PROCEEDINGS

OF THE

Royal Society of Victoria.

VOL. XLIII (New Series).

PARTS I and II

Edited under the Authority of the Council.

ISSUED 30th SEPTEMBER, 1930, and 28th FEBRUARY, 1931.

(*Containing Papers read before the Society during the months of April to December, 1930.*

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

ROYAL SOCIETY'S HALL,
VICTORIA STREET, MELBOURNE, C. 1.

FORD & SON PRESS PTY. LTD., DRUMMOND ST., CARLTON, MELBOURNE.

1931.

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[Proc. Roy. Soc. Victoria, 43 (N.S.), Pt. I, 1930.]

Art. I.—*Additions to the List of Australian Sea-Grasses.*

By C. H. OSTENFELD
(Copenhagen, Denmark).

(Communicated by Professor A. J. Ewart.)

[Read 10th April, 1930; issued separately 30th August, 1930.]

The following are additions to the list of Australian Sea Grasses (*These Proc.*, n.s., xlii (1), p. 1, 1929.)

Both *Diplanthera uninervis* and *Halophila spinulosa* (♂) have been found in W. Australia, at Carnarvon (1914, Herb. Copenhagen), which adds two more sea-grasses to the flora of W. Australia.

Cymodocea antarctica reaches in W. Australia at least as far north as Carnarvon.

I use this opportunity to add some new records which are due to the Danish Oceanographical Expedition on "Dana," 1929; viz:—

Cymodocea isoetifolia. Queensland: Brisbane.

Cymodocea rotundata. Queensland: Brisbane; Thursday Island. These records corroborate the somewhat uncertain record from Port Denison.

Zostera capricorni. Queensland: Brisbane. New South Wales: Newcastle; Lake Macquarie; Swansea.

Halophila ovalis. Queensland: Brisbane. New South Wales: Newcastle; Lake Macquarie; Botany Bay.

Collectors of Sea Grasses are requested to send any doubtful material to Dr. Ostenfeld, University, Copenhagen, for identification.

[Proc. Roy. Soc. Victoria, 43 (N.S.), Pt. I, 1930.]

Art. II.—*New Formicidae, with Notes on some Little-known Species.*

By J. CLARK, F.L.S.

(Entomologist to the National Museum of Victoria, Melbourne.)

[Read 12th June, 1930; issued separately 30th August, 1930.]

The following pages contain the descriptions of fourteen new species, and the female of a previously described species.

A new genus, *Eubothroponera*, has been erected to contain three species which cannot satisfactorily be placed elsewhere. It is certainly close to *Bothroponera* Mayr.

Owing to the confusion which has always surrounded the ants collected by the members of the Horn Expedition and described by W. F. Kirby (Horn Expedition, i, suppl., pp. 203-207, 1896), it has been considered advisable to review the types in the National Museum collection. The identifications and descriptions are worthless, and none of the species are recorded by Emery in the Genera Insectorum. This is not to be wondered at, as it is impossible to determine anything from the descriptions given, and even with the types at hand it is difficult to make them agree. There appears to be five valid species among the material. These, with the exception of *Iridomyrmex flavipes*, have been redescribed. Forel's description of *I. rostrinotus* (=*I. flavipes* Kirby) is too complete to warrant further detail.

Eusphinctus (Nothosphinctus) brunnicornis, n. sp.

(Text-fig. 1, No. 1.)

Worker.—Length, 3·5—4·5 mm.

Yellow. Mandibles and funiculus, except the apical segment, brown.

Shining. Finely and densely punctate throughout.

Hair yellow, short and suberect, longer and more numerous on the apical segments of the gaster. Pubescence very fine, short, particularly on the antennae and legs.

Head one fourth longer than broad, as broad in front as behind, the occipital border concave, the sides feebly convex. Frontal carinae erect, truncate behind. Clypeus very short, with a blunt translucent tooth-like projection at the middle in front. Cheeks not, or very feebly, carinate. No trace of eyes or ocelli. Antennae short and robust, scapes not extending beyond the middle of the head; segments one to ten of the funiculus broader than long, the apical as long as the four preceding together. Mandibles large and triangular, furnished with twelve to fourteen teeth. Thorax one and three-quarter times longer than broad, without traces of sutures, feebly constricted in the mesonotal region, posterior border of the epinotum feebly margined. Epinotal declivity abrupt, concave below, submarginate on the sides above; there is a blunt, tooth-like projection at each side below. Node as broad as long, slightly broader behind than in front, the anterior border straight, the sides and posterior border feebly convex; in profile as high as long, almost dome shaped; there is a broad, blunt, tooth-like projection on the ventral surface in front. Postpetiole almost one and a half times broader than long, broader behind than in front, the sides feebly convex. There is a deep and wide constriction between each of the segments of the gaster, all the segments broader than long. Pygidium truncate, flattened above, with a row of short, sharp spines on each side. Legs short and stout.

Habitat.—Western Australia: Collie (J. Clark).

Near *E.* (*N.*) *silaceus* Clark, from which it is readily distinguished by the somewhat shorter thorax, longer node and broader postpetiole, as well as by the colour of the mandibles and antennae.

Phyracaces clarus, n. sp.

(Text-fig. 1, No. 2.)

Worker.—Length, 9—10 mm.

Bright castaneous. Antennae and tarsi darker. Eyes, ocelli, margins of the thorax and node black.

Shining. Densely and microscopically punctate throughout, slightly coarser on the front of the head than elsewhere. Lower half of the sides of the thorax finely rugose.

Hair yellow, long and erect, pointed, abundant throughout, particularly on the apical segments of the gaster, shorter on the antennae and legs. Pubescence very fine and adpressed, confined to the antennae and legs.

Head as long as broad, the occipital border almost straight, the sides convex. Frontal carinae erect, truncate and confluent behind. Carinae of the cheeks short, extending back level with the frontal carinae. Clypeus short, broadly rounded and feebly produced in front. Eyes large, almost globular, placed at the middle of the sides. Three large prominent ocelli. Scapes extending to the anterior ocellus; second segment of the funiculus fully one-third longer than the first, apical barely as long as the two preceding together. Mandibles triangular, finely denticulate, abruptly bent at their base. Thorax one and three-quarter times longer than broad, constricted at the mesonotal region, with faint traces of sutures. Pronotum convex and subbordered in front, strongly bordered and convex on the sides, the border terminates at the suture. Mesonotum not margined. Epinotum strongly convex and margined on the sides, the posterior border feebly convex and strongly margined. The declivity short and steep, submarginate on the sides. Petiole broader than long, much broader behind than in front, the anterior border concave, submarginate, the sides strongly convex and marginate, the anterior angles sharp, the posterior angles produced as broad translucent teeth, directed outward and curved inward. There is only a feeble indication of a tooth on the ventral surface, near the middle. Postpetiole fully one-third broader than long, much broader behind than in front, the anterior border straight, marginate, the sides strongly convex, the anterior two-thirds submarginate. A deep and wide constriction between the postpetiole and gaster, the latter broader than long. Legs long and slender, hind coxae without a lamella behind.

Female.—Length, 10—12 mm.

Similar to the worker, but larger and winged. The pilosity is much more abundant. Parapsidal furrows strongly impressed. Mayrian furrows not defined. Wings hyaline, all the veins in front of the cubitus obsolete.

Male.—Length, 8 mm.

Colour and pilosity similar to the worker.

Shining. Head, pronotum, scutellum and epinotum finely and densely rugose. Mesonotum, node, postpetiole and gaster smooth with large, scattered, piligerous punctures.

Head broader than long, strongly convex behind. Frontal carinae erect, truncate but not confluent behind. Clypeus short, broadly rounded. Eyes large and convex, occupying almost half the sides. Ocelli large and convex. Scapes of the antennae extending to the anterior ocellus; second segment of the funiculus one third longer than the first. Mandibles large and triangular, edentate. Pronotum short, just visible from above, broadly convex. Mesonotum large, as broad as long, strongly arched in front, straight behind, mayrian and parapsidal furrows not indicated. Scutellum dome shaped, slightly broader than long. Epinotum broader than long, the posterior border margined; in profile the declivity straight, the sides margined. Node as long as broad, the anterior border straight, the sides and posterior border convex. Postpetiole as broad as long, almost three times broader behind than in front. First segment of the gaster one-fourth broader than long, broadest behind. Genitalia retracted. Legs long and slender.

Habitat.—Western Australia: Cannington (D. L. Serventy); Mundaring, Kalamunda and National Park (J. Clark).

This species comes nearest to *P. constricta* Clark, but may be distinguished by its smaller size and more robust thorax. In *P. constricta* the sides of the declivity are margined.

PHYRACACES FLAMMEUS, n. sp.

(Text-fig. 1, No. 3.)

Worker.—Length, 6·5 mm.

Red. Eyes and margins of the head, thorax and node black.

Shining. Mandibles punctate. Front of the face finely rugose, the rest of the head, thorax, node and gaster with isolated, shallow, piligerous punctures.

Hair yellow, long and suberect, abundant throughout, particularly on the apical segments of the gaster. Pubescence not apparent.

Head as broad as long, broader behind than in front, the occipital border and sides feebly convex, the angles rounded and margined; the margin extends from the inferior posterior corner to within one-third of its length from the posterior border of the eyes; this carina is continued on the under surface, and is the same length as the one above. Frontal carinae erect, truncate and confluent behind, with a distinct longitudinal carina between them. Clypeus very short and rounded. Eyes moderately large and convex, placed at the middle of the sides. No ocelli. A moderately strong carina on the cheek extending to the anterior third of the eyes, strongly bent inward behind the middle. Scapes extending to the posterior fourth of the head, gradually thickened to their apex; apical segment of the funiculus barely as long as the two preceding segments together. Mandibles triangular, the external border concave in the middle, the inner border edentate. Thorax one and one-half times longer than broad, the sutures feebly indicated. Pronotum feebly convex in front and on the sides, the angles sharp, strongly marginate. The posterior border of the epinotum almost straight, the sides convex; in profile the declivity straight and at an obtuse angle, the sides marginate. The pronotum is sharply margined vertically. Node one fourth broader than long, much broader in front than behind, the anterior border straight, strongly marginate, the sides strongly convex and marginate, the posterior corners produced as broad sharp teeth, directed upward and backward; in profile there is a broad bifid tooth in front below, directed backward. Postpetiole one fourth broader than long, the anterior border straight, or feebly concave, the sides strongly convex and margined. First segment of the gaster fully one fourth broader than long. Legs long and slender. Coxae of the hind pair with a broad translucent lamina on top behind.

Female.—Length, 6·5—7 mm.

Closely resembles the worker, differing only in larger size, the ocelli well developed, and the sutures of the thorax more strongly impressed. The pilosity is a little longer and more abundant.

Habitat.—Western Australia: Lesmurdie Falls (J. Clark).

This species comes nearest to *P. brevicollis* Clark, but is readily distinguished by its smaller size and more slender form.

Phyracaces flavescens, n. sp.

(Text-fig. 1, No. 4.)

Worker.—Length, 3·8—4·3 mm.

Reddish yellow. Eyes and margins of the thorax and node black.

Shining. Head very finely and densely reticulate-punctate. Mandibles smooth, with some large scattered punctures. Thorax, node and postpetiole reticulate-punctate as on the head, remainder of the gaster superficially reticulate.

Hair yellow, long and erect, abundant throughout, very short and adpressed on the antennae and legs.

Head slightly longer than broad, as broad in front as behind, the occipital border straight, the sides convex. Frontal carinae erect, truncate and confluent behind. Clypeus short and rounded. Eyes large, moderately convex, placed at the middle of the sides. No ocelli. Carina of the cheeks extending to and touching the anterior third of the eyes, bent inward and branched at the middle, one portion extending to the frontal carina above the antennal fovea. Scapes extending to the posterior third of the head, gradually thickened to their apex; first segment of the funiculus one fourth longer than the second, the apical as long as the three preceding segments together. Mandibles triangular, abruptly bent near the base, the external border concave at the middle, the inner border sharp, edentate. Thorax fully one and three quarter times longer than broad, without traces of sutures. Strongly constricted at the mesonotal region, the pronotum and epinotum of equal width. All four sides of the dorsum strongly marginate. Anterior border of the pronotum feebly convex, the angles sharp; in profile a sharp carina extending downward from the anterior angle. Posterior border of the epinotum convex; in profile the declivity abrupt and concave, marginate on the sides. Petiole broader than long, slightly broader behind than in front, the anterior border concave, the sides feebly convex, the posterior angles produced backward and inward as sharp, translucent teeth. The anterior border and sides marginate. Postpetiole slightly broader than long, convex in front and on the sides. First segment of the gaster much broader than long. Pygidium truncate, feebly margined, with a row of short bristles on each side. Legs long and slender, the posterior coxae with a large translucent lamina on top behind.

Female.—Length, 4.5—5 mm.

Very similar to the worker, but larger and more robust. Ocelli well developed. Mesonotum without mayrian furrows, parapsidal furrows well developed. Wings hyaline, with a brownish tinge, all the veins in front of the cubitus obsolete.

Habitat.—Western Australia: Eradu (J. Clark).

Near *P. newmani* Clark, from which it is distinguished by the colour, sculpture and more slender form, as well as by the form of the node.

Subfamily PONERINAE.

ACANTHOPONERA NIGRA, n. sp.

Worker.—Length, 2·7—3 mm.

Black. Mandibles brown. Scapes and tarsi blackish brown.

Head, thorax and node opaque. Mandibles coarsely punctate. Head finely, longitudinally, striate-rugose on the middle, more reticulate-punctate on the sides. Pronotum finely reticulate-punctate. Mesonotum, epinotum and node and postpetiole more coarsely so. Declivity and gaster finely and densely punctate.

Hair reddish, long and erect, abundant throughout, shorter and suberect on the antennae and legs. Pubescence reddish, rather long and coarse, particularly on the gaster.

Head longer than broad, as broad in front as behind, the occipital border straight, the sides parallel, feebly convex, the angles rounded. Frontal carinae short, not as long as their distance apart, overhanging the antennal insertions in front. Clypeus convex above, the anterior border broadly convex. There is a strong carina extending from the anterior border of the clypeus to the occipital border. Eyes convex, placed at the posterior two-thirds of the head. Scapes extending slightly beyond the hind margin of the eyes; first segment of the funiculus three times longer than the second, the others subequal to the apical, which is longer than the two preceding together. Mandibles triangular, armed with five or six sharp teeth. Thorax one and a half times longer than broad. Pronotum one and two-third times broader than long, convex in front and on the sides. Suture between the mesonotum and epinotum very feebly defined. Mesonotum almost twice as long as broad. Epinotum fully twice as broad as long, the posterior border strongly concave, the angles produced. Declivity concave, with a distinct median furrow below, margined above and on the sides. Node one and two-third times broader than long, the anterior border and sides strongly convex, posterior border straight, or very feebly convex; in profile twice as high as long, parallel, the anterior, posterior and dorsal faces straight, the angles feebly rounded. There is a long, strong tooth in the middle of the under surface. This is continued in front, by a translucent membrane, as a plate-like projection. Postpetiole slightly broader than long, strongly convex in front and on the sides. There is a strong constriction between the postpetiole and first segment of the gaster, the latter slightly broader than long. Legs short and stout.

Habitat.—Victoria: Mt. William, Grampians (J. Clark).

The colour and pilosity separate this from the other known species.

Euponera (Trachymesopus) pachynoda, n. sp.

(Text-fig. 1, No. 5.)

Worker.—Length, 5 mm.

Castaneous. Densely and finely reticulate-punctate, more coarsely so on the gaster. Mandibles coarsely punctate.

Hair yellow, erect, long and abundant throughout, particularly on the apical segments of the gaster. Pubescence yellow, long and adpressed on the head, thorax and node, much longer and more abundant on the gaster, but not hiding the sculpture, shorter on the antennae and legs.

Head longer than broad, as broad in front as behind, the occipital border concave, the sides convex. Frontal carinae short, twice as long as broad, flattened, overhanging the antennal insertions, separated by a very fine groove. Clypeus short, convex, broadly rounded in front. Eyes very minute, placed in front of the anterior third of the sides. Scapes extending beyond the occipital border by barely their thickness; first segment of the funiculus almost twice as long as the second, the others subequal to the apical, which is as long as the two preceding segments together. Thorax twice as long as broad. Pronotum broader than long, convex in front and on the sides. Mesonotum broader than long, strongly convex in front, feebly so behind. Epinotum longer than broad, convex in front, the sides parallel, the posterior border concave; in profile the dorsum straight longitudinally, the declivity convex, the sides feebly bordered. Node massive, one-third broader than long, strongly convex in front and on the sides, the posterior border straight; in profile almost one-third higher than long, parallel, the anterior and posterior faces straight, the dorsum feebly convex. There is a long tooth on the middle of the ventral surface, directed backward. Postpetiole broader than long, the anterior border and sides feebly convex, almost straight. There is a deep constriction between the postpetiole and first segment of the gaster, the latter broader than long.

Habitat.—Victoria: Ferntree Gully (F. P. Spry; L. B. Thorn).

It is with some doubts that this species is placed in the present genus. The epinotum and node are similar to those of the genus *Acanthoponera*, whilst the remainder are quite those of the present genus.

Genus **Eubothroponera** gen. nov.

Worker.—Monomorphic. Mandibles triangular, edentate, Maxillary palpi with four, labial palpi two segments. Eyes large and convex. No ocelli. Frontal carinae represented as small flat, horizontal plates, or lobes, overhanging the antennal insertions, not, or hardly, defined behind, widely separated. In profile the head forms an even convexity from the anterior border of the clypeus to the occipital border. Clypeus broad and convex, level with the top of the carinae. Antennae with twelve segments, scapes pass the occipital border. Suture between the pronotum and mesonotum strongly impressed. Mesoepinotum without traces of a suture. Node massive, broader than long, with a long tooth in front below. First and second segments of the gaster separated by a strong constriction. Legs long and slender, the anterior pair each with one spur, the middle and posterior pair each with two spurs, claws small and simple.

Male and female unknown.

Genotype *Eubothroponera dentinodis*, n. sp.

Near *Bothroponcra.* Distinguished by its small size, large eyes and differently shaped epinotum.

KEY TO THE SPECIES.

1. Red. Node with a strong tooth at the middle of the posterior border above. .. .. *dentinodis*. n. sp.
2. Red. Head and gaster brown. Node with a slight indication of a tooth at the middle of the posterior border above .. .. *bicolor*. n. sp.
3. Brown. Epinotal declivity sharply margined. Node without a tooth above. .. .. *micans*, n. sp.

EUBOTHROPONERA DENTINODIS, n. sp.

(Text-fig. 1, Nos. 6, 6*a*.)

Worker.—Length, 4—4·5 mm.

Castaneous. Mandibles, antennae and legs lighter, eyes and posterior margin of the node black.

Subopaque. Head finely reticulate, with some large, very shallow, punctures. Mandibles densely punctate. Scapes and thorax densely and very finely punctate, the punctures larger on the end of the epinotum. Node more coarsely punctate, almost rugose. Gaster microscopically punctate, with some large, isolated, shallow punctures.

Hair yellow, erect, long and abundant on the head, thorax, node and gaster, none on the antennae and legs. Pubescence yellow, very fine and moderately abundant, particularly on the apical segments of the gaster, very abundant and adpressed on the antennae and legs.

Head slightly longer than broad, the occipital border feebly, the sides strongly convex. Frontal carinae overhanging the antennal insertions in front, hardly defined behind. Clypeus large, convex above, level with the top of the carinae. Eyes large and convex, placed at the middle of the sides. Scapes extending beyond the occipital border by twice their thickness; first segment of the funiculus as long as the second, the others subequal. Mandibles triangular, abruptly bent at their base, edentate. Thorax one and three-quarter times longer than broad. Pronotum fully one-third broader than long, convex in front and on the sides, the suture strongly impressed. Mesonotum and epinotum united without traces of a suture, the posterior border straight, feebly margined; in profile convex longitudinally, the declivity face straight, at an obtuse angle, the sides feebly margined. Node one-fourth broader than long, convex in front and on the sides, the posterior border sharply margined; there is a strong, tooth-like projection at the middle, directed backward; in profile higher than long, the anterior face vertical, as long as the dorsum, the posterior face concave; there is a long, broad, blunt tooth below in front, and a smaller one behind directed backward. First segment of the gaster one-third broader than long. There is a decided constriction between the first and second segments, the latter broader than long. Legs long and slender.

Habitat.—Western Australia: Bungulla (J. Clark).

Eubothroponera micans, n. sp.

(Text-fig. 1, Nos. *7*, *7a*.)

Worker.—Length, 4—4·7 mm.

Blackish brown. Mandibles, antennae and legs brown.

Subopaque. Head, thorax and node very finely and densely reticulate, with a few isolated shallow punctures. Mandibles coarsely punctate. Scapes, legs, and gaster densely and very finely punctate; face of the declivity reticulate.

Hair yellow, erect, short and pointed, sparse throughout, very short and suberect on the legs. Pubescence long and fine, adpressed, forming a thin, but distinct, clothing on all the body.

Head one-fourth longer than broad, the occipital border feebly, the sides strongly convex. Frontal carinae overhanging the antennal insertions. Clypeus convex above, strongly convex and projecting in front. Eyes large, placed at the middle of the sides. Scapes extending beyond the occipital border by one-fourth of their length; first segment of the funiculus as long as the second, the others subequal. Mandibles triangular, abruptly bent near the base, edentate. Thorax almost twice as long as broad. Pronotum one-third broader than long, the anterior border strongly, the sides feebly, convex, the suture strongly impressed. Mesonotum and epinotum united without traces of a suture, the posterior border and sides of the declivity sharply margined; in profile convex longitudinally, the declivity abrupt, concave laterally. Node one-third broader than long, broader behind than in front, the anterior border feebly, the sides strongly convex, the posterior border straight, the dorsum flattened behind in the middle; in profile one-third higher than long, the anterior face and dorsum feebly convex, the posterior face straight; there is a long, broad, translucent tooth in front below, and a feeble one behind, directed backward. There is a well-defined constriction between the first and second segments of the gaster. Legs long and slender.

Habitat.—Western Australia: Mundaring (J. Clark).

Two small colonies of this species have been found. One, the first, was nesting in a burrow made by a trap-door spider. The second was under a piece of old bark on the ground. Both colonies appeared to be temporary, or moving; no females, eggs, larvae nor pupae were present.

Readily separated from *E. dentinodis* by the form of the head and node, as well as by the colour, sculpture and pilosity.

EUBOTHROPONERA BICOLOR, n. sp.

(Text-fig. 1, Nos. 8, 8*a*.)

Worker.—Length, 4·8—5·3 mm.

Red. Head and gaster brown, mandibles, clypeus, antennae and legs reddish brown.

Shining. Head, thorax and node finely and densely punctate, the punctures on the thorax a little larger than those on the head, some large shallow punctures scattered sparingly throughout. Gaster densely, microscopically punctate.

Hair yellow, short and suberect, very sparse throughout. Pubescence fine, short and adpressed, particularly on the antennae and legs.

Head slightly longer than broad, the occipital border and sides convex. Frontal carinae overhanging the antennal insertions. Clypeus strongly convex above, the anterior border strongly produced. Eyes convex, placed at the middle of the sides. Scapes extending beyond the occipital border by one-fourth of their length; first segment of the funiculus slightly longer than the second, the others subequal. Mandibles triangular, abruptly bent at their base, edentate. Thorax one and three-fourth times longer than broad. Pronotum fully one and two-third times broader than long, convex in front and on the sides. Mesonotum and epinotum united without traces of a suture, convex laterally, the posterior border not margined; in profile convex longitudinally, the declivity at an obtuse angle, the boundary between the two faces hardly defined. Node one-fourth broader than long, broader behind than in front, the anterior border straight, sides convex, the posterior border straight and submargined, with traces of a tooth in the middle. Gaster distinctly constricted between the first and second segments. Legs long and slender.

Habitat.—Western Australia: Ludlow (J. Clark).

Several specimens taken on tree trunks. No nest has been found. This species comes near *E. micans,* but can be distinguished by the form of the head and node, also by the colour, sculpture and pilosity.

BOTHROPONERA TASMANIENSIS Forel.

Pachycondyla (*Bothroponera*) *tasmaniensis* Forel, Bull. Soc. Vaud. Sc. Nat., xlix, p. 176, 1913. ☿

I have not seen this species, but from the description given by Forel I am of the opinion that it is congeneric with the three preceding.

Subfamily FORMICINAE.

POLYRHACHIS (CHARIOMYRMA) OPALESCENS, n. sp.

(Text-fig. 1, Nos. 9, 9*a*.)

Worker.—Length, 5—6 mm.

Black, but so densely clothed with reddish green opalescent matter as to give it an iridescent brownish sheen.

Shining. Head and mandibles finely longitudinally striate. Thorax more coarsely so. Declivity of the epinotum transversely striate. Node smooth. Gaster very finely and densely reticulate.

Hair yellowish, very long and erect, abundant throughout, shorter and suberect on the antennae and legs. Pubescence very fine and adpressed.

Head longer than broad, convex behind and on the sides. Frontal carinae swerving outward at the middle. Clypeus carinate, broadly produced in front, feebly dentate, the angles sharp. Eyes large and convex, placed at the posterior third of the sides. Scapes extending beyond the occipital border by one-half their length; first segment of the funiculus one-fourth longer than the second, the others sub-equal to the apical. Mandibles broad, armed with five large sharp teeth. Thorax one and one-fifth times longer than broad. Pronotum one and two-third times broader than long, much broader in front than behind, the sides strongly convex, the anterior angles bluntly produced, the anterior border and sides marginate. Mesonotum twice as broad in front as long, the sides convex, marginate. The suture between the mesonotum and epinotum feebly defined, the latter twice as broad as long, furnished with two long slender spines directed backward and outward, as long as their distance apart at the base, on the side of the epinotum, between the spines and base, is a broad angular projection. In profile the dorsum and declivity united without traces of a boundary, the spines feebly inclined upward near the base, then horizontal. Node thin, furnished with two long slender spines encircling the gaster; between these, on the dorsum, is a short, blunt tooth directed upward; in profile the node is much thicker below than above, the spines almost straight. Gaster slightly longer than broad. Legs robust.

Habitat.—New Hebrides: Banaka (W. W. Froggatt).

Polyrhachis (Hedomyrma) kershawi, n. sp.

(Text-fig. 1, Nos. 10, 10*a*.)

Worker.—Length, 6·5—7 mm.

Thorax and node bright castaneous. Apical half of the spines and the middle of the dorsum of the pronotum blackish brown. Head, mandibles, antennae, tibia, tarsi and gaster black. Femora brown.

Subopaque. Head finely and densely reticulate-punctate. Pronotum finely striate longitudinally, the anterior portion and the whole of the mesonotum finely punctate. Epinotum and node smooth and shining. Gaster microscopically punctate.

Hair brownish, erect, long and pointed, very abundant on the thorax and gaster. Pubescence yellow, long and adpressed on the thorax and gaster, where it forms a distinct covering, but not hiding the sculpture.

Head very slightly longer than broad, broader behind than in front, the occipital border broadly convex, the sides feebly convex, the angles bluntly rounded. Frontal carinae erect, swerving behind. Clypeus carinate, bluntly produced in front. Scapes extending beyond the occipital border by more than half their length; first segment of the funiculus one-fourth longer than the second, the others subequal. Mandibles armed with four to five strong sharp teeth. Thorax one and one-half times longer than broad. Pronotum much broader than long, the dorsum square, marginate on the sides, furnished on each side in front with a long sharp spine directed outward and slightly forward; in profile the spines are curved downward at the points, the dorsum convex. Mesonotum one-third broader than long, much broader in front than behind, sharply marginate on the sides, convex laterally in front, flat behind. Epinotum broader than long, sharply marginate on the sides, furnished with two long sharp spines directed backward and slightly outward, the dorsum concave; in profile the spines horizontal, abruptly bent at their base, slightly higher than the dorsum, the declivity straight, at an obtuse angle, fully twice as long as the dorsum. Node one-fourth broader than long, the anterior border straight, the posterior convex, furnished with two long, slender spines directed outward, backward and slightly upward, much wider than the epinotum, almost encircling the gaster; in profile parallel, twice as high as long, the dorsum inclined behind, the spines raised toward the points. Gaster longer than broad. Legs long and slender.

Habitat.—North Queensland: Claudie River (J. A. Kershaw).

Near *P. daemeli* Forel, but readily distinguished by the longer spines on the pronotum, colour and pilosity.

Polyrhachis (Myrmhopla) glabrinotum, n. sp.

(Text-fig. 1, Nos. 11, 11*a*.)

Worker.—Length, 10—10·5 mm.

Black. Legs brown. Mandibles and epinotum with a brownish tinge.

Subnitid. Mandibles and pronotum shining, almost smooth. Head coarsely rugose behind the eyes, finely and densely punctate in front of the eyes. Epinotum smooth above, finely and densely punctate. Sides of the mesonotum and epinotum coarsely and irregularly rugose. Gaster, legs and antennae microscopically punctate.

Hair greyish, erect, long and pointed, abundant throughout, shorter and suberect on the antennae and legs. Pubescence greyish, very fine and adpressed, abundant throughout, slightly longer on the gaster, but not hiding the sculpture.

Head one-third longer than broad, the sides convex, the occipital produced as a bluntly rounded point. Frontal carinae erect, diverging behind. Clypeus convex, with a distinct median carina, produced in front. Eyes large and globular, placed almost at the posterior third. Scapes extending beyond the occipital border by almost one-half their length; first segment of the funiculus one-fourth longer than the second. Mandibles armed with five to six strong sharp teeth. Thorax fully twice as long as broad. Pronotum as long as broad, convex laterally, furnished with a long, slender, sharp spine at each side in front, directed outward and curved forward; in profile the dorsum strongly convex longitudinally, the spines directed downward and forward. Mesonotum longer than broad, convex above. Epinotum as long as broad, furnished with two long, slender spines, meeting at their base, directed outward, and backward, fully twice as long as those on the pronotum; in profile suberect, curved backward, the dorsum of the epinotum and mesonotum forming a straight line, much lower than the pronotum. The declivity at an obtuse angle, as long as the dorsum. Node longer than broad, the sides strongly convex, furnished with two long, sharp, slender spines, directed outward and backward, slightly longer than their distance apart at the base; in profile one-fourth higher than long, higher behind than in front, the anterior and posterior faces straight, parallel, the dorsum convex, the spines directed slightly upward. Gaster longer than broad. Legs long and slender.

Habitat.—North Queensland: Cape York (W. B. Barnard).

This species is near *P. barnardi* Clark, but is readily distinguished by its smaller size and more slender form, more shining appearance, and highly polished pronotum. The sculpture is much coarser than in *P. barnardi*. The shape of the head and node at once separate this species from *P. clotho* Forel.

Polyrhachis (Myrmhopla) barnardi Clark.

Journ. Roy. Soc. W. Aust., xv, p. 39, pl. i, figs. 37-38, 1928.

Female.—Length, 14·5—15 mm. Not previously described.

Resembles the worker, but is much larger and more robust. The colour, sculpture and pilosity are identical. The spines of the pronotum, epinotum and node are shorter and thicker. On the mesonotum there is a sharp longitudinal carina in the middle of the anterior half, effaced behind. A strong carina on each side takes the place of parapsidal furrows. The posterior border finely, but sharply, margined, with a sharp tooth-like corner at the junction with the lateral carina. Wings hyaline, with a smoky tinge.

Habitat.—North Queensland: Cape York (W. B. Barnard).

Since the worker was described I have received further examples of this species from Mr. Barnard, including the female, also examples of *P. clotho* Forel. The latter is very distinct from *P. barnardi*, having a differently shaped head and node. The formation of the thorax is somewhat similar. In *P. clotho* the head is almost as broad as long, and broadly rounded behind. The spines of the epinotum are more widely separated and raised at a very slight angle. The node is higher in front than behind, more like that of *P. trapezoidea* Mayr. The pilosity is similar to that of *P. glabrinotum*, described above.

Polyrhachis (Campomyrma) gravis, n. sp.

(Text-fig. 1, Nos. 12, 12*a*.)

Worker.—Length, 7·5—9 mm.

Black. Mandibles, apical segments of the antennae, legs and four posterior coxae reddish brown, anterior coxae black. In a few examples the tibiae are darker than the femora.

Shining. Head very finely striate-rugose longitudinally. Clypeus slightly rugose behind, punctate in front. Mandibles very finely and densely striate longitudinally. Pronotum longitudinally arched striate-rugose, diverging outward behind, almost transverse in front. Mesonotum and epinotum longitudinally striate-rugose, the striae following the contour of the segments. Sides of the thorax longitudinally striate, much stronger than on the dorsum, declivity transversely striate. Node transversely striate in front and behind. Gaster finely and microscopically striate-punctate, with a longitudinally arched direction. Anterior coxae finely transversely rugose.

Hair yellow, erect, very short and sparse throughout, except on the apex of the gaster.

Head slightly longer than broad, the occipital border appearing strongly convex, but really composed of three straight portions, the base, or centre, short, the portions from the base to the angles three times longer than the base, sides convex. Frontal carinae parallel, or very feebly diverging behind. Clypeus broad and convex, not carinate, the anterior border broadly produced, straight, feebly crenulate. Eyes large and convex, placed at the posterior angles. Scapes extending beyond the occipital border by more than half their length; first segment of the funiculus slightly longer than the second, the others subequal to the apical. Mandibles armed with six large, sharp teeth. Thorax one and one-half times longer than broad. Pronotum almost twice as broad as long, convex and marginate in front and sides, the posterior border almost straight, the anterior angles bluntly produced. Mesonotum broader than long, one and a-half times broader in front than behind, the sides marginate. Epinotum one-third longer than broad, fully twice as broad in front as behind, the sides strongly marginate, produced behind as short, sharp teeth, directed upward, their length equal to their distance apart at the base. The declivity abrupt, concave, as long as the dorsum. Node thick, broader than long, furnished with four sharp, slender spines, the middle pair slightly longer than the lateral pair, longer than their distance apart, parallel, the points of the lateral pair level with the base of those in the middle. First segment of the gaster strongly margined in front, and anterior two-thirds of the sides. Legs long and slender.

Habitat.—Central Australia: Burt Plains (C. Barrett).

Polyrhachis (Campomyrma) flavibasis, n. sp.

(Text-fig. 1, Nos. 13, 13*a*.)

Worker.—Length, 7—7·5 mm.

Head, thorax and node black. Anterior border of the mandibles, funiculus, knees, tarsi and gaster brown. Femora, tibia, base of the first segment and posterior margin of the other segments of the gaster yellow. Posterior coxae more or less splashed with yellow.

Shining. Head and thorax very finely, densely and irregularly, reticulate, slightly coarser on the thorax, reticulate-punctate on the sides. Declivity smooth and shining. Anterior and posterior faces of the node superficially reticulate. Gaster microscopically punctate.

Hair yellow, erect, very sparse, confined to the front of the head and apical segments of the gaster. Pubescence yellow, very sparse on the gaster and antennae, not apparent elsewhere.

Head longer than broad, convex behind and on the sides. Frontal carinae short. Clypeus convex, with a faint carina in the middle in front, the anterior border produced and almost straight. Eyes large and convex, placed at the posterior third of the sides. Scapes extending beyond the occipital border by barely half their length; first segment of the funiculus one-third longer than the second. Mandibles armed with five strong, sharp teeth. Thorax one and three-quarters times longer than broad, the sutures strongly impressed. Pronotum as long as broad, strongly convex in front and on the sides, the latter submarginate, feebly convex above. Mesonotum broader than long, broader in front than behind, submarginate on the sides. Epinotum square, as long as broad, the sides submarginate, the posterior border sharply marginate. Declivity face steep, concave near the bottom, longer than the dorsum, the sides rounded. Node almost twice as broad as long, the lateral angles sharp, the top edge high and narrow, furnished with two broad, triangular teeth. Gaster longer than broad, the anterior border feebly concave below. Legs short and robust.

Female.—Length, 9 mm.

Larger and more robust than the worker. Sculpture a little coarser, more reticulate-punctate. Parapsidal furrows well impressed. Mayrian furrows not defined. Colour identical. Wings hyaline with a brownish tinge.

Habitat.—New South Wales: Brooklana and Dorrigo (W. W. Froggatt).

Notes on the Ants of the Horn Expedition.

The collection, here re-examined, was dealt with by Mr. W. F. Kirby, Results of the Horn Expedition, Part I, Supplement, pp. 203-207, 1896. In each case the number and name given by Kirby are stated first, notes and corrections follow.

1. *Camponotus schencki* Mayr. Paisley Bluff. One specimen.

   This species cannot now be traced in the collection.

2. *Camponotus impavidus* Forel. MacDonnell Range, several specimens.

This is not *impavidus*, but a species subsequently described by Wheeler as *Calomyrmex purpureus* Mayr var. *eremophilus* (*Trans. Roy. Soc. S. Aust.*, xxxix, p. 820, 1915). The material consists of workers, females and males. As Wheeler described only the worker I give here descriptions of the sexes:—

Female.—Length, 8-8·5 mm.

Head and thorax bright metallic green. Mandibles, antennae, legs and gaster black. Wings hyaline, with a slight brownish tinge. Sculpture and pilosity identical with that of the worker. Ocelli prominent. Thorax without mayrian furrows. Parapsidal furrows prominent. There is a short median, longitudinal groove on the front of the mesonotum. The anterior angles of the pronotum are subbordered; on the middle of the base of the pronotum there is a distinct raised tubercle.

Male.—Length, 6·5-7 mm.

Greenish-black throughout. Sculpture somewhat coarser than in the worker. Hair reddish, very long and abundant throughout.

Head as long as broad, broader behind than in front, the occipital border and sides strongly convex. Frontal carinae short, twice as wide behind as in front; there is a distinct longitudinal carina between them. Clypeus broad and convex. Eyes large and convex, placed at the middle of the sides. Ocelli prominent. Scapes extending beyond the occipital border by half their length; first segment of the funiculus longer than the second. Mandibles edentate. Mesonotum one third broader than long, strongly convex in front and on the sides, the anterior face steep and convex, not quite hiding the pronotum from above. Mayrian furrows not impressed, parapsidal and median furrows as in the female. Scutellum as broad as long, broader in front than behind. Epinotum broader than long. Node twice as broad as long, convex in front and behind; in profile higher than long, the anterior and posterior faces and dorsum convex. Gaster much longer than broad. Cerci moderately long and thick. Outer genital processes slender; legs long and slender. Wings hyaline with a slight brownish tinge.

Many examples from MacDonnell Range.

3. *Camponotus arcuatus* Mayr. Hugh Creek; MacDonnell Range. Two specimens apparently belonging to this rare species.

This species cannot be traced in the collection.

4. *Camponotus reticulatus* Kirby. Paisley Bluff, burrow-nest under stones, many specimens; also Palm Creek and Finke Gorge.

This appears to be a valid species, but Kirby's name having been preoccupied by Roger, 1863 (*Berl. Ent. Zeitschr.*, vii, p. 139), I have substituted the name of the late Sir Baldwin Spencer, leader of the expedition, for the species. The major and minor workers are here more fully described as *Camponotus* (*Tanaemyrmex*) *spenceri,* nom. nov.

Worker Major.—Length, 8·5-9 mm.

Reddish brown. Mandibles red. Funiculus, tarsi and apical margin of the segments of the gaster testaceous.

Subopaque. Mandibles shining, very sparsely punctate. Head, thorax, node and first segment of the gaster finely and densely punctate-reticulate, the rest of the gaster microscopically punctate.

Hair reddish, long and erect, moderately abundant throughout.

Head very slightly longer than broad, much broader behind than in front, the occipital border straight, the sides convex. Frontal carinae diverging slightly behind, one fourth longer than their width at the middle; there is a strong carina between them. Clypeus convex above, strongly projecting at the middle in front, this portion of the clypeus as long as broad, strongly carinate, the anterior border concave. Eyes convex, placed at the posterior third of the sides. Scapes extending beyond the occipital border by one-fourth of their length; segments one to four of the funiculus almost equal in length, the others subequal. Mandibles large and triangular, armed with six strong sharp teeth. Thorax almost two and a half times longer than broad. Pronotum one-third broader than long, strongly convex in front, on the sides and above. Mesonotum circular, convex above. Epinotum narrow above, fully twice as long as broad. Node scale-like, convex in front, concave behind; in profile inclined forward, the anterior face strongly convex, posterior flat, bluntly pointed above. Gaster longer than broad. Legs long and slender.

Worker Minor.—Length, 6-7·3 mm.

Colour, sculpture and pilosity similar to the worker major. Head longer than broad, as broad in front as behind, the occipital border strongly, the sides feebly, convex. Scapes extending beyond the occipital border by half their length. The rest as in the major, but much more slender.

Habitat.—Paisley Bluff, Palm Creek, Finke Gorge.

5. *Camponotus novae-hollandiae* Mayr. MacDonnell Range; Palm Creek; Paisley Bluff.

Three species are included under this name. The specimens from Paisley Bluff are correctly placed. This is *Camponotus* (*Tanaemyrmex*) *novae-hollandiae* Mayr. The examples from MacDonnell Range are all referred to *Camponotus* (*Tanaemyrmex*) *discors* Forel, var. *laetus* Forel (*Rev. Suisse Zool.*, xviii, p. 70, 1910), subsequently described from the same locality. The specimens from Palm Creek are dëalated females of the genus *Iridomyrmex*, not in condition to be described.

6. *Camponotus denticulatus* Kirby. MacDonnell Range; Paisley Bluff.

The specimen from Paisley Bluff is a dëalated female of the genus *Iridomyrmex*, apparently identical with those placed under the preceding species, and not in condition to be named. The species from the MacDonnell Range appears to be valid, and is here redescribed as *Camponotus* (*Tanaemyrmex*) *denticulatus* Kirby.

Worker Minor.—Length, 8·5-9 mm.

Brownish red. Posterior half of the head, top of the pronotum and mesonotum, whole of the node and gaster black. Apical margin of the segments of the gaster yellowish.

Opaque. Densely and finely punctate throughout.

Hair yellowish, long and erect, very sparse throughout. Pubescence greyish, fine, very abundant throughout, but not hiding the sculpture. There is a row of bristles on the underside of the tibia.

Head longer than broad, as broad in front as behind, the occipital border strongly, the sides feebly, convex. Frontal carinae diverging behind, with a feeble but distinct carina between them. Clypeus broad and convex, feebly carinate, the anterior border broadly produced, convex and feebly crenulate. Eyes large and convex, placed at the posterior angles. Scapes extending beyond the occipital border by half their length; first and third segments of the funiculus of equal length, second slightly shorter. Mandibles large, armed with six large sharp teeth. Thorax two and a-quarter times longer than broad. Pronotum one-third broader than long, convex on the sides and above. Mesonotum slightly broader than long, convex above. Epinotum three times longer than broad on top, almost parallel, the declivity very short, hardly apparent. Node twice as broad as long, all four sides convex; in profile twice as high as long, parallel, the anterior and posterior faces straight, the dorsum convex. Gaster oval, longer than broad. Legs long and slender.

Worker Major.—Length, 10-10·5 mm.

Colour and sculpture as in the worker minor, but a little more shining. Pubescence not so abundant.

Head one-fourth broader than long, much broader behind than in front, the occipital border straight, the sides convex. Scapes extending beyond the occipital border by fully one-third of their length. Eyes large and rather flat, placed about half their diameter from the occipital border. Ocelli represented by three small depressions, the anterior largest. Thorax similar but larger. Node three times broader than long, straight in front and behind, sides convex; in profile scale-like, the anterior face strongly convex, the posterior straight. Legs robust.

Habitat.—MacDonnell Range.

7. *Camponotus horni* Kirby. Palm Creek, burrow nest under stone.

Kirby says: "The peculiar structure of this species will probably ultimately necessitate its removal to another genus, but the rufous body and purple abdomen will render it easily recognisable." In this statement he is correct, for the worker is *Iridomyrmex detectus* Smith, the most common and widely distributed ant in Australia. The female appears to be a valid species, and is here redescribed as *Camponotus* (*Tanaemyrmex*) *horni* Kirby.

Female.—Length, 13 mm.

Black. Inner edge of the mandibles, front of the face, antennae and pronotum ferrugineous. Legs testaceous. Tarsi and knees darker. Wings hyaline with a brownish tinge.

Shining. Head, pronotum and epinotum finely and densely reticulate-punctate. Mesonotum, scutellum and gaster superficially so.

Hair reddish, long and erect, rather sparse throughout. Pubescence reddish, short and sparse.

Head longer than broad, broader behind than in front, the occipital border feebly convex, the sides nearly straight. Frontal carinae diverging widely behind, with a longitudinal median groove between them. Clypeus feebly carinate, the anterior border produced, straight, or feebly concave. Eyes large, rather flat, their distance from the occipital border somewhat less than their diameter. Ocelli large. Scapes passing the occipital border by one-fourth of their length. Thorax almost twice as long as broad. Pronotum small, hardly visible from above. Mesonotum broader than long, strongly convex in front and on the sides, flattened, or feebly convex, above. Parapsidal furrows impressed. Scutellum broader than long, broader in front than behind. Epinotum twice as broad as long, the declivity steep, but without a defined boundary on the dorsum. Node scale-like, fully three times broader than long, convex in front, straight behind; in profile strongly convex in front, the top edge sharp. Gaster longer than broad. Legs long and slender.

Habitat.—Palm Creek.

8. *Hoplomyrmus micans* Mayr. Storm Creek, four specimens.

This has no connection with Mayr's species, but is identical with that subsequently described by Wheeler as *Polyrhachis* (*Campomyrma*) *macropus* (*Trans. Roy. Soc. S. Aust.*, xxxix, p. 821, 1915). It is widely distributed throughout Central Australia.

9. *Hypoclinea flavipes* Kirby. Tempe Downs. Ants from Porcupine grass (*Triodia pungens*).

This very distinct species is an *Iridomyrmex,* and identical with that subsequently described by Forel as *Iridomyrmex rostrinotus* (*Rev. Suisse Zool.*, xviii, p. 53, 1910, ☿ ♀ ♂). The descriptions of all three forms by Forel are very complete, and it is unfortunate that his name must give way to *Iridomyrmex flavipes* Kirby. It is known as the Spinifex Ant, being so named from its habit of collecting the gum from the leaves of this grass to construct its nest. It is widely distributed, being found wherever the spinifex grows.

10. *Bothroponera denticulata* Kirby. Blood Creek; several specimens.

This distinct species is near *B. regularis* Forel, subsequently described from Western Australia. It is widely distributed throughout the interior. The worker is here re-described:—

Worker.—Length, 12 mm.

Black, or blackish brown. Inner half of the mandibles, antennae and legs ferrugineous.

Opaque. Head coarsely reticulate. Thorax more coarsely and irregularly reticulate, with a more or less longitudinal direction. Node, first and second segment of the gaster longitudinally striate. Posterior face of the node smooth and shining.

Hair brown, suberect, long and abundant throughout, but longer and more numerous on the apical segments of the gaster. Pubescence very fine and adpressed.

Head as long as broad, as broad in front as behind, the occipital border straight, the sides feebly convex. Frontal carinae raised and lobe-like, as broad in front as long; between them is a long double carina with a median longitudinal groove. Clypeus short, convex, the anterior border bluntly produced in the middle in front. Eyes large, placed fully their diameter from the anterior border. Scapes passing the occipital border by fully their thickness; second segment of the funiculus slightly longer than the first, the apical as long as the two preceding together. Mandibles broad, armed with eight to ten irregular teeth, the apical five long and sharp, the others decreasing in size to the base. Thorax barely twice as long as broad. Pronotum almost twice as broad as long, strongly convex in front and on the sides. Pro-mesonotal suture sharply defined. In profile the thorax is evenly convex longitudinally, the declivity at an obtuse angle, rather flat, the boundary between the two faces feebly defined. Node almost twice as broad as long, the anterior face and sides strongly convex, posterior face straight, furnished with numerous long sharp teeth; these are a continuation of the dorsal striae; in profile fully twice as high as long, subparallel, the anterior face and dorsum united in a convexity, posterior face straight to near the top, then abruptly curved backward; there is a long, broad concave projection on the ventral surface. Postpetiole one third broader than long, strongly convex in front and on the sides, slightly narrower than the following segment, which is broader than long. Legs robust.

Habitat.—Blood Creek.

11. *Myrmecia nigriceps* Mayr. Reedy Hole; Bagot Creek and Alice Springs, one specimen from each; Ayers Rock and Illamurta, several specimens from each.

This has been so determined by various entomologists until it was recognised by Wheeler, who described the worker as *Myrmecia vindex* Smith var. *desertorum* (*Trans. Roy. Soc. S. Aust.*, xxxix, p. 805, 1915). On examining large series, including the sexes, from various parts of Central and Western Australia, I raised it to the rank of species, *Myrmecia desertorum* Wheeler (Clark, *Vic. Naturalist*, xlii, p. 143, 1925, ☿ ♀ ♂).

12. *Pheidole longiceps*, Mayr. Paisley Bluff, in burrow nest under stone.

Wrongly identified by Kirby and subsequently described by Forel as *Pheidole deserticola* (*Rev. Suisse Zool.*, xviii, p. 34, 1910, ♃ ☿ ♂).

The following species were described by Froggatt, Horn Exped. Zool., Part 2, 1896. As there are some doubts concerning the two species, I append a few notes, having examined the types in the National Museum.

(1) *Camponotus cowlei* Frogg., l.c., p. 387, pl. xxvii, figs. 1-5.

Examples compared with Lubbock's type of *Melophorus bagoti*, by my friend, Mr. W. C. Crawley, are identical with the types in the National Museum. This species is widely distributed throughout Central and Western Australia, and is known as the yellow honey-ant. The synonymy of this species is as follows:—

MELOPHORUS BAGOTI Lubbock.

Journ. Linn. Soc. Lond. Zool., xvii, p. 51, 1883.

Camponotus cowlei Frogg.

Melophorus cowlei Wheeler, Bull. Amer. Mus. Nat. Hist., xxiv, p. 388, 1908.

Camponotus (*Myrmophyma*) *cowlei* Emery, Gen. Insect., Fasc. 183, p. 110, 1925.

(2) *Camponotus midas* Froggatt, l.c., p. 390, pl. xxvii, figs. 6-9.

This species was wrongly placed in the subgenus *Myrmophyma* by Emery (*Gen. Insect.*, Fasc. 183, p. 111, 1925). It is placed in the sub-genus *Myrmosaulus*, near *C.* (*M.*) *aurocincta* Smith. The workers and female are redescribed below.

CAMPONOTUS (MYRMOSAULUS) MIDAS Froggatt.

Worker Major.—Length, 14-15 mm.

Dark brown, almost black. Head, epinotum, node and femora brown, or reddish brown. Posterior half of the first segment of the gaster, and the whole of the others bright golden yellow.

Opaque. Densely and finely reticulate-punctate throughout. Mandibles coarsely striate.

Hair reddish, long and erect, sparse throughout. Pubescence very fine and adpressed. Tibia with two rows of slender bristles. Tarsi with stronger and more numerous bristles.

Head large, one-third broader than long, almost twice as broad behind as in front, the occipital border concave, the sides strongly convex. Frontal carinae short, diverging behind, with a faint longitudinal groove between them. Clypeus convex, finely crenulate. Eyes small and flat, placed at the posterior third of the sides, the anterior ocellus small, situated in a pit, or cavity, the posterior ocelli hardly apparent. Scapes extending beyond the occipital border by barely their thickness; first segment of the funiculus as long as the third, second slightly shorter. Mandibles broad, armed with six large teeth, including the apex. Thorax one and a half times longer than broad. Pronotum four times broader than long, strongly convex in front and on the sides. Mesonotum large, three times longer than the pronotum, circular, or very slightly longer than broad. Epinotum short and broad, without traces of a boundary between the dorsum and declivity; in profile strongly convex longitudinally, highest at the middle of the dorsum, much lower than the mesonotum. Node fully one third broader than long, broader behind than in front, the anterior and posterior faces straight, sides convex; in profile one third higher than long, parallel, the dorsum convex. Gaster ovate, longer than broad. Legs robust.

Worker media.—Length, 11-12 mm.

Colour, sculpture and pilosity as in the major.

Head slightly longer than broad, slightly broader behind than in front, the occipital border and sides strongly convex. Clypeus more distinctly carinate. Eyes a little more convex. Mandibles armed with eight teeth, including the apex. Scapes extending beyond the occipital border by fully half their length. The epinotum is abruptly truncate in front, forming a deep and wide constriction; in profile strongly convex from the top of the truncature to the bottom of the declivity, the cavity between the mesonotum and epinotum almost as long as the dorsum of the latter. Node as long as broad, much broader behind than in front, the anterior border slightly concave, the posterior and sides convex; in profile as long as high, the anterior face straight, the dorsum and posterior face feebly convex. Gaster longer than broad. Legs long and robust.

Worker Minor.—Length, 9-10 mm.

Colour darker, except on the gaster. Sculpture and pilosity similar.

Head longer than broad, the occipital border strongly convex, the sides parallel, feebly convex. Clypeus feebly carinate. Eyes large, at the posterior third of the sides. Thorax similar. Node one fourth longer than broad, broader behind than in front, the anterior border feebly concave, the posterior border and sides convex. Legs long and slender.

Female.—Length, 16·4 mm.

Colour, sculpture and pilosity similar to the major.

Head narrower. Clypeus feebly carinate. Mesonotum, with distinct parapsidal furrows, and a faint longitudinal groove in the middle, flattened above. Scutellum convex, high. Node as in the major. Wings hyaline, with a brownish tinge, particularly at the apex.

Habitat.—Illamurta, in the James Range.

This species is very near *C. aurocincta* Smith, from which it may be distinguished by the shape of the thorax and node, and the colour of the gaster. In *C. aurocincta* the posterior margin of the segments is narrowly yellow. In *midas* the whole of the segments, except the base of the first, are entirely bright golden yellow.

FIG. 1.

1.	*Eusphinctus (Nothosphinctus) brunnicornis*, n. sp.	Dorsal view of worker.
2.	*Phyracaces clarus*, n. sp.	Dorsal view of worker.
3.	*Phyracaces flammeus*, n. sp.	Dorsal view of worker.
4.	*Phyracaces flavescens*, n. sp.	Dorsal view of worker.
5.	*Euponera (Trachymesopus) pachynoda*, n. sp.	Dorsal view of worker. *a*, Lateral view of worker.
6.	*Eubothroponera dentinodis*, n, sp.	Dorsal view of worker *a*, Lateral view of worker.
7.	*Eubothroponera micans*, n. sp.	Dorsal view of worker. *a*, Lateral view of worker.
8.	*Eubothroponera bicolor*, n. sp.	Dorsal view of worker. *a*, Lateral view of worker.
9.	*Polyrhachis (Chariomyrma) opalescens*, n. sp.	Dorsal view of worker. *a*, Lateral view of worker.
10.	*Polyrhachis (Hedomyrma) kershawi*, n. sp.	Dorsal view of worker. *a*, Lateral view of worker.
11.	*Polyrhachis (Myrmhopla) glabrinotum*, n. sp.	Dorsal view of worker. *a*, Lateral view of worker.
12.	*Polyrhachis (Campomyrma) gravis*, n. sp.	Dorsal view of worker. *a*, Lateral view of worker.
13.	*Polyrhachis (Campomyrma) flavibasis*, n. sp.	Dorsal view of worker. *a*, Lateral view of worker.
14.	*Camponotus (Myrmosaulus) midas* Froggatt	Dorsal view of worker major. *a*, Lateral view of same.
15.	*Camponotus (Myrmosaulus) midas* Froggatt	Dorsal view of worker minor. *a*, Lateral view of same.

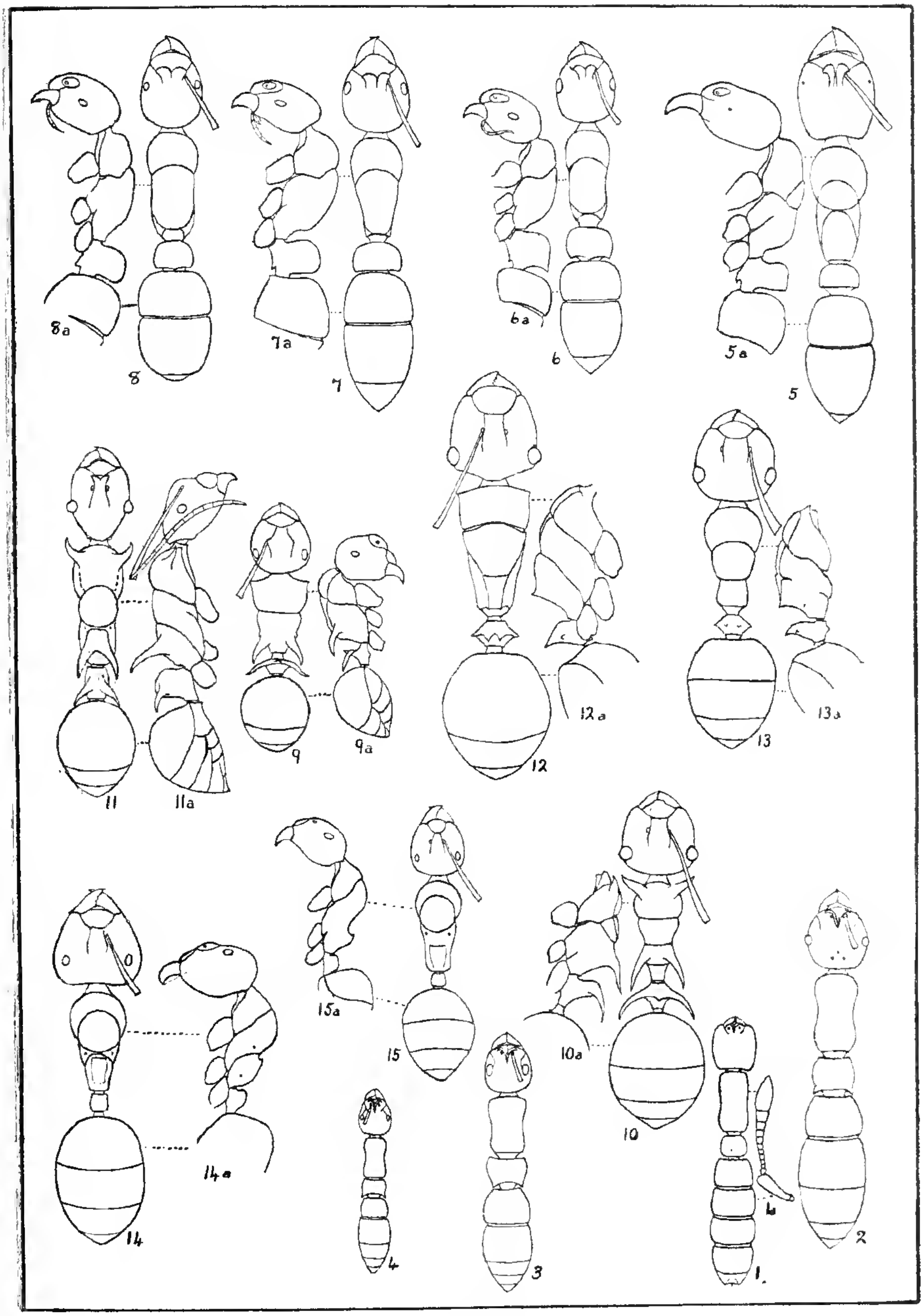


FIG. 1.

[Proc. Roy. Soc. Victoria, 43 (N.S.), Pt. I, 1930.]

Art III.—*New Hymenoptera Proctotrypoidea from Victoria.*

By ALAN P. DODD.

(Communicated by F. E. Wilson, F.E.S.)

[Read 12th June, 1930; issued separately 8th September, 1930.]

The material from which this paper was prepared was submitted by Mr. F. Erasmus Wilson. Six new species are proposed, three of which are placed in *Xenotoma* Foerster, a Belytid genus not previously recognised in Australia. In addition, the males of *Prosoxylabis pictipennis* Dodd (Belytidae), *Neobetyla spinosa* Dodd (Belytidae), and *Hemilexomyia abrupta* Dodd (Diapriidae) are made known.

Family SCELIONIDAE.

Opisthacantha nubila, n. sp.

Female.—Length, 1·75 mm. Jet black, the antennae concolorous, the articulate joint of the scape yellow; coxae and femora black, the trochanters yellow, the tibiae and tarsi dusky yellow-brown.

Head normal, the vertex moderately long, and sloping gently posteriorly to the concave occipital margin; frons gently convex, from frontal aspect somewhat wider than deep, not depressed above the antennal insertion; cheeks moderately broad; eyes moderately large, bearing scattered hairs; ocelli small, wide apart, the lateral pair situated close to the eyes; head wholly smooth and polished, the cheeks and frons with scattered fine hairs, the vertex with scattered long black hairs. Antennal scape long and slender; pedicel almost twice as long as its greatest width; funicle 1 as long as the pedicel, 2 shorter than 1, one-third longer than wide, 3 quadrate, 4 small, much wider than long; club compact, joints 1-5 each twice as wide as long. Thorax about one-fourth longer than its greatest width; pronotum visible from above as a narrow line laterally, armed with a row of stout black hairs; anterior margin of scutum very broadly rounded, the median lobe anteriorly with a declivous area, devoid of pubescence, separated by a transverse groove a little in front of the anterior end of the parapsidal furrows; parapsidal furrows delicate, complete, rather wide apart; scutum and scutellum smooth, with a scattered pubescence of fine hairs and of long stout black hairs; scutellum semi-circular, with a row of punctures along its anterior and posterior margins; metanotum short, foveate, armed medially with an acute horizontal tooth; propodeum broadly and deeply divided to its base to receive the base of the abdomen, so that lateral triangular areas only are visible, the posterior angles sub-acute. Forewings rather short, extending to apex of fourth abdominal segment; rather narrow,

$3\frac{1}{2}$ times as long as the greatest width; marginal cilia moderately long, the discal cilia fine and dense; distinctly stained brownish; venation fuscous, armed with stout long hairs or bristles except on the stigmal vein; marginal vein two-thirds as long as the stigmal, which is moderately long and very oblique, the postmarginal over twice as long as the stigmal vein; basal vein marked hy a thick light brown line, the median vein by a fainter line. Legs normal, the femora, tibiae, and tarsi slender; posterior tarsi no longer than their tibiae, their basal joint a little shorter than 2—5 united. Abdomen one-third longer than the head and thorax united; $2\frac{1}{2}$ times as long as its greatest width; slightly wider than the thorax; narrowed at base but not sub-petiolate, almost pointed at apex, the lateral margin regularly convex from base to apex; segment 1 as long as its basal width, which is two-thirds the posterior width, with a slight hump at base medially; 2 almost twice as long as 1; 3 one-half longer than 2, almost as long as 4—6 united; 4 somewhat longer than 5; 5 and 6 subequal; 1 strongly striate, smooth at base medially; 2 strongly striate but rather broadly smooth laterally and posteriorly; the rest smooth; 4—6 and lateral and posterior margins of 2 and 3 with fine pubescence.

Male.—Unknown.

Habitat.—Victoria: Bogong Plains, 5,000—6,000 feet, two females taken in tussocks in January, F. E. Wilson.

Holotype in the collection of F. E. Wilson. Paratype in the Queensland Museum.

A very dark species, recognised by the smooth head, scutum and scutellum with their long black hairs. In the paratype the abdomen is deformed, in that segment 2 appears as a narrow sclerite on one side only, segment 3 thus joining 1 broadly.

Baryconus curtatus, n. sp.

Female.—Length, 1·90 mm. Head chestnut-red, the vertex dusky, the eyes and ocelli black; thorax bright chestnut-red; abdomen brownish-black, the third segment orange-red; antennae black, the scape reddish-yellow, dusky toward apex; coxae clear yellow-brown, the legs suffused with dusky, the tibiae blackish.

Head normal; vertex moderately long, sloping gently from the line of the lateral ocelli to the posterior margin, which is gently concave; frons somewhat wider than deep, from lateral aspect lightly convex, not depressed above the antennal insertion, with a delicate median carina for one-half its length from the antennal insertion; cheeks broad; mandibles tridentate, the teeth acute, almost subequal; eyes moderately large, faintly pubescent; ocelli small, wide apart, the lateral pair against the eyes; head smooth, polished, with scattered small punctures bearing fine hairs; vertex with fine impressed polygonal reticulation but smooth medially behind the anterior ocellus, and narrowly against the occipital margin; mouth with short converging striae. Antennal scape long and slender, its articulate joint long; pedicel slender, $2\frac{1}{2}$ times as long as its greatest width; funicle 1 a little shorter than the pedicel, twice as long as its greatest width, 2 somewhat longer than wide, 3 quadrate, 4 small and transverse; club compact, 6-jointed, 1—5 each twice as wide as long, 1 small, 3 slightly the widest. Thorax from dorsal aspect not much longer than its greatest width; pronotum very narrowly visible; anterior margin of scutum rather sharply convex; median lobe of scutum divided anteriorly by a transverse groove at the anterior end of the parapsidal furrows; parapsidal furrows complete, rather delicate; scutum smooth, with small scattered punctures bearing pale hairs and with a narrow line of scaly reticulation on either side at the parapsidal furrows; scutellum semi-circular, smooth, with scattered small punctures bearing fine hairs, its posterior margin finely foveate; metanotum short, transverse, smooth, declivous, not prominent; propodeum finely sculptured, very short, the posterior margin faintly concave and rather broadly divided medially, the posterior angles acute. Forewings short, reaching to posterior margin of segment 3 of abdomen; slender, four times as long as their greatest width; distinctly dusky; venation fuscous; marginal vein one-half as long as the stigmal, which is oblique and rather short, the postmarginal a little less than twice as long as the stigmal; basal and median veins marked by brown lines; hindwings almost as long as the forewings. Legs normal, slender; posterior tarsi no longer than their tibiae, their basal joint as long as 2—5 united. Abdomen one-half longer than the head and thorax united, $2\frac{1}{2}$ times as long as its greatest width, which is somewhat greater than that of the thorax; narrowed at base, almost pointed at apex, the apical segment not stylate; segment 1 a little shorter than its basal width, a little wider posteriorly than basally, somewhat raised at base but without a distinct prominence, its anterior margin straight; 2 one-half longer than 1; 3 one-half longer than 2, as long as 4—6 united, one-fourth wider than long; 4—6 gradually shortening; 1 striate, smooth medially at base; 2 strongly striate for less than its basal half; rest of abdomen smooth; 4—6 and lateral margins of 1—3 with scattered fine hairs.

Male.—Unknown.

Habitat.—Victoria: Bogong Plains, 5,000—6,000 feet, two females taken in tussocks in January, F. E. Wilson.

Holotype in the collection of F. E. Wilson. Paratype in the Queensland Museum.

Readily distinguished from other Australian species in the genus by the shorter wings.

Telenomus wilsoni, n. sp.

Female.—Length, 1·50 mm. Black; antennae black, the scape deep red at extreme base; coxae and femora black, the trochanters fuscous, the tibiae and tarsi bright red.

Head very wide and transverse, somewhat distinctly wider than the thorax, the vertex very thin, and descending sharply to the foveate occipital margin, which is gently concave; from frontal aspect the head is plainly wider than deep; eyes wide apart, large, bare; ocelli large, very wide apart, the lateral pair almost touching the eyes; vertex, upper frons, lateral margins of frons against the eyes, and between the ventral end of the eyes and the mouth, with fine pale pubescence, dense fine coriaceous-reticulate sculpture and obscure shallow punctures; lower two-thirds of frons, except against the eye margins, with strong transverse striae joining an ill-defined median carina; cheeks very narrow, rugose. Antennae 11-jointed; articulate joint of scape rather long and slender; scape slender, as long as the next four joints combined; pedicel twice as long as its greatest width; funicle 1 one-half longer than the pedicel, three times as long as its greatest width; 2 a little less than one-half as long as 1, a little longer than wide; 3 somewhat wider than long; club rather slender, 6-jointed, but not well differentiated from the funicle, joint 1 somewhat wider than funicle 3, wider than long, 2 the largest and sub-quadrate, 3—5 wider than long. Thorax stout, from dorsal aspect no longer than wide, from lateral aspect shorter than its height, the dorsal outline strongly convex; pronotum narrowly visible laterally; scutum somewhat convex, finely pubescent, with rather strong irregular rugose-punctate sculpture which on the posterior half medially has a definite tendency toward irregular longitudinal rugae; parapsidal furrows absent; scutellum semi-circular, strongly irregularly rugose-punctate and with fine pubescence; metanotum situated below the scutellum, a prominent transverse rugose plate which hides the short propodeum medially; propodeum short, broad, broadly hidden medially, visible as rugose lateral areas only. Forewings extending a little beyond apex of abdomen; broad, a little more than twice as long as the greatest width; distinctly fumated around the stigmal vein; marginal cilia short; discal cilia fine and dense; venation deep brown; marginal vein almost one-half as long as the stigmal, which is slender and very long, the postmarginal a little less than twice as long as the stigmal. Femora a little thickened; tibiae moderately slender; tarsi slender, the posterior tarsi a little longer than their tibiae, their basal joint as long as 2—5 united. Abdomen one-third longer than its greatest width, broad at base; segment 1 short and transverse; 2 two-thirds as long as wide; 3—6 combined two-thirds as long as 2; 1 strongly sparsely striate, its lateral margins smooth and with a few hairs; 2 at base, except laterally, with a row of foveae, densely rather finely striate for two-thirds its length, smooth for its posterior third and along lateral margins, where there are scattered hairs; 3—5 rather densely pin-punctate, each with a row of fine hairs at one-half the length.

Male.—Unknown.

Habitat.—Victoria: Eltham, thirteen females collected by F. E. Wilson, in May, associated with an ant.

Holotype in the collection of F. E. Wilson. Paratypes in the collections of the Queensland Museum, F. E. Wilson, and the author.

At once separated from the many Australian species by the lengthened first funicle joint of the antennae. I have much pleasure in naming this species after the discoverer, whose enterprise has brought to light the several new species described in this paper.

Family BELYTIDAE.

Xenotoma Foerster.

This world-wide genus, with over eighty known species, has not previously been recognised in Australia. The three forms described below, all from Victoria, may be separated by means of the following key:—

1. Larger apical spur of posterior tibiæ two-thirds as long as the first tarsal joint; petiole one-half as long as body of abdomen; recurrent vein very short .. .. *X. longispina.*
   Larger apical spur of posterior tibiæ one-third as long as the first tarsal joint; petiole not more than one-third as long as body of abdomen; recurrent vein as long as the radial .. .. 2.
2. Forewings hyaline; antennal scape a little longer than the next two joints united .. ..*X. claripennis.*
   Forewings cloudy with hyaline areas; scape as long as the next four joints united .. .. ..*X. variipennis.*

Xenotoma variipennis, n. sp.

Female.—Length, 3·40 mm. Head black; thorax blackish, the pronotum, posterior half of median lobe of the scutum, and many of the segmental sutures, deep red, the tegulae yellow; abdominal petiole blackish, the abdomen dull chestnut-brown, blackish apically, and along the lateral margins; coxae fuscous, the legs brownish-yellow, the posterior tibiae and tarsi dusky; antennae black, the scape bright testaceous, the pedicel and basal funicle joints sometimes suffused reddish.

Head from dorsal aspect transverse; from frontal aspect wider than deep; from lateral aspect the frons convex; without sculpture but with a rather dense pale pubescence; eyes very wide apart, with scattered hairs; ocelli close together; mandibles long, crossed, falcate. Antennae 15-jointed; scape slender, somewhat curved, very long, as long as the next four joints united; pedicel hardly twice as long as wide; flagellar joints filiform, 1 almost twice as long as the pedicel, 2—12 gradually shortening, 12 as long as the pedicel, the apical joint one-half longer than the preceding.

Thorax two-thirds longer than its greatest width; pronotum narrowly visible, its angles sub-acute; parapsidal furrows complete, deep, a little curved against the posterior margin; scutum and scutellum with a pubescence of rather scattered long pale hairs; scutellum somewhat declivous posteriorly, with a deep wider-than-long basal fovea; metanotum transverse, depressed laterally, the median area with a strong median carina and more delicate lateral carinae; propodeum moderately long, smooth, with scattered fine pubescence, with a strong median and lateral carinae, the posterior margin carinate and gently concave, the lateral margins carinate, the posterior-lateral angles in the form of projecting small acute teeth. Forewings long and broad; fumated, the colour being darker and blackish against the distal margin, with two large hyaline areas, one against either border in the distal half of the wing, and there is a narrow hyaline area beneath the distal portion of the submarginal vein from the junction of the basal vein; venation dark, complete; marginal vein two-thirds as long as the closed radial cell; recurrent vein as long as the radial, its apex directed to the base of the discoidal vein. Legs normal, slender, as in *claripennis*. Abdominal petiole slender, $2\frac{1}{2}$ times as long as its greatest width, less than one-third as long as the abdomen, striate; body of abdomen narrowed at base, pointed at apex, over twice as long as its greatest width, with scattered hairs, finely striate at extreme base; composed of five segments; segment 2 (first body segment) fully twice as long as 3—6 united, 3 not greatly longer than 4, 5 very short and transverse, 6 as long as 3; oviduct prominent in the form of a short stylus.

Male.—Differs from the female in that the head, thorax, and abdomen are wholly black; body of abdomen somewhat shorter, not more than twice as long as its greatest width and a little less than three times as long as the petiole, composed of seven segments (excluding the petiole), segment 2 fully four times as long as 3—8 united, 3—7 all very transverse, 8 broadly rounded at apex. Antennae black, the scape clear testaceous, the pedicel brown; 14-jointed; pedicel stout, one-third longer than its greatest width; flagellar joint 1 three times as long as the pedicel, two-thirds as long as the scape, excised on one side at half its length; 2—11 very gradually shortening, 11 two-thirds as long as 1, the apical joint slightly longer than the penultimate.

Habitat.—Victoria: Grampian Mts., Macedon, Belgrave, Healesville, three females, one male collected by F. E. Wilson, two males taken by A. P. Dodd, in October, December, March, April, and June.

Holotype in the collection of Mr. F. E. Wilson. Allotype in the Queensland Museum. Paratypes in the collections of F. E. Wilson and the author.

Xenotoma claripennis, n. sp.

Female.—Length, 3·10 mm. Black; prothorax, scutellum, and posterior half of median lobe of the scutum, chestnut-brown; tegulae bright yellow; antennae black, the scape reddish-yellow, the pedicel brown; legs, including the coxae, clear reddish-yellow, the posterior tarsi dusky.

Head much as in *variipennis,* the frons from lateral aspect rather more strongly convex owing to the antennal prominence being more distinct; smooth with a moderately dense pubescence of fine pale hairs; eyes with a few hairs; mandibles long, crossed, falcate. Antennae 15-jointed; scape slender, a little longer than the next two joints combined; pedicel two-thirds longer than wide; flagellar joints filiform, 1 twice as long as the pedicel, 2—12 gradually shortening, 12 as long as the pedicel, the apical joint one-half longer than the penultimate. Thorax much as in *variipennis,* the pronotal angles sub-acute; pubescence of scutum and scutellum very scattered; propodeum and its carinae as in *variipennis,* but the posterior margin is faintly carinate, and the acute posterior angles project outwardly. Forewings long and broad; sub-hyaline; venation blackish; marginal vein one-half as long as the radial cell. Legs slender, the posterior tibiae and tarsi long and slender; apical spurs of posterior tibiae not very long, the longer spur not more than one-third as long as the basal tarsal joint. Abdominal petiole slender, one-third as long as the body of the abdomen, $2\frac{1}{2}$ times as long as its basal width, strongly striate, with scattered long hairs laterally; body of abdomen over twice as long as its greatest width, with a short basal stalk which continues the outline of the petiole; smooth, with scattered long fine hairs; composed of five segments, segment 2 (first body segment) fully three times as long as 3—6 united, its base striate and with a longer median groove; relative length of 3—6 about as in *variipennis;* oviduct shortly prominent.

Male.—Unknown.

Habitat.—Victoria: Grampian Mts., three females in October, F. E. Wilson.

Holotype in the collection of F. E. Wilson. Paratypes in the collections of F. E. Wilson and the author.

This species is very similar to *variipennis,* but differs in the clear wings, the chestnut-brown scutellum, the clear yellow coxae, the shorter scape in relation to the following joints, and the narrowing of the base of the abdomen.

A female taken at Belgrave, Victoria, in January, by F. E. Wilson, differs in several particulars, and may be a distinct species; the scutellum is black; the posterior coxae are dusky; the abdominal petiole is finely densely striate; the body of the abdomen is not more than twice as long as its greatest width, and is not stalked at base; the distal margin of the forewing is definitely, although lightly, smoky.

XENOTOMA LONGISPINA, n. sp.

Female.—Length, 3·25—3·65 mm. Black, the prothorax and posterior half of median lobe of the scutum deep red, the tegulae yellow; antennae black, the first two joints clear testaceous, the third and fourth brownish-yellow; legs clear testaceous, the posterior coxae and all femora, except at base, fuscous, the posterior tibiae brownish.

Head normal, transverse, the frons rather gently convex, the antennal prominence not large; with a moderately dense pubescence of fine pallid hairs; eyes with a few hairs; mandibles long, crossed, falcate. Antennal scape moderately long, a little longer than the next two joints combined; pedicel one-half longer than wide; flagellum filiform, joint 1 2½ times as long as the pedicel, two-thirds as long as the scape, 2 two-thirds as long as 1, 2—12 gradually shortening, 12 a little longer than wide, the apical joint a little longer than the penultimate, but a little shorter than 2. Thorax normal, from lateral aspect strongly convex above; pronotum, scutum, and base and lateral margins of scutellum, with a conspicuous golden pubescence; pronotal angles sub-acute; parapsidal furrows deep and complete; basal fovea of scutellum deep; median carina of metanotum delicate, the lateral carinae of the raised median area absent; propodeum smooth, the median carina rather strong, the lateral carinae fine, the posterior margin almost straight, the posterior angles not prominent. Forewings long and broad; sub-hyaline; marginal vein somewhat less than one-half as long as the closed radial cell; stigmal vein curved, slightly longer than the marginal vein; recurrent vein very short. Legs spiny, not as slender as in *variipennis* and *claripennis;* femora distinctly thickened, and with a basal stalk; larger apical spur of the posterior tibiae very long, two-thirds as long as the basal tarsal joint. Petiole of abdomen long, one-half as long as the body of the abdomen, four times as long as its greatest width; body of abdomen somewhat compressed, rather slender, over 2½ times as long as its greatest width, smooth, with a few fine scattered hairs; composed of five segments; segment 2 (first body segment) over twice as long as 3—6 united; 3 twice as long as 4, which is very transverse; 5 as long as 3; 6 somewhat longer than 5; 5 and 6 strongly compressed; base of 2 with a median groove and traces of short striae.

Male.—Length, 2·80 mm. Differs from the female in having the scutum wholly black; the pubescence of the head and thorax is rather sparser; body of abdomen somewhat shorter, 2½ times as long as its greatest width, the apical segments shortened, segment 2 being four times as long as the following segments united, composed of seven segments of which the apical two are curved downward; legs darker, the tibiae and tarsi being dusky-brown. Antennae 14-jointed, about as long as the body; black, the scape and pedicel reddish-yellow, the first flagellar joint reddish at base;

flagellar joint 1 two-thirds as long as the scape, slightly excised on one side, 2 a little shorter than 1, 2—11 gradually shortening, 11 two-thirds as long as 1, the apical joint slightly longer than the penultimate.

Habitat.—Victoria: Eltham, one female in August, F. E. Wilson; Belgrave, one female in January, F. E. Wilson, one male in December, A. P. Dodd.

Holotype in the collection of F. E. Wilson. Allotype in the Queensland Museum. Paratype in the author's collection.

At once differing from *variipennis* and *claripennis* in the very long spine of the posterior tibiae, the stouter femora, the short recurrent vein, and the longer abdominal petiole.

Neobetyla spinosa Dodd.

Trans. Roy. Soc. South Aust., 1, p. 298, 1926.

This species was erected on a female from the Blackall Range, South Queensland. I have seen a pair collected from tussock grass, Mt. Arapiles, Victoria, October, 1927. In comparison with the holotype, the Victorian female differs somewhat in colour in that the antennae are brownish apically, the legs are deeper reddish, and the abdomen is blackish at base and bears a broad incomplete black band at one-half its length. The male of *Neobetyla* was unknown previously, and it is interesting to learn that, as in the female, the wings are vestigial and the thorax is of the narrow type associated with wingless or semi-wingless forms.

Male.—Head deep red; thorax blackish, the scutum and scutellum red; abdomen black. Thorax as in the female; wings represented by short flaps. Body of abdomen showing five segments; segments 3 and 4 very short, 5 a little longer but transverse, 6 as long as 5, transverse, truncate at apex. Antennae 14-jointed; golden-yellow, the apical joints brownish; a little longer than the body; pedicel short, a little longer than wide; flagellar joints cylindrical, 1 longest, three-fifths as long as the scape, 2—11 gradually shortening, 11 two-thirds as long as 1.

Prosoxylabis pictipennis Dodd.

Proc. Linn. Soc. N.S.W., xl, p. 445, 1920.

This species was described from a single female from Tasmania in the collection of Mr. W. W. Froggatt. A male from Victoria, taken at Belgrave in January by Mr. F. E. Wilson, agrees very well with the original description, and probably represents the same species. The head, thorax (except the bright chestnut scutum), petiole, and body of abdomen are darker, being almost black. The scutellar tooth is stout and acute. Antennae 14-jointed; black, the first two joints red, the third suffused with red; scape moderately long and stout; pedicel a little longer than wide; flagellar joints filiform, 1 a little more than one-half as long as the scape, excised on one side, 2—11 gradually shortening, 11 one-half as long as 1, the apical joint twice as long as the penultimate.

Family DIAPRIIDAE.

HEMILEXOMYIA ABRUPTA Dodd.

Proc. Linn. Soc. N.S.W., xl, p. 443, 1920.

This species was described from several females reared from pupae of sheep-maggot flies, *Ophyra, Calliphora,* from several localities in New South Wales. I have seen four specimens from Victoria, two females collected at Belgrave in December by myself, and two males taken at Belgrave in March and Millgrove in February by Mr. F. E. Wilson. The male, unknown previously, closely resembles the female except in the more slender abdominal petiole and in the antennae. Antennae reddish-yellow, becoming dusky toward apex, as long as the body; 13-jointed; scape long and slender; pedicel stout, hardly longer than wide; flagellar joints filiform, 1 two-thirds as long as the scape, 2 two-thirds as long as 1, a little excised on one side, 3—10 very gradually lengthening, but 10 is hardly as long as 1. As well as the Victorian examples I have collected four males in March at Scone, N.S.W.

[PROC. ROY. SOC. VICTORIA, 43 (N.S.), PT. I, 1930.]

ART. IV.—*Notes on the Jurassic Rocks of the Barrabool Hills, near Geelong, Victoria.*

By ALAN COULSON, B.Sc.

(With Plate I.)

[Read 12th June, 1930; issued separately, 9th September, 1930.]

Introduction.

The Barrabool Hills comprise the fertile "rolling downs" agricultural country to the west of Geelong, between the townships of Highton (3 miles) and Gnarwarre (12 miles). The hills were once well timbered, but were cleared about 80 years ago, and are now remarkably bare and treeless.

Two east-flowing streams—the Barwon River and the Waurn Ponds Creek—drain the northern and southern faces of the hills, and their tributary creeks have carved the soft Jurassic sandstone into a series of rounded hills and spurs. The hills thus present the mature erosion topography characteristic of a region of slight relief.

Nature of the work done.

The map herewith shows for the first time the extent of Jurassic rocks in the Barrabool Hills. The eastern portion of the hills was included in Quarter Sheets 24 S.E. and 28 N.E. of the Geological Survey of Victoria, mapped by R. Daintree in 1861-2. Certain minor corrections have been made to this part, and the western portion has been added.

Dips were determined at every available outcrop, and the plotting of these led to the recognition of an unsuspected fault between the Jurassic basal beds and the normal sandstone beds.

Particular attention was given to the basal beds, where a fine series of conglomerates, sandstones, and fossiliferous mudstones is exposed in a river cliff on the Barwon, at the spot on the map marked "Basal Conglomerate." The collection of fossil flora obtained from the mudstone bands has clearly indicated the Lower Jurassic character of the basal beds.

Description of the Palaeozoic igneous rocks in the area has already been made (1), but the Kainozoic series has not yet been fully studied, and description of this is postponed. The debatable question of the origin of the Jurassic rocks is also deferred until more evidence is obtained.

Palaeontology.

A resumé of the recorded fossils from the Victorian Jurassic has been published by Mr. W. H. Ferguson (2). References to general geological and mining work on the Jurassic have been compiled by Prof. J. W. Gregory (3).

In the display cases at the National Museum, Melbourne, there are 3 specimens of Jurassic plants from the Barrabool Hills. These were presented by the Mines Department in 1903, and it is understood that Mr. (afterwards Sir) R. Daintree collected them while mapping Quarter Sheet 24 S.E. The forms are *Baiera sub-gracilis*, McCoy; *B. ipsviciensis*, Shirley; *Taeniopteris spatulata*, McClell. var. *Daintreei*, McCoy.

Mr. F. Chapman (4. p. 216) has recorded *Taeniopteris spatulata* McClell. var. *Daintreei*, McCoy, from Barrabool Hills.

Mr. G. B. Hope, of Geelong, has collected from a mudstone band in Queen's Park and the Newtown Brick pit nearby, the forms *Equisetites* sp.; *Sphenopteris maccoyi*, Sew.; *Taeniopteris spatulata*, McClell. var. *Daintreei*, McCoy; *Dictyophyllum* sp.; *Linguiofolium* sp.

From the fine grey mudstone intercalated with the basal boulder beds at the river cliff on the Barwon, I have collected numerous leaf impressions which Mr. R. A. Keble has identified as follow:—

EQUISETALES.
- 2. Equisetites sp.

FILICALES.
- 4. Coniopteris hymenophylloides, Brongn. var. Australica, Sew.
- 1. Coniopteris sp. (?)
- 27. Sphenopteris ampla, McCoy.
- 5. Sphenopteris sp.
- 7. Taeniopteris spatulata, McClell. var. Daintreei, McCoy.
- 5. Taeniopteris spatulata, var. Carruthersi, T. Woods.
- 2. Cladophlebis denticulata, Brongn. var. Australis, Morris.
- 1. Taeniopteris crassinervis, Feistl.
- 4. Cladophlebis indica, Old. and Morris.
- 1. Cladophlebis sp.
- 1. Thinnfeldia cf. indica, Feistl.
- 1. Thinnfeldia sp.
- 1. Dictyophyllum sp.

GINKGOALES.
- 2. Ginkgo digitata, McCoy var. Huttoni, Sew.
- 5. Ginkgo sp.
- 4. Baiera Australis, McCoy.

CONIFERALES.
- 3. Araucaria sp.
- 2. Brachyphyllum Gippslandicum, McCoy.
- 1. Palissya (?) sp.
- 1. Cyparissidium sp.

GYMNOSPERMAE.
- 2. Carpolithes sp.

Mr. Keble commented on the collection thus: "The flora is in many respects comparable with the *Sphenopteris ampla* beds from Archie's Creek (Chapman, F., Jurassic Plant Remains from Gippsland, *Rec. Geol. Surv. Vic.*, iii (2), p. 107), and Binginwarri (idem, p. 108). The *Ginkgo* and *Baiera* element suggests a lower part of the series. There are 7 specimens of *Ginkgo* and 4 specimens of *Baiera,* and a number of indeterminate fragments of both genera, so that the Ginkgoales are relatively well represented. A single specimen of *B. australis* is recorded from one of the Binginwarri collections (idem, p. 108), in the same association, and similarly from Jumbunna (idem, p. 106), which shows that, while it is present, it is not a common form. The opinion is expressed here that the Barrabool Hills beds at Ceres are older than those at Binginwarri and Jumbunna. They are still apparently Jurassic, but the age of the underlying series is problematical, and we know by bores that there is a Mesozoic series at least 1500 feet thick at Jumbunna."

Only about 27 feet thickness of beds is exposed under the fossiliferous mudstone band, and from the structural features it is doubtful whether more than 100 feet of Jurassic would be passed through below that band before the bed-rock was met. There is little likelihood that the Jurassic series passes comformably downwards into beds of Lower Mesozoic age.

Lithology.

The Barrabool Hills rock is almost exclusively a brown felspathic sandstone (5, p. 190) of medium grain, with occasional thin bands of fine grey mudstone separating the thick sandstone beds. Near the base of the series the beds are coarser sandstones and grits. The conglomerates and boulder beds appear to be truly basal in position.

False bedding, carbonaceous laminae, small "clay pellets," and hard ovoidal indurations ("bullets") of calcareous matter, occur in the sandstone; these features are characteristic of the Victorian Jurassic. Small included fragments of slate (? Ordovician) are also common in the Barrabool sandstone.

Near Pollocksford, at the place marked on the map, "Gravel Conglomerate," there is a coarse grit, composed of rounded pebbles of quartz and slate fragments, interstratified with the normal sandstone beds.

The remarkable basal boulder beds and conglomerates are best seen on the face of the river cliff in the extreme south-eastern corner of the bend in the Barwon River, at the spot on the map marked "Basal Conglomerate." Talus obscures the beds elsewhere, but similar material can be traced to Buckley's Gorge about ½ mile east of the river cliff.

Reading from the top of the cliff to the water level, the beds are:—

Sandstone and grit, normal type	63′
Conglomerate, type A	2′
Sandstone and grit, with slate inclusions	6′
Conglomerate, type B	2′
Sandstone, normal type	1′6″
Conglomerate, type B	0′6″
Sandstone, normal type	4′
Conglomerate, type B, smaller pebbles	1′

Sandstone, normal type	0′6″
Boulder bed, type C	20′
Mudstone, fine grey carbonaceous, with flakes of mica. Fossil bed	2′
Conglomerate, type B	0′3″
Mudstone, fine grey carbonaceous, as above	1′9″
Boulder bed, type C	6′
Sandstone, normal type	16′
Grit, resembling arkose	2′6″
Conglomerate, type B, only partly visible	2′
Total	131′0″

The distinction into types A, B and C among the conglomerates has been made because of differences in the size and nature of their pebbles. All the pebbles are waterworn and partly rounded, and are embedded in a matrix of much smaller pebbles and felspathic sand. Calcareous matter cements the whole, and has formed vertical veins of calcite through the beds.

The pebbles comprise: Heathcotian green epidiorite, Lower Palaeozoic pink granite, Ordovician black slate, quartzite, spotted slate, Ordovician white quartz, grey mica schist, and Jurassic mudstone, sandstone and grit.

In type A conglomerate the Ordovician pebbles predominate, with fragments of Jurassic rock next in importance, and rare epidiorite and granite. The pebbles average about 2 in. diameter.

In conglomerate of type B the pebbles are about 4 in. in diameter, and consist of about equal amounts of epidiorite and Ordovician, with rare granite and Jurassic fragments.

Boulder bed C consists of pebbles in the same proportion as those of type B, but the boulders of epidiorite and granite are very large, up to 24 in. diameter.

The Ordovician material was identified by the discovery of graptolites in the slate pebbles by Mr. C. S. Wilkinson (6, p. 81).

Inclusion of fragments of Jurassic mudstone in Jurassic sandstone, etc., has also been recorded from South Gippsland (2, 7).

Structural Features.

Absence of Supposed Anticlinal Fold.

On Quarter Sheet 24 S.E. there is a line drawn in a N.E.-S.W. direction, roughly coincident with the course of the creek which meets the Barwon at the basal conglomerate cliff, and parallel to the section line AB of the present map, to indicate the axis of an anticlinal fold. Apparently the few dips shown on the Quarter Sheet furnished the evidence for this view, but the corrected dips fail to support the idea of an anticline. Actual folding of Jurassic strata has not been recorded in Victoria, and although the earlier workers, such as Daintree (8) and Wilkinson (9), represented folds in the sections they drew, more recent investigators, Whitelaw (10), Ferguson (2, 7), and Dunn (11) attribute the changes of dip to faulting.

Basal Beds Fault.

In the area near the basal beds, there is a decided change of dip in the Jurassic beds; whereas the main block dips N.E. at about 10°, the basal beds have a strong dip of 30° to the South, almost directly opposed to this. The line of junction of the opposed dips runs E-W from Highton to the central epidiorite mass.

Two possible explanations of the opposed dips present themselves:—

(i.) There may be an asymmetrical syncline.

(ii.) Local sagging of the Jurassic along that line may have occurred, causing a fracture or fault between the two tilted blocks.

Insufficient outcrops are available to decide the point absolutely. Were the conglomerate beds constant and widespread, the fact that they do not reappear in the vicinity of Ceres township would be evidence against a syncline. But as with other Jurassic conglomerates, their horizontal distribution is very limited, and the beds probably "peter out" long before this. The second explanation, however, seems by analogy with other areas to be the more likely. Fig. 1 represents a section along the line ABC drawn in accordance with this view.

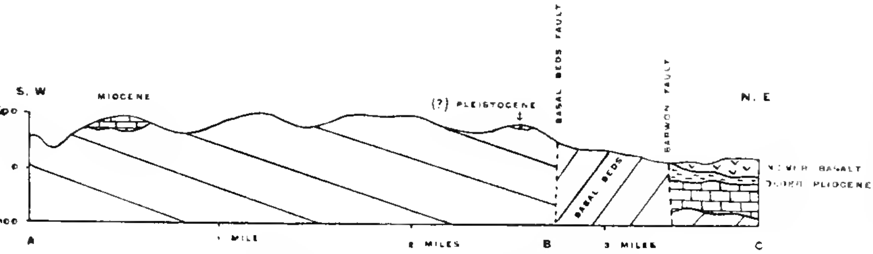
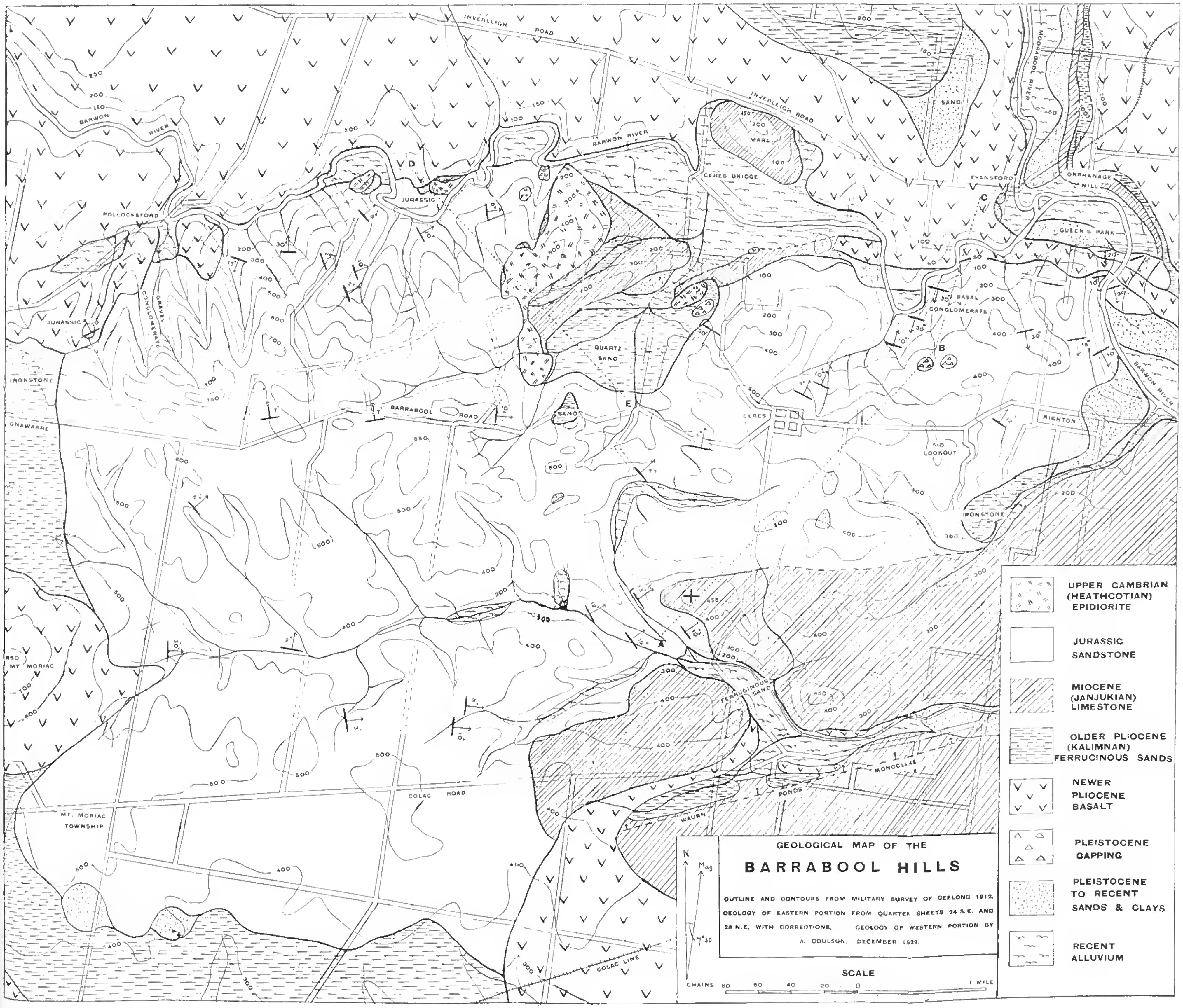


FIG. 1.—Sketch section along ABC.

Barwon Fault.

Topographic and geological evidence is available for this fault, which runs E-W along the northern face of the Barrabools coincident with the course of the Barwon River. The let-down block to the north of the hills consists of Kainozoic sediments overlain by Newer Basalt. Similar Kainozoic sediments capping the Jurassic on the southern upthrow side of the fault are considerably higher than those of the let-down block. For example, the Miocene limestone in the let-down block has not been bottomed by the Cement Company's bores at Batesford, although these reached 50 ft. below sea-level. The base of the same limestone in the upthrow block, alongside the central epidiorite mass, is 100 ft. above sea-level. This gives a minimum throw of 150 ft., but judging from the elevation of the fault scarp, the throw was of the order of 400 ft. This fault is shown in Fig. 2, a section drawn along the line DE.


GEOLOGICAL MAP OF THE
BARRABOOL HILLS
OUTLINE AND CONTOURS FROM MILITARY SURVEY OF GEELONG 1912. GEOLOGY OF EASTERN PORTION FROM QUARTER SHEETS 24 S.E. AND 28 N.E. WITH CORRECTIONS. GEOLOGY OF WESTERN PORTION BY A. COULSON. DECEMBER 1929.
SCALE
CHAINS 80 60 40 20 0 1 MILE
N
Mag
7°30'
UPPER CAMBRIAN (HEATHCOTIAN) EPIDIORITE
JURASSIC SANDSTONE
MIOCENE (JANJUKIAN) LIMESTONE
OLDER PLIOCENE (KALIMNAN) FERRUGINOUS SANDS
NEWER PLIOCENE BASALT
PLEISTOCENE CAPPING
PLEISTOCENE TO RECENT SANDS & CLAYS
RECENT ALLUVIUM
INVERLEIGH ROAD
BARWON RIVER
POLLOCKSFORD
JURASSIC
CONGLOMERATE
GRAVEL
IRONSTONE
GNAWARRE
BARRABOOL ROAD
QUARTZ SAND
SAND
MARL
CERES BRIDGE
CERES
EVANSFORD
MOORABOOL RIVER
ORPHANAGE MILL
QUEEN'S PARK
BASAL CONGLOMERATE
RIGHTON
LOOKOUT
FERRUGINOUS SAND
MONOCLINE
PONDS
WAURN
MT. MORIAC
MT. MORIAC TOWNSHIP
COLAC ROAD
COLAC LINE

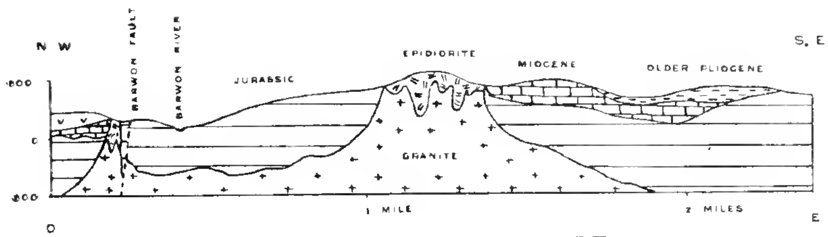


Fig. 2.—Sketch section along DE.

Acknowledgements.

To Mr. G. B. Hope, B.M.E., of Geelong, I am deeply indebted for his unfailing help throughout the work. For the identification of the fossils and his valuable comments thereon, I must thank Mr. R. A. Keble, F.G.S., palaeontologist to the National Museum. Messrs. E. D. Pridgeon, J. M. Edgar, and G. Baker have also assisted me in this and other work, and their help I would also like to acknowledge.

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[Proc. Roy. Soc. Victoria, 43 (N.S.), Pt. I, 1930.]

Art. V.—*New and Remarkable Bees.*

By TARLTON RAYMENT.

[Read 10th July, 1930; issued separately 9th September, 1930.]

The late Mr. D. Best bequeathed the whole of his large collection of insects to the National Museum, Melbourne. The bees are not well represented, for the naturalist favoured other groups, but among them is a remarkable female, the label of which bore only the number "504." No information is available of either the locality of this specimen or the date when it was found. It is probable that as Mr. Best did little if any collecting beyond Victoria, the specimen is a native of this State.

Perkins (*Proc. Hawaiian Ent. Soc.*, ii, p. 29, 1908), described a unique male from the Violet Range, W.A., and seeing some affinity to the American genus *Pasiphae*, he erected the genus *Neopasiphae*, and named the species *mirabilis*. Since that time less than half a dozen males have been taken, at long intervals, but the female remained unknown. I was, therefore, very pleased indeed to find among Best's few honey-gatherers a new species of *Neopasiphae*, a female.

The second bee is no less remarkable since it, too, is the first to be added to another genus of Perkins. The genus *Ceratina* is well-known in America, and once more being impressed with its affinity to a bee which he collected at Bundaberg, Qld., he erected the genus *Neoceratina*, and named the species *australensis* (*Ann. Mag. Nat. Hist.* [8], xi, p. 117, 1912). No other specimen has been recorded, so it was interesting to find, among the unworked material, another *Neoceratina*, a female, collected by Mr. Charles Barrett at Townsville, Queensland, in August, 1920. Perkins describes his bee as having five segments in the maxillary palpus, as against six in *Ceratina*, but Barrett's specimen appears to have six segments, though the mouth-parts are not in good order, and I may be in error. I have been able to study these insects owing to the courtesy of the Director, Mr. J. A. Kershaw, and the Entomologist, Mr. J. Clark, of the National Museum, Melbourne.

Division COLLETIFORMES.

Family PROSOPIDIDAE.

Neopasiphae insignis, sp. nov.

(Text-Fig. 1.)

Female.—Length, 10 mm. approx.

Head transverse, black, bright, with close puncturing of medium size; a few light brown hairs; face-marks are confined to the light clypeus and supraclypeal area; frons rough, subrugose owing to

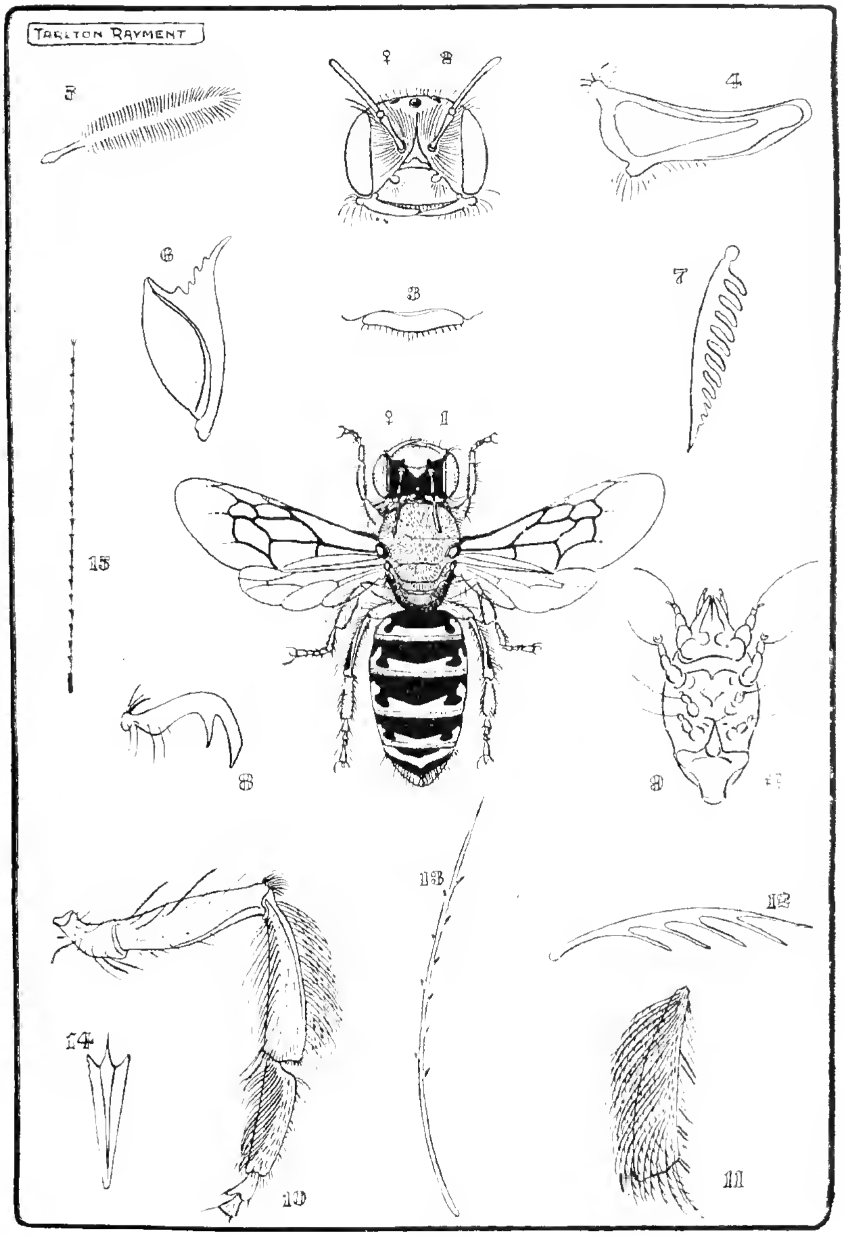


FIG. 1.

1. Adult female of ***Neopasiphae insignis***, sp. nov. 2. Frontal view of head of female. 3. The labrum or lip is very narrow. 4. The jaw of the female is not notched, but is spoonlike. 5. One of the short stout plumose hairs of the mesothorax. 6. The strigil or antenna-cleaner is of Prosopoid form. 7. The hind tibial spur is toothed like that of *Colletes*. 8. The claws are bifid, and the empodium large. 9. Acarid mite, ventral view, taken from hairs of this bee. 10. Inside surface of hind femur, tibia and tarsi. 11. Outside view of hind tibia, showing harvesting hairs. 12. Forked hair from tibia, highly magnified. 13. One of the long hairs of the femur. 14. A butterfly scale found on the bee. 15. A hair from the entanglement surrounding the mites.

the puncturing being pear-shaped, and not so close; clypeus creamy-yellow, large, bright, convex, two small black spots laterally, a cluster of creamy, plumose hairs below these, numerous punctures of medium size; supraclypeal area black, with a large, creamy-yellow patch, an exceedingly fine carina reaching the median ocellus, a few punctures and light hairs; vertex sharply developed; the rather large, brown ocelli being placed in a low curve; compound eyes of a yellowish brown colour, the anterior margins parallel; genae black, finely cancellate, a few light-brown hairs; labrum wide, but very shallow, yellow suffused with pale amber; mandibulae creamy-yellow, with amber margins and tips, no defined teeth; antennae submoniliform, black, the scape creamy-yellow beneath, the flagellum almost orange beneath.

Prothorax black, well developed, closely covered with punctures of medium size; tubercles black, but the hairs adjacent have been stuck together by immersion in some liquid; mesothorax black, dull, excessively punctured, with scattered, short, plumose hair; scutellum similar in colour and structure to mesothorax; postscutellum similar to scutellum, except that the punctures are longer; metathorax black, bright, a narrow lunate area, bounded by a rim, encloses a number of fine anastomosing rugae. Abdomen: dorsal segments, black, dull, excessively punctured, hind margins amber, creamy-yellow bands, broad laterally, with an indentation and a lobe; the marks resemble those of a European *Anthidium*. Ventral segments black, punctured, with amber margins.

Legs coxae, trochanters, and basal ends of femora, and inside surface of tibiae black, apical ends of femora, and outside surface of tibiae creamy yellow, anterior tibiae yellowish-amber, much golden hair. Tarsi: basitarsi broad, yellow; other tarsal joints short and amber-coloured; claws dark amber, bidentate, pulvillus large, reddish; velum convex; hind calcariae pale amber, with twelve strong teeth diminishing in size; tegulae amber, with yellowish patches and a tuft of hair; wings yellowish, prismatic, anterior measuring 8 mm. nervures clear ferruginous, the straight basal running beyond the nervulus, the two recurrents entering the second cubital cell at the ends. Cells: the two large cubitals are of equal size, the radial long, narrow and rounded on costa; pterostigma ferruginous, long and narrow; hamuli eleven in number, of moderate development.

Locality.—Probably Victoria. Best's label "510." Type in National Museum.

Allies.—This bee is clearly close to *N. mirabilis* Perkins, which was described from Western Australia, but the abdominal bands are of different shape.

Though no observations are available, the anatomical structure shows that the nest is a shaft in the ground, the cradle a skin cell laid down from the tongue, and the stores a stiff batter of honey and pollen formed into a ball. A few acarid mites were obtained from the fleece of this bee.

MEROGLOSSA MIRANDA, sp. nov.

(Text-figs. 2 and 3.)

Male.—Length, 8 mm. approx.

Head narrow, of oily brightness, black, numerous punctures; face-marks dull cream-colour, acutely pointed above the insertion of the scapes; frons with numerous punctures and a fine longitudinal carina reaching to the median ocellus; clypeus dull cream-colour, finely aciculate, anterior edge narrowly fulvous; supraclypeal area black, with a small transverse dull-cream mark; vertex with wine-pink ocelli in a triangle, facial foveae short and straight; compound eyes dark-brown, converging below; genae black, numerous punctures, long silvery hair; labrum oval, very pale-fulvous; the maxillary palpi being nearly twice the length of the antennae; mandibulae very pale amber, dark red apically; glossa short and pointed; antennae very long, scape stout, blackish above, fulvous beneath.

Prothorax black, a cream stripe, dilated at ends but interrupted in middle; tubercles cream colour; mesothorax black, bright, rough, with numerous punctures, a few white hairs posteriorly; scutellum and postscutellum similar to mesothorax, postscutellum with white hair; metathorax black, bright, a small area with slightly coarser sculpture; abdominal dorsal segments black, hind margins dull reddish, a fine cancellate sculpture, on one a short line of white hair laterally, a short fringe on all others.

Legs black, basal third of tibiae cream, also the knees, a few white hairs; tarsi fulvous, the basitarsi of hind legs cream; claws bifid, reddish; hind calcariae finely serrated, pale; tegulae fulvous posteriorly, cream anteriorly; wings hyaline, iridescent, anterior 5 mm.; nervures blackish-brown, basal slightly arched, second cubital receiving both recurrents. Cells: second cubital slightly contracted at apex; pterostigma long, narrow, brownish; hamuli widely spaced, eight in number.

Locality.—Milly Milly station, West Australia (J. Glauert, 10th May, 1922). Type in the West Australian Museum.

Allies.—Not close to any described species. The exceedingly long palpi and the extraordinary abdominal processes distinguish it as one of the most remarkable bees yet described. It is very hairy for this genus.

EURYGLOSSA INCONSPICUA Ckll.

Ann. Mag. Nat. Hist. [8], xii, p. 512, 1913.

Male.—Length, 5 mm. approx.

Head broad, not bright, a few short white hairs, obscurely greenish; face marks nil; frons with a minute sculpture; clypeus obscurely greenish, coarse scattered punctures, a minute sculpture, a few short white hairs; supraclypeal area similar to clypeus; vertex with tessellate pattern, and clear glassy ocelli; compound

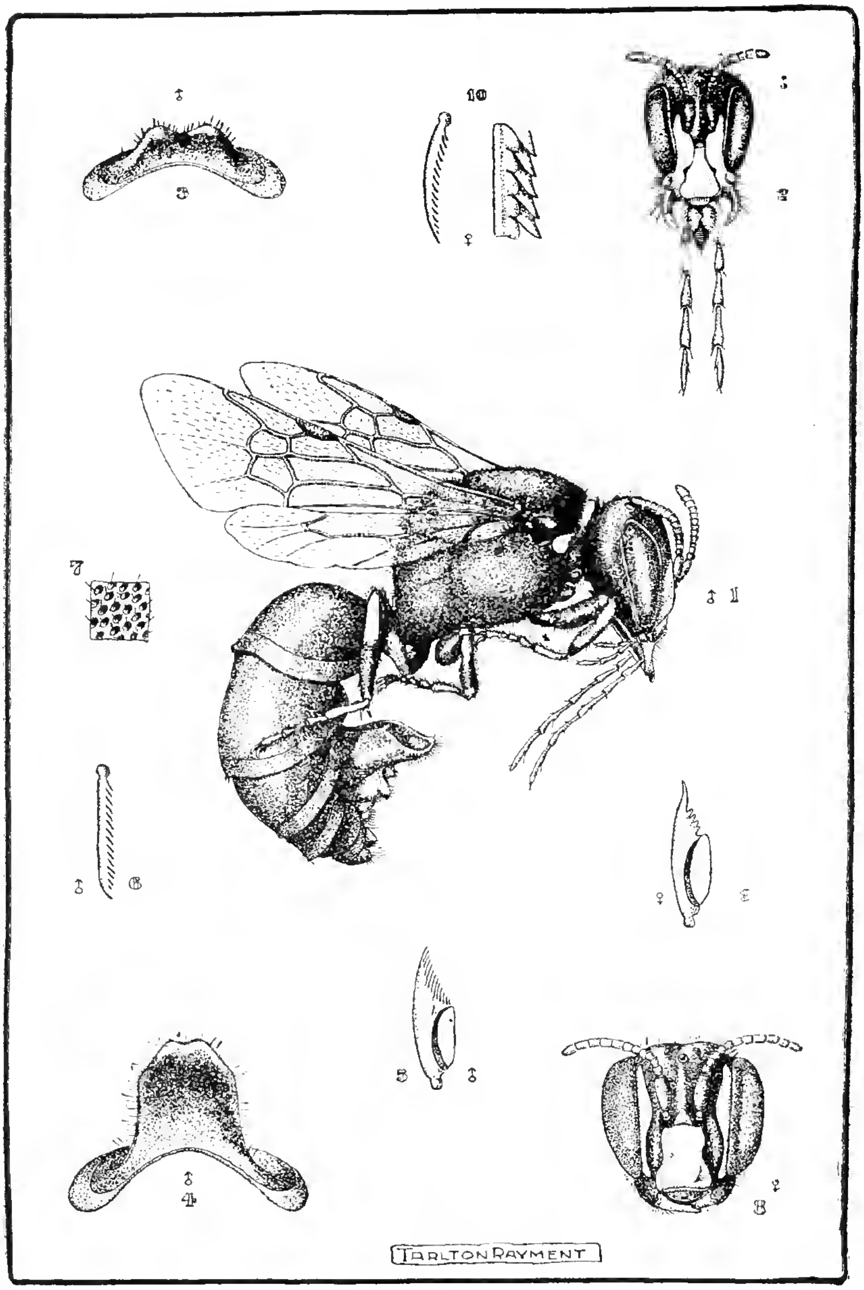


FIG. 2.

1. Adult male *Meroglossa miranda*, sp. nov. 2. Anterior view of head-capsule with the exceedingly long maxillary palpi extruded. 3. Nodose ridge on fourth ventral segment. 4. Posterior view of huge process on third ventral segment. 5. Strigil or antenna-cleaner of male. 6. Hind calcar or tibial spur. 7. Portion of the tegument of mesothorax. 8. Front view of head-capsule of female *M. impressifrons*. 9. Strigil of female. 10. Calcar of female, with serrations highly magnified.

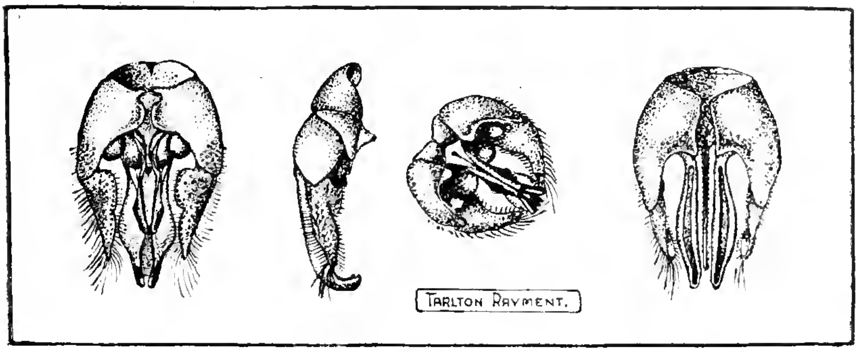


FIG. 3.

Four views, dorsal, lateral, oblique and ventral, of genitalia of *Meroglossa miranda,* sp. nov.

eyes blackish-claret; genae with a few stiff hairs; labrum black; mandibulae black at bases, reddish apically; antennae submoniliform, black.

Prothorax not visible from above; a fringe of long white hair surrounds the tubercles, black; mesothorax bright, dark bluish-green, with a minute tessellate sculpture, scattered punctures of medium size, a few dull-white hairs on disc; scutellum similar to mesothorax; postscutellum black, rough, a few long white hairs; metathorax black, bright, with a large area covered with a fine sculpture. Abdomen: dorsal segments black, polished, hind margins broadly but obscurely lighter, a finely lined transverse sculpture; ventral segments similar to dorsal surface.

Legs: coxae, trochanters femora, and hind tibiae black, knees and other tibiae light ferruginous, sparse long white hair: tarsi light ferruginous with white hair; claws reddish-amber; hind calcariae pale amber, finely serrated; tegulae dark ferruginous; wings hyaline, iridescent; nervures dark sepia, heavy, basal far short of nervulus; cells: the large second cubital is contracted at top; pterostigma dark sepia; hamuli few and weak.

Locality.—Sandringham, Port Phillip, Victoria (March, 1928, Rayment). Allotype in the National Museum.

The female was described from Purnong, South Australia.

Biological Data.—This may be called the Summer *Euryglossa;* one brood, consisting of both sexes, emerges during the hottest months. Nests are in the sandy loam, and the males hover over the burrows in great numbers. These bees visit the flowers of *Goodenia ovata.*

Division COLLETIFORMES.

Family COLLETIDAE.

PARACOLLETES PICTA, sp. nov.

Female.—Length, 11 mm. approx.

Head transverse, a brilliant blue-green with metallic iridescence; face-marks nil; there is a fairly dense covering of whitish plumose hair; frons highly polished, closely punctured, punctures somewhat pear-shaped; clypeus rather flat, polished, well-punctured; supraclypeal area similar to clypeus; vertex highly polished, very iridescent, densely and coarsely punctured, whitish hair; compound eyes claret-brown; genae densely covered with pear-shaped punctures, some long whitish plumose hair; labrum blackish; mandibulae dark amber; antennae submoniliform, beneath testaceous towards apex.

Prothorax just visible as a bright blue-green line; tubercles black, with a thick fringe of cinereous plumose hair; mesothorax polished blue-green, coarsely well-punctured, hair whitish at sides, but intermixed with black on disc; scutellum coloured like mesothorax, but punctures larger and closer, hair similar; postscutellum darker, finely granular, a tuft of whitish hair, small punctures; metathorax with small enclosed area highly polished and impunctate. Abdomen: dorsal segments brilliant bluish-green, highly polished, closely and coarsely punctured, hind margins narrowly brown, the anal fimbria of a brilliant golden orange; ventral segments of similar colour to dorsal surface, a few light and dark hairs.

Legs black or obscurely brownish, with pale plumose hair, floccus and scopa of a drab colour; tarsi fulvous beneath; claws reddish-amber; hind calcariae dark brown, with a number of long fine teeth; tegulae very dark, with only very obscure brownish tint; wings not entirely clear, iridescent, anterior 7 mm.; nervures dark sepia, radius rounded on costa, basal just short of nervulus; cells; cubitals contracted at top; first recurrent nervure entering second cubital cell at basal third, second recurrent entering third cubital at apical corner; pterostigma dark brown; hamuli of moderate development.

Locality.—Charleville, Queensland (G. F. Hill, 13th November, 1927). Type in the National Museum.

Allies.—Prof. Cockerell states this is close to *P. elegans* Smith, which is distinguished by ochreous hair at sides of thorax, lighter legs, and impunctate polished postscutellum.

Paracolletes maculatus, sp. nov.

(Text-fig. 4.)

Female.—Length, 10 mm. approx.

Head broad, black, bright, dull-white plumose hair; face-marks nil; frons rugose in middle, but finely granular at margins of orbits; clypeus prominent, scattered coarse punctures, polished, scattered whitish hair, a fringe of stiff fulvous hair; supraclypeal area similar to clypeus, but a fine carina rises to and surrounds the median ocellus; vertex finely granular, with wine-red ocelli in a curve; compound eyes blackish-claret, slightly converging below; genae rugose, with dull-white long plumose hair, but not well developed; labrum black; mandibulae black basally, reddish apically; antennae black, submoniliform.

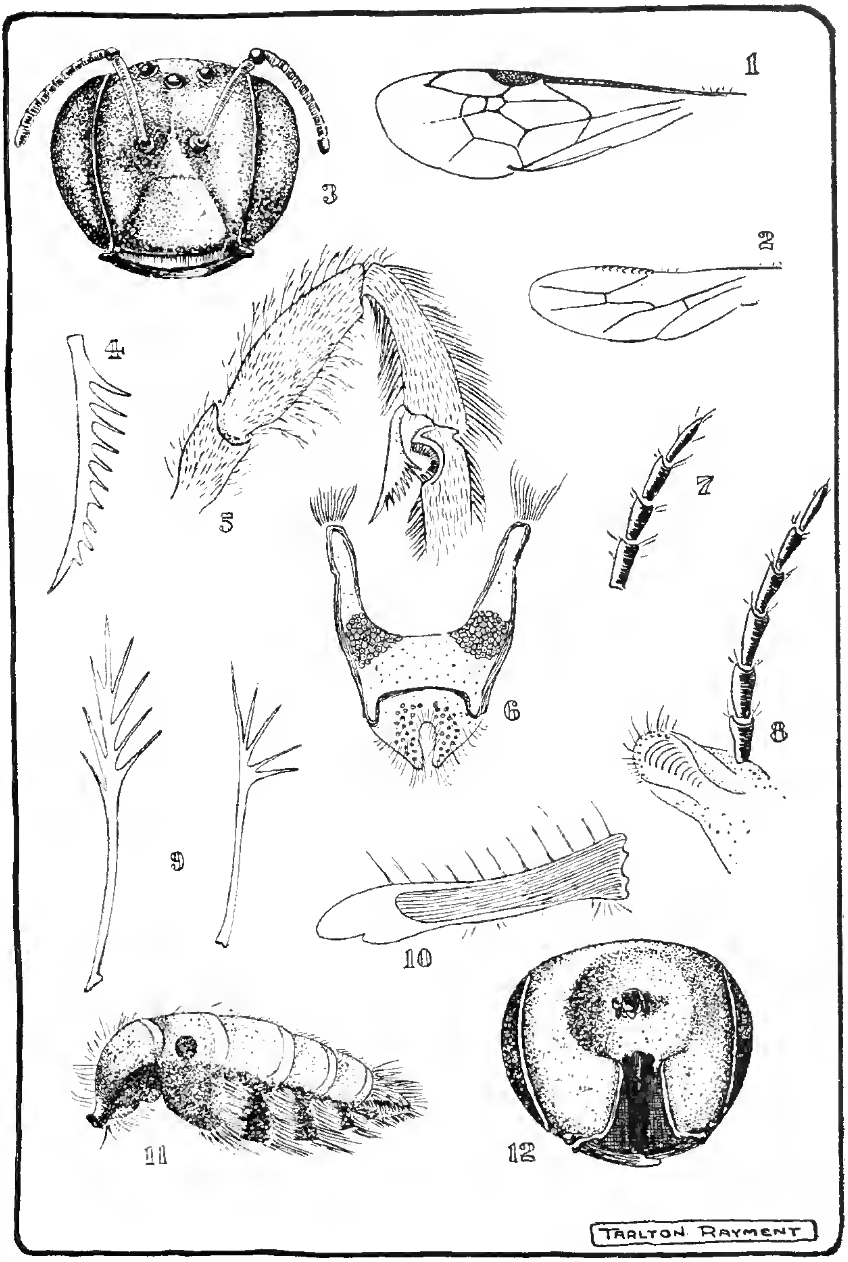


FIG 4.

1. Anterior wing of *Paracolletes maculatus*, sp. nov. 2. Posterior wing of female. 3. Front view of head-capsule of female. 4. Hind calcar of female. 5. Portion of anterior leg, showing the strigil or antennal scraper and antennal brush. 6. The apical dorsal segment of the abdomen. 7. Labial palpus has four segments. 8. Maxillary palpus has six segments. 9. Forked hairs from the legs of the female. 10. Mandible or jaw. 11. Lateral view of abdomen, showing the macula. 12. View of back of head-capsule of female.

Prothorax not visible from above; a fringe of drab-coloured hair surrounds the thorax; tubercles black, bright, a crescentic patch of light-drab short plumose hair; mesothorax black, bright, a minute tessellate pattern, scattered punctures of medium size, scattered hair of blackish tint on disc; scutellum similar to mesothorax; postscutellum dull, finely granular, black, a few long plumose drab-white hairs; metathorax black, bright, a very small lunate area with a few coarse converging rugae superimposed on a minute sculpture of tessellate pattern. Abdomen: dorsal segments red, sixth segment black, basal more or less blackish in some specimens, hind margins broadly darker, the second with a black spot at the sides, a few drab hairs laterally, a naked plate at apex; ventral segments; wider black bands, each fringed with drab hair.

Legs black, hind tibia with a floccus of beautiful plumose hair of drab tint; tarsi black, drab hair; claws reddish-amber; hind calcariae pale amber, with ten long spines gradated in size; tegulae polished black, with a fine tessellate pattern; wings sub-hyaline, iridescent, anterior 7 mm.; nervures dark ferruginous, second recurrent meeting third intercubitus, first recurrent entering second cubital cell at apical third; cells; second and third cubitals contracted at top; pterostigma dark amber; hamuli eight in number, of moderate development.

Male.—Length, 9 mm. approx.

Head black; wide, hair more ochreous than drab; face-marks nil, but granular sculpture becomes coarser at sides; frons with some anastomosing rugae; clypeus has close coarse puncturing and a minute sculpture, long plumose hair; supraclypeal area finely granular, a distinctive area; on the vertex the shafts of the hair are dark; compound eyes blackish claret; genae not well developed in this genus, slightly rugose, with drab plumose hair; labrum black, some specimens show obscure reddish tints; mandibulae black. The tongue is short and wide, of Colletid type; antennae submoniliform, black.

Prothorax not visible from above. A fringe of drab hair surrounds the thorax; tubercles black, and lack the fringe of the female; mesothorax black, finely granular, punctures difficult to find, the shafts of the hair being black; scutellum similar to mesothorax; postscutellum rough, black, hair with black shafts; a feature common to many bees of this genus; metathorax black, with a narrow lunate area enclosed by a fine rim, a few coarse irregular short rugae. Abdominal dorsal segments, basal black, red margin; all the others red, hind margins obscurely lighter; ventral segments red, with broad black margins.

Legs black, hair golden; tarsi black, hair more golden; claws reddish-amber; hind calcariae pale amber, finely serrated; tegulae polished black; wings sub-hyaline, iridescent, anterior 7 mm.; nervures dark amber, the basal being interstitial with nervulus; cells similar to those of female; pterostigma dark amber; hamuli seven in number, of moderate development.

Locality.—Sandringham, Port Phillip, Victoria (12th September, 1926, Rayment). Type (female) and allotype in the National Museum.

Allies.—Prof. Cockerell points out that this species is very close to *P. platycephalus* Ckll., *P. rufoaeneus* and *P. bimaculatus* Smith. The first-named was described from Windsor, Victoria. The palpi of the mouth parts are black, and it seems that a group could be separated on that character. In some New Zealand and Victorian *Paracolletes* the first recurrent nervure is absent, and the two discoidal cells are confluent.

The general appearance of this species is that of a red-bodied *Parasphecodes*.

Biological Data.—There is one brood, composed of both sexes, which emerges in spring. The larvae are carried over the winter, asleep in skin cells. They frequent, and mate on, the flowers of *Leucopogon richei*, *Myoporum insulare* and *Cryptostemma calendulaceum*. The males are very active, and are much in evidence among the females on the plants specified. Copulation is effected on the flowers, and that is unusual with males of this genus.

ANDRENOPSIS WILSONI, sp. nov.

(Text-fig. 5.)

Male.—Length, 9 mm. approx.

Head broad, black, shining; tufts of white appressed hair at sides of clypeus; face-marks dull yellow; frons closely and coarsely punctured, producing a subrugose effect; clypeus shining, with a carina continued up beyond the supraclypeal area; a large amber mark roughly concavo-triangular, coarsely punctured; vertex with wine-pink ocelli, the numerous punctures producing a rugose appearance; compound eyes blackish-brown, almost parallel; genae well punctured, with long silvery plumose hair; labrum reddish; mandibulae amber, reddish apically, two strong teeth; antennae submoniliform, scape fulvous, first joint of flagellum black, others dark above, fulvous beneath, apical joint like a rounded chisel edge.

Prothorax not visible from above; tubercles black, fringed with white hair; mesothorax black, shining, coarsely and closely punctured; scutellum very wide, colour and sculpture of mesothorax; postscutellum triangular, posterior edge standing up sharply; metathorax very small, black, bright, roughened, a fringe of white hair, a rugose area is enclosed by a rim shaped like a Moorish arch, the apex reaching down the angle of truncation. Abdominal dorsal segments dull, closely punctured, ferruginous, a wide dark band on each segment, scattered short white hair; ventral segments ferruginous, with a scopa of white hair.

Legs ferruginous, coxae black, trochanters black, basal portion of hind femora dark, long white plumose hairs; tarsi clear chestnut-red; claws amber, reddish apically; hind calcariae pale amber,

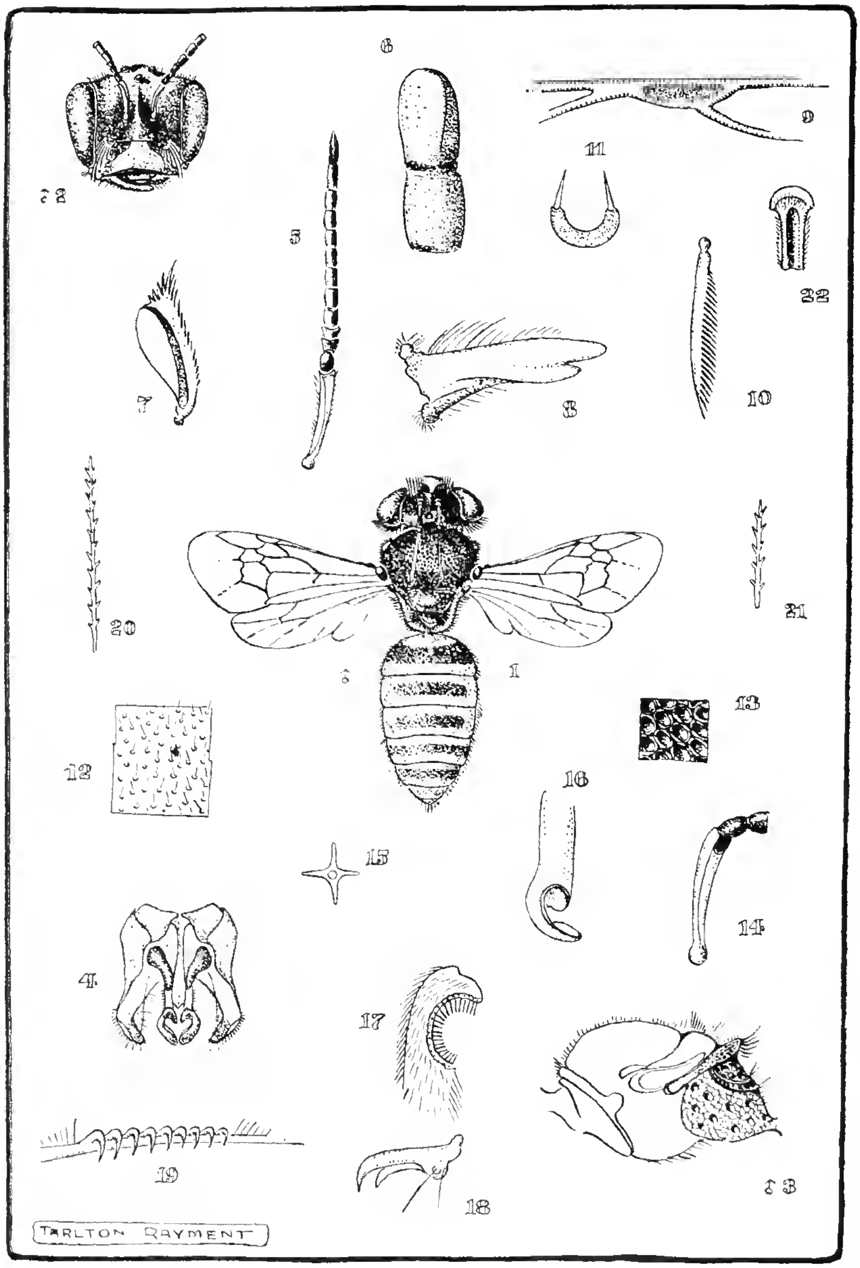


Fig. 5.

1. Adult male *Andrenopsis wilsoni*, sp. nov. (legs not shown). 2. Front view of head-capsule. 3. Lateral view of thorax to show sculpture of metathorax. 4. Genitalia. 5. Antenna. 6. The flattened apical segment of the flagellum. 7. Strigil of the anterior leg. 8. Mandible. 9. The pterostigma is surrounded with a nervure. 10. The hind calcar has long fine serrations. 11. Transverse section of calcar. 12. Portion of wing surface showing fine hairs. 13. Portion of tegument from mesothorax showing sculpture. 14. Apex of scape showing small cavity; compare with *Microglossa*. 15. A plumose hair viewed vertically. 16. Clasper from genitalia more highly magnified. 17. The antennal brush of the anterior leg. 18. One of the bifid claws. 19. The hamuli or wing-hooklets are of moderate strength. 20. Plumose hair from the gena or cheek. 21. Plumose hair from the abdomen. It will be noticed that these are Colletid bees, with only two cubital cells, and the plumosity of the body-hairs is very short. 22. The genitalia has a titillatum of the type of *Paracolletes*.

with long fine serrations fringing the thick rib; tegulae ferruginous; wings subhyaline, yellowish; anterior 6·5 mm.; nervures dark amber, basal arched and interstitial with nervulus, radius rounded on the costa, first recurrent entering second cubital cell at first third of its length; cells, the two cubitals equal, the second discoidal very large and pentagonal; pterostigma long, very narrow, sepia-coloured; hamuli, ten, of moderate development.

Locality.—Bogong High Plains (5000 ft.), Victoria (10th January, 1928, F. E. Wilson).

Allies.—The neuration of the wings is unusual, but the hairy covering is suggestive of the Colletid bees. While this description was in manuscript Professor Cockerell described the genus, and, consequently, this species is now added to it. This bee is very distinct from *A. flavorufus* Ckll. and *A. velutinus* Ckll. The first was described from Sydney, and the second from Kojarena, Western Australia, and this record adds the genus to the Victorian fauna.

PARACOLLETES RUFA, sp. nov.

(Text-fig. 6.)

Male.—Length, 11 mm. approx.

Head very wide, black, bright, a dense covering of long plumose golden hair; face-marks nil; frons shining and hollowed out; clypeus very convex, with numerous punctures of medium size, long hair; supraclypeal area similar to clypeus; vertex sharply developed, the wine-pink ocelli in a low curve; compound eyes claret-brown, inner orbital margins parallel; genae with long golden plumose hair; labrum reddish-brown; mandibulae long, reddish-amber, black basally and apically, one large tooth and a very small one; antennae with long hair on scape, flagellum almost subserrate, and articulated in such a way that a number of pore organs appear along the side.

Prothorax not visible from above; tubercles covered with dense long, golden hair; mesothorax black, bright, with numerous punctures of medium size, and a dense coat of long golden, beautifully plumose hair, there is a delicate sculpture; scutellum similar to mesothorax; postscutellum difficult to determine owing to the density of the long golden hair; metathorax covered with long plumose hair that hides all sculpture; abdominal dorsal segments clear chestnut red, with scattered long hair of dark colour; ventral segments lighter, with darker margins.

Legs: coxae, trochanters and basal half of femora brown, anterior femora and all tibiae ferruginous, with golden hair, the exterior of hind tibia having blackish hair; tarsi clear ferruginous; claws clear ferruginous; pulvilli black; hind calcariae amber, finely serrated; tegulae clear pale-amber; wings hyaline, iridescent, anterior 7 mm.; nervures dark-amber, first recurrent entering the second cubital at its middle. Cells: the second cubital slightly contracted at the apex, second and third cubitals subequal; pteros-

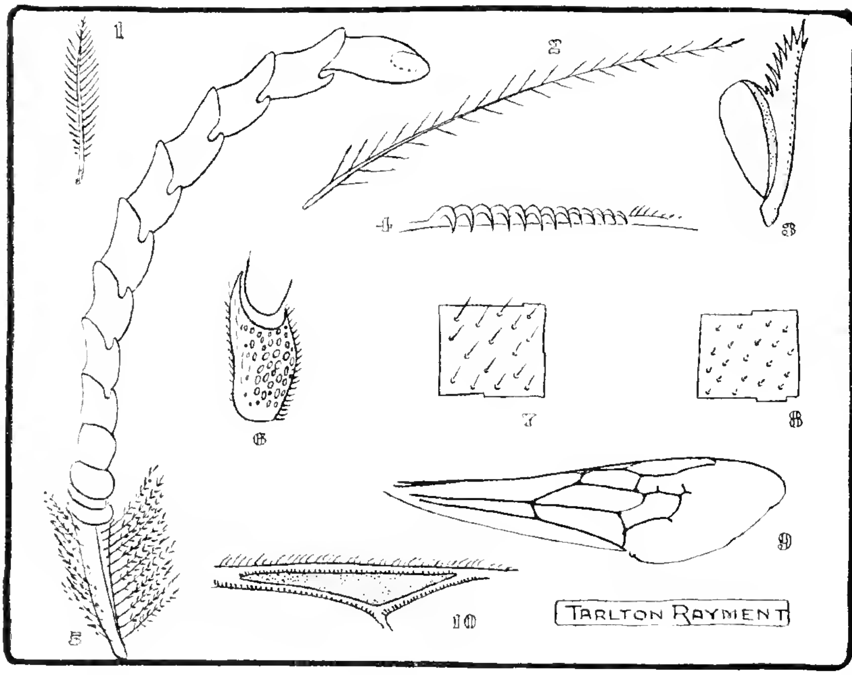


FIG. 6.

1. Small hair from thorax of *Paracolletes rufa*, sp. nov. 2. Long plumose hair from leg. 3. The strigil has fine spines; that of *Trichocolletes* coarse teeth. 4. Hamuli are well developed. 5. The segments of the flagellum are almost subserrate. 6. A segment more highly magnified to show pore organs. 7. Portion of membrane of wing (anterior). 8. Portion of membrane of wing (posterior). 9. The second and third intercubitus nervures of *Paracolletes* wing are often partly obsolete. 10. The pterostigma is surrounded with a nervure; compare with *Andrenopsis*.

tigma honey-coloured, not well developed; hamuli moderately developed.

Locality.—Purnong, South Australia (S. W. Fulton, 30th June, 1911). Type in the collection of the author.

Allies.—Not very close to any described species. It has a slight superficial resemblance to *Paracolletes fimbriatinus* Ckll., but is clearly distinct.

Division ANDRENIFORMES.

Family ANDRENIDAE.

Subfamily HALICTINAE.

HALICTUS DEMISSUS Ckll.

Proc. Acad. Nat. Sci. Philad., p. 371, 1916. ♀

Male.—Length, 6 mm. approx.

Head wide, black, not shining, a good covering of white plumose hair; face-marks nil; frons rough, hair shorter; clypeus prominent, hair longer and dense; on supraclypeal area hair not so dense; vertex roughly lined, with clear glassy ocelli; compound eyes slightly converging about and below; genae black, with rough lines and a few plumose white hairs; labrum black; mandibulae black; antennae submoniliform, black, obscurely lighter beneath.

Prothorax not visible from above; tubercles with a few long white plumose hairs; mesothorax shining, obscurely greenish, scattered punctures of medium size, a fine tessellate sculpture, a few long white hairs; scutellum similar to mesothorax; postscutellum black; bright, rough; metathorax black, bright, a lunate area, not enclosed by a rim, with a few coarse radiating rugae superimposed on a minute sculpture. Abdominal dorsal segments polished, black, impunctate, minutely striate, except first, a few scattered white hairs; ventral segments similar to dorsal surface, hind margin of second lighter.

Legs slender, black, a few long white plumose hairs; tarsi dark amber with white hair; claws reddish; hind calcariae normal for male *Halictus*, i.e., finely serrate; tegulae light ferruginous; wings clear, iridescent, anterior 3·5 mm.

Nervures dilute sepia, second recurrent, and third intercubitus almost obsolete. Cells: second discoidal and third cubital confluent; pterostigma dark sepia; hamuli few and of weak development.

Locality.—Sandringham, Port Phillip, Victoria (Rayment, December, 1927). Allotype in National Museum, Melbourne.

Allies.—It seems to have some affinity to *H. inclinans*, Smith.

Biological Data.—Both sexes collected on flowers of Cauliflower, and the females are a little larger than the type which had previously been collected from Tasmania. There is a single brood composed of both sexes; the larvae are carried over the winter, but a rapid development takes place in Spring.

Division XYLOCOPIFORMES.

Family CERATINIDAE.

(Text-fig. 7.)

Neoceratina rubinii, sp. nov.

Female.—Length, 7 mm. approx.

Head wide, colour dull orange, tegument bright, with numerous plumose white hairs of medium length; face-marks nil; frons suffused with black, bright, with numerous coarse punctures; clypeus convex, dull orange, coarse punctures, hidden by plumose white hair; supraclypeal area similar to clypeus; vertex roundly developed, coarsely punctured, but the dark suffused area does not extend to the orbital margins; compound eyes claret-brown, bulging, slightly converging below, numerous white, short, peglike hairs appear between the facets; an unusual character; genae conspicuous, with coarse punctures hidden by plumose white hair; labrum dull orange, rectangular; mandibulae reddish-brown,

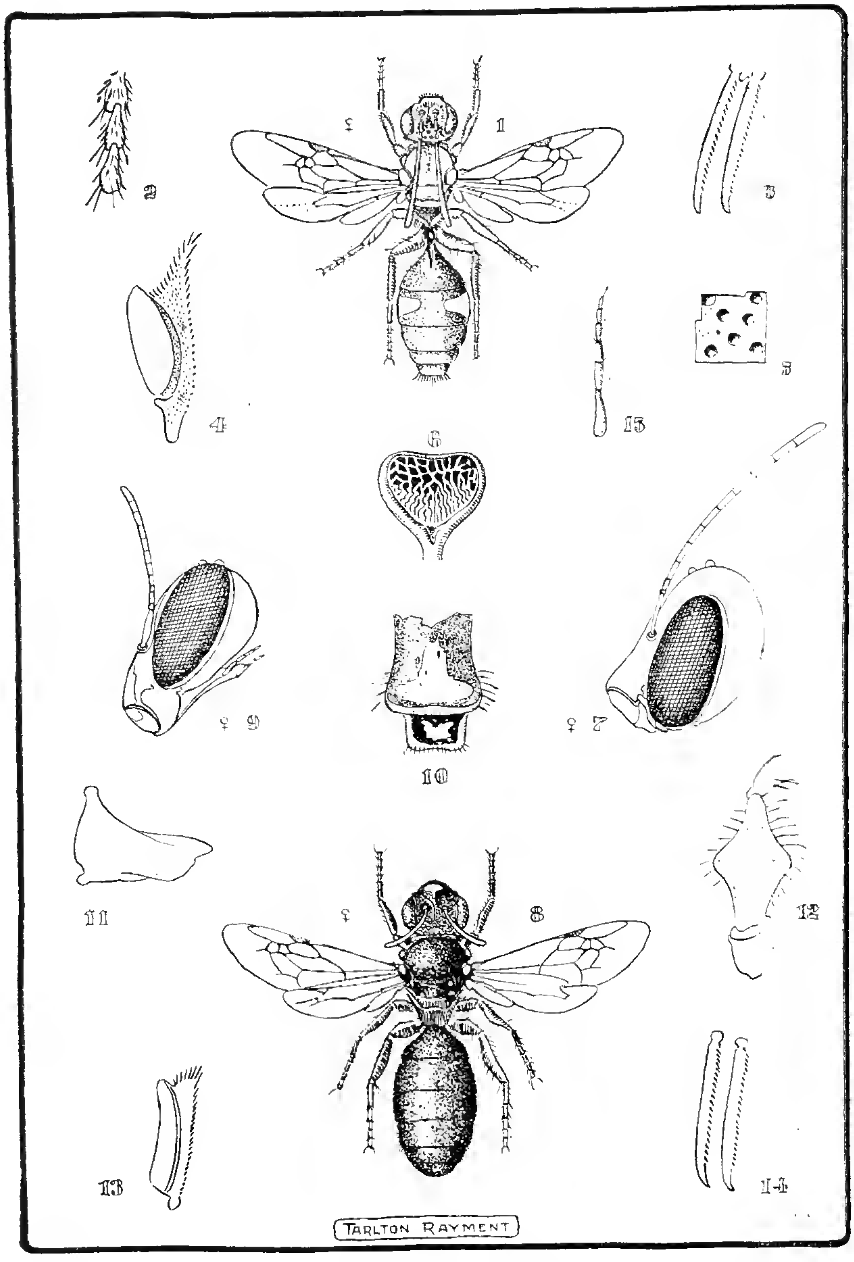


FIG. 7.

1. Adult female of Australian *Neoceratina rubinii*, sp. nov. 2. Tarsal segments from anterior leg. 3. The hind-tibial spurs are finely serrated. 4. The strigil or antenna-cleaner has an acute malus. 5. Portion of the tegument enlarged to show punctures. 6. The enclosed area of the metathorax is rugulose. 7. Lateral view of head, showing long antennae. 8. Adult female of American *Ceratina dupla* Say. 9. Lateral view of head, showing position of labrum. 10. Clypeus and labrum, showing cream markings. 11. The mandible or jaw is short and thick at base. 12. The femora are dilated. 13. Strigil has a short truncated malus. 14. The tibial spurs are characteristic of all bees that excavate and dwell in reeds.

spoonlike and short, with thick bases; antennae extremely long for a female, submoniliform, dull orange, extreme bases of scapes dark.

Prothorax dull orange, coarsely and densely punctured, bright; tubercles clear reddish-amber, polished, with a fringe of white plumose hair; mesothorax polished, reddish-amber, suffused down middle with black, many scattered punctures of large size; scutellum with sculpture like mesothorax, but colour lighter, bigibbous; postscutellum similar to scutellum; metathorax black, two obscure red patches laterally, a subtriangular area, enclosed with a fine rim, with coarse, anastomosing rugae basally, two pointed processes apically and laterally two dense patches of short white plumose hair; abdominal dorsal segments shining, rich reddish-amber, hind margins of five and six broadly lighter, two with deep-cream patch laterally, apex with a fringe of white hair; ventral segments much paler in colour.

Legs dull reddish orange, with scattered pale hair; tarsi paler; claws ferruginous; hind calcariae ferruginous, finely serrated, typical of reed-dwelling bees; tegulae clear, pale yellowish-amber; wings suffused with brownish colour and iridescent, very hairy, anterior 5 mm. Nervures dilute sepia, the first and third intercubitus much bent at apex, the basal straight, and running beyond the nervulus; cells: first cubital large, second and third cubitals small, subequal, contracted at apex; the radial cell rounded on the costa; pterostigma dilute sepia; hamuli seven in number, and of weak development.

Locality.—Townsville, Queensland (C. Barrett, August, 1920).

Allies.—Not close to the unique *N. australensis* Perkins, which has a white stripe on the clypeus, pallid spots on the tubercles, and a white stripe on the legs. I have not seen the genotype, but the neuration of the wings seems to agree.

Nothing is known of the life-history of these bees, but the anatomy of the creatures stamps them as reed-dwellers. Collected by Mr. Chas. Barrett. The species is dedicated to Jan Rubini, the musician.

Division APIFORMES (Social Bees).

Family APIDAE.

Subfamily MELIPONINAE.

TRIGONA COCKERELLI, sp. nov.

(Text-fig. 8.)

Worker.—Length, 5 mm. approx.

Head wide, bright, densely and finely punctured, with numerous appressed short white hairs, black; face-marks confined to a dull-white spot at the bases of the anterior orbital margins; frons large, with minute even puncturing, and appressed short white hair; clypeus similar to frons in sculpture, with a transverse dull white

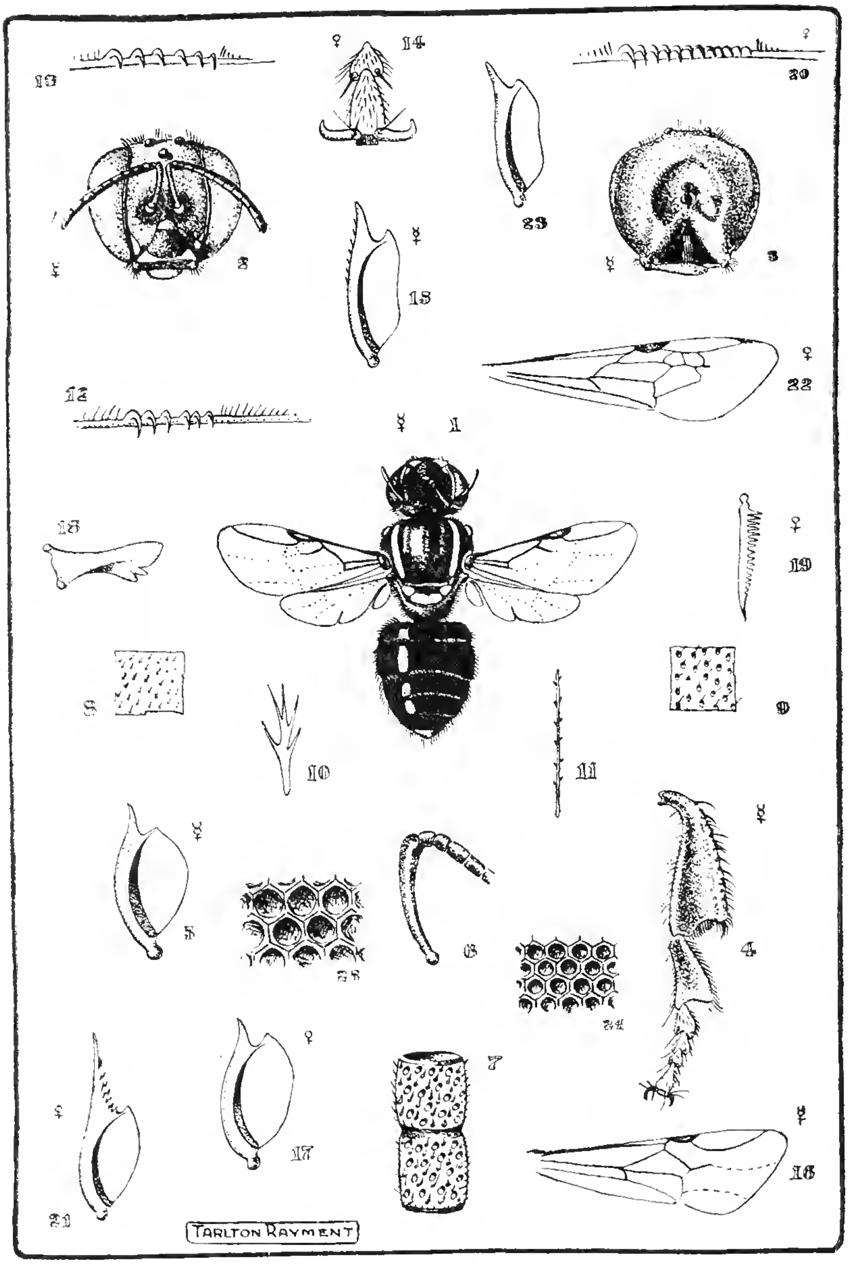


FIG. 8.

1. Adult worker of Australian social bee, *Trigona cockerelli*, sp. nov. (legs not shown). 2. Front view of head-capsule. 3. Posterior view of head-capsule of *T. carbonaria* Sm. 4. The hollowed tibia and tarsi of *T. Cockerelli*. 5. Strigil of the anterior leg. 6. Scape showing small cavity at apex; compare this with that of *Microglossa* Raym. 7. Segments of flagellum, showing pore and peg organs. 8. Minute hairs on wings. 9. The punctate sculpture of the mesothorax. 10. A forked hair from the face. 11. A fine plumose hair from the leg. 12. Hamuli or small wing-hooklets. 13. Hooklets from African social bee, *T. zebrae* Friese. 14. Claw segment of female (queen) *T. carbonaria* Sm. 15. Strigil of the South American social bee *T. capitata* Sm. 16. Anterior wing of the worker. 17. Strigil of female (queen) *T. carbonaria* Sm. 18. Mandibles of worker. 19. Hind tibial spur of South African Colletid bee. 20. Hamuli or wing-hooklets. 21. Strigil or antenna-cleaner. 22. The neuration of the wing is of Colletid type. 23. Strigil of South African social bee, *T. denoiti* Vachel. 24. 25. Cells of hive-bee *Apis* compared with those of *Trigona*.

median band which is dilated laterally into large triangular ends, convex; supraclypeal area with a wide, dull-white crescentic mark; vertex roundly developed, the clear glassy ocelli in a curve; compound eyes claret-brown, converging slightly at base and apex; genae with numerous short appressed white hairs; labrum dull-white; a distinct malar space; mandibulae black at bases, reddish apically, the median portion dull-white; antennae submoniliform, the scapes dull-white in front, flagellum fulvous beneath, dark above.

Prothorax black, not visible from above; tubercles cream, shaded to fulvous, a short fringe of white hair; mesothorax black, bright, with minute even puncturing, minute white hair, a narrow creamy stripe laterally from the prothorax to the scutellum; scutellum black, with a large cream dot laterally, and a large emarginate fulvous mark, a few long white hairs; postscutellum black, hidden; metathorax black, with a large scale-like sculpture, bright; abdominal dorsal segments highly polished, black, hind margins broadly reddish; ventral surface similar, with a whitish fringe on margins.

Legs black, with a whitish dot on median and anterior knees, and trochanters, the hind tibiae and basitarsi very broad and deeply concave on exterior surface, white hair; tarsi reddish-amber, with fulvous hair; claws reddish; empodium large; hind calcariae absent; tegulae dull, with drab patches and short white hair; wings hyaline, iridescent, anterior 3 mm.; the posterior with a large anal lobe; nervures pale-amber, basal arched and meeting nervulus, recurrents and intercubitals obsolete, only the basal stump of the cubitus being visible; cells: radial, long and narrow, the cubitals and discoidals are all confluent; pterostigma pale-amber, distinctly margined with a nervure; hamuli six in number, of weak development.

Locality.—Borroloola, North Australia (Gerald Hill, 25th September, 1911). Type in the National Museum.

Allies.—*T. essingtoni* Ckll., which has a pale yellow mark, and two reddish-brown dots on clypeus, and a yellow scutellum; *T. cassiae* Ckll., which has different markings on clypeus and scutellum, and narrow lateral facemarks. The species is dedicated to Professor Cockerell, my mentor in Taxonomy.

Biological Data.—These social bees construct small horizontal brood-combs, the mouths of the cells being at the bottom. The honey-pots are large, and grouped on the circumference of the brood-combs; they are irregular spheres. The queen-larvae do not receive any "super-food," like those of *Apis*, but are reared solely on honey and pollen. Dr. Tillyard has stated that no social bee has a tibial spur, but it is present in *Bombus*, although wanting in the present genus. I have received a bee from the museum at Bulawayo, Africa, labelled "*Trigona beckeri* Friese. Id. Stevenson," but it is a Colletid bee; the wings and strigil are shown in the drawing.

A Correction.

In the immediately preceding issue of these Proceedings I erected the genus *Melitribus.* This was further discussed by me in the *Vic. Naturalist,* May, 1930, where I supplanted the genera *Stenotritus* and *Gastropsis.* I find my action is not in accordance with the rules of nomenclature and the law of priority. It is now definitely proved that the species contained in the genus *Gastropsis* are merely the males of the genus *Stenotritus.* The latter was founded some fifteen years before *Gastropsis,* and must, therefore, stand. Two well-defined groups are represented in the material at my disposal, and I therefore take this opportunity of correcting my error. Group 1 may be retained in Smith's genus *Stenotritus,* the species of which are tabulated below. Smith's description of *Stenotritus,* from an incomplete specimen, is so meagre that I did not regard it as sufficient; indeed, Smith himself had doubts about it. The following characters will serve to distinguish this genus:

Large hairy bees of dull metallic or submetallic green or yellow colour; the head wide; the ocelli well forward; the glossa short and wide; the paraglossae long; the second joint of the flagellum long; the females with a naked area on the apical segment the calcariae of the median and hind legs strongly toothed. The males smaller, very hairy, with a short shovel-shaped abdomen; the malus of the strigil double-curved, acute, very long; the velum being very short with a concave edge. The males have a superficial resemblance to *Anthophora.*

Stenotritus Smith.

Cat. Hym. Brit. Mus., p. 119, 1853.

Gastropsis Sm., Trans. Ent. Soc. Lond., p. xxxix, 1868.

Genotype, *S. elegans* Smith.

elegans Smith.
var. A. Ckll.
elegantior, Ckll.
glauerti, Raym. (Melitribus).
pubescens, Sm. (Gastropsis).
var. *nigrescens* Friese (Gastropsis).
var. *splendida* Raym. (Gastropsis).
smaragdinus Sm.

The remaining species I have retained in the genus *Melitribus.* These may be distinguished from *Stenotritus* as follows:—

Large black highly polished, but not metallic bees; the head circular; the compound eyes almost holoptic; the ocelli nearly at the level of the insertion of the antennae; the glossa short and wide; the paraglossa short; the second joint of the flagellum long; no naked area on abdomen, which is long and parallel-sided; the exceedingly thick malus of the strigil is truncated, and has a simple curve; the velum being large and straight on the edge. The males have a superficial resemblance to *Megachile*.

Melitribus Rayment.

Proc. Roy. Soc. Vic., n.s., xlii (2), p. **217**, 1930.

Genotype, *M. victoriae* Ckll.

greavesi Raym.
victoriae Ckll. (Gastropsis).
var. *rufocollaris* Ckll. (Gastropsis).
var. A. Ckll. (Gastropsis).

[Proc. Roy. Soc. Victoria, 43 (N.S.), Pt. I, 1930.]

Art. VI.—*Catalogue of the Land Shells of Victoria.*

By C. J. GABRIEL.

(With Plates II, III.)

[Read 10th July, 1930; issued separately 11th September, 1930.]

Students of the Victorian Terrestrial Mollusca owe a great debt to the "Index to the Land Shells of Victoria," compiled by the late Dr. J. C. Cox and the late Mr. Charles Hedley, and published as Memoir No. 4 of the National Museum, Melbourne. Its excellent illustrations enable one to identify the various forms without difficulty. In some instances, however, the writer is a little at variance with their views, and the differences are noted in this communication. Little can be learnt of these forms without exhaustive study of specimens from different localities.

The work has been greatly facilitated by the privilege of examining the National Museum collection dealt with by Cox and Hedley. Much help has also been gained from specimens collected by Mr. F. L. Billinghurst and the late Mr. T. Worcester, both of whose land shell collections have passed into the hands of the writer. The late Mr. J. H. Young, of Meredith, was an indefatigable collector, and his untimely death removed a keen observer of these forms. Thanks to the zeal and activity of these and other naturalists, the total since Cox and Hedley's Index has been considerably increased, notwithstanding the reputed paucity of our Land Shell fauna.

This catalogue records 45 species and 2 varieties, including 8 new species. The synonymy of each appears, but it has been the aim of the writer to refer to a generic change, or perhaps to a record of some distant locality rather than to supply every available reference. It is probable that a fair number of additions will be made when the whole State is thoroughly explored. In fact, the writer is in possession of several apparently new forms, but with single specimens only it is considered advisable to postpone description until further examples appear. I now take the opportunity of expressing my indebtedness to Mr. J. Clark for the careful execution of the figures. The types of the new species are in the collection of the writer.

Family PUPILLIDAE.
Sub-Family PUPILLINAE.
Genus **Pupilla**, Leach, 1820.

Pupilla australis, Adams and Angas.

1863. Vertigo australis, Adams and Angas, P.Z.S. Lond., p. 522.
1864. Pupa nelsoni, Cox, Cat. Aust. Land Shells, p. 29.
1867. Pupa lincolnensis, Cox, P.Z.S. Lond., p. 39.

1868. Pupa australis, Ad. and Ang. Cox, Mon. Aust. Land Shells, p. 79.
1868. Pupa lincolniensis, Cox, Mon. Aust. Land Shells, p. 80, pl. 14, fig. 16.
1868. Pupa nelsoni, Cox, Mon. Aust. Land Shells, p. 79. pl. 14, figs. 19, 19a.
1878. Pupa lincolnensis, Cox. Sowerby, Conch. Icon., xx (Pupa), pl. 11, fig. 104.
1883. Pupa tasmanica, Johnston, P.R.S. Tas. for 1882, p. 144, pl. 1.
1895. Pupa lincolnensis, Cox. Smith, P. Mal. Soc. Lond., i, p. 96.
1896. Pupa australis, Ad. and Ang. Tate, Horn Exped. Zool., p. 205.
1909. Vertigo lincolnensis, Cox. Petterd and Hedley, Rec. Aust. Mus., vii (4), p. 283.
1916. Vertigo lincolnensis, Cox. Hedley, J.R.S. W. Aust., i (for 1914-15), p. 68.
1921. Pupilla australis, Angas. Pilsbry, Man. Conch. [2]. xxvi, p. 218, pl. 23, figs. 13-19.
1921. Vertigo lincolnensis, Cox. May, Check-List Moll. Tas., p. 91, No. 891.
1923. Vertigo lincolnensis, Cox. May, Ill. Index Tas. Shells, pl. 42, fig. 1.

Size of Type.—Length, 4·23; breadth, 1·58 mm.

Localities.—Irymple (J. H. Young); Natya (C. Oke); Cape Bridgewater (W. H. Dillon); Bannerton (A. C. Nilson); Frankston.

Obs.—A sinistral form, showing much variation. The author remarks: "A cylindrical and, for the genus, a large species, with the aperture furnished with but two plicae." Johnston states: "The name *P. tasmanica*, first given to the shell, has been withdrawn, as on comparison with *P. lincolnensis* Angas, I found that the Tasmanian form was not specifically distinct from it." Dr. Pilsbry (loc. cit.) notes: "Typically rather coarsely striate, but this is individually variable in my specimens, embryonic whorls are irregularly, densely, but shallowly pitted. Aperture shows an angular nodule connected with the termination of the lip (sometimes nearly obsolete)." In regarding these four species as synonymous, the writer concurs in the decision arrived at by Dr. Pilsbry, and, further, it appears to be more happily placed in the genus *Pupilla*. E. A. Smith recorded *P. lincolnensis* from Pigeon Island, near Wallaby Island (Dr. Richardson in Brit. Mus..), and East Wallaby Island, Houtman's Abrolhos (Walker). He remarks: "The specimens collected by Dr. Richardson and Mr. Walker have a second basal tubercle as indicated in Cox's figure, and a third far within upon the columella. It is possible that in the examples examined by Dr. Cox, the denticles were only feebly developed, or they may even have been overlooked, being rather indistinct." This addition to our fauna provides an interesting distribution, being located in New South Wales, Victoria, South Australia, Western Australia and Tasmania.

The type was obtained at Rapid Bay, South Australia, in crevices of rocks.

Family PUPIDAE.

Genus **Bifidaria**, Sterki, 1889.

BIFIDARIA BANNERTONENSIS, sp. nov. (Pl. III, Figs. 9, 10).

Shell minute, white, dextral, attenuate, narrowly umbilicate. Apex obtuse. Whorls five, convex, ornamented by numerous oblique growth-striae. Sutures deeply impressed. Aperture roundly oblong, armed with five white teeth; one situated about the centre of parietal wall, comparatively large and unequally bifid; three placed within the basal and outer margin, the centre of which is the most prominent; the fifth on the columella. Peristome expanded, the columellar expansion partly concealing the narrow umbilicus.

Size of Type.—Length, 2·6; breadth, 1·3 mm.

Locality.—Bannerton (A. C. Nilson).

Obs.—Few species have been described from Australia, and the present is the first representation of the genus in Victoria. In general arrangement the dentition is fairly constant, but specimens have been examined showing the teeth a trifle stronger. As regards measurements, the species is subject to variation, the paratype figured being 2·3 x 1 mm. *Pupa larapinta*, Tate, and *P. mooreana*, Smith, from Central Australia, bear some resemblance, but may be distinguished by their broader contour and more convex whorls.

Genus **Pupoides**, Pfeiffer, 1854.

PUPOIDES ADELAIDAE, Adams and Angas.

1863. Buliminus (Chondrula) adelaidae, Ad. and Ang., P.Z.S. Lond., p. 522.
1864. Pupa ramsayi, Cox, Cat. Aust. Land Shells, p. 28.
1868. Bulimus adelaidae, Ad. and Ang. Cox, Mon. Aust. Land Shells, p. 69, pl. 13, fig. 5.
1889. Bulimus (Chondrula) adelaidae, Ad. and Ang. Cox, P.L.S. N.S.W. [2], iii (for 1888), p. 1254.
1896. Buliminus adelaidae, Ad. and Ang. Mulder, Geelong Nat., v (4), p. 7.
1900. Pupoides adelaidae, Ad. and Ang. Pilsbry, Proc. Ac. Nat. Sci. Phil., p. 428.
1921. Id., Pilsbry, Man. Conch. [2], xxvi, p. 140, pl. 15, figs. 1, 2.

Size of Type.—Length, 6·34; breadth, 2·11 mm.

Localities.—Irymple (J. H. Young); Sea Lake, Mallee (J. C. Goudie); Bannerton (A. C. Nilson); Geelong (Mulder).

Obs.—A form readily recognised. E. A. Smith suggests that his species *Pupa contraria*, from East Wallaby Is., W.A., may prove to be a sinistral form of *P. adelaidae*, Ad. and Ang. Tate, in the Zoology of the Horn Expedition, p. 204, disagrees, remarking that it differs conspicuously by its pyramidal outline. With specimens collected under stones by C. W. Musson, it is recorded from Little Mountain, Narrabri, N.S.W., by Dr. Cox (loc. cit.). The present record, with those of the neighbouring States, proves this to be a widely distributed species. The Type was collected in South Australia.

PUPOIDES ISCHNUS, Tate.

1894. Pupa ischna, Tate, T.R.S.S.A., xviii, p. 191.
1896. Id., Horn Exped. Zool., p. 204, pl. 19, figs. 16*a*,*b*.
1900. Pupoides ischnus, Tate, Pilsbry, Proc. Ac. Nat. Sci. Phil., p. 428.
1921. Id., Pilsbry, Man. Conch. [2], xxvi, p. 146, pl. 15, figs. 3, 4.

Size of Type.—Length, 4·25; breadth, 1·25 mm.

Localities.—Irymple (J. H. Young); Bannerton (A. C. Nilson).

Obs.—A sinistral form, hitherto unrecorded from Victoria, compared with co-types from the late W. T. Bednall's collection. The author's observations are: "A more slender shell and more attenuate apically than *P. contraria;* in its sinistral spire and apertural characters it agrees with *P. myoporinae,* Tate, which is possibly only a sinistral form of *P. pacifica,* from which it differs in its narrow elongate shape and flatter whorls. It may prove on comparison of actual specimens conspecific with *Chondrula lepidula,* Ad. and Ang."

Type from Central Australia.

Family SUCCINEIDAE.

Genus **Succinea**, Draparnaud, 1801.

SUCCINEA AUSTRALIS, Ferussac.

1821. Succinea australis, Fer., Tabl. Syst., ii, p. 27.
1825. Id., Gray, Ann. Phil., p. 415, pl. 9.
——. Id., Fer. and Desh., Hist. Nat. Moll. Terr. et Fluv., ii (2), p. 137, pl. 11, fig. 11.
1832. Id., Quoy and Gaimard, Voy. Astrolabe, Zool., Moll., ii, p. 150, pl. 13, figs. 19-23.
1868. Id., Cox, Mon. Aust. Land Shells, p. 88, pl. 15, figs. 7, 7*a*.
1871. Succinea legrandi, Cox, in Legrand Coll. Mon., sp. 2.
1873. Succinea australis, Fer. Reeve, Conch. Icon., pl. 9, fig. 59.
1882. Succinea australis, Fer. Tate, T.R.S.S.A., iv, p. 75.
1893. Id., Billinghurst, Vic. Nat., x, p. 62.
1909. Id., Petterd and Hedley, Rec. Aust. Mus., vii, p. 283.
1912. Id., Cox and Hedley, Mem. Nat. Mus. Melb., No. 4, p. 6.
1921. Id., May, Check-List Moll. Tas., p. 91, No. 892.
1923. Id., May, Ill. Index Tas. Shells, pl. 42, fig. 2.

Size of Average Specimen.—Length, 12; breadth, 7 mm.

Localities.—Western Port (Astrolabe); Melbourne (Petterd); Castlemaine and Harcourt (Billinghurst); Timboon (H. W. Davey); Frankston and Wimmera District (Kershaw); You Yangs (C. L. Barrett); Yarraby; Cape Nelson; Tarraville; Mornington (Rev. G. Cox); Dartmoor.

Obs.—Petterd and Hedley (loc. cit.) remark: "We consider this to be the shell usually called *Succinea strigata,* Pfr., originally described from Port Clarence, Behring Strait. The localities for the types of *S. australis* are Kangaroo Island and the Isles of St. Peter and St. Francis, in South Australia." This is one of the commonest of our Land Shells. They are not confined to the ground, being frequently located beneath the bark of tree-trunks. The species is widely distributed throughout Victoria and Tasmania.

SUCCINEA AUSTRALIS, Fer., var. QUEENBOROUGHENSIS, Petterd.

1879. Succinea australis, Fer., var. queenboroughensis. Petterd, Mon. Tas. Land Shells, p. 49.

Size of Type.—Length, 11·5; breadth, 8 mm.
Locality.—Frankston (T. Worcester).
Obs.—Compared with Tasmanian specimens in the Hobart Museum, from Brown's River road.

Family ACAVIDAE.

Genus **Hedleyella,** Iredale, 1914.

HEDLEYELLA ATOMATA, Gray, var. KERSHAWI, Brazier, (Pl. III, Figs. 1-8).

1871. Bulimus (Liparus) kershawi, Brazier, P.Z.S. Lond., p. 641.
1882. Id., Tate, T.R.S.S.A., iv, p. 75.
1892. Panda atomata, var. kershawi, Braz., Hedley, Rec. Aust. Mus., ii, p. 31, pl. 5, fig. 9.
1912. Id., Cox and Hedley, Mem. Nat. Mus. Melb., No. 4, p. 6.
1892. Id., Pilsbry, Man. Conch., viii, p. 293.
1894. Id., Pils., Man. Conch., ix, p. 164.
1900. Id., Pils., Man. Conch., xiii, p. 122, pl. 5, fig. 84.

Size of Type.—Length, 50·79; breadth, 28·56; alt., 25·39. Aperture: Length, 31·73; breadth, 15·86 mm.
Localities.—Snowy River, Gippsland (W. Kershaw); Nowa Nowa (self).
Obs.—Iredale, when proposing *Hedleyella,* states that *Panda,* Albers, is invalid through preoccupation. Four species constitute the genus in Australia, and, as the author remarks, it comprises the most interesting and magnificent land shells of our country. This, the largest of the Victorian land forms, apparently is confined to the eastern portion, and as noted by Hedley, "No habitat has been recorded for this form between the valleys of the Hunter and of the Snowy River. Yet, despite their geographical isolation, southern specimens can be precisely matched, as Dr. Cox has kindly demonstrated to me, by northern shells." The writer's observations agree entirely with Pilsbry, Cox and Hedley's treatment in regarding *kershawi* as a variety only. Many specimens in Victorian collections have been examined, and, as evidenced in the figures of Plate III, show extreme variation in contour. The coloration, likewise, is very variable. Brazier, in his description of *kershawi,* remarks that "it approaches in appearance to *B. larreyi,* Braz., and *B. atomatus,* Gray. It differs from those species in not having the dark spots and zig-zag lines that are so characteristic in them." Mr. Hedley has separated three forms of *atomata* as varieties—*azonata, tigris, elongata.*

Family HELICIDAE.

Genus **Chloritis**, Beck, 1837.

CHLORITIS VICTORIAE, Cox.

1868. Helix victoriae, Cox, Mon. Aust. Land Shells, p. 37, pl. 12, fig. 5.
1882. Id., Tate, T.R.S.S.A., iv, p. 75.
1888. Helix brunonia, Johnston, P.R.S. Tas., for 1887, p. 75.
1890. Helix victoriae, Cox. Tryon, Man. Conch., vi, p. 149.
1909. Chloritis brunonia, Johnston. Petterd and Hedley, Rec. Aust. Mus., vii (4), p. 285, pl. 82, figs. 2-4.
1912. Chloritis victoriae, Cox. Cox and Hedley, Mem. Nat. Mus. Melb., No. 4, p. 6, pl. 1, figs. 1, 2.
1921. Id., May, Check-List Moll. Tas., p. 91, No. 896.
1923. Id., May, Ill. Index Tas. Shells, pl. 42, fig. 6.

Size of Type.—Maj. diam., 15·99; min., 12·69; alt., 11·42 mm.

Localities.—Western Port (type locality, Masters and Petterd); Jan Juc (Kershaw); Forrest (Steel); Cape Otway (Petterd); Torquay (Miss E. Gatliff); Millgrove (C. L. Barrett); Lorne, Grampians, Whitfield (self); Wartook; Dartmoor; Frankston.

Obs.—This is a very common and widely distributed species throughout Victoria. Beyond the State it is recorded from King Island and Mt. Kosciusko. Normally the shell is of a uniform brown colour, but a specimen before me, collected at Millgrove by Mr. Barrett, is almost colourless, although in perfect condition. A favourite haunt of this species is under charred timber and tree-fern trunks. When deprived of its characteristic bristly epidermis, it alters in general appearance, and is suggestive of another species.

CHLORITIS BREVIPILA, Pfeiffer.

1850. Helix brevipila, Pfeiffer, P.Z.S. Lond., for 1849, p. 130.
1854. Id., Reeve, Conch. Icon., vii, pl. 128, fig. 777.
1864. Id., Cox, Cat. Aust. Land Shells, p. 6.
1868. Id., Cox, Mon. Aust. Land Shells, p. 47, pl. 5, figs. *2a,b*.
1888. Id., Hedley, P.R.S. Qld., v (2), p. 54.
1890. Helix (Chloritis) brevipila, Pfr. Pilsbry, Man. Conch., vi, p. 265, pl. 58, figs. 28-30.
1896. Chloritis brevipila, Pfr. Hedley, Rec. Aust. Mus., ii, p. 105.
1906. Id., Gude, P. Mal. Soc. Lond., vii, pp. 48, 114, pl. 4, fig. 9.

Size of Type.—Maj. diam., 12; min., 10; alt., 6·5 mm.

Locality.—Victoria (Kershaw, Gude).

Obs.—Recalling the preceding species, but with sparser bristles. Gude (loc. cit.) discusses the genus *Chloritis*, describing among other forms two from New South Wales, *C. novacambrica* and *C. disjuncta*. The former is "similar in shape to *C. brevipila*, but twice the size, and with the hairs much more crowded," while the latter is "smaller, the spire more elevated, the umbilicus slightly narrower, and not excavated or angulated, and the hair-scars more crowded." Outside of Victoria it is recorded by Gude from S. Australia, N.S. Wales, Queensland, and islands in Torres Straits.

Genus **Thersites**, Pfeiffer, 1855.

THERSITES JERVISENSIS, Quoy and Gaimard.

1832. Helix jervisensis, Quoy and Gaimard, Voy. Astrolabe, Zool., Moll., ii, p. 126, pl. 10, figs. 18-21.
1847. Id., Pfeiffer, Mon. Helix, i, p. 79.
1854. Id., Reeve, Conch. Icon., pl. 126, fig. 758.
1868. Id., Cox, Mon. Aust. Land Shells, p. 30, pl. 1, figs. 2, 2*a*.
1890. Id., Pilsbry, Man. Conch., vi, p. 141, pl. 40, figs. 90, 91.
1892. Id., Pils., Man. Conch., viii, p. 281.
1894. Thersites jervisensis, Q. and G. Pilsbry, Man. Conch., ix, p. 131.
1925. Id., Gabriel, Vict. Nat., xlii (8), p. 207.

Size of Type.—Diam., 19·04; alt., 12·69 mm.

Locality.—On a hill-slope near Stony Creek (tributary of Genoa River) (C. L. Barrett).

Obs.—On a single specimen this was added to our fauna by the writer in 1925. With such well-executed figures by the authors one may readily identify the species. A useful recognition mark is the carination on the body-whorl. Pilsbry (loc. cit., page 281), states: " The synonymy of the *grayi* type of shells is believed by my friend, Dr. Cox, to be as follows: *H. jervisensis*, Q. and G. 1832; *H. gilberti*, Pfr., 1845; H. *grayi*, Pfr., 1848; *H. exocarpi*, Cox, 1868; *H. bednalli*, Braz., 1871. I am in full agreement with this synonymy. Dr. Cox also suggests that the lighter, thinner forms, *corneovirens*, Pfr., 1851, and *mulgoae*, Cox, 1868, may prove to fall into this species." The question is further discussed by Cockerell in the British Journal of Conchology, xviii, p. 321.

THERSITES FODINALIS, Tate.

1892. Helix (Hadra) fodinalis, Tate, T.R.S.S.A., xvi, p. 63, pl. 1, figs. 1*a*-1*c*.
1892. Hadra fodinalis, Tate. Pilsbry, Man. Conch., viii, p. 277, pl. 58, figs. 2, 3, 4.
1894. Thersites fodinalis, Tate, Pils., Man. Conch, ix, p. 131.
1896. Thersites (Badistes) fodinalis, Tate, Horn Exped. Zool., p. 199.
1896. Xanthomelon fodinalis, Tate Hedley, Horn Exped. Zool. (Appendix), p. 223, figs. in text, G, H, I (anatomy).

Size of Type.—Maj. diam., 18; min., 15; alt., 14·25 mm.

Locality.—Yarrara, N.W. Victoria (Nat. Mus. Melb.), collected by Mrs. L. J. Collard.

Obs.—A moderately umbilicated species, with its surface coarsely and closely wrinkled, transversely. Hitherto unrecorded for Victoria. It appears to be common in S. Australia, the author remarking: " This is by far the most widely-spread and abundant snail over the region explored by the Horn Expedition."

Family RHYTIDIDAE.

Genus **Rhytida,** Albers, 1860.

RHYTIDA LAMPRA, Reeve.

1854. Helix lampra, Reeve, Conch. Icon., vii, pl. 186, fig. 1295.
1855. Id., Pfeiffer, P.Z.S. Lond., for 1854, p. 53.
1868. Id., Cox, Mon. Aust. Land Shells, p. 28, pl. 10, fig. 9.
1873. Rhytida lampra, Pfr. Crosse and Fischer, J. de Conch., p. 19.
1885. Id., Tryon, Man. Conch., i, p. 125, pl. 23, fig. 29.
1892. Id., Hedley, P.L.S. N.S.W. [2], vi, p. 23, pl. 2, figs. 8, 9, pl. 3, fig. 3.
1905. Rhytida (Eurhytida) lampra, Pfr. Moellendorff and Kobelt, Conch. Cab. (Agnatha), p. 28, pl. 5, figs. 4-7.
1909. Rhytida lampra, Reeve. Petterd and Hedley, Rec. Aust. Mus., vii, p. 286.
1921. Id., May, Check-List Moll. Tas., p. 92, No. 898.
1923. Id., May, Ill. Index Tas. Shells, pl. 42, fig. 8.

Size of average specimen.—Maj. diam., 17; min., 14; alt., 9 mm.

Localities.—Gippsland (J. A. Kershaw); Lakes Entrance (T. Worcester).

Obs.—A glossy species, hitherto unrecorded for Victoria. It approaches *Rhytida ruga*, Cox, but may be distinguished by its fewer and stronger ribs. The smooth character beneath is evident in both species. Comparison with specimens from near Launceston, Tasmania, the type locality, reveals an absolute identity.

RHYTIDA RUGA, Cox.

1871. Helix ruga, Cox, in Legrand Coll. Mon. Tas. Land Shells, sp. 24, pl. i. fig. 5.
1879. Id., Petterd, Mon. Tas. Land Shells, p. 7.
1882. Helix exoptata, Tate, T.R.S.S.A., iv., p. 75.
1887. Helix (Videna) ruga, Cox. Tryon, Man. Conch., iii, p. 264, pl. 37, figs. 93-95.
1905. Rhytida (Eurhytida), ruga, Cox. Moellendorff and Kobelt, Conch. Cab. (Agnatha), p. 29, pl. 5, figs. 10-12.
1909. Rhytida ruga, Cox. Petterd and Hedley, Rec. Aust. Mus., vii, p. 286.
1912. Id., Cox and Hedley, Mem. Nat. Mus., Melb., No. 4, p. 7.
1921. Id., May, Check-List Moll., Tas., p. 92, No. 900.
1923. Id., May, Ill. Index Tas. Shells, pl. 42, fig. 10.
1929. Id., Gabriel, Vic., Nat., xlvi (6), p. 131.

Size of Type.—Maj. diam., 9; min., 8; alt., 3 mm.

Localities.—Dandenong Ranges (Petterd and self); Rubicon and Daylesford (F. L. Billinghurst); Mallacoota (C. L. Barrett); Ararat and Timboon (H. W. Davey); Cann River (J. Clark); Lorne (self).

Obs.—One of our commoner forms, being generally distributed throughout the State. Comparison may be made with *Rhytida lampra*, Rve., and *R. lamproides*, Cox. From the former, it is immediately separable by its finer sculpture, and from the latter by the absence of a bluntly angular periphery, which is so characteristic of that species. Consistency of contour is not apparent, as the Cann River examples are a trifle higher in the spire. Professor Tate regarded the Victorian shells obtained at Dandenong, Sale, Cape Otway and Fernshaw as specifically distinct, and provided the name *Helix exoptata* without stating the points of difference. The species varies somewhat, but specimens may easily be matched with the island form, and the writer agrees with Cox and Hedley in placing the name into synonymy. The same authors remark: "The size principally distinguished *R. ruga* from its northern relations, and it may prove a dwarf of a widespread species which, in different parts of Australia, has received different names."

Usually found under stones and fallen timber.

RHYTIDA LAMPROIDES, Cox.

1867. Helix lamproides, Cox, P.Z.S., Lond., p. 722.
1868. Id., Mon. Aust. Land Shells, p. 28, pl. 10, fig. 13.
1871. Id., (Patula), Cox, in Legrand Coll. Mon., sp. 7.
1879. Id., Petterd, Mon. Tas. Land Shells, p. 3.
1885. Rhytida lamproides, Cox. Tryon, Man. Conch., i, p. 124, pl. 23, fig. 51.
1905. Rhytida (Eurhytida) lamproides, Cox. Moellendorff and Kobelt, Conch. Cab. (Agnatha), p. 29, pl. 5, figs. 8, 9.
1909. Rhytida lamproides, Cox, Petterd and Hedley, Rec. Aust. Mus., vii, p. 286.
1921. Id., May, Check-List Moll. Tas., p. 92, No. 899.
1923. Id., May, Ill. Index Tas. Shells, pl. 42, fig. 9.

Size of Type.—Maj. diam., 14·47; min., 12·69; alt., 5·58 mm.

Locality.—Lillypilly Gully, National Park, Wilson's Promontory (Nat. Mus., collected by J. A. Kershaw; and E. S. Hanks).

Obs.—A species with a bluntly angular periphery, a feature which immediately contrasts it with the other Victorian members of the genus. The specimens were obtained under logs, and provide an additional entry for our fauna.

RHYTIDA GAWLERI, Brazier.

1873. Helix (Zonites) gawleri, Brazier, P.Z.S. Lond., p. 618.
1881. Patula (Charopa) gawleri, Braz. Pfr., Nomencl., p. 97.
1886. Helix (Charopa) gawleri, Braz. Tryon, Man. Conch., ii, p. 210.
1905. Rhytida (Eurhytida) gawleri, Braz. Moellendorff and Kobelt, Conch. Cab. (Agnatha), p. 37, pl. 7, figs. 12-14.

Size of Type.—Maj. diam., 16·92; min., 12·69; alt., 8·46 mm.

Localities.—Portland (W. H. Dillon); Dartmoor (C. L. Barrett); near mouth of Glenelg River (E. Ashby).

Obs.—A form coarsely wrinkled with oblique striae, which immediately separates it from its Victorian congeners. The author remarks: "This species appears to be quite common in a subfossil state in and around Adelaide."

Found nestling in the Bidgee-Widgee plant, *Acaena sanguisorba*, Vahl., by my late friend and keen naturalist, Mr. W. H. Dillon. Not previously recorded for Victoria.

Genus **Paryphanta**, Albers, 1850.

PARYPHANTA ATRAMENTARIA, Shuttleworth.

1852. Nanina atramentaria, Shuttl., Mittheil. Naturf. Gesell. Bern., p. 194.
1877. Id., Fischer, Notitiae Malacol., ii, p. 5, pl. i, fig. 2.
1868. Helix atramentaria, Shutt'l, Cox, Mon. Aust. Land Shells, p. 5, pl. 3, figs, *2a, 2b*.
1879. Helicarion atramentaria, Shuttl. T. Wds., P.L.S., N.S.W., iii, p. 124, pl. 12, figs. 2, *2a*.
1882. Id., Tate, T.R.S.S.A., iv, p. 75.
1885. Paryphanta atramentaria, Shuttl. Tryon, Man. Conch., i, p. 127, pl. 26, figs. 5, 6.
1912. Id., Cox and Hedley, Mem. Nat. Mus. Melb., No. 4, p. 8.
1913. Id., Davies, P.R.S. Vic. (N.S.), xxv, p. 221, pl. 15, figs. 2, 5, pl. 17, fig. *9b* (anatomy).

Size of Average Specimen.—Maj. diam., 31; min., 26; alt., 18 mm.

Localities.—Port Phillip (Shuttleworth); Mount Arnold and Bendigo (Cox); Fernshaw (Tate); Black Watch Range, Croajingolong (J. Searle)); S. Gippsland (Rev. G. Cox); Olinda (self).

Obs.—The largest of the genus in Victoria, familiarly known as the "Black Snail." The anatomy of this species and *P. compacta*, Cox and Hedley, has been ably dealt with by O. B. Davies (loc. cit.). When contrasting the two species, the author stated: "The animal is much larger than *P. compacta*. The shell is flatter and of about the same colour, or, perhaps, a little lighter. The animal itself is the same dark grey colour, except at the edge of the mantle and the foot, where it is coloured a brilliant orange-red."

PARYPHANTA COMPACTA, Cox and Hedley.

1912. Paryphanta compacta, Cox and Hedley, Mem. Nat. Mus. Melb., No. 4, p. 8, pl. i, figs. 3, 4, 5.
1913. Id., Davies, P.R.S. Vic. (N.S.), xxv, p. 221, pl. 15, figs. 1, 3, 4, pl. 16, fig. 6, pl. 17, figs. 7, 8, *9a*, 10 (anatomy).

Size of Type.—Maj. diam., 24; min., 19; alt. 17 mm.

Localities.—Smithers Creek, Otway Ranges (A. D. Hardy) Type; Forrest (H. W. Davey); Mount Sabine; Erskine Falls (Kershaw); Splitters' Falls, Lorne (self).

Obs.—A handsome species readily distinguished from *P. atramentaria*, Shuttleworth, by its more globose form and more polished surface. It is apparently confined to the southern portion of the State, and no record is known to the writer east of the Otway Ranges.

Type in the Australian Museum, Sydney.

PARYPHANTA DYERI, Petterd.

1879. Helix dyeri, Pett., Mon. Tas., Land Shells, p. 40.
1879. Id., Journ. Conch., ii, p. 210.

1909. Paryphanta dyeri, Pett. Petterd and Hedley, Rec. Aust. Mus., vii (4), p. 287, pl. 86, figs. 38-40.
1921. Id., May, Check-List Moll. Tas., p. 92, No. 902.
1923. Id., May, Ill. Index Tas. Shells, pl. 42, fig. 12.

Size of Type.—Maj. diam., 3·5; min., 2·5; alt., 1·5 mm.

Localities.—Tarraville, S. Gippsland (T. Worcester); Belgrave, Fern Tree Gully, Hall's Gap, Grampians (C. Oke); Olinda Falls, Splitters' Falls, Lorne (self); Warburton (F. E. Wilson).

Obs.—The smallest representative of the genus in Victoria. The author remarks: "Under the lens a very pretty, glossy species. Its nearest ally is *Helix nelsonensis,* Braz., from which it differs in being imperforate, and is more often rayed with chestnut markings. Like the great majority of land shells, it is a moist-loving species." This is an interesting addition to our fauna, having been detected in several localities throughout the State. Found nestling in moss (*Rhizogonium novaehollandiae,* Brid.), and the Hepatic (*Blyttia spinosa,* Gotch).

Type from banks of Distillery Creek, near Launceston.

Family ENDODONTIDAE.

Genus **Charopa**, Albers, 1860.

CHAROPA TAMARENSIS, Petterd.

1879. Helix tamarensis, Petterd, Mon. Tas. Land Shells (April), p. 30.
1879. Helix rosacea, Pett., Journ. of Conch., ii (July), p. 213 (*non* Helix rosacea, Muller, 1774).
1882. Id., Tate, T.R.S.S.A., iv, p. 75.
1893. Charopa tamarensis, Petterd. Billinghurst, Vic., Nat., x, p. 62.
1894. Endodonta tamarensis, Pett. Pilsbry, Man. Conch., ix, p. 35.
1894. Flammulina tamarensis, Pett. Pils. Man. Conch., ix, p. 338.
1896. Endodonta tamarensis, Pett. Hedley, Rec. Aust. Mus., ii, p. 104.
1903. Id., Hedley, P.L.S., N.S.W., xxvii, p. 605, pl. 31, figs. 18-20.
1909. Id., Pett, and Hed., Rec. Aust. Mus., vii, p. 291.
1912. Id., Cox and Hed., Mem. Nat. Mus. Melb., No. 4, p. 10.
1921. Id., May, Check-List Tas. Moll., p. 94, No. 917.
1923. Id., May, Ill. Index Tas. Shells, pl. 42, fig. 17.
1929. Charopa tamarensis, Pett. Gabriel, Vic. Nat., xlvi (6), p. 132.

Size of Type.—Maj. diam., 6; min., 5; alt., 2 mm.

Localities.—Burrumbeet (Tate); Mount Franklin (Billinghurst); Meredith (J. H. Young); Fern Tree Gully (C. Oke); Geelong (H. W. Davey); Cann River (J. Clark); Longford; Mt. Martha; Croydon.

Obs.—A characteristic little species, readily recognised by its wide umbilicus and rays of rusty-brown colour. The type locality is rifle butts, near Launceston, Tasmania. In Victoria, it is widely distributed, and Hedley records a northern extension to Mt. Kosciusko, having been located at Wilson's Valley, at an altitude of 4500 feet. Found generally under stones and in moss.

CHAROPA ALBANENSIS, Cox.

1867. Helix albanensis, Cox, P.Z.S. Lond., p. 723.
1868. Id., Mon. Aust. Land Shells, p. 15, pl. 4, fig. 2.
1871. Helix macdonaldi, Cox, in Legrand Coll. Mon., sp. 32, pl. 1, fig. 14.
1871. Helix kingstonensis, Cox, loc. cit., sp. 40, pl. 2, fig. 5.
1871. Helix officieri Cox, loc. cit., sp. 57.
1879. Helix stanleyensis, Petterd, Mon. Tas., Land Shells, p. 32.
1879. Helix petterdiana, Taylor, Journ. Conch., p. 287, pl. 1, fig. 3.
1882. Helix stanleyensis, Pett. Tate, T.R.S.S.A., iv, p. 75.
1886. Charopa albanensis, Cox, Tryon, Man. Conch., ii, p. 209, pl. 62, figs. 25, 26.
1892. Id., Hedley, P.L.S. N.S.W. [2], vii, p. 163, pl. 2, figs. 5-8.
1894. Endodonta albanensis, Cox. Pilsbry, Man. Conch., ix, p. 34.
1895. Id., Hed., P. Mal. Soc. Lond., i, p. 260.
1896. Id., Hed., Rec. Aust. Mus., ii, p. 104.
1909. Id., Hed. and Pett., Rec. Aust. Mus., vii, p. 288.
1912. Id., Cox and Hed., Mem. Nat. Mus. Melb., No. 4, p. 9.
1921. Id., May, Check-List Tas. Moll., p. 93, No. 905.
1923. Id., May, Ill. Index Tas. Shells, pl. 42, fig. 16.

Size of Type.—Maj. diam., 5·07; min., 4·57; alt., 2·53 mm.

Localities.—Fernshaw (Petterd); Wimmera (Aust. Mus.); Gippsland and Wilson's Prom. (Kershaw); Belgrave (C. Oke); Tarraville (T. Worcester); Warburton (F. E. Wilson); Lorne (self).

Obs.—An umbilicated species with radiating reddish-brown bands. The Victorian and Tasmanian representatives show a slight difference, the ribs being a little more numerous. This feature, however, is not constant, as intermediate specimens occasionally appear.

Type from King George's Sound.

CHAROPA FUNEREA, Cox.

1868. Helix funerea, Cox, Mon. Aust. Land Shells, p. 16, pl. 3, fig. 1.
1886. Charopa funerea, Cox. Tryon, Man. Conch., ii, p. 209, pl 62, figs. 23, 24.
1894. Endodonta funerea, Cox. Pilsbry, Man. Conch., ix, p. 34.
1896. Id., Hedley, Rec. Aust. Mus., ii, p. 104.
1912. Id., Cox and Hedley, Mem. Nat. Mus. Melb., No. 4, p. 9.
1912. Endodonta murrayana, Pfr. var. submurrayana, Cox and Hedley, loc. cit., p. 10, pl. 1, figs. 6-8.

Size of Type.—Maj. diam., 6·34; min., 5·33; alt., 2·53 mm.

Localities.—Frankston (Aust. Mus.); Jan Juc, Mulgrave, Black's Spur (Nat. Mus. Melb.); Burrumbeet (Tate); Bairnsdale (Kershaw); Mount Shadwell (Whan); Meredith (J. H. Young); Mt. Franklin (Billinghurst); Nowa Nowa, Whitfield, Hamilton (self).

Obs.—A brown, closely-ribbed species, widely distributed throughout the State. The type locality is Mudgee, N.S.W., and Hedley (loc. cit.) records it from S. Queensland. The author remarks: "Apparently little subject to variation in colour, very beautifully representing *H. inusta*, but more coarsely sculptured, and having a large umbilicus." Petterd and Hedley regard *E. ricei*, Braz., from Tasmania, as being similar, but "a narrower umbilicus, greater height in proportion to diameter and finer sculpture," separate it. Having examined the types of *E. funerea*, Cox, and *E. murrayana*, Pfr., var. *submurrayana*, Cox and Hedley, the writer is convinced that one form only is represented, and the latter must sink as a synonym. *E. murrayana*, Pfr., is quite a distinct species, being flatter, with wider umbilicus, and more distant radial lamellae. Found under stones and decayed timber.

CHAROPA RETIPORA, COX.

1867. Helix retipora, Cox, P.Z.S. Lond., p. 39.
1868. Helix retepora, Cox, Mon. Aust. Land Shells, p. 21, pl. 7, figs. 8, 8*a*.
1887. Helix retipora, Cox. Tryon, Man. Conch., iii, p. 34, pl. 7, figs. 95, 96.
1894. Endodonta retepora, Cox, Pilsbry, Man. Conch., ix., p. 34.

Size of Type.—Maj. diam., 5·33; min., 4·31; alt., 2·79 mm.
Locality.—Expedition Pass, Chewton (F. L. Billinghurst).
Obs.—A dull, reddish-brown, perforated shell, with some of the ribs at somewhat regular intervals much more projecting than others, the interstices crossed by minute and close-raised lines.

CHAROPA RETIPORA, COX, var. MELBOURNENSIS, COX.

1868. Helix melbournensis, Cox, Mon. Aust. Land Shells, p. 22, pl. 12, fig. 10.
1882. Id., Tate, T.R.S.S.A., iv, p. 75.
1887. Id., Tryon, Man. Conch., iii, p. 35, pl. 7, figs. 97-99.
1893. Helix retipora, Cox. Billinghurst, Vic. Nat., x, p. 62.
1894. Endodonta melbournensis, Cox. Pilsbry, Man. Conch., ix, p. 34.
1903. Id., Hedley, P.L.S. N.S.W., xxvii (1902), p. 604, pl. 31, figs. 16, 17.
1912. Endodonta retipora, Cox, var. melbournensis, Cox. Cox and Hedley, Mem. Nat. Mus. Melb., No. 4, p. 10.

Size of Type.—Maj. diam., 5·07; min., 4·31; alt., 3·55 mm.
Localities.—Melbourne (Masters); Fernshaw (Petterd); Castlemaine and Harcourt (Billinghurst); Gippsland and Wimmera (Aust. Mus.); Mount Macedon; Dandenong Range. Western Port (Kershaw); Meredith (J. H. Young); Anakie Ranges (C. Oke); Whitfield (self); You Yangs (C. L. Barrett); Berwick and Jan Juc (Nat. Mus. Melb.).
Obs.—The author describes the shell as being finely and regularly striated, but, as Cox and Hedley (loc. cit.) remark, the difference is not constant enough for specific distinction. Pilsbry (loc. cit.) regards this form as a synonym of *E. sericatula*, Pfr., a decision which is not generally accepted. Frequently located under stones.

CHAROPA SERICATULA, Pfeiffer.

1850. Helix sericatula, Pfeiffer, P.Z.S. Lond. for 1849, p. 127.
1852. Id., Reeve, Conch., Icon., vii, pl. 132, fig. 812.
1868. Id., Cox, Mon. Aust. Land Shells, p. 12, pl. 12, figs. 6, 6*a*.
1871. Helix (Charopa) limula, Cox, in Legrand Coll. Mon., sp. 72.
1886. Charopa sericatula, Pfr. Tryon, Man. Conch., ii, p. 208, pl. 62, figs. 17, 18
1894. Endodonta sericatula, Pfr. Pilsbry, Man. Conch, ix., p. 34.
1909. Id., Petterd and Hedley, Rec. Aust. Mus.. vii, p. 291.
1921. Id., May, Check-List Moll. Tas., p. 94, No. 915.
1923. Id., May, Ill. Index Tas. Shells, pl. 43, fig. 2.

Size of Type.—Maj. diam., 4·5; min., 4; alt., 2·3 mm.

Locality.—East Gippsland (Nat. Mus. Melb.), collected by W. Kershaw.

Obs.—" A shell easily recognised, although it varies much in markings, and is sometimes without any, and entirely of a light brown. Usually the ribs are black at intervals, or wholly, giving the shell a streaked appearance " (Dr. Cox). Pilsbry (loc. cit.) regards *E. melbournensis* as a synonym, a decision with which the writer cannot agree. This is an addition to our fauna. The type locality is Port Jackson, and it appears in Tasmania.

CHAROPA ELENESCENS, Cox and Hedley.

1912. Flammulina elenescens, Cox and Hedley, Mem. Nat. Mus. Melb., No. 4, p. 12, pl. 3, figs. 16-18.

Size of Type.—Maj. diam., 6·7; min., 5·4; alt., 2·9 mm.

Localities.—Merri Creek (Tenison Woods); Preston (C. L. Barrett); Geelong (H. W. Davey); Sunshine (J. E. Dixon); Broadmeadows.

Obs.—A rather flat species with a broad umbilicus. The authors remark: " In general appearance like *F. diemenensis* and F. *marchianae*, between which it is intermediate in size. The break in sculpture of *F. elenescens* readily distinguishes it." Though not typical, this species appears to be more happily placed in *Charopa*.

Type in the Australian Museum, Sydney.

CHAROPA DIEMENENSIS, Cox.

1868. Helix diemenensis, Cox, P.Z.S. Lond. for 1867, p. 723.
1868. Helix wellingtonensis, Cox, P.Z.S. Lond. for 1867, p. 723.
1868. Helix diemenensis, Cox, Mon. Aust. Land Shells, p. 20, pl. 7, figs. 6, 6*a*.
1868. Helix wellingtonensis, Cox, Mon. Aust. Land Shells, p. 29, pl. 7, figs. 5, 5*a*.
1871. Helix daveyensis, Cox. Cox, in Legrand Coll. Mon., sp. 35, pl. 2, fig. 4.
1871. Helix atkinsoni, Cox, loc. cit., sp. 62, pl. 2, fig. 12.
1871. Helix thompsoni, Cox, loc. cit., sp. 73.
1871. Helix camillae, Cox, loc. cit., sp. 74.
1874. Helix midsoni, Brazier. Braz., in Legrand Coll. Mon. Addenda.
1880. Helix diemenensis, Cox. Johnston, P.R.S. Tas. for 1879, p. 49.
1887. Id., Tryon, Man. Conch., iii, p. 24, pl. 3, figs. 16-18.

1887. Helix daveyensis, Cox. Tryon, Man. Conch, iii, p. 265, pl. 37, figs. 87, 88.
1887. Helix atkinsoni, Cox. Tryon, Man. Conch., iii, p. 266, pl. 37, figs. 89, 90.
1894. Endodonta diemenensis, Cox. Pilsbry, Man. Conch., ix, p. 34.
1894. Flammulina diemenensis, Cox, Suter, Ann. Mag. Nat. Hist. [6], xiii, p. 64.
1909. Id., Petterd and Hedley, Rec. Aust. Mus., vii, No. 4, p. 299.
1921. Id., May, Check-List Moll. Tas., p. 96, No. 935.
1923. Id., May, Ill. Index Tas. Shells, pl. 43, fig. 18.

Size of Type.—Maj. diam., 9·39; min., 8·37; alt., 3·55 mm.

Locality.—Mount William (Nat. Mus. Melb.), collected by J. Clark.

Obs.—A shell with numerous riblets, and many radiate pale-red bands. It is common in Tasmania, and on the islands in Bass Straits. This addition to our fauna is based on a specimen obtained by Mr. Clark.

Found under decayed timber.

CHAROPA ERSKINENSIS, sp. nov. (Pl. II, Figs. 1, 2).

Shell small, cream-colour, glossy, discoidal, distinctly umbilicated, the umbilicus being deep and about one-fourth of the shell's diameter in breadth, exposing all preceding whorls. Whorls, including protoconch, about four and one half, well rounded, parted by deeply impressed sutures, the last slightly descending. Sculpture: the whorls are crossed by fine, regularly-spaced radial riblets to the number of about 154 on the ultimate. Further ornamentation may be seen in the interstices, which are cancellated by microscopic radials and spiral hair-lines. Aperture lunate, lip simple, callus on the previous whorl distinct, concealing several of the riblets.

Size of Type.—Maj. diam., 2·5; min., 2; alt., 1·0 mm.

Localities.—Near "Sanctuary," Erskine River, Lorne (Type, self); Splitter's Falls, Lorne (self). Found under charred logs.

Obs.—A delicate little species, quite distinct from any Victorian form. Its nearest ally is perhaps the Tasmanian *F. roblini*, Pett. On comparative examination with authentic specimens in the Hobart Museum, distinctive characters were readily discernible. The novelty is flatter, the umbilicus a trifle larger, and the absence of a spirally-striate apex immediately separates it.

CHAROPA GATLIFFI, sp. nov. (Pl. II, Figs. 3, 4).

Shell small, thin, shining, subdiscoidal, finely ribbed, broadly umbilicated, light-brown colour with irregular darker-brown zigzag bands crossing the whorls, the bands being plainly visible in the umbilicus, which is wide and almost one-third of the shell's diameter. The umbilicus is deep, exposing all the volutions. Whorls about four and one-half, regularly increasing, well rounded, and parted by deeply impressed sutures. The whorls are ornamented by delicate, closely-set, evenly-spaced radial riblets, traceable to the extreme apex, and which penetrate the umbilicus, numbering about 210 on the ultimate whorl. Between the riblets the surface is microscopically reticulated by fine growth and spiral striae, the latter being slightly stronger in the umbilicus. Aperture rotundly-lunate, lip thin, callus on the preceding whorl resolving itself into a thin, whitish, polished layer, which covers several of the riblets.

Size of Type.—Maj. diam., 3·3; min., 2·8; alt., 1·7 mm.

Localities.—Type near Splitters' Falls, Lorne (self); also at most of the Falls in this district (self). Found under stones.

Obs.—Though small, a well-marked, elegant form, with very little affinity to any Victorian species. The characteristic zig-zag banding will serve as a useful recognition mark. *E. tamarensis*, Pett., which has a faint resemblance, is, however, flatter, possesses a coarser sculpture and a wider umbilicus. I have much pleasure in associating this ornate little species with the name of my friend and collaborator, Mr. J. H. Gatliff.

Charopa tarravillensis, sp. nov. (Pl. II, Figs. 5, 6).

Shell small, fragile, light-brown, shining, umbilicated, subdiscoid, apex fairly conspicuous, finely ribbed. Whorls about four and one-half, including protoconch, well-rounded, the ultimate gradually descending to about one quarter the depth of the previous whorl. Sutures deeply impressed. Sculpture: protoconch finely, radially striate, the succeeding whorls ornamented with closely-set sub-equidistant radial ribs which are clearly visible in the umbilicus, and number about 84 on the last whorl. Interstitial surface with fine riblets, decussate by microscopic spiral striae. Umbilicus wide and deep, about one quarter of the shell's diameter in width, exposing all previous volutions. Aperture roundly lunate. Peristome acute, regularly curved. Several ribs in front of aperture covered by a shining whitish callus glaze.

Size of Type.—Maj. diam., 2·6; min., 2·3; alt., 1·2 mm.

Locality.—Tarraville (T. Worcester).

Obs.—The Tasmanian *H. legrandi*, Cox, somewhat resembles this species, but on comparison with authentic specimens in the Hobart Museum, distinctive features are at once discernible, the novelty not being so flat and possessing a narrower umbilicus.

Charopa scindocataracta, sp. nov. (Pl. II, Figs. 9, 10).

Shell, minute, planorbiform, spire slightly sunken, shining, cream-colour, with narrow splashes and streaks of lighter coloration crossing the whorls at irregular intervals, discoidal, unusually thin and fragile, umbilicated, whole surface finely, radiately ribbed. Including protoconch whorls about four and one-half, gradually increasing in width, rounded, and parted by well-impressed sutures, last whorl not descending. Sculpture consisting of numerous, equidistant, microscopic radial riblets, about 205 on the body-whorl, visible to the extreme apex, and which may be traced into the well-defined umbilicus. The whorls are further ornamented by extremely fine, concentric striae. Aperture lunate. Peristome simple, thin, sharp, regularly rounded. Glazed callosity on the preceding whorl well-marked, covering many of the riblets. Umbilicus wide, about one-fifth of the shell's diameter, exposing all previous whorls.

Size of Type.—Maj. diam., 1·5; min., 1·3; alt., 0·7 mm.

Localities.—Type near Splitters' Falls, Lorne (self); also at most of the Falls in this district (self). Found under stones.

Obs.—Though minute, the species may be easily recognised by its discoidal shape and light splashes of colour, which are constant features, and separate it from any Victorian form. Its nearest ally is, perhaps, the Tasmanian *E. antialba*, Bedd., from which it may be distinguished by its smaller umbilicus, less sunken spire, and lighter coloration.

Charopa bairnsdalensis, sp. nov. (Pl. II, Figs. 11, 12).

Shell minute, fragile, light horn-colour, broadly umbilicated, sub-discoidal, distinctly ribbed. Apex fairly prominent. Whorls about four and one half, including protoconch, rather convex, parted by well impressed sutures, the last slightly descending. Sculpture consisting of rather sharp, radial ribs, traceable almost to apex, fairly regularly spaced, which may be seen entering the umbilicus; the ribs being disposed to the number of 28 on the ultimate whorl. The whorls are further ornamented by fine intermediate riblets. Under high power faint traces of spiral scratches are discernible. Umbilicus in width about five-twelfths of the shell's diameter, very open, exposing all previous whorls. Aperture rotundly lunar, in front of which two or three ribs are concealed in callus (outer lip fractured).

Size of Type.—Maj. diam., 2·0; min., 1·8; alt., 0·9 mm.

Locality.—Bairnsdale (T. Worcester).

Obs.—A species with few ribs. Its nearest ally is, perhaps, *H. cochlidium*, Cox. Compared with authentic specimens in the Aust. Mus. from the type locality, Clarence River, N.S.W., the novelty is flatter, and possesses a larger umbilicus.

Family LAOMIDAE.

Genus **Laoma,** Gray, 1849.

Laoma morti, Cox.

1864. Helix morti, Cox. Ann. Mag. Nat. Hist. [3], xiv, p. 182.
1864. Helix paradoxa, Cox, Cat. Aust. Land Shells, p. 21.
1864. Helix morti, Cox, Cat. Aust. Land Shells, p. 22.
1868. Id., Mon. Aust. Land Shells, p. 21, pl. 11, fig. 13.
1868. Helix hobarti, Cox, Mon. Aust. Land Shells, p. 22 (not pl. 12, fig. 11, as quoted).
1868. Helix similis, Cox, Mon. Aust. Land Shells, p. 23, pl. 12, fig. 12 (*non* H. similis, C. B. Adams).

1870. Helix stellata, Brazier, P.Z.S. Lond., p. 662.
1871. Helix derelicta, Cox, in Legrand Coll. Mon., sp. 11.
1878. Helix arenicola, Tate, P.L.S. N.S.W., ii, p. 291.
1882. Helix morti, Cox. Tate, T.R.S.S.A., iv, p. 75.
1882. Helix hobarti, Cox. Tate, T.R.S.S.A., iv, p. 75.
1887. Helix morti, Cox. Tryon, Man. Conch., iii, p. 34, pl. 7, figs. 87, 88.
1894. Charopa retinodes, Tate. T.R.S.S.A., xviii, p. 192.
1894. Endodonta paradoxa, Cox. Pilsbry, Man. Conch., ix, p. 34.
1894. Laoma hobarti, Cox. Pils. Man. Conch., ix, p. 338.
1895. Patula morti, Cox. Smith, P. Mal. Soc. Lond., i, p. 87 (read 1894).
1896. Flammulina retinodes, Tate, Horn, Exp. Zool., ii, p. 187, pl. 17, figs. 4*a*, *b*, *c*.
1902. Helix discors, Petterd, P.R.S. Tas. for 1900, p. 2.
1909. Laoma morti, Cox. Petterd and Hedley, Rec. Aust. Mus., vii, No. 4, p. 294.
1912. Id., Cox and Hedley, Mem. Nat. Mus. Melb., No. 4, p. 11.
1921. Laoma morti, Cox. May, Check-List Moll. Tas., p. 95, No. 926.
1923. Id., May, Ill. Index Tas. Shells, pl. 43, fig. 12.

Size of Type.—Maj. diam., 2·03; min., 1·77; alt., 1·01 mm.

Localities.—Mount Eliza (Pritchard and self); Jan Juc (Kershaw); Sea Lake (J. C. Goudie); Castlemaine (F. L. Billinghurst); Mornington (Rev. G. Cox); Bannerton (A. C. Nilson); Belgrave (C. Oke); University Grounds (Nat. Mus.); Wangaratta and Edi (self).

Obs.—A small species, presenting features which are subject to considerable variation, hence the heavy synonymy. It is widely distributed, being recorded from New South Wales, Victoria, South Australia, Western Australia and Tasmania.

Found under stones, dry timber, and fallen leaves.

LAOMA MUCOIDES, Tenison Woods.

1879. Helix mucoides, Tenison Woods, P.L.S. N.S.W., iii, p. 125, pl. 12, figs. 5, 5*a*.
1882. Id., Tate, T.R.S.S.A., iv, p. 75.
1887. Helix mucoides, Stephens (in error for Ten. Wds.). Tryon, Man. Conch, iii, p. 44, pl. 5, figs. 75, 76.
1894. Endodonta mucoides, T. Wds. Pilsbry, Man. Conch., ix, p. 34.
1912. Laoma mucoides, T. Wds. Cox and Hedley, Mem. Nat. Mus. Melb., No. 4, p. 11, pl. 2, figs. 9-12.

Size of Type.—Maj. diam., 3; min., 2·5; alt., 1·5 mm.

Localities.—Melbourne (Type); Meredith (J. H. Young); Gong Gong Reservoir (C. Oke); Trentham Falls (J. K. Gabriel); Splitters' Falls, Lorne (self).

Obs.—In form and sculpture a close ally of *L. morti*, Cox. Both species possess radial lamellae, which are better developed in *L. mucoides*. The last whorl is obtusely carinated, a feature absent in *L. morti*.

Type in Australian Museum, Sydney.

LAOMA PENOLENSIS, Cox.

1867. Helix penolensis, Cox, P.Z.S. Lond., p. 724.
1868. Id., Mon., Aust. Land Shells, p. 8, pl. 11, fig. 12.
1878. Helix pictilis, Tate, P.L.S. N.S.W., ii, p. 290.
1886. Helix penolensis, Cox. Tryon, Man. Conch., ii, p. 179, pl. 54, figs. 93, 94.
1894. Laoma pictilis, Tate. Pilsbry, Man. Conch., ix, p. 10.
1894. Id., Suter, Ann. Mag. Nat. Hist [6], xiii, p. 64.
1909. Id., Petterd and Hedley, Rec. Aust. Mus., vii (4), p. 294, pl. 86, figs. 35-37.
1912. Laoma penolensis, Cox. Cox and Hedley. Mem. Nat. Mus. Melb., No. 4, p. 11.
1921. Id., May, Check-List Moll. Tas., p. 95, No. 927.
1923. Id., May, Ill. Index Tas. Shells, pl. 43, fig. 5.

Size of Type.—Maj. diam., 3·8; min., 3·3; alt., 2·03 mm.

Localities.—Port Fairy (Rev. W. T. Whan); near Melbourne and Oberon Bay (J. A. Kershaw); Lorne (Dr. G. B. Pritchard); Frankston and Grampians (C. Oke); Portland; Meredith; San Remo; Bairnsdale; Tarraville.

Obs.—A rather dull, horny, broadly semi-conical species, widely distributed throughout the State. Tate distinguished *H. pictilis* from *H. penolensis* by its "coarser ribbing, its coloration, and the presence of transverse striae." As Cox and Hedley (loc. cit.) remark, the first and second characters are variable, and examination of the type of *H. penolensis* in the Cox collection reveals the presence of microscopic spiral striae. The same authors note that Cape Northumberland, the type locality of *H. pictilis,* is but a short distance from Penola, where the type of *H. penolensis* was found. That one species only is represented it is obvious, and *H. pictilis* must sink as a synonym.

LAOMA MINIMA, Cox.

1868. Helix minima, Cox, Mon. Aust. Land Shells, p. 10, pl. 12, fig. 8.
1877. Helix collisi, Brazier, P.R.S., Tas. for 1876, p. 168.
1879. Helix henryana, Petterd, Mon. Tas. Land Shells, p. 21.
1879. Helix furneauxensis, Petterd, Mon. Tas., Land Shells, p. 21.
1879. Id., Petterd, Journ. Conch, ii. p. 215.
1894. Laoma henryana, Petterd. Suter, Ann. Mag. Nat. Hist. [6], xiii, p. 64.
1894. Endodonta furneauxensis, Petterd. Pilsbry, Man. Conch., ix, p. 34.
1894. Laoma furneauxensis, Pett. Pils. Man. Conch., ix, p. 338.
1894. Id., Suter, Ann. Mag. Nat. Hist. [6], xiii, p. 64.
1909. Laoma minima, Cox, Petterd and Hedley, Rec. Aust. Mus., vii, No. 4, p. 295.
1921. Id., May, Check-List Moll. Tas., p. 94, No. 925.
1923. Id., May, Ill. Index Tas. Shells, pl. 43, fig. 10.

Size of Type.—Maj. diam., 1·77; min., 1·52; alt., 0·76 mm.

Localities.—Bairnsdale and Tarraville (T. Worcester); Carrum (C. Oke).

Obs.—A small, shining, broadly umbilicated species, with nothing approaching it in Victoria. This is an addition to our fauna. Found under stones and fallen leaves. Type in Australian Museum, Sydney.

LAOMA HALLI, Cox.

1871. Helix halli, Cox, in Legrand Coll. Mon., sp. 34, pl. 2, fig. 9.
1879. Id., Petterd, Mon. Tas. Land Shells, p. 22.
1887. Helix (Rhyssota) halli, Cox. Tryon, Man. Conch., iii, p. 264, pl. 37, figs. 54, 55.
1894. Laoma halli, Cox. Suter, Ann. Mag. Nat. Hist. [6], xiii, p. 64.
1894. Endodonta halli, Cox. Pilsbry, Man. Conch., ix, p. 34.
1894. Laoma halli, Cox. Pils., Man. Conch., ix, p. 338.
1909. Id., Petterd and Hedley, Rec. Aust. Mus., vii, p. 295.
1921. Id., May, Check-List Moll. Tas., p. 94, No. 922.
1923. Id., May, Ill. Index Tas. Shells, pl. 43, fig. 11.

Size of Type.—Maj. diam., 1·52; min., 1·26; alt., 1·01 mm.

Localities.—Castlemaine (F. L. Billinghurst); Frankston and Tarraville (T. Worcester); Fern Tree Gully, Mt. Donna Buang (C. Oke); Trentham Falls (J. K. Gabriel); Grampians, Lorne (self).

Obs.—A minute form, found under decaying wood, and in moss. Narrowly umbilicated and finely striated. It is rather remarkable the species has escaped notice for so long, as it appears to be widely distributed. Consistency in shape is not apparent, as considerable variation is seen, more particularly in regard to height.

LAOMA TURBINULOIDEA, sp. nov. (Pl. II, Fig. 7).

Shell small, umbilicated, shining, chocolate-brown colour, thin, turbinately globose; spire obtusely conical; apex well rounded. Whorls, including protoconch, about four and one half, regularly increasing, and conspicuously convex. Sutures deeply impressed. In the earlier stages, the whorls are ornamented by close, even, thread-like radials, which, as growth continues, are rounder, wider apart and irregularly spaced. This sculpture is visible within the umbilicus. Aperture, slightly oblique, lunate; peristome thin, regular, columellar margin partially concealing the umbilicus. The umbilicus is about one-fourth of the shell's diameter.

Size of Type.—Maj. diam., 2·2; min., 2·2; alt., 2·0 mm.

Locality.—Bairnsdale (T. Worcester).

Obs.—From its Victorian congeners it is immediately distinguished by the well-rounded whorls and characteristic chocolate-brown colour. A suggestion has been made that this species represents a new genus, but it is preferred to allow its inclusion here until more is known of these puzzling forms.

LAOMA SINISTRA, sp. nov. (Pl. II, Fig 8).

Shell small, fragile, horn-colour, semi-transparent, sinistral, narrowly umbilicated; spire obtusely-conical; apex fairly prominent and finely spirally lirate. Whorls, including protoconch, about six and one-half, convex. Sutures well impressed. Sculpture of post-nuclear whorls consisting of somewhat inequidistant, microscopic radial riblets which vary in strength, are obliquely situated, and may be seen entering the umbilicus. Interstices with fairly numerous growth-striae and microscopic spiral lines. Aperture rotundly lunate. Peristome simple, sharp and thin.

Size of Type.—Maj. diam., 1·0; min., 1·0; alt., 1·2 mm.

Localities.—Tarraville (Type, T. Worcester); Fern Tree Gully (C. Oke).

Obs.—This novelty provides an interesting addition to the infrequent sinistral forms. It approaches the Tasmanian *H. weldii*, T. Wds. An authentic specimen of this species from the type locality, Circular Head, received from the late Mr. W. L. May, is of much broader proportions. The specimens collected at Fern Tree Gully were found nestling in moss.

Genus **Allodiscus,** Pilsbry, 1892.

Allodiscus otwayensis, Petterd.

1879. Helix otwayensis, Petterd, Mon. Tas. Land Shells (April), p. 39.
1879. Id., Journ. of Conch., ii (December), p. 356.
1880. Id., Johnston, P.R.S., Tas. for 1879, p. 24.
1882. Id., Tate, T.R.S.S.A., iv, p. 75.
1886. Charopa otwayensis, Petterd. Tryon, Man. Conch., ii, p. 210.
1894. Endodonta otwayensis, Pett. Pilsbry, Man. Conch., ix, p. 34.
1903. Id., Hedley, P.L.S. N.S.W., xxvii, p. 605, pl. 29, figs. 10-12.
1909. Flammulina otwayensis, Pett. Pett. and Hedley, Rec. Aust. Mus., vii (4), p. 300, pl. 85, figs. 23-25.
1912. Id., Cox and Hedley, Mem. Nat. Mus. Melb., No. 4, p. 13.
1921. Id., May, Check-List Moll. Tas., p. 96, No. 941.
1923. Id., May, Ill. Index Tas. Shells, pl. 43, fig. 21.

Size of Type.—Maj. diam., 2; min., 1·5; alt., 1 mm.

Localities.—Cape Otway (Petterd); Fernshaw (Kershaw); Fern Tree Gully and Gong Gong Reservoir, Ballarat (C. Oke); Taggerty (Nat. Mus. Melb.); Mt. Dandenong (self), Tarraville (T. Worcester).

Obs.—An ornate little species, imperforate and with the interstices minutely decussate. The type locality is Cape Otway scrubs. Cox and Hedley record it from Tasmania. The dimensions of the type are exceeded in a specimen from Fern Tree Gully, which measures 3 mm.

Allodiscus subdepressus, Brazier.

1871. Helix subdepressa. Brazier, P.Z.S. Lond., p. 641.
1879. Helix dandenongensis, Petterd, Journ. of Conch., ii, p. 355.
1882. Id., Tate, T.R.S.S.A., iv, p. 75.
1894. Endodonta subdepressa, Braz. Pilsbry, Man. Conch., ix, p. 34.
1903. Id., Hedley, P.L.S. N.S.W., xxvii, p. 605, pl. 31, figs. 13-15.
1912. Flammulina subdepressa, Braz Cox and Hedley, Mem. Nat. Mus. Melb., No. 4, p. 13.

Size of Type.—Maj. diam., 3·17; min., 2·11; alt., 1·05; diameter of umbilicus, 1·58 mm.

Localities.—Snowy River and Fernshaw (Kershaw); Dandenong Range (Petterd and self); Oakleigh (French); Gembrook (Coghill); Emerald District (Jarvis); Yarragon (Nat. Mus. Melb.); S. Gippsland (Rev. G. Cox); Korumburra (F. L. Billinghurst); Lorne (self).

Obs.—A white shell, with an umbilicus equalling more than half the diameter. It is of gregarious habit, being commonly located in large numbers under decayed timber and among moss.

ALLODISCUS MERACUS, Cox and Hedley.

1912. Flammulina meraca, Cox and Hedley, Mem. Nat. Mus. Melb., No. 4, p. 13, pl. 3, figs. 19-21.

Size of Type.—Maj. diam., 4; min., 3; alt., 2 mm.

Localities.—Dandenong Ranges (Kershaw); Fernshaw (Petterd); Olinda and Lorne (self); Belgrave, Evelyn.

Obs.—A pure white species, found mostly under fallen logs and frequently associating with *H. subdepressa*, Braz. The animal is of a very dark colour, rendering it more difficult to detect than the species named. The authors remark: ' It is nearest related to *F. nivea*, Hedley, from Kosciusko, which differs in the microscopic details of the sculpture, is more closely coiled, and has a sunken instead of an elevated spire." Two specimens collected by the writer at Paradise Falls, near Whitfield, show a slight increase in the size of the umbilicus, but are otherwise identical. The Type is in the National Museum, Melbourne.

ALLODISCUS CANNFLUVIATILUS, Gabriel.

1929. Allodiscus cannfluviatilus, Gabriel, Vic. Nat., xlvi (6), p. 133, figs. 1, 2, and text fig.

Size of Type.—Maj. diam., 2·8; min., 2·4; alt., 1·7 mm.

Locality.—Cann River (Nat. Mus. Melb.), collected by J. Clark.

Obs.—A distinctive little form. The spiral lirae bordering the umbilicus provide a helpful and striking diagnostic character. The species somewhat resembles *H. otwayensis*, Petterd, from which it may be distinguished by its fewer ribs and the presence of an umbilicus.

Genus **Thalassohelix**, Pilsbry, 1892.

THALASSOHELIX FORDEI, Brazier, var. M'COYI, Petterd.

1879. Helix fordei, var. m'coyi, Petterd, Mon. Tas. Land Shells, p. 14.
1879. Helix fernshawensis, Petterd, Journ, of Conch., ii, p. 355.
1879. Id., Mon. Tas. Land Shells, p. 15.
1882. Helix m'coyi, Pett. Tate, T.R.S.S.A., iv, p. 75.
1882. Helix fernshawensis, Pett. Tate, T.R.S.S.A., iv, p. 75.

1886. Nanina fernshawensis, Pett. Tryon, Man. Conch., ii, p. 124.
1887. Helix fernshawensis, Pett. Tryon, Man. Conch. iii, p. 36.
1912. Flammulina fordei, Braz., var. m'coyi, Pett. Cox and Hedley, Mem. Nat. Mus. Melb., No. 4, p. 12, pl. 2, figs. 13-15.

Size of Type.—Maj. diam., 7·61; min., 5·58; alt., 4·06 mm.

Localities.—Dandenong Range (Petterd); Fernshaw (Tate); Don River (Nat. Mus. Melb.); Upper Yarra (Kershaw); Hoddle Range (J. Searle); Healesville (Brown); Belgrave (C. Oke); Olinda (self).

Obs.—This form is slightly taller, more tightly wound, and finer in sculpture than typical *fordei,* but nevertheless the writer is inclined to follow previous authors in regarding it as a variety only. Throughout the Dandenongs it is frequently seen, being generally located under stones. Cox and Hedley (loc. cit.) state that the type, which has been presented by the author to the Australian Museum, measures maj. diam., 7·5; min., 6; alt., 5·5 mm. This shows a slight discrepancy with the dimensions in the original description.

Family FLAMMULINIDAE.

Genus **Flammulina**, von Martens, 1873.

FLAMMULINA EXCELSIOR, Hedley.

1896. Flammulina excelsior, Hedley, Rec. Aust. Mus., ii, p. 103, pl. 23, figs. 2-4.
1912. Id., Cox and Hedley, Mem. Nat. Mus. Melb., No. 4, p. 11.
1929. Id., Gabriel, Vic. Nat., xlvi (6), p. 132.

Size of Type.—Maj. diam., 9; min., 8; alt., 6 mm.

Localities.—Victoria (Sir W. B. Spencer); Cann River (Nat. Mus., Melb.), collected by J. Clark.

Obs.—The author remarks: "This very fragile shell of a group hitherto unrecorded from Australia seems in shape to be nearest allied to *F. cornea,* Hutton, from Auckland, New Zealand, from which its size, colour and perforation distinguish it. In a bottle with *Cystopelta,* but without locality more precise than "Victoria," Prof. W. Baldwin Spencer has sent me examples of this species in spirits."

Again, in 1912, in collaboration with the late Dr. J. C. Cox, Mr. Hedley remarks: "It is likely that the unlocalized Victorian specimen obtained by Professor Spencer, and referred to in the original description, came from some neighbouring alpine district." A characteristic feature is the angular brown flames of irregular pattern. Type in Australian Museum, Sydney, from Mt. Kosciusko.

Family ZONITIDAE.

Genus **Helicarion**, Ferussac (em.), 1821.

HELICARION CUVIERI, Ferussac.

1821. Helixarion cuvieri, Ferussac, Tabl. Syst., p. 20.
1832. Vitrina nigra. Quoy and Gaimard, Voy. Astrolabe, Zool., Moll. ii, p. 135, pl. 11, figs. 8, 9.
1850. Vitrina verreauxi, Pfeiffer, P.Z.S. for 1849, p. 132.
1862. Id., Reeve, Conch. Icon., xiii, pl. 4, fig. 21.
1868. Id., Cox, Mon., Aust. Land Shells, p. 83, pl. 14, figs. 14, 14*a*.
1870. Helicarion cuvieri, Semper, Reis in Philipp., iii, p. 31, pl. 3, figs. 7*a*,*b*; pl. 6, fig. 11.
1882. Vitrina nigra, Q. and G. Tate, T.R.S.S.A., iv, p. 75.
1891. Helicarion verreauxi, Pfr. Hedley, P.L.S. N.S.W. [2], vi, p. 24, pl. 2, figs. 10-12; pl. 3, fig. 4.
1909. Helicarion cuvieri, Ferussac. Petterd and Hedley (loc. cit.), vii, p. 301.
1921. Id., May, Check-List Moll. Tas., p. 97, No. 945.
1923. Id., May, Ill. Index Tas. Shells, pl. 43, fig. 26.

Size of Average Specimen.—Diam., 11; alt., 6·5 mm.

Localities.—W. Port (Astrolabe); Fernshaw, Sale and Cape Otway (Petterd); Jumbunna (Kitson); Mallacoota (C. L. Barrett); Mornington (Rev. G. Cox); Bairnsdale (Nat. Mus.); Lorne (self); Lillypilly Gully, Wilson's Promontory (E. S. Hanks).

Obs.—Reeve says: "Distinguished chiefly by its narrowly produced transverse form." It is a frequent species, which appears to prefer damp conditions under decayed timber. Examples from the last-named locality are much darker than typical specimens, approaching chocolate brown. It extends to Tasmania, the largest coming from the extreme south.

HELICARION VIRENS, Pfeiffer.

1849 Vitrina virens, Pfeiffer, P.Z.S. Lond., p. 108.
1862. Id., Reeve Conch. Icon., xiii, pl. 3, fig. 14.
1868. Id., Cox, Mon. Aust. Land Shells, p. 85, pl. 14, figs. 5, 5*a*.
1885. Helicarion virens, Pfr. Tryon, Man. Conch., i, p. 172, pl. 39, figs. 69-71.
1888. Id., Hedley, P.R.S. Qld., v. (2), p. 49.

Size of Type.—Diam., 16; alt., 8 mm.

Locality.—Lakes Entrance (T. Worcester).

Obs.—A rather dull, greenish-olive shell, with little indication of striae. It is recorded from Clarence River, N.S. Wales (Dr. Cox), and Moreton Bay, Queensland (Hedley).

Genus **Microcystis**, Beck, 1837.

MICROCYSTIS CIRCUMCINCTA, Cox.

1864. Helix marmorata, Cox, Ann. Mag. Nat. Hist. [3], xiv, p. 182 (*non* Ferussac).
1864. Id., Cat. Aust. Land Shells, p. 20.

1868. Helix circumcinta, Cox, Mon. Aust. Land Shells, p. 3, pl. 5, figs. 6*a*, *b*.
1886. Nanina marmorata, Cox. Tryon, Man. Conch., ii. p. 105, pl. 35, figs. 39, 40.
1888. Id., Hedley, P.R.S. Qld., v (2), p. 50.
1903. Rhytida (Macrocycloides) circumcincta, Cox. Moellendorff and Kobelt, Conch. Cab. (Agnatha), p. 56, pl. 10, figs. 9-11.
1912. Microcystis marmorata, Cox. Hedley, P.L.S. N.S.W., xxxvii, p. 262.
1917. Id., Odhner, K. Sv. Vet. Ak. Handl., lii (16), p. 78, figs 30*a*, 31 (in text).

Size of Type.—Major diam., 10·15; min., 8·6; alt., 5·57 mm.

Locality.—Lakes Entrance (T. Worcester).

Obs.—A minutely perforated species bearing a general resemblance to *Nanina jacksoniensis*, Gray, which, however, is said to be imperforate. This is not an uncommon species in New South Wales, extending as far north as the Hunter River. Hitherto unrecorded for Victoria.

Genus **Cystopelta**, Tate, 1881.

CYSTOPELTA PETTERDI, Tate.

1881. Cystopelta petterdi, Tate, P.R.S. Tas., 1880, p. 17.
1890. Id., Hedley, P.L.S. N.S.W. [2], v, p. 44, pl. i.
1891. Id., Hed., loc. cit. vii, p. 24, pl. 3, fig. 5.
1896. Id., Hed., Rec. Aust. Mus., ii. p. 102.
1909. Id., Hedley and Petterd, Rec. Aust. Mus., vii, p. 292.
1912. Id., Cox and Hed., Mem. Nat. Mus. Melb., No. 4, p. 10.

Localities.—Ballarat (Musson); Loch (Frost); Baw Baws (J. Searle).

Obs.—A genus without a shell. This was once placed in the Limacidae. Later, Tryon chose Tebennophoridae, while Hedley's classification is Fam. Zonitidae; Sub-fam. Helicarionae; gen. *Cystopelta*.

CYSTOPELTA PETTERDI, Tate, var. PURPUREA, Davies.

1912. Cystopelta petterdi, Tate, var. purpurea, Davies, P.R.S. Vic. (n.s.), xxiv (2), p. 331, pls. 64-69.

Localities.—Beech Forest; Fernshaw; Narbethong.

Naturalized Land Mollusca found in Victoria.

References.—Musson, P.L.S. N.S.W. [2], v, 1890, pp. 883-896; Woodward, Journ. Conch., x, 1903, pp. 352-367; Cox and Hedley, Mem. Nat. Mus. Melb., No. 4, 1912, p. 14; Gabriel, Vict. Nat., xlvi (6), 1929, p. 133.

LIMAX MAXIMUS, Linné.

"A large slug, colour varying from ash to yellowish-grey, or sometimes black; often streaked or spotted with white or black; much wrinkled. Size: 4 to 6 inches long."

LIMAX FLAVUS, Linné.

"A yellowish slug; tessellated with white, and black, or dark brown, coarsely tuberculated, very variable, as are all these creatures; keeled towards the tail, which is pointed. Size: 2½ to 4 inches long."

AGRIOLIMAX AGRESTIS, Linné.

"A common slug; usually ash-grey, rufous, yellowish, cream colour, or whitish, often mottled; with a short keel at the tail; shell internal, consisting of a calcareous plate, such as all the Limaces have. Size: 1½ to 2 inches long."

MILAX GAGATES, Draparnaud.

"A very variable slug; black, slate colour, dark-red, brown or yellowish, with dusky markings, pale underneath, acutely keeled from mantle to tail, shell internal. A small calcareous plate. Size: 1½ to 2½ inches long."

VITREA CELLARIA, Muller.

A flat, pale yellowish shell, very shining, nearly smooth; umbilicated. Widespread and frequently found in glass houses. Size: diam., 8 mm.

ZONITOIDES NITIDUS, Muller.

A small, flattish, horny shell. Size: diam., 5 mm.

HELICELLA CAPERATA, Montagu.

A brownish shell, banded, with regular close-set raised wrinkles; body whorl slightly angulated at the periphery; very abundant at many parts of our coast-line. Size: diam., 9 mm.

HELICELLA (COCHLICELLA) BARBARA, Linné.
=*Cochlicella acuta*, Muller.

A turreted-conical shell, white, with brown bands, encircling the whorls. Extremely common in flower gardens. Size: ½ inch long.

HELIX PISANA, Muller.

A whitish shell, with numerous more or less interrupted linear coloured bands on the larger whorls; mouth moderately large, usually pink edged. Size: diam., ¾ inch.

HELIX ASPERSA, Muller.

A fawn coloured shell, with brown bands. The common "garden snail." Size: diam., 1 to 1½ inch.

HYALINA (EUCONULUS) FULVA, Muller.

A minute shell, yellowish horn-colour, smooth, shining, spire elevated, almost imperforate. Only recorded from the Cann River district. Size: maj. diam., 2·8; alt., 2·2 mm.

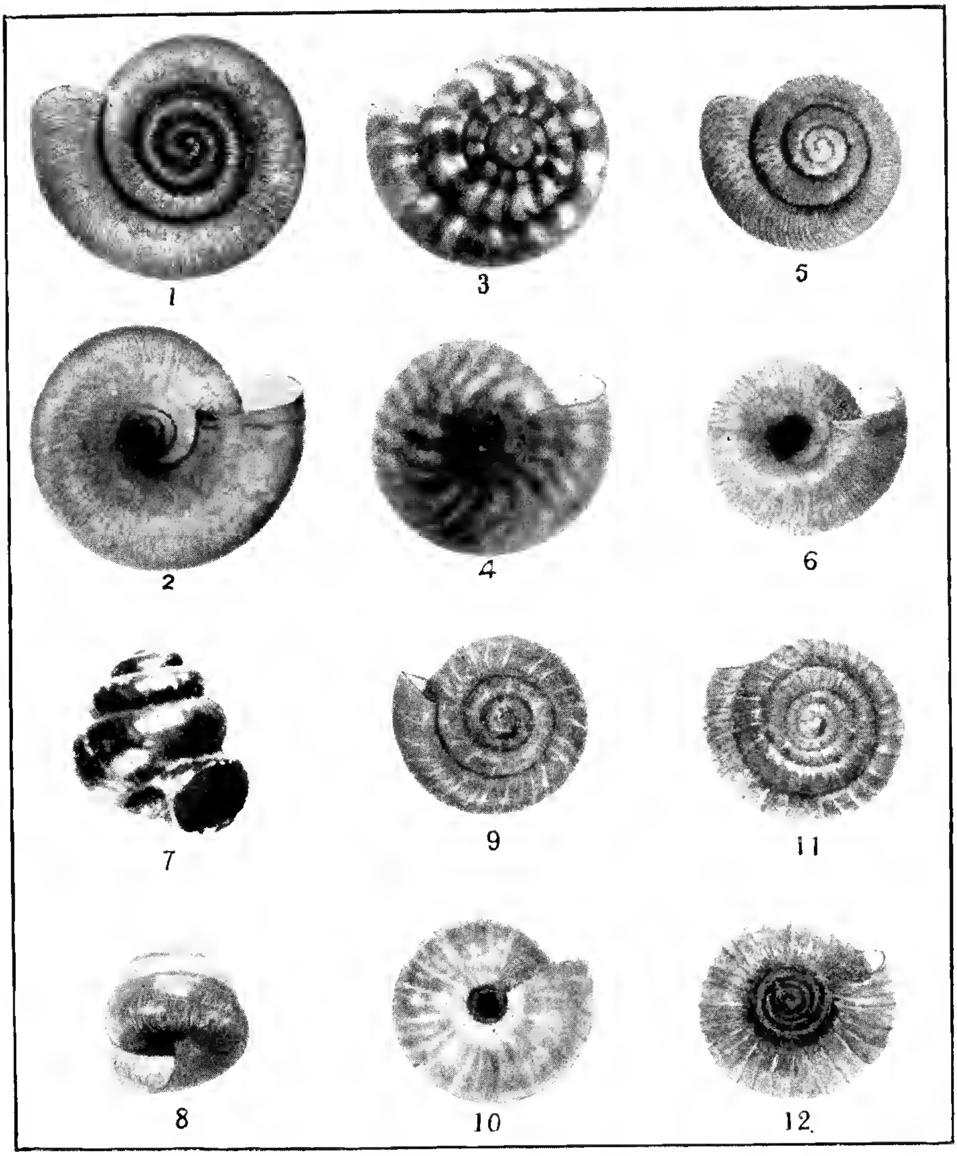
Explanation of Plates.

Plate II.

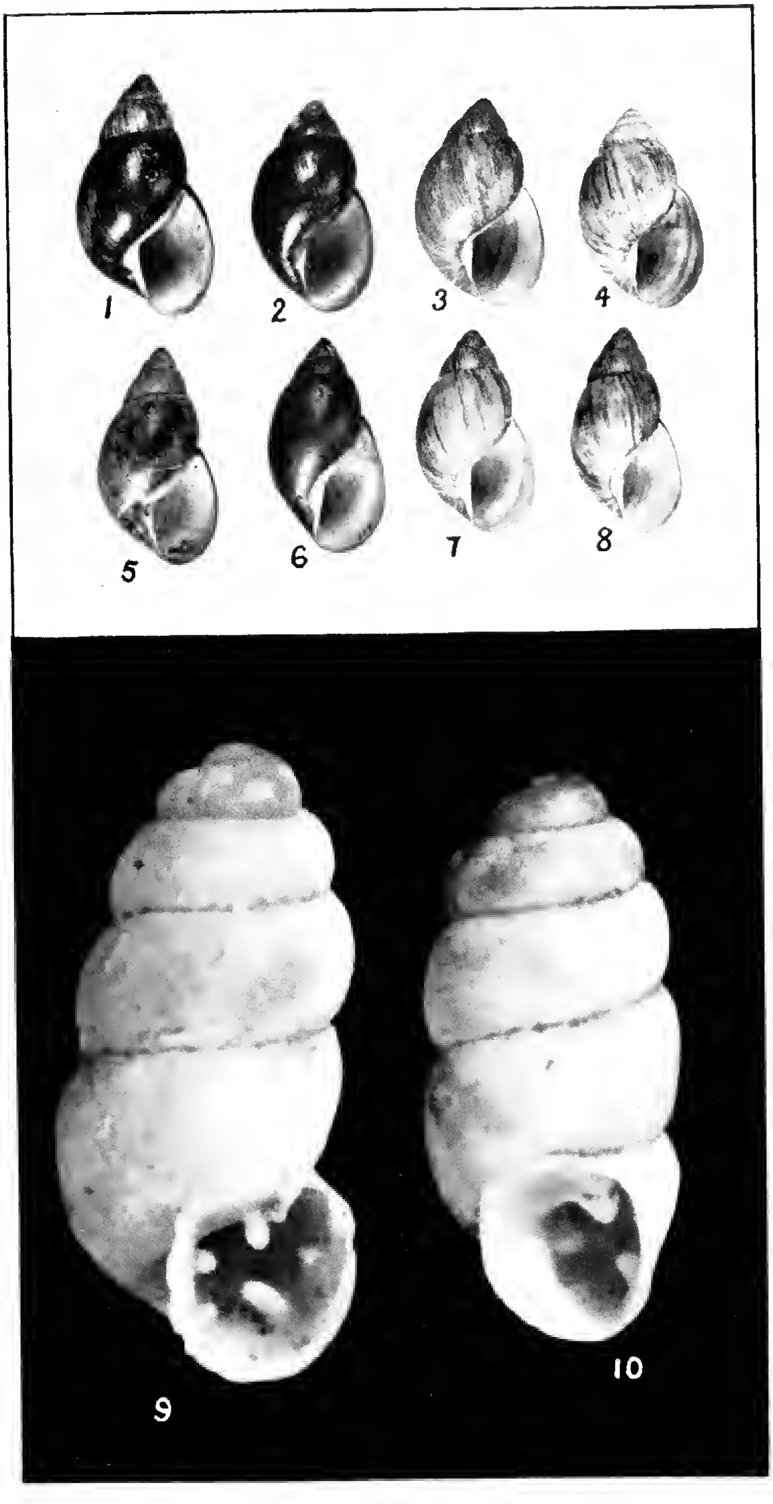
Figs. 1, 2.—*Charopa erskinensis*, sp. nov. ×13.
„ 3, 4.—*Charopa gatliffi*, sp. nov. ×9.
„ 5, 6.—*Charopa tarravillensis*, sp. nov. ×9.
Fig. 7.—*Laoma turbinuloidea*, sp. nov. ×10.
„ 8.—*Laoma sinistra*, sp. nov. ×20.
Figs. 9, 10.—*Charopa scindocataracta*, sp. nov. ×17.
„ 11, 12.—*Charopa bairnsdalensis*, sp. nov. ×12.

Plate III.

Figs. 1-8.—*Hedleyella atomata*, Gray, var. *kershawi*, Brazier. ×$\frac{1}{2}$.
Fig. 9.—*Bifidaria bannertonensis*, sp. nov. ×30.
„ 10.—*Bifidaria bannertonensis*, sp. nov. Paratype, ×30.



Victorian Land Shells



Victorian Land Shells

[PROC. ROY. SOC. VICTORIA, 43 (N.S.), PT. I, 1930.]

ART. VII.—*Notes on Australian and New Zealand Foraminifera. No. 1.—The Species of Patellina and Patellinella, with a Description of a new Genus, Annulopatellina.*

By WALTER J. PARR, F.R.M.S., and ARTHUR C. COLLINS, A.R.V.I.A.

(With Plate IV.)

[Read 10th July, 1930; issued separately 29th September, 1930.]

Introduction.

The object of this series of papers is to review the species of foraminifera found living and fossil in the Australian and New Zealand region. It is proposed to deal with one or more related genera in each paper.

The foraminifera of the Indo-Pacific area are of especial interest. Many of the species of the Eocene of the Paris Basin are found in the Oligocene and Miocene of Victoria, and some, or closely related forms, are still living on the Australian coast and elsewhere in the shallower waters of the Indian and Pacific Oceans. The Miocene faunas of Austria and Hungary are also represented here, while, as Dr. J. A. Cushman has recently pointed out, the living fauna of the Caribbean and West Indian region is much more like that of the Australian region than any other.

With the exception of *Patellina*, the genera now studied are confined to the Indo-Pacific. The genus *Patellina* has recently been the subject of a paper by Cushman (1930, pp. 11-17, pl. iii), to which the present notes may be regarded as supplementary. *Patellinella* is known by a single species, *P. inconspicua* (Brady), and has been considered by some authors to be unrelated to *Patellina* or to other genera of the Rotaline group. The discovery of a more primitive species of *Patellinella*, showing without doubt that *Patellinella* has evolved from *Patellina*, is therefore of great interest. The third genus is a new one which we have erected to receive *Orbitolina annularis* Parker and Jones, a species common in South Australian waters, which differs in several important points from the true *Orbitolinae* and *Patellinae* with which it has been grouped.

For much help in the form of material from the important localities of Europe and elsewhere, and valuable advice, we are indebted to our friend, Mr. Frederick Chapman, A.L.S., etc., the Commonwealth Palaeontologist. We are also under obligations to Dr. J. A. Cushman, of Sharon, U.S.A., for his assistance.

Description of Species.

Genus **Patellina** Williamson, 1858.

PATELLINA CORRUGATA Williamson.

(Plate IV, Figs. 1-5.)

Patellina corrugata Williamson, 1858, p. 46, pl. iii, figs. 86-89. Chapman, 1909B, p. 354; 1915, p. 28; 1916, pp. 338, 359, 377. Heron-Allen and Earland, 1922, p. 198, pl. vii, fig. 5.

Description.—Test spiral, trochoid, concave inferiorly, early whorls usually undivided, later whorls consisting of long crescentic chambers, about two to the whorl, divided into chamberlets by septa; septa of varying length, sometimes in alternating series of two or more orders, arising from the peripheral margin of the chamber, and stopping short of the inner margin, where all the chamberlets communicate; umbilical area filled by an exogenous growth of shelly material in which there are thickened ridges arranged in an irregularly coiled pattern; aperture not visible; wall calcareous, hyaline, perforate.

Diameter.—0·3-0·4 mm.

Observations.—Cushman has suggested that the species of *Patellina* present in the Indo-Pacific region is *P. advena* Cushman, a species described from the Lower Oligocene (Mint Spring Calcareous Marl), Mint Spring Bayou, Vicksburg, Miss., U.S.A. We have examined a large series of specimens, both fossil and recent, from Australia and New Zealand, and after comparing them with examples of *P. corrugata* from the British Isles, are of the opinion that they are identical with Williamson's species. There is some variation in the degree of fineness of the secondary septation. Three examples illustrating this, from the one dredging, are figured on Plate IV. Fig. 2 represents a megalospheric specimen. This is coarsely subdivided as in the examples of *P. corrugata* at hand from the British Isles. Fig. 4 is a microspheric example, very finely subdivided. It agrees with one we have, through the kindness of Dr. Cushman, from the Lower Oligocene (Byram Marl), of Leaf River, Miss., U.S.A., which is apparently *P. advena*. Our specimens are connected by an intermediate form, with a smaller proloculum than Fig. 2, but larger than Fig. 4. This is represented by Fig. 3. Apparently we have here an example of what Hofker (1925, pp. 68-70) has termed trimorphism.

In our material there are examples with fewer chambers than usual. Similar specimens were met with by Cushman in his New Zealand collections, in company with *P. advena*. This character is also found in some of the British specimens of *P. corrugata*. The finding of the peculiar oval form of *Patellina* figured by Heron-Allen and Earland in their paper (1913, p. 109, pl. ix, fig. 11) on Clare Island foraminifera, in the dredging from off the Snares, S. of New Zealand, with typical *P. corrugata* and the forms recorded by Cushman appears to be evidence that our identification of *P. corrugata* is correct. Heron-Allen and Earland regarded this oval form as being the microspheric stage of *P. corrugata*, with which it occurred. Our example is definitely megalospheric (Plate IV, fig. 5), and as it here also occurs with *P. corrugata*, it may prove to be a variety of that species, when more material is available. This oval form suggests the relationship of *Patellina* to *Patellinella*, which is brought out by a new species of the latter genus, which we describe below.

Occurrence.—Recent: dredgings, Geraldton Harbour, Western Australia; Bass Strait, off Gabo Island; E. of Tasmania, 1320 fms.; E. of Cape Saunders, Otago, N.Z., 40-50 fms.; off the Snares, S. of N.Z., 60 fms. Lower Pliocene (Kalimnan): Mallee Bores. Miocene (Janjukian); Mallee Bores. Oligocene (Balcombian): Balcombe Bay, Mornington; Kackeraboite Creek; and Muddy Creek, near Hamilton, Victoria.

Genus **Patellinella** Cushman, 1928.

Patellinella annectens, sp. nov.

(Plate IV, Fig. 6.)

Description.—Test subconical, depressed, trochoid, about 1½ times as long as broad, consisting of a small proloculum, followed by a short undivided coiled series, remaining chambers also undivided, arranged two to the whorl; sutures distinct, flush; wall calcareous, coarsely perforate; aperture at the base of the last-formed chamber. Length, 0·32 mm.; breadth, 0·25 mm.; height, 0·14 mm.

Holotype (Parr and Collins Coll.) from Oligocene (Balcombian), Muddy Creek, near Hamilton, collected by W. J. Parr.

Observations.—This is a particularly interesting species, showing, as it does, the relationship between the genera *Patellina* and *Patellinella*, which is clearly brought out by the figures of the two genera. It resembles *Patellina* in having the early portion of the shell coiled. It has also a similar deposit of shell substance on the under surface, formed by each chamber, and in this species extending as a thin lamina more than halfway across the inferior surface, that of each pair of chambers forming what may be described as a roughly sigmoidal depression, at the base of the last-formed portion of which lies the aperture. That it is a true *Patellinella* is shown by the lateral compression of the test, the textularian plan of growth, and the undivided character of the chambers. As might be expected from its appearance in the Oligocene, it is a more primitive form than *P. inconspicua*, which appears for the first time in the Post-Tertiary of Victoria.

Occurrence.—Oligocene (Balcombian): Muddy Creek, near Hamilton, Victoria.

Patellinella inconspicua (Brady).

(Plate IV, Fig. 7.)

Textularia inconspicua Brady, 1884, p. 357, pl. xlii, fig. 6*a-c*. Millett, 1899, p. 557, pl. vii, fig. 1.
Discorbis inconspicua (Brady): Cushman, 1919, p. 626.
Textularia inconspicua Brady: Heron-Allen and Earland, 1922, p. 116.
Patellinella inconspicua (Brady): Cushman, 1928, p. 5, pl. i, fig. 8*a-c*.

Observations.—This species was recorded by Brady from three "Challenger" stations in the Pacific, off East Moncoeur Island, Bass Strait; Nares Harbour, Admiralty Islands; and the *Hyalonema* ground, S. of Japan. Millett's examples from the Malay Archipelago are lower and more outspread than the specimen figured by Brady, which was from Bass Strait. Subsequent records are those of Cushman from off New Zealand, and Heron-Allen and Earland from the same area. The species is also known from the Kerimba Archipelago, off Portuguese East Africa.

Our specimens are all typical. The figured example, from the Post-Tertiary of Victoria, is an exceptionally large one, with strongly limbate sutures. The species seems to be subject to little variation, as examples from a depth of 1320 fms. agree in every respect with those from shallow water.

Occurrence.—Recent: shore sand, Point Lonsdale; Torquay; Port Fairy, Victoria; dredgings, E. of Tasmania, 1320 fms. Post-Tertiary: boring near Boneo, Victoria, 177-187 ft.

Annulopatellina, gen. nov.

Description.—Test depressed conical, concave on the inferior side, consisting of a globular proloculum, which is wholly or partly embraced by a crescentic to subcircular second chamber; remaining chambers annular and with the exception of the first two or three, always subdivided into chamberlets, which extend inwards on the under surface of the test in the form of tubular prolongations closed at the ends and sometimes anastomosing; wall calcareous, hyaline, perforate, thin; aperture apparently absent.

Observations.—This genus has been erected for the reception of Parker and Jones's *Orbitolina annularis*, which was later transferred to the genus *Patellina* by Carpenter. This species resembles *P. corrugata* and other typical species of the same genus in its depressed plano-convex test, and in the subdivision of the chambers, but its plan of growth is quite distinct. Instead of being built on a rotaline plan, with two or three chambers to the whorl, as in *P. corrugata*, the chambers are, with the exception of the proloculum and the following chamber, annular. The early undivided coils of *P. corrugata* are also absent from *A. annularis* in both megalospheric and microspheric forms. Further notes on the points of difference between the two genera will be found in the notes on *A. annularis*.

ANNULOPATELLINA ANNULARIS (Parker and Jones).

(Plate IV, Figs. 8, 9, 10.)

Orbitolina annularis Parker and Jones, 1860, pp. 30, 31.
Patellina corrugata Williamson: Carpenter (*pars*), 1862, p. 230, pl. xiii, figs. 16, 17.
Patellina annularis (Parker and Jones): Parker and Jones, 1865, p. 438.
Patellina corrugata Chapman (*non* Williamson), 1909A, p. 134, pl. x, fig. 7.
Patellina corrugata, var. *annularis* (Parker and Jones): Heron-Allen and Earland, 1922, p. 198.

Description.—The characters of the species are those of the genus.

Dimensions.—Diameter up to 1·2 mm.; height to 0·25 mm.

Observations.—This species was originally described from Australian shore sands, and the remainder of the records, with the exception of a somewhat doubtful one by Heron-Allen and Earland from off New Zealand, are all from the Australian coast. It is not known as a fossil.

Our own records are all from Australian waters, over an area extending from Geraldton, Western Australia, along the southern coast to as far east as Gabo Island. The specimens fall into two groups, one consisting of those with a large proloculum, followed by an undivided crescentic chamber, and then an annular series of up to twelve chambers, and the other, of much larger specimens, with a small proloculum, embraced by a kidney-shaped to subcircular chamber, subdivided into chamberlets, and followed by a greater number, up to as many as sixteen, annular chambers. The two groups clearly represent the megalospheric and microspheric forms of the species. The diameter of the proloculum of a megalospheric example measures 0·07 mm., and that of a microspheric specimen, 0·015 mm. The degree of fineness of the subdivisions of the annular chambers varies considerably, but not according to whether the specimen is megalospheric or microspheric. Plastogamy occurs in *A. annularis*, particularly in the material from Hardwicke Bay, South Australia, in which the paired shells and others which had become disunited are quite common. In every such case, it was found that most of the base and the whole of the septa had disappeared, having been absorbed in the process of reproduction.

Reference has already been made to the subdivision of the chamber surrounding the proloculum in the microspheric form. The number of these chamberlets is very variable, and it is difficult to determine just what their nature is. In one example, the apex of which is figured (fig. 10), they are undoubtedly similar to those in the later annular series. In others, including that figured by Mr. Chapman (*loc. cit. supra*), which he has kindly allowed us to examine, they have curved septa in a few, sometimes only one, of the chamberlets, which therefore seem to be of a rotaline nature, although it should be stated that, to us, the outer septal face of some of these chamberlets appears concave or flat, not convex, as one would expect to find in a rotaline form. It was intended to figure several of these chamberlets, but an unfortunate accident resulted in the destruction of the specimens selected for figuring.

In the absence of anything definite regarding the nature of the early chamberlets in the microspheric form, the affinities of the genus remain obscure. When recording this species (as *Patellina corrugata*, var. *annularis*) from the "Terra Nova" dredgings, off New Zealand, Heron-Allen and Earland note the occurrence of other specimens representing transition stages between it and *P. corrugata*. No such specimens have been met with by us, the characters of *A. annularis*, judging by the plentiful material at our disposal, being very constant. If it is related to *Patellina*, the ontogeny of the microspheric form should provide evidence of the relationship, but this is lacking. The only point of resemblance is the subdivision of the chambers. More examples of the rather rare microspheric form are needed to clear up this interesting problem.

Occurrence.—Dredgings, Geraldton Harbour, Western Australia; shore sand, Hardwicke Bay; Glenelg, South Australia; Torquay; Point Lonsdale, Victoria; dredgings, off Gabo Island, Bass Strait.

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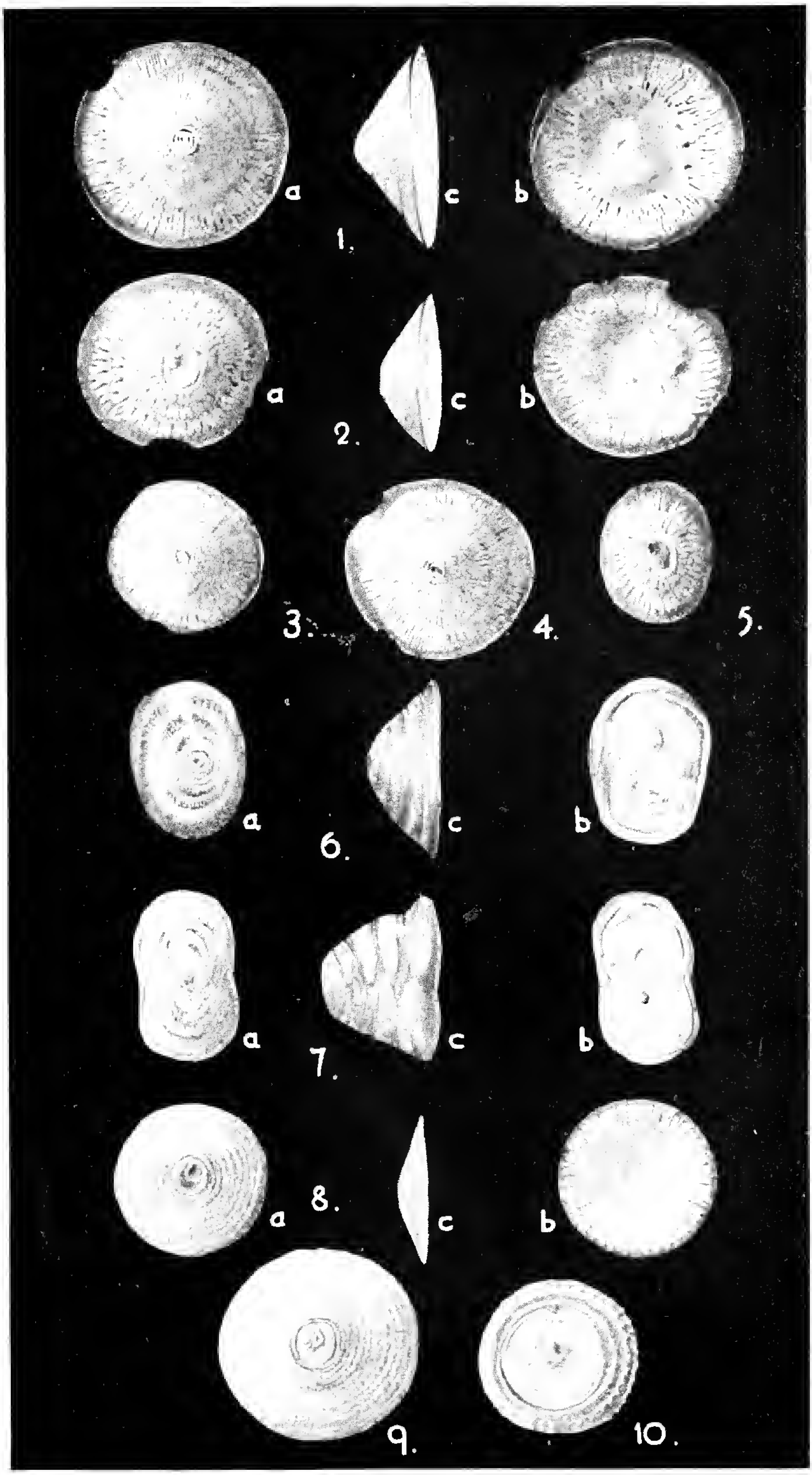

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Explanation of Plate IV.

(*a*, dorsal view; *b*, ventral view; *c*, side view.)

Fig. 1*a-c*.—*Patellina corrugata* Williamson. Oligocene (Balcombian). Lower Beds, Muddy Creek, near Hamilton, Victoria. ×60.

Fig. 2*a-c*.—*P. corrugata* W'mson. Megalospheric form. Dredgings off Gabo Island. ×60.

Fig. 3.—*P. corrugata* W'mson. Intermediate megalospheric form. Dredgings off Gabo Island. ×60.

Fig. 4.—*P. corrugata* W'mson. Microspheric form. Dredgings off Gabo Island. ×60.

Fig. 5—*P. corrugata* W'mson., oval var. Dredgings off the Snares, S. of New Zealand. ×60.

Fig. 6*a-c*.—*Patellinella annectens,* sp. nov. Oligocene (Balcombian). Lower Beds, Muddy Creek, near Hamilton, Victoria. ×80.

Fig. 7*a-c*.—*P. inconspicua* (Brady). Post-Tertiary. Bore near Boneo, Victoria, 177-187 feet. ×60.

Fig. 8*a-c*.—*Annulopatellina annularis* (Parker and Jones). Megalospheric specimen. Shore sand, Glenelg, South Australia, ×50.

Fig. 9.—*A. annuloris* (P. & J.). Microspheric example, Shore sand, Glenelg, South Australia. ×50.

Fig. 10.—*A. annularis* (P. & J.). Apical chambers of Fig. 9. ×100.

[PROC. ROY. SOC. VICTORIA, 43 (N.S.), PT. I, 1930.]

ART. VIII.—*Rare Foraminifera from Deep Borings in the Victorian Tertiaries.* *Part II.*

By

FREDERICK CHAPMAN, A.L.S., F.G.S., Hon. F.R.M.S.
(Palaeontologist to the Commonwealth Government),

and IRENE CRESPIN, B.A.
(Assistant Palaeontologist).

(With Plate V.)

[Read 10th July, 1930; issued separately 29th September, 1930.]

In continuation of our former paper on "Rare Foraminifera from Deep Borings in the Victorian Tertiaries," under the auspices of the Commonwealth Government, the following series of new forms from the East Gippsland Area is described. Most of these are affording valuable evidence in the discrimination of zones, especially in the older part of the Tertiary Series, and in the main are restricted to the Gippsland area.

Genus **Cyclammina** H. B. Brady, 1876.

CYCLAMMINA ROTUNDATA, sp. nov.

(Plate V, Figs 1, 2.)

Haplophragmoides latidorsatum (*non* Born.) Chapman, 1904, p. 227, pl. xx, fig. 1.

Description of Holotype.—Test subglobular, depressed in umbilical area; peripheral margin, especially in later portion, well rounded, about 8 sutures visible on the last whorl. Aperture a narrow arched slit at base of the septal face, with cancellation on the surface. Aperture always more or less oblique. Shell texture moderately finely arenaceous, colour varying from white to grey.

Dimensions.—Greatest diameter of test, 1·4 mm.; greatest width, 0·82 mm.

Paratype.—From 1165 ft. No. 1 Bore, Parish of Bumberrah (Metung), shows a less depressed umbilical area, and coarser arenaceous structure.

Observations.—The specimen figured previously by one of us from the ochreous clay from Brown's Creek, Otway Coast (loc. supra cit.), is here regarded as a species of *Cyclammina,* the type specimen of which was obtained from deep borings in Gippsland. In the first place it differs from *Haplophragmoides latidorsatum* of authors later than Bornemann, and also from *Haplophragmoides* *subglobosum* of Sars, by the less inflated chambers and the cancellated structure of the test. *Cyclammina rotundata* is less depressed than *C. incisa* (Stache), and is generally a smaller form with fewer chambers. It is often accompanied by *C. incisa.*

Occurrence.—No. 1 Bore, Parish of Bumberrah (Metung) at 1165, 1240, and 1295 feet; No. 3 Bore, Darriman at 1189 feet; No. 5 Bore, Parish of Glencoe, at 430 feet.

CYCLAMMINA LONGICOMPRESSA, sp. nov.

(Plate V, Figs. 3, 4.)

Description of Holotype.—Test spiral, ovately lengthened towards the termination of the last whorl. Surface somewhat compressed. whorls involute with a small umbilical depression. Chambers few, about 7 in the whorl. Sutures not deeply impressed; periphery sub-acute, aperture narrow; arched slit, rather oblique, the last chamber has a flat septal face; colour generally white; structure arenaceous, with a medium texture.

Dimensions.—Longest diameter of holotype, 2 mm.; shortest diameter, 1·3 mm.; thickness of test, 0·86 mm.

Observations.—This form of *Cyclammina* might be regarded as a distorted variety of *C. incisa,* but for the fact that it appears to be a constant form in the deep parts of the borings in the Victorian Tertiaries. It has also been met with in the Brown's Creek material from the Aire Coast.

Occurrence.—No. 4 Bore, Parish of Glencoe at 230 feet, and in No. 5 Bore at 486 feet; No. 3 Bore, Parish of Darriman, at 1207 feet; also from Brown's Creek, Aire Coast.

Genus **Lingulina** d'Orbigny, 1826.

LINGULINA BARTRUMI Chapman var. METUNGENSIS, nov.

(Plate V, Fig. 5.)

Lingulina bartrumi Chapman, 1926, p. 54, pl. xi, figs. 12*a,b*.

Description of Holotype.—Test broadly ovate, bluntly pointed at extremities, compressed at the sides and on the distal margin of the last chamber. Segments number four, the height of the last almost equal to the previous three. Surface of chambers delicately striate. Aperture is a short slit-like orifice at the apex of the last chamber.

Dimensions.—Length of test, 4·8 mm.; greatest breadth, 1·5 mm.; height of last chamber, 1·18 mm.

Observations.—This variety resembles the New Zealand species *L. bartrumi* in its general characters, but there are varietal differences which make it necessary to refer to it as a variety. The differences seen in the Metung specimens consist in the wider chambers, in the more arched sutures, and greater compression of the border of the last chamber. The type series from New Zealand occurred in the Upper Eocene grey marls at Weka Creek; in the Oligocene of Waikato South Head; North Head, Kaawa Creek; and south of Port Waikato.

Occurrence.—No. 1 Bore, Parish of Bumberrah (Metung), at 895 and 1320 feet.

Genus **Vaginulina** d'Orbigny, 1826.

VAGINULINA GIPPSLANDICA, sp. nov.

(Plate V. Fig. 6.)

Description of Holotype.—Test linear, elongate, slightly curved, marginuline in general form but strongly compressed. Proloculum rounded, half enclosed by the second chamber; the ten succeeding chambers low and more or less oblique. Surface of test ornamented with a series of strong partially interrupted costae, about 11 showing on each side of the penultimate chamber, the last chamber somewhat inflated and nearly smooth. Aperture subcircular situated on the concave side of the test at the end of a short spout-like prolongation. The above extremity terminates in a short blunt spinous process.

Dimensions.—Length, 4·2 mm.; greatest width, 1·04 mm.

Observations.—This species is quite a typical form in the lower part of the Tertiary series in the borings in Gippsland. The characters of the species are fairly constant. In ornament it bears certain resemblance to the *Marginulina costata* type, and in general shape with that of *Vaginulina legumen*. The compression of the test shows it to belong to the genus *Vaginulina*. A somewhat related form is the *Marginulina asprocostulata* (Stache, 1864, pl. xxii, fig. 53), but our species differs in being elliptical in section and in having the costulation finer, more oblique and somewhat interrupted.

Occurrence.—No. 3 Bore, Parish of Darriman, at 1189 feet; Parish of Glencoe, No. 3 Bore, at 180 feet, 190 feet, 200 feet and 210 feet; No. 4 Bore, at 240 feet and 260 feet, and No. 5 at 450 feet; No. 1 Bore, Parish of Bumberrah (Metung), at 1180 feet, 1240 feet and 1320 feet. The species will apparently prove a good zonal fossil since at present it occurs only in the basal beds of the Tertiary series proved by the bores in Gippsland.

Genus **Carpenteria** Gray, 1858.

CARPENTERIA ROTALIFORMIS, sp. nov.

(Plate V, Figs. 7, 8.)

Carpenteria proteiformis Goës (*pars*): Chapman, 1913, p. 171, pl. xvi, fig. 7.

Description of Holotype.—Test suborbicular, convex on one side, somewhat flattened on the opposite. The aperture occurs in the periphery. Point of attachment very small, usually on the flattened surface. Test consists of a rudely coiled system about 5 chambers. Surface papillate.

Dimensions.—Width of holotype, 1·7 mm.; height, 1·3 mm.

Observations.—The figured specimen from the Mallee borings referred to above (Paratype in National Museum, No. 12428) undoubtedly belongs to this varietal form. At the time it was remarked upon as follows:—" The specimens from the polyzoal rock of the Mallee borings are invariably arrested in growth, showing only the first tier of segments above the primordial group."

Occurrence.—No. 3 Bore, Parish of Darriman at 939, 1079 and 1109 feet; Parish of Glencoe, Bores No. 2 at 813 feet, No. 3 at 180 feet; No. 4 at 158-160 and 240 feet, No. 5 at 150 feet; No. 1 Bore, Parish of Bumberrah (Metung) at 984, 1020 and 1040 feet. In the Mallee it occurred in Bore 11 at 540-542 feet; 544-546 feet and 560-562 feet.

Carpenteria alternata, sp. nov.

(Plate V, Figs. 9, 10.)

Description of Holotype.—Test conoidal, chambers sub-globular, sometimes depressed increasing in size from the apical attached surface and arranged in a more or less alternating series, sutures deeply impressed. Surface of test moderately smooth. Aperture crescentic to sub-circular, partially surrounded by a necklike process. The aboral extremity usually concave, indicating an impressed surface of attachment. Another specimen figured (Paratype) shows a similar alternating series, but with the test more generally compressed.

Dimensions.—Length of holotype, 1·8 mm.; greatest width, 1·5 mm.

Observations.—In the structure of the shell this species resembles *Carpenteria proteiformis,* but the constant character of a series of specimens enables us to separate these short forms with a textularian growth from the latter species.

Occurrence.—No. 5 Bore, Parish of Glencoe, at 150 feet.

Genus **Lamarckina** Berthelin, 1881.

Lamarckina glencoensis, sp. nov.

(Plate V, Figs. 11, 12).

Description of Holotype.—Test elongate ovate. Superior face flattened. Whorls entirely exposed, consisting of 2 whorls, the outer one consisting of about 8 chambers and enlarging rapidly. Sutures thickened. Surface ornamented with closely set pustules. Inferior face showing about two-thirds of last whorl, surface somewhat smooth. Aperture on inferior surface wide and partially closed by a semicircular flap. Periphery of test bluntly carinate along the inner septal edge.

Dimensions.—Greatest length, 0·95 mm; width, 0·77 mm.; greatest thickness, 0·68 mm.

Observations.—In its general form and tuberculated surface our species resembles *Lamarckina rugulosa* (Cushman, Plummer MS., 1926, p. 8, pl. iii, fig. 6*a-c*) with a distinction that in the latter the inner whorl does not carry so far, and no septation is visible after the first outer chamber or so. In our specimen, the limbation of the chambers of the inner whorl is a marked feature. *Lamarckina rugulosa* occurred in the lower Eocene of Midway, Texas and in the Clayton, Mississippi.

Occurrence.—No. 3 Bore, Parish of Glencoe at 100 feet, and No. 5 Bore at 387 feet.

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Explanation of Plate V.

Fig. 1.—*Cyclammina rotundata*, sp. nov. No. 1 Bore, Parish of Bumberrah (Metung), 1295 feet. Holotype. ×22.

Fig. 2.—*C. rotundata*, sp. nov. Metung, 1165 feet. Paratype. ×12.

Fig. 3.—*C. longicompressa*, sp. nov. No. 4 Bore, Parish of Glencoe, 230 feet. Holotype, lateral aspect. ×22.

Fig. 4.—*C. longicompressa*, sp. nov. No. 4 Bore, Parish of Glencoe, 230 feet. Apertural aspect of another specimen. (Paratype). ×22.

Fig. 5.—*Lingulina bartrumi* Chapman var. *metungensis*, nov. No. 1 Bore, Parish of Bumberrah (Metung), 1320 feet. Holotype, natural aspect. ×15.

Fig. 6.—*Vaginulina gippslandica*, sp. nov. No. 3 Bore, Parish of Glencoe, 180 feet. Holotype, natural aspect. ×14.

Fig. 7.—*Carpenteria rotaliformis*, sp. nov. No. 1 Bore, Parish of Bumberrah (Metung), 1020 feet. Holotype, superior surface. ×14.

Fig. 8.—*C. rotaliformis*, sp. nov. Ditto. Holotype, inferior surface. ×14.

Fig. 9.—*Carpenteria alternata*, sp. nov. No. 5 Bore, Parish of Glencoe, 150 feet. Holotype. ×18.

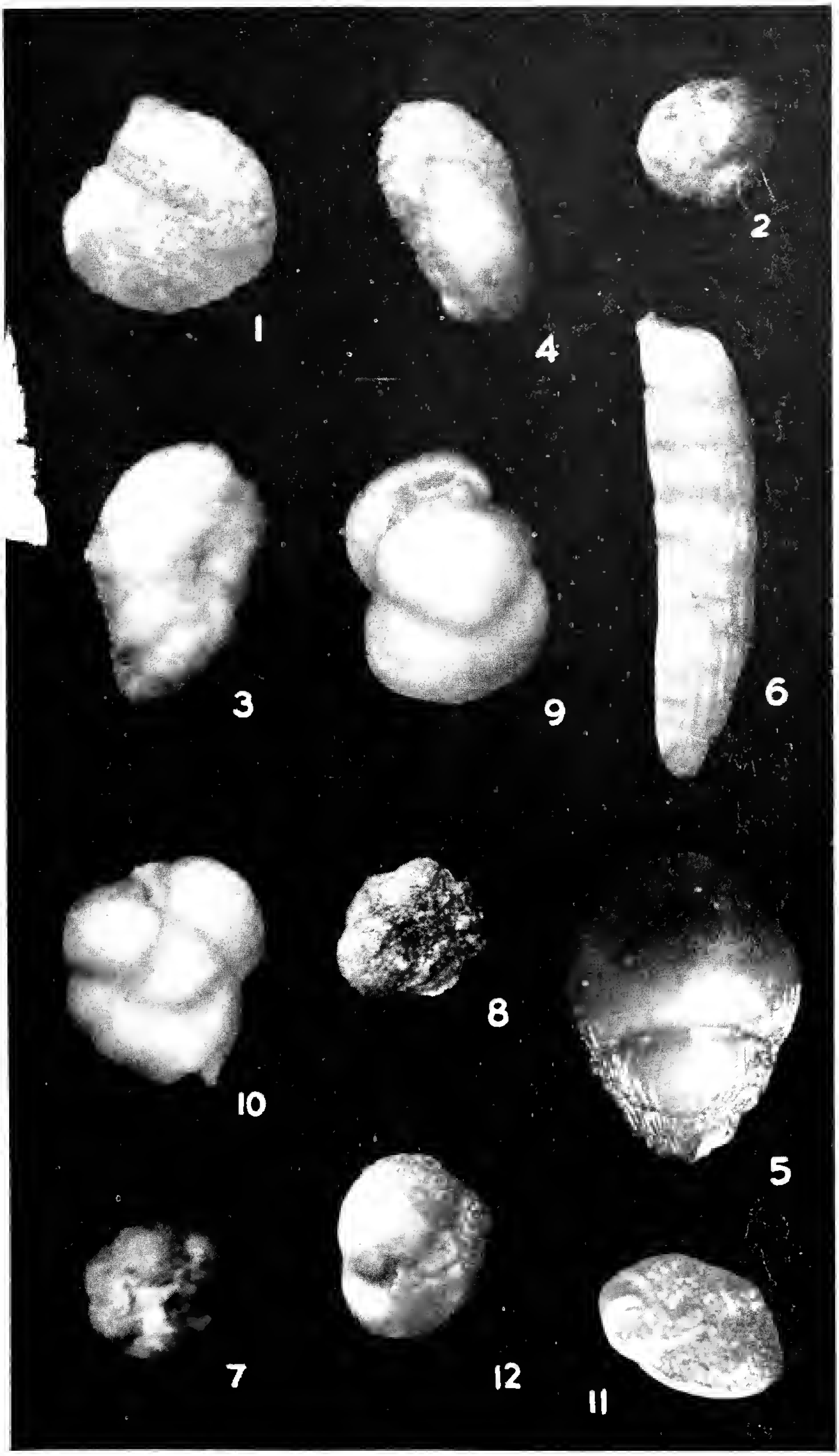
Fig. 10.—*C. alternata*, sp. nov. Ditto. Paratype. ×18.

Fig. 11.—*Lamarckina glencoensis*, sp. nov. No. 3 Bore, Parish of Glencoe, 1000 feet. Holotype, superior surface. ×28.

Fig. 12.—*L. glencoensis*, sp. nov. Ditto. Inferior surface of another specimen. Paratype. ×28.

END OF VOLUME XLIII, PART I.

[PUBLISHED 30TH SEPTEMBER, 1930].



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New Foraminifera from Deep Borings in Gippsland.

[Proc. Roy. Soc. Victoria, 43 (N.S.), Pt. II, 1931.]

Art. IX.—*The Age, Distribution and Petrological Characters of the Granites of Eastern Australia.*

By Professor ERNEST W. SKEATS, D.Sc. A.R.C.Sc.. F.G.S.
(Department of Geology, University of Melbourne).

(With Plate VI).

[Read 14th August, 1930; issued separately 15th January, 1931.]

Introduction.

The collection of material for this paper was made for the purposes of a discussion, of which the author was leader, at the Brisbane meeting of the Australasian Association (now Australian and New Zealand Association) for the Advancement of Science, in May, 1930.

In many respects Australia may be considered as consisting of two parts or units. The Western part or unit includes West Australia, South Australia, Central Australia and North Australia, and consists largely of an exposed basement of Pre-Cambrian rocks riddled with ancient basic and acid intrusions, with a minor development of generally more or less flat-lying younger sediments resting on it.

Eastern Australia, comprising Tasmania, Victoria, New South Wales and Queensland, has in great measure a distinct geological history. In successive geological periods marine sediments have been added to the old Pre-Cambrian basement, which now is only exposed in the western part of the block. The Palæozoic marine sediments have been closely folded and even the Mesozoic sediments suffered minor folding before the close of the period. Associated probably with late stages in the various fold movements, intrusions of granitic and other igneous rocks have invaded these sediments and are now exposed at the surface over wide areas. This paper is concerned solely with the granitic intrusions of the eastern unit of the continent, with their geographical distribution, their ages, and to some extent their petrological characters.

The subject is so comprehensive that little progress could have been made without the assistance from geological colleagues in the States of Eastern Australia. I have received from Mr. P. B. Nye, B.M.E., Government geologist of Tasmania, a map of the distribution of the granites of Tasmania and a useful discussion of their age and characters. In Victoria Mr. D. J. Mahony, M.Sc., has supplied me with a statement on Victorian granites and Mr. H. B. Hauser, M.Sc., has helped me with the literature generally. In New South Wales Dr. W. R. Browne's presidential address to the Linnean Society of New South Wales, 1929, has supplied a wealth of information with regard to New South Wales occurrences and this he has supplemented in correspondence. In Queensland Mr. Dunstan has provided me with a map showing the distribution of the Queensland granites, Professor Richards has given information by letter, and Dr. Bryan's presidential address to the Royal Society of Queensland in 1925 has provided valuable information on Queensland granites. Dr. Browne's and Dr. Bryan's papers provide the bulk of the references to literature. The remainder are in Geological Survey and Royal Society publications of the various States.

In attempting to summarize the information available, to supplement it, and to evaluate the evidence for the ages of the various granites of Eastern Australia, I have been led to realize how much of the information is based on analogy, on certain mineral resemblances or on correlation with periods of what are believed to be mountain-making movements, and how little of it is based on definite stratigraphical evidence.

In setting out the information, it is proposed to describe the granitic rocks in order of age, commencing with the Pre-Cambrian, and under each period to deal summarily with their mineral characters and their distribution in the States of Tasmania, Victoria, New South Wales and Queensland. Proceeding in this way it is hoped that material for tentative generalizations may emerge, and in any case, correlation may be facilitated and the strength or weakness of the evidence in particular cases may be more clearly realized.

As a preliminary it must be stated that the evidence of age of many granites is very indefinite. In particular cases it may amount to no more than that a granite is intrusive into Pre-Cambrian rocks and is older than the Pleistocene. In such cases the reference of a granite to a particular period of intrusion must rest upon evidence of an indirect, inferential and usually uncertain character. In showing the general distribution of the granites of Eastern Australia upon a map in which tentative or positive ages are assigned by colouring or shading, it is recognized that the only really safe reference is to describe the granites as intrusive into Pre-Cambrian, into Ordovician, Silurian or Permo-Carboniferous, as the case may be. (See Plate VI).

Pre-Cambrian Granites.

TASMANIA.

The Pre-Cambrian rocks of Tasmania include some altered basic igneous rocks but so far as is known no granites. Small intrusions of pegmatites into Pre-Cambrian rocks near Ulverstone, however, have been recognized.

Victoria.

The metamorphic rocks in N.E. Victoria, for a time referred to the Pre-Cambrian, are now believed to be Upper Ordovician sediments metamorphosed by and associated with younger gneisses and granites.

In Western Victoria granites, pegmatites and gneissic rocks occur among schists in the basin of the Glenelg River. Their age is not known with certainty, but as they show some resemblance to Pre-Cambrian rocks in South Australia they are regarded as probably of Pre-Cambrian age. The Dergholm granite in the Western District is an acid variety similar to the granites of the Murray Bridge district, and may be Pre-Cambrian. In the Bushey Creek district, south of Glen Thompson, a small triangular area of schists and other metamorphic rocks, including some granites, junctions sharply with normal folded sediments and with diabases and cherts to the north. These latter types are, in the absence of fossils, on lithological grounds correlated with the Lower Ordovician and Cambrian (Heathcotian) respectively. If this reference is correct the metamorphic rocks to the south and the granite types associated with them are presumably of Pre-Cambrian age.

New South Wales.

In Western New South Wales, in the Barrier Ranges, Lower Cambrian or Proterozoic sediments, including tillites, rest unconformably on a thick series of schists and gneisses of Pre-Cambrian age—known as the Willyama series. With them are associated acid granite gneisses and later biotite granite gneisses as concordant intrusions into the metamorphosed sediments. The rocks are commonly foliated. The foliated concordant types are regarded as deep-seated or abyssal injections. Later than these is a massive, rather acid type, with pegmatite, the Mundi Mundi granite. It occurs as sills or intrusive sheets. As no igneous rocks penetrate the Proterozoic(?) tillites it is inferred that both the massive and the foliated intrusions are of Pre-Cambrian age.

Queensland.

"Associated with the very metamorphosed Pre-Cambrian series of the Cloncurry district, with the supposedly Pre-Cambrian series of the Einasleigh district, and with several of those other very old series which may be Pre-Cambrian . . . there are found granite rocks of a very old facies" (Bryan). These older granites of the Einasleigh, Croydon and Cloncurry districts are largely due to "lit-par-lit" injection. While the bulk of these older granites is gneissic, coarse granites and intrusive pegmatite dykes also occur. The Pre-Cambrian age of the metamorphosed sediments of the Cloncurry district is inferred by reason of the fact that unaltered and relatively flat-lying fossiliferous Lower or Middle Cambrian sediments occur at the Templeton Range a few miles to the West. Since these Cambrian rocks are not penetrated by granite intrusions the Pre-Cambrian age of the gneissic granites is probable.

To the west of Cairns, as in the Mareeba district, are granite gneisses which are believed to be of Lower Palæozoic or older age.

Cambrian and Cambro-Ordovician Granites.

Tasmania.

The proved Cambrian sediments of Tasmania have no associated intrusive rocks.

Among the series described as Cambro-Ordovician in Tasmania are the porphyroid suite of igneous rocks interbedded with and also intrusive into the Cambro-Ordovician series, especially those associated with and overlying the Dundas series. They are overlain by the basal series (West Coast Range Conglomerates) of the Silurian system which contain pebbles of the porphyroid rock types. They are thus pre-basal-Silurian. Although not foliated they have been subjected to stresses resulting in strain and mineral re-constitution from which the Devonian granites are free.

The granitic rocks occur in the western, north-western and north-central divisions of the State; their areal extent is small but they are associated with other igneous rocks of the same suite which occupy a greater area. The granites are known from a few localities only, e.g., Mt. Farrel, where granite and syenite occur. The greater part of the plutonic rocks is a syenite with quartz in some specimens. At Dove River (and Bond Peak) an acid red granite and a granophyre occur. In the Low Rocky Point district long dykes of extremely coarse grained to medium grained acid granite are intrusive into the Cambro-Ordovician series.

Victoria.

The Upper Cambrian (Heathcotian) rocks of the Heathcote district in central Victoria consist largely of basic lavas ("diabase") and ashes and interbedded cherts passing up into chocolate-coloured shales. At Heathcote the "diabase" series is intruded by a fine grained granodiorite or microgranite in which oligoclase, orthoclase, muscovite and a little biotite occur. It differs markedly from the Devonian granites and is believed to belong genetically to the Heathcotian "diabases" and to be a late acid differentiate from the basic magma. It is only known to intrude the "diabase and diabase ash." Many of the Ordovician sandstones of Victoria on microscopic examination are found to contain a fair quantity of felspar, presumably of granitic origin. One may therefore safely infer their derivation from fairly wide-spread pre-Ordovician granites now largely buried beneath younger rocks.

New South Wales.

Albitised lavas and tuffs are interbedded with Ordovician sediments at Forbes and in this district granophyric soda-aplite and a fine grained albite gneiss, both evidently intrusive, occur. Their exact relationships with the volcanic rocks are not known, but their richness in soda suggests that they may be co-magmatic and if so their reference to the Ordovician is justified.

Queensland.

Granitic rocks of this age are unknown in Queensland.

Lower Devonian(?) Granites.

Tasmania.

Granites of post-Silurian age occur throughout Tasmania, but especially in the north-western, north-eastern, eastern and south-western parts. The largest areas are in the north-eastern and eastern districts, where they probably represent the outcropping portions of a batholith. The tin deposits of Tasmania are associated with these post-Silurian granites, while basic and ultra-basic intrusions are often associated with the granites, as slightly earlier intrusions.

The age of the granites is determined by the following evidence:—

1. They are intrusive into all rock formations up to and including the Silurian. They therefore are post-Silurian.
2. They are overlain by the basal beds of the Permo-Carboniferous and therefore are pre-Permo-Carboniferous.
3. The Older Palæozoic rocks have been eroded not only sufficiently to expose the granites but to form a peneplain before the Permo-Carboniferous beds were laid down. The granite intrusions thus occurred a considerable time before the Permo-Carboniferous.

These granites have usually been placed in the Lower Devonian and as such are placed here, but the evidence does not exclude the possibility of their being of Upper Devonian or even of Lower Carboniferous age. In the north-east district the normal rock type is porphyritic granodiorite approaching adamellite, but in the vicinity of the tin deposits the granite is usually finer, more even grained and contains muscovite, either primary or secondary. At Lisle and Golconda the rock is a non-porphyritic, fine grained biotite granite. In close proximity to the tin deposits, pegmatite, aplite and greisen occur. At Heemskirk, Meredith Range and Stanley River, pink granite, granite porphyry, aplite and pegmatite occur. In the Balfour district the granite is porphyritic and medium grained while at Moina it is a pink, even and medium grained rock.

Victoria.

The bulk of the granitic rocks of Victoria used to be regarded as probably of Lower Devonian age. For many of the occurrences the evidence was, and still is, unsatisfactory. The acid granite porphyry of Mt. Taylor near Bairnsdale is clearly pre-Upper Devonian, for flat-bedded sediments of that age rest upon it. Howitt described several granitic rocks and quartz-mica diorites in North Gippsland, especially in the Omeo and Ensay districts, as intruding the Silurian [Upper Ordovician]. Some of his papers were written before the term Ordovician was coined and all of them before the term was in current use in Australia. Some writers who have quoted Howitt's work have not realized that his Silurian rocks are Upper Ordovician in our present sense. Howitt refers, however, to certain granitic rocks as underlying the Snowy River Porphyries, which pass up into the Middle Devonian limestones. Such granites he referred to the commencement of the Lower Devonian and the reference seems to be justified. The general low dips, apart from local folding, of the Mid-Devonians of Buchan and Bindi and the absence of granitic rocks intrusive into them suggest that the granitic rocks of much of Eastern Victoria antedate the Mid-Devonian. The only area of Mid-Devonian sediments which is closely folded is near Tabberabbera, where a diorite-porphyrite may be intrusive into them, but its relations are not precisely settled. Many of the granitic and gneissic rocks of Eastern Victoria are clearly intrusive into Upper Ordovician sediments. We may conclude that in much of Eastern Victoria the granitic and gneissic rocks are post-Upper Ordovician and probably pre-Middle Devonian, but beyond that we cannot go with certainty. The question as to whether granitic intrusions followed the close of the Ordovician period or the close of the Silurian period deserves consideration.

The Silurian and Ordovician sediments are more completely developed and have been more closely studied in Victoria than in New South Wales or the other States. It is found that the strikes of the two series are sometimes discordant, suggesting unconformable relations and a period of earth movements between them. But the inliers of Upper Ordovician rocks north of Walhalla and in the Wood's Point district have similar strikes and dips to the adjoining Silurian sediments. The Ordovician sediments are generally, but not always, more closely folded than the Silurian sediments, but the graptolite content of the beds at the top of the Upper Ordovician and those at the base of the Silurian show such marked resemblances and so few differences that the time interval between them must have been small, and little or nothing of mountain-making movements could have occurred during this interval. Even if close folding of the mountain-making type could be demonstrated to occur in such a time interval, it would not prove that granitic intrusions accompanied it, for such intrusions, while common in these circumstances, are sometimes wanting. Tattam (Bull. 52, Geol. Surv. Vic., 1929), following an earlier view of Howitt, points out that the metamorphic belt of North-Eastern Victoria with its associated foliated gneisses and massive granites appears to constitute the axis of a big structural anticline or geanticline, on either flanks of which lie normal Upper Ordovician sediments. Tattam points out that outside this belt the Silurian sediments outcrop to the west, north, and east. These relations suggest either the elevation and erosion of the axis of Ordovician rocks around which the Silurian beds were deposited, or that it formed the major anticline of the whole Lower Palæozoic system in which both Silurian and Ordovician rocks were involved. He inclines to the latter point of view, i.e., that the period of folding and of intrusion of granites and gneisses followed the Silurian and is probably referable to the Lower Devonian period. The evidence is suggestive rather than conclusive, but I have adopted this view for the purposes of this paper.

Tattam has shown that many of the concordant granite gneisses, with NNW. strike of the foliation, are lit-par-lit injections into the Upper Ordovician sediments and include many examples of contaminated rocks. At Koetung the Tallangatta gneisses merge gradually into the massive acid granite. He regards the Tallangatta gneisses as a sheared phase of the granite. Howitt adopted the same view for most of the gneisses he examined further south near Omeo. At Corryong a grey granite is intruded by a pink granite and both of them by acid dykes. The Mitta Mitta and Bethanga gneisses and schists include acid granite dykes and veins which are tin-bearing. The acid granite of the Pilot range near Beechworth is also tin-bearing. The Buffalo granite is a true acid granite, while the Tatonga mass is granodiorite and the rock at Ensay is described as a quartz mica diorite. With the Lower Devonian granites may be placed tentatively, on inadequate evidence, the tin-bearing acid granite of Wilson's Promontory, the pink granite of Cape Wollamai and the porphyritic acid granites of the Dog Rocks and of the You Yangs, near Geelong. In this uncertain group just mentioned the granites in most cases can be proved to invade Ordovician rocks, but how much younger they are is uncertain.

New South Wales.

Browne (Pres. Addr. Linn. Soc. N.S.W., 1929) claims that the earth movements at the close of the Ordovician period were the most intense, except those closing the Willyama sedimentation, that have been experienced, not only in New South Wales, but also in Queensland, Victoria and Tasmania. He points out, however, that little igneous activity can be found to be associated with these earth movements in New South Wales. He instances the Cooma gneisses formed by lit-par-lit injection and with primary gneissic banding and with meridional strike of the foliation. The only other area referred to is Albury where schists are penetrated by acid granites. The evidence adduced by Dr. Browne seems to me to be insufficient to relate these intrusions to the close of the Ordovician period. In Victoria, as I have previously stated, post-Ordovician and pre-Silurian earth movements, while definite in some places, are in others feeble or absent, and the time interval, as measured by graptolite similarities in the two rocks, seems very small. We have no granitic rocks in Victoria which we can definitely assign to this period, unless we include on grounds of negative evidence the acid granites of Victoria which intrude Ordovician sediments but so far as is known do not come in contact with the Silurian. Dr. Summers (Proc. Roy. Soc. Vic., n.s., xxvi (2), 1914) showed, however, that study of the chemical analyses of the acid granites of Victoria links them with the granodiorites which invade the Silurian as well as the Ordovician sediments. The latter for reasons stated below are now placed in the Upper Devonian. Dr. Browne's evidence with regard to the Cooma gneisses shows that they are post-Ordovician, but he associates their intrusion with the earth movements at the close of the Ordovician without giving any definite evidence. In the circumstances, I think the balance of evidence, mainly indirect I admit, justifies me in placing these Cooma gneisses tentatively in the Lower Devonian and I would also include here the acid granites intrusive into the schists at Albury. The Kosciusko foliated gneiss and unfoliated acid granite and the composite mass with meridional trend stretching from Cooma northwards to the Federal Territory are also placed here. This intrusion is partly a quartz mica diorite, in places it becomes gneissic, especially on the eastern boundary and along this eastern edge is a pink or white acid granite-gneiss. Towards the northern end of the mass, orthoclase comes in and the rock becomes a granite with cataclastic foliation. Similar to the Kosciusko mass is an extensive intrusion of granite and gneiss from the Toolong and Bogong districts, 20-30 miles north of Kosciusko. East of the Federal Territory mass at Michelago are two elongated granitic intrusions with foliation in places. Further north on the eastern shores of Lake George a foliated granite-gneiss may belong to this period and at Wheeo, 60 miles north of Canberra, is a gneissic granite similar to the Cooma-Federal Territory mass.

QUEENSLAND.

The Charters Towers granodiorite with later aplite appears to belong to the Lower Devonian, for Middle Devonian sediments rest on it in places. Hence it is of pre-Middle Devonian age. At Silverwood in Southern Queensland, Richards and Bryan (Proc. Roy. Soc. Qld., xxxvi (6), p. 44, 1924) have described boulder beds including granite types which indicate the former existence in that district of granites of Lower Devonian or older age. Upper Devonian rocks in the Rockhampton district in Central Queensland contain granite pebbles and in the coastal strip between Rockhampton and Townsville granitic rocks of more than one age occur (Dr. Whitehouse, personal communication).

Upper Devonian.

TASMANIA.

The tin bearing granites of Tasmania in this discussion have been placed in the Lower Devonian, but it is recognized that this reference is not based on very positive information and there is a possibility that they may belong to the Upper Devonian or even to the Lower Carboniferous series of intrusions.

VICTORIA.

It has long been known that many of the granodiorites and adamellites of central Victoria are intrusive into but co-magmatic with the dacite series. The dacites had been regarded as probably Lower Devonian, since in the northern part of the Strathbogie district there was some evidence that a rock apparently related to the dacite was overlain without intrusion by Upper Devonian or Lower Carboniferous sediments (Skeats, Pres. Add. Aust. Assoc. Adv. Sci. Brisbane, 1909). The recent work of Hills (Proc. Roy. Soc. Vic., n.s., xii (2), 1929, and xiii (1), 1929) has shown that in the Taggerty-Marysville district the Upper Devonian sequence consists of fossiliferous Upper Devonian sediments at the base, followed by rhyolites and then dacites. He has traced this succession to Marysville where the granitic rocks invade the dacites. It follows that these granodiorites and adamellites in central Victoria which are related in this way to the dacites, should now be referred to the close of the Devonian period. This includes granitic rocks in the Macedon, Dandenong ranges, Healesville, Warburton, Marysville and Strathbogie areas definitely. The Strathbogie granite continues westwards to Trawool. The remaining granitic rocks, apart from those previously referred to and with the exception of those in the Grampians to be discussed later, form a group whose age cannot be precisely defined. In the Werribee Gorge the adamellite was exposed before the Permo-Carboniferous tillites were laid down. Some of them, such as the Baw Baw, Gembrook, Narrewarren, Pyalong and Mount Disappointment masses, invade the Silurian sediments and are therefore post-Silurian. Others like the Harcourt masses and smaller intrusions in the Pyrenees are intrusive into Ordovician, generally Lower Ordovician, sediments but do not come into relation with younger rocks. They are principally granodiorites or adamellites and many of the goldfields of Victoria are in Ordovician rocks closely associated with these granitic rocks. All these rocks are here provisionally placed with the Upper Devonian as they have certain differences of distribution and of mineral characters from the Lower Devonian intrusions. In the Wedderburn district (O. A. L. Whitelaw, Mem. Geol. Surv. Vic. No. 10, 1911, pp. 9-10) an earlier coarse granite with porphyritic orthoclase is intruded by a later pink fine grained granite with tourmaline. These granites at the contact with the Ordovician sediments contain hornblende and pass into granodiorites. Both granites are invaded by felspar porphyrite and pegmatite dykes. In the extreme eastern part of Victoria a granite mass, starting at Gabo Island and Cape Everard passes northerly into south-eastern New South Wales where it is intrusive into Upper Devonian sediments. This granitic mass therefore is represented on the map as intrusive into the Upper Devonian.

New South Wales.

Under this age group appear to come the bulk of the granitic rocks of New South Wales except those previously referred to, and excepting also the younger granites within the Permo-Carboniferous basin in the eastern and north-eastern part of the State. Sussmilch has given the name of Kanimbla epoch to the period of earth movements and of granitic intrusions, which may possibly belong to or extend into the Lower Carboniferous. The intrusions consist of massive transgressive batholiths with a general meridional elongation which may be to some extent determined by the direction of Devonian folding. The distribution is generally within the limits of Upper Devonian strata, extending to beyond the River Darling to the west but not as far east as the Serpentine belt running through Tamworth. With these intrusions are associated gold, copper, silver, lead, zinc, and tin, tungsten and molybdenum, bismuth, and some antimony and arsenic deposits. These, with the exception of gold, are not found with the Older Palæozoic intrusions. It is true that these minerals are also characteristic of the late Palæozoic granites of New England, but these latter are geographically restricted to the north-east of New South Wales. Dr. Browne describes the principal masses, which include the following:—

Mt. Werong extending N.E. to Kanimbla and Hartley, and towards Jenolan and Bathurst and westerly through Sodwalls, Oberon and Tarana to Bathurst plains. Acid phases occur in the Upper Macquarie, and at Yetholme it has produced deposits of molybdenite and in other places gold and wolfram. It includes aplites, pegmatites, porphyritic biotite granite, hornblende biotite granite, quartz monzonite, granodiorite, quartz mica diorite, etc. Porphyritic granites outcrop between Capertee and Mudgee and non-porphyritic types N. of Mudgee, at Gulgong, Ulan in the Upper Goulburn Valley, and various places along the western margin of the Permo-Carboniferous basin as far as Wombeyan. At Blayney, Harper (1920) found sphene-bearing quartz mica-diorite resembling the Hartley type intrusive into old Palæozoic sediments and Morrison (1916) noted molybdenite in an acid granite at Manildra, near Molong. Near Dubbo is the northern extremity of a mass of granite which extends far to the south. At Yeoval in this belt tungsten occurs. At Engowra normal biotite granite rich in orthoclase occurs extending northwards towards Forbes and Parkes.

Morrison thinks this is intrusive into Upper Devonian strata and petrological characters support this, but Andrews (1910) says it is pre-Devonian. Possibly there are two intrusions of different ages. The biotite granite of Cowra contains occasional garnets derived from sediments. This is probably Upper Devonian. The granites in the Condobolin district and Nymagee and Nuyngan are all believed to be Devonian. At Wyalong (Watt, 1899) quartz mica diorite, much crushed in places, passes into hornblende quartz diorite with fluxional fabric. At Ardlethan Harper (1912) described some biotite granite, but the principal type is very acid with tourmaline, topaz, mica and fluorspar; metallic minerals are ores of tin, copper, bismuth, molybdenum, tungsten, lead and zinc. The acid phase extends 45 miles NNW. through Yalgogrin to Mulyan and at least 30 miles SE. of Ardlethan and it may be more than coincidence that ores of tin, tungsten and molybdenum, associated with acid granite are found at intervals along a belt running SSE. through Pulletop, Holbrook to Jingellic on the Murray (Carne 1894; Harper 1912). At Hume reservoir, 10 miles from Albury, a granite of the massive biotite type is different petrologically, and is grouped by Dr. Browne with the Kanimbla types. I personally prefer to associate it with the Lower Devonian(?) intrusives in N.E. Victoria. At Adelong Harper (1916) states that quartz felspar porphyry accompanies the granite, which is partly a hornblende-biotite type but with acid differentiates, greisen, aplite and tourmaline rocks. This Adelong granite may belong to the same mass as that of Tumbarumba to the south and a porphyritic granite north of Yarrangobilly. The eastern margin of what is believed to be the same granite crosses the Murrumbidgee at

Burrinjuck, intruding into Middle Devonian sediments, and is a granite with both normal and pink acid varieties. At Kiandra, Andrews (1901) includes monzonites, also biotite hornblende granite with sphene, closely resembling some of the Bathurst-Hartley types, but the relations to the monzonite are uncertain. At Berridale, the granite extends north towards Adaminaby and south through Dalgety. It is tonalitic between Berridale and Cooma, is massive and post-Ordovician and believed to be late Devonian from its petrological and structural characters which contrast strongly with the intrusions of Cooma. The similar granodiorite of Gunning and quartz diorite of Binalong (Carne 1892) are believed to be late Devonian. The Tallong hypersthene-diorite (Woolnough 1909), is associated with the Marulan granite. South from Goulburn are the massive acid granites of Mt. Fairy and Boro, south-east of Tarago, where tinstone has been mined (Harper 1915). At Braidwood and Major's Creek occurs a hornblende biotite granite with free gold. At Yalwal the section in the Shoalhaven tributaries shows Upper Devonian sediments injected by acid granite. At Moruya, on the South coast (Browne 1928), is a complex ranging from ultra-acid aplite to basic hornblende gabbro. The intrusion is sheet-like and may link up with that of Araluen about 30 miles north-west. Further south along the coast are quartz diorites at Cobargo, probably of Kanimbla age, the granite and quartz mica diorite of Brogo, and porphyritic granite and sphene bearing granodiorite of Bega. This complex extends west nearly to Nimmitabel, south-west to near Bombala and south through Wolumla and Wyndham beyond the Victorian border east of Nungatta River; gold, tungsten, molybdenum and bismuth occur in it (Carne 1897).

Among the Kanimbla intrusions there is a tendency for the concentration of tinstone along the western or south-western part of the area and of sphene in granites and granodiorites of the more easterly belts, such as the south coast and along the western margin of the Permo-Carboniferous basin. Carne (1896) has shown on the South Coast at Eden and Pambula and possibly Wagonga and Tathra further north that auriferous quartz felsites intrusive into Upper Devonian sediments are themselves intruded or metamorphosed by the granite. It appears that the felsites antedate the granites while porphyries and porphyrites were sometimes later than the granites but frequently of indeterminate age relationship. Kanimbla intrusions are cut off sharply to the east by the western boundary of the Permo-Carboniferous basin, but the granodiorites of Pokolbin (David 1907) and Gosforth (Browne 1926), exposed by faulting and erosion, are sphene-bearing rocks of Kanimbla type and are overlain by Kuttung sediments and lavas.

One difficulty experienced in setting down on a map of Eastern Australia the granitic areas and trying to represent intrusions of different ages by different shading, is the lack of respect shown by granitic masses in ignoring interstate boundaries. The Kosciusko mass starts in North-Eastern Victoria and extends as a continuous mass in a northerly direction past Young to Grenfell. On the Victorian side these are shaded as Lower Devonian(?) intrusions and the author has continued the shading into New South Wales in the Kosciusko mass until he lost courage as he was trespassing into the heart of the Upper Devonian intrusions.

Some of the difficulty may be due to the fact that the Geological Survey maps in this part of Victoria and of New South Wales represent only reconnaissance work and intrusive masses shown as continuous may be really discontinuous. It may be that a continuous intrusion may be a composite of intrusions of different ages. Certain it is that we have still much to learn before we can set down on a map information as to age and distribution of the granites in this region which is beyond the reach of destructive criticism.

Queensland.

The granite of Newelltown in North Queensland may be Upper Devonian or even possibly Lower Carboniferous. Jensen (Qld. Geol. Surv., Publ. 274, 1923, p. 19) quotes Stirling as stating that the granitic intrusions do not affect sediments containing Rhacopteris. The granite may be Upper Devonian but the intrusion of similar granites into the Hodgkinson series (Devonian) according to Jensen makes it likely that the granites are Devono-Carboniferous or early Carboniferous.

Carboniferous.

Tasmania.

Granites definitely of this age are unknown in Tasmania. It is just possible that the tin-bearing granites, or some of them, may belong here.

Victoria.

The Grampian sandstones in Western Victoria yielded a few fossils some years ago (Ferguson, Chapman, Rec. Geol. Surv. Vic., v (1), 1917). The fish remains include *Physonemus micracanthus* Chapman, and *P. alternatus* Davis. In addition the brachiopod *Lingula squamiformis* Phillips, var. *borungensis* Chapman occurs in considerable numbers in a very thin band of shale. On this evidence Mr. Chapman says they undoubtedly belong to the Lower Carboniferous. Professor Benson, however, (Trans. N.Z. Inst., 1923, p. 28) is not convinced that these few fossils finally settle the Lower Carboniferous age of the Grampian sandstone. He points out that *Lingula squamiformis* also occurs in the Upper Devonian and the evidence from the fossil fish is not convincing. He is inclined to group them with the Upper Devonian. I have followed Mr. Chapman in his interpretation, but I realize that if Professor Benson is correct these rocks would find a place with the Upper Devonian of this State. Granitic rocks of the hornblende granodiorite type, and hornblende porphyrite and quartz porphyrite dykes, are all intrusive into the Grampian sandstone at Mt. William and also near Wartook dam (Skeats, E. W., Proc. Roy. Soc. Vic., n.s., xxxvi, 1923). I have suggested that the intrusions may have occurred during the formation of the main geosyncline of the Grampians possibly during the Middle to Upper Carboniferous periods. If, however, these sandstones belong to the Upper Devonian, the intrusions may fall into line with the Upper Devonian intrusions of Central Victoria.

New South Wales.

No granitic intrusions can with certainty be placed here, but it is possible that some of the earlier of the New England granites may belong to this period. Near Ashford, Sir Edgeworth David has recently (May, 1930) found a small granite erratic in Permo-Carboniferous fluvio-glacial conglomerate and what appears to be a similar granite in situ within half a mile. G. D. Osborne's evidence of absence of granite pebbles in massive Wallarobba conglomerates at the base of the Kuttung, but extraordinarily abundant coarse shingle and blocks of granite on top of the volcanic series of the Kuttung, i.e., top of the Middle Kuttung (200 feet thick coarse conglomerate entirely formed of granite), indicate the former exposure of granites of at least Carboniferous age.

Queensland.

No granitie rocks of this age are definitely known. It is possible that the Newellton granite, described under the Upper Devonian, may belong here.

Permo-Carboniferous.

Tasmania and Victoria.

No granitic rocks of this age are known.

New South Wales.

Granitic rocks of this age appear to be restricted to the New England district and were first clearly described by Andrews (Rec. Geol. Surv. N.S.W., viii (3), 1905), who states that the youngest of them may belong to the commeneement of the Mesozoie period.

The sequence established by Andrews is:—

1. "Blue granite," a sill or laccolithic intrusion of quartz porphyrite with augite, hornblende and biotite phenocrysts set in a fine-grained to microcrystalline matrix.

2. Quartz monzonite or granodiorite with large crystals of sphene and orthoclase. This rock is of great areal extent throughout northern New England and a similar type occurs at Kootingal and Walcha Road about 150 miles to the south.

3. Coarse acid granites with aplite, quartz porphyry and spherulitic granophyre dykes. These granites are associated with the deposits of tin, molybdenum, bismuth, tungsten and antimony so widespread in northern New England.

At Mount Dromedary, on the south coast of New South Wales, Miss Brown (Proc. Linn. Soc. N.S.W., liv (1), 1929) described the injection of a monzonite magma with alkaline differentiates including shonkinites and nepheline-bearing types. It is the only alkaline plutonic intrusion of probable pre-Triassic age in New South Wales.

Queensland.

Jensen (Qld. Geogr. Journ., 1918-20) described the early Carboniferous as a time of violent folding and great granitic intrusion in northern Queensland, but in a later publication (Qld. Geol. Surv. Publ. No. 274) he says the "Newer granites of the Etheridge and Croydon districts have not undergone metamorphism. They are consequently of Carboniferous or later age. . . . probably late Carboniferous." Ball regards most of the granites of North Queensland as of Permian age. Bryan (Pres. Addr. Roy. Soc. Qld., 1925) agrees with the Permian or Permo-Carboniferous age of these granites and extends it also to those of Southern Queensland with a few exceptions to be noted later. Among these granites are the newer intrusions of the following districts: Herberton, a biotite granite; Etheridge, a hornblende and biotite granite; Chillagoe, including tonalite and monzonite; Cairns, Mareeba and Townsville, true granites. All these are in North Queensland. Among the South Queensland granitic intrusions also placed here are the intrusions of Enoggera and Kedron Brook near Brisbane, with granite porphyry, hornblende quartz diorite and biotite granite. The Silverwood granite and the Maryland adamellite are placed here. True granites occur near the New South Wales border in the Stanthorpe district, while the "Blue granite" of Wallangarra is a granite porphyry.

Triassic and post-Triassic.

Tasmania and Victoria.

No granites of Triassic age are known.

New South Wales.

Andrews (1905) suggested the possibility that some of the later granites of New England might belong to the earliest part of the Mesozoic period. This view has been confirmed and made precise by recent evidence obtained by Professor Richards and Drs. Bryan and Whitehouse (personal communication, May 4th, 1930). They have shown in the Drake goldfield at Kettle's Lift, between Drake and Tabulam and about 6-7 miles west of Tabulam, that the Clarence series, containing *Cladophlebis,* and probably of Walloon age, is disturbed and intruded by a granite resembling the "Sandy granite" near Wallangarra.

This is the first definite record in New South Wales of granites intruding rocks probably of Upper Triassic age.

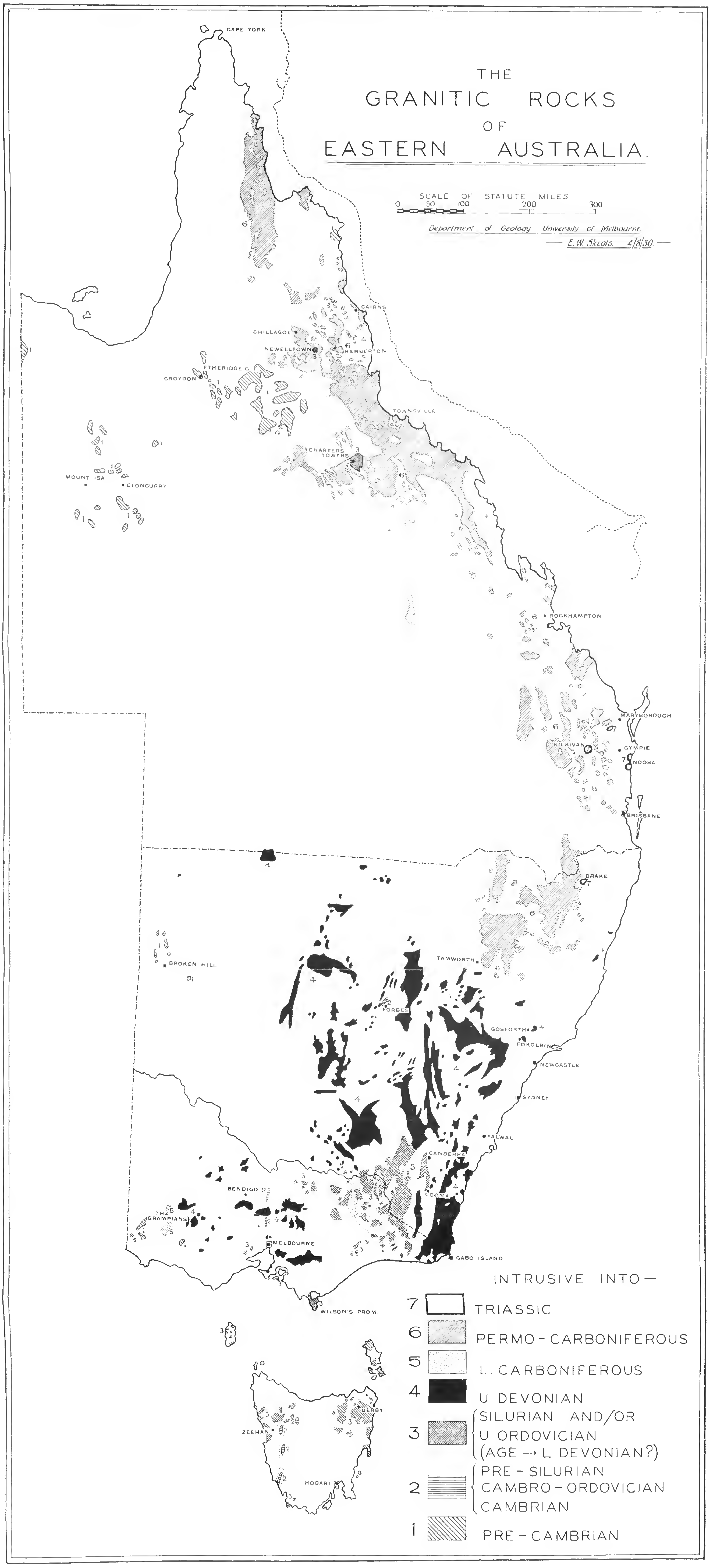
Queensland.

The youngest granitic rocks of Queensland, so far as is yet known, occur in the most easterly part of Queensland in the neighbourhood of Gympie and of Maryborough. At Mt. Bopple, south-west of Maryborough, graphite has been formed by intrusions of "syenite" (Min. Index of Qld., p. 761) into the Tiaro series (Walloon). At Kilkivan, 30 miles north-west of Gympie, the presence of a cinnabar lode in tuffaceous rocks yielding *Cladophlebis* and also in a neighbouring granite suggests a granitic intrusion into the Upper Triassic sediments. At Point Arkwright and Noosa, south-east of Gympie, grey diorite intrusions into the Tiaro (Walloon) coal measures occur. These occurrences appear to be the youngest granitic intrusions in Queensland of which there is evidence.

Possible Generalizations.

A survey of the evidence of the granitic intrusions of Eastern Australia indicates certain possible correlations or generalizations which may be suggestive. Among them are such questions as:

1. The areal distribution of the granitic intrusions.
2. The association of granitic intrusions with periods of severe mountain folding.
3. The association of granitic intrusions with directions of fold or fault movements.
4. The association of particular geological periods with soda-rich intrusives.
5. The relation of certain granitic intrusions to the occurrence of metallic minerals.


THE
GRANITIC ROCKS
OF
EASTERN AUSTRALIA.
SCALE OF STATUTE MILES
0 50 100 200 300
Department of Geology, University of Melbourne.
E.W. Skeats. 4/8/30.
CAPE YORK
CAIRNS
CHILLAGOE
NEWELLTOWN
HERBERTON
ETHERIDGE G.
CROYDON
TOWNSVILLE
CHARTERS TOWERS
MOUNT ISA
CLONCURRY
ROCKHAMPTON
MARYBOROUGH
KILKIVAN
GYMPIE
NOOSA
BRISBANE
DRAKE
TAMWORTH
BROKEN HILL
FORBES
GOSFORTH
POKOLBIN
NEWCASTLE
SYDNEY
YALWAL
CANBERRA
COOMA
BENDIGO
THE GRAMPIANS
MELBOURNE
GABO ISLAND
WILSON'S PROM.
DERBY
ZEEHAN
HOBART
INTRUSIVE INTO—
7 TRIASSIC
6 PERMO-CARBONIFEROUS
5 L. CARBONIFEROUS
4 U DEVONIAN
3 SILURIAN AND/OR U ORDOVICIAN (AGE → L DEVONIAN?)
2 PRE-SILURIAN CAMBRO-ORDOVICIAN CAMBRIAN
1 PRE-CAMBRIAN

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The Areal Distribution of Granitic Intrusions.

1. The Pre-Cambrian granites appear to be limited to the western part of Eastern Australia, i.e., Western Victoria, Western New South Wales and the Western part of North Queensland. This may lend support to the hypothesis of the growth of Australia from West to East by the attachment of folded sedimentary geosynclines on the eastern border of the continent throughout the Palæozoic and Mesozoic periods. These later accretions apparently have not been sufficiently deeply dissected by erosion to expose any Pre-Cambrian rocks in the Eastern part of Eastern Australia. At Facing Island, however, ancient schists are unconformably overlain by a representative of part of the Brisbane schist series.

2. Cambrian and Cambro-Ordovician intrusions are limited to small areas in Western Tasmania and in Central Victoria with the possible inclusion of a small area of soda-rich intrusions in the Ordovician of the Forbes District of New South Wales.

3. Lower Devonian(?) granitic intrusions are widespread in Tasmania, Eastern Victoria and in Southern New South Wales. There is some uncertainty as to the precise age of the Tasmanian intrusions and of some of those in Victoria and New South Wales.

4. Upper Devonian granitic intrusions are spread widely in Central Victoria, and in New South Wales occur in the southern, south-eastern and west-central parts.

5. Lower Carboniferous intrusions are recorded in a small area in the Grampians in Western Victoria and at Newellton in North Queensland. These may possibly be Upper Devonian in age.

6. Permo-Carboniferous intrusions are not recorded in Tasmania and Victoria. In New South Wales they are restricted to the north-east part of the State but are widely distributed in Queensland, in the south, the central and the northern parts of the State.

7. Triassic or post-Triassic intrusions have recently been recognized near Drake in Northern New South Wales and at three localities in South-Eastern Queensland, near Gympie and Maryborough.

This distribution suggests an easterly migration of the locus of granitic intrusion from the Pre-Cambrian up to and including the Lower Devonian period, the latest period of severe compressive movements in the southern part of Australia.

In the Permo-Carboniferous the area is restricted to Eastern and Northern Australia.

In the Triassic or post-Triassic the intrusions are still more narrowly restricted to limited areas in Northern New South Wales and South-East Queensland.

Association of Granitic and Gneissic Intrusions with Periods of Severe Mountain Folding, i.e., Periods of Compressive Movements.

The sill-like, lit-par-lit, concordant types of intrusion, associated with fluxion-gneisses or cataclastic gneisses and with highly folded and metamorphosed sediments, are the usual criteria by which the eroded stumps of a great folded mountain range are recognized.

Judging by these criteria there are only two important periods of mountain-making folding in Eastern Australia, the Pre-Cambrian, widely distributed in the western part of the area from Western Victoria through Western New South Wales to North-West Queensland, and the Lower Devonian(?) which appears to be restricted to North-Eastern Victoria and the southern part of New South Wales.

The Association of Granitic Intrusions with Periods of Tensional Stress.

Probably the bulk of the massive granites, ranging in age from Lower Devonian to Triassic, were intruded under conditions of tension, although apparent exceptions are to be noted in the Lower Devonian in certain massive granites passing marginally into foliated gneisses in Victoria and New South Wales.

The Association with Directions of Fold Movements or of Fault Movement.

The distribution of Lower Devonian gneisses and granites in Victoria and New South Wales shows a general northerly elongation, although in North-East Victoria the trend is north-north-west along lines established or renewed in post-Upper Devonian times, since the strike of the Upper Devonian sediments between Mt. Wellington and Mansfield conforms to this direction.

In Central Victoria the Upper Devonian granites have a general west to east trend and the boundaries seem in places to be guided by faults. This and their massive transgressional character suggest the development of tensional stresses following the Lower Devonian period of compression and folding.

In New England Professor David has claimed (quotation from Bryan, p. 68, David, Journ. Roy. Soc. N.S.W., 1911, p. 56) that the axes of granitic intrusions differ from the general north-north-west strikes of the folded Palæozoic rocks and seem to sympathize with the north-north-east trend of the present coast-line and continental shelf. Dr. Bryan suggests that they are discordant with older pressure directions and concordant with newer tension directions.

The distribution of the granites on the map, especially if allowance is made for the cover of younger sediments, seems to me to bring the axes of the intrusions into approximate alignment with the strike of the axis of the pitching anticline of the older Palæozoic sediments and with that of the subsequent syncline of the Permo-Carboniferous and Triassic rocks, i.e., the granites were intruded along lines of structural weakness developed by tensional stresses late in the Permo-Carboniferous and extending into the Mesozoic period.

The Association of Soda-rich Granitic Intrusives with Rocks of a Particular Period.

The Cambro-Ordovician intrusions of Tasmania, the Cambrian intrusions of Heathcote in Victoria and the somewhat later Ordovician(?) intrusives of the Forbes district in New South Wales suggest a common period of Cambrian to Ordovician soda-rich intrusions.

The Distribution of Metallic Minerals in Relation to Granitic Intrusions.

Gold is widely distributed in space and in time but especially in relation to the granodiorites and adamellites and is not associated with acid granites.

Tin and wolfram are especially associated with acid granites or with the acid margins of granodiorites and are absent from the granodiorites. So far as distribution in age is concerned they are associated with intrusions which may be Lower Devonian in Tasmania, Victoria and at Ardlethan in New South Wales. They are found with some of the Upper Devonian intrusions in New South Wales. They are especially associated with the acid granites of late Permo-Carboniferous to Triassic age in New England and in Southern and Northern Queensland. It may be claimed that this distribution lends support to the hypothesis of a progressive lateral and northerly migration of the tin bearing granitic magmas from the Lower Devonian to the Triassic.

Molybdenum is developed in Lower Devonian(?) granites of Everton near Beechworth in N.E. Victoria, in the Upper Devonian granite of Manildra near Molong in New South Wales, and molybdenum and bismuth occur freely in the late Permo-Carboniferous granites of New England and North Queensland.

[Proc. Roy. Soc. Victoria, 43 (N.S.), Pt. II, 1931.]

Art. X.—*A New Species of Lymexylonidae (Coleoptera).*

By J. CLARK, F.L.S.

(Entomologist to the National Museum of Victoria, Melbourne).

[Read 11th September, 1930; issued separately 20th January, 1931].

Atractocerus crassicornis, n. sp.

Female.—Length 30 mm.

Brown. Antennæ and legs lighter, more reddish, tarsi yellow. Pronotum with a longitudinal yellow vitta, extending on to the head and scutellum. Eyes black, with a silvery sheen below. Elytra reddish, lighter in middle.

Head rounded, longer than broad, finely punctate-rugose, very finely and densely reticulate between the punctures: a shallow longitudinal groove extending from the middle of eyes to posterior border. Eyes very large, practically touching from centre to front. The whole of the head, including the eyes, clothed with short erect yellowish hairs. Mandibles rather long, shining near apex; densely clothed with long reddish hairs. Clypeus very short, concave in front. Palpi (Fig. 1*c*) large, half as long as antenna, with 6 or 7 finger-like branches at each side bent inward, basket-like. Antennæ short and thick, slightly longer than the head, densely clothed with short, oblique, reddish hairs, rather longer and more erect on the first two segments; first segment slightly broader than long, broadest in front, second subglobular, smaller than the first, third to ninth twice as broad as long but decreasing rapidly in size from the fourth, tenth one-fourth longer than broad, eleventh as long as broad, apical short and sharp pointed. Prothorax slightly longer than broad, sides parallel to the apical third then evenly rounded in front; a wide and moderately deep longitudinal groove on top, wider and deeper behind than in front, densely covered with shallow piligerous punctures, the hairs yellowish, short and erect. Elytra slightly longer than head, finely reticulate-punctate, the punctures coarser near base. Abdomen long and slender, the sides parallel, densely and rather finely punctate; pubescence yellow, very fine and close-lying, some long erect hairs on the sides in front. Legs long and slender.

Habitat.—North Western Australia: Turkey Creek (F. May).

Captured at light at night. Type in National Museum.

Near *A. kreuslerae,* from which it is readily distinguished by shorter and thicker antennæ, slightly different palpi, more elongate prothorax and very short elytra. The colour too is much

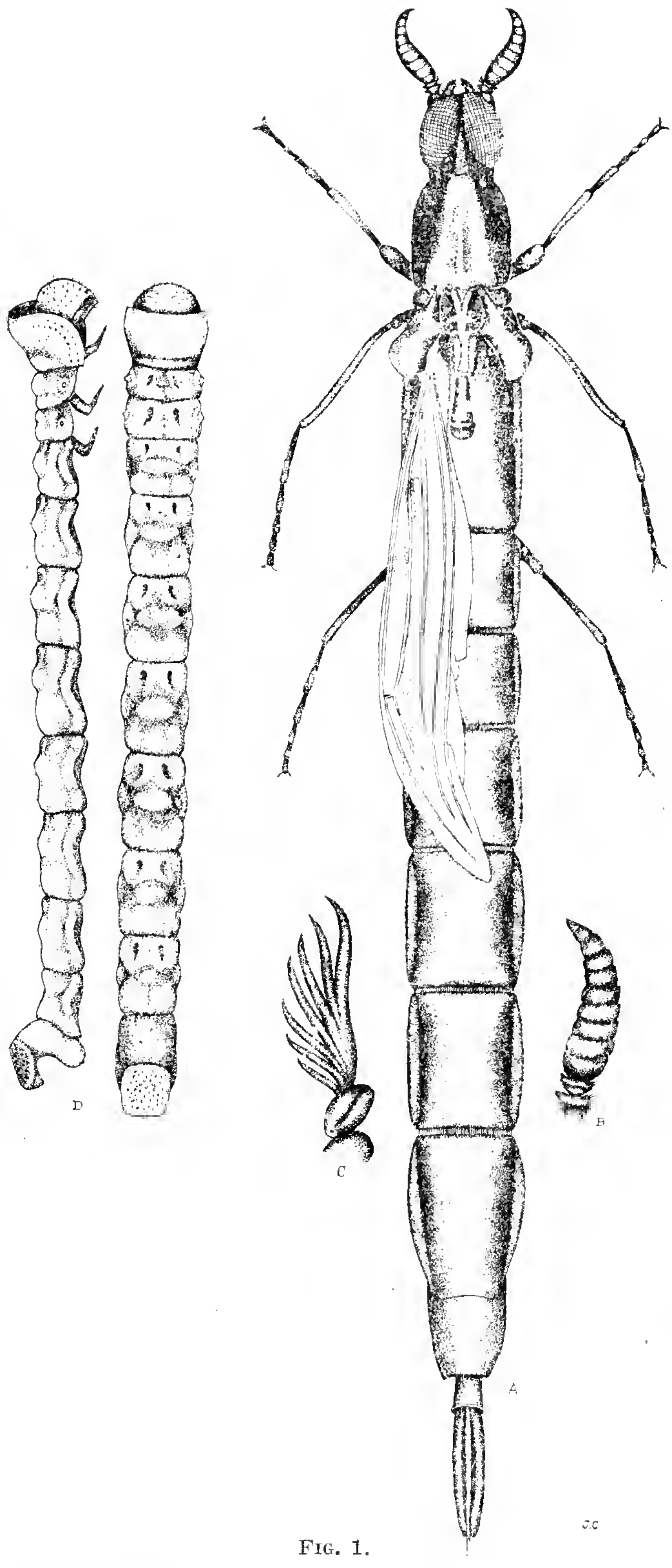


Fig. 1.

A. *Atractocerus crassicornis*, n. sp. Female, one wing removed to show segments.
B. Antenna.
C. Palpi, showing only one half, or side, greatly enlarged.
D. Top and side view of larva of *A. kreuslerae* Pasc.

darker and the broad yellow vitta is lacking in the former. The palpi are branched as in *A. kreuslerae* but the branches are not pectinate as in that species.

In a previous article (1) on the bionomics of *A. kreuslerae* Pasc., I erroneously stated that the antennæ have eleven segments. They have twelve segments, the apical being small, almost fused with the eleventh. I have also examined the antennæ on the type of *A. victoriensis* Blkb., in the National Museum collection: they have twelve segments. It is probable that the antennæ of *A. tasmaniensis* Lea have also twelve segments, although he mentions only the seventh to eleventh as thin.

A curious error appears in Tillyard's "Insects of Australia and New Zealand," 1926, p. 213. Speaking of *Atractocerus* he says:—"These insects have been seen in Western Australia flying in swarms around bushes at dusk, rising and falling in the air like May-flies." When on the wing the beetle may easily be mistaken for a May-fly or other Neuropteron as I had stated in the previously mentioned journal. The resemblance is, however, confined to the peculiar manner in which the long body is carried when in flight, not from a habit of flying in swarms. The beetles usually emerge from their burrows in the trees late in the afternoon and fly, very rapidly, to the tops of the trees. This habit accounts for their rarity in collections, even our largest museums containing very few examples of any species.

The larvæ (Fig. 1*d*) are very abundant, occurring always in small colonies in the trees affected. They are slender and elongated, measuring up to 35 mm. They are of a light cream colour with the head and cowl yellow. They bore for a considerable distance into the tree, mostly in a horizontal direction, but frequently upwards or downwards, and very often in all directions. As the larvæ progress inwards they continually push out a long thread-like core, which is usually projecting about one inch from the burrow, eventually breaking off and accumulating in a heap at the base of the tree, or the injured portion; this thread-like core is very characteristic of the pin-hole borer. No doubt the peculiar terminal segment is adapted for ejecting this material, the short forward-bent legs giving it great power to push the core along the burrow.

Reference.

(1) CLARK, *Journ. Dept. Agric. W. Australia*, [2], ii (1), pp. 138-142, figs., 1925.

[Proc. Roy. Soc. Victoria, 43 (N.S.), Pt. II, 1931.]

Art. XI.—*Alkaline Tertiary Rocks near Trentham and at Drouin, Victoria.*

By D. J. MAHONY, M.Sc., F.G.S.

(With Plate VII.)

[Read 9th October, 1930; issued separately 20th January, 1931.]

Trentham is situated about 60 miles north-west of Melbourne, close to the main divide, and is 2,260 ft. above sea level. In this district a belt of Newer Volcanic rocks extends east and west between Kyneton and Daylesford, along and just north of the divide, with northerly extensions along the valleys of the Campaspe, Coliban and Loddon Rivers and Kangaroo Creek. Alkaline rocks have been recorded from various localities from Mt. Macedon to Daylesford (3, 5 and 8), a distance of about 30 miles from east to west. In the neighbourhood of Trentham the volcanic rocks include olivine-basalts, olivine-anorthoclase-basalts, trachytes and pitchstone, basaltic types being apparently much more abundant than the others. Mr. H. Foster is engaged in mapping the district, and a systematic petrographic examination of his specimens may settle this question. Many of the volcanic rocks are converted into deep soils.

Some of the numerous points of eruption are hills formed mainly of lavas and others of scoriae. Mount Wilson, Babbington's Hill and Blue Mountain are examples of trachytic lava hills; Spring Hill and Mount Franklin are basaltic scoria cones.

Eucalypt leaves which McCoy(4), who described them, considered to be of Pliocene age, have been found in sub-volcanic deep leads during mining operations. The moderate amount of erosion affecting the volcanic rocks and the survival of scoria cones support McCoy's opinion.

Extensive faulting and vertical earth-movements occurred a few miles to the south during the Tertiary period (2). The age of the faults has not been definitely established, but the Greendale fault is younger than the *Laurus Werribeensis* beds (Miocene?).

The rocks described below have already been noted by Professor Skeats and by E. J. Dunn(1 and 7). Good analyses are now available, and more detailed petrographic descriptions than have yet been published are given below.

Mount Wilson is a hill composed of anorthoclase-trachyphonolite, about 3 miles south of Bullarto, near the heads of the Lerderderg and Werribee Rivers, on the southern edge of the volcanic area. The surrounding rocks are deeply entrenched by narrow valleys, and the lava from this centre of eruption seems to be of small extent. The rock is dark greenish grey, fine-grained, compact and free from vesicles. It contains a few felspar phenocrysts about ½ in. long. It has a tendency to fracture in one direction, apparently due to flow structure. No tuffs were noted.

Two samples were taken for analysis, one from the top and the other from the north-western flank of the hill. The sample from the top (slice *2126*, analysis 1) has a well-defined trachytic texture, with small granular areas. It is a holocrystalline, moderately fine-grained rock composed of sanidine, anorthoclase, aegirine-augite, sodalite, magnetite and apatite; no nepheline was identified, but Professor Skeats (7) indicates that it was present in the slice examined by him. The felspars are in two generations, the larger being slender, simply-twinned sanidine prisms about 1 mm. long and shorter, broader anorthoclase crystals of ill-defined shape. The smaller felspars are sanidine prisms about 0·2 mm. long. Aegirine-augite occurs as scattered prisms about 0·2 mm. long, and as numerous minute prisms and grains; it is grass green and slightly pleochroic. A colourless, isotropic, allotriomorphic mineral with a low refractive index is identified as sodalite; it is present in small amount only. The identification corresponds with the chlorine determined in the analysis, which would represent about 3·7% of sodalite. Grains and crystals of iron ore, probably titaniferous magnetite, are sparingly scattered throughout the rock. Apatite is present in very small amount as minute, rod-like crystals enclosed in the felspars.

The rock from the flank of Mount Wilson (slice *2272*, anal. 2) is porphyritic, consisting of phenocrysts of anorthoclase about 1 mm. long, aegirine-augite (0·2 mm.) and grains of iron ore in a granular groundmass composed of the same minerals together with aenigmatite (cossyrite), sodalite, analcite (?), and olivine. The colourless isotropic mineral seems too abundant to be all sodalite, which (judging by the chlorine content) should not form more than 4% of the rock; possibly some analcite is also present. Aenigmatite (cossyrite) forms small, irregular, brown, strongly pleochroic crystals; it is a rare mineral, but has been identified in the solvsbergites of the Macedon district (3).

The analyses of these two rocks agree fairly closely. Notable features are the high percentages of alkalies and alumina and the presence of chlorine in appreciable quantities. No nepheline or diopside appears in the norm.

Blue Mountain (Wuid Kruirk) is a conspicuous point of eruption on the main divide 3 miles south of Trentham. Like Mount Wilson, it has no crater, and is formed of lava. The flows are of small extent (about 2 or 3 square miles). The rock forming the main mass of the hill closely resembles the rocks of Mount Wilson, but is rather finer in grain. The top consists of a small flow of grey, compact rock, with occasional felspar phenocrysts. Both rocks are anorthoclase-olivine-trachyte.

Microscopic examination of the latter rock (slice *2278*, anal. 3) shows that it has a well-defined trachytic texture and consists of sanidine, anorthoclase, aegirine-augite, olivine, iron ores and apatite. The sanidine prisms average 0·5 to 0·8 mm. long and are either simply twinned or untwinned. Anorthoclase forms stouter, irregular prisms and is fairly abundant. Small grains of olivine are scattered through the rock. Apatite forms minute prisms and larger crystals with fibrous inclusions like the apatite in macedonite of the Macedon district (8).

The rock from the lower slopes of the hill also has a trachytic texture, but is not porphyritic. It has the same mineral composition as the rock from the top. The olivine is usually in small grains (about 0·2 mm. across), but occasionally forms larger crystals (about 1 mm. long). Crystals of iron ore are occasionally 0·3 mm. across, but usually much smaller.

These rocks are also high in alumina and alkalies, but they differ from those of Mount Wilson in their lower content of chlorine. Small quantities of both nepheline and diopside appear in the norm.

Pitchstone is fairly abundant on the plateau of volcanic rocks west of the Coliban River, between Spring Hill and the Upper Coliban Reservoir. It is black and glassy with the lustre of pitch. It grades into more lithoidal types, and is associated with grey basaltic rock which breaks like slate. This pitchstone was first recorded by Mr. Dunn(1) as pebbles in the Coliban River below the reservoir, and he had an analysis of one of these pebbles made, as quoted below. Mr. H. Foster found the rock in situ during his geological survey of the Parish of Coliban, and proved it to be part of the Newer Volcanic series. Its chief interest lies in the fact that its silica content is much higher than is usual for our New Volcanic rocks, and that glassy rocks are rare in Victoria. This rock or similar rock from unknown localities was widely used by the aborigines for stone implements. The analysis shows that alkalies are also fairly high, and that, if the magma had crystallised instead of cooling rapidly to form a glass, the rock would be a quartz-trachyte. TiO_2 is high for a rock with such a silica percentage.

Under the microscope (slice 1619, anal. 5), it is a transparent brown glass containing abundant globulites, numerous unidentified minute prisms, larger prisms of pyroxene (about 0·02 mm. long), a little olivine, and occasional felspar microliths. A few pyroxene crystals of considerably larger dimensions, in which are numerous inclusions of glass, also occur. The glass is traversed by lines rendered darker in colour by countless globulites, and these give a flow structure, especially near the larger phenocrysts.

An attempt to plot a variation diagram from the five analyses here given, and Orr's analysis of olivine-anorthoclase-basalt from Daylesford, shows that the oxides do not fall on smooth curves, and suggests local centres of magmatic differentiation.

The olivine-nephelinite from near Drouin comes from a quarry worked for road metal by the shires of Drouin and Warragul in Allot. 91, parish of Drouin West, about 2 miles south of Drouin township. Volcanic rocks in this district extend about 25 miles north and south and 12 miles east and west; they are generally decomposed to deep soils, and outcrops are rare. On the geological map of Victoria they are marked Older Volcanic (that is, Middle or Lower Tertiary), but apart from physiographic considerations and analogy with similar areas in other parts of Gippsland, there is no evidence of their exact age.

Owing to the paucity of outcrops in this area, the nature of the underlying rocks can only be judged from the soil. Samples from quarries near Crossover and near the southern boundary of the Parish of Warragul are olivine basalts.

The quarry where the olivine-nephelinite is worked is situated on the western slope of a small hill which rises to about 700 feet above sea level. Some years ago several bores were put down to test the area of solid rock, and, according to report, it is not more than 2 acres in extent, which suggests that it is a volcanic plug. The surrounding soil is typically volcanic, but it contains fragments of indurated slate and sandstone which are probably ejected blocks. The face of the quarry exposes about 40 feet of solid rock with no signs of successive flows. In some parts a rough columnar structure is developed. The rock is dense and free from vesicles, but contains occasional patches of solid white zeolites, which were probably the final minerals to consolidate from the magma. The rock is excellent road metal.

Under the microscope (slice 2401, anal. 6), it is holocrystalline and panidiomorphic. It consists of nepheline, augite, olivine, iron ore and apatite; felspar is absent. Nepheline forms about one-third of the rock; it is limpid and colourless, and the crystals are from 0·05 to 0·25 mm. across. Augite, the next most abundant mineral, forms greenish prisms about 0·08 mm. long in felted aggregates between the nepheline crystals. Olivine is fairly abundant in crystals about 1 mm. to 1·5 mm. long; it is generally fresh, but is partly altered to serpentine. Abundant cubes of iron ore, probably titaniferous magnetite, are scattered through the rock.

The outstanding features of the Tertiary period in Victoria are vertical earth-movements, extensive faulting and widespread volcanic activity, all no doubt causally connected.

Taking a general survey of the Tertiary igneous rocks of Victoria, so far as they have been examined, we find them to consist of lava flows, tuffs, dykes and volcanic necks, the plutonic equivalents being nowhere exposed. In composition they range from thoroughly basic types, such as limburgites and olivine-basalts, through more andesitic varieties to trachytes, solvsbergites and pitchstones. The olivine basalts are overwhelmingly predominant, but an examination of 37 available superior analyses shows that nepheline appears in the norm, though not in the mode, in about one-third of them. The typical alkaline rocks are sporadic in distribution and of small extent. Taking those mentioned by

Skeats (7), it will be noticed that they lie within or on the edge of the central highland area. To these may be added the crinanites or olivine-analcite-basalts and dolerites in the much-faulted Mesozoic area of South Gippsland. These rocks are abundant, but no modern analyses are available. Old analyses are quoted below, but neither of them separates TiO_2 from Al_2O_3, so that the figures for the latter are too high, probably by 1 or 2 per cent. This will have the effect of making the figures of nepheline in the norm also too high. The analyses, however, are consistent, though by different analysts, and show that the rocks are distinctly rich in soda. Both are coarse grained, ophitic rocks consisting of plagioclase, anorthoclase, augite, olivine, analcite and iron ores, and they resemble the rocks from Camperdown described as essexites.

It appears, then, that the Tertiary igneous rocks of Victoria, and indeed of Eastern Australia, have much in common with the rocks of the Brito-Icelandic petrographic province and with those of the islands of the Pacific Ocean. There also appears to be some evidence to show that the alkaline types are most common in the neighbourhood of extensive faults.

Analyses.

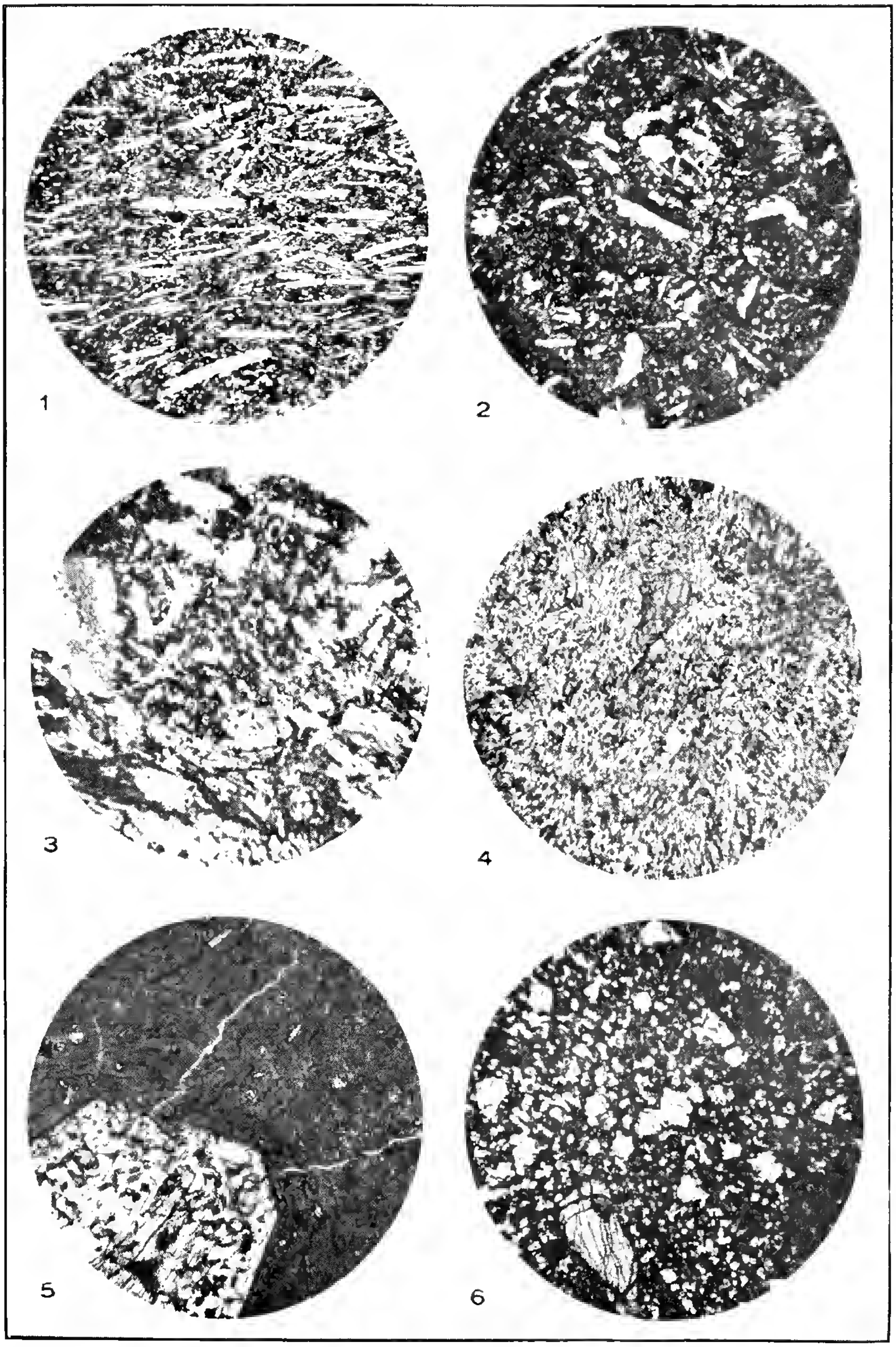
1. Trachyphonolite from top of Mt. Wilson. Analyst, F. F. Field. Pl. VII, Fig. 1.
2. Trachyphonolite from slope of Mt. Wilson. Analyst, F. F. Field. Pl. VII, Fig. 2.
3. Trachyte, top of Blue Mountain. Analyst, F. F. Field. Pl. VII, Fig. 3.
4. Trachyte, Allot. L, Parish of Trentham, lava flow from Blue Mountain. Analyst, F. F. Field. Pl. VII, Fig. 4.
5. Pitchstone, pebble from Coliban River, near railway viaduct, Taradale. Analyst, J C. Watson. Pl. VII, Fig. 5.
6. Olivine-nephelinite, quarry, Allot. 91, Parish of Drouin West. Analyst, F. F. Field. Pl. VII, Fig 6.
7. Olivine-analcite-dolerite, volcanic neck near Kilcunda Road State School, Parish of Jumbunna East. Analyst, P. W. G. Bayly (1903).
8. Olivine-analcite-dolerite, one and a half miles west of Poowong. Analyst, J. Dennant (1899). See J. Stirling (9).

	1	2	3	4	5	6	7	8
	%	%	%	%	%	%	%	%
SiO_2 -	58·90	58·56	57·49	57·29	63·67	41·13	46·76	47·56
Al_2O_3 -	18·60	20·33	19·14	18·70	15·83	15·74	22·85	16·79
Fe_2O_3 -	3·70	1·71	2·20	1·57	1·39	4·02	3·80	3·05
FeO -	2·30	2·81	4·29	4·67	4·06	7·71	5·83	8·71
MgO -	0·41	0·60	0·65	0·68	2·15	7·98	4·32	6·30
CaO -	1·47	1·85	2·47	3·02	3·88	10·48	8·05	8·57
Na_2O -	6·74	6·56	6·48	5·61	3·57	5·56	5·30	4·96
K_2O -	4·92	4·29	4·90	5·12	3·69	1·12	1·54	1·78
H_2O+ -	1·12	1·12	0·75	1·37	0·02	2·11	1·55	*2·23
H_2O- -	0·79	1·03	0·32	0·48	0·15	0·58	—	—
CO_2 -	nil.	nil.	nil.	nil.	nil.	nil.	—	—
TiO_2 -	0·13	0·14	0·59	0·65	1·27	2·34	—	—
P_2O_5 -	0·09	0·06	0·40	0·36	0·02	0·54	tr.	—
MnO -	0·13	0·19	0·17	0·19	0·43	0·14	—	tr.
Li_2O -	ft. tr.	nil.	sl. tr.	sl. tr.	tr.	sl. tr.	—	—
SO_3 -	nil.	nil.	nil.	nil.	nil.	nil.	—	tr.
Cl -	0·27	0·28	st. tr.	st. tr.	nil.	nil.	—	—
NiO -	—	—	—	—	0·01	—	—	—
CoO -	—	—	—	—	tr.	—	—	—
Total -	99·57	99·53	99·85	99·71	100·14	99·45	100·00	99·95
Sp. Gr. -	2·62	2·63	2·63	2·64	2·569	3·05	—	2·28

*Loss on ignition.

Norms.

	1	2	3	4	5	6	7	8
Q -	nil.	nil.	nil.	nil.	15·49	nil.	nil.	nil.
or -	29·14	25·40	29·03	30·37	21·88	6·64	9·15	10·55
ab -	52·04	53·55	44·21	42·34	30·30	2·26	19·41	16·33
an -	6·75	8·84	8·56	10·60	16·18	14·61	33·94	18·21
ne -	1·70	nil.	5·82	2·85	nil.	24·32	13·84	13·94
C -	0·06	2·03	nil.	nil.	nil.	nil.	nil.	nil.
NaCl -	0·44	0·47	nil.	nil.	nil.	nil.	nil.	nil.
di -	nil.	nil.	0·99	1·83	2·49	27·29	4·99	20·10
hy -	nil.	0·45	nil.	nil.	9·18	nil.	nil.	nil.
ol -	1·64	3·71	4·93	5·55	—	10·23	11·62	14·16
il -	0·24	0·16	1·13	1·23	2·42	4·42	nil.	nil.
mt -	5·37	2·48	3·20	2·27	2·01	5·83	5·51	4·42
ap -	0·19	0·13	0·87	0·78	0·03	1·18	nil.	nil.



J. S. Mann photomicr.

Alkaline Volcanic Rocks, Victoria

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Explanation of Plate VII.

Fig. 1.—Trachyphonolite; top of Mt. Wilson. Trachytic texture and abundant sanidine prisms. Most of the darker minerals are aegirine, but a little olivine also ocurs. The black grains are magnetite. Ordinary light. × 20.

Fig. 2.—Trachyphonolite; flank of Mt. Wilson. Anorthoclase phenocrysts (one, near centre of photograph, simply twinned) in a groundmass of sanidine, anorthoclase, aegirine-augite, olivine and iron ores. Crossed nicols. × 20.

Fig. 3.—Anorthoclase-trachyte; top of Blue Mountain. Irregular anorthoclase crystals, sanidine prisms, aegirine-augite, olivine and iron ores. One of the anorthoclase crystals shows characteristic indefinite partial extinction. Crossed nicols. × 20.

Fig. 4.—Anorthoclase-trachyte; allot. L, parish of Trentham, on western slope of Blue Mountain. A trachytic rock with the same mineral composition as that in Fig. 4. Near the centre is an irregular olivine crystal. Ordinary light. × 20.

Fig. 5.—Pitchstone; Coliban River. Glass with globulites, microliths, crystals of augite and iron ore, and a considerably larger augite phenocryst with inclusions of glass. Ordinary light. × 65.

Fig. 6.—Olivine-nephelinite; allot. 91, parish of Drouin West. The colourless minerals (except one rather large piece of olivine) are nepheline. Between them are abundant augite prisms and less plentiful magnetite crystals. Ordinary light. × 20.

[Proc. Roy. Soc. Victoria, 43 (N.S.), Pt. II, 1931.]

Art. XII.—*Erosion and Sedimentation in Port Phillip Bay, Victoria, and their bearing on the Theory of a Recent Relative Uplift of the Sea Floor.*

By J. T. JUTSON, B.Sc., LL.B.

[Read 9th October, 1930; issued separately 20th January, 1931.]

Contents.

I.—Introduction and Acknowledgments.

With the aid of a grant from the Trustees of the Council for Scientific and Industrial Research, an investigation of the shores of Port Phillip Bay has been undertaken for the purpose of ascertaining, if possible, where erosion and sedimentation are now taking-place, and in the recent past have taken place, and the bearing of such knowledge on the theory that the land has suffered a recent relative uplift, as deduced from the occurrence of recent marine deposits on the shores (especially the western one) of the bay. It was recognised that the testing of the theory would probably bring many new facts to light, which could not fail to be of value, whatever theory was ultimately adopted. That belief has been fully justified.

The observations hitherto made have been confined mainly to the western side of the bay. The examination is not finished and levels are required. Some detailed mapping is also to be undertaken.

The paper is a summary of the observations made, and of the provisional interpretation of the evidence. It is hoped that details, with illustrations, together with references to any earlier work, will be given in the future.

The writer desires to acknowledge the generous assistance he has received in the prosecution of the work. Maps have been provided or loaned by the trustees of the Council for Scientific and Industrial Research, by the Director (Mr. W. Baragwanath) and the Petrologist (Mr. D. J. Mahony) of the Victorian Geolo-

gical Survey, and by Mr. J. P. Larkin, Hydrographic Surveyor, and his Assistant (Mr. F. L. Young); and various information has been received from Engineer-Commander Bloomfield, and from Messrs. F. Chapman, F. A. Singleton and R. A. Keble.

He is also much indebted to Professor Douglas W. Johnson, of New York, for his valued advice and discussion of the problems in those parts of the field which the writer had the privilege of showing him over.

II.—Configuration of Port Phillip Bay.

The general outline of Port Phillip Bay is of such a character as to indicate that the bay has had an interesting, although hitherto little deciphered, history. Its formation is generally regarded as being due to a comparatively recent submergence of the land, which was mainly low-lying, and in consequence of which a wide area has been covered by the sea, and now forms the bay.

Following such submergence, the mouth of the bay apparently extended, as suggested by the late Dr. T. S. Hall, from Ocean

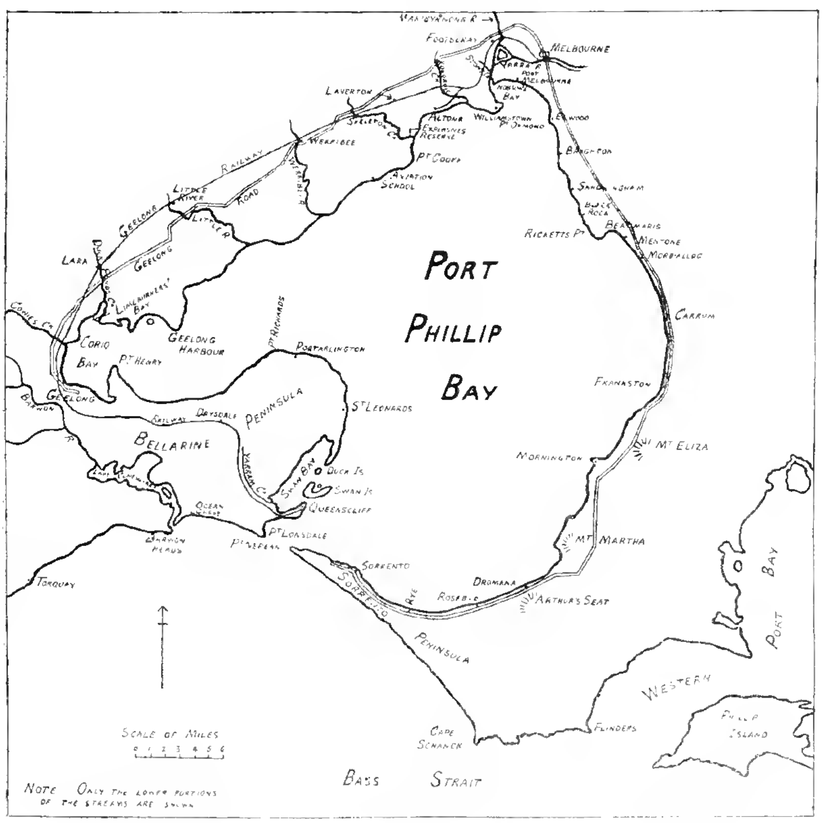

Fig. 1.—Port Philip Bay, Victoria, shewing localities mentioned in text.

Grove to Cape Schanck; but it has been reduced to its present narrow dimensions by the formation of the Sorrento Peninsula and the long corresponding ridge on the opposite side of the bay mouth, extending from Point Lonsdale to Ocean Grove. Such ridges have been formed by the growth of sand dunes, which have become hardened into a sandy limestone (the "dune limestone") by the solution and subsequent precipitation of the calcium carbonate present in the old sand dunes in the form of the hard remains of marine organisms.

Other striking features of the bay are the small Williamstown Peninsula which gives rise to Hobson's Bay; the large Bellarine Peninsula, with Corio Bay on the north; and the pronounced "break back" of the coast line at Beaumaris. By far the greatest drainage that enters the bay does so at Hobson's Bay, its narrowest part (omitting the entrance to Port Phillip).

The origin of these features is not further considered in this paper.

III.—Erosion and Sedimentation along the Coast Line.

Broadly speaking, and with certain exceptions, erosion appears to be taking place on the eastern side of the bay, and sedimentation on the western side. At the narrow head of the bay the delta of the Yarra is probably growing.

Erosion on the eastern side is probably due to the strong winds that prevail on that side, aided by the weak character of the rocks in places. Thus the cliffs from Brighton to Black Rock are mainly practically unconsolidated Tertiary sands, which are easily removed. At Beaumaris the rocks are Tertiary ironstones dipping approximately to the south or south-east. They have offered a stout resistance to the forces of erosion, with the result that the ironstones now form the cliffs of Beaumaris Bay, along the line of which from Ricketts' Point to Mentone the softer rocks have been removed.

At Mentone itself the cliffs are high, but are composed of almost unconsolidated sands, which are being so rapidly removed as to cause anxiety as to the waste of the land.

At Mts. Eliza and Martha and Arthur's Seat, the rocks are granodiorite, considerably decomposed, and erosion here is fairly rapid. High cliffs are formed.

At Mornington there are Tertiary ironstones, similar to those at Beaumaris, and they project as headlands. Tertiary clays and sands, and some small patches of more or less decomposed Older Basalt also occur. Most of the rocks are easily removed.

Along the bay shore of the Sorrento Peninsula are dune limestones, which, on account of the numerous contained patches of loose sand and unindurated material, are being rapidly eroded, resulting in wave-cut platforms and cliffs.

On the eastern side, the streams entering the bay, being few and inconsiderable, carry only a small amount of detritus into the sea. The work of erosion of the coast is thus facilitated.

Summing up the characters of the eastern side of the bay, the coast is largely made up of cliffs of moderate height, composed of various kinds of rocks; and, although some progradation is going on, the coast line is essentially one of erosion. Where a moderate amount of land formation has taken place, it has been mainly in the direction of bay filling, such as the old Elwood and Rosebud Bays.

On the western side of the bay (from the mouth of the Yarra River to the north-western corner of Corio Bay), the rocks are mainly the hard Newer Basalt which resists erosion. The area, however, appears to be one chiefly of sedimentation, portion of the sediments being carried perhaps from the eastern side of the bay by a marine current. Another portion is derived from those brought to the sea by the Yarra and Maribyrnong Rivers. The well developed Werribee and Little Rivers, and minor streams, must, combined, bring to the sea a large quantity of sediment. Erosion is also going on, but in a limited way.

The few observations yet made around Corio Bay and along the northern side of the Bellarine Peninsula indicate that both erosion and sedimentation are taking place, probably, however, with a predominance of erosion.

Swan Bay is a huge area of sedimentation. The rate has doubtless been accentuated by the building of the Queenscliff and the St. Leonard's Spits and of Swan Island, the formation of which has helped to separate the bay largely from the main portion of Port Phillip Bay.

IV.—Description of Individual Localities.

The Yarra Delta.

Much of the original contour of the land cannot now be seen, owing to man's operations. The writer has as yet examined only the part close to the coast, on the left bank of the river, known as the Fishermen's Bend.

An extensive area immediately to the west of the town of Port Melbourne, and a similar smaller area flanking the left bank of the river at its mouth, have been built up by man by dumped material, which is now being cut into for filling elsewhere. Between these areas is a belt of beach ridges and depressions approximately parallel to one another and to the coast, and stretching from the sea coast northwards for a short distance across the Williamstown Road, which lies between the Yarra River on the north and the coast on the south. This belt is practically at sea-level, and certainly appears to have been reclaimed naturally from the sea at present sea-level. The ridges are from one to two feet above the depressions, or old lagoons. Very few recent marine shells are visible in the deposits, although on the present beach they are not uncommon. No explanation of this peculiarity for the moment is forthcoming.

The deposits now forming on the coast are a continuation of those just described.

The Maribyrnong River at Footscray is tidal, so that the flood plains there are just above sea-level.

The Yarra River as far up as the mouth of Gardiner's Creek is only three feet above sea-level (per J. S. Kitson), and the recent marine shells found when the river was straightened near the Botanical Gardens appear to have been in sections at or below present sea-level.[1]

The known facts, therefore, do not justify the assumption that the Yarra Delta is an upraised sea floor. Rather is it a true delta formed at present sea-level, as would be expected from its location and the quantity of detritus carried to the sea by the Yarra and Maribyrnong Rivers.

Stony Creek, Spotswood.

At low tide, or when the sea is quiet, the Stony Creek, at its mouth on the eastern side of the Geelong railway line, meanders through a flat belt, which is covered with low vegetation. This belt represents an old small bay, formed by subsidence, and since changed into dry land. At a very high tide, however, or when a strong wind is blowing onshore, the sea spreads over the flat, and also upstream beyond the railway bridge. This fact indicates that the area has been silted up at present sea-level, being ordinary bay filling, without any indication of recent uplift, a conclusion negatively supported by the absence of river terraces in the valley.

Williamstown Area.

At the outer beach at the Williamstown township there is a fringe, a few yards wide, of recent marine beds, the top of which is perhaps two or three feet above mean sea-level. Those deposits, however, could easily be laid down by high tides. Relative uplift need not therefore be considered.

Towards the western end of the rifle ranges, which lie to the west of the township, recent excavations, about 50 or 60 yards from the shore, show recent shell beds, which rest on, and between the joints and erosion planes of, the Newer Basalt. The greatest height of the deposits may be from four to six feet above mean sea-level. Other nearby outcrops of basalt a few yards in extent also rise above general sea-level. The basalt is massively jointed, and along the joints erosion by the waves has taken place, but the interspaces are now filled with recent marine shells. These areas are surrounded by silted-up, lower-lying land. The

1.—Gardiner's Creek is about three and one-half miles, and the Botanical Gardens about one mile upstream from the City of Melbourne in a direct line.

same features occur at the water's edge, and the interspaces can now be seen filling with shells, sand and seaweed. Just behind, similar rocks occur, with the interspaces completely filled, and with vegetation growing on the soil-covered surface, which is perhaps three feet above the lower-lying, silted-up land. Examined alone, such basalt outcrops might be interpreted as evidence of recent marine uplift, which would be untrue. Doubts are therefore suggested as to whether the deposits at the excavations mentioned indicate relative uplift.

Small lagoons occur which have been cut off from the sea. These are fringed in places with mangroves, which help (by the collection of mud about their roots) the filling up process which is taking place at present sea-level.

Kororoit Creek.

The valley of this creek in its lower portion has been drowned, and recent marine deposits can be traced along its bed to just beyond the Geelong railway line.

Below the bridge on the Altona railway line the stream meanders through a wide flat, which on its left bank is slightly higher than that on the right bank, which is practically at sea-level, and is covered (so far as can be seen, for the Williamstown Racecourse hides much of the ground) with samphire vegetation. The flat on the left bank is grass-covered and level. The stream is tidal beyond the Altona railway bridge.

If the stream be traced from its mouth to that bridge, on the left bank a practically continuous deposit of recent marine shells occurs, rising to about two feet from the floor of the valley, to which height at high tide the water reaches. This section, therefore, does not indicate relative uplift.

Above the shell beds, from two to three feet of sandy material, free from marine shells, occur. This material, the top of which forms the flat on the left bank of the stream, is evidently non-marine, and apparently has been formed as a flood plain as the mouth of the stream extended seawards.

The land on the right bank is typical samphire country formed at present sea-level.

Upstream from the Altona railway bridge the stream is extremely sluggish, and much of the ground marshy. There is no evidence of rejuvenation to support the idea of a recent uplift.

Live mollusca do not extend so far upstream as their shells are found. This is probably due to the fact that as the mouth of the stream extended seawards the water higher up became too fresh for the mollusca to live in.

Altona Area.

This area, which extends south-westwards from the Williamstown Racecourse to the northern boundary of the Explosives Reserve, and north-westwards from the sea to the boundary of the Newer Basalt, comprises a fairly extensive belt of recent marine deposits, with a probable maximum height above sea-level of 10 feet. They are well shown in section on the Altona railway line opposite the Williamstown Racecourse and in the adjacent fields, where, according to Grant and Thiele, their upper surface is 7½ feet above ordinary high water.

The association of these beds and those in the immediate vicinity with tongues of the Newer Basalt, makes the interpretation of the marine deposits difficult. For, as in the Williamstown area, the basalt may rise above the general sea-level, and yet its interspaces and upper surface may contain marine deposits. Moreover, the narrow tongue of basalt which occurs on the right side of the Kororoit Creek valley by the Williamstown Racecourse (see Geological Survey Quarter Sheet No. 1, S.W.), and which is an old peninsula, forms an ideal area for the banking up of marine deposits above mean sea-level, which is the tendency along a shore line. Hence the inference of a rise of 10 feet of the land may not be justifiable.

Two large basins which may be termed lakes, but which are very often quite dry, may be referred to as Lakes Truganina and Seaholme. The former lies to the west, and the latter to the north of Altona township. Immediately to the south of Lake Seaholme, at its western end, is another lake—small, but comparatively long—of the same character, which may be termed Lake Altona, on the northern side of which is a narrow tongue of basalt (not fully shown on the geological map of the area), extending eastwards past the eastern end of Lake Seaholme, and covered by recent marine shells at the eastern end of Lake Altona.

The height above sea-level of the bottoms of these lakes, although not yet determined, is probably negligible. The marine deposits which have cut off these old bays are higher than the present bottoms of the lakes.

Recent marine shells are found on the floors of the three lakes, and are traceable largely around their shores, indicating that the lakes are old arms of the sea, from which they have been cut off by bay bars. The sea water evaporated and marine life ceased to exist, but the remains of brackish water molluscs, which thrive after rain, occur in countless thousands.

Following the building of the bay bars, a series of beach ridges, roughly parallel to one another and to the coast, has been formed, extending to the present coast line. The intervening depressions (old lagoons) have been silted up.

Abundant recent marine shells are found on the ridges and in the depressions, and on the ridges well water-worn pebbles of quartz and other rocks, up to several inches in diameter, occur. Thus the ridges are not old sand dunes, but are true beach ridges, although there is some wind-blown sand on their tops. Some ridges die out or merge into others.

Several ridges occur near the Williamstown Racecourse, where some basalt outcropping in the depressions suggests that perhaps uplift has taken place since the formation of the beach ridges.

The best examples of the beach ridges, however, occur to the south-west of Altona township, between the latter and the Explosives Reserve, where seven or eight distinct ridges parallel to one another can be counted. The formation of the township of Altona has obliterated many of the natural features of the land there.

The general height of the ridges varies from four to probably less than ten feet above sea-level.

Near the Williamstown Racecourse there is a sudden drop from the ridges to a narrow flat which extends to the sea, which fact suggests that the ridges are raised beaches, and that the flat has been formed since the uplift of those beaches. This idea is embodied in the geological map of the district, which separates the flat as a formation distinct from the ridges. The flat has been formed with sea-level as at present, but it is difficult to say definitely the same of the ridges. If it be assumed, however, that both were formed at present sea-level, then the only inference is that for some time past the sea, at the locality mentioned, has lost its power of building strong beach ridges, and that progradation of the land is by ordinary silting only.

Near the Explosives Reserve there is also a fairly sharp rise from the beach ridges close to the sea to those farther inland.

At Seaholme (which is a short distance east of Altona), close to the sea some low beach ridges occur, which have been clearly formed at present sea-level. They pass gradually and apparently without any physical break into the somewhat higher ridges inland. These facts, therefore, tend to confirm the idea of no recent uplift.

Whether there has been a recent uplift or not, it is clear that there has been a reclamation of the land by successive beach ridge building (assuming that such ridges were built so as to project above the then sea-level, about which there seems to be no doubt), and not by a simple uplift of a widely submerged area, although a slight subsequent relative uplift may have occurred. Levels are required to assist in coming to a definite conclusion, but if uplift has taken place, then its vertical extent was probably not more than three feet, after allowing for the height above sea-level, to which the beach ridges were built.

The very small valleys that connect with the larger lakes on the landward side prohibit the idea that the lakes are the remains of the drowned lower ends of such valleys, as the disproportion in the respective areas is too great.

Skeleton Creek Area.

This area includes the country about the mouth of the Skeleton Creek, which in its lower portion meanders through recent marine deposits which form a low-lying marshy plain, usually covered with a layer of black mud. The waters of the creek are tidal as far upstream as the deposits extend. Near the coast the deposits are at present sea-level, at which they have been formed. As no apparent break occurs in any of the deposits, the whole plain appears to be due to silting at the same level.

Several prominent long ridges rise a few feet above the level of the plain. They are composed of quartzose and shelly sand, with recent marine shells and well water-worn pebbles of quartz, sandstone and basalt. The ridges are, therefore, of marine origin, and at first sight appear to be distinct in origin from the plain, and they have been so mapped by the Geological Survey; but the shells are apparently similar in both cases.

If the ridges represent an uplift, we then have the following history: formation of the ridges as beach ridges at a lower level than at present; uplift of the ridges; then the formation of the marshy plain at present sea-level. The height of the ridges above present sea-level is the only justification for assuming this history; but the height is not inconsistent with the idea of their formation at that level. The more probable history, therefore, appears to be: first, the formation of the scattered beach ridges with sea-level as at present, and then the gradual silting up around them at the same level to form the plain.

A belt of country just south and south-west of the Skeleton Creek, and occupied by the Cheetham Company's extensive salt works, forms a narrow basin trending westerly. Numerous trenches as well as natural outcrops, showing an abundance of recent marine shells, prove that the sea formerly occupied the basin, which may be termed the "Skeleton Basin." The company's works prevent its history from being fully deciphered, but from analogy with other areas on the western side of Port Phillip it may be assumed that the small bay was cut off from the main sea by a bay bar, and that the coast was then prograded by silting and beach ridge building.

No valley connects with the basin. The Skeleton Creek valley is to the north of, and quite separated from it. The basin, therefore, when occupied by the sea was not a drowned valley. It must be tectonic in origin, at least in part. Its origin is discussed in conjunction with similar features in Section VII of this paper.

Point Cooke Area.

On the northern side of Point Cooke there is a narrow belt of beach ridges and old partly silted up lagoons, which form marshy ground at present sea-level. This belt is a continuation of the Skeleton Creek area.

On the south-western side of Point Cooke there is a narrow (perhaps 200 to 300 yards wide on the average) belt of marine deposits stretching (but with an old bay to be presently referred to) from Point Cooke south-westerly to the Aviation School. At first sight the deposits appear to be parallel sand dunes, the greatest height of which above sea-level is apparently from eight to ten feet. Their crests have probably some wind-blown sand, but the occurrence of recent marine shells and of water-worn rock pebbles indicates that the ridges are beach ridges. The old lagoons have probably been largely filled up with wind-blown sand, although the remains of some are still visible.

The deposits at their inner margin abut the Newer Basalt, and at the junction they are distinctly higher than the basalt, from which they could not have been stripped by erosion (except possibly by wind, which could not, however, remove the included shells and pebbles); and consequently it is difficult to understand how the deposits could have been laid down beneath the sea entirely, if the present edge of the basalt formed the sea coast at a relatively higher level than the present coast, in accordance with the uplift theory. If that were so, there would be a gradual overlap on the basalt without the land surface of the latter being lower than the marine deposits. An alternative is that the ridges have been formed with sea-level as at present.

At the back of the marine beds there is an elongated basin about half a mile long by about one-eighth of a mile wide, which is marked on the Geological Survey Map as the "Sheepwash." It is divided into two sub-basins by a low saddle. The basin is entirely surrounded by basalt, no marine deposits occur in it, and it is obviously due to subsidence of the basalt. Such basins occur on the basalt between Laverton and Geelong.

Another somewhat larger basin lies to the south-west. It contains a salt lake (which may be named Lake Aplin, after the geologist who first mapped much of the ground in the vicinity), the size of which varies according to the season. The basin is surrounded by Newer Basalt except on the seaward side.

Recent marine shells (although none is now living) can be traced practically right around and in the basin. It has, therefore, been an arm of the sea, with a history apparently similar to the Skeleton Basin and the lakes at Altona.

The beach ridges are higher than the present bottom of the lake, and no valley enters the basin.

Little River Area.

There is a fairly extensive belt of recent marine deposits at the mouth of the Little River, but only a cursory examination has been made on the left bank, where abutting the coast is a wide, marshy flat, intersected by small, sluggish, tidal streams, and covered mainly by tall samphire bushes. This area has undoubtedly been formed by ordinary silting at present sea-level.

Behind the belt mentioned is another belt which is less marshy, and may be slightly higher. Numerous drains were being cut which revealed sections of recent shell beds, but further examination is required.

Lara Area.

The valley of Duck Ponds Creek downstream from the main Geelong Road to the mouth of Limeburners' Bay has been examined. The lower portion of the valley has been drowned, the bay mentioned representing such drowned portion. In Limeburners' Bay, towards its head, there has been considerable silting, which has resulted in the usual type of marshy low-lying land, covered with samphire and formed at present sea-level. On the banks farther upstream are some recent marine deposits, which possibly have been uplifted. If so, they are older than those of the marshy belt. The question of uplift is left open pending further examination.

At the mouth of the bay there is a long, quite recent, spit, stretching from the eastern side probably at least two-thirds across the bay. Low beach ridges, formed with sea-level as at present, also occur.

Geelong and Henry Peninsula Areas.

Geelong.—At the western end of Corio Bay, where the rocks are Tertiary sediments, and where, being at the head of the bay, sedimentation would be expected, practically no progradation of the shore is taking place, but on the contrary the cliffs are receding owing to marine abrasion. Similar features continue past the Geelong township on the southern side of the bay, but to the east of the Botanical Gardens there is an old small bay, the head of which reaches to the Drysdale Road. This area is now completely silted up into a low-lying samphire flat, which is just above, and appears to have been formed at, present sea-level.

Farther east at the south-western corner of the Henry Peninsula, there has evidently been considerable silting, but the extensive salt works there preclude confirmation of this idea.

At the western end of Corio Bay is a band of recent oyster shells, varying in height from nothing to eight feet above present sea-level. This suggests the possibility of uplift, but, on the other hand, it may be the remains of an old beach ridge, or be due to local crumpling.

Henry Peninsula.—This short peninsula, which may be termed the "Henry Peninsula," terminates in Point Henry. At its base it is very low-lying, but the ground gradually rises northwards until it terminates at Point Henry in a somewhat prominent but not high cliff, composed of soft, unstratified, Tertiary clays, which are remarkable in that they have not been entirely removed by erosion.

The Peninsula is being eroded at its northern extremity, but on each side of this point there is a slight accumulation of detritus which has apparently been formed at present sea-level.

At the low-lying base of the peninsula are the remains of an old lagoon, around which a low beach ridge has been built. On all sides of the ridge is a succession of similar ridges and depressions, more or less parallel to the side of the lagoon on which they lie. These ridges extend to the sea on either side.

The peninsula was therefore at one time an island, which, by silting alone, or silting combined with uplift, has been converted into the peninsula.

No heights have been obtained, and in the absence thereof the question of uplift must be left open, but the ground is, as a rule, so little above present sea-level that it is not necessary to assume an uplift. Some deposits, however, are higher than others, so that there is the possibility of two series occurring, the older of which may have been uplifted.

Eastwards for some distance from the Henry Peninsula a narrow strip of land has been reclaimed from the sea. The old sea cliffs are now grass covered and safe (for the present at least) from the attack of the sea by reason of the progradation of the coast line, in part by silting, and in part by the formation of low beach ridges, without uplift.

Portarlington Area.

To the west of the township and of the pier there is a low-lying triangular belt, covered with samphire vegetation, at the base of the old sea-cliffs, and forming a cuspate foreland, which may be termed the "Richards Foreland," as Point Richards is the apex of the triangle. The Geological Survey Map shows the foreland to be two and one half miles in length along its base, and about five-eighths of a mile from the base to the apex. Ordinary silting at present sea-level accounts for the foreland.

To the east of the pier a wave-cut platform, in somewhat decomposed Older Basalt, is exposed at low tide, and the sea is still extending the platform landward by cutting back the cliffs which here form the coast line. Probably the Richards Foreland is being extended seawards, so that only a few hundreds yards apart, progradation and retrogradation are both taking place. The area hitherto examined is very small.

Queenscliff Area.

This area consists mainly of high land formed of dune limestone, which on the ocean side forms steep cliffs due to marine abrasion. The Queensliff Spit, however, which points towards Swan Island and helps to shut off Swan Bay from the main water surface of Port Phillip Bay, has been formed at present sea-level. Narrow marshy belts of marine deposits occur along the south-eastern shore of Swan Bay, together with slightly higher deposits also of marine origin. The latter may indicate relative uplift.

The marine deposits at the south-western end of Swan Bay are included in the description of the Point Lonsdale area.

Swan Island.

Swan Island in its northern portion is divided by a pronounced bay, thus giving rise to two peninsulas pointing northerly and north-easterly respectively. No rocks *in situ* have been found, the island apparently being composed wholly of sand ridges and of silt.

Forming the backbone of the western portion of the island, a prominent sand ridge extends practically from the southern shore to the end of the western peninsula. Short irregular ridges are associated with the main ridge at its southern end, and on its eastern side are several minor ridges roughly parallel to the main ridge. The ridges are covered with vegetation (mainly small trees), and the sand therefore is fixed, except as specified below.

Along the south-eastern shore for perhaps half its length from the southern end, is a ridge of blown sand, this ridge evidently being younger than the main ridge on the western shore.

The eastern peninsula is densely wooded with small trees and shrubs, and the ground is seen to be divided into a series of ridges and depressions, some of which run more or less at right angles to the south-eastern shore, and some more or less parallel to it. The height of the ridges above sea-level is probably not more than four feet.

The remainder of the island is occupied by low-lying marshy ground covered with samphire, the main belt of which lies between the main western and the eastern coastal ridges, and stretches from sea to sea. The whole of this marshy ground is at present sea-level, and it seems to be beyond doubt that it has been formed at that level by ordinary siltation, which has been aided by the pre-existence of the various sand ridges.

In places on the crest of the main western sand ridge, the vegetation has been destroyed, but by what agent the writer does not know. The result has been that much sand has been blown away, to a depth of three to four feet, and this has resulted in a concentration of the recent marine shells (many of which are large) and water-worn pebbles of ironstone, quartz, basalt and sandstone up to three or four inches in their largest diameter, which occur in the sand, and the existence of which is thus strikingly demonstrated. The sand ridge therefore is not of aeolian origin, but is a true beach ridge, the greatest height of which above sea-level is probably about 12 feet, but it has not been accurately determined.

Where the vegetation on the main western ridge has been removed, the sand has been blown by the strong westerly winds against trees and shrubs, partly burying them, and in one instance at least it has passed down on the eastern side of the ridge as a small "sand glacier."

In regard to the question of uplift, it has been shown above that the marshy flats have been formed (and they are still forming) by ordinary siltation at present sea-level. If there has been uplift, it must therefore have taken place before the building of the flats. The sand ridges (with the exception of the eastern coastal ridge) are beach ridges, and it therefore follows that if uplift be evidenced by the occurrence of the beach ridges, then they have been formed as ridges a little above sea-level, and then uplifted to their present height. This requires strong evidence before such an assumption can be accepted; but such evidence is not known to the writer; and the assumption is unnecessary if it be admitted that ridges of the height mentioned can be formed where strong seas prevail, as they do on the eastern side of the island, as will be shown below. The probability therefore is that both the ridges and the flats have been formed with sea-level as at present.

Some of the low ridges of the eastern peninsula run more or less at right angles to the sea coast. These ridges may be the remains of originally more extensive ones, the southern portions of which have been removed by erosion, the removed portions perhaps having had a north-easterly trend. This probability was suggested to the writer by Professor Johnson, and it should be considered in any future study of the island.

On the eastern shore some surveys which have from time to time been made by the Hydrographic Department, show striking changes in the outline of that shore in the course of a few years. Such changes attest the severity of the storms which sweep through Port Phillip Heads, and attack the exposed eastern coast of the island.

The waters on the western shore of the island form Swan Bay, which is remarkably calm and shallow. Hardly any erosion takes place on that shore, and the whole bay is rapidly silting up.

Point Lonsdale Area.

A belt of high land composed of Tertiary sedimentary rocks stretches first, south-westerly from St. Leonard's to Yarram Creek, and then west-south-westerly to Ocean Grove. Another belt of high land, composed of the dune limestone, stretches westerly from Point Lonsdale to Ocean Grove. Point Lonsdale and Queenscliff are connected by a narrow belt composed, at least in part, of dune limestone. The country almost enclosed by the three belts of land referred to consists of flat, marshy ground covered largely with samphire vegetation. Some subordinate low ridges of the dune limestone also occur. The low ground rises somewhat as Ocean Grove is approached.

At the eastern end of this low-lying tract of country is the south-western side of Swan Bay. Recent marine shells are found over the very low ground which occupies most of the area. The sea has therefore extended much farther west than it does at present—that is to say, the early Swan Bay was very much larger than the present bay, and it had several long narrow islands which now form the subordinate low ridges of dune limestone above referred to.

The long straight lines running south-west and west-south-west, which form the boundaries of the high belt of Tertiary rocks which stretches from St. Leonard's to Ocean Grove, suggest that these lines are fault lines along which the land to the south-east was let down. Evidence, however, confirming the suggestion has not yet been obtained, but it may be remarked that as one approaches from the low ground between the high Tertiary belt and the Ocean Grove-Point Lonsdale ridge, towards Ocean Grove, the recent marine shell beds die out, the country rises somewhat (although much lower than the high Tertiary belt) and the rocks, so far as observed in one or two sections, are ferruginous grits which may correspond with the rocks of the high Tertiary belt. This rising ground therefore suggests that it may represent the down-faulted beds, and also that the sea in its most recent submergence of the land did not extend along the whole base of the Tertiary high land to Ocean Grove. Further investigation, however, is required on these points.

The low-lying area in which recent marine shells occur, between the high Tertiary belt and the Point Lonsdale-Ocean Grove ridge, comprises—(*a*) several low isolated ridges more or less elongated (which were islands in the ancient sea), and a long "peninsula," all of dune limestone; and (*b*) four lakes of varying size.

Three of the lakes are salt, and the largest is a mile and one quarter in length from east to west, by half a mile in its greatest width, although in summer it becomes considerably reduced in area and shows much of its flat sandy or muddy floor, on which common salt is precipitated as the water evaporates. Recent marine shells are found all around the lake, which may be named Lake Lonsdale. Immediately to the west is another small salt lake, a few hundred yards only in diameter, but possessing similar characters to Lake Lonsdale. Both lakes lie along and form part of the low samphire belt.

South-west from the small lake just mentioned is another small circular salt lake, on the margins of which are found recent marine shells. It abuts against the Point Lonsdale-Ocean Grove ridge on the south, and differs from the two previous ones in that it is entirely cut off from the main low-lying area by comparatively high sand ridges. The lake may be named Lake Daintree, after the geologist who geologically surveyed the country in 1861.

The fourth lake is stated on the Quarter Sheet to have fresh water, but at the time of the writer's visit in the autumn it was perfectly dry. Remains of recent marine shells are there found, but it, like Lake Daintree, was also apparently isolated from the main sea area by wind-blown sand ridges, which are perhaps underlain by the dune limestone. The lake may be named Lake Selwyn, after the first director of the Geological Survey of Victoria.

The chief interest is in Lake Lonsdale. This and the small lake to the west are the only remains now of the extensive sea that formerly occupied the area (omitting Lakes Daintree and Selwyn, which, as shown above, were early cut off). Around Lake Lonsdale some stages of the process of conversion of the sea into land can be traced. Its northern shore abuts almost on to two of the dune limestone ridges mentioned above, at the southern foot of which is a wave-cut platform in the same rock. At its western end, it is cut off from the small lake by ordinary silt and low beach ridges. At its eastern end a bay bar was apparently formed, as the ground rises into a series of beach ridges and depressions which farther east die out to give place to low outcrops of travertine which probably cap dune limestone, although to the east-north-east the marine shell beds extend to Swan Bay.

On the south-eastern side of the lake a series (probably seven or eight of each) of low beach ridges and depressions can be traced southwards and south-eastwards for perhaps 200 yards, beyond which there is a fairly wide long belt of low-lying ground extending to the high coastal ridge. The low-lying belt is apparently a portion of the sea which was early cut off by the building of a bay bar followed by beach ridges, and which later was transformed into a lagoon which now, however, has been changed into practically dry land.

At about the centre of the southern shore of Lake Lonsdale, the high land from the south approaches the shore, then recedes as one goes westward, and again approaches the shore of the lake at its western end. The area so defined between the high land and the present lake was originally an arm of the sea, and probably later an arm of the lake. A beach ridge, acting as a bay bar, has been formed along the northern side of the arm. It brought about the formation of a large lagoon, portions of which still remain.

A low beach ridge now extends practically all around and follows the present outline of the lake, which no doubt it has determined. This ridge is the most recently formed physical feature.

From the imperfect description just given some idea may be obtained of how and by what means the sea has shrunk to its present dimensions, as indicated by Lake Lonsdale.

Whether relative uplift has occurred cannot be stated without some heights of various points in the district being obtained, but the evidence generally is against such theory. Much of the low marshy ground extending westwards from the south-western corner of Swan Bay is undoubtedly mere bay filling at present sea-level. The ground can be traced without any physical break westwards towards the high Tertiary belt, and into the Lake Lonsdale area by a gap between two of the dune limestone ridges on the northern side of the lake. That being so, the presumption is strong that there has been no recent uplift. When, however, the altitudes of certain critical localities have been ascertained, more light will probably be thrown on the matter.

It has not been proved whether the recent sea (that is, the sea which existed after the formation of the dune limestone) ever extended across where the low sand ridge stands which connects Point Lonsdale with Queenscliff. Its only direct connection with the main waters of Port Phillip Bay may have been through Swan Bay.

On the northern slopes of some of the low sand-covered dune limestone ridges, recent marine shells have been found. The origin of the shells has not yet been satisfactorily determined by the writer.

Rosebud Area.

South-west of Dromana there is a wide extent of low-lying land forming the north-eastern portion of the Sorrento Peninsula, over which area Mr. R. A. Keble guided Professor Johnson and the writer.

The low-lying ground consists of various broad but low beach ridges (which are oriented in different directions) containing recent marine shells, and some water-worn pebbles of quartz and other rocks. Towards the high ground to the south, which consists of dune limestone and forms the backbone of the peninsula, extensive marshy flats surround the ridges, and these flats contain remains of small fresh or brackish water mollusca. It appears, therefore, that the sea has been cut off by a bay bar, and the area gradually changed into a lagoon, in which the organisms mentioned flourished. The greater part of this lagoon has now been silted up. In the way mentioned the land has been prograded to the present shoreline at Rosebud.

The height of the low-lying land is not known. Probably the tops of the beach ridges are not more than 10 feet above present sea-level, but whether there has been uplift since their formation is at present an open question.

Carrum Area.

To the south of Mordialloc the coast line consists largely of low sand dunes, behind which is an extensive low-lying flat area which the Dandenong and other creeks enter. This area was earlier known as the Carrum Swamp. It has not yet been examined by the writer.

Elwood Area.

The small area to the north of Pt. Ormond, formerly occupied by the Elwood Swamp, which has now been drained, was originally an arm of the sea. This is proved by the fact that recent marine shells occur beneath the two to three feet of black mud which accumulated in the swamp. There can be little doubt that a low sand bar must have cut off this small old bay from the main part of Port Phillip Bay. The marine mollusca died, and the lagoon was gradually changed into a swamp by the accumulation of detritus from the adjacent land.

Allowing for the thickness of the black mud, the marine beds are probably at sea-level, and if that be so, then there is no evidence of uplift. Levels, however, are required.

V.—Wave-Cut Platforms.

A wave-cut platform standing beyond the reach of the waves is excellent evidence of a relative uplift, but neither within the bay nor outside in the immediate vicinity of Port Phillip Heads is there any such evidence.

Fine examples of wave-cut platforms in the dune limestone occur at Barwon Heads, Point Lonsdale, and on the ocean side of the Sorrento Peninsula. A wave-cut platform is also found cut in the Older Basalt just to the west of Cape Schanck. In all these cases the platforms are backed by rock cliffs which are receding owing to marine abrasion, and in this way the platforms are being extended with sea-level as at present. The platforms are exposed at low tide, and are bare of detritus. The slope of the platforms seaward is very gentle; in fact, their surface must be almost horizontal. This raises the question whether the platforms have been cut as they now stand at present sea-level, or whether since their cutting there has been an uplift of the land. If the latter has taken place, then it is a striking coincidence that the platforms should be uplifted just to low water mark. Of course this could occur, but the coincidence emphasises the necessity of caution in dealing with the matter, especially in view of the occurrence inside the bay of marine deposits above sea-level. One would expect, on the theory of uplift, that the platforms would be in similar positions.

If there has been uplift then the coastal edge of the platforms before uplift would be at present sea-level, which means that the slope of the platforms would then be much greater than now, and also that the uplift must have been along a hinge line which would follow the contour of the coast, a phenomenon so remarkable as to call for the strongest evidence of its occurrence. Such evidence is not available so far.

If the uplift extended landward beyond the present coast-line, then the landward edge of the platform must have been lifted above sea-level; and as no remains of the platform above sea-level have been found, it must have been removed by marine erosion. It follows, therefore, that the landward edge of the present platform has been cut at present sea-level.

It is clear that the platforms are now being extended landward by marine abrasion at present sea-level. It may be asked, therefore, why could not the whole width of the platforms have been cut at that level. A difficulty in this connection is to understand how such a high-level platform could be cut for a considerable width. One would think that the waves would practically cease to abrade. That they do not, however, is shown by the fact that, as already stated, the cliffs are still receding, and anyone who has watched the waves at high tide, especially with a strong wind behind them, will realise the great height and power that they attain on the platforms. The facts stated discount the uplift theory.

At one of the stacks on the platform at Point Lonsdale, a few yards from the shore, marine abrasion is now working to a height of five feet above the platform.

On their seaward side the platforms are now being destroyed, so that they are relatively narrow, probably on the average not more than 100 to 200 yards wide. They have been in places breached right through to the sea shore, where the bottom of the sea, although sand-covered, is two to four feet below the surface of the platforms. At their seaward edge the depth of the sea is much greater. There is thus another lower platform being cut by the waves, the surface of which would accord more with the diagrams of the text-books. This suggests that perhaps the present high-level platforms were formed at lower levels, that they have been uplifted, and that the sea, in establishing the old level over again, is destroying the original platforms. It has been shown above, however, that such uplift is improbable, but it is possible that in some way not yet fully understood, the sea can cut two platforms at different levels at the same time under certain conditions, such as the general abrasive power of the sea in a particular locality, which power is influenced by winds and currents, and such as the character of the rocks and the height of the land above the sea.

If the land were comparatively low and the rocks "soft," the formation of the high-level platform might be faster than that of the low-level one, and hence the two platforms, at least for a time, would be found. Increasing height of the cliffs or a change to "hard" rocks, or the occurrence of both these factors, would slow down the formation of the high-level platform, and permit the lower one to gain upon it. Ultimately the higher one might be completely overtaken and disappear.

If the land were high and the rocks "hard," the high-level platform might be destroyed so soon as a few feet in width of it were formed. Hence only one platform—the low-level one—would be regarded as forming, although, in reality, both would be formed, but the high-level one would be almost immediately destroyed.

The destruction of the high-level platform at its seaward edge aids the waves to maintain their abrasive power at its landward edge.

Examples on a small scale of wave-cut rock platforms may be seen within Port Phillip Bay at Portarlington (decomposed Older Basalt), Sorrento and Point Lonsdale (dune limestone), Geelong (Tertiary sediments), Beaumaris (ironstone), and elsewhere. They all occur similarly to the ocean platforms, and the remarks made in regard to the latter apply to the bay platforms.

VI.—River Terraces as bearing on the Question of Recent Relative Uplift.

If there has been a recent relative uplift there should be some evidence of a corresponding rejuvenation of the streams entering the bay. Such a correlation has been claimed in connection with the marine deposits at Altona, and the alluvial terraces of the Moonee Ponds Creek[2] at Moonee Ponds. (See T. S. Hall, "Victorian Hill and Dale.") But before such a correlation can be accepted, it must be beyond doubt that the terraces are really due to uplift, and if that be satisfactorily shown, then it has to be demonstrated that such uplift took place simultaneously with that at the sea coast. Similar evidence should also be forthcoming from other streams entering the bay, but so far that evidence is not known.

In the valleys of the Yarra and its tributaries, the writer is not aware of any terraces that can be definitely stated to be the result of uplift. In the valley of the Maribyrnong River there are several terraces in places, but some of these are clearly not due to uplift, but to aggradation, followed by erosion on changes in the course of the stream. In other places in the same valley, although uplift seems to be the only interpretation of the phenomena, yet the evidence suggests that such uplift took place prior to the uplift (if any) of the recent marine deposits.

The Stony Creek and Kororoit Creek valleys do not indicate any rejuvenation. On the contrary, that of the Kororoit Creek suggests aggradation only, such being due to the submergence of the valley.

In the lower Werribee River valley there are terraces some of which may be due to uplift, but as in the case of the Maribyrnong River, such uplift may have taken place prior to the uplift (if any) of the recent marine deposits.

In the lower Little River valley no terraces have been observed.

The other streams have not yet been sufficiently examined to say whether any terraces occur in them, but such study is in progress.

2.—The Moonee Ponds Creek is just to the east of the Maribyrnong River.

VII.—Origin of the Old Minor Bays.

Eastern Side.

The old Rosebud and Elwood bays appear to be due to the earth movements which formed Port Phillip Bay as a whole by submergence of the land beneath the sea. Prior to that submergence inequalities had been developed on the land surface, and those at Elwood and Rosebud were probably very low-lying areas. Consequently they became submerged at the same time as the remainder of the land which now forms Port Phillip Bay.

Western Side.

These old minor bays, besides being more numerous and yet of smaller area, are more interesting and difficult to explain than those on the eastern side. They cannot be regarded as being entirely due to marine abrasion, since the formation of bays of the character referred to is practically impossible by such means. They occur in the Newer Basalt, and they are probably connected with the subsidences that have taken place on the surface of the basalt during or subsequent to the cooling of that rock. Evidence of such subsidence is provided by the small closed basins, generally from one hundred to several hundred yards in diameter, which occur on the surface of the basalt, and which can only be accounted for by earth movements. Examples of such basins may be seen to the south-west of the Laverton Railway Station; at the "Sheepwash," to the west of Point Cooke; on the left bank of the Little River east of the main Geelong Road; and at other localities. But the old minor bays had of course mouths which connected with the sea, and it is difficult to imagine how such areas could be formed by subsidence alone. A possible explanation is that a number of basins (the bottoms of which were below sea-level) were formed close to the old coast, that erosion took place by marine abrasion which caused the retreat of the basalt until the seaward-facing rim of a basin was breached, and that the sea then entered the basin. If this be the true history, then the basins referred to were not submerged on the general subsidence which formed Port Phillip Bay, and therefore as old arms of the sea they are considerably younger than the Elwood and Rosebud Bays and Port Phillip Bay generally.

It might be urged that such minor basins represent the lower widened portions of old river valleys, but this is not tenable, as no valleys (except some very small ones, which are quite out of proportion to the size of the basins) enter the latter.

VIII.—General Summary of the Facts and their Interpretation.

From the observations so far made it may be said that on the whole, the eastern side of Port Phillip Bay is one of erosion, the primary causes of which are the strong current that apparently sweeps from the Heads along that side of the bay, and the power of the waves that are formed by the strong southerly and south-westerly winds. These agents of erosion find, in places, nothing but unconsolidated or only slightly consolidated sands, such as those which form the cliffs at Mentone. It is, therefore, not surprising that under those conditions erosion is severe, and causes much anxiety to the foreshore authorities.

There are no streams of any size entering the bay on its eastern side; hence there is scarcely any river-borne detritus to be first removed.

A prominent exception to the general statement made above as to the predominance of erosion on the eastern side of the bay is the Rosebud area, where extensive marine deposits occur. Elwood is a similar area.

The head of the bay is an area of progradation, as shown by the formation of the Yarra Delta. Such a delta is naturally to be expected, considering the very favourable position for its growth, and the large amount of detritus carried into the area from the basins of the Yarra and Maribyrnong River drainage systems.

That portion of the western shore of the bay which extends from the Yarra mouth to the north-western corner of Corio Bay has, in contrast with the western shore, been an area of deposition, as shown by the extensive recent marine deposits which there occur, and which, in some instances at least, have undoubtedly been formed at present sea-level. The deposition may be due to the slowing down of a current from the eastern side of the bay, and to the overloading of the coastal water by the abundant detritus brought to the head of the bay by the rivers mentioned above, part of which no doubt is carried towards the western shore. In addition, two fairly large rivers, the Werribee and Little, and some smaller streams, also enter on the western side of the bay, and thus furnish a further considerable quantity of detritus for land building if it cannot be removed promptly by the sea.

The rocks of the eastern side are also in marked contrast with those of the western, those of the former being, as already noted, in many places quite or comparatively soft; but the Newer Basalt occurs on the western shore, and its erosion by the sea, despite its low height above sea-level, is very slow.

An interesting feature of the western shore of the bay, as above defined, is the number of small bays which formerly existed, but which have been cut off from the main bay by the formation of bay bars across their mouths, following which a series of beach ridges has been formed, thus bringing about the progradation of the land.

Along the western and southern shores of Corio Bay there are cliffs of Tertiary sediments, and there is scarcely any progradation.

Between Geelong and Point Henry an old minor bay has been slowly prograded by silting. There appears to be no bay bar first formed there.

The Henry Peninsula is an example of an island which has been tied to the mainland by silting alone, or silting combined with uplift, and hence may be regarded as an example of a tombolo. At the central part of Point Henry the cliffs of Tertiary clays are receding by erosion, and on either side the land is being prograded by deposition of detritus, the old sea cliffs being now a few yards away from the shore and grass-covered.

Immediately east of the Henry Peninsula, the coast line has been slightly prograded at present sea-level by means of low beach ridges. The old sea cliffs at the rear are now partly grass-covered.

The coast thence to Portarlington has not been examined, but it has some cliffs, and appears to be one mainly of erosion.

At Portarlington there is evidence of both the growth and removal of land.

St. Leonard's has not been examined, but from the geological maps there has apparently been a certain amount of progradation, especially by the formation of a long spit—the St. Leonard's Spit—projecting southwards, and thus helping to isolate Swan Bay from the main bay of Port Phillip.

The area between the high belt of Tertiary rocks stretching from St. Leonard's to Ocean Grove and the Point Lonsdale-Ocean Grove Ridge, is one of great siltation. Much land has been naturally reclaimed from the sea in this area. Swan Bay is the portion as yet unreclaimed, but siltation is rapidly taking place there. On the eastern side of Swan Bay is the large Swan Island, which has been formed by recent beach ridge building and by siltation. The small Rabbit Island, between Swan Island and Queenscliff, and Duck Island, to the north of Swan Island, also apparently belong to the same category, although Duck Island has not been examined. The St. Leonard's Spit hastens the siltation of Swan Bay.

The Queenscliff Spit is the only pronounced area of deposition at Queenscliff, the remainder of the coast being chiefly an area of erosion. Between Queenscliff and Point Lonsdale the coast is one of erosion, although erosion is slowed down by the action of the wind in picking up the beach sand and building up sand dunes.

The present bay side of the Sorrento Peninsula is being eroded by the sea, as shown by the steep cliffs and wave-cut platforms. Deposition seems to be at a minimum, but in the Rosebud area it has been extensive in the past.

The Lake Connewarre area, although outside Port Phillip Bay, may for the sake of completeness be referred to as an area in which much recent natural reclamation of the land from the sea has taken place.

In regard to whether or not there has been a recent small relative uplift of the land, the general weight of the evidence, as outlined in the preceding sections, is in favour of no uplift, that is to say, that all the features of beach ridges, depressions and low-lying flats, which have been taken as evidence of an uplift, and which have been termed raised beaches, may be interpreted as having been formed, with sea-level as at present. The wave-cut platforms inside and outside Port Phillip Bay appear on the whole to support the conclusion stated.

Levels, however, are required in several (or perhaps many) districts, and especially at some critical localities, before a definite pronouncement can be made on the matter, and moreover, certain ground has not been examined, and its examination may give much valuable information.

Apart, however, from the levelling required and the necessity for the examination of further ground, there are certain facts which may be read as indicating uplift. Thus the beach ridges at Altona which are associated with the Newer Basalt, the sudden drop in height in some of the deposits as the sea is approached (as at Altona, the Henry Peninsula, Lara, and, probably, at Queenscliff), and the higher deposits inland than close to the sea, where there are apparently no beach ridges (as in the western portion of the Skeleton Basin and in the Little River area) may be evidence of uplift.

Similarly a prominent oyster band on the western shore of Corio Bay from sea-level to eight feet above it, may possibly be interpreted in the same way, although other interpretations may be suggested.

The possible effect on erosion and deposition within the bay, of the building of the dune limestone at its mouth, has not been considered yet.

Enough has been said to indicate the necessity for further investigations, and to show that for the present the question of relative uplift or not must be left open, although, as indicated above, the weight of the known evidence is against uplift for most of the deposits. Possibly there are two series of deposits in some localities, the older of which may have been uplifted.

Whether there has been a recent uplift or not, the formation of much of the land has apparently been by the building of successive beach ridges (progradation) and not by a simple uplift of a submerged area.

[PROC. ROY. SOC. VICTORIA 43 (N.S.), PT. II, 1931.]

ART. XIII.—*Flowering Periods of Victorian Plants.*

By JEAN HEYWARD, M.Sc.
(Research Scholar, Botanical Department, University of Melbourne).

[Read 13th November, 1930; issued separately 6th February, 1931.]

In the following pages an attempt has been made to give, in the form of graphs, a phenological record for all native Victorian genera of plants, with the exception of the genus *Eucalyptus.* This genus has been omitted on account of the irregularity of its flowering—some species flower biennially, others triennially, so that it would be impossible to give a satisfactory record in one graph for the genus as a whole. The graphs are intended to cover the flowering periods throughout the whole State, although these will necessarily vary slightly in different parts according to habitat, rainfall, etc. Just as they vary in different parts of the State in any one season, they also vary in the same part according to the season. In most cases, however, the variations in the time of flowering are not as great as one might expect, and do not amount to more than a few weeks even with great variation in rainfall, temperature or elevation.

The months during which each species was in flower were recorded from observations in the field, and from Herbarium records. Then, by combining the flowering periods of all species of a genus, a single flowering period for that genus was obtained. In this way, a more generalised summary is made possible with less interference due to the irregular behaviour of individual species. From these records also, that portion of the flowering period during which the majority of species are in flower, can be observed. This portion has been represented in the graphs by a very thick line (▬▬). A thinner line (———) represents the period during which an average number of species flower, and a very fine line (———) shows when a single species or an occasional plant of a species is in flower. In some cases, as in Acacia, extra degrees of thickness have been employed to denote more pronounced differences in the number of species in flower. Several genera, such as *Morgania* and *Rochelia,* can be found in flower all the year round, according to the climatic conditions without a climax at any particular time. This has been shown in the graphs by a short, thick line in each month thus ▬▬ ▬▬. In some genera, such as *Drakaea,* two distinct flowering periods are illustrated. This is necessary when the species of the genus do not have a common flowering period, but flower at different times of the year. In these cases, numbers are given on the graphs with the genus corresponding to the numbers opposite the species in the Flora of Victoria (1).

Tables have been constructed from these graphs to test a hypothesis put forward by Illichevsky on the Data of Systematics, and the Order of Flowering (2). On this hypothesis the order of flowering of plants during a summer coincides with the order of their phylogenetic evolution—that is, the most highly developed plants—those with inferior ovaries, sympetalous flowers, etc.—being more complex, require for their maturation and flowering a longer time and a greater quantity of warmth than simpler plants. Further, it implies that plants should flower in the order in which they prevailed during geological periods. The following tables, set out on the lines of those of Illichevsky, show that the Victorian Flora does not agree with this hypothesis. Not only the summer months but every month in the year is taken into account.

An examination of Table I, which deals with the dicotyledons as a whole, show a gradual rise from June to November in the number of genera in flower, then a gradual decline to the following June.

TABLE I.—ALL DICOTYLEDONS.

No. of genera		June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May
404	No. in flower	28	61	118	226	305	328	313	250	160	105	61	29
	%	6·9	15·1	29·2	55·9	75·5	81·2	77·5	61·9	39·6	26·0	15·1	7·2

Exactly the same rise to November and fall to June is shown in Tables II and III. These tables deal only with the more highly developed plants—those with inferior ovaries (Table II) and those with sympetalous flowers (Table III), so that, if Illichevsky's theory held, there should be a later maximum shown in the two latter tables than in Table I. There should be a steady increase to February, which is our hottest month, instead of the rise to November, followed by a gradual decline over the hotter months of December, January and February, as is actually shown.

TABLE II.—DICOTYLEDONS WITH INFERIOR OVARIES.

No. of genera		June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May
112	No. in flower	3	8	23	56	81	91	89	76	35	34	22	11
	%	2·7	7·1	20·5	50	72·3	81·3	79·5	67·9	29·5	30·4	19·6	9·8

TABLE III.—SYMPETALAE (DICOTYLEDONS).

No. of genera		June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May
148	No. in flower	7	14	34	72	117	128	118	95	53	38	22	11
	%	4·7	9·5	23·0	48·6	79·0	86·5	79·7	64·8	35·8	25·7	14·9	7·

Again, if Illichevsky's hypothesis held any truth, it should be borne out by the family Compositae, which is generally regarded as highly specialised, and hence fairly recently evolved. One would expect to find a very late maximum, but here, too, only the same rise to November and fall to June, as is in (Tables I, II, III) can be seen.

TABLE IV.—COMPOSITAE (DICOTYLEDONS).

No. of genera		June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May
51	No. in flower	2	4	12	26	35	38	33	28	15	14	10	7
	%	3·95	7·8	23·5	50·9	68·3	74·5	64·7	54·9	29·8	27·45	19·6	13·7

The tables dealing with Monocotyledons do not show quite the same regular rise and fall. In Table V, which includes all the monocotyledonous genera, the maximum month is December, with a gradual decrease to June. Thus the Monocotyledons as a whole seem to flower later than the Dicotyledons.

TABLE V.—ALL MONOCOTYLEDONS.

No. of genera		June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May
163	No. in flower	12	20	37	72	102	123	138	101	77	51	33	15
	%	7·4	12·3	22·7	44·2	62·6	75·5	84·7	62·0	47·2	31·3	20·3	9·2

Some of the more highly developed Monocotyledons, taking for example those with inferior ovaries, show the same maximum in December (Table VI).

TABLE VI.—MONOCOTYLEDONS WITH INFERIOR OVARIES.

No. of genera		June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May
35	No. in flower	6	9	13	17	20	21	23	18	10	8	10	8
	%	17·1	25·7	37·1	48·6	57·1	60·0	65·7	51·4	28·6	22·9	28·6	22.9

In Table VI there seems to be a slight rise again in April before the final minimum in June. This slight rise in April is probably due to the Autumn flowering orchids, for the table representing Orchidaceae shows the same variation. In Orchidaceae (Table VII) the maximum is spread over September, October and November.

TABLE VII.—ORCHIDACEAE.

No. of genera		June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May
25	No. in flower	5	8	11	14	14	14	13	6	3	2	6	4
	%	20	32	44	56	56	56	52	24	12	8	24	16

Orchidaceae is generally regarded as the most highly developed monocotyledonous family, and therefore, if this is so, it is a direct contradiction of Illichevsky's hypothesis, for all the monocotyledons together—including primitive as well as highly developed genera—show a later flowering maximum than do these specialised orchids.

The family Gramineae (Table VIII) shows the same rise and fall as all the Monocotyledons (Table V).

TABLE VIII.—GRAMINEAE.

No. of genera		June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May
54	No. in flower	3	3	9	18	31	43	48	45	36	21	13	—
	%	5·5	5·5	16·6	33·3	57·4	79·6	88·8	83·3	66·6	38·9	24·0	—

Some slight agreement with the hypothesis is shown by the family Liliaceae. The maximum flowering is in October, while the minimum is spread over May, June and July. Here it is shown that a primitive family like Liliaceae has an earlier maximum than the monocotyledons as a whole.

TABLE IX.—LILIACEAE.

No. of genera		June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May
25	No. in flower	—	—	5	15	22	21	19	14	7	3	1	—
	%	—	—	20	60	88	84	76	56	28	12	4	—

Thus, of all the tables constructed, No. IX alone shows any agreement with Illichevsky's theory. For the Victorian flora as a whole, the maximum flowering month is November, while the minimum is June, and between these two months there seems to be a fairly steady rise and fall. Moreover, if the number of species in flower in each month is calculated instead of the number of genera, the position of the maximum remains the same. It seems, therefore, on the evidence presented by these tables that factors other than that of temperature, which Illichevsky regards as the main one, affect the period of flowering. One of the main factors to be considered is that of rainfall. With early rains, plants will doubtless flower earlier. In Central Australia, immediately after the rains, plants spring up, flower and die in a few weeks. These plants, of course, are annuals which seem to adjust themselves more readily to variations in the conditions. In this instance, the flowering period depends entirely on the rainfall. Even in Victoria, in spite of its moister climate, the supply of water is more commonly a limiting factor to plant development than is temperature. Only very few areas in Victoria have a rainfall approaching 40 inches; the average is not more than 20 inches, and in the northern areas the lowest rainfall coincides with the highest annual temperatures so that the general conditions are strongly xerophytic. In addition, the hot north winds which come from the dry interior, in the course of ages, may have had the effect of shortening the summer flowering period in many of the more delicate plants. Plants which are capable of perennating over a dry period—those with bulbs, for instance—will often lie dormant during more or less unfavourable conditions until the rains come or moisture is otherwise supplied.

The habitat is another factor affecting the flowering period which must be taken into account. Plants growing in a shaded valley, for instance, will often flower at a later date than those on the sides of a hill, or on a level plain fully exposed to the sunlight. Another factor which may have some slight effect on the period of flowering is the presence of insects. Flowers pollinated by insects must flourish during the life cycle of the insects on which they are dependent, if they can only reproduce by seeds, and if they are incapable of self-pollination or unable to form cleistogamous flowers. Several other factors also should probably be taken into account—such as the chemical and physical composition of the soil and internal factors, so that no single factor can be the sole determinant of the time of flowering and its duration.

This work has been carried out in the Botany School of the Melbourne University during the tenure of a Government Research Scholarship. In conclusion, I wish to thank Professor Ewart for his helpful suggestions and interest, Dr. E. McLennan for her assistance, and members of the staff of the National Herbarium for their co-operation in giving me ready access to their specimens.

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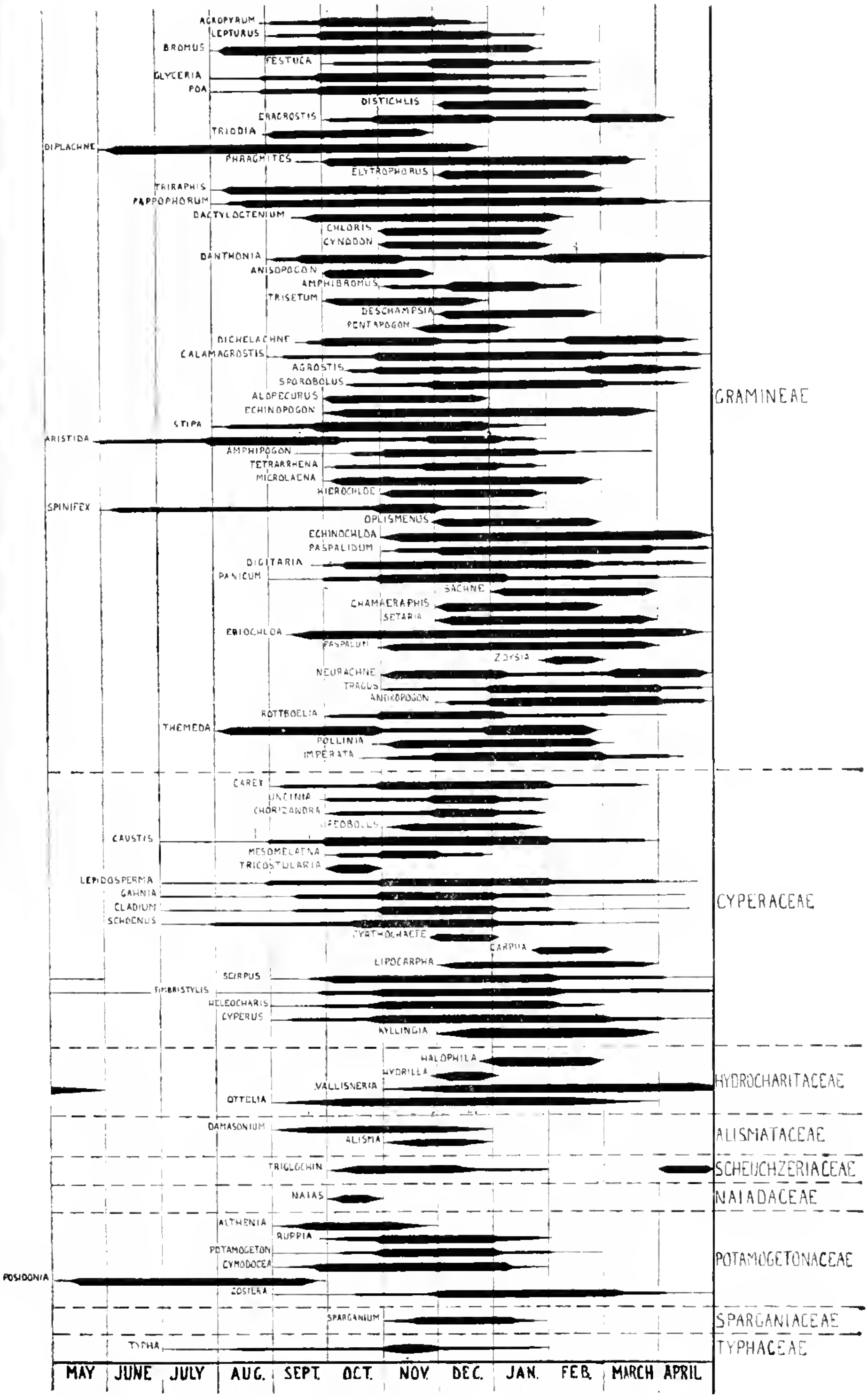
1. A. J. Ewart. Flora of Victoria (In press, 1930).
2. S. Illichevsky. Data of Systematics and the Order of Flowering. *Proc. International Congress of Plant Sciences*, ii, 1926.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TRIRAPHIS
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DACTYLOCTENIUM
CHLORIS
CYNODON
DANTHONIA
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SETARIA
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ZOYSIA
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TRAGUS
ANDROPOGON
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CAREX
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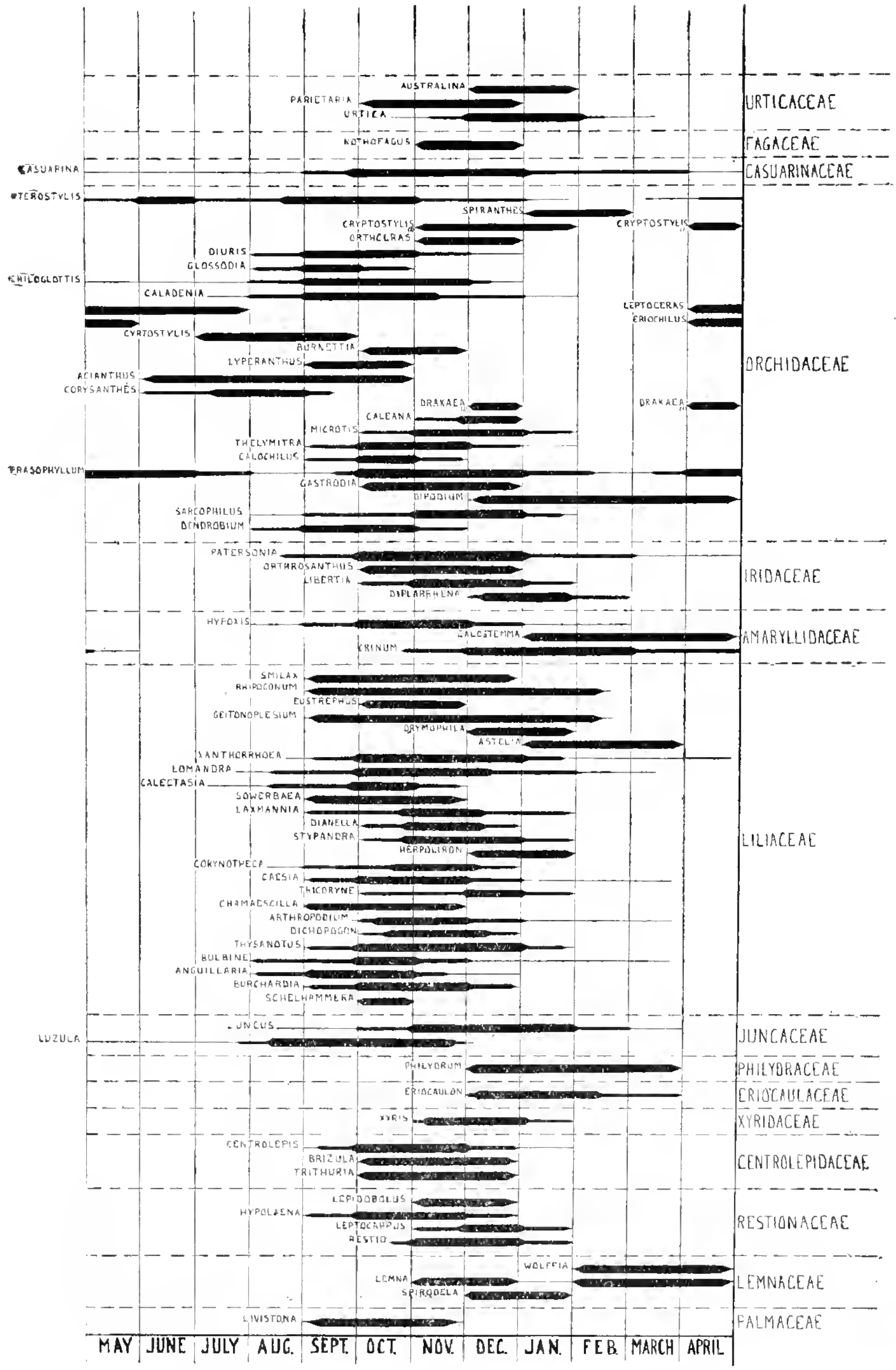
FIG. 1.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DRAKAEA
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Fig. 2.

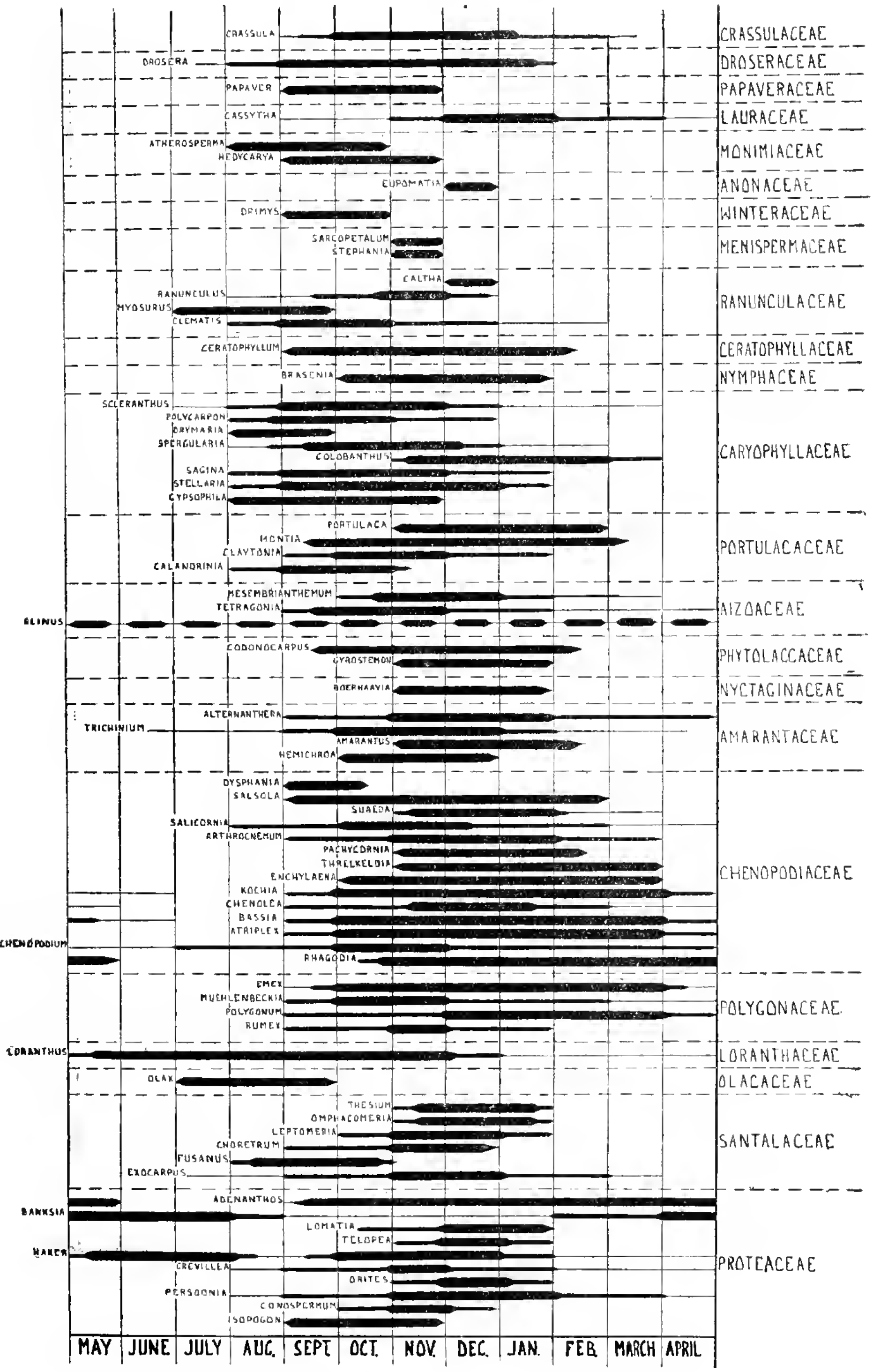
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Fig. 3.

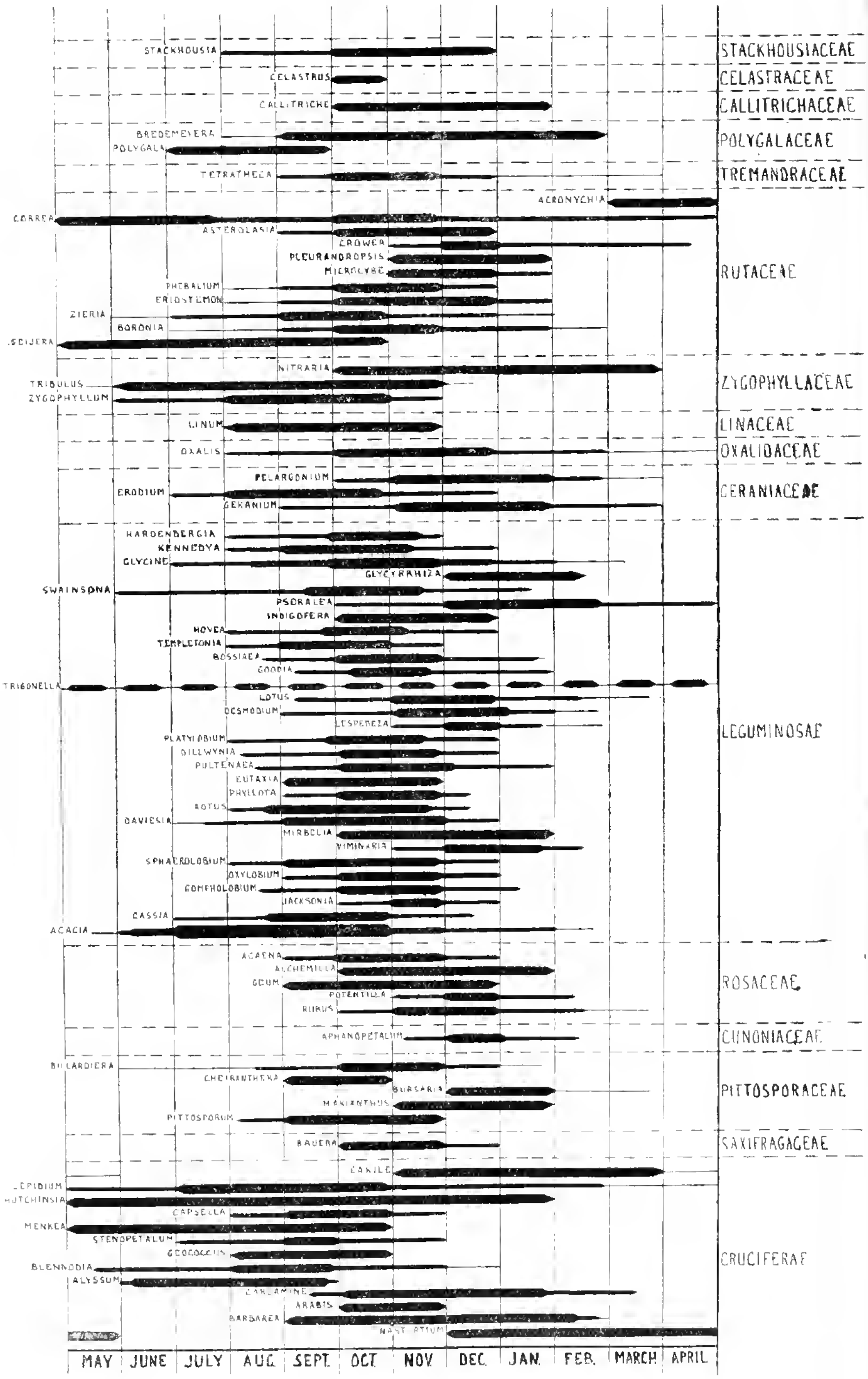
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Fig. 4.

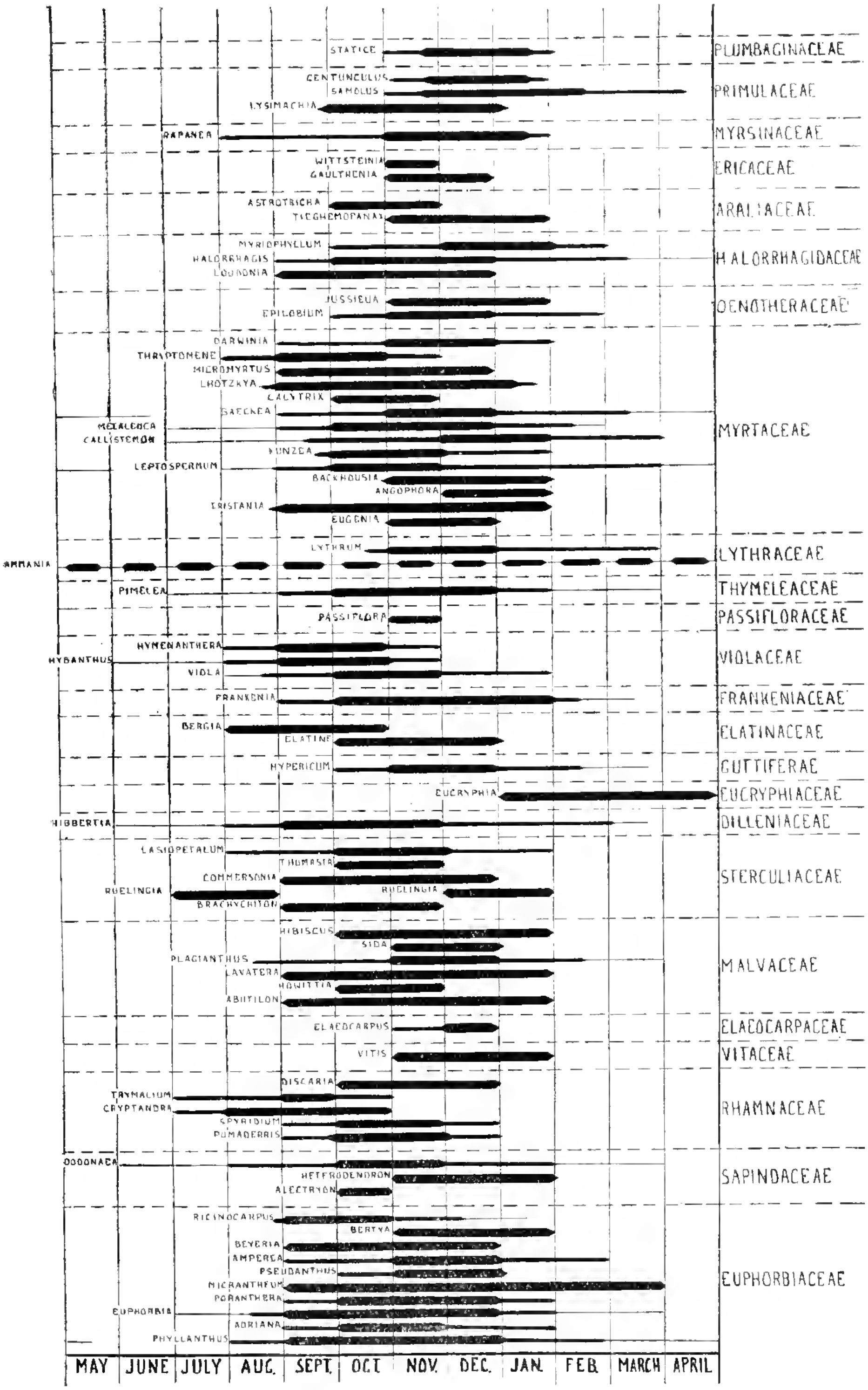
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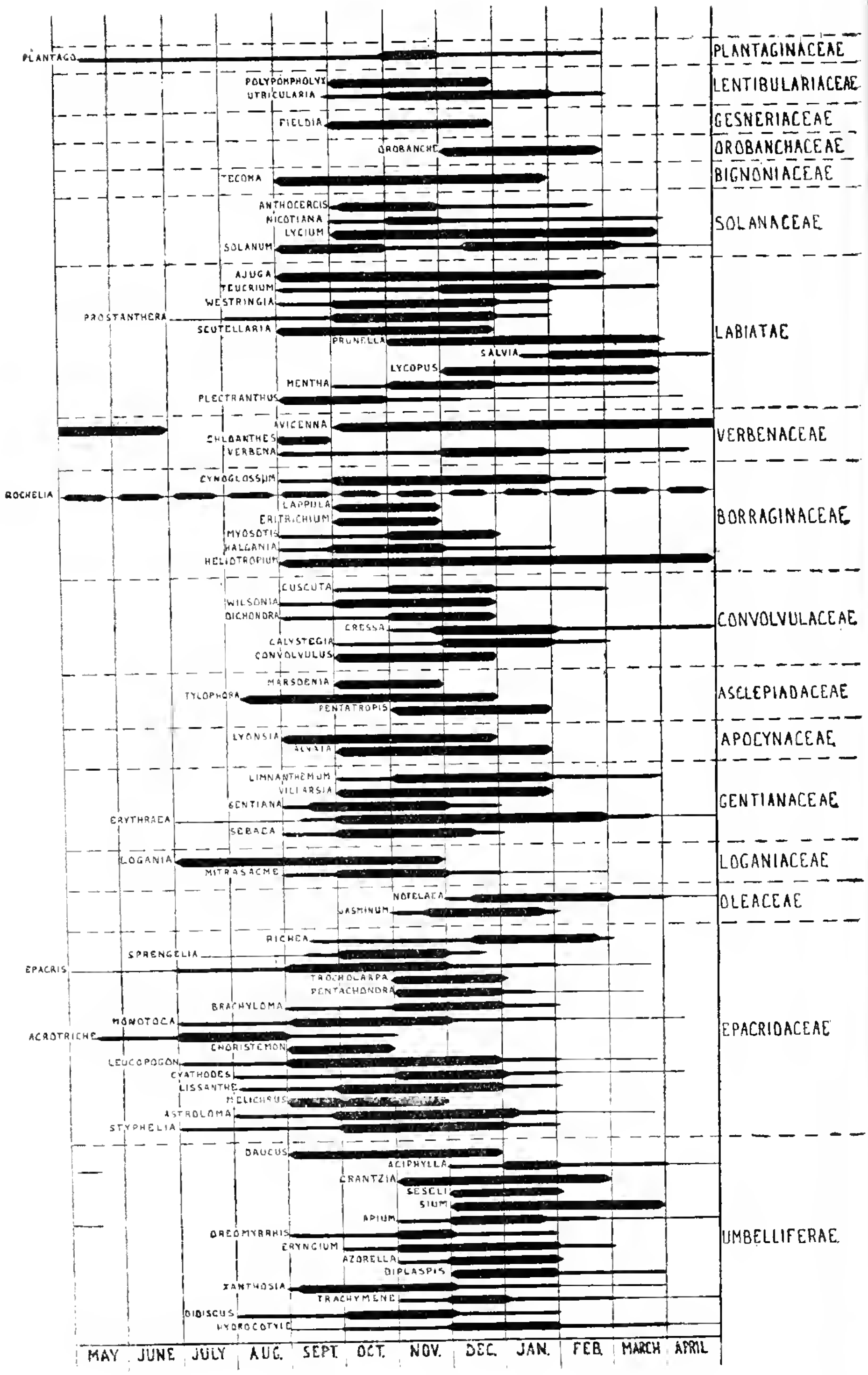
Fig. 5.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CYNOGLOSSUM
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LAPPULA
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HALGANIA
HELIOTROPIUM
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CRESSA
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ERYNGIUM
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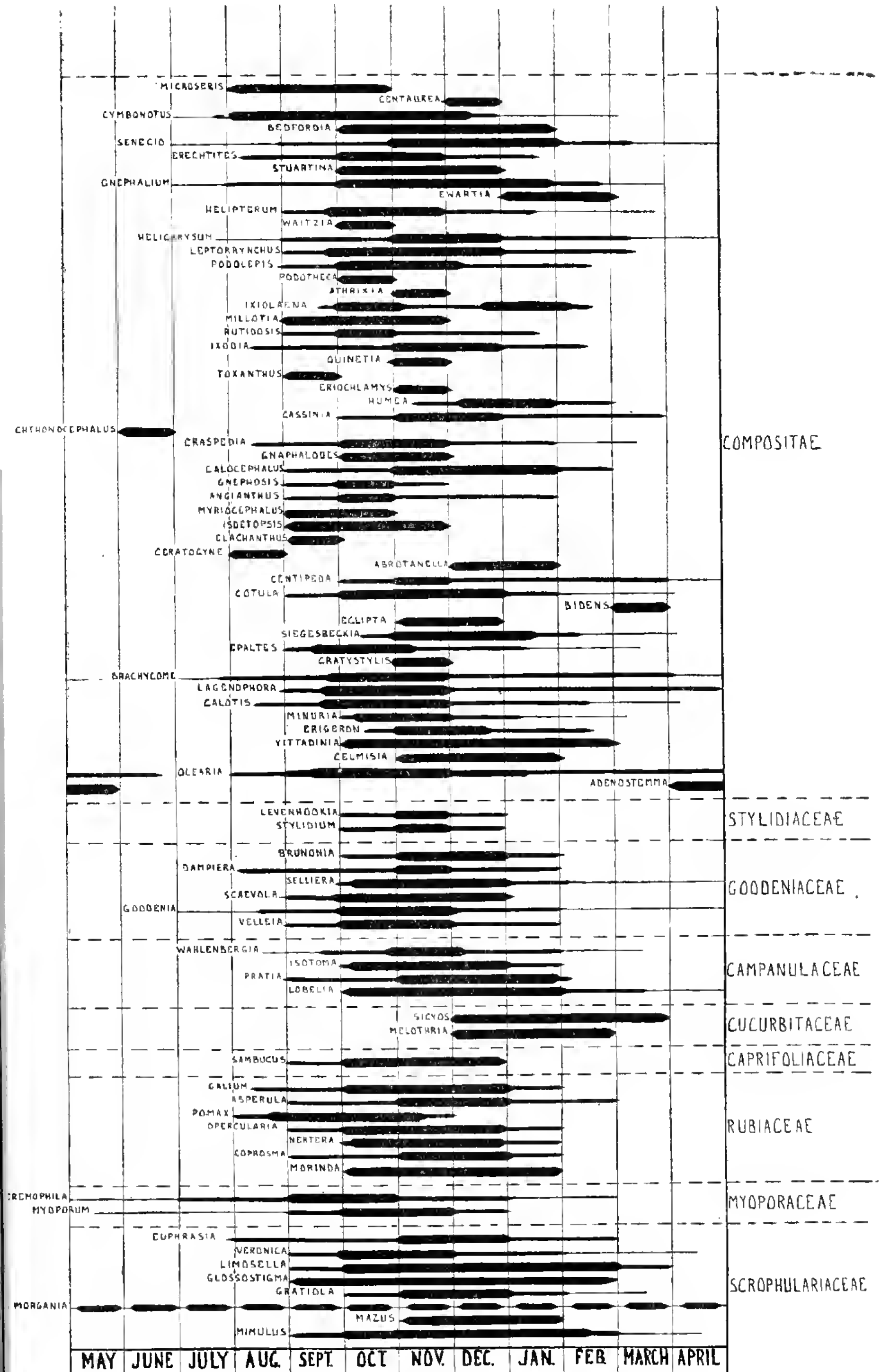
Fig. 6.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ATHRIXIA
IXIOLAENA
MILLOTIA
RUTIDOSIS
IXODIA
QUINETIA
TOXANTHUS
ERIOCHLAMYS
HUMEA
CASSINIA
CHTHONOCEPHALUS
CRASPEDIA
GNAPHALODES
CALOCEPHALUS
GNEPHOSIS
ANGIANTHUS
MYRIOCEPHALUS
ISOETOPSIS
CLACHANTHUS
CERATOGYNE
ABROTANELLA
CENTIPEDA
COTULA
BIDENS
ECLIPTA
SIEGESBECKIA
EPALTES
CRATYSTYLIS
BRACHYCOME
LAGENOPHORA
CALOTIS
MINURIA
ERIGERON
VITTADINIA
CELMISIA
OLEARIA
ADENOSTEMMA
COMPOSITAE
LEVENHOOKIA
STYLIDIUM
STYLIDIACEAE
BRUNONIA
DAMPIERA
SELLIERA
SCAEVOLA
GOODENIA
VELLEIA
GOODENIACEAE
WAHLENBERGIA
ISOTOMA
PRATIA
LOBELIA
CAMPANULACEAE
SICYOS
MELOTHRIA
CUCURBITACEAE
SAMBUCUS
CAPRIFOLIACEAE
GALIUM
ASPERULA
POMAX
OPERCULARIA
NERTERA
COPROSMA
MORINDA
RUBIACEAE
EREMOPHILA
MYOPORUM
MYOPORACEAE
EUPHRASIA
VERONICA
LIMOSELLA
GLOSSOSTIGMA
GRATIOLA
MORGANIA
MAZUS
MIMULUS
SCROPHULARIACEAE
MAY
JUNE
JULY
AUG.
SEPT.
OCT.
NOV.
DEC.
JAN.
FEB.
MARCH
APRIL

FIG. 7.

[Proc. Roy. Soc. Victoria, 43 (N.S.), Pt. II, 1931.]

Art. XIV.—*Australian Hydrophilidae; Notes and New Species*

By CEDRIC DEANE, A.M.I.E., Aust.

[Read 13th November, 1930; issued separately 26th February, 1931.]

The insects here dealt with all inhabit running streams where the water is flowing at a somewhat slower velocity than that to which the members of the family Dryopidae are usually adapted. In some respects, however, their habits are similar, and collectors are known to mistake the one for the other.

The Hydrophilidae may for certain purposes be divided into two classes according to their habits, viz.: (*a*) those which swim in the water and have legs formed for swimming (natatorious) and which rest lightly against reeds and other plants when stationary, and (*b*) those which do not swim, and have legs not formed for swimming, but which cling to sticks, logs, stones or other objects in the flowing water, being at most times submerged.

It is with the latter group that the present paper is concerned.

In Stephens' "Manual of British Coleoptera," 1839, there appear the names and descriptions of eleven species of a genus *Ochthebius* and three of *Enicocerus*. The species of the former were later re-arranged and *Enicocerus* was included in *Ochthebius*. This genus occurs throughout Europe and other parts.

Hitherto only four species have been described under *Ochthebius* from Australia. These are *O. australis* Blackburn, *O. novicius* Blackburn, *O. brisbanensis* Blackburn, and *O. macrognathus* Lea. The difference between *O. novicius* on the one hand and the remaining three on the other are, in my opinion, sufficiently great to accord them at least generic separation. Moreover, *O. brisbanensis* Bl., and *O. longipes*, n. sp., in regard to the clypeus, prothorax and legs, could well be separated from *O. australis* Bl., *O. clarki*, n. sp., and *O. clypeatus*, n. sp.

An interesting feature of these insects is the structure and arrangement of the antennae and maxillary palpi. Without the aid of a lens the palpi may be mistaken for the antennae, due to the prominence of the former, and partial concealment of the latter. The antennae are laid back and curved around the base of the eyes below; they are with difficulty set out for examination. The club, composed of the five apical segments, is entirely concealed in the cavity of the prothorax, which receives the eye when the head is retracted. These segments seem almost prone to become broken off, the appearance of the remaining portion of the appendage being thus misleading. Whether this calamity occurs before or after death of the insect I have not yet ascertained, but sometimes the detached club may be seen adhering to the gum on the card near the mounted specimen.

OCHTHEBIUS CLARKI, n. sp.

(Text-fig. 1, No. 1.)

Subelliptic, nitid, cupreous. Head spatulate, dull black. Clypeus arcuate, anterior margin entire, not excavated. Eyes normal. Pronotum subtrapeziform, somewhat transverse, brown, rather nitid; scarcely emarginate, widest at apex; anterior angles acute, median sulcus straight, narrow; four shallow depressions or foveolae on the disc symmetrically placed with regard to the median axis, the two anterior sub-quadrate, parallel, the two posterior narrower, converging towards base. Scutellum invisible. Elytra obovate convex, slightly depressed at centre, sloping away near apex; sides marginate on basal two-thirds, immarginate on apical third; marginal curvature not uniform; punctate striate; interstices feebly convex. Suture elevated. Legs small, light brown, not nitid; posterior tibiae not reaching to apex of elytra. Claws very small. Wings white.

Length, 1·65 mm.; width, 0·72 mm.

Habitat.—Sydney, New South Wales.

Type in National Museum, Melbourne.

This species may be distinguished from *O. australis* by its more metallic cupreous colour, its smaller legs, less convex interstices to the elytral striae and pronotum narrowing towards base. The eyes also are set forward slightly, whilst in *O. australis* they are set somewhat backward. Dedicated to Mr. John Clark, of the National Museum, Melbourne.

OCHTHEBIUS ANGUSTIPENNIS, n. sp.

(Text-fig. 1, No. 2.)

Convex, rather elongate, brassy-black, nitid. Head irregular, coarsely wrinkled, black, nitid. Clypeus with a medial protuberance, pubescent anteriorly, nitid and finely granulate posteriorly. Eyes set slightly upward. Palpi large. Pronotum jardiniere-shaped, surrounded by a membraneous frill, black, nitid, subcylindric in centre, flanged at sides; medial sulcus wide, rather deep, constricted at centre; anterior impressions nearly circular, conspicuous: posterior almost obsolete; widest before middle, anterior angles acute. Scutellum minute, hardly visible. Elytra narrow, convex, striato-punctate, interstices not very convex; humeral angles normal; apices slightly rounded; suture gaping, somewhat raised. Legs normal, orange to light brown. Tibiae straight, posterior extending just beyond apex of elytra.

Length, 1·44 mm; width, 0·61 mm.

Habitat.—Sydney, New South Wales (H. W. Cox).

Type in National Museum, Melbourne.

This species differs from *O. clarki* in having form narrower, side portions of prothorax cut away before reaching base, prothorax widest just before middle, pronotum more convex, clypeus toothed.

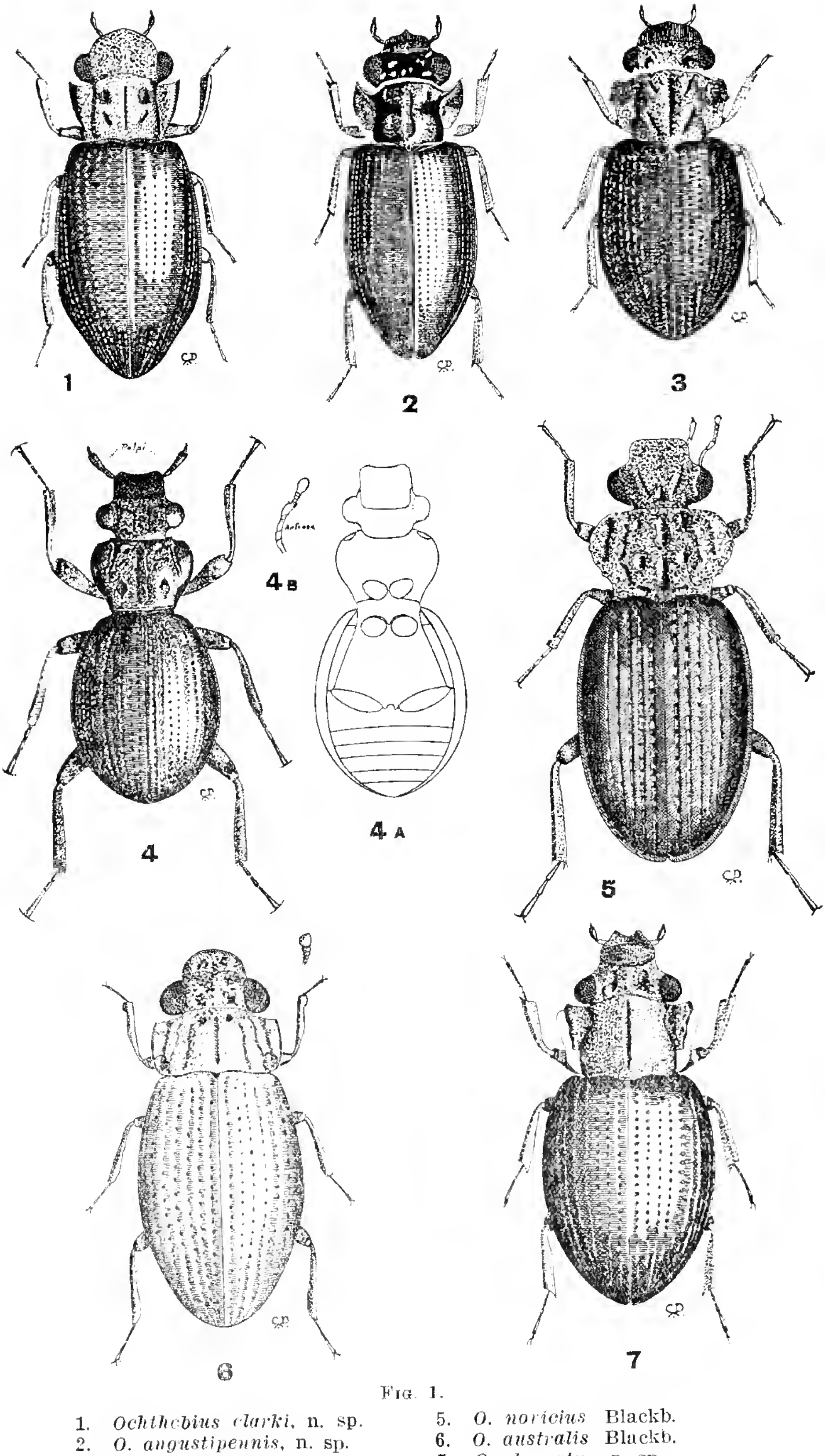

FIG. 1.

1. *Ochthebius clarki*, n. sp.
2. *O. angustipennis*, n. sp.
3. *O. tenebricosus*, n. sp.
4. *O. longipes*, n. sp., *4a*, ventral diagram. *4b*, antenna.
5. *O. noricius* Blackb.
6. *O. australis* Blackb.
7. *O. clypeatus*, n. sp.

OCHTHEBIUS TENEBRICOSUS, n. sp.

(Text-fig. 1, No. 3.)

Ovate, lightly convex, dull black. Head short, wide, black; a globular brown tubercle on each side near base. Clypeus slightly pubescent, with faint protuberance at middle of anterior margin. Eyes set slightly upwards. Palpi small. Pronotum sub-scutellate, dull; membraneous frill on anterior margin only; flanges wide, toothed at widest part; lateral margins excavate on posterior half; median sulcus deep, not constricted, widest just before middle, tapering towards base and apex; the four discal impressions fossate oblique, both pairs converging towards base. Scutellum invisible. Elytra wide, punctate-striate, the punctures wide and shallow. Suture close-fitting, not elevated. Legs flavous, small, posterior tibiae not reaching to apex of elytra.

Length, 1·57 mm.; width, 0·69 mm.

Habitat.—Sydney, New South Wales (Carter).

Type in National Museum, Melbourne.

This species is perhaps distantly allied to *O. novicius* Blackburn, more particularly in the general structure of the prothorax, the elytra and the legs, which, however, are shorter. In the shape of the head it differs greatly, the front of clypeus being protuberant in middle, and the eyes being set more normally. The pronotal impressions in the new species are all fossate, whereas in *O. novicius* Bl. the outer four are foveolate. The elytra are practically immarginate, and the striae are less strongly marked in the new species, which on the whole is much smaller.

OCHTHEBIUS PALLIDIPENNIS, n. sp.

(Text-fig. 2*a*.)

Elongate-elliptic, convex, somewhat nitid, flavous. Head narrow, spatulate, coarsely rugose. Clypeus arcuate on anterior margin. Antennae rather free, terminal segments composing club distinctly separated. Palpi with terminal segment very slender, acutely pointed. Eyes small, prominent. Prothorax sub-cordate-scutellate, widest before middle, coarsely and irregularly and feebly punctate; no large and conspicuous fossae; transverse, with narrow pergameneous, flanges on basal half of sides and on anterior margin. Scutellum invisible. Elytra elliptic, punctate-striate, margin entire, not dehiscent at apex; suture not raised. Legs medium; posterior femora not reaching to, tibiae extending beyond, apex of abdomen.

Length, 1·85 mm.; width, 0·83 mm.

Habitat.—Townsville, North Queensland (G. F. Hill).

Type in Coll. Wilson.

This species stands somewhat alone, being not nearly allied to any of the other Australian forms of the genus; in fact, it would be suggestive of a new genus, were it not for the palpi which are rather of the typical *Ochthebius* form.

OCHTHEBIUS FISCHERI, n. sp.

Oval, convex, somewhat nitid, black, form rather wide. Head fossate. Clypeus obtusely pointed or with a tooth on centre of anterior margin; suture strong; feebly tuberculose near eyes. Eyes large. Palpi with apical segment short. Prothorax strongly transverse, disc qualrifossate, with narrow pergameneous flange on anterior margin only; widest at middle. Scutellum invisible. Elytra oval, strongly striate-punctate; not dehiscent at apex. Legs light brown; anterior tibiae robust, posterior tibiae scarcely reaching to apex of abdomen.

Length, 1·65 mm.; width, 0·77 mm.

Habitat.—Melbourne, Victoria (Ejnar Fischer).

Type in National Museum, Melbourne.

I have named this species after my late friend Ejnar Fischer, of Oslo, Norway. It is allied to *O. australis* Blackb., from which

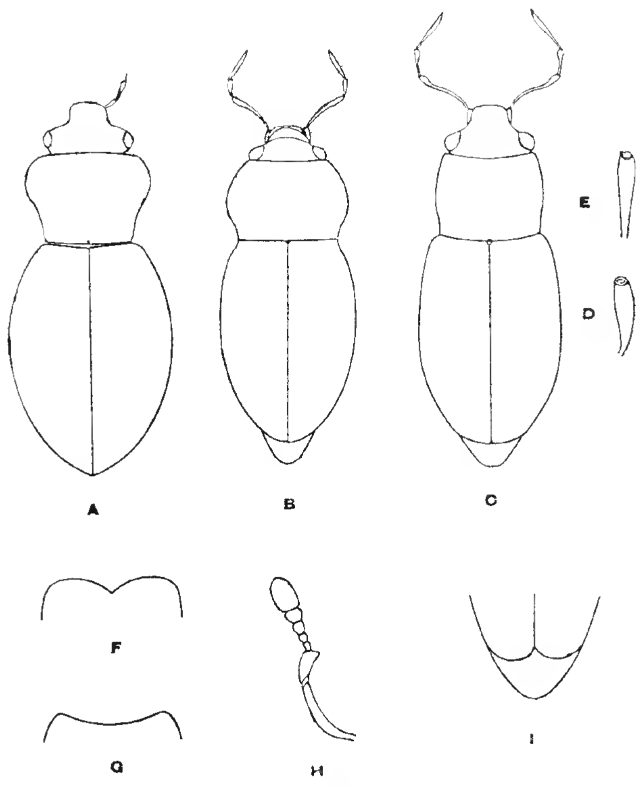

FIG. 2.

A. *Ochthebius pallidipennis*, n. sp.
B. *Hydraena williamsensis*, n. sp.
C. *Hydraena simplicicollis* Blackb.
D. Sub-apical palp segment of *H. williamsensis*, n. sp.
E. Sub apical palp segment of *H. simplicicollis* Blackb.
F. Clypeus of *Ochthebius obcordatus*, n. sp.
G. Clypeus of *O longipes*, n. sp.
H. Antenna of *O. obcordatus*, n. sp.
I. Apices of abdomen and elytra of *H. rudallensis* Blackb. (from type).

it differs in colour, wider form, clypeus bluntly pointed or toothed in front, terminal palpi segments shorter and pronotum with four separate fossae instead of two long ones.

Ochthebius clypeatus, n. sp.

(Text-fig. 1, No. 7.)

Ovate, convex, cupreous-black, nitid. Head sub-triangular, concave above, black, dull; two deep foveolae on crest, each with a hemispherical tubercle behind. Clypeus deeply and narrowly excavated. Eyes normal or projecting slightly backward. Palpi normal. Pronotum: median sulcus normal, not constricted, widest near apex; flanges truncate behind; membraneous frill on lateral margins only, reaching to base but scarcely to apex; frill rather wide. Scutellum invisible. Elytra widely ovate, convex, entire; bronze-black, nitid, striate-punctate. Legs pale ochreous, slightly nitid; tibial spurs strong; posterior tibiae reaching to apex of elytra. Tarsi long.

Length, 1·87 mm.; width, 0·88 mm.

Habitat.—Alps, Victoria.

Type in National Museum, Melbourne.

This species differs from *O. clarki* in having the anterior angles of pronotum rounded, the lateral portions truncate, side margins sinuous, form wider, head foveolate tuberculose, prothoracic frills strongly developed, clypeus deeply notched in the male.

Ochthebius leai, n. sp.

Ovate, convex, black, opaque. Head rounded in front, convex above; clypeus, nitid, arcuate on anterior margin. Tuberculae on disc near base. Palpi small. Prothorax transverse, explanate, nitid, not punctate; disc fossate; side margins nearly parallel. Scutellum invisible. Elytra ovate, very convex on posterior declivity, depressed somewhat in centre, feebly punctate-striate, interstices scarcely convex, side margins recurved, conspicuous from above. Legs reddish brown, robust; posterior tibiae reaching to apex of elytra.

Length, 1·6 mm.; width, 0·75 mm.

Habitat.—Tasmania (A. M. Lea).

Type in National Museum, Melbourne.

This species differs from *O. australis* Blackb., in size, colour, sculpture of the head, elytral flanges and shoulders, and the position of maximum convexity on the elytra.

Ochthebius longipes, n. sp.

(Text-fig. 1, No. 4; text-fig. 2*g*.)

Convex, black nitid. Head quadrate. Clypeus excavated in front, clypeal suture concave anteriorly, furrow on each side arising before and near the eye running towards centre, then parallel to each other back to near the posterior margin. Antennae incrassate near middle. Palpi large, brown, nitid. Eyes widest at middle, projecting outwards. Pronotum subcordate, not deltoid, widest before middle, without pergameneous flanges, lateral margins convex on anterior two-thirds, concave on posterior thirds, anterior angles notched, median suture on raised ridge wide, continuous; an oblique fossa near each anterior corner, these fossae diverging posteriorly; a large pit or variole in the shape of the ace of spades near each posterior angle; a variole on either side of the median suture or ridge near apex. Scutellum invisible. Elytra oval, convex, entire, striate-punctate, punctures regular and even, continuing to apex; convexity uniform, not dipping away on apical third, marginal curvature uniform; punctures large, distinct, interstices lightly convex; suture not elevated. Legs large, posterior femora reaching apex, tibiae extending far beyond apex of elytra. Tarsi robust; claws strong. Wings pale violet, iridescent; fringed with hairs.

Length, 1·37 mm.; width, 0·62 mm.

Habitat.—Tambourine, South Queensland (C. Deane).

Type in National Museum; co-types in South Australian Museum, Coll. Lea, Coll. Deane, etc.

This species may possibly be allied to *O. brisbanensis* Blackb., although not having seen the type I am unable to say how close the relationship may be. A point of distinction between the two would be the emarginate prothorax of *O. brisbanensis* given in Blackburn's description as against an absence of that feature in the present species. *O. longipes* differs from the specimens of *O. brisbanensis* in the S.A. Mus. in the excavated anterior clypeal margin absence of flanges to the prothorax and longer legs, etc.

In Stephens' Manual of British Coleoptera published in 1839 three species of *Enicocerus* are listed with their descriptions; these are *E. viridiaeneus*, *E. tristis* and *E. gibsoni*. In G. R. Waterhouse's Pocket Catalogue of British Coleoptera, however, published in 1861, *Enicocerus* was included under *Ochthebius* as a subgenus. The new species herein described as *O. longipes* bears a resemblance to these three British species, specimens of which I have examined. Moreover the two or three new species herein described differ more widely from the typical species of *Ochthebius*, e.g. *O. australis*, *O. leai*, and *O. clarki*, in Australia, or *O. aeratus*, *O. aeneus* and *O. bicolon* in Europe, than does *Enicocerus*. It therefore appears that a new genus may eventually become desirable to accommodate *O. longipes* and *O. obcordatus*, or else *Enicocerus* should again be elevated to full generic status.

Ochthebius obcordatus, n. sp.

(Text-fig. 2*f,h*.)

Convex, black, nitid. Head sub-quadrate. Clypeus notched in front, clypeal suture concave anteriorly; convex, irregularly punctate, feebly fossate, tuberculose at base between eyes. Eyes and palpi normal. Antennae slightly incrassate. Prothorax obcordate, widest just before middle, without pergameneous flanges, centre almost flat, sides sloping, almost longitudinally prismatic; median sulcus almost obsolete, very shallow, wide, its boundary marked by slight ridge; not fossate near posterior angles; side margins crenulate. Scutellum invisible. Elytra oval, convex, entire, striate-punctate, punctures regular and even, continuing to apices; interstices, except 4th and 6th, finely punctate, the punctures being in single row. Legs rather large, nitid, piceous, posterior femora reaching apex of abdomen.

Length, 1·84 mm.; width, 0·87 mm.

Habitat.—Upper Williams River, New South Wales (F. E. Wilson).

Type in National Museum, Melbourne.

O. obcordatus differs from *O. longipes* in having much larger size, surface more nitid, legs piceous, head not rugose, clypeus notched instead of widely excavated in front, antennae less incrassate, palpi slightly more slender but first segment more clavate, posterior femora shorter in proportion, striae and punctuation of elytra more sharply defined.

For convenience in having under the one cover descriptions of existing species for comparison, treated on the same plan, I have redescribed *O. australis* Blackb. and *O. novicius* Blackb. from authentic material available, the former being certified to by Mr. A. M. Lea and the latter being Blackburn's original type specimen.

Ochthebius australis Blackb.

(P.L.S.N.S.W. [2], iii, p. 835, 1888.)

(Text-fig. 1, No. 6.)

Elliptic, convex, scarcely nitid, light coppery brown. Head spatulate, rather depressed, somewhat lacunose, glabrous, bay, rather nitid; clypeus narrowly rounded in front, sides converging slightly anteriorly, descending towards frontal margin, convex, dark chestnut. Eyes of medium size, set slightly backward, hardly socketed, yellowish grey. Palpi small, nitid, flavous, terminal segment small, obconic; subterminal short subovate. Antennae seven-segmented; scape long, yellow, apparently of two segments, but the joint not mobile; pedicel short, yellow, rather wide; flagellum of a slightly darker shade, composed of five segments increasing uniformly towards apex, each of the terminal four being considerably larger than the one preceding it. Pronotum strongly transverse, subquadrate, marginate, margins thick; disc transversely convex, subcylindric, trifossate, bifoveolate, nitid, cinnamomeous, faintly punctate, very sparsely pubescent; anterior margin, convex medially, concave laterally, posterior margin bisinuate; anterior angles obtuse, posterior rounded, greatly depressed, almost pergameneous. Scutellum small, visible, glabrous, black. Elytra ovate, widest at centre, convex, strongly so on apical half, apices narrow, striate-punctate, sparsely pubescent, the pubescence confined to striae, punctures dark brown, rather deep, interstices very convex; suture elevated; humeral angles obtuse, hardly rounded, marginate. Wings white, margins sparsely ciliate. Prosternum with antennal cavities, widely open in front. Sternal surface brown. Metasternal episterna with margins dark brown. Epipleurae widest near base, gradually tapering and extending to and vanishing at apex. Abdomen with seven visible ventral segments. Legs flavous. Anterior coxae rather small, ellipsoidal, contiguous, somewhat exserted; intermediate coxae of medium size, globular, almost contiguous, deeply set in mesosternum; posterior coxae lamellate, transverse, depressed in centre, the depression extending for the greater part of the length and being surrounded by a small ridge. Femora glabrous, tibiae setose, setae white; tarsi with apical segment light brown. Claws rather small, flavous.

Length, 1·9 mm.; width, 0·82 mm.

Habitat.—Adelaide, South Australia (Rev. T. Blackburn).

Type in British Museum.

Ochthebius novicius Blackb.

(Rept. Horn Exped. Centr. Aust., Feb., 1896.)

(Text-fig. 1, No. 5.)

Subelliptic, somewhat elongate, rather depressed, black, opaque. Head subquadrate, depressed, opaque, fossate, finely rugose. Clypeus rectangular, front margin rectilinear, side margins parallel; base narrower than front. Eyes medium to small, socketed, set somewhat forward and upward, almost pear-shaped. Antennae irregular, incrassate, somewhat clavate, acicular, elbowed. Palpi rather small. Pronotum cordate, depressed, embossed, gibbose, fossate, porose, widest just before middle; anterior margin very slightly convex horizontally, posterior margin somewhat biconcave; anterior angles obtuse, posterior rectangular or scarcely acute; base narrower than apex; most elevated portion of disc bifossate-quadrifoveolate Scutellum invisible or very minute. Elytra oval, slightly convex, narrowly marginate, striate-punctate; interstices wide, hardly convex; striae broad, shallow, distinct, punctures well defined; suture not raised; not steeply sloping from centre towards apical declivity; apices not dehiscent; margins moderately thin, uniform, continuing to, but not vanishing to, apices; widest at middle; humeral angles rounded. Sternum, excluding appendages, dull purplish grey, almost finely velutinous. Metasternum with a scutellate nitid patch in centre; metasternal episternum equal in length to the metasternum. Epipleurae extending to apices of elytra. Abdomen with six visible ventral segments, apex light brown, nitid. Legs light brown, nitid. Anterior coxae ellipsoidal, contiguous; intermediate coxae globular, almost contiguous; posterior coxae lamellate, broad, transverse-oblique; femora robust, posterior pair not reaching nearly to apex of abdomen; posterior tibiae extending just beyond apex of abdomen. Tarsi with apical segments dark brown; claws yellow.

Length, 2·54 mm.; width, 1·08 mm.

Habitat.—Central Australia, Reedy Hole (Horn Expedition).

Type in National Museum, Melbourne.

The antennae are seven-segmented, although appearing eight-segmented; the scape is divided into two portions, but the joint between these is not mobile. The scape and pedicel are yellow, nitid, the remaining five segments are dull grey and finely pubescent, globular to subcordate in form, each of the terminal four being larger than its preceding one, increasing uniformly. The scape is in the form of a long curved stem which fits around the eye base; in *O. longipes*, n. sp., this segment is divided into as many as four subsegments, all of them being immobile. The shape and proportions of the flagellum are also characteristic; in *O. obcordatus*, n. sp., the apical segment is two and one-half times the length of the preceding one, in *O. longipes*, n. sp., the proportion is four and one half, whilst in O. *novicius* Blackb. it is only one and one half. The underneath surface of the head in the gular region, measured in a longitudinal direction, is highly convex as compared with other species of the same genus. The labium is more sharply rectangular, the side portions of mentum being acutely triangular.

Hydraena williamsensis, n. sp.

(Text-fig. 2*b*.)

Elongate ovate, lightly convex, dark brown, strongly punctate, somewhat nitid. Head short, broad, black, finely punctate, nitid. A broad shallow tubercle on anterior declivity. Clypeus not produced, arcuate in front. Eyes rather widely separated, flat above. Palpi medium, 2nd segment curved one way only (C-form, not S-form); sub-apical segment robust, finely curved at base. Prothorax transverse, widest just behind middle, anterior margin concave, posterior straight, lateral strongly convex; dark brown in centre, light brown towards margins, strongly and irregularly punctate, somewhat nitid, obliquely fossate, the fossae converging towards and meeting near base. Scutellum minute, almost invisible. Elytra lightly convex, or somewhat depressed striate-punctate, broadest at middle; the punctate striae extending to apex; apices not dehiscent, closely contiguous. Side margins upturned. Legs light brown, robust. Posterior tarsi very pale brown.

Length, 1·62 mm.; width, 0·67 mm.

Habitat.—Upper Williams River, New South Wales (F. E. Wilson).

Type in Coll. Wilson.

The species differs from *H. luridipennis* Macl., in having colour dark brown, thorax transverse, none of its angles acute, sides arcuately dilate at middle; from *H. simplicicollis* Blackb., in having width across elytra 9·1% greater than across prothorax instead of 38·6%, also in colour; from *H. rudallensis* in having apices of elytra not at all dehiscent. From *H. simplicicollis* it also differs in having the basal segments of palpi much less curved, and the sub-apical segment rapidly thickening from the base, which is in the form of a curved stem. In the new species also this segment is thickest near middle, whereas in *H. simplicicollis* it is thickest near apex.

The author desires to express his thanks to Mr. Hale and Mr. Lea, of the South Australian Museum, Mr. Kershaw and Mr. Clark, of the National Museum, and Mr. F. E. Wilson and Mr. Oke, of Melbourne, for assistance readily given.

[PROC. ROY. SOC. VICTORIA, 43 (N.S.), PT. II, 1931.]

ART. XV.—*On some Australian Curculionoidea.*

By CHARLES OKE.

[Read 13th November, 1930; issued separately 26th February, 1931.]

This article contains the description of four new genera and twenty-six new species. The genus *Phrynixus*, hitherto known only from New Zealand, is now recorded from Australia, and three species are referred to it. A new genus, *Mandalotina*, has been erected for some small species somewhat similar to *Mandalotus*, but without ocular lobes and with setose clothing only. *Daylesfordia* is proposed for a small species found living in wet moss, which has its eyes sunk in a groove and below the plane of the rostrum. *Dixoncis* is proposed for a pretty species found breeding in *Hakea nodosa*, and which is rather doubtfully referred to the Aterpinae. *Nyella* is proposed for an interesting species found on *Rapanea variabilis*, which is remarkable for its very fine small claws, which can hardly be seen except under a microscope, and for its anterior coxae being widely separated without a groove for the reception of the rostrum. The relation of this genus to any of the established subfamilies is at present doubtful.

The author wishes to acknowledge his indebtedness to the authorities of the South Australian Museum, and to Mr. A. M. Lea for permission to compare specimens with their types, for comparative notes on some species, and for many specimens; also to Mr. S. Butler for loan of materials and advice in the preparation of illustrations.

All types are in the author's collection.

Family CURCULIONIDAE.

Subfamily OTIORHYNCHINAE.

ECRIZOTHIS SIMILIS, n. sp.

Piceous, tarsi and antennae diluted with red. Densely clothed with dingy greyish scales, interspersed with stiff setae.

Male.—Head with small indistinct punctures. Rostrum with median carina fine and obscured by the clothing. Antennae rather stout, just passing base of prothorax; scape lightly curved; funicle with two basal joints equal, longer than following joints, third to seventh equal; club as long as three preceding joints combined. Prothorax longer than wide, widest at apical third, sides rounded; surface uneven and transversely rugulose. Elytra elongate-ovate, striate punctate; interstices lightly convex, the third with two tubercles, the first postmedial, the second on edge of apical slope, anterior tibiae thickened at apex.

Female.—A little larger and stouter, with the prothorax as wide as long, and its sides more rounded, and the elytra widely ovate.

Length, 4·5-5 mm.

Habitat.—Victoria: Lorne (C. Oke).

Close to *E. inaequalis* Bl. in appearance, but the antennae are not so stout, the scape is lightly curved, and the joints of the funicle are differently proportioned.

On the fifth interstice there are some feeble swellings, scarcely visible through the clothing.

ECRIZOTHIS BLACKBURNI, n. sp.

Piceous. Densely clothed with dingy greyish scales, interspersed with stiff setae.

Head and rostrum as in *E. terminalis.* Antennae long and thin; scape scarcely reaching prothorax, suddenly thickened near apex; funicle with first joint longer than second, third shorter than second, fourth to seventh equal, shorter than third; club about as long as three preceding combined. Prothorax about as wide at apical third as long; appearing smooth on disc through clothing, slightly roughened on sides, with a fairly distinct medial line. Elytra ovate, striate punctate; third interstice with a rather large round tubercle on edge of apical slope, fifth ridged from middle of elytra to near apex. Anterior tibiae produced inwards at apex and sparsely denticulate beneath. Length, 10 mm.

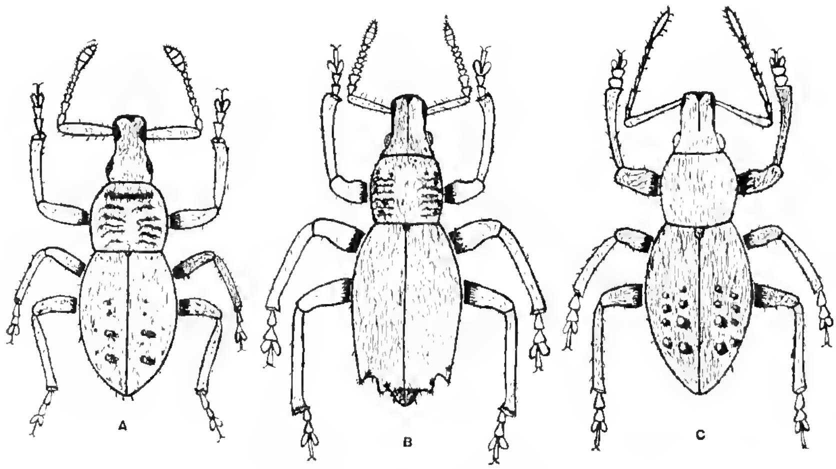

FIG. 1.—A. *Ecrizothis inaequalis* Bl.
B. *E. terminalis,* n. sp.
C. *E. bovei* Lea.

Habitat.—Victoria: Macedon (C. Oke).

Larger than normal specimens of *E. bovei* Lea, from which it is distinguished by the antennae and elytral tubercles.

ECRIZOTHIS TERMINALIS, n. sp.

(Text-fig. 1*b*.)

Castaneous, appendages diluted with red. Densely clothed with ashen-grey scales interspersed with semidecumbent setae.

Head with small dense punctures, normally concealed by the clothing, and a small interocular fovea. Rostrum gently incurved on sides; median carina fine. Antennae long; scape reaching thorax; first and second joint of funicle long, second slightly longer than first, none of the others transverse; club fairly large, distinctly four jointed. Prothorax longer than wide, widest in front of middle; surface uneven, transversely rugulose and with some impressions towards sides. Elytra elongate; depressed behind shoulders; third and fifth interstices raised and each with a large tubercle on edge of apical slope. Anterior tibiae with a few small denticulations.

Length, 8 mm.

Habitat.—Victoria: Grampians (C. Oke); Portland (National Museum).

Of the size of *E. bovei* Lea, from which it differs in the thicker scape and larger and differently shaped tubercles. The third and fifth interstices are raised, or formed, into several small obtuse tubercles, but end in large conical tubercles which are produced over the apical slope.

Paratypes in National Museum, Melbourne.

Subfamily LEPTOSINAE.

POLYPHRADES VIRIDIS, n. sp.

Black, tibiae and tarsi reddish-brown. Densely clothed with metallic green scales, in parts with a golden flush, but in certain lights appearing greyish.

Male.—Head rather feebly granulate. Rostrum moderately short and thick, with median carina short and sub-obsolete, lateral ridges strongly raised. Antennae stout, scape reaching middle of eye, first joint of funicle perceptibly longer than second. Prothorax transverse, with large feeble granulations. Elytra same width as prothorax at base and but little widened posteriorly; the striae with large subquadrate punctures, wider than the interstices, but partially concealed by the clothing; without basal margin. Front tibiae sinuate and feebly denticulate below, with the apex spurred.

Female.—Larger, and the front tibiae without denticulations.

Length, 5-6·25 mm.

Habitat.—Victoria: Hattah (J. E. Dixon, C. Oke), on Mallee.

Specimens of this species in good condition are very distinct on account of the colour of the scales, but, unfortunately, the colour is easily lost on account of the "varnishing," as Mr. Lea has called it, to which species of the genus are subject.

The width is almost evenly increased from apex of prothorax to the apical declivity of elytra, though the prothorax is very slightly wider across its middle than at base.

Leptops nothus, n. sp.

(Text-fig. 2*a*.)

Piceous-black, antennae brownish. Densely clothed with muddy brown scales, interspersed with stout decumbent setae.

Head with two large swellings between eyes. Rostrum rather short; median carina fairly prominent; sublateral sulci distinct. Scrobes deep, curved, becoming obsolete near eyes. Scape rather stout, none of the joints of the funicle transverse. Prothorax lightly transverse, with numerous tubercles. Scutellum absent. Elytra ovate, base truncate, where it is same width as prothorax, shoulders rounded off; with some large obtuse tubercles on sides

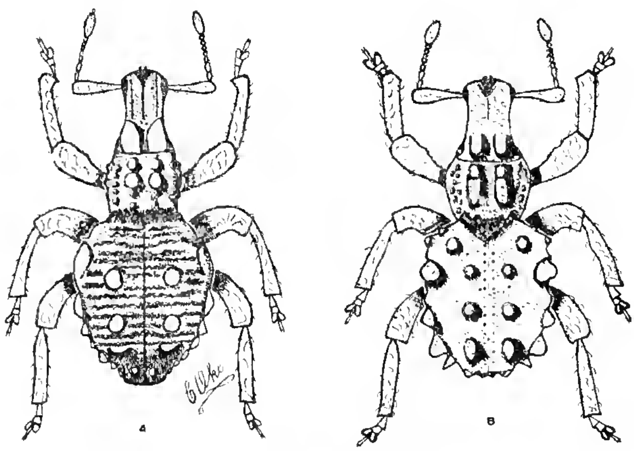

Fig. 2.—A. *Leptops nothus*, n. sp.
B. *L. phymatodis* Lea.

of disc, and on edge of apical slope, and with smaller and sharper ones down apical slope; with series of large punctures, concealed by the clothing, and transversely rugose. Front tibiae produced inwards to a strong spur.

Length, 9 mm.

Habitat.—Victoria: Belgrave; Mitchell Gorge (C. Oke).

Allied to *L. phymatodis* (1) and *L. crassirostris* (1) in the absence of a scutellum, but with different tubercles. In the present species the tubercles on the prothorax are small and numerous on the sides, and in two rows of four down centre, the four in front being fairly large, and the basal four small. On the base of elytra there are six very small tubercles projecting over prothorax. On the side behind the shoulder there is a small obtuse swelling, behind which is a larger one, while below them, on the deflexed side, there is a small subconical projection. On the disc there is a medial tubercle common to the second and third interstice, and on the edge of the apical slope there is a procurved row of four tubercles.

This species has the facies of *Amisallus* (2), and agrees with that genus in not having a scutellum, but I have placed it in *Leptops* on the authority of Mr. Lea.

Leptops phymatodis Lea.

(Text-fig. 2*b*.)

The specimen from which the figure was drawn I obtained at Mt. Macedon, Victoria, and Mr. Lea subsequently identified it as his species.

Mandalotus acanthocnemis Lea.

(Text-fig. 3*e*.)

(Proc. Linn. Soc. N.S.W., liv, 1929, p. 531.)

I obtained a pair of this species at Eltham, Victoria, which I think had been in copulation. The male is 3 mm. long, and the subbasal tooth on anterior tibiae is larger than on some specimens of *M. avenaceus* obtained at Ballarat.

The female differs from the male in having the anterior tibiae shorter, without subbasal tooth and the apical sinus shorter and more acute. The abdomen is gently convex beneath.

Allotype in author's coll.

Mandalotus bivitticollis Lea.

(Rec. S. Aust. Mus., iii, 1926, p. 171.)

A single male which I obtained at Macedon belongs to this species, but the prothorax is without the pale vittae on the sides, as described by Lea.

Besides the described tubercles, there is a small rounded one on the suture at apical slope. This and the rostrum are clothed with metallic golden scales. The tubercle on abdomen is small, but distinct.

Mandalotus tuberipennis Lea.

(Proc. Linn. Soc. N.S.W., liv, 1929, p. 530.)

Specimens of this species collected on top of Mt. Donna Buang (4080 ft.) are slightly more robust than a specimen obtained on the river flats below Warburton. All are decidedly dark reddish-brown, which is apparently the mature colour.

Mandalotus insignipes Lea.

(Rec. S. Aust. Mus., iii, 1926, p. 172, figs. 78*g*, 79*d*.)

This is a very handsome beetle when in good condition. On a male from Fern Tree Gully, all the tubercles, sides of prothorax and elytra, and parts of the legs, are covered with reddish-golden coloured scales. Mr. Lea describes the female as wider than the male, but the five females in my collection are much smaller than the male.

Mandalotus pentagonoderes Lea.

(Proc. Linn. Soc. N.S.W., liv, 1929, p. 528.)

As suspected by Lea, his type of this species was immature. Seven specimens before me show that the normal colour is dark brown or blackish, with parts of the legs and antennae, beyond scape, reddish. On some specimens the golden scales are very numerous. In one case the golden scales on the pronotum are as numerous as the brown, while the apical slope and sides of the elytra are entirely clothed with reddish-golden scales, making it a very pretty specimen.

The male has the metasternum and abdomen with a large excavation common to both. In the female the metasternum is flat, as is also the apex of the first abdominal segment, but its base is slightly raised, so that the plane of the two segments is not the same. Collected at Belgrave, Emerald and Warburton (Oke).

Allotype in author's coll.

Mandalotus macrops Lea.

(Rec. S. Aust. Mus., iii, 1926, p. 183, fig. 80*u*.)

Two specimens of this species from Beechworth, Vic., show no sign of the swellings on the elytral interstices, otherwise they agree with the description.

Female similar to the male, but the abdomen convex beneath.

Allotype in author's coll.

Mandalotus vacillans Lea.

(Trans. Roy. Soc. S. Aust., xxxi, 1907, p. 140.)

Specimens of this species have been obtained at Cheltenham, Vic., by Mr. J. C. Goudie and myself. Now first recorded from the mainland.

Mandalotus inconspicuus Lea and M. crawfordi Bl.

(Lea, Trans. Roy. Soc. S. Aust., xl, 1916, p. 329.)

(Blackburn, Proc. Linn. Soc. N.S.W., v, 1890, p. 314.)

(*Dysostines*).

A few specimens of *M. inconspicuus* were obtained, in the company of many specimens of *M. crawfordi*, at Lake Hattah, under rubbish around cultivated land. Both are now recorded for the first time from Victoria.

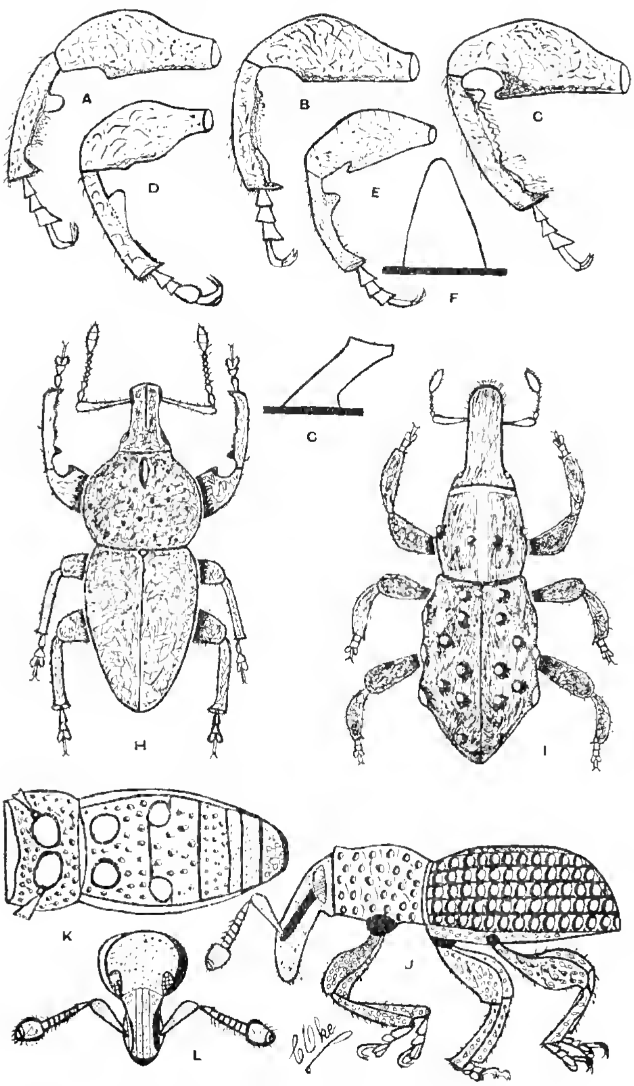

FIG. 3.—A. Anterior leg of *Mandalotus impressicollis*, n. sp.
B. ,, ,, ,, *M. octagonalis*, n. sp.
C. ,, ,, ,, *M. bryophilus*, n. sp.
D. ,, ,, ,, *M. avenaceus* Lea.
E. ,, ,, ,, *M. acanthocnemis* Lea.
F. Mesosternal process of *M. leai*, n. sp., viewed from behind.
G. ,, ,, ,, ,, side view.
H. *Mandalotus impressicollis*, n. sp.
I. *Daylesfordia uvida*, n. sp.
J. *Mandalotina atranotata*, n. sp., side view.
K. ,, ,, ,, undersurface.
L. ,, ,, ,, front view of head.

Mandalotus pentagonalis Lea.

(Rec. S. Aust. Mus., iii, 1926, p. 168, fig. 80*cc*.)

A single male of this species collected at Cheltenham, Vic., the type locality, in September, has the same pale colour as the type. This is probably the normal colour, as my specimen appears to be mature.

Mandalotus leai, n. sp.

(Text-fig. *3f,g; 4a.*)

Black, funicle and club reddish, tarsi and inside of anterior tibiae pale castaneous. Densely clothed with elongate muddy-brown scales interspersed with long stiff setae.

Male.—Rostrum short and stout, transversely impressed at base; median carina distinct. Antennae long; scape long, almost straight, regularly increasing in width to apex; first joint of funicle longer than second. Prothorax as long as wide, base trisinuate, sides bisinuate, apex produced and bituberculate; disc very uneven, with a transverse impression near apex, from the ends of which is an oblique impression to the sides, and an impression on each side towards base; median line not traceable; with numerous small granules. Elytra trisinuate at base, humeral angles lightly produced, posthumeral process very prominent; with rows of punctures, appearing small through clothing, and numerous granules; with fourteen tubercles on disc and six on apical slope. Anterior coxae narrowly separated. Metasternum with a strong projecting process. Base of abdomen with a large shallow impression. Femora inflated. Anterior tibiae straight to apical fourth, thence strongly curved inwards, apex produced into a thin plate, emarginate at its apex, the inner side of curved part nitid and glabrous. Intermediate tibiae feebly bisinuate and spurred at apex. Posterior tibiae bisinuate, the apical sinus longer and deeper, and produced into a curved spur on the lower surface, on the upper, notched near apex.

Female.—Smaller, with the upper surface the same except that the elytra are more tuberculate across middle, but the abdomen is convex on first segment, and the tubercle on metasternum is conical, and only on a level with the coxae. The legs are similar in outline, but on a modified scale, with the inside of the anterior tibiae clothed with scales.

Length, male, 7 mm.; female, 5·5 mm.

Habitat.—Victoria: Evelyn (C. Oke).

A large, rough-looking species, very distinct from any so far described. The prothorax might have been described as tuberculate, but the protuberances are more in the nature of swellings and not sharply defined. There are two at apex, two at base, on either side of scutellum and somewhat produced over elytra, a small one on lateral margin, and an elongate one, or ridge, on anterior half, not reaching apex. The tubercles of the elytra are in six transverse rows; four on the base, two small ones, half way to apical slope, on the second interstice, just behind which are two larger ones near the sides, then two small ones on the second interstice, and four large ones on apex of slope, the median pair being behind the outer pair.

The mesosternal process is about half the length of a middle femur. From the front view it appears as a wedge-shaped piece, rather sharply pointed, but from the side it appears to be round, of even width from base to apex, with the apex itself produced into a small tooth and bent forward almost at right angles. The front tibiae are like Tindale's figure of *M. laminatipes* (3), but the apex in *M. leai* is emarginate.

Mandalotus impressicollis, n. sp.

(Text-fig. 3*a,h.*)

Dark brown or blackish, legs and antennae (scape infuscated) reddish-brown. Densely clothed with dusky brown, ochreous, and whitish scales, interspersed with stout, curved setae.

Male.—Rostrum short, stout, curved; median carina very prominent. Antennae long and rather thin; scape curved, clubbed; first joint of funicle longer than second. Prothorax transverse, strongly rounded on sides, wider than elytra; median line distinct, foveate near apex; granules small and sparse. Elytra almost straight across base, posthumeral process absent; with regular rows of rather large punctures. Anterior coxae well separated. Intercoxal process of mesosternum with a narrow carina on its posterior edge. Metasternum and first segment of abdomen with a fairly deep impression, which is lightly continued on to the second segment. Anterior tibiae with a large blunt tooth near base, in front of which are seven small denticulations, the apex suddenly turned inwards and spurred. The other tibiae lightly spurred.

Female.—Similar to the male, but tibiae unarmed and abdomen gently convex. Length, 3·5-4 mm.

Habitat.—Victoria: Warburton, Ballarat, Emerald (C. Oke).

Allied to *M. avenaceus,* with which it would be associated in Mr. Lea's table (4), but differs in the front tibiae, not having a flange in front of the basal tooth. Perhaps nearer to *M. acanthocnemis,* but is larger, with the prothorax wider and the front coxae less separated.

On the type, which is in perfect condition, the pale scales cover the base of rostrum, sides and three discal spots on pronotum and two elongate spots at base of elytra, on third and fourth interstice. In some specimens the pale markings are rather obscure.

Mandalotus bryophilus, n. sp.

(Text-fig. 3*c*.)

Blackish, appendages reddish-brown. Clothed with dark ashen grey and lighter variegated scales, interspersed with short, curved setae.

Male.—Rostrum short, curved, dilated to apex; median carina very prominent. Antennae long and thin; scape rather strongly curved. Prothorax transverse, sides feebly rounded, widest towards apex; median line distinct; with small close granules, distinct through clothing. Elytra feebly trisinuate at base, posthumeral process absent; with rows of punctures appearing small through clothing; anterior coxae narrowly separated. Metasternum and base of abdomen rather deeply impressed. Anterior tibiae with a blunt tooth near base, in front of which are six small denticulations, apex abruptly curved inwards and spurred. Posterior tibiae with a small sharp tooth at apical fourth, the apex suddenly dilated.

Length, 3-3·5 mm.

Female.—Similar, but the abdomen convex and the tibiae simple.

Habitat.—Victoria: Lorne (C. Oke).

The elytra could scarcely be called tuberculate, though there are some vague swellings just before the apical slope. From some directions the unevenness of the elytra appear to be due to transverse impressions. The outer interstices are more convex than the inner ones. The variegation of the clothing is general, without any distinct pattern, except an elongate white spot on base of third interstice. Another species allied to *M. avenaceus*, but the uneven elytra and armed hind tibiae will separate it from that species.

Mandalotus graminicola, n. sp.

Reddish brown, blackish in parts. Clothed with muddy-brown and golden scales, interspersed with semi-erect stiff setae.

Male.—Rostrum rather stout, dilated to apex; median carina obscured by clothing. Antennae long, scape lightly and evenly dilated to apex; first joint of funicle thicker and longer than second; club large. Prothorax as long as wide, widest at apical third, strongly narrowed to apex, less to base; median line distinct; with rather large rough granules. Elytra trisinuate at base, shoulders rounded off; a small tubercle on suture at apical slope, three tubercles on third interstice, an elongate one at base, a small one premedial, and one on apical slope, three on fifth interstice, each one just behind the corresponding one on third interstice. Undersurface almost glabrous. Metasternum deeply hollowed. Basal segment of abdomen flattened, and with a carina on its posterior edge, straight in middle, the ends lightly curved; basal and apical segments conspicuously punctured. Front coxae touching. Femora inflated. Tibiae spurred, anterior incurved at apex.

Length, 3 mm.

Female.—With abdomen gently convex, and without carina.

Habitat.—Victoria: Belgrave, Warburton, Emerald (C. Oke).

A narrow species with conspicuous tubercles on the elytra and the abdomen strongly carinate. In the table (4) it would be associated with *M. bryophagus*, from which it is separated by its tuberculated elytra. It is perhaps nearest to *M. denticulatus*, but the abdominal carina is more conspicuous, is longer and almost straight, and the tibiae are not denticulate, though the anterior are slightly roughened. All the specimens were found in grass.

MANDALOTUS EXPLANICOLLIS, n. sp.

(Text 4b.)

Dark brown, elytra and legs reddish. Clothed with dense dark brown scales on head and prothorax, elytra with pale yellowish brown scales, undersurface and legs with thinner reddish-brown scales, a narrow stripe of white scales around sides of prothorax; interspersed with short stiff setae.

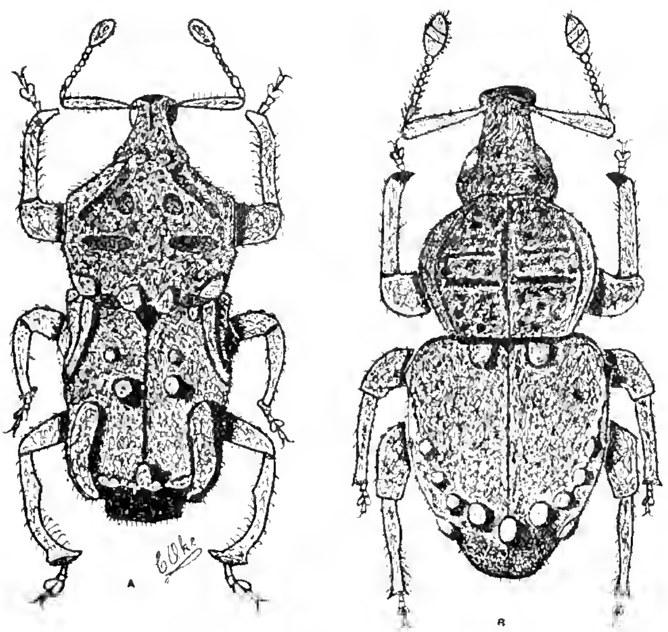

FIG. 4.—A. *Mandalotus leai*, n. sp.
B. *M. explanicollis*, n. sp.

Male.—Rostrum strongly curved and dilated to apex, median carina indistinct. Antennae long, scape dilated at apex, club stouter than usual. Prothorax strongly transverse, widely rounded and explanate on sides, which are lightly raised; median lin fine but distinct; granules appearing small and indistinct through clothing. Elytra trisinuate at base, shoulders rounded off, post-humeral process distinct; with a strongly curved row of six tubercles, behind which is a straight row of three. Front coxae distinctly separated by a narrow, bluntly pointed, process from the front, which meets a wider, rounded, process from behind. First abdominal segment flattened and with a strongly curved carina, from coxa to coxa, reaching apex of segment. Second segment with a small flattened space, and a short curved carina on its apical fourth. All femora inflated. Tibiae bisinuate and spurred at apex; front tibiae denticulate and the apical sinus deep.

Length, 3·5 mm.

Habitat.—Victoria: Lorne (C. Oke).

In the table (4) would be associated with *M. magnicollis,* from which it differs in many respects, in its very different prothorax, elytra tuberculate and trisinuate at base, and metasternum and abdomen not having a large excavation. From *M. bicarinatus* it differs, besides thorax, in having tuberculate elytra and alternate interstices not raised.

The tubercles form a deeply procurved row, the posthumeral process forming its apices, and the large tubercles covering the third and fourth interstices its base; behind this is a straight row of three tubercles; a large round one on the suture and a sharp conical one on either side, on the sixth interstice. From some directions the prothorax appears to be transversely impressed near base and apex, causing the middle to appear raised, but this is not distinct.

Mandalotus octagonalis, n. sp.

(Text-fig. 3*b*.)

Reddish-brown, undersurface and appendages castaneous. Densely clothed with dusky brown scales, except on rostrum, apex and sides of prothorax; an arcuate fascia on apex of apical slope of elytra, a wide ring on femora and on sides of abdomen, where they are white or nearly so; interspersed with stiff dark setae. Most of undersurface nitid and glabrous.

Male.—Rostrum short and stout, dilated to apex; median carina not visible through clothing. Antennae long, rather stout; scape curved; second joint of funicle longer than first. Prothorax a little longer than wide, obliquely narrowed to base and apex, the apex lightly produced in centre; median line distinct; granules transversely arranged. Elytra conjointly arcuate at base, shoulders rounded off and lightly raised; a small swelling at base of third interstice and some small swellings about apical slope; with regular rows of punctures, appearing small through clothing. Metasternum and first abdominal segment deeply impressed, and lightly continued on to the second. Front coxae rather widely separated, middle coxae with a thin, shining carina. Femora inflated, the front ones very strongly. Tibiae strongly spurred at apex; anterior curved and with a few small denticulations, being larger near base.

Length, 4 mm.

Habitat.—Victoria: Warburton, at about 3000 ft. (C. Oke). Unique.

The elytra can scarcely be called tuberculate, but, if so, it would be associated with *M. funereus* in the table (4), which is a larger species, with different tubercles, abdominal impression not so deep and hind tibiae denticulate. If elytra be not considered tuberculate, it would be associated with *M. raui,* from which it is distinct by the shape of the prothorax and its elytra. The intercoxal process of pro-, meso-, and metasternum are rather deeply foveate. The outline of the prothorax appears from some angles to be of eight, though unequal, sides.

MANDALOTUS MINUSCULUS, n. sp.

Blackish, antennae reddish brown, parts of legs flavous, clothed with variegated scales, brown predominating, though many are golden; interspersed with short, semi-erect setae.

Male.—Rostrum short, thick; median carina absent. Eyes unusually large and round. Antennae thin, ordinary length. Prothorax transverse, rounded on sides; roughly granulated. Elytra wider than prothorax, feebly trisinuate at base, shoulders rounded off, posthumeral prominence absent; punctures in striae appearing very small through clothing, but, on abrasion, seen to be about the width of intervals. Undersurface thinly clothed with setae only; lightly punctured; with an elongate hollowed space common to metasternum and basal segment of abdomen. Femora inflated, the anterior more strongly than the others. Tibiae feebly spurred.

Female.—With eyes smaller, elytra wider, femora not so inflated, and without the depression on the undersurface.

Length, 2-2·5 mm.

Habitat.—Victoria: Carrum (Rev. E. Nye, C. Oke). On marshy, wet ground.

A small species, having unusually large eyes, the distance between them being about half the width of an eye. The prothorax after abrasion appears to have the whole surface roughly granulate.

In the table (4) would be associated with *M. macrops*, but the ocular lobes of that species are very different. It is more like *M. vigilans* in appearance, but the elytra are nowhere tuberculate.

Some of the specimens obtained are pale, of a flavous colour, but this is probably due to immaturity. Many of the scales give off golden, silvery and greenish reflections.

Paratypes in coll. Nye.

Mandalotus egenus, n. sp.

Black, or nearly so, antennae and legs reddish. Clothed with greyish scales, interspersed with curved setae. Undersurface nitid and mostly glabrous.

Male.—Rostrum short, dilated to apex; median carina absent. Antennae moderately long. Prothorax distinctly longer than wide, median line well defined; with numerous small rough granules. Elytra elongate, base conjointly arcuate, shoulders rounded, posthumeral prominence absent; alternate interstices feebly raised; with regular rows of large punctures. Undersurface with well-defined punctures, becoming more numerous at apex of abdomen; with a deep impression common to metasternum and first segment of abdomen; second segment with a carina on its apex, occupying about one third of its width. Anterior coxae lightly separated, all tibiae scooped out on lower surface towards their apices, which are spurred.

Length, 2·5-3 mm.

Female.—With metasternum and abdomen simple, and tibiae not so scooped out.

Habitat.—Victoria: Belgrave; Fern Tree Gully (C. Oke).

This species is exactly like *M. tenuis* Lea, except in the characters of the abdomen. Both species should, I think, be placed in a separate genus, as neither can be said to have ocular lobes. They are also narrower and more depressed than the other species, but still they have much the facies of the genus.

In the table (4), *M. egenus* would require a new section:—DD, eee. A transverse carina on second segment—*egenus*.

Mandalotina, n. gen.

Body elongate, apterous, setose. Head small, rounded. Eyes round, facets moderate. Rostrum rather stout, almost straight, carinate; scrobes slightly oblique. Antennae with 7-jointed funicle. Prothorax subcylindrical, ocular lobes absent. Elytra striate-punctate. Anterior coxae touching, intermediate very little separated, posterior distant. Legs short, femora inflated.

This new genus is proposed for some small weevils having the facies of small Mandaloti, but without ocular lobes and clothed with setae only. They all agree in having the prothorax with a transverse impressed line near the apex, and the undersurface with sharp distinct punctures.

Genotype *M. atranotata.*

Mandalotina atranotata, n. sp.

(Text-fig. 3*j,k,l.*)

Reddish castaneous, with black markings on elytra. Clothed with short, stiff, yellowish setae.

Male.—Head finely punctured. Rostrum with semiconfluent punctures. Antennae with scape straight, and dilated on apical third; funicle with first joint longer and stouter than second; club fairly large. Prothorax lightly rounded on sides; constricted near apex; with large rugose punctures. Elytra conjointly arcuate at base, shoulders rounded off; interstices sharply convex; striae with punctures wider than, and encroaching on, interstices. Undersurface with punctures more closely packed on metasternum and first abdominal segment, which are also hollowed out. Femora lightly inflated, tibiae straight.

Female.—Differs from the male in not having the metasternum and abdomen hollowed, and the femora less inflated.

Length, 1·5 mm.

Habitat.—Victoria: Belgrave; Warburton; Lorne (C. Oke).

The black markings on the elytra vary; in some specimens they are mere spots on the sides, but are more widely spread in others. In one specimen they appear as two sinuate fasciae. The rostrum from some angles appears to be finely tricarinate.

MANDALOTINA VARIA, n. sp.

Ferruginous; metasternum, base of abdomen and parts of legs reddish; elytra infuscated in parts; swellings castaneous. Rather thickly clothed with pale yellowish, decumbent setae.

Head and rostrum with fine confluent punctures. Rostrum with very fine carinae. Antennae long and thin. Prothorax transverse, widest near base, lightly rounded on sides; the preapical impression very distinct; with confluent punctures. Elytra conjointly arcuate, shoulders rounded off, with a posthumeral prominence; striae with punctures encroaching on the interstices, which are finely punctate; with numerous swellings. Anterior femora more inflated than the others. Tibiae fairly stout on basal half, then scooped out to near apex, the anterior lightly incurved to apex.

Length, 2·25 mm.

Habitat.—Victoria: Emerald (C. Oke).

The swellings, or tubercles, on the elytra consist of an elongate one on the suture at apical slope, on either side of which, near its base, is a small one on the second interstice, and two each on the fifth to eighth interstices. The first on the sixth is basal, the other seven elongate swellings are placed in two oblique rows near the middle.

MANDALOTINA BICOLOR, n. sp.

Piceous black; pronotum, a median line excepted, tubercles on elytra, antennae and middle of femora red or reddish. Very sparsely clothed with short decumbent setae.

Head with small, rough, reticulate punctures. Rostrum with fine carinae and rows of punctures. Antennae rather long and thin, prothorax widest at about middle, rounded on sides; with an elongate median fovea, and the preapical impression very distinct; punctures a little larger than on head. Elytra conjointly arcuate at base, shoulders rounded off; striae with punctures encroaching on the interstices, which are convex, and with tubercles. Anterior femora slightly more inflated than the others. Anterior tibiae lightly bisinuate, apical sinus the longer, incurved to apex, which is spurred. The other tibiae lightly curved to apex.

Length, 2 mm.

Habitat.—Victoria: Warburton (C. Oke).

The tubercles on the interstices are four on the third, a basal, medial, on edge of apical slope, and preapical, the basal being elongate; a medial on the fifth; and one humeral.

The punctures on the rostrum are in rows, leaving fine carinae between the rows.

Subfamily RHYPAROSOMINAE.

Phrynixus Pascoe.

(Ann. Mag. Nat. Hist., Sept., 1875.)

Rostrum moderately long, arcuate, base constricted; scrobes median, foveiform at insertion of antennae and lightly impressed to middle of eye. Eyes small, round, coarsely granulated; distant from thorax. Antennae with scape clubbed; funicle 7-jointed, first and second joints longer than the others; club distinct. Prothorax sub-oblong, uneven, ocular lobes obsolete. No scutellum. Elytra ovate, tuberculate. Legs short, femora thickened in middle; tibiae with apices mucronate; tarsi with two basal joints short, third longer, excavated on upper surface, fourth longer, with two claws. Abdomen with two basal joints connate.

Genotype, *P. terreus* Pasc. (5).

This genus has hitherto been confined to New Zealand. Lea's example (7) of *P. astutus* Pasc. (6), from Victoria, is probably a mistaken identification.

The three species now described have a rough, shaggy appearance, with the clothing matted together, and generally having mud mixed with it. On specimens in good condition the clothing is formed into fascicles on pronotum, elytra and legs. The legs are densely clothed, with the setae and scales formed into three or four fascicles, running around the tibiae, gaving them an angular appearance, but they are almost straight. A specimen of *P. victoriae* and one of *P. major* have been completely abraded so as to describe their sculpture, this not being visible through the clothing.

A short generic description based on Pascoe and specimens in my collection is given above.

Phrynixus victoriae, n. sp.

(Text-fig. 5*a*.)

Dark reddish-brown, infuscated in parts. Densely clothed with muddy brown scales and fairly long, stiff setae.

Head with a large foveiform impression behind eyes; with a few indistinct punctures. Rostrum long and stout, dilated to apex; a short carina between eyes; with indistinct punctures. Antennae with scape lightly bent, thin at base, suddenly and strongly thickened near apex; first and second joints of funicle sub-equal; club fairly large. Prothorax about as long as wide, rounded on sides; surface very uneven and with large punctures; a strong median carina; a large angular tubercle at apical angle, behind which are two smaller ones; two round tubercles near middle, about equidistant from each other and the sides; and an elongate tubercle, on either side of median carina, on the base. Elytra with humeral angles widely rounded off, thence gradually narrowed to apex; with large punctures in striae, the punctures wider than the interstices, but interrupted and pushed out of place by the swellings and tubercles; the third interstice with three tubercles; an elongate one (occupying the length of four punctures) on base, a rounded postmedian, and a large acute one on apical slope; the fifth interstice with two tubercles; a small rounded medial and a large acute one near apical slope. Undersurface smooth. Femora inflated. Anterior tibiae lightly curved, the others straight.

Length, 5-5·5 mm.

Habitat.—Victoria: Belgrave; Warburton (C. Oke).

Very distinct from the following species in the large elongate tubercles on base of elytra, and its more rounded outline.

PHRYNIXUS SYLVICOLA, n. sp.

Dark flavous, tip of rostrum infuscated. Clothing as in preceding species.

Head transversely impressed behind eyes. Rostrum moderately stout. Antennae with scape very thin at base, suddenly thickened near apex; first joint of funicle stouter and longer than second; club moderately large. Prothorax longer than wide, lightly narrowed to base; apex bisinuate; tuberculate in centre and on sides. Elytra strongly arcuate at base, shoulders obliquely cut away, thence parallel to apical slope; tuberculate near shoulders and on sides, and with four tubercles on apical slope, the inner pair smaller and in front of the outer pair; with large deep punctures. Undersurface smooth. Legs straight.

Length, 4·5-5 mm.

Habitat.—Victoria: Belgrave, Gembrook (C. Oke).

This species is the nearest to *P. astutus* Pasc., for a specimen of which I am indebted to Mr. Lea, but the scape is much thinner and more suddenly clubbed, the rostrum is also thinner, the clothing is rougher, and the tubercles are larger, though fewer in number.

PHRYNIXUS MAJOR, n. sp.

(Text-fig. 5*b*.)

Black; antennae and tarsi reddish-brown. Clothing as in *P. victoriae*.

Head impressed between eyes, with rough uneven punctures. Rostrum fairly stout, strongly curved; somewhat raised down centre, on either side of which is a narrow sulcus from eyes to antennae; antennal scrobes fairly well developed, but invisible through clothing; rugosely punctured. Antennae with scape very thin till near apex, where it is suddenly thickened; second joint of funicle thinner and longer than first; club moderate. Prothorax oblong, trisinuate at apex, the median sinus feeble; abruptly narrowed near apex; carinate down centre, the apical two-fifths strongly raised; two small medial tubercles on disc, and one on each side at apical fourth; with large rough punctures. Elytra

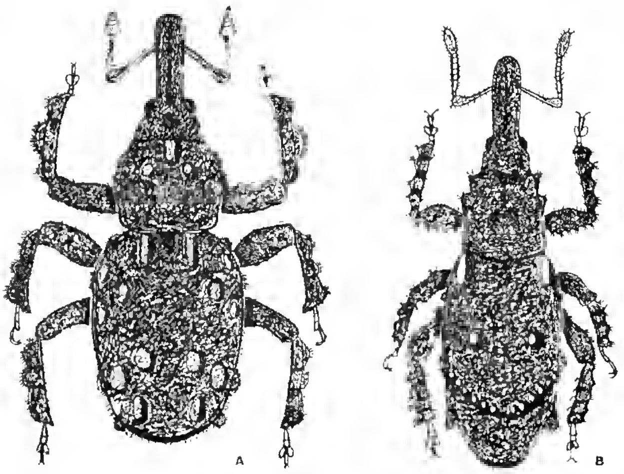

FIG. 5.—A. *Phrynixus victoriae*, n. sp.
B. *P. major*, n. sp.

sub-elliptic, widely depressed between shoulders; shoulders raised or ridged; a medial tubercle on fourth interstice, a strongly procurved row of tubercles on summit of apical slope, a small tubercle on the sixth and the largest (on the insect) on the fifth interstice, on the apical slope; with large punctures in the striae, wider than the interstices. Undersurface smooth. Anterior tibiae with a small rounded tubercle near apex.

Length, 8-9 mm.

Habitat.—Victoria: Belgrave; Gembrook (C. Oke).

The clothing on this species is less rough than on the other two species, but is fasciculate on the sides of prothorax and on the tibiae. It is also decidedly larger.

Daylesfordia, n. gen.

Ovate. Rostrum of moderate length, lightly compressed and curved, slightly narrowed to apex; with median carina. Scrobes flexuous, turned under head. Eyes strongly transverse, coarsely facetted, sunk in a groove at base of rostrum. Antennae inserted about apical third of rostrum; scape clubbed; funicle 6-jointed, first joint large, globose, second small; club large annulated. Prothorax without ocular lobes, lightly emarginate below. Elytra ovate, tuberculate. Metasternum short, prominent. Abdomen with two basal segments subequal, suture strongly incurved, third and fourth very short. Anterior coxae contiguous, intermediate very narrowly separated. Legs short, femora inflated, tibiae with apices bimucronate and with a fringe of small spines. Tarsi wide, 1-3 subequal in length, 3 bilobed, 4 a little longer, with two divaricate claws. Apterous.

The most interesting and distinctive character of the small weevil for which this new genus is proposed, is the eyes. These are strongly transverse, about 2:5, and sunk in an impression, at base of rostrum, so that their surface is below that of the rostrum. The metasternum is protuberant, but I have not been able to see its episternum clearly, probably on account of the coarse reticulate punctures with which it is covered. The club is as long as the funicle, the joints of the latter are very distinct, with the first large, the second very small, and then increasing to the sixth.

In the present state of the classification of the family this genus might be referred to any one of several subfamilies, but I think it is placed preferably in Rhyparosominae.

Genotype, *D. uvida.*

Daylesfordia uvida, n. sp.

(Text-fig. *3i; 6d*).

Piceous, a white stripe across apex and a white vitta down centre of prothorax. Clothed with muddy brown scales, feebly variegated in parts; also with sparse stiff setae.

Male.—Rostrum in front of antennae nitid and with setae only; median carina distinct through clothing. Prothorax a little longer than wide, sides rounded, transversely impressed near apex; with a raised longitudinal carina; with two medial tubercles, one on either side of carina, and one on the lateral margin, slightly in advance of the medial tubercles. Elytra trisinuate and a little wider than prothorax at base, shoulders rounded off; the third interstice with four tubercles; first on base, second close behind, third postmedial, and fourth on edge of apical slope; the fifth interstice, with two tubercles; first median, second just before apical slope; the sixth interstice, with one tubercle, the largest on elytra, on edge of apical slope; there is also a tubercle on the side just behind humerus. Legs semifasciculate. Tibiae straight on inner edge.

Female.—Differs from male in being a little larger, with rostrum slightly longer, and the abdomen convex.

Length, 1·60-1·90 mm.

Habitat.—Victoria: Daylesford district (C. Oke), in wet moss, and in moss received from Mr. C. J. Gabriel.

Subfamily ATERPINAE.

Dixoncis, n. gen.

Head short. Eyes oval. Rostrum short, thick, dilated to apex; scrobes curved and directed obliquely downwards and meeting on lower surface at base of rostrum. Antennae inserted at apical third of rostrum; rather thin, with scape shorter than funicle; funicle 7-jointed. Prothorax subcylindrical; ocular lobes moderate; deeply emarginate below. Scutellum small, round. Elytra elongate. Metasternum long. Abdomen with segment 1 long, 2 shorter, 3-4 short, equal, 5 same as 2; sutures distinct, first strongly incurved to middle, others straight. Legs short. Femora dentate. Tibiae spurred at apex. Tarsi moderately wide; third joint cleft, fourth long with two fine claws, lightly separated. Winged.

Genotype, *D. pictus.*

Referred to the Aterpinae with some doubts, but it seems more in place there than elsewhere. The following characters, in combination, will distinguish it from other Australian genera: rostrum and scrobes, femora armed, tarsi with third joint lobed and the small claws, only lightly separated.

Named after my friend, Mr. J. E. Dixon, who has taken a fine series of specimens.

Dixoncis pictus, n. sp.

(Text-fig. 6*b,c.*)

Dark reddish-brown, scape, funicle and legs pale reddish. Densely clothed with bright reddish, brown and ochreous scales.

Rostrum carinate, and with moderate semi-confluent punctures. Prothorax longer than wide, slightly rounded on the sides, widest about middle. Elytra conjointly arcuate at base, with rows of large punctures, wider than the interstices. Undersurface with rather large, close punctures. Femora thickened towards apex, with a fairly large tooth on underside, between this and apex deeply notched. Anterior tibiae incurved to apical spur; intermediate and posterior lightly bisinuate.

Length, 5·5-7·75 mm.

Habitat.—Victoria: Killara (C. Oke); Ringwood-Bayswater district (J. E. Dixon, C. Oke). Tasmania: Cradle Mountain (Carter and Lea).

A pretty species with the shade of the red scales varying in individual specimens, but the following ochreous markings are constant in all; a fine median and wider lateral vittae on full length of prothorax; scutellum, and some spots alongside suture ending in two large medial blotches; an oblong blotch, placed obliquely, on sides behind shoulders; an arcuate mark on apical slope, starting on sides, reaching fourth interstice, and then turned obliquely downwards to the apex. All the pale markings are outlined with the darker brownish scales.

Paratypes in National and South Australian Museums, and colls. Dixon, Lea, Nye.

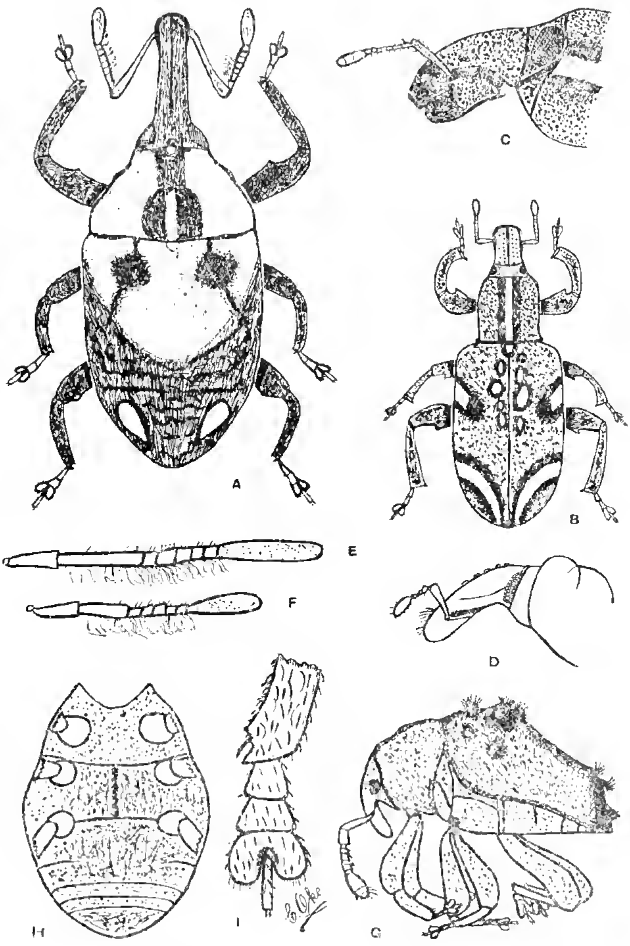

FIG. 6.—A. *Blepiarda panacis*, n. sp.
B. *Dixoncis pictus*, n. sp.
C. „ „ side view of head
D. *Daylesfordia uvida*, n. sp., side view of head.
E. Antenna of *Blepiarda undulata* Pasc.
F. „ „ *B. panacis*, n. sp.
G. *Nyella tuberculata*, n. sp., side view.
H. „ „ undersurface.
I. „ „ posterior tarsus.

Subfamily CEUTORHYNCHINAE.

Rhinoncus australis, n. sp.

Piceous-black, appendages reddish. Sparingly clothed with white, or almost white, scales, becoming more numerous on sides of prothorax and sternum, and forming an elongate spot behind scutellum.

Male.—Head and rostrum carinate down middle; with confluent punctures. Prothorax widest at base, narrowed to apex; with fine reticulate punctures. Elytra conjointly arcuate; striae with punctures encroaching on the interstices; interstices almost flat near suture, but becoming rather sharply raised towards the sides, interstices finely punctured, and, from the fifth interstice, with numerous small granules. Posterior femora inflated.

Female.—A little darker and wider, and with the abdomen slightly more convex.

Length, 2·5 mm.

Habitat.—Victoria: Natya (C. Oke); Kerang (R. Blackwood).

In general appearance close to *R. nigriventris,* but distinguished by the sculpture of the elytra. When looked at from above, the granules are not very distinct, but when viewed sideways they are very apparent as small projections. The clothing is also sparser, the pronotum not trivittate, and the scutellar pale marking is shorter, though wider, in *R. australis.*

This weevil has quite a loud "squeak" for so small an insect, and when held in the fingers stridulates freely. It can also jump a height of two or three inches for a length of about five inches. This is less than the Rhamphi, whose bulk is considerably less, and whose hind femora are much larger, can manage.

Subfamily CRYPTORHYNCHINAE.

Diethusa setosa, n. sp.

Reddish. Densely clothed with stramineous, brown and black scales, interspersed with suberect, stout setae, mostly black.

Male.—Rostrum long, thin, curved, with very sparse, small punctures. Antennae inserted in middle of rostrum. Prothorax scarcely transverse, lightly rounded on sides. Elytra trisinuate at base, wider than prothorax; sides parallel for a short distance, then narrowed to apex; interstices flat; punctures in striae appearing small through clothing. Metasternum and basal segment of abdomen conjointly concave. Second segment not as long as next two combined. Anterior femora edentate; intermediate subdentate; posterior strongly dentate. Anterior tibiae lightly falcate, with apical spur long and acute.

Length, 4 mm.

Habitat.—Victoria: Bendigo (C. Oke), on *Acacia pycnantha.*

A large species with distinctive clothing; the setae are very conspicuous and thick on head, prothorax and elytra, mostly black, with a fair number of pale ones. On the rostrum between antennae and tip there are some pale, fine setae.

Diethusa venusta, n. sp.

Dull reddish. Densely clothed with white, stramineous, golden and rusty-brown scales; whitish on undersurface.

Male.—Rostrum thin, about length of prothorax, moderately curved; with close, elongate punctures; squamose near base; median ridge faint. Antennae inserted about three-fifths from apex. Prothorax transverse, lightly rounded on sides, much narrowed to apex. Elytra trisinuate and scarcely one-fifth wider than prothorax, at base; sides nowhere parallel; striae with small punctures; interstices flat, finely punctured. Basal segment of abdomen depressed on base; second scarcely width of third and fourth combined. Anterior femora edentate, the others subdentate. Anterior tibiae with a fairly large spur.

Female.—Differs in having rostrum longer, thinner, nitid, almost impunctate, and median ridge not traceable; antennae inserted nearer base of rostrum; basal segment of abdomen gently convex; second slightly longer than next two combined.

Length, 3·70 mm.

Habitat.—Victoria: Gypsum (C. Oke).

A prettily variegated species of the size of *D. apicalis*, but the base of elytra and clothing very different. On head and rostrum the scales are pale golden; on prothorax white or whitish with an indistinct medial fascia and a medial vitta, from apex to fascia, of scales with a golden gloss; on elytra they are mostly golden-brown across base, with a white spot on shoulders, then a dark rusty-brown, uneven fascia, obliquely connected with scutellum, then follows an interrupted arcuate fascia of white scales, then an area of rusty-brown and golden spots, with the apex mostly pale. The hind feroma are strongly notched, but are scarcely dentate.

Blepiarda panacis, n. sp.

(Text-fig. 6*a,f.*)

Very like *B. undulata* Pasc., but differs in being smaller, with darker markings on thorax and base of elytra, the scales on prothorax even larger in proportion to those of elytra, and in two basal joints of funicle being equal in length.

Length, 6·25-7·75 mm.

On the thorax the median third is dark except for a narrow pale vitta, from base to about middle, and a small medio-apical spot. On the elytra there is the same pale triangular basal part as in *B. undulata*, but it is invaded by a dark mark on base of the third interstice, which is connected with a square mark, common to the third to fifth interstices, on its lower and outer edge, with the rest of the dark surface. The markings are the same on all the specimens examined, but are more sharply defined on some than on others.

Mr. Lea's detailed description of *B. undulata* (8) fits this species so well in other respects that further description is unnecessary.

Habitat.—Victoria: Fern Tree Gully (C. Oke), on, and bred from, *Tieghemopanax sambucifolius*.

INCERTAE SEDIS.

Nyella, n. gen.

Head small, round. Rostrum short, curved, a little wider at apex than base, almost cylindrical. Scrobes turning towards underside of rostrum. Antennae short, inserted about middle of rostrum; funicle 7-jointed; club distinct. Eyes rather large, lightly transverse, coarsely facetted. Prothorax transverse. Scutellum small. Elytra tuberculate. Prosternum flat between coxae. Mesosternum very short. Metasternum rather long, sulcate down centre, side pieces distinct, uncovered. Segments 1-2 of abdomen large, suture straight, very indistinct across middle, 3-4 very short, subequal, 5 same length as 3-4 combined. Anterior coxae widely separated. Tarsi with joints 1-2 narrow, equal, 3 wide, cleft to base, 4 twice length of 3, with two minute claws, very close together.

Genotype, *N. tuberculata*.

The position of this genus is doubtful, but the table of Le Conte and Horn, in the Classification of the Coleoptera of North America, indicates a grouping with the Trypetini. It is quite distinct from any other genus known to me. The anterior coxae are as widely separated as is possible without being on the sides of the prosternum.

It is with pleasure that I dedicate this genus to my friends, the Rev. E. Nye, of Wesley College, and his son, Mr. E. E. Nye, in memory of a very pleasant collecting trip.

Nyella tuberculata, n. sp.

(Text-fig. 6*g,h,i*.)

Dark reddish-brown. Thickly clothed with pale stramineous scales, the tubercles with black scales.

Head and rostrum with fine close punctures, apical three-fourths of rostrum glabrous. Antennae thin, scape straight, lightly dilated to apex; first joint of funicle stout, as long as next three combined; club large. Prothorax transverse, widest at base, constricted near apex; with small reticulate punctures. Elytra trisinuate at base, evenly narrowed to apex; shoulders rounded; with a curved row of six tubercles near base; the largest being on the third interstice, one on the fifth, and the third on the side; a large tubercle on fifth interstice at apical slope, and a smaller one on third interstice near apex; striae narrow, with small punctures; interstices flat, with close, fine punctures. Sternum with moderate sized reticulate punctures. Abdomen with very fine punctures. Anterior femora distinctly emarginate below.

Length, 3·5 mm.

Habitat.—Victoria: Mitchell Gorge (Rev. E. Nye, E. E. Nye, C. Oke).

At first glance this species is rather suggestive of *Rhaciodes,* with its tuberculate elytra, but is, in reality, far removed from that genus. Seen from the sides it has a peculiar outline, being flat with strongly humped shoulders.

The specimens described were beaten from the Mutton-wood, *Rapanea variabilis* Mez. I am indebted to Mr. J. W. Audas for the name of this plant.

References.

1. A. M. LEA. *Ann. Soc. Ento. Belg.*, l, 1906, p. 353.
2. A. M. LEA. l.c., p. 314.
3. N. B. TINDALE. *Rec. S. Aust. Mus.*, iii, 1926, fig. 80*o*.
4. A. M. LEA. *Ibid.*, p. 149-158.
5. F. PASCOE. *Ann. Mag. Nat. Hist.*, Sept., 1875, p. 221, pl. v, Fig. 2.
6. F. PASCOE. l.c., July, 1876, p. 59.
7. A. M. LEA. *Trans. Roy. Soc. S. Aust.*, xxvii, 1904, p. 115.
8. A. M. LEA. *Proc. Linn. Soc. N.S.W.*, xxx, 1905, p. 353.

[PROC. ROY. SOC. VICTORIA, 43 (N.S.), PT. II, 1931.]

ART. XVI.—*Additions to and Alterations in the Catalogue of Victorian Marine Mollusca.*

By J. H. GATLIFF and C. J. GABRIEL.

[Read 11th December, 1930; issued separately 27th February, 1931.]

There have been very many alterations in nomenclature of our Marine Molluscan Fauna of recent years and our intentions in this paper are to give those which may be validly adopted.

The additional species number 35, and the names of those which we have already listed, but are now altered, number 133, making the total dealt with herein 168.

We have to acknowledge the kind assistance of Sir Joseph Verco and Mr. F. A. Singleton, M.Sc.

Genus **Cavolina** Abildgaard, 1791.

The species included by Pritchard and Gatliff in the genus *Cavolinia* has to be changed, as that name had not been regularly introduced. They are now placed in the genus *Cavolina*.

Genus **Gatliffena** Iredale, 1929.

GATLIFFENA FENESTRATA (Tate and May).

1922. Syntagma fenestrata Tate and May. Gatliff and Gabriel, P.R.S. Vic., n.s., xxxiv, p. 140.
1922. Exomilus fenestratus Tate and May. Hedley, Rec. Aust. Mus., xiii (6), p. 334.
1929. Gatliffena fenestrata Tate and May. Iredale, ib., xvii (4), p. 186.

Obs.—At the last reference Iredale states that it has nothing to do with *Donovania=Syntagma* and therefore makes the above genus. This will be the genotype.

Genus **Galfridus** Iredale, 1924.

GALFRIDUS SPECIOSUS (Angas).

1863. Murex scalarinus A. Adams, P.Z.S. Lond., p. 508, not Murex scalarinus Bivona, 1832.
1871. Triton speciosus Angas, ib., p. 13, pl. 1, f. 7.
1902. Tritonium speciosum Ang. Kesteven, P.L.S.N.S.W., xxvi (4), for 1901, p. 713, pl. 36, f. 10, 11.
1902. "Triton speciosus" Ang. Kesteven, ib., xxvii (3), p. 479, f. 3 in text.
1913. Craspedotriton speciosus Ang. Hedley, ib., xxxviii (2), p. 327.
1924. Galfridus speciosus Ang. Iredale, ib., xlix (3), p. 271.

Hab.—Mallacoota (Roy Bell).

Obs.—Kesteven in his first reference to it gives figures 10-11 of the protoconch and its sculpture, and in his second reference describes and figures the operculum and dentition and remarks, "This species is, as Tryon suspected, a *Trophon*."

This will be the genotype.

Genus **Cymatium** Bolten, 1798.

CYMATIUM WATERHOUSEI (Adams and Angas).

1864. Triton waterhousei Adams and Angas, P.Z.S. Lond., p. 35 (no figure).

Obs.—Pritchard and Gatliff considered that owing to the variability of *C. spengleri* Perry, they included in that species *C. waterhousei*; in some cases it is difficult to define them.

Genus **Personella** Conrad, 1865.

PERSONELLA QUOYI (Reeve).

1844. Triton quoyi Reeve, P.Z.S., Lond., p. 118.
1844. Id., Rve., Conch. Icon., ii, pl. 17, f. 71.
1902. Lotorium quoyi Rve. Kesteven, op. cit., xxvii (3), p. 463, pl. 17, f. 25.

Hab.—Port Fairy.

Obs.—In the first part of their Catalogue in volume 10 of these Proceedings, 1908, Pritchard and Gatliff considered this species should be regarded as a synonym of *T. verrucosus* Rve. Since then further specimens have been obtained from Port Fairy, and we consider that the shells, although nearly related, may be separated into two species. One of us when visiting the British Museum in 1907 found there exhibited shells under the name of *Personella quoyi* Reeve. Dall in his paper, "An Historical and Systematic Review of the Frog-shells and Tritons" (Smithsonian Misc. Coll., xlvii) on page 130 says of the genus *Personella* Conrad, 1865. "Recent analogue *Triton quoyi* Reeve."

PERSONELLA GAIMARDI (Iredale).

1929. Cymatiella gaimardi Iredale, Rec. Aust. Mus., xvii (4), p. 176, pl. 40, f. 7.

Hab.—Port Fairy.

Obs.—We also have this species from South Australia. Iredale states that it is known in that State as *quoyi*.

Genus **Mayena** Iredale, 1917.

MAYENA AUSTRALASIA (Perry).

1811. Biplex australasia Perry, Conch., pl. 4, f. 2.
1906. Lotorium (Argobuccinum) australasia Perry. Pritchard and Gatliff, P.R.S. Vic., n.s., xvii (2), p. 42.
1915. Charonia australasiana Perry. E. A. Smith, P. Mal. Soc. Lond., xi, pp. 283, 284.
1917. Mayena australasia Perry. Iredale, ib., xii, p. 324.
1921. Id. May, Moll. of Tasmania, p. 65.
1923. Id. May. Ill. Index Tas. Shells, p. 63, pl. 29, f. 21.

Genus **Propefusus** Iredale, 1924.

PROPEFUSUS UNDULATUS (Perry).

1906. Fusus undulatus Perry. Pritchard and Gatliff, op. cit., p. 43.
1924. Propefusus undulatus Perry. Iredale, P.L.S.N.S.W., xlix (3), p. 268.

Obs.—This species will be the genotype.

Genus **Tasmeuthria** Iredale, 1925.

TASMEUTHRIA CLARKEI (Tenison-Woods).

1875. Siphonalia clarkei T.-Woods, P.R.S. Tas. for 1874, p. 138.
1898. Latirus clarkei T.-Woods. Pritchard and Gatliff, op. cit., x (2), p. 272.
1906. Euthria clarkei T.-Woods. Prit. and Gat., ib., xviii (2), p. 143.
1925. Tasmeuthria clarkei T.-Woods. Iredale, Rec. Aust. Mus., xiv, p. 262.

Obs.—Iredale makes this species the genotype.

Genus **Cominella** Gray, 1847.

COMINELLA EBURNEA Reeve.

1833. Buccinum costatum Quoy and Gaimard, Astrolabe, ii, p. 417, pl. 30, f. 17-20, (not of Linn.).
1898. Cominella costata Quoy and G. Pritchard and Gatliff, op. cit., x (2), p. 274.

Genus **Fax** Iredale, 1925.

FAX TABIDA (Hedley).

1913. Euthria tabida Hed. Gatliff and Gabriel, op. cit., xxvi (1), p. 72.
1925. Fax tabida Hed. Iredale, Rec. Aust. Mus., xiv (4), p. 262, pl. 43, f. 19.

Obs.—When Hedley originally described this species he placed it in the genus *Phos*, and stated, " The specimen here described is immature."

Genus **Nassarius** Dumeril, 1806.

NASSARIUS PYRRHUS (Menke).

1822. Buccinum fasciatum Lamarck, Anim. s. Vert., vii, p. 271, (not Muller, 1774).
1843. Buccinum pyrrhum Menke, Moll. Nov. Holl., p. 21, No. 93.
1898. Nassa fasciata Lk. Pritchard and Gatliff, op. cit., x (2), p. 278.
1915. Alectrion victorianus Iredale, T.N.Z.I., xlvii, p. 467.
1925. Nassarius pyrrhus Menke. Ire., Vic. Nat., xlii, p. 128.

Genus **Ericusa** H. and A. Adams, 1858.

ERICUSA PAPILLOSA KENYONIANA (Brazier).

1897. Voluta kenyoniana Braz., P.L.S.N.S.W., xxii (4), p. 779.
1906. Voluta papillosa var. kenyoniana Braz. E. A. Smith, P. Mal. Soc. Lond., vii, p. 6.
1913. Voluta papillosa Swainson var. kenyoniana Braz. Gatliff and Gabriel, op. cit., xxvi (1), p. 72.

Hab.—Cape Everard.

Genus Ancilla Lamarck, 1799.

ANCILLA FUSIFORMIS (Petterd).

1886. Ancillaria fusiformis Petterd. P.R.S. Tas. for 1885, p. 342.
1924. Baryspira fusiformis Pett. Iredale, P.L.S.N.S.W., xlix (3), p. 260, pl. 36, f. 10.

Hab.—Bass Straits.

Obs.—Size of Type: "Long. 20; lat. 9 mil. Apert. long. 10; lat. 4 mil."

Genus Hemipleurotoma Cossmann, 1889.

HEMIPLEUROTOMA GABENSIS (Hedley).

1922. Epideira gabensis Hedley, Rec. Aust. Mus., xiii (6), p. 228, pl. 43, f. 16.

Hab.—80 fath. off Gabo Island (type, "Endeavour").

Obs.—Size of Type: Length, 21; breadth, 9 mm. The author remarks, "Nearest to this is *E. xanthophaes*, which is far narrower and has a smaller protoconch. *E. xanthophaes* has several bead rows, but *gabensis* only one in which the beads are closer, smaller, and more compressed."

Genus Filodrillia Hedley, 1922.

FILODRILLIA STEIRA Hedley.

1922. Filodrillia steira Hedley, op. cit., p. 224, pl. 42, f. 11.

Hab.—80 fath. off Gabo Island ("Endeavour.").

Obs.—Size of Type: Length, 8; breadth, 3·5 mm. The author remarks, "Compared with *A. dilecta* this is a shorter, broader shell, and is especially distinguished by the prominent single keel on the periphery."

FILODRILLIA TRICARINATA (Tenison-Woods).

1910. Drillia tricarinata T.-Woods. Gatliff and Gabriel, op. cit., xxiii (1), p. 89.
1922. Filodrillia tricarinata T.-Woods. Hedley, op. cit., xiii (6), p. 225, f. 4 in text.

Obs.—This is the genotype.

FILODRILLIA COLUMNARIA Hedley.

1923. Filodrillia columnaria, Hedley, op. cit., p. 221, pl. 42, f. 7.

Hab.—Off Wilson's Promontory ("Endeavour").

FILODRILLIA SPADIX (Watson).

1886. Pleurotoma (Drillia) spadix Watson, "Challenger," xv, p. 310, pl. 26, f. 6.
1922. Inquisitor spadix Watson. Hedley, op. cit., p. 265.

Hab.—80 fathoms off Gabo Island ("Endeavour'), (Hedley).

FILODRILLIA IMMACULATA (Tenison-Woods).

1876. Mangelia immaculata T.-Woods, P.R.S. Tas. for 1875, p. 142.

1899. Drillia gabrieli Pritchard and Gatliff, op. cit., xii (1), p. 100, pl. 8, f. 1.
1900. Id. Prit. and Gat., ib., xii (2), p. 173.
1901. Drillia immaculata T.-Woods. Tate and May, P.L.S.N.S.W., xxvi (3), p. 369.
1922. Inquisitor immaculatus T.-Woods. Hedley, op. cit., p. 241. pl. 44, f. 31.

Genus **Crassispira** Swainson, 1840.

CRASSISPIRA EBURNEA (Hedley).

1922. Melatoma eburnea Hedley, op. cit., p. 251, pl. 45, f. 43.

Hab.—80 fath. off Gabo Island (type, " Endeavour ").

Obs.—Size of Type: Length, 10; breadth, 4 mm. " This is like *Drillia laevis* Hutton, but is much smaller, with sharper and more numerous ribs."

CRASSISPIRA LYGDINA (Hedley).

1922. Melatoma lygdina Hedley, op. cit., p. 252, pl. 45, f. 44.

Hab.—150 to 200 fath. off Gabo Island (" Endeavour ").

Obs.—Size of Type: Length, 27; breadth, 8·5 mm.

CRASSISPIRA SUBVIRIDIS (May).

1911. Drillia subviridis May, P.R.S. Tas. for 1910, p. 392, pl. 14, f. 18.
1922. Melatoma subviridis May. Hedley, op. cit., p. 253.

Hab.—80 fath. off Gabo Island (" Endeavour ").

Obs.—Size of Type: Length, 16; breadth, 6 mm.

CRASSISPIRA LACTEOLA (Verco).

1913. Drillia lacteola Verco. Gatliff and Gabriel, op. cit., p. 74.
1922. Filodrillia lacteola Verco. Hedley, op. cit., p. 222.

CRASSISPIRA HARPULARIA (Des Moulins).

1853. Drillia (Crassispira) harpularia Des Moul. H. and A. Adams, Gen. Recent Moll., i (3), p. 91.
1900. Drillia harpularia Des Moul. Pritchard and Gatliff, op. cit., p. 170.
1922. Melatoma harpularia Des Moul. Hedley, op. cit., p. 251.

CRASSISPIRA SCHOUTANICA (May).

1913. Drillia schoutanica May. Gatliff and Gabriel, op. cit., p. 73.
1922. Epideira schoutanica May. Hedley, op. cit., p. 230.

CRASSISPIRA WOODSI (Beddome).

1883. Drillia woodsi Beddome, P.R.S. Tas. for 1882, p. 167.
1899. Drillia howitti Pritchard and Gatliff, op. cit., xii (1), p. 101, pl. 8, f. 2.
1900. Id. Prit. and Gat., ib., xii (2), p. 172.
1901. Drillia woodsi Bedd. Tate and May, P.L.S.N.S.W., xxvi (3), p. 368.

Crassispira aemula (Angas).

1877. Drillia aemula Ang., P.Z.S. Lond., p 36, pl. 5, f. 6.
1900. Drillia aemula Ang. Pritchard and Gatliff, op. cit., p. 171.

Crassispira beraudiana (Crosse).

1900. Drillia beraudiana Crosse. Pritchard and Gatliff, op. cit., xii (2), p. 171.
1922. Austrodrillia beraudiana Crosse. Hedley, op. cit., p. 248, pl. 45, f, 40.

Obs.—As it has been decided that the generic name *Drillia* is not applicable to our Australian species, we use the above name when it is suitable.

Crassispira angasi (Crosse).

1908. Drillia angasi Crosse. Gatliff and Gabriel, op. cit., xxi (1), p. 375.
1922. Austrodrillia angasi Crosse. Hedley, op. cit., p. 247, pl. 44, f. 38, 39.

Crassispira saxea (Sowerby).

1913. Drillia saxea Sowb. Gatliff and Gabriel, op. cit., xxvi (1), p. 74.
1922. Austrodrillia saxea Sowb. Hedley, op. cit., p. 249.

Genus **Scrinium** Hedley, 1922.

Sorinium furtivum Hedley.

1922. Scrinium furtivum Hed., op. cit., p. 259, pl. 45, f. 53.

Hab.—80 fath. off Gabo Island (type, " Endeavour ").
Obs.—Size of Type: Length, 7·5; breadth, 3 mm.

Genus **Etrema** Hedley, 1922.

Etrema bicolor (Angas).

1900. Clathurella bicolor Ang. Pritchard and Gatliff, op. cit., xii (2), p. 179.
1922. Etrema bicolor Ang. Hedley, op. cit., p. 275.

Etrema denseplicata (Dunker).

1906. Clathurella denseplicata Dkr. Pritchard and Gatliff, op. cit., xviii (2), p. 50.
1922. Etrema denseplicata Dkr. Hedley, op. cit., p. 277.

Etrema denseplicata kymatoessa (Watson).

1900. Clathurella kymatoessa Watson. Pritchard and Gatliff, op. cit., xii (2), p. 178.
1922. Etrema denseplicata var. kymatoessa Wats. Hedley, op. cit., p. 278.

Etrema nassoides (Reeve).

1922. Glyphostoma nassoides Rve. Gatliff and Gabriel, op. cit., xxxiv., p. 140.
1922. Etrema nassoides Rve. Hedley, op. cit., p. 280, pl. 47, f. 81.

Etrema walcotae (Sowerby).

1922. Glyphostoma walcotae Sowb. Gatliff and Gabriel, op. cit., p. 140.
1922. Asperdaphne walcotae Sowb. Hedley, op. cit., p. 344.

Genus **Guraleus** Hedley, 1922.

Guraleus pictus (Adams and Angas).

1900. Mangilia picta Ad. and Ang. Pritchard and Gatliff, op. cit., xii (2), p. 173.
1922. Guraleus pictus Ad. and Ang. Hedley, op. cit., p. 320, pl. 53, f. 149.

Hab.—Coast generally.
Obs.—This is the genotype.

Guraleus flaccidus (Pritchard and Gatliff).

1899. Mangilia flaccida Pritchard and Gatliff, op. cit., xii (1), p. 102, pl. 8, f. 3, 4.
1900. Id. Prit. and Gat., ib., xii (2), p. 175.
1922. Guraleus flaccidus Prit. and Gat. Hedley, op. cit., p. 315, pl. 53, f. 143.

Guraleus granulosissimus (Tenison-Woods).

1907. Mangilia granulosissima T.-Woods. Gatliff, P.R.S. Vic., n.s., xx (1), p. 32.
1922. Guraleus granulosissimus T.-Woods. Hedley, op. cit., p. 315.

Guraleus saint-gallae (Tenison-Woods).

1901. Mangelia St. Gallae T.-Woods. Tate and May, P.L.S.N.S.W., xxvi, p. 369, pl. 24, f. 33.
1906. Mangilia St. Gallae T.-Woods. Pritchard and Gatliff, op. cit., xviii (2), p. 50.

Guraleus insculptus (Adams and Angas).

1910. Mangilia insculpta Ad. and Ang. Gatliff and Gabriel, op. cit., p. 90.
1922. Guraleus insculptus Ad. and Ang. Hedley, op. cit., p. 316.

Guraleus delicatulus (Tenison-Woods).

1907. Mangilia delicatula T.-Woods. Gatliff, op. cit., xx (1), p. 31.
1921. Guraleus delicatula Ten.-Woods. May, Moll. of Tas., p. 74.
1923. Id. May, Ill. Index Tas. Shells, pl. 35, f. 1.

Guraleus tasmanicus (Tenison-Woods).

1900. Mangilia tasmanica T.-Woods. Pritchard and Gatliff, op. cit., p. 175.
1922. Guraleus tasmanicus T.-Woods. Hedley, op. cit., p. 322, pl. 53, f. 151.

Guraleus bilineatus (Angas).

1912. Mangilia bilineata Ang. Gatliff and Gabriel, op. cit., xxv (1), p. 170.
1922. Heterocithara bilineata Ang. Hedley, op. cit., p. 297, pl. 49, f. 106.

GURALEUS LALLEMANTIANUS (Crosse and Fischer).

1900. Clathurella lallemantiana Crosse and F. Pritchard and Gatliff, ib., p. 177.
1922. Guraleus lallemantianus Crosse and F. Hedley, op. cit., p. 317.

GURALEUS CUSPIS (Sowerby).

1896. Mangilia cuspis Sowb., P. Mal. Soc. Lond., ii, p. 31, pl. 3, f. 17.
1922. Guraleus cuspis Sowb. Hedley, op. cit., p. 314.
1926. Mangilia cuspis Sowb. Gatliff and Gabriel, op. cit., xxxviii, p. 89.

GURALEUS BRAZIERI (Angas).

1922. Id. Hedley, op. cit., p. 312, pl. 52, f. 138.
1926. Mangilia brazieri Ang. Gatliff and Gabriel, op. cit., p. 89.

GURALEUS FALLACIOSUS (Sowerby).

1910. Mangilia fallaciosa Sowb. Gatliff and Gabriel, op. cit., xxiii (1), p. 90.
1922. Guraleus fallaciosus Sowb. Hedley, op. cit., p. 315.

GURALEUS NENIUS (Hedley).

1913. Drillia nenia Hed. Gatliff and Gabriel, op. cit., xxvi (1), p. 74.
1922. Austrodrillia nenia Hed., op. cit., p. 249, f. 7 in text.

GURALEUS MOROLOGUS Hedley.

1922. Guraleus morologus Hedley, op. cit., p. 319, pl. 52, f. 146.
1926. Mangilia morologus Hed. Gatliff and Gabriel, op. cit., p. 89.

GURALEUS ALUCINANS (Sowerby).

1900. Mangilia alucinans Sowb. Pritchard and Gatliff, op. cit., p. 175.

GURALEUS VINCENTINUS (Crosse and Fischer).

1900. Mangilia vincentina Crosse and F. Pritchard and Gatliff, op. cit., p. 174.
1922. Guraleus pictus var. vincentinus Crosse and F. Hedley, op. cit., p. 321, pl. 53, f. 149.

Genus Marita Hedley, 1922.

MARITA COMPTA (Adams and Angas).

1900. Cithara compta Ad. and Ang. Pritchard and Gatliff, op. cit., xii (2), p. 176.
1922. Guraleus (Marita) comptus Ad. and Ang. Hedley, op. cit., p. 313.

Obs.—Hedley, ib., p. 312, calls this a subgenus of *Guraleus*. We consider *Marita* worthy of being raised to rank as a genus. This species is the genotype.

MARITA BELLA (Adams and Angas).

1900. Mangilia adcocki Sowerby. Pritchard and Gatliff, op. cit., p. 174.
1922. Guraleus (Marita) bellus Ad. and Ang. Hedley, op. cit., p. 312.

MARITA KINGENSIS (Petterd).

1906. Cithara kingensis Pett. Pritchard and Gatliff, op. cit., xviii (2), p. 50.
1922. Guraleus (Marita) kingensis Pett. Hedley, op. cit., p. 317.

MARITA MITRALIS (Adams and Angas).

1900. Mangilia mitralis Ad. and Ang. Pritchard and Gatliff, op. cit., p. 173.
1922. Guraleus (Marita) mitralis Ad. and Ang. Hedley, op. cit., p. 318.

MARITA AUSTRALIS (Adams and Angas).

1922. Guraleus (Marita) mitralis var. australis Ad. and Ang. Hedley, op. cit., p. 319.

Obs.—After due consideration of the original descriptions of this, and the foregoing species, we agree with the authors that they are rightly given specific distinction.

Genus **Daphnella** Hinds, 1844.

DAPHNELLA BOTANICA Hedley.

1867. Daphnella crebriplicata Reeve. Angas, P.Z.S. Lond., p. 203 (not of Reeve)
1889. Id. Whitelegge, J.R.S.N.S.W., xxiii, p. 254 (not of Rve.).
1918. Daphnella botanica Hedley, ib., li, suppl., p. M83.
1922. Daphnella crebriplicata Rve. Gatliff and Gabriel, op. cit., p. 140 (not of Rve.).
1922. Daphnella botanica Hedley, op. cit., p. 326, pl. 53, f. 157-159.

Obs.—Angas in his paper quoted above stated, "Dredged in Port Jackson," N.S.W.

Genus **Mitrithara** Hedley, 1922.

MITRITHARA ALBA (Petterd).

1879. Columbella alba Petterd, Journ. of Conch., ii, p. 104.
1899. Mitromorpha flindersi Pritchard and Gatliff, op. cit., p. 104, pl. 8, f. 6.
1900. Id. Prit. and Gat., ib., xii (2), p. 180.
1922. Mitrithara alba Pett. Hedley, op. cit., p. 233, pl. 43, f. 22.

Obs.—This species is the genotype.

MITRITHARA PROLES Hedley.

1922. Mitrithara proles Hedley, op. cit., p. 236, pl. 43, f. 24.

Hab.—80 fath. off Gabo Island ("Endeavour").

Obs.—Size of Type: Length, 6; breadth, 2·7 mm. "This form was at first mistaken for *M. alba*. It is, however, much nearer to the fossil *M. daphnelloides,* of which it may be a variety, differing by a more pointed protoconch, less prominent plications on the columella, and finer, closer riblets."

Genus **Asperdaphne** Hedley, 1922.

ASPERDAPHNE BASTOWI (Gatliff and Gabriel).

1908. Daphnella bastowi Gatliff and Gabriel, op. cit., xii (1), p. 365, pl. 21, f. 1-4, and p. 375.
1922. Asperdaphne bastowi Gat. and Gab. Hedley, op. cit., p. 339.

ASPERDAPHNE TASMANICA (Tenison-Woods).

1906. Daphnella tasmanica T.-Woods. Pritchard and Gatliff, op. cit., xviii (2), p. 52.
1922. Asperdaphne tasmanica T.-Woods. Hedley, op. cit., p. 343, f. 12 in text.

ASPERDAPHNE MINUTA (Tenison-Woods)

1900. Drillia minuta T.-Woods. Pritchard and Gatliff, op. cit., xii (2), p. 172.
1922. Nepotilla minuta T.-Woods. Hedley, op. cit., p. 337.

ASPERDAPHNE MIMICA (Sowerby).

1906. Daphnella mimica Sowb. Pritchard and Gatliff, op. cit., xviii (2), p. 52.
1922. Nepotilla mimica Sowb. Hedley, op. cit., p. 337.

ASPERDAPHNE SCULPTILIS (Angas).

1908. Daphnella sculptilis Ang. Gatliff and Gabriel. op. cit., xxi (1), p. 375.
1922. Asperdaphne sculptilis Ang. Hedley, op. cit., p. 342.

ASPERDAPHNE DESALESII (Tenison-Woods).

1899. Clathurella sexdentata Pritchard and Gatliff, op. cit., xii (1), p. 104, pl. 8, f. 7.
1900. Id. Prit. and Gat., ib., xxx (2), p. 179.
1922. Pseudodaphnella albocincta Ang. Gatliff and Gabriel, ib., xxxiv, p. 141.
1922. Asperdaphne desalesii T.-Woods. Hedley, op. cit., p. 341, f. 11 in text.

Genus **Teleochilus** Harris, 1897.

TELEOCHILUS ROYANUS Iredale.

1922. Daphnobela sp.? Gatliff and Gabriel, op. cit., xxxiv, p. 141.
1924. Teleochilus royanus Iredale, P.L.S.N.S.W., xlix (3), p. 264, pl. 34, f. 6, 7.
1925. Id. Ire., Rec. Aust. Mus., xiv (4), p. 259.

Hab.—Off Gabo Island (80 fathoms); off Cable, Bass Strait.

Obs.—Size of Type: Length, 16; breadth, 6·5 mm. Comparison of the Cable specimen with one from the type locality convinces us of their specific identity.

Genus Hypocassis Iredale, 1927.

HYPOCASSIS FIMBRIATA (Quoy and Gaimard).

1833. Cassis fimbriata Quoy and Gaimard, "Astrolabe," Zool. ii, p. 596, pl. 43, f. 7, 8.
1900. Cassis fimbriata Quoy and G. Pritchard and Gatliff, op. cit., xii (2), p. 188.
1927. Hypocassis fimbriata Quoy and G. Iredale, Rec. Aust. Mus., xv (5), p. 329.

Genus Xenophalium Iredale, 1927.

XENOPHALIUM LABIATUM (Perry).

1811. Cassidea labiata Perry, Conchology, pl. 34, f. 1.
1822. Cassis achatina Lamarck, Anim. s. Vert., vii, p. 226.
1900. Id. Pritchard and Gatliff, op. cit., p. 189.
1918. Phalium labiatum Perry. Hedley, J.R.S.N.S.W., li, Suppl., p. M67.
1927. Xenogalea labiatum Perry. Iredale, op. cit., p. 347, pl. xxxi, f. 1.

Obs.—*Xenophalium* was erected by Iredale, op. cit., p. 333, and we consider that his subsequent genus *Xenogalea* does not warrant the erection of a separate genus.

XENOPHALIUM PYRUM (Lamarck).

1822. Cassis pyrum Lamarck, op. cit., vii, p. 226.
1900. Cassis pyrum Lam. Pritchard and Gatliff, op. cit., p. 189.
1927. Xenogalea pyrum Lam. Iredale, op. cit., p. 339, pl. 32, f. 14, 16.

XENOPHALIUM STADIALIS (Hedley).

1903. Cassidea turgida Reeve. Hedley, Mem. Aust. Mus., p. 340, pl. 36, f. 1 (not of Reeve).
1914. Cassidea stadialis Hed., Zool. Commonwealth trawler "Endeavour," ii (2), p. 72, pl. 10, f. 41.
1916. Cassis achatina Lamarck var. stadialis Hed. Gatliff and Gabriel, op. cit., xxix (1), p. 108.
1927. Xenogalea stadialis Hed. Iredale, op. cit., p. 341, pl. 31, f. 3.

XENOPHALIUM THOMSONI (Brazier).

1875. Cassis (Casmaria) thomsoni Brazier, P.L.S.N.S.W., i, p. 8.
1902. Cassidea pyrum Lamarck var. thomsoni Braz. Hedley, Mem. Aust. Mus., iv, p. 341.
1927. Xenogalea thomsoni Braz. Iredale, op. cit., p. 342, pl. 31, f. 6, 7.

Hab.—Off Cape Everard.

XENOPHALIUM PAUCIRUGIS (Menke).

1843. Cassis paucirugis Menke, Moll. Nov. Holl., p. 23.
1865. Semicassis (Casmaria) paucirugis Menke. Angas, P.Z.S. Lond., p. 168.
1916. Cassidea paucirugis Menke. Hedley, Journ. Roy. Soc. West Aust., i, p. 47.
1927. Xenogalea paucirugis Menke. Iredale, op. cit., p. 345, pl. 31, f. 2.

Hab.—Portsea, Port Phillip; Western Port.

Genus **Antephalium** Iredale, 1927.

ANTEPHALIUM SEMIGRANOSUM (Lamarck).

1906. Cassis semigranosa Lam. Pritchard and Gatliff, op. cit., p. 190.
1927. Antephalium semigranosum Lam. Iredale, op. cit., p. 351.

ANTEPHALIUM SINUOSUM (Verco).

1904. Cassidea sinuosa Verco, T.R.S.S.A., xxviii, p. 141, pl. 26, f. 7-10.
1922. Phalium sinuosum Verco. Gatliff and Gabriel, op. cit., xxxiv (1), p. 143.
1927. Antephalium sinuosum Verco. Iredale, op. cit., p. 353.

Genus **Turritella** Lamarck, 1799.

TURRITELLA AUSTRALIS DIFFIDENS (Iredale).

1925. Ctenocolpus australis diffidens Iredale, Rec. Aus. Mus., xiv, p. 267, pl. 43, f. 17.

Hab.—Lakes Entrance (Thos. Worcester); Gabo Island (Iredale).

Genus **Glyptozaria** Iredale, 1924.

GLYPTOZARIA OPULENTA (Hedley).

1911. Turritella opulenta Hed. Gatliff and Gabriel, op. cit., xxiv (1), p. 95.
1924. Glyptozaria opulenta Hed. Iredale, P.L.S.N.S.W., xlix, p. 248.

Genus **Vermicularia** Lamarck, 1799.

VERMICULARIA SIPHO (Lamarck).

1818. Vermetus sipho Lamarck, Anim, s. Vert., v, p. 262.
1900. Vermetus novae-hollandiae Rousseau. Pritchard and Gatliff, op. cit., xii (2), p. 204.
1913. Serpulorbis sipho Lam. Suter, Man. N.Z. Moll., p. 259.
1915. Id. Suter, Atlas, pl. 40, f. 9.

Genus **Ianthina** Bolten, 1798.

IANTHINA SMITHIAE Reeve.

1858. Ianthina smithiae Reeve, Conch. Icon., xi, pl. 3, f. 15.

Hab.—Mallacoota (Mrs. W. Hanks).

Genus **Coenaculum** Iredale, 1924.

COENACULUM MINUTULUM (Tate and May).

1900. Scalaria (Acrilla) minutula Tate and May, T.R.S.S.A., xxiv. (2), p. 95.
1906. Scala minutula Tate and May. Pritchard and Gatliff, op. cit., xviii (2), p. 54.
1924. Coenaculum minutulum Tate and May. Iredale, P.L.S. N.S.W., xlix (3), p. 244.

Obs.—A minute brown shell, recorded also from N.S.W., S. Aust., Tas. This is the genotype.

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

Diala imbricata A. Adams.

1862. Alaba imbricata A. Ad., Ann. Mag. Nat. Hist. [3], x, p. 397.
1913. Diala imbricata A. Ad. Hedley, P.L.S.N.S.W., xxxviii (2), p. 287, pl. 18, f. 61.

Hab.—Western Port.

Genus **Botellus** Iredale, 1924.

Botellus bassianus (Hedley).

1911. Onoba bassiana Hedley, Zool. Commonwealth trawler "Endeavour," pt. 1, p. 108, pl. 19, f. 25.
1912. Rissoa (Onoba) bassiana Hed. Gatliff and Gabriel, op. cit., xxv (1), p. 170.
1914. Id. Chapman and Gabriel, ib., xxvi (2), p. 322, pl. 28, f. 31.
1915. Subonoba bassiana Hed. Iredale, T.N.Z. Inst., xlvii, p. 450.
1922. Subonoba bassiana Hed. Gatliff and Gabriel, op. cit., xxxiv, p. 148.
1924. Botellus bassianus Hed. Iredale, P.L.S.N.S.W., xlix (3), p. 244.

Obs.—Chapman and Gabriel, loc. cit., record this from a deep boring in the Mallee.

Genus **Stiva** Hedley, 1904.

Stiva royana Iredale.

1924. Stiva royana Iredale, P.L.S.N.S.W., xlix (3), p. 245, pl. 34, f. 11.

Hab.—Dredged in 10-15 fathoms, off Gabo Island (Iredale).

Genus **Liotella** Iredale, 1915.

Includes *Cyclostrema vercoi* Gat. and Gab. and *C. kilcundae* G. and G.

Genus **Monodonta** Lamarck, 1799.

Monodonta obtusa (Dillwyn).

1817. Trochus obtusus Dillwyn. Descriptive Cat., ii, p. 809.
1902. Monodonta (Austrocochlea) constricta Lamarck, Pritchard and Gatliff, op. cit., xiv (2), p. 123.
1918. Monodonta obtusa Dill. Hedley, J.R.S.N.S.W., li, Suppl., p. M43.

Hab.—Coast generally.

Monodonta concamerata (Wood).

1828. Trochus concameratus Wood, Index Test. Sup., pl. 6, f. 35.
1902. Monodonta (Austrocochlea) striolata Quoy and Gaimard. Pritchard and Gatliff, op. cit., xiv (2), p. 124.

Obs.—Pritchard and Gatliff did not adopt this name, although they cited it, because Wood only gave a figure without description. Since then, in the International Rules on Nomenclature, the opinion has been given a "published figure (illustration)" is sufficient. We now adopt the above name instead of *striolata.*

Genus **Gena** Gray, 1840.

Gena impertusa (Burrow).

1844. Haliotis impertusa Burrow, Elements Conch., p. 162, pl. 21, f. 2.
1850. Gena strigosa A. Adams, P.Z.S. Lond., p. 37.
1854. Gena strigosa A. Ad. Sowerby, Thes. Conch., ii, p. 830, pl. 173, f. 11, 12.
1867. Gena strigosa A. Ad. Angas, P.Z.S. Lond., p. 218.
1924. Gena impertusa Burrow. Iredale, P.L.S.N.S.W., xlix (3), p. 323.

Obs.—Pritchard and Gatliff cited this species as a synonym of *G. nigra*. Having since received a New Caledonian specimen of the latter, we consider that it is a distinct species.

Genus **Haliotis** Linné, 1758.

Haliotis laevigata Donovan.

1808. Haliotis laevigata Donovan, Rees' Encyclopedia, Conchological series, pl. 6.
1834. Haliotis albicans, Quoy and Gaimard, "Astrolabe," Zool., iii, p. 311, pl. 68, f. 1, 2.
1903. Haliotis albicans Quoy and G. Pritchard and Gatliff, op. cit., xv (2), p. 178.
1924. Haliotis laevigata Donovan, Iredale, P.L.S.N.S.W., xlix (3), p. 222.

Family SCISSURELLIDAE replaces Pleurotomariidae.

Genus **Megatebennus** Lamarck, 1801.

Megatebennus omicron (Crosse and Fischer).

1864. Fissurella omicron Crosse and F. Journ. d. Conch., p. 348.
1903. Id. Pritchard and Gatliff, op. cit., xv (1), p. 182
1916. Megatebennus omicron, C. and F. Hedley, Journ. Roy. Soc. West Aust., i, p. 26.

Genus **Emarginula** Lamarck, 1801.

Emarginula amitina Iredale.

1925. Emarginula amitina Iredale. Rec. Aust. Mus., xiv (4), p, 257, pl. 42, f. 12, 13.

Hab.—Off Wilson's Promontory.

Obs.—Size of Type: Length, 11·5; breadth, 7·5; height. 4 mm. Compared with the type by the author and C.J.G.

Genus **Patella** Linné, 1758.

Patella perplexa Pilsbry.

1903. Patella perplexa Pilsbry. Pritchard and Gatliff, op. cit., xv (2), p. 194.
1906. Acmaea octoradiata Hutton. Pritchard and Gatliff, ib., xviii (2), p. 65.
1922. Acmaea saccharina L. var. perplexa Pilsbry =? Patella octoradiata Hutton. Peile, P. Mal. Soc. Lond., xv, p. 15, p. 16, f. No. 4 of radula.

Obs.—The examination of the radula by Peile proves that it belongs to a *Patella*. The name *Patella octoradiata* had prior use by Gmelin.

Genus **Cellana** H. Adams, 1869.

CELLANA RUBROAURANTIACA (Blainville).

1825. Patella rubroaurantiaca Blainville, Dict. des Sci. Naturelles, p. 111.
1903. Patella limbata Philippi. Pritchard and Gatliff, op. cit., p. 192.
1924. Patella rubraurantiaca Blainv. Iredale, P.L.S.N.S.W., xlix (3), p. 241.

Genus **Patelloida** Quoy and Gaimard, 1834.

PATELLOIDA ALTICOSTATA (Angas).

1865. Patella alticostata Angas, P.Z.S Lond., p. 56, pl. 2, f. 11.
1903. Acmaea costata Sowerby. Pritchard and Gatliff, p. 194 (not of Sowerby).
1924. Acmaea alticostata Ang. Tomlin, P. Mal. Soc., Lond., xvi, p. 98.

Obs.—At the last reference above Mr. Tomlin in a note on the identity of *Acmaea costata* Sowb. states, "The name *costata*, Sow., is at present in common use for a well-known New South Wales *Acmaea*. This must for the future be called *A. alticostata* Angas," and gives reasons for the change.

PATELLOIDA MARMORATA (Tenison-Woods).

1876. Acmaea marmorata T.-Woods, P.R.S. Tas. for 1875, p. 156.
1903. Acmaea gealei Ang. Pritchard and Gatliff, op. cit., p. 197.

Obs.—Having now a larger series of these species we recognise that they are distinct.

Genus **Bullaria** Rafinesque, 1815.

(=Bulla Linné, Syst. Nat., 10th ed., p. 725, but not op. cit., p. 427.)

BULLARIA BOTANICA Hedley.

1903. Bulla australis Gray. Pritchard and Gatliff, op. cit., p. 214.
1918. Bullaria botanica Hedley. J.R.S.N.S.W., li, pp. 103-104, new name for B. australis Gray, 1825, not of Ferussac, 1822.

Genus **Ischnochiton** Gray, 1847.

ISCHNOCHITON VERSICOLOR (Sowerby).

1840. Chiton versicolor Sowerby, Mag. Nat. Hist., iv, p. 292. (Conch. Illus., f. 75).
1847. Chiton proteus Reeve, Conch. Icon., iv, pl. 18, f. 111.
1917. Ischnochiton proteus Rve. Gatliff and Gabriel, op. cit., xxx (1), p. 25.
1924. Ischnochiton versicolor Sowb. Iredale and Hull, Aust. Zool., iii (6), p. 234, pl. 34, f. 1*b*.
1927. Id. Iredale and Hull, Monograph Australian Loricates, p. 17, pl. 2, f. 1*b*.

ISCHNOCHITON MILLIGANI Iredale and May.

1916. Ischnochiton milligani Iredale and May, P. Mal. Soc. Lond., xii, pl. 5, f. 2, 2*a*.
1924. Ischnochiton versicolor milligani Iredale and Hull, op. cit., p. 234, pl. 34, f. 1, 1*a*.
1927. Id. Monograph, p. 17, pl. 2, f. 1, 1*a*.

Hab.—Ocean beach, Point Nepean; Shoreham and San Remo, Western Port.

ISCHNOCHITON VARIEGATUS (H. Adams and Angas).

1864. Lepidopleurus variegatus H. Adams and Angas, P.Z.S. Lond., p. 192.
1924. Ischnochiton variegatus H. Ad. and Ang. Iredale and Hull, op. cit., p. 230, pl. 33, f. 2.
1927. Id. Monograph, p. 13, pl. 1, f. 2.

Hab.—Kilcunda; San Remo, Shoreham, Palm Beach and Cowes, Western Port; Mornington, Port Phillip; Barwon Heads.

Genus **Subterenochiton** Iredale and Hull, 1924.

SUBTERENOCHITON GABRIELI (Hull).

1912. Ischnochiton gabrieli Hull, P.R.S. Vic., n.s., xxv (1), p. 120, pl. 8, f. 1*a*-*f*.
1912. Id. Gatliff and Gabriel, ib., p. 171.
1924. Subterenochiton gabrieli Hull. Iredale and Hull, op. cit., iii (7), p. 278, pl. 35, f. 1. and pl. 37, f. 1-6.
1927. Id. Monograph, p. 22, pl. 3, f. 1 and pl. 5, f. 1-6.

Hab.—Western Port.

Obs.—The type of the genus. It is also recorded from N.S.W.

Genus **Heterozona** Dall, 1878.

HETEROZONA CARIOSA Dall.

1892. Heterozona cariosa Dall. Pilsbry, Man. Conch., xiv, p. 66, pl. 24, f. 23.
1924. Heterozona cariosa Dall. Iredale and Hull, op. cit., p. 280, pl. 35, f. 5.
1927. Id. Monograph, p. 24, pl. 3, f. 5.

Hab.—Mallacoota (Roy Bell) and coast generally.

HETEROZONA FRUTICOSA (Gould).

1846. Ischnochiton fruticosus Gould, Proc. Boston Soc. Nat. Hist., ii, p. 142.
1892. Id. Pilsbry, Man. Conch., xiv, p. 91, pl. 23, f. 78-80.
1912. Id. Gatliff and Gabriel, op. cit., p. 171.
1924. Heterozona fruticosa Gould. Iredale and Hull, op. cit., p. 279, pl. 35, f. 3.
1927. Id. Monograph, p. 24, pl. 3, f. 3.

Hab.—Torquay (C. J. Gabriel); Mallacoota (Roy Bell).

Genus **Autochiton** Iredale and Hull, 1924.

AUTOCHITON TORRI (Iredale and May).

1903. Ischnochiton ustulatus Reeve. Pritchard and Gatliff, op. cit., xv (2), p. 202 (not of Reeve).
1916. Ischnochiton torri Iredale and May, P. Mal. Soc. Lond., xii (2 and 3), p. 111, pl. 5, f. 3.
1924. Autochiton torri Iredale and May. Iredale and Hull, op. cit., p. 283, pl. 35, f. 6.
1927. Id. Monograph, p. 27, pl. 3, f. 6 and pl. 5, f. 17.

Hab.—Port Phillip; Phillip Island ocean beach; Portland.
Obs.—This is the genotype.

AUTOCHITON (EUPOROPLAX) VIRGATUS (Reeve).

1848. Chiton virgatus Reeve, Conch. Icon., iv, pl. 28, f. 192.
1903. Ischnochiton virgatus Rve. Pritchard and Gatliff, op. cit., p. 203.
1924. Autochiton (Euporoplax) virgatus Rve. Iredale and Hull, op. cit., p. 283, pl. 35, f. 7.
1927. Id. Monograph, p. 28, pl. 3, f. 7

Hab.—Phillip Island; Torquay; Portland.
Obs.—This is the type of the subgenus *Euporoplax*.

AUTOCHITON (EURETOPLAX) WILSONI (Sykes).

1896. Ischnochiton wilsoni Sykes, P. Mal. Soc. Lond., ii, p. 89, pl. 6, f. 1, 1*a*.
1903. Id. Pritchard and Gatliff, op. cit., p. 202.
1924. Autochiton (Euretoplax) wilsoni Sykes. Iredale and Hull, op. cit., p. 284, pl. 35, f. 8.
1927. Id. Monograph, p. 28, pl. 3, f. 8, and pl. 5, f. 10.

Hab.—Port Phillip Heads (J. B. Wilson).
Obs.—This is the type of the subgenus *Euretoplax*.

Genus **Stenochiton** H. Adams and Angas, 1864.

STENOCHITON PILSBRYANUS (Bednall).

1897. Ischnochiton (Stenochiton) pilsbryanus Bednall, P. Mal. Soc. Lond., ii. p. 142. text fig.
1924. Stenochiton pilsbryanus Bednall. Iredale and Hull, op. cit., p. 286, pl. 36, f. 10.
1927. Id. Monograph, p. 30, pl. 4, f. 10.

Hab.—Victoria (Iredale and Hull).

STENOCHITON LONGICYMBA (Blainville).

1825. Chiton longicymba Blainville, Dict. Sci. Nat., xxxv, p. 542.
1864. Stenochiton juloides H. Adams and Angas, P.Z.S. Lond., p. 193.
1892. Ischnochiton (Stenochiton) juloides H. Ad. and Ang. Pilsbry, Man. Conch, xiv, p. 55, pl. 16, f. 6-8.
1903. Ischnochiton juloides Ad. and Ang. Pritchard and Gatliff. op. cit., p. 200.

Hab.—Port Phillip Heads (J. B. Wilson).

STENOCHITON PALLENS (Ashby).

1900. Ischnochiton (Stenochiton) pallens Ashby, T.R.S.S.A., xxiv, p. 86, pl. 1, f. 1*a-e*.
1917. Id. Gatliff and Gabriel, op. cit., xxx (1), p. 26.

Hab.—Port Phillip Heads.

Genus **Ischnoradsia** Shuttleworth, 1853.

ISCHNORADSIA AUSTRALIS (Sowerby).

1840. Chiton australis Sowerby, Mag. Nat. Hist., iv, p. 290.
1840. Chiton evanidus Sowb., loc. cit., p. 291.
1847. Chiton novaehollandiae Reeve, Conch. Icon., pl. 21, f. and sp. 142.
1903. Ischnochiton australis Sowb. Pritchard and Gatliff, op. cit., p. 203.
1903. Ischnochiton novaehollandiae Rve. Prit. and Gat., ib., p. 204.
1924. Ischnoradsia australis Sowb. Iredale and Hull, op. cit., p. 289, pl. 37, f. 9.
1927. Id. Monograph, p, 33, pl. 5, f. 9.

Hab.—Coast generally.

Genus **Haploplax** Pilsbry, 1894.

HAPLOPLAX RESPLENDENS (Bednall and Matthews).

1906. Ischnochiton resplendens Bed. and Matthews, P. Mal. Soc. Lond., vii, p. 91, pl. 9, f. 4-4*f*.
1907. Id. Gatliff, P.R.S. Vic., n.s., xx (1), p. 34.
1924. Id. Iredale and Hull, op. cit., p. 292, pl. 36, f. 2.
1927. Id. Monograph, p. 36, pl. 4, f. 2.

Hab.—Shoreham, Western Port; Port Fairy; Torquay and Portland (C.J.G.).

HAPLOPLAX PURA (Sykes).

1896. Ischnochiton (Haploplax) pura Sykes. P. Mal. Soc. Lond., ii (2), p. 88, pl. 6, f. 3, 3*a*.
1903. Ischnochiton pura Sykes. Pritchard and Gatliff, op. cit., p. 202.
1924. Haploplax pura Sykes. Iredale and Hull, op. cit., p. 295, pl. 36, f. 4.
1927. Id. Monograph, p. 39, pl. 4, f. 4.

Hab.—Port Phillip Heads; Western Port.

HAPLOPLAX THOMASI (Bednall).

1897. Ischnochiton thomasi Bednall, P. Mal. Soc. Lond., ii, p. 149, pl. 12, f. 4, 5.
1912. Id. Gatliff and Gabriel, op. cit., xxv (1), p. 171.
1924. Id. Iredale and Hull, op. cit., p. 294, pl. 36, f. 3.
1927. Id. Monograph, p. 39, pl. 4, f. 3.

Hab.—Torquay and Portland (C.J.G.).

Genus **Terenochiton** Iredale, 1914.

TERENOCHITON BADIUS (Hedley and Hull).

1909. Lepidopleurus badius Hedley and Hull, Rec. Aust. Mus., vii, p. 260, pl. 73, f. 1, 2.
1912. Id. Gatliff and Gabriel, op. cit., p. 171.
1925. Terenochiton badius Hed. and Hull. Iredale and Hull, Aust. Zool., iii (8), p. 340, pl. 39, f. 1, 2.
1927. Id. Monograph, p. 42, pl. 6, f. 1, 2.

Hab.—Torquay; Portland.

Obs.—The pustules are rather fewer and more scattered than in the N. S. Wales form, but they are otherwise inseparable.

TERENOCHITON LIRATUS (Adams and Angas).

1864. Lepidopleurus liratus Adams and Angas, P.Z.S. Lond., p. 192.
1903. Lepidopleurus inquinatus Reeve. Pritchard and Gatliff, op. cit., p. 198.
1925. Terenochiton liratus Ad. and Ang. Iredale and Hull, op. cit., ib., p. 342, pl. 39, f. 4.
1927. Id. Monograph, p. 44, pl. 6, f. 4.

Hab.—Port Phillip; Ocean Beach, Phillip Island; Torquay; Portland.

Obs.—Iredale and Hull (loc. cit.) give Habitat (? Victoria). We definitely establish it as a Victorian species, having located it in several places along our coast.

Genus **Parachiton** Thiele, 1909.

PARACHITON COLUMNARIUS (Hedley and May).

1908. Lepidopleurus columnarius Hedley and May, Rec. Aust. Mus., vii, p. 213, pl. 24, f. 27, 28.
1917. Id. Gatliff and Gabriel, op. cit., p. 24.
1925. Parachiton columnarius Hed. and May. Iredale and Hull, op. cit., p. 345, pl. 39, f. 11-12.
1927. Id. Monograph, p. 47, pl. 6, f. 11-12.

Hab.—Bass Straits.

Obs.—The range of this species extends to Tasmania and South Australia.

PARACHITON PROFUNDUS (May).

1923. Lepidopleurus inquinatus Reeve, May, Illus. Index Tas. Shells, pl. 14, f. 2 (not of Reeve).
1923. Lepidopleurus profundus Ashby [MS.]. May, ib., Appendix (p. 100), for L. inquinatus auct. (not of Reeve).
1923. Lepidopleurus profundus Ashby, T.R.S.S.A., xlvii, p. 221, pl. 16, f. 2, 2*a*.
1925. Parachiton profundus May. Iredale and Hull, op. cit., p. 346, pl. 39, f. 21.
1927. Id. Monograph, p. 48, pl. 6, f. 21.

Hab.—Dredged in 8 fathoms off Point Cook, Port Phillip.

Obs.—Actually Ashby's proposal of *L. profundus* was not published until later in the year than May's citation of the name, so that the latter, having referred to a good figure, must be quoted as author.

Genus **Icoplax** Thiele, 1892.

ICOPLAX MAYI (Torr).

1912. Callochiton mayi Torr, P.R.S. Tas., p. 1.
1912. Id. May and Torr, ib., p. 28, pl. 1, f. 5-7.
1922. Id. Gatliff and Gabriel, op. cit., xxxiv (2), p. 153.
1925. Icoplax mayi Torr. Iredale and Hull, op. cit., p. 348, pl. 39, f, 23-27.
1927. Id. Monograph, p. 50, pl. 6, f. 23-27.

Genus **Paricoplax** Iredale and Hull, 1929.

PARICOPLAX CROCINA (Reeve).

1847. Chiton crocinus Reeve, Conch. Icon., iv, pl. 22, f. 146.
1929. Paricoplax crocina Rve. Iredale and Hull, Aust. Zool., vi (1), p. 87, pl. 10, f. 12, 13.

Hab.—Portland.

Obs.—This species is what recent writers have wrongly identified as *Chiton platessa* Reeve, and the alteration is fully discussed by Iredale and Hull in the above paper.

Genus **Callistelasma** Iredale and Hull, 1925.

CALLISTELASMA ANTIQUA (Reeve).

1847. Chiton antiquus Reeve, Conch. Icon., iv., pl. 25, f. 169.
1906. Callistochiton antiquus Rve. Pritchard and Gatliff, op. cit., xviii (2), p. 66.
1925. Callistelasma antiqua Rve. Iredale and Hull, op. cit., p. 352, pl. 40, f. 6.
1927. Id. Monograph, p. 54, pl. 7, f. 6.

Hab.—Eastern Victoria (Iredale and Hull).

CALLISTELASMA MAWLEI (Iredale and May).

1916. Callistochiton mawlei Iredale and May, P. Mal. Soc. Lond., xii, p. 113, pl. 4, f. 5.
1925. Callistassecla mawlei Ire. and May. Iredale and Hull, op. cit., p. 354, pl. 40, f. 5, 7.
1927. Id. Monograph, p. 56, pl. 7, f. 5, 7.

Hab.—Portland.

Obs.—The Type was collected at Southern Tasmania, and measures 17 x 9·5 mm.

Genus **Lorica** H. and A. Adams, 1852.

LORICA CIMOLIA (Reeve).

1847. Chiton cimolius Reeve, Conch. Icon., iv, pl. 21, f. 141.
1903. Lorica volvox Reeve. Pritchard and Gatliff. P.R.S. Vic., n.s., xv (2), p. 210 (not of Reeve).
1925. Lorica cimolia Rve. Iredale and Hull, op. cit., p. 359, pl. 40, f. 19, 21.
1927. Id. Monograph, p. 61, pl. 7, f. 19, 21.

Hab.—Back Beach, Williamstown (Pritchard); Port Fairy (Iredale and Hull).

Obs.—When Pritchard and Gatliff dealt with this species they had only a single specimen, and they adopted Pilsbry's opinion that *L. cimolius* was a synonym. Since then, having obtained specimens from the adjacent States, we find that they may be separated, those from New South Wales as *L. volvox*, and others from South Australia, Tasmania, and our single Victorian example being *L. cimolia*.

Genus **Loricella** Pilsbry, 1892.

LORICELLA ANGASI (H. Adams).

1864. Lorica angasi H. Adams, P.Z.S. Lond., p. 193.
1892. Lorica (Loricella) angasi Adams and Angas. Pilsbry, Man. Conch., xiv, p. 238, pl. 51, f. 9-13.
1894. Loricella angasi Adams. Pilsbry, Proc. Acad. Nat. Sci. Philadelphia, p. 86.
1903. Loricella angasi Adams and Angas. Prit. and Gab. op. cit., p. 211.

Obs.—All subsequent authors have wrongly given the authors of this species as Adams and Angas, whereas H. Adams is the sole describer of it. In 1892 in the Man. Conch., xiv, Pilsbry gave the name *Loricella* as a section of *Lorica*, and in 1894, loc. cit., he gave it generic rank.

Genus **Kopionella** Ashby, 1919.

KOPIONELLA MATTHEWSI (Iredale).

1910. Plaxiphora matthewsi Iredale, P. Mal. Soc. Lond., ix, p. 99.
1916. Id. Iredale and May, ib., xii, p. 101, pl. 5, f. 4, 4a″, 4a‴.
1919. Kopionella matthewsi Iredale. Ashby, T.R.S.S.A., xliii, p. 71, pl. 11, f. 1, 1a.
1925. Id. Iredale and Hull. op. cit., p. 361, pl 40, f. 25-28.
1927. Id. Monograph, p. 63; pl. 7, f. 25-28.

Hab.—Mornington, Port Phillip (Rev. G. Cox); Portland (C.J.G.).

Genus **Acanthochitona** Gray, 1821.

ACANTHOCHITONA SUEURII (Blainville).

1825. Chiton sueurii (Blainville), Dict. Sci. Nat., xxxvi, p. 553.
1884. Chiton (Acanthochiton) asbestoides E. A. Smith, Alert Zool., p. 83, pl. 6, f. G.
1903. Acanthochites asbestoides E. A. Sm. Pritchard and Gatliff, op. cit., p. 207.
1925. Acanthochiton sueurii Blain. Iredale and Hull, Aust. Zool., iv (2), p. 82, pl. 10, f. 1-4.
1927. Id. Monograph, p. 71, pl. 9, f. 1-4.

Hab.—Hobson's Bay, Port Phillip; Bennison Island, Corner Inlet (J. A. Kershaw).

ACANTHOCHITONA PILSBRYI (Sykes).

1896. Acanthochites pilsbryi Sykes, P. Mal. Soc. Lond., ii, p. 91, pl. 6, f. 6, *6a.*
1898. Acanthochites maughani Torr and Ashby, T.R.S.S.A., xxii, p. 218, pl. 7, f. *5a-f.*
1909. Id. Hedley and Hull, Rec. Aust. Mus., vii, p. 265, pl. 74, f. 24-27.
1910. Id. Gatliff and Gabriel, op. cit., xxiii (1), p. 95.
1925. Acanthochiton pilsbryi Sykes. Iredale and Hull, op. cit., p. 84, pl. 9, f. 31-35.
1927. Id. Monograph, p. 73, pl. 8, f. 31-35.

Hab.—Shoreham (Gatliff) and Cowes, Phillip Island (M. Edith Gatliff); off piles, Portsea Pier, Port Phillip (C.J.G.).

Genus **Meturoplax** Pilsbry, 1894.

METUROPLAX RETROJECTA (Pilsbry).

1894. Acanthochites retrojectus Pilsbry, Nautilus, vii, p. 107.
1907. Acanthochites (Meturoplax) retrojectus Pilsbry. Gatliff, P.R.S. Vic., n.s., xx (1), p. 34.
1925. Meturoplax retrojectus Pilsbry. Iredale and Hull, op. cit., p. 89, pl. 10, f. 26-30.
1927. Id. Monograph, p. 78, pl. 9, f. 26-30.

Hab.—Coast generally.

Obs.—The sculpture of this varies greatly, as also does that of *A. variabilis.*

Genus **Notoplax** H. Adams, 1861.

NOTOPLAX SPECIOSA (H. Adams).

1861. Cryptoplax (Notoplax) speciosa H. Adams, P.Z.S. Lond., p. 385.
1903. Acanthochites speciosus H. Ad. Pritchard and Gatliff, op. cit., p. 206.
1925. Notoplax speciosa H. Ad. Iredale and Hull, op. cit., p. 91, pl. 12, f. 3.
1927. Id. Monograph, p. 80, pl. 11, f. 3.

Hab.—Port Phillip; Portland; Western Port.

Obs.—Readily recognised by its large girdle, and long, thin spicules.

NOTOPLAX COSTATA (H. Adams and Angas).

1864. Acanthochites costatus H. Adams and Angas, P.Z.S., Lond., p. 194.
1922. Acanthochitona costata Ad. and Ang. Gatliff and Gabriel, op. cit., xxxiv, p. 155.
1925. Notoplax costata H. Ad. and Ang. Iredale and Hull, op. cit., p. 93, pl. 4, f. 1, 5, 8, 11, 14.
1927. Id. Monograph, p. 82, pl. 10, f. 1, 5, 8, 11, 14.

Hab.—Portland.

Obs.—A species with a minutely spinulose girdle and prominent sutural tufts.

Genus **Glyptelasma** Iredale and Hull, 1925.

GLYPTELASMA MATTHEWSI (Bednall and Pilsbry).

1894. Acanthochites (Notoplax) matthewsi Bednall and Pilsbry, Nautilus, vii, p. 120.
1903. Acanthochites matthewsi Bed. and Pils. Pritchard and Gatliff, op. cit., p. 206.
1925. Glyptelasma matthewsi Bed. and Pils. Iredale and Hull, op. cit., p. 94, pl. 11, f. 17, 19, 21, 22.
1927. Id. Monograph, p. 84, pl. 10, f. 17, 19, 21, 22.

Hab.—Port Phillip Heads (J. B. Wilson); Palm Beach, Western Port (M. Edith Gatliff).

GLYPTELASMA GLYPTA (Sykes).

1896. Acanthochites (Notoplax) glyptus Sykes, P. Mal. Soc. Lond., ii, p. 92, pl. 6, f. 5, 5*a*.
1903. Acanthochites glyptus Sykes. Pritchard and Gatliff, op. cit., p. 206.
1925. Glyptelasma glypta Sykes. Iredale and Hull, op. cit., p. 95, pl. 11, f. 23.
1927. Id. Monograph, p. 85, pl. 10, f. 23.

Hab.—Port Phillip Heads (J. B. Wilson); Portsea (Gatliff).

Genus **Craspedoplax** Iredale and Hull, 1925.

CRASPEDOPLAX VARIABILIS (H. Adams and Angas).

1864. Hanleya variabilis H. Adams and Angas, P.Z.S., Lond., p. 194.
1908. Acanthochites (Loboplax) variabilis Ad. and Ang. Gatliff and Gabriel, op. cit. xxi (1), p. 384.
1925. Craspedoplax variabilis H. Ad. and Ang. Iredale and Hull, op. cit., p. 96, pl. 11, f. 29-34.
1927. Id. Monograph, p. 86, pl. 10, f. 29-34.

Hab.—Western Port; Port Phillip; Portland; Torquay.

CRASPEDOPLAX CORNUTA (Torr and Ashby).

1898. Acanthochites cornutus Torr and Ashby, T.R.S.S.A., xxii, p. 217, pl. 6, f. 3*a-f*.
1898. Acanthochites exilis Torr and Ashby, ib., pl. 7, f. 6*a-f*.
1913. Id. Gatliff and Gabriel, op. cit., xxvi (1), p. 79.
1922. Acanthochites cornutus Torr and Ashby. Ashby, T.R.S.S.A., xlvi, p. 17.

Hab.—Western Port; Sorrento, Port Phillip; Portland; Torquay.

Obs.—At the last reference given above Ashby states that he had since seen a series of specimens ranging in length from 3 mm. (*exilis*) to 10 mm. (*cornutus*) and considered that *exilis* was only a young form of *cornutus*.

Genus **Cryptoplax** Blainville, 1818.

CRYPTOPLAX IREDALEI Ashby.

1903. Cryptoplax gunnii Reeve. Pritchard and Gatliff, op. cit., p. 208 (not of Reeve).

1923. Id. May, Ill. Index. Tas. Shells, pl. 16, f. 7 (not of Reeve).
1923. Cryptoplax iredalei Ashby. T.R.S.S.A., xlvii, p. 238, pl. 19, f. 4.
1925. Id. Iredale and Hull, op. cit., p. 106, pl. 12, f. 6, 11, 18, 26, 30, 34.
1927. Id. Monograph, p. 96, pl. 11, f. 6, 11, 18, 26, 30, 34.

Hab.—Port Phillip; Western Port; Torquay.

Obs.—Similar to *C. striata* Lam., but easily distinguished by its finer girdle spicules, the girdle somewhat resembling felt.

Genus **Poneroplax** Iredale, 1914.

PONEROPLAX COSTATUS (Blainville).

1825. Chiton costatus Blainville, Dict. Sci. Nat., xxxvi, p. 548.
1922. Plaxiphora costata Blain. Gatliff and Gabriel, op. cit., xxxiv, p. 155.
1926. Poneroplax costata Blain. Iredale and Hull, Aust. Zool. iv (3), p. 165, two figs. in text and pl. 18, f. 1, 9, 10.
1927. Id. Monograph, p. 100, pl. 12, f. 1, 9, 10.

Hab.—Coast generally.

Obs.—Iredale has made this species his genotype.

PONEROPLAX BEDNALLI (Thiele).

1909. Plaxiphora bednalli Thiele, Revision Chitonen (Chun's Zoologica, Heft 56), pt. 1, p. 25, pl. 3, f. 27-31.
1922. Id. Gatliff and Gabriel, op. cit., p. 154.

Hab.—Kilcunda; Corio Bay, Port Phillip (Gatliff); Ocean Beach, Phillip Island (C.J.G.).

Genus **Rhyssoplax** Thiele, 1893.

RHYSSOPLAX ORUKTA (Maughan).

1900. Chiton oruktus Maughan, T.R.S.S.A., xxiv, p. 89, pl. 1, f. *3a-g*.
1926. Rhyssoplax orukta Maughan. Iredale and Hull, op. cit., p. 173, pl. 18, f. 31 and pl. 20, f. 2.
1927. Id. Monograph, p. 108, pl. 12, f. 31 and pl. 14, f. 2.

Hab.—Victoria (Ire. and Hull); Flinders, Western Port (Mackay).

RHYSSOPLAX DIAPHORA Iredale and May.

1916. Rhyssoplax diaphora Ire. and May, P. Mal. Soc. Lond., xii, p. 115, pl. 5, f. 1.
1921. Id. May, Moll. of Tas., p. 33.
1923. Id. May, Ill. Index Tas. Shells, pl. 16, f. 9.
1926. Chiton (Rhyssoplax) jugosus Gould, var. diaphora Iredale and May, Vic., Nat., xliii, p. 16.
1926. Rhyssoplax diaphora Ire. and May. Iredale and Hull, op. cit., p. 175, pl. 18, f. 39 and pl. 19, f. 1.
1927. Id. Monograph, p. 110, pl. 12, f. 39 and pl. 13, f. 1.

Hab.—Port Fairy; Torquay (C.J.G.); Portland (W. H. Dillon and C.J.G.).

Obs.—Previous records as *C. jugosus* Gld. apply only to *R. diaphora* which, however, proves to be distinct. The sculpture in the pleural areas immediately separates them. *C. jugosus* remains in the Victorian list with a record from Eastern Victoria by Iredale and Hull.

Genus **Mucrosquama** Iredale and Hull, 1926.

MUCROSQUAMA VERCONIS (Torr and Ashby).

1898. Chiton verconis Torr and Ashby, T.R.S.S.A., xxii, p. 215, pl. 6, f. 1.
1912. Id. Gatliff and Gabriel, op. cit. xxv (1), p. 172.
1926. Mucrosquama verconis Torr and Ashby. Iredale and Hull, op. cit., p. 183, pl. 19, f. 6 and pl. 20, f. 3.
1927. Id. Monograph, p. 118, pl. 13, f. 6 and pl. 14, f. 8.

Hab.—Port Fairy.

Genus **Xylotrya** (Leach MS.) Gray, 1847.

XYLOTRYA AUSTRALIS Calman.

1915. Teredo (Xylotrya) saulii Wright. Gatliff and Gabriel, op. cit., xxviii, p. 121 (not of Wright).
1920. Xylotrya australis Calman, P.Z.S. Lond., p. 397, text figs. 6-8.

Obs.—It is evident that Australian conchologists have erred in associating this species with *saulii* Wright. It was stated by Wright that the type specimens in the British Museum came from Port Phillip, Australia, though they are labelled Callao, Peru, and are quite distinct from the present form. Calman, loc. cit., fully deals with this matter.

Genus **Ostrea** Linné, 1758.

OSTREA CUCULLATA Born.

1778. Ostrea cucullata Born, Index Mus. Caes. Vind., p. 100.
1780. Id. Testacea, ib., p. 114, pl. 6, f. 11, 12.
1917. Id. Hedley, J.R.S.N.S.W., li, Suppl., p. M8.

Hab.—Tellaburga Island (Roy Bell).

Genus **Panope** Menard, 1807.

This is the original spelling, although *Panopaea* has been generally used.

Genus **Corbula** Bruguiere, 1792.

CORBULA CRASSA Hinds.

1843. Corbula crassa Hinds, P.Z.S. Lond., p. 55.
1856. Id. Hanley, Recent Bivalve Shells, appendix, p. 344, pl. 12, f. 29.
1916. Id. Hedley, Jour. Roy. Soc. W.A., i, p. 20.

Hab.—Portland (Maplestone).

Genus **Thracidora** Iredale, 1924.

THRACIDORA ARENOSA (Hedley).

1904. Thraciopsis arenosa Hedley, P.L.S.N.S.W., xxix, p. 197, pl. 9, f. 26, 27.
1907. Pholadomya arenosa Hed. Verco, T.R.S.S.A., xxxi, p. 230.
1910. Thraciopsis arenosa Hed. Gatliff and Gabriel, op. cit., xxiii (1), p. 96.
1914. ?Pholadomya arenosa Hed. Hedley and May, P. Mal. Soc. Lond., xi, p. 132.
1921. Thraciopsis arenosa Hed. May, Moll. of Tas., p. 13.
1923. Id. May, Illust. Index Tas. Shells, pl. 5, f. 6.
1924. Thracidora arenosa Hed. Iredale, P.L.S.N.S.W., xlix (3), p. 200.

Obs.—The peculiar features of this form have presented some difficulty in assigning it to its correct generic location. We agree with Iredale that a new genus was necessary for its reception. This species is the genotype.

Genus **Mactra** Linné, 1767.

MACTRA AUSTRALIS Lamarck.

1818. Mactra australis Lamarck, Anim. s. Vert., v. p. 475.
1903. Mactra polita Chemnitz. Pritchard and Gatliff, op. cit., xv (1), p. 107.
1914. Mactra australis Lam. Smith, P. Mal. Soc. Lond., xi, p. 141.

Obs.—The work of Chemnitz not being binomial, the above change in the name is necessary.

Genus **Mesodesma** Deshayes, 1830.

MESODESMA ANGUSTA Reeve.

1854. Mesodesma angusta Reeve, Conch. Icon., viii, pl. 1, f. 2.
1855. Mesodesma elongata Deshayes, P.Z.S., Lond., p. 337.
1903. Id. Pritchard and Gatliff, op. cit., xvi (1), p. 110.

Genus **Hemidonax** Morch, 1870.

HEMIDONAX CHAPMANI Gatliff and Gabriel.

1923. Hemidonax chapmani Gatliff and Gabriel, Vic. Nat., xl, p. 10 pl. 2.

Hab.—San Remo, ocean beach, Victoria.

Obs.—This is the species that formerly had been wrongfully identified in South Australia and here as *Donax cardioides* Lk.; and later by us as *Hemidonax australiense* Rve., and it is not that species.

Genus **Eumarcia** Iredale, 1924.

EUMARCIA FUMIGATA (Sowerby).

1917. Marcia nitida Quoy and Gaimard. Gatliff and Gabriel, op. cit., xxx (1), p. 27.
1924. Eumarcia fumigata Sowb. Iredale, P.L.S.N.S.W., xlix (3), p. 211.

Obs.—At the last reference Iredale states that Warlow in 1833 had used the name *Marcia* for a goose, hence his change, and the name of Quoy and Gaimard *Venus nitida* had prior use by Defrance in 1828. Iredale establishes *fumigata* as the genotype.

Genus **Macrocallista** Meek, 1876.

MACROCALLISTA DIEMENENSIS (Hanley).

1844. Cytherea diemenensis Hanley, P.Z.S. Lond., p. 110.
1903. Meretrix planatella Lamarck, Pritchard and Gatliff, op. cit., xvi (1), p. 129.
1913. Macrocallista diemenensis Han. Hedley, P.L.S.N.S.W., xxxviii (2), p. 270.

Obs.—In 1912 when Hedley visited the Museum at Geneva, where Lamarck's collection is now located, he examined three specimens of *Cytherea planatella* Lamarck, "types, with the author's label," and found that they were *C. costata*, of Römer, and differed from the *costata* of Chemnitz, which it was supposed to represent.

Genus **Bassina** Jukes-Browne, 1914.

BASSINA PACHYPHYLLA (Jonas).

1839. Venus pachyphylla Jonas, Archiv. fur Naturgeschichte, i, p. 344, pl. 9, f. 6, 7.
1903. Meretrix paucilamellata Dunker. Pritchard and Gatliff, op. cit., xvi (1), p. 130.
1922. Bassina paucilamellata Dunker. Gatliff and Gabriel, ib., xxxiv, p. 159.
1923. Bassina pachyphylla Jonas. Hedley, P.L.S.N.S.W., xlviii, p. 305.

Genus **Lioconcha** Morch, 1853.

LIOCONCHA AUSTRALIS (Angas).

1865. Gouldia australis Angas, P.Z.S. Lond., p. 459.
1885. Circe angasi Smith, "Challenger," Zool. xiii, Lamelli., p. 148, pl. 2, f. 4-4*e*.
1889. Cytherea angasia Smith. Whitelegge, J.R.S.N.S.W., xxiii, p. 239.
1909. Circe angasi Smith. Gatliff and Gabriel, op. cit., xxii (1), p. 44.
1917. Lioconcha angasi Smith. Hedley, J.R.S.N.S.W.. li., Suppl., p. M22.

Obs.—As the species is not a *Circe*, there was no need to change its specific name; we therefore restore it as above.

Genus **Sunetta** Link, 1807.

SUNETTA ALICIAE (Adams and Angas).

1903. Sunetta excavata Hanley. Pritchard and Gatliff, op. cit., xvi (1), p. 132.
1924. Sunettina aliciae Ad. and Ang. Iredale, P.L.S.N.S.W., xlix (3), p. 208.

Obs.—Iredale at the last reference writes fully about this genus, and states that the species name *excavata* is not available as it had prior use by Morton in 1834.

Genus **Cleidothaerus** Stutchbury, 1830.

CLEIDOTHAERUS ALBIDUS (Lamarck).

1819. Chama albida Lamarck, Anim. s. Vert., vi, p. 96.
1835. Cleidothaerus chamoides Stutchbury, Zool. Jour., v, p. 98, pl. 4, *bis*, f. 5-8.
1903. Chamostrea albida Lam. Pritchard and Gatliff, op. cit., p. 137.

Hab.—Port Phillip and Western Port.

Obs.—In 1825 de Roissy did not validly establish his generic name *Chamostrea*.

Genus **Borniola** Iredale, 1924.

BORNIOLA LEPIDA (Hedley).

1906. Bornia lepida Hedley, P.L.S.N.S.W., xxx, p. 543, pl. 32, f. 22, 23.
1909. Id. Gatliff and Gabriel, op. cit., xxii (1), p. 45.
1924. Borniola lepida Hed. Iredale, P.L.S.N.S.W., xlix (3), p. 207.

Hab.—San Remo.

Obs.—This species is Iredale's genotype.

Genus **Numella** Iredale, 1924.

NUMELLA ADAMSI (Angas).

1867. Mysia (Felania) adamsi Angas, P.Z.S. Lond., p. 910, pl. 44, f. 9.
1904. Diplodonta adamsi Ang. Pritchard and Gatliff, op. cit., xvii (1), p. 225.
1924. Numella adamsi Ang. Iredale, op. cit., p. 206.

Hab.—Port Phillip; Western Port.

NUMELLA JACKSONIENSIS (Angas).

1867. Mysia (Felania) jacksoniensis Angas, op. cit., pl. 46, f. 13.
1912. Diplodonta jacksoniensis Ang. Gatliff and Gabriel, op. cit., xxv (1), p. 173.
1924. Numella jacksoniensis Ang. Iredale, op. cit., p. 206.

Hab.—Port Phillip; Western Port.

Genus **Mysella** Angas, 1877.

This replaces *Rochefortia* Velain, 1878.

Genus **Venericardia** Lamarck, 1801.

VENERICARDIA AMABILIS (Deshayes).

1852. Cardita amabilis Deshayes, P.Z.S. Lond., p. 102, pl. 17, f. 8, 9.
1885. Cardita beddomei Smith, "Challenger" Zool., xiii, Lamelli., p. 211, pl. 15, f. 5, 5*a*.

Hab.—Western Port; off East Moncoeur Island; Lakes Entrance.

Obs.—By various authors these two forms have hitherto been regarded as distinct species. Reconsideration, with the assistance of numerous specimens from several localities, convinces us that one species only is represented. It is subject to much variation.

Genus **Cardita** Bruguiere, 1789.

CARDITA AVICULINA (Lamarck).

1904. Mytilicardia calyculata Lin. Pritchard and Gatliff, op. cit., p. 234.
1924. Cardita aviculina, Lam. Iredale, op. cit., p. 204.

Obs.—The last-named species is found in the Mediterranean Sea. Our species *aviculina* has been generally placed as a synonym of it, and ours shows much variation in form.

Genus **Propeleda** Iredale, 1924.

PROPELEDA ENSICULA (Angas).

1904. Leda ensicula Ang. Pritchard and Gatliff, op. cit., p. 239.
1924. Propeleda ensicula Ang. Iredale, op. cit., p. 186.

Obs.—This is the genotype.

Genus **Comitileda** Iredale, 1924.

COMITILEDA MILIACEA (Hedley).

1913. Leda miliacea Hedley. Gatliff and Gabriel, op. cit., p. 86.
1924. Comitileda miliacea Hed. Iredale, op. cit., p. 185.
1930. Id. Cotton, Rec. S. Aust. Mus., iv (2), p. 226.

Obs.—This is the genotype. The last reference provides an interesting distribution, it being recorded from N. S. Wales, Victoria and South Australia.

Genus **Barbatia** Gray, 1840.

BARBATIA PISTACHIA (Lamarck).

1904. Barbatia fasciata Reeve. Pritchard and Gatliff, op. cit., p. 240.
1924. Arca pistachia Lam. Iredale, op. cit., p. 186.

Obs.—Iredale at the last reference states that the species name *fasciata* had prior use by Wiedemann in 1802.

Genus **Glycymeris** Da Costa, 1778.

GLYCYMERIS FLAMMEUS Reeve.

1904. Glycimeris australis Quoy and Gaimard. Pritchard and Gatliff, op. cit., p. 244.
1924. Glycymeris flammeus Rve. Iredale, op. cit., p. 189.

Obs.—At the last reference Iredale on p. 187 states that the species name *australis* had prior use for a fossil by Morton.

Genus **Amygdalum** Muhlfeldt, 1811.

AMYGDALUM ARBORESCENS (Dillwyn).

1904. Modiola arborescens Chemnitz. Pritchard and Gatliff, op. cit, p. 252.
1921. Modiolus arborescens Dill. May, Moll. of Tas., p. 12.
1923. Id. May, Illust. Index, Tas. Shells, pl. 4, f. 8.
1924. Amygdalum beddomei Iredale, op. cit., p. 197, pl. 35, f. 21.

Genus **Vulsella** Bolten, 1798.

VULSELLA SPONGIARUM Lamarck.

1819. Vulsella spongiarum Lamarck, Anim. s. Vert., vi, p. 222.
1911. Vulsella spongiarum Lam. Smith, P. Mal. Soc. Lond., ix, p. 311, pl. 11, f. 4.

Obs.—Pritchard and Gatliff recorded this as *V. lingulata* Lam. We now consider that this is a distinct species.

Genus **Lima** Bruguiere, 1792.

LIMA NIMBIFER Iredale.

1843. Lima multicostata Sowerby, Thes. Conch., i, p. 85, sp. 6, pl. 22, f. 38 (not of Geinitz, 1839.).
1904. Lima multicostata Sowb. Pritchard and Gatliff, op. cit., p. 259.
1924. Lima nimbifer Iredale, op. cit., p. 195, pl. 34, f. 1-4.

Hab.—Cowes, Western Port; Anderson's Inlet.

Obs.—Iredale states that the name *Lima multicostata* had been previously used by Geinitz in 1839.

LIMA ORIENTALIS Adams and Reeve.

1843. Lima angulata Sowerby, Thes. Conch., i, p. 86, pl. 22, f. 39, 40 (not of Münster, 1841).
1850. Lima orientalis Adams and Reeve. Voy. Samarang, pt. 3, p. 75, pl. 21, f. 7.
1907. Lima angulata Sowb. Gatliff, P.R.S. Vic., n.s., xx (1), p. 37.
1924. Lima orientalis Ad and Rve, Iredale, op. cit., p. 194.

Hab.—Portland; Ocean Beach, Point Nepean.

Obs.—Iredale states that "*L. angulata* Sowb. was described from Panama, and it is fortunate that the name is invalid, having been used previously by Münster in 1841.

Genus **Pecten** Müller, 1776.

PECTEN NOVAEZELANDIAE Reeve.

1904. Pecten medius Lamarck. Pritchard and Gatliff, op. cit., p. 261.

Obs.—Iredale (P.L.S.N.S.W., xlix (3), p. 193, 1924), states that the species name of *medius* had prior use by Bosc in 1802.

Genus **Chlamys** Bolten, 1798.

CHLAMYS FAMIGERATOR Iredale.

1925. Chlamys famigerator Iredale, Rec. Aust. Mus., xiv (4), p. 252, pl. 41, f. 1, 2.

Hab.—Off Cable, Bass Strait; off Wilson's Promontory; off Portsea.

Obs.—On the identification of Mr. H. Suter, this was recorded by us in 1910 as *Chlamys radiatus* Hutton, which we have found to be an error.

CHLAMYS PERILLUSTRIS Iredale.

1925. Chlamys perillustris Iredale, op. cit., p. 254, pl. 41, f. 3, 4.

Hab.—Off Gabo Island, 150-250 fathoms (Iredale).

Obs.—Size of Type: Height, 29; breadth, 25 mm. The author remarks, "This species has little to do with any other Australian scallop, save *Pecten challengeri* E. A. Smith."

[Proc. Roy. Soc. Victoria, 43 (N.S.), Pt. II, 1931.]

Art. XVII.—*On the Occurrence of a Fossil Hydractinia in Australia.*

By FREDK. CHAPMAN, A.L.S., F.G.S.,
(Commonwealth Palaeontologist.)

(With Plate VIII.)

[Read 11th December, 1930; issued separately 27th February, 1931.]

Whilst sorting and arranging the great amount of fossil material in the National Museum, I came across, many years ago, a unique specimen of *Hydractinia* from the Miocene of the Murray River Cliffs. This specimen was found, among other fossils from the same locality, in a collection made by the late J. B. Thatcher, an indefatigable collector who has enriched, not only the National Museum, but many others. To him I have dedicated this rare species.

Notes on the Genus.

The peculiar group of the Hydractiniidae is interesting to palaeontologists on account of their supposed affinity with the geologically important reef-building hydroids of the Palaeozoic rocks (Ordovician to Permo-Carboniferous). G. B. Twitchell (1929) has lately contended this point in favour of their being ancestral to the Demospongiae.

The genus *Hydractinia*, to which the present specimen belongs, is characterised as an encrusting hydroid, which forms a fibrous or reticulating perisarc or hydrophyton, with an echinate or papillate surface. The "horn cells," at the base of the attached organism, according to Nicholson, give rise to primitive radial pillars, united by the radiating, horizontal processes or fibres, and this basal lamina corresponds morphologically with the fundamental structure of the stromatoporoids.

The living species of *Hydractinia* are often found encrusting gasteropod shells occupied by living hermit crabs, in which case we can hardly suppose the association with the crabs to be accidental. In most of the living forms the hydractinian perisarc is chitinous, but in the fossil forms they are more often calcareous, as in the present example. H. J. Carter (1873, p. 3) has shown, in the case of *Hydractinia echinata*, how a shell that forms a surface of attachment may be dissolved or absorbed by the parasitic hydroid.

There are many supposedly related forms to the Hydractiniae. They include *Stoliczkaria* and *Heterastridium* from the Trias; *Sphaeractinia* and *Ellipsactinia* from the Upper Jurassic; the globular and verrucose *Parkeria* from the Gault (Lower Cretaceous); *Porosphaera* from the Upper Cretaceous; and *Loftusia* from the Eocene. The structural relations in these genera are discussed by Regny (1901, p. 152).

Description of the Specimen.

Hydractinia thatcheri, sp. nov.

(Plate VIII.)

Description.—Perisarc calcareous, of a dark cream colour, moderately thin; surface covered with a closely packed series of conical and apically rounded spines. These spines have smooth surfaces, and on and around the apices are as many as a dozen or more rounded apertures with the inner face of the foramen depressed; they probably represent the sunken and grooved orifices, the astrorhizae of the stromatoporoid organism. The hydrophyton encrusts what was in all probability a gasteropod shell, of the form and size of a *Nassarius*, although the actual shell was later dissolved and absorbed by the hydractinian, as is so frequently the case in living examples. The edges of the perisarc tend to curl away from the general surface of attachment, and to become thicker there than on the attached region. The surface between the papillate spines, although smooth when slightly magnified, shows under a high power a finely porous surface.

Dimensions.—Extent of hydrophyton, 18 mm. in longest diameter, corresponding to the length of the original gasteropod shell; greatest width, 11·5 mm. Average length of spines, 0·7 mm.; width near apex, 0·5 mm. Foramina on spines having a diameter, circ. 0·04 mm.

Occurrence.—In the shell-bearing polyzoal limestone of the River Cliffs of the Murray, South Australia.

Age.—Middle Miocene (Middle Murravian).

Collected by the late J. B. Thatcher. Holotype in the National Museum, Melbourne. (Reg. No. 3831.)

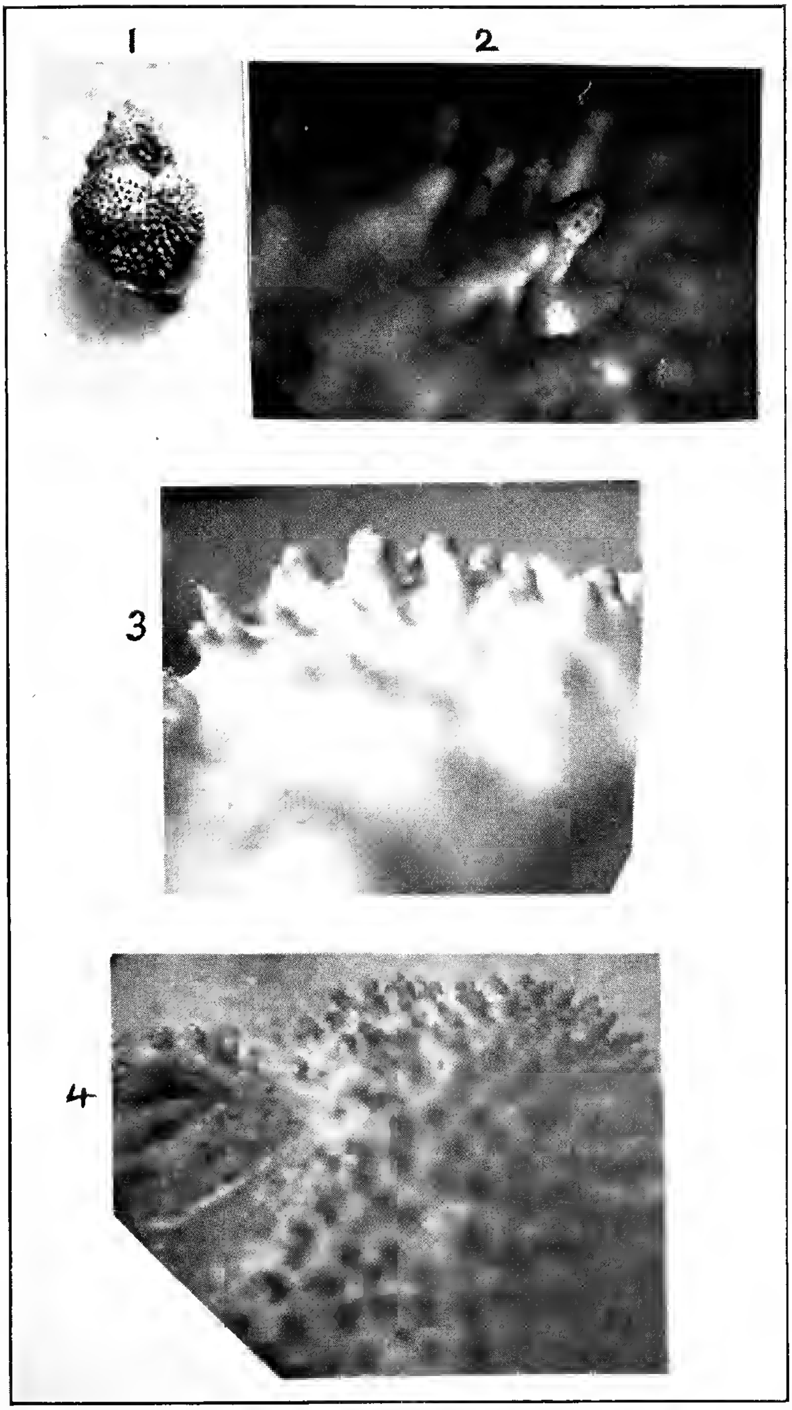
Previously Recorded Species of the Genus.

Recent Species.—

- *H. arborescens* Carter (chitinous). Polynesia.
- *H. calcarea* Carter (calcareous). Cape Palmas.
- *H. echinata* (Fleming) (chitinous). North Sea and Mediterranean.
- *H. levispina* Carter (chitinous). Mediterranean.
- *H. polyclina* Agassiz. Mediterranean.

Fossil Forms.—

- *H. pliocaena* Allman. Pliocene (English Crag).
- *H. michelini* Fischer. Pliocene (Italy).
- *H. saccoi* Regny, and vars. *longispina* and *bifida*. Pliocene (Italy).



F.C. photo.

Hydractinia thatcheri, sp. nov. Miocene: South Australia.

(?) *H. gregaria* (Schafh.). Eocene (Kressenberg).
(?) *H. cretacea* Fischer. Cenomanian (Le Mans).
(?) *H. vicaryi* Carter. Cenomanian (Haldon Hills, Devon).

Affinities of the Australian Species.

The Australian Miocene specimen here described as *H. thatcheri* resembles *H. saccoi* Regny (1901, p. 132, pl. i, figs. 8-15) in general habit of growth, such as the thin encrustation and regularly disposed papillae. In the Italian species, however, the papillae are vertically grooved along the sides of the cone, and transversely crenulated, whilst in *H. thatcheri* the papillae are smooth. A point of agreement in both is the arrangement of the zoöidal pores at the apex of each papilla.

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Explanation of Plate VIII.

Hydractinia thatcheri, sp. nov. Middle Miocene (Middle Murravian). Murray River Cliffs, S. Australia. Holotype (No. 3831) in the National Museum, Melbourne.

Fig. 1.—Perisarc (polypidom). ×3/2.
Fig. 2.—Enlarged figure of the papillae, with terminal pores. ×17.
Fig. 3.—Enlarged photograph of papillae in profile. ×12.
Fig. 4.—General enlarged view of surface. ×6.

[PROC. ROY. SOC. VICTORIA, 43 (N.S.), PT. II, 1931.]

ART. XVIII.—*Notes on New and Aberrant Types of Foraminifera.*

By F. CHAPMAN, A.L.S., Hon. F.R.M.S., and
W. J. PARR, F.R.M.S.

(With Plate IX.)

[Read 11th December, 1930; issued separately 27th February, 1931.]

1.—On a New Genus, Heronallenia.

(Plate IX, figs. 6-8.)

Henry Bowman Brady in 1884 (pl. xci, figs. 2, 3) figured two forms of "*Discorbina*" under the specific name of *D. biconcava* Jones and Parker. That in fig. 2 represents a typical example of Jones and Parker's species (now *Planulina biconcava* J. and P. sp.), whilst fig. 3 is quite a distinct form. This latter we are now compelled, by further evidence from other related species, to regard as a new generic type.

Brady's fig. 3 is, to our minds, identical with Burrows and Holland's *Discorbina lingulata*, described by them from the Coralline Crag (Gedgravian of the Lower Pliocene) of Sutton, England. Their species was also recorded by them, at the same time, from the Lower beds of Muddy Creek (Oligocene, not "Miocene"), (1895, pl. vii, figs. 33*a-c;* 1896, p. 297). As regards the fig. 3 by Brady, this appears to be incorrectly drawn, for we have examined Recent material from the same area (off Moncoeur Island), Bass Strait) without detecting anything like the structure of the inferior face shown in Brady's fig. 3*b*. The ventral surfaces of those we have examined are identical with Burrows and Holland's fig. 33*b*. The aperture of *D. lingulata* is not described by Burrows and Holland, but is indicated in their figure. It is a strongly reflexed or arched opening towards the inner edge of the inferior face of the last-formed chamber. The under surface of the test is slightly concave, and there is usually a radially striate ornament converging upon the aperture.

The several forms of this type of shell that have been described are as follows:—

1895. *Discorbina lingulata* Burrows and Holland (op. cit.). Pliocene; Suffolk, England. Oligocene; Muddy Creek, Victoria.

1915. *Discorbis pulvinulinoides* Cushman (p. 23, pl. vi, figs. 3*a,b*). Recent; off Japan, 59 fathoms.

1918. *Discorbina lingulata*, var. *unguiculata* Sidebottom (p. 255, pl. vi, figs. 12-14). Recent; off the coast of New South Wales, 465 fathoms.

1922. *Discorbina wilsoni* Heron-Allen and Earland (p. 206, pl. vii, figs. 17-19). Recent; Antarctic.

1929. *Discorbis kempii* Heron-Allen and Earland (p. 332, pl. iv, figs. 40-48). Recent; off Falkland Islands.

Generic Description.—Test compressed, ovate, plano-convex; superior face gently rounded, inferior, flat to concave. Periphery rounded. Sutures and margin on superior face usually limbate. Chambers comparatively few, concave to slightly inflated on upper surface. Aperture a strongly arched slit situated in a depression on the inner face of the last chamber. Shell surface very finely perforate and polished; exogenous beads sometimes developed on the superior face, or single ones near the suture, when they appear as vesicles. Inferior surface often radially striate.

From *Discorbis* and *Planulina* this genus differs in the position of the aperture, which is a central, short, curved slit in the former, and a curved slit at the base of the last chamber on the periphery in the latter. The finely perforated superior surface further separates *Heronallenia* from *Discorbis*.

Genotype.—*Discorbina wilsoni* Heron-Allen and Earland, 1922. Recent; Antarctic.

Affinities.—This generic type appears to occupy a position near *Discorbis,* in the Family of the Rotaliidae.

This genus is named in honour of Edward Heron-Allen, F.R.S., whose work on the Foraminifera, in conjunction with Mr. Earland, is too well-known to need comment.

2.—On a new Genus, Hofkerina.

(Plate IX, figs. 1-5.)

Of late years some curious thick-walled forms of Foraminifera have been discovered, some of which, like *Eorupertia* Yabe and Hanzawa, and *Victoriella* Chapman and Crespin, have proved to be free-growing kinds related to the adherent generic type *Carpenteria*. The present genus is a third member of this group.

Generic Description.—Test free, trochoid with a rotaline plan of growth; strongly biconvex, margin rounded, chambers comparatively few, strongly inflated; wall calcareous, thick, laminated, fairly coarsely tubulate, closely papillate above in central portion, inferior face smooth. Aperture cribrate, occupying the umbilical depression.

Dimensions.—Howchin gives the measurements of his specimens as 1/16 inch. The example figured here, from Muddy Creek, measures 2·2 mm. in diameter. The Balcombe Bay specimen has a diameter of 1·6 mm.

Genotype.—*Pulvinulina semiornata* Howchin (1889, p. 14, pl. i, figs. 12*a-c*). From the Oligocene (Balcombian) of Muddy Creek, Victoria.

In all probability the newly-described *Pegidia* of Heron-Allen and Earland may also prove to be related to the interesting genera comprised in the Family Victoriellidae. We may also refer to what appears to be another and more closely related form of the Victoriellidae, viz., *Pulvinulina decipiens* Heron-Allen and Earland (1928, p. 297, pl. iii, figs. 47-50). This species was described from examples found off Georgia, 440 fathoms. Its points of agreement with *Hofkerina semiornata* are the thick-walled test, tuberculate superior face and the coarsely perforated inferior side, with no apparent oral opening beyond the cribration of the shell-wall. It has also a small number of convolutions, but as compared with *Hofkerina semiornata* it may exhibit a larger number of chambers. As no figure of the shell structure of *Pulvinulina decipiens* is given, we can offer no opinion as to the ultimate relationships of the two species, but their similarity is striking.

General Observations.—The relationship of *Hofkerina semiornata* with the *Victoriellidae* is apparent, when the shell structure is examined. The tubulations of the shell-wall are coarse as in the adherent type of *Carpenteria,* and this character is maintained throughout the free-tested genera of *Victoriella* and *Eorupertia.*

Hofkerina differs from *Victoriella* in the rotaline form of the test and the cribrate apertures.

Occurrence.—From the Oligocene (Balcombian), of Muddy Creek and Balcombe Bay, Victoria.

3.—On an Anomalous Specimen of Homotrema rubrum (Lamarck).

(Plate IX, figs. 9, 10.)

Dr. H. J. Carter in 1876 (p. 188, pl. xiii, fig. 6) described and figured, as *Polytrema miniaceum,* an interesting foraminiferon which in its main characters conformed to the generic type established by Prof. S. J. Hickson (1911, p. 445, 454, pl. xxx, fig. 2; pl. xxxi, fig. 9; pl. xxxii, figs. 19, 22, 28), although in other respects showed a relationship with *Polytrema.*

Carter describes his specimen in the following terms:—" Presenting a variety of surface-patterns, according with the age of the structure, locally and generally, viz., at first, or in the earliest period, a foraminated groundwork in which there may be a few unforaminated dimples or depressions (fig. 6 *g,g,g*) ; then the dimples may be united by limited, branched, linear, unforaminated areae, somewhat narrower than the foraminated part, so as often to present together a submeandriniform appearance (fig. 6 *h,h*) ; or the dimples may be expanded into circular foraminated areae, surrounded respeetively by an unforaminated ring, the whole being set in a foraminated groundwork (fig. 6 *i*) ; or, lastly, over the thickest parts of the fully developed test, the foraminated groundwork may give place to a subhexagonal or polygonal unforaminated reticulation, whose interstices *only* are foraminated (fig. 6 *k*)."

Later, in 1911, Hickson, in describing his *Homotrema* (op. cit., p. 446) remarked that "Carter evidently examined a large number of specimens which he considered to be *Polytrema miniaceum* from the Red Sea and from other parts of the world. His figure 6 of the species appears to me a composite production, the upper part being taken from a true *Polytrema*, and the lower part from a *Homotrema*. . . . Both his figures and descriptions appear to have been composed from notes taken from the examination of a number of specimens of a mixed collection of the two genera."

In a collection of rough coral fragments from the Island of Ambrym, in the New Hebrides, given us by our friend Mr. J. Searle, of Melbourne, we found some typical examples of *Homotrema rubrum,* attached to the surface of the broken coral. With these was one exceptionally well-preserved specimen, exhibiting the typical *Homotrema*-like structure in the lower part of the test. This portion showed the perforated areolae of *Homotrema,* but many were less regular in shape than usual. Above this, the amount of imperforate shell-growth increases, and the size and number of the areolae become much less. The areolae become more irregular than previously, and are smaller. Above this, again, the whole surface becomes perforated, as in the earlier areolae, while the areolae are replaced by open pits, still retaining, however, the imperforate border.

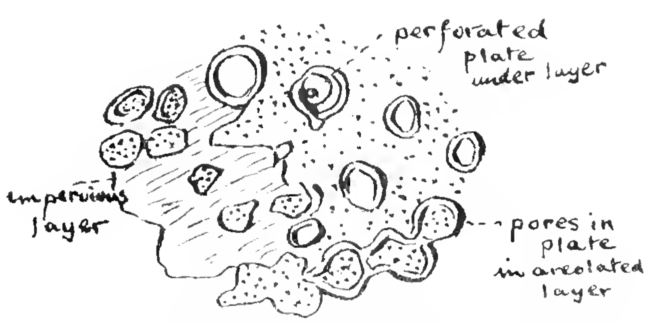

FIG. 1.—Structure in abnormal *Homotrema*.—I. of Ambrym.

In this specimen we have, therefore, a transitional structure, from the typical perforated plate bordered by a shelly, limbate wall, to an expanded structure, of similar elements, but where the perforated plates have expanded to an intermediate, perforated structure between the irregular meandrine non-perforated shell. Moreover, the normal perforated surface plates become depressed pits, through which the perforated plates of the previous shell layer are visible. It thus, at first sight, simulates *Polytrema,* but still retains, in most respects, the typical *Homotrema*-like characters. Hofker has suggested (1927, p. 33) that the perforated plates are resorbed each time a new shell layer is added.

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Explanation of Plate IX.

Fig. 1.—*Hofkerina semiornata* (Howchin). Inferior aspect. Oligocene (Balcombian). Muddy Creek, Victoria. ×13.

Fig. 2.—*H. semiornata* (Howchin). Superior aspect. Ditto. ×13.

Fig. 3.—*H. semiornata* (Howchin). Inferior aspect. Oligocene (Balcombian). Balcombe Bay, Mornington. ×21.

Fig. 4.—*H. semiornata* (Howchin). Superior aspect. Ditto. ×21.

Fig. 5.—*H. semiornata* (Howchin). Median section of test. Oligocene (Balcombian). Muddy Creek, Victoria. ×53.

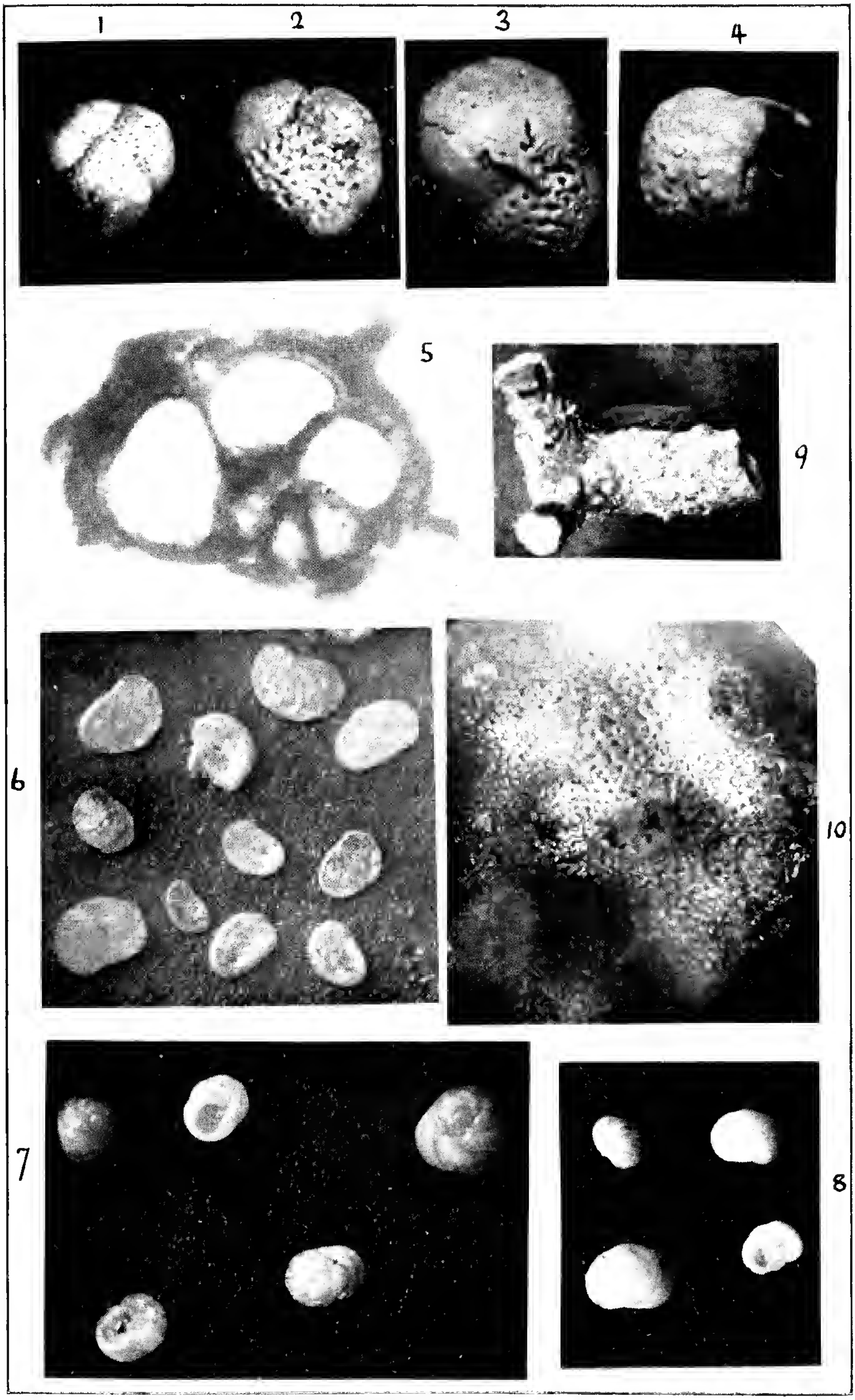
Fig. 6.—*Heronallenia lingulata* (Burrows and Holland). Oligocene (Balcombian). Muddy Creek, Victoria. ×22.

Fig. 7.—*Heronallenia wilsoni* (Heron-Allen and Earland). Miocene. Marl above limestone. Filter Quarry, Batesford, Victoria. ×26.

Fig. 8.—*H. wilsoni* (H.-A. and E.). Recent. Off the Snares, New Zealand, 60 fathoms. ×21.

Fig. 9.—*Homotrema rubrum* (Lamarck). On coral. Ambrym Island, New Hebrides. Coll. J. Searle. ×5/4.

Fig. 10.—Ditto. Surface enlarged to show pore-plates and pits. ×18.



F.C. photo.

Heronallenia, Hofkerina and Homotrema.

[Proc. Roy. Soc. Victoria, 43 (N.S.), Pt. II, 1931.]

Art. XIX.—*The Seasonal Sap Flow of Eucalyptus botryoides.*

By A. O. BARRETT and HEBER GREEN.

[Read 14th August, 1930; issued separately 28th February, 1931.]

Preliminary observations by A. O. Barrett (1927-8.)

After some years' observation in my garden at "Lalbert," Orrong Road, Armadale, Victoria, on the effect of a large number of dripping taps I gradually became aware that in those places where the "wet spots" caused by this dripping were adjacent to Eucalyptus trees, they tended to become dry areas in April to October, and then became wet spots again from November to March. On the other hand, those wet spots adjacent to European trees such as Poplars, Pines, Yews, Oaks, Oriental Planes, Chestnuts, etc., became dry in the late spring, summer, and early autumn, and remained wet during the remainder of the year.

I therefore decided to watch this action for twelve months during 1927-8, and found that my previous observations were correct. Details are, however, omitted for the sake of brevity.

The mean annual temperature is about 58° F., and the annual rainfall averages 25.5 inches.

The soil is a sandy loam on the surface, and beneath this is a fine sand, 98 per cent. of which will pass through a 50-mesh sieve, and beneath this again, at varying depths up to ten feet, is a clay mud.

Consideration of the above facts prompted the following investigation on three mature trees, specimens of *Eucalyptus botryoides*. The behaviour of these mature trees in my garden is entirely different from that of seedlings of from one year up to seven years old. During this period they form leaves, extend their branches, and increase the height of the main stem, and develop their root system throughout the year. If flower buds develop they are cast off while immature.

From eight to fourteen years they begin to pass into a new phase, and cease leaf formation in the winter (instantly if a crop of capsules form in March), but at about sixteen years of age they have become large trees, producing copious fruit buds and entirely ceasing to form new leaves or extending their branches from April until well into October. In all cases, however, sporadic short-lived developments may occur under abnormal conditions.

In August these mature trees develop tiny red beginnings of leaves, which do not enlarge until well into October. Thereafter they form successive flushes of leaves and extend their branches about every five weeks until the end of March. At Christmas they flower, and the white blossom is fertilized in January. By the end of March they are usually covered with capsules, and all leaf development ceases. In April an active growth of white roots begins which lasts until October in a normal season and then ceases.

Where, however, abnormally heavy rain falls in November, a sporadic development of fine roots will result. These roots are not more than 1/16th inch in diameter and seldom more than two to three inches long, and their appearance is unusual.

The hot weather then ensues with consequent surface dryness of the soil, and no digging will reveal any further white roots until the end of March.

Plan of Systematic Experiment.

In order to examine their habits in detail from the generalizations enumerated above, we selected three specimens of *Eucalyptus botryoides* which were growing normally and away from any dripping taps.

They had been grown from the same lot of seed, planted in 1913, and averaged thirty-five feet in height; their trunks were five feet in circumference, and the trees' branches had a spread of some twenty-five feet. They were healthy, full of vigour, and loaded with leaves. They were placed in a row about ten yards apart with other smaller trees and shrubs, but were not overshadowed by, or very close to, any other large trees.

They are indicated by the letters A, B, and C, and the only difference to be seen between them is that the outside dead bark of C is darker than that of the others, being at the North end of the row whilst A is at the Southern and more shaded end.

Experimental Methods.

Quantitative experiments on growing trees are difficult to carry out in such a manner that the experimental error does not vitiate the result, but it was decided to work with the three trees described, and to measure the variations of the water, ash (mineral matter), and sugar content of the bark from month to month throughout the year.

Sampling.

In the first place it was necessary to devise an instrument by which samples could be obtained each month, which would not only be comparable from tree to tree, but for each month of the year.

The taking of the sample must also interfere as little as possible with the growth of the tree. For this purpose a large "Cork-borer" was constructed of $\frac{5}{8}''$ mild steel, provided with a sharp saw-tooth cutting edge and fitted with an accurately machined plunger with which to push out the sample of bark when it had been cut.

To obtain a sample of bark one bores through the dead bark down to the living layers, then cleans the borer and bores gently through the living bark until the alburnum is reached, being careful not to express the sap water more than can be helped during the process. When the borer arrives at the alburnum it stops and slips round freely on its wet surface. By continuing the turning and pulling, the core obtained comes freely out and is gently pushed into the drying bottle, whose lid is immediately replaced. The boring is continued until from three to six borings of the living bark of each of the three trees have been secured.

In the summer there is no bleeding, but during the winter the bark contains so much sap that the pressure on the borer expresses some liquid even with the most careful manipulation.

The error due to this cause is insufficient to vitiate the conclusions we have arrived at as to the seasonal variation of the moisture content.

After much experimenting with other trees, the samples for the first month (August, 1928), consisting of at first three and afterwards six borings, were taken at a level of four to five feet from the ground, and about three to four inches apart from one another. Next month they were taken three to four inches diagonally lower so as not to be affected by the previous set.

As even a casual observation shows that there are some more or less dormant parts in the bark of any individual tree, and also parts that are more active, it was decided to take the samples in each tree from directly between the under side of a large branch and the top side of the root obviously supplying that branch. A similar position was chosen on the western side of each tree, and all samples were taken in that western quadrant in the direct line of the flowing sap.

Determination of moisture content of the living bark.

The weighing bottle containing each sample (5 to 8 grams at first, but increased to double that amount in later months) was placed in a drying oven at about 50°C. for about twelve hours; then the temperature was raised to 70°C. for two hours, and finally to 100°C. for two hours longer, or until weight was constant. This procedure was necessary to prevent the decomposition of any sugars present.

In this way the following figures were obtained for the samples taken on 8th September, 1928:—

	A.	B.	C.
Weight of sample	8·313	6·986	4·988
Loss of weight on drying	5·493	4·535	2·939
Percentage of moisture	66·0%	65·0%	59·9%

Samples were similarly taken and examined at the beginning of the second week in each month, and the moisture contents so obtained have been tabulated, with other data, in the Table and Graphs.

Graph I also shows the actual falls of rain as recorded at Caulfield and Prahran, the nearest meteorological stations to Armadale, during the period of the experiments. It will be seen that the rain has in some cases apparently shown its effect on the moisture content, and sometimes on the sugar and ash as well, but, generally speaking, the predominating influence has clearly been the seasonal habits of the trees only slightly modified by the local climatic conditions.

Determination of the ash and sugar contents.

The determination of the ash content of the dried bark was straightforward, and summaries of the results are recorded in the table and in Graph II.

The estimation of the sugar was a more difficult problem. The ordinary method of titration with Fehling solution may be seriously inaccurate when applied to materials containing other soluble matters than sugars, especially if only small and variable amounts of the sugar be present. For these reasons the suitability of some of the more recent methods has been investigated, and the experience gained related in some detail.

Trial of the Chloramine-T method.

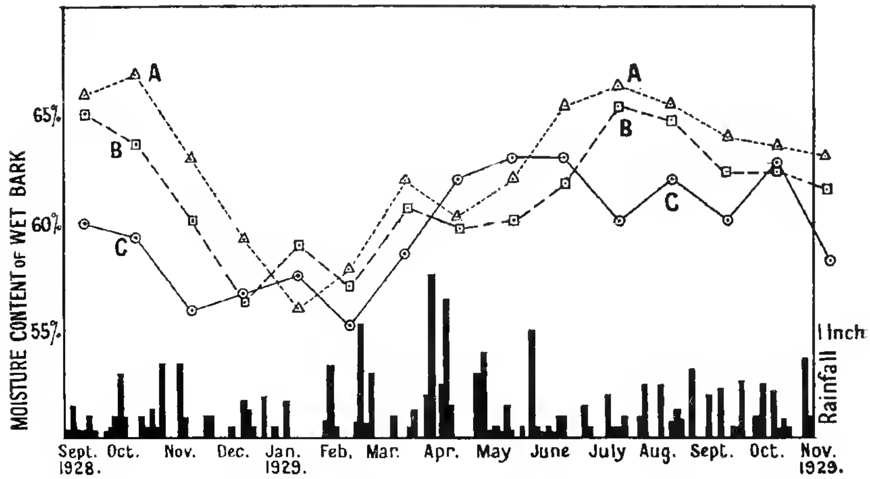
This method, in which a solution of chloramine-T in the presence of potassium iodide provides a mild oxidizing action, has several advantages, notably in its power of differentiating between the aldose and ketose groups of sugars.

Preliminary experiments soon emphasized the fact that accurate results can only be obtained when the proportions and balance of all the reagents are carefully adjusted, not only with regard to the concentration of the sugar to be determined, but also to the acidity of the solution and the amounts of iodide, chloramine-T, etc., used.

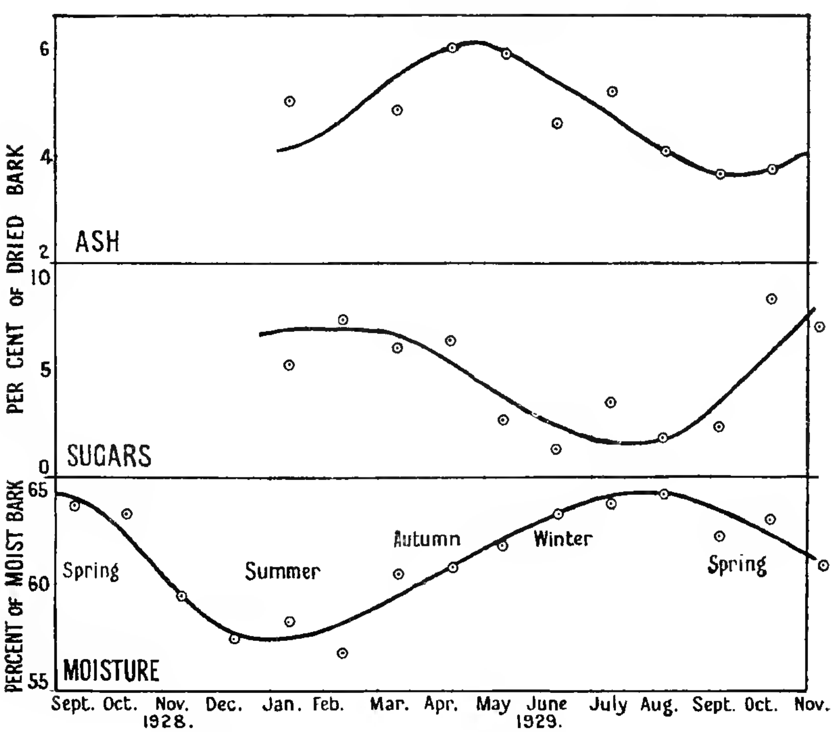
Variations in the temperature and duration, not only of the reaction itself, but also of the extraction of the sugars from the bark, were also found to be vital factors, and attempts were made to fix these conditions arbitrarily and carry out the estimation of sugar on the quantities of bark samples available.

After many tests, it was found that while quite accurate results could be obtained with pure sugar solutions by this method, the results for extracts of the bark varied so erratically with slight changes in the procedure that they could not be considered as giving any reliable measure of the sugar content. Although phospho-tungstate reagent was added in every case to remove tannins, albuminoids, etc., it is probable that other substances as well as sugar are present that are affected by the iodine oxidizing solution. The chloramine-T method was therefore discarded for our purpose, and attention was directed to the process of preparing the extract.

GRAPH I.—MOISTURE CONTENT OF LIVING BARK.



GRAPH II.—AVERAGE VALUES OF THE ASH, SUGAR, AND MOISTURE CONTENTS OF THE BARK OF THREE TREES.



Summary of the Analytical Data for the three Trees.

Date of Sample	Tree	Moisture %	Sugar %	Ash %	Mean for 3 Trees Moisture	Sugar	Ash
1928.							
Aug. 9	A	65·25					
	B	65·07			63·6		
	C	60·5					
Sept. 8	A	66·1					
	B	56·0			63·7		
	C	59·9					
Oct. 10	A	67·0					
	B	63·8			63·4		
	C	59·4					
Nov. 10	A	63·0					
	B	60·0			59·6		
	C	55·8					
Dec. 10	A	59·3					
	B	56·4			57·4		
	C	56·6					
1929.							
Jan. 10	A	56·0	5·9	4·73			
	B	58·9	5·2	4·62	58·2	5·2	4·98
	C	57·6	4·45	5·60			
Feb. 9	A	57·8	6·7	3·50			
	B	57·0	6·55	3·15	56·6	6·95	3·50
	C	55·0	8·6	3·94			
March 14	A	62·2	3·8	4·07			
	B	60·5	6·2	4·55	60·4	6·0	4·85
	C	58·4	8·0	5·94			
April 10	A	60·2	4·75	6·06			
	B	60·0	7·45	4·29	60·7	6·3	6·02
	C	62·0	6·7	7·70			
May 11	A	61·8	3·7	5·46			
	B	60·0	2·05	5·48	61·6	2·5	5·95
	C	63·1	1·8	6·90			
June 11	A	65·3	1·1	4·58			
	B	61·6	1·8	—	63·3	1·25	4·58
	C	62·9	0·9	—			
July 9	A	66·3	5·45	5·96			
	B	64·8	3·2	5·79	63·9	4·4	5·19
	C	62·0	4·65	3·82			
Aug. 9	A	65·6	2·65	4·03			
	B	64·8	1·85	3·44	64·1	1·75	4·09
	C	62·0	0·75	4·80			
Sept. 17	A	64·0	3·1	—			
	B	62·8	2·6	—	62·3	2·4	—
	C	60·0	1·45	—			
Oct. 10	A	63·7	8·2	—			
	B	62·5	8·1	—	62·9	8·5	—
	C	62·6	9·25	—			
Nov. 12	A	63·0	6·95	—			
	B	61·4	7·2	—	60·8	7·05	—
	C	58·1	7·0	—			
Average for Period	A	62·9	4·85				
	B	60·95	4·85				
	C	59·6	5·8				

Preparation of bark extract.

It was soon found that the cores of bark were not in a form or condition that enabled them to be accurately sampled or completely extracted. However, after the experience gained in the chloramine-T tests the following procedure was developed and finally adopted for preparing the extract for analysis.

The dried material as received was in brittle lumps, but not very homogeneous; this was ground in a coffee mill and again dried at 100°-105°. Of this powder, 2·00 grams were weighed out into a flask, and allowed to soak in about 50 cc. of water over-night. Next day 5 cc. of phospho-tungstate reagent was added to precipitate reducing substances other than sugars, and the total volume made up to exactly 100 cc. This readily filtered, and the filtrate, or rather an aliquot of it, was used for the determination of the reducing sugars.

Trial of Fehling solution using methylene blue as indicator.

An attempt was made to use ordinary Fehling solution with methylene blue as the indicator of the end-point. This latter reagent, though requiring a little practice in its use, and necessitating the exclusion of air during the boiling process, is undoubtedly superior to the starch-iodide method of spotting the end-point.

The difficulty was soon met, however, that the amount of sugar available in the bark was generally much too small to reduce 5 cc. lots of Fehling solution, and that when lesser quantities of Fehling solution were tried the detection of the end-point became uncertain and the titration volumes were not proportional to the sugar content.

This method, therefore, also had to be discarded, and Clark's process was given a trial.

Trial of Clark's method.

Here the sugar is oxidized by boiling with an exact amount of Benedict's solution for exactly five minutes—the whole mixture occupying a definite volume (in our case, 40 cc.). The reduced cuprous oxide is determined by adding measured volumes of acetic acid, N/25 iodine, and hydrochloric acid, and titrating the residual iodine with N/25 thiosulphate, using starch paste as indicator.

This method, though apparently complicated, and requiring some ten measurements of volume, time, or weight for each determination, is capable of estimating much smaller quantities than the others. (The amount concerned in each titration actually ranged from one to eight milligrams.) Here, as in the chloramine-T method, a careful balance of the quantities is necessary, and the proportions of this balance had to be worked out for our present purpose.

Standardizing the solutions with pure invert sugar showed that even with this process the titration results are not quite proportional to the amount of sugar present, but a graph was drawn from which an accurate determination of the sugar content could be made in each case.

In conclusion, Clark's method was found to give consistent results with the bark extracts, and the estimations were done in duplicate, or oftener, if any doubt arose as to their substantial accuracy.

Unfortunately, the peculiar requirements of the estimation had not been recognized at first, and by the time the above procedure had been evolved, the material for the first three months had been used up: the results obtained with them were of uncertain value and have been discarded.

Each month an aliquot of the bark extract was also inverted with acid before titration, but the results obtained were merely duplicates of the untreated extracts, and confirmed the absence of invertible sugars.

The figures thus obtained by Clark's method for reducing sugars are recorded in the table and in Graph II.

Discussion of Results.

Tree A on the southern end of the row was somewhat shaded by the others, and the ground in which it was growing was also slightly lower, and possibly its roots had a sli htly damper feeding ground than either B or C. This difference shows itself definitely, though not invariably, in the moisture content of the bark, the average value of which over the period of experiment varies by some three per cent. from tree to tree.

No similar consistent difference shows itself in the sugar and ash contents.

The averages of the results obtained for all three trees have plotted in Graph II so as to summarize in one view as much of the data as possible.

Two results stand out clearly:—

1. In spite of any slight and temporary influence that the climatic factor may show, it will be seen that the moisture content of the bark reaches a minimum in February, and begins to rise in March until it attains a maximum in August, when it begins to fall again. It is then ready for the rise at the start of the next autumn.

2. The sugar contents (expressed as a percentage of the dry bark) fluctuate inversely as the moisture content. Were they expressed as a percentage of the wet bark, or of the water contents, this inverse relation would be still more marked.

It is also certain that these seasonal variations of the water content are not merely apparent variations due to corresponding alerations in the thickness (or volume) of the bark.

Although no attempt was made to measure the thickness of the bark from month to month, it obviously did not vary much from ⅝ inch in the part that was being sampled. It was also noted that in January the bark was so rope-like in texture that air-spaces were clearly apparent to the eye; in winter, on the other hand, these spaces were filled with water. In a wet year the living bark and alburnum are loaded with water by August, and the tree can hold no more from root-tip to leaf stalk.

As regards the concentration of sugar in the spring and summer, a simple calculation will show that this is a real accumulation, and not merely an arithmetical change due to variations in the percentage of water content.

Collateral Observations (1929-30.)

Simultaneously with the above experiments, the growth of the tree roots was also watched and investigated.

On February 1st, 1929, a large root from tree A was carefully uncovered from the trunk to its furthest extremity—about twenty yards away. As soon as possible it was all covered in again with the same soil, except that, in order to facilitate future inspection, the root-tips were first protected with cornsacks and then covered to their original depth with two inches of soil.

An examination of the root-tips showed the central extension of the main roots to be obviously alive, and covered with a thin red-brown bark having a sweetish taste. The old growing tips had died and were black and rotten. There was no sign of any active white roots or even of any growing root-tips.

On March 1st the earth under the sacking was quite wet and the sacking was rotting.

On April 1st new root apices were freely growing from the old root ends, but not from the apex itself in any case.

On May 1st the soil beneath was dry and the cornsacks were so pierced through with white roots that they could only be lifted by tearing the roots off.

On June 1st the sacking had so rotted that it had become part of the soil, so the spot was protected with a wire cage from disturbance till the next spring.

On September 1st the weather and the soil began to dry out.

On October 1st, 1929, no white roots could be found.

On February 1st, 1930, the entire system was uncovered as before, and this time protected with a galvanized-iron frame 8 feet long by 30 inches wide, and reaching 1 inch clear of the roots. Its roof was covered with sacking and soil, and it could be lifted in two sections and held up by a stake. The undisturbed soil was wet for three inches below the surface.

On March 1st the roots were still dormant, only two incipient root-tips being noticed.

On April 1st many sturdy white rootlets were visible.

On May 1st a multitude of white rootlets had appeared, and the ground was dry.

On June 1st white rootlets were still abundant and the soil quite dry, especially where the roots were most plentiful.

On July 1st another set of rootlets had begun to form, and it would appear that there are probably three different varieties of rootlets produced during the root-forming period.

On August 1st a few sturdy white roots remained, and these were covered with soft down-like hairs.

These types of root growth are being further studied.

On watching an individual rootlet, one finds that it has a short life—three weeks at the most. All through the autumn and winter these roots, perhaps ¼ inch in diameter, are steadily extending via the growing point, cuticularizing, and then often drying up and dying. At the same time the front, actively living portion, is sending out new roots with hairs, which drain the soil in that immediate location, and then they too shrivel up and decay.

When the living bark of the tree is full of the water sent up from these roots, *i.e.*, by the beginning of spring in a normal season, all the root extremities become dormant, and no white roots can be found during the spring or summer. They await the return of autumn.

Summary.

1. The roots of mature trees of *Eucalyptus botryoides* are apparently dormant during the spring and summer, but begin to form white, very active roots and root hairs in the early autumn.

2. During the autumn and winter, water is stored up in the bark, the moisture content of the living bark rising from 57 to 64 per cent. (*i.e.*, 132 to 178 per cent. of the dry bark), whilst the formation of new leaves is almost nil.

3. After the irrigative period the new leaves form in a succession of flushes or waves every three to five weeks throughout the spring and summer. At the same time, the sugar produced by these leaves accumulates in the bark until the sugar content has increased from 1·5 to 8 per cent.

4. The ash content is at its minimum (3·5 per cent.) in the spring, and at its maximum (6·0 per cent.) in the autumn.

5. It seems probable that these periods of root growth and the other peculiarities observed so different from those of the exotic plants of colder climates, are some of the developments which have enabled our Eucalypts to flourish in a semi-arid climate, withstanding a summer drought, and taking the opportunity of storing up a water supply in the wet season.

6. There are possibilities of the better use of Eucalypts, whether as firewood, as timber, or as grown to protect water-supply areas, that depend on an exact knowledge of the seasonal flow of sap in their roots and stems.

We hope this preliminary investigation will emphasize the need for systematic research on the subject.

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Balfour, Lewis J., B.A., M.B., B.S., 536 Toorak-road, Toorak, S.E.2. 1892
Baragwanath, W., Geological Survey Department, Treasury Gardens, East Melbourne, C.2. 1922
Barrett, A. O., 25 Orrong-road, Armadale, S.E.3 1908
Barrett, Sir J. W., K.B.E., C.M.G., M.D., M.S., 105 Collins-street, Melbourne, C.1. 1910

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Cudmore, F. A., 12 Valley View-road, East Malvern, S.E.6 1920

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Elliott, R. D., 395 Collins-street, Melbourne, C.1 1927
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Gault, E. L., M.A., M.B., B.S., 4 Collins-street, Melbourne, C.1. 1899
Gepp, H. W., c/o P. W. Powell, Temple Court, Collins-street, Melbourne, C.1. 1926
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Mahony, D. J., M.Sc., Geological Survey, Public Offices, Treasury Gardens, East Melbourne, C.2. 1904
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Reid, J. S., 498 Punt-road, South Yarra, S.E.1 1924
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Shillinglaw, Godfrey V., No. 8, "Darley," 377 Dandenong-road, Armadale, S.E.3. 1925
Singleton, F. A., M.Sc., University, Carlton, N.3 1917
Stillwell, F. L., D.Sc., 44 Elphin-grove, Hawthorn, E.2 .. 1910
Summers, Associate Prof. H. S., D.Sc., University, Carlton, N.3. 1902

Thirkell, Geo. Lancelot, B.Sc., 4 Grace-street, Malvern, S.E.4. 1922
Thomas, D. E., c/o Geological Survey, Mines Dept., C.2 1929
Thomas, Dr. D. J., M.D., 12 Collins-street, Melbourne, C.1. 1924
Tiegs, O. W., D.Sc., University, Carlton, N.3. 1925

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Country Members.

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Caldwell, J. J., Geological Survey Office, Bendigo, Vic. 1930
Coulson, A., B.Sc., 68 McKillop-street, Geelong, Vic. 1929
Crawford, W., Gisborne, Vic. 1920

Drevermann, A. C., Dookie Agricultural College, Dookie, Vic. 1914

Easton, J. G., "Kiewa," Murphy-street, Bairnsdale, Vic. 1913
Fisher, C. C., B.A., Dip.Ed., 131 Barkly-street, Mt. Pleasant, Ballarat, Vic. 1929

Harris, W. J., B.A., High School, Echuca, Vic. 1914
Hart, T. S., M.A., B.C.E., School of Mines, Bairnsdale, Vic. 1894
Hope, G. B., B.M.E., "Carrical," Hermitage-road, Newtown, Geelong, Vic. 1918

James, A., B.A., M.Sc., High School, Colac, Vic. 1917

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Lea, A. M., F.E.S., 241 Young-street, N. Unley, S. Aus. 1909

Mackenzie, H. P., Engr. Commr. R.N.(Ret.), Trawalla, Vic. 1924
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Sutton, J. W., 127 Doncaster-avenue, Kensington, Sydney, N.S.W. 1924

Trebilcock, Captain R. E., M.C., Wellington-street, Kerang, Vic. 1921

White, R. A., B.Sc., School of Mines, Bendigo, Vic. 1918

Corresponding Member.

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Associates.

Abraham, W. S., Geological Survey Museum, Gisborne-street, East Melbourne, C.2. 1929
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Elford, F. G., B.Sc., 177 Albert-street, Sebastopol, via Ballarat, Vic. 1929

Feely, J. A., Observatory, South Yarra, S.E.1. 1924
Fenner, C., D.Sc., Education Department, Flinders-street, Adelaide, S.A. 1913
Ferguson, W. H., 37 Brinsley-road, E. Camberwell, E.6 .. 1894
Finney, J. M., "Armidale," Springvale-road, Forest Hill, Tunstall. 1925
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Flecker, Dr. H., 71 Collins-street, Melbourne, C.1 1922

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Hanks, W., 16 Holroyd-street, Coburg, N.13. 1930
Hardy, A. D., F.L.S., Forests Department, Melbourne, C.2. 1903
Hauser, H. B., M.Sc., Geology School, University, Carlton, N.3. 1919
Hercus, E. O., D.Sc., F.Inst.P., University, Carlton, N.3 1923
Heslop, G. G., D.V.Sc., 7 Hudson-street, Caulfield, S.E.7. 1923
Heyward, Miss L. J., M.Sc., 256 Wattletree-road, Malvern, S.E.4. 1930
Hill, Gerald F., Council for Scientific and Industrial Research, Box 9, Canberra City, Canberra, F.C.T. 1924
Hills, E. S., M.Sc., Geology School, University, Carlton, N.3. 1928
Holmes, W. M., M.A., B.Sc., Observatory, South Yarra, S.E.1. 1913
Howitt, A. M., Department of Mines, Treasury Gardens, East Melbourne, C.2. 1910

Jack, A. K., M.Sc., 49 Aroona-road, Caulfield, S.E.7 1913
Jessep, A. W., B.Sc., M.Ag.Sc., Dip. Ed., Horticultural Gardens, Burnley, E.1. 1927
Jona, J. Leon, M.D., M.S., D.Sc., Lister House, 61 Collins-street, Melbourne, C.1. 1914

Kannuluik, W. G., M.Sc., Natural Philosophy Dept., University, Carlton, N.3. 1927
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Luly, W. H., Department of Lands, Public Offices, Melbourne, C.2. 1896

Macdonald, B. E., Dairy Export Branch, Rialto, Collins-street, Melbourne, C.1. 1920
Maclean, C. W., 56 Cole-street, Elsternwick, S.4 1879
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Melhuish, T. D'A., M.Sc., Adelaide Chemical and Fertilizer Co., Currie-street, Adelaide, S.A. 1919
Mollison, Miss E., M.Sc., Royal-crescent, Camberwell, E.6. 1915
Moon, A. Ramsay, 32 Power-street, Hawthorn, E.2 1929
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Nelson, Miss E. A., M.A., M.Sc., University, Carlton, N.3 1924
Newman, B. W., Meteorological Bureau, Adelaide, S.A. 1927
Nicholls, Miss Annie, B.Sc., 633 Inkerman-road, Caulfield, S.E.7. 1929

Oke, C., 56 Chaucer-street, St. Kilda, S.2 1922
Orr, D., B.Sc., 860 Mount Alexander-road, Essendon, W.5 1927
Osborne, N., c/o Vacuum Oil Co., Margaret-street, Sydney, N.S.W. 1930

Parr, W. J., 17 Bokhara-road, Caulfield, S.E.8 1927
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Petrie, A. H. K., M.Sc., Ph.D., University, Carlton, N.3 .. 1927
Pretty, R. B., M.Sc., Technical School, Warrnambool, Vic. 1922

Raff, Miss J. W., M.Sc., F.E.S., University, Carlton, N.3 1910
Rayment, Tarlton, Bath-street, Sandringham, S.8 1929
Richardson, Sidney C., 2 Geelong-road, Footscray, W.11 1923
Ripper, Miss E. A., 8 Mitchell-street, St. Kilda, S.2. .. 1930
Rosenthal, Newman H., B.A., B.Sc., 10 Oulton-street, Caulfield, S E. 7 1921

Ross, Miss D. J., M.Sc., Merton Hall, Anderson-street, South Yarra, S.E.1. 1924

Sayce, E. L., B.Sc., A.Inst.P., Research Laboratories, Maribyrnong, W.3. 1924

Sharman, P. J., M.Sc., "Glenalvie," 9 Daphne-street, Canterbury, E.7. 1916

Sherrard, Mrs. H. M., M.Sc., "Balnagowan," Bromley-ave., Cremorne, N.S.W. 1918

Smith, J. A., 25 Collins-place, Melbourne, C.1 1905

Stickland, John, 433 Brunswick-street, Fitzroy, N.6. 1922

Thomas, L. A., B.Sc., 191 Royal Parade, Parkville, N.2. 1930

Thomas, R. G., B.Ag.Sc., c/o Dr. Thomas, Northam, W.A. 1922

Thompson, Mrs. G. R., 26 Fawkner-street, St. Kilda, S.2 1922

Traill, J. C., B.A., B.C.E., 630 St. Kilda-road, Melbourne, S.C.3. 1903

Trüdinger, W., 27 Gerald-street, Murrumbeena, S.E.9 .. 1918

Turner, A. H., M.Sc., Natural Philosophy Dept., University, Carlton, N.3. 1927

Turner, A. W., M.V.Sc., Veterinary School, Parkville, N.2. 1925

Wilcock, E. L., B.Sc., University High School, Carlton, N.3 1925

Wilson, F. E., F.E.S., 22 Ferncroft-avenue, E. Malvern, S.E.5. 1921

Wilson, Major H. W., O.B.E., M.C., C.de G., B.Sc., 630 Inkerman-road, Caulfield, S.E.7. 1923

Withers, R. B., 10 Nicholson-street, Coburg, N.13. 1926

Woodburn, Mrs. Fenton, 17 Roslyn-street, Brighton Beach, S.5. 1930

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The names of the new genera and species are printed in italics.

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[PART II. PUBLISHED 28th FEBRUARY, 1931.]