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MINUTE BIVALVES FROM NEW SOUTH WALES.

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(Figures 1-44.)

INTRODUCTION.

This paper was originally intended to be a review of three groups only, *Cuna*, *Condylocardia* and *Cyamiopectra*, but it has been extended to cover most of the minute bivalves living on the coast of New South Wales. In the course of the investigation so many minute forms came under observation, many of rather obscure classification, that the opportunity was taken to study and draw them, and thus the scope of the paper was gradually extended. The term minute is not an arbitrary one, but is here taken to refer to shells less than about 3 mm. in size. An exception is *Cunanax pisum* Hedley, which is 6 mm. in height, but the other members of this family are all minute, so this species could hardly be excluded. The only really small shells not dealt with are certain deep water forms such as *Cyrella*, *Bathyarca*, *Cratis*, *Notomytilus* and *Pronucula*. These were omitted either because of insufficient material, or because there was nothing new to add to the excellent work done by the late Charles Hedley.

Practically all the material here dealt with has been collected by my son John and myself in the last twenty years, and to my collecting partner must go most of the credit for picking out the rarities and novelties from shell sand and dredgings. To Mr. Tom Iredale my thanks are also due, for throughout he has given me the benefit of his great experience and much advice concerning the classification.

All types and specimens illustrated have been presented to the Australian Museum.

THE CUNA GROUP OF GENERA.

Genus *Cuna* Hedley, 1902.

Genotype, *Cuna concentrica* Hedley.

The main characters taken from Hedley's description are:—"A genus of the Crassatellitidae. Shell very small, equilateral or slightly rostrate, higher than long with lunule and impressed dorsal area, beaks erect, prodissoconch marked, valves sometimes clasping. Sculpture concentric. Inner ventral margin usually denticulate. Hinge plate broad and flat; in the left valve two well developed cardinals; in the right a rudimentary cardinal and a massive, projecting, flat-topped and triangular cardinal. Laterals produced, sometimes transversely striated, a posterior and anterior in each valve. Ligament partly internal, protruding in a notch below the beaks."

Hedley included the two species *delta* and *atkinsoni* in *Cuna*, and later described two new species, *C. particula* and *C. pisum*. Iredale (1930) pointed out that these were a very heterogeneous group, and proposed the new genera *Volupicuna*, *Saltocuna* and *Cunanax*, but beyond indicating genotypes did not append generic descriptions. Cotton in his excellent work on the Pelecypods of South Australia (1938) added two more genera *Hamacuna* and *Propecuna*. Even among the South Australian shells still listed under *Cuna* there is such diversity that, had they been larger, further generic differentiation would surely have been undertaken. This has now been done with the New South Wales species, and to keep the relationship clear I have followed Iredale and Cotton in retaining the word "*cuna*" in some part of the new generic names.

The systematic position of *Cuna* and other small genera is still rather obscure. Hedley placed *Cuna* with the Crassatellitidae, a quite reasonable classification for, in hinge and other characters, it conforms broadly with this family. In view of the minute

size, however, of all the species here discussed, it would seem there is some other factor which binds them together. With the rather similar group of *Condylocardia* the view has been advanced that it is a degenerate branch of the Carditellidae in which growth has been arrested shortly after the prodissoconch stage. If this view be correct, it is possible that *Cuna* and its allies bear the same relationship to such large shells as *Crassatellites*, as *Condylocardia* does to *Cardita*. There are so many elements in the southern Australian molluscan fauna which have survived from the past, that in the problem of phylogenetic relationship fossil evidence is likely to be of more importance than comparison with other contemporary geographical provinces. With the larger forms such as the Volutes, much work has already been done, particularly in New Zealand, and even the smaller gasteropods, notably the Pyramidellidae and the Rissoidae have not been neglected. In Australia the only available Tertiary marine rocks are the mainly Miocene beds of Victoria and South Australia, and though from these many species of mollusca have been described, knowledge of the smaller forms is still very fragmentary. There is a wonderful field here, a field which needs long and specialized study, and one cannot do more at present than point out its possibilities.

***Cuna concentrica* Hedley.**

(Figures 1, 1a.)

Hedley 149.

This is a deep water species, the type locality 63—75 fathoms off Port Kembla. The specimen figured is one collected by the late Charles Hedley from 111 fathoms off Cape Byron; its dimensions are, height 1.8 mm., length, 1.6 mm. The colour is white, the concentric sculpture strong, and it is a robust little shell.

***Cuna littoralis*, sp. nov.**

(Figures 2, 2a, 2b.)

Shell very small, trigonal, flat, nearly an equilateral triangle, with the lower margin curved, height equal to length, white and translucent. Anterior margin sharp and slightly concave, lunule elongate, posterior margin straight, ventral margin curved and dentate anteriorly. Umbos erect, sharp, with a distinct but very small prodissoconch. Sculpture concentric, strong, about 30 rounded ribs, equal in width to the spaces between. Muscular scars visible but faintly impressed, pallial line entire. Hinge of the right valve with a strong, massive triangular, subumbonal, cardinal tooth, left valve with two diverging cardinals, lateral teeth elongated and not prominent. Height 2.2 mm., length, 2.2 mm.

Localities.—Common on Ocean Beach, Manly (type); also Cronulla and other outer beaches; 6—9 fathoms, Sow and Pigs Reef; 15—25 fathoms, Twofold Bay.

Remarks.—This species is closely allied to *C. concentrica*, and for long we had it labelled with that species. Comparison with the type, however, shows it to be a rather thinner shell, more triangular in shape, and relatively broader. Some slight variation in shape is shown in the dredged specimens which are smaller, with a straighter anterior margin, but otherwise no difference could be detected. Under the microscope in some lights what appear to be radial rays may be detected, but these appear to be differences in translucency rather than incipient radial sculpture.

Genus *Ovacuna*, gen. nov.

Genotype, *Cuna atkinsoni*, Ten.—Woods.

Related to *Cuna*, but oval in shape, slightly inflated, with large erect umbos, robust in habit, the concentric sculpture confined to faint growth lines, inner ventral margin strongly denticulate, adductor scars and entire pallial line strongly impressed. Right valve with a strong, triangular, bifurcate, subumbonal cardinal, left valve with two diverging cardinals, the anterior larger and bifurcate. Laterals elongated and not conspicuous. Prodissoconch not prominent.

The South Australian species *Cuna solida* Cotton should probably also come here.

Ovacuna atkinsoni (Ten.-Woods).

(Figures 3, 3a, 3b.)

Hedley 148.

In appearance this species is superficially not unlike some small mussels and is generally yellowish or yellow-brown in colour. It is very easily distinguished by its shape from all other cognate local species. The specimen figured came from 15 fathoms between the Heads, Port Jackson, and is 2.2 mm. in height, with a length of 1.7 mm. It is not a common species.

Genus **Volupicuna** Iredale, 1938.Genotype, *Cuna delta* Tate and May.

Related to *Cuna*, but with distinct radial sculpture, triangular, solid, deep, anterior margin truncate, excavate with a large well-pronounced lunule. Inner ventral margin denticulate. Hinge plate large, left valve with a larger bifurcate cardinal and a smaller one anteriorly, right valve with two diverging, bifurcate cardinals. Pallial line and adductors faintly impressed.

Volupicuna novacambrica, sp. nov.

(Figures 4, 4a.)

Hedley 150 (*Cuna delta*).

Shell very small, triangular, rather deep, equilateral, anterior margin straight, posterior margin slightly convex, ventral margin rounded and denticulate within. Umbos erect with a distinct prodissoconch set in a circular, saucer-like depression. Colour white or yellowish. Adductor scars very faintly impressed, hardly visible. Anterior margin truncate with large, prominent lunule. Sculpture not prominent, consisting of faint, concentric growth lines crossed by 8 or 9 imperfectly defined radial ribs. Left valve with a triangular, bifurcate, median placed cardinal, and a small anterior cardinal, right valve with two, diverging, bifurcate cardinals, hinge plate large. Height 2.1 mm., length 1.7 mm.

Localities.—6—9 fathoms, Sow and Pigs Reef, Port Jackson (type); 30—35 fathoms off Crookhaven; also occasionally on ocean beaches.

Remarks.—The true *V. delta* is the Tasmanian species, and the New South Wales form has always been previously identified with it. Comparison, however, shows that the local shell is quite different, and among other characters is a much narrower shell.

Genus **Saltocuna** Iredale, 1936.Genotype, *Cuna particula* Hedley.

Related to *Cuna* but oblique and very inequilateral, the hinge of the same general type, but the hinge plate long and narrower. Inner ventral margin denticulate. Sculpture concentric. Prodissoconch distinct and comparatively large.

Saltocuna particula (Hedley).

(Figures 5, 5a.)

Hedley 151.

The type locality is 63—75 fathoms off Port Kembla. We have a number of specimens from 40—50 fathoms off Port Stephens, that figured being 2.2 mm. long and 2.2 mm. high. The oblique form, truncate anterior margin and expanded posterior margin distinguish this from all other species related to *Cuna*.

Genus **Hamacuna** Cotton, 1931.

Genotype, *Cuna hamata* Hedley and May.

Cotton gives as the essential characters of his genus:— "The unique, hooked, ventrally directed umbos and massive compressed hinge plate." Sculpture of genotype concentric, but if the species here added from New South Wales is co-generic it may also be radial. Cardinal teeth heavy and massive.

Hamacuna radiata, sp. nov.

(Figures 6, 6a.)

Shell relatively large, massive, elongate-ovate, higher than long, sub-equilateral, umbos large and elongated, twisted posteriorly and slightly overhanging. Prodissoconch small and circular, barely distinguishable. Hinge plate large and massive, left valve with a large, massive, triangular cardinal tooth, right valve with two strong cardinals converging below the umbo, between them a small deep chondrophore, laterals strong in both valves, lunule very slight. Adductor muscle scars and entire pallial line moderately impressed. Colour white. Inner ventral margin denticulate. Sculpture consisting of about 16 strong, rounded, radial ribs, fading on the umbos, crossed by fine but well defined concentric growth lines. Height, 4 mm., length, 3.5 mm.

Locality.—14 fathoms off Long Reef, one complete specimen and 5 single valves.

Remarks.—This resembles in general form the genotype *H. humata*, a Tasmanian deep-water shell which is also recorded from Victoria and South Australia. The umbos are not, however, quite so twisted, and it is of course easily distinguished by its strong radial sculpture.

Genus **Propecuna** Cotton, 1931.

Genotype, *Cuna obliquissima* Tate.

Cotton gives the following essential characters for his genus:— "The peculiar concentric grooves cutting obliquely across the accremental striae, and the presence of marked posterior radial grooves and dorso-ventral angulations serve to distinguish this genus from *Cuna*."

No species of this genus has yet been recognized from New South Wales.

Genus **Mesocuna**, gen. nov.

Genotype, *Mesocuna saza* Laseron.

Shell small, massive, ovate, higher than long, equilateral, umbos prominent and erect. Hinge plate massive, the left valve with a massive, triangular cardinal, the right valve with two, massive, diverging cardinal teeth, laterals strong and elongate, chondrophore subumbonal and deep, pallial line entire and adductor scars slightly impressed. Sculpture radial, crossed by growth lines.

This genus generally resembles *Hamacuna*, but the umbos are erect, and the shell is nearly equilateral.

Mesocuna saza, sp. nov.

(Figures 7, 7a.)

Shell small, massive, elongate-ovate, equilateral, higher than long, umbos prominent, erect, prodissoconch small and round. Posterior margin straight, anterior margin very slightly convex, ventral margin rounded. Hinge plate massive with a strong triangular cardinal in the left valve, and two equally strong, diverging cardinals in the right valve, laterals strong and elongated, chondrophore small, deep and subumbonal. Colour white. Sculpture consisting of about 20 strong, regular, rounded, radial ribs, crenulated by numerous, fine, well-defined, concentric growth lines. Inner ventral margin of valves denticulate. Height, 2.5 mm., length, 2 mm.

Localities.—14 fathoms off Long Reef (type); 18 fathoms off North Head; dredged in Port Stephens; Ocean Beach, Manly.

Remarks.—The strong radial sculpture distinguishes this from all other *Cuna*-like shells, except *Hamacuna radiata*, than which it is much smaller, and it also lacks the twisted umbos.

Genus **Cunanax** Iredale, 1936.

Genotype, *Cuna pisum* Hedley.

Hedley's species was described from a single specimen with joined valves, and the hinge was evidently not visible and was left undescribed. Iredale, when he proposed *Cunanax*, gave no further particulars, beyond remarking that it was a much larger, crasser shell (than *Cuna*), with a hinge of a different type. To supply the omission the following characters may be noted:—

Shell comparatively large, thick and massive, inequilateral, umbos tumid and turned anteriorly, prodissoconch not distinguishable, hinge plate broad and massive, the left valve with two massive, triangular, diverging, bifurcate cardinals, the right valve with two strong, laterally placed, diverging cardinals, with two thinner teeth between. Pallial line entire, adductor scars moderately impressed. Sculpture primarily radial. Inner ventral margin strongly denticulate.

The hinge at once distinguishes this from all other members of what might be called the *Cuna* group of genera, and it would seem to have entirely different relationship. It is suggested that this will be found with fossil rather than other living bivalves.

Cunanax pisum (Hedley).

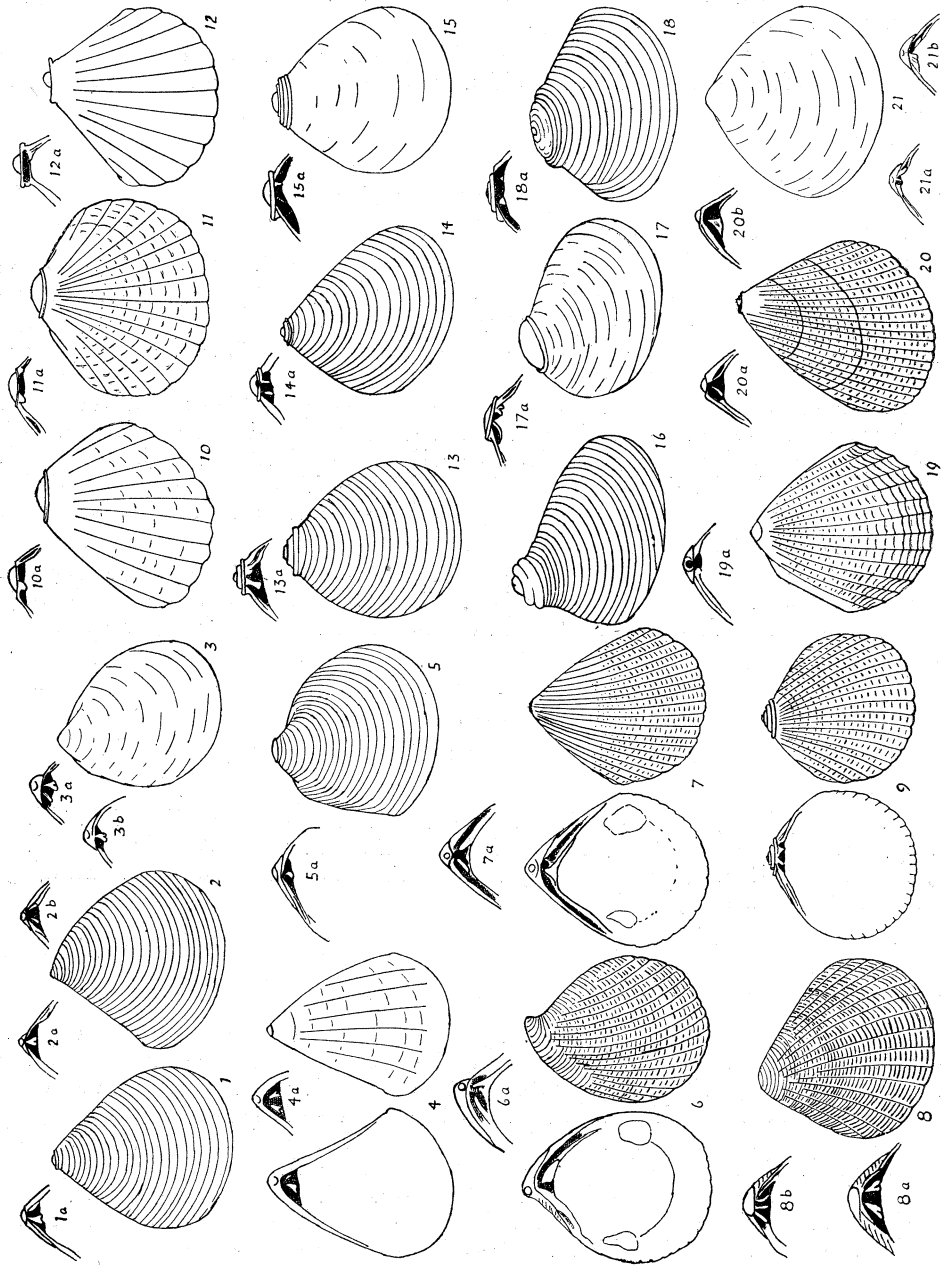
(Figures, 8, 8a, 8b.)

Hedley 152.

The description given above should serve for the future recognition of this shell. The figured specimen was dredged in 15 fathoms off North Head, Port Jackson, where it was abundant, its height 6 mm., length 6.5 mm. It was also abundant in dredgings from 14 fathoms off Long Reef.

Family CONDYLOCARDIIDAE.

Cotton gives as the characters of this family:— "Shells minute, related to the Carditidae, but which retain in the adult state the immaturity of hinge characters which characterises the nepionic shell of *Cardita*, and moreover, have the resilium sunken and centrally located between the valves. The prodissoconch is of the usual size, but appears very prominent on account of the relatively small additions made to it in growth." He includes in the family two genera, *Carditella* E. A. Smith, and *Condylocardia*. As *Carditella* is small but not minute, and has among other characters an external ligament, it might well be left in the Carditidae where it was originally placed, and it is not dealt with here. The Australian species which have been included in *Condylocardia*, a New Zealand genus, form a complex group, between some of which there appears little relationship. Iredale (1936) recognized this and proposed two new genera *Condylocuna* and *Radiocondyla*, but beyond designating genotypes, he gave no descriptions. Unfortunately most of the species are so minute that it is very difficult to determine their hinges even under the microscope. Slight changes in lighting and viewpoint often give an entirely different impression. Fortunately the different species are easy to distinguish and they fall into groups which seem natural and which may be generically separated.



Figures 1—21.

- 1, 1a. *Cuna concentrica* Hedley. 2, 2a, 2b. *Cuna littoralis* Laseron. 3, 3a, 3b. *Ovacuna atkinsoni* (Ten-Woods). 4, 4a. *Volupicuna novacambria* Laseron. 5, 5a. *Saltocuna particula* Hedley. 6, 6a. *Hamacuna radiata* Laseron. 7, 7a. *Mesocuna saza* Laseron. 8, 8a, 8b. *Cunanzar pisum* Hedley. 9. *Radiocondyla rotunda* Laseron. 10, 10a. *Condylocardia kunopia* Laseron. 11, 11a. *Condylocardia rotunda* Laseron. 12, 12a. *Condylocardia sp.* 13, 13a. *Condylucuna cambrica* Iredale. 14, 14a. *Condylucuna minuta* Laseron. 15, 15a. *Benthocardia vitrea* Laseron. 16. *Condylucuna projecta* Hedley. 17, 17a. *Condylucuna ovata* Hedley. 18, 18a. *Condylucuna moringa* Laseron. 19, 19a. *Radiocondyla jacksonensis* Laseron. 20, 20a, 20b. *Particondyla cuneata* Laseron. 21, 21a, 21b. *Neolepton novacambria* Hedley.

Genus **Condylocardia** Bernard, 1896.

Genotype, *C. sanctipauli* Bernard.

The Australian species which most approaches the genotype is that listed in May's Tasmanian list as *C. crassicosta* Bernard, and without expressing an opinion as to the correctness of May's identification, this may be taken as co-generic with several New South Wales species at present undescribed. The characters which they have in common are their minute size, all in the vicinity of 1 mm., their pectinate shape and strong radial sculpture. All are white and subtranslucent. The prodissoconch is comparatively very large, consisting of a tumid dome rising from a saucer-like depression. The hinge plate is wide, its dorsal margin bordering the rim of the prodissoconch, and one or two obscure cardinals are present with an anterior lateral. The form of the shell varies from inequilateral to very nearly equilateral.

Condylocardia kunopia, sp. nov.

(Figures 10, 10a.)

Shell minute, broadly ovate, inequilateral, anterior margin long and straight, posterior margin shorter and straight, ventral margin rounded, prodissoconch comparatively very large, consisting of a saucerlike depression with an outer rim, and within a broad, rounded protuberance. Colour white and translucent. Hinge plate wide, bordered by the rim of the prodissoconch, right valve with an obscure cardinal and an anterior lateral. Sculpture consisting of 11 or 12 prominent, rounded, radial ribs, separated by rather wide shallow channels. Ventral margin slightly crenulate. Height, 1.1 mm., length, 1 mm.

Locality.—Shell sand, Narrabeen. (Several specimens.)

Remarks.—This resembles *C. crassicosta* as figured from Tasmania, but it is relatively longer in proportion to its height and has a larger prodissoconch.

Condylocardia rotunda, sp. nov.

(Figures 11, 11a.)

Shell minute, white, subtranslucent, equilateral, nearly circular in shape, with anterior and posterior margins slightly flattened, slightly longer than high. Prodissoconch large, saucer-shaped with an external ring, almost filled by a broad, dome-shaped protuberance. Hinge plate broad and narrow with obscure laterally placed cardinals, anterior lateral well defined, long and narrow. Sculpture about 14 prominent, rounded, well-defined, regular, radial ribs, separated by rounded furrows, and slightly tuberculated by faint concentric sculpture. Dorsal margin crenulated.

Adductor muscles and pallial line not indented. Height 0.9 mm., length 1 mm.

Locality.—Narrabeen in shell sand, a number of specimens.

Remarks.—The rotund shape and symmetry at once distinguish this from other species of this group.

Condylocardia sp.

(Figures 12, 12a.)

A single, rather worn specimen of an undescribed species was sorted from sand from 15—25 fathoms, Twofold Bay. It is felt that the material is insufficient at this stage to justify a new specific name, so it is figured for future reference. The shell is white and minute, height 1 mm., length 1.1 mm. and in form it approaches closely to *C. kunopia*, but differs chiefly in the prodissoconch. This is saucer-shaped, rising above the summit of the shell, is very flat on top, and the enclosed protuberance is small and high.

Genus *Condylocuna* Iredale, 1936.Genotype, *Condylocardia projecta* Hedley.

Beyond naming the genotype, Iredale gave no description beyond saying that it had concentric sculpture and the hinge formation was different. To this may be added that the shell is generally strongly inequilateral, though the different species gradate to nearly symmetrical forms, as in *C. trifoliata*. The hinge features are rather obscure and difficult to define, but the hinge plate is generally broad and abuts directly on the straight line of the prodissoconch. One or two cardinals are present in each valve but they are narrow and ill-defined. Laterals are also present. The prodissoconch is circular, large and distinctive, consisting of a number of concentric rings, one within the other. Of species outside New South Wales, Cotton's species *isosceles* comes within this group.

***Condylocuna projecta* Hedley.**

(Figure 16.)

Hedley 165.

This species may readily be recognized by the peculiar shape; it is very inequilateral, with the umbos posteriorly placed, the dorsal margin being contracted just below the large prodissoconch, which consists of two or three large concentric rings with a medially cleft central protuberance. The hinges of our specimens do not show the characters well, but Hedley says:—"in the right valve a feeble anterior and posterior cardinal; in the left a single, massive posterior cardinal; in each valve an anterior lateral." The sculpture is strongly concentric. The type figured by Hedley was dredged in Watson's Bay and it also occurs on the continental shelf. Our specimens come from shell sand, Narrabeen, that figured being 1.1 mm. in height and 1.4 mm. long.

***Condylocuna ovata* Hedley.**

(Figures 17, 17a.)

Hedley 162.

The type came from Manly Beach. We have only found one specimen of this species, a right valve from shell sand at Angowrie on the North Coast. This is evidently not mature and is smaller than the type, being 0.8 mm. in height with a length of 1.3 mm. The species can be recognized by its obliquely ovate shape, its very fine concentric sculpture, often nearly smooth, and its large, faintly concentric prodissoconch. Hedley figures but does not describe the hinge. That in our specimen appears to have two laterally placed cardinals, the posterior bifurcate, the anterior bow-shaped, with an anterior and posterior lateral, but even under the microscope the details are obscure.

***Condylocuna moringa*, sp. nov.**

(Figures 18, 18a.)

Shell large for the genus, solid, white, obliquely ovate, inequilateral but not markedly so, umbos posteriorly placed. Prodissoconch extremely large, circular, consisting of numerous concentric rings within each other with a small nucleus. Hinge plate long and narrow, the cardinals laterally placed, small and obscure, anterior lateral well defined, adductor scars not impressed. Ventral margin of valves denticulate within. Sculpture concentric and strong, the later ridges posteriorly overlapping the earlier ones. Height 2 mm., length 2.5 mm.

Locality.—Dredged off North Head, Port Jackson, in 15 fathoms.

Remarks.—Closely related to *C. ovata*, from which it differs by its more solid shell, by being less inequilateral, and by its still larger and peculiar prodissoconch. The specific name is derived from Moring the aboriginal name for Bottle and Glass Rocks, just within the harbour. With *C. projecta* and *C. ovata* it forms a small natural group, distinguished from the following three species by being longer than high.

Condyllocuna cambrica Iredale.

(Figures 13, 13a.)

Rec. Aust. Museum, 1936, XIX, p. 272.

Hedley 166 (*Cuna trifoliata*).

Hedley's type of *trifoliata* came from Mast Head Reef, North Queensland, and Iredale separated the New South Wales form as being "broader, less strongly sculptured, with a protoconch proportionately larger and less notably trifoliate." The type came from Chinaman's Beach, Middle Harbour, Port Jackson. We have a good series dredged from 6—9 fathoms, Sow and Pigs Reef within the harbour, that figured having a height of 1.1 mm. and a width of 0.7 mm. The concentric sculpture varies somewhat, sometimes almost smooth, sometimes moderately strong. The prodissoconch is distinctly trifoliate as in the Queensland shell and the proportions are much the same, but the New South Wales shell is nearer equilateral and this justifies Iredale's separation. The hinge, as with others of the group, is rather obscure, but the hinge plate is comparatively deep, with a larger posterior and a small anterior cardinal in the right valve, and an anterior lateral. The adductor scars are not impressed, but are visible externally through the translucent shell.

Condyllocuna minuta, sp. nov.

(Figures 14, 14a.)

Shell extremely minute, white and translucent, obliquely ovate, higher than long, produced anteriorly, umbos posteriorly placed, anterior and posterior margins slightly convex. Prodissoconch relatively small but prominent, trifoliate. Hinge plate moderately deep, the cardinals obscure and ill-defined. Sculpture fine, but strongly and regularly concentric. Inner ventral margins slightly denticulate. Height 0.9 mm., length 0.8 mm.

Locality.—Abundant in shell sand, Narrabeen.

Remarks.—This is nearly the smallest of the New South Wales species. It is closely related to *C. cambrica*, but is much more oblique and has a much smaller prodissoconch.

Genus **Benthiocardiella** Powell, 1930.Genotype, *B. pusilla* Powell.

A minute shell from Narrabeen seems to fit very well with the New Zealand genus *Benthiocardiella*. Powell based his genus on the hinge, stating that the right valve had three cardinals, an elongated anterior and two posterior, and the left valve two cardinals, one anterior and one posterior. In these minute shells it is difficult even under the microscope to determine the exact number and disposition of the teeth, and in the New South Wales species they are rather obscure. More easy recognition points are the smooth, glassy shell, nearly symmetrical, and the huge prodissoconch. It is probable that the South Australian species *Condylocardia isosceles* Cotton should also be included in *Benthiocardiella*.

Benthiocardiella vitrea, sp. nov.

(Figures 15, 15a.)

Shell extremely minute, white and glassy and transparent, vertically ovate, higher than long, very nearly equilateral but slightly produced anteriorly, anterior and posterior margins slightly convex. Prodissoconch large, of four concentric rings with a dome-shaped central nucleus. Hinge plate large, the right valve with two or three obscure cardinals, laterals not distinct. Sculpture faint concentric growth lines, otherwise smooth and shining. Height 0.8 mm., length 0.7 mm.

Locality.—Shell sand, Narrabeen.

Remarks.—This is even smaller than *Condyllocuna minuta*. It is very close to *C. isosceles* Cotton, a South Australian species, but *C. isosceles* is practically equilateral and has a multifoliate prodissoconch rising to a peak.

Genus *Radiocondyla* Iredale, 1936.

Genotype, *Radiocondyla arezela* Iredale.

Iredale took as his genotype the Tasmanian shell which May had identified as *Condylocardia porrecta* Hedley. Iredale gives no generic characters, and in the absence of specimens of the genotype it is difficult to supply the omission. Iredale tentatively included *C. pectinata* in *Radiocondyla*, and we have this and two new species from New South Wales which may also be tentatively included. From May's figure and from these we may summarize some generic characters. Shell generally larger than the true *Condylocardia*, heavier and more massive, more inequilateral, with a smaller prodissoconch, the sculpture strongly radial, the ribs crossed by fine concentric ridges.

The hinge characters vary in the three species here listed, but no definite characters could be selected on which to justify immediate generic separation. Further study may justify this at a later date.

Hedley included *Condylocardia porrecta* on the New South Wales list (No. 164), but I can find no direct reference to its occurrence in this State. The type comes from Mast Head Island in North Queensland and differs from any of the cognate species we have examined, and in the absence of any clear record it should be omitted from the New South Wales list.

Radiocondyla jacksonensis, sp. nov.

(Figures 19, 19a.)

Hedley 163. (*C. pectinata* Tate and May.)

Shell very small, yellow-brown, vertically ovate, nearly equilateral, higher than long, anterior margin straight and slightly aurate, posterior margin straight, heavy and solid. Prodissoconch very small, horseshoe-shaped, vertically placed on the extreme tip of the umbo. Sculpture strongly radial, consisting of about 15 rounded ribs about equal in width to the grooves between and plicated by the fine, concentric growth lines. Inner ventral margin denticulate. Hinge plate long and rather narrow, one or two obscure cardinals, posterior lateral well marked. Height 1.5 mm., length 1.4 mm.

Locality.—Abundant in sand, 6—9 fathoms, Sow and Pigs Reef, Port Jackson.

Remarks.—*R. pectinata* is a South Australian species and has also been recorded from Tasmania. The New South Wales shell recorded as this species is quite distinct, being more equilateral, with straight anterior and posterior margins. The suggestion of a slight wing anteriorly is also distinctive.

Radiocondyla ampla, sp. nov.

(Figure 22.)

Shell comparatively large, solid and massive, slightly inequilateral, broadly ovate, as high as long, colour white. Adductor scars slightly impressed and visible. Prodissoconch comparatively large, separated from the main shell by a ridge, the large central dome nearly filling the usual saucer-shaped depression. Right valve with two diverging cardinals on a large hinge plate, ligament internal in a small subumbonal pit. Sculpture consisting of about 15 broad, rounded radial ribs, separated by narrow, shallow furrows, and crossed by fine concentric striae. Ventral margin crenulate both externally and internally. Height 2.9 mm., length 2.8 mm.

Locality.—14 fathoms off Long Reef, one left valve and a pair of united valves.

Remarks.—This species approaches very close to *Condylocardia subradiata* Tate from South Australia, but is not so inequilateral and more rounded.

Radiocondyla rotunda, sp. nov.

(Figure 9.)

Shell of medium size, solid, sub-circular, nearly equilateral, colour white. Prodissoconch large and prominent, consisting of several concentric rings with a small nucleus. Adductor muscle scars not impressed. Hinge plate short and wide, the

left valve with two short cardinals and a long narrow posterior lateral. Sculpture consisting of about 18 rounded radial ribs, about equal in width to the furrows, and crossed by fine concentric striae. Inner ventral margin strongly crenulate. Height 2.2 mm., length 2.4 mm.

Locality.—30—35 fathoms off Crookhaven.

Remarks.—The nearly equilateral shell and nearly circular outline separate this from all cognate species and should make its future recognition easy.

Genus **Particondyla**, gen. nov.

Genotype, *Particondyla cuneata* Laseron.

Shell large for the group, inequilateral, higher than long. Prodissoconch small, saucer-shaped with a central protuberance, ligament internal, hinge plate deep and narrow, left valve with a large, triangular cardinal, fitting between two thin diverging cardinals in the right valve. Sculpture radial.

The large, massive, triangular tooth in the left valve separates this from other members of the family, and suggests some relationship with *Cuna* and its allies, but the prodissoconch is typically that of the group *Condylocardia*, and it is retained here, though its exact relationship is yet uncertain.

Particondyla cuneata, sp. nov.

(Figures 20, 20a, 20b.)

Shell comparatively large, massive, inequilateral, wedge-shaped, higher than long anterior margin nearly straight, posterior margin slightly convex, ventral margin evenly curved. Colour very pale yellow. Prodissoconch small, a central dome set within a saucer-shaped depression with a slight rim. Adductor muscle scars not impressed. Hinge plate triangular, narrow and deep, left valve with a massive triangular cardinal fitting between two narrow diverging cardinals in the right valve, laterals not prominent, lunule narrow. Sculpture consisting of about 20, prominent, rounded, radial ribs, separated by narrow furrows, crossed by fine, narrow concentric ridges, inner ventral margin denticulate. Height, 2.8 mm., length 2.2 mm.

Locality.—14 fathoms, off Long Reef, 4 specimens.

Remarks.—There is no other species with which this can be confused, its oblique wedge shape and hinge at once distinguishing it from all others with radial sculpture.

Genus **Warrana**, gen. nov.

Genotype, *Warrana dielasma* Laseron.

The generic name *Warrana* is here proposed for three undescribed species of uncertain classification, which while presenting certain features in common may yet be found to have little relationship. All are minute, almost equilateral, much higher than long, with the appearance somewhat of small brachiopods of the *Terebratula* type, and have concentric sculpture. All have small distinct prodissoconchs separated by grooves, and inclined to be rectangular. The sculpture is concentric. Hinge characters are rather obscure, the hinge plate varying in size, with one or two indistinct cardinals. In the genotype the ligament is internal in a small subumbonal pit. The name *Warrana* is derived from Warrane the aboriginal name for Sydney.

Warrana dielasma, sp. nov.

(Figure 23).

Shell minute, bright yellow-brown, solid but subtranslucent, vertically ovate, higher than long, very nearly equilateral and symmetrical, the posterior (?) margin slightly more convex than the anterior (?). Prodissoconch distinct, separated by a groove and nearly rectangular and flat. Adductor scars impressed and visible, pallial line entire. Hinge characters rather obscure, the hinge plate well developed, with one

or two obscure cardinals. Sculpture consisting of 8 or 9 more or less defined, narrow concentric folds, the spaces between smooth and vitreous. Height 1 mm., length 0.7 mm.

Locality.—A number of specimens in shell sand, Narrabeen.

Remarks.—This is totally unlike any other bivalve described from Australian waters, and its resemblance in shape to the fossil brachiopod *Dielasma* and others of that type should make future recognition very easy.

***Warrana vitrea*, sp. nov.**

(Figures 24, 24a.)

Shell minute, white, vitreous and shining, irregularly ovate, higher than long, acute dorsally, broadened ventrally, nearly equilateral, anterior margin nearly straight, posterior margin convex, ventral margin irregularly curved, slightly prolonged posteriorly. Prodissoconch prominent, a saucer-shaped depression nearly filled by a high dome-shaped nucleus. Hinge plate large and triangular, with one or two obscure cardinals, laterals not distinct. Adductors scars not impressed. Sculpture practically none, confined to a few irregular concentric growth lines, surface smooth and shiny. Height 1.2 mm., length 1 mm.

Locality.—Shell sand, Narrabeen; a number of specimens both single and united valves.

Remarks.—Tentatively included generically with the former species, its classification is not yet certain. It is a very distinctive species, not readily confused with any other.

***Warrana eccentrica*, sp. nov.**

(Figures 25, 25a.)

Shell minute, white, solid, opaque, irregularly subquadrate, higher than long, nearly equilateral, anterior margin shouldered and straight, posterior margin rounded, the whole shell broadening slightly to the ventral margin which is rounded. Prodissoconch small but prominent, with a large, high, rather angular nuclear dome, nearly filling a saucer-shaped depression. Adductor muscle scars not impressed. Hinge plate rather long and narrow, the left valve with a large single, posteriorly sloping cardinal and a small subumbonal cardinal. Interior ventral margin strongly denticulate. Sculpture strongly concentric, consisting of about 12 regular, rounded folds about equal in width to the furrows between. Height 1.5 mm., length 1.2 mm.

Locality.—A single left valve from 20—25 fathoms, Shoalhaven Bight.

Remarks.—Though described from a single specimen, the form and characters of this peculiar little species are so distinctive that there should be no difficulty in its future recognition. Like so many of the small bivalves its classification is anomalous, but its general form corresponds well enough with the two previous species to warrant its tentative inclusion in the same genus. There is no other species with which it can readily be confused.

Family CYAMIIDAE.

Genus ***Cyamiomactra*** Bernard, 1897.

The systematic position of *Cyamiomactra* has been dealt with by Cotton, who includes it in the family Cyamiidae, a family confined to Antarctica and Australasia. A prominent feature of all the Australian species, which Cotton omitted to mention, is the relatively large prodissoconch, which is round and flattened, and often with the edges protruding beyond the top of the adult shell. Species which may be fairly included in *Cyamiomactra* in New South Wales include more than listed in Hedley's check list, and amongst these there is considerable difference in the hinge characters, but whether the difference is merely specific, or whether it warrants generic separation is entirely at the moment a matter of opinion. My own opinion is that it does not, and I am content to let the matter rest there.

Cyamiomactra mactroides Tate and May.

(Figures 27, 27a, 27b.)

Hedley 209.

If all the identifications are correct this species has a very wide range—Tasmania, South Australia, Victoria and Queensland. In New South Wales it is common in many localities, particularly the outer beaches. The specimen figured is from 6—9 fathoms, Sow and Pigs Reef, its height 1.8 mm. and length 2.2 mm. Local specimens agree very well with and cannot be separated, superficially at least, from those figured from both Tasmania and South Australia. Good recognition points are the shape and pink coloration.

Cyamiomactra communis Hedley.

(Figures 28, 28a, 28b.)

Hedley 208.

The type came from Manly Beach, and the specimen figured is from the same locality, its dimensions, height 1.2 mm., and length 2 mm. It has since been recorded from Tasmania and South Australia. It can be readily distinguished from *C. mactroides* by its smaller size, white coloration and more regular oval shape.

Cyamiomactra symmetrica, sp. nov.

(Figures 29, 29a &, 29b.)

Shell minute, pinkish-yellow, shining, broadly ovate, longer than high, nearly equilateral, umbos centrally situated, upright, anterior and posterior margins slightly convex and equal, ventral margin semi-circular and even. Prodissoconch small but distinct, like a small, rounded circular cap. Adductor muscle scars and pallial line not impressed. Left valve with a strong, bifid cardinal tooth, with a shorter posterior limb, right valve with two, diverging, bow-shaped teeth, and between them a minute cardinal. Ligament internal, subumbonal. Sculpture to the eye smooth and shining, but beneath the microscope very fine, concentric growth lines. Internal ventral margin smooth. Height, 1.9 mm., length 2.3 mm.

Locality.—30—35 fathoms off Sydney, a number of specimens.

Remarks.—This is not readily confused with other species of *Cyamiomactra*, from which it may be at once distinguished by its symmetrical shape. There is another species, however, described later in this paper as *Macropolia typica* (Fig. 33), which is so close superficially that it is difficult to separate. This, however, has a quite different hinge, and lacks the distinct prodissoconch.

Cyamiomactra distorta, sp. nov.

(Figures 30, 30a, 30b.)

Shell small, yellowish-brown, with red-brown umbos, moderately solid, very slightly translucent. Contour rather irregular, umbos nearly central, anterior margin narrowed and prolonged, posterior margin nearly truncate, ventral margin rounded. Umbos prominent and upright, with a small rounded prodissoconch. Adductor muscle scars very faintly impressed. No marked hinge plate, the left valve with a strong, inverted, bifid cardinal tooth, flanked by short, well-marked bow-shaped laterals, right valve with two deep, diverging, bow-shaped teeth, the anterior the more prominent and rather pointed. Sculpture to the eye smooth and shining, microscopically with fine, concentric growth lines, no trace of radial sculpture, interior ventral margin smooth. Height 1.9 mm., length 2.5 mm.

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

Remarks.—It bears a general resemblance to *C. mactroides*, but can be readily separated by its irregular shape, smooth inner ventral margin and lack of radial sculpture, also by details of the hinge.

Cyamiomactra nitida Hedley.

(Figures 31, 31a (after Hedley).)

Hedley 207.

I have not yet seen this species, the type locality of which is 20 fathoms off Sussex Inlet, New South Wales. The species elsewhere described as *C. symmetrica* was at first labelled *C. nitida*, but a comparison of the figures at once shows the difference. Hedley gives the dimensions as height 2.2 mm., length 2.6 mm.

Cyamiomactra carina, sp. nov.

(Figures 26, 26a, 26b.)

Shell comparatively large, white to pinkish, glassy and translucent, oval, umbos prominent, about one-third from the anterior end, upright. A slight but definite keel runs obliquely to the posterior ventral margin. Prodissoconch comparatively large and distinct, rounded and rather flattened, with extended edges. Adductor muscle scars and pallial line very faintly impressed. Left valve with a strong, anterior, inverted V-shaped cardinal, and two posterior thin cardinals on a fairly wide hinge plate, right valve with three thin divergent cardinals, laterals not distinct. To the eye no sculpture is visible and the surface is smooth and shining, but under the microscope regular, fine, concentric growth lines are visible, also radiating translucent rays, which slightly indent the shell near the ventral margin. Interior ventral margin faintly crenulate. Height 2.3 mm., length 3 mm.

Localities.—Manly Beach (type); Cronulla and other outer beaches.

Remarks.—The regular oval shape, and the slight keel at once separate this from all other local species. Though placed tentatively in *Cyamiomactra* its exact systematic position is doubtful.

Genus **Calvitium**, gen. nov.Genotype, *Calvitium glabra* Laseron.

Shell minute, thin, translucent, equivalve, inequilateral, closed, umbos anteriorly placed, tumid, erect. Prodissoconch large and dome-shaped. Ligament obscure and nearly obsolete, internal. Adductor scars large, faint, pallial line faint, apparently entire. Left valve with a small, rounded cardinal tooth, anteriorly placed, with a large fold of the hinge, hardly a tooth, behind, and two prominent laterals. Right valve without cardinal teeth, but two prominent laterals.

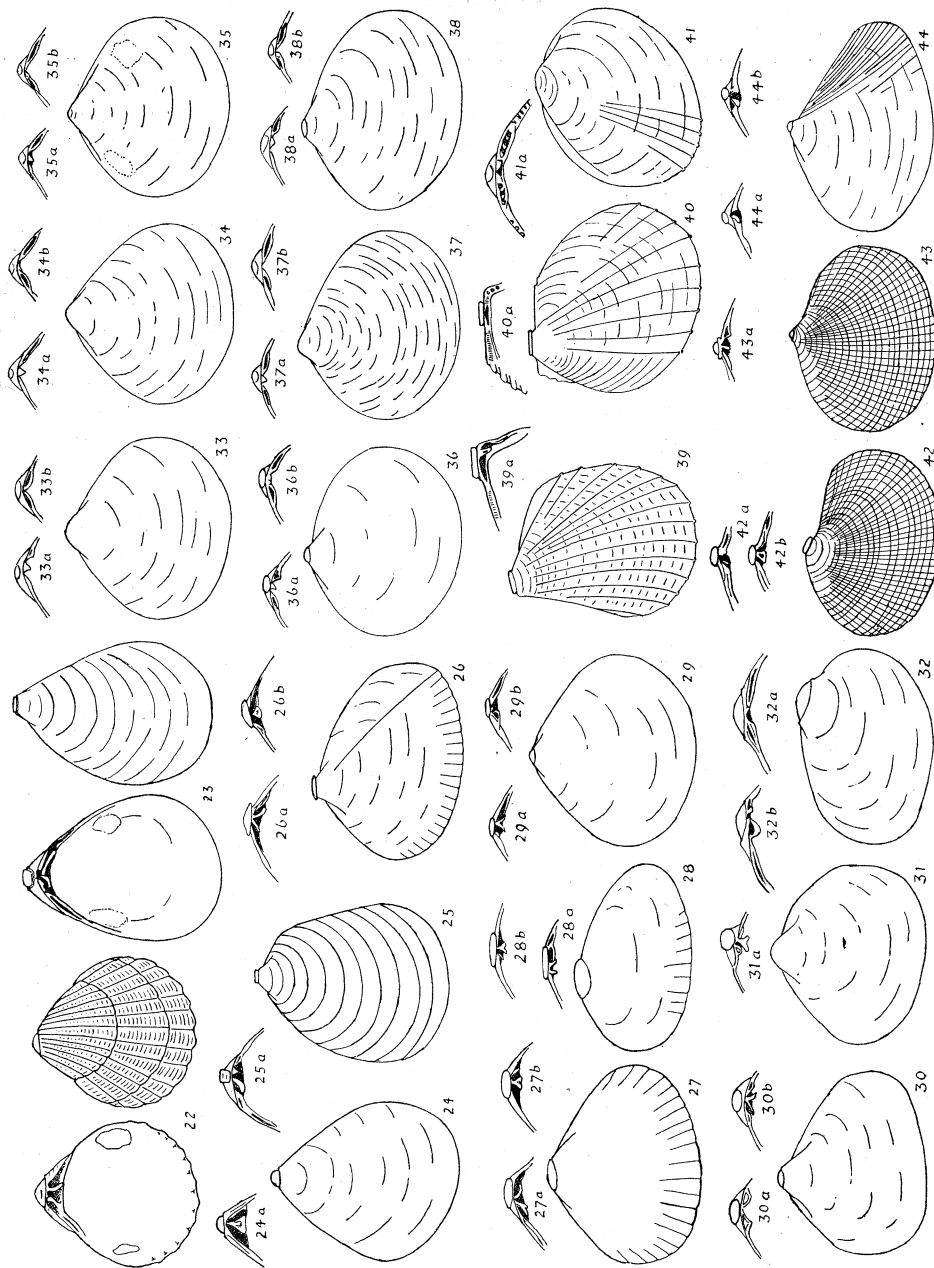
This is another of the small Australian bivalves for which it is difficult to find relationship with any of the larger and better known families. The obsolete ligament, form of the large prodissoconch, and general shell characters suggest that temporarily at least it may be placed with *Cyamiomactra* in the superfamily Cyamiaceae, but further revision of its systematic position will probably be necessary.

Calvitium glabra, sp. nov.

(Figures 32, 32a, 32b.)

Shell minute, white, translucent, elliptical, very inequilateral, rather inflated, margins rounded. Umbos at anterior end, large and tumid, erect, the prodissoconch very large and well defined, dome-shaped, lying within and encircled by a distinct narrow ridge. Surface of shell smooth, sculpture confined to a few indefinite concentric growth lines. Adductor scars very faint and hardly discernible, but apparently large, with the faint pallial line entire. Dorsal margin formed by the edge of the prodissoconch. Left valve with a small, but prominent, almost spherical cardinal tooth anteriorly placed, and behind it a large rounded fold or tooth. The two laterals are elongated and well defined, the posterior the stronger. The right valve has no cardinal, but two well-defined laterals, while between them there is a small fold of the hinge projecting into the shell. Length 1.4 mm., height 1 mm.

Locality.—Quite common in shell sand, Gunnamatta Bay, Port Hacking.



Figures 22—44.

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| 22. <i>Radiocondyla ampla</i> Laseron. | 23. <i>Warrana dielasma</i> Laseron. | 24, 24a. <i>Warrana vitrea</i> Laseron. |
| 25. 25a. <i>Warrana eccentrica</i> Laseron. | 26, 26a, 26b. <i>Cyamiopecten carina</i> Laseron. | 27, 27a, 27b. |
| <i>Cyamiopecten mactroides</i> Tate and May. | 28, 28a, 28b. <i>Cyamiopecten communis</i> Hedley. | 29, 29a, 29b. |
| <i>Cyamiopecten symmetrica</i> Laseron. | 30, 30a, 30b. <i>Cyamiopecten distorta</i> Laseron. | 31, 31a. <i>Cyamiopecten nitida</i> Hedley (after Hedley). |
| 32, 32a, 32b. <i>Calvitium glabra</i> Laseron. | 33, 33a, 33b. <i>Micropolia typica</i> Laseron. | 34, 34a, 34b. <i>Micropolia jacksonensis</i> Laseron. |
| 35, 35a, 35b. <i>Micropolia depressa</i> Laseron. | 36, 36a, 36b. <i>Micropolia ovalis</i> Laseron. | 37, 37a, 37b. <i>Micropolia concentrica</i> Laseron. |
| 38, 38a, 38b. <i>Micropolia profundis</i> Laseron. | 39, 39a. <i>Cosa stephensensis</i> Laseron. | 40, 40a. <i>Cosa auriculata</i> Laseron. |
| 41, 41a. <i>Austrosarepta elliptica</i> Laseron. | 42, 42a, 42b. <i>Spondervilia rubra</i> Laseron. | 43, 43a. <i>Spondervilia simplex</i> Laseron. |
| 44, 44a, 44b. <i>Spondervilia australis</i> Angas. | | |

Genus **Micropolia**, gen. nov.Genotype, *Micropolia typica* Laseron.

Shell minute, thin, translucent, subtrigonal, equivalve and nearly equilateral, smooth, sculpture confined to faint growth lines. Umbos erect, rather tumid. Ligament nearly obsolete, adductor muscles sub-equal, faintly impressed, generally visible externally, pallial line not visible. Left valve with a single, pointed trigonal cardinal tooth, sub-umbonal, anterior and posterior bow-shaped laterals. Right valve with no cardinal tooth but two bow-shaped laterals. Prodissoconch small and not prominent.

This genus is proposed for several species of minute shells which, though not uncommon, seem completely to have escaped notice. Superficially they resemble the deep-water shell named by Hedley *Neolepton novacambria*, and at first it was thought that they were congeneric, but examination of the hinge showed that there is really little relationship. The hinge is quite distinctive. The single rather pointed cardinal tooth in the left valve, and the bow-shaped laterals in both valves at once define the genus. The systematic position of *Micropolia* is not certain. The obsolete ligament and shell characters suggest the Cyamiidae, and *Cyamiomactra* is possibly its nearest relation, but again it is probable that a new family should be introduced for its reception.

Micropolia typica, sp. nov.

(Figures 33, 33a, 33b.)

Shell minute, pinkish-white, thin, vitreous, translucent, sub-trigonal, moderately inflated, equivalve, almost equilateral, anterior and posterior margins slightly curved, ventral margin rounded. Umbos erect, tumid. Sculpture confined to faint growth lines. Adductor muscles faint, barely discernible within the shell, but visible externally. Hinge with a fairly strong pointed cardinal tooth in the left valve, flanked by bow-shaped laterals, the posterior the most prominent, right valve with no cardinal and only the two bow-shaped laterals. Length 2.3 mm., height 1.8 mm.

Locality.—30—35 fathoms off Crookhaven, fairly common.

Remarks.—This is very close to the next two species described, but it differs from both by its more tumid umbo.

Micropolia jacksonensis, sp. nov.

(Figures 34, 34a, 34b.)

Shell minute, yellowish with pink tinge, thin, translucent, nearly as high as long, subtrigonal, anterior and posterior margins nearly straight, ventral margin rounded, umbos erect, only moderately tumid, surface smooth with faint growth lines. Hinge almost as in *M. typica*, but with the anterior lateral in the left valve more elongated and not so bow-shaped. Length 2.2 mm., height 2.1 mm.

Locality.—6—9 fathoms, Sow and Pigs Reef, Port Jackson.

Remarks.—Almost identical with *M. typica*, but it differs chiefly in its less tumid umbo and greater height in proportion to its length. To *M. depressa* from the same locality it is even closer, and the greatest care must be taken in separating the species. This is mainly on account of their minute size. Even under a strong lens they appear to be identical, and at first all the specimens were grouped together. It was only under strong magnification that it was seen that two species were mixed, and then each individual specimen had to be compared under the microscope before they were finally sorted. The main difference is in the ratio of height to length, that in *M. jacksonensis* being 0.95 and in *M. depressa* 0.84.

Micropolia depressa, sp. nov.

(Figures 35, 35a, 35b.)

Shell minute, yellowish with a pink tinge, thin, glassy, translucent, general characters of hinge, umbos, etc., the same as in *M. jacksonensis*, but the umbos a little more pointed, and the shell longer in relation to its height. Length 2.5 mm., height 2.1 mm.

Locality.—6—9 fathoms, Sow and Pigs Reef, Port Jackson.

Micropolia ovalis, sp. nov.

(Figures 36, 36a, 36b.)

Shell, minute, thin, white, glassy and translucent, nearly a perfect oval in shape, nearly equilateral, rather longer than high, anterior, posterior and ventral margins rounded, umbos erect, tumid, with a distinct rounded prodissoconch. Surface smooth, the sculpture confined to faint concentric growth lines. Hinge as others in the group, with a small, subumbonal, pointed cardinal in the left valve, flanked by two laterals, the anterior the more prominent. Right valve with two laterals only, bow-shaped. Length 2.1 mm., height 1.6 mm.

Locality.—30—35 fathoms off Crookhaven.

Remarks.—These were easily picked out from *M. typica*, with which they were associated, by their oval shape and white colour, and by the presence of a distinct prodissoconch. The hinge is typically that of the other species, but the prodissoconch suggests relationship with *Cyamiomactra* and strengthens the possible link with the Cyamiaceae.

Micropolia concentrica, sp. nov.

(Figures 37, 37a, 37b.)

Shell minute, yellowish, thin, translucent, oval, rather longer than high, moderately inflated, not quite equilateral, the umbos not erect, tumid, pointing slightly anteriorly. Prodissoconch small and ill-defined. The surface is covered with very fine, regular, concentric sculpture, which under high magnification is slightly granulate. Hinge typically that of *Micropolia*, left valve with a small, central cardinal tooth and two bow-shaped laterals, right valve with two bow-shaped laterals only. Posterior margin slightly flattened, anterior and ventral margins rounded. Length 2.2 mm., height 1.7 mm.

Habitat.—Quite common living in beds of the common mussel between tide marks, North Harbour, Port Jackson.

Remarks.—This can easily be distinguished from the previous three species by the fine, concentric sculpture and less symmetrical shell. Were it not for the hinge it might well be placed in a separate genus.

Micropolia profundis, sp. nov.

(Figures 38, 38a, 38b.)

Shell minute, white, thin and translucent, oval, rather inequilateral, the umbos tumid and pointing slightly anteriorly, anterior, posterior and ventral margins rounded. Surface with very fine, regular concentric sculpture, under high magnification showing minute transverse striae. Hinge as in other members of the group with a small, pointed central cardinal tooth in the left valve flanked by two bow-shaped laterals. The two bow-shaped laterals in the right valve are strong and well defined. Prodissoconch comparatively large and well defined. Length 2.5 mm., height 1.9 mm.

Locality.—30 to 35 fathoms off Crookhaven, several single valves.

Remarks.—This is very close to *M. concentrica*, but there are small but definite differences which separate the two species. *M. profundis* is white, slightly larger and flatter, the posterior margin is more rounded, and the prodissoconch is larger and more distinct. The habitat is of course different, *M. concentrica* living between tide marks while *M. profundis* is an inhabitant of the deeper water on the continental shelf.

Notolepton novacambrica Hedley.

(Figures 21, 21a, 21b.)

Hedley 192.

When studying the species of *Micropolia* just described it was thought that one of these, particularly *M. jacksonensis*, might be Hedley's *Neolepton novacambrica* but, while the form was practically identical, the hinge could not be reconciled. Hedley's,

work was so consistent, and his drawings so accurate, that this could not be overlooked, and it was decided that *N. novacambrica* was not in the collection. Later two specimens, however, were sorted from material from 14 fathoms off Long Reef, and the difference in the hinge was at once apparent. A figure is here given for comparison, the dimensions being, length 2.4 mm., height 2.4 mm.

The generic name *Notolepton* was proposed by Finlay (1926), with *Kellia antipoda* Filhol as genotype, to replace *Neolepton* Monterosato (1875), a British group-name wrongly used. Finlay listed *novacambrica* in this genus.

Family PHILOBRYIDAE.

Genus *Cosa* Findlay, 1926.

Genotype, *Cosa costata* (Bernard).

Findlay proposed *Cosa* to cover the New Zealand species of *Philobrya* which had costate sculpture, at the same time pointing out that the hinge differed from the true European *Philobrya*. He considered that the New South Wales species, *P. parallelogramma* is congeneric with the New Zealand *Cosa*. Iredale (1931) agreed with this and removed all the New South Wales species to *Cosa*, though Cotton (1938) retained *Philobrya* for the Adelaidean forms. It is doubtful if the true *Philobrya* occurs in Australia at all, and as the Adelaidean species are closely related to those from New South Wales, it would be better if they too were removed to *Cosa*. Iredale's genus *Denticosta*, which has a very different hinge, has so far not been recognized from New South Wales.

Space precludes figures of all the local species, but those mentioned in Hedley's Check List have all been so well figured and described by him that further description is not necessary. The complete list of New South Wales species is now *Cosa inornata* (Hedley), *C. parallelogramma* (Hedley), *C. pectinata* (Hedley), *C. tatei* (Hedley), *C. sagana* Iredale, *C. pharetra* Iredale, *C. stephensis* Laseron, and *C. auriculata* Laseron.

Cosa stephensis, sp. nov.

(Figures, 39, 39a.)

Shell of medium size, white, subquadrate, rather higher than long, extremely inequilateral, umbos terminally situated, and right above the slightly concave anterior margin, ventral and posterior margins rounded. Prodissoconch large and prominent, flat and disc-like, standing above the main valve from which it is separated by a narrow furrow. Hinge moderately long, chondrophore subumbonal, rather irregular, with a small projection visible in some lights at the anterior end, hinge plate vertically striate posteriorly, posterior margin of shell strongly denticulate, fading to small crenulations on the ventral margin. Sculpture cancellate, the radial the stronger, consisting of 12 equally-spaced narrow rays, indenting the ventral margin, crossed by numerous, narrow concentric ridges, rising to small points where they cross the rays. Height 3.8 mm., length 2.8 mm.

Locality.—Shell sand, Port Stephens.

Remarks.—This species generally resembles the deep water species, *Cosa pectinata* (Hedley), but is not so rounded in shape, is even more inequilateral, and the radial rays are fewer in number, only 12 instead of 22.

Cosa auriculata, sp. nov.

(Figures 40, 40a.)

The shell here figured is from 30—35 fathoms off Crookhaven, its height 2.3 mm., and its length 2.5 mm. The periostracum is moderately thick, covering the whole shell, and extending as a fringe beyond the ventral margin. The sculpture is eight radial rays. The shell is not so inequilateral as others in the group, the umbo is some distance from the anterior end leaving a small auriculate projection. The prodissoconch is large,

flat, round, and separated by a fine groove from the main valve. The hinge line is long and straight, chondrophore wide and narrow, hinge plate vertically striate, the anterior striations few, posterior margin beyond the hinge strongly crenulate, anterior margin smooth. Colour of shell, pale yellow buff.

This shell was at first thought to be *C. sagana* Iredale, (*Rec. Aust. Mus.*, xviii, p. 204.), which Iredale described as follows:— "It differs from all other New South Wales species in being long and broad, and having a very pronounced cap. The sculpture is stronger than that of *Hochstetteria inornata* Hedley which it most approaches, but its hinge line is that of *Cosa*, most like that of *C. tatei*. Eight major rays can be counted, the cancellate sculpture being weak." This species, together with *C. pharetra* Iredale, was described from two unnamed species collected by Hedley from 100 fathoms off Wollongong. No figures were given.

A comparison of *C. sagana* with *C. auriculata*, shows that although the sculpture is similar, the latter can be readily separated by its long hinge line; it is not nearly so inequilateral, and the auricle at the anterior end is distinctive.

Family LIMOPSIDAE.

Genus **Austrosarepta** Hedley, 1899.

Genotype, *Austrosarepta picta* Hedley.

Proc. Linn. Soc. N.S.W., 1899, p. 429.

Salient features taken from Hedley's generic description are the amphidetic internal ligament and distinct though feebly separated resilium. The hinge line is arched, the teeth few, and the dorsal margin is crenulated both before and behind. The shell is brightly coloured and substrate, and the genotype has a sharp fold proceeding obliquely from the beak to the postero-ventral margin.

In his 1918 Check List Hedley synonymized *Austrosarepta* under Smith's *Lissarca*, but Iredale (1924, p. 186), revived *Austrosarepta* as distinct from *Lissarca*.

Austrosarepta picta is quite a common shell on the coast, both on the outside beaches and in dredgings up to 10 fathoms. Hedley's description is so full and adequate and his figures so accurate that it is unnecessary to repeat or add to them.

Austrosarepta elliptica, sp. nov.

(Figures 41, 41a.)

Shell small, uniformly bright red-brown, broadly elliptical and inflated, inequilateral, umbos tumid, all margins rounded. Surface of shell nearly smooth, sculpture confined to faint growth lines, and a few faint oblique transverse ridges which crenulate the posterior ventral margin. There is no keel as in *A. picta*. Hinge line slightly arched with a narrow, transverse, subumbonal depression apparently the position of the internal, amphidetic ligament. In the centre of this area is the distinct triangular resilium. The teeth are few but prominent and protruding, three posterior and three anterior, and beyond these the dorsal margin is strongly crenulated both before and behind. Length 2.5 mm., height 2.3 mm.

Locality.—Not uncommon, 30—35 fathoms off Crookhaven.

Remarks.—From the hinge this is undoubtedly congeneric with *A. picta*, but the hinge is not nearly so sharply arched. Externally the species are easily separated. *A. elliptica* is much more rounded, it lacks the oblique keel which is replaced by faint transverse ridges, and the uniform red-brown colour is a good recognition point.

Family AMPHIDESMATIDAE.

Genus *Spondervilia* Iredale, 1930.Genotype, *Ervilia australis* Angas.

There has been considerable uncertainty about both the identity and systematic position of a rather rare Sydney shell long known to local conchologists as *Ervilia bisculpta* Gould. The type of *Ervilia bisculpta* came from Japan and the occurrence of this species in Port Jackson has always been open to doubt. Angas (1877) described and figured *Ervilia australis* from "Sow and Pigs" bank, Port Jackson, and his description, as far as it goes, fits the shell here considered conspecific, but the figure does not altogether agree with the description, and is also too indefinite and does not show the essential characters. Hedley (1906, p. 479), recorded *E. bisculpta* from the Mast Head Reef, Queensland, and also mentions that it occurs in Sydney Harbour. In his Check List he synonymizes Angas's species *australis* under *bisculpta*. Iredale (1930) restored *australis* and named it as the genotype of a new genus *Spondervilia*. The shell I have taken as *australis* is certainly related to the Queensland shell, but the well known accuracy of Hedley's drawings leaves no doubt that it is a different species, and that the restoration of Angas's *australis* is quite justified. Iredale is quite in agreement with my identification of *australis* and that the specimen here figured is appropriate as the genotype of *Spondervilia*.

Unfortunately, when proposing *Spondervilia*, Iredale gave no generic characters, and merely said that it "does not bear much resemblance to the Palaearctic type of *Ervilia*." In order to clarify the position the following characters are suggested as characteristic of *Spondervilia*.

Shell small, equivalve, closed, nearly equilateral but more or less prolonged anteriorly, umbos turned anteriorly, capped with a small but very prominent dome-shaped prodissoconch, ligament internal, the resilium in a subumbonal pit, hinge with one or two ill-defined cardinals in each valve, laterals present but not prominent. Pallial line not entire, pallial sinus moderately deep. Sculpture variable, but concentric and transverse sculpture both present.

***Spondervilia australis* Angas.**

(Figures 44, 44a, 44b.)

Hedley 306.

This small white shell may be recognized by its form and sculpture, the bulk of the shell with faint concentric growth lines, with fine, continuous, transverse ridges at the anterior end. The margin of the transverse sculpture is marked by a faint keel sloping from the umbo to the anterior ventral margin, the keel more prominent dorsally near the umbo. The specimen figured was dredged in Manly Cove, Port Jackson; its dimensions are length 5.2 mm., height 2.9 mm.

***Spondervilia rubra*, sp. nov.**

(Figures, 42, 42a, 42b.)

Shell minute, thin, bright pink, subtranslucent, elliptical, nearly equilateral, anterior end narrowed, umbos prominent, pointing anteriorly, prodissoconch small but very prominent, dome-shaped and brown. Adductor scars and pallial line indistinguishable. Resilium narrow and deep, centrally situated, left valve with an obscure narrow cardinal and well defined laterals, right valve with a large but obscure cardinal and well defined laterals. Sculpture distinctive, the whole surface covered with both concentric and transverse very fine ridges which, where they cross, are seen under the microscope to rise into minute tubercles. Length 2.5 mm., height 1.7 mm.

Locality.—Long Reef, collected by Miss Duff.

Remarks.—The bright pink colour, the general form and sculpture should make this species easy for future recognition. It is rather doubtfully placed in *Spondervilia*, but the form of the shell and particularly the prodissoconch suggest close relationship.

***Spondervilia simplex*, sp. nov.**

(Figures 43, 43a.)

Shell very small, white, thin, subtranslucent, nearly equilateral, elliptical, umbos nearly erect, small, pointed slightly anteriorly, prodissoconch very small but very prominent, dome-shaped, very pale brown. Anterior end of shell narrowed but not so much as in *S. rubra*. Adductor muscle scars faint, pallial sinus just discernible. Resilium in both valves placed in a deep but narrow pit, each valve with an obscure cardinal and laterals, the anterior lateral in the left valve prominent and projecting. Sculpture both concentric and transverse, consisting of very fine ridges covering the whole of the shell, and where they cross rising into minute tubercles, visible only under high magnification. Length 2.8 mm., height 2.4 mm.

Locality.—Ocean Beach, Manly (type); North Harbour, Port Jackson; Caloundra, Queensland (J. Laseron.)

Remarks.—Closely allied to *S. rubra*, from which it may be readily separated by its colour, broader outline, particularly anteriorly, by its smaller prodissoconch, and more erect umbos.

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