APPENDIX II

Species recorded

These are arranged following the classification of Loeblich and Tappan (1987) except where, as for the Family Cancrisidae (following Revets, 1996) and retention of *Pileolina* (following Quilty [1977] and Hayward and others, 1999), an alternative classification is employed.

Benthic species Superfamily Astrorhizacea Family Rhabdamminidae

?Rhizammina spp.

Two species are tentatively placed in *Rhizammina*. Neither form seems attributable to species that would be expected in a shallow-water environment.

?R. sp. 1 consists of a simple tube, slightly curved, and varying irregularly in diameter. It also has 'growth lines' that are oblique to the axis of the test. It may be related to the forms that Brady (1884) referred to as 'chitinous Rhizopod-tubes'.

?*R*. sp. 2 is a simple, straight tube with cemented grains that dominantly are fine but with coarser platey grains arranged perpendicular to the axis. The latter appears to be the form identified by Brady (1884) as *Pelosina* cylindrical but is open at both ends of the tube.

Superfamily Ammodiscacea Family Ammodiscidae

Ammodiscus exsertus Cushman, 1910, p. 75, figs. 95, 96.

Clomospira charoides (Jones and Parker).- Yassini and Jones, 1995, 66: figs. 26-28 = *Trochammina squamata* var. *charoides* Jones and Parker, 1860, p. 304. This may be the species recorded by Yassini and Jones (1995) as *G. charoides* (Jones and Parker) but it lacks the systematic change of growth form from the earlier parts that mimic characian algae. The form recorded here has a very irregular coiling pattern and the tube increases very slowly in size with irregular constrictions.

Glomospira gordialis (Jones and Parker) = *Trochammina squamata* var. *gordialis* Jones and Parker, 1860, p. 304 (figures, Carpenter, Parker and Jones, 1862, pl. 11, fig. 4.)

Superfamily Hormosinacea

Family Thomasinellidae

Protoschista sp. A single incomplete specimen. The initial chambers are missing and thus the generic assignment is tentative. The noteworthy features are that the rectilinear series of six chambers increases slowly in size, becoming progressively smoother and flatter, and the ultimate chamber has two apertures, each on a slight neck. Apthorpe (1980) figured *Martinottiella* cf. *communis* and *Ammotium salsum* from Lakes Entrance, Victoria. This fragment could belong to an aberrant form of either, or to *Protoschista* which is well known in Australian estuaries.

Superfamily Lituolacea

Family Lituolidae

Ammobaculites agglutinans (d'Orbigny).- Barker, 1960, pl. 32, figs. 19-21, 24-26 = *Spirolina agglutinans* d'Orbigny, 1846, p. 137, pl.7, figs.10-12.

Superfamily Spiroplectamminacea Family Pseudobolivinidae

Pseudobolivinid indet.

A single specimen lacking early chambers. Test consists of an alternating series of chambers, elongate biserial but with no obvious change in habit. Test mainly of fragments of sponge spicules. Aperture terminal, small, lacking lip, rim or neck. It is not the minute *Pseudobolivina* described by Wiesner (1931).

Superfamily Textulariacea

Family Valvulinidae

Clavulina multicamerata Chapman, 1909.- *Clavulina parisiensis* var. *multicamerata* Chapman, 1909, 127: pl. 60, fig. 5 = *Clavulina multicamerata* Chapman.- Parr, 1932, 4: pl. 1, fig.s 4, 5.

An incomplete single specimen consisting of a few rectilinear chambers that could belong either to this taxon or to the terminal chambers of a species of *Martinottiella*.

Clavulina pacifica Cushman, 1924, p. 22, pl. 6, figs. 7-11.

Cribrobulimina polystoma (Parker and Jones).- *Cribrobulimina polystoma* (Parker and Jones); Cushman, 1937, p. 27, pl. 3, figs. 19-22 = *Valvulina polystoma* Parker and Jones, 1865, 155: 437 (figs. in Carpenter, Parker and Jones, 1862, pl. 11, figs. 21, 24).

This species was recorded by Parker and Jones (1865, p. 437) from 'Swan River, white shelly mud, 7-8 fms.' It was figured in Carpenter, Parker and

Jones (1862) and is thus is one of the few early records of foraminifera from this vicinity.

Family Textulariidae

Textularia agglutinans d'Orbigny, 1839, p. 144, pl. 1, figs. 17, 18, 32 - 34.

Textularia conica d'Orbigny, 1839, p. 143, pl. 1, figs. 19,20.

Textularia earlandi Parker, 1952 = *Textularia tenuissima* Earland, 1933, p. 95, pl. 3, figs. 21-30 = *Textularia earlandi* Parker, 1952, p. 458.- Hayward and others 1999, p. 90, pl. 2, figs, 22, 23.

The specimens found here usually are fragmentary and can be referred to either *T. earlandi* or to the form figured by Brady (1884, pl. 43, fig. 4) as *T. agglutinans* var. *porrecta*.

Textularia pseudogramen Chapman and Parr, 1937, p. 153.- Barker, 1960, pl. 43, figs. 9, 10.

Superfamily Verneuilinacea

Family Verneuilinidae

Gaudryina convexa (Karrer) = *Textilaria convexa* Karrer, 1865, p. 78, pl. 16, figs.8a-c. A specimen consisting only of the triserial portion of the test.

Superfamily Spirillinacea Family Spirillinidae

Spirillina inaequalis Brady, 1879, p. 278, pl. 8, figs. 25a, b.

Patellina corrugata Williamson, 1858, p. 46, pl. 3, figs. 86-89.

Superfamily Cornuspiracea

Family Cornuspiridae

Cornuspira involvens (Reuss) = *Operculina involvens* Reuss, 1850, p. 370, pl. 46, fig. 20.- Hayward and others 1999, p. 94, pl. 3, fig. 16.

Family Fischerinidae

Vertebralina striata d'Orbigny, 1826, p. 283, modeles no. 81.- Yassini and Jones, 1995, p. 78, 125.- Haig, 1997, p. 273.

Planispirinella exigua (Brady) = Hauerina exiqua Brady, 1879, p. 19, 53.

Superfamily Miliolacea

FamilyHauerinidae

- *Massilina secans tropicalis* Collins.- Yassini and Jones, 1995, p. 82, figs. 172, 173. = *Massilina secans* (d'Orbigny) var. *tropicalis* Collins, 1958, p. 362, pl. 2, figs. 10ac.
- *Massilina tenuistriata* Earland = *Massilina secans* (d'Orbigny) var. *tenuistriata* Earland, 1905, p. 198, pl. 11, fig. 5.
- Miliolinella subrotunda (Montagu).- Yassini and Jones, 1995, p. 88, figs. 1984, 195.-M. subrotundata (Montagu).- Hayward and others 1999, p. 96, pl. 3, fig. 24 = Vermiculum subrotundum Montagu, 1803, p. 521.
 This species is interpreted broadly. A few specimens may be as extreme as M. circularis. Yassini and Jones (1995) recorded nine species of this genus but Hayward and others (1999) only three, similar to the approach taken here. Several of the forms identified by Yassini and Jones (1995) may be included in large populations of M. rotunda as employed here.
- *Pyrgo* cf. *depressa* (d'Orbigny).- Hayward and others 1999, p. 98, pl. 4, figs. 5, 6 = *Biloculina depressa* d'Orbigny, 1826, p. 298, modeles no. 91.
- *Pyrgo lucernula* (Schwager).- Yassini and Jones, 1995, p. 90, figs. 952, 953 = *Biloculina lucernula* Schwager, 1866, p. 202, pl. 4, figs. 14, 17.
- *Pyrgo globula* (Bornemann).– Cushman, 1932, p. 65, pl. 15, figs. 6-8 = *Biloculina globulus* Bornemann, 1855, p. 349, pl. 19, fig. 3.

Pyrgo sp. 1.

This species occurs in only one sample (Station 3) and is unusual in its aperture which has not a normal simple bifid tooth but appears to be circular, perhaps representing a bifid tooth, similar to that figured by Loeblich and Tappan (1987, pl. 351, figs. 9, 10) of *P. williamsoni* (Silvestri), in which the distal ends of the teeth have joined. The species also has, at its antapical end, a flap between two invaginations of the periphery. It also is similar to *P. pisum* Schlumberger but is less inflated.

- *Quinqueloculina angularis* d'Orbigny.- Fornasini, 1906, p. 66, pl. 3, figs. 12a-c; pl. 12, figs. 12a-c. = *Quinqueloculina angularis* d'Orbigny, 1826, p. 302, modeles 23.
- *Quinqueloculina arenata* Said.- Orpin and others 1999, p. 616, fig. 6. = *Quinqueloculina anguina arenata* Said, 1949, p. 9, pl. 1, fig. 25.- Yassini and Jones, 1995, p. 83, figs. 180-182.

Quinqueloculina boueana d'Orbigny, 1846, p. 293, pl.19, figs.7-9.

- Brady (1884, pl. 7, fig. 13) figured this species. It probably has been recorded in Australasia under other names such as *Q. tenagos* (Hayward and others 1999, pl. 5, figs. 14, 15) which seems identical to the species figured by Brady. The species described by Albani (1974) as *Q. poeyana carinata* may come within the purview of this form but has an elongate neck supporting its aperture. *Q. tasmanica* (Albani) has a prominent ridge down each of the final chambers. The forms reported here vary from those whose degree of development of striae is typical to those where striations are minor.
- Quinqueloculina bradyana Cushman, 1917, p. 52, pl. 18, fig. 2.
- *Quinqueloculina cliarensis* (Heron-Allen and Earland).- *Quinqueloculina* cf. *cliarensis* Heron-Allen and Earland; Haynes, 1973, p. 68, pl. 7, figs. 8, 9; text-fig. 17 = *Miliolina cliarensis* Heron-Allen and Earland, 1930, p. 58, pl. 3, figs. 26-31.
 This form is similar to *Q. bidentata* d'Orbigny but is not agglutinated.
- *Quinqueloculina delicatula* Vella, 1957, p. 27, pl. 4, figs. 77-79.- Hayward and others, 1999, p. 102, pl. 4, figs. 23, 24.
- *Quinqueloculina granulocostata* Germeraad, 1946, 63. = *Massilina granulocostata* (Germeraad). Loeblich and Tappan, 1994, 47: pl. 79, figs. 1-12. The concept employed differs from that of Yassini and Jones (1995 as *Quinqueloculina*), and Hayward and others (1999 as *Massilina*) who recorded a form with more and less prominent ridges than envisaged by Loeblich and Tappan (*op. cit.*).

Quinqueloculina intricata Terquem, 1878, p. 73, pl. 8, figs. 16-21.

Quinqueloculina lamarckiana d'Orbigny, 1839, p. 189, pl.11, figs.14,15.– Yassini and Jones, 1995, p. 84, figs. 203-205, 208.

The range of variation includes rare specimens that are unusual in being irregular and with a striate surface.

cf *Quinqueloculina lata* Terquem, 1876, p. 82, pl. 11, figs. 8a-c. The species has the form of *Q. lata* but has finely striate chambers on which the striae are gently depressed fine grooves. *Q. moynensis* Collins is similar but has a smooth surface.

Quinqueloculina oblonga (Montagu) = *Triloculina oblonga* (Montagu); Yassini and Jones, 1995, p. 92, figs. 188-192, 196, 197.- *Quinqueloculina oblonga* (Montagu);

Hayward and others, 1999, p. 102, pl. 4, figs. 27, 28 = *Quinqueloculina* sp. 6; Haig, 1997, fig. 4, 14, 15 = *Vermiculum oblongum* Montagu, 1803, p. 179, pl.10, figs. 15-17. The species commonly found here is a little more elongate than that illustrated by Hayward and others (1999) and more akin to that figured by

Yassini and Jones (1995). The latter figures clearly show a quinqueloculine chamber arrangement.

- *Quinqueloculina pittensis* Albani, 1974, p. 33, pl. 1, figs. 1-3.- Haig, 1997, p. 272, fig. 4, 23.
- *Quinqueloculina poeyana* d'Orbigny, 1839, p. 191, pl. 11, fig. 25-27.- Yassini and Jones, 1995, p. 84, fig. 158, 160-163.- Haig, 1997, p. 272, fig. 4, 4,5. The ribs on the form recorded here are a little finer than the specimens shown in Yassini and Jones (1995) but very similar to the specimen shown by Hayward and others (1999) as *Q. tenagos*.
- *Quinqueloculina seminulum* (Linné).- Yassini and Jones, 1995, p. 85, figs. 198, 199.- Hayward and others, 1999, p. 103, pl. 5, figs. 9, 10 = *Serpula seminulum* Linné, 1758, p. 786.
- *Quinqueloculina tropicalis* Cushman, 1924, p. 63, pl. 23, figs. 9, 10.- Yassini and Jones, 1995, p. 85, figs. 170, 171, 174, 175.- Haig, 1997, p. 272. Despite the comment in Yassini and Jones (1995) that the wall is smooth, the specimen figured here and their figures 170, 171 are of a species with a slightly roughened surface but without any obvious regular pattern. Cushman's original description refers to the surface as 'granular, dull'.

Quinqueloculina venusta Karrer, 1868, p. 147, pl. 2, fig. 6.

Quinqueloculina sp. 1

This species is one of the most abundant in the Swan River. It is highly variable from triloculine, through quinqueloculine, almost to miliolinelline. Test smooth, polished, lacking longitudinal striae but with occasional transverse irregularities or wrinkles. Aperture varies markedly in size to very large and almost circular. Tooth small, usually a simple peg but varying to small flap or with weak tendency to become bifid. It cannot be identified as a known species but has similarities with *Miliolinella lakemacquariensis* Yassini and Jones while lacking longitudinal striae. The small, simple tooth is characteristic.

Quinqueloculina sp. 6

This form is similar to that recorded by Hayward and others (1999) as *Q. suborbicularis* d'Orbigny and possibly that reported by Haig (1997) as *Q.* sp. 3.

Quinqueloculina sp. indet.

Triloculina affinis d'Orbigny, 1826, p. 299.- Yassini and Jones, 1995, p. 92, fig. 202.

The form is very similar to the concept employed by Hayward and others (1999) but the chambers are more inflated.

Triloculina circularis Bornemann, 1855.- Cushman, 1932, p. 52, pl. 11, figs. 11a-c.

Triloculina marioni Schlumberger, 1893, p. 62, pl. 1, figs. 38-41.

- *Triloculina striatotrigonula* Parker and Jones, 1865, p. 438.- Hayward and others 1999, p. 105, pl. 5, figs. 25, 26. The ribs of this form are more robust than on the form figured by Hayward and others (1999).
- *Triloculina tricarinata* d'Orbigny, 1826, p. 299, modeles no 94.- Haig, 1997, p. 273.- Hayward and others 1999, p. 106, pl. 5, figs. 29, 30.
- *Triloculina trigonula* (Lamarck).- Yassini and Jones, 1995, p. 92, figs. 200, 201.-Hayward and others 1999, p. 106, pl. 5, figs. 31, 32 = *Miliolina trigonula* Lamarck, 1804, p. 351, no. 3.

Triloculina sp. 2

In two samples there is a species or subspecies that is very similar to *T. trigonula* but has more inflated chambers and finely striate chamber surfaces, much less prominent than in *T. striatotrigonula*. Striae become less prominent towards maturity. It appears to match no described species.

Triloculina sp. 3

A highly inflated form with large aperture and small tooth that is only slightly bifid.

Triloculina sp. 4

An inflated form with a slightly extended neck, some angulation on the chambers and weak striae on earlier chambers.

Triloculina sp. indet.

? Parrina sp.

A single miliolid specimen that appears to have been attached and grown in a trochospiral mode with chamber increasing rapidly as added, with large round aperture, marked lip and no teeth.

Neopateoris sp.

This appears to be the first Australasian record of this genus originally described by Bermudez and Sieglie (1963) from modern sediments of Venezuela. A single very well preserved specimen was recovered. It differs from the genoholotype in being more inflated.

Unidentified miliolids

Family Miliolidae

Rupertianella rupertiana (Brady).- Loeblich and Tappan, 1985, p. 52 = *Miliolina rupertiana* Brady, 1881, p. 46 (figures Brady, 1884, pl. 7, figs. 7-12).

Family Spiroloculinidae

Spiroloculina antillarum d'Orbigny, 1839, p. 166, pl. 9, figs. 3, 4.- Yassini and Jones, 1995, p. 81, figs. 141, 145, 146.- Hayward and others, 1999, p. 107, pl. 6, figs. 4, 5.

- *Spiroloculina depressa* d'Orbigny, 1826, p. 298, modèles no. 92.- Parker and Jones, 1863, p. 33, pl. 1, fig. 6.
- *Spiroloculina henbesti* Petri = *Spiroloculina concava* Petri 1954, p. 53, pl. 2, figs. 3-6 (see Thalmann, 1955, p. 82).

Spiroloculina rugosa Cushman and Todd, 1944, p. 66, 9, 9-13.

Spiroloculina terquemiana Fornasini, 1900, p. 360, fig. 3

Spiroloculina sp. indet.

Planispirinoides bucculentus placentiformis (Brady) = *Miliolina bucculenta* Brady var. *placentiformis* Brady, 1884, p. 171, pl. 4, figs. 1,2.

Family Peneroplidae

Monalysidium sp.

An incomplete specimen of two chambers with no ribs but about 20 rows of fine perforations arranged longitudinally.

- Peneroplis pertusus (Forskål) = Nautilus pertusus Forskål, 1775, p. 125 (fig. in Brady, 1884, pl. 13, figs. 16, 17, 23).
- *Peneroplis planatus* (Fichtel and Moll).- Yassini and Jones, p. 80, fig. 128 = *Nautilus planatus* var. *beta* Fichtel and Moll, 1798, pl. 16, figs. 1 d-f.

Family Soritidae

Amphisorus hemprichii Ehrenberg, 1839, p. 134, pl. 3, fig. 2.
 A few fragmentary specimens are included here and the identification is tentative. Haig (1997) pointed out that earlier records of *Marginopora vertebralis* from south-western Australia probably should refer to this species.

Superfamily Nodosariacea

Family Nodosariidae *Nodosaria* spp. indet.

Family Vaginulinidae

Lenticulina limbosa (Reuss).- Yassini and Jones, 1995, p. 134, Fig. 726 = *Cristellaria* (*Robulina*) *limbosa* Reuss, 1863, p. 55, pl. 6, fig. 89.

Lenticulina juv. sp. indet.

Family Lagenidae

Lagena pustulostriata Albani and Yassini, 1989, p. 379, figs. 2q-r.

Lagena striata strumosa Reuss, 1858, p. 434.

Procerolagena distoma - margaritifera (Parker and Jones).- Lagena distomamargaritifera Parker and Jones, 1865, p. 357, pl. 18, figs. 6a,b.

Family Polymorphinidae

Guttulina pacifica (Cushman and Ozawa).- Yassini and Jones, 1995, p. 139, figs. 673, 712, 715, 716 = *Sigmoidella* (*Sigmoidina*) *pacifica* Cushman and Ozawa, 1928, p. 19, pl. 2, fig. 13.

? Guttulina sp.

Family Ellipsolagenidae

Fissurina cf. *elliptica* (Cushman).- cf. *F. elliptica* (Cushman).- Haynes, 1973, p. 94, pl. 14, fig. 5; text fig. 19. = *Lagena orbignyana* (Seguenza) var. *elliptica* Cushman, 1922, p. 42, pl. 8, fig. 5.

The identification is a little tentative because this species has a notch in the margin at the base. Haynes (1973) discussed this species in some detail and neither Haynes, nor Cushman discussed or illustrated this feature.

Fissurina globosocaudata Albani and Yassini, 1989, p. 395, figs. 6C, D.

Fissurina quiltyi Albani and Yassini, 1989, p. 398, figs. 6 i,j.

Palliolatella albaniiYassini and Jones, 1995, p. 119, figs. 439-441.

Pseudoolina sp.

Hayward *et al.* (1999) recorded *Fissurina lucida* (Williamson) which has much in common with the species recorded here. It has the slit-like aperture and inflated smooth test with very weakly developed ridges. The form recorded here is even more inflated. That figured by Hayward *et al.* (1999) is not *F. lucida* which has a more elongate, tapering, compressed test.

Superfamily Bolivinacea

Family Bolivinidae

- *Bolivina compacta* Sidebottom.- Hayward and others, 1999, p. 124, pl. 8, figs. 10, 11 *= Bolivina robusta* var. *compacta* Sidebottom, 1905, p. 15, pl. 15, fig. 7.
- *Bolivina doniezi* Cushman and Wickenden, 1929, p. 9, pl. 4, figs. 3a, b.- Yassini and Jones, 1995, p. 129, figs. 520, 521, 525.
- *Bolivina pseudoplicata* Heron-Allen and Earland, 1930, p. 81, pl. 3, figs. 36-40.-Hayward and others 1999, p. 126, pl. 8, figs. 14, 15.
- *Bolivina rhomboidalis* (Millett).- Cushman, 1942, p. 19, pl. 6, figs. 7, 8 = *Textularia rhomboidalis* Millett, 1899, p. 559, pl.7, fig.4.
- *Brizalina striatula* (Cushman).- Yassini and Jones, 1995, p. 274, figs. 526-529, 543, 544, 655.- Hayward and others 1999, p. 127, pl. 8, fig. 21 = *Bolivina striatula* Cushman, 1922a, p. 27, pl. 3, fig.10.
- *Brizalina subaenariensis* (Cushman).- Yassini and Jones, 1995, p. 132, figs. 535, 536, 664 = *Bolivina subaenariensis* Cushman, 1922b, p. 104, pl. 7, fig. 6.

Superfamily Cassidulinacea Family Cassidulinacea

Globocassidulina subglobosa (Brady) = *Cassidulina subglobosa* Brady, 1884, p. 430, pl. 54. fig. 17.

Superfamily Buliminacea

Family Siphogenerididae

Siphogenerina raphana (Parker and Jones).- Rectobolivina raphana (Parker and Jones); Yassini and Jones, 1995, p. 146, fig. 695.- Siphogenerina raphana (Parker and Jones); Hayward and others 1999, p. 130, pl. 9, fig. 4 = Uvigerina (Sagrina) raphanus Parker and Jones, 1865, p. 364, pl. 18, figs. 16, 17.

Family Buliminidae

Bulimina gibba Fornasini, 1902, p. 378, figs. 32, 34..- Yassini and Jones, 1995, p.147, figs. 588-589.

Bulimina marginata d'Orbigny, 1826, p. 269, pl. 12, figs. 10-12.- Yassini and Jones, 1995, p. 148, figs. 564, 586, 587, 591-594.

Specimens recorded here have less prominent basal chamber projections than seems normal (Hayward and others, 1999, pl. 9, figs. 13-15) for the species and more similar to the situation illustrated by Apthorpe (1980, pl. 27, fig. 3).

Family Uvigerinidae

Trifarina bradyi Cushman, 1923, p. 99, pl. 22, figs. 3-9.

Trifarina pacifica (Albani) = *Trimosina pacifica* Albani 1974, p. 38, pl. 1, figs. 8,9.-Yassini and Jones, 1995, p. 154, fig. 62 = *Trifarina pacifica* (Albani).- Hayward and others 1999, p. 134, pl. 9, figs. 25, 26.

I follow Hayward and others (1999) in placing this form in *Trifarina* as it lacks the 'prominent proximally directed spine on each chamber' (Loeblich and Tappan 1987) and has a terminal aperture.

Family Reussellidae

Reussella simplex (Cushman). - Cushman, 1945, p. 40, pl. 7, fig. 5 = *Trimosina simplex* Cushman, 1929, p. 158, text fig. 2.

Reussella spinulosa (Reuss).- Cushman, 1942, p. 40, pl. 11, figs. 5-8 = *Verneuilina spinulosa* Reuss, 1850, p. 374, pl. 47, fig.12.

Reussella sp. indet.

Family Trimosinidae

Mimosina pacifica Cushman, 1933a, p. 77, pl. 8, figs. 3a,b.- Cushman, 1933b, p. 45, pl. 12, figs. 8a, b.

This form conforms well to the definition of *Mimosina* given by Loeblich and Tappan (1987) in that it has a primary aperture and another opening below it. It has highly perforate chamber walls with several blunt spines per

chamber. It may be a blunter spire than for Cushman's species. It is not to be confused with *Trimosina pacifica* Albani, taken here to belong to *Trifarina*.

Family Pavoninidae

Pavonina flabelliformis d'Orbigny, 1826, p. 260, pl. 10, figs. 10, 11.- Yassini and Jones, 1995, p. 154, fig. 730.

Superfamily Fursenkoinacea

Family Fursenkoinidae

Fursenkoina complanata (Egger).- Yassini and Jones, 1995, p. 154, figs. 580, 581, 646-648 = *Virgulina schreibersiana* Czjzek var. *complanata* Egger, 1893, p. 292, pl. 8, figs. 91, 92.

A species widely reported through Australasia as *F. schreibersiana* (e.g. Hayward and others 1999) or *F. complanata*, is recorded here. Either name has some validity.

Superfamily Discorbacea

Family Cancrisidae

Cancris auriculus (Fichtel and Moll).- Yassini and Jones, 1995, p. 157, figs. 803, 804 = *Nautilus auricula* Fichtel and Moll, 1798, p. 108, pl. 20, figs. a-f.

Family Heleninidae

Helenina n. sp.

Helenina anderseni (Warren) has been recorded in Australasia by Hayward and others (1999) who recorded it widely from the north island of New Zealand. They suggested that Albani's (1968a, b) record of *Rotalia perlucida* Heron-Allen and Earland refers to *H. anderseni*. While this is likely to be true of those recorded by Albani's (1968) papers, it is not true of Yassini and Jones' (1995) record of *R. perlucida* which is of a more compressed species, apparently lacking any dorsal supplementary apertures and close to *Ammonia tepida* as recorded here.

The species recorded here differs from *H. anderseni* in having only five chambers in the final whorl and in being more inflated. It is identical on the dorsal surface to *Helenina* in having dorsal supplementary apertures that pass from the intercameral sutures to the spiral sutures. It is thus does not belong to *Pseudohelenina* which is said to have subtriangular dorsal supplementary apertures, although available figures are ambiguous, and the two genera may have identical dorsal surface features. It does not sit easily with *Helenina* because the features of the ventral surface are somewhat different, but enough is in common to suggest that it is closer to *Helenina* to than to *Pseudohelenina*. Loeblich and Tappan (1987) and Hayward and others

(1999) described and figured species with extensive umbilical flaps that cover the umbilicus. The new species lacks these extensive umbilical flaps and has a small, open, deep umbilicus. The apertural face of this species and that of the specimens figured by Loeblich and Tappan (1987) are characterised by the presence of a small extension into a flap or lip halfway from umbilicus to periphery. This is not the extensive umbilical flap referred to above.

Pseudohelenina collinsi (Parr).- Discorbis collinsi Parr, 1932, p. 230, pl. 22, figs. 33a-c.- Pseudohelenina collinsi (Parr); Collins, 1974, p. 37, pl. 2, figs. 26a-c.
As implied from the comments above, the validity of Pseudohelenina Collins as a genus is in question.

Family Discorbidae

Rotorbis auberii (d'Orbigny).- Hansen and Revets, 1992, p. 175, pl. 3, figs. 1-3, 7 = *Discorbis mirus* Cushman, 1922, p. 39, pl. 6, figs. 10, 11.

Lamellodiscorbis dimidiatus (Jones and Parker).- Discorbina dimidiatus Jones and Parker, in Carpenter, Parker and Jones, 1862, p. 201, fig. 32B. Discorbina vesicularis (Lamarck).- Brady, 1884, 651, pl. 87, fig. 2a-c. Lamellodiscorbis dimidiata (Jones and Parker).- Bermudez, 1952, p. 39. Discorbis sp. nov..- Barker, 1960: pl. 87, figs. 2a-c. Lamellodiscorbis dimidiatus (Jones and Parker).- Hansen and Revets, 1992, p. 176, pl. 4, figs. 1-3, 7, 8. Trochulina dimidiata (Jones and Parker).- Yassini and Jones, 1995, p. 158, figs. 916, 917. Trochulina dimidiatus (Jones and Parker).- Hayward and others 1999, 139: pl. 10, figs. 9-11. This highly characteristic species has a remarkable nomenclature history. Barker (1960) argued that the name *dimidiatus* is inappropriate for this species, following examination of type material of *dimidiatus* and *vesicularis* (whatever their generic status) and decided that this species had not been formally described. Mohan and Bhatt (1968) provided the specific name barkeri but this has been ignored (Hansen and Revets 1992). Loeblich and Tappan (1987) accepted the generic name Trochulina but Hansen and Revets (1992) argued against the availability of this name but this seems also to have been ignored (Yassini and Jones 1995; Hayward and others 1999). The nomenclature of Hansen and Revets (1992) is followed here.

Family Rosalinidae

Neoconorbina pacifica Hofker, 1951, p. 438, figs. 302, 303.- Hayward and others, 1999, p. 141, pl. 10, figs, 21-23.

Neoconorbina terquemi (Rzehak).- Hayward and others, 1999, p. 149, pl. 10, figs. 24-26 = *Discorbina terquemi* Rzehak, 1888, p. 228.

The few specimens recovered vary from those with a coarsely perforate dorsal surface (similar to that figured by Hayward and others, 1999) to those with an identical profile and dorsal surface but apparently finely perforate dorsal surface. Hansen and Revets (1992) figured *N. concinna* (Brady) with the same coarsely perforate dorsal surface.

Although species of *Rosalina* and *Neoconorbina* are important components of faunas throughout Australia and New Zealand, Yassini and Jones (1995) recorded only three species of *Rosalina*, but no species of *Neoconorbina*.

- *Rosalina anglica* (Cushman).- Yassini and Jones, 1995, p. 159, figs. 762, 764, 765 = *Discorbis globularis* (d'Orbigny) var. *anglica* Cushman, 1931, p. 23, pl. 4, figs. 10a-c.
- Rosalina australis (Parr).- Yassini and Jones, 1995, 159: fig. 768. = Discorbis australis Parr, 1932, 227: pl.22, fig.31. This species is left in *Rosalina* following Yassini and Jones (1995), despite the fact that the dorsal intercameral sutures are thickened and elevated.
- *Rosalina bradyi* (Cushman).- Yassini and Jones, p. 159, fig. 767.- Hayward and others, 1999, p. 142, pl. 11, figs. 1-3 = *Discorbis globularis* (d'Orbigny) var. *bradyi* Cushman, 1915, p. 12, pl. 8, figs. 1a-c.
- *Rosalina irregularis* (Rhumbler).- Hayward and others 1999, p. 142, pl. 11, figs. 4,5 = *Discorbina irreularis* Rhumbler, 1906, p. 70, pl. 5, figs. 57, 58.
- *Tretomphalus planus* Cushman = *T. bulloides* var. *plana* Cushman, 1924, p. 36, pl. 10, fig. 8.

Family Bronnimannidae

Bronnimannia haliotis (Heron-Allen and Earland).- Collins, 1953, 406.- Todd, 1965, 27: pl. 5, fig. 2 *=Discorbina haliotis* Heron-Allen and Earland, 1924, 173: pl.13, figs.99-101.

This is a variant of the species described by Todd (1965) from approximately 100 m off Fiji but it does not accord well with the generic diagnosis given by Loeblich and Tappan (1987). It is identical with that figured as *B. haliotis* by Li and McGowran (1995) from the earliest Middle Miocene of South Australia, except that the figured Swan River form is sinistrally coiled. One side is very finely perforate or imperforate while the other is uniformly coarsely perforate. There is no prominent imperforate keel. It is bievolute but only the coarsely perforate side is concave. It lacks a broadly truncate periphery but has one that is rounded.

This species has been recorded in modern sediments in Australia previously only from the Great Barrier Reef and Haig (personal communication 2005) has noted it in material from the Western Australian coast.

Superfamily Glabratellacea Family Glabratellidae

Angulodiscorbis quadrangularis Uchio, 1953, p. 156, pl.7, fig.4.- Yassini and Jones, 1995, p. 160, figs. 1012-1013.

Conorbella pulvinata (Brady).- Yassini and Jones, 1995, 161: figs. 740, 742 = *Discorbina pulvinata* Brady, 1884, 650: pl.88, figs.10a,b = *Glabratella pulvinata* (Brady).- Jones, 1994, pl. 88, fig.10.

The species varies from those in which the coarse pores on the dorsal surface are surrounded by highly raised rims giving the characteristic appearance, to those that are flush but have the identical distribution pattern.

Pileolina australensis (Heron, Allen and Earland).- Barker, 1960, pl. 89, figs. 2-4 = Discorbis australensis Heron-Allen and Earland, 1932, 416.

The concept employed is that of Barker (*op. cit.*) which seems to be of a form with a hemispherical dorsal surface, rather than the conical form suggested by Yassini and Jones (1995, figs. 731-734). It is highly consistent with the description of Heron-Allen and Earland. It occurs in a few samples near the river mouth.

Pileolina tabernacularis (Brady).- Barker, 1960, pl. 89, figs. 7a-c = Discorbina tabernacularis Brady, 1881, p. 65.- Brady, 1884, pl. 89, figs. 7a-c.
The few specimens recorded here lack the complex structure of the dorsal surface and are equated to Brady's (1884, pl. 89, figure 7a-c) specimen which is consistent in both dorsal and ventral aspects.

Pileolina sp. 1.

A few specimens were recovered from samples 7 and 11. They consist of very low, almost scale-like forms. The ventral surface is pustulose and marked by a series of radial ribs that lie close to the periphery, one per chamber.

Murrayinella murrayi (Heron-Allen and Earland).- Farías, 1977, p. 343.- Haig, 1997, p. 277, fig. 7, 11-12 = *Rotalia murrayi* Heron-Allen and Earland, 1915 Haig (1997) commented that the specimens figured by Loeblich and Tappan (1994) are atypical of the species. Loeblich and Tappan (1987) refigured Heron-Allen and Earland's (1915) specimen that has only minor hispidity on the ventral surface. That of Haig (1997) is mildly hispid and similar to the original Heron-Allen and Earland figure. The specimen illustrated here has a more hispid ventral surface than seems to have been noted previously.

Planoglabratella opercularis (d'Orbigny).- Yassini and Jones, 1999, p. 162, figs. 751, 752 [non *P. opercularis* (d'Orbigny), Hayward and others 1999, p. 148, pl. 13, figs. 1-3] = Rosalina opercularis d'Orbigny, 1826, p. 271. This form is typical on the ventral surface but differs from the typical in possessing raised dorsal intercameral sutures.

Family Buliminoididae

Buliminoides williamsonianus (Brady).- Yassini and Jones, 1995, p. 144, fig. 636 = *Bulimina williamsoniana* Brady, 1881, p. 56.

Family Siphinoididae

Siphoninoides echinatus (Brady).- Cushman, 1927, p. 77.- Barker, 1960, p. 198, pl. 96, figs. 9-14 = *Planorbulina echinata* Brady, 1879, p. 283, pl. 8, figs. 31a-c.

Superfamily Planorbulinacea Family Cibicididae

Cibicidoides collinsi Yassini and Jones, 1995, p. 168, figs. 881-883.

The few specimens recovered are less regular in growth than the illustrated holotype and thus the identification is a little tentative. In the same vein, it may be the form identified by Haig (1997) from Exmouth Gulf, Western Australia, as ?*Cibicides* sp.

- *Cibicides lobatulus* (Walker and Jacob).- Cushman, 1927, p. 93, pl. 20, fig. 4 = *Nautilus lobatulus* Walker and Jacob, 1798, p. 642, pl.14, fig. 36.
- *Cibicides pseudoungerianus* (Cushman).- Cushman, 1931, p. 123, pl. 22, figs. 3-7. *= Truncatulina pseudoungeriana* Cushman, 1922b, p. 97, pl. 20, fig.9.
- *Cibicides* sp. cf. *refulgens* Montfort, 1808, 122.- cf. *Cibicides refulgens* Montfort. Cushman, 1931, p. 116, pl. 21, fig. 2.

Hayward and others (1999) recorded *C. corticatus* Earland from New Zealand. It may be this species. Haig and others (1999) questioned the relationship between ?*Cibicides* sp. of Haig (1997) (taken here as *C. collinsi*) and *C. corticatus*. Haig also noted that Western Australian specimens have 9-10 chambers in the final whorl in contrast to *C. refulgens sensu stricto* which has only six. This has led to the tentative identification.

Family Planorbulinidae

Planorbulina mediterranensis d'Orbigny, 1826, p. 280, pl. 14, figs. 4-6.

Family Cymbaloporidae

Cymbaloporetta bradyi Cushman, 1915, p. 25, pl. 10, figs. 2a-c: pl. 14, figs. 2a-c.-Yassini and Jones, 1995, p. 173, figs. 763, 766.- Hayward and others 1999, p. 155, pl. 14, figs. 28, 29.

Cymbaloporetta squammosa (d'Orbigny).- Yassini and Jones, 1995, p. 173, figs. 758-761. = *Rosalina squammosa* d'Orbigny, 1839, p. 91, pl. 3, figs.12-14.

Superfamily Acervulinacea

Family Acervulinidae

Acervulina inhaerens Schultze, 1854, p. 68, pl. 6, fig. 12.- Yassini and Jones, 1995, p. 173, figs. 754, 755, 757.- Hayward and others,1999, p. 156, pl. 15, figs. 2, 3.

Superfamily Asterigerinacea Family Asterigerinidae

Asterigerina sp.

The species recorded here appears to belong to no described species. It is characterised by having about six chambers in the final whorl, each marked on the periphery by a short protuberance. The floor of the chamber below the apertural face is pustulose and there are rare protuberances on the dorsal surface but with no obvious pattern. Surface smooth; periphery sharply angled.

Family Amphisteginidae

Amphistegina lessonii d'Orbigny, 1826, p. 304, pl. 17, figs.1-4.- Haig, 1997, p. 275.

Superfamily Nonionacea

Family Nonionidae

Haynesina schmitti (Cushman and Wickenden). = *Elphidium schmitti* Cushman and Wickenden, 1929, p. 7: pl. 3, figs. 9a-c.

This species occurs in only one sample and it agrees very well with the original description by Cushman and Wickenden. Yassini and Jones (1995) recorded a species under the name *Cribrononion*, purporting to be this species, but it differs in being involute and with well-developed retral processes. Hayward and others (1999) placed Yassini and Jones' concept appropriately in *E. oceanicum* Cushman, which is taken here to be a *Cribrononion*. The form recorded here is more closely allied to *Haynesina*

Gypsina globulus (Reuss).- Loeblich and Tappan, 1994, p. 154, pl. 334, figs. 4-6 = *Ceriopora globulus* Reuss, 1848, p. 33, pl. 5, fig. 7.

depressulum (Walker and Jacob) but is more evolute with correspondingly larger pustulose umbilical area and chambers that are shorter radially.

Haynesina simplex (Cushman).- Elphidium simplex Cushman, 1933b, p. 52, pl. 12, figs. 8,9.- Haynesina depressula simplex (Cushman); Hayward and others, 1999, p. 99, pl. 19, figs. 4-10.
Yassini and Jones (1995) recorded *Cribrononion simplex* but the form from the Swan River is more evolute with obvious umbilical plug formed from the earlier whorls and is identical with the species recorded by Hayward and others (1999). It is marked by pustulose depressed radial sutures typical of *Haynesina*.

Nonionella auris (d'Orbigny).- Yassini and Jones, 1995, p. 182, figs. 1055, 1056.= *Valvulina auris* d'Orbigny, 1839, p. 47, pl. 2, figs. 15-17.

Superfamily Chilostomellacea Family Oridorsalidae

Schwantzia sp.

Haig (1997) reported *Schwantzia* from modern sediments of Exmouth Gulf, Western Australia. It, like the species recorded here, lacks the 'prominent central plug' supposedly characteristic of the genus (Loeblich and Tappan 1987). The species figured by Haig (*op. cit.*) is similar to *S. elegantissima* McCulloch but has only six chambers in the final whorl. The form recorded here has about six chambers in the final whorl but is more dorso-ventrally compressed than is *S. elegantissima*. Dorsal supplementary apertures are progressively filled with growth and are retained only on the last three chambers.

Superfamily Rotaliacea

Family Rotaliidae

Ammonia cf. *aoteana* (Finlay).- cf. *Ammonia aoteana* (Finlay).- Hayward and others 2004 = cf. *Streblus aoteana* Finlay, 1940, p. 461.

The question of the validity of the use of the name *Ammonia beccarii* is emerging as an example of the 'lumpers' vs 'splitters' argument. Walton and Sloan (1990) reviewed the nomenclature of this species group and recognised the validity of the single species – *A. beccarii* – and three 'forms' within that species – *A. a. beccarii*, *A. a. parkinsoniana* and *A. a. tepida*. Hayward *et al.* (1999) recognised *A. a. parkinsoniana* as a species in its own right, with a series of 'forms', including *A. a. aoteana* and *A. a. tepida* within it

The approach taken here is to recognise as distinct, two categories that may be ecotypic variants – *A*. cf. *aoteana* and *A. tepida*. The former has more

chambers per whorl (8-9 vs 6), differences on the dorsal surface (coarse pores and thickened sutures vs fine pores and flush or depressed sutures), and on the ventral surface (coarse pores and more closed umbilicus vs fine pores and more open umbilicus). The ventral surface of *A*. cf. *aoteana* is more domed in contrast with the virtually flat ventral surface of *A*. *tepida*. Apthorpe's (1980) record of *A*. *aoteanus* (Finlay) is taken to be of this species.

Hayward and others (2004) examined the use of the name *Ammonia beccarii* (Linné) and determined that using it as a global species is incorrect and that genetic studies can be integrated with detailed morphology to identify a series of 'species' of *Ammonia*. The form figured here is a little more pronounced than others in the study, in the coarseness of pores but in other respects is typical of what occurs in the Swan River.

This species normally has 8-9 chambers in the final whorl, is approximately 0.25-0.30 mm in diameter (gsd of Hayward and others, 2004) and is thus a small species and significantly smaller than topotypes of *A. beccarii*. Visual estimation of hn and hs suggests that it has a slightly higher spiral side. Comparison with figures 9, 10 of Hayward and others (2004) indicates that it is closest to *A. aoteana* but likely to have larger pores. It is similar to what Hayward and others (1999, pl. 16, figs. 10-12) identified as *A. parkinsoniana* form *tepida* but has more chambers per whorl. The form identified here as *A. tepida* conforms well to the type description. *A. cf. aoteana* conforms well to the type description of *A. aoteana*. *A. cf. aoteana* differs from the specimens figured as *A. parkinsoniana* form *aoteana*. By Hayward and others (1999) in normally having an umbilical plug (whether or not the absence from some specimens is real or an artefact of preservation is not clear) and not so highly spired.

Ammonia pustulosa (Albani and Serandrei Barbero).- Buccella pustulosa Albani and Serandrei Barbero; Yassini and Jones, 1995, p. p. 174, figs. 985-987, 990-991.-?Hayward and others 1999, 163: pl. 16, figs. 4-6 = Buccella pustulosus Albani and Serandrei Barbero, 1982, 238: pl. 1, figs. 1,2.
This species is figured by Yassini and Jones (1995, especially figs. 986, 987) as Buccella pustulosa Albani and Serandrei Barbero. It is not clear that it is the same species as figured by Hayward and others (1999, pl. 16, figs. 4-6) which has fewer chambers per whorl (seven vs nine). Any doubt about identity with Albani and Serandrei Barbero's species stems from the features of the dorsal surface which do not seem clearly attributable to Ammonia as done by Hayward and others (1999). It differs from Buccella in lacking a carinate periphery and in having highly subdivided incised ventral sutures. It is a consistent, but generally minor, component in many samples.

- Ammonia tepida (Cushman) = Rotalia beccarii var. tepida Cushman, 1926, p. 79, pl.1. The species name used here incorporates *Helenina perlucida* (Heron-Allen and Earland) of Yassini and Jones (1995) but is different from the concept of *A*. *parkinsoniana* f. *tepida* of Hayward *et al.* (1999) which has more chambers per whorl and is part of *A*. cf. *aoteana* as used here. The species does not fit any definition of *Helenina*.
- *Pararotalia nipponica* (Asano).- Haig, 1997, p. 278, figs. 7, 19-20 = *Rotalia nipponica* Asano, 1936, p. 614, pl. 31, figs. 2a-c.

'Rotalia' sp. 3 (too poorly preserved to identify or to warrant comment)

Rotaliid gen. et sp. indet. (too poorly preserved to warrant comment)

Family Elphidiidae

- *Cribrononion oceanicum* (Cushman).- Yassini and Jones, 1995, p. 179, fig. 1050 = *Elphidium oceanicum* Cushman, 1933b, p. 52, pl. 12, fig. 7.
- *Cribrononion sydneyensis* Albani, 1978, p. 387, figs. 9 I-K, M, N.- Yassini and Jones, p. 179, figs. 1046-1047, 1054, 1073, 1076-1077. Albani (1978) stated that this species is slightly asymmetrical but Yassini and Jones (1995) figured specimens that are symmetrical and thus this species is placed here.
- *Elphidium advenum advenum* (Cushman).- Albani and Yassini, 1993, p. 23, figs. 34, 35.- Hayward and others 1997, p. 65, pl. 2, figs. 9-18 = *Polystomella advena* Cushman, 1930, p. 25, pl. 10, fig. 2.
- *Elphidium carteri* Hayward and others, 1997, 71: pl. 1, fig. 15; pl. 6, figs. 8-12. This species is very abundant, constituting as much as 40% of a fauna. It was described originally from the Indo-Pacific region of Queensland and may be evidence of waters warmer than in southeastern Australia. It could also be regarded as a subspecies of *E. macellum*.
- *Elphidium excavatum* (Terquem). Hayward and others, 1997, 77: pl. 1, figs. 3, 12; pl. 9, figs. 9-18 = *Polystomella excavatum* Terquem, 1875, 25: pl. 2, fig. 2a-f. Hayward and others (1997) provided a valuable review of this species including a useful synonymy of the name's use in Australasia. The species recorded here is identical in all respects except that there are consistently a smaller number of retral processes than typical.

- *Elphidium gunteri* Cole, 1931, p. 34, pl. 4, figs. 9, 10 = *Elphidium vadescens* Cushman and Brönnimann; Yassini and Jones, 1995, p. 178, fig. 1043. Several similar species have been documented throughout Australia and New Zealand. They include Apthorpe's (1980) record of *E. oceanensis* (d'Orbigny), and *E. vadescens* Cushman and Brönnimann as noted by Hayward and others (1997) and Hayward and others (1999).
- *Elphidium sagrum* (d'Orbigny).- Cushman, 1939, p. 55, pl. 15, figs. 1-3. = *Polystomella sagra* d'Orbigny, 1839, p. 55, pl. 6, figs.19, 20.

Elphidium sp. indet.

Planktonic species

- *Globigerina bulloides* d'Orbigny.- Banner and Blow, 1960, p. 3, pl. 1, figs. 1, 4 = *Globigerina bulloides* d'Orbigny, 1826, p. 277, list no. 1.
- *Globigerinoides quadrilobatus* (d'Orbigny).- Banner and Blow, 1960, p. 17, pl. 4, figs. 3a, b = *Globigerina quadrilobata* d'Orbigny, 1846, p. 164, pl. 9, figs. 7-10.
- *Globigerinoides ruber* (d'Orbigny).- Cushman, 1927, p. 87 = *Globigerina rubra* d'Orbigny, 1839, p. 82, pl. 4, figs. 12-14.
- *Globorotalia inflata* (d'Orbigny).- Banner and Blow, 1967, p. 145, pl. 4, Ia-II = *Globigerina inflata* d'Orbigny, 1839, p. 134, pl. 12, figs. 7-9.
- *Globorotalia menardii* (Parker, Jones and Brady).- Bolli, 1957, p. 120, pl. 29, figs. 6-10 = *Rotalia menardii* Parker, Jones and Brady, 1865, p. 20, pl. 3, fig. 81.

Globorotalia ?obesa Bolli, 1957, p. 119, pl. 29, figs. 2a-3.

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