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REVIEW OF THE RISSOIDAE OF NEW SOUTH WALES.

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(Figures 1–94.)

INTRODUCTION.

This paper, the second of a series reviewing some of the families of New South Wales mollusca, is based primarily on the collections made by my son John and myself during the last twenty years. When Hedley published his check list in 1917 it was thought that the work of the systematist was nearly completed and that comparatively few species awaited discovery and naming. Since that time, nevertheless, the list has been appreciably enlarged, partially by checking known material, but particularly from new material brought in by trawlers operating on the continental shelf. Even from easily accessible locations on the shore systematic collecting has revealed that a far greater molluscan fauna exists than was ever suspected. This applies particularly to the smaller species which, though often of quite striking character, have in many cases been overlooked. Size is, after all, relative, and actually the species of small shells, say under 5 mm. in length, greatly outnumber those of larger size, while the number of individuals must be very much greater. Thus when the broader problems of marine zoology are considered, the relative importance of minute molluscs must at least be as great as, if not greater than, those of more conspicuous size.

Minute size makes study perhaps a little more difficult, but the student of small shells is fortunate in one way. In the early days of collecting very few found their way abroad, and they have thus escaped the involved synonymy which so obscures the identity of many of the larger species. Most of the known species have been described locally, and the literature and types are accessible to the local student. The contributions of such men as May, Tate, Charles Hedley and others to Australian scientific journals have been most carefully compiled and are of great accuracy. The work of the late Charles Hedley particularly is so clear, careful and accurate that it is a magnificent foundation on which to build.

The chief limitation in the past has been that most of the small material dealt with has been collected from shell sand from the beaches. This, though not without value, is at times worn and faded, and specimens are found in ones and twos instead of in colonies as when procured alive. One can go farther and say that with some groups beach material is practically unidentifiable, yet the same when found alive present very little difficulty at all.

In this paper live material has been dealt with wherever possible. A fruitful collecting ground has been the various algae abundant in rock pools right along the coast. These, if washed in fresh water, yield myriads of small shells which can be sorted out with a lens from the debris. The bottoms of rocks when scrubbed into a basin yield a further harvest, as do also masses of mussels, broken galiolaria tubes, the surface of sponges, and so on. Deeper water material has been obtained by dredging, also by the examination of mud and sand brought up by trawlers from the continental shelf. For the latter I am particularly indebted to Mr. T. Nielsen, of Crookhaven, who has for some time regularly sent me parcels of material so obtained. Though only a small proportion of dredged material is obtained alive, on the whole it is in much better condition than that found on the beach. Even for shore species

it has been found more profitable to dredge in very shallow water adjacent to the beaches and rocks than to rely on what is washed up by the tide.

The limitation of this paper to New South Wales is deliberate, as has been the determination to keep the limits of collecting within this area. The coast of New South Wales has long been considered a distinct zoogeographical province, separable on the one hand from the tropical waters of the Queensland coast, and on the other from the southern shores of Australia by the isthmus which until recently connected Tasmania with the mainland. With the east coast of Tasmania there is much closer relationship, and many zoologists have considered that these two areas should be merged into one province. A check of the species dealt with here rather strengthens this viewpoint. Hedley allowed 49 species under Rissoidae in his check list. This list is now raised to 95. Of these, 33 are described as new, but it is possible that the range of some of these will be later extended to Tasmania. Of the remainder, 36 species are so far found to be common to both areas, and these include many of the commonest and most typical forms.

Though a large number of new species and records is now added to the list, it is doubtful if this is yet nearly complete. The day of the systematist is not ended, for only when the lists are practically completed, and all the species identified and named, can the more important research be properly undertaken. Such questions, therefore, as comparative anatomy, life history, evolution and ecology are still largely problems for future study and solution.

Acknowledgements.

My thanks are particularly due to Miss Joyce Allan, Conchologist of the Australian Museum, who has read and checked the manuscript of this paper and has made many useful suggestions and corrections. To Mr. Tom Iredale, former Conchologist, I am also greatly indebted for advice and suggestions. Mr. Iredale's interest in the paper throughout its compilation has been particularly unselfish, inasmuch as he had years before actually completed a paper on the same subject, the manuscript of which was unfortunately lost. My son John has also contributed much, particularly in the collection and sorting of material, most of which we did together.

Types.

All specimens illustrated, in addition to the types of new species, have been presented to the Australian Museum.

Families and Genera.

Under Rissoidae is here included a rather heterogeneous assemblage of forms, between many of which there will probably ultimately be found but little relationship. For the purpose of a review of species, Hedley's New South Wales check list has been used as a basis, and all genera there included under Rissoidae have been dealt with. In a recent paper on the Australian Rissoidae, B. C. Cotton (1944, p. 286) has pointed out that *Rissoina*, *Rissolina* and *Stiva* are now recognized as belonging to a separate family, the Rissoinidae, while *Diala* goes to the Litiopidae and *Cithna* to the Cyclostremidae. Probably as knowledge grows a further regrouping of genera will be necessary.

Owing to the generally simple form of the shell, shell characters alone are sufficient for little more than specific determination, and questions of true genetic relationship are largely undecided. Even the selection of generic names for Australian rissoids is still a major problem. Certain groupings seem fairly natural, and as long as this is regarded as tentative and a matter of convenience no great harm is done. Throughout the world a multiplicity of genera have been introduced, but attempts to correlate

Australian species with these has led to much confusion. Iredale (1914) introduced a number of genera for Neo-Zealandic species, and both Hedley and May used Iredale's names for many New South Wales and Tasmanian shells. On the whole it seems wise to follow the same procedure, rather than plunge again into the maze of involved nomenclature in which so much of a research worker's time and energy is so hopelessly lost. It is a relief, in fact, to have on hand established generic names, and future writers can be left to thrash out their validity.

Unfortunately, Iredale, while he designated certain species as genotypes, and in a few cases discussed their relationship, entirely omitted any generic descriptions, and it has been left to others to define the limits his genera are intended to cover. That opinions have differed can be seen by comparing the check lists of New South Wales (Hedley) and Tasmania (May). In these each writer frequently uses different generic names for the same species, those under *Haurakia*, *Merelina* and *Estea* being particularly confused.

For this reason generic descriptions are here given, and may be considered as general interpretations adapted for the identification of Neo-Peronian forms alone. This had already been done before reading Cotton's paper, rather fortunately perhaps, as it ensured a quite independent approach to the problem. It is interesting, therefore, that the conclusions reached are almost identical, though differing in some details, mainly on the relative genetic importance of some shell characters. Cotton also gives a key to the various genera. While such keys are useful to students, they are of necessity somewhat artificial. I have not followed his key in this paper as, in my opinion, forms which seem closely allied are separated too widely—for instance, *Estea* and *Scrobs*. After checking this paper with Cotton's, some revision in names has been made, in order to bring the two as closely in line as possible. For instance, Cotton prefers *Scrobs* of Watson to Carpenter's genus *Amphithalamus*, which I think is justified, particularly as the genotype of *Scrobs* is a well-known Australian species. Of Cotton's new genera, *Subestea* and *Eusetia*, so far no New South Wales shells can be identified with them, and in turn I have added some new generic names for types unknown in South Australia. On the whole, however, I think the two papers dovetail well together and, it is hoped, will form a basis for future work on the group.

Review of Species.

Reference.

"Hedley 535." Number in Hedley's Check List of Marine Mollusca of New South Wales. Supplement to Jour. Royal Society of N.S.W., Vol. li, 1917.

"May 476." Number in May's Check List of Mollusca of Tasmania. Govt. Printer, Hobart, 1921.

Genus Rissoina D'Orbigny.

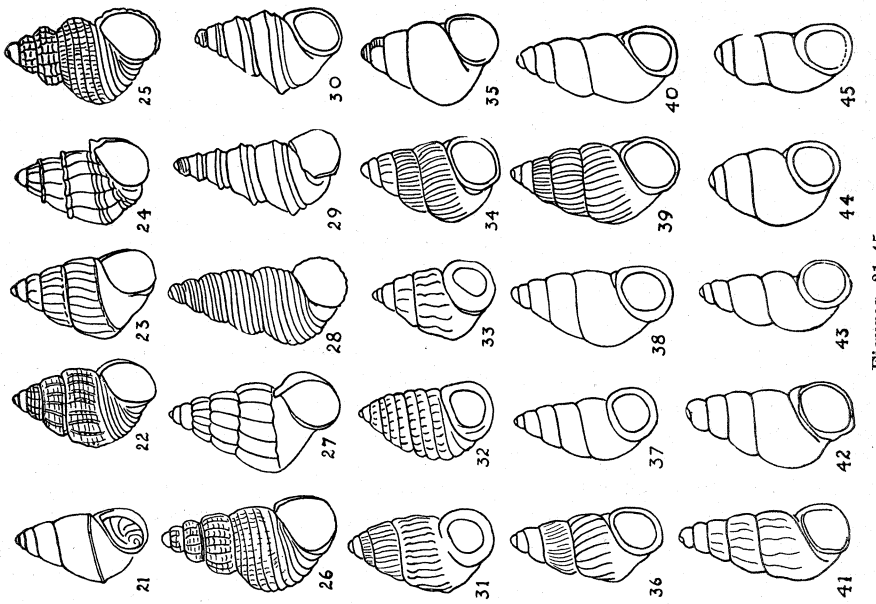
Under *Rissoina* are included elongated shells, of moderate size, from 3 to 7 mm. in length, solid, with entire, arcuate apertures. The peristome is thickened and is reflected back anteriorly to make a rounded, bay-like indentation on the inner margin. The sculpture may be spiral or transverse or both, and is sometimes cancellate.

Rissoina variegata Angas. (Fig. 1.)

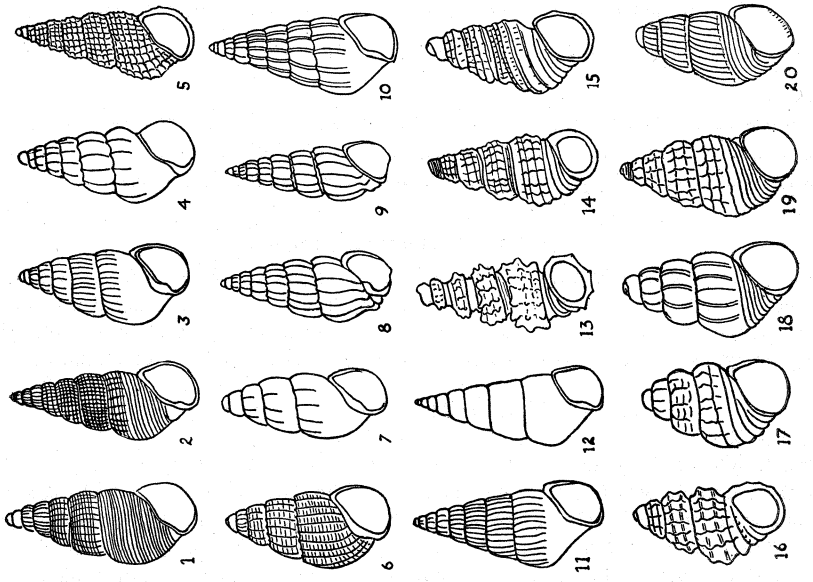
Hedley 536; May 480.

This is one of the commonest species on the coast. It is found in abundance under stones in rock pools between tide marks, both on the outer reefs and within the harbours. It is somewhat variable, chiefly in colour, but is generally marked more or less with brown. The ribs are also variable in strength, becoming less persistent on the later whorls, and are generally entirely absent on the body whorl of adult shells, the fine spiral striae alone being present.

The figured specimen is from Long Reef, its length 7 mm.



Figures 21-45.



Figures 1-20.

Rissoina elegantula Angas. (Fig. 2.)

Hedley 534; May 475.

This resembles *R. variegata* in general characters, but is slenderer, thinner, with very fine and delicate sculpture, and is white in colour. It is not a common shell and we have not taken it alive. It is generally found on the outer beaches. Length 7 mm.

Localities.—Point Halliday (figure); Long Reef; Shellharbour, etc.

Rissoina cretacea Ten.-Woods. (Fig. 3.)

Hedley 533.

Useful recognition marks are the glossy, white, vitreous texture, the faint transverse ribs and the absence of spiral sculpture. It is a deep-water species, and typical of the continental shelf. Length 6 mm.

Localities.—18 fathoms off North Head, Port Jackson (figure); 6–9 fathoms, Sow and Pigs Reef; 30–35 fathoms off Crookhaven. Hedley records it from 22 fathoms off the Manning River.

Rissoina fasciata Adams. (Fig. 4.)

Hedley 535; May 476.

This is another of the very common species on the coast. It has a lengthy synonymy, but Hedley's determination of the proper specific name is accepted. It is found with *R. variegata* alive under rocks in pools, but is very abundant on the beaches right throughout New South Wales. Though somewhat variable, this is more apparent than real, a sharply defined brown band below the suture often giving an angular appearance to the whorls. The broad, rounded ribs form a useful recognition mark.

The specimen figured was dredged in shallow water in North Harbour; length 5·8 mm.

Rissoina allanae, sp. nov. (Fig. 5.)

Shell elongated, conical, solid, pure white. Whorls 8, including protoconch, the first dome-shaped, the remainder rounded, sutures impressed. The first two whorls (protoconch) are smooth, the sculpture on the remainder consisting of well-defined sharp ribs, about 14 to a whorl, crossed at regular intervals by 4 to 5 sharp radial keels, elevated to points where they cross the transverse ribs, producing a regular, square cancellation, which persists right to the base. Aperture arcuate, angled posteriorly, expanded anteriorly, peristome complete, thickened, rounded on the outer margin, arched on inner margin. Length 5 mm.

Locality.—Woolgoolga, fairly common on the beach (type).

The regular and beautiful cancellation at once separates this from all other New South Wales species, but it would not be surprising to find its range extended north into

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Figures 1-20.

1, *Rissoina variegata* Angas. 2, *R. elegantula* Angas. 3, *R. cretacea* Ten.-Woods. 4, *R. fasciata* Adams. 5, *R. allanae* Laseron. 6, *R. iredalei* Laseron. 7, *R. usitata* Laseron. 8, *Rissolina crassa* Angas. 9, *Rissolina angasi* Pease. 10, *Stiva ferruginea* Hedley. 11, *S. royana* Iredale. 12, *S. nielseni* Laseron. 13, *Merelina cheilostoma* Ten.-Woods. 14, *M. gracilis* Angas. 15, *M. subreticulata* Laseron. 16, *M. eminens* Laseron. 17, *M. strangei* Brazier. 18, *M. ochroleuca* Brazier. 19, *M. apicilirata* Tate and May. 20, *Haurakia lucida* Laseron.

Figures 21-45.

21, *Microfossa incidata* Frauenfeld. 22, *Haurakia novarensis* Frauenfeld. 23, *H. descrepans* Tate and May. 24, *H. profundior* Hedley (after Hedley). 25, *H. filocincta* Hedley and Petterd (after Hedley). 26, *H. sculptilis* May. 27, *H. praeda* Hedley (after Hedley). 28, *Lironoba hebes* Laseron. 29, *L. imbrex* Hedley. 30, *L. praetornatilis* Hedley. 31, *Estea olivacea* Frauenfeld. 32, *E. castella* Laseron. 33, *E. salebrosa* Frauenfeld. 34, *E. jervisensis* Laseron. 35, *E. pyramidata* Hedley. 36, *E. frauenfeldi* Frauenfeld. 37, *E. tasmanica* Ten.-Woods. 38, *E. albizona* Laseron. 39, *E. narrabeenensis* Laseron. 40, *E. pulvilla* Hedley. 41, *E. figula* Laseron. 42, *E. perpolita* May. 43, *E. gemma* Laseron. 44, *E. gregaria* Laseron. 45, *E. alvea* Laseron.

Queensland. I have much pleasure in naming it after Miss Joyce Allan, Conchologist at the Australian Museum.

Rissoina iredalei, sp. nov. (Fig. 6.)

Shell broadly conical, slightly translucent, shining, yellowish, with tinges and patches of chestnut. Whorls 6, the first dome-shaped, smooth and white, the remainder increasing rapidly, slightly rounded, slightly angled below the sutures, which are deeply impressed. Aperture arcuate, slightly angled posteriorly, peristome complete, but reduced to a broad smear of callus on the body whorl, outer lip somewhat thin, inner lip arched and reflected anteriorly. Sculpture consisting of thin, sharp, well-defined, transverse ribs, about 16 on the body whorl. The spaces between the ribs are flat and crossed by numerous, regular, fine, spiral ridges. Length 5·5 mm.

Localities.—Dredged 15 fathoms between Heads, Port Jackson (type), 6 specimens; 14 fathoms off Long Reef, 2 specimens.

This handsome species is unlike any other Australian *Rissoina*; it is broader, has a thinner outer lip, and very distinctive sculpture. It is evidently an inhabitant of fairly deep water.

Rissoina usitata, sp. nov. (Fig. 7.)

Shell small, sub-cylindrical, thin, white, glossy and translucent except for a white, opaque band in the centre of each whorl. Whorls 5, the first broad and dome-shaped, the remainder slightly rounded, sutures indented. Aperture arcuate, peristome complete, but reduced on inner margin to a band of callus on the body whorl. The first whorl is smooth, the others have a few faint, incomplete, broad ribs, reaching from the suture to the centre; base smooth. Length 2·4 mm.

Locality.—15 fathoms off mouth of Clarence River (type), two specimens.

This is the smallest of the local species and is nearest to *R. cretacea*, than which it is smaller, narrower and thinner.

Rissoina lintea Hedley and May.

May 478.

This deep-water Tasmanian shell was recorded from 50–70 fathoms off Green Cape by T. Iredale (1924). It is generally like *R. variegata*, but is faintly striate, with a channelled suture.

Genus Rissolina Gould.

Rissolina is generally like *Rissoina*, but the inner margin of the peristome is reflected anteriorly to form a plate-like process over the columella. There is also a strong fold at the base of the whorl. The shell is heavy, the sculpture consisting of strong, well-defined, transverse ribs, persisting right to the base.

Rissolina crassa Angas. (Fig. 8.)

Hedley 538.

Rissolina angasi Pease. (Fig. 9.)

Hedley 537; May 481.

Hedley allowed both these species in his check list, and two species have been generally considered to occur on the coast. Both are common under rocks in pools, *crassa* being applied to larger, broader forms, *angasi* to smaller, narrower forms. Figure 8 is from a specimen in the Museum collected by J. Brazier from Little Coogee, 7 mm. long; figure 9 from a specimen from North Harbour, 6 mm. long. Specimens down to 4·5 mm. do not differ from the latter in any way.

Both species are allowed here, but it is by no means certain that they are distinct, as many intermediate forms seem to exist. Further study of long series of good material is necessary to decide this question.

Genus **Stiva** Hedley.

Stiva is like *Rissoina*, but with flatter whorls, and very large for the family, specimens being found up to 20 mm. in length. It has the same arcuate aperture, but Hedley (1904, p. 192) separated it chiefly by the operculum, which he describes as "peltate, concentric, . . . and with a horn resembling that of Jeffreysia". It is confined to deep water.

Stiva ferruginea Hedley. (Fig. 10.)

Hedley 540.

The specimen figured is from 50 fathoms off Sydney, and its length 19 mm. Hedley's type came from 100 fathoms, 16 miles east of Wollongong.

Stiva royana Iredale. (Fig. 11.)

Proc. Linn. Soc. N.S.W., xlix, 3, 1924, p. 245, pl. xxxiv, fig. 11.

Differs from *ferruginea* by being smaller and with more numerous and finer ribs. The type locality is from 10–25 fathoms, Twofold Bay, and the specimen here figured, 15 mm. long, is from the same locality. We also have it from 30–35 fathoms off Crookhaven.

Stiva nielseni, sp. nov. (Fig. 12.)

Shell conical, elongate, cream-coloured, faintly splashed with brown. Whorls 9, the first dome-shaped, white and glassy, the remainder nearly flat, increasing regularly, sutures distinct but not deeply impressed. Aperture arcuate, like a drawn bow, the outer margin expanded, the inner margin sharply arched. Peristome complete, thickened on the inner margin and reflected anteriorly. Nearly smooth except for faint growth-lines which are crossed by faint spiral striae. Length 13 mm.

Localities.—30–35 fathoms off Crookhaven (type); 18 fathoms off North Head, Port Jackson. A specimen was also picked up on Cronulla Beach.

Generally like *S. royana*, but can be readily distinguished by the absence of ribs, smaller size, and slightly narrower form. The species is named after Mr. T. Nielsen, skipper of the trawler "Joan" of Crookhaven, to whom I am indebted for much material from the continental shelf.

Genera **Merelina** Iredale and **Haurakia** Iredale.

Considerable confusion has occurred among Australian writers as to where the demarcation lies between these two genera. Iredale, when introducing the genera, gave no generic description, but observed in general discussion that *Merelina* has a spirally sculptured protoconch, is heavily varicosed, has a somewhat oval aperture, and varies from slender, elongate types to large, stout, tightly wound forms. The genotype is *Rissoa cheilostoma*. For *Haurakia* he gives no characters whatsoever. The genotype is *Rissoa hamiltoni*, a New Zealand species. In private conversation he has emphasized that the main difference between the two is that the protoconch of *Haurakia* is smooth, that of *Merelina* being spirally striated.

I have examined a number of specimens of *Merelina cheilostoma*, which is not uncommon, and, curiously enough, though it is the genotype of *Merelina*, with ordinary magnification the protoconch appears to be always quite smooth, while that of the closely related *M. gracilis* is strongly striate. On the general question of the value of the protoconch for genetic purposes I am inclined to agree with Dr. H. L. Kesteven, who states that there is a growing inclination to over-estimate its value (1905, p. 332). Another example will be referred to later in this section, where *Merelina ochroleuca* has a smooth protoconch, while the closely related *M. apicilirata* has a striated protoconch, yet these two species are, I should say, undoubtedly co-generic.

Both Hedley and May have had difficulty in assigning species to these two genera. For instance, Hedley places *novarensis* under *Merelina*, while May puts it under

Haurakia; on the other hand, *filocincta* is a *Haurakia* in Hedley's list and a *Merelina* in May's. A further complication arises by the use by Cotton of the genus *Linemara* of Finlay, the genotype of which is the New Zealand species *L. interrupta*. Of the New South Wales species, Cotton includes *filocincta* and *sculptilis* under *Linemara*. He remarks that it is distinguished from *Merelina* by a smooth, glossy and dome-shaped protoconch, and from *Haurakia* by the "tendency to a slight indentation and a stronger spiral rib near the suture". In view of what has already been said about the protoconch, this is not altogether satisfactory, and the latter character is altogether too slight for generic separation. The use of *Linemara* for Australian shells would therefore be better discontinued.

As a working basis and for the purpose of this paper, under *Merelina* are here classed heavy, elongate shells with thickened apertures and complete peristomes, while under *Haurakia* are broader, thinner shells, with the peristome interrupted, its inner margin reflected to produce an umbilical furrow or false umbilicus. Many of the species will be found to be between these two extremes, so that it is a matter of opinion under which they should be included; but the alternative would be to synonymize *Haurakia* under *Merelina* or to propose further new genera, a course I am reluctant to take without more data.

Merelina cheilostoma Ten.-Woods. (Fig. 13.)

Hedley 502; May 427.

This is a fairly common species on the outer beaches, and may be recognized by the extremely rugose sculpture and deeply indented sutures.

The specimen figured is from the Ocean Beach, Manly, its length 2·7 mm. We have also taken it from Port Stephens and from other beaches on the north and south coasts.

Merelina gracilis Angas. (Fig. 14.)

Hedley 503; May 429.

This species is found with the former on ocean beaches in many localities, and we have it from Port Stephens, Manly and Shellharbour. We have also taken it alive on seaweed at North Harbour within Port Jackson. The specimen figured is from this locality and is 2·6 mm. in length.

It is readily separated from *M. cheilostoma* by its less rugged sculpture and its strongly striated protoconch.

Merelina subreticulata, sp. nov. (Fig. 15.)

Shell conical, solid, yellow. Whorls 4½, including a 1½-whorled protoconch, which is globose and smooth. Whorls rounded, sutures deeply indented. Aperture ovate, not angled posteriorly. Peristome entire but reduced on the inner margin to a band of callus on the body whorl, where it is somewhat obscured by the overhang of the whorl. Outer lip rounded with a moderately thick varix. Sculpture on first mature whorl two keels, the upper the most prominent; on the next whorl three, and on the body whorl nine regular keels, more prominent above but persisting right to the base. The keels are overlaid by regular, transverse riblets, which rise to small protuberances where they cross the keels, but become obsolete on the lower part of the body whorl and the base. A slight umbilical furrow is caused by the reflection of the inner margin of the peristome anteriorly. Length 2·3 mm.

Localities.—6–9 fathoms, Sow and Pigs Reef (type); Ocean Beach, Manly.

This resembles *Rissoa apicilerata* Tate and May, a Tasmanian species, which has a less definite sculpture and a striated protoconch.

Merelina eminens, sp. nov. (Fig. 16.)

Shell small, colourless, translucent, solid, conical. Whorls 4½, including a 1½-whorled, smooth, globose protoconch. Later whorls rounded, sutures deeply impressed. Aperture

ovate, slightly angled posteriorly. Peristome entire, outer margin with thick varix, inner margin rounded. Sculpture on first adult whorl a few indistinct ribs, on the second two prominent keels, and on the body whorl seven keels, regularly spaced and persisting to the base. These are crossed by well-defined, prominent, transverse ribs, which rise to sharp protuberances where they cross the keels, producing a regular cancellation. There are about 14 ribs to a whorl. Length of figured specimen 2·2 mm.

Habitat.—Probably a sand-living type. Fairly common on Ocean Beach, Manly (type); also in shell sand from Port Stephens.

The nearest ally to this is *M. hulliana* Tate, a common Tasmanian species.

Merelina strangei Brazier. (Fig. 17.)

Hedley 505.

This is a fairly common species, characterized by its small size, broad form and prominent, rounded ribs. We have found it alive and abundant under rocks at Long Reef, the length of the specimen illustrated being 2 mm. Also from shell sand at Port Stephens.

Merelina ochroleuca Brazier. (Fig. 18.)

Proc. Linn. Soc. N.S.W., xix, 1894, p. 174, pl. 14, f. 12 (not 11).

Hedley 501.

Hedley in his check list synonymized Brazier's species under *australiae* of Frauenfeld (1867). This is a curious and very unusual mistake by Hedley, for Frauenfeld's species, with its excellent description and illustration, is a totally different shell, which is discussed elsewhere in this paper with a new generic title. May further added to the confusion by identifying still another shell as *australiae*. The Tasmanian shell will probably need a new name, but that is outside the scope of this paper.

Brazier's description of *ochroleuca* is good; it is sufficient to add that it has a 1½-whorled protoconch which is smooth and white. The type locality is Watson's Bay, Port Jackson. The species is not unlike *strangei*, but is narrower, the widely separated ribs are not so prominent, and the base is regularly and finely striate.

Habitat.—It is not uncommon alive under rocks at Long Reef, the specimen figured is 2 mm. in length, and the colour of the live specimens is a pale yellow.

Merelina apicilirata Tate and May. (Fig. 19.)

Proc. Linn. Soc. N.S.W., xxvi, 1901, pl. 26, f. 61.

In the absence of Tasmanian shells for comparison, this has been rather doubtfully identified with Tate and May's species. It is thus either a new record for New South Wales or, if it finally proves different, a new species. It generally resembles *M. ochroleuca*, but is larger and has a strongly striated protoconch.

Habitat.—Alive on seaweed in rock pools, North Harbour, Port Jackson. Length of specimen figured 2·5 mm.

Haurakia lucida, sp. nov. (Fig. 20.)

Shell small, conical, colourless, translucent. Whorls 4, the first dome-shaped, remainder slightly rounded, sutures indented. Aperture ovate, slightly angled posteriorly, peristome interrupted, reflected and expanded anteriorly, moderately thick. The first whorl is smooth, on the second regular transverse ribs appear, of about equal width to the furrows. On the third whorl the ribs cease just above the suture, where they are replaced by two spiral rounded ridges of about the same magnitude. On the body whorl the ribs number about 22, ceasing about the centre, being replaced on the lower half by regular spiral ridges which persist right to the base and continue inside the aperture. Length 2·2 mm.

Habitat.—Unknown, but probably living in sand in shallow water. Three specimens, including the type, were found in shell sand, Ocean Beach, Manly; two specimens from Shellharbour.

The interrupted peristome places this in *Haurakia*, from the other species of which it differs by its narrower form and distinctive sculpture.

Haurakia novarensis Frauenfeld. (Fig. 22.)

Hedley 504; May 412.

This handsome species is not uncommon on the outer beaches, and we have found it at Port Stephens, Manly Beach, Kurnell and Shellharbour. We have also dredged it in five fathoms in North Harbour, and procured one specimen alive on seaweed from four fathoms off Woollahra Point, Port Jackson. Length of specimen figured (Shellharbour), 2·5 mm. Hedley placed this species under *Merelina*, but on the limitations of generic characters here adopted it is a typical *Haurakia*, under which genus May included it in his check list. It is not unlike *H. strangei* in general characters, but is larger and has finer and more defined sculpture.

Haurakia descrepans Tate and May. (Fig. 23.)

Hedley 498; May 411.

Hedley (1908, p. 468) described this as a new species, *Rissoa incompleta*, but afterwards synonymized it with Tate and May's species. We have it from shell sand, Port Stephens, but it is not a common shell. The specimen figured is 2·5 mm. long. A ready recognition mark is the absence of sculpture on the base, and the wavy, spiral ridge cutting off the radial ridges on the body whorl.

Haurakia profundior Hedley. (Fig. 24, after Hedley.)

Hedley 499.

This is a deep-water species, the type locality 800 fathoms, 35 miles east of Sydney. Only deep-sea expeditions are likely to procure further specimens.

Haurakia filocincta Hedley and Petterd. (Fig. 25, after Hedley.)

Hedley 500; May 428.

This is another deep-water species, the type locality from 250–300 fathoms off Sydney. We have not yet taken it, though like some other species it may occur higher up on the continental shelf.

Haurakia sculptilis May. (Fig. 26, after Hedley.)

May 431.

Like *filocincta*, but with an extra whorl, rather narrower and with finer sculpture. Taken from 30–35 fathoms off Crookhaven (a new record for the State). Length 3 mm.

Haurakia praeda Hedley. (Fig. 27, after Hedley.)

Hedley 516.

Hedley included this under *Estea*, but from his figure and description it is a typical *Haurakia*. The type came from Middle Harbour, but we have not yet collected this species. It has the same abruptly terminated, transverse ridges as *H. descrepans*, but they are fewer and wider.

Genus **Lironoba** Iredale.

Iredale (1914) gives no generic characters at all for *Lironoba*, beyond that *Rissoa suteri*, a New Zealand species, is the genotype. For the purpose of this paper we are taking *Lironoba imbrex* Hedley as typical of the New South Wales species. *Lironoba* will therefore include solid, elongate shells, of moderate size, imperforate, with oval or ovate apertures, the peristome complete, but its inner margin sometimes obscured

by the overhang of the body whorl. The sculpture, as distinct from *Merelina*, is spiral only, and consists of prominent keels, varying from two or three to many. As with *Merelina* and *Haurakia*, the protoconch may be strongly lirate or smooth. In *L. imbrex* it is not only lirate, but is separated from the adult whorls by a distinct varix. *Lironoba* is essentially a deep-water genus. Only three species have so far been recorded off our coast but, as many more are found in Tasmania, it is to be expected that some of these or new species will yet be found on the continental shelf.

Lironoba imbrex Hedley. (Fig. 29.)

Hedley 507.

Readily recognized by its elongate form, strong double keel and striate protoconch, separated from the adult whorls by a strong varix. Type locality, Middle Harbour. We have dredged it from North Harbour, the figured specimen being 5 mm. long. We also have it from 6–9 fathoms, Sow and Pigs Reef, 15 fathoms between Port Jackson Heads, and from 30–35 fathoms off Crookhaven.

Lironoba praetornatilis Hedley. (Fig. 30.)

Hedley 508.

Like *imbrex*, but smaller, shorter and broader, the protoconch less strongly lirate with no varix. Type locality 35 fathoms off Broughton Island. We have it from 14 fathoms off Long Reef, the figured specimen 3 mm. in length, and from 30–35 fathoms off Crookhaven.

Lironoba hebes, sp. nov. (Fig. 28.)

Hedley 505, *Lironoba agnewi* Ten.-Woods.

Shell of moderate size, thinner than other members of the genus, pale yellow, conical. Whorls 5½, the first somewhat inflated, rounded, increasing regularly, sutures deeply impressed. Aperture rounded, peristome entire, somewhat thin, standing vertically on the inner margin producing a false umbilicus, expanded slightly anteriorly. Sculpture on the initial whorl obscure striae; on the second whorl four, on the third and fourth whorls five, and on the body whorl about 10 spiral, rounded keels, equally spaced and separated by narrower smooth furrows. The spiral sculpture persists right to the base. Length 4·5 mm.

Habitat.—Deeper water. Taken from 14 fathoms off Long Reef (type); 8–10 fathoms off Point Halliday; 15 fathoms between Heads, Port Jackson; 30–35 fathoms off Crookhaven.

This is No. 505, *Lironoba agnewi* Ten.-Woods., of Hedley's check list. He (1904, p. 184) records it from 100 fathoms off Wollongong. Hedley himself had doubts about the identification of this Tasmanian species, and submitted specimens to May, who, identifying it with *L. agnewi*, remarked that it had an extra whorl and blunter apex. These characters are constant in all our specimens, and as experience in this section of the Rissoidae shows that there is practically no variation of this nature in the various species, it must be removed from *L. agnewi* and given specific status.

Genus **Microfossa**, gen. nov.

Genotype, *Subanaea incidata* Frauenfeld.

Shell minute, brown, solid, conical, few-whorled, imperforate. Aperture sub-ovate, angled posteriorly, peristome entire, outer margin reflected, whorls slightly flattened, angled at the periphery, on which is a narrow but sharply defined channel. Operculum thick and horny and, as far as can be determined, spiral, the spirals few and rapidly expanding and crossed by wavy growth lines, the nucleus sub-marginal.

Allied to *Estea* and *Scrobs*, but differs from both by the shape of the aperture and by the distinct channel on the periphery of the body whorl.

Microfossa incidata Frauenfeld. (Fig. 21.)

Hedley 514.

This is a common weed-living species right along the coast, and we have found it alive on various species of algae in rock pools at Ballina, Yamba, Point Halliday, Long Reef, North Harbour and Huskisson; also in beds of the common mussel at Bottle and Glass Rocks, Port Jackson. The specimen figured is from Long Reef, 1·5 mm. in length.

Though included in *Estea* by Hedley, its distinctive shell characters are anomalous in an otherwise fairly uniform group, necessitating its generic separation. It is also recorded from Tasmania, May No. 445, but from the figure this is definitely not Frauenfeld's species and needs revision.

Genus **Estea** Iredale.

Once again Iredale gives no generic description, but mentions the following characters in discussion: "Aperture perpendicular, circular, peristome reflected all round." These characters fit very well the group of species included by both Hedley and May in their check lists. It might be added that they are all small to minute, solid, few-whorled, the sculpture varying from more or less irregular ribs to growth lines; or they may be quite smooth. Most of the species are brown, but there are some white or colourless shells of rather a different facies, whose relationship may be more apparent than real.

In May's check list one group of these is separated from *Estea* under *Dardanula* Iredale, the genotype of which is a New Zealand species, *Dardanula olivacea* Hutton (not *olivacea* Frauenfeld). Iredale gives no description, but Cotton (1944) gives details of both the shell and operculum, the salient points of which are smooth, flattened whorls and a sub-spiral, ovate operculum, with a long shelly process below the nucleus. The only New South Wales species he lists as *Dardanula* is *flammea*. I have so far been unable to extract and examine the operculum of *flammea*, and it is retained for the time being in *Estea*, but further information will probably justify not only its separation but also that of several closely allied species.

Estea olivacea Frauenfeld. (Fig. 31.)

Hedley 515; May 452.

This is identified from the original description, though our specimens are typically somewhat broader. The colour is pale to deep yellow-brown, and the sculpture is variable, the earlier whorls being quite smooth, with ribs developing only on the last two whorls, though these may also occasionally be nearly smooth.

It is one of our common species. We found it abundant, alive, under stones in North Harbour, the specimen figured 2 mm. in length; also at Huskisson and on the reclamations, Bay View, Pittwater.

Estea castella, sp. nov. (Fig. 32.)

Shell small, solid, conical, yellow. Whorls 4½, the first 1½ small and rounded, then rapidly expanding, somewhat flattened, sutures narrowly channelled. Aperture nearly circular, peristome entire and reflected all round. The first 1½ whorls are smooth, the first adult whorl with indistinct ribs, the penultimate and body whorls with three spiral, broad, rounded folds. These are crossed by regular, transverse ribs, which become obsolete as they cross the furrows, but are elevated into nodules on the folds, giving the whole a strongly granulated appearance. The base, except for one slight fold is smooth. Length 1·8 mm.

Habitat.—Deeper water. 30–35 fathoms off Crookhaven (type), 1 specimen; 6–9 fathoms, Sow and Pigs Reef, 4 specimens.

The spiral sculpture separates this from all other Australian Esteas, but in its absence it would not be unlike *E. olivacea.*

Estea salebrosa Frauenfeld. (Fig. 33.)

Hedley 519.

This can be identified very well from the original description and also from shells so labelled in the Australian Museum. The broad pyramidal shape and the few coarse ribs somewhat indented in the centre are good recognition marks. We have not taken this species alive. The specimen figured, length 2·2 mm., is from the reclamations, Bay View, Pittwater, and we also have it from 6–9 fathoms, Sow and Pigs Reef. The type locality is Sydney.

Estea jervisensis, sp. nov. (Fig. 34.)

Shell large for the genus, solid, broadly conical, brown, generally with a white band of varying width on the centre or base of the body whorl. Whorls 5, increasing evenly, slightly rounded, sutures impressed, generally marked by a white line. Aperture nearly round, peristome entire, reflected all round, but slightly more at the inner margin, where it is flattened and fused to the body whorl. The first two whorls are smooth, the remainder have numerous rounded, slightly oblique, transverse ribs, becoming obsolete on the base. Length 3·7 mm., width 2 mm.

Locality.—Abundant on the beach at Huskisson, Jervis Bay.

This is one of a group of species which centre round *E. olivacea* and *E. frauenfeldi.* The described differences are not great, but are very constant, and the species can be easily separated on comparison. *E. jervisensis* differs from *E. olivacea* by being nearly twice the size, broader, and with more numerous ribs. The same differences separate it from *E. frauenfeldi.* It also resembles *E. kershawi* Ten.-Woods, a Tasmanian species.

Estea pyramidata Hedley. (Fig. 35.)

Hedley 518.

This is a deep-water species characteristic of and abundant on the continental shelf. The type came from 54–59 fathoms off Wati Mooli, and Hedley records it from other localities. We have it from 30–35 fathoms off Crookhaven, the figured specimen 2·2 mm. long; 20 fathoms Shoalhaven Bight (mud); 60 fathoms off Botany; and 40 fathoms Twofold Bay.

The broad, pyramidal shape and peculiar striate protoconch are easy recognition marks. In his original description Hedley placed it under *Scrobs,* but in his check list removed it to *Estea.* Cotton returned it to *Scrobs,* but actually it fits neither genus, and ultimately I think will need a new generic name altogether.

Estea frauenfeldi Frauenfeld. (Fig. 36.)

Hedley 513.

The type locality is given as from the upper end of Sydney Harbour. It can be separated from *E. olivacea* by its larger size; it is slenderer, with a sub-sutural white band, and has fewer and more irregular ribs. These are often obsolete on all but the body whorl.

Habitat.—Alive under stones, North Harbour, the figured specimen 2·5 mm. long.

Estea tasmanica Ten.-Woods. (Fig. 37.)

May 457.

This is an addition to the New South Wales fauna. It may be considered the deep-water representative of *E. frauenfeldi,* but is slenderer, slightly larger, and of a chestnut colour rather than chocolate. The ribs, too, are practically obsolete and are replaced by fine growth lines—May says "faintly striate". We have it abundantly from 30–35 fathoms off Crookhaven, the figured specimen 2·8 mm.; also from 14 fathoms off Long Reef.

Estea albizona, sp. nov. (Fig. 38.)

Shell of medium size for the genus, solid, conical, somewhat tumid, brown to chestnut, with a well-marked, sharply defined, white, sub-sutural band. Whorls five, the first dome-shaped, the remainder slightly rounded, sutures hardly at all indented. Aperture rounded, evenly reflected all round. Practically smooth, the only sculpture faint, irregular, oblique growth lines, a few irregular transverse ribs sometimes present on the body whorl. Length 2·8 mm.

Habitat.—Found alive fairly abundantly on seaweed in rock pools at Point Halliday (type).

This is another of the *frauenfeldi* group and at first was considered but a variety of that species. In view of the constancy in shape and size of the Esteas, however, it has been separated as a distinct species. Its tumid shape, general smoothness and the unindented suture are good recognition points, also the sub-sutural white band is very distinct and sharply defined.

Estea narrabeenensis, sp. nov. (Fig. 39.)

Shell large for the genus, solid, conical, colour brown, slightly variegated with white. Whorls 5½, the first half-whorl flat, the next dome-shaped, remainder slightly rounded, sutures slightly indented. Aperture nearly circular, peristome entire, reflected all round, slightly flattened on the inner margin. The first 1½ whorls are smooth, the remainder are crossed by regular, rounded, somewhat oblique ribs, about 20 to the whorl, becoming obsolete on the base. Length 3·5 mm.

Habitat.—Alive on seaweed in rock pools, Long Reef (type).

This is another of the *frauenfeldi* group and is close to *E. jervisensis*, from which it differs by its narrow form and in the details of the sculpture. Both these species are larger than any of the other related species, each being 3·5 mm. or more in length.

Estea pulvilla Hedley. (Fig. 40.)

Hedley 517.

Agreeing very well with Hedley's description and figure, this species has been identified from the type locality, Manly Beach, from where the figured specimen is 2·5 mm. in length. We also have it from shell sand, Port Stephens, and from 15 fathoms off the Clarence River. It is to be noted that the two brown bands mentioned by Hedley are not always present, and most of the specimens collected, as well as those labelled *pulvilla* in the Australian Museum, are pure white.

Estea figula, sp. nov. (Fig. 41.)

Shell of medium size for the genus, solid, conical, elongate, white to pale yellow, shiny with a translucent sub-sutural band. Whorls 5½, initially rather globose, the remainder slightly rounded, sutures moderately indented. Aperture sub-circular, peristome entire, slightly reflected on outer margin, but widely reflected on inner anterior margin and narrowed and straightened where fused onto the body-whorl. Sculpture smooth except for a few faint growth lines, the surface porcellaneous and shining. Length 2·6 mm.

Localities.—A number of specimens, including type, were picked out from unsorted material collected by Mr. Roy Bell from 15–25 fathoms, Twofold Bay.

This was at first thought to be *E. obeliscus* May, but that species has two more whorls and a more tumid protoconch.

Estea perpolita May. (Fig. 42.)

May 453.

One specimen, 1·8 mm. in length, was picked out from unsorted material collected by Mr. Roy Bell from 40–50 fathoms, Twofold Bay. The main characteristics are the

tumid protoconch and highly porcellaneous surface. This is a new record for the State, but must be considered tentative, as more material may show that it is a new species. True *perpolata* has a more flattened protoconch than the one here recorded.

Estea gemma, sp. nov. (Fig. 43.)

Shell minute, cylindrical, elongate, deep chocolate, with a resplendent, highly polished surface. Whorls 5, the first flattened and small, the second rapidly increasing, the remainder rounded, sutures moderately impressed. Aperture round, expanded, peristome entire, greatly reflected anteriorly. There is no sculpture, the surface being quite smooth and very highly polished. Length 1·5 mm.

Habitat.—Alive on seaweed in channels exposed to the inrush of the surf. Abundant at Crookhaven Heads (type); Brunswick Heads; Shellharbour. Specimens have been found on beaches in intermediate localities, but dead specimens are paler and much less resplendent.

This beautiful little species is quite unlike others of this genus. It can be readily distinguished by its slender form, expanded aperture, and the brilliance of its lustre.

Estea gregaria, sp. nov. (Fig. 44.)

Shell minute, the smallest of the genus, short and broad, fairly solid, uniformly deep brown. Whorls 4, the first small and dome-shaped, the remainder rapidly increasing, rounded, sutures hardly indented, body whorl inflated. Aperture round, peristome entire, evenly reflected all round. Sculpture almost absent, consisting of a few faint growth lines, the surface otherwise smooth, slightly shining, and in living specimens slightly translucent. Length 0·8 to 0·9 mm.

Habitat.—Abundant, living in many locations; under stones in rock pools, North Harbour (type), and at Long Reef; on seaweed at North Harbour and Point Halliday, and in mussel beds at Bottle and Glass Rocks. Also dredged from 6–9 fathoms off Sow and Pigs Reef.

This is a well-defined and constant little species, not easily confused with any other *Estea*. It is readily distinguished by its minute size and by its inflated and broadly oval silhouette.

Estea alvea, sp. nov. (Fig. 45.)

Shell minute, solid, cylindrical, yellow. Whorls 4, the first flattened and small, the next much larger, and the penultimate and body whorl nearly the same size, giving the whole shell a characteristic contour. Aperture sub-circular and expanded, peristome entire, evenly reflected all round. There is no sculpture and the shell surface is slightly lustrous. Length 0·9 mm.

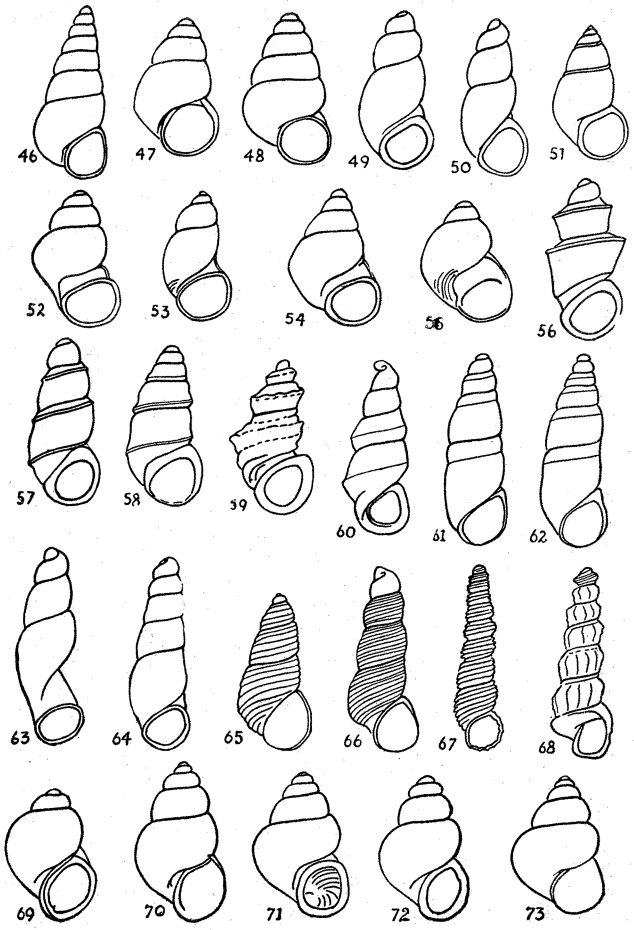
Locality.—6–9 fathoms, Sow and Pigs Reef (type), two specimens; also from dredgings in North Harbour.

Again the minute size is a distinguishing character, as is also the curious beehive-like contour. Though only a few specimens have been noted to date, it is probably not as rare as it seems. It is inconspicuous and can readily be overlooked.

Estea bicolor Petterd. (Fig. 46.)

Hedley 511; May 441.

The largest of the genus, can be readily recognized by the sub-sutural, white band, flattened whorls, long spire (6½ whorls), and ovate mouth. A deep-water species, we have dredged it in 15 fathoms between the Heads, Port Jackson, on a sandy bottom; the figured specimen from this locality 5 mm. in length. We also have it from 30–35 fathoms off Crookhaven, and it is not uncommon in other localities on the continental shelf.



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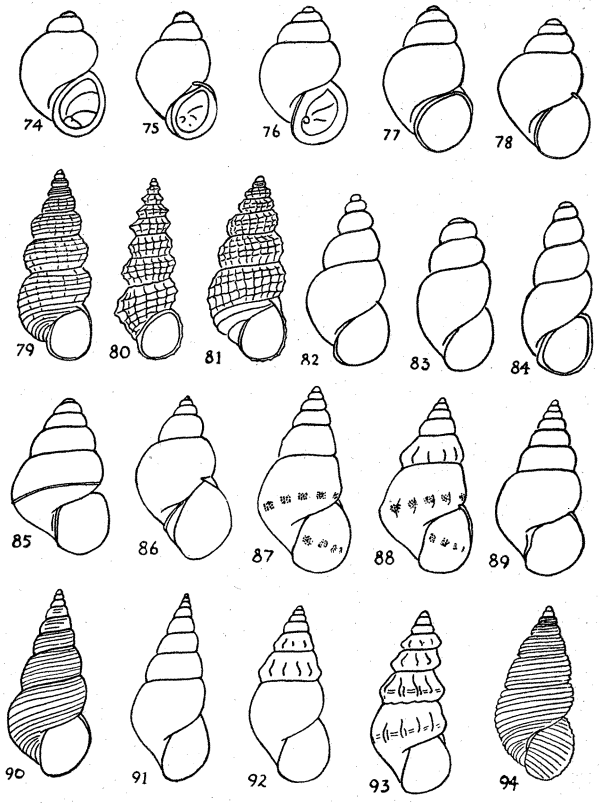

Figures 74-94.

Estea flammea Frauenfeld. (Fig. 47.)

Hedley 512; May 438.

The type locality is Botany Bay, but it is abundant right down the coast, living on seaweed in the rock pools. Alive it is a bright red colour, but partly faded dead specimens are variegated with white. The figured specimen, 2·2 mm. long, is from seaweed at Point Halliday, and other specimens come from North Harbour, Jervis Bay, etc.

May included this under *Dardanula* Iredale. As Iredale gives no generic characters at all for *Dardanula*, I can offer no opinion on its validity, but am following Hedley in its allocation to *Estea*.

Estea erratica May. (Fig. 48.)

May 437.

This is a new record for New South Wales. Specimens were found in shell sand, Ocean Beach, Manly, the figured specimen 1·8 mm. long. The species is like *flammea*, but white, the whorls more compressed, and there is an extra whorl, making 5 in the same length. May includes this under *Dardanula*, and it is certainly co-generic with *flammea*, and these two species, whatever genus they are discussed under, must be kept together.

Genus **Scrobs** Watson.

Under *Scrobs* are included Australian shells which have the same general character as *Estea*, but differ in the details of the aperture. The peristome is entire as in *Estea*, but owing to a tendency of the shell to become uncoiled there is a channel between it and the body whorl. The inner margin of the aperture is also generally flat. The width and shape of the channel are a good guide for specific determination. It may be reduced to a narrow slit, it may be widened at either end, or it may be broad and pit-like with ridges at either end connecting the peristome to the body whorl. In extreme cases the peristome may disappear on the inner margin and be replaced by a shelf within the aperture. The curious little shell called *Epigrus protractus* by Hedley, which is later discussed under the new generic name *Saltatrix*, shows certain affinities with *Scrobs* and may possibly represent the ultimate development of this type of aperture.

Scrobs scrobiculator Watson. (Fig. 49.)

Hedley 528.

This is the genotype of *Scrobs* and excellently represents the main characters of the genus. The channel flanking the aperture is narrow but deep, and widens slightly

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Figures 46-73.

46, *Estea bicolor* Petterd. 47, *E. flammea* Frauenfeld. 48, *E. erratica* May. 49, *Scrobs scrobiculator* Watson. 50, *S. petterdi* Brazier. 51, *S. vincula* Laseron. 52, *S. jacksoni* Brazier. 53, *S. delta* Laseron. 54, *S. pyramis* Laseron. 55, *S. pluteus* Laseron. 56, *Anabathron contabulatum* Frauenfeld. 57, *A. lene* Hedley. 58, *A. nothus* Laseron. 59, *A. emblematicum* Hedley. 60, *A. semicinctus* May. 61, *Epigrus dissimilis* Watson. 62, *E. cylindricus* Ten.-Woods. 63, *Saltatrix protractus* Hedley. 64, *Epigrus badius* Petterd. 65, *Microdryas australiae* Frauenfeld. 66, *M. elongata* Laseron. 67, *Attenuata integella* Hedley. 68, *Coenaculum minutula* Tate and May. 69, *Notosetia fulva* Laseron. 70, *N. procincta* Hedley. 71, *N. nitens* Frauenfeld. 72, *N. pellucida* Laseron. 73, *N. simillima* May.

Figures 74-94.

74, *Notosetia fusca* Laseron. 75, *N. aethiopia* Laseron. 76, *N. galbinia* Laseron. 77, *N. atropurpurea* Frauenfeld. 78, *N. castanea* Laseron. 79, *Obtortio lutosus* Hedley. 80, *O. jacksonensis* Laseron. 81, *O. reticulata* Laseron. 82, *Rissopsis puniceus* Laseron. 83, *R. brevis* May. 84, *Paranoba subquadrata* Laseron. 85, *Cithna angulata* Hedley. 86, *Laevilitorina mariae* Ten.-Woods. 87, *Diala phasianella* Angas. 88, *D. phasianella* Angas (*monile* variation). 89, *D. translucida* Hedley. 90, *D. lirata* Laseron. 91, *D. lauta* Adams. 92, *D. lauta* Adams (*monile* variation). 93, *D. lauta* Adams (*monile* variation). 94, *Laevitesta scobina* Laseron.

at the posterior end. We have not taken it alive but, like other species of the group, it probably lives on seaweed. The colour of the dead specimens is brownish-yellow. It is abundant on the reclamations at Bay View, Pittwater, the figured specimen 1·8 mm. in length; and also from dredgings from 6–9 fathoms, Sow and Pigs Reef.

Scrobs petterdi Brazier. (Fig. 50.)

Hedley 527; May 468.

Like *S. scrobiculator*, but smaller, narrower, and the channel reduced to a thin, straight crack. Alive on seaweed in the rock pools at North Harbour, the figured specimen 1·2 mm. in length; also under rocks in the same locality; and on seaweed, Crookhaven Heads. Colour of living specimens, deep brown-red.

Scrobs vincula, sp. nov. (Fig. 51.)

Shell minute, solid, conical, deep brown-red. Whorls 4½, the first 1½ dome-shaped, remainder increasing regularly, rather flattened. Aperture sub-circular, expanded, slightly angled posteriorly. Peristome entire, reflected all round, flattened transversely on inner margin, the channel reduced to a mere line. There is no sculpture, except a slight, rounded keel immediately above the sutures, which are barely indented. Length 1·6 mm.

Habitat.—Alive on seaweed, rock pools, North Harbour (type).

This is rather doubtfully referred to *Scrobs*. The flattened inner margin of the peristome keeps it in *Scrobs*, but the channel is practically non-existent, which suggests *Estea*. The narrow keel just above the suture again suggests *Anabathron*, and it is possible that relationship lies somewhere between the three genera.

Scrobs jacksoni Brazier. (Fig. 52.)

Hedley 526; May 466.

We have not taken this alive, but it is abundant in dredgings, 6–9 fathoms, Sow and Pigs Reef, the figured specimen 1·7 mm. in length. It is also abundant on the Ocean Beach, Manly. The colour of dead specimens is amber. It can be recognized by the broad, trough-shaped channel, which is enclosed by ridges both anteriorly and posteriorly connecting the peristome to the body whorl.

Scrobs delta, sp. nov. (Fig. 53.)

Shell minute, solid, conical, red-brown, shining. Whorls 4, the first small, then increasing rapidly, the body whorl elongated, slightly rounded, the sutures moderately impressed. Aperture semi-circular, peristome complete, reflected and expanded on outer margin, the inner margin slightly curved. The channel is well marked and trough-like, as in *S. jacksoni*, but is narrow anteriorly and widened greatly at its posterior end, where it is enclosed by a ridge connecting the peristome to the body whorl. The only sculpture consists of a few faint spiral lines right at the base. The surface of the shell is polished and shiny. Length 1·2 mm.

Habitat.—Alive under stones in rock pools, Long Reef (type); also under stones and on seaweed, North Harbour; and in mussel beds, Bottle and Glass Rocks.

It is closely related to *S. jacksoni*, from which it is readily separated by the delta-shaped channel, smaller size and much narrower form.

Scrobs pyramis, sp. nov. (Fig. 54.)

Shell comparatively large for the genus, pyramidal in contour, solid, pale yellow to amber in dead specimens. Whorls five, the first very small, increasing regularly, flattened, sutures barely indented. Aperture semi-circular, peristome complete, slightly curved on inner margin. Channel wide and trough-like, slightly broader at posterior end, where it is enclosed by a ridge connecting the peristome to the body whorl. There is no sculpture and the surface is smooth and shining. Length 2 mm.

Locality.—We have not found this alive, but it is not uncommon on the Ocean Beach, Manly (type).

This is also related to both *S. delta* and *S. jacksoni*, from both of which it can be readily distinguished by its pyramidal form and in the details of the aperture.

Scrobs pluteus, sp. nov. (Fig. 55.)

Shell minute, solid, broadly conical, reddish-brown, base white. Whorls three, the first dome-shaped, others rounded, body whorl inflated, sutures indented. Aperture greatly expanded, outer margin rounded and reflected, peristome obsolete on inner margin, being replaced by a broad, flat shelf, with a thin, curved edge, well within the aperture. This shelf is enclosed on either side by ridges joining the peristome to the body whorl. Sculpture absent, except for a few well-marked radial striae right on the base. The smallest of the group, length 1 mm.

Locality.—6–9 fathoms, Sow and Pigs Reef (type), three specimens.

This extraordinary little shell is quite unlike any other Australian rissoid and can be readily recognized by the peculiar structure of the aperture. This almost justifies generic separation, but I think it may well represent an extreme phase in the development of the typical *Scrobs* channel. If, for example, the inner portion of the peristome of *S. jacksoni* became obsolete, the bottom of the channel would remain as a shelf within the aperture, similar to this species. It is thus retained in *Scrobs*, the other species of which it closely resembles in general facies.

Genus **Anabathron** Frauenfeld.

The genotype is *A. contabulatum*. The group seems a natural one and includes small, solid shells, imperforate, with rounded apertures, the peristome complete and either thickened or reflected, thus recalling *Estea*, from which it differs by the possession of one or more prominent spiral keels, giving a marked angularity to the whorls.

Anabathron contabulatum Frauenfeld. (Fig. 56.)

Hedley 520; May 461.

This species is easily recognized by the extreme angularity of the whorls. The colour is very deep, a reddish-brown, almost black at times in living specimens. We have found it alive on seaweed in rock pools at Shellharbour, the figured specimen 1·2 mm. in length; also on seaweed at North Harbour; and in shell sand on the ocean beaches right along the coast.

Anabathron lene Hedley. (Fig. 57.)

Hedley 520A; May 461.

Frauenfeld (1867) originally figured this species as a variety of *A. contabulatum*, and Hedley gave it the varietal name of *lene* in his check list, May following the same procedure in the Tasmanian list. Having collected it alive in quantity from numerous localities, and after repeated comparisons of large series, there can be no doubt that it is a distinct and constant species and that there is no gradation between it and *contabulatum*. The much less angularity of whorls is the chief difference, but the apex is more inflated and generally it is a narrower shell. The colour also differs constantly; it is bright red, much lighter than *contabulatum*, and when together they can be readily sorted by this means alone. It is more abundant than *contabulatum*, and we have found it alive under stones at Long Reef, the figured specimen 1·3 mm. in length; also on seaweed in rock pools at North Harbour and Shellharbour; and at other localities right along the coast.

Anabathron nothus, sp. nov. (Fig. 58.)

Shell comparatively large, solid, conical, deep brown. Whorls five, the first rounded, increasing regularly, flattened, sutures moderately impressed. Aperture sub-circular,

expanded, peristome entire, reflected all round, slightly flattened on inner margin. The sculpture consists of two widely separate keels, the uppermost just below the suture, not prominent and little more than a rounded swelling, the lower narrower, rounded and higher, making it more conspicuous and giving a slight angularity to the body whorl. The whorls are crossed by faint, rather irregular and oblique growth lines. Length 2 mm.

Habitat.—Alive on seaweed, Point Halliday, one specimen (type); and under stones, North Harbour, two specimens.

This is placed with some doubt under *Anabathron*. In one way or another it combines the characters of several genera, *Anabathron*, *Estea* and *Scrobs*. It is very close in many ways to *Scrobs vincula*, than which it is larger and with well-defined keeling. Both species are on the borderline, probably closely related, but the one verges towards *Anabathron*, the other towards *Scrobs*.

Anabathron emblematicum Hedley. (Fig. 59.)

Hedley 521.

This species is not unlike *contabulatum*, but the prominent keel is medially placed and is crossed by irregular, transverse ribs, which may become obsolete, except where they cross the keel, where they appear as irregular undulations. We have not found this species alive, but it is not uncommon on the ocean beaches at Port Stephens, the figured specimen 2 mm. in length; and on the Ocean Beach at Manly. The colour of the dead specimens is yellow.

Anabathron semicinctus May. (Fig. 60.)

May 465.

This is a new record for the State. Two specimens were sorted from mud from 30–35 fathoms off Crookhaven, the one figured 1·8 mm. in length. May described this species as an *Epigrus*, but the characters of the aperture and the keeling preclude this and bring it within the suggested limits of *Anabathron*. The curious tilted protoconch is a distinguishing feature, and probably it would be better placed in a new genus, though I think further knowledge is desirable before this step is taken.

Genus **Epigrus** Hedley.

Hedley's original description reads: "Shell tall, slender, smooth, cylindrical. Aperture oblique, appressed; apex large, often protuberant." To this might be added that the genotype is colourless and translucent. It is probable that the question of shell texture in shells of simple type will ultimately be found to be of considerable generic importance.

Epigrus cylindricus Ten.-Woods. (Fig. 62.)

Hedley 523; May 463.

This is a deep-water species and we have it fairly abundantly from 18 fathoms off North Head, Port Jackson, the figured specimen 5 mm. in length; from 14 fathoms off Long Reef; and from 15 fathoms off the Clarence River.

Epigrus dissimilis Watson. (Fig. 61.)

Hedley 524; May 464.

This very closely resembles *E. cylindricus*, but is little more than half the size, the figured specimen from 6–9 fathoms off Sow and Pigs Reef being 3 mm. in length; there are only four whorls as against five in *cylindricus*, and the inner margin of the aperture is slightly more transverse. We have it also from 15 fathoms off the Clarence River.

Epigrus badius Petterd. (Fig. 64.)

Hedley 522; May 462.

Though Hedley included this species in *Epigrus*, it has many points in common with *Scrobs*, also with the curious *Epigrus protractus*, which is now separated under the new generic name *Saltatrix*. It is a small shell, the figured specimen from 6–9 fathoms, Sow and Pigs Reef, 2·2 mm. in length, with the long cylindrical shape of *Epigrus* but with the peristome entire, its inner margin separate from the body whorl. The apex is bulbous and, though the shell substance is sub-translucent, it is pale brown, not colourless as in the typical *Epigrus*. Its exact generic position is doubtful and it could logically come under *Scrobs* or even *Saltatrix*.

Genus **Saltatrix**, gen. nov.

Genotype, *Epigrus protractus* Hedley.

Minute, cylindrical, elongate, few-whorled, becoming uncoiled in the later stages, imperforate, the aperture oval, peristome entire and flattened, reflected all round.

Saltatrix protractus Hedley. (Fig. 63.)

Hedley 525.

This curious little shell, known to collectors as "The Dancing Lady", is so unlike other rissoids that it has been considered best to give it a new generic name. The uncoiling of the last whorl is characteristic, also its elongation in the line of the spire, as is also the oval mouth. The figured specimen is from 6–9 fathoms, Sow and Pigs Reef, and is 1·2 mm. in length. We also have it from the mud flats, North Harbour. The colour is pale brown and the shell substance sub-translucent.

Genus **Microdryas**, gen. nov.

Genotype, *Cingula australiae* Frauenfeld.

Shell minute, conical to cylindrical, few-whorled, imperforate, colourless and translucent, sculpture numerous fine, parallel, spiral, incised lines. Aperture ovate, expanded, angled posteriorly. Peristome entire, but thin on inner margin.

Microdryas australiae Frauenfeld. (Fig. 65.)

Novara Exped., Moll., 1867, p. 14, pl. 2, fig. 23.

Hedley 501.

This curious little species has been much confused in Australian literature. Hedley included it under *Merelina* in his check list and excluded Brazier's *ochroleuca* as a synonym. Elsewhere in this paper *ochroleuca* has been restored, for it is nothing like Frauenfeld's description or figure. The type locality is given as "Sidney", but it is evidently not a common species, for it has not since been seen from Port Jackson. We have, however, found three specimens in shell sand from Port Stephens, the figured one 1·4 mm. in length; and one from Cronulla. All of these agree very well with Frauenfeld, and this is evidently the long-debated species. As Frauenfeld's paper is not generally accessible, a liberal translation of his description, combining the Latin and the German, is here given as follows: Shell pointed conical, shiny, horn-coloured (?), matte, slightly translucent, 6 whorls loosely arched, sutures scarcely indented, on upper one 4, on last 7 spiral lines equi-distant, fine and strongly incised. Mouth one-third of entire height, oval, on top slightly angular, rounded below, margin blunt but not specially thickened. Length 2·4 mm., width 1·1 mm.

It has been very difficult to assign this species to any known Australian genus, and it has been necessary to propose a new one for its reception. *Epigrus iravadiodes* Gabriel and Gatcliffe should also be transferred to *Microdryas*. It may possibly be a synonym of *australiae*.

Microdryas elongata, sp. nov. (Fig. 66.)

Shell small, cylindrical, elongate, colourless and translucent, texture glassy. Aperture ovate, expanded, particularly anteriorly, where it extends well beyond the body whorl. Peristome entire but thin. Whorls 4½, the first 1½ inflated and smooth, the remainder rounded, sutures impressed. The body bends in very sharply to meet the aperture, giving a characteristic contour. The sculpture on the last three whorls consists of very numerous, fine, distinctly incised, equi-distant, spiral lines. Length 1·8 mm.

Locality.—Two specimens from shell sand at Narrabeen (type).

This species fits in fairly well with the generic characters assigned to *Microdryas*, and in texture and sculpture resembles *M. australiae.* It is, however, larger, more elongate, the aperture is more expanded anteriorly, and the apex is much larger and more inflated.

Genus **Attenuata** Hedley.

Genotype, *A. integella* Hedley.

"Shell tall, slender, cylindrical, thin, colourless and translucent, many whorled. Aperture sub-circular, peristome complete, inner lip reflected over an umbilical furrow. Sculpture, numerous, sharp, spiral, parallel keels."

From this description *Attenuata* may be separated from *Microdryas* by the much greater number of whorls and by the nature of the aperture.

Attenuata integella Hedley. (Fig. 67, after Hedley.)

Hedley, Proc. Linn. Soc. N.S.W., xxix, 1904, p. 185, pl. 9, f. 20.

The type locality is 100 fathoms, 16 miles east of Wollongong. We have not yet obtained this species, which is apparently confined to very deep water.

Genus **Coenaculum** Iredale.

Genotype, *Attenuata minutula* Tate and May.

Iredale (1924, p. 245) separated this generically from *Attenuata* and considers it does not belong to the Rissoidae at all. Tate and May originally placed the type species in *Scalaria.* There are many odd species of gasteropods whose generic determination at present is largely a matter of guesswork, and until something is known of their anatomy and life history their systematic position must remain in abeyance. Iredale does not give any generic description, but for future reference the following characters may be noted. Shell minute, elongate, with angular whorls and strong transverse sculpture. Aperture sub-circular, expanded, peristome interrupted, outer margin reflected. Apex keeled and lirate.

Coenaculum minutula Tate and May. (Fig. 68.)

Hedley 510; May 425.

This species occurs in shell sand in various localities along the coast, though we have not seen it alive. The figured specimen, 2·4 mm. in length, comes from Port Stephens.

Genus **Subonoba** Iredale.

Subonoba bassiana Hedley.

Hedley, Zool. Results "Endeavour", 1, 1911, p. 108, pl. 19, f. 25.

Iredale (1924, p. 244) records this Tasmanian species from 50–70 fathoms off Green Cape, at the same time introducing the new generic name *Botellus.* He gives no generic characters for *Botellus*, nor indeed for his other genus, *Subonoba*, but only remarks that "the circular mouth separates this group from any other of the Austral rissoid series". Under the circumstances it would seem well that either *Botellus* be

rejected or at least held in abeyance until some generic characters can be specified. I have not yet seen this species, so for the moment it is retained in the New South Wales list without further comment.

Genus **Notosetia** Iredale.

This is another of Iredale's genera for which no generic characters at all are stated, the only information given being that the type is *Barleira neozelandica* and that it covers a heterogeneous assembly. Hedley used the genus in his check list, and as far as possible we have followed his interpretation, though some revision has been found necessary.

Included under *Notosetia* are small to minute shells, mostly living on algae, with few rounded whorls, the body whorl large and inflated, thin, shell substance varying from an eggshell to a vitreous texture, generally white or with yellow bands, but some species coloured from yellow to purple. Aperture sub-circular, peristome incomplete, inner margin reflected over columella producing an umbilical furrow. Operculum horny, sometimes white and transparent.

In view of the large number of species here proposed, a certain amount of criticism may be anticipated. The simple nature of the shell makes it difficult to find strong shell characters on which to base specific descriptions; moreover, many of the species are very close to each other, so much so that much beach material will always be unidentifiable. It is only by collecting long series of living specimens and by sorting beneath the microscope that the differences can be seen, and it is then surprising how constant, though small, these differences are and how readily the various species can be separated.

It may be noted that with the minute species colour is a very useful first guide in sorting, either the colour of the shell itself or of the animal showing through the transparent whorls.

Notosetia fulva, sp. nov. (Fig. 69.)

Shell minute, thin, horny, deep yellow-brown, translucent. Whorls three, the first small and dome-shaped, the others rapidly expanding, rounded, sutures deeply impressed. Body whorl very large and inflated. Aperture large, expanded, peristome incomplete, rounded and thin on outer margin, reflected anteriorly over the columella, inner margin curved. There is no sculpture and the surface is smooth and shining. Operculum horny, details not ascertainable, but nucleus apparently sub-marginal. Length 1 mm.

Habitat.—Alive under stones at Long Reef (type); also in Galiolaria tubes, North Harbour.

The minute size and colour are good recognition points. In general form this species greatly resembles *N. fusca*, described below, with which it is associated in North Harbour, but, while the differences are not great, the colour enables them to be readily sorted.

Notosetia procincta Hedley. (Fig. 70.)

Hedley 531.

The largest of the group, the figured specimen from Ocean Beach, Manly, 2·5 mm. in length. It is not uncommon on ocean beaches right along the coast. Two pale yellow bands are a good recognition point, but these are not always present and fade rapidly on beach-worn specimens. We have not seen this species alive.

Notosetia nitens Frauenfeld. (Fig. 71.)

Hedley 530; May 470.

This species resembles the last one, but is smaller, the figured specimen, found alive on algae (*Graciolaria* sp.), being 2 mm. in length. It is also relatively broader.

The two brown bands mentioned by Frauenfeld are very faint and are sometimes absent. The operculum is horny, pauci-spiral, and crossed with numerous growth lines. We have also found it alive in mussel beds on the Bottle and Glass Rocks.

Notosetia pellucida, sp. nov. (Fig. 72.)

Shell minute, thin, smooth, colourless, glassy and transparent. Whorls 4, the first dome-shaped, remainder rounded, sutures deeply impressed. Aperture sub-circular, peristome thin, outer margin rounded, inner margin arched, reflected over the columella, producing an umbilical fold, expanded anteriorly. There is no trace of any sculpture. Operculum thin and horny, apparently smooth, but details could not be observed. Length 1·5 mm.

Habitat.—Alive on algae, North Harbour, fairly common.

This is very like the two preceding species, but is again smaller and differs in details of contour and aperture that can be better seen in the figures than by description.

Notosetia simillima May. (Fig. 73.)

May 473.

A pure white shell, the texture varying from white and opaque to an alternation of transverse opaque and translucent bands. This is very close to *N. nitens* and was at first thought to be a variety. May in his check list also expresses the same doubt. But *simillima* possesses an extra whorl, five against four in *nitens*, and the differences, being constant over such a distance, warrant the retention of the species. This is a new record for New South Wales. We found it abundantly on the reclamations at Bayview, Pittwater, the figured specimen 2 mm. in length; also on the reclamation at The Spit, Middle Harbour.

Notosetia fusca, sp. nov. (Fig. 74.)

Shell minute, thin and translucent, horny, deep brown. Whorls three, the first dome-shaped, the others rounded, body whorl comparatively very large and inflated, sutures deeply impressed. Aperture sub-circular, angled posteriorly, expanded posteriorly, peristome thin, reflected over the columella, umbilical furrow fairly deep. There is no sculpture except faint growth lines, and the surface is smooth and shiny. The operculum is comparatively thick, horny, and transparent, but appears white and stony from the attaching muscle, its details as far as can be detected as in the illustration. Length 0·8 mm., but some specimens are slightly larger.

Habitat.—Alive on seaweed, North Harbour (type); also on weed at Yamba on the north coast; and in *Galeolaria* tubes, North Harbour associated with *Notosetia fulva*.

Very close to *N. fulva*, but separable by the colour, which, though not great, is quite distinctive; also by minor differences of contour and aperture.

Notosetia aethiopia, sp. nov. (Fig. 75.)

Shell minute, thin, horny and sub-translucent, very deep, blackish-brown. Whorls three, the first dome-shaped, the others rounded, body whorl inflated but less than in *N. fusca*, sutures impressed. Aperture broadly ovate, slightly angled posteriorly, peristome thin, reflected over the columella, expanded posteriorly. Sculpture very faint growth lines, surface shiny. Operculum similar to *N. fusca*. Length 1·2 mm.

Habitat.—Alive in abundance in *Galeolaria* tubes between tide marks, North Harbour (type), and in mussel beds, Bottle and Glass Rocks.

This species is very close to *N. fusca*, but can be readily separated by its deeper colour, which is almost black. It is also narrower, the second whorl is relatively much larger, and the body whorl less inflated.

Notosetia galbinia, sp. nov. (Fig. 76.)

Shell minute, thin, glassy and sub-translucent, pale yellowish. Whorls four, the first dome-shaped, remainder rounded, body whorl moderately inflated, sutures impressed. Aperture ovate, expanded, peristome thin, rounded on outer margin, inner margin nearly vertical and strongly reflected back over the columella, expanded anteriorly. Umbilical slit narrow and well defined. There is no sculpture and the surface is smooth and shining. Operculum similar to that of *N. fusca*. Length 1·5 mm.

Habitat.—Alive in seaweed, North Harbour (type); also on seaweed at Long Reef.

This is somewhat larger than either of the two preceding species, it has an extra whorl, differs in details of the aperture, and can be readily sorted by the pale yellowish colour.

Notosetia atropurpurea Frauenfeld. (Fig. 77.)

Hedley 529.

This species is allied to *N. fusca* and the preceding species, but can be readily recognized by its purple colour and white apex. Again there are small but constant differences in contour and aperture. We found a few specimens living on seaweed at Shellharbour, but the operculum was so far retracted as to be practically invisible. It was abundant in dredgings from 6–9 fathoms, Sow and Pigs Reef, the figured specimen 1·3 mm. in length; and also from the reclamation at Bayview, Pittwater.

Notosetia castanea, sp. nov. (Fig. 78.)

Shell minute, thin, sub-translucent, colour bright chestnut. Whorls four, the first dome-shaped, remainder rounded, body whorl inflated, sutures deeply impressed. Aperture ovate, angled posteriorly, expanded anteriorly, peristome thin, rounded on outer margin, reflected over the columella on inner margin, umbilical furrow deep. There is no sculpture and the surface is smooth and lustrous. Operculum retracted too far to be visible. Length 1·1 mm.

Habitat.—Living in *Galeolaria* tubes, North Harbour (type).

Once again the colour is a useful guide to identification, but as with the other species of this group, small differences of contour and the aperture are constant.

Genus **Obtortio** Hedley.

Under *Obtortio* are included elongate, many-whorled shells, with small apices and strong sculpture, both spiral and transverse. The former may predominate or the sculpture may be strongly cancellate. There is a tendency for the median whorls to increase rapidly, with but little subsequent increase to the body-whorl, so that the whole shell appears to bulge somewhat in the centre. The peristome is incomplete and rather thin. Some species are not unlike *Bittium* in appearance, but of course have no anterior canal.

The systematic position of *Obtortio* is still very obscure. Hedley originally included it in the Pyramidellidae, but later transferred it to the Rissoidae. Within the present more restricted limits of this family it hardly seems in place, but it is difficult to suggest other relationship. Further investigation will possibly show that it should be placed in a family by itself.

Obtortio lutosus Hedley. (Fig. 79.)

Hedley 545.

This is a very distinctive species, easily recognized from the figure. We have dredged it in six fathoms, North Harbour, the figured specimen 3·8 mm. in length; and it also occurs in the reclamations at Bayview, Pittwater.

Obtortio jacksonensis, sp. nov. (Fig. 80.)

Shell elongate, cylindrical, grey-white. Whorls on the type 9, though a specimen from North Harbour has 10, the first very small, the second much larger, the next four increasing more rapidly than the later whorls, which are nearly uniform in size. Sutures deeply impressed. The first two whorls are smooth and rounded; on the third there is a single sharp keel; on the fourth to the seventh there are two keels; on the penultimate there is a third keel; and on the body whorl four, which are subequal with smaller subsidiary keels persisting on the base. The keels throughout are crossed by well-defined, transverse ridges, about 15 on the body whorl, which do not, however, persist on to the base. Where the transverse ridges cross the keels they rise into rather sharp, elevated points, which give a rugose appearance to the whole shell. Aperture broadly ovate, slightly angled posteriorly, somewhat produced anteriorly. Outer margin thin, inner margin slightly reflected and thickened, peristome incomplete. Length of specimen figured 4 mm., but specimen from North Harbour with extra whorl 5 mm.

Localities.—Port Jackson: 18 fathoms off North Head (type), fairly abundant; North Harbour, 5 fathoms, one specimen.

This species is not unlike *O. vulnerata* Hedley (1909, p. 439), from the Hope Islands, North Queensland, but differs chiefly in the fewer and more pronounced keels and the sharper sculpture.

Obtortio reticulata, sp. nov. (Fig. 81.)

Shell elongate, solid, colour of dead specimens dull buff. Whorls 8, including a small, smooth, 2-whorled protoconch. Remainder rounded, the third adult whorl much larger than the preceding, the last two not increasing proportionately, giving a bulging appearance to the shell. Sutures deeply impressed. Aperture ovate, angled posteriorly, peristome thin, expanded anteriorly. Sculpture: The first adult whorl is keeled, crossed by obscure ribs; on the others are regular transverse ribs, about 20 to a whorl, crossed by three, increasing to four, well-defined but narrow spiral keels, producing a strong and regular cancellation. The transverse ribs do not extend to the base, on which three well-defined spiral keels extend right to the aperture. The relative strength of the spiral and transverse sculpture varies somewhat, producing a corresponding variation in the cancellation. Length 3·8 mm.

Locality.—Middle Harbour, Port Jackson (type), fairly common.

O. reticulata is relatively much broader than *O. elongatum*, and the spiral sculpture is not nearly so strong. Shells of this type occur right along the Australian coast, and there are many in the Australian Museum, chiefly from Queensland, which have not yet been worked out, and probably quite a number of species remain to be named.

Genus Rissopsis Garrett.

Under *Rissopsis* are placed a number of species, the classification of which is very doubtful and which probably include more than one generic or even family type. The shell of a gasteropod, in its simplest form, is little more than a conical tube, which assumes a more or less spiral form owing to the asymmetry of the animal, and it throws but little light on the animal which secretes it. Thus in the simpler types parallel development can be expected as quite a normal process, and quite different animals may secrete very similar shells. For this reason the inclusion of the following species under one generic name must be considered tentative. It is well, however, that they should be listed, and where necessary be given specific names to aid in future recognition and as a basis for future research.

The shells here called *Rissopsis* are all more or less elongated, very thin and transparent, smooth or faintly striate, with expanded apertures, the peristome incomplete, more or less reflected. Nothing is known of their exact habitat, operculum or anatomy.

Rissopsis puniceus, sp. nov. (Fig. 82.)

Shell conical, varying slightly in form, very thin, quite transparent, the columella showing clearly through the whorls, colour a delicate pink. Whorls five, the first small and rounded, increasing regularly, sutures impressed. Aperture sub-circular, angled posteriorly. Peristome incomplete, thin, expanded anteriorly, reflected on inner margin. Umbilical furrow narrow but distinct. There is no sculpture and the surface is smooth and glassy. Length 3 mm.

Locality.—Found in shell sand, Port Stephens (type), a number of specimens.

The very thin, transparent shell and pink colouring are useful features for future recognition. I do not know any species with which it may be compared, unless it be *R. columnaria* May, a deep-water Tasmanian species.

Rissopsis brevis May. (Fig. 83.)

May 482.

Two specimens of a small, semi-opaque, white shell, dredged in Middle Harbour, Port Jackson, agree very well with May's species, with which they are tentatively identified, making a new record for New South Wales. The figured specimen is 1·8 mm. in length. The broad, blunt apex is a good recognition feature.

Rissopsis maccoyi Ten.-Woods.

Hedley 539.

This Tasmanian species was recorded from New South Wales by A. U. Henn (1896, p. 500). It has not, however, since been seen and, until further confirmation, must be considered very doubtful as a member of the New South Wales fauna.

Genus **Paronoba**, gen. nov.

Genotype, *Paronoba subquadrata* Laseron.

Elongate, translucent, whorls rounded. Aperture sub-quadrate, expanded. Peristome entire but hidden on inner margin by the overhanging body whorl, greatly reflected on inner, anterior margin, forming a small fold, and giving the quadrate shape to the aperture. Sculpture finely lirate. Umbilical furrow very slight.

Paronoba subquadrata, sp. nov. (Fig. 84.)

Shell of moderate size, sub-cylindrical, thin, translucent, white. Whorls five, the first dome-shaped, remainder rounded, sutures deeply impressed. Aperture sub-quadrate, outer margin slightly rounded, peristome entire, disappearing beneath the body whorl on its inner margin when viewed from in front, expanded and widely reflected anteriorly, curled right over at extreme anterior tip, also much reflected at posterior extremity. Sculpture consisting of very numerous, finely incised, spiral lines, continuing right on to the base and into the umbilical furrow. Length 4 mm.

Locality.—Shell sand, Port Stephens (type), a number of specimens.

The complete peristome and peculiar features of the aperture separate this from all other thin, translucent shells of the same general form and warrant its separation generically. It is not unlike *Rissopsis buliminoides* Tate and May from Tasmania in shape, but is easily separated by the lirate sculpture.

Genus **Cithna** Adams.

This is another of the simple-shelled gasteropods to which it is hard to assign definite generic characters. To *Cithna* Hedley assigned one deep-water species, of which the chief features which might be considered as generic are the vertical and straight columella, making almost a right angle with the upper, inner portion of the peristome, and the possession of a slight but distinct keel.

Cithna angulata Hedley. (Fig. 85.)

Hedley 546; May 492.

The generic characters assigned to *Cithna* apply also to the species *angulata*, which is common and widespread on the continental shelf. Hedley records it from numerous stations, from off Port Stephens, from 40–50 fathoms off Cape Three Points, and from 100 fathoms off Wollongong, etc. We have it quite commonly from 20–35 fathoms off Crookhaven. The length of the figured specimen is 2·8 mm.

Genus **Laevilitorina** Pfeffer.

This is another genus to which it is difficult to ascribe definite generic characters. Hedley states that he compared it with Pfeffer's genotype, *L. caliginosa*, with which it closely corresponds. Selected characters from the one Australian species are the sharp spire, large inflated aperture with the peristome widely reflected almost into a plate on the inner margin, and the brown, horn-like texture of the translucent shell.

Laevilitorina mariae Ten.-Woods. (Fig. 86.)

Hedley 532; May 474.

We have taken this species alive on seaweed at Ballina, the length of the figured specimen 1·7 mm. It does not seem common on the coast, though single specimens are sometimes found on the ocean beaches, and its range extends to Tasmania. The operculum is thin and horny, but is retracted too far into the wide aperture to observe details.

Genus **Diala** Adams.

Diala is a well-defined and natural genus with a recognizable facies, yet with few characters which lend themselves to comparative description. It is medium-sized for the family, elongate and conical, with moderately rounded whorls increasing regularly, thin, texture varying from transparent to nearly opaque, generally decorated with spots or streaks of brown. The aperture is moderately expanded, the peristome interrupted, thin and not reflected, and there is no umbilical slit. It is a typical weed-liver, and is abundant in this habitat on southern as well as eastern Australian coasts. Species show considerable individual variation in form, so much so that at first sight a great many species seem to be indicated. Examination of long series, however, reduces these to four, within the limits of each of which is much variation. Shell texture and general facies are the best guides to specific determination, and the following key may be useful:

A. Transparent.	*a.* Smooth	*translucida.*
	b. Lirate	*lirata.*
B. Translucent		*phasianella.*
C. Nearly opaque		*lauta.*

The nodulose species, *D. monile* Adams, is here rejected as an aberration of more than one species (see Figs. 88, 92 and 93). This condition has long puzzled systematists. The development of swellings and nodules, particularly on the median whorls, has led to a number of specific names, such as *monile*, *pagodella*, etc. Where these have been figured by more than one author there has been considerable disagreement and none of the drawings agree. This applies particularly to the New South Wales species known as *D. monile*. In fact, examination of any large series of any species shows that there is a tendency in some individuals to develop nodulation to a greater or lesser extent. As a rule the nodules are more prominent on the middle and particularly the penultimate whorls, while the earlier and body whorls may be quite smooth. The character seems to begin as a rounded swelling of the shell just above the suture, developing into a number of low, rounded protuberances, as in Figure 88 (*Diala*

phasianella). In a more extreme example the protuberances are larger, as in Figure 92 (*D. lauta*), and may become so prominent as to give the shell a rugose and pagoda-like appearance (Fig. 93, *D. lauta*). Every stage between these extremes can be found. A possible analogy exists in the curious development of large hollow nodules on the body whorl of some specimens of quite another shell on our coast, *Turbo miliaris*. It is impossible at this stage to hazard a guess at the cause of this nodulation, but whether it is induced by disease or is the incipient stage of further evolution, it is a character which apparently has no value for taxonomic purposes, and species based on it must be rejected.

Diala phasianella Angas. (Figs. 87, 88.)

Hedley 543.

Variable in form, but the whorls are generally flatter than in other species and are neither completely transparent, as in *D. translucida*, nor with the nearly opaque, rather eggshell texture of *D. lauta*. It generally has also more colour than the other species, the commonest decoration being a line of brown spots on the middle of the body whorl; but other individuals show irregular, transverse, brown lines. The brown spots are sometimes replaced by white, opaque patches. In some specimens where the nodulation is present there seems to be a definite connection between it and the pigmentation.

The species probably lives below low tide, for though it is common on beaches within the harbour, we have not taken it alive. The figured specimens come from North Harbour and are each 4 mm. in length.

Diala translucida Hedley. (Fig. 89.)

Hedley 491; May 491.

This species can be recognized by its transparency. Like *D. phasianella* it is very variable in form, and may be quite broad or comparatively elongate. It shows a few brown markings occasionally, but the most common decoration is a line of opaque spots just above the suture or on the centre of the body whorl. It is abundant living on seaweed in rock pools or on piles, and though found on the outer reefs is more typical of the calmer waters within the harbours. The figured specimen, 4 mm. long, comes from weed on wharf piles at Toronto, Lake Macquarie, where it is very abundant. We also have it from seaweed at North Harbour, Port Jackson; Huskisson, Jervis Bay; Long Reef and other localities.

Diala lirata, sp. nov. (Fig. 90.)

Shell elongate, conical, variable in form, many specimens comparatively broad, thin, transparent in beach specimens, translucent and yellowish when alive, colourless when found on the beach except for a few faint brown markings, but decoration generally consisting of a line of opaque spots similar to those in *D. translucida*. Whorls nine, initial whorl small and rounded, the others increasing regularly, slightly rounded, sutures impressed. Aperture rounded on outer margin, inner margin arched, slightly expanded anteriorly. Peristome interrupted, thin, not reflected, inner margin nearly straight. Sculpture numerous, very fine but distinct, regular spiral striations, slightly pitted, and completely covering the shell right to the base. Length 5·5 mm.

Habitat.—An exceedingly common species, living on weed in many localities, both inside the bays and on the outer coast. The type comes from *Sargassum* sp. adhering to piles at Toronto, Lake Macquarie. We also have it from seaweed at Brunswick Heads; Point Halliday; Long Reef; North Harbour, Port Jackson; and from the beach at Port Stephens.

This in facies is a typical *Diala*, though the lirate sculpture would suggest another genus. It has been apparently overlooked in the past, as the sculpture is only visible under a fairly strong lens. It is commonly associated with *D. translucida* and in the live state is not always easy to separate without close examination.

Diala lauta Adams. (Figs. 91, 92, 93.)

This may be recognized by the general absence of colouring, the typically elongate form with rather flattened whorls, and by its nearly opaque texture. Like the other species, it is very variable in form. It lives in rather deeper water, and though found on the beaches is more commonly taken in depths of from four to six fathoms in the harbour. We have not found it alive. Of the figured specimens, No. 91, 5 mm. in length, comes from North Harbour; No. 92, 4·5 mm. in length, from the same locality; and No. 93, 6 mm. in length, from Balmoral.

The majority of specimens which have been labelled *D. monile* may be assigned to *D. lauta*, and probably *D. pagodella* is but a nodulated variety of this or an allied species.

Genus **Laevitesta**, gen. nov.

Genotype, *Laevitesta scobina* Laseron.

Shell conical, pointed, small, thin, variable, aperture ovate, peristome thin, interrupted, but almost entire on old specimens, very slightly reflected, umbilical slit deep, sutures channelled, sculpture strongly radially lirate, continuous through the shell and thus reversed on the interior.

But for its thin shell this would pass for a *Lironoba*, yet in its general facies it resembles *Diala*.

Laevitesta scobina, sp. nov. (Fig. 94.)

Shell small, thin, conical, pointed, somewhat variable in form, uniformly brown or white with faint brown markings, the latter probably bleached. Whorls seven, initial whorls very small and rounded, remainder increasing regularly, flattened to slightly rounded, sutures channelled. Aperture ovate, rounded on outer margin, inner margin curved. Peristome thin, nearly entire, particularly in old specimens, slightly reflected on inner margin, which is curved, the umbilical slit deep and well defined. The sculpture consists of numerous, well-defined, sharp, spiral ridges, about seven on the earlier whorls and about 15 on the body whorl, separated by narrow, well-defined channels. The sculpture is impressed right through the shell and is visible on the interior, but not so sharply. Length 3·2 mm.

Locality.—Abundant from the reclamations, Bayview, Pittwater (type); and also from the reclamations at The Spit, Middle Harbour.

This interesting little species, though abundant in certain localities, has apparently been overlooked, as at first sight it appears very ordinary and undistinguished. The sharp, well-defined, lirate sculpture, visible on the interior of the shell, the thin yet strong shell, and channelled suture are good recognition points.

Genus **Heterorissoa** Iredale.

Heterorissoa wilfredi Gatliff and Gabriel.

Proc. Royal Soc. Victoria, xxiv, 1911, p. 188, pl. xlvi, f. 3.

This was recorded from shallow water in Twofold Bay by Iredale (1924), who remarks also that he has found it not uncommon on the Sydney beaches. So far, however, we have not identified it from the Sydney area, and lack data to offer further information.

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Unfigured species: *Rissoina lintea* Hedley and May; *Subonoba bassiana* May; *Rissopsis maccoyi* Ten.-Woods; *Heterorissoa wilfredi* Gatliff and Gabriel.