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TASMANIAN TERTIARY FORAMINIFERA

Part 1. Textulariina, Miliolina, Nodosariacea

by Patrick G. Quilty

West Australian Petroleum Pty. Limited, Perth, W.A.

(with four plates)

ABSTRACT

Foraminifera of the Suborders Textulariina and Miliolina and the Superfamily Nodosariacea are recorded from samples of all known Tasmanian marine Oligo-Miocene sections. Thirteen species of agglutinated foraminifera are identified specifically and one category is left in open nomenclature. Thirty species of porcellanous foraminifera (including *Crenulostomina banksi* n. gen., n. sp.) are recorded and there are eight open categories. The Nodosariacea is represented by 63 identified species (including *Lagena tasmaniae* n. sp.) and 10 categories in open nomenclature.

Information on each species includes original citation, synonymy of Australian identifications, remarks where necessary and occurrence and age in Tasmania. All identified forms are figured.

INTRODUCTION AND ACKNOWLEDGEMENTS

The stratigraphy of the Tasmanian Tertiary Marine succession has been reviewed by Quilty (1972). The results noted in that paper are based on foraminiferal studies conducted at the University of Tasmania. Localities, sample numbers etc., mentioned here are detailed further in Quilty (*op. cit.*) and this paper should be read in company with that paper. This paper is the first of a projected series of three papers documenting the Tasmanian Tertiary foraminifera.

Classification adopted in these papers follows closely that proposed by Loeblich and Tappan (1964a) and reviewed by them (1964b) but differs in minor respects which will be indicated where necessary.

Quilty (*op. cit.*) noted that the first record of Tasmanian Tertiary foraminifera was by Goddard and Jensen (1907). In fact Howchin (1893) listed five species from Fossil Bluff and referred to R.M. Johnston's identification of seven genera.

The reference list following the text includes only publications referred to in discussion of species and does not necessarily include those given under synonymy.

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Typing and photographic facilities of West Australian Petroleum Pty. Limited (WAPET) are gratefully acknowledged. Photograph of *Crenulostomina banksi* n. gen., n. sp. and several species of *Lagena* were taken by Mr. W. Copley on WAPET'S JSM

Scanning Electron Microscope. WAPET contributed to the cost of publication of this paper.

ZONATION

When this work was initiated at the University of Tasmania, the only recent advance in zonation of southeastern Australian marine Cainozoic was the formulation of Carter's (1958) Faunal Unit scheme. As this work progressed, the Faunal Unit scheme was formalised into zones by Carter (1964). The study of Tasmanian Tertiary foraminifera was conducted using this zonation.

Since that time, Blow's (1969) comprehensive zonation has appeared and Quilty (1972) attempted to relate Tasmanian faunas to that scheme. A more comprehensive attempt to relate southeastern Australia to international zonation was that by McGowran, Lindsay and Harris (1971). The results given by Quilty (1972) are in agreement with this.

The equivalence used here is as follows:

(a) Carter's *Globoquadrina dehiscens* Zone (Faunal Unit 6) is approximately equivalent to Blow's N4 and N5. Thus Tasmanian material of this age is referred to N4/N5 undifferentiated.

(b) Carter's *Globigerinoides ruber* and *G. transitoria* Zones (Faunal Units 8 and 9 respectively) are approximately equivalent to N8 (taking the base of N9 - the *Orbulina* datum - as the base of Carter's *O. suturalis* Zone - Faunal Unit 10). Exact equivalence has not been established.

(c) Carter's *Globigerinoides trilobus* Zone (Faunal Unit 7) has not yet been recognised in Tasmania.

SYSTEMATIC PALAEONTOLOGY

Introductory Comments

Throughout the systematic section, the "Occurrence" of a species gives -
(a) the locality at which the sample containing the species was collected (detailed in Quilty 1972),
(b) the University of Tasmania, Geology Dept. catalogue number of the sample containing the species, and
(c) a measure of the abundance of the species in the sample.

The measure of the abundance of the species is given by the following symbols -

(v)	the species makes up less than 0.5% of the sample
(r)	" " " " 0.5-2.0% of the sample
(q)	" " " " 2-5% of the sample
(f)	" " " " 5-10% of the sample
(c)	" " " " 10-20% of the sample
(a)	" " " " 20-40% of the sample
(a+)	" " " " 40-80% of the sample
(a++)	" " " " more than 80% of the sample
(p)	the species is present in the sample but the sample is too small for any meaningful estimate of species abundance to be given.

Figured specimens have been selected from samples and catalogued separately.

Suborder TEXTULARIINA
Superfamily LITUOLACEA
Family LITUOLIDAE
Subfamily CYCLAMMININAE
Genus *CYCLAMMINA* Brady, 1879
Cyclammina cf *incisa* (Stache), 1865
(Pl. 1, figs. 1-3)

Haplophragmium incisum Stache, 1865, *"Novara" Expedn, Geol. Theil*, 1, 165, pl. 21, fig. 1.

Cyclammina incisa, Chapman, 1926, *Palaeont. Bull.* Wellington 11, 29, pl. 2, fig. 1.

Cyclammina longicompressa Chapman and Crespin, 1930, *Proc. R. Soc. Vict.*, 43, 97, pl. 5, figs. 3, 4.

Cyclammina incisa Chapman and Crespin, 1932, *Palaeont. Bull.*, Canberra 1, 6, pl. 1, fig. 6.

Cyclammina rotundata Crespin, 1950, *Contr. Cushman Fdn foramin. Res.*, 1, 72, pl. 10, fig. 5.

Cyclammina incisa, Raggatt and Crespin, 1954, *Proc. R. Soc. Vict.*, 67, 119 etc., pl. 7, fig. 3.

Haplophragmoides cf *incisa*, Taylor, 1965, *Proc. R. Soc. Vict.*, 78, 150, fig. 3, nos. 3a, b.

Cyclammina incisa, Hornibrook, 1971, *Palaeont. Bull.* Wellington 43, 34, pl. 6, figs 88-91.

Remarks

The two specimens found here are true *Cyclammina*. They are well preserved, as are all the specimens from the same sample, and there are no adverse diagenetic or weathering affects as listed by Taylor (1965) in his study of Victorian *"Cyclammina"* faunas. Preservation is such that good sections can be cut and these show the primary structure of the wall, not the product of some later alteration. The specimens found are rather large (1-1.5 mm) completely involute, with 10-11 chambers in the final whorl and are slightly asymmetrical with a smooth surface. The slight asymmetry is present in both specimens and may well be a primary feature, not a preservation phenomenon, as suggested by Taylor. It is interesting to note that this true *Cyclammina* is here found in very shallow water sediments.

Crespin's (1950) figure of *Cyclammina rotundata* has more than eight chambers in the final whorl (more likely 11-12) and thus does not agree with Taylor's diagnosis of that species in which he suggests that six to eight chambers are present in the final whorl. However Chapman and Crespin's (1930) type description of C *rotundata* mentions eight chambers (or sutures) in the final whorl. Thus Crespin's (1950) specimen, referred to C. *rotundata*, is more likely to be C. cf *incisa*.

Occurrence - Fossil Bluff - 84010a (v).

Age - Early Miocene, N 4/5.

Maximum diameter of figured specimens

(a) Complete specimen 1.2 mm
(b) wall section 0.92 mm

Repository - (a) U.T.G.D. 84138
(b) U.T.G.D. 84484

Subfamily COSCINOPHRAGMINAE

Genus *BDELLOIDINA* Carter, 1877

Bdelloidina aggregata Carter, 1877

(Pl. 1, fig. 4)

Bdelloidina aggregata Carter, 1877, *Ann. Mag. nat. Hist.*, ser. 4, 19, 201, 208, pl. 13, figs. 1-8.

Bdelloidina aggregata, Brady, 1884, *"Challenger" Expedn, Scient. Results, Zool.* 9, 319, pl. 36, figs. 4-6.

Bdelloidina aggregata, Howchin, 1889, *Trans. Proc. R. Soc. S. Aust.*, 12, p. 6.

Bdelloidina aggregata, Heron-Allen and Earland, 1924, *Jl R. microsc. Soc.*, (1924) pt. 2, 135.

Bdelloidina aggregata, Todd and Low, 1960, *Prof. Pap. U.S. Geol. Surv.*, 260-X, 827, pl. 263, fig. 8.

Remarks

The specimens found here are more similar to Carter's type figure and Todd and Low's figured specimen than to Brady's figured specimen. It is probably the same species as that recorded by Howchin.

Occurrence - Mussel Roe Bay - 84483 (v).

Age - Late Oligocene - Early Miocene, N3-5.

Maximum diameter of figured specimen 3.8 mm.

Repository - U.T.G.D. 84472.

Family TEXTULARIIDAE

Subfamily TEXTULARIINAE

Genus *TEXTULARIA* Defrance, 1824

Textularia fistulosa Brady, 1884

(Pl. 1, figs. 5, 6)

Textularia sagittula Defrance var. *fistulosa* Brady, 1884, *"Challenger" Expedn, Scient. Results, Zool.*, 9. 362, pl. 42, figs. 19-22.

Textularia sagittula var. *fistulosa*, Howchin, 1889, *Trans. Proc. R. Soc. S. Aust.*, 12, 7.

Spiroplecta sagittula, Defr. var. *fistulosa* Chapman, 1907, *Jl Linn. Soc.*, 30, 27, pl. 3, fig. 60

Textularia fistulosa, Crespin, 1943, *Palaeont. Bull.*, Canberra 4, 83.

Remarks

Heron-Allen and Earland (1924, p. 136) also make reference to this form in discussing the presence of *T. sagittula* in their "Filter Quarry" material. In the

numerous specimens recovered, no actual fistulose growths were seen, but their positions are marked by an open pore on the ends of many chambers.

Occurrence - Mussel Roe Bay 84483 (f), 84481 (v).

Age - Late Oligocene - Early Miocene, N3-5.

Figured specimen from 84483.

Maximum diameter of figured specimen 0.72 mm.

Repository - U.T.G.D. 84474.

Textularia gramen d'Orbigny, 1846

(Pl. 1, fig. 7)

Textularia gramen d'Orbigny, 1846, *Foraminiferes fossiles du Bassin Tertiare de Vienne (Autriche)*, Gide and Co.: Paris, 248, pl. 15, figs. 4-6.

Textularia gramen, Heron-Allen and Earland, 1924, *Jl R. microsc. Soc.*, (1924), pt. 2, 137.

For more complete synonymy, see Ellis and Messina (1940 *et seq.*).

Remarks

This name is used for a species which occurs sporadically throughout all sections examined in Tasmania. It seems to be the same species as that referred to by Heron-Allen and Earland (1924, *op. cit.*). It does not correspond well with any other described Australasian species and seems to fit within the compass of this species.

Occurrence - (a) Mussel Roe Bay - 84481 (q), 84482 (f),
(b) Fossil Bluff section - 84010a (r), 84010b (v), 84025a (v), 84024 (v),
(c) King Island - 84083 (v),
(d) Mt Cameron West - 84118 (r), 84120 (v),
(e) Marrawah - 84092 (v), 84108 (q), 84109 (q), 84110 (c), 84111 (r), 84113 (q), 84114 (f), 84115 (r), 84104 (q), 84105 (f), 84106 (c), 84107 (q).

Age - Early Miocene, N4-8.

Figured specimen from Fossil Bluff (84010a).

Maximum diameter of figured specimen 0.72 mm.

Repository - U.T.G.D. 84139.

Textularia cf *hayi* Karrer, 1864

(Pl. 1, figs. 8, 9)

Textularia hayi Karrer, 1864, *"Novara" Expedn, Geol. Theil*, 1,78, pl. 16, fig. 7.

?Textularia rugosa, Chapman, 1907, *Jl Linn. Soc.*, 30, 27, pl. 3, fig. 57.

Textularia marsdeni Finlay, 1939, *Trans. R. Soc. N.Z.*, 69, (1), 90, pl. 14. fig. 67.

Textularia marsdeni, Finlay and Marwick, 1940, *Trans. R. Soc. N.Z.*, 70, (1), 118.

Textularia marsdeni, Hornibrook, 1961, *Palaeont. Bull.*, Wellington, 34 (1), 16, pl. 1, fig. 7.

Textularia hayi, Hornibrook, 1971, *Palaeont. Bull.*, Wellington, 43, 15, pl. 1. figs. 1-7.

Remarks

The specimens recovered here are very similar to the older half of Finlay's (1939) type figure, and also very similar to Chapman's (1907) figure of *T. rugosa* and Hornibrook's (1961) figure of *T. marsdeni*. It seems highly probable that all occurrences belong to the one species.

Occurrence - (a) Cape Grim - 84008 (r), 84007 (r), 84006 (r), 84005 (v), 84001 (v),
(b) Mt Cameron West - 84117 (r).

Age - Early Miocene, N4/5.

Figured specimen from 84008

Maximum diameter of figured specimen 0.75 mm.

Repository - U.T.G.D. 84140.

Textularia praelonga Reuss, 1845

(Pl. 1, fig. 10)

Textularia praelonga Reuss, 1845, *Die Versteinerungen der bohmischen Kreide-formation*, E. Schweizerbart: Stuttgart, Abth. 1, 39, pl. 12, figs. 14 a, b.

Textularia praelonga, Heron-Allen and Earland, 1924, *Jl R. microsc. Soc.*, (1924), pt. 2, 137.

For a more complete synonymy, see Ellis and Messina (1940 *et seq.*).

Remarks

Two specimens have been referred to this species.

Occurrence - Fossil Bluff - 84024 (v).

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.70 mm.

Repository - U.T.G.D. 84141.

Textularia spp

Remarks

The few specimens recorded under this heading cannot be placed in the species otherwise listed here, usually because of poor or incomplete preservation.

Occurrence - (a) Mussel Roe Bay - 84483 (v), 84481 (r),
(b) King Island - 84476 (r),

(c) Preservation Island - 84479 (v),

(d) Brittons Swamp - 84480 (r).

Late Oligocene - Early Miocene.

Genus *SEMIVULVULINA* Finlay, 1939

Semivulvulina capitata (Stache), 1865

(Pl. 1, Fig. 11)

Textilaria capitata Stache, 1865, *"Novara" Expedn Geol. Theil*, 1 (2), 272, pl. 24, fig. 19

Vulvulina (Semivulvulina) capitata, Finlay, 1939, *Trans. R. Soc. N.Z.*, 68, 505.

Vulvulina (Semivulvulina) capitata, Loeblich and Tappan, 1964, *Treat. Invert. Palaeont.*, C2 (1), C 254, fig. 165, 10-12.

Vulvulina (Semivulvulina) capitata, Hornibrook, 1971, *Palaeont Bull.*, Wellington, 43, 31, pl. 5, fig. 76

Remarks

There is no doubt that this is the species figured by Loeblich and Tappan (1964a) as *S. capitata* (Stache). Stache's (1865) original figures look a little different and this may be one of the other species of *Semivulvulina*.

Occurrence - Marrawah area - 84104 (r). 84105 (r).

Age - Early Miocene, N8.

Figured specimen from 84104.

Maximum diameter of figured specimen 0.57 mm.

Repository - U.T.G.D. 84142.

Subfamily PSEUDOBOLIVININAE

Genus *SIPHOTEXTULARIA* Finlay, 1939

Siphotextularia aff. *bolivina* Hornibrook, 1961

(Pl. 1, fig. 12)

Siphotextularia bolivina Hornibrook, 1961, *Palaeont. Bull.*, Wellington, 34 (1), 22, pl. 2, figs. 18, 23.

Remarks

Only 4 specimens of this species were recovered. The apertural characters, wall characters etc., correspond almost exactly with those listed by Hornibrook (1961) for *S. bolivina*. The only difference between these specimens and the New Zealand species is one of length/width ratio. The New Zealand species is relatively longer. The Tasmanian specimens are very similar to the older half of Hornibrook's holotype. The Tasmanian and New Zealand species are clearly very closely related and may be the same thing.

Occurrence - (a) Mussel Roe Bay - 84483 (v),
(b) Fossil Bluff - 84010b (v), 84011 (v),

Age - Late Oligocene - Early Miocene, N3-5.

Figured specimen from Mussel Roe Bay.

Maximum diameter of figured specimen 0.40 mm.

Repository - U.T.G.D. 84143.

Family TROCHAMMINIDAE

Subfamily TROCHAMMININAE

Genus *AMMOSPHAEROIDINA* Cushman, 1910

Ammosphaeroidina sphaeroidiniformis (Brady), 1884

(Pl. 1, fig. 13)

Haplophragmium sphaeroidiniformis Brady, 1884, *"Challenger" Expedn, Scient. Results, Zool.*, 9, 313.

Haplophragmium sphaeroidiniformis, Howchin, 1889, *Trans. R. Soc. S. Aust.*, 12, 6.

Haplophragmium sphaeroidiniforme, Chapman, 1907, *Jl Linn. Soc.*, 30, 24, pl. 3, figs. 50-51.

Ammosphaeroidina sphaeroidiniformis, Cushman, 1910, *Bull, U.S. natn. Mus.*, 71 (1), 24.

Ammosphaeroidina sphaeroidiniformis, Loeblich and Tappan, 1964, *Treat. Invert. Paleont.* C2 (1), C 259, fig. 174, 1.

Ammosphaeroidina sphaeroidiniformis, Reed, 1965, *Bull. Am. Paleont.*, 49 (220), 65.

Remarks

The details of this species are by no means clear as it has an indistinct aperture and very coarsely arenaceous rough surface. It is identified mainly by its similarity to the figures in Chapman (1907) (*op. cit.*)

Occurrence - (a) Mussel Roe Bay - 84481 (v),
(b) Marrawah district - 84113 (v), 84101 (r).

Age - Early Miocene, N4/5,8.

Figured specimen from 84113.

Maximum diameter of figured specimen 0.52 mm.

Repository - U.T.G.D. 84144.

Family ATAXOPHRAGMIIDAE

Subfamily VERNEULININAE

Genus *GAUDRYINA* d'Orbigny, 1839

Gaudryina convexa (Karrer), 1865

(Pl. 1, figs. 14, 15)

Textilaria convexa Karrer, 1865, *"Novara" Expedn Geol. Theil*, 1, 78, pl. 16, figs. 8 a-c.

(non Gaudryina convexa Karrer: Cushman, 1911, *Bull. U.S. natn. Mus.*, 71 (2), 66, fig. 105)

Gaudryina crespinae, Cushman, 1936, *Spec. Publns Cushman Lab.*, 6, 14, pl. 2, figs. 15 a, b.

Gaudryina convexa, Burdett *et al.*, 1963, *N. Zealand Jl Sci.*, 6 4, 513-530.

Gaudryina convexa, Hornibrook, 1971, *Palaeont. Bull*, Wellington, 43, 16, pl. 1, figs. 8-15.

Remarks

Burdett *et al. (op. cit.)* gave an idea of the problems associated with systematics and synonymy of this species. I have followed them here in their broad concept of *G. convexa*, although Reed (1965) did not. The synonymy presented here is very incomplete, as is also that in Burdett *et al.*. Only those references which seem to have any relevance at all are listed. The general range of specimens is probably closest to *G. crespinae* which may possibly be considered as a subspecies. It is common in the Tasmanian material.

More than one type of specimen is present. In 84093 (Redpa), the specimens have very clear, depressed sutures and slightly concave sides. In all other samples, they have much less distinct sutures and flat (generally) or even convex (occasionally) sides. A specimen of each type is figured.

Occurrence - (a) Mussel Roe Bay - 84483 (f), 84481 (f), 84482 (f),
(b) King Island - 84084 (v), 84085 (r), 84082 (r), 84083 (c), 84086 (q), 84475 (q), 84476 (f), 84477 (q),
(c) Daisy Creek - 84478 (r),
(d) Cape Grim - 84008 (v), 84006 (v),
(e) Mt Cameron West - 84118 (r), 84120 (r), 84117 (q),
(f) Granville Harbour - 54144 (r),
(g) Preservation Island - 84479 (v),
(h) Redpa - 84097 (v), 84093 (r), 84095 (r), 84096 (v),
(i) Marrawah district - 84092 (r), 84109 (r), 84110 (r), 84111 (r), 84113 (q), 84104 (q), 84101 (q), 84105 (r), 84106 (r), 84107 (q).

Age - Late Oligocene - Early Miocene, N3-8.

Figured specimen from (a) Redpa (84093) and (b) Marrawah (84104).

Maximum diameter of figured specimens (a) 0.87 mm.
(b) 0.60 mm.

Repository - (a) U.T.G.D. 84145,
(b) U.T.G.D. 84146.

Genus *TRITAXIA* Reuss, 1860

Tritaxia victoriensis (Cushman), 1936

(Pl. 1, figs. 16, 17)

Clavulina angularis, Chapman, 1907, *Jl Linn. Soc.*, 30, 29, pl. 4, figs. 68-73.
(The upper of the two specimens labelled 69, should be 70.)

Clavulinoides szaboi (Hantken) var. *victoriensis* Cushman, 1936, *Spec. Publs Cushman Lab.*, 6, 22, pl. 3, figs. 19, 22.

Clavulinoides victoriensis, Ludbrook, 1961, *Bull. geol. Surv. S. Aust.*, 36, pl. 4, fig. 4.

Clavulinoides victoriensis, Reed, 1965, *Bull. Am. Paleont.*, 49, (220), 73, pl. 11, figs. 2, 9.

Remarks

Several well preserved specimens were recovered from Mussel Roe Bay, Mt Cameron West and Marrawah.

Cushman (1948) considered that two genera - *Tritaxia* and *Clavulinoides* - could be distinguished. Glaessner (1945) and Pokorny (1958) also followed this usage, but Loeblich and Tappan (1964a) place the two genera in synonymy. The differences between them as earlier envisaged do seem to be rather minor and they are here considered as being congeneric.

Occurrence - (a) Mussel Roe Bay - 84483 (v),
(b) Fossil Bluff - 84010b (v),
(c) Mt Cameron West - 84121 (v), 84120 (q), 84117 (r),
(d) Marrawah - 84109 (r).

Age - Late Oligocene - Early Miocene, N3-5, N8.

Figured specimen from Mt Cameron West (84120).

Maximum diameter of figured specimen 1.35 mm.

Repository - U.T.G.D. 84147.

Subfamily GLOBOTEXTULARIINAE

Genus *DOROTHIA* Plummer, 1931

Dorothia parri Cushman, 1936

(Pl. 1, figs. 18, 19)

Dorothia parri Cushman, 1936, *Spec. Publns Cushman Lab.*, 6, 29, 30, pl. 4, figs. 19a, b.

Dorothia parri, Crespin, 1954, *Rep. Bur. Miner. Resour. Geol. Geophys. Aust.*, 11, 3-5.

Dorothia parri, Ludbrook, 1961, *Bull. geol. Surv. S. Aust.*, 36, 49, 56, 63, etc.

Gaudryina (Gaudryina) heywoodensis Reed, 1965, *Bull. Am. Paleont.*, 49 (220), 71, pl. 11, figs. 1, 13.

Remarks

Bowen's (1965) suggestion that *Dorothia* and *Gaudryina* are congeneric, is probably untenable. The main difference (a clear one) seems to be that *Dorothia* begins with a trochoid coil (whether 3, 4, 5 ... chambers means little) which is followed by an appreciable number of pairs of chambers arranged biserially, whereas *Gaudryina* has an early portion consisting of several triserial whorls (more than one) followed by a later portion consisting of a few or several, regular or irregular, pairs of chambers arranged biserially. Most species are clearly one genus or the other but in some cases differentiation is difficult and the generic name not very dependable. On the belief that *Dorothia* and *Gaudryina* are distinct, Reed's (1965) name *Gaudryina (Gaudryina) heywoodensis* lapses. It is very widespread species in Tasmanian Tertiary sediments.

Occurrence - (a) Mussel Roe Bay - 84483 (q), 84481 (r), 84482 (q),
(b) Fossil Bluff - 84010a (v), 84011 (v), 84012 (r), 84024 (v),
(c) King Island - 84477 (r),
(d) Cape Grim - 84006 (v),
(e) Mt Cameron West- 84120 (r), 84117 (r),
(f) Marrawah district - 84092 (v), 84109 (q), 84110 (q), 84113 (r), 84114 (v), 84104 (v), 84101 (r), 84105 (r), 84106 (f), 84107 (v).

Age - Late Oligocene - Early Miocene, N3-8.

Figured specimen from Fossil Bluff (84010a).

Maximum diameter of figured specimen 1.25 mm.

Repository - U.T.G.D. 84148.

Subfamily VALVULININAE

Genus *PSEUDOCLAVULINA* Cushman, 1936

Pseudoclavulina cf *anglica* Cushman, 1936

(Pl. 1, figs. 20, 21)

Pseudoclavulina anglica Cushman, 1936, *Spec. Publns Cushman Lab.*, 6, 18, pl. 3, fig. 5.

Pseudoclavulina anglica, Hornibrook, 1958, *N.Z. Jl Geol. Geophys.*, 1, (4), 654, figs. 1,2.

?Pseudoclavulina rudis, Reed, 1965, *Bull, Am. Paleont.*, 49 (220), 72, pl. 11, figs 3, 6, 12, 14.

Remarks

A few poorly preserved specimens have been found, of a species very much like that figured in both Cushman (1936, *op. cit.)* and Hornibrook (1958, *op. cit.*). On the single specimen with a well preserved aperture the aperture is terminal, roughly rounded, but without a distinct valvuline tooth. On the other hand it has a rounded uniserial portion and an indistinct early triserial portion. Thus it is distinct from both *Tritaxia* and *Clavulina*. Cushman's genus *Pseudoclavulina* is used herein for this species although Loeblich and Tappan (1964a, p. C279) regard this genus as synonymous with *Clavulina*.

Occurrence - Fossil Bluff - 84010b (v).

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 1.67 mm.

Repository - U.T.G.D. 84485.

Suborder MILIOLINA

Superfamily MILIOLACEA

Family FISCHERINIDAE

Genus *CYCLOGYRA* Wood, 1842

Cyclogyra involvens (Reuss), 1850

(Pl. 1, fig. 22)

Operculina involvens Reuss, 1850, *Denkschr. Akad. Wiss.*, Wien, 1, 370, pl. 46, fig. 20.

Cornuspira involvens, Brady, 1884, *"Challenger" Expedn, Scient. Results, Zool.*, 9, 200, pl. 11, figs. 1-3.

Cornuspira involvens, Howchin, 1891, *Trans. Proc. R. Soc. S. Aust.*, 14, 350.

Cornuspira involvens, Chapman, 1907, *Jl Linn. Soc.*, 30, 22, 23, pl. 2, fig. 46.

Cornuspira involvens, Reed, 1965, *Bull. Am. Paleont.*, 49, (220), 66.

Remarks

Following Loeblich and Tappan (1964a, p. C438) the genus *Cornuspira* Schultze is regarded as synonymous with *Cyclogyra* Wood, hence *Cornuspira involvens* (Reuss) becomes *Cyclogyra involvens* (Reuss). The species is well preserved in the Fossil Bluff section.

Occurrence - Fossil Bluff - 84010a (v).

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.65 mm.

Repository - U.T.G.D. 84149.

Family NUBECULARIIDAE

Subfamily SPIROLOCULININAE

Genus *SPIROLOCULINA* d'Orbigny, 1826

Spiroloculina angulata Cushman, 1917

(Pl. 1, fig. 23)

Spiroloculina grata, Brady, 1884, *"Challenger" Expedn, Scient. Results, Zool.*, 9, 155, pl. 10, figs. 16, 17, 22, 23.

Spiroloculina grata var. *angulata* Cushman, 1917, *Bull. U.S. natn. Mus.*, 71, 36, pl. 7, fig. 5.

Spiroloculina angulata Cushman and Todd, 1944, *Spec. Publns Cushman Lab.*, 11, 50.

Remarks

This species is generally well preserved, especially at Fossil Bluff (84010a) where the specimens are often coloured black along the longitudinal striae and chamber junctions (see pl. 1, fig. 23). Whether this colouration is due to original colouring or to secondary development of framboidal pyrite is hard to decide.

Occurrence - (a) Fossil Bluff - 84010a (v),
(b) Cape Grim - 84008 (q), 84007 (r), 84002 (r), 84001 (r).

Age - Early Miocene, N4/5.

Figured specimen from 84010a.

Maximum diameter of figured specimen 1.45 mm.

Repository - U.T.G.D. 84150.

Spiroloculina rotunda d'Orbigny, 1826

(Pl. 1, fig. 24)

Frumentaria sigma Soldani, 1795, *Testaceographiae ac* ..... Tomi Primi pars tertia, Rossi: Siena, 229, pl. 154, figs. hh, ii.

Spiroloculina rotunda d'Orbigny, 1826, *Annls Sci. nat*,. ser. 1, 7, 299.

Spiroloculina rotunda, Parker, Jones and Brady, 1871, *Ann. Mag. nat. Hist.*, ser. 4, 8, pl. 8, fig. 25.

Remarks

This species does not seem to have been recorded from Australia before. It is probably a varient of *S. depressa* d'Orbigny, or *S. canaliculata* d'Orbigny, both of which it resembles.

Occurrence - Fossil Bluff - 84011 (r).

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.81 mm.

Repository - U.T.G.D. 84151.

Spiroloculina cf *sublimbata* Parr, 1950

(Pl. 1, fig. 25)

Spiroloculina limbata Parr, 1950, *Rep. B.A.N.Z. Antarct. Res. Expedn*, 1929-1931 ser. B, 5 (6), 291, pl. 6, figs. 14a-c.

Remarks

This species is tentatively identified as *S. sublimbata* as only one complete specimen was found. From the side view it is very similar to *S. canaliculata* but differs

from it in having a third central keel in the outer part of each chamber. *S. sublimbata* seems to be the only species in which this feature is clearly shown.

Occurrence - Cape Grim - 84002 (v), 84001 (v).

Age - Early Miocene, N4/5.

Figured specimen from 84002.

Maximum diameter of figured specimen 0.52 mm.

Repository - U.T.G.D. 84153.

Spiroloculina tenuiseptata Brady, 1884

(Pl. 1, fig. 26)

Spiroloculina tenuiseptata Brady, 1884, *"Challenger" Expedn, Scient. Results, Zool.*, 9, 153, pl. 10, figs. 5, 6.

?Spiroloculina canaliculata, Carter, 1958, *Bull. geol. Surv. Vict.*, 55, 30, pl. 2, figs. 1, 2.

Spiroloculina tenuiseptata, Reed, 1965, *Bull. Am. Paleont.*, 49 (220), 74.

Remarks

This species is distinct from *S. depressa* d'Orbigny in having an elliptical aperture without tooth, rather than having a round to square aperture with tooth, and from *S. canaliculata* d'Orbigny in having depressed sutures and chambers with convex sides.

The few specimens recovered are seldom well preserved, but the figured specimen is quite well preserved and is notable in that the last two chambers are arenaceous.

The specimen figured by Carter (1958, *op. cit.*) shows depressed sutures and convex sides to the chambers, and appears more likely to be *S. tenuiseptata* than *S. canaliculata*. On the other hand, Chapman's (1907, pl. 1, figs. 20, 21) illustrations are very convincing as figures of *S. canaliculata*.

Occurrence - Fossil Bluff - 84011 (r), 84013 (r), 84015 (r).

Age - Early Miocene, N4/5.

Figured specimen from 84015.

Maximum diameter of figured specimen 0.80 mm.

Repository - U.T.G.D. 84152.

Spiroloculina acutimago Brady, 1884

(Pl. 1, fig. 27)

Spiroloculina acutimago Brady, 1884, *"Challenger" Expedn, Scient. Results, Zool.*, 9, 154, pl. 10 fig. 14.

Spiroloculina acutimago, Chapman, 1907, *Jl. Linn. Soc.*, 30, 16, pl. 1, fig. 19.

Spiroloculina tenuirostra, Heron Allen and Earland, 1924, *Jl Linn. Soc.*, 35, 604.

Spiroloculina sp. abnorm., Barker, 1960, *Spec. Publns Soc. econ. Paleont. Miner.*, Tulsa, 9, pl. 10, fig. 14.

Remarks

Specimens almost identical with Brady's (1884, pl. 10, fig. 14) figure are present in two samples from Fossil Bluff. It seems probable that they are not abnormal specimens, as suggested by Barker (1960), but constitute a species in their own right.

Occurrence - Fossil Bluff - 84011 (v), 84012 (r).

Age - Early Miocene, N4/5.

Figured specimen from 84012.

Maximum diameter of figured specimen 0.48 mm.

Repository - U.T.G.D. 84154.

Spiroloculina spp

Remarks

This category is used to include all those specimens not identifiable below generic level but which are obviously *Spiroloculina*. They are recorded mainly in an effort to help calculate fairly accurate ratios of miliolids to other species for ecological interpretations. A similar category is used for unidentifiable *Quinqueloculina*, *Triloculina*, miliolids etc.

Occurrence - (a) Mussel Roe Bay - 84483 (v),
(b) Fossil Bluff - 84013 (r), 84015 (q), 84016 (r).

Age - Late Oligocene - Early Miocene.

Family MILIOLIDAE

Subfamily QUINQUELOCULININAE

Genus *CRENULOSTOMINA* Quilty, n. gen.

Genoholotype: *Crenulostomina banksi* n. sp.

Generic Diagnosis

Test free, quinqueloculine in chamber arrangement; wall imperforate, microgranular calcite with porcellanous appearance. Wall without outer agglutinated layer. Aperture terminal, circular, with (in the type species) a weakly developed tooth in the proximal part. Margin of aperture deeply crenulate.

Remarks

This genus is dintinct from *Dentostomina* Carman in having no agglutinated outer layer to the wall. It is distinct from *Quinqueloculina* in having a deeply crenulate margin to the aperture. In dealing with the new species, three alternatives presented themselves.

(a) Emend *Dentostomina* to include non-agglutinated species,
(b) Emend *Quinqueloculina* to include apertures with crenulate margins,
(c) Erect a new genus.

The latter choice was taken, in preference to the first, as *Dentostomina* and *Crenulostomina* are probably different lineages from a quinqueloculine stock, the stock of *Crenulostomina* being akin to *Q. singletoni* Crespin. Emendation of *Quinqueloculina* does not seem advisable. It is a large genus badly in need of effective subdivision. Adding the character of crenulate aperture only increases the need for subdivision. This step would also render *Dentostomina* synonymous with *Quinqueloculina*.

Derivation of name - *crenula* - little notch (L); *stoma* - mouth (L from Gr.).

Crenulostomina banksi Quilty, n. sp.

(Pl. 1, figs. 28-33)

Diagnosis

Test quinqueloculine in chamber arrangement, very elongate with length/width ratio of a little over three. Chambers approximately semicircular in section, each end extending over the ends of the previously formed test. Chambers with five to seven longitudinal costae, in earlier chambers, reducing to one to four in the last two or three chambers.

Description

Test free elongate, with length of 0.7-2.0 mm and width (maximum diameter perpendicular to length) of 0.24-0.52 mm, giving a length/width ratio of 3.0-3.6. Chamber arrangement quinqueloculine, three chambers visible from one side (the middle two visible for about three-quarters and three-fifths of test length respectively).

Growth axis remains fixed throughout ontogeny and chambers are added parallel to it. Chambers elongate, only about one-tenth as wide as long; semicircular in section; patterned with longitudinal costae which in later chambers may be as few as one to four, often with more at each end than in the middle, some costae dying out before reaching the middle of the chamber. Earlier chambers with five to seven costae. Chamber surface between costae commonly with very fine pits which are often coarser in the vicinity of the sutures which are very clear. Growth sometimes a little irregular. Aperture terminal, large, circular with crenulated margin and weak tooth in the proximal part.

Remarks

Of seven specimens recovered, three are from sample 84012 and are quite iron stained and unclear. The other four are from 84010a and are very well preserved and all have been included in the type collection. As only these few are available, none has been sectioned.

Occurrence - Fossil Bluff - 84010a (r), 84012 (r).

Age - Early Miocene, N4/5.

Holotype and three paratypes from 84010a.

Maximum diameter of (a) holotype 1.80 mm,
(b) figured paratype 1.92 mm.

Repository - (a) U.T.G.D. 84156,
(b) U.T.G.D. 84157,
(c) Other paratypes 84155, 84158.

Genus *PYRGO* Defrance, 1824

Pyrgo elongata (d'Orbigny), 1826

(Pl. 2, figs. 34, 35)

Biloculina elongata d'Orbigny, *Annls Sci. nat.* ser., 1, 7, 298.

Biloculina elongata, Parker, Jones and Brady, 1871, *Ann. Mag. nat. Hist.*, ser. 4, 8, pl. 8, fig. 6.

?Biloculina elongata, Chapman, 1907, *Jl Linn. Soc.*, 30, 15, pl. 1, fig. 14.

Remarks
A few very poorly preserved specimens are tentatively referred to this species. Overall test length and apertural characters are compatible with the identification. Another possible identification is *P. myrrhyna* (Schwager).

Occurrence - (a) Cape Grim - 84008 (v), 84002 (v),
(b) Marrawah district - 84114 (v).

Age - Early Miocene, N4-8.

Figured specimen from Cape Grim (84008).

Maximum diameter of figured specimen 0.45 mm.

Repository - U.T.G.D. 84170.

Pyrgo inornata (d'Orbigny), 1846

(Pl. 2, fig. 36)

Biloculina inornata d'Orbigny, 1846, *Foraminiferes fossiles du Bassin Tertiaire de Vienne (Autriche)*, Gide and Co.: Paris, 266, pl. 16, figs. 7-9.

Pyrgo inornata, Reed, 1965, *Bull. Am. Paleont.*, 49 (220), 74.

Remarks
A few poorly preserved specimens were recovered. None is preserved well enough to allow study of apertural details.

Occurrence - (a) Brittons Swamp - 84480 (v),
(b) Marrawah district - 84113 (r), 84114 (r).

Age - Early Miocene, N8.

Figured specimen from the Marrawah district (84113).

Maximum diameter of figured specimen 0.36 mm.

Repository - U.T.G.D. 84171.

Pyrgo sarsi (Schlumberger), 1891

(Pl. 2, fig. 37)

Biloculina sarsi Schlumberger, 1891, *Mem. Soc. Zool. Fr.*, 4, 553, figs. 55-59, text figs. 10-12.

Biloculina sarsi, Chapman, 1907, *Jl Linn. Soc.*, 30, 14, pl. 1, figs. 1, 2.

Biloculina bradii, Chapman, 1907, *op. cit.*, 13, pl. 1, figs. 7, 8.

Biloculina laevis, Chapman, 1907, *op. cit.*, 14, pl. 1. figs. 15.

Biloculina depressa, Chapman, 1907, *op. cit.*, 14, pl. 1, fig. 16.

Biloculina sarsi, Heron-Allen and Earland, 1924, *Jl, R. microsc. Soc.*, (1924), pt. 2, 131.

Pyrgo sarsi, Ludbrook, 1961, *Bull. geol. Surv. S. Aust.*, 36, 50.

Pyrgo sarsi, Carter, 1964, *Mem. geol. Surv. Vict.*, 23, 61, pl. 1, figs. 10, 11.

Pyrgo sarsi, Reed, 1965, *Bull. Am. Paleont.*, 49 (220), p. 66.

Occurrence - (a) Fossil Bluff - 84010a (v),
(b) Cape Grim - 84008 (v),
(c) Marrawah district - 84113 (v), 84104 (v), 84101 (r).

Age - Early Miocene, N4-8.

Figured specimen from Fossil Bluff (84010a)

Maximum diameter of figured specimen 0.95 mm.

Repository - U.T.G.D. 84172.

Pyrgo vespertilio (Schlumberger), 1891

(Pl. 2, fig. 38)

Biloculina ringens, Brady, 1884, *"Challenger" Espedn, Scient. Results, Zool.*, 9, 142, pl. 11, fig. 8.

Biloculina vespertilio Schlumberger, 1891, *Mem. Soc. zool. Fr.*, 4, 561, pl. 10, figs. 74-76.

Biloculina ringens, Chapman, 1907, *Jl Linn. Soc.*, 30, 13, pl. 1, figs. 9, 10.

Pyrgo vespertilio, Thalmann, 1932, *Eclog. geol. Helv.*, 25, 295.

Pyrgo vespertilio, Crespin, 1943, *Palaeont. Bull.*, Canberra 4, 81.

Occurrence - (a) Fossil Bluff - 84010a (v), 84010b (v),
(b) Brittons Swamp - 84480 (v).

Age - *Early Miocene, N4-8.*

Figured specimen from 84010b.

Maximum diameter of figured specimen 0.50 mm.

Repository - U.T.G.D. 84173.

Pyrgo sp.

Remarks

Poorly preserved unidentifiable specimens were recovered from each of the samples 84554 (r), 84110 (v), 84111 (v), 84101 (v).

Age - Early Miocene, N8.

Genus *QUINQUELOCULINA* d'Orbigny, 1826

Quinqueloculina angularis d'Orbigny, 1826

(Pl. 2, figs. 39, 40)

Quinqueloculina angularis d'Orbigny, 1826, *Annls Sci. nat.*, ser. 1, 7, 302, no. 3.

Quinqueloculina angularis, Fornasini, 1905, *Memorie R. Accad. Sci. Ist. Bologna.*, ser. 6, 2, 66, pl. 3, fig. 12.

Occurrence - (a) Fossil Bluff - 84011 (r), 84006 (v), 84001 (r).

Age - Early Miocene, N4/5.

Figured specimen from 84008.

Maximum diameter of figured specimen 0.60 mm.

Repository - U.T.G.D. 84159.

Quinqueloculina angulostriata Cushman and Valentine, 1930

(Pl. 2, figs. 41, 42)

Quinqueloculina angulo-striata Cushman and Valentine, 1930, *Contr. Dep. Geol. Stanford Univ.*, 1 (1), 12, pl. 2, figs. 5 a-c.

Remarks

In three samples, specimens were recovered which are difficult to name accurately, even though well preserved. They seem to be halfway between *Q. striata* d'Orbigny and *Q. angulostriata*. While being finely striate, they do have angular ridges on the test, but not so strongly developed as in typical *Q. angulostriata*.

Occurrence - (a) Fossil Bluff - 84010b (r), 84012 (v),
(b) Cape Grim - 84008 (v).

Age - Early Miocene, N4/5/

Figured specimen from Fossil Bluff (84010b).

Maximum diameter of figured specimen 0.60 mm.

Repository - U.T.G.D. 84160.

Quinqueloculina aspera d'Orbigny, 1826

(Pl. 2, figs. 43, 44)

Frumentaria semiluna Soldani, 1795, *Testaceographiae ac* ..... Tomi Primi pars tertia, Rossi: Siena, 228, pl. 152, fig. B.

Quinqueloculina aspera d'Orbigny, 1826, *Annls Sci. nat.*, ser. 1, 7, 301.

Quinqueloculina aspera, Parker, Jones and Brady, 1871, *Ann. Mag. nat. Hist.*, ser. 4, 8, pl. 8, fig. 11.

Remarks

Three well preserved specimens were recovered from Fossil Bluff (84011) in which the species is very rare.

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 1.48 mm.

Repository - U.T.G.D. 84161.

Quinqueloculina bradyana Cushman, 1917

(Pl. 2, figs. 45, 46)

Miliolina undosa Brady, 1884, *"Challenger" Expedn, Scient. Results, Zool.*, 9, 176, pl. 6, figs. 6-8.

Quinqueloculina bradyana Cushman, 1917, *Bull. U.S. natn. Mus.*, 71, 52, pl. 18, fig. 2.

Remarks

From Brady's figures of the species it seems probable that this species is simply an irregular varient of *Q. cuvieriana*. In this study, the species is recorded from one sample only. In this sample (84008, Cape Grim), it does not show the elongate aperture and tooth (Brady, 1884, pl. 6, fig. 6) but has an aperture more like that illustrated by Brady (*op. cit.* fig. 8).

Occurrence - Cape Grim - 84008 (r).

Age - Early Miocene, N4/5.

Maximum diameter of figured speciman 0.59 mm.

Repository - U.T.G.D. 84162.

Quinqueloculina cuvieriana d'Orbigny, 1839

(Pl. 2, figs. 47, 48)

Quinqueloculina cuvieriana d'Orbigny, *in* de la Sagra, 1839, *Histoire physique, politique et naturelle de L'ile de Cuba*, A. Bertrand: Paris, 8, 190, pl. 11, figs. 19-21.

Quinqueloculina lamarckiana d'Orbigny, (*op. cit.*), 8, 189, pl. 11, figs. 14, 15.

Miliolina cuvieriana, Brady, 1884, *"Challenger" Expedn, Scient. Results, Zool.*, 9, 162, pl. 5, figs. 7, 12.

Miliolina cuvieriana, Chapman, 1907, *Jl. Linn. Soc.*, 30, 19, pl. 2, fig. 33.

Quinqueloculina lamarckiana, Cushman, 1922, *Publns Carnegie Instn.*, 311, 64.

Quinqueloculina cuvieriana, Reed, 1965, *Bull. Am. Paleont.*, 49 (220), 65.

Remarks

Barker (1960, p. 10) suggested that *Q. lamarckiana* d'Orbigny has page priority over *Q. cuvieriana*. According to Article 24(a) of the I.C.Z.N. the "relative priority is determined by the action of the first reviser". Brady placed *Q. lamarckiana* in the synonymy of *Q. cuvieriana*, cited both names and chose one name *(Q. cuvieriana)* as the name of the taxon. Under these conditions Brady must surely satisfy the requirements of "first reviser" as set out in I.C.Z.N. Art. 24(a) (i). Thus Cushman (1922) is not the first reviser, and his action in giving priority to *Q. lamarckiana* is invalid.

Barker (1960) placed two forms in this species. One is a short species (Pl. 5, fig. 12) and the other (Pl. 5, fig. 7) is a longer one. Barker's usage is employed here. However, no intermediates seem to exist and it may be that the two are distinct species as envisaged by Brady (1884) when he placed the former type in *Miliolina cuvieriana* and the latter in *M. venusta*.

Occurrence - (a) Fossil Bluff - 84010a (q), 84010b (v), 84011 (f), 84012 (r), 84013 (q), 84016 (r), 84025a (q),
(b) Cape Grim - 84008 (v), 84007 (q), 84006 (r), 84001 (q),
(c) Marrawah district - 84111 (v).

Age - Early Miocene, N4-8.

Figured specimen from Fossil Bluff (84010a).

Maximum diameter of figured specimen 0.30 mm.

Repository - U.T.G.D. 84163.

Quinqueloculina granulosa Natland, 1938

(Pl. 2, figs. 49, 50)

Quinqueloculina granulosa Natland, 1938, *Bull. Scripps Instn Oceanogr. Tech. Ser.*, 4 (5), 141, pl. 4, fig. 1.

Remarks

This species is very common in the Tasmanian Tertiary. It agrees very well with Natland's (1938) description, varying from 0.35 to 0.60 mm in length and 0.20 to 0.35 mm in width. It also has a smooth surface, apparently very rare in arenaceous miliolids. Within the samples, a large variation is found in the amount by which early chambers jut out between the last two chambers. This is due to a variation in the extent to which each chamber covers the preformed test. A glance at a few isolated specimens easily gives the erroneous impression that one is dealing with a new species. Body form varies from typical *Q. granulosa* to forms very similar to *Siphonaperta macbeathi* Vella or *Q. mauricensis* Howe var. *lisbonensis* Cushman and Todd. However the smooth surface seems to be almost a unique feature.

The size, smooth surface and arenaceous test of this species are reminiscent of *Sigmoilopsis chapmani* (Cushman) (Reed 1965). However it is a true *Quinqueloculina*. It is possible that the *Q. granulosa* and *S. chapmani* have sometimes been confused.

Occurrence - (a) Fossil Bluff - 84010b (r), 84011 (q), 84012 (v), 84013 (r), 84025a (r),
(b) Cape Grim - 84008 (v), 84001 (v),
(c) Marrawah district - 84113 (v), 84106 (r).

Age - Early Miocene, N4-8.

Figured specimen from Fossil Bluff (84010b).

Maximum diameter of figured specimen 0.57 mm.

Repository - U.T.G.D. 84164.

Quinqueloculina laevigata d'Orbigny, 1839
(Pl. 2, fig. 51)

Quinqueloculina laevigata d'Orbigny (*in* Barker-Webb and Berthelot, 1839), *Histoire Naturelle des Iles Canaries*, Bethany: Paris, 2 (2), 143, pl. 3, figs. 31-33.

Occurrence - Cape Grim - 84002 (v).

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.60 mm.

Repository - U.T.G.D. 84165.

Quinqueloculina seminulum (Linne), 1758
(Pl. 2, figs. 52,53)

Serpula seminulum Linne, 1758, *Systema Naturae* (10th ed.) 1, 786.

Miliolina seminulum, Brady, 1884, *"Challenger" Expedn, Scient. Results, Zool.* 9, 157, pl. 5, figs. 6a-c.

Miliolina seminulum, Howchin, 1889, *Trans. Proc. R. Soc. S. Aust.*, 12, 2.

Miliolina seminulum, Howchin, 1891, *Trans. Proc. R. Soc. S. Aust.*, 14, 350.

Miliolina seminulum, Chapman, 1907, *Jl Linn. Soc.*, 30, 19, pl. 2, fig. 34.

Quinqueloculina seminulum, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 83.

Quinqueloculina seminulum, Ludbrook, 1961, *Bull. geol. Surv. S. Aust.*, 36, 50.

Remarks

Q. seminulum here includes such forms as *Q. schreiberiana* d'Orbigny, but excludes *Q. vulgaris* d'Orbigny, which is distinguished here in having a more carinate margin to the chambers and in having a very clearly visible fourth chamber on one side of the test, whereas *Q. seminulum* is less carinate and has the fourth chamber either not visible or only faintly visible.

The species is probably the most abundant miliolid in the Tasmanian Tertiary.

Occurrence - (a) Fossil Bluff - 84010a (f), 84010b (c), 84011 (v), 84102 (f),
84013 (v), 84015 (r), 84016 (r).

(b) Cape Grim - 84008 (q), 84002 (r), 84001 (q),
(c) Brittons Swamp - 84480 (r).

Age - Early Miocene, N4-8.

Figured specimen from Fossil Bluff (84010a).

Maximum diameter of figured specimen 1.30 mm.

Repository - U.T.G.D. 84166.

Quinqueloculina simplex Terquem, 1882
(Pl. 2, figs. 54, 55)

Quinqueloculina simplex Terquem, 1882, *Mem. Soc. geol. France*, ser. 3, 2 (3), 172, pl. 18, figs. 5-13.

Occurrence - (a) Fossil Bluff - 84010a (q), 84010b (r), 84013 (v),
(b) Cape Grim - 84008 (r), 84002 (r), 84001 (r).

Age - Early Miocene, N4/5.

Figured specimen from Fossil Bluff (84010a).

Maximum diameter of figured specimen 0.85 mm.

Repository - U.T.G.D. 84167.

Quinqueloculina vulgaris d'Orbigny, 1826
(Pl. 2, figs. 56, 57)

Quinqueloculina vulgaris d'Orbigny, 1826, *Annls Sci. nat.*, ser. 1, 7, 302, no. 33.

Miliolina vulgaris, Chapman, 1907, *Jl Linn. Soc.*, 30, 18, pl. 2, fig. 32.

Quinqueloculina vulgaris, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 83.

Quinqueloculina vulgaris, Ludbrook, 1961, *Bull. geol. Surv. S. Aust.*, 36, 51.

Quinqueloculina vulgaris, Reed, 1965, *Bull. Am. Paleont.*, 49 (220), 66.

Remarks
See *Q. seminulum*.

Occurrence - (a) Fossil Bluff - 84010a (r), 84010b (v),
(b) Cape Grim - 84002 (r).

Age - Early Miocene, N4/5.

Figured specimen from Fossil Bluff (84010b).

Maximum diameter of figured specimen 1.05 mm.

Repository - U.T.G.D. 84168.

Quinqueloculina sp. 1

(Pl. 2, fig. 58)

? Miliolina ferussacii, Brady, 1884, *"Challenger" Expedn, Scient. Results, Zool.*, 9, 175, pl. 113, fig. 17a, b.

? Quinqueloculina sp. nov ? Barker, 1960, *Spec. Publs Soc. econ. Paleont. Miner.*, Tulsa, 9, 234, pl. 113, fig. 17a, b.

Remarks

A very elongate species similar in overall test characters is found in two samples (84008 (v) and 84006 (v)) from Cape Grim. However, instead of one, two or three strong longitudinal ridges in each of the last chambers, it has very many fine striae and may thus represent a different undescribed species.

Age - Early Miocene, N4/5.

Figured specimen from 84008.

Maximum diameter of figured specimen 1.30 mm.

Repository - U.T.G.D. 84169.

Quinqueloculina spp.

Miliolid and planktonic species are more susceptible to breakage than other types and although not identifiable at generic or specific level in several cases, their abundances are recorded to help calculate relative abundances at the family or superfamily level for each sample.

Occurrence - (a) Mussel Roe Bay - 84483 (q), 84482 (v),
(b) Fossil Bluff - 84010a (q), 84011 (v), 84012 (r), 84013 (q), 84019 (q), 84023 (c), 84025a (r), 84025b (r),
(c) Daisy Creek - 84478 (q),
(d) Cape Grim - 84007 (r), 84006 (r), 84005 (r),
(e) Marrawah district - 84111 (r), 84113 (r), 84114 (r).

Age - Late Oligocene - Early Miocene.

Genus *SIGMOILINA* Schlumberger, 1887

Sigmoilina obesa Heron-Allen and Earland, 1932

(Pl. 2, figs. 59-64)

Sigmoilina obesa Heron-Allen and Earland, 1932, *"Discovery" Reps*, 4, 320, pl. 7 figs. 1-4.

Sigmoilina obesa, Earland, 1933, *"Discovery" Reps*, 7, 49.

Sigmoilina obesa, Earland, 1934, *ibid.*, 10, 50.

Sigmoilina obesa, Earland, 1936, *ibid.*, 13, 22, pl. 1, figs. 2-4.

Sigmoilina obesa, Cushman, 1946, *Contr. Cushman Lab. foramin. Res.*, 22 (2), 43, pl. 6 figs. 29-31.

Remarks

From the exterior, small specimens of this species are indistinguishable generically from *Pyrgo*. Two small specimens were sectioned. One (megalospheric) consisted of a large, spherical proloculus 0.15 mm in diameter followed by only one pair of chambers, so no sigmoidal arrangement was seen. The other specimen is microspheric with a pyrite filled proloculus 0.05 mm in diameter. This shows a sigmoidal arrangement. Thus the species belongs to *Sigmoilina*. Larger specimens are clearly distinct from *Pyrgo* as one side of the test shows three chambers and has very shallow, almost flush sutures, while the other side shows two chambers with a broadly, deeply depressed suture between.

That this species should occur here at all seems a little anomalous. Dorman (1966) listed temperatures, based on O^{16}/O^{18} ratios for Victorian specimens, in this part of the geological column of 15-20°C. This species is now a predominantly Antarctic one, living in much colder waters.

Occurrence - (a) Fossil Bluff - 94010b (r), 84011 (v), 84012 (r), 84013 (v), 84014 (r), 84016 (r), 84025b (v),
(b) Cape Grim - 84001 (v).

Age - Early Miocene, N4/5.

Figured specimens from (a) 84010b
(b) 84010b
(c) 84011
(d) 84010b

Maximum diameter of figured specimens
(a) complete microspheric specimen 0.58 mm,
(b) complete megalospheric specimen 0.35 mm,
(c) megalospheric section 0.36 mm,
(d) microspheric section 0.24 mm.

Repository - (a) U.T.G.D. 84176,
(b) U.T.G.D. 84177,
(c) U.T.G.D. 84175,
(d) U.T.G.D. 84174.

Sigmoilina victoriensis Cushman, 1946
(Pl. 2, figs. 65, 66)

Planispira sigmoidea, Howchin, 1889, *Trans. Proc. R. Soc. S. Aust.*, 12, 5.

Sigmoilina sigmoidea, Chapman, 1907, *Jl Linn. Soc.*, 30, 20, 21, pl. 2, fig. 40.

Sigmoilina sigmoidea, Heron-Allen and Earland, 1924, *Jl R. microsc. Soc.*, (1924) pt. 2, 133.

Sigmoilina sigmoidea, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 83.

Sigmoilina sigmoidea (H.B. Brady) var. *compressa*, Cushman, 1946, *Contr. Cushman Lab. foramin. Res.*, 22 (2), 32, pl. 5, figs. 10-12.

Sigmoilina victoriensis Cushman, 1946, *ibid.*, 22 (3), 103.

Sigmoilina victoriensis Reed, 1965, *Bull. Am. Paleont.*, 49 (220), 66.

Remarks

From an examination of the seven specimens recovered, it seems almost as if Cushman's splitting of this species from *S. sigmoidea s.s.* is unwarranted. Within the specimens there is a range from specimens identical with the type specimens of *S. victoriensis* to those which are identical with Brady's (1884) or Cushman's (1946) figures of *Sigmoilina sigmoidea s.s.* However, the typological species can be recognised, and all variants of it are placed in this species. Thus *Sigmoilina sigmoidea s.s.* probably also occurs here. The Marrawah specimen is an internal mould and the identification is tentative only.

Occurrence - (a) Fossil Bluff - 84010b (v), 84011 (v),
(b) Cape Grim - 84002 (v),
(c) Marrawah district - 84111 (v).

Age - Early Miocene, N4-8.

Figured specimen from Fossil Bluff (84010b).

Maximum diameter of figured specimen 0.38 mm.

Repository - U.T.G.D. 84178.

Genus *SIPHONAPERTA* Vella, 1957

Siphonaperta ammophila (Parr), 1932
(Pl. 2, figs. 67, 68)

Quinqueloculina ammophila Parr, 1932, *Proc. R. Soc. Vict.* n.s., 44, 8, pl. 1, fig. 10.

Quinqueloculina ammophila, Howchin and Parr, 1938, *Trans. R. Soc. S. Aust.*, 62 (2), 291, 292, pl. 15, figs. 3, 4.

Quinqueloculina ammophila, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 82.

Siphonaperta ammophila, Ludbrook, 1961, *Bull. geol. Surv. S. Aust.* 36, 71, pl. 6, fig. 2.

Remarks

Loeblich and Tappan (1964a, pl C466) record this genus as a Pleistocene to Recent one. As long ago as 1943, Crespin *(op. cit.)* had recorded this species in Batesfordian rocks and this record (also one from Ludbrook, pers. comm.) shows it to be in Early Miocene, Longfordian rocks.

This species stands out among arenaceous forms, as one which apparently at will selects and incorporates in its test a high proportion of dark particles. Among dark minerals it seems quite partial to biotite flakes.

Occurrence - (a) Fossil Bluff - 84010a (r), 84013 (q), 84025b (v),
(b) Cape Grim - 84001 (v).

Age - Early Miocene, N4/5.

Figured specimen from Fossil Bluff (84010a)

Maximum diameter of figured specimen 0.70 mm.

Repository - U.T.G.D. 84179.

Genus *SPIROSIGMOILINA* Parr, 1942

Spirosigmoilina tateana (Howchin), 1889

(Pl. 2, figs. 69-71)

Spiroloculina tateana Howchin, 1889, *Trans. Roy. Soc. S. Aust.*, 12, 3, pl. 1, figs. 4, 5.

Sigmoilina tateana, Howchin , 1929, *The geology of South Australia*, The author: Adelaide, Fig. 108, figs. 4, 5.

Spirosigmoilina tateana, Parr, 1942, *Min. geol. Jl*, 2 (6), 361.

Spriosigmoilina tateana, Loeblich and Tappan, 1964, *Treat. Invert. Paleont.*, C2 (1), C466, fig. 353, 5.

Remarks

About 100 specimens are referred to this species, all from the lower part of the Fossil Bluff section. Specimens are of two types, here taken as being microspheric and megalospheric. The microspheric form is represented by a single specimen which is figured. It is the typical form of the species and has all the characters of the genus, i.e. a sigmoiline initial part and later spiroloculine part. However the dominant form of the species does not have a sigmoiline initial part but consists of an enrolled tube. This type is consistently smaller than the microspheric type. The megalospheric form begins with a proloculus followed by an enrolled planispiral tube which grows by discontinuous growth. At every 120° to 180°, the growth has halted and the wall is strongly thickened. Thus the individual growth units (chambers) are 120 - 180° long, usually nearer to 180° but earlier ones often nearer to 120°. These chambers are in turn subdivided into chamberlets by transverse septa, there being about four to five chamberlets in each adult chamber. I have not determined whether or not these are true septa or simply thickenings of the chamber wall. There is no external expression of these septa.

The more abundant form of the species does not fit the generic diagnosis at all. The form is consistent with a position in the Fischerininae (*sensu* Loeblich and Tappan) or in the genus *Heterillina*, or even in *Cornuloculina*. The aperture does not show the hauerine trematophore. The megalospheric specimens are almost identical externally with *Hauerina fragilissima* (Brady).

Thus it is possible that *Spirosigmoilina* is biologically invalid, being only the microspheric form of some other genus. It it is valid, it must be emended to include the megalospheric form thus rendering the "typical" form atypical.

Occurrence - Fossil Bluff - 84010b (r), 84011 (c), 84012 (v), 84013 (q), 84014 (v), 84015 (r).

Age - Early Miocene, N4/5.

Figured specimens from (a) 84010b (microspheric),
(b) 84011 (megalospheric).

Maximum diameter of figured specimens (a) 0.95 mm,
(b) 0.30 mm.

Repository - (a) U.T.G.D. 84188.
(b) U.T.G.D. 84187.

Genus *TRILOCULINA* d'Orbigny, 1826

Triloculina affinis d'Orbigny, 1850

(Pl. 2, figs. 72, 73)

Triloculina affinis d'Orbigny, 1850, *Prodome de paleontologie stratigraphique universelle des animaux mollusques et rayonnes*, V. Masson: Paris, 3, 161.

Triloculina affinis, Fornasini, 1905, *Memorie R. Accad. Sci. Ist. Bologna*, ser. 6, 2, pl. 1, fig. 1.

Occurrence - Cape Grim - 84008 (r), 84006 (v), 84001 (v).

Age - Early Miocene, N4/5.

Figured specimen from 84006.

Maximum diameter of figured specimen 0.45 mm.

Repository - U.T.G.D. 84181.

Triloculina brochita Carter, 1964

(Pl. 2, figs. 74, 75)

Triloculina brochita Carter, 1964, *Mem. geol. Surv. Vict.*, 23, 59, pl. 1, figs. 3, 4.

Triloculina brochita, Reed, 1965, *Bull. Am. Paleont.*, 49 (220), 73.

Remarks

Only in the large adult form (such as the figured specimen) does the species become identical with the holotype figured by Carter *(op. cit.)*. In small specimens, the chambers are not quite so inflated and their margins are a little less rounded as a result of it.

Occurrence - (a) Fossil Bluff - 84010a (r), 84011 (r), 84013 (q), 84014 (q) 84025a (v), 84024 (v), 84017 (r)

(b) Cape Grim - 84008 (v), 84006 (v), 84002 (v), 84001 (r),

(c) Marrawah district - 84101 (v).

Age - Early Miocene, N4-8.

Figured specimen from Fossil Bluff (84011).

Maximum diameter of figured specimen 0.92 mm.

Repository - U.T.G.D. 84142.

Triloculina laevigata d'Orbigny, 1878

(Pl. 2, figs. 76, 77)

Triloculina laevigata d'Orbigny, 1826, *Annls Sci. nat.*, ser. 1, 7, 134.

Triloculina laevigata, Terquem, 1878, *Mem. Soc. geol. Fr.*, ser. 3, 1 (3), 57, pl. 5, figs. 20, 21.

Remarks

In a few samples from Fossil Bluff and Cape Grim, are found specimens of an elongate *Triloculina* very much like *T. consobrina* d'Orbigny or *T. elongata* d'Orbigny. However, it differs from these species in possessing a clearly bifid tooth, not the simple tooth of the latter species, and is therefore placed in *T. laevigata*.

Occurrence - (a) Fossil Bluff - 84010b (r),
(b) Cape Grim - 84008 (r), 84006 (v).

Age - Early Miocene, N4/5.

Figured specimen from 84008.

Maximum diameter of figured specimen 0.62 mm.

Repository - U.T.G.D. 84185.

Triloculina rotunda d'Orbigny, 1893
(Pl. 2, figs. 78, 79)

Triloculina rotunda d'Orbigny, 1826, *Annls Sci. nat.*, ser. 1, 7, 299, No. 4.

Triloculina rotunda Schlumberger, 1893, *Mem. Soc. zool. Fr.*, 6, 64, pl. 1, figs. 48-50.

Occurrence - Cape Grim - 84008 (q), 84006 (r), 84002 (q), 84001 (r),

Age - Early Miocene, N/45.

Figured specimen from 84008.

Maximum diameter of figured specimen 0.72 mm.

Repository - U.T.G.D. 84183

Triloculina trigonula (Lamarck), 1804
(Pl. 2, figs. 80, 81)

Miliolites trigonula Lamarck, 1804, *Ann. Mus. natn. Hist. nat.*, Paris 5, 351, (figs. Vol. 9, pl. 17, figs. 4a-c, 1807).

Triloculina trigonula, d'Orbigny, 1826, *Annls Sci. nat.*, ser. 1, 7, 299, pl. 16, figs. 5-9.

Miliolina trigonula, Howchin, 1889, *Trans. Proc. R. Soc. S. Aust.*, 12, 2.

Miliolina trigonula, Howchin, 1891, *Trans. Proc. R. Soc. S. Aust.*, 14, 350.

Miliolina trigonula, Chapman, 1907, *Jl Linn. Soc.*, 30, 18, pl. 2, fig. 30.

Miliolina trigonula, Heron-Allen and Earland, 1924, *Jl R. microsc. Soc.*, (1924), pt. 2, 131.

Triloculina trigonula, Howchin and Parr, 1938, *Trans. R. Soc. S. Aust.*, 62 (2), 305.

Triloculina trigonula, Crespin, 1943, *Palaeont. Bull.*, 4, 84.

Triloculina trogonula, Ludbrook, 1961, *Bull. geol. Surv. S. Aust.*, 36, 50, 79.

Triloculina trigonula, Reed, 1961, *Bull. Am. Paleont.*, 49 (220), 73.

Occurrence - (a) Fossil Bluff - 84010a (r), 84010b (f), 84011 (r), 84012 (v), 84013 (r), 84016 (r),
(b) Cape Grim - 84008 (v), 84002 (r),
(c) Marrawah district - 84113 (r), 84114 (v), 84101 (r).

Age - Early Miocene, N4-8.

Figured specimen from Fossil Bluff (84010a).

Maximum diameter of figured specimen 0.66 mm.

Repository - U.T.G.D. 84184.

Triloculina sp 1

(Pl. 3, figs. 82, 83)

Remarks

From Cape Grim (84001 (v)) a few specimens of a very inflated species were recovered. They look very much like *T. brochita* Carter but have an obvious, bifid tooth. Occasionally the wall of the chambers is 'crinkled' giving an irregular pattern to the otherwise smooth surface of the test. It may be a variety of *T. rotunda*.

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.53 mm.

Repository - U.T.G.D. 84186.

Triloculina spp

Remarks

What has been said for *Quinqueloculina* spp and *Spiroloculina* spp also holds for unidentified specimens of *Triloculina*.

Occurrence - Fossil Bluff - 84010a (r), 84013 (v), 84019 (r), 84023 (q).

Age - Early Miocene.

Subfamily *MILIOLINELLINAE*

Genus *MILIOLINELLA* Wiesner, 1931

Miliolinella subrotunda (Montagu), 1803

(Pl. 3, figs. 84, 85)

Vermiculum subrotundum Montagu, 1803, *Testacea Brittanica* ....., J.S. Hollis: Romsey, England, 521.

Miliolinella subrotunda Wiesner, 1931, *Deutsche Sudpolar Expedn, Zool.*, 12, 63, 65, 107.

Remarks

This appears to be the only Australian record of this species. Chapman (1907) and Reed (1965) record *M. oblonga* (Montagu).

Occurrence - Cape Grim - 84008 (r), 84002 (r), 84001 (r).

Age - Early Miocene, N4/5.

Figured specimen from 84008.

Maximum diameter of figured specimen 0.52 mm.

Repository - U.T.G.D. 84180.

Subfamily TUBINELLINAE

Genus *ARTICULINA* d'Orbigny, 1826

Articulina carinata Wiesner, 1923

(Pl. 3, fig. 86)

Articulina sagra d'Orbigny var. *carinata* Wiesner, 1923, *Die Milioliden der oestlichen Adria*, H. Wiesner: Prague, 74, pl. 19, fig. 188.

Remarks

Two specimens of this species were recovered from Fossil Bluff (84010b). Of the described Australian species, it is closest to *A. parri* Cushman but lacks such features as spiral costae, which although not expressly mentioned by Cushman (1944) as a specific character, are clear in his figures of the species.

Wiesner's variety is herein raised to specific rank, as there seems to be more difference between it and *A. sagra s.s.* than, for example between *A. sagra* and *A. parri* or between *A. sagra* and *A. victoriana* Cushman.

In the specimens recovered, the aperture and its lip are missing.

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.78 mm.

Repository - U.T.G.D. 84189.

Articulina sp.

(Pl. 3, fig. 87)

Remarks

A single unidentifiable specimen was recovered from Fossil Bluff (84013). It consists of a single cylindrical chamber 0.52 x 0.15 mm with a strongly everted lip to its aperture. It is the final chamber of a specimen and is 'ornamented' with several longitudinal striae which are all continuous throughout the length of the specimen. The closest species appears to be *A. canui* Cushman.

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.52 mm.

Repository - U.T.G.D. 84190.

Unidentified miliolids

Remarks

These are noted in an effort to reconstruct the ratios of families etc. to each other, so that a reconstruction of palaeoecology can be attempted, taking into account all the characters available of foraminiferal distributions. See also *Quinqueloculina*, *Triloculina* and *Spiroloculina*.

Occurrence - (a) Fossil Bluff - 84010a (q), 84014 (q), 84015 (q), 84016 (f), 84017 (q), 84022 (r), 84023 (c), 84025a (r),
(b) Cape Grim - 84008 (r), 84006 (r), 84003 (q), 84002 (f), 84001 (v),
(c) Granville Harbour - 54144 (f),
(d) Brittons Swamp - 84480 (f),
(e) Marrawah district - 84108 (a+), 84109 (r), 84111 (r), 84114 (r), 84115 (r), 84104 (r), 84105 (r), 84106 (r).

Age - Early Miocene.

Suborder ROTALIINA

Superfamily NODOSARIACEA

Family NODOSARIIDAE

Subfamily NODOSARIINAE

Genus *DENTALINA* Risso, 1826

Dentalina advena (Cushman), 1923

(Pl. 3, fig. 89)

Nodosaria (Dentalina) roemeri, Brady, 1884, *"Challenger" Expedn, Scient. Results, Zool.*, 9, 505, pl. 63, fig. 1.

Nodosaria advena Cushman, 1923, *Bull. U.S. natn. Mus.*, 104 (4), 79, pl. 14, fig. 12.

Dentalina advena, Barker, 1960, *Spec. Publs Soc. econ. Paleont. Miner.*, Tulsa, 9, 132, pl. 63, fig. 1.

Occurrence - (a) Mussel Roe Bay - 84483 (v),
(b) Cape Grim - 84008 (v), 84007 (r), 84006 (v),
(c) Marrawah district - 84092 (v).

Age - Late Oligocene - Early Miocene, N3-5.

Figured specimen from Cape Grim (84007).

Maximum diameter of figured specimen 0.70 mm.

Repository - U.T.G.D. 84195.

Dentalina cf *divergens* Reuss, 1865

(Pl. 3, fig. 88)

Dentalina divergens Reuss, 1965, *Sber, Akad. Wiss.*, Wien, 50 (1), 456, pl. 4, fig. 10.

Remarks

Dentalina divergens is the most similar described species to that found here. The present species is much more arcuate than *D. divergens* in the one complete specimen recorded. It also has a much smaller portion, only the first one or two chambers,

patterned with spiral grooves. It is probably a new species but, as only two specimens are known, it is given this tentative identification.

Occurrence - Cape Grim - 84008 (v).

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 1.95 mm.

Repository - U.T.G.D. 94098.

Dentalina filiformis (d'Orbigny), 1826

(Pl. 3, fig. 90)

Nodosaria filiformis d'Orbigny, 1826, *Annls Sci. nat.*, ser. 1, 7, 253.

Nodosaria filiformis, Brady, 1884, *"Challenger" Expedn, Scient. Results, Zool.*, 9, 500, pl. 63, figs. 3-5.

Dentalina filiformis, Barker, 1960, *Spec. Publs Soc. econ. Paleont. Miner.*, Tulsa, 9,

Remarks

The name is used here for the same species that Brady illustrated and listed. The chambers seem to be much more elongate than in the species figured by Parker, Jones and Brady (1871) as *Dentalina filiformis*, and it may well be that later workers have used the name for a different species than d'Orbigny intended.

Occurrence - (a) Fossil Bluff - 84011 (v), 84013 (v),
(b) Cape Grim - 84008 (v).

Age - Early Miocene, N4/5.

Figured specimen from Fossil Bluff (84011).

Maximum diameter of figured specimen 1.15 mm.

Repository - U.T.G.D. 84196.

Dentalina godjeni Quilty, 1969

(Pl. 3, fig. 91)

Nodosaria roemeri Neugeboren var. *semicostata* Goddard and Jensen, 1907, *Proc. Linn. Soc. N.S.W.*, 32, (2), 313, pl. 6, fig. 14.

Dentalina godjeni Quilty, 1969, *Pap. Proc. Roy. Soc. Tasm.*, 103, 97, fig. 2.

Occurrence - (a) Mussel Roe Bay - 84483 (r),
(b) Fossil Bluff - 84010a (v), 84010b (v).

Age - Late Oligocene - Early Miocene, N3-5.

Figured topotype from Fossil Bluff (84010a).

Maximum diameter of figured specimen 4.4 mm.

Repository - U.T.G.D. 84293.

Dentalina obliqua (Linné), 1758
(Pl. 3, fig. 92)

Nautilus obliquus Linné, 1758, *Systema Naturae* ....., 10th edn, G. Engelman: Lipsiae, 1, 701.

Nodosaria (Dentalina) obliqua, Chapman and Parr, 1926, *Jl. Linn. Soc.*, 36, 384, pl. 19, fig. 46.

Dentalina obliqua, Howchin and Parr, 1938, *Trans. R. Soc. S. Aust.*, 62 (2), 298, pl. 16, fig. 5.

Dentalina obliqua, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 78.

Remarks
A single large incomplete specimen about 5.8 mm long was recovered from Mussel Roe Bay (84483 (v)).

Age - Late Oligocene, N3.

Repository - U.T.G.D. 84294.

Dentalina semirugosa (d'Orbigny), 1846
(Pl. 3, fig. 93)

Nodosaria semirugosa d'Orbigny, 1846, *Foraminiferes fossiles du Bassin Tertiaire de Vienne (Autriche)*, Gide and Co: Paris, 34, pl. 1, figs. 20-23.

Nodosaria costulata, Brady, 1884, *"Challenger" Expedn, Scient. Results, Zool.*, 9, 515, pl. 63, figs. 23-27.

Dentalina guttifera (d'Orbigny) var. *semirugosa*, Barker, 1960, *Spec. Publs Soc. econ. Paleont. Miner.*, Tulsa, 9, 134, pl. 63, figs. 23-27.

Remarks
There seems to be no good reason why the specific name of this species should not be the one d'Orbigny intended for it. Admittedly, calling it a variety of *D. guttifera* probably does express a relationship, but no adequate reason for reducing its rank from species to variety seems to have been put forward. Thus after a circuitous trip through the taxonomic hierarchy, this species is approximately back to where it started.

The bend in the axis of the species is so slight that even the generic change from *Nodosaria* to *Dentalina* is mainly a pedantic one.

Occurrence - Fossil Bluff - 84012 (v).

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.62 mm.

Repository - U.T.G.D. 84197.

Dentalina subcostata Chapman, 1926

(Pl. 3, fig. 94)

Nodosaria (Dentaline) obliqua Linne var. *subcostata* Chapman, 1926, *Palaeont. Bull.*, Wellington, 11, 51, pl. 11, fig. 3.

Dentalina subcostata, Finlay, 1946, *Trans. R. Soc. N.Z.* 76 (2), 243.

Dentalina subcostata, Hornibrook, 1961, *Palaeont. Bull.*, Wellington, 34 (1), 45, pl. 6, fig. 88.

Occurrence - Fossil Bluff - 84010a (v).

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 2.90 mm.

Repository - U.T.G.D. 84537.

Dentalina subsoluta (Cushman), 1923

(Pl. 3, fig. 95)

Nodosaria subsoluta Cushman, 1923, *Bull. U.S. natn. Mus.*, 104 (4), 74, pl. 13, fig. 1.

Nodosaria soluta, Heron-Allen and Earland, 1924, *Jl R. microsc. Soc.*, (1924), pt. 2, 155.

Nodosaria (Dentalina) soluta, Chapman and Parr, 1926, *Jl Linn. Soc.*, 36, 383, pl. 19, fig. 40.

Dentalina soluta, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 78.

Occurrence - Mussel Roe Bay, 84483 (v).

Age - Late Oligocene, N3.

Maximum diameter of figured specimen 2.1 mm.

Repository - U.T.G.D. 84295.

Genus *DIMORPHINA* d'Orbigny, 1826

Dimorphina sp.

(Pl. 3, fig. 96)

Remarks

A single poorly preserved specimen is referred to this genus. It does not appear

to belong to any previously defined genus. It may be a *Marginulina* as the detail of the early chambers is not clear.

Occurrence - Marrawah district - 84110 (v).

Age - Early Miocene, N8.

Maximum diameter of figured specimen 0.55 mm.

Repository - U.T.G.D. 84199.

Genus *LAGENA* Walker and Jacob, 1798

Lagena aspera Reuss, 1862

(Pl. 3, fig. 97)

Lagena aspera Reuss, 1862, *Sber. Akad. Wiss.*, Wien, 44 (1), 305, pl. 1, fig. 5.

Lagena aspera, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 80.

Remarks

The species recorded here seems to be identical with one figured by Brady (1884, pl. 57, fig. 11) and Barker (1960) as *L. aspera*. It seems close to *L. aspera* var. *spinifera* Chapman, in that it has a spherical test with short neck. However, no spines are evident.

Occurrence - Mussel Roe Bay - 84483 (v).

Age - Late Oligocene, N3.

Maximum diameter of figured specimen 0.29 mm.

Repository - U.T.G.D. 84371.

Lagena hexagona (Williamson), 1848

(Pl. 3, fig. 98)

Entosolenia squamosa (Montagu) var. *hexagona* Williamson, 1848, *Ann. Mag. nat. Hist.*, ser. 2, 1, 20, pl. 2, fig. 23.

Lagena hexagona, Howchin, 1889, *Trans. Proc. R. Soc. S. Aust.*, 12, 8.

Lagena hexagona, Howchin, 1891, *Trans. Proc. R. Soc. S. Aust.*, 14, 351.

Lagena hexagona, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 80.

Lagena hexagona, Ludbrook, 1961, *Bull. geol. Surv. S. Aust.*, 36, 19.

Remarks

The practice of taxonomists in listing this species has been to give Williamson the credit for placing the species in *Lagena* by not putting his name in parentheses after the specific name. Williamson placed the species in *Entosolenia*. The position is similar to a case in which var. *hexagona* Williamson is first given full specific rank within the genus *Entosolenia* and becomes *Entosolenia hexagona* Williamson. A later revisor would then change the generic assignation from *Entosolenia* to *Lagena*. Williamson's name then should be placed in parentheses.

Occurrence - (a) Mussel Roe Bay - 84483 (v),
(b) Fossil Bluff - 84011 (v), 84012 (r), 84022 (v), 84024 (v),
(c) Mt. Cameron West - 84118 (r),
(d) Granville Harbour - 54144 (q),
(e) Redpa - 84096 (v),
(f) Marrawah district - 84105 (v).

Age - Late Oligocene - Early Miocene, N3-8.

Figured specimen from Fossil Bluff (84011).

Maximum diameter of figured specimen 0.30 mm.

Repository - U.T.G.D. 84486.

Lagena hispida Reuss, 1863
(Pl. 3, fig. 99)

Lagena hispida Reuss, 1863, *Sber. Akad. Wiss.*, Wien., 46 (1), 335, pl. 6, figs. 77-79.

Lagena hispida, Chapman and Parr, 1926, *Jl Linn. Soc.*, 36, 375, pl. 17, fig. 9.

Lagena hispida, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 80.

Occurrence - (a) Fossil Bluff - 84015 (q), 84019 (v), 84024 (v), 84025b (v),
(b) Redpa - 84095 (v).

Age - Early Miocene, N4/5, N8.

Figured specimen from Fossil Bluff (84019).

Maximum diameter of figured specimen 0.32 mm.

Repository - U.T.G.D. 84200.

Lagena hispidula Cushman, 1913
(Pl. 3, fig. 100)

Lagena laevis, Brady, 1884, *"Challenger" Expedn, Scient. Results, Zool.*, 9, 455, pl. 56, figs. 10, 11.

Lagena hispidula Cushman, 1913, *Bull. U.S. natn. Mus.*, 71 (3), 14, pl. 5, figs. 2, 3.

Remarks
One well preserved, finely hirsute specimen from Fossil Bluff (84013) is referred to this species.

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.27 mm.

Repository - U.T.G.D. 84203.

Lagena laevis (Montagu), 1803

(Pl. 3, figs. 101, 102)

Serpula (Lagena) laevis ovalis Walker and Boys, 1784, *Testacea minuta* ....., J. March: London, 3, pl. 1, fig. 9.

Vermiculum laeve, Montagu, 1803, *Testacea Brittanica* ....., J.S. Hollis: Romsey, England, 524.

Lagena laevis, Howchin, 1891, *Trans. Proc. R. Soc. S. Aust.*, 14, 351.

Lagena laevis, Chapman and Parr, 1926, *Jl Linn. Soc.*, 36, 373, pl. 17, fig. 1.

Lagena laevis, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 80.

Lagena laevis, Crespin, 1954, *Rep. Bur. Miner. Resour. Geol. Geophys. Aust.*, 11, 4.

Lagena laevis, Barker, 1960, *Spec. Publs Soc. econ. Paleont. Miner.*, Tulsa, 9, 118, pl. 57, figs. 14, 16-18, 23, 25-27.

Remarks

In this work, this species has been interpreted rather widely following Barker *(op. cit.)*. Two specimens are figured. The Marrawah record is doubtful as the two specimens are very poorly preserved.

Occurrence - (a) Fossil Bluff - 84010 (v), 84011 (v), 84015 (r), 84019 (v), 84025b (v),
(b) Mt Cameron West - 84120 (v),
(c) Marrawah district - 84109 (r), 84114 (v).

Age - Early Miocene, N4-8.

Figured specimens from Fossil Bluff (a) 84010a,
(b) 84011.

Maximum diameter of figured specimens (a) 0.32 mm,
(b) 0.35 mm.

Repository - (a) U.T.G.D. 84202,
(b) U.T.G.D. 84201.

Lagena mariae Karrer, 1877

(Pl. 3, fig. 103)

Lagena mariae Karrer, 1877, *Abh. geol. Bundesanst.*, Wien, 9, 378, pl. 166, fig. 16.

Remarks

Only one poorly preserved specimen was recovered from King Island (84081) and is very tentatively referred to this species.

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.48 mm.

Repository - U.T.G.D. 84204.

Lagena montagui Silvestri, 1902

(Pl. 3, fig. 104)

Lagena montagui Silvestri, 1902, *Memorie Accad. pont. Nuovi Lincei*, 19, 153, figs. 40-43.

Remarks

A single well preserved specimen with a strongly raised irregular network of ridges on its surface, is referred to this species. It is in part reminiscent of a coarse *L. hexagona* but the pits between ridges are irregular polygons not regular hexagons.

Occurrence - Fossil Bluff - 84013 (v).

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.35 mm.

Repository - U.T.G.D. 84205.

Lagena striata (d'Orbigny), 1839

(Pl. 3, fig. 105)

Oolina striata d'Orbigny, 1839, *Voyage dans l'Amerique Meriodionale-Foraminiferes*, Pitois Levrault and Co: Paris.

Lagena striata, Chapman and Parr, 1926, *Jl. Linn. Soc.*, 36, 374, pl. 17, fig. 5.

Lagena striata, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 80.

Lagena striata, Barker, 1960, *Spec. Publs Soc. econ. Paleont. Miner.*, Tulsa, 9, 118, pl. 57, figs. 19, 22, 24, 28.

Lagena striata, Ludbrook, 1961, *Bull. geol. Surv. S. Aust.*, 36, 19.

Lagena striata, Reed, 1965, *Bull. Am. Paleont.*, 49 (220), 67.

Remarks

This species, as with *L. laevis*, is interpreted in the broad sense, as is done by Barker (1960).

Occurrence - Fossil Bluff - 84010b (v), 84013 (v), 84014 (r), 84024 (v).

Age - Early Miocene, N4/5.

Figured specimen from 84013.

Maximum diameter of figured specimen 0.40 mm.

Repository - U.T.G.D. 84206.

Lagena sulcata (Walker and Jacob), 1798

(Pl. 3, fig. 106)

Serpula (Lagena) striata, sulcata, rotunda Walker and Boys, 1784, *Testacea minuta* ....,

J. March: London, 2, pl. 1, fig. 6.

Serpula (Lagena) sulcata Walker and Jacob, 1798, *Adams' essays on the microscope*, Dillon and Keating: London, 2nd edn., 634, pl. 14, fig. 5.

Vermiculum striatum Montagu, 1803, *Testacea Brittanica .....*, J.S. Hollis: Romsey, England, 523.

Lagena sulcata, Howchin, 1889, *Trans. Proc. R. Soc. S. Aust.*, 12, 8.

Lagena sulcata, Howchin, 1891, *Trans. Proc. R. Soc. S. Aust.*, 14, 351.

Lagena sulcata, Heron-Allen and Earland, 1924, *Jl R. microsc. Soc.*, (1924), pt. 2, 149, pl. 9, fig. 35.

Lagena sulcata, Chapman and Parr, 1926, *Jl. Linn. Soc.*, 36, 375, pl. 17, fig. 6.

Lagena sulcata, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 80.

Lagena sulcata, Crespin, 1954, *Rep. Bur. Miner. Resour. Geol. Geophys. Aust.*, 11, 4.

Lagena sulcata, Ludbrook, 1961, *Bull. geol. Surv. S. Aust.*, 36, 19.

Lagena sulcata, Reed, 1965, *Bull. Am. Paleont.*, 49 (220), 67.

Remarks

The name *Vermiculum striatum* Montagu, 1803 is apparently a senior homonym of *L. sulcata* (d'Orbigny), 1839. However usage would probably be a sufficient criterion for validity.

Occurrence - (a) Fossil Bluff - 84011 (v), 84024 (v), 84025b (v),
(b) Mt Cameron West - 84117 (r),
(c) Redpa - 84096 (v).

Age - Early Miocene, N4-8.

Figured specimen from Fossil Bluff (84011).

Maximum diameter of figured specimen 0.25 mm.

Repository - U.T.G.D. 84207.

Lagena tasmaniae Quilty n. sp.

(Pl. 3, fig. 107)

Diagnosis

Lagena characterised by having about 15 spiral ridges, twisting through 90° from neck to basal pole, these ridges being perforated by numerous, radial pores, the test surface between the ridges being smooth.

Description

Test free, small, unilocular, composed of very nearly spherical chamber 0.19 mm in diameter, with a neck 0.05 mm long and 0.05 mm wide at its base, which may, or may not, be clearly demarcated from the main chamber. Chamber "ornamented" with about 15

(seven visible from any side) spirally arranged thin ridges. The ridges are about 0.02 mm high, very thin and perforated by a large number of clear radially arranged pores. The ridges twist through about 90° from the neck to the basal pole of the chamber and are present on the neck.

Remarks

This species is named from only two specimens, of which only one (the holotype) was measured for the above description. The only close species are *L. spiralis* Brady, *L. spiralis* Brady var. *cubensis* Palmer and Bermudez, *L. torsicostata* Copeland and *L. tortilis* Egger. *L. spiralis* is most similar but has too few (about 10) spiral ridges. However, the ridges are perforate and rotate through about 90° so the two species seem closely related. *L. spiralis cubensis* differs in having a much more elongate, narrow neck and clear perforations in the chamber wall between the spiral ridges. *L. tortilis* has too many ridges, they are not distinct enough and they twist through something like 180°. The species is also relatively more elongate than this new species. *L. torsicostata* probably has too many ridges (12-24, average 20) and lacks the coarse perforations in the ridges.

Occurrence - (a) Fossil Bluff - 84011 (v) (holotype),
(b) Cape Grim - 84006 (v) (paratype).

Age - Early Miocene, N4/5.

Maximum diameter of holotype 0.25 mm.

Repository - (a) Holotype U.T.G.D. 84209,
(b) Paratype U.T.G.D. 84208.

Lagena sp A

(Pl. 3, fig. 108)

Lagena sp. nov. Barker, 1960, *Spec. Publs Soc. econ. Paleont. Miner.*, Tulsa, 9, 117, pl. 57, fig. 31.

Occurrence - (a) King Island - 84083 (v), 84086 (r),
(b) Cape Grim - 84006 (v), 84001 (v),
(c) Redpa - 84097 (v), 84096 (v),
(d) Marrawah district - 84113 (c).

Age - Early Miocene, N4-8.

Figured specimen from Cape Grim (84001).

Maximum diameter of figured specimen 0.26 mm.

Repository - U.T.G.D. 84210.

Lagena sp B.

(Pl. e, fig. 109)

Occurrence - (a) Fossil Bluff - 84012 (v),
(b) Marrawah district - 84107 (v).

Age - Early Miocene, N4/5, N8.

Figured specimen from Fossil Bluff.

Maximum diameter of figured specimen 0.17 mm.

Repository - U.T.G.D. 84211.

Lagena spp indet.

Occurrence - (a) Fossil Bluff - 84010a (v),
(b) King Island - 84477 (q),
(c) Redpa - 84094 (r).

Age - Early Miocene.

Genus *LENTICULINA* Lamarck, 1804

Lenticulina cf *chambersi* (Garrett), 1939
(Pl. 3, fig. 110)

Robulus chambersi Garrett, 1939, *J. Paleont.*, 13, 576, pl. 65, figs. 8,9.

Remarks
A single specimen very similar to this species was recovered from King Island (84082). It agrees with *L. chambersi* in having slightly elevated straight sutures, and only few chambers per whorl. However it does not seem to have the sharp keel of *L. chambersi* and is thus a little different.

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.80 mm.

Repository - U.T.G.D. 84212.

Lenticulina cultrata (de Montfort), 1808
(Pl. 4, fig. 111)

Robulus cultratus de Montfort, 1808, *Conchyliologie Systematique* ...., F. Schoell: Paris, 2, 215, fig. (p. 214).

Cristellaria cultrata, Howchin, 1889, *Trans. Proc. R. Soc. S. Aust.*, 12, 10.

Cristellaria cultrata, Howchin, 1891, *Trans. Proc. R. Soc. S. Aust.*, 14, 351.

Cristellaria cultrata, Chapman and Parr, 1926, *Jl. Linn. Soc.*, 36, 390, pl. 21, fig. 68.

Lenticulina cultrata, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 81.

Robulus cultratus, Hornibrook, 1961, *Paleont. Bull.*, Wellington, 34, (1), 38, pl. 4, fig. 62.

Robulus cultratus, Reed, 1965, *Bull. Am. Paleont.*, 49 (220), 67.

Remarks
This species is not identified from de Montfort's own figure (*op. cit.*, *fide* Ellis and Messina) but by comparison with various other figures (e.g. Stache, 1865; Chapman, 1926 etc.) and the identification depends on their accuracy. It is the most common species

of *Lenticulina* in the Tasmanian Tertiary.

Occurrence - (a) Mussel Roe Bay - 84483 (v), 84482 (v),
(b) Fossil Bluff - 84010a (v), 84011 (v), 84015 (r), 84019 (r), 84025a (v), 84024 (r), 84025b (v),
(c) Cape Grim - 84006 (v), 84003 (v),
(d) Mt Cameron West - 84121 (v), 84120 (v), 84117 (r),
(e) Brittons Swamp - 84480 (v),
(f) Redpa - 84093 (v),
(g) Marrawah district - 84092 (r), 84108 (r), 84110 (r), 84113 (q), 84114 (r), 84104 (r), 84101 (r), 84105 (r), 84016 (r), 84107 (r).

Age - Late Oligocene - Early Miocene, N3-8.

Figured specimen from Fossil Bluff (84109).

Maximum diameter of figured specimen 0.50 mm.

Repository - U.T.G.D. 84213.

Lenticulina gibba (d'Orbigny), 1839
(Pl. 4, fig. 112)

Cristellaria gibba d'Orbigny, (*in* de la Sagra, 1839), *Histoire physique, politique et naturelle de l'île de Cuba*, A. Bertrand: Paris, 40, 8, pl. 7, figs. 20, 21.

Cristellaria gibba, Heron-Allen and Earland, 1924, *Jl R. microsc. Soc.*, (1924), 160.

Cristellaria gibba, Chapman and Parr, 1926, *Jl. Linn. Soc.*, 36, 388, pl. 20, fig. 61.

Lenticulina gibba, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 81.

Occurrence - Mussel Roe Bay - 84483 (r).

Age - Late Oligocene - Early Miocene, N3-5.

Maximum diameter of figured specimen 0.65 mm.

Repository - U.T.G.D. 84400.

Lenticulina gyroscalpra (Stache), 1865
(Pl. 4, fig. 113)

? Cristellaria intermedia d'Orbigny var. *whaingeroica* Stache, 1865, *"Novara Expedn, Geol. Theil*, 1, 242, pl. 23, figs. 21a, b.

Cristellaria gyroscalprum Stache, 1865, *ibid.*, 245, pl. 23, figs. 22a, b.

Robulina foliata Stache, 1865, *ibid.*, 245, pl. 23, figs. 24a, b.

Cristellaria gyroscalprum, Chapman, 1926, *Palaeont. Bull.*, Wellington, 11, 62, pl. 4, figs. 21, 22, 24.

Lenticulina gyroscalprum, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 81.

Robulus gyroscalprus, Hornibrook, 1961, *Palaeont. Bull.*, Wellington, 34 (1), 36, pl. 5, fig. 67.

Robulus gyroscalprus, Reed, 1965, *Bull. Am. Paleont.* 49 (220), 67.

Robulus gyroscalprus, Hornibrook, 1971, *Palaeont. Bull.*, Wellington, 43, 43, pl. 9 figs. 160, 161.

Occurrence - (a) Mussel Roe Bay - 84483 (v), 84481 (r),
(b) Fossil Bluff - 84010b (v), 84011 (v), 84014 (r),
(c) Mt Cameron West - 84118 (v),
(d) Brittons Swamp - 84480 (r).

Age - Late Oligocene - Early Miocene, N3-N8.

Figured specimen from Fossil Bluff (84011).

Maximum diameter of figured specimen 0.26 mm.

Repository - U.T.G.D. 84214.

Lenticulina oblonga (Coryell and Rivero), 1940

(Pl. 4, fig. 119)

Robulus oblongus Coryell and Rivero, 1940, *J. Paleont.*, 14, 332, pl. 43, figs. 12a, b.

Remarks

Differs from typical *L. oblonga* in not having a sharply carinate periphery. However, number of chambers, characters of sutures, lack of an umbilical boss and straight periphery to each chamber suggest that this species probably fits well within the variation of *L. oblonga*.

Occurrence - (a) Mussel Roe Bay - 84483 (r),
(b) Cape Grim - 84008 (v), 84006 (v).

Age - Late Oligocene - Early Miocene, N3-N5.

Figured specimen from Cape Grim (84006).

Maximum diameter of figured specimen 0.55 mm.

Repository - U.T.G.D. 84215.

Lenticulina punctata (Rzehak), 1895

(Pl. 4, fig. 114)

Cristellaria punctata Rzehak, 1891, *Annln naturh. Mus.*, Wien, 6 (1), 3.

Cristellariopsis punctata, Rzehak, 1895, *ibid.*, 10, 227, pl. 6, fig. 12.

Occurrence - Fossil Bluff - 84011 (v).

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.38 mm.

Repository - U.T.G.D. 84216.

Lenticulina (?) triangularis (d'Orbigny), 1840

(Pl. 4, figs. 115, 116)

Cristellaria triangularis d'Orbigny, 1840, *Mem. Soc. geol. Fr.*, 4, 27, pl. 2, figs. 21, 22.

Remarks

A single very well preserved specimen from Fossil Bluff (84011) is questionably assigned to *L. triangularis*. Another similar species is *L. brachyspira* Reuss.

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.39 mm.

Repository - U.T.G.D. 84217.

Lenticulina sp.

(Pl. 4, figs. 117, 118)

Remarks

A single incomplete specimen of a slightly asymmetrical *Lenticulina* was found at Cape Grim (84006). While no positive identification is possible, the species does resemble *L. reniformis* (d'Orbigny), or some such species.

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.40 mm.

Repository - U.T.G.D. 84218.

Genus *MARGINULINOPSIS* Silvestri, 1904

Marginulinopsis hydropica Hornibrook, 1961

(Pl. 4, fig. 120)

Marginulinopsis hydropica Hornibrook, 1961, *Palaeont. Bull.*, Wellington, 34 (1), 43, pl. 5, figs. 74, 75, 79, 80.

Remarks

The two specimens found here agree very well with Hornibrook's figures and descriptions of the species. It is found here in rocks of Late Oligocene age (Janjukian) whereas, in New Zealand the species is a little older.

Occurrence - Mussel Roe Bay - 84483 (v).

Age - Early Miocene N4/5.

Maximum diameter of figured specimen 1.05 mm.

Repository - U.T.G.D. 84402

Genus *NODOSARIA* Lamarck, 1812

Nodosaria grossecostata Costa var. a, 1856

(Pl. 4, fig. 121)

Nodosaria grossecostata var. *a* Costa, 1856, *Atti R. Accad. pontan.*, 7 (2), 148, pl. 12, fig. 2.

Remarks

A single specimen showing a bulbous final chamber, and broken, cylindrical earlier parts of the test, was found in each of 3 samples. They appear identical with Costa's type figure of his variety a.

Occurrence - (a) Mussel Roe Bay - 84482 (v),
(b) Redpa - 84095 (v),
(c) Marrawah district - 84113 (v), 84105 (v).

Age - Early Miocene, N4-N8.

Figured specimen from 84113.

Maximum diameter of figured specimen 2.6 mm.

Repository - U.T.G.D. 84192.

Nodosaria hochstetteri Schwager, 1865

(Pl. 4, fig. 122)

Nodosaria hochstetteri Schwager, 1865, *"Novara" Expedn, Geol. Theil.*, 2 (2), 214, pl. 5, fig. 32.

Nodosaria hochstetteri, Hornibrook, 1961, *Palaeont. Bull.*, Wellington, 34 (1), 47, pl. 6, fig. 91.

Occurrence - Fossil Bluff - 84011 (v).

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 2.75 mm.

Repository - U.T.G.D. 84536.

Nodosaria lamnulifera Boomgaart, 1950

(Pl. 4, fig. 123)

Nodosaria bradyi Boomgaart, 1949, *Geogr. geol. Meded.*, 79, pl. 6, fig. 11.

Nodosaria lamnulifera Thalmann, 1950, *Contr. Cushman Fdn foramin. Res.*, 1, 42.

Nodosaria lamnulifera, Barker, 1960, *Spec. Publs Soc. econ. Paleont. Miner.*, Tulsa, 9, 134, pl. 64, figs. 6-10.

Remarks

Two fragmentary specimens have been identified by reference to Barker (1960).

Occurrence - Fossil Bluff - 84011 (v), 84017 (r).

Age - Early Miocene, N4/5.

Figured specimen from 84011.

Maximum diameter of figured specimen 0.65 mm.

Repository - U.T.G.D. 84191.

Nodosaria proxima Silvestri, 1872

(Pl. 4, fig. 124)

Nodosaria proxima Silvestri, 1872, *Atti Accad. gioenia Sci. nat.*, ser. 3, 1, 63, pl. 6, figs. 138-147.

Nodosaria proxima, Heron-Allen and Earland, 1924, *Jl R. microsc. Soc.*, (1924) pt. 2, 153.

Remarks

A single well preserved specimen from Marrawah (84107) is referred to this species. It is very similar to Silvestri's *(op. cit.)* fig. 138 which shows a specimen with spiral costae. Another similar species is *N. contorta* Hantken.

Age - Early Miocene, N8.

Maximum diameter of figured specimen 0.48 mm.

Repository - U.T.G.D. 84193.

Nodosaria separans Brady, 1884

(Pl. 4, fig. 125)

Nodosaria scalaris, Brady, 1884, *"Challenger" Expedn, Scient. Results, Zool.*, 9, 510, pl. 63, figs. 28-31.

Nodosaria scalaris var. *separans* Brady, 1884, *ibid.*, 511, pl. 64, figs. 16-19.

Nodosaria scalaris (Batsch) var. *biloculatis* Rhumbler, 1911, *Ergeb. Plankton Expedn Humboldt-Stiftung*, 3 (1), pl. 20, figs. 12-16.

Amphicoryna scalaris, Barker, 1960, *Spec. Publs Soc. econ. Paleont. Miner.*, Tulsa, 9, 136, pl. 63, figs. 28-31.

Amphicoryna separans, Barker, 1960, *ibid.*, 138, pl. 64, figs. 16-19.

Remarks

There seems to be no valid reason for separating this species from *Lagenonodosaria separans* Brady, but as *Amphicoryna* has priority, the species becomes *A. separans* (Brady). Silvestri (1902) has shown that *Amphicoryna*, being the microspheric form of some *Nodosaria* species, is biologically invalid. Hence the species is here regarded as a species of *Nodosaria*. It is doubtfully separable from *N. scalaris* (Batsch). In all specimens seen there are only two or three chambers.

Occurrence - (a) Fossil Bluff - 84024 (v), 84025b (v),

(b) Brittons Swamp - 84480 (v),

(c) Marrawah district - 84104 (v).

Age - Early Miocene, N4-N8.

Figured specimen from Brittons Swamp (84480).

Maximum diameter of figured specimen 0.62 mm.

Repository - U.T.G.D. 84487.

Nodosaria spp. indet.

Remarks
Only unidentifiable fragments are included under this heading.

Occurrence - (a) Fossil Bluff - 84011 (v),
(b) Mt Cameron West - 84121 (v), 84117 (v),
(c) Redpa - 84095 (v),
(d) Marrawah district - 84092 (v), 84113 (r), 84105 (v).

Age - Early Miocene.

Genus *VAGINULINA* d'Orbigny, 1826

Vaginulina sp.

Remarks
Two very poorly preserved specimens from Marrawah (84111) and one from Brittons Swamp (84480) are placed in this genus. None is figured.

Age - Early Miocene, N8.

Subfamily PLECTOFRONDICULARIINAE

Genus *BOLIVINELLA* Cushman, 1927

Bolivinella australis Cushman, 1929
(Pl. 4, fig. 126)

Textularia folium, Heron-Allen and Earland, 1924, *Jl R. microsc. Soc.*, (1924) pt. 2, 135.

Bolivinella folia, Cushman, 1927, *Contr. Cushman Lab. foramin. Res.* 2 (4), 79.

Bolivinella australis Cushman, 1929, *Contr. Cushman Lab. foramin. Res.*, 5 (2), 32, pl. 5, figs. 6, 7.

Bolivinella folia, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 77.

Occurrence - (a) Fossil Bluff - 84010a (v),
(b) Cape Grim - 84005 (r), 84001 (v).

Age - Early Miocene, N4/5.

Figured specimen from Fossil Bluff (84010a).

Maximum diameter of figured specimen 0.35 mm.

Repository - U.T.G.D. 84219.

Family POLYMORPHINIDAE

Subfamily POLYMORPHININAE

Genus *GLOBULINA* d'Orbigny, 1839

Globulina gibba (d'Orbigny), 1826

(Pl. 4, fig. 127)

Polymorphina (Globuline) gibba d'Orbigny, 1826, *Annls Sci. nat.*, ser. 1, 7, 266.

Polymorphina gibba, Howchin, 1889, *Trans. Proc. R. Soc. S. Aust.*, 12, 10.

Polymorphina gibba, Howchin, 1891, *Trans. Proc. R. Soc. S. Aust.*, 14, 351.

Polymorphina gibba, Heron-Allen and Earland, 1924, *Jl R. microsc. Soc.*, (1924), pt. 2, 162.

Polymorphina gibba, Chapman and Parr, 1926, *J. Linn. Soc.*, 36, 391, pl. 21, fig. 71.

Globulina gibba, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 80.

Globulina gibba, Reed, 1965, *Bull. Am. Paleont.*, 49 (220), 68.

Occurrence - Fossil Bluff - 84010a (v).

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.80 mm.

Repository - U.T.G.D. 84220.

Genus *GUTTULINA* d'Orbigny, 1839

Guttulina communis (d'Orbigny), 1826

(Pl. 4, figs. 128, 129)

Polymorphina (Guttulina) communis d'Orbigny, 1826, *Annls Sci. nat.*, ser. 1, 7, 26.

Guttulina problema Parr and Collins, 1937, *Proc. R. Soc. Vict.*, n.s. 50, 191, pl. 12, fig. 1.

Remarks

A very widespread, but usually rare species, it is one of the few species of foraminifera previously recorded from Fossil Bluff (Parr and Collins, 1937, p. 191).

Occurrence -

(a) Mussel Roe Bay - 84483 (r), 84481 (q), 84482 (q),

(b) Fossil Bluff - 84010a (q), 84010b (r), 84012 (v), 84013 (r), 84022 (q), 84023 (r), 84025a (r), 84024 (v), 84025b (q).

(c) King Island - 84084 (v), 84085 (v), 84082 (r), 84089 (p),

(d) Cape Grim - 84008 (r), 84007 (r), 84005 (r), 84001 (v),

(e) Mt Cameron West - 84118 (r), 84121 (v), 84120 (v), 84117 (r),

(f) Brittons Swamp - 84480 (r),

(g) Redpa - 84097 (v), 84093 (q), 84094 (r), 84095 (r), 84096 (r),

(h) Granville Harbour - 54144 (q),

(i) Preservation Island - 84479 (r),

(j) Marrawah district - 84092 (r), 84108 (r), 84109 (q), 84110 (q), 84111 (q), 84113 (r), 84114 (v), 84115 (v), 84104 (r), 84101 (r), 84105 (q), 84106 (q), 84107 (q).

Age - Late Oligocene - Early Miocene, N3-N8.

Figured specimen from Fossil Bluff (84010a).

Maximum diameter of figured specimen 0.70 mm.

Repository - U.T.G.D. 84221.

Guttulina frankei Cushman and Ozawa, 1930

(Pl. 4, fig. 130)

Polymorphina lactea var. *cuspidata* Franke, 1925, *Abh. Ber. Mus. Nat. u. Heimatk. (Naturk. Vorgesch.) Madgeburg* (1925), 177, pl. 6, fig. 46b.

Guttulina frankei Cushman and Ozawa, 1930, *Proc. U.S. natn. Mus.*, 77, art. 6, 28, pl. 4, figs. 1a-c.

Remarks

In a few samples, typical specimens are found. The figured specimen is a little atypical in having a single distinct ridge on the distal part of several chambers.

Occurrence - (a) Mussel Roe Bay - 84482 (r),

(b) Fossil Bluff - 84010b (v), 84022 (v), 84024 (v),

(c) Redpa - 84093 (v).

Age - Early Miocene, N4-N8.

Figured specimen from Fossil Bluff (84010b).

Maximum diameter of figured specimen 0.92 mm.

Repository - U.T.G.D. 84222.

Guttulina lactea (Walker and Jacob), 1798

(Pl. 4, fig. 131)

Serpula tenuis ovalis laevis Walker and Boys, 1784, *Testacea minuta* ...., J. March: London, 2, pl. 1, fig. 5.

Serpula lactea Walker and Jacob, 1798, *Adams' essays on the microscope*, Dillon and Keating: London, 2nd Edn., 634, pl. 14, fig. 4.

Polymorphina lactea, Howchin, 1889, *Trans. Proc. R. Soc. S. Aust.*, 12, 10.

Polymorphina lactea, Howchin, 1891, *Trans. Proc. R. Soc. S. Aust.*, 14, 352.

The bend in the axis of the species is so slight that even the generic change from *Nodosaria* to *Dentalina* is mainly a pedantic one.

Occurrence - Fossil Bluff - 84012 (v).

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.62 mm.

Repository - U.T.G.D. 84197.

Dentalina subcostata Chapman, 1926

(Pl. 3, fig. 94)

Nodosaria (Dentaline) obliqua Linne var. *subcostata* Chapman, 1926, *Palaeont. Bull.*, Wellington, 11, 51, pl. 11, fig. 3.

Dentalina subcostata, Finlay, 1946, *Trans. R. Soc. N.Z.* 76 (2), 243.

Dentalina subcostata, Hornibrook, 1961, *Palaeont. Bull.*, Wellington, 34 (1), 45, pl. 6, fig. 88.

Occurrence - Fossil Bluff - 84010a (v).

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 2.90 mm.

Repository - U.T.G.D. 84537.

Dentalina subsoluta (Cushman), 1923

(Pl. 3, fig. 95)

Nodosaria subsoluta Cushman, 1923, *Bull. U.S. natn. Mus.*, 104 (4), 74, pl. 13, fig. 1.

Nodosaria soluta, Heron-Allen and Earland, 1924, *Jl R. microsc. Soc.*, (1924), pt. 2, 155.

Nodosaria (Dentalina) soluta, Chapman and Parr, 1926, *Jl Linn. Soc.*, 36, 383, pl. 19, fig. 40.

Dentalina soluta, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 78.

Occurrence - Mussel Roe Bay, 84483 (v).

Age - Late Oligocene, N3.

Maximum diameter of figured specimen 2.1 mm.

Repository - U.T.G.D. 84295.

Genus *DIMORPHINA* d'Orbigny, 1826

Dimorphina sp.

(Pl. 3, fig. 96)

Remarks

A single poorly preserved specimen is referred to this genus. It does not appear

to belong to any previously defined genus. It may be a *Marginulina* as the detail of the early chambers is not clear.

Occurrence - Marrawah district - 84110 (v).

Age - Early Miocene, N8.

Maximum diameter of figured specimen 0.55 mm.

Repository - U.T.G.D. 84199.

Genus *LAGENA* Walker and Jacob, 1798

Lagena aspera Reuss, 1862

(Pl. 3, fig. 97)

Lagena aspera Reuss, 1862, *Sber. Akad. Wiss.*, Wien, 44 (1), 305, pl. 1, fig. 5.

Lagena aspera, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 80.

Remarks

The species recorded here seems to be identical with one figured by Brady (1884, pl. 57, fig. 11) and Barker (1960) as *L. aspera*. It seems close to *L. aspera* var. *spinifera* Chapman, in that it has a spherical test with short neck. However, no spines are evident.

Occurrence - Mussel Roe Bay - 84483 (v).

Age - Late Oligocene, N3.

Maximum diameter of figured specimen 0.29 mm.

Repository - U.T.G.D. 84371.

Lagena hexagona (Williamson), 1848

(Pl. 3, fig. 98)

Entosolenia squamosa (Montagu) var. *hexagona* Williamson, 1848, *Ann. Mag. nat. Hist.*, ser. 2, 1, 20, pl. 2, fig. 23.

Lagena hexagona, Howchin, 1889, *Trans. Proc. R. Soc. S. Aust.*, 12, 8.

Lagena hexagona, Howchin, 1891, *Trans. Proc. R. Soc. S. Aust.*, 14, 351.

Lagena hexagona, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 80.

Lagena hexagona, Ludbrook, 1961, *Bull. geol. Surv. S. Aust.*, 36, 19.

Remarks

The practice of taxonomists in listing this species has been to give Williamson the credit for placing the species in *Lagena* by not putting his name in parentheses after the specific name. Williamson placed the species in *Entosolenia*. The position is similar to a case in which var. *hexagona* Williamson is first given full specific rank within the genus *Entosolenia* and becomes *Entosolenia hexagona* Williamson. A later revisor would then change the generic assignation from *Entosolenia* to *Lagena*. Williamson's name then should be placed in parentheses.

Occurrence - (a) Mussel Roe Bay - 84483 (v),
(b) Fossil Bluff - 84011 (v), 84012 (r), 84022 (v), 84024 (v),
(c) Mt. Cameron West - 84118 (r),
(d) Granville Harbour - 54144 (q),
(e) Redpa - 84096 (v),
(f) Marrawah district - 84105 (v).

Age - Late Oligocene - Early Miocene, N3-8.

Figured specimen from Fossil Bluff (84011).

Maximum diameter of figured specimen 0.30 mm.

Repository - U.T.G.D. 84486.

Lagena hispida Reuss, 1863
(Pl. 3, fig. 99)

Lagena hispida Reuss, 1863, *Sber. Akad. Wiss.*, Wien., 46 (1), 335, pl. 6, figs. 77-79.

Lagena hispida, Chapman and Parr, 1926, *Jl Linn. Soc.*, 36, 375, pl. 17, fig. 9.

Lagena hispida, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 80.

Occurrence - (a) Fossil Bluff - 84015 (q), 84019 (v), 84024 (v), 84025b (v),
(b) Redpa - 84095 (v).

Age - Early Miocene, N4/5, N8.

Figured specimen from Fossil Bluff (84019).

Maximum diameter of figured specimen 0.32 mm.

Repository - U.T.G.D. 84200.

Lagena hispidula Cushman, 1913
(Pl. 3, fig. 100)

Lagena laevis, Brady, 1884, *"Challenger" Expedn, Scient. Results, Zool.*, 9, 455, pl. 56, figs. 10, 11.

Lagena hispidula Cushman, 1913, *Bull. U.S. natn. Mus.*, 71 (3), 14, pl. 5, figs. 2, 3.

Remarks
One well preserved, finely hirsute specimen from Fossil Bluff (84013) is referred to this species.

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.27 mm.

Repository - U.T.G.D. 84203.

Lagena laevis (Montagu), 1803

(Pl. 3, figs. 101, 102)

Serpula (Lagena) laevis ovalis Walker and Boys, 1784, *Testacea minuta* ....., J. March: London, 3, pl. 1, fig. 9.

Vermiculum laeve, Montagu, 1803, *Testacea Brittanica* ....., J.S. Hollis: Romsey, England, 524.

Lagena laevis, Howchin, 1891, *Trans. Proc. R. Soc. S. Aust.*, 14, 351.

Lagena laevis, Chapman and Parr, 1926, *Jl Linn. Soc.*, 36, 373, pl. 17, fig. 1.

Lagena laevis, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 80.

Lagena laevis, Crespin, 1954, *Rep. Bur. Miner. Resour. Geol. Geophys. Aust.*, 11, 4.

Lagena laevis, Barker, 1960, *Spec. Publs Soc. econ. Paleont. Miner.*, Tulsa, 9, 118, pl. 57, figs. 14, 16-18, 23, 25-27.

Remarks

In this work, this species has been interpreted rather widely following Barker *(op. cit.)*. Two specimens are figured. The Marrawah record is doubtful as the two specimens are very poorly preserved.

Occurrence - (a) Fossil Bluff - 84010 (v), 84011 (v), 84015 (r), 84019 (v), 84025b (v),
(b) Mt Cameron West - 84120 (v),
(c) Marrawah district - 84109 (r), 84114 (v).

Age - Early Miocene, N4-8.

Figured specimens from Fossil Bluff (a) 84010a,
(b) 84011.

Maximum diameter of figured specimens (a) 0.32 mm,
(b) 0.35 mm.

Repository - (a) U.T.G.D. 84202,
(b) U.T.G.D. 84201.

Lagena mariae Karrer, 1877

(Pl. 3, fig. 103)

Lagena mariae Karrer, 1877, *Abh. geol. Bundesanst.*, Wien, 9, 378, pl. 166, fig. 16.

Remarks

Only one poorly preserved specimen was recovered from King Island (84081) and is very tentatively referred to this species.

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.48 mm.

Repository - U.T.G.D. 84204.

Lagena montagui Silvestri, 1902

(Pl. 3, fig. 104)

Lagena montagui Silvestri, 1902, *Memorie Accad. pont. Nuovi Lincei*, 19, 153, figs. 40-43.

Remarks

A single well preserved specimen with a strongly raised irregular network of ridges on its surface, is referred to this species. It is in part reminiscent of a coarse *L. hexagona* but the pits between ridges are irregular polygons not regular hexagons.

Occurrence - Fossil Bluff - 84013 (v).

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.35 mm.

Repository - U.T.G.D. 84205.

Lagena striata (d'Orbigny), 1839

(Pl. 3, fig. 105)

Oolina striata d'Orbigny, 1839, *Voyage dans l'Amerique Meriodionale-Foraminiferes*, Pitois Levrault and Co: Paris.

Lagena striata, Chapman and Parr, 1926, *Jl. Linn. Soc.*, 36, 374, pl. 17, fig. 5.

Lagena striata, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 80.

Lagena striata, Barker, 1960, *Spec. Publs Soc. econ. Paleont. Miner.*, Tulsa, 9, 118, pl. 57, figs. 19, 22, 24, 28.

Lagena striata, Ludbrook, 1961, *Bull. geol. Surv. S. Aust.*, 36, 19.

Lagena striata, Reed, 1965, *Bull. Am. Paleont.*, 49 (220), 67.

Remarks

This species, as with *L. laevis*, is interpreted in the broad sense, as is done by Barker (1960).

Occurrence - Fossil Bluff - 84010b (v), 84013 (v), 84014 (r), 84024 (v).

Age - Early Miocene, N4/5.

Figured specimen from 84013.

Maximum diameter of figured specimen 0.40 mm.

Repository - U.T.G.D. 84206.

Lagena sulcata (Walker and Jacob), 1798

(Pl. 3, fig. 106)

Serpula (Lagena) striata, sulcata, rotunda Walker and Boys, 1784, *Testacea minuta* ....,

J. March: London, 2, pl. 1, fig. 6.

Serpula (Lagena) sulcata Walker and Jacob, 1798, *Adams' essays on the microscope*, Dillon and Keating: London, 2nd edn., 634, pl. 14, fig. 5.

Vermiculum striatum Montagu, 1803, *Testacea Brittanica .....*, J.S. Hollis: Romsey, England, 523.

Lagena sulcata, Howchin, 1889, *Trans. Proc. R. Soc. S. Aust.*, 12, 8.

Lagena sulcata, Howchin, 1891, *Trans. Proc. R. Soc. S. Aust.*, 14, 351.

Lagena sulcata, Heron-Allen and Earland, 1924, *Jl R. microsc. Soc.*, (1924), pt. 2, 149, pl. 9, fig. 35.

Lagena sulcata, Chapman and Parr, 1926, *Jl. Linn. Soc.*, 36, 375, pl. 17, fig. 6.

Lagena sulcata, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 80.

Lagena sulcata, Crespin, 1954, *Rep. Bur. Miner. Resour. Geol. Geophys. Aust.*, 11, 4.

Lagena sulcata, Ludbrook, 1961, *Bull. geol. Surv. S. Aust.*, 36, 19.

Lagena sulcata, Reed, 1965, *Bull. Am. Paleont.*, 49 (220), 67.

Remarks

The name *Vermiculum striatum* Montagu, 1803 is apparently a senior homonym of *L. sulcata* (d'Orbigny), 1839. However usage would probably be a sufficient criterion for validity.

Occurrence - (a) Fossil Bluff - 84011 (v), 84024 (v), 84025b (v),
(b) Mt Cameron West - 84117 (r),
(c) Redpa - 84096 (v).

Age - Early Miocene, N4-8.

Figured specimen from Fossil Bluff (84011).

Maximum diameter of figured specimen 0.25 mm.

Repository - U.T.G.D. 84207.

Lagena tasmaniae Quilty n. sp.

(Pl. 3, fig. 107)

Diagnosis

Lagena characterised by having about 15 spiral ridges, twisting through 90° from neck to basal pole, these ridges being perforated by numerous, radial pores, the test surface between the ridges being smooth.

Description

Test free, small, unilocular, composed of very nearly spherical chamber 0.19 mm in diameter, with a neck 0.05 mm long and 0.05 mm wide at its base, which may, or may not, be clearly demarcated from the main chamber. Chamber "ornamented" with about 15

(seven visible from any side) spirally arranged thin ridges. The ridges are about 0.02 mm high, very thin and perforated by a large number of clear radially arranged pores. The ridges twist through about 90° from the neck to the basal pole of the chamber and are present on the neck.

Remarks

This species is named from only two specimens, of which only one (the holotype) was measured for the above description. The only close species are *L. spiralis* Brady, *L. spiralis* Brady var. *cubensis* Palmer and Bermudez, *L. torsicostata* Copeland and *L. tortilis* Egger. *L. spiralis* is most similar but has too few (about 10) spiral ridges. However, the ridges are perforate and rotate through about 90° so the two species seem closely related. *L. spiralis cubensis* differs in having a much more elongate, narrow neck and clear perforations in the chamber wall between the spiral ridges. *L. tortilis* has too many ridges, they are not distinct enough and they twist through something like 180°. The species is also relatively more elongate than this new species. *L. torsicostata* probably has too many ridges (12-24, average 20) and lacks the coarse perforations in the ridges.

Occurrence - (a) Fossil Bluff - 84011 (v) (holotype),
(b) Cape Grim - 84006 (v) (paratype).

Age - Early Miocene, N4/5.

Maximum diameter of holotype 0.25 mm.

Repository - (a) Holotype U.T.G.D. 84209,
(b) Paratype U.T.G.D. 84208.

Lagena sp A

(Pl. 3, fig. 108)

Lagena sp. nov. Barker, 1960, *Spec. Publs Soc. econ. Paleont. Miner.*, Tulsa, 9, 117, pl. 57, fig. 31.

Occurrence - (a) King Island - 84083 (v), 84086 (r),
(b) Cape Grim - 84006 (v), 84001 (v),
(c) Redpa - 84097 (v), 84096 (v),
(d) Marrawah district - 84113 (c).

Age - Early Miocene, N4-8.

Figured specimen from Cape Grim (84001).

Maximum diameter of figured specimen 0.26 mm.

Repository - U.T.G.D. 84210.

Lagena sp B.

(Pl. e, fig. 109)

Occurrence - (a) Fossil Bluff - 84012 (v),
(b) Marrawah district - 84107 (v).

Age - Early Miocene, N4/5, N8.

Figured specimen from Fossil Bluff.

Maximum diameter of figured specimen 0.17 mm.

Repository - U.T.G.D. 84211.

Lagena spp indet.

Occurrence - (a) Fossil Bluff - 84010a (v),
(b) King Island - 84477 (q),
(c) Redpa - 84094 (r).

Age - Early Miocene.

Genus *LENTICULINA* Lamarck, 1804

Lenticulina cf *chambersi* (Garrett), 1939
(Pl. 3, fig. 110)

Robulus chambersi Garrett, 1939, *J. Paleont.*, 13, 576, pl. 65, figs. 8,9.

Remarks
A single specimen very similar to this species was recovered from King Island (84082). It agrees with *L. chambersi* in having slightly elevated straight sutures, and only few chambers per whorl. However it does not seem to have the sharp keel of *L. chambersi* and is thus a little different.

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.80 mm.

Repository - U.T.G.D. 84212.

Lenticulina cultrata (de Montfort), 1808
(Pl. 4, fig. 111)

Robulus cultratus de Montfort, 1808, *Conchyliologie Systematique* ...., F. Schoell: Paris, 2, 215, fig. (p. 214).

Cristellaria cultrata, Howchin, 1889, *Trans. Proc. R. Soc. S. Aust.*, 12, 10.

Cristellaria cultrata, Howchin, 1891, *Trans. Proc. R. Soc. S. Aust.*, 14, 351.

Cristellaria cultrata, Chapman and Parr, 1926, *Jl. Linn. Soc.*, 36, 390, pl. 21, fig. 68.

Lenticulina cultrata, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 81.

Robulus cultratus, Hornibrook, 1961, *Paleont. Bull.*, Wellington, 34, (1), 38, pl. 4, fig. 62.

Robulus cultratus, Reed, 1965, *Bull. Am. Paleont.*, 49 (220), 67.

Remarks
This species is not identified from de Montfort's own figure (*op. cit.*, *fide* Ellis and Messina) but by comparison with various other figures (e.g. Stache, 1865; Chapman, 1926 etc.) and the identification depends on their accuracy. It is the most common species

of *Lenticulina* in the Tasmanian Tertiary.

Occurrence - (a) Mussel Roe Bay - 84483 (v), 84482 (v),
(b) Fossil Bluff - 84010a (v), 84011 (v), 84015 (r), 84019 (r), 84025a (v), 84024 (r), 84025b (v),
(c) Cape Grim - 84006 (v), 84003 (v),
(d) Mt Cameron West - 84121 (v), 84120 (v), 84117 (r),
(e) Brittons Swamp - 84480 (v),
(f) Redpa - 84093 (v),
(g) Marrawah district - 84092 (r), 84108 (r), 84110 (r), 84113 (q), 84114 (r), 84104 (r), 84101 (r), 84105 (r), 84016 (r), 84107 (r).

Age - Late Oligocene - Early Miocene, N3-8.

Figured specimen from Fossil Bluff (84109).

Maximum diameter of figured specimen 0.50 mm.

Repository - U.T.G.D. 84213.

Lenticulina gibba (d'Orbigny), 1839
(Pl. 4, fig. 112)

Cristellaria gibba d'Orbigny, (*in* de la Sagra, 1839), *Histoire physique, politique et naturelle de l'île de Cuba*, A. Bertrand: Paris, 40, 8, pl. 7, figs. 20, 21.

Cristellaria gibba, Heron-Allen and Earland, 1924, *Jl R. microsc. Soc.*, (1924), 160.

Cristellaria gibba, Chapman and Parr, 1926, *Jl. Linn. Soc.*, 36, 388, pl. 20, fig. 61.

Lenticulina gibba, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 81.

Occurrence - Mussel Roe Bay - 84483 (r).

Age - Late Oligocene - Early Miocene, N3-5.

Maximum diameter of figured specimen 0.65 mm.

Repository - U.T.G.D. 84400.

Lenticulina gyroscalpra (Stache), 1865
(Pl. 4, fig. 113)

? Cristellaria intermedia d'Orbigny var. *whaingeroica* Stache, 1865, *"Novara Expedn, Geol. Theil*, 1, 242, pl. 23, figs. 21a, b.

Cristellaria gyroscalprum Stache, 1865, *ibid.*, 245, pl. 23, figs. 22a, b.

Robulina foliata Stache, 1865, *ibid.*, 245, pl. 23, figs. 24a, b.

Cristellaria gyroscalprum, Chapman, 1926, *Palaeont. Bull.*, Wellington, 11, 62, pl. 4, figs. 21, 22, 24.

Lenticulina gyroscalprum, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 81.

Robulus gyroscalprus, Hornibrook, 1961, *Palaeont. Bull.*, Wellington, 34 (1), 36, pl. 5, fig. 67.

Robulus gyroscalprus, Reed, 1965, *Bull. Am. Paleont.* 49 (220), 67.

Robulus gyroscalprus, Hornibrook, 1971, *Palaeont. Bull.*, Wellington, 43, 43, pl. 9 figs. 160, 161.

Occurrence - (a) Mussel Roe Bay - 84483 (v), 84481 (r),
(b) Fossil Bluff - 84010b (v), 84011 (v), 84014 (r),
(c) Mt Cameron West - 84118 (v),
(d) Brittons Swamp - 84480 (r).

Age - Late Oligocene - Early Miocene, N3-N8.

Figured specimen from Fossil Bluff (84011).

Maximum diameter of figured specimen 0.26 mm.

Repository - U.T.G.D. 84214.

Lenticulina oblonga (Coryell and Rivero), 1940

(Pl. 4, fig. 119)

Robulus oblongus Coryell and Rivero, 1940, *J. Paleont.*, 14, 332, pl. 43, figs. 12a, b.

Remarks

Differs from typical *L. oblonga* in not having a sharply carinate periphery. However, number of chambers, characters of sutures, lack of an umbilical boss and straight periphery to each chamber suggest that this species probably fits well within the variation of *L. oblonga*.

Occurrence - (a) Mussel Roe Bay - 84483 (r),
(b) Cape Grim - 84008 (v), 84006 (v).

Age - Late Oligocene - Early Miocene, N3-N5.

Figured specimen from Cape Grim (84006).

Maximum diameter of figured specimen 0.55 mm.

Repository - U.T.G.D. 84215.

Lenticulina punctata (Rzehak), 1895

(Pl. 4, fig. 114)

Cristellaria punctata Rzehak, 1891, *Annln naturh. Mus.*, Wien, 6 (1), 3.

Cristellariopsis punctata, Rzehak, 1895, *ibid.*, 10, 227, pl. 6, fig. 12.

Occurrence - Fossil Bluff - 84011 (v).

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.38 mm.

Repository - U.T.G.D. 84216.

Lenticulina (?) triangularis (d'Orbigny), 1840

(Pl. 4, figs. 115, 116)

Cristellaria triangularis d'Orbigny, 1840, *Mem. Soc. geol. Fr.*, 4, 27, pl. 2, figs. 21, 22.

Remarks

A single very well preserved specimen from Fossil Bluff (84011) is questionably assigned to *L. triangularis*. Another similar species is *L. brachyspira* Reuss.

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.39 mm.

Repository - U.T.G.D. 84217.

Lenticulina sp.

(Pl. 4, figs. 117, 118)

Remarks

A single incomplete specimen of a slightly asymmetrical *Lenticulina* was found at Cape Grim (84006). While no positive identification is possible, the species does resemble *L. reniformis* (d'Orbigny), or some such species.

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.40 mm.

Repository - U.T.G.D. 84218.

Genus *MARGINULINOPSIS* Silvestri, 1904

Marginulinopsis hydropica Hornibrook, 1961

(Pl. 4, fig. 120)

Marginulinopsis hydropica Hornibrook, 1961, *Palaeont. Bull.*, Wellington, 34 (1), 43, pl. 5, figs. 74, 75, 79, 80.

Remarks

The two specimens found here agree very well with Hornibrook's figures and descriptions of the species. It is found here in rocks of Late Oligocene age (Janjukian) whereas, in New Zealand the species is a little older.

Occurrence - Mussel Roe Bay - 84483 (v).

Age - Early Miocene N4/5.

Maximum diameter of figured specimen 1.05 mm.

Repository - U.T.G.D. 84402

Genus *NODOSARIA* Lamarck, 1812

Nodosaria grossecostata Costa var. a, 1856

(Pl. 4, fig. 121)

Nodosaria grossecostata var. *a* Costa, 1856, *Atti R. Accad. pontan.*, 7 (2), 148, pl. 12, fig. 2.

Remarks

A single specimen showing a bulbous final chamber, and broken, cylindrical earlier parts of the test, was found in each of 3 samples. They appear identical with Costa's type figure of his variety a.

Occurrence - (a) Mussel Roe Bay - 84482 (v),
(b) Redpa - 84095 (v),
(c) Marrawah district - 84113 (v), 84105 (v).

Age - Early Miocene, N4-N8.

Figured specimen from 84113.

Maximum diameter of figured specimen 2.6 mm.

Repository - U.T.G.D. 84192.

Nodosaria hochstetteri Schwager, 1865

(Pl. 4, fig. 122)

Nodosaria hochstetteri Schwager, 1865, *"Novara" Expedn, Geol. Theil.*, 2 (2), 214, pl. 5, fig. 32.

Nodosaria hochstetteri, Hornibrook, 1961, *Palaeont. Bull.*, Wellington, 34 (1), 47, pl. 6, fig. 91.

Occurrence - Fossil Bluff - 84011 (v).

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 2.75 mm.

Repository - U.T.G.D. 84536.

Nodosaria lamnulifera Boomgaart, 1950

(Pl. 4, fig. 123)

Nodosaria bradyi Boomgaart, 1949, *Geogr. geol. Meded.*, 79, pl. 6, fig. 11.

Nodosaria lamnulifera Thalmann, 1950, *Contr. Cushman Fdn foramin. Res.*, 1, 42.

Nodosaria lamnulifera, Barker, 1960, *Spec. Publs Soc. econ. Paleont. Miner.*, Tulsa, 9, 134, pl. 64, figs. 6-10.

Remarks

Two fragmentary specimens have been identified by reference to Barker (1960).

Occurrence - Fossil Bluff - 84011 (v), 84017 (r).

Age - Early Miocene, N4/5.

Figured specimen from 84011.

Maximum diameter of figured specimen 0.65 mm.

Repository - U.T.G.D. 84191.

Nodosaria proxima Silvestri, 1872

(Pl. 4, fig. 124)

Nodosaria proxima Silvestri, 1872, *Atti Accad. gioenia Sci. nat.*, ser. 3, 1, 63, pl. 6, figs. 138-147.

Nodosaria proxima, Heron-Allen and Earland, 1924, *Jl R. microsc. Soc.*, (1924) pt. 2, 153.

Remarks

A single well preserved specimen from Marrawah (84107) is referred to this species. It is very similar to Silvestri's *(op. cit.)* fig. 138 which shows a specimen with spiral costae. Another similar species is *N. contorta* Hantken.

Age - Early Miocene, N8.

Maximum diameter of figured specimen 0.48 mm.

Repository - U.T.G.D. 84193.

Nodosaria separans Brady, 1884

(Pl. 4, fig. 125)

Nodosaria scalaris, Brady, 1884, *"Challenger" Expedn, Scient. Results, Zool.*, 9, 510, pl. 63, figs. 28-31.

Nodosaria scalaris var. *separans* Brady, 1884, *ibid.*, 511, pl. 64, figs. 16-19.

Nodosaria scalaris (Batsch) var. *bilocularis* Rhumbler, 1911, *Ergeb. Plankton Expedn Humboldt-Stiftung*, 3 (1), pl. 20, figs. 12-16.

Amphicoryna scalaris, Barker, 1960, *Spec. Publs Soc. econ. Paleont. Miner.*, Tulsa, 9, 136, pl. 63, figs. 28-31.

Amphicoryna separans, Barker, 1960, *ibid.*, 138, pl. 64, figs. 16-19.

Remarks

There seems to be no valid reason for separating this species from *Lagenonodosaria separans* Brady, but as *Amphicoryna* has priority, the species becomes *A. separans* (Brady). Silvestri (1902) has shown that *Amphicoryna*, being the microspheric form of some *Nodosaria* species, is biologically invalid. Hence the species is here regarded as a species of *Nodosaria*. It is doubtfully separable from *N. scalaris* (Batsch). In all specimens seen there are only two or three chambers.

Occurrence - (a) Fossil Bluff - 84024 (v), 84025b (v),

(b) Brittons Swamp - 84480 (v),

(c) Marrawah district - 84104 (v).

Age - Early Miocene, N4-N8.

Figured specimen from Brittons Swamp (84480).

Maximum diameter of figured specimen 0.62 mm.

Repository - U.T.G.D. 84487.

Nodosaria spp. indet.

Remarks
Only unidentifiable fragments are included under this heading.

Occurrence - (a) Fossil Bluff - 84011 (v),
(b) Mt Cameron West - 84121 (v), 84117 (v),
(c) Redpa - 84095 (v),
(d) Marrawah district - 84092 (v), 84113 (r), 84105 (v).

Age - Early Miocene.

Genus *VAGINULINA* d'Orbigny, 1826

Vaginulina sp.

Remarks
Two very poorly preserved specimens from Marrawah (84111) and one from Brittons Swamp (84480) are placed in this genus. None is figured.

Age - Early Miocene, N8.

Subfamily PLECTOFRONDICULARIINAE

Genus *BOLIVINELLA* Cushman, 1927

Bolivinella australis Cushman, 1929
(Pl. 4, fig. 126)

Textularia folium, Heron-Allen and Earland, 1924, *Jl R. microsc. Soc.*, (1924) pt. 2, 135.

Bolivinella folia, Cushman, 1927, *Contr. Cushman Lab. foramin. Res.* 2 (4), 79.

Bolivinella australis Cushman, 1929, *Contr. Cushman Lab. foramin. Res.*, 5 (2), 32, pl. 5, figs. 6, 7.

Bolivinella folia, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 77.

Occurrence - (a) Fossil Bluff - 84010a (v),
(b) Cape Grim - 84005 (r), 84001 (v).

Age - Early Miocene, N4/5.

Figured specimen from Fossil Bluff (84010a).

Maximum diameter of figured specimen 0.35 mm.

Repository - U.T.G.D. 84219.

Family POLYMORPHINIDAE

Subfamily POLYMORPHININAE

Genus *GLOBULINA* d'Orbigny, 1839

Globulina gibba (d'Orbigny), 1826

(Pl. 4, fig. 127)

Polymorphina (Globuline) gibba d'Orbigny, 1826, *Annls Sci. nat.*, ser. 1, 7, 266.

Polymorphina gibba, Howchin, 1889, *Trans. Proc. R. Soc. S. Aust.*, 12, 10.

Polymorphina gibba, Howchin, 1891, *Trans. Proc. R. Soc. S. Aust.*, 14, 351.

Polymorphina gibba, Heron-Allen and Earland, 1924, *Jl R. microsc. Soc.*, (1924), pt. 2, 162.

Polymorphina gibba, Chapman and Parr, 1926, *J. Linn. Soc.*, 36, 391, pl. 21, fig. 71.

Globulina gibba, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 80.

Globulina gibba, Reed, 1965, *Bull. Am. Paleont.*, 49 (220), 68.

Occurrence - Fossil Bluff - 84010a (v).

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.80 mm.

Repository - U.T.G.D. 84220.

Genus *GUTTULINA* d'Orbigny, 1839

Guttulina communis (d'Orbigny), 1826

(Pl. 4, figs. 128, 129)

Polymorphina (Guttulina) communis d'Orbigny, 1826, *Annls Sci. nat.*, ser. 1, 7, 26.

Guttulina problema Parr and Collins, 1937, *Proc. R. Soc. Vict.*, n.s. 50, 191, pl. 12, fig. 1.

Remarks

A very widespread, but usually rare species, it is one of the few species of foraminifera previously recorded from Fossil Bluff (Parr and Collins, 1937, p. 191).

Occurrence - (a) Mussel Roe Bay - 84483 (r), 84481 (q), 84482 (q),

(b) Fossil Bluff - 84010a (q), 84010b (r), 84012 (v), 84013 (r), 84022 (q), 84023 (r), 84025a (r), 84024 (v), 84025b (q).

(c) King Island - 84084 (v), 84085 (v), 84082 (r), 84089 (p),

(d) Cape Grim - 84008 (r), 84007 (r), 84005 (r), 84001 (v),

(e) Mt Cameron West - 84118 (r), 84121 (v), 84120 (v), 84117 (r),

(f) Brittons Swamp - 84480 (r),

(g) Redpa - 84097 (v), 84093 (q), 84094 (r), 84095 (r), 84096 (r),

(h) Granville Harbour - 54144 (q),

(i) Preservation Island - 84479 (r),

(j) Marrawah district - 84092 (r), 84108 (r), 84109 (q), 84110 (q), 84111 (q), 84113 (r), 84114 (v), 84115 (v), 84104 (r), 84101 (r), 84105 (q), 84106 (q), 84107 (q).

Age - Late Oligocene - Early Miocene, N3-N8.

Figured specimen from Fossil Bluff (84010a).

Maximum diameter of figured specimen 0.70 mm.

Repository - U.T.G.D. 84221.

Guttulina frankei Cushman and Ozawa, 1930

(Pl. 4, fig. 130)

Polymorphina lactea var. *cuspidata* Franke, 1925, *Abh. Ber. Mus. Nat. u. Heimatk. (Naturk. Vorgesch.) Madgeburg* (1925), 177, pl. 6, fig. 46b.

Guttulina frankei Cushman and Ozawa, 1930, *Proc. U.S. natn. Mus.*, 77, art. 6, 28, pl. 4, figs. 1a-c.

Remarks

In a few samples, typical specimens are found. The figured specimen is a little atypical in having a single distinct ridge on the distal part of several chambers.

Occurrence - (a) Mussel Roe Bay - 84482 (r),

(b) Fossil Bluff - 84010b (v), 84022 (v), 84024 (v),

(c) Redpa - 84093 (v).

Age - Early Miocene, N4-N8.

Figured specimen from Fossil Bluff (84010b).

Maximum diameter of figured specimen 0.92 mm.

Repository - U.T.G.D. 84222.

Guttulina lactea (Walker and Jacob), 1798

(Pl. 4, fig. 131)

Serpula tenuis ovalis laevis Walker and Boys, 1784, *Testacea minuta ....*, J. March: London, 2, pl. 1, fig. 5.

Serpula lactea Walker and Jacob, 1798, *Adams' essays on the microscope*, Dillon and Keating: London, 2nd Edn., 634, pl. 14, fig. 4.

Polymorphina lactea, Howchin, 1889, *Trans. Proc. R. Soc. S. Aust.*, 12, 10.

Polymorphina lactea, Howchin, 1891, *Trans. Proc. R. Soc. S. Aust.*, 14, 352.

Polymorphina lactea, Heron-Allen and Earland, 1924, *Jl R. microsc. Soc.*, (1924), pt. 2, 161.

Guttulina lactea, Cushman and Ozawa, 1930, *Proc. U.S. natn. Mus.*, 77, art. 6, 43, 44, pl. 10, figs. 1-4.

Guttulina lactea, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 80.

Occurrence - (a) Fossil Bluff - 84010b (r), 84022 (v),
(b) Cape Grim - 84006 (v).

Age - Early Miocene, N4/5.

Figured specimen from Fossil Bluff (84010b).

Maximum diameter of figured specimen 0.92 mm.

Repository - U.T.G.D. 84223.

Guttulina regina (Brady, Parker and Jones), 1870
(Pl. 4, figs. 132-134)

Polymorphina regina Brady, Parker and Jones, 1870, *Trans. Linn. Soc. Lond.*, 27, 241, pl. 41, figs. 32a, b.

Polymorphina regina, Howchin, 1889, *Trans. Proc. R. Soc. S. Aust.*, 12, 10.

Polymorphina regina, Howchin, 1891, *ibid.*, 14, 351.

Guttulina regina, Cushman and Ozawa, 1930, *Proc. U.S. natn. Mus.*, 77, art. 6, 34, pl. 6, figs. 1, 2.

Guttulina regina, Parr and Collins, 1937, *Proc. R. Soc. Vict.*, n.s. 50 (1), 192, pl. 12, figs. 6, 7.

Guttulina regina, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 80.

Remarks

This species is here recorded as two separate forms. Form 'a': this form is represented by a single specimen from Fossil Bluff and is probably only a costate form of *G. communis*. Form 'b': this form has more elongate and more strongly costate chambers, and occurs in two Mussel Roe Bay samples (84481 and 84482).

Occurrence - Form 'a' Fossil Bluff - 84024 (v),
Form 'b' Mussel Roe Bay - 84481 (r), 84482 (r).

Age - Early Miocene, N4/5.

Figured specimen from (a) Fossil Bluff (84024),
(b) Mussel Roe Bay (84481).

Maximum diameters of figured specimens (a) 0.46 mm,
(b) 0.96 mm.

Repository - (a) U.T.G.D. 84244,
(b) U.T.G.D. 84489.

Guttulina (?) schafferi Cushman and Ozawa, 1930

(Pl. 4, fig. 135)

Guttulina schafferi Cushman and Ozawa, 1930, *Proc. U.S. natn. Mus.*, 77, art. 6, 45, pl. 11, figs. 1a-c.

Remarks

Two poorly preserved hispid specimens from King Island (84090) are referred very tentatively to this species.

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.62 mm.

Repository - U.T.G.D. 84490.

Guttulina yabei Cushman and Ozawa, 1929

(Pl. 4, fig. 136)

Polymorphina oblonga, Brady, 1884, *"Challenger" Expedn, Scient. Results, Zool.*, 9, 569, pl. 73, figs. 2, 3.

Guttulina yabei Cushman and Ozawa, 1929, *Jap. J. Geol. Geogr.*, 6, 68, pl. 13, fig. 2; pl. 14, fig. 6.

Guttulina yabei, Cushman and Ozawa, 1930, *Proc. U.S. natn. Mus.*, 77, art. 6, 30, 41, pl. 4, figs. 6, 7.

Guttulina yabei, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 80.

Guttulina yabei, Reed, 1965, *Bull. Am. Paleont.*, 49 (220), 68.

Occurrence - King Island - 84086 (r).

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.75 mm.

Repository - U.T.G.D. 84225.

Guttulina sp. indet.

Occurrence - Fossil Bluff - 84014 (v).

Age - Early Miocene, N4/5.

Genus *PSEUDOPOLYMORPHINA* Cushman and Ozawa, 1928

Pseudopolymorphina beaumarisensis Parr and Collins, 1937

(Pl. 4, fig. 137)

Pseudopolymorphina doanei (Galloway and Wissler) var. *beaumarisensis* Parr and Collins, 1937, *Proc. R. Soc. Vict.*, n.s. 50 (1), 200, pl. 14, fig. 3.

Pseudopolymorphina doanei var. *beaumarisensis* Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 82.

Remarks

Two specimens were recovered from Fossil Bluff. One complete, typical specimen (from 84010b) is figured. The other (from 84024) is broken and is atypical in having much coarser ribs than the former. A single specimen was recovered from Preservation Island (84479, v).

Age - Early Miocene, N4-N8.

Maximum diameter of figured specimen 1.15 mm.

Repository - U.T.G.D. 84226.

Pseudopolymorphina subcylindrica (Hantken), 1876

(Pl. 4, fig. 138)

Polymorphina subcylindrica, Hantken, 1876, *Magy. allami földt. Intez. Evk.*, 4, 51, pl. 14, fig. 14.

Pseudopolymorphina subcylindrica, Cushman and Ozawa, 1930, *Proc. U.S. natn. Mus.*, 77, art. 6, 107, pl. 28, figs. 2a-c.

Remarks

This species differs from *P. tasmanica*, mainly in having less obvious sutures because the chambers are much less inflated than those in *P. tasmanica*. Two very well preserved specimens were recovered.

Occurrence - Fossil Bluff - 84024 (v).

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 1.07 mm.

Repository - U.T.G.D. 84227.

Pseudopolymorphina tasmanica Parr and Collins, 1937

(Pl. 4, fig. 139)

Pseudopolymorphina tasmanica Parr and Collins, 1937, *Proc. R. Soc. Vict.*, n.s. 50, 200, pl. 14, figs. 6a-c.

Remarks

A single, partly broken topotype was found at Fossil Bluff (84010a).

Age - Early Miocene, N4/5.

Maximum diameter of figured topotype 1.48 mm.

Repository - U.T.G.D. 84228.

Genus *PYRULINA* d'Orbigny, 1826

Pyrulina fusiformis (Roemer), 1838

(Pl. 4, fig. 140)

Polymorphina fusiformis Roemer, 1838, *Neues Jb. Miner. Geol. Paläont.*, (1838), 386, pl. 3, fig. 37.

Polymorphina angusta, Brady, 1884, *"Challenger" Expedn, Scient. Results, Zool.*, 9, 563, pl. 72, figs. 1-3.

Pyrulina fusiformis, Cushman and Ozawa, 1930, *Proc. U.S. natn. Mus.*, 77, art. 6, 54, pl. 13, figs. 3-8.

Pyrulina fusiformis, Parr and Collins, 1937, *Proc. R. Soc. Vict.*, n.s. 50 (1), 197, pl. 13, figs. 2, 3; pl. 14, fig. 5.

Pyrulina fusiformis, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 82.

Pyrulina fusiformis, Reed, 1965, *Bull. Am. Paleont.*, 49 (220), 68.

Remarks

In common with many polymorphinids, this was recorded by Parr and Collins *(op. cit.)*.

Occurrence - (a) Mussel Roe Bay - 84482 (r),
(b) Fossil Bluff - 84010b (v), 84025b (v).

Age - Early Miocene, N4/5.

Figured specimen from Fossil Bluff (84010b).

Maximum diameter of figured specimen 0.55 mm.

Repository - U.T.G.D. 84230.

Pyrulina gutta d'Orbigny, 1826

(Pl. 4, fig. 141)

Pyrulina gutta d'Orbigny, 1826, *Annls Sci. nat.*, 7, 267, no. 28.

Polymorphina lactea Brady, 1884, *"Challenger" Expedn. Scient. Results, Zool.*, 9, 559, pl. 71, fig. 14.

Remarks

This appears to be the only reference to this species from Australia. The specimen from Mussel Roe Bay (84483) is identified mainly by comparison with Brady's (1884) figure of *Polymorphina lactea (= Pyrulina gutta* of Barker, 1960).

Occurrence - Mussel Roe Bay - 84483 (v).

Age - Late Oligocene, N3.

Maximum diameter of figured specimen 0.80 mm.

Repository - U.T.G.D. 84439.

Genus *SIGMOIDELLA* Cushman and Ozawa, 1928

Sigmoidella elegantissima (Parker and Jones), 1865

(Pl. 4, fig. 142)

Polymorphina elegantissima Parker and Jones, 1865, *Phil. Trans. R. Soc.*, 155, 438.

Polymorphina elegantissima, Howchin, 1889, *Trans. Proc. R. Soc. S. Aust.*, 12, 10.

Polymorphina elegantissima, Howchin, 1891, *Trans. Proc. R. Soc. S. Aust.*, 14, 352.

Polymorphina elegantissima, Heron-Allen and Earland, 1924, *Jl R. microsc. Soc.*, (1924), 162.

Polymorphina elegantissima, Chapman and Parr, 1926, *Jl Linn. Soc.*, 36, 392, pl. 21, fig. 77.

Sigmoidella elegantissima, Cushman and Ozawa, 1929, *Jap. Jl Geol Geogr.*, 6, 76, pl 16, figs. 10, 11.

Sigmoidella elegantissima, Cushman and Ozawa, 1930, *Proc. U.S. natn. Mus.*, 77, art. 6, 140, 141, pl. 39, figs. 1a-c.

Sigmoidella elegantissima, Parr and Collins, 1937, *Proc. R. Soc. Vict.*, n.s. 50, 206, pl. 14, fig. 9.

Sigmoidella elegantissima, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 83.

Sigmoidella elegantissima, Ludbrook, 1961, *Bull. geol. Surv. S. Aust.*, 36, 19.

Sigmoidella elegantissima, Reed, 1965, *Bull. Am. Paleont.*, 49 (220), 68, pl. 12, fig. 6.

Remarks

Considering the large size, and the fact that it is more abundant than many of the polymorphinids reported from Fossil Bluff, it is very surprising that this species was not recorded from this locality by Parr and Collins (1937, *op. cit.*). It is quite clear that they cannot have confused it with any of the species they did record and it seems most likely to me that the omission is due to an editorial slip rather than lack of identification.

Occurrence - (a) Mussel Roe Bay - 84483 (r), 84481 (v), 84482 (q),
(b) Fossil Bluff - 84010a (v), 84010b (r), 84011 (v), 84012 (v), 84013 (v), 84025a (v).
(c) Mt Cameron West - 84118 (r), 84121 (r), 84117 (r),
(d) Preservation Island - 84479 (r),
(e) Brittons Swamp - 84480 (v),
(f) Marrawah district - 84092 (r), 84108 (q), 84109 (r), 84110 (v), 84111 (r), 84114 (v), 84105 (r), 84106 (q), 84107 (r).

Age - Late Oligocene - Early Miocene, N3-N8.

Figured specimen from Fossil Bluff (84010a).

Maximum diameter of figured specimen 1.10 mm.

Repository - U.T.G.D. 87231

Genus *SIGMOMORPHINA* Cushman and Ozawa, 1928

Sigmomorphina chapmani (Heron-Allen and Earland), 1924
(Pl. 4, fig. 143)

Polymorphina chapmani Heron-Allen and Earland, 1924, *Jl R. microsc. Soc.*, (1924), 163, pl. 10, figs. 60-63.

Sigmomorphina chapmani, Cushman and Ozawa, 1930, *Proc. U.S. natn. Mus.*, 77, art. 6, 124, pl. 32, figs. 4, 5.

Sigmomorphina chapmani, Parr and Collins, 1937, *Proc. R. Soc. Vict.*, n.s. 50 (1), 204, pl. 15, figs. 2a-c.

Sigmomorphina chapmani, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 83.

Sigmomorphina chapmani, Reed, 1965, *Bull. Am. Paleont.*, 49 (220), 68, pl. 12, fig. 3.

Occurrence - Mussel Roe Bay - 84483 (v).

Age - Late Oligocene, N3.

Maximum diameter of figured specimen 1.0 mm.

Repository - U.T.G.D. 84452.

Sigmomorphina schwageri (Karrer), 1877
(Pl. 4, fig. 144)

Polymorphina schwageri Karrer, 1877, *Abh. geol. Bundesanst.*, Wien, 9, 384, pl. 166, fig. 43.

Sigmomorphina schwageri, Cushman and Ozawa, 1930, *Proc. U.S. natn. Mus.*, 77, art. 6, 130, pl. 34, figs. 1a-c.

Sigmomorphina cf *schwageri*, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 83.

Remarks
The specimens are also very similar to Parr and Collins' (1937) figures of *Polymorphina lingulata* Stache.

Occurrence - Mussel Roe Bay - 84483 (v).

Age - Late Oligocene, N3.

Maximum diameter of figured specimen 2.15 mm.

Repository - U.T.G.D. 84453.

Sigmomorphina semitecta (Reuss), 1867
(Pl. 4, fig. 145)

Polymorphina semitecta Reuss, 1867, *Sber, Akad. Wiss.* Wien, 55 (1), 91, pl 3, fig. 10.

Sigmomorphina semitecta, Cushman and Ozawa, 1930, *Proc. U.S. natn. Mus.*, 77, art. 6, 129, pl. 33, figs. 6, 7.

Remarks

This species, apparently unrecorded from the Australian Tertiary, is represented by a single well preserved specimen in the Fossil Bluff section (84010b). While Cushman and Ozawa (1930) state that the species is broadly rounded at the base, their figures show it to be quite noticeably attenuated and this is the condition of the specimen recovered.

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.36 mm.

Repository - U.T.G.D. 84232.

Sigmomorphina williamsoni (Terquem), 1878

(Pl. 4, fig. 146)

Polymorphina williamsoni Terquem, 1878, *Mem. Soc. geol. Fr.*, ser. 3, 1, 37.

? Polymorphina lactea var. *oblonga*, Howchin, 1889, *Trans. Proc. R. Soc. S. Aust.*, 12, 10.

Sigmomorphina williamsoni, Cushman and Ozawa, 1930, *Proc. U.S. natn. Mus.*, 77, art. 6, 138, pl. 38, figs. 3, 4.

Sigmomorphina williamsoni, Parr and Collins, 1937, *Proc. R. Soc. Vict.*, n.s. 50, 205, pl. 15, fig. 5.

Sigmomorphina williamsoni, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 83.

Occurrence - (a) Marrawah district - 84092 (v),
(b) Brittons Swamp - 84480 (v).

Age - Early Miocene, N4-N8.

Figured specimen from Marrawah.

Maximum diameter of figured specimen 0.42 mm.

Repository - U.T.G.D. 84233.

Sigmomorphina wynyardensis Parr and Collins, 1937

(Pl. 4, figs. 147, 148)

Sigmomorphina wynyardensis Parr and Collins, 1937, *Proc. R. Soc. Vict.*, n.s. 50, 203, pl. 15, fig. 3a-c.

Remarks

A few topotypes were recovered from Fossil Bluff (84010a (v)) and a poorly preserved specimen from Redpa (84093 (v)).

Age - Early Miocene, N4-N8.

Figured topotype from 84010a.

Maximum diameter of figured topotype 1.56 mm.

Repository - U.T.G.D. 84234.

Family GLANDULINIDAE

Subfamily GLANDULININAE

Genus *GLANDULINA* d'Orbigny, 1826

Glandulina laevigata d'Orbigny, 1826
(Pl. 4, fig. 149)

Nodosaria (Glandulina) laevigata d'Orbigny, 1826, *Annls Sci. nat.*, ser. 1, 7, 252, pl. 10, figs. 1-3.

Glandulina laevigata d'Orbigny, 1846, *Foraminiferes fossiles du Bassin Tertaire de Vienne (Autriche)*, Gide and Co.: Paris, 29, pl. 1, figs. 4, 5.

Nodosaria laevigata, Heron-Allen and Earland, 1924, *Jl R. microsc. Soc.*, (1924), 152.

Nodosaria (Glandulina) laevigata, Chapman and Parr, 1926, *Jl Linn. Soc.*, 36, 378, pl. 17, fig. 20.

Glandulina laevigata, Cushman and Ozawa, 1930, *Proc. U.S. natn. Mus.*, 77, art. 6, 143, pl. 40, figs. 1a, b.

Glandulina laevigata, Parr and Collins, 1937, *Proc. R. Soc. Vict.*, n.s. 50, 208, pl. 13, figs. 6a, c.

Glandulina laevigata, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 79.

Glandulina laevigata, Reed, 1965, *Bull. Am. Paleont.*, 49, (220), 68.

Remarks

All specimens found here are relatively more elongate than the figured specimens of Cushman and Ozawa (1930) and Parr and Collins (1937), but fit within the variation range of d'Orbigny's figures.

Occurrence - (a) Fossil Bluff - 84010a (r), 84011 (v), 84014 (v),
(b) Mt Cameron West - 84120 (v).

Age - Early Miocene, N4/5.

Figured specimen from 84010a.

Maximum diameter of figured specimen 0.56 mm.

Repository - U.T.G.D. 84229.

Subfamily OOLININAE

Genus *FISSURINA* Reuss, 1850

Fissurina annectens (Burrows and Holland), 1895

(Pl. 4, fig. 150)

Lagena annectens Burrows and Holland, *in* Jones, 1895, *Palaeontogr. Soc. Monogr.*, (1895), 203, pl. 7, fig. 11.

Lagena annectens, Heron-Allen and Earland, 1924, *Jl R. microsc. Soc.*, (1924), pt. 2, 151.

Lagena annectens, Chapman and Parr, 1926, *Jl Linn. Soc.*, 36, 376, pl. 17, fig. 11.

Remarks

Although in the single specimen recovered (Cape Grim, 84006) the surface sulci are very poorly visible, they are present.

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.30 mm.

Repository - U.T.G.D. 84340.

Fissurina circulum Seguenza, 1862

(Pl. 4, fig. 151)

Fissurina circulum Seguenza, 1862, *Die terreni Terziarii del Distretto di Messina: Parte II* ..., T. Capra: Messina, 63, pl. 2, fig. 15.

Occurrence - (a) Mussel Roe Bay - 84483 (r),
(b) Fossil Bluff - 84019 (r).

Age - Late Oligocene - Early Miocene, N3-5.

Figured specimen from Fossil Bluff.

Maximum diameter of figured specimen 0.25 mm.

Repository - U.T.G.D. 84235.

Fissurina cucullata Silvestri, 1902

(Pl. 4, fig. 152)

Fissurina cucullata Silvestri, 1902, *Memorie Accad. pont. Nuovi Lincei*, 19, 146, figs. 23-25.

Occurrence - (a) Mussel Roe Bay - 84483 (v),
(b) Fossil Bluff - 84010b (v), 84012 (v), 84013 (r), 84022 (q), 84025a (v), 84024 (v), 84025b (r),
(c) Mt Cameron West - 84117 (r),
(d) Granville Harbour - 54144 (r).

Age - Late Oligocene - Early Miocene, N3-N8.

Figured specimen from Fossil Bluff (84013)

Maximum diameter of figured specimen 0.25 mm.

Repository - U.T.G.D. 84236.

Fissurina laevigata Reuss, 1850

Fissurina laevigata Reuss, 1850, *Denkschr. Akad. Wiss. Wien*, 1, 366, pl. 46, fig. 1.

Remarks
A single broken, silicified specimen was recovered from the Granville Harbour deposit (54144) and is not figured.

Age - Early Miocene, N8.

Repository - U.T.G.D. 84341.

Fissurina marginata (Montagu), 1803
(Pl. 4, fig. 153)

Serpula (Lagena) marginata Walker and Boys, 1784, *Testacea minuta...*, J. March: London, 2, pl. 1, fig. 7.

Vermiculum marginatum Montagu, 1803, *Testacea Brittanica...*, J.S. Hollis: Romsey, England, 524.

Occurrence - Granville Harbour - 54144 (r).

Age - Early Miocene, N8.

Maximum diameter of figured specimen 0.23 mm.

Repository - U.T.G.D. 84342.

Fissurina cf *quadrata* (Williamson), 1858
(Pl. 4, fig. 154)

Entosolenia marginata (Montagu) var. *quadrata* Williamson, 1858, *Ray Soc. Publs*, (1858), 11, pl. 1, figs. 27-28.

Lagena quadrata, Chapman and Parr, 1926, *Jl Linn. Soc.*, 36, pl. 17, fig. 16.

Remarks A few specimens of an elongate species, probably *F. quadrata* are included here.

Occurrence - (a) Fossil Bluff - 84022 (v), 84025b (v),
(b) Brittons Swamp - 84480 (v),
(c) Marrawah district - 84106 (r).

Age - Early Miocene, N4-N8.

Figured specimen from Fossil Bluff (84025b).

Maximum diameter of figured specimen 0.27 mm.

Repository - U.T.G.D. 84237.

Fissurina siciliensis Loeblich and Tappan, 1954

(Pl. 4, fig. 155)

Fissurina (Fissurine) marginata Seguqnza, 1862, *Die terreni Terziarii del Distretto di Messina: Part II* ..., T. Capra: Messina, 66, pl. 2, figs. 27-28.

Fissurina siciliensis Loeblich and Tappan, 1954, *J. Wash. Acad. Sci.*, 44 (12), 384.

Occurrence - (a) Mussel Roe Bay - 84483 (r),
(b) Fossil Bluff - 84010b (r), 84011 (v), 84012 (r), 84013 (r), 84015 (r), 84017 (r), 84021 (f), 84022 (r), 84025a (v), 84024 (v).
(c) Daisy Creek - 84478 (r),
(d) Marrawah district - 84104 (v).

Age - Late Oligocene, - Early Miocene, N3-N8.

Figured specimen from Fossil Bluff (84013).

Maximum diameter of figured specimen 0.30 mm.

Repository - U.T.G.D. 84238.

Fissurina simplex Seguenza, 1862.

(Pl. 4, fig. 156)

Fissurina (Fissurina) simplex Seguenza, 1862, *Die terreni Terziarii del Distretto di Messina: Part II* ..., T. Capra: Messina, 56, pl. 1, fig. 44.

Remarks

Separated from *F. circulum* mainly in being much more inflated and a little attentuated at the apertural end.

Occurrence - (a) Fossil Bluff - 84010b (v), 84015 (r),
(b) Cape Grim - 84006 (v).

Age - Early Miocene, N4/5.

Figured specimen from Cape Grim (84006).

Maximum diameter of figured specimen 0.34 mm.

Repository - U.T.G.D. 84239

Fissurina spp. indet.

Remarks

Only four specimens are listed here. All seem to belong to different species but identification is very difficult. One is probably *Parafissurina*.

Occurrence - (a) Mussel Roe Bay - 84481 (v),
(b) Fossil Bluff - 84011 (v),
(c) Cape Grim - 84008 (v), 84007 (r).

Age - Early Miocene, N4/5.

Genus *OOLINA* d'Orbigny, 1839

Oolina apiculata Reuss, 1851
(Pl. 4, fig. 157)

Oolina apiculata Reuss, 1851, *Abh. naturw. Wien*, 4 (1), 22, pl. 2, fig. 1.

Lagena apiculata, Heron-Allen and Earland, 1924, *Jl R. microsc. Soc.*, (1924), pt. 2, 147, pl. 9, fig. 29.

Lagena apiculata, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 80.

Occurrence - (a) Fossil Bluff - 84013 (v), 84014 (r), 84015 (r), 84019 (v),
(b) Mt Cameron West - 84117 (v).

Age - Early Miocene, N4/5.

Figured specimen from 84014.

Maximum diameter of figured specimen 0.40 mm.

Repository - U.T.G.D. 84240.

Oolina globosa (Montagu), 1803
(Pl. 4, fig. 158)

Serpula (Lagena) laevis globosa Walker and Boys, 1784, *Testacea minuta* ..., J. March: London, 3, pl. 1, fig. 8.

Vermiculum globosum Montagu, 1803, *Testacea Brittanica* ..., J.S. Hollis: Romsey, England, 523.

Lagena globosa, Howchin, 1889, *Trans. Proc. R. Soc. S. Aust.*, 12, 8.

Lagena globosa, Heron-Allen and Earland, 1924, *Jl R. microsc. Soc.*, (1924), pt. 2, 146.

Lagena globosa, Crespin, 1943, *Palaeont. Bull.*, Canberra, 4, 80.

Occurrence - (a) Mussel Roe Bay - 84483 (r),
(b) Fossil Bluff - 84011 (v), 84013 (r), 84019 (v), 84025a (v), 84024 (v), 84025b (r),
(c) King Island - 84085 (v), 84081 (v), 84082 (q), 84086 (r), 84477 (q),
(d) Cape Grim - 84006 (v), 84001 (v),
(e) Redpa - 84097 (r), 84093 (v).

Age - Early Miocene, N4-N8.

Figured specimen from Fossil Bluff (84013).

Maximum diameter of figured specimen 0.25 mm.

Repository - U.T.G.D. 84241.

Oolina inornata d'Orbigny, 1839

(Pl. 4, fig. 159)

Oolina inornata d'Orbigny, 1839, *Voyage dans l'Amerique Meridionale; Foraminiferes*, Pitois-Levrault: Paris; V. Levrault: Strasbourg.

Occurrence - Fossil Bluff - 84011 (v).

Age - Early Miocene, N4/5.

Maximum diameter of figured specimen 0.30 mm.

Repository - U.T.G.D. 84242.

Oolina (?) multicosta (Karrer), 1877

(Pl. 4, fig. 160)

? Fissurina multicosta Karrer, 1877, *Abh. geol. Bundesanst. Wien*, 9, 379, pl. 16b, fig. 20.

Lagena multicostata, Brady, 1884, *"Challenger" Expedn, Scient. Results, Zool*, 9, 466, pl. 61, fig. 4.

Oolina multicostata, Barker, 1960, *Spec. Publs Soc. econ. Paleont. Miner.*, Tulsa, 9, 127, pl. 61, fig. 4.

Remarks

The species found at Mussel Roe Bay (84483) is almost identical with that figured by Brady (1884). It is here regarded as the same species.

However, it is not so clear that it is *Oolina multicostata*. Karrer's (1877) original figure of the species seems much closer to *Oolina variata* (Brady) than to the species figured by Brady and recorded here.

Occurrence - Mussel Roe Bay - 84483 (v).

Age - Late Oligocene, N3.

Maximum diameter of figured specimen 0.32 mm.

Repository - U.T.G.D. 84405.

Genus *PARAFISSURINA* Parr, 1947

Parafissurina sp.

(Pl. 4, fig. 161)

Remarks

A single, well preserved specimen was recovered from Mussel Roe Bay (84483). It appears to be an undescribed species.

Age - Late Oligocene, N3.

Maximum diameter of figured specimen 0.25 mm.

Repository - U.T.G.D. 84407.

REFERENCES

Barker, R.W., 1960: Taxonomic notes. *Spec. Publs Soc. econ. Palaeont. Miner., Tulsa,* 9.

Blow, W.H., 1969: Late Middle Eocene to Recent planktonic foraminiferal biostratigraphy. *Proc. 1st Intern 'l Conf. Planktonic Microfoss.* Geneva, 1, 199-422, pls. 1-54.

Bowen, R., 1955: Observations on the Foraminiferal genus *Gaudryina* d'Orbigny, 1839. *Micropaleontology,* 1 (4), 359-364.

Brady, H.B., 1884: Report on the foraminifera dredged by H.M.S. Challenger, during the years 1873-1876. *"Challenger" Expedn, Scient. Results, Zool.,* 9, 1-814, pl. 1-116.

Burdett, I.D.J., Hedley, R.H. Hornibrook, N. de B. and Hurdle, C.M., 1963: *Gaudryina convexa* (Karrer) 1865 - Upper Eocene to Recent; an example of variation and synonymy among foraminifera. *N.Z. Jl Sci.,* 6 (4), 513-530.

Carter, A.N., 1958: Tertiary foraminifera from the Aire district, Victoria. *Bull. geol. Surv. Vict.,* 55.

_____, 1964: Tertiary foraminifera from Gippsland, Victoria and their stratigraphical significance. *Mem. geol. Surv. Vict.,* 23.

Chapman, F., 1907: Tertiary foraminifera of Victoria, Australia: the Balcombian deposits of Port Phillip; part 1. *Jl Linn. Soc.,* 30, 10-35, pl. 1-4.

_____, 1926: The Cretaceous and Tertiary foraminifera of New Zealand. *Palaeont. Bull.,* Wellington, 11.

_____, and Crespin, 1930: Rare foraminifera from deep borings in the Victorian Tertiaries; part 2. *Proc. R. Soc. Vic.,* 43, (1), 96-100, pl. 5.

Crespin, I., 1943: The stratigraphy of the Tertiary marine rocks in Gippsland, Victoria. *Palaeont. Bull.,* Canberra, 4.

_____, 1950: Some Tertiary foraminifera from Victoria, Australia. *Contr. Cushman Lab. foramin. Res.,* 1, 70-75, pl. 10.

Cushman, J.A., 1922: Shallow water foraminifera of the Tortugas region. *Publns Carnegie Instn.,* no. 311, vol. 17, 1-85, pl. 1-14.

_____, 1936: New genera and species of the Families Verneuilinidae and Valvulinidae and of the Subfamily Virgulininae. *Spec. Publs Cushman Lab.,* 6.

_____, 1944: The genus *Articulina* and its species. *Spec. Publs Cushman Lab.*, 10.

_____, 1945: The species of the Subfamily Reussellinae of the foraminiferal Family Buliminidae. *Contr. Cushman Lab. foramin. Res.* 21, (2), 23-54, pl. 5-8.

_____, 1946: The genus *Sigmoilina* and its species. *Contr. Cushman Lab. foramin. Res.*, 22 (2), 29-45, pl. 5, 6.

_____, 1948: *Foraminifera: their classification and economic use*, Harvard Univ. Press: Cambridge, Mass., 605 p., 55 pl.

_____, and Ozawa, Y., 1930: A monograph of the foraminiferal Family Polymorphinidae, Recent and fossil. *Proc. U.S. natn. Mus.*, 77 (2829).

Dorman, F.H., 1966: Australian Tertiary Paleotemperatures. *J. Geol.*, 74 (1), 49-61.

Ellis, B.F., and Messina, A., 1940 *et seq.: Catalogue of foraminifera*, Am. Mus. nat. Hist.: New York.

Finley, H.J., 1939: New Zealand foraminifera: Key species in stratigraphy. *Trans. R. Soc. N.Z.*, 69 (1), 89-128, pl. 11-14.

Glaessner, M.F., 1945: *Principles of Micropalaeontology*, Melbourne Univ. Press: Melbourne, 296 p.

Goddard, E.J., and Jensen, H.I., 1907: Constributions to a knowledge of Australian foraminifera. Part II. *Proc. Linn. Soc. N.S.W.*, 32 (2), 291-318, pl. 6.

Heron, Allen E., and Earland, A., 1924: The Miocene foraminifera of the "Filter Quarry", Moorabool River, Victoria, Australia. *Jl R. Microsc. Soc.*, (1924), 121-186, pl. 7-14.

Hornibrook, N. de B., 1958: New Zealand foraminifera: Key species in Stratigraphy - No. 6. *N.Z. Jl Geol. Geophys.*, 1 (4), 653-676.

_____, 1961: Tertiary foraminifera from the Oamaru district (N.Z.). *Palaeont. Bull.*, Wellington, 34, 1-194, pl. 1-28.

_____, 1971: A revision of the Oligocene and Miocene Foraminifera from New Zealand described by Karrer and Stache in the reports of the "Novara" Expedition. *Palaeont. Bull.*, Wellington, 43, 1-85, pl. 1-13.

Howchin, W., 1893: A census of the fossil foraminifera of Australia. *Aust. Assoc. Advmt. Sci.*, (1893), 348-371.

Karrer, F., 1877: Geologie der Kaiser Franz-Josefs Hochquellen-Wasser-Leitung, eine Studie in den Tertiar-Bildungen am Westrande des alpinen Theiles der Niederung von Wien *Abh. K. K. geol. Reichensanst, Wien*, 9, 1-420, pl. 1-20.

Loeblich, A.R. and Tappan, H., 1964a: *Treatise on Invertebrate Paleontology, Part C, Protista 2*, vols. 1, 2, 900 p., Geol. Soc. Am. and Univ. of Kansas Press: Lawrence, Kansas.

_____, 1964b: Foraminiferal classification and evolution, *Jl Geol. Soc. India.*, 5, 5-40.

Mc Gowran, B., Lindsay, J.M., and Harris, W.K., 1971: Attempted reconciliation of Tertiary biostratrigraphic systems *in* Wopfner and Douglas (Eds). The Otway Basin of southeastern Australia. *Spec. Bull. Geol. Surv. S. Aust. and Vict.*

Natland, M.L., 1938: New species of forminifera from off the west coast of north America and from the late Tertiary of the Los Angeles Basin. *Bull. Scripps Instn Oceanogr. tech. ser.*, 4 (5), 137-164, pl. 3-7.

Parker, W.K., Jones, T.R., and Brady, H.B., 1871: On the nomenclature of the foraminifera, part 14, the species enumerated by d'Orbigny in the 'Annales des Sciences Naturelles', 1826. *Ann. Mag. nat. Hist.*, ser. 4, 8, 145-266.

Parr, W.J., and Collins, A.C., 1937: Notes on Australian and New Zealand foraminifera. No. 3: Some species of the Family Polymorphinidae. *Proc. R. Soc. Vict.*, n.s. 50 (1), 190-211, pl. 12-15.

Pokorny, V., 1963: *Principles of zoological micropaleontology.* vol. 1, Pergamon Press: Oxford, pp. 1-652.

Quilty, P.G., 1966: The age of Tasmanian Tertiary marine rocks. *Aust. J. Sci.* 29 (5), 143-144.

_____, 1969: On two recorded species of Tertiary foraminifera from Fossil Bluff, Wynyard. *Pap. Proc. R. Soc. Tasm.* 103, 97-8 .

_____, 1972: The biostratigraphy of the Tasmanian marine Tertiary. *Pap. Proc. R. Soc. Tasm.*, 106, 25-44.

Reed, K.J., 1965: Mid-Tertiary smaller foraminifera from a bore at Heywood, Victoria, Australia. *Bull. Am. Paleont.*, 49 (220), 43-104, pl. 11-15.

Silvestri, A., 1902: Lageninae del mar Tirreno. *Memorie Accad. pont. Nuovi Lincei.*, 19, 133-172.

Silvestri, O., 1872: Le Nodosarie fossili nel Terreno subappenino Italiano e viventi nei mari d'Italia. Monografia delle Nodosarie. *Atti Accad. gioenia Sci. nat.*, 3, 7, 1-108, pl. 1-11.

Stache, G., 1865: Die Foraminiferen der tertiaren Mergel des Whaingaroa-Hafens (Prov. Auckland). *'Novara" Expedn, Geol. Theil.*, 1 (2), 159-304, pl. 21-24.

Taylor, D.J., 1965: Preservation, composition and significance of Victorian Lower Tertiary *'Cyclammina* faunas'. *Proc. R. Soc. Vict.*, 78 (2), 143-160.

ILLUSTRATIONS OF TASMANIAN TERTIARY FORAMINIFERA

PLATE 1

Figure

1-3 *Cyclammina* cf. *incisa* (Stache), Fossil Bluff. 1, 2. U.T.G.D. 84138, x 20. 3. wall section showing labyrinthine structure. U.T.G.D. 84484, x 60.

4 *Bdelloidina aggregata* Carter, Mussel Roe Bay, U.T.G.D. 84472, x 13.

5,6 *Textularia fixtulosa* Brady, Mussel Roe Bay, U.T.G.D. 84474, x 40. 5. peripheral view; 6. lateral view.

7 *T. gramen* d'Orbigny, Fossil Bluff, U.T.G.D. 84139, x 30.

8,9 *T.* cf. *hayi* Karrer, Cape Grim, U.T.G.D. 84140, x 40. 8. lateral view; 9. apertural view.

10 *T. praelonga* Reuss, Fossil Bluff, U.T.G.D. 84141, x 40.

11 *Semivulvulina capitata* (Stache), Marrawah, U.T.G.D. 84142, x 40.

12 *Siphotextularia* aff. *bolivina* Hornibrook, Mussel Roe Bay, U.T.G.D. 84143, x 40.

13 *Ammosphaeroidina sphaeroidiniformis* (Brady), Marrawah, U.T.G.D. 84144, x 35.

14,15 *Gaudryina convexa* (Karrer), x 35. 14. Redpa, U.T.G.D. 84145; 15. Marrawah, U.T.G.D. 84146.

16,17 *Tritaxia victoriensis* (Cushman), Mt. Cameron West, U.T.G.D. 84147, x 35. 16. lateral view; 17 apertural view.

18,19 *Dorothia parri* Cushman, Fossil Bluff, U.T.G.D. 84148, x 25. 18. apertural view; 19 lateral view.

20,21 *Pseudoclavulina* cf. *anglica* Cushman, Fossil Bluff, U.T.G.D. 84485. 20. apertural view, x 40; 21. Lateral view, x 25.

22 *Cyclogyra involvens* (Reuss), Fossil Bluff, U.T.G.D. 84149, x 45.

23 *Spiroloculina angulata* Cushman, Fossil Bluff, U.T.G.D. 84150, x 35.

24 *S. rotunda* d'Orbigny, Fossil Bluff, U.T.G.D. 84151, x 40.

25 *S.* of *sublimbata* Parr, Cape Grim, U.T.G.D. 84153, x 50.

26 *S. tenuiseptata* Brady, Fossil Bluff, U.T.G.D. 84152, x 25.

27 *S. acutimargo* Brady, Fossil Bluff, U.T.G.D. 84154, x 55.

28-33 *Crenulostomina banksi* n. gen. n. sp., Fossil Bluff. 28,29. Holotype U.T.G.D. 84156, x 29. 30. enlarged view of aperture, Holotype, x 220. 31. enlarged view of chamber surface, Holotype, x 75. 32,33 Paratype U.T.G.D. 84157, x 29.

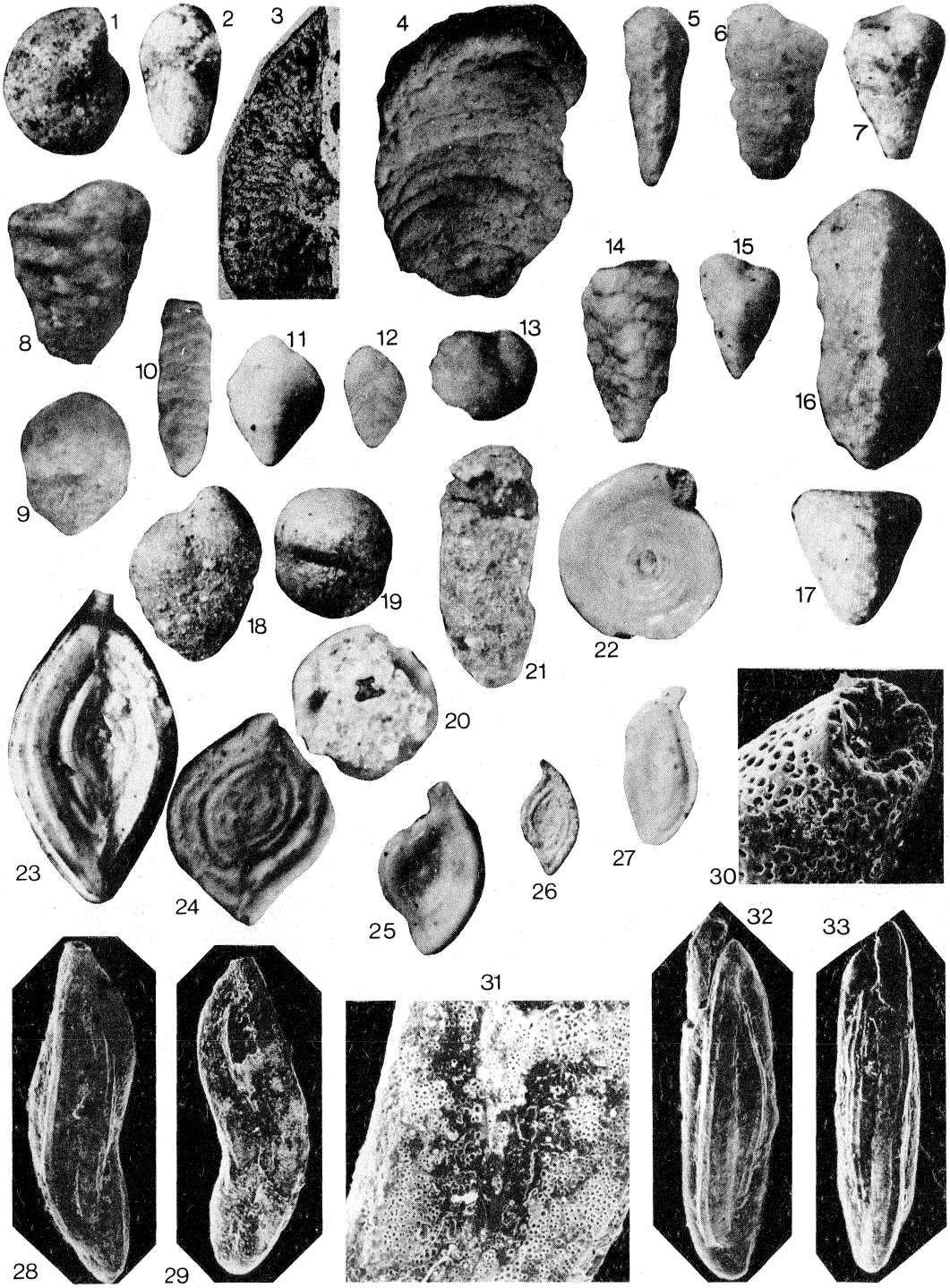
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PLATE 1

PLATE 2

Figure

34,35 *Pyrgo elongata* (d'Orbigny), Cape Grim, U.T.G.D. 84170, x 35.

36 *P. inornata* (d'Orbigny) Marrawah, U.T.G.D. 84171, x 45.

37 *P. sarsi* (Schlumberger), Fossil Bluff, U.T.G.D. 84172, x 35.

38 *P. vespertilio* (Schlumberger), Fossil Bluff, U.T.G.D. 84173, x 40.

39,40 *Quinqueloculina angularis* d'Orbigny, Cape Grim, U.T.G.D. 84159, x 40.

41,42 *Q. angulostriata* Cushman and Valentine, Fossil Bluff, U.T.G.D. 84160, x 40.

43,44 *Q. aspera* d'Orbigny, Fossil Bluff, U.T.G.D. 84161, x 20.

45,46 *Q. bradyana* Cushman, Cape Grim, U.T.G.D. 84162, x 35.

47,48 *Q. cuvieriana* d'Orbigny, Fossil Bluff, U.T.G.D. 84163, x 60.

49,50 *Q. granulosa* Natland, Fossil Bluff, U.T.G.D. 84164, x 45.

51 *Q. laevigata* d'Orbigny, Cape Grim, U.T.G.D. 84165, x 45.

52,53 *Q. seminulum* (Linne), Fossil Bluff, U.T.G.D. 84166, x 45.

54,55 *Q. simplex* Terquem, Fossil Bluff, U.T.G.D. 84167, x 45.

56,57 *Q. vulgaris* d'Orbigny, Fossil Bluff, U.T.G.D. 84168, x 25.

58 *Q.* sp. 1, Cape Grim U.T.G.D. 84169, x 25.

59-61 *Sigmoilina obesa* Heron-Allen and Earland, microspheric form, Fossil Bluff. 59,60. complete, U.T.G.D. 84176, x 45; 61. transverse section, U.T.G.D. 84174, x 60.

62-64 *S. obesa* Heron-Allen and Earland, megalospheric form, Fossil Bluff. 62,63. complete, U.T.G.D. 84177 x 45; 64. transverse section, U.T.G.D. 84175, x 65.

65,66 *S. victoriensis* Cushman, Fossil Bluff, U.T.G.D. 84178, x 50.

67,68 *Siphonaperta ammophila* (Parr), Fossil Bluff, U.T.G.D. 84179, x 45.

69-71 *Spirosigmoilina tateana* (Howchin), Fossil Bluff. 69. microspheric form, U.T.G.D. 84188, x 35; 70,71. megalospheric form, U.T.G.D. 84187, x 70. Shown immersed in Figure 71.

72,73 *Triloculina affinis* d'Orbigny, Cape Grim, U.T.G.D. 84181, x 45.

74,75 *T. brochita* Carter, Fossil Bluff, U.T.G.D. 84182, x 25.

76,77 *T. laevigata* d'Orbigny, Cape Grim, U.T.G.D. 84185, x 45.

78,79 *T. rotunda* d'Orbigny, Cape Grim, U.T.G.D. 84183, x 30.

80,81 *T. trigonula* (Lamarck), Fossil Bluff, U.T.G.D. 84184, x 45.

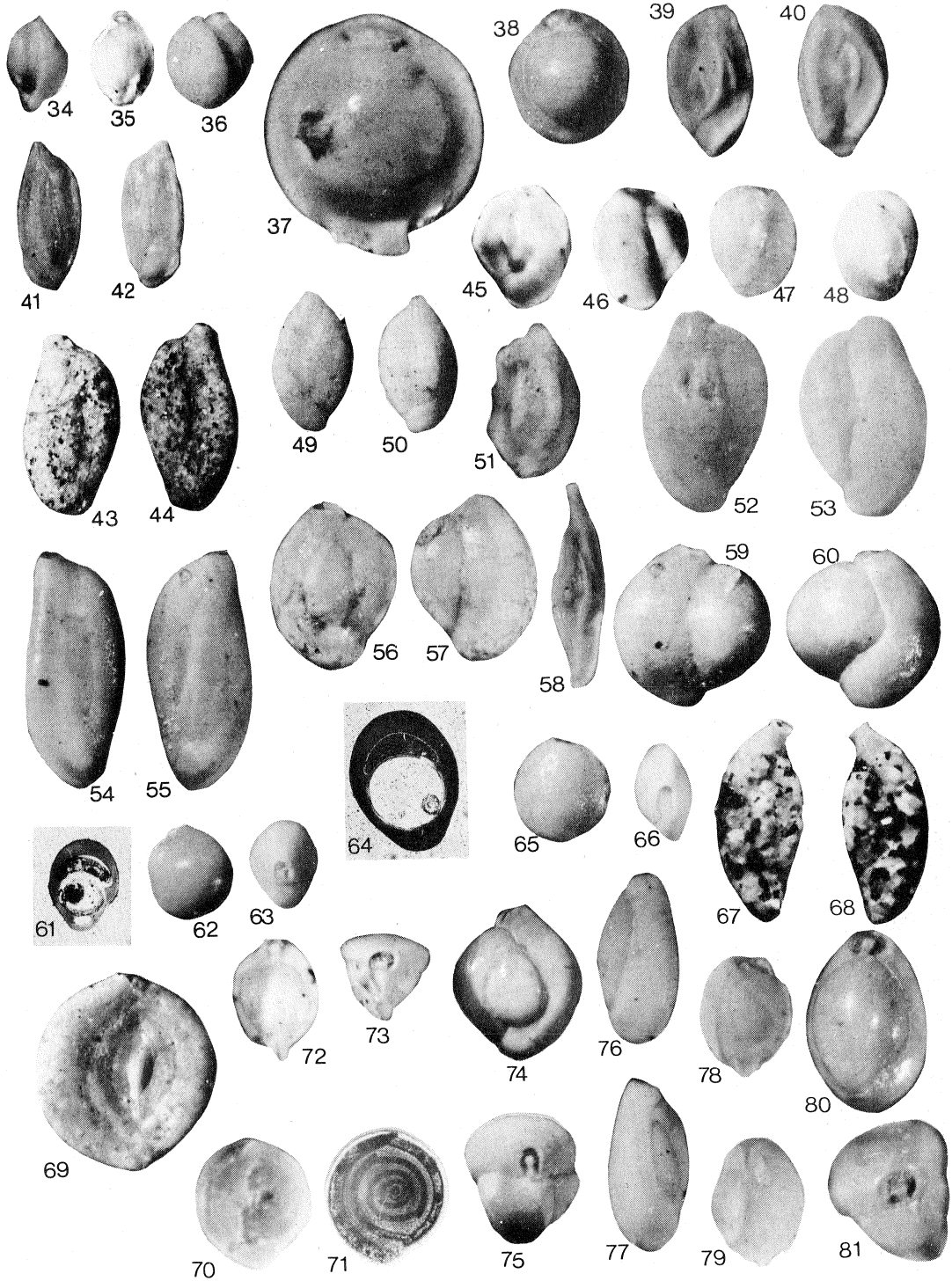
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PLATE 2

PLATE 3

Figure

82,83 *T.* sp. 1, Cape Grim, U.T.G.D. 84186, x 45.

84,85 *Miliolinella subrotunda* (Montagu), Cape Grim, U.T.G.D. 84180, x 35.

86 *Articulina carinata* Wiesner, Fossil Bluff, U.T.G.D. 84189, x 40.

87 *A.* sp., Fossil Bluff, U.T.G.D. 84190, x 45.

88 *Dentalina divergens* Reuss, Cape Grim, U.T.G.D. 84198, x 12.

89 *D. advena* (Cushman), Cape Grim, U.T.G.D. 84195, x 60.

90 *D. filiformis* (d'Orbigny), Fossil Bluff, U.T.G.D. 84196, x 40.

91 *D. godjeni* Quilty, topotype, Fossil Bluff, U.T.G.D. 84293, x 10.

92 *D. obliqua* (Linné), Mussel Roe Bay, U.T.G.D. 84294, x 7.

93 *D. semirugosa* (d'Orbigny), Fossil Bluff, U.T.G.D. 84197, x 60.

94 *D. subcostata* Chapman, Fossil Bluff, U.T.G.D. 84537, x 9.

95 *D. subsoluta* (Cushman), Mussel Roe Bay, U.T.G.D. 84295, x 16.

96 *Dimorphina* sp. Marrawah, U.T.G.D. 84199, x 60.

97 *Lagena aspera* Reuss, Mussel Roe Bay, U.T.G.D. 84371, x 110.

98 *L. hexagona* (Williamson), Fossil Bluff, U.T.G.D. 84486, x 125.

99 *L. hispida* Reuss, Fossil Bluff, U.T.G.D. 84200, x 110.

100 *L. hispidula* Cushman, Fossil Bluff, U.T.G.D. 84203, x 125.

101,102 *L. laevis* (Montagu), Fossil Bluff. 101. U.T.G.D. 84202, x 110; 102. U.T.G.D. 84201, x 100.

103 *L. mariae* Karrer, King Island, U.T.G.D. 84204, x 70.

104 *L. montagui* Silvestri, Fossil Bluff, U.T.G.D. 84205, x 100.

105 *L. striata* (d'Orbigny), Fossil Bluff, U.T.G.D. 84206, x 90.

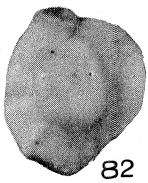
106 *L. sulcata* (Walker and Jacob), Fossil Bluff, U.T.G.D. 84207, x 125.

107 *L. tasmaniae* n. sp., Fossil Bluff, Holotype, U.T.G.D. 84209, x 125.

108 *L.* sp. A., Cape Grim, U.T.G.D. 84210, x 125.

109 *L.* sp. B., Fossil Bluff, U.T.G.D. 84211, x 200.

110 *Lenticulina* cf. *chambersi* (Garrett), King Island, U.T.G.D. 84212, x 60.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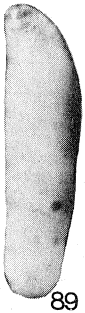
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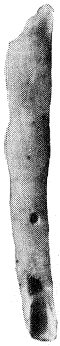
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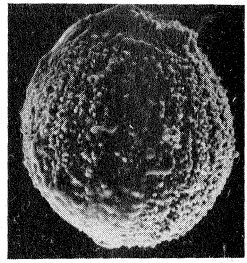
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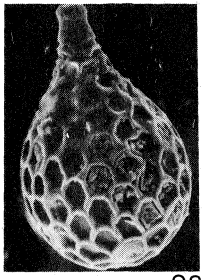
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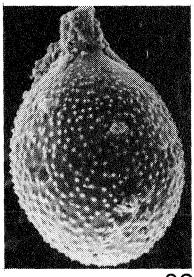
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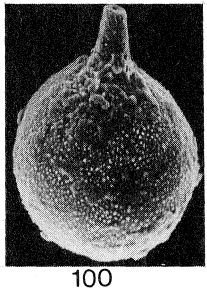
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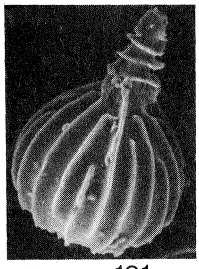
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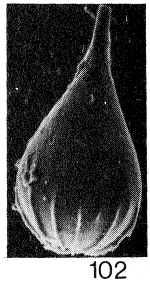
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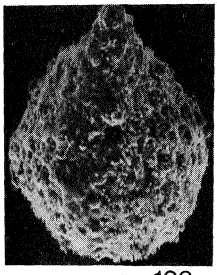
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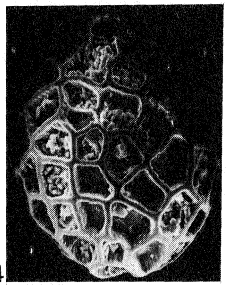
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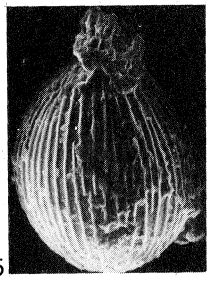
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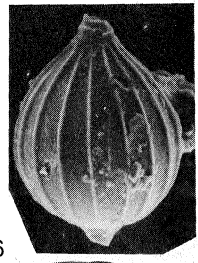
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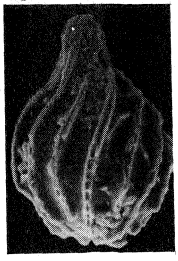

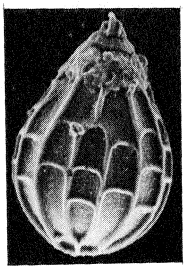
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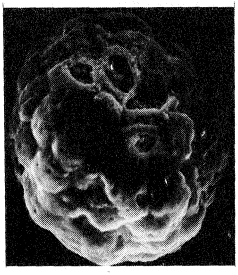
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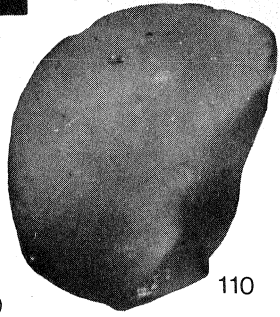
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PLATE 4

Figure

111 *L. cultrata* (de Montfort), Fossil Bluff, U.T.G.D. 84213, x 35.

112 *L. gibba* (d'Orbigny), Mussel Roe Bay, U.T.G.D. 84400, x 60.

113 *L. gyroscalpra* (Stache), Fossil Bluff, U.T.G.D. 84214, x 60.

114' *L. punctata* (Rzehak), Fossil Bluff, U.T.G.D. 84216, x 60.

115,116 *Lenticulina (?) triangularis* (d'Orbigny), Fossil Bluff, U.T.G.D. 84217, x 45.

117,118 *L.* sp., Cape Grim, U.T.G.D. 84218, x 45.

119 *L. oblonga* (Coryell and Rivero), Cape Grim, U.T.G.D. 84215, x 60.

120 *Marginulinopsis hydropica* Hornibrook, Mussel Roe Bay, U.T.G.D. 84402, x 38.

121 *Nodosaria grossecostata* Costa var. a, Marrawah, U.T.G.D. 84192, x 12.

122 *N. hochstetteri* Schwager, Fossil Bluff, U.T.G.D. 84536, x 9.

123 *N. lamnulifera* Boomgaart, Fossil Bluff, U.T.G.D. 84191, x 50.

124 *N. proxima* Silvestri, Marrawah, U.T.G.D. 84193, x 45.

125 *N. separans* Brady, Brittons Swamp, U.T.G.D. 84487, x 40.

126 *Bolivinella australis* Cushman, Fossil Bluff, U.T.G.D. 84219, x 25.

127 *Globulina gibba* (d'Orbigny), Fossil Bluff, U.T.G.D. 84220, x 25.

128,129 *Guttulina communis* (d'Orbigny), Fossil Bluff, U.T.G.D. 84221, x 25.

130 *G. frankei* Cushman and Ozawa, Fossil Bluff, U.T.G.D. 84222, x 30.

131 *G. lactea* (Walker and Jacob), Fossil Bluff, U.T.G.D. 84223, x 35.

132 *G. regina* (Brady, Parker and Jones) form A, Fossil Bluff, U.T.G.D. 84244, x 45.

133,134 *G. regina* (Brady, Parker and Jones) form B, Mussel Roe Bay, U.T.G.D. 84489, x 35.

135 *G. (?) schafferi* Cushman and Ozawa, King Island, U.T.G.D. 84490, x 40.

136 *G. yabei* Cushman and Ozawa, King Island, U.T.G.D. 84225, x 45.

137 *Pseudopolymorphina beaumarisensis* Parr and Collins, Fossil Bluff, U.T.G.D. 84226, x 35.

138 *P. subcylindrica* (Hantken), Fossil Bluff, U.T.G.D. 84227, x 35.

139 *P. tasmanica* Parr and Collins, Fossil Bluff, U.T.G.D. 84228, x 35.

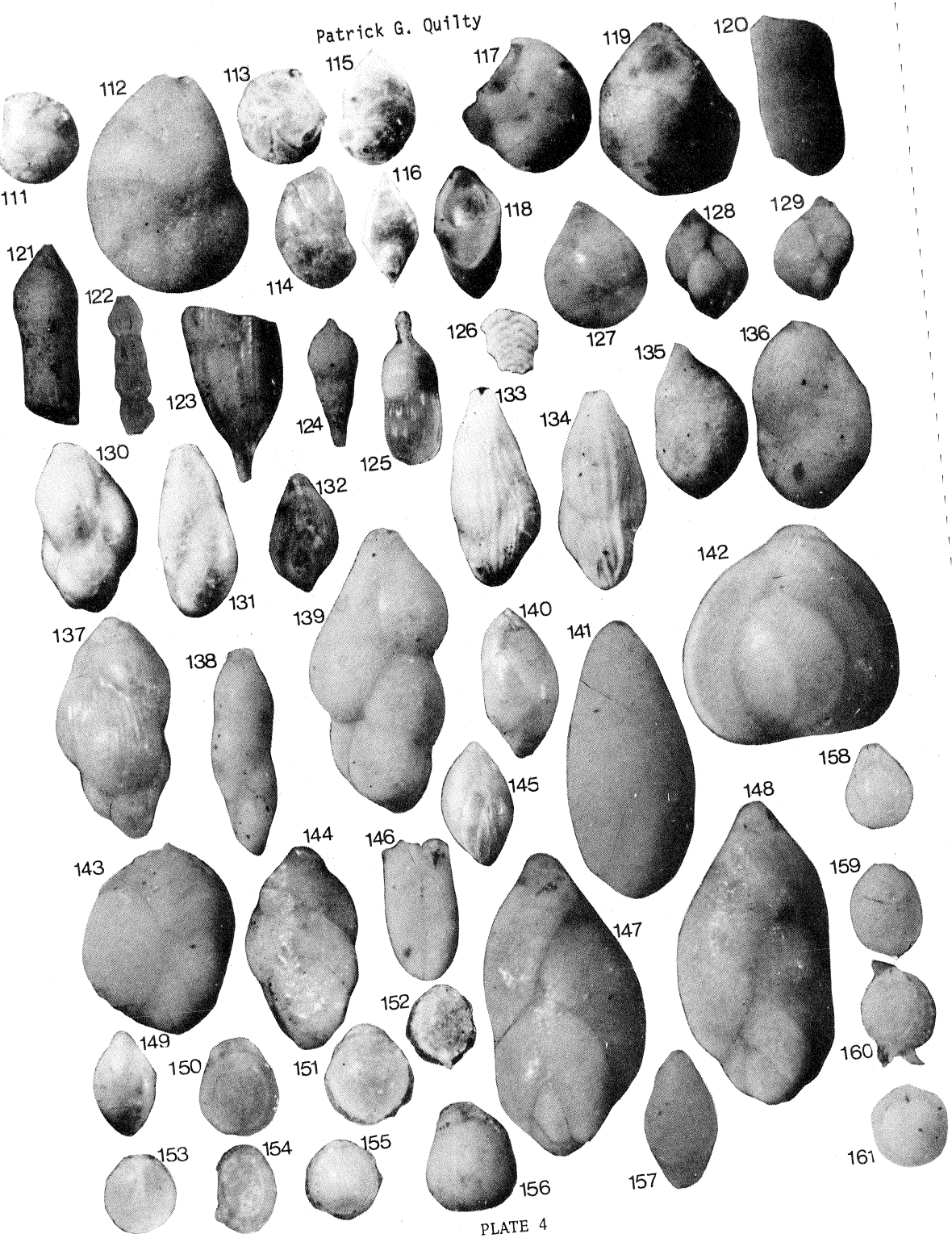
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PLATE 4

140 *Pyrulina fusiformis* (Roemer), Fossil Bluff, U.T.G.D. 84230, x 50.

141 *P. gutta* d'Orbigny, Mussel Roe Bay, U.T.G.D. 84439, x 60.

142 *Sigmoidella elegantissima* (Parker and Jones), Fossil Bluff, U.T.G.D. 87231, x 35.

143 *Sigmomorphina chapmani* (Heron-Allen and Earland), Mussel Roe Bay, U.T.G.D. 84452, x 35.

144 *S. schwageri* (Karrer), Mussel Roe Bay, U.T.G.D. 84453, x 17.

145 *S. semitecta* (Reuss), Fossil Bluff, U.T.G.D. 84232, x 60.

146 *S. williamsoni* (Terquem), Marrawah, U.T.G.D. 84233, x 60.

147,148 *S. wynyardensis* Parr and Collins, Topotype, Fossil Bluff, U.T.G.D. 84234, x 35.

149 *Glandulina laevigata* d'Orbigny, Fossil Bluff, U.T.G.D. 84229, x 30.

150 *Fissurina annectens* (Burrows and Holland), Cape Grim, U.T.G.D. 84340, x 60.

151 *F. circulum* Seguenza, Fossil Bluff, U.T.G.D. 84235, x 70.

152 *F. cucullata* Silvestri, Fossil Bluff, U.T.G.D. 84236, x 60.

153 *F. marginata* (Montagu), Granville Harbour, U.T.G.D. 84342, x 60.

154 *F. quadrata*, (Williamson). Fossil Bluff, U.T.G.D. 84237, x 60.

155 *F. siciliensis* Loeblich and Tappan, Fossil Bluff, U.T.G.D. 84238, x 45.

156 *F. simplex* Seguenza, Cape Grim, U.T.G.D. 84239, x 60.

157 *Oolina apiculata* Reuss, Fossil Bluff, U.T.G.D. 84240, x 60.

158 *O. globosa* (Montagu), Fossil Bluff, U.T.G.D. 84241, x 60.

159 *O. inornata* d'Orbigny, Fossil Bluff, U.T.G.D. 84242, x 60.

160 *O. (?) multicosta* (Karrer), Mussel Roe Bay, U.T.G.D. 84405, x 60.

161 *Parafissurina* sp., Mussel Roe Bay, U.T.G.D. 84407, x 60.