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OSTRACODA FROM LEE POINT ON SHOAL BAY, NORTHERN AUSTRALIA: PART 3. PODOCOPINA (CYTHERACEA)

M. T. WARNE1, R. C. WHATLEY2 AND B. BLAGDEN2

1 School of Life and Environmental Sciences, Deakin University, Burwood Campus; 221 Burwood Highway, Burwood, Victoria, 3125, Australia. E-mail: mwarne@deakin.edu.au
2 Micropalaeontology Research Group, Institute of Earth Studies, University of Wales, Aberystwyth, UK.

Abstract

Recent littoral environments within Shoal Bay, Northern Territory (Australia) contain a very high diversity of cytheracean Ostracoda (51 genera/subgenera and 97 species/subspecies). This diversity is probably a consequence of three factors: (1) warm, well oxygenated marine environments conducive to high rates of biological productivity; (2) shallow marine environments which are favourable to post mortem accumulation of shell material, and (3) a central location on the continental shelf dispersal route between the SW Pacific and SE Asian regions. A particular feature of this cytheracean fauna is that a number of genera, such as Alocopocythere, can be traced back through the fossil record to the Cretaceous when they first evolved in the shallow waters of Tethys. Overlain on this ancient taxonomic component of the fauna are those dominant modern Indo-Pacific taxa, which include genera such as Keijia. The Cytheracea dominate the overall ostracod fauna of the study area, although the other groups, particularly the marine Cypridacea, Bairdiacea and Platycopina are very well represented and quite diverse (see Whatley et al., 1995, 1996). One new genus, Paraxestoleberis, is described and 15 species are new: Dentibythere multituberosa, Dampieriycythe papillolineata, Neocysteromorpha papilloporosa, Loxoconcha catasteros, Semicytherura gamma, Callistocythere cookei, Loxocorniculum koolpionyahensis, Keijia intermedia, K. profundosculpta, K. paradentissa, Quasibradleya leepointensis, Actinocythereis gippsi, Henryhowella sinespinosa, Pontocythereis spatulospinosa and Paraxestoleberis posteroacuminata. Due to insufficient of material, 16 species are left in open nomenclature: Bythoceratina sp., Coralicythere sp., Venericythere sp., Tanella sp., Loxocorniculum sp. 1, L. sp. 2, Gambiella sp., Javanella sp., Paradoxostoma sp., Neomonoceratina sp., Bradleya (s.l.) sp., Echinocythereis (s.l.) sp., Platcythereis? sp., Alocopocythere sp., Xestoleberis sp. and Paraxestoleberis sp. The remaining 66 species/subspecies have all been previously described or are compared with previously described species.

Key words: Ostracoda, Cytheracea, new species and genus, Recent, Shoal Bay, Northern Australia.

Resumen

Los ambientes litorales actuales en Shoal Bay, Northern Territory (Australia) muestran una alta diversidad de ostrácodos cytheráceos (51 géneros y 97 especies). Probablemente esta diversidad es debida a tres factores: (1) ambientes marinos cálidos y bien oxigenados que conducen a un alto nivel de productividad biológica; (2) ambientes someros marinos favorables para la acumulación post mortem de material conchífero, y (3) una ubicación central en el camino de dispersión sobre la plataforma continental, entre las regiones del Pacífico y de Asia suroriental. Una característica particular de esta fauna de Cytheracea es que algunos géneros, como por ejemplo Alocopocythere, pueden remontarse hasta el Cretácico cuando aparecieron por primera vez en las aguas someras del Tethys. En superposición a esta componente antigua de la fauna están los ostrácodos dominantes en las asociaciones modernas del Indo/Pacífico, como el género Keijia. Mientras los Cytheracea son los ostrácodos dominantes, otros grupos, especialmente los Cypridacea marinos, Bairdiacea y Platycopina, están bien representados y son bastante diversos (fide Whatley et al., 1995, 1996). Se describe aquí un

**Palabras clave:** Ostracoda, Cytheracea, nuevo género, nuevas especies, Reciente, Shoal Bay, Norte de Australia.

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**INTRODUCTION**

Ostracods of the podocopid superfamily Cytheracea are very diverse in the warm shallow marine seas of northern Australia. Cytheraceans from Recent littoral environments of Shoal Bay within the Beagle Gulf, Northern Territory (Australia) include genera with ancient Cretaceous Tethyan origins, such as *Alocopocythere* as well as typical modern Indo-Pacific taxa such as *Keijia* (NB. *Keijia* also occurs in the Atlantic and Caribbean).

As a consequence of the large complexity of easily discernible carapace characters, ornate cytheraceans have commonly been finely subdivided into a large array of genera. This practice has probably lead to ornate groups of ostracods having been split into more genera than non-ornate groups, relative to that which might be apparent from the examination of soft part anatomy. As our knowledge of modern and fossil ostracod faunas grows, it is becoming increasingly apparent that greater efforts towards understanding morphological associations between cytheracean genera are needed in order to gain better insights into phylogenetic relationships. Therefore, the taxonomic discussions presented here aim at extending taxonomic concepts and knowledge of taxonomic relationships for northern Australian cytheracean Ostracoda. Many of these have been previously considered in major works by Brady, 1880; Hartmann, 1978; Whatley & Zhao, 1987, 1988; Howe & McKenzie, 1989; Yassini et al., 1993; Mostafawi, 1992; Dewi, 1997, and Titterton et al., 2001.

Ostracods were collected from back beach to tidal flat sediment samples gathered from Lee Point on the coast of Shoal Bay approximately 15 kilometres northeast of Port Darwin in the north of the Northern Territory of Australia. Details of the sites and the sample settings are given in Whatley et al., 1995. Non-cytheracean ostracods obtained from the same samples were described and illustrated in two previous papers (Whatley et al., 1995, 1996). The present paper, which is the third in this series on the ostracod faunas from these samples, deals exclusively with the dominant Cytheracea and concludes the documentation of this diverse and important fauna.

This paper is one of a series, with which the ostracod group at the University of Wales, Aberystwyth, has initiated or been associated with, designed to extend our knowledge of the benthonic Ostracoda of the Indo-Pacific, Australia, Indonesia and adjacent areas. This research programme concentrates on the systematics and taxonomy of the various faunas and on their zoogeography, particularly their migrational history. Whatley, 1986, and Titterton & Whatley, 1988b, began this endeavour based on a study of the fauna of the Solomon Islands and an analysis of the existing literature. Since this date, important studies by a number of authors in the region have provided much more detailed and comprehensive data, although the zoogeographical provincial structures outlined by Titterton & Whatley remain more or less intact. Among the important contributions of the last decades are Behrens, 1991a, b, 1992 (Great Barrier Reef); Cabioch et al., 1986 (New Caledonia); Dewi, 1997 (Java Sea); Howe & McKenzie, 1989 (NW Australia); Jellinek, 1993 (Kenya); Labutis, 1977 (southern Great Barrier Reef); Montenegro et al.,
2004 (Thailand); Mostafawi, 1992 (Malaysia); Mostafawi et al., 2005 (Indonesia); Titterton & Whatley (1988a, 2005 & in press a, b, c, d & e Solomon Islands); Whatley et al., 1995 & 1996 (Northern Australia); Whatley & Keeler, 1989 (Reunion Island); Whatley & Zhao, 1987 & 1988 (Malacca Straits); Whatley, 2000: Whatley & Jones, 1999; Whatley et al., 2000 (Easter Island); Whatley & Roberts, 1995; Whatley et al., 2004 (Pitcairn Group), Yassini et al., 1993 (Northern Australia), Yassini & Jones, 1995 (Eastern Australia), Zhao & Whatley, 1989 (Malaysia).

The high cytheracean diversity here reported from Lee Point on Shoal Bay, northern Australia probably relates to three factors. These are the presence of (1) warm, well oxygenated marine environments conducive to high rates of biological productivity; (2) shallow marine environments which are favourable to post mortem accumulation of shell material, and (3) a central location on the continental shelf dispersal route between the SW Pacific and S. E. Asian regions. The Cytheracea dominate the overall ostracod fauna of the study area, although the other groups, particularly the marine Cypridacea, Bairdiacea and Platycopina are very well represented and are also quite diverse (see Whatley et al., 1995, 1996).

SYSTEMATIC DESCRIPTIONS

All specimens are deposited in the collections of the Palaeontology Department, The Natural History Museum (London) and are registered in the collection reference file under catalogue numbers prefixed BB/NA (or BB). The following conventions are employed: A: adult; juv.: juvenile; RV: right valve; LV: left valve; C: articulated carapace; A-1: penultimate instar; A-2: antepenultimate instar; rpc: radial pore canals; npe: normal pore canals; im: inner margin; om outer margin. Dimensions are quoted in millimetres. Size groupings are based on the following standards for length: less than 0.4 mm, very small; 0.4-0.5 mm, small; 0.5-0.7 mm, medium; 0.7-1.0 mm, large; greater than 1.0, very large. Qualitative references to the abundance of radial pore canals and normal pore canals are based on the following numerical framework: less than 30, few; 30-70, numerous; greater than 70, very numerous. Distribution data within the systematic palaeontology only pertains to the samples examined for this study (outlined in Fig. 2 of Whatley et al., 1995).

Phylum CRUSTACEA Pennant, 1777
Class OSTRACODA Latreille, 1806
Order PODOCOPIDA Müller, 1894
Suborder PODOCOPINA Sars, 1866
Superfamily CYTHERACEA Baird, 1850
Family BYTHOCYTHETERIDAE Sars, 1926
Genus Bythoceratina Hornbrook, 1952

Bythoceratina scabrecuneata (Yassini, Jones & Jones, 1993) comb. nov.
(Pl. 1, Fig. 15)

1993 Dentibytheare scabrecuneata Yassini et al., p. 394, Pl. 6, Figs. 109-114.

Material.—1 adult valve.
Distribution.—Sample A5.
Dimensions.

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<tr>
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</table>

Remarks.—A species of Bythoceratina characterised by its strongly reticulate ornament, strongly atate ventrolateral spine, ventral and dorsal ribs and a proximally plicate anteromarginal rim. B. orientalis (Brady, 1869), from Hong Kong, is similar in overall outline to the present species, as well as in possessing a ventral flange or frill, and medium sulcus, but can be distinguished by its lack of strong reticulate ornament.

Bythoceratina sp.
(Pl. 1, Figs. 8-10)

Material.—9 valves.
Distribution.—Samples A4, A5 and B 4.
Dimensions.

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<tr>
<td>ALV, BB/NA 004</td>
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<td>ARV, BB/NA 005</td>
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<td>0.24</td>
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Remarks.—The closest species to the present material is B. bicornis Mostafawi, 1992, but the latter has a delicate carapace reticulation and two small, short parallel ribs extending ventrally from the dorsal margin at 1/3 distance from the anterior margin. Bythoceratina scabra van den Bold, 1960, from the
Eocene and Oligocene of Trinidad is similar to the present species, but possesses a more strongly inflated dorsal region of the carapace. B. monstruosa Holden, 1967, from the Neogene of Hawaii also lacks the well developed dorsal rib and its alar process is less strongly bifurcate. Similarly the alar process in Dentibythe schornikovii Yassini & Jones, 1995, is less strongly bifurcate than for the species here illustrated. The present species also occurs in reef and reef associated environments of the Java Sea (Watson MS, 1988) and in the Solomon Islands (Titterton & Whatley, in press b).

Genus Dentibythe s.l. Schornikov, 1982

Remarks.—Dentibythe Schornikov is generally characterised by its coarse surface ornament and a strong denticulate hinge compared to Bythoceratina Hornbrook. However, one species illustrated in this study (Pl. 1, Figs. 11-14) possesses rugged ornament typical of Dentibythe but a simple lophodont hinge typical of Bythoceratina. The differential diagnosis of Bythoceratina and Dentibythe appears, therefore, to require clarification, although this is beyond the scope of the present study.

Dentibythe multituderosa sp. nov. (Pl. 1, Figs. 11-14)

Derivatio nominis.—Latin. With reference to the multituderulate nature of the carapace.

Holotype.—ALV, BB/NA 006 (Pl. 1, Fig. 11).

Type locality and level.—Lee Point East, sample A5, Recent.

Material.—11 valves. Adult to A-1.

Diagnosis.—A species of Dentibythe, characterised by its subquadrate to subrectangular outline and multi-tuberculate surface. The tuberculae are ornamented by riblets and puncta.

Description.—Small, subtranslucents. Subquadrate to subrectangular in lateral view. Anterior margin broad but rather angular, with a weakly developed marginal ridge. Dorsal margin slightly concave, overhung by strong dorsal rib posteriorly and tubercle just anterior of mid-length. Anterior cardinal angle distinct. Posterior cardinal angle obtuse. Posterior margin subaudate, accumulate; extremity subdorsal. Ventral margin straight, overhung ventromedianly, and posteroventrally by well developed tubercle and blunt alar spine respectively. Greatest length above mid-height. Greatest width through lateral extremity of posteroventral spines. Surface ornament of 5 irregularly spaced tubercles and reticulate meshwork made up of fine riblets, that cover both the tubercles and the inter-tuberculate areas, as do numerous, prominent npc openings that resemble puncta. Anteriorly a weakly developed marginal rib occurs, sub parallel to margin. This marginal rib, becomes divergent anteroventrally to form ventro-lateral rib, which merges with well developed ventromedian tubercle and the very strong, spine-like ala. Dorsal marginal rib extending from posterodorsal cardinal angle to well developed dorsal tubercle medially. A sharp rib extends from the anterior cardinal angle ventrally, to a large subovate, anteromedian tubercle. A pronounced and sinusious median sulcus extends from the dorsal margin to 1/3 the distance from the ventral margin. An elongate, rounded lateral tubercle extends from the posterior edge of the...
median sulcus, to reach the posterior margin medianly. Inner lamella narrow, im subparallel to on. Small crescentic vestibulum anteriorly. Rpc rather few, simple, slightly sinuous. Central muscle scars; a subvertical row of 5 ovate adductors. Dorsal-most adductor largest; remainder decreasing in size towards ventral margin. Hinge; lophodont.

Distribution.—Samples A1-A5.

Dimensions.

<table>
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<tr>
<td>Paratype ALV, BB/NA 007</td>
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<td>Paratype ARV, BB/NA 008</td>
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<tr>
<td>Paratype ALV, BB/NA 009</td>
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<tr>
<td>Paratype ARV, BB/NA 010</td>
<td>0.48</td>
<td>0.24</td>
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Remarks.—The present species is closest in external appearance to Bythoceratina sp. McKenzie, 1974, although the latter differs in not possessing an elongate posteromedian tubercle or posteroventral subalar process with broad, sharp spine. Furthermore the dorsal rib in McKenzie’s species is less strongly developed. This species is superficially very similar to Dentibyzhere dentata Schornikov, 1982, but differs in lacking large marginal denticles and in its lophodont hinge. Very similar in external ornament to Dentibyzhere dentata Schornikov as illustrated by Yassini & Jones, 1987, and Yassini et al., 1993, except that the present species has a much stronger mid-posterior node.

Genus Rhombobythere Schornikov, 1982
Rhombythere intertexta Schornikov, 1982
(Pl. 1, Figs. 2-3)

1982 Rhombobythere intertexta Schornikov, p. 70,
Pl. 9, Figs. 1-2.

Material.—95 valves.
Dimensions.

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<td>0.22</td>
</tr>
<tr>
<td>ARV, BB/NA 017</td>
<td>0.44</td>
<td>0.24</td>
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Remarks.—The accumulate postero dorsal caudal process and weak alar-like tubercle posteroventrally, as well as its smaller size, distinguish the present species from R. intertexta, Schornikov 1982. Specimens of R. tuberculata Schornikov 1982 collected from samples examined for this study, can be readily distinguished from the present species by their prominent tubercle immediately behind and below the antero dorsal cardinal angle. Mostafawi’s (1992) species Bythoceratina ventristriata from the Sunda Shelf, SE Asia appears conspecific with the present species.

Rhomobythere tuberculata Schornikov, 1982
(Pl. 1, Figs. 6-7)

67, Pl. 8, Fig. 2.
1993 *Rhomboctyhere alata* Schornikov. Yassini *et al.*, p. 393, Pl. 6, Figs. 199, 120.

*Material.*—17 valves, 1 carapace.

*Distribution.*—Sample A3-A5, B2, B4.

*Dimensions.*

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</tr>
<tr>
<td>ALV, BB/NA 021</td>
<td>0.36</td>
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*Remarks.*—The present species is closest to *R. saltata* Schornikov in external appearance and size, the latter being distinguished by lack of a prominent tubercle immediately behind and below the anterior dorsal cardinal angle and in being more acuminate posterodorsally.

Family *CYTHERIDEIDAE* Sars, 1925
Subfamily *CYTHERIDEINAE* Sars, 1925
Genus *Coralloctyhere* Hartmann, 1974
*Coralloctyhere* sp.
(Pl. 1, Figs. 21, 22)

*Material.*—1 valve.

*Distribution.*—Sample A4.

*Dimensions.*

<table>
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<tr>
<td>ALVF, BB/NA 022</td>
<td>0.56</td>
<td>0.32</td>
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*Remarks.*—The present species resembles *Dampiercythere papillolineata* sp. nov. of the present study, but differs externally in being less elongate, and having its tubercles less regularly orientated. Internally the two can be distinguished by the difference in muscle scar pattern, 3 adductors in *Coralloctyhere* as opposed to 4 in *Dampiercythere*. The generic assignment of this species is uncertain because the one specimen to hand may be juvenile, in that its inner lamella is very narrow and poorly developed. Watson (MS, 1988) records a very similar species from reef environments in the Java Sea. *Coralloctyhere arcanis* Behrens, 1991, from the northern Great Barrier Reef differs in being only feebly ornamented peripherally and smooth medianly. *Coralloctyhere* sp. Mostafawi, 1992, from the Sunda Shelf (SE Asia) differs from the present species by possessing a more concave ventral margin and coarser ornament.

Genus *Dampiercythere* Hartmann, 1978
*Dampiercythere papillolineata* sp. nov.
(Pl. 1, Figs. 23-26; Pl. 2, Figs. 1-2)

*Derivatio nominis.*—Latin. Referring to the ornament of papillae which are arranged in rows.

*Holotype.*—LVM, BB/NA 023 (Pl. 1, Fig. 23).

*Type locality and level.*—Lee Point East, sample A4. Recent.

*Material.*—31 valves, 10 carapaces. Adult to A-1.

*Diagnosis.*—A species of *Dampiercythere* characterised by its subrectangular outline and broadly rounded end margins. Surface ornament of papillae arranged in rows; vertically (posteriorly and medially) and longitudinally (ventrally and anteriorly).

*Description.*—Medium to large, thick-shelled, elongate subrectangular, in lateral view. Anterior margin asymmetrically rounded, extremity below mid-height. Dorsal margin straight to very slightly convex. Cardinal angles obtuse. Posterior margin broadly rounded, extremity at mid-height. Ventral margin straight. Surface ornamentation of papillae arranged in rows; vertically (posteriorly and medially) and horizontally (ventrally). Anteriorly papillae arranged in 3-4 rows, subparallel to anterior margin. Npc few. Inner margin narrow but robust. Rp closely numerous, simple, short. Avestibulate. Four adductors in a subvertical row; three dorsal-most scars equidimensional, ventral scar large and rounded. Frontal scar “L” shaped, opening anteriorly. Hinge antimerodont with strongly developed terminal elements, comprising in the RV, a dentate bar with 5 teeth anteriorly and 4 posteriorly separated by a uniformly locellate median groove. Sexual dimorphism not very pronounced.

*Distribution.*—Samples A3-A5 and B2, B4.

*Dimensions.*

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<td>Paratype ARVM, BB/NA 024</td>
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<tr>
<td>Paratype ACF, BB/NA 028</td>
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*Remarks.*—The present species resembles *Dampiercythere tuberoreticulata* Hartmann, 1978,
from the west coast of Australia, but differs in its more regular arrangement of papillae. The form of the papillae within the present species ranges from low and smoothly rounded, to elevated with castellate distal endings. Corallicythere sp. (this study) is also superficially very similar but can be distinguished by differences in its muscle scars, less orderly arrangement of papillae and more flared anterior margin.

*Dampierecythere tuberoreticulata* Hartmann, 1978
(Pl. 2, Figs. 3-4)

1978 *Dampierecythere tuberoreticulata* Hartmann, p. 74, Pl. 13, Figs. 13-30; Pl. 14, Figs. 1-3.

**Material.**—111 valves, 67 carapaces. Adult to A-1. **Distribution.**—Samples A1, A3-A5 and B1-B4.

**Dimensions.**

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<tr>
<td>ALV, BB/NA 032</td>
<td>0.72</td>
<td>0.34</td>
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**Remarks.**—The present material, with its delicate reticulum and deeply lipped median sulcus is identical in all respects to that described by Hartmann, 1978, from the eulittoral of Western Australia, except that the development of papillae is not as marked as in Hartmann’s specimens. Occasionally, presumably due to abrasion, the papillae are absent altogether. The present species is similar to *Dampierecythere papillolineata* sp. nov., the latter differing in having a strongly developed lateral surface ornament of papillae arranged in horizontal and vertical rows, and a more rounded posterior margin. *Corallicythere verrucosa* Hartmann, 1974, can be distinguished from the present species by its smaller size, less elongate rectangular shape, and in the nature of its surface ornament.

Family CYTHERIDAE Baird, 1850
Genus *Saida* Hornibrook, 1952

*Saida herrigi* Keij, 1975
(Pl. 1, Fig. 1)

1975 *Saida herrigi* Keij, p. 238, Pl. 2, Figs. 5-8.

**Material.**—1 valve. **Distribution.**—Sample A4.

**Dimensions.**

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**Remarks.**—*Saida herrigi* Keij, 1975, recorded from the Holocene of Indo-Malaysia is very similar to *S. torresi* (Brady, 1880) from the Torres Strait, off northern Australia. However, *S. herrigi* has a more triangular shaped ala on each valve and usually a more curved and thickened posterodorsal carina. As assessed from the illustrations presented in Hornibrook,
1952, *S. truncula* Hornibrook from New Zealand differs from *S. herregi* by virtue of its less conspicuous posterodorsal carina. *S. truncula* can be further distinguished from the present species by its straight, flat dorsal margin. Nevertheless, these three very similar species require further study to fully verify their taxonomic relationships. *S. herregi* was also recorded from the Great Barrier Reef, Australia by Labutis (MS, 1977).

Genus *Loxocythere* Hornibrook, 1952
Subgenus *Novoloxythere* Warne, 2004

*Loxocythere* (Novoloxythere) *kerryswansoni* (Yassini & Jones, 1995)
(Pl. 3, Figs. 9-11)


1989 *Microcytherura* sp. Howe & McKenzie, p. 16, Fig. 66.


Material.—29 valves, 2 carapaces. Adults only.


Distribution.—Sample A1-A5, B1, B4.

Dimensions.

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Remarks.—This species is most similar to *Oculocytheropteran* sp. cf. *raybabei* McKenzie & Pickett of Whatley & Keeler, 1989, from Reunion Island but differs in having a more rounded anterior margin, which lacks anterodorsal marginal scalloping. The presence in the latter, of a small almost indistinct glassy eye tubercle also distinguishes the two species. *O. microfornix raybabei* McKenzie & Pickett, 1984 n. comb. (see below), can be distinguished from the present species by its larger size, subrectangular to subovate outline in lateral view, stronger, more pronounced alar development, presence of a small eye spot (expressed internally by a large ocular sinus below the anterior cardinal angle); and by differences in surface ornament. Unlike *C. alabarda*, which has a surface ornament of faint reticulae, *O. microfornix raybabei* has an ornament composed of numerous evenly spaced papillae. Other similar Australian species, which differ in details of their ornamentation, size and shape are *C. bermaguensi* Yassini & Jones, 1995 and *C. wighti*. Yassini & Jones, 1987. *Cytheropteran* crassipinatum Brady & Norman of Whatley & Masson, 1979, from Britain differs in being more elongate and having a less rounded alar process.
Genus *Oculocysteroperon* Bate, 1972

*Oculocysteroperon microfornix raybatei* (McKenzie, 1984) comb. nov.

(Pl. 3, Figs. 6-8)

1984 *Oculocysteroperon raybatei* McKenzie [in McKenzie & Pickett], Pl. 6, Figs. G, H.

1989 *Oculocysteroperon sp. cf. raybatei* McKenzie, Whateley & Keeler, Pl. 1, Fig. 16.


**Material.**—51 valves. Adult to A-1.

**Dimensions.**

<table>
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<td>ALV BB/NA067</td>
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</table>

**Distribution.**—Sample A3-A5, B4.

**Remarks.**—The present species is very similar to *O. microfornix* s.s. Whateley & Downing, 1983, from the Miocene of Victoria, Australia. However, *O. microfornix raybati* possesses a well-developed series of ribs extending from the posterior of its alar process obliquely towards the posterior cardinal angle. *O. microfornix* s.s. lacks such clearly defined ribs. *Loxocythere (N.) kerrywansoni* Yassini & Jones, 1995, and *Oculocysteroperon castateros* sp. nov. can clearly be distinguished from the present species by their reticulate ornament (the ornament of *O. microfornix raybati* consisting of numerous papillae covering the whole of the valve surface); more subrectangular outline in lateral view, less convex dorsal margin, and to a lesser extent ventral margin; and lack of a prominent medioventral alar process. Internally *O. microfornix raybati* can be distinguished from *L. (N.) kerrywansoni* and *O. castateros* by its shorter, more strongly developed hinge. *Cytheropteron alabarda* Bonaduce *et al.*, 1976 (and herein) closely resembles the present species but differs in having a more subovate outline in lateral view, less pronounced alar process, lack of a papillose and ribbed surface ornament, and smaller size. This subspecies has been recorded by Whatley & Keeler, 1989, from the Island of Reunion in the S. W. Indian Ocean. Williams, MS 1980, illustrated specimens attributable to this species from the Quaternary of the Solomon Islands as did Watson, 1988, from Recent reef environments of the Java Sea. *Oculocysteroperon microfornix amphora* (Yassini *et al.*, 1993) n. comb. has thicker posterior ribs extending from the alar to the posterior cardinal angle and less pronounced depressions along the upper surface of the alar process.

*Oculocysteroperon castateros* sp. nov.

(Pl. 3, Figs. 12-15)

**Derivatio nominis.**—Gr. *castateros*: set with stars. From the fanciful resemblance of the interreticulate punctate ornament of this species to dense star clusters as in the Milky Way galaxy.

**Holotype.**—ALV BB/NA 072 (Pl. 3, Fig. 12).

**Type locality and level.**—Lee Point on Shoal Bay, sample A4. Recent.

**Material.**—15 valves, 2 carapaces. Adults.

**Diagnosis.**—A species of *Oculocysteroperon* characterised by its delicate reticulate primary ornament and densely punctate secondary surface ornament and weakly developed alate extension.


**Distribution.**—Samples A3-A5, B4, B5.

**Dimensions.**

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<td>Paratype ARVF BB/NA 075</td>
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**Remarks.**—The present species is most similar to *L. (N.) kerrywansoni* but differs in the strength of its reticulation as well as in the nature and position of the posterior margin. In *L. (N.) kerrywansoni* the apex of the posterior margin is subdorsal while in the present species it is at...
mid height. The hinge line in \textit{L. (N.) kerryswansoni} is straight while in the present species it is convex dorsally. The two species also differ in the size of the eyespot, and the ocular sinus, these features tending to be larger and more obvious in \textit{L. (N.) kerryswansoni}. \textit{O. catarsteros} belongs to the same Australasian/S. E. Asian species group as \textit{Oculocysteroptheron infrequens} (Mostafawi, 1992) n. comb., which includes carapace forms that are transitional in morphology towards some species of \textit{Lexocytthera (Novoloxocytthera)} Warne and \textit{Antarctilo xoconcha} Hartmann (see discussion in Warne, 2004).

**Subfamily CYTHERURINAE** G. W. Müller, 1894  
**Genus Eucytherura** Müller, 1894

\textit{Eucytherura} sp. cf. \textit{E. orientalis} Kingma, 1948  
(Pl. 2, Fig. 26; Pl. 3, Figs. 1-2)

1948 \textit{Eucytherura orientalis} Kingma, p. 93.  
1989 \textit{Eucytherura} cf \textit{orientalis} Kingma. Howe and McKenzie, p. 47, Fig. 149.

**Material.**—1 valve, 2 carapaces. Adult to A-1.  
**Distribution.**—Samples A4, B5.

**Dimensions.**

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<td>ALV BB/NA 059</td>
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**Remarks.**—The present species differs from \textit{E. multiformata} Ayress \textit{et al.}, 1995; \textit{E. sp. 3} Whatley & Downing, 1983, and \textit{E. horrida} McKenzie \textit{et al.}, 1993 in the positions of its tubercles; reticulation pattern and more quadrate outline in lateral view. Watson (MS, 1988) also records this species in Recent reef and reef associated environments in the Java Sea. Howe & McKenzie, 1989, commented on the similarity that this species has with \textit{Eucytherura orientalis} Kingma, 1948, but were uncertain whether their specimens and those of Kingma, 1948, were sufficiently comparable on available illustrations to attribute to the same species.

**Genus Kangarina** Coryell & Fields, 1937  
\textit{Kangarina} sp. cf. \textit{K. macropus} Whatley & Downing, 1983  
(Pl. 3, Figs. 3-5)

1974 \textit{Kangarina} sp. McKenzie, p. 177, Pl. 3, Fig. 8.  
1983 \textit{Kangarina macropus} Whatley & Downing, p. 375, Pl. 6, Figs. 20-21; Pl. 7, Figs. 1-2.  
1987 \textit{Kangarina macropus} Whatley & Downing, \textit{Warne}, p. 442, Pl. 4, Fig. F.  
1989 \textit{Kangarina} sp. Howe & McKenzie, p. 47, Fig. 152.

**Material.**—14 valves, 4 carapaces. Adult to A-1.  
**Distribution.**—Samples A1, A3-A5; B1, B2, B4.

**PLATE 3–1. 2. Eucytherura sp. cf. \textit{E. orientalis} Kingma, 1948; 1, RV, ext., BB/NA 058, x 118. 2, LV, int., BB/NA 059, x 118. 3–5, Kangarina sp. cf. \textit{K. macropus} Whatley & Downing, 1983; 3, LV, ext., BB/NA 061, x 127; 4, RV, ext., BB/NA 060, x 127; 5, RV, int., BB/NA 062, x 127. 6–8, \textit{Oculocysteroptheron microfroni}x \textit{raybates} (McKenzie, 1984); 6, Male, LV, ext., BB/NA 065, x 106; 7, Female, RV, ext., BB/NA 064, x 97; 8, Female, RV, int., BB/NA 064, x 102. 9–11, \textit{Lexocytthera (Novoloxocytthera) kerryswansoni} (Yassini \textit{et al.}, 1993); 9, LV, ext., BB/NA 068, x 112; 10, RV, ext., BB/NA 069, x 110; 11, LV, int., BB/NA 068, x 110. 12–15, \textit{Oculocysteroptheron catarsteros} sp. nov.; 12, Holotype, Male, LV, ext., BB/NA 072, x 118; 13, Paratype, Female, LV, ext., BB/NA 073, x 118; 14, Paratype, Female RV, ext., BB/NA 074, x 118; 15, Paratype, Female, RV, int., BB/NA 074, x 118. 16–19, \textit{Semicytthera gamma} sp. nov.; 16, Holotype, Male, LV, ext., BB/NA 080, x 93; 17, Paratype, Male, RV, ext., BB/NA 083, x 85; 18, Paratype, Female, LV, ext., BB/NA 081, x 93; 19, Paratype, Female, LV, int., BB/NA 081, x 93. 20–22, \textit{Paracytheridea remanei orientalis} subsp. nov.; 20, Paratype, LV, ext., BB/NA 077, x 68; 21, Holotype, RV, ext., BB/NA 076, x 68; 22, Paratype, LV, int., BB/NA 077, x 68. 23–24, \textit{Rotundocythera mytilo} Hornibrook, 1952; 23, RV, ext., BB/NA 084, x 110; 24, RV, int., BB/NA 084, x 110. 25–27, \textit{Caudites emoutheensis} Hartmann, 1978; 25, LV, ext., BB/NA 085, x 72; 26, RV, ext., BB/NA 086, x 68; 27, LV, int., BB/NA 085, x 72.
Dimensions.

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<td>ALV BB/NA063</td>
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Remarks.—The present material accords well with Whatley & Downing’s (1983) specimens from the Miocene of Victoria, Australia, although it differs in its less well developed posteroventral spine. The present species is also very similar in external appearance to K. radiata (Hornbrook, 1952) and further detailed study of both species is required to better document morphological differences. Unillustrated specimens recorded by McKenzie & Peyrouquet, 1984, as Kangarina sp. come from the type locality for Kangarina macrospus and may be the same as the later.

Genus Semicytherura Wagner, 1957

Semicytherura gamma sp. nov.
(Pl. 3, Figs. 16-19)

1993 Semicytherura sp. 2 Yassin et al., p. 404, Pl. 9, Figs. 167, 168.

Derivatio nominis.—Gr. γαμμα. From the fanciful resemblance of the bifurcating median rib of this species to a reclined lower case Greek letter gammadion or gamma.

Material.—12 valves. Adult to A-1.

Holotype.—ALVM BB/NA 080 (Pl. 3, Fig. 16).

Type locality and level.—Lee Point on Shoal Bay, sample A 4. Recent.

Diagnosis.—A species of Semicytherura characterised by its subrectangular outline in lateral view, inflated carapace posteriorly, and strong smooth lateral rib extending from the anterior median margin; posteroventrally forming a strong, broad alar process, which bifurcates at quarter length, with a ramus extending diagonally to a postero-dorsal position and overall resembling a reclined Greek letter gamma. Mural walls of fossae with minute vertical striae.


Surface ornament of irregular but delicate reticulae, weakly developed costate, and with a strongly developed alar process posteroventrally. Weakly developed ocular rib extending anteromedianly. Strongly developed median rib extending obliquely from anteromedian edge, towards posteroventral margin as an alar process and with a ramus, produced by an anterior bifurcation extending to a postero-dorsal position. Remainder of surface covered with a fine reticulate meshwork. Mural walls with minute vertical striae. Sexual dimorphism marked; males more elongate, and less high, inflated posterozidianly. Females shorter, taller, less obviously inflated posteriorly. Also, males tend to develop a median rib extending from the anterior margin of the alar process (below the eye tubercle) towards the postero-dorsal cardinal angle. Inner margin extremely broad, broadest posteriorly. Rp6 long, sinuous, simple. Muscle scar details not observed. Hinge modified antimerodont.

Distribution.—Samples A4, A5, B4.

Dimensions.

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<tr>
<td>Paratype ARVM BB/NA 083</td>
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<td>0.18</td>
</tr>
</tbody>
</table>

Remarks.—The present species resembles Semicytherura pasila Barbeito-Gonzalez, 1971, from the Recent Mediterranean, but the latter lacks the well developed alar process and well developed ocular rib. Both S. boatswainensis Hartmann, 1980, and S. cryptifera (Brady, 1880) closely resemble the present species but differ in shape and position of the caudal process as well as in the strength of their costae and reticulation. This species is unusual in that sexual dimorphism is manifested in ornamental variation with respect to the strength of medium rib development. S. cryptifera (Brady) sensu Yassin et al., 1993, differs from the present species by possessing an additional lateral rib above and parallel to the ala extending from the anterior margin for about two-thirds the length of the valves. This rib is present at about mid height at the anterior margin and is inclined downwards towards the posteroventral margin.

Subfamily Paracytherideidae Puri, 1957
Genus Paracytheridea Müller, 1894
Paracytheridea remanei Hartmann, 1964
Paracytheridea remanei orientalis subsp. nov.
(Pl. 3, Figs. 20-22)
1993 Paracytheridea remanei Hartmann. Yassini et al., p. 393, Pl. 5, Fig. 99.

**Derivatio nominis.**—L. With reference to the fact that the two records of this subspecies are both from locations to the east of known occurrences for the nominative subspecies in the Red Sea and Western Australia.

**Holotype.**—ARV BB/NA 076 (Pl. 3, Fig. 21).

**Type locality and level.**—Lee Point on Shoal Bay, sample A 3. Recent.

**Material.**—360 valves. Adults to A-2.

**Diagnosis.**—A subspecies of Paracytheridea remanei characterised by the absence of a continuous median rib across the subcentral tubercle.

**Description.**—Medium, thick shelled, subquadrate in lateral outline. Anterior broadly rounded with extremity at mid height. Posterior with strong caudal process; extremity well above mid height. Dorsal margin gently arched. Ventral margin straight anterior of mid length and strongly inclined upwards to posterior extremity posterior of mid length. Surface of carapace with marked posterodorsal “hump-like” swelling and large ventral ala. Strong ribs extend from the posterodorsal margin across the “hump-like” swelling to subcentral tubercle. Internal features as for *P. remanei s.s.*


**Dimensions.**

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**Remarks.**—The present material accords well with Hornibrook’s specimens from New Zealand, apart from lacking the faint reticulate ornament, although this may be due to abrasion. *Eucythere gibba* Edwards, 1944, differs in being shorter, having a more broadly rounded anterior, and a different muscle scar pattern. The present species, as illustrated here, is very similar to *Rotundactythere gracilis* (Yassini & Jones, 1995), although the latter has a greater length to height ratio.

1993 Paracytheridea echinata Hu & Cheng, 1977, and Paracytheridea polyplinosa Hu & Cheng, 1981, are similar in general carapace morphology to the present species, but differ in the detail of ridge patterns and reticulate ornament. See also discussion on sexual dimorphism in *P. remanei* and comparative morphology between various *Paracytheridea* spp. in Mostafawi et al. (2005).

**Family EUCYTHERIDAE** Puri, 1953

**Genus Rotundactythere** Mandelstam, 1958

*Rotundactythere mytila* Hornibrook, 1952 (Pl. 3, Figs. 23-24)

**Material.**—1 adult RV.

**Distribution.**—Sample A2.

**Dimensions.**

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**Remarks.**—The present material accords well with Hornibrook’s specimens from New Zealand, apart from lacking the faint reticulate ornament, although this may be due to abrasion. *Eucythere gibba* Edwards, 1944, differs in being shorter, having a more broadly rounded anterior, and a different muscle scar pattern. The present species, as illustrated here, is very similar to *Rotundactythere gracilis* (Yassini & Jones, 1995), although the latter has a greater length to height ratio.

1978 *Caudites exmouthensis* Hartmann, p. 102, Pl. 9, Figs. 10-11.

**Material.**—19 valves, 176 carapaces. Adults only.

**Distribution.**—Samples A1-A5; B1-B5.

**Dimensions.**

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Remarks.—The present species differs from *C. scopulicola territoriae* (Howe & McKenzie, 1989) n. comb. from the northern coast of Australia, in the shape and form of the surface ornamentation, i.e. the present species lacks the development of thick strong radial ribs. Whatley & Keeler, 1989, record this species from Reunion Island, SW Indian Ocean, while the type material is from Western Australia.

*Caudites scopulicola territoriae* (Howe & McKenzie, 1989) comb. nov. (Pl. 4, Fig. 1)


Material.—3 valves, 1 carapace. Adults only.

Distribution.—Samples A5, B4.

Dimensions.

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Subfamily *Auriliniae* Puri, 1974

Genus *Mutulus* Neviiani, 1928

*Mutulus fungoides* (Brady, 1866) comb. nov. (Pl. 4, Figs. 2-3)

1866 *Cythere fungoides* Brady, p. 385, Pl. 61, Figs. 7a-d.
1880 *Cythere fungoides* Brady. Brady, p. 93, Pl. 19, Figs. 7a-d.

Material.—169 valves, 2 carapaces. Adults to A-4.

Distribution.—Samples A1-A5, B1, B3, B4.

Dimensions.

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Remarks.—The present species resembles *Pontocythere spatulospinosa* sp. nov. of the present study. The latter differs in having a more elongate, sub-rec-
tangular outline, less prominent alar process and less irregularly ornamented surface. Brady (1866, 1880) described this species from Australia (including Booby Island) and Bermuda. Howe & McKenzie, 1989, record that Jugocythereis henryhowei [= Mutilus fungoides (Brady)] has two frontal scars.

*Mutilus splendidornatus australiensis* Hartmann, 1978
(Pl. 4, Figs. 4-6)

1978 *Mutilus splendidornatus australiensis* Hartmann, pp. 99-100; Text-Figs. 223-230; Pl. 8, Fig. 10-16.
1990 *Robustaurila splendidornata australiensis* (Hartmann, 1978), Gou, p. 27, Pl. 2, Figs. 26, 27 (also see synonymy list therein).
1992 *Mutilus australiensis* Hartmann. Mostafawi, p. 143, Pl. 3, Fig. 54.
1995 *Auradilus australiensis* (Hartmann). Jellinek, p. 168, Figs. 1-8, Text-Fig. 4.
2005 *Auradilus australiensis* (Hartmann). Mostafawi *et al.*, p. 132, Pl. 2, Figs. 4-5 (also see synonymy list therein).

**Material.**—70 valves, 34 carapaces. Adults to A-3.

**Distribution.**—Samples A5, B4.

**Dimensions.**

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**Remarks.**—The present species can readily be distinguished from *Mutilus varionatus* Hartmann, 1978, and herein, by its well developed, strong lateral costae, particularly subdorsally and subventrally, and more strongly developed anterior marginal flange. The strongly reticulate ornament with deep fossae and sharp muri of *M. splendidornatus australiensis* also serves to differentiate this taxon from *Mutilus varionatus*. Subspecies of *M. splendidornatus*, which differ only in the strength and minor details of ribbing and reticulation, are known from Africa (Hartmann, 1974), Australia (Hartmann, 1978; Howe & McKenzie, 1989) and Southeast Asia (Gou, 1990; Mostafawi, 1992). Some authors (i.e. Jellinek, 1995) raise this subspecies to species level. For discussion of the relationship between the present species and *Mutilus convolutes* (Brady, 1868) see Mostafawi *et al.* (2005).

*Mutilus varionatus* Hartmann, 1978
(Pl. 4, Figs. 7-9)

1978 *Mutilus varionatus* Hartmann, p. 98, Pl. 8, Figs. 1-9.
1989 *Mutilus varionatus* Hartmann. Whatley & Keeler; Pl. 3, Figs. 4-6.
1992 *Mutilus cf. variornatus* Hartmann, Mostafawi, p. 143, Pl. 3, Fig. 55.

**Material.**—11 valves, 4 carapaces. Adults to A-2.

**Distribution.**—Samples A1, A4, A5, B3, B4.

**Dimensions.**

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<td>0.58</td>
<td>0.28</td>
</tr>
</tbody>
</table>

**Remarks.**—M. varionatus Hartmann, 1978, can be distinguished from *M. splendidornatus* Hartmann 1978 (various subspecies), by its lack of strong costae extending laterally across the carapaces, and less strongly reticulate ornament. The shape and ornament of the present species can vary considerably. The ornament consists of a finely reticulate surface with weak radiating costae. It is the strength and position of these costae that are so variable within the species. Hartmann’s original material was from the west coast of Australia. Whatley & Keeler, 1989, recorded this species from Reunion Island in the SW Indian Ocean.

Family CAMPYLOCYTHERIDAE Puri, 1960
Subfamily RUGGIERIANAE subfamily nov.

**Remarks.**—This subfamily is erected to accommodate such genera as Ruggiera Keij, Keiella Ruggieri,
Bicornucythere Schornikov & Saitaru, Parakeijella Jellineck, Venericythere Mostafawi, Lankacythere Bhatta & Kumar and Pistocythereis Gou. This subfamily is distinguished from the Campylocytherinae Puri, 1960 (i.e. Leguminocythereis Howe & Law, Campylocythere Edwards, etc.) on the basis of their generally less elongate carapace, usually more pointed posterior and (with the exception of Lankacythere and Pistocythereis) their much less subquadrat/subrectangular outline. All these genera (of the Campylocytherinae and Ruggierianae) are here removed from the Trachyleberidae, where they have commonly been previously placed, and are here listed separately under the family Campylocytheridae.

Genus Keijella Ruggieri, 1967
Keijella kloempriensis (Kingma, 1948)

1948 Cythere kloempriensis Kingma, p. 69, Pl. 7, Figs. 5a, b.
1982 Leguminocythereis? hodgii (Brady) (pars). Hou et al., p. 182, Pl. 76, Figs. 10-12.
1989 Keijella kloempriensis (Kingma). Zhao & Whatley; p. 241, Pl. 4, Figs. 6-8.

Material.–9 valves. Adults to A-2.
Distribution.–Samples A3, A4, A5.
Dimensions.

<table>
<thead>
<tr>
<th>Length</th>
<th>Height</th>
</tr>
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<tbody>
<tr>
<td>LV BB-1 (?juv.)</td>
<td>0.52</td>
</tr>
<tr>
<td>RV BB-2 (?juv.)</td>
<td>0.51</td>
</tr>
</tbody>
</table>

Remarks.–The illustrated specimens for this species (BB-1 and BB-2) are from slide no. 76 of the Blagden Collection in the Natural History Museum (London). The present species differs from Venericythere sp. of the present study by its more quadrangle outline and weaker longitudinally arranged costae.

Venericythere sp. (Pl. 9, Fig. 17)


Material.–4 valves. Adult to A-1.
Distribution.–Samples A4, A5.
Dimensions.

<table>
<thead>
<tr>
<th>Length</th>
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<tbody>
<tr>
<td>ALV BB/NA 272</td>
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<tr>
<td>ARV BB/NA 273</td>
<td>0.52</td>
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</tbody>
</table>

Remarks.–The present species differs from Venericythere papuensis (Brady) of the present study by its less quadrangle outline and more prominent longi-
tudinally arranged costae. This species differs from *Keijella gonia* Zhao and Whatley, 1989, in the pattern of the ornament in the central portion of the carapace surface.


*Pistocythereis* sp. (Pl. 8, Figs. 10-12)

*Cythere euplectella* Brady. Puri & Hullings, Pl. 25, Figs. 14-18.

*Pistocythereis cibriformis* Brady. Yassini *et al.*, p. 398, Fig. 128.

**Material.**—121 valves, 6 carapaces. Adult to A-3.

**Distribution.**—Samples A2-A5, B2-B4.

**Dimensions.**

<table>
<thead>
<tr>
<th></th>
<th>Length</th>
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<tbody>
<tr>
<td>ALVF BB-3</td>
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</tr>
<tr>
<td>ARVM BB-4</td>
<td>0.67</td>
<td>0.36</td>
</tr>
</tbody>
</table>

**Remarks.**—The illustrated specimens for this species (BB-3 and BB-4) are from slide no. 81 of the Blagden Collection in the Natural History Museum (London). The present material is closest to *Pistocythereis cibriformis* (Brady, 1866) and *Pistocythereis bradyi* (Ishizaki, 1968), but differs by possessing prominent lateral (subhorizontal) carinae developed from the relatively heavy calcification of certain muri. The present species is also close to *Lankacythere coralloides* (Brady, 1886) and *Lankacythere elaborata* Whatley & Zhao, 1988, but differs in the form and shape of the reticulum.

**Family KRITHIDAE** Mandelstam, 1958

*Parakrithella* Hanai, 1959

*Parakrithella placida* (Mostafawi, 1992) comb. nov. (Pl. 4, Figs. 10-11)

*Pseudopsammocycythe* cf. *reniformis* (Brady). Howe & McKenzie, p. 26, Fig. 27.

*Parakrithe placida* Mostafawi, p. 142, Pl. 3, Figs. 49-57.


*Parakrithella* sp. Dewi, p. 63, Figs. 37-38.

**Material.**—1 valve, 2 carapaces. Adults only.

**Distribution.**—Samples A4, A5.

**Dimensions.**

<table>
<thead>
<tr>
<th></th>
<th>Length</th>
<th>Height</th>
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<tbody>
<tr>
<td>ARV BB/NA 103</td>
<td>0.46</td>
<td>0.20</td>
</tr>
<tr>
<td>ALV BB/NA 104</td>
<td>0.46</td>
<td>0.20</td>
</tr>
</tbody>
</table>

**Remarks.**—A relatively large species with a straight dorsal margin and a narrowly rounded posterior margin. This species also occurs in the Solomon Islands. *Parakrithella placida* Mostafawi is significantly smaller than the very large species, *Parakrithella oblongata* Hu, 1978 (see also Hu & Yeh 1978).

**Family LEPTCYTHERIDAE** Hanai, 1957

*Callistocythere* Ruggieri, 1953

*Callistocythere cookei* sp. nov. (Pl. 4, Figs. 12-15)

1989 *Callistocythere* cf. *insolata* McKenzie [1967]. Howe & McKenzie, p. 28, Fig. 86.

**Derivatio nominis.**—L. named for Peter Cooke, in recognition of his valuable contribution to our knowledge of the non-cytheracean ostracods of the Port Darwin area of northern Australia.

**Holotype.**—ARV BB/NA 105 (Pl. 4, Fig. 12).

**Type Locality and Level.**—Lee Point on Shoal Bay, Sample A4. Recent.

**Material.**—11 valves, 24 carapaces. Adults to A-1.

**Diagnosis.**—A species of *Callistocythere* with a surface ornament of weak, irregular, broadly rounded ribs, forming an open reticulate meshwork with shallow to moderately deep fossae. Distinguished by its prominent ocular rib, but particularly by the two circular reticulae joined by a rib across the median surface resembling *pinz nez* and imparting a binocular appearance to the two valves.

**Description.**—Small, thick-shelled, opaque, sexual dimorphism apparent; males longer and less high than females. Sub-rectangular to subovate in lateral view. Anterior margin broadly rounded with 6–7 short, blunt marginal denticles, extremity below midheight. Posterior margin more narrowly rounded, extremity at mid-height. Dorsal margin almost straight, slightly convex; cardinal angles rounded, obtuse. Ventral margin concave orally. Greatest length at mid-height. Greatest height through anterior cardinal angle. Greatest width medianly. Eye spot obscured by ocular rib. Surface of valves weakly to moderately ornamented by irregular ribs forming an
open reticulate meshwork. Prominent ocular rib extends subparallel to anterior margin. Two circular reticulae joined by a rib across the median surface resembling ping nez and impart a binocular appearance to the two valves. NPC few, widely distributed. Inner lamella wide, line of concrescence and inner margin subparallel to outer margin, divergent anteriorly and posteriorly forming crescentic vestibula. RPC few, wide, short, branching. Selvage moderately developed. Hinge pseudointomodont. Central muscle scars comprising 4 adductors in a vertical row of subovate to subrectangular scars. Frontal "V" shaped opening dorsally.

**Distribution.**—Samples A1-A5; B2-B4.

**Dimensions.**

<table>
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<tr>
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<tbody>
<tr>
<td>Holotype ARVF BB/NA 108</td>
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<td>0.26</td>
</tr>
<tr>
<td>Paratype ALVF BB/NA 109</td>
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<td>0.24</td>
</tr>
<tr>
<td>Paratype ARVM BB/NA 110</td>
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<td>0.24</td>
</tr>
<tr>
<td>ALVM BB/NA 111</td>
<td>0.44</td>
<td>0.22</td>
</tr>
</tbody>
</table>

**Remarks.**—C. cookei sp. nov. can be distinguished from the present species by its more open, less prominent reticulation and strong ocular ridge extending to 1/3 the distance from the ventral margin; an ocular ridge being absent in the present species, and by its binocular structures on the lateral surface. *C. neili* Howe & McKenzie, 1989, can similarly be distinguished from the present species by its open reticulation and smaller size. The present species also differs from other Australian *Callistocythere* species in its numerous and large NPC, which occur on the upper flanks of the ribs. The pattern of the surface ornament on specimens of *C. keiji* illustrated by Hartmann, 1978, is almost identical to that illustrated for *C. rhine* by Howe & McKenzie, 1989. Thus, the latter is here considered a junior synonym of the former.

**Callistocythere neili** Howe & McKenzie, 1989
(Pl. 4, Figs. 18-21)

1989 *Callistocythere neili* Howe & McKenzie, p. 30, Fig. 88.

**Material.**—15 valves, 9 carapaces. Adults to A-1.

**Amended diagnosis.**—A species of *Callistocythere* with a surface ornament of strong irregular, broad, rounded ribs forming an open reticulate meshwork, with moderately deep fossae. Particularly conspicuous is the almost "X"-shaped median, or posteromedian fossa.

**Amended description.**—Small, thick-shelled, opaque, sexually dimorphic, males longer and lower than females. Carapace subrectangular to subquadrate in lateral view. Anterior margin broadly rounded with 10-11, very small, short blunt marginal denticles, extremity at or slightly below mid-height. Posterior margin obliquely rounded, slightly truncated, extremity at mid-height; partially obscured by strong posterior marginal rib. Dorsal margin straight, cardinal angles obtuse, rounded. Ventral margin concave medially. Greatest length at mid-height, greatest height through anterior cardinal angle, greatest width posteriorly. Large prominent, subspherical eye spot. Surface of valves strongly ornamented by irregular ribs forming an open reticulate meshwork of moderate
to deep broad fossae. A broad “X” shaped median to posteromedian fossae is characteristic. A strong ocular ridge extending anterointerally towards its termination 1/2 distance from ventral margin is also present. Strong anterior marginal rib, and extremely broad posterior marginal rib, sub parallel to anterior and posterior margins respectively. Npc irregularly distributed. Line of concrescence and inner margin divergent anteriorly and posteriorly. Rpc short, branched distally. Hinge pseudoentomodont. Central muscle scar pattern a subvertical row of four elongate oval scars. Frontal scar not clearly visible.

Distribution.—Samples A2-A5; B2, B4.

<table>
<thead>
<tr>
<th>Dimensions.</th>
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<tbody>
<tr>
<td><strong>Length</strong></td>
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<tr>
<td>ARVF BB/NA 112</td>
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<tr>
<td>ALVF BB/NA 113</td>
</tr>
<tr>
<td>ARVM BB/NA 114</td>
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<tr>
<td>ALVM BB/NA 115</td>
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</tbody>
</table>

**Remarks.**—The present species is similar to C. cookei sp. nov. but differs in the lack of such a strong ocular rib and the binocular structure on the lateral surface and in its more strongly developed reticulation. C. cookei also lacks the “X” shaped median fossae, and has a more elongate, subovate outline than the present species. C. keiji Hartmann, 1978, from the eulittoral of Western Australia can be distinguished from the present species by its stronger, irregular, less open reticulation. This species has a less tapered posterior and different ornament pattern to C. warnel Howe & McKenzie, 1989.

Genus *Tanella* Kingma, 1948

*Tanella* sp.

(Pl. 4, Fig. 22)

**Material.**—1 adult left valve.

**Description.**—Small, moderately thick-shelled, subrectangular to subcylindrical in lateral view. Anterior margin broadly rounded, extremity slightly below mid-height. Dorsal margin convex, cardinal angles rounded. Posterior margin rounded, slightly accumulate, extremity below mid-height. Ventral margin biconvex, about anteriorly positioned oral concavity. Greatest length below mid-height, greatest height through anterior cardinal angle. Surface ornament of strong reticulae; muri broad, smooth. Indistinct anterior marginal rib. Internal details not observed.

Distribution.—Sample A4.

<table>
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<tbody>
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<td><strong>Length</strong></td>
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<tr>
<td>ALVF BB/NA 117</td>
</tr>
<tr>
<td>ARVF BB/NA 118</td>
</tr>
<tr>
<td>ARVM BB/NA 119</td>
</tr>
<tr>
<td>ALVM BB/NA 120</td>
</tr>
</tbody>
</table>

**Remarks.**—The present species can be readily distinguished from *T. gracilis* Kingma, 1948, due to its more ovate shape in lateral view, more robust ornament and more rounded anterior margin. *T. africana* Hartmann, 1974, also differs in being more elongate, as well as in its pattern of reticulation. A similar species is described by Titterton & Whatley (in press, d) from the Solomon Islands. The absence of *T. gracilis* from the present study is remarkable as the species is very widespread in the Indo-Pacific region, but this absence may be due to its partial euryhaline habitat preference.

Family *LOXOCONCHIDAE* Sars, 1925

Subfamily *LOXOCONCHINAE* Sars, 1925

Genus *Loxoconcha* Sars, 1866

*Loxoconcha australis* Brady, 1880

(Pl. 4, Fig. 23)

1880 *Loxoconcha australis* Brady, p. 119, Pl. 28, Figs. 5a-f; Pl. 29, Figs. 3a-d.


1988 *Loxoconcha australis* Brady. Yassini & Kendrick, p. 112, Figs. 4H-L.


1993 *Loxoconcha australis* Brady. Yassini et al., p. 394.

**Material.**—14 valves, 1 carapace. Adults to A-1.

**Distribution.**—Samples A2, B2-B4.

<table>
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<tr>
<th>Dimensions.</th>
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</thead>
<tbody>
<tr>
<td><strong>Length</strong></td>
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<tr>
<td>ALVF BB/NA 117</td>
</tr>
<tr>
<td>ARVF BB/NA 118</td>
</tr>
<tr>
<td>ARVM BB/NA 119</td>
</tr>
<tr>
<td>ALVM BB/NA 120</td>
</tr>
</tbody>
</table>

**Remarks.**—*Loxoconcha australis* Brady, 1880, recorded from Port Jackson, Australia, and from Booby Island north of mainland Australia, is similar
to *L. pulchra* McKenzie, 1967, but differs in the form of the reticulation; the latter being more irregular than in the present species. The lectotype specimen of *Loxoconcha australis* Brady illustrated by Puri and Hullings has a more strongly upturned posterior than the present material. *Loxoconcha* cf. *australis* Hartmann, 1979, is similar to the present species but has a more strongly developed caudal process. *L. paiki* Whatley & Zhao, 1987, can be distinguished from the present species by its nearly oval outline in lateral view; as well as in its smaller size and more pronounced, larger and deeper reticulation. *Loxoconcha miniaustralis* Howe & McKenzie, 1989, is markedly smaller than the specimens of *L. australis* encountered in this study. The present material is very similar to *L. broomensis* Hartmann, 1978, except the former lack the conspicuous postero-dorsal ornamental “notch” (short carina) of the latter.

*Loxoconcha dampieriensis* Hartmann, 1978

(Pl. 4, Fig. 24)

1978 *Loxoconcha dampieriensis* Hartmann, p. 106, Pl. 10, Fig. 8.
1989 *Loxoconcha judithiae* Howe & McKenzie, p. 28, Fig. 79.

**Material.**—101 valves, 2 carapaces. Adult to A-2.


**Dimensions.**

<table>
<thead>
<tr>
<th></th>
<th>Length</th>
<th>Height</th>
</tr>
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<tbody>
<tr>
<td>ALV BB/NA 121</td>
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<td>0.32</td>
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<tr>
<td>ARV BB/NA 122</td>
<td>0.62</td>
<td>0.34</td>
</tr>
<tr>
<td>ALV BB/NA 123</td>
<td>0.60</td>
<td>0.30</td>
</tr>
<tr>
<td>ARV BB/NA 124</td>
<td>0.62</td>
<td>0.30</td>
</tr>
</tbody>
</table>

**Remarks.**—The present species, first recorded by Hartmann 1978, from eulittoral habitats in Western Australia, can be distinguished from other species of *Loxoconcha* by its subovate to subrectangular lateral outline, and muri of the reticulae that form a ventral series of arcuate, lateral costae. *L. paiki* Whatley & Zhao, 1987, resembles the present species but can be distinguished from it by virtue of its smaller size, less elongate subrectangular lateral outline, and more poorly developed ventrolateral costae. *Loxoconcha violacea* Behrens, 1991a, is very similar to the present species except these two species differ slightly in shape and the strength of the ornament.

*Loxoconcha heronilandensis* Hartmann, 1981

(Pl. 4, Figs. 25-26)

1981 *Loxoconcha heronilandensis* Hartmann, p. 117, Pl. 9, Figs. 1-6, Text-Figs. 52-54.
1984 *Loxoconcha heronilandensis* Hartmann. Titterton MS, p. 365, Pl. 11, Figs. 11, 12; Pl. 47, Figs. 1-10.
1988 *Loxoconcha heronilandensis* Hartmann. Whatley & Zhao, p. 350, Pl. 5, Fig. 12.
2000 *Loxoconcha georgei* Hartmann. Hoibian et al., p. 223, Pl. 1, Fig. 7.
2002 *Loxoconcha heronilandensis* Hartmann. Hoibian et al., p. 191, Pl. 1, Fig. 4.

**Material.**—2 valves. Adult to A-1.

**Distribution.**—Samples A1, B4.

**Dimensions.**

<table>
<thead>
<tr>
<th></th>
<th>Length</th>
<th>Height</th>
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<tbody>
<tr>
<td>ARV BB/NA 125</td>
<td>0.56</td>
<td>0.36</td>
</tr>
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</table>

**Remarks.**—The present species is most similar to *L. albaniensis* Hartmann, 1979, and to *L. trita* McKenzie, 1967 [sensu Hartmann, 1978], from eulittoral habitats in western and southeastern Australia respectively. All three species possess a prominent alar inflation and are reticulate, but can be seen to differ in their carapace outline, and strength of reticulation. Large numbers of the present species were collected from algae off Heron Island, eastern Australia by Hartmann (1981) where it was more numerous in the protected inner reef than in the outer reef. Dead shells were also found with coral detritus in pools within the reef. Williams (1980, MS, unpub.) found 29 valves in Quaternary brackish water sediments from the Indispensable Reefs off the Solomon Islands. Gou, 1990, regarded *L. heronilandensis* Hartmann as a junior synonym of *Loxoconcha tumu-
Los Hu, 1979. Whilst these species are very similar, the specimens listed as *L. tumulosae* Hu in Gou, 1990, possess a less regularly concentric reticulation pattern in the posterodorsal region of the carapace than is apparent in *L. heronislandensis*. This difference may represent subspecies level morphological variation, although classification as such will require future study of the currently scantily illustrated type material of *L. tumulosae*.

*Loxoconcha liljebogii* Brady, 1868

(Pl. 4, Fig. 27; Pl. 5, Fig. 1)

1868 *Loxoconcha liljebogii* Brady, p. 183, Pl. 13, Figs. 11-15.

1954 *Loxoconcha liljebogii* Brady. Keij, p. 358, Pl. 3, Fig. 4.

1968 *Loxoconcha liljebogii* Brady. Guha, p. 61, Pl. 4, Fig. 2.

1975 *Loxoconcha liljebogii* Brady. Gramman, p. 29, Pl. 5, Figs. 6-8.

1985 *Loxoconcha liljebogii* Brady. Zhao et al., p. 206, Pl. 20, Fig. 12.

1988 *Loxoconcha liljebogii* Brady. Whatley & Zhao, p. 351, Pl. 5, Fig. 13.

1989 *Loxoconcha liljebogii* Brady. Whatley & Keeler, p. 73, Pl. 4, Figs. 4-6, 9.

1992 *Loxoconcha liljebogii* Brady. Mostafawi, p. 151, Pl. 5, Fig. 102.

**Material.**—6 valves, 2 carapaces. Adults only.

**Distribution.**—Samples A3-A4, B2-B3

<table>
<thead>
<tr>
<th>Dimensions.</th>
<th>Length</th>
<th>Height</th>
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<tbody>
<tr>
<td>ARV BB/NA 126</td>
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<tr>
<td>AC BB/NA 127</td>
<td>0.48</td>
<td>0.30</td>
</tr>
</tbody>
</table>

**Remarks.**—*L. liljebogii* Brady, 1868, was first described from the Recent of Mauritis in the Indian Ocean. Since then it has been reported from the Recent of the Philippines (Keij, 1954), Burma (Gramman, 1975) and Reunion Island (Whatley & Keeler, 1989) and also from the Malacca Straits (Whatley & Zhao, 1988) and Malaysia (Mostafawi, 1992). *L. georgi* Hartmann, 1978, is very similar to the present species but has a more narrowly rounded anterior margin and less strongly developed reticulation. Mostafawi et al., 2005, regarded *Loxoconcha broomensis* Hartmann, 1978, as a junior synonym of *Loxoconcha liljebogii*, although it is here noted that specimens previously attributed to these two species vary in the extent of rib-like muri thickening in the anterior and posterior regions of the lateral carapace surface.

*Loxoconcha paiki* Whatley & Zhao, 1987

(Pl. 5, Figs. 2-3)

1977 *Loxoconcha* sp. A. Paik, Pl. 6, Figs. 112-115; Pl. 10, Fig. 170.

1987 *Loxoconcha paiki* Whatley & Zhao, Pl. 5, Fig. 14-16.

1988 *Loxoconcha paiki* Whatley & Zhao. Watson MS, p. 180, Pl. 34, Figs. 4-6.
1992 *Loxoconcha paiki* Whatley & Zhao. Mostafawi, p. 151, Pl. 5, Fig. 105.

**Material.**—156 valves, 33 carapaces. Adult to A-4.


**Dimensions.**

<table>
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<tr>
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<th>Length</th>
<th>Height</th>
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<tbody>
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</tr>
<tr>
<td>ARVM BB/NA 131</td>
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<td>0.32</td>
</tr>
</tbody>
</table>

**Remarks.**—The present species differs from other species of *Loxoconcha* in its nearly oval shape in lateral outline, especially, in the females, strongly oblique rounded anterior margin, strong close set reticulation and strongly inflated carapace. Whatley & Zhao, 1987, record this species from the Malacca Straits and Watson (MS 1988) from the Java Sea. *L. paiki* has a more evenly rounded anterior and posterior outline than *Loxoconcha miniaustralis* Howe & McKenzie, 1989. The present species is very similar to *Loxoconcha tata* Hu, 1978, although the latter displays a somewhat greater posteroventral inflation of the carapace.

*Loxoconcha parvifoveolata* Hartmann, 1980

(Pl. 5, Figs. 4-5)

1980 *Loxoconcha parvifoveolata* Hartmann, p. 139, Pl. 10, Fig. 10-13.

**Material.**—1 adult RV.

**Distribution.**—Sample A4.

**Dimensions.**

<table>
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<tr>
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<tbody>
<tr>
<td>ARVF BB/NA 132</td>
<td>0.50</td>
<td>0.24</td>
</tr>
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**Remarks.**—The present species is similar to *L. abditocostata parva* Hartmann, 1984, from the Society and Taumotu Islands; but differs in not possessing a dorsal costa or posterodorsal tubercle. *L. abditocostata* Hartmann, 1981, from the eulittoral of the east coast of Australia differs in not displaying the deep reticulate to punctate surface ornament of the present species. The present species is very similar in shape to *Loxoconcha ismaulisnai* Dewi, 1997 from Indonesian seas, but the latter possesses a more coarsely reticulate ornament.

*Loxoconcha sp. cf. L. georgi* Hartmann, 1978

(Pl. 5, Figs. 6-10)

1978 *Loxoconcha georgi* Hartmann, p. 105, Pl. 9, Figs. 13-16.

1989 *Loxoconcha georgi* Hartmann. Howe & McKenzie, p. 18, Fig. 84.

1990 *Loxocriniculum georgi* (Hartmann). Gou, p. 26, Figs. 43, 44.


**Material.**—50 valves, 17 carapaces. Adult to A-2.

**Distribution.**—Samples A3-A5, B3-B4.

**Dimensions.**

<table>
<thead>
<tr>
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<th>Length</th>
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<tr>
<td>ALVM BB/NA 134</td>
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<td>ALVF BB/NA 135</td>
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</tbody>
</table>

**Remarks.**—The present species is similar to *L. australis* Brady, 1880, but differs in being inflated medianly, and in having a slightly different pattern of reticulation. Also the latter has a small opaque patch medianly. The specimens of the present study illustrated here are very similar to *L. georgi s.s.* Hartmann, 1978, although the latter tends to have a slightly more elongated and narrowly rounded anterior in both male and female specimens. The present species is very similar in shape to *L. wrighti* Dewi, 1997, from Indonesian seas, although the latter possesses a coarser reticulate ornament.

Genus *Loxocriniculum* Benson & Coleman, 1963

*Loxocriniculum koolpionyahensis* sp. nov.

(Pl. 5, Figs. 15-18)

**Derivatio nominis.**—Referring to the Aboriginal name for the area around Lee Point.

**Holotype.**—ARV BB/NA 137 (Pl. 5, Fig. 16).

**Type Locality and level.**—Lee Point East on Shoal Bay, sample A4. Recent.

**Material.**—17 valves, 28 carapaces. Adult to A-1.

**Diagnosis.**—A species of *Loxocriniculum* characterised by its small size, rather subquadrate shape in...
lateral outline and strong deep reticulate ornamentation, with a very steeply inclined slope from the flanks of the muri to the floor of the solae.


Dimensions.

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<tr>
<td>Paratype AC BB/NA 141</td>
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</table>

Remarks.—The present species is similar to Loxocorniculum sp. 2 (this study) but differs in having a less well developed alate process and lacking the tubercle below the posterior cardinal angle present in the latter. The present species is similar in shape to Loxoconcha gilli McKenzie, 1967; Loxoconcha susanhayseae Yassini & Jones, 1995; Loxoconcha trita McKenzie, 1967; Loxoconcha variolata Brady, 1878; Loxoconcha cumulus (Brady, 1880) and Loxoconcha magowranzi McKenzie et al., 1991, although varying from all of these latter six species in the details of the reticulate ornament and/or extent of development of alate process.

Loxocorniculum sp. 1
(Pl. 5, Figs. 11-12)

Material.—4 valves. Adult to A-2.

Dimensions.

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Remarks.—The present species is similar to L. koolpionyahensis sp. nov. of this study but lacks the strong deep reticulae of the latter.

Loxocorniculum sp. 2
(Pl. 5, Figs. 13-14)

Material.—6 valves. Adult to A-1.

Dimensions.

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<tr>
<td>ARV BB/NA 145</td>
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</table>

Remarks.—Loxoconcha insulaecapricornensis Hartmann, 1981, is similar to the present species but differs in being more elongate and possessing a weakly reticulate, and costate surface ornament. Loxoconcha huahinensis Hartmann, 1984, is also very similar to the present species but differs in the position and shape of the caudal process, as well as in lacking a postero-dorsal 'tubercle'. This species is also known from the Recent of the Solomon Islands (Titterton & Whatley, in press, c).

Subfamily CYTHEROMORPHINAE Mandelstam, 1960
Genus Gambiella Witte, 1985

Remarks.—Gambiella is here placed in the Loxoconchidae and Cytheromorphinae because in terms of overall carapace structure, species of Gambiella are related to some species of Cytheromorpha. Interestingly, the shape of Gambiella is somewhat similar to that of the paradoxostomatid Javenella Kingma, Warne, 1996, suggested a possible affinity between Gambiella and Hemicytheridea Kingma, 1948, on the basis of similarities in hing type, although there is little resemblance with respect to other carapace characters.

Gambiella pytta Howe & McKenzie, 1989
(Pl. 5, Figs. 19-22)

1989 Gambiella pytta Howe & McKenzie, p. 34, Figs. 94-95.
1993 Gambiella ptyta Howe & McKenzie. Yassini et al., p. 392, Pl. 9, Figs. 173-175.

Material.—8 valves, 59 carapaces. Adult to A-1.
Distribution.—Samples A1-A5, B1, B2, B4, B5.

Dimensions.

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<tr>
<td>AC BB/NA 149</td>
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</table>

Remarks.—The present species differs from Gambiella caelata Witte, 1985, from The Gambia, West Africa, in lacking the strongly developed posteroventral caudal process. The present species also has a stronger reticulation pattern than Witte’s type specimen. The present species is closest in external appearance to Cytherura interposita Lyubimova and Guha, 1960, from the Miocene of India, but differs in having a more strongly developed reticulation, and less pronounced oral incurvature. Gambiella sp. of the present study is also very similar in having a strongly developed micro-reticulation, but differs in having a more elongate outline in lateral view. This species possesses a hemigonglyodont hinge (sensu Warne, 1996).

Family PARADOXOSTOMATIDAE Brady & Norman, 1889
Genus Javenella Kingma, 1948

Gambiella sp.
(Pl. 5, Figs. 23-24)

Material.—2 valves, 1 carapace. Adults only.

Diagnosis.—A species of Gambiella characterised by its subovate shape in lateral view and strong deep reticulate surface ornament.


Distribution.—Samples A4, A5.

1978 Paracytheroma caudata Hartmann, p. 82, Figs. 114-126.
1988 Paracytheroma caudata Hartmann. Yassini & Kendrick, p. 114, Figs. 5L-M.
1993 Paracytheroma caudatum (Hartmann). Yassini et al., p. 384, Pl. 2, Figs. 27-30.

Material.—9 valves, 41 carapaces. Adult to A-1.
Distribution.—Samples A2-A5, B4.

Dimensions.

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<tr>
<td>ALV BB/NA 154</td>
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<td>0.26</td>
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</tbody>
</table>

Remarks.—The present material is very similar to the original material of Javenella kendengensis Kingma, 1948, from the Upper Pliocene of East Java.
but differs in the slightly greater length of the carapace and in its greater height to length ratio. The taxonomic relationships between, and taxonomic status of, *J. kendengensis*, *J. caudata* (Hartmann, 1978) and *J. aestaphila* Behrens, 1991, requires clarification through the further study of relevant populations of adult female and male specimens.

Genus *Paradoxostoma* Fisher, 1855
*Paradoxostoma* sp. (Pl. 6, Figs. 4-5)


Material.—2 valves, 2 carapaces. Adult to A-1.

Diagnosis.—A species of *Paradoxostoma* characterised by its subcylindrical lateral outline, rounded accumulate anterior margin and sharply accumulate posterior margin. Dorsal margin convex. Ventral margin straight, slightly convex. Greatest length at mid height. Greatest height at mid length. Vestibulum of similar extent both anteriorly and posteriorly.

Distribution.—Samples A3, A4, B4.

Dimensions.

<table>
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<tr>
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<tr>
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<tr>
<td>ARV BB/NA 156</td>
<td>0.70</td>
<td>0.26</td>
</tr>
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</table>

Remarks.—The present species resembles *P. cylindricum* Müller, 1894, from the Bay of Naples, Italy, but has a more accumulate anterior margin. *P. limbata*gh Allison & Holden, 1971, from Clipperton Island, is also similar, but has a less narrowly rounded anterior than the present species. The material of *Paradoxostoma* sp. 2 Whatley & Zhao, 1988, from the Malacca Straights differs only in being a little less high posteriorly. Typical of paradoxostomatids, this species possesses four adductor muscle scars. There are also other similar species that occur widely in the Australia/Indo-Pacific region, all of which differ in important details of size, shape and internal morphology from the present taxon. Among the species referred to are: *Paradoxostoma mimicus* (Whatley et al., 2000) from Easter Island; *Paradoxostoma* sp. 3 Watson MS, 1988, from the Java Sea; *Machaerina* sp. A Titterton MS, 1984, Solomon Islands; *Paradoxostoma* sp. Mostafawi, 1992 [= *Paradoxostoma* sp. Dewi, 1997], SE Asia; *Paracytheroid* sp. A Labutis MS, 1977, Great Barrier Reef; *Paradoxostoma lizards* Behrens, 1991, Great Barrier Reef.

Family *Pectocytheridae* Hanai, 1957

Remarks.—The Pectocytheridae are both abundant and diverse in the present study, as they are throughout the warm, shallow marine waters of the area. This diversity is greater than anywhere else within their modern geographical range. This is probably a reflection of the fact that the family originated in this region and from this locus have migrated out to other seas/oceans. In the main they have maintained themselves in warm shallow waters, but some species, especially in the subantarctic and adjacent South Atlantic, have become more cryophilic. The Australasian locus of origination dates back at least to the late Mesozoic as testified by the studies of Bate, 1972, and Neale, 1975, in the Upper Cretaceous of Western Australia. As a further distribution note, there is a particular large diversity of pectocytherid species in late Neogene shallow marine strata of SE Australia.

Genus *Keijia* Teeter, 1975

Remarks.—The genus *Keijia* is here regarded as a morphologically plastic taxon that includes a diversity of species groups including those previously assigned to the genera *Mckenziartia* Labutis & Bentley in Bentley, 1988; *Parakeijia* McKenzie in Howe & McKenzie, 1989, and *Labutisella McKenzie* in Howe & McKenzie, 1989.

*Keijia demissa* (Brady, 1868)

(Pl. 6, Figs. 7-9)

1868 *Cythere demissa* Brady, Pl. 12, Figs. 1-2.
1880 *Cythere demissa* Brady, Brady; p. 66, Pl. xii, Figs. 1a-j.
1987 *Keijia demissa* (Brady). Whatley & Zhao; Pl. 5, Figs. 27, 28.
1989 *Keijia demissa* (Brady). Whatley & Keeler; Pl. 4, Figs. 12-14.
2005 *Keijia demissa* (Brady). Mostafawi et al., p. 130-131, Pl. 1, Fig.15.

Material.—3 valves. Adults only.

Distribution.—Samples A4, A5.
Remarks.—The present material is most similar to K. parademissa sp. nov. of the present study, but differs in its less pronounced concentric reticulation pattern. K. parademissa also possesses a broad posterior marginal depression. K. nordaustrialiae Howe & McKenzie, 1989, and K. profundosculpta sp. nov. also differ in their more open reticulation pattern, and strong ventral and posterior marginal depressions. This species is widespread in the Indo-Pacific and also in the Caribbean and Gulf of Mexico (see Witte, 1993, and Titterton et al., 2001). K. tjokrosapetriti Dewi, 1997, from central Indonesian marine waters differs from K. demissa in the fine detail of the carapace ornament and by having a less strongly tapering posterior half of the carapace.

Keijia intermedia sp. nov.
(Pl. 6, Figs. 10-13)

Derivatio nominis.—Latin, referring to the nature of the reticulation pattern and peripheral muri, which incorporate elements from both K. nordaustrialiae Howe & McKenzie, 1989, and K. parademissa sp. nov., and to the apparently intermediate status of this species with respect to carapace morphology.

Holotype.—ARV BB/NA 159 (Pl. 6, Figs. 12, 13).

Type locality and level.—Lee Point on Shoal Bay. Sample A4.

Material.—22 valves, 17 carapaces. Adults only.

Diagnosis.—Small, subrectangular, elongate Keijia species characterised by its ornamentation, which incorporates the pattern of reticulation displayed by K. parademissa sp. nov. together with the posterior peripheral depression subdivided into three, similar to K. nordaustrialiae Howe & McKenzie.

Description.—Small, moderately thick-shelled, semi-transparent, subrectangular in lateral view. Anterior margin broadly rounded, extremity at mid-height and with straight antero-dorsal slope. Dorsal margin nearly straight, sloping posteriorly. Anterior cardinal angle rounded, posterior cardinal angle distinct. Posterior margin truncated, subquadrate, 4 short, blunt marginal denticles and extremity at mid-height. Ventral margin concave medially. Greatest length at mid height. Greatest height through anterior cardinal angle. Surface ornament fairly strongly reticulate, formed by the intersection of weakly developed irregular costae concentric to mid-point of carapace with less strong radial costae. Intercostal areas reticulate. Reticulation deep subrectangular to subquadrate. Prominent deep subrectangular fossae around periphery. Two rows of moderately deep reticulae anterior and anteroventrally of marginal ridge. Posteriorly, peripheral depression divided into three subequally, large, deep, fossae. Npc few, simple. Inner lamella broad, subparallel to om. Line of concrescence and inner margin divergent to form crescentic vestibulum anteriorly. Rpc moderate, long irregular. Central muscle scar pattern indistinct, subcentral. Hinge penta-

---

Sexual dimorphism exhibited, males longer and lower than females.

**Distribution.**—Samples A4, A5.

**Dimensions.**

<table>
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<tr>
<th>Type</th>
<th>Length</th>
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<td>Paratype ALV BB/NA 162</td>
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<tr>
<td>Paratype ARV BB/NA 163</td>
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</table>

**Remarks.**—The present material is closest to *K. parademissa* sp. nov. in overall shape and ornamentation, although differences in reticulation do occur especially medianly and posteromedianly. Also, the present species differs in having its posterior marginal depression strongly subdivided into three subequal fossae. *K. nordaustrialiae* Howe & McKenzie, 1989, is also similar, but lacks the reticulation pattern of the present species. *K. demissa* (Brady, 1868) differs in having a narrower posterior marginal depression, as well as in the pattern of its reticulation.

*Keijia nordaustrialiae* Howe & McKenzie, 1989 (Pl. 6, Figs. 14-18, 20)

1989 *Keija nordaustrialiae* Howe & McKenzie, p. 32, Fig. 74.


**Material.**—31 valves, 107 carapaces. Adults only.

**Amended diagnosis.**—Small, subrectangular, elongate species of *Keijia* characterised by its anterior depression being divided into three (two large and one very small) sub-depressions, irregular open reticulation posteriorly and prominent “X” shaped, or bird shaped muri medially.

**Amended description.**—Small, moderately thick-shelled, semitranslucent, subrectangular in lateral view. Anterior margin broadly rounded, extremity at mid-height. Dorsal margin nearly straight, sloping posteriorly. Anterior cardinal angle rounded, posterior cardinal angle distinct. Posterior margin truncated, 4-5 blunt marginal denticles, posteroventrally. Ventral margin concave. Greatest length at mid height, greatest height through anterior cardinal angle. Surface ornament of strong irregular open reticulae posteriorly and dorsally; anteromedianly reticulae small, subequal. Muri rounded, smooth. Large broad peripheral depression divided into three subdepressions (one very small and two large) anteriorly and anteromedially, and two posteriorly and posteroventrally. Anteriorly, immediately bordering the margin, two rows of small deep fossae. Npc large, simple, few. Inner lamella broad, im subparallel to om. Line of concrescence and inner margin divergent to form crescentic vestibule anteriorly. Rp medium in number, long irregular. Central muscle scar pattern indistinct, subcentral. Hinge pentadont.

**Distribution.**—Samples A1-A5, B1-B5.

**Dimensions.**

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<tr>
<td>ALVM BB/NA 169</td>
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**Remarks.**—The present species possesses a degree of variation in the form of the ornamentation, particularly in the posterior and posteroventral areas. Occasionally two large fossae are developed, the more ventral of the two being open to the ventromarginal peripheral depression. The present species can be distinguished from *K. demissa* (Brady, 1868), by its coarser reticulation medianly, and broad postero marginal depression. *K. intermedia* sp. nov. is closest to the present species, but can be distinguished from it by its more compact reticulate ornament, concentric to the median area of the carapace. *K. parademissa* sp. nov. has a somewhat similar pattern of ornament, but in the present species, all the structural elements are much stronger.

*Keijia parademissa* sp. nov. (Pl. 6, Figs. 21-23, 25)

**Derivatio nominis.**—Latin, with reference to the similarity of this species to *K. demissa* (Brady, 1868).

**Holotype.**—ALVF BB/NA 171 (Pl. 6, Fig. 21).

**Type locality and level.**—Lee Point on Shoal Bay. Sample A4. Recent.

**Material.**—10 valves, 31 carapaces. Adults only.

**Diagnosis.**—Small, subrectangular species of *Keijia* characterised by its small, closely spaced, subrectangular, moderately deep reticulum and numerous weak rounded costae arranged subcentrically about the mid-point of the carapace.

Distribution.—Samples A3-A5, B1, B3, B4.

Dimensions.

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<tr>
<td>Paratype ALVF BB/NA 175</td>
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</table>

Remarks.—Very similar to *K. demissa* (Brady, 1868), but differs in having a broad posterior marginal depression and different reticulation pattern medially and posteriorly. The present species is also similar to *K. nordaustraliae* Howe & McKenzie, 1989, but differs in its weaker costae, as well as in the number of posterior peripheral fossae. This species is also quite similar to *Keija australis* Yassini *et al.*, 1993, except it has a less narrowly rounded and tapering posterior and somewhat different pattern of surface ornament. The close similarity in surface ornament pattern between *K. intermedia* sp. nov. and *K. parademissa* sp. nov. perhaps reflects a close phylogenetic relationship (see also remarks for *K. intermedia* sp. nov.).

*Keija profundosculpta* sp. nov.

(Pl. 6, Figs. 26-31)

1989 *Keija nordaustraliae* Howe & McKenzie, p. 32, Fig. 74.

In part 1993 *Keija nordaustraliae* Howe & McKenzie. Yassini *et al.*, p. 392, Pl. 4, Fig. 78.

Derivatio nominis.—Latin with reference to the deeply dissected nature of the ornament.

Holotype.—ALV BB/NA 177 (Pl. 6, Fig. 26).

Type locality and level.—Lee Point on Shoal Bay.

Material.—130 valves, 12 carapaces. Adults to A-1.

Diagnosis.—Small, subrectangular species of *Keija* characterised by its long, strong irregular and labyrinthine ornament, in which the strongly elevated smooth muri enclose deep, narrow fissure-like fossae.

Description.—Small, thick-shelled, semi-translucent, subrectangular in lateral view. Anterior margin asymmetrically and irregularly rounded. Dorsal margin slightly concave medially, cardinal angles indistinct, obtuse. Posterior margin subtruncated and bearing 4-5 short, blunt, marginal denticles. Ventral margin nearly straight, slight oral incurvature. Maximum length at mid height, greatest height through anterior cardinal angle. Maximum width posteriorly. Surface ornament of strong irregular and labyrinthine ornament in which the strongly elevated, smooth muri enclose deep, narrow, fissure-like fossae. Strong “ocular” ridge subparallel to anterior margin; merges dorsally into dorsal rib, parallel to dorsal margin. Dorsal margin merges with posterior marginal ridge and then via weakly developed ventral rib coalesces with anterior margin. Remainder of surface covered by irregular, strongly elevated, smooth muri enclosing deep narrow fossae. Rare large, simple npe, irregularly distributed. Large crescentic vestibulum anteriorly. Line of concrescence and inner margin subparallel to periphery. Rpe long, irregular. Hinge pentadont. Central muscle scar pattern indistinct, vertical row of four elongate, subovate adductors and a “V” shaped frontal scar.

Distribution.—Samples A1-A5, B1, B3-B5.

Dimensions.

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<td>Paratype ALV BB/NA 179</td>
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<tr>
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</table>

Remarks.—The present species, although clearly belonging to *Keija* on the basis of its internal features is, in respect of its ornament, reminiscent of certain species of the genus *Kotoracythere* Ishizaki, 1966. It also resem-
bles some species of Callistocythere. The ornament of this species is unusually strong for Keijiia and differs from K. noradaustraliae Howe & McKenzie, in its more massive ornament of fewer components. K. parademissa sp. nov., is much more delicately and regularly ornamented. It differs from all other members of the genus in the present study by being relatively more subquadrate.

Keijiia bentleyi (Howe & McKenzie, 1989) comb. nov. (Pl. 7, Figs. 1-2)

1989 Mackenziaria bentleyi Howe & McKenzie, p. 34, Figs. 32, 105.
1993 Mckenziaria bentleyi Howe & McKenzie. Yassini et al., Pl. 4, Figs. 75-77.

Material.—4 adult valves.

Distribution.—Samples A3-A5.

Dimensions.

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<tr>
<td>ARV BB/NA 183</td>
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<td>0.18</td>
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Remarks.—In the present material details of the reticulation are difficult to observe, due to the relatively poorly preserved nature of the specimens. However, the material examined here is assigned to the species K. bentleyi on the basis of its broad scale external ornamental features. Keijiia portjacksonensis (McKenzie, 1967) only differs from the present species in the fine detail of the surface ornament pattern (very minor) and by possessing a very slightly inflated posterodorsal region of the carapace.

Keijiia darwinensis (Howe & McKenzie, 1989) comb. nov. (Pl. 6, Fig. 19)


Material.—29 valves, 43 carapaces. Adults (?) & juveniles.

Distribution.—Samples A1-A5, B1-B5.

Dimensions.

<table>
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<td>LV BB/NA 170</td>
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Remarks.—The specimens here illustrated accord closely in external morphology to the type specimens of this species illustrated by Howe & McKenzie, 1989, except that the later appear to be slightly more elongate.

Keijiia interrupta (Howe & McKenzie, 1989) comb. nov. (Pl. 6, Fig. 24)

1989 Labutisella interrupta Howe & McKenzie, p. 38, Fig. 103.

Material.—2 valves, 16 carapaces. Adults (?) & juveniles.
Distribution.—Samples A1-A5, B1, B3, B4.

Dimensions.

<table>
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<tr>
<td>LV BB/NA 176</td>
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Remarks.—The specimen of this species illustrated here is similar in external ornament to the type specimens of this species illustrated by Howe and McKenzie, 1989. However the latter are significantly larger than the former.


The taxon Praemunita was established as a genus in Howe and McKenzie, 1989. Howe and McKenzie, 1989, assigned authorship of this genus name to Labutis. It had been previously referred to as a nomen nudum by Hartmann, 1978. Such establishment of a genus name, that has previously been a nomen nudum, appears permissible under the International Code of Zoological Nomenclature (4th edition), which states the following. “A nomen nudum is not an available name, and therefore the same name may be made available later for the same or a different concept; in such a case it would take authorship and date [Arts. 50, 21] from that act of establishment, not from any earlier publication as a nomen nudum.” (International Commission on Zoological Nomenclature 1999, p. 111). Praemunita is here regarded as a subgenus of Keijia. Keijia (Praemunita) is transitional in carapace morphology between the rather morphologically plastic genus Keijia (Keijia) (as here defined) and the morphologically conservative pectocyttherine genus Ameghinocythere Whetley et al., 1997.

Keijia (Praemunita) sp. cf. K. (P.) broomensis (Hartmann, 1978) comb. nov.

(Pl. 5, Fig. 25)

1978 Pectocytthere (?) broomensis Hartmann, p. 145, Text-Figs. 621-629, Pl. 14, Figs. 15-20.
1989 Praemunita broomensis (Hartmann). Howe & McKenzie, p. 36, Fig. 96.
1993 Praemunita broomensis (Hartmann). Yassini et al., p. 390, Pl. 4, Figs. 72-74.

Material.—1 adult valve.

Description.—Small, thick-shelled, subrectangular in lateral view. Anterior margin rounded, slightly truncated; extremity at mid-height. Dorsal margin concave medianly; sloping posteriorly. Cardinal angles rounded, obtuse. Posterior margin truncated, sub-quadrate, smooth. Extremity below mid-height. Ventral margin, concave medianly. Greatest length median: greatest height through anterior cardinal angle. Surface ornament of weakly defined costae and reticulae. Anterior margin with 3-4 subparallel smooth costae extending from the anterior cardinal angle to their termination at the ventral margin. Posterior margin with 5-6 similar costae extending from the posterior cardinal angle, subparallel to the posterior margin, until their termination at the ventral margin. Three weakly defined costae, obliquely extending from the anterior cardinal angle, anteromedianly. Remainder of carapace covered with a fine meshwork of subequal reticulae. Internal details not observed.

Distribution.—Samples A4, A5.

Dimensions.

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Remarks.—This species, as illustrated here, has a slightly greater height to length ratio than previously illustrated specimens of P. broomensis (i.e. Hartmann, 1978, Pl. 14, Figs. 15-20). The present material differs from Hemicythereidea reticulata Kingma, 1948, from Malaysia in its more subrectangular outline in lateral view, hinge structure and in the form of its ornamentation (in Kingma’s species no vertical costae were developed). P. broomensis is extremely similar to Keijia (P.) mowbrayi (Yassini & Mikulandra, 1989) comb. nov., the latter possibly being a junior synonym or subspecies of the former. Topotypic populations of adult female and male specimens of both species will require comparison to determine the taxonomic status of K. (P.) mowbrayi. The species K. (P.) broomensis also bears comparison to the similarly shaped littoral pectocyttherid species from Argentina, Ameghinocythere reticulata Whetley et al., 1997. The latter differs by possessing a less rounded posterior and near vertical posterior margin.

Genus Kotoracythere Ishizaki, 1966
Kotoracythere inconspicua (Brady, 1880)
(Pl. 6, Fig. 6)

1880 Cythere inconspicua Brady, p. 70, Pl. 13, Fig. 1.
1954 Leptocythere inconspicua (Brady). Keij, p. 354, Pl. 1, Figs. 3a, b.
1975 Morkhovenia inconspicua (Brady). Teeter, p. 435, Figs. 70q, 8c.
1981 Morkhovenia cf. inconspicua (Brady). Hartmann, p. 120, abb. 50-61b.
1984 Morkhovenia inconspicua (Brady). Hartmann, p. 126, Pl. 4, Figs. 9-10.
1989 Kotoracythere inconspicua (Brady). Whatley & Keeler, Pl. 5, Figs. 5-7.
1990 Morkhovenia kingstoni McKenzie et al., p. 11, Pl. 3, Fig. 1.
1991 Kotoracythere inconspicua (Brady). Witte & Van Harten, p. 434, Figs. 3a-n, 4a-x, 5a-v.
1993 Kotoracythere inconspicua (Brady). Jellinek, p. 121, Pl. 7, Figs. 157-165; Pl. 8, Figs. 166-170.
2001 Kotoracythere inconspicua (Brady). Titterton et al., p. 39, Pl. 2, Figs. 11, 12 (also see synonymy list therein).
2005 Kotoracythere inconspicua (Brady). Mostafawi et al., p. 130, Pl. 1, Figs. 10-12 (also see synonymy list therein).


Dimensions.

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<td>ARV BB/NA 186</td>
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Remarks.—The present species can be distinguished from N. koenigswaldi Keij, 1954, by its stronger ribs and the lack of intercostal reticulation. The present species is also smaller than N. koenigswaldi. Whatley and Zhao’s original type material of the present species was from the Malacca Straits between Indonesia and Malaysia.

Neomonoceratina koenigswaldi (Keij, 1954) (Pl. 7, Figs. 6-7)

1981 Neomonoceratina koenigswaldi (Keij). Hartmann, p. 101, Pl. 11, Figs. 5-8.
1984 Neonomoceratina koenigswaldi (Keij). Titterton MS, p. 447, Pl. 14, Fig. 14; Pl. 53, Figs. 8-9.
1993 Neomonoceratina iniqua (Brady, 1868). Yassini et al., p. 393, Pl. 5, Figs. 84-90.

Material.—41 valves, 3 carapaces. Adults to ?A-4. Distribution.—Samples A1, A3-A5, B3-B4.

Dimensions.

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Remarks.—The present species closely resembles Neomonoceratina sp. of this study but differs in being
more elongate, and more subrectangular in lateral view. Also lacking in *N. koenigswaldi*, is the strong rib extending vertically from the ocular tubercle to join the median rib. *N. helvetica* Oerli, 1958, from the Miocene of Switzerland, also resembles the present species but differs in carapace shape, reticulation pattern, and position, and number of ribs. This species was originally recorded from Manila in the Philippines (see Keij, 1954) but is widespread in Australia and the Solomon Islands and occurs in reef environments of the Java Sea (Watson MS, 1988). Zhao and Whatley, 1988, illustrated both *N. iniqua* (Brady, 1868) [type material] and *N. koenigswaldi* Keij, 1954. Comparisons based on Zhao and Whatley's (1988) illustrations and those of Keij, 1954, indicate that the latter has a (relatively) much lower posterior extremity than the former. A consequence of this observation is that specimens illustrated as *N. iniqua* by Yassini et al., 1993, are better placed under *N. koenigswaldi*.

*Neomonoceratina porocostata* Howe & McKenzie, 1989

(Pl. 7, Figs. 8, 9)

1984 *Neomonoceratina mediterranea* (Ruggieri). McKenzie & Pickett, p. 237, Figs. 4Y, Z.

1989 *Neomonoceratina porocostata* Howe & McKenzie, p. 12, 14, Figs. 60, 61.


**Material.**—1 adult valve, 5 carapaces. Adults only.

**Distribution.**—Sample A4, A5.

**Dimensions.**

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<tr>
<td>ALVM BB/NA 193</td>
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<td>0.18</td>
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**Remarks.**—The present material differs slightly from the very similar types of *P. mediterranea* Ruggieri in possessing a stronger ocular ridge, and a short arcuate rib in an anteromedian position. For other differences with *P. mediterranea* see comments by Howe & McKenzie, 1989. While the specimens illustrated here are undoubtedly of the same species as those recorded as *N. porocostata* by Howe & McKenzie, 1989, and Yassini et al., 1993, it is noted that this name may be a junior synonym of *P. mediterranea malayensis* Zhao & Whatley, 1988. However, the illustrations and descriptions of *P. mediterranea malayensis* in Zhao & Whatley, 1988, are currently of insufficient extent, for detailed comparisons to be made with *N. porocostata*. Similarly, the present species is very similar to *Neomonoceratina crispata* Hu, 1976, and *Neomonoceratina delicata* Ishizaki & Kato, 1976, although the latter two species have more complex ornament on the ventral half of the carapace and tend to display an inter-rib reticulate ornament. The present material displays strong sexual dimorphism with males being more elongate than females.

*Neomonoceratina sp.*

(Pl. 7, Figs. 10-11)

**Material.**—1 adult valve.

**Diagnosis.**—A species of *Neomonoceratina* characterised by its subovate outline in lateral view, finely reticulate surface ornament, with strong ocular, median and circumperipheral ribs.

**Description.**—Medium, thick-shelled, subovate in lateral view. Anterior margin broadly rounded, smooth; extremity at mid-height. Dorsal margin nearly straight, sloping posteriorly. Cardinal angles rounded, indistinct. Posterior margin, subcaudate, slightly truncated; extremity below mid-height. Ventral margin nearly straight, slightly convex posteriorly, slight oral curvature anteriorly. Greatest length below mid-height. Greatest height through eye tubercle. Surface ornament of a strong mediolateral rib sloping obliquely anteriorly. A strongly developed circum-submarginal rib extending from the eye tubercle, anterodorsally around the entire free margin. This rib is deflected, mediadorsally, towards the centre of the carapace, its termination situated within the median sulcus. A strong ocular rib is also present, extending from the eye tubercle to merge with the mediolateral rib anteromedianly. Intercostal areas occupied by a fine mesh-work of deep reticulae. Internal details as for genus.

**Distribution.**—Sample A4.

**Dimensions.**

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<tr>
<td>ALV BB/NA 194</td>
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<td>0.40</td>
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**Remarks.**—The present species closely resembles *N. koenigswaldi* Keij, 1954, but can be distinguished
from the latter by the presence of the ocular rib extending almost vertically down to merge with the mediolateral costae. The ocular rib in *N. koenigswaldi* is less prominent and extends anteriorly to merge with the anterior marginal rib. The reticulation pattern of the present species also differs from that of the latter in being less open. *N. koenigswaldi* is also slightly larger and more elongate than the present species. While almost certainly a new species, this taxon is left in open nomenclature due to its rarity.

**Family THAEROCTHERIDAE Hazel, 1967**

*Bradleya* s.l. Hornibrook, 1952

**Remarks.**—As with Hornibrook’s (1952) original concept of the morphological range of this taxon, there are a large number of morphologically distinct species groups of *Bradleya* s.l. inhabiting shallow marine realms in Australasia. The greatest diversity of these shallow marine *Bradleya* s.l. groups probably occurs in southeast Australian coastal waters with *Bradleya* s.l. group taxa being relatively less diverse in tropical waters of northern Australia. *Quasibradleya* Benson, 1972, is one such group that has been separated out as a distinctly named species cluster (see below).

*Bradleya* sp.
(Pl. 8, Fig. 7)

**Material.**—1 adult valve.
**Distribution.**—Sample A2-A5, B3-B4.

**Dimensions.**

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<tr>
<td>ALV BB/NA 263</td>
<td>0.68</td>
<td>0.34</td>
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**Remarks.**—Only adults and juveniles to A-1, were found in the Recent material of Lee Point. The species is common in the Quaternary of the Solomon Islands. The species most closely resembles *Q. leepointensis* sp. nov. of the present study, but differs in having a more strongly developed alar process and in the form of a caudal process. The present species is similar in carapace morphology to *Bossella polyclada* (Hu, 1981) n. comb., *Bossella (?) macroloba* (Hu, 1981) n. comb. and *Bossella elongata* (Hu, 1979), except the latter three species posses heavier ornament around the subcentral region of the carapace and also differ in the details of the ribbing and reticulate ornament.

*Quasibradleya leepointensis* sp. nov.
(Pl. 9, Figs. 11-13)

**Derivatio nominis.**—L. With reference to the type locality of the species.
**Holotype.**—ALVF BB/NA 264 (Pl. 9, Figs. 11, 13).
**Type locality and level.**—Lee Point on Shoal Bay.
Lee Point East. Sample A4. Recent.
**Material.**—24 valves, 27 carapaces. Adults to A-2.
Diagnosis.—A species of *Quasibradleya* characterised by its coarsely reticulate surface and prominent ribs parallel to the periphery. Two strong ribs emerge from the posterodorsal cardinal angle; one parallel and over-reaching the dorsal margin, deflected towards the anterior, medianly, the other extending vertically down towards the ventral surface to meet and join with a weakly alate, medioventral rib. Subquadrate caudal process.

Description.—Large, subquadrate in female, subrectangular in male, thick-shelled, semitranslucent. Anterior margin, asymmetrically but broadly rounded, anterodorsally sloping up to meet nearly straight dorsal margin. Median to posterior portion of dorsal margin over-reached by dorsal rib. Posterodorsal margin short, straight, sloping posteroventrally to form a short subquadrate caudal process. Anterior cardinal angle rounded, obtuse. Posterior cardinal angle pronounced. Ventral margin nearly straight, slight ventral incurvature orally. Maximum length at mid height; maximum height through anterodorsal cardinal angle; maximum width through posterior extremity of slight alar process. Surface coarsely ornamented with strong ribs and large, deep, subequal intercostal reticulae. Strong ocular rib, extends from large spherical glassy eye tubercle, anterodorsally, towards the anterior margin. This rib continues parallel to ventral margin as the ventrolateral rib, becoming subulate posteriorly. Two strong ribs emerge from the posterodorsal cardinal angle, one parallels and over reaches the dorsal margin, and is deflected anteroventrally, medianly. The other extends vertically down towards the ventral margin to meet, first the median rib and then the ventrolateral rib at their posterior termination. Median rib subparallel to dorsal margin; extends from posterior vertical rib anteriorly through the subcentral tubercle to join anterior marginal rib. Intercostal surface of the values coarsely reticulate. Costae with fine secondary reticulation. Npc’s, along the flanks of the costae. Well developed broad inner lamella. Avestibulate. Short, straight radial pore canals, evenly distributed. Central muscle scar pattern not clearly visible. Hinge strongly holomorphodont.

Distribution.—Samples A2-A5, B3-B4.

Dimensions.

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<tr>
<td>Paratype ARVM BB/NA 267</td>
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<td>0.30</td>
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Remarks.—The present species is most similar to *Quasibradleya* sp. of the present study, but differs in being more quadrate, and in its weaker but denser reticulation. *Bradleya (Quasibradleya) plicocarinata* Benson, 1972, is also very similar to the present species, but differs in its reticulation pattern and, unlike the present species only has the median rib joined with the dorsal carina, forming a posterodorsal loop, whereas the present species has both a posterodorsal loop and a posteroventral loop developed. Specimens illustrated and described as *Bradleya mkenziei* by Yassini and Jones, 1995, are very similar to the specimens here designated *Quasibradleya leepointensis* sp. nov. However, the name *Bradleya mkenziei* designated for the Yassini & Jones, 1995 specimens, is invalid as it had previously been designated for a different species —*Bradleya mkenziei* Benson, 1972 (see Benson, 1972; p. 42). As an additional note, Benson, 1972, later referred to this species in the same publication under a different spelling —*Bradleya mckenziei* (Pl. 7, Fig. 6). However, despite similarities, adult specimens of the present material from tropical northern Australian marine waters are much smaller than the Yassini & Jones, 1995 material from temperate marine waters of southeastern Australia. In addition, the present material has a slightly better developed posteroventral loop and some very minor differences in the reticulation pattern in the posterior of the carapace, compared to the Yassini & Jones, 1995 material.

*Quasibradleya* sp. cf. *Q. elongata* Howe & McKenzie, 1989
(Pl. 9, Figs. 14-16)

1989 *Quasibradleya elongata* Howe & McKenzie, pp. 40-41, Fig. 119.

Material.—420 valves, 15 carapaces. Adult to A-5.

Description.—Large, subovate to subrectangular, thick-shelled, semi-translucent. Anterior margin broadly rounded, with 14-16 very small marginal denticles. Dorsal margin nearly straight, interrupted by dorsal rib; medianly. Dorsal rib deflected anteroventrally towards its anterior termination. Posterior margin subcaudate, with 5-6 short, blunt, denticles, posteroventrally. Ventral margin nearly straight, convex posteriorly, with slight oral concavity. Anterior cardinal angle indistinct, rounded, obscured by hinge ear. Posterior cardinal angle obtuse. Greatest length at mid-height; greatest height through anterior cardinal angle. Surface ornamented by deep, strong reticula-
tion. Strong tricarinate ribs with the median rib joined to the dorsal rib, forming a posterodorsal loop. The median rib extends anteriorly to join a complex of muri over the sub-central tubercle, then continues to join the ocular rib. Dorsal rib extends above dorsal margin, diverted anteriorly towards the anteroventral margin. Ventrolateral rib subparallel to the ventral margin, extends to meet the ocular rib. Ocular rib extends parallel to the anterior margin to unite with the median and ventral ribs. Large, glassy subspherical eye tubercle present. Inner margin broad, Avestibulate. Numerous, long simple rpc’s. Central muscle scars difficult to observe. Hinge holamphidont.


Dimensions.

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Remarks.—The present species is very similar to B. (Quasibradleya) plicocarinata Benson, 1972, but differs in its reticulation and size of the caudal process. Q. leepointensis sp. nov. from the same sample locality, differs in its more quadrate outline, smaller truncated posterior margin, well developed subquadrate caudal process and different reticulation pattern. The specimens illustrated here have very similar ornament to the holotype specimen of Q. elongata illustrated by Howe & McKenzie, 1989, except for minor differences in the posterior reticulation. Further the holotype specimen of Q. elongata is somewhat smaller than the specimens illustrated herein.

Family TRACHYLEBERIDIDAE Sylvester-Bradley, 1948
Subfamily TRACHYLEBERIDINAE Sylvester-Bradley, 1948

Genus Actinocythereis Puri, 1953
Actinocythereis scutigera (Brady, 1868) (Pl. 7, Figs. 12-14)

1868 Cythere scutigera Brady, p. 70, Pl. 8, Figs. 15, 16.
1880 Cythere scutigera Brady. Brady, p. 109, Pl. 22, Figs. 5a, b.
1954 Trachyleberis scutigera (Brady). Keij, p. 356, Pl. 3, Figs. 5a, b.

1985 Actinocythereis scutigera (Brady). Zhao et al.; Pl. 19, Fig. 12.
1988 Actinocythereis scutigera (Brady). Whatley & Zhao, p. 63, Pl. 6, Fig. 14.
1992 Actinocythereis scutigera (Brady, 1868). Mostafawi, p. 143, Pl. 3, Fig. 61.
1997 Actinocythereis scutigera (Brady, 1868). Dewi, p. 68, Figs. 145-146.

Material.—8 valves, 1 carapace. Adults to A-1.

Distribution.—Samples A4, B3, B4.

Dimensions.

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Remarks.—The present species differs slightly from Brady’s specimens in exhibiting an anteroventral, and median spines, as well as, well developed proximal rims of spines. These spines tend to be broken in most specimens. Actinocythereis costata Hartmann, 1978, from the west and north coast of Australia can clearly be distinguished from the present species by its general lack of tubercles on the lateral surface and by the development of a strong mediolateral rib. Actinocythereis tetrica (Brady, 1880), and A. gippsi sp. nov., can be distinguished from the present species by their smaller size; more elongate, subrectangular outline and different arrangement of spines and denticles.

Actinocythereis costata Hartmann, 1978 (Pl. 7, Figs. 15-16)

1978 Actinocythereis scutigera costata Hartmann, p. 87, Pl. iv, Figs. 6-9.
1988 Actinocythereis scutigera (Brady). Yassini & Kendrick, p. 112, Figs. 4C-G.

Material.—2 valves, 3 carapaces. Adult to A-1.

Distribution.—Samples A3, A4, B4.

Dimensions.

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Remarks.—The present species resembles *Ponticocyttheres militaris* (Brady, 1868), externally, but the latter lacks the well developed marginal ridge and sub-ventral rib of the present species. Also, in *P. militaris* the median rib is not divided into two distinct elements. See also comments by Warne, 2001.

*Actinocythereis tetraca* (Brady, 1880)  
(Pl. 7, Figs. 17-19)

1880 *Cythere tetraca* Brady, p. 104, Pl. 23, Figs. 5a-d.  
1976 *Cythere tetraca* Brady. Puri & Hulings, p. 293, Pl. 27, Figs. 4-6.  
1978 *Actinocythereis dampierensis* Hartmann, p. 89, Pl. 5, Figs. 10-11.  
1984 *Trachyleberis dampierensis* (Hartmann). McKenzie & Pickett, Figs. 4, 5.  
1993 *Actinocythereis tetraca* (Brady). Yassini et al., p. 398, Figs. 131-137.  
2000 *Actinocythereis tetraca* (Brady). Hoibian et al., p. 223, Fig. 22.  
2002 *Actinocythereis tetraca* (Brady). Hoibian et al., p. 191, Pl. 1, Fig. 10.  

Material.—15 valves, 1 carapace. Adult to A-1.  
Distribution.—Samples A3, A4, B3, B4.  
Dimensions.

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Remarks.—The present species differs from *Actinocythereis indica* Rajagopalan, 1962, from the Eocene of southern India in having a line of tubercles mediolaterally, aligned subparallel to the dorsal and ventral margins and extending from the subcentral tubercle to the posterior margin, as well as an anteroventral cluster of 4-5 spines. Hartmann, 1978, described this taxon as a new species, *A. dampierensis*, from the west coast of Australia. From an examination of his plates and descriptions, it was concluded by Warne & Whatley, 1996, that this species was synonymous with *A. tetraca* (Brady).

Actinocythereis gipsi sp. nov.  
(Pl. 7, Figs. 20-22)

Derivatio nominis.—Named in honour of Sir George Gipps, who became Governor of New South Wales and its various dependencies in 1838.  
Holotype.—ALV BB/NA 205 (Pl. 7, Fig. 20).  
Type locality and level.—Lee Point on Shoal Bay. Sample A4. Recent.  
Material.—36 valves, 8 carapaces. Adult to A-2.  
Diagnosis.—A strongly dimorphic species of *Actinocythereis* characterised by its elongate, subrectangular outline, prominent marginal ridges and inflated carapace. Surface ornament of spines and papillae, distally flattened and castellate, and irregularly distributed.

Description.—Large, moderately thick-shelled, translucent, sexual dimorphism distinct (males longer and less tall than females). Carapaces subrectangular to sub-quadrance in lateral view. Anterior margin obliquely rounded, strongly denticulate, with a well developed marginal rim of 2-3 rows of short, blunt to slightly pointed, distally flattened and expanded denticles, parallel to anterior margin. Dorsal margin convex, broken by denticles of largely decayed dorsal rib. Cardinal angles indistinct. Posterior margin broadly rounded, with a well developed, denticulate marginal ridge. Ventral surface nearly straight, slight ventral incurvature orally. Greatest length at mid height; greatest height through anterior cardinal angle. Surface of carapace ornamented by evenly spaced, but randomly distributed, short, blunt, occasionally long, sharp spines, castellate distally. Anterior margin of 2-3 rows of denticles each successive row towards the posterior with fewer and larger, more strongly developed spines. Posterior marginal rib with two rows of similar spines. Dorsal marginal rib largely decayed but with 5-6 pointed, castellate, short, spines. Rib sloping slightly posteriorly. Subcentral tubercle an aggregate of 5 long, sharp spines. Large glassy subspherical eye tubercle. Avestibulate, inner lamella broad. Numerous straight, simple evenly spaced radial pore canals. Central muscle scar pit deep, adductor muscle scars in subvertical row of four. Dorsal and dorsomedian scar largest, all scars elongate, subelliptical. “V” shaped frontal scar opening anterodorsally. Hinge strongly holamphidont.

Dimensions.

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Holotype ALVF BB/NA 205</td>
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<td>Paratype ARVF BB/NA 206</td>
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<td>Paratype ALVM BB/NA 209</td>
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<tr>
<td>Paratype ARVM BB/NA 210</td>
<td>0.80</td>
<td>0.30</td>
</tr>
</tbody>
</table>

Remarks.—The present species differs from *Actinocythereis tetrica* (Brady, 1880), in not possessing a clearly discernable ventral line of 5-7 spines extending from the ventral margin, and sloping towards the posterodorsal margin. The present species is also larger and more elongate than the latter. The present species is also similar to *Trachyleberis* cf. *probesiodes* Hornbrook of McKenzie et al., 1991, and *Trachyleberis brevicosta major* McKenzie et al., 1991, although varies from these two taxa in the pattern of spine positions on the carapace surface.

Genus *Actinoleberis* McKenzie in Howe & McKenzie, 1989

Remarks.—Publication of the genus name *Actinoleberis* McKenzie, 1989 predates publication of the genus name *Malacythereis* Zhao & Whatley, 1989, by a few months.

*Actinoleberis arafurae* Howe & McKenzie, 1989

(Pl. 8, Fig. 13)

1989 *Malacythereis trachodes* Zhao & Whatley, Pl. 3, Figs. 17-19; Pl. 4, Figs. 1-3.
1997 *Malacythereis trachodes* Zhao & Whatley. Dewi, p. 68, Fig. 150.

Material.—4 valves. Adult to A-1.
Distribution.—Samples A3, A4.
Dimensions.

<table>
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<tr>
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<tr>
<td>ALVM BB/NA 238</td>
<td>0.44</td>
<td>0.26</td>
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</tbody>
</table>

Remarks.—The present species and genus has been recorded from northern Australia (Howe & McKenzie, 1989; present study) and from the Sedili River, and the Jason Bay area of the south eastern Malay Peninsula (Zhao & Whatley, 1989), Dewi, 1997, records it from the Java Sea. Howe and McKenzie, 1989, noted that the frontal scars of this species were generally v-shaped, but that some specimens display divided frontal scars.

Genus *Henryhowella* Puri, 1957

*Henryhowella sinespinosa* sp. nov.
(Pl. 9, Figs. 18-21; Pl. 10, Fig. 1)

1993 *Venericythere* sp. Yassini et al., p. 393, Pl. 7, Figs. 129, 130.

Derivatio nominis.—L. sine without, plus spina thorn, spine = sinespinosa. Referring to the fact that, although most species of *Henryhowella* are ornamented by spines superimposed on reticulation, the spines are lacking in this species.

Material.—67 valves. Adult to A-2.
Holotype.—ARVM BB/NA 274 (Pl. 9, Fig. 20).
Type locality.—Lee Point on Shoal Bay.

Dimensions.

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<td>Paratype ALVM BB/NA 275</td>
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<td>Paratype ALVF BB/NA 276</td>
<td>0.70</td>
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</tr>
<tr>
<td>Paratype JLV BB/NA 277</td>
<td>0.58</td>
<td>0.32</td>
</tr>
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</table>

Diagnosis.—A species of *Henryhowella* characterized by its subquadrate to subrectangular outline in lateral view, medium size, and reticulate ornamentation which forms a series of 2-3 rather poorly defined costae subparallel to the ventral margin; and two less distinct costae subparallel to the anterior margin. The strong reticulate ornament shows a tendency to be arranged concentrically about the median area of the carapace. Spines absent.

Description.—Medium to large, thick-shelled, opaque, subquadrate to subrectangular in lateral outline. Anterior margin broadly rounded, with 13-14 short, blunt marginal denticles. Extremity at mid-height. Dorsal margin almost straight to slightly convex. Cardinal angles rounded, indistinct. Ventral margin almost straight; very slight oral incurvature. Posterior margin bluntly rounded with 3-4 short blunt marginal denticles posterodorsally; extremity slightly above mid height. Greatest length at mid height, greatest height through anterior cardinal angle. Eye spot small.

Remarks.—The present species is similar to *Wichmanella meridionalis* Bertels, 1969, from the lower Tertiary of Argentina, but differs in the details of the reticulate ornament particularly in the median and posterodorsal areas of the carapace. Also, the 2 distinct anterior marginal ribs, and the 3 ribs that sub-parallel the ventral margin, formed by the muri of the reticulate ornament; are not present in the latter. The genus *Wichmanella* Bertels is here regarded as synonymous with *Henryhowella*.

Genus *Australimoosella* Hartmann, 1978

*Australimoosella* spp. all have a well-formed "V" shaped frontal scar, and are here considered to be members of the Trachyleberidinae. It is here argued that *Yassinicythea* McKenzie in Howe & McKenzie, 1989, was erected on specific rather than generic grounds and that it is scarcely necessary to expand the diagnosis of *Australimoosella* to subsume *Yassinicythea* within it. We concur with McKenzie (in Howe & McKenzie, 1989) that Hartmann, 1978, inappropriately placed species such as *Australimoosella bassiouni* in *Hiltermannicythea*, a European genus belonging to a different subfamily.

*Australimoosella* sp. cf. *A. exmouthensis* Hartmann, 1978

(Pl. 7, Figs. 23-24)

1978 *Australimoosella exmouthensis* Hartmann, p. 95-97, Pl. 6, Figs. 6-14.
1984 *Australimoosella* sp. Hartmann. McKenzie & Pickett, p. 239, Fig. 5b.

Material.—1 adult valve.

Distribution.—Sample A4.

Dimensions.

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<tbody>
<tr>
<td>ARV BB/NA 211</td>
<td>0.52</td>
<td>0.28</td>
</tr>
</tbody>
</table>

Remarks.—The present material is similar to Hartmann's type specimens of *A. exmouthensis* from the west coast of Australia, although there is slight variation in surface ornament. *Australimoosella liebau* Hartmann, 1978, resembles the present species, but differs in the strength, number and position of the longitudinal ribs, especially posteriorly.

*Australimoosella rockinghamensis* Hartmann, 1979

(Pl. 8, Fig. 2)

1979 *Australimoosella rockinghamensis* Hartmann, p. 233, Pl. 6, Figs. 1-4.
1980 Australimoosella rockinghamensis Hartmann. 
Hartmann, p. 133, Pl. 9, Figs. 1-3.

1989 Australimoosella liebau Hartmann. Howe & 
McKenzie, p. 43, Figs. 121-122.

1990 Australimoosella rockinghamensis Hartmann. 
McKenzie et al., p. 23, Pl. 7, Figs. 3-4.

1993 Australimoosella liebau Hartmann. Yassini 
et al., p. 396, Pl. 6, Figs. 115-118.

1995 Australimoosella rockinghamensis Hartmann. 
Yassini & Jones, p. 358, Fig. 365.

Material.–9 carapaces. Adults to A-1.

<table>
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<td>AC BB/NA 217</td>
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<td>AC BB/NA 218</td>
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</tr>
<tr>
<td>AC BB/NA 219</td>
<td>0.50</td>
<td>0.24</td>
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</table>

Remarks.–The present species is very similar in 
size, shape and ornamentation to Australimoosella 
liebau Hartmann 1978, recorded from the eulittoral 
of Western Australia, but differs in the detail of the 
reclining anterior crown and in having more 
strongly developed lateral ribs than the present 
species. Externally, Australimoosella bassiounii s.s. 
(Hartmann, 1978) can be distinguished from the 
present species by its less elongate outline in lateral 
view, and fewer longitudinal ribs. Further, the surface 
ornamentation of the valves in A. bassiouni is charac-
teristically heavily ciliated, thus tending to obscure 
the reticulate and costate ornamentation. 
Australimoosella bassiounii reticulata (Hartmann, 
1980) differs in its less elongate, more reniform outline, 
greater size, and less strongly costate ornamentation. 
Australimoosella paenenda Howe & 
McKenzie, 1989, and A. exmouthensis, Hartmann, 
1978, can be distinguished from the present species 
by lack of surface ornament in the first instance; and 
by a less elongate, more subrectangular outline and 
different orientation and strength of ribs in the second.

Australimoosella paenenda Howe & McKenzie, 
1989
(Pl. 7, Figs. 25-27; Pl. 8, Fig. 1)

1981 Australimoosella spec. 117 Hartmann, p. 
105, Pl. 5, Figs. 5, 6.

1989 Australimoosella paenenda Howe & 
McKenzie, pp. 43-44, Fig. 139.

Material.–4 valves, 4 carapaces. Adults to A-1.
Amended description.–Medium, thin-shelled, 
subrectangular in lateral view. Anterior margin, bro-
dly rounded, smooth, extremity at mid-height. Dorsal 
margin nearly straight, slightly convex. Cardinal 
angles obtuse. Posterior margin sharply rounded, 
accumulate, extremity at mid height. Ventral margin 
nearly straight with slight concavity medially. 
Greatest length at mid height. Greatest height through 
anterior dorsal cardinal angle. Eye tubercle large. 
Surface ornamentation of fine reticulae, highlighted 
by marginal punctae. Inner margin narrow, parallel to 
outer margin, avestillate. Rpe numerous, simple, 
straight. Central muscle scars in a vertical row of four, 
dorsal and ventral most scars smallest. “V” shaped 
frontal opening anterodorsally. Two other scars high 
in carapace towards anterior cardinal angle. Sexual 
dimorphism not observed.

Distribution.–Samples A3, A4, B1, B4.

Dimensions.

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<td>ALV BB/NA 212</td>
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<td>ARV BB/NA 213</td>
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<td>ALV BB/NA 214</td>
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<td>0.24</td>
</tr>
<tr>
<td>ARV BB/NA 215</td>
<td>0.56</td>
<td>0.26</td>
</tr>
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</table>

Remarks.–The present species differs from 
Australimoosella sp. Hartmann 1981; in lacking the 
fine reticulate ornament of the latter, probably due to 
celation. A. rockinghamensis Hartmann, 1979, and A. 
liebau Hartmann, 1978, are also very similar in 
external outline to the present species, but have a strong 
costate and reticulate ornament, as does A. tomodokae 
(Ishizaki, 1968).

Australimoosella bassiounii bassiounii (Hartmann, 
1978) comb. nov.
(Pl. 8, Figs. 3-4)

1978 Hiltermanicythere bassiouni Hartmann, p. 
91-93, Pl. 7, Figs. 6-14.
1979 Hiltermanicythere bassiouni Hartmann. 
Hartmann, p. 232, Pl. 5, Figs. 10-20.
1988 Makencythere venata (Brady). Yassini & 
Kendrick, p. 114, Fig. 5A-D.
1989 Yassincythere bassiounii (Hartmann). Howe 
& McKenzie, p. 45, Fig. 126.
1989 *Makencythere* sp. Howe & McKenzie, p. 45, Fig. 124.

**Material.**—26 valves, 30 carapaces. Adults to A-1.

**Distribution.**—Samples A3-A5, B2-B4.

**Dimensions.**

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<td>ALVF BB/NA 220</td>
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<td>ALVF BB/NA 221</td>
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<tr>
<td>ARVF BB/NA 222</td>
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<td>0.26</td>
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<tr>
<td>ARVM BB/NA 223</td>
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</tr>
<tr>
<td>ALVM BB/NA 224</td>
<td>0.54</td>
<td>0.24</td>
</tr>
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</table>

**Remarks.**—Australimoosella *bassiouini reticulata* (Hartmann, 1980), differs from the present subspecies in its weaker ribs and strong secondary reticulation. The present specimens are slightly smaller than those illustrated by Hartmann, 1978, 1979. Yassini et al., 1993, stated that *Australimoosella bassiouini triornata* [= *Yassinicythere triornata* Yassini et al., 1993] is distinguished from *A. bassiouini* (s.s.) by the latter’s smaller size and lack of numerous parallel ridges. However the type specimens of *A. bassiouini* do not appear to show any difference in the number of parallel ridges to *A. bassiouini triornata*. However, *A. bassiouini triornata* tends to display greater complexity in the reticulation and as a consequence is regarded here (see below) as a subspecies of *A. bassiouini*.

*Australimoosella bassiouini triornata* (Yassini, Jones & Jones, 1993) comb. nov.

(Pl. 8, Figs. 5-6)

1988 *Hiltermannicythere* *bassiouini* Hartmann. Yassini & Kendrick, p. 114, Fig. 5E-H.

1993 *Yassinicythere triornata* Yassini et al., p. 396, Pl. 6, Figs. 109-114.

**Material.**—3 adult valves.

**Distribution.**—Sample A4.

**Dimensions.**

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<td>ALVF BB/NA 225</td>
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<td>ARVM BB/NA 226</td>
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<tr>
<td>ALVM BB/NA 227</td>
<td>0.62</td>
<td>0.30</td>
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</tbody>
</table>

**Remarks.**—This subspecies was originally designated as a new species of *Yassinicythere* by Yassini et al., 1993. The major difference between *A. bassiouini* s.s. and *A. bassiouini triornata* is that the latter has a more prominent reticulate ornament. *A. bassiouini triornata* differs from *A. bassiouini reticulata* by possessing stronger lateral surface ribs.

**Genus Dumontina** Deroo, 1966

**Dumontina lauta** (Brady, 1880) comb. nov.

(Pl. 8, Figs. 17-18)

1880 *Cythere lauta* Brady, p. 85, Pl. 21, Figs. 4a-d.

1976 *Cythere lauta* Brady. Puri & Hulings; p. 280, Pl. 14, Figs. 5-8.

1993 *Carvocythere lauta* (Brady). Yassini et al., p. 396, Pl. 6, Fig. 121.

**Material.**—12 valves, 20 carapaces. Adults to A-2.


**Dimensions.**

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<tbody>
<tr>
<td>ALV BB/NA 243</td>
<td>0.58</td>
<td>0.30</td>
</tr>
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</table>

**Remarks.**—First recorded by Brady, 1880, from the Booby Island dredging, Lat 10°36’ S, Long 141°55’ E at a depth of 6 to 8 fathoms. Brady described this species from only one station (station 187) and figures a complete carapace. The present material contains valves and carapaces from adult to A-2. *Dumontina lauta australiae* (McKenzie et al., 1990) n. comb. differs from the present species by having slightly coarser ornament and being overall, slightly larger in size.

**Genus Platycythereis** Triebel, 1940

*Platycythereis* sp.

(Pl. 8, Fig. 19)

**Material.**—1 adult carapace.

**Description.**—Medium in size. Elongate subrectangular, with almost equally well-rounded end margins. Dorsal and ventral margins slightly concave; not inclined to the posterior. Apart from a median area, which has a broad but ill-defined rib, the lateral surface is depressed and is completely surrounded by a strong,
mostly smooth sub-Peripheral rib. Very largenpc’s occur on the inner flank of this rib anteriorly and on the lateral surface, which is minutely but very densely micropunctate. Internal features not seen.

**Distribution.**–Sample A4.

**Dimensions.**

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<tbody>
<tr>
<td>AC(LV) BB/NA 244</td>
<td>0.58</td>
<td>0.30</td>
</tr>
</tbody>
</table>

**Remarks.**–*Platycythereis* is a Cretaceous genus, common in the Valanginian to Campanian of Europe. The authors know of no bona fide post Mesozoic record but, equally, know of no other cytheracean genus with a rib that loops around the entire sub-Periphery of the taxon. With only a single carapace it is impossible to be more exact and the taxon is, therefore, included here in *Platycythereis* only very tentatively.

**Genus Bradyleberis** McKenzie in Howe & McKenzie, 1989

*Bradyleberis cristatella* (Brady, 1880) (Pl. 8, Figs. 20-21)

1880 *Cythere cristatella* Brady, p. 90, PI. 19, Figs. 6a-d.
1976 *Cythere cristatella* Brady, Puri & Hulings, p. 271, PI. 26, Figs. 5, 7

**Material.**–63 valves, 36 carapaces. Adults to A-1.

**Distribution.**–Lee Point East, sample A4.

**Dimensions.**

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<td>ALV BB/NA 247</td>
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<tr>
<td>ARV BB/NA 249</td>
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</table>

**Remarks.**–There is a considerable variation in the angle of the median rib in that it may be parallel to the dorsal margin or sloping posteriorly at various angles. The median and ventral ribs may or may not be joined. Brady, 1880, recorded this species from Booby Island, Challenger station 187, at a depth of 6-8 fathoms. Howe & McKenzie, 1989, also previously recorded it from northern Australia.

**Genus Ponticocythereis** McKenzie, 1967

*Ponticocythereis spatulospinosa* sp. nov. (Pl. 8, Figs. 22-24)

1978 *Pterygocythereis* spec. (Jurien 71) Hartmann, p. 91, PI. vi, Fig. 15.

**Derivatio nominis.**–L. With reference to the spatulate tubercles which surround the margins of this species.

**Holotype.**–ARV BB/NA 250 (Pl. 8, Fig. 22).

**Type locality and level.**–Lee Point on Shoal Bay, sample A4. Recent.

**Material.**–127 valves, 18 carapaces. Adult to A-3.

**Distribution.**–Samples A2- A4, B2- B4.

**Diagnosis.**–A species of *Ponticocythereis* characterised by its prominent subcentral tubercle, its mediolateral line and periphery of distally expanded spatulate spines; and its elongate subrectangular outline in lateral view.

**Description.**–Medium, thick-shelled, translucent. Elongate subrectangular in lateral view. Anterior margin broadly rounded. Two rows of long distally expanded anterior marginal denticles, that coalesce at the antero-dorsal margin to form a short crest. Dorsal margin nearly straight, sloping slightly posteriorly, interrupted and overhung by five spines of the dorsal rib. Anterior cardinal angle, obscured by ornamentation, obtuse. Posterior cardinal angle, rounded, marked by prominent posterodorsally orientated spine. Posterior margin, subcaudate, with two rows of 4-5 long, sharp distally flattened marginal denticles posteromedianly and posteroventrally. Ventral margin denticulate in lateral view nearly straight, slight oral incurvature. Greatest length at mid height; greatest height through anterior cardinal angle; greatest width through subcentral tubercle. Surface ornamented by marginal ribs bearing irregular spatulate tubercles. Dorsal rib of 4-5 short, distally, expanded spatulate tubercles. Dorsal rib extends from eye tubercle to posterior cardinal angle. Termination at posterior cardinal angle deflected medially. Ventrolateral rib with similar tubercles and united to posterior and anterior marginal ribs. Weakly developed tuberculate alar process ventrally. Tubercles expanded distally and laterally and coalescing to form a “velate” rim to leading edge of alar process. Prominent sub-central tubercle bearing 4-5 short, blunt spines. Median rib of five distally expanded tubercles extending across subcentral tubercle. Intercostal surface smooth. Npc’s well spaced, inner lamella broad, avestibulate. Rpc’s, numerous, straight, simple long, tendency to cluster. Central muscle scars; four adductors in a vertical row, distorted by well developed, deep subcentral pit. Large “V” shaped frontal scar. Hinge strongly holamphidont.
**Distribution.**—Samples A2-A4, B2-B4.

### Dimensions.

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</tbody>
</table>

**Remarks.**—The present species resembles *Mutilus fungoides* (Brady, 1880) externally and internally, except that *M. fungoides* has the whole of the lateral surface ornamented by short, strong tri-radiate spines and internally possesses two frontal scars. It differs from *P. militaris* (Brady) and from *P. manis* Whatley & Tittleton in its smaller size, larger, more prominent subcentral tubercle, lack of an inclined ventral costa in the first instance and by a lack of denticles covering the entire lateral surface in the second. Note that Howe & McKenzie, 1989, included *Pterygocycleirus* spec. (Jurien 71) Hartmann, 1978, under *Jugocythereis henryhowei* Howe and McKenzie [= *Mutilus fungoides* (Brady)] while here, *Pterygocycleirus* spec. (Jurien 71) Hartmann, 1978, is regarded as a synonym of *Ponticocycleirus spatulospinosus* sp. nov. *P. spatulospinosus* belongs to the same species group as *P. tricristata* (Brady, 1880) (see discussion in Warne, 2001). *P. spatulospinosus* differs from *P. tricristata* by being less elongate and possessing a more distinct spinose and ribbed ornament.

**Genus Puriana** Coryell & Fields, 1953 [in Puri 1953]
*Puriana lubbockiana* (Brady, 1880) comb. nov.

(Pi. 9, Figs. 1-6)

1880 *Cythere lubbockiana* (Brady), p. 68, Pl. 14, Figs. 6a-d.

**Material.**—384 valves, 10 carapaces. Adult to A-2.


### Dimensions.

<table>
<thead>
<tr>
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<tr>
<td>JLV BB/NA 259</td>
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**Remarks.**—The single species here recorded as belonging to *Pterygocycleirus s.l.* Blake differs from other species of the genus in its divided frontal muscle scar. Also in *Pterygocycleirus s.s.* the ventral and dorsal adductors tend to be the smallest. This is not the case in the present species, which also has some adductor muscle scar division (giving a total of 5 discrete adductor scars). Labutis, MS 1977, also noted these differences between this species and true *Pterygocycleirus* species.
and should other like species with similar morphological differences from true Pterygocythereis species be subsequently discovered, consideration should be given to erecting a new genus or subgenus for such forms.

Subfamily ECHINOCYTHEREIDINAE Hazel, 1967
Genus Echinocythereis s.l. Puri, 1953
Echinocythereis sp. (Pl. 8, Fig. 16)

non 1890 Cythere melobesoides Brady, 1869. Brady, p. 108, Pl. 18, Fig. 1
1987 Echinocythereis melobesoides (Brady). Yassini & Jones, p. 823, Figs. 3.15, 3.16.
1988 Echinocythereis melobesoides (Brady). Yassini & Wright, p. 169, Figs. 6A, B.

Material.—3 adult left valves.
Distribution.—Samples A3, A4.
Dimensions.

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<tr>
<td>ALV BB/NA 242</td>
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<td>0.30</td>
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</table>

Remarks.—The present material possesses divided frontal muscles scars thus differentiating it from Henryhowella melobesiodes (Brady), which possesses a V-shaped frontal muscle scar. The present material, here assigned to Echinocythereis s.l., differs from Echinocythereis s.s. spp. by possessing a simpler (antimerodont) hinge structure. Externally the present species is somewhat similar to Echinocythereis scabra (Münster, 1830), but can be distinguished from it by its more subovate outline and by the orientation of the spinose ornament. Neobuntonia sabulosa (Brady, 1880) is also similar, but can be distinguished from the present species by its lack of a strongly spinose ornament; instead a fine reticulate ornament is developed. The present species perhaps belongs to the same evolutionary lineage of ostracods as the morphologically similar south-east Australian fossil Cenozoic species, Echinocythereis karooma McKenzie et al., 1993, although the latter differs from the former in the details of spine numbers and positions. The present species also occurs in the Solomon Islands.

Genus Neobuntonia Hartmann, 1981

Remarks.—At present there is an inadequate differential diagnosis between the genera Neobuntonia Hartmann, 1981, and Digmocythere Mandelstam, 1958. The present material is placed in Neobuntonia pending clarification of the above taxonomic relationship. It is here considered that species of Neobuntonia described from Australian waters/strata have taxonomically significant similarities in carapace morphology to species of Bosquetina Keij, 1957, suggesting that Neobuntonia species are echinocythereidines.
Neobuntonia sp. cf. N. sabulosa (Brady, 1880) comb. nov.
(Pl. 8, Figs. 14-15)

1880 Cythere sabulosa Brady, p. 80, Pl. xix, Figs. 1a-h.

Material.—6 valves. A-1 juveniles (?).
Distribution.—Samples A1, A4, B4.
Dimensions.

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<tr>
<td>LV BB/NA 240</td>
<td>0.48</td>
<td>0.28</td>
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</table>

Remarks.—A small to medium species of Neobuntonia with shape and outline typical of most species of this genus but with gentler ventro-lateral tumidity. Apart from a series of 4 weak ribs that parallel the anterior margin, carapace finely reticulate. This species is also known from the Solomon Islands (Titterson & Whatley, in press, a). The lectotype specimen of Neobuntonia sabulosa (Brady) chosen by Puri & Hulings, 1976, is very similar to the holotype specimen of Neobuntonia joveata McKenzie et al., 1990, although the former is slightly larger than the latter. Specimens assigned to both these taxa are significantly larger and possess a more coarsely “pitted” carapace surface than the present material (which may be juveniles). Further study of relevant type material is required in order to clarify the taxonomic relationship between N. sabulosa (Brady), N. joveata McKenzie et al., Neobuntonia jonesi (Yassini & Jones, 1987) and Neobuntonia praemucronata (Chapman & Crespin, 1928) n. comb. [in Chapman, Crespin & Keble, 1928].

Subfamily CYTHERITTINAE Triebel, 1952
Genus Alocopocythere Siddiqui, 1971
Alocopocythere ventrocostata (Howe & McKenzie, 1989) comb. nov.
(Pl. 2, Figs. 5-10)

1989 Neocytheretta ventrocostata Howe & McKenzie, p. 46, Figs. 117, 118.
1993 Neocytheretta spongiosa (Brady), Yassini et al., p. 400, Pl. 7, Figs. 140-142; Pl. 8, Fig. 153.

Material.—290 valves, 65 carapaces.

Amended diagnosis.—A species of Alocopocythere characterised by: (1) its regular, strongly reticulate ornament (with many circular and oval fossae), which does not extend to the anterior margin, and (2) the presence of a postero-dorsal protuberance in females.


Distribution.—Samples A1-5 and B1-B5.
Dimensions.

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<td>ALV, BB/NA 042</td>
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<tr>
<td>ALV, BB/NA 043</td>
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<td>0.36</td>
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</table>

Remarks.—The present species is similar to Neocytheretta spongiosa (Brady) sensu Whatley & Zhao (1988) from the Malacca Straits, but differs in that it lacks the short subhorizontal costae in the posterior third of the carapace surface, characteristic of the latter. Also in the latter species, the surface ornament of reticulae extends to the anterior margin. Externally, the present species is closest to Alocopocythere reticulata indomustralica Hartmann,
1978, from the eulittoral of Western Australia, but the latter species has a slight depression in the posterodorsal region of the carapace surface. Two subspecies of a very similar species, that differs mainly in its lack of a postero-dorsal protuberance, occurs in the Solomon Islands (Titterton & Whatley, in press, a). Specimens illustrated by Mostafawi, 1992, as Neocyttheretta vandijkii (Kingma, 1948) only differ from the present species by possessing reticulate ornament that extends continuously across the carapace surface to the anterior margin. Neocyttheretta formosana Hu, 1984, differs by possessing reticulate ornament that extends to the anterior margin and by possessing a faint posteroventral ridge.

Alocopocythere sp.
(Pl. 2, Figs. 11-12)

2001 Neocyttheretta spongiosa (Brady), Clarke et al., Fig. 8q.

Material.—103 valves, 19 carapaces. Adult to A-3.
Distribution.—Samples A1-A5, B1-B5.
Dimensions.

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<td>ARVM BB/NA 050</td>
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<td>0.46</td>
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</table>

Remarks.—The present subspecies can be distinguished from N. inflata Malz, 1980, from the Pliopleistocene of Taiwan in lacking three prominent longitudinal posterior ribs. It can be distinguished from other species of Neocyttheretta by its lack of surface reticulation. Specimens of N. aduna aduna (Brady) illustrated by Yassini et al., 1993, and Mostafawi, 1992, have more prominent ribbing than specimens of the present subspecies.

Neocyttheretta spinobifurcata Yassini, Jones & Jones, 1993
(Pl. 2, Figs. 16-19)

1993 Neocyttheretta spinobifurcata Yassini et al., p. 398; Pl. 7, Figs. 126, 127.

Material.—7 valves. Adults only.

Distribution.—Samples A1, A3-A5; B2-B4.
**Dimensions.**

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<td>ARVF BB/NA 052</td>
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<td>ALVF BB/NA 053</td>
<td>0.50</td>
<td>0.32</td>
</tr>
<tr>
<td>ARVF BB/NA 054</td>
<td>0.50</td>
<td>0.30</td>
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</tbody>
</table>

**Remarks.**—The present species can clearly be distinguished from other species of *Neocythereita* by its small size. Average length and height for the species is 0.50 mm and 0.32 mm respectively. The present species is closest to *N. spongiosa* (Brady, 1870) but differs in its internal features and in details of ornament. *Alocopocythere ventrocosta* (Howe & McKenzie, 1989) is a somewhat similar species which differs in possessing a distinctly arcuate posterodorsal rib rather than a series of tubercles.

**Subfamily ARUCALYCTHERINAE** Hartmann, 1981  
**Genus Neocytheromorpha** Guan, 1978

**Remarks.**—A small to median genus, characterised by its elongate, subrectangular shape in lateral outline. Broadly rounded anterior and posterior margins, weakly developed reticulate ornament, strong anterior and posterior marginal depressions. Adductors in a subvertical row of 4 scars. Frontal scar “V” shaped opening dorsally. Hinge lophodont. *Neocytheromorpha s.s.* differs from the very similar genus *Arculacythereis* Hartmann, 1981, by possessing strong anterior and posterior marginal depressions. These features are conspicuously absent in *Arculacythereis*. *Arculacythereis* species may have a heterochronic evolutionary relationship to *Neocytheromorpha* species. *Neocytheromorpha* also resembles *Bensonocythere* Hazel, 1967; *Cuneocythere* Lienecklaus, 1894, and *Triginglymus* Blake, 1950, although there is little possibility of confusion with *Bensonocythere*, which has a more advanced (complex) hinge structure than *Neocytheromorpha*. It differs from *Cuneocythere* in its more elongate, subrectangular outline and avestibulate nature, and from *Triginglymus* in lacking a distinctive subcentral tubercle, and in its lophodont hinge, as opposed to a holamphidont hinge in the latter.

*Neocytheromorpha papilloporosa* sp. nov.  
(Pl. 2, Figs. 20-24)

**Derivatio nominis.**—Latin. Named for the clusters of 4-5 papillae that centre on the normal pore canals.  
**Material.**—10 valves, 3 carapaces. Adults to A-1.

**Holotype.**—ALV BB/NA 055 (Pl. 2, Figs. 20, 23).  
**Type locality and level.**—Lee Point on Shoal Bay. Recent.

**Diagnosis.**—A species of *Neocytheromorpha* characterised by its subrectangular to subcyidlindrical outline, smooth carapace and clusters of 4-5 bulbous protrusions around normal pore canals, and weakly developed reticulation with secondary punctation.

**Description.**—Small to medium, thin-shelled, translucent, subrectangular to subcylindrical in lateral view. Anterior margin broadly rounded, extremity slightly below mid-height. Posterior margin broadly rounded, extremity at mid-height. Dorsal margin straight sloping posteriorly. Cardinal angles rounded. Ventral margin nearly straight with slight incurvature medially. Greatest length at mid height, greatest height through anterior cardinal angle. Surface ornamentation consists of very weakly developed, shallow microreticulation. Fossae secondarily punctate. A strong crescentic depression occurs anteriorly extending from below anterior cardinal angle to ventral margin. Remainder of carapace slightly tumid, strongly inflated posteroventrally with a marked posteroventral marginal depression and with groups (clusters) of 4-5 small bulbous tubercles, which surround nvp. Inner lamella wide and irregular, widest anteriorly, approaching outer margin ventrally. Rpc numerous, mostly simple, long slightly sinuous, occasionally branching. Central muscle scars consist of 4 adductors in a subvertical row with central two scars set obliquely to other scars. Frontal scar “V” shaped, opening dorsally. Hinge lophodont composed of a weak bar in the left valve and with strong accommodation groove in RV.

**Distribution.**—Samples A4, A5; B1, B4.

**Dimensions.**

<table>
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<td>Holotype ALV BB/NA 055</td>
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<tr>
<td>Paratype ARV BB/NA 056</td>
<td>0.52</td>
<td>0.22</td>
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</table>

**Remarks.**—At present this is the only known record of the genus in Australian waters.

**Family XESTOLEBERIDIDAE** Sars, 1928  
**Genus Foveoleberis** Malz, 1980  
**Foveoleberis cypraeoides** (Brady, 1868)  
(Pl. 10, Figs. 2-3)

1868 *Cythere cypraeoides* Brady, p. 72, Pl. 8, Figs. 21, 22.
1880 *Xestoleberis foveolata* Brady. Brady, p. 130, Pl. 30, Figs. 1a-g.
1988 *Foveoleberis foveolata* (Brady). Whatley & Zhao, p. 26, Pl. 10, Figs. 18, 19 and synonymy.


1992 *Foveoleberis cypraeoides* (Brady). Mostafawi, p. 158, Pl. 6, Fig. 139.

1993 *Foveoleberis cypraeoides* (Brady). Yassini et al., p. 402, Pl. 9, Figs. 171, 172.

1997 *Foveoleberis cypraeoides* (Brady). Dewi, pp. 75-76, Figs. 225, 228.

**Material.**—2006 valves, 103 carapaces. Adult to A-3.

**Distribution.**—Samples A1-A5, B1-B5.

**Dimension.**

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**Remarks.**—Whatley & Zhao (1988) have recently demonstrated that the two species *Foveoleberis cypraeoides* and *F. foveolata* (Brady) are conspecific. The present species is widely distributed throughout the Indo-Pacific. In the present study, this species was by far the most dominant.

**Genus Xestoleberis** Sars, 1866

*Xestoleberis* sp. cf. *X. broomensis* Hartmann, 1978

(Pl. 10, Fig. 4)

1978 *Xestoleberis broomensis* Hartmann, p. 117, Pl. 12, Figs. 8-10.


**Material.**—1 valve, A-1?

**Distribution.**—Sample A4.

**Dimension.**

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<tr>
<td>RV (A-1 juven.) BB/NA 282</td>
<td>0.32</td>
<td>0.28</td>
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</table>

**Remarks.**—The present species closely resembles *X. cautica* Hartmann 1978 (and *Xestoberis* sp. cf. *X. cautica* of the present study), but differs in having a more convex dorsal margin and more obliquely rounded ante-

ror margin. The illustrations of the original type material of this species (Hartmann, 1978) only include one SEM photograph of a whole valve (int. RV), which together with the juvenile aspect of the present material, makes the species level identification of the latter uncertain.

*Xestoleberis* sp. cf. *X. cautica* Hartmann, 1978

(Pl. 10, Figs. 5-6)


**Material.**—51 valves, 22 carapaces. Adult to A-3.


**Dimension.**

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<tr>
<td>ARVM BB/NA 284</td>
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**Remarks.**—*Xestoleberis broomensis* Hartmann 1978, from the eulittoral of Western Australia resembles the present species, but differs in its more convex dorsal margin and obliquely rounded anterior. Differences in the hinge can also be observed, with *X. broomensis* having a shorter median element. *Xestoleberis cautica* Hartmann, 1978, also resembles *Xestoleberis darwinensis* Howe & McKenzie, 1989, and *Xestoleberis paramargaritea* Howe & McKenzie, 1989, but differs in having a carapace maximum height distinctly anterior of mid length. The specimens illustrated here are slightly smaller than those of *X. cautica* recorded by Hartmann, 1978.

*Xestoleberis paraporheidlandensis* Hartmann, 1978

(Pl. 10, Fig. 7)

? 1966 *Xestoleberis* sp. XF Maddocks, p. 68, Fig. 58.

1978 *Xestoleberis paraporheidlandensis* Hartmann, p. 122, Text-Figs. 409-422, Pl. 13, Figs. 1, 2.

1984 *Xestoleberis paraporheidlandensis* Hartmann, 1978. Hartmann, p. 131, Text-Figs. 55-56, Pl. 9, Figs. 4-7.

1988 *Xestoleberis paraporheidlandensis* Hartmann, 1978. Watson MS, p. 251, Pl. 11, Figs. 2, 3; Pl. 46, Figs. 8-14.

2005 Xestoleberis porthedlandensis Hartmann. Titterton & Whatley, p. 302, Fig. 4, Nos. 14, 17; Pl. 3, Figs. 1-8.

Material.—18 valves. Adult to A-3.

Distribution.—Sample A1, A3-A5, B4-B5. Also, Hartmann, 1978 (Recent eulittoral, Western Australian coast); Hartmann, 1984 (Recent eulittoral, Huahine Island and Rangiroa Atoll); Recent, Pulau Seribu, Java Sea (Watson MS 1988). Solomon Islands, Guadalcanal and Shortland islands (Titterton & Whatley, 2005).

Dimensions.

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<td>ARV BB/NA 285</td>
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Remarks.—Several species of Xestoleberis are similar to the present species. As indicated by Titterton & Whatley, 2005, Xestoleberis capensis Müller, 1908, illustrated by Benson & Maddocks, 1964, from the Recent of the Kaysna Estuary, South Africa, is very similar but does not appear to have opaque patches. Xestoleberis trimaculata Hartmann, 1979, from the Recent eulittoral of southern Australia (and the present study), has a similar opaque patch but differs in the shape of the carapace, and central muscle scar pattern. Xestoleberis sp. (present study) varies slightly in carapace shape and in possessing a different opaque patch pattern.

Xestoleberis trimaculata Hartmann, 1979
(Pl. 10, Fig. 9)

1979 Xestoleberis trimaculata Hartmann, p. 252, Pl. 12, Figs. 1-4.

Material.—32 valves, 9 carapaces. Adult to A-3.


Dimensions.

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<tr>
<td>ALV BB/NA 290</td>
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Remarks.—The present species resembles X. broomensis Hartmann, 1979, but differs in its slightly more elongate shape in lateral view and slightly different opaque patches on the lateral surface. Xestoleberis sp. (this study) can be distinguished from the present species by virtue of its quadrato, truncated posterior margin.

Xestoleberis sp.
(Pl. 10, Fig. 8)

Material.—20 valves, 5 carapaces. Adult to A-1.

Distribution.—Samples A1-A5, B1-B5.

Dimensions.

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<td>ARV BB/NA 287</td>
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Remarks.—The present species can be distinguished from other species of the genus in the present study by its strongly truncated posterior margin, relatively inconspicuous Xestoleberis spot and relatively large size. This species has a close resemblance to a number of species known from the Solomon Islands,

PLATE 10—1, Henryhowella sinespinosa sp. nov. Paratype, Female, LV, int., BB/NA 276, x 54. 2, 3. Foveoleberis cypraeoides (Brady, 1868); 2, Female, LV, ext., BB/NA 278, x 71; 3, Female, LV, int., BB/NA 278, x 71. 4. Xestoleberis sp. cf. X. broomensis Hartmann, 1978. RV (A-1 juv.), ext., BB/NA 282, x 107. 5, 6. Xestoleberis sp. cf. X. cautilo Hartmann, 1978; 5, Female, LV, ext., BB/NA 283, x 84; 6, Male, RV, ext., BB/NA 284, x 84. 7, Xestoleberis paraporthedlandensis Hartmann, 1978, RV, ext., BB/NA 285, x 88. 8, Xestoleberis sp. RV, ext., BB/NA 286, x 71. 9, Xestoleberis trimaculata Hartmann, 1979. LV, ext., BB/NA 288, x 69. 10-16, Paraxestoleberis posteroacuminata gen. et sp. nov.; 10, Holotype, Female, LV, ext., BB/NA 291, x 74; 11, Paratype, Male, RV, ext., BB/NA 293, x 74; 12, Paratype, Female, RV, ext., BB/NA 292, x 74; 13, Paratype, Female, carapace, dorsal view, BB/NA 294, x 116; 14, Paratype, Male, carapace, dorsal view. BB/NA 295, x 116; 15, Paratype, Male, RV, int., BB/NA 293, x 75; 16, Holotype, Female, LV, int., BB/NA 291, x 74. 17, Paraxestoleberis sp. Female. RV, ext., BB/NA 296, x 78.

Genus Paraxesteoberis gen. nov.

**Type species.**—Paraxesteoberis posteresauminata gen. et sp. nov.

**Diagnosis.**—A xesteoberidid genus distinguished by its elongate, subrectangular shape in lateral view, and with well rounded anterior margin; pointed posterior margin, and overall strongly convex dorsal margin. *Xesteoberis* spot prominent, concave posteriorly, especially in RV. Surface smooth, translucent, numerous large, simple, regularly distributed normal pores. Hinge anteromedontal, marginal areas narrow. Small crescentic vestibula anteriorly and posteriorly. Rpc’s numerous, short, straight, simple; adductor scars in a vertical row of four, with “V” shaped frontal scar, two mandibular scars anteroventrally.

**Remarks.**—This genus is closest to *Xesteoberis*, Sars 1866, Ornatoleberis, Keij 1975, Foveoleberis, Malz 1980 and Uroleberis, Tribel 1958, although there is little possibility of confusion with either *Foveoleberis* or *Uroleberis* which have short carapaces with strongly arched dorsal margins and the posterior margin drawn out into a caudal processes. It differs from *Xesteoberis* in its more broadly rounded anterior margin and accumulate posterior. The “arrow head” shaped frontal scar typical of *Xesteoberis* is not present. *Ornatoleberis*, although with an outline more similar to the present genus, can also be distinguished by its surface ornament of spines, carinae or reticulae.

**Paraxesteoberis posteresauminata** sp. nov.

(Pl. 10, Figs. 10-16)

**Derivatio nominis.**—Latin, with reference to the accumulate posterior margin of this species.

**Holotype.**—ALVF BB/NA 291 (Pl. 10, Figs. 10, 16).

**Type locality and level.**—Lee Point on Shoal Bay, sample A4. Recent.

**Material.**—107 valves, 37 carapace. Adult to A-3.

**Diagnosis.**—A species of *Paraxesteoberis* characterised by its elongate subrectangular shape in lateral view. Anterior margin well rounded. Posterior margin accumulate and especially pointed in RV. Valve surface densely but minutely punctate; micropapillate anterioly. Inner lamella narrow with numerous simple, straight rpc’s. Muscle scars situated subcentrally.

Adductor scars in a vertical row of four, second scar from the dorsal margin subdivided into two discrete subcircular scars, other scars elongate. Frontal “V” shaped opening anterodorsally. Small mandibular scar also present. *Xesteoberis* spot prominent.

**Description.**—Small to medium, thin-shelled, translucent, shiny. Sexual dimorphism distinct with females shorter, higher and more inflated posteroventrally than males. Carapace elongate subovate in lateral view; ovate in dorsal view. Anterior margin well rounded in LV, more narrowly in RV. Posterior margin bluntly pointed at about mid-height in LV, sharply pointed in RV. Dorsal margin slightly arched. Cardinal angles rounded, obtuse. Ventral margin almost straight, with slight concavity slightly anterior of mid length. Greatest height below mid-height; greatest height 1/3 from anterior margin; greatest width antero-medianly. LV > RV, slight overlap around entire free margin. Surface of valves densely micropunctate, micropapillate in some parts, especially anteriorly. Npc’s numerous. Eye spot inconspicuous. *Xesteoberis* spot distinctive, thin crescent-shaped; convex anteriorly extending 1/4 height. Inner lamella narrow. Narrow vestibula anteriorly and posteriorly, widest anteriorly. Rpc’s numerous, straight, simple. Selvage strongly developed. Hinge anteromedontal. Posterior and anterior terminal elements of RV comprise dentate bar with small ovate teeth, median element a fine loculate groove. Terminal elements of similar size, median element twice the length of terminal elements. Central muscle scars situated subcentrally, comprise a vertical row of four adductors, second scar from dorsal margin subdivided. Dorsal scar also shows some signs of subdivision. Other scars elongate. Frontal “V” shaped, opening antero-dorsally. Small ovate mandibular scar also present.

**Distribution.**—Samples A1-A5, B1-B5.

**Dimensions.**

<table>
<thead>
<tr>
<th></th>
<th>Length</th>
<th>Height</th>
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<tbody>
<tr>
<td>Holotype ALVF BB/NA 291</td>
<td>0.50</td>
<td>0.26</td>
</tr>
<tr>
<td>Paratype ARVF BB/NA 292</td>
<td>0.49</td>
<td>0.28</td>
</tr>
<tr>
<td>Paratype ARVM BB/NA 293</td>
<td>0.52</td>
<td>0.26</td>
</tr>
<tr>
<td>Paratype ACF BB/NA 294</td>
<td>0.52</td>
<td>0.26</td>
</tr>
<tr>
<td>Paratype ACM BB/NA 295</td>
<td>0.52</td>
<td>0.26</td>
</tr>
</tbody>
</table>

**Remarks.**—The present species most closely resembles *Xesteoberis claroculata* Bate *et al.*, 1981, from Ecuador, but differs from it in its more broadly rounded anterior, smaller and less deep anterior vestibulum, a greater number of radial pore canals, 30 in the
present species as opposed to 10 in *X. claroculata* and subdivided adductors, and larger, less recurved *Xestoleberis* spot.

*Paraxestoleberis* sp.  
(Pl. 10, Fig. 17)

**Material.** Two right valves, male and female.

**Diagnosis.** A species of *Paraxestoleberis* characterised by its almost straight dorsal and truncated posterior margins.


**Distribution.** Samples A4, A5.

**Dimensions.**

<table>
<thead>
<tr>
<th></th>
<th>Length</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARVF BB/NA 296</td>
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<td>0.28</td>
</tr>
<tr>
<td>ARVM BB/NA 297</td>
<td>0.50</td>
<td>0.24</td>
</tr>
</tbody>
</table>

**Remarks.** The present species differs from *Paraxestoleberis posteroacuminata* sp. nov., in its straighter dorsal margin and slightly truncated posterior margin.

**ACKNOWLEDGEMENTS**

R.C. Whatley and B. Blagden thank M. Bentley for the collection of samples and details of localities. Mark Warne acknowledges an *Australian Academy of Science – Royal Society (of London) Travel Grant*, which supported collaborative research on northern Australian Ostracoda with RCW at the University of Wales, Aberystwyth during 1997. Dr John Whittaker is thanked for the SEM images of the *Venericethea papuensis* and *Pistocythereis* sp. specimens illustrated herein [from the “Blagden Collection” in Natural History Museum (London)]. Other photographic images and plates were originally created/compiled by B. Blagden and later digitally restored by P. Irwin. MTW acknowledges access to various facilities at Deakin University, Australia, used to support the latter phases of the research presented in this work. Dr. Peter Frenzel and Dr. Julio Rodríguez-Lázaro are thanked for their reviews of this manuscript.

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