration of the intermediate meeting for technical work. Dr. Pulleine contributed an interesting paper entitled "Notes on Some South Australian Spiders," illustrated by exceptionally beautiful photographic lantern slides, which were projected on the screen by the Zeiss apparatus.

June 22.—Mr. D. Gordon reported progress in connection with the practical meetings, at which members had devoted themselves to the study of opaque mounting of Foraminifera. The Chairman delivered an address upon "Later Methods of Staining Preparations of Lymphatic Glands." He exhibited several exquisitly-stained sections, so as to show the fine reticulated structure of the glands, the lymphocytes having been first digested with an alterative solution of pancreatin.

July 27.—Mr. D. Mawson, B.Sc., gave a short résumé of his journey and scientific excursion in the Antarctic Circle, exhibiting lichens and rock specimens, among the latter being Kenyte from Mount Erebus. He also showed photo-micrographs of a variety of Rotifers, which were found in abundance in Lake Green, near which the expedition established its winter quarters.

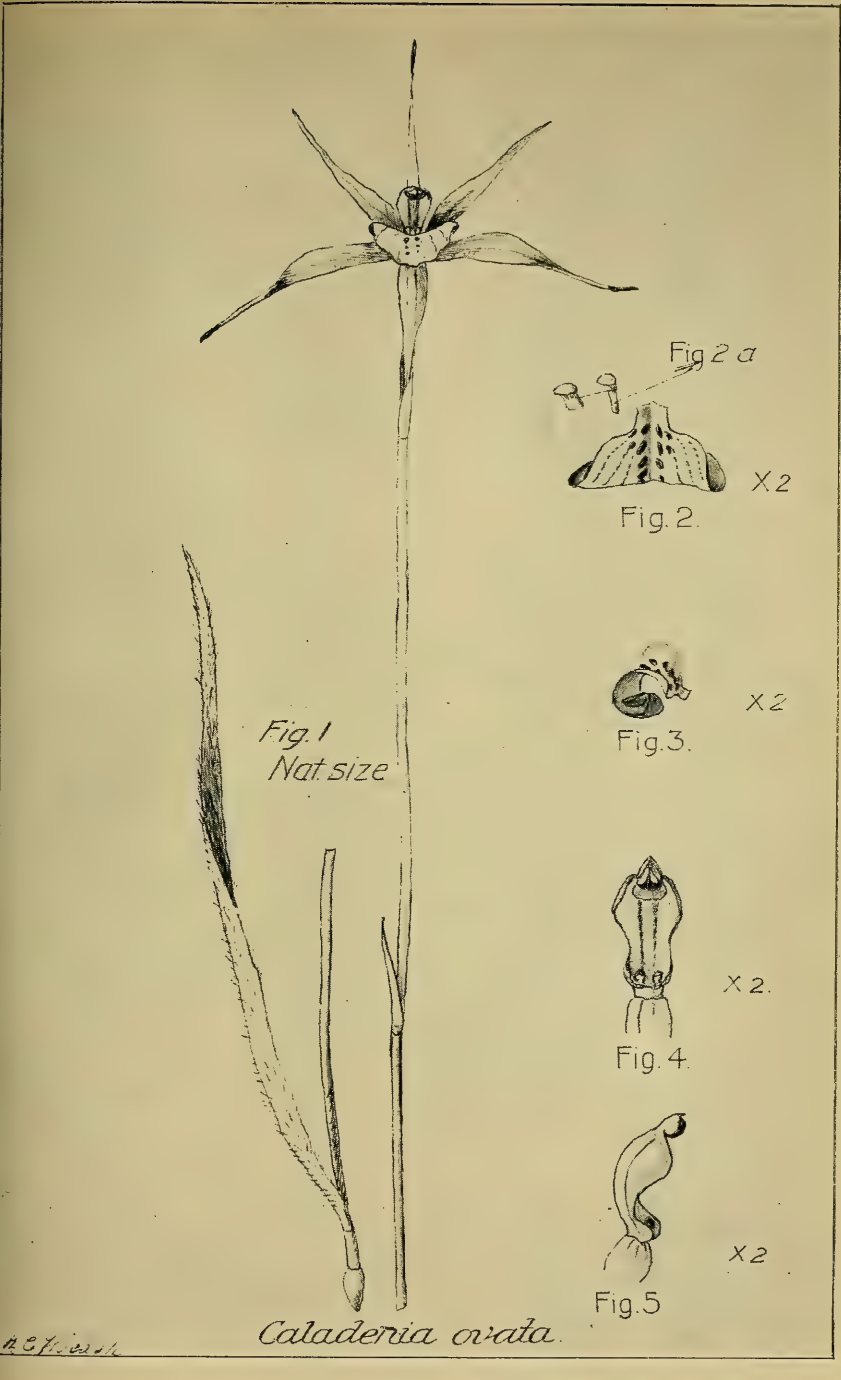
August 21.—Exhibition of Expansive Stop for Substage by Mr. Poole. Specimens of photo-micography, the work of Mr. H. Showell, were submitted by Mr. Gordon, and an interesting introductory paper upon "The Microscopical Structure of Wood" was contributed by the President (Mr. William Fuller).

Harold W. H. Hale, Hon. Secretary.

GENERAL INDEX.

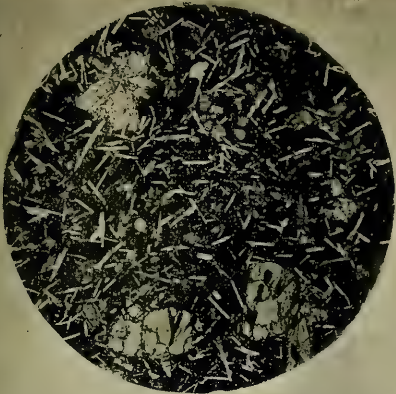
[Generic and specific names printed in italics indicate that the forms described are new.]

PLATES I. TO XXIX.



Caladenia ovata.

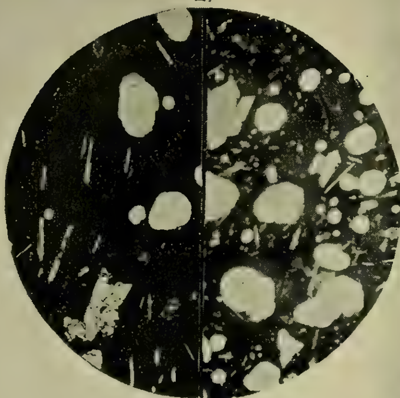
Hussey & Gillingham, Printers, Adelaide.



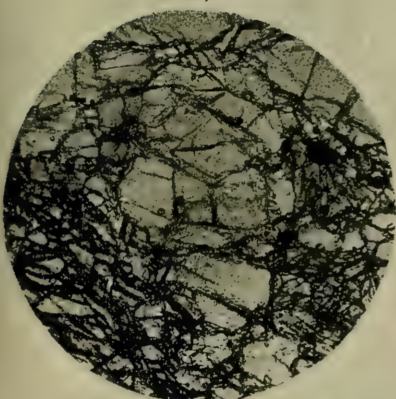
1.

2.

3.



a. 4. b.



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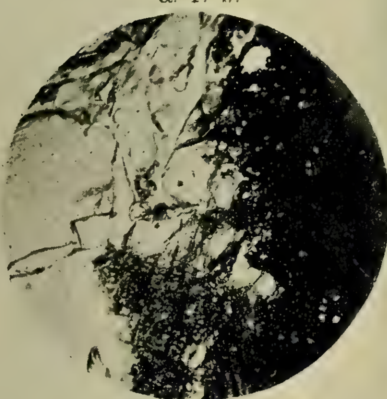

6.

Evan R. Stanley

Hussey & Gillingham, Printers, Adelaide.

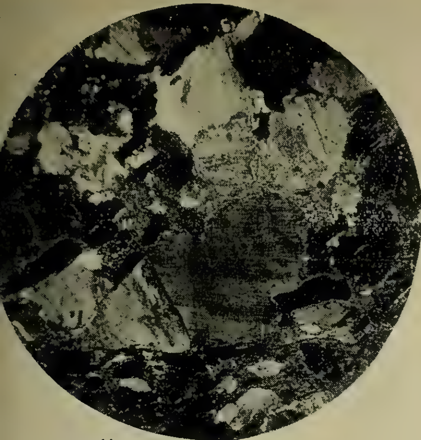

Fig 1 ×15†

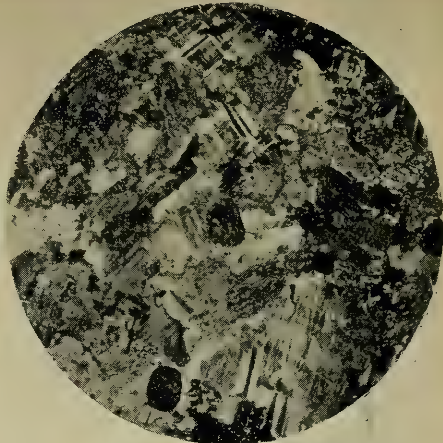

Fig 2 ×32†

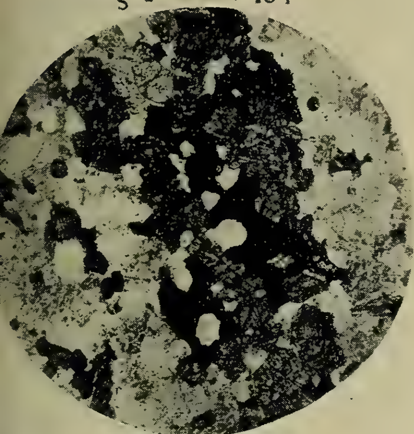

Fig 3 ×16

Fig 4 ×29†

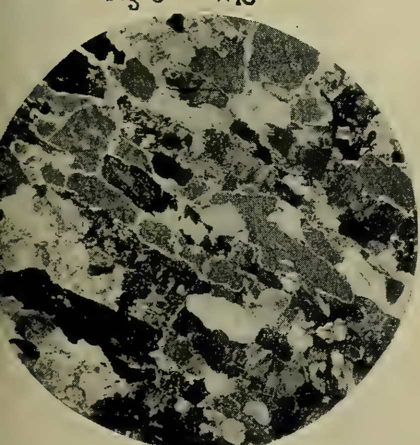

Fig 5 ×15†

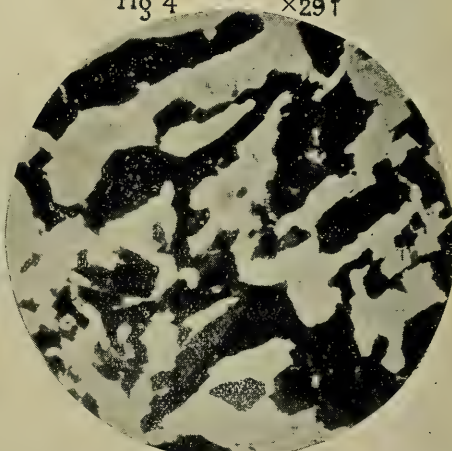

Fig 6 ×13

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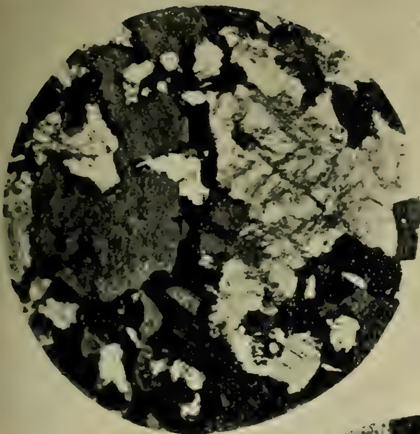

Fig 7. ×16

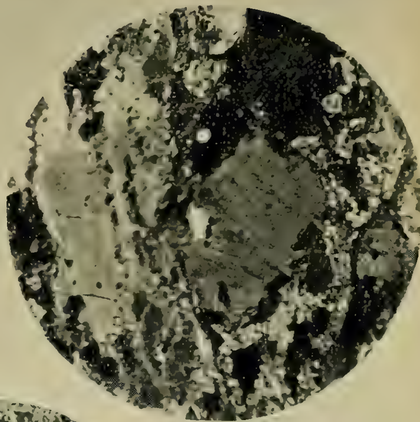

Fig 8 ×26†

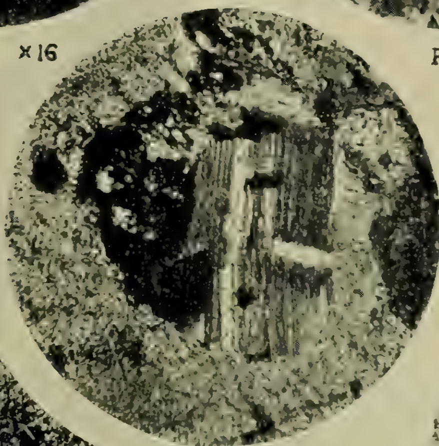

Fig 9 × 17†

Fig 10 Aplite.

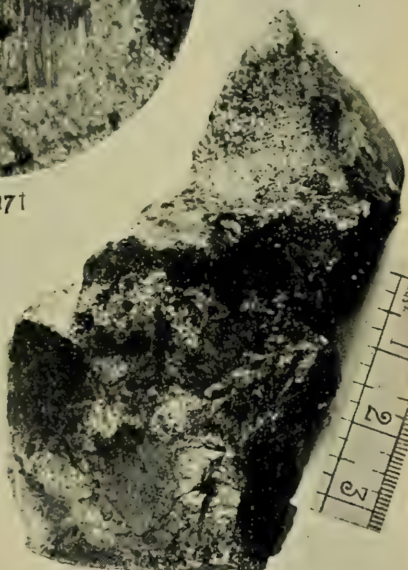

Fig. 11 Yatalite.

Hussey & Gillingham, Printers, Adelaide.

aide.

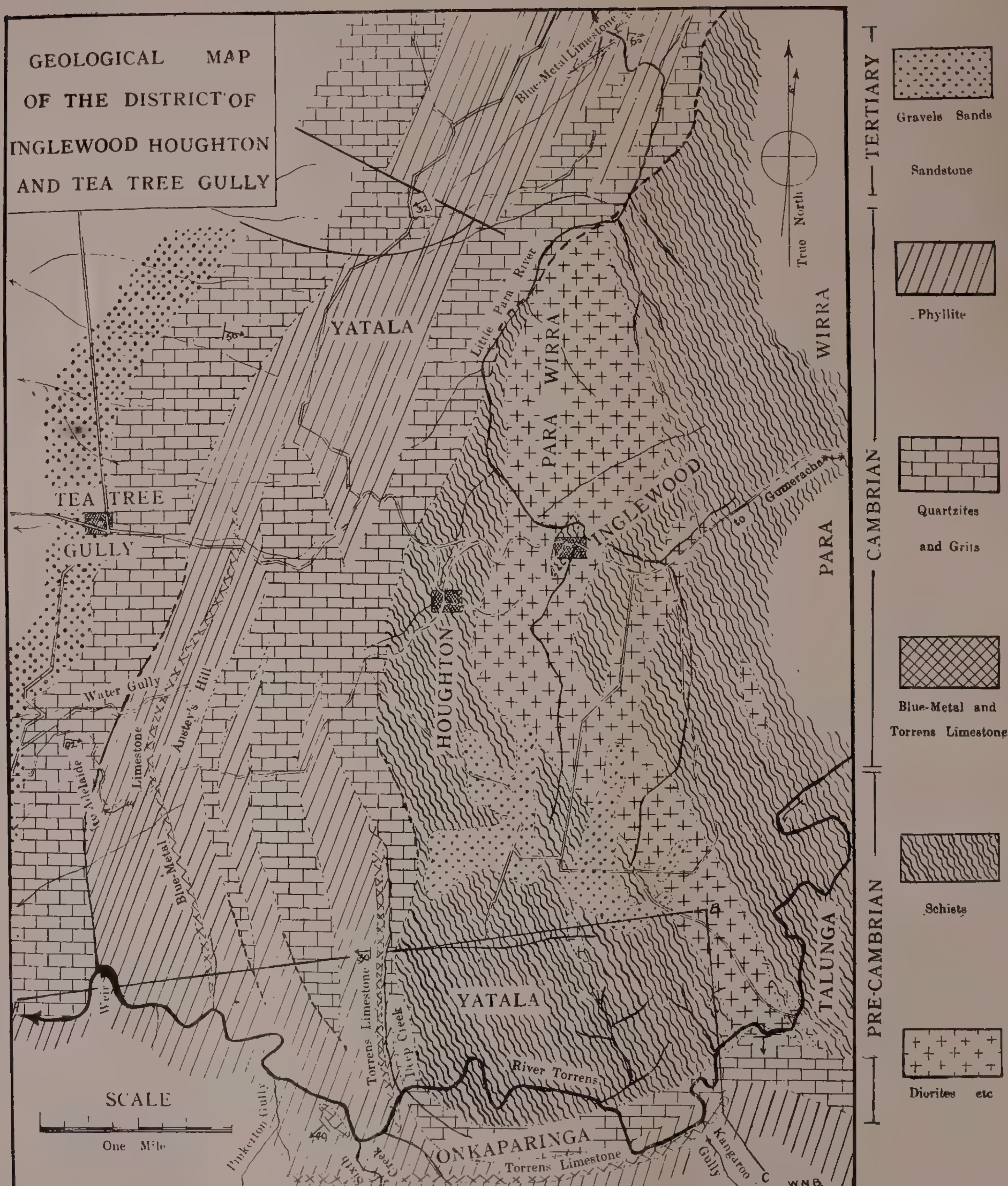

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Fig. 1.

Fig. 2.

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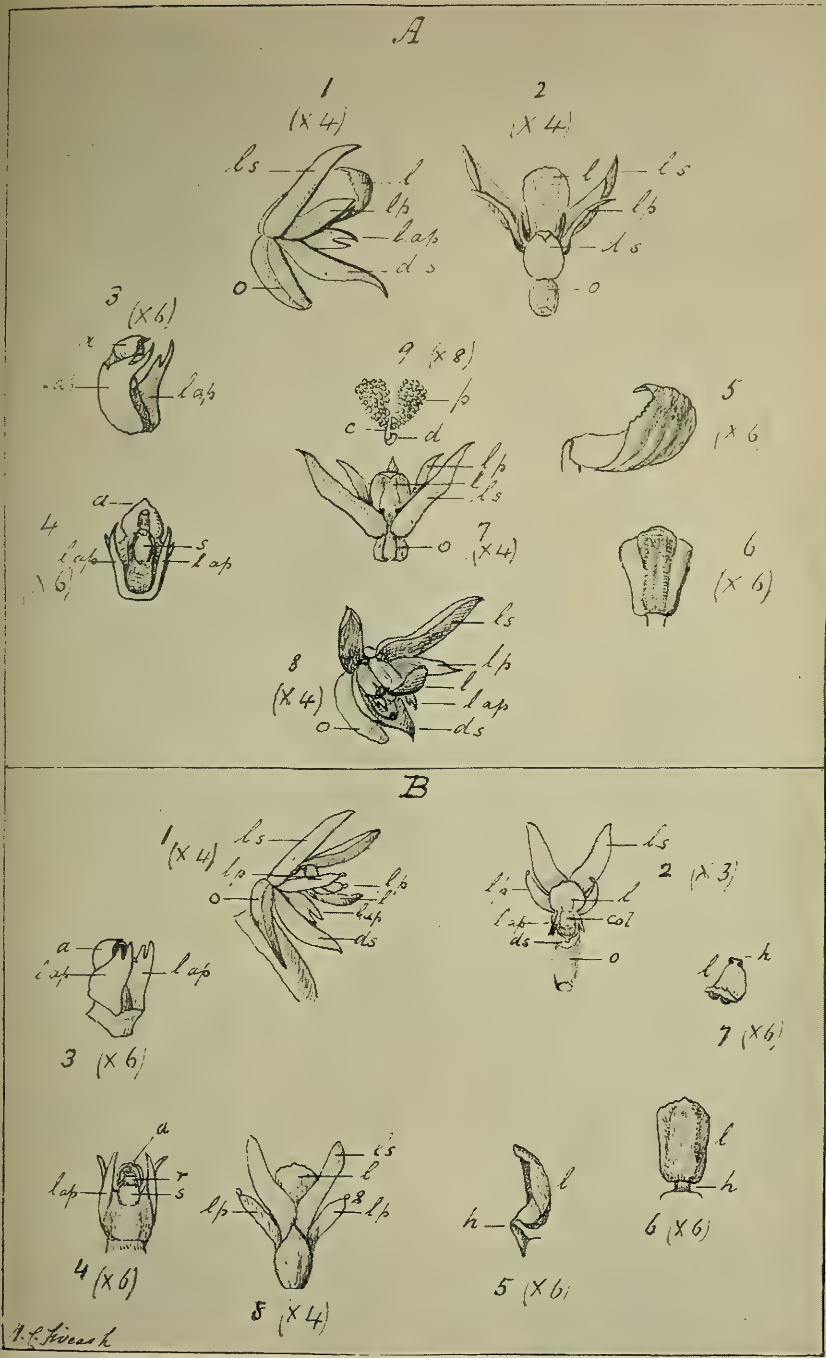

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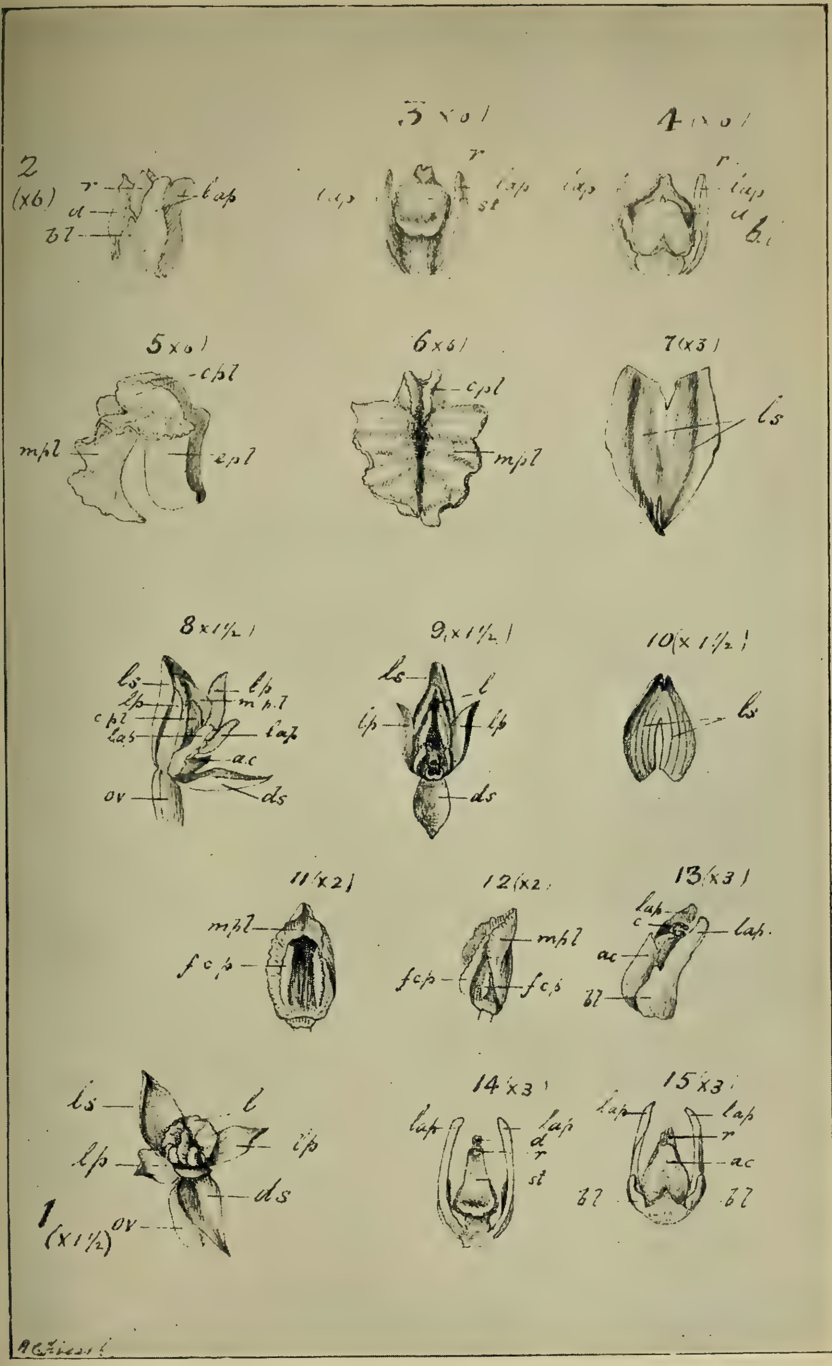

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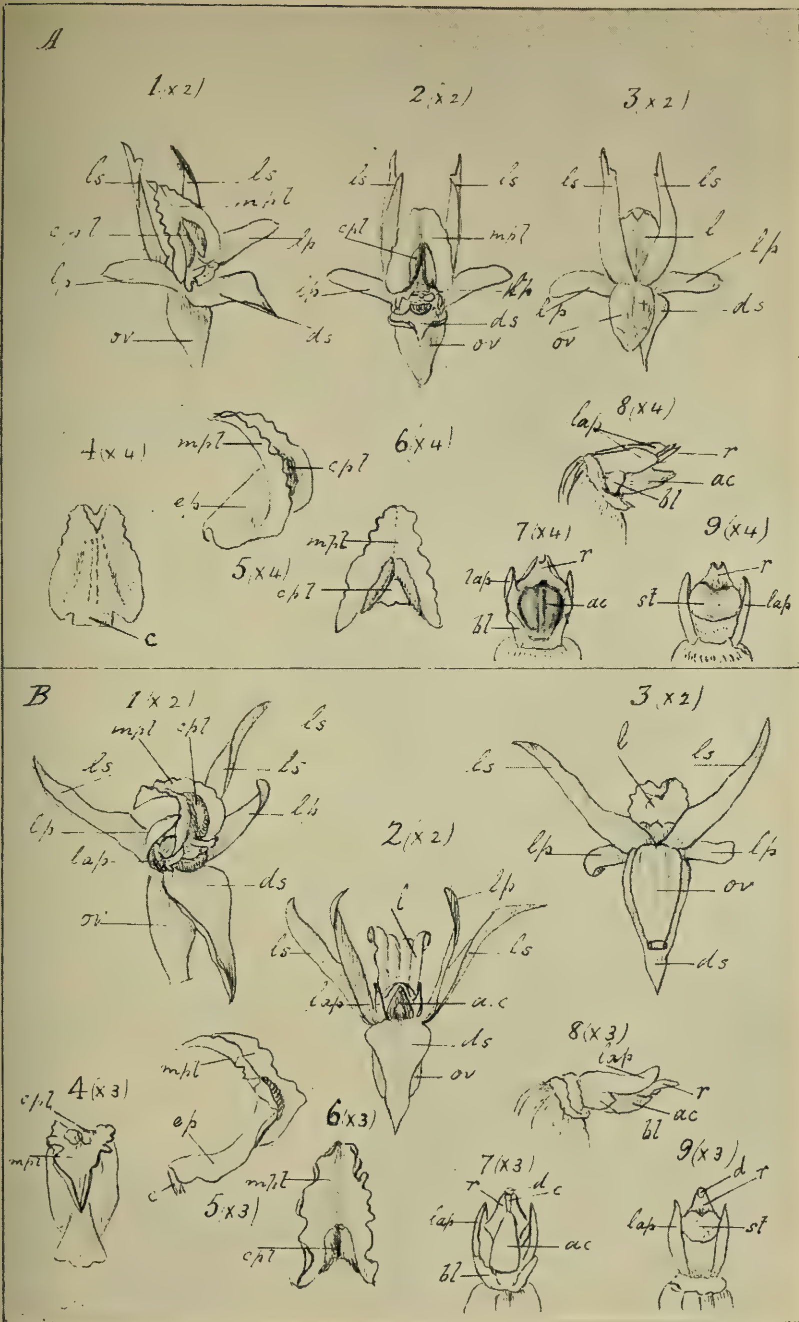

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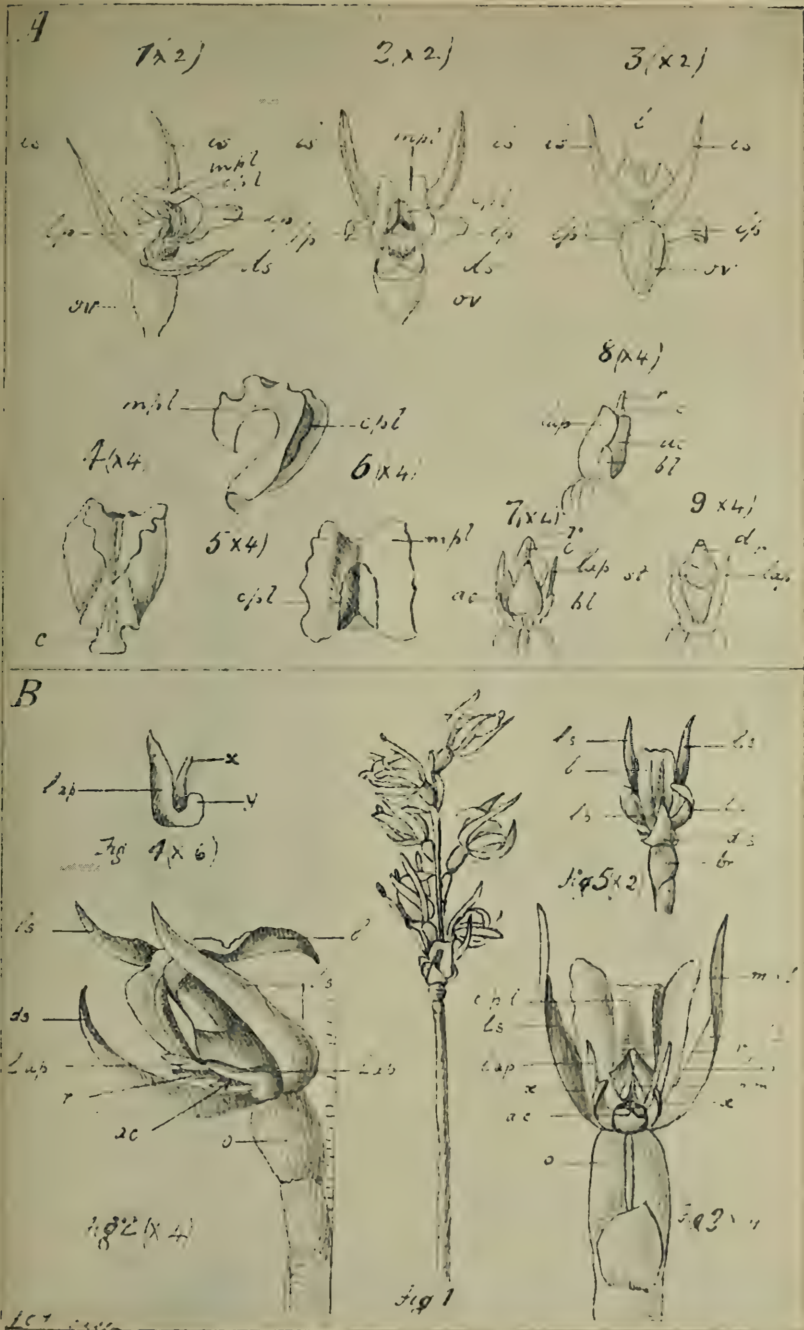

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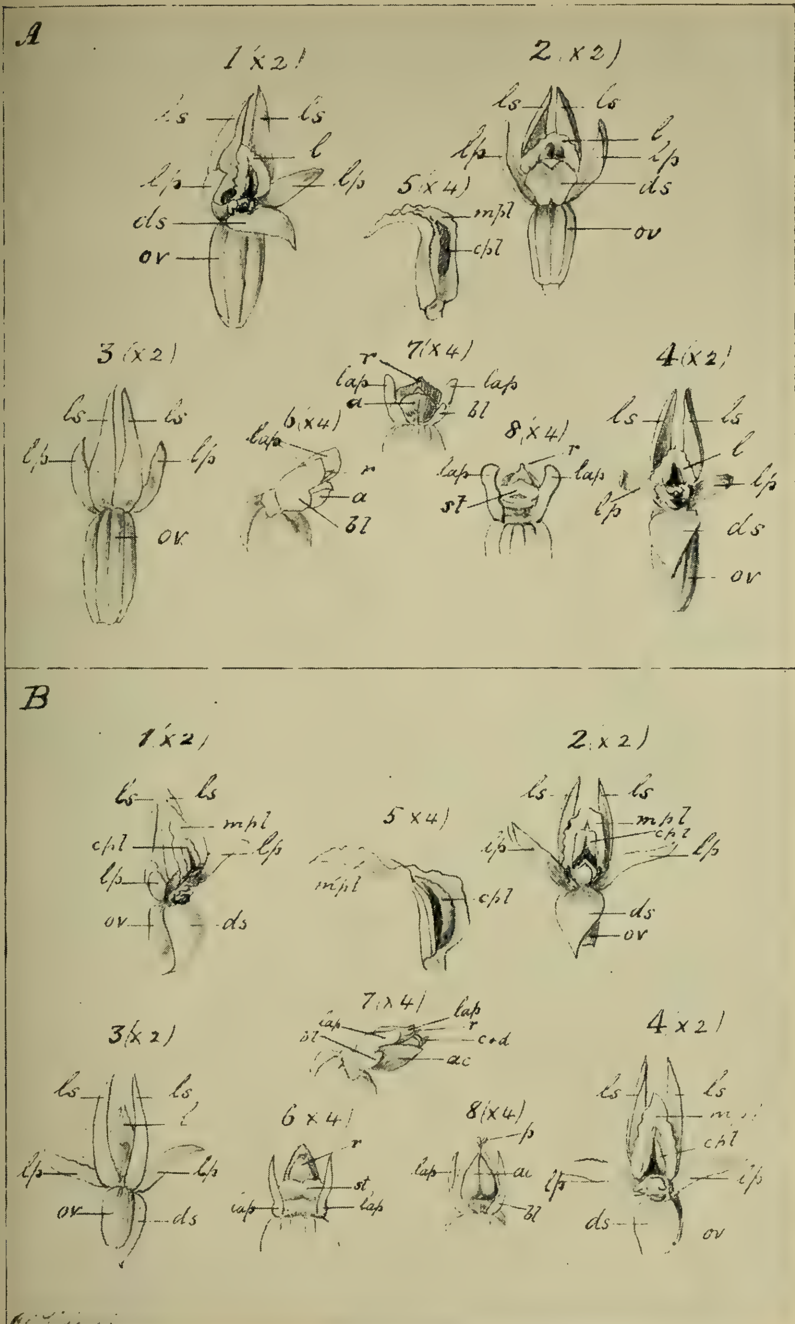

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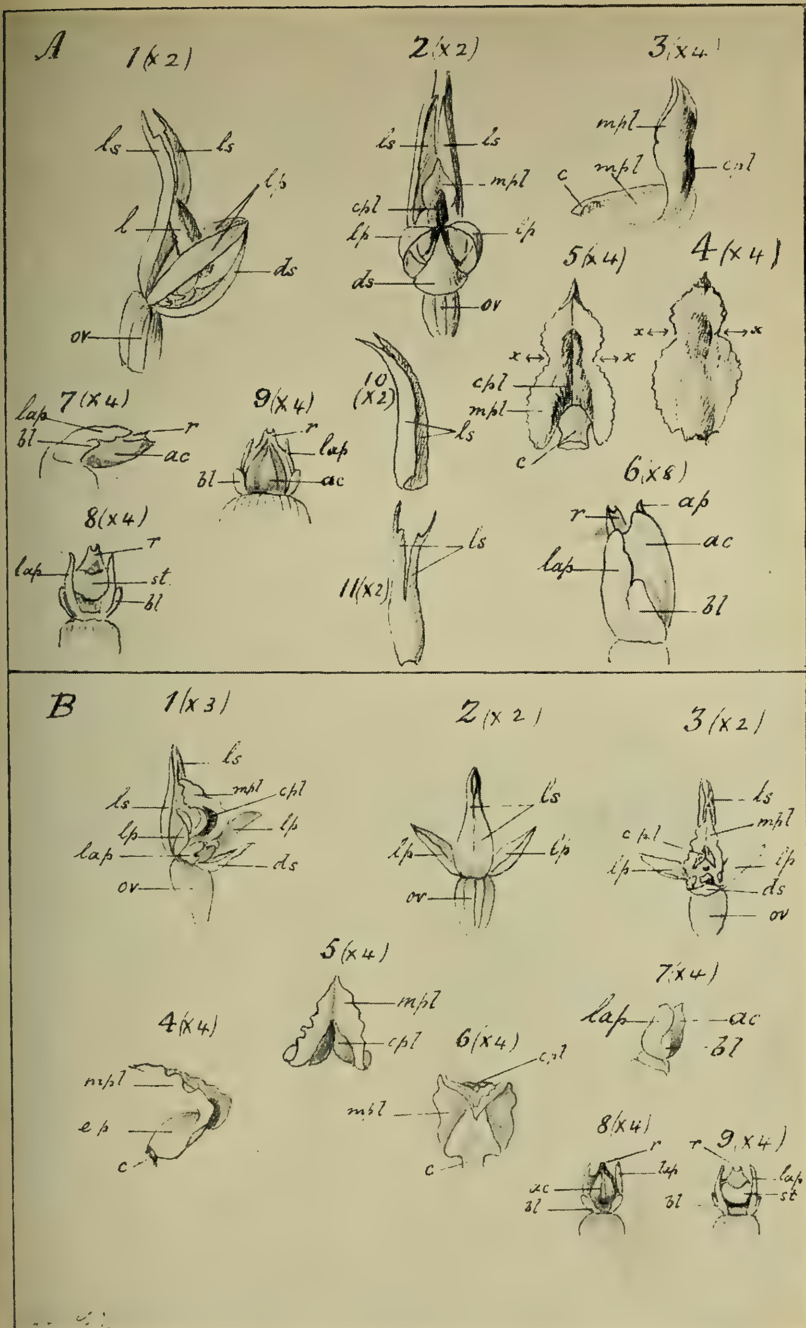

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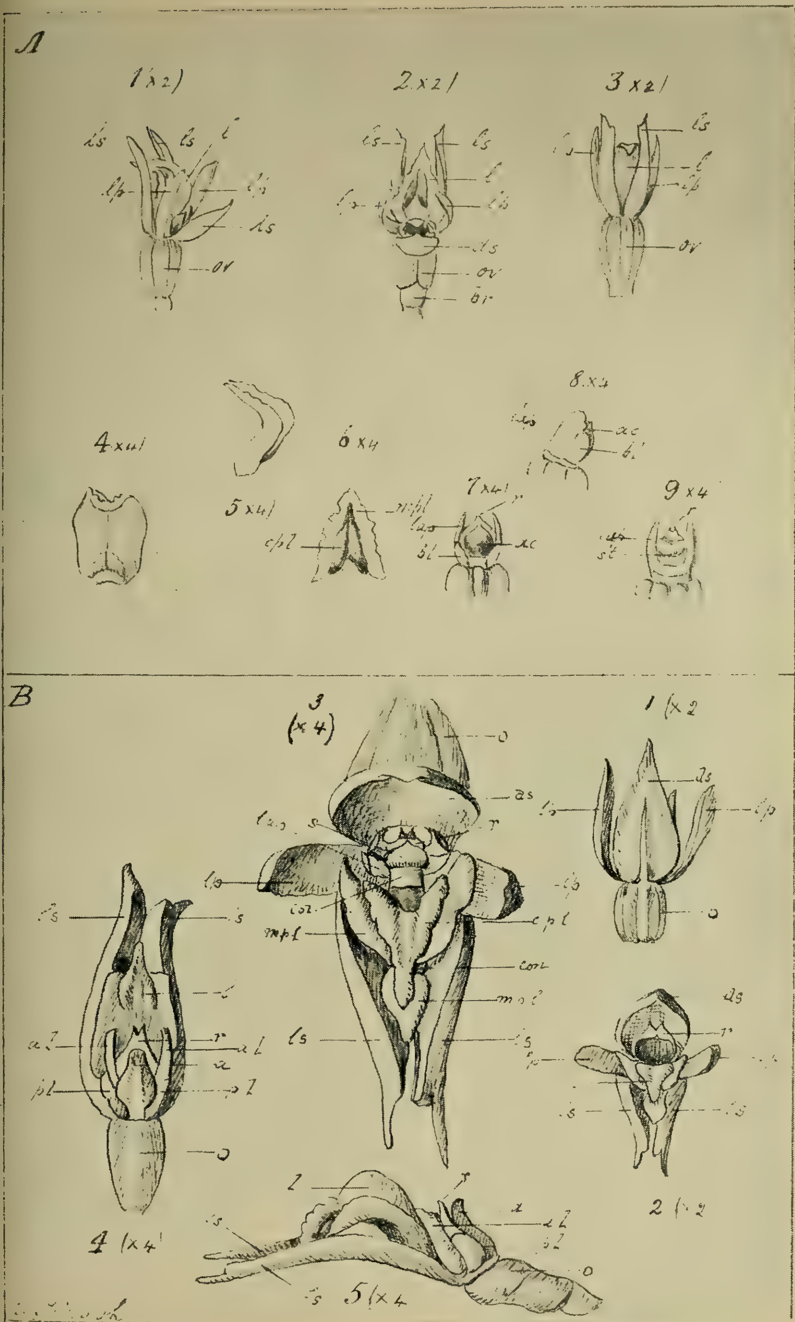
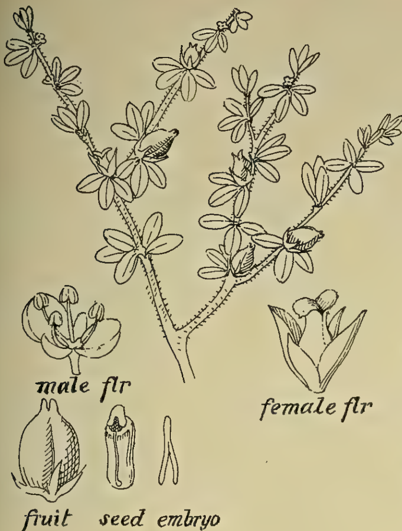
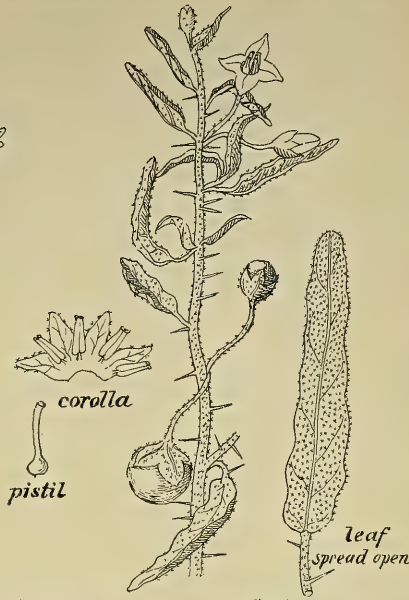


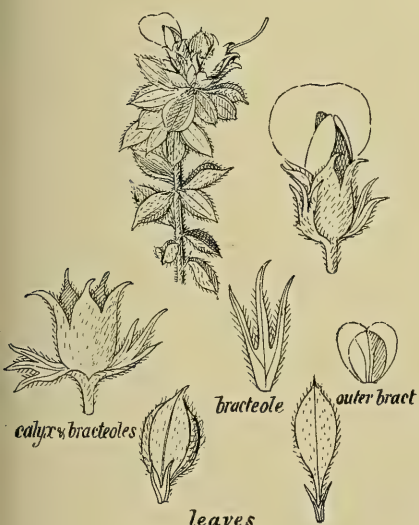
Hussey & Gillingham, Printers, Adelaide.



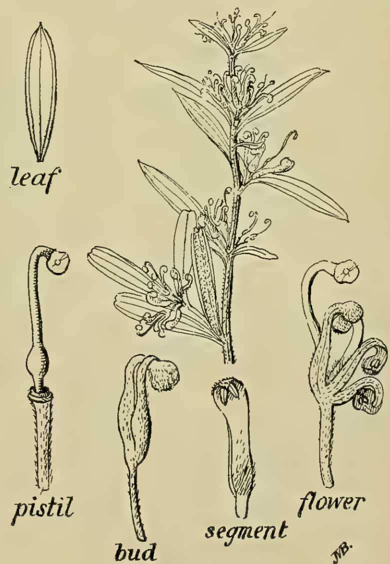
Micrantheum demissum, F.v.M.



Solanum coactiliferum, Bl.



Pultenæa trifida, Black.



Grevillea quinquenervis, Bl.

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Fig. 1. Melaphyre. ×17.

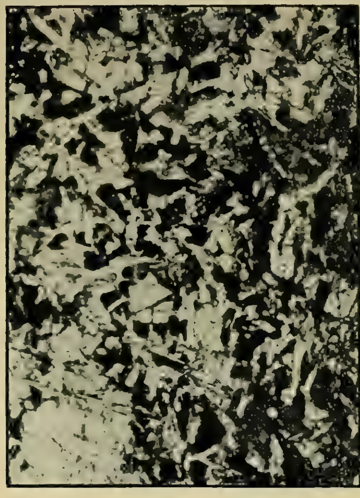

Fig. 2. Olivine-Diabase. ×21.

Fig. 3.—Granophyric Gabbro-Diabase. ×15.

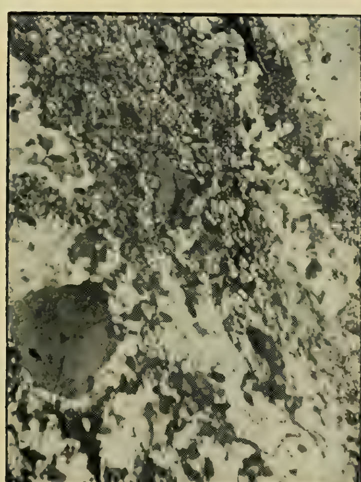

Fig. 4. Gneiss. ×22.

Blinman Rocks.

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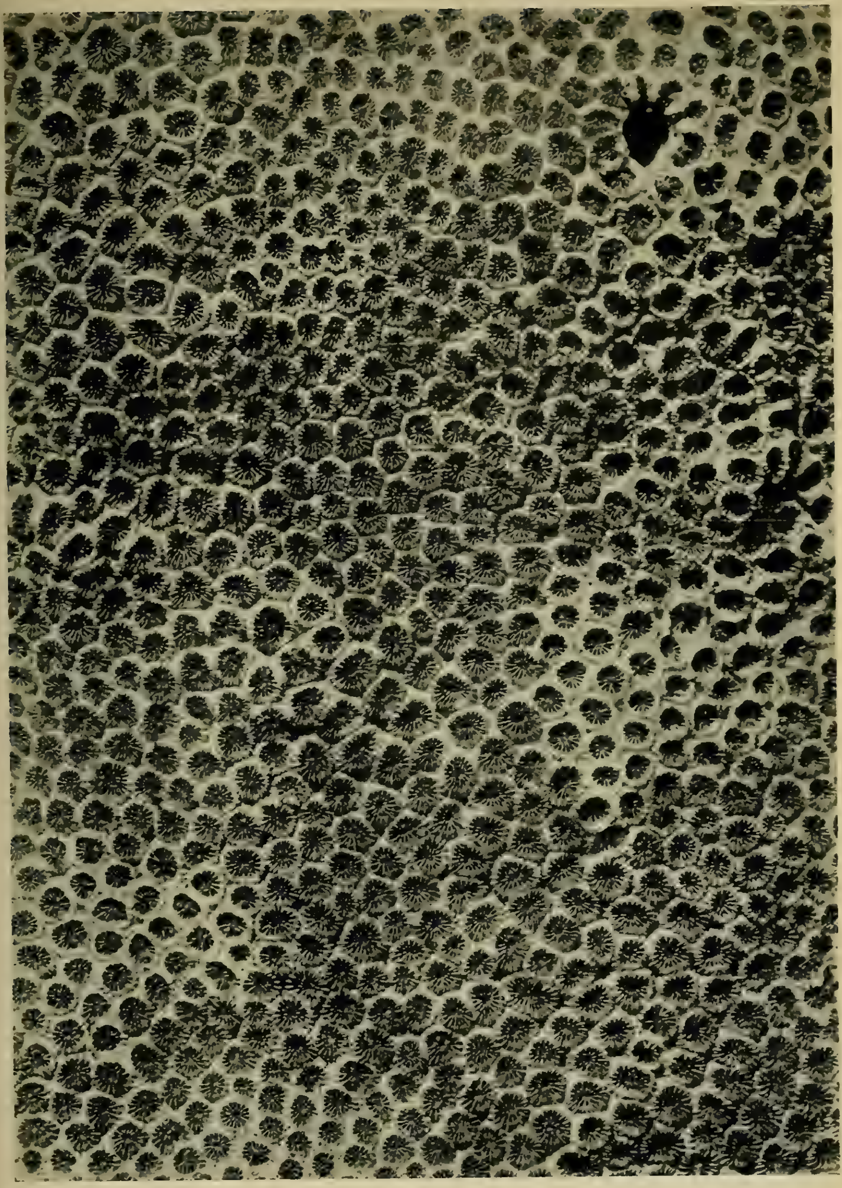

Plesiastræa urvillei, Ed. et Haime. Natural size.

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Fig. 1. Pekina Creek. Head of Old Lake.
Lacustrine Deposits form a cliff face on side of bank.

Fig. 2. Pekina Creek. Old Lake area above the Irrigation Weir.
The prominent hill with level stratification is a fragment of the old lake deposits.

Hussey & Gillingham, Printers, Adelaide

Panoramic View of the Lower Part of Extinct Lake Basin (below the Weir), Pekina Creek, near Orroroo. The alluvial and lacustrine terraces are much scored by rain-wash. The terrace on the left hand of the Plate is the spot where the *Chara* limestone occurs, referred to in the postscript of the paper.

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Fig 2

Fig 1

Fig 3

Fig 4

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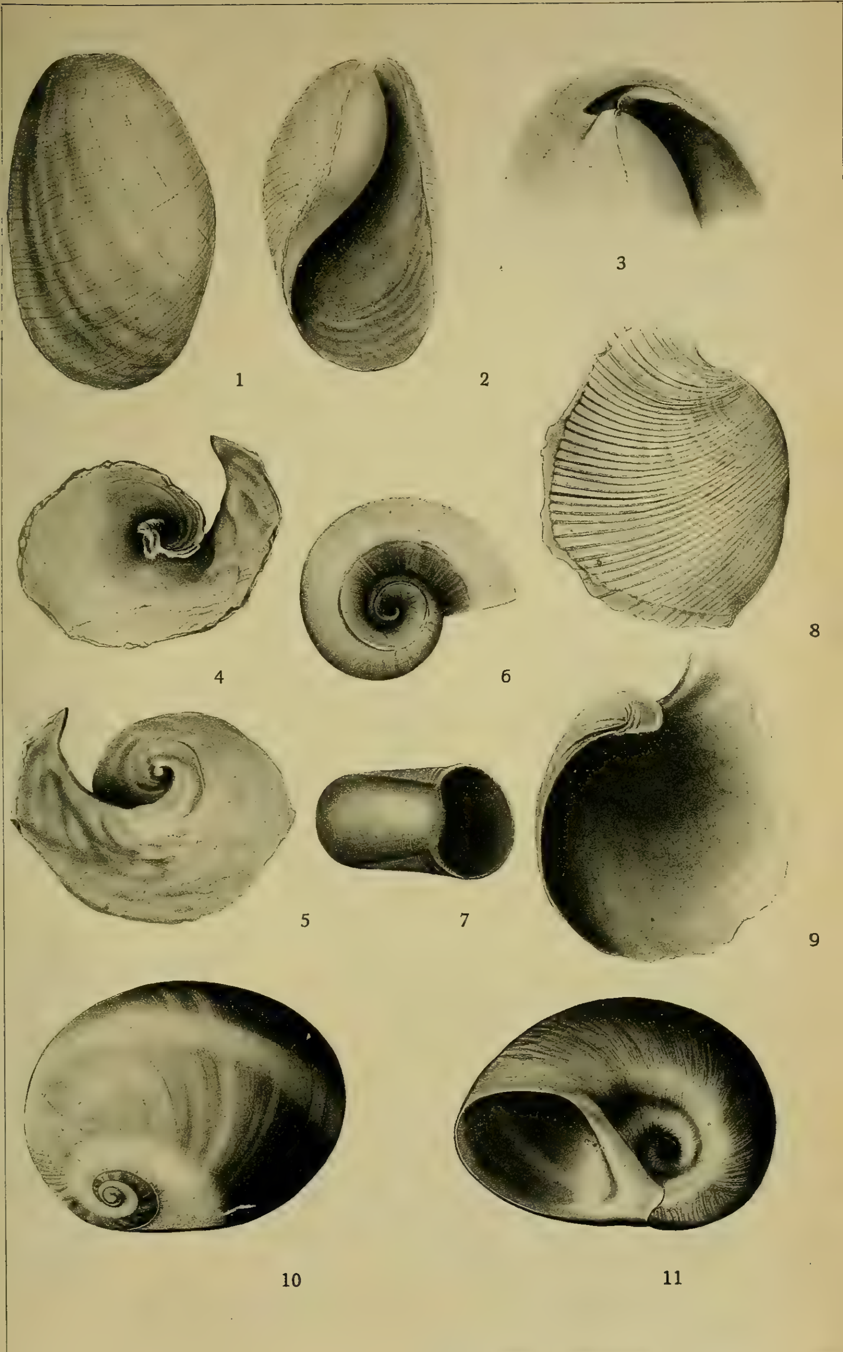

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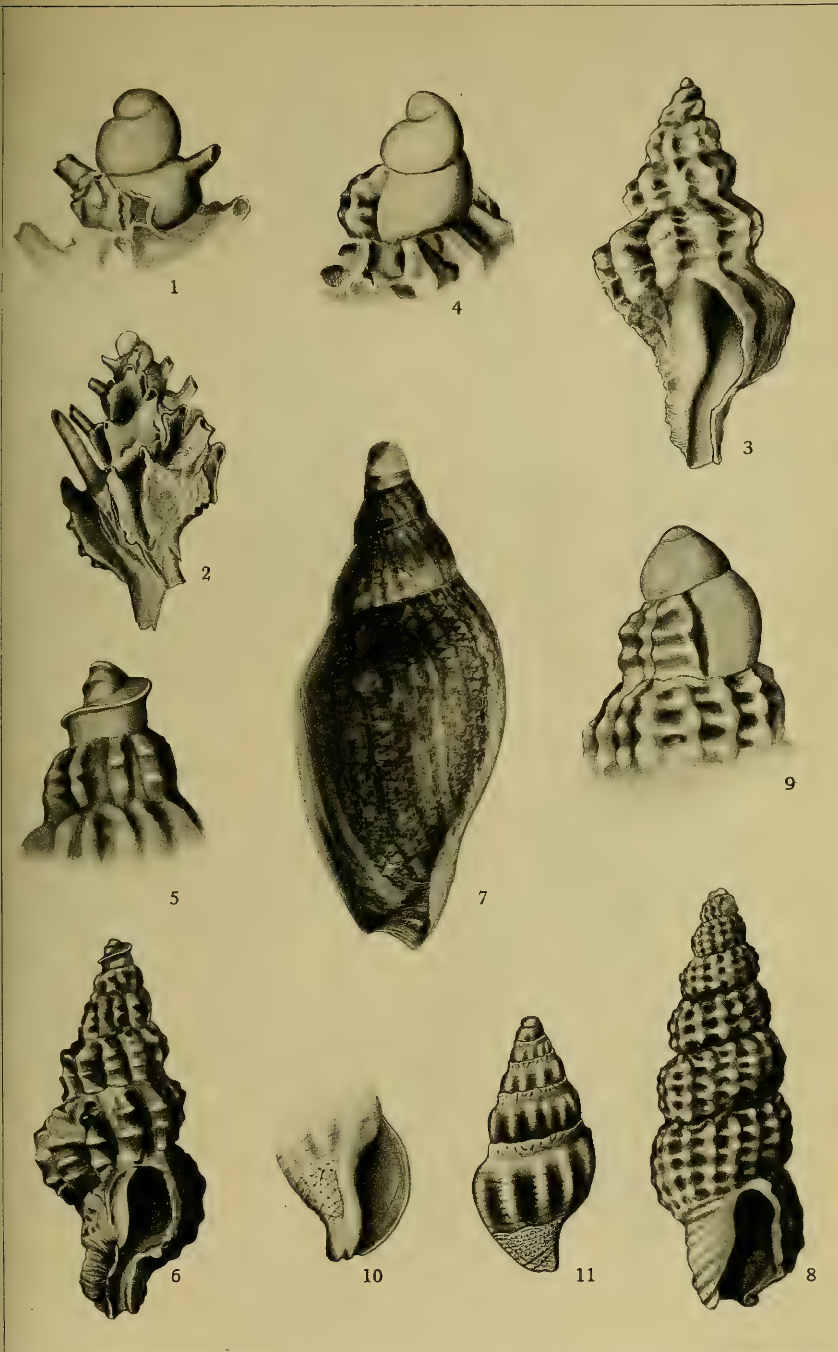

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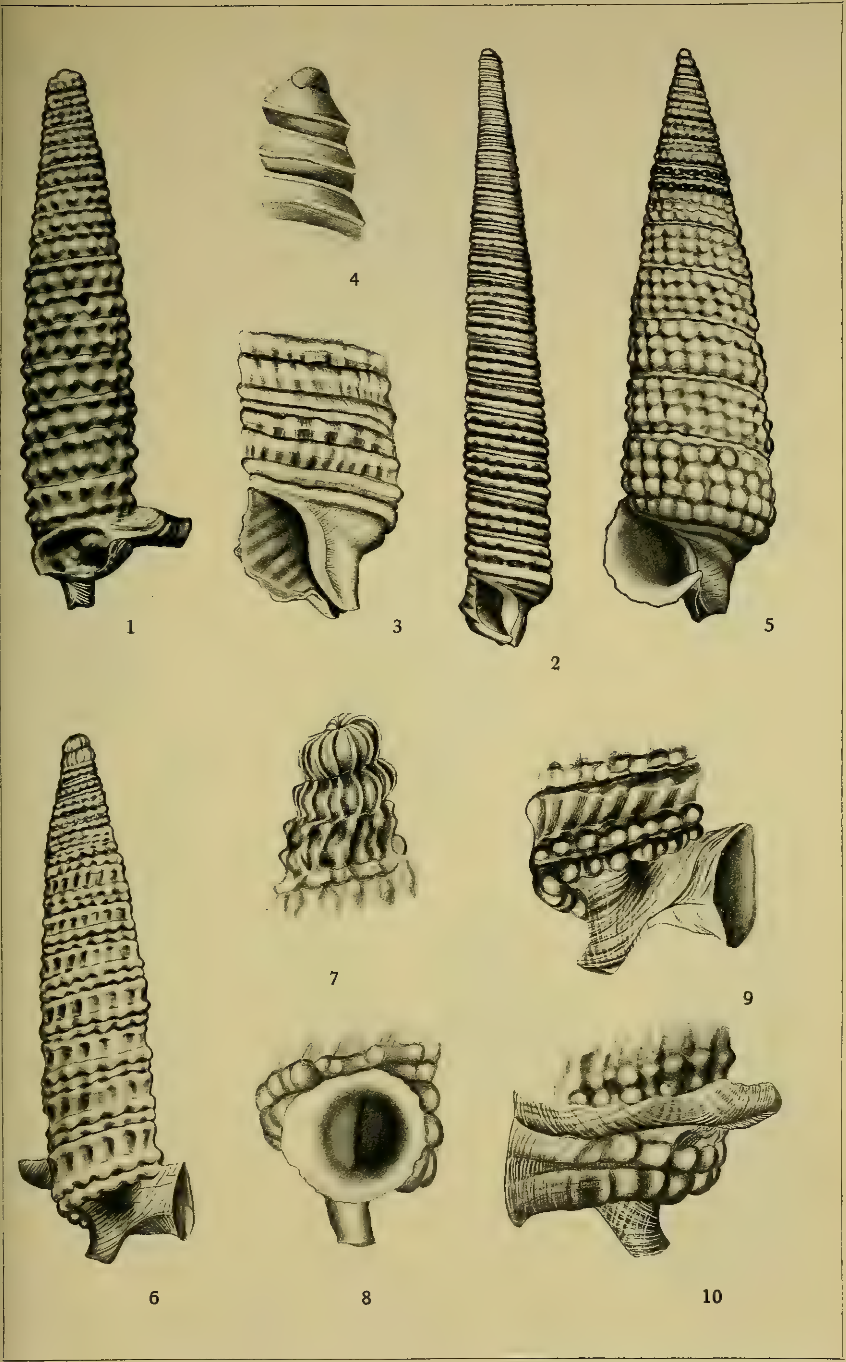

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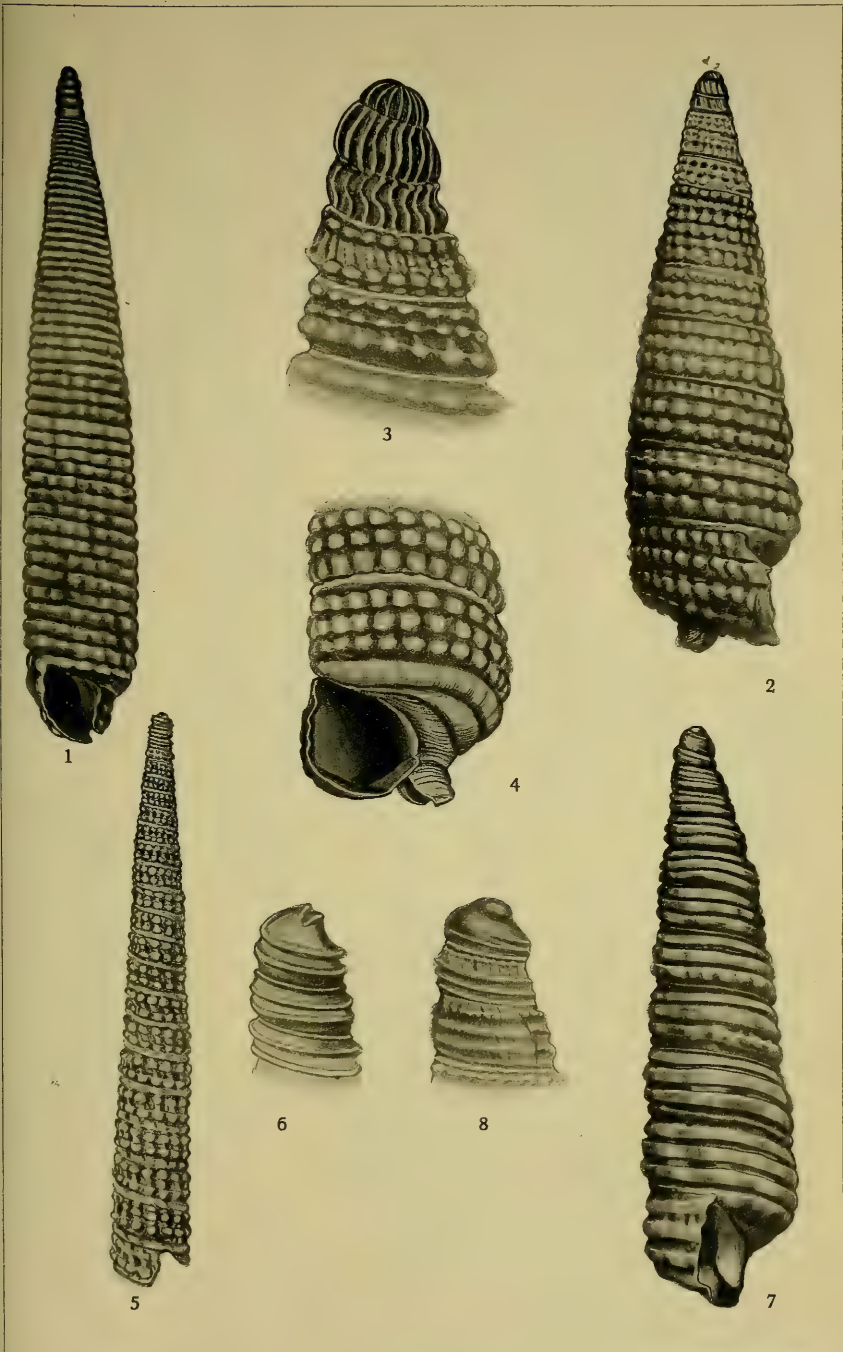

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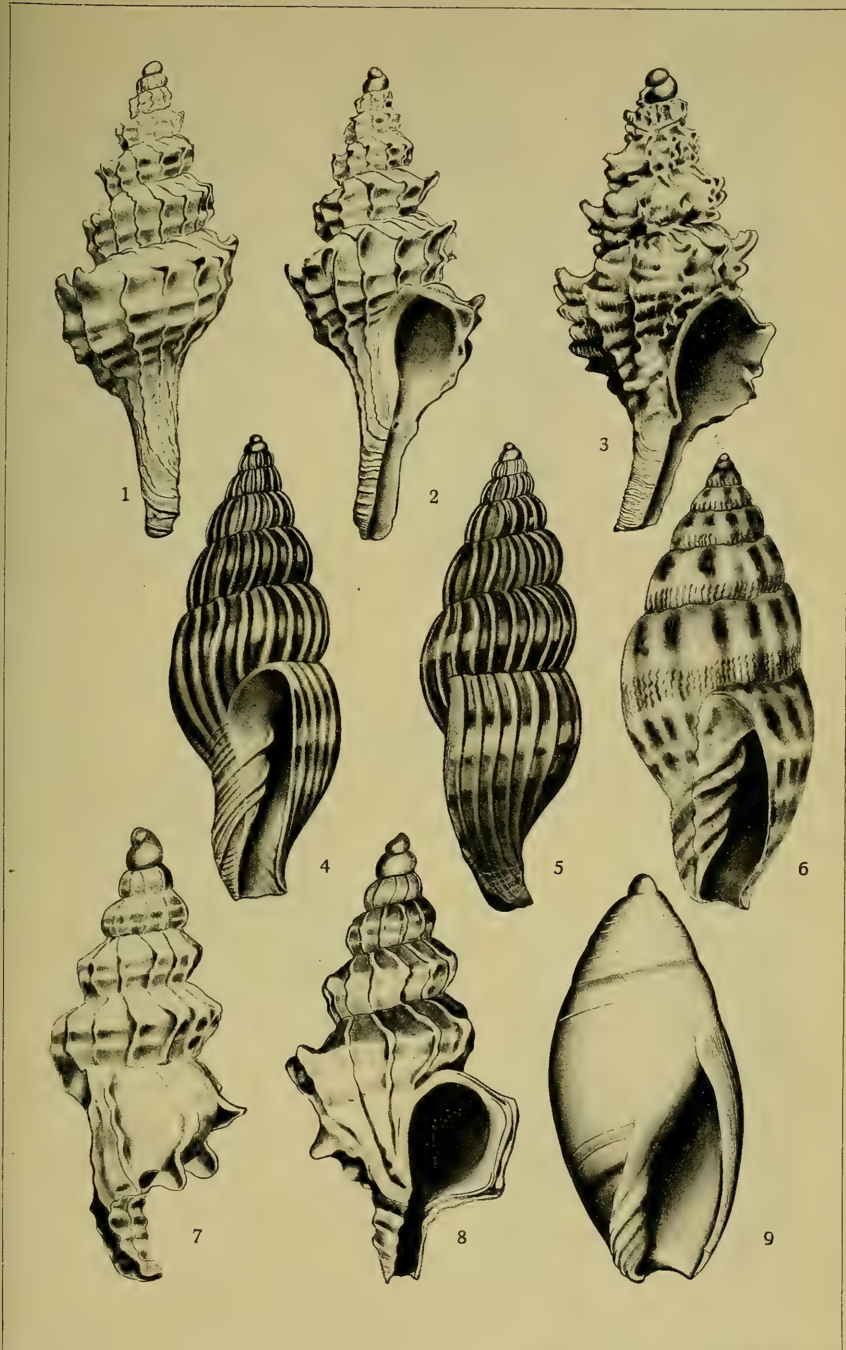

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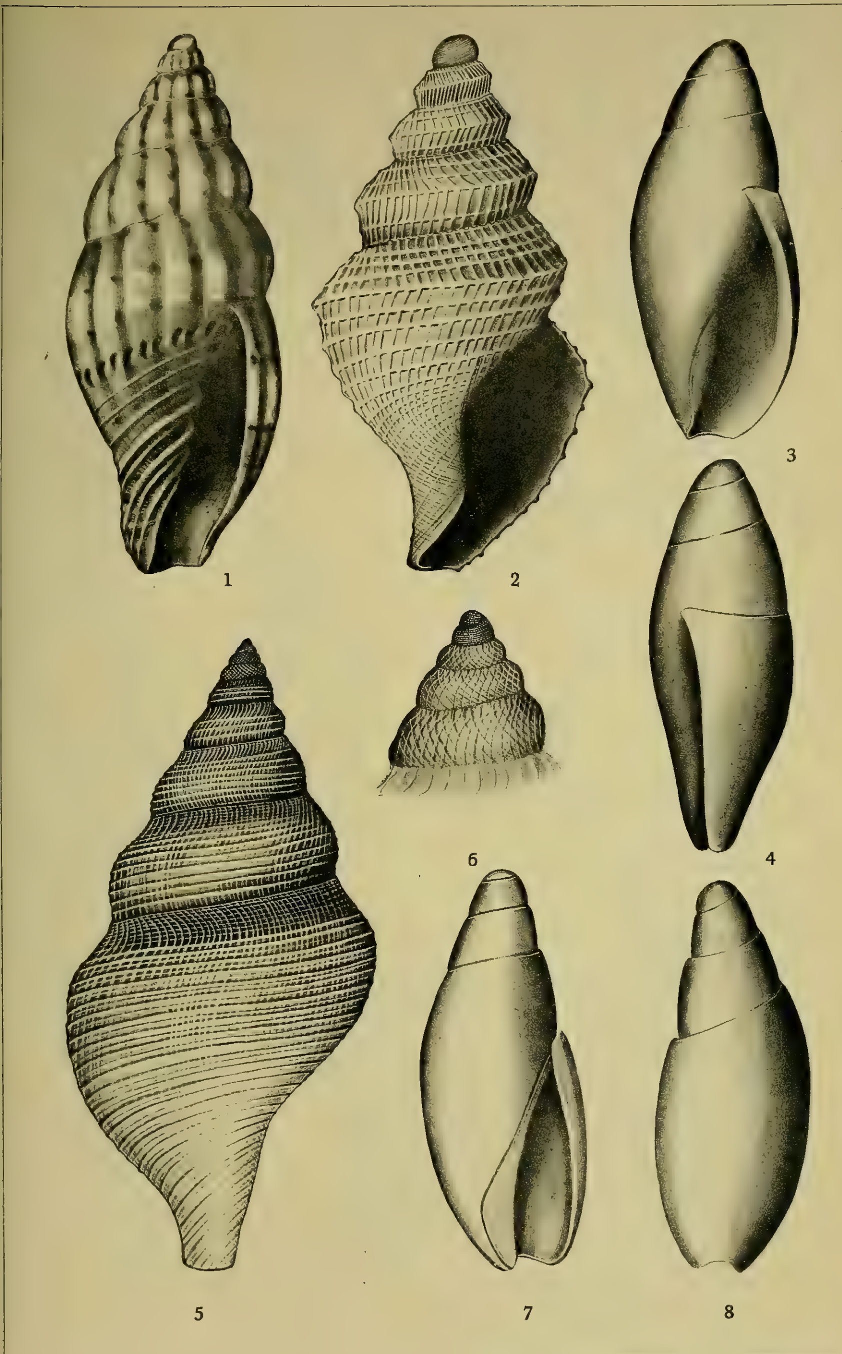

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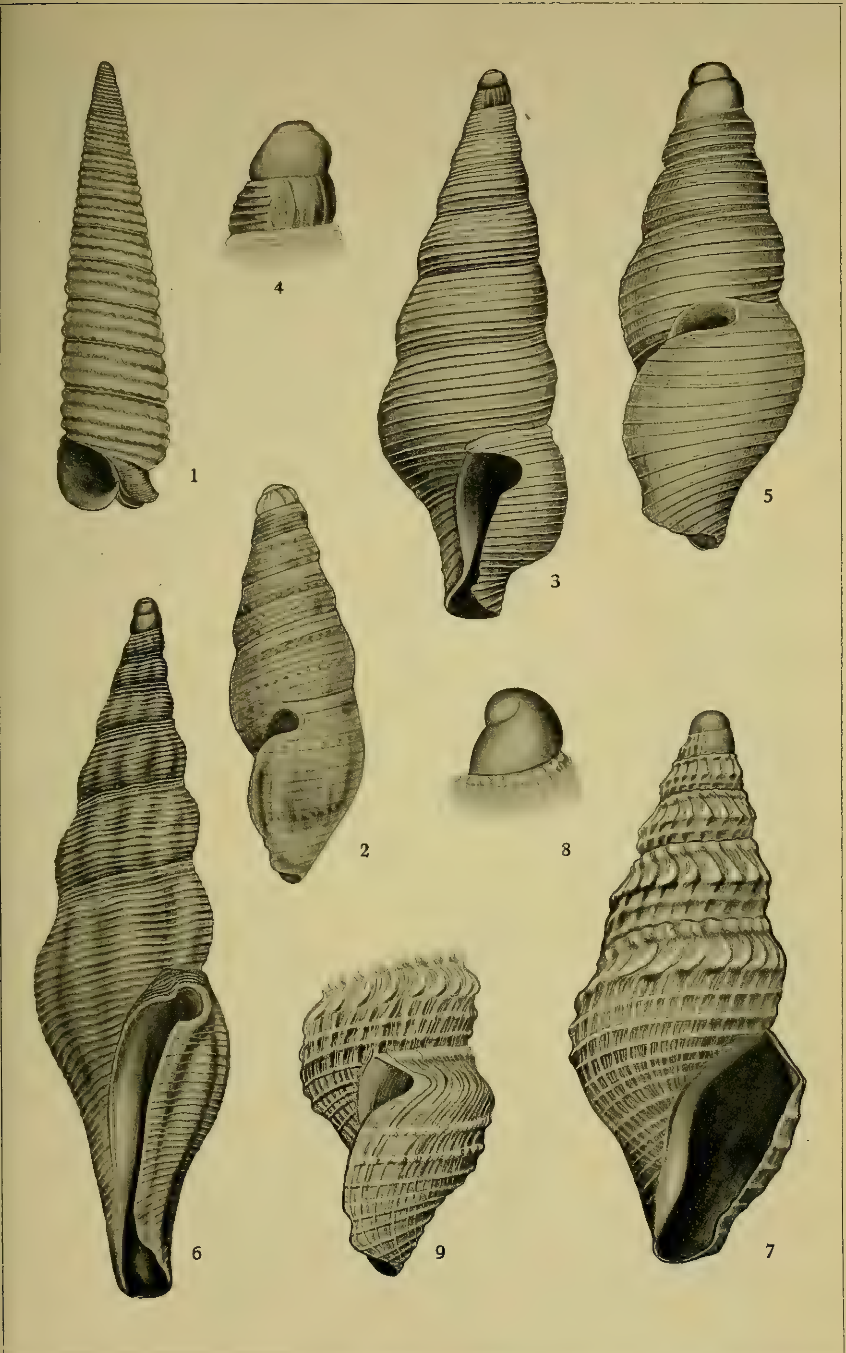

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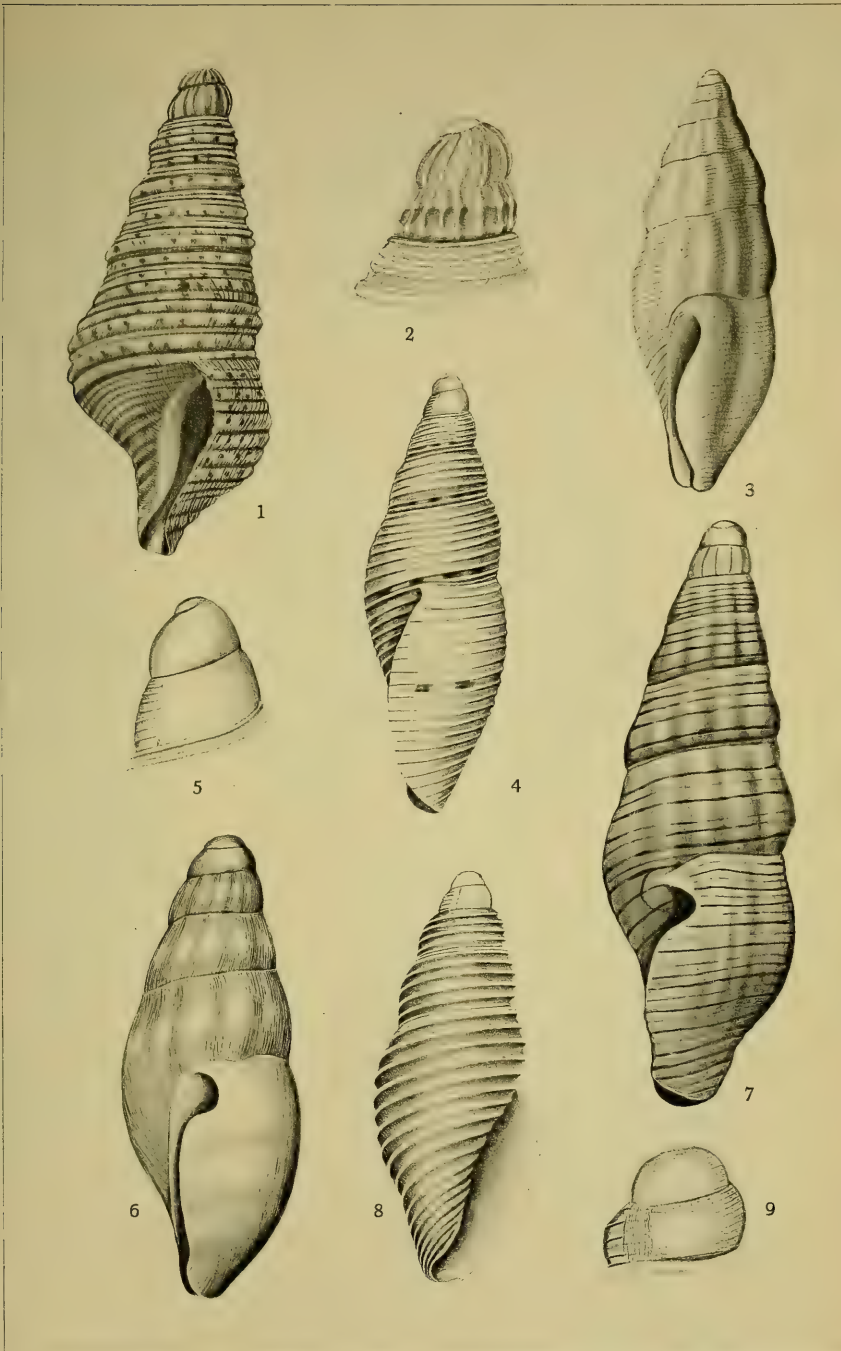

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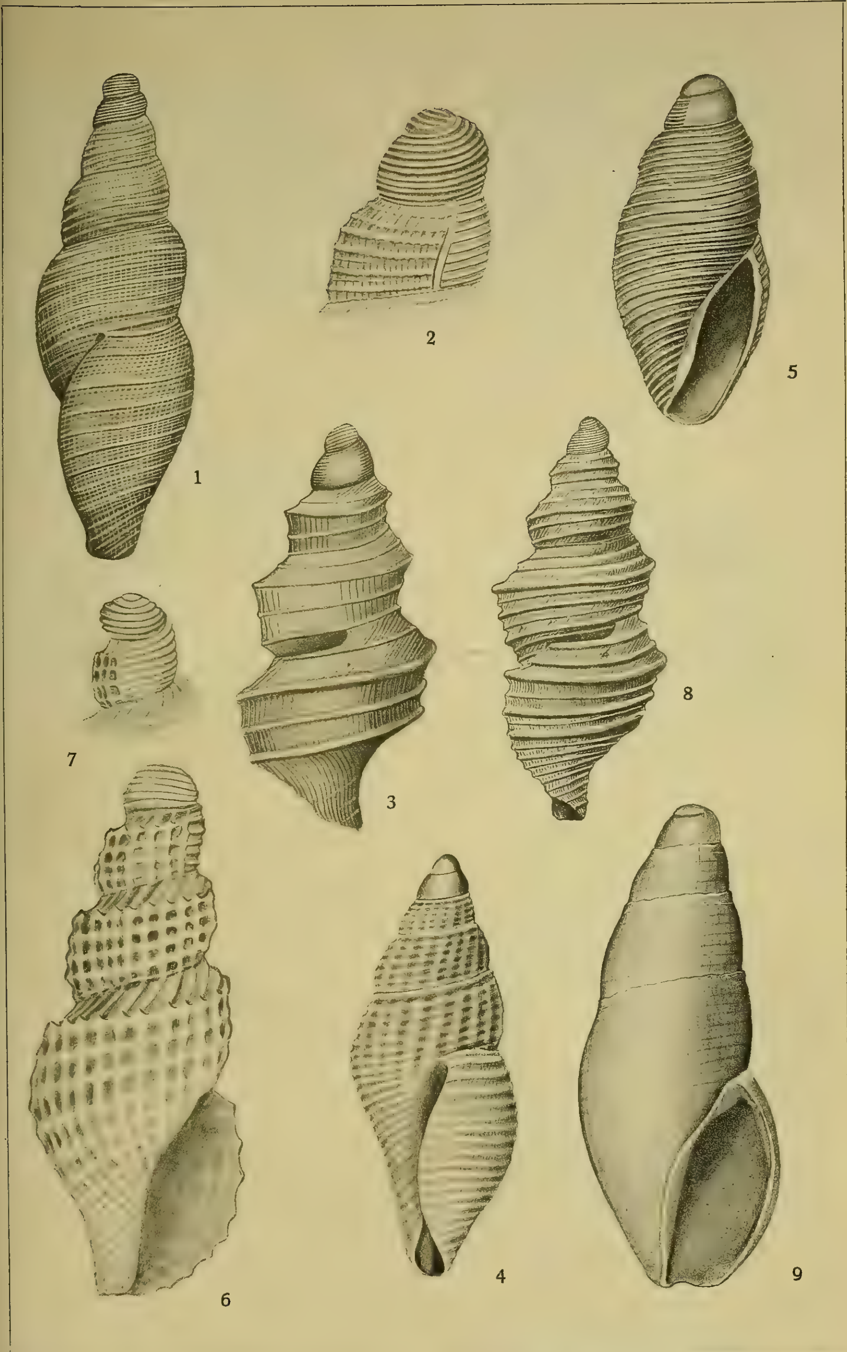

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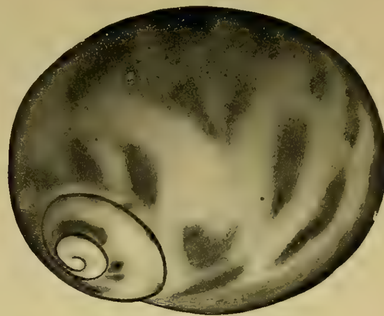

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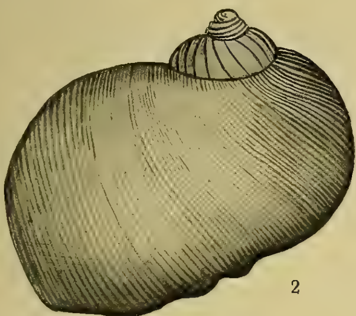

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Drawings and Printing,
Donald Taylor Collotype Co,. Ltd., North Adelaide.

CONTENTS.

APPENDICES.