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Bathyal Upper Miocene Mollusca from Wairarapa District, New Zealand

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Abstract

MIDDLE Tongaporutuan Mollusca are listed from three localities in the Mangaopari Stream area, south of Martinborough, and from three localities in the Wainuioru Valley, east of Gladstone. They include *Cymatona, Teremelon, Inglisella, Bathytoma, Eoscobinella,* and several other genera that are rare in the Upper Miocene of New Zealand, and also *Apiotoma,* which has not been recorded from New Zealand before. Two new genera and species of Turridae, a new genus of Cancellariidae, and new species of *Cuna, Pristinacca, Friginatica, Oamaruia, Waipaoa, Inglisella, Austromitra, Euliginella, Apiotoma, Turridrupa, Bathytoma, Mauidrillia, Cosmasyrinx, Eoscobinella, Splendrillia,* and *Hauturua* are described. The siltstone from which the faunas were collected have apparently been deposited in the upper part of the bathyal zone.

INTRODUCTION

VELLA (1954) described several new and highly unusual species and genera of Mollusca from a middle Tongaporutuan locality at Bell's Creek, a tributary of Mangaopari Stream, near White Rock Road, South Wairarapa. He did not list the fauna as a whole, but recorded a number of interesting forms (such as *Marshallena curtata* Marwick) in addition to the new species. Collecting at the locality over a period of about five years by the writer, by Mr P. Wellman, and recently by Mr D. Cowe, has added considerably to the list of species known from Bell's Creek, including further new genera and species. Substantially different faunas were collected at similar localities in Mangaopari Stream and its major tributary McLeod's Stream, along the strike with the Bell's Creek locality and only half a mile to the east of it. Faunas from Bell's Creek, Mangaopari Stream, and McLeod's Stream are listed in Table I. Location of the three localities is shown in Fig. 1.

Near Ruakiwi Road, 50km north-east of Bell's Creek, Mr S. Bunopas, Geological Survey of Thailand,† collected several small faunas of middle Tongaporutuan age that resemble those from Mangaopari Stream and McLeod's Stream in many features. They contain several genera that have not previously been reported from the Tongaporutuan Stage, such as *Teremelon, Proximitra, Inglisella, Cymatona, Thatcheria,* and *Eoscobinella.* The localities have been re-collected twice, the

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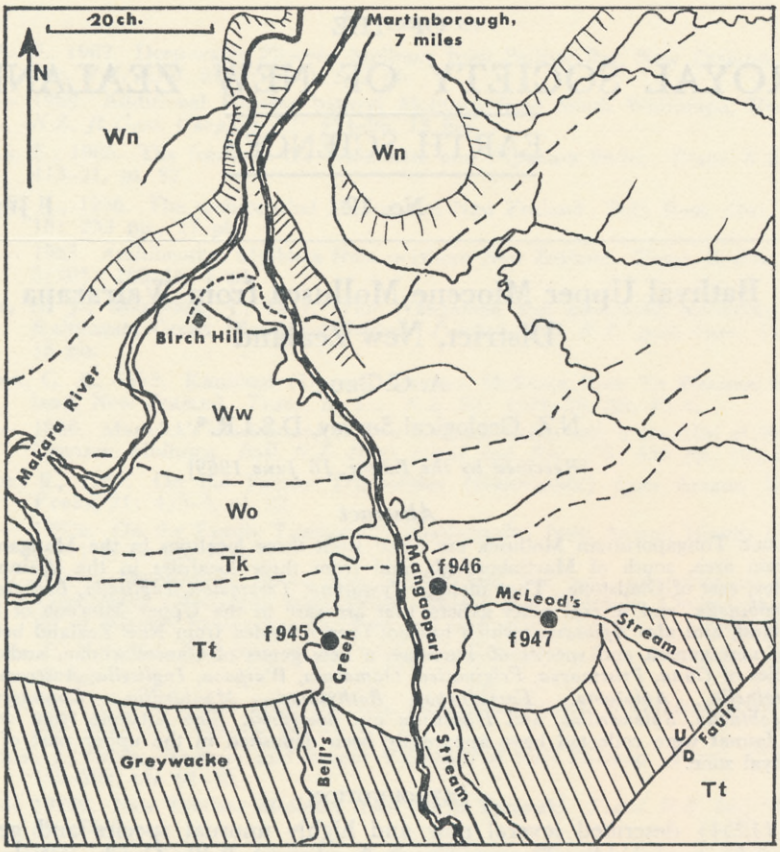


FIG. 1.—Map showing position of Tongaporutuan bathyal mollusc localities in the Mangaopari Stream area, South Wairarapa. Fossil localities: f945, etc. Stage symbols: Tt, Tongaporutuan, Tk, Kapitean, Wo, Opoitian, Ww, Waipipian + Mangapanian, Wn, Nukumaruan.

second visit producing very little result. Faunas from the three localities in the area (Fig. 2) are listed in Table I.

Most holotypes of species described in this paper, and many paratypes, are lodged in the Geology Department, Victoria University of Wellington (numbers prefixed by VM); holotypes and paratypes of some species are lodged in the New Zealand Geological Survey (numbers prefixed by TM); and some paratypes are lodged in the Auckland Institute and Museum and in Mr D. Cowe's personal collection.

The faunas listed in Table I are from the following localities: V1949 (= GS10200), N165/945 (re-collection of Vella's V298), Bell's Creek, quarter of a mile upstream from junction with Mangaopari Stream, near White Rock Road, South Wairarapa; V1950, N165/946, horizon approximately equal to that of the Bell's Creek locality, half a mile up Mangaopari Stream from its junction with Bell's Creek; V1951 (= GS10201), N165/947, quarter of a mile down McLeod's Stream from Tertiary–Greywacke contact, tributary of Mangaopari Stream, South Wairarapa; V1359, N162/872, south bank of Mangaoriki Stream, midway between Manga-a-whanaki Stream and next stream to the east, near Ruakiwi Road, Wainuioru Valley near Gladstone–East Coast Road, grid ref. N162/225421; V1360 (= GS10202), N162/873, near junction of Mangaoriki and Manga-a-whanaki streams, quarter of a mile below Ruakiwi Road, Wainuioru Valley, grid ref.

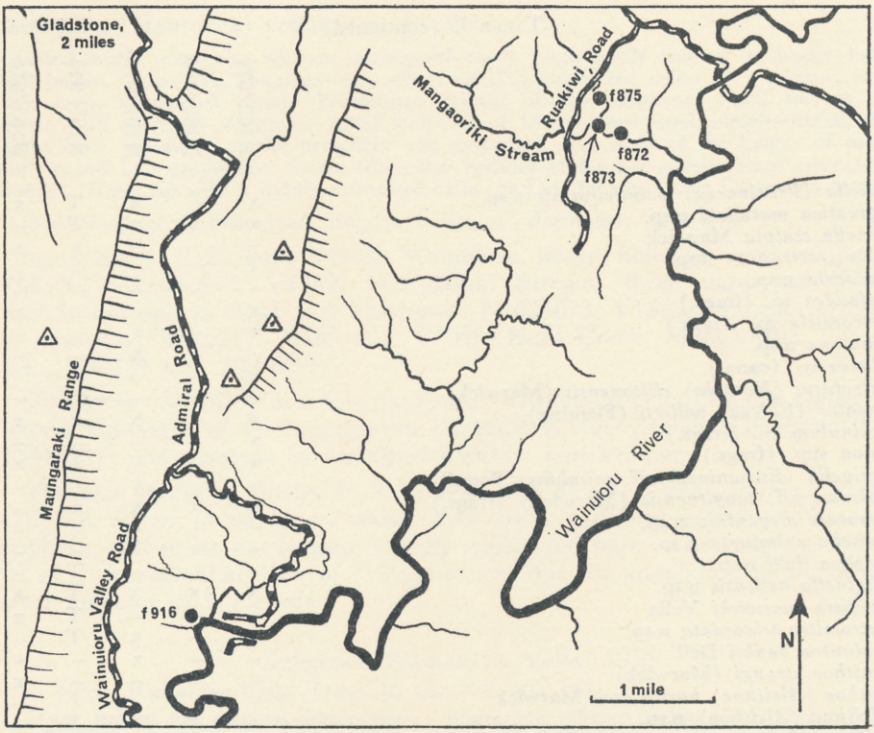


FIG. 2.—Map showing position of Tongaporutuan bathyal mollusc localities in the Wainuioru Valley, central Wairarapa. Fossil localities: f916, etc.

N162/223423; V1419 (and V1420, combined) (= GS10203), N162/916 and 917, cliff on large river bend and small side creek to the west, Wainuioru River at end of Admiral Road, Wainuioru Valley, grid ref. N162/163355. All localities are of middle Tongaporutuan age, from evidence of Foraminifera.

TABLE I.—List of Mollusca from Tongaporutuan bathyal localities in the Mangaopari and Wainuioru districts, Wairarapa. T indicates type locality.

	N162/872	N162/873	N162/916	N165/945	N165/946	N165/947
Nucula otamaringaensis Marwick	x	x	x	x	x	x
Nucula n.sp.	–	x	–	–	–	–
Nucula sp.	–	–	–	x	–	–
Jupiteria aff. *uawa* (Marwick)	–	–	–	x	x	–
Zealeda cf. *inflatella* Marwick	–	–	–	x	–	–
Neilo sublaevis Marwick	–	x	–	x	x	x
Limopsis cf. *retifera* Marwick	–	–	–	–	x	x
Pectunculina aoteana Vella	x	x	x	T	–	–
Parvamussium zitteli (Hutton)	–	x	x	x	–	x
Cuna awheaensis n.sp.	–	–	–	T	–	–
Myrtea haurangiensis Vella	–	–	–	T	x	–
?*Lucinoma* sp.	–	–	–	–	–	x
Notocorbula cf. *pumila* (Hutton)	–	–	–	x	–	–
Periploma macphersoni Marwick	–	–	–	x	–	–
Solariella (*Zetela*) aff. *castigata* (Marwick)	–	x	–	x	–	–
Lunella sp. (operculum)	–	–	–	x	–	–
Conjectura proava Marwick	–	–	–	x	–	–
Lissotesta sp.	–	–	–	x	–	–
Ihungia cf. *acantha* Marwick	–	–	–	x	–	–
Uberella cicatrix Marwick	x	x	x	x	x	x

TABLE I. (continued)

	N162/872	N162/873	N162/916	N165/945	N165/946	N165/947
Taniella (*Pristinacca*) *poliniciformis* n.sp.	x	–	x	T	x	x
Friginatica marwicki n.sp.	x	x	x	T	–	–
Polinella scalpta Marwick	–	–	–	x	x	x
Inella zeattenuata n.sp.	T	–	–	–	–	–
Turriscala n.sp.	–	–	–	–	–	x
?*Galeodea* sp. (frags.)	x	–	–	x	x	x
Austrosassia sp. (frags.)	x	–	x	–	–	–
Cymatona n.sp.	–	–	x	–	–	–
Coluzea sp. (canal)	–	–	–	x	–	–
Austrofusus (*Neocola*) *cliftonensis* (Marwick)	–	–	–	x	–	–
Aeneator (*Ellicea*) *willetti* (Fleming)	x	x	x	x	x	x
Buccinulum sp. (frags.)	x	–	–	–	–	x
Penion spp. (frags.)	x	–	–	x	x	–
Cominella (*Eucominia*) aff. *mirabilis* (Powell)	–	–	x	–	–	–
Falsicolus aff. *tangituensis* (Marwick) (frags.)	x	x	x	x	–	–
Oamaruia elegantula n.sp.	–	–	–	–	–	T
Inglisella culminata n.sp.	–	x	T	–	–	–
Waipaoa delli n.sp.	–	–	–	T	–	–
Euliginella bellensis n.sp.	x	x	x	T	x	x
Vexillitra marwicki Vella	–	–	–	T	x	x
Austromitra tricordata n.sp.	–	–	x	T	–	–
Proximitra banksi Dell	–	–	x	–	–	–
Mauithoe strongi (Marwick)	–	–	–	–	x	–
Alcithoe (*Alcithoe*) *hurupiensis* Marwick	–	–	–	–	–	x
?*Alcithoe* (*Alcithoe*) n.sp.	–	–	–	–	–	x
Alcithoe (*Leporemax*) *rugosa* (Marwick)	–	–	x	x	x	x
Teremelon knoxi Dell	x	x	x	–	–	–
Amalda (*Gracilispira*) *wairarapaensis* (Olson)	x	x	x	T	x	x
Apiotoma zelandica n.sp.	–	–	–	T	–	–
Apiotoma n.sp. B	x	–	–	–	–	–
Comitas terrisae Vella	–	–	–	T	–	–
Comitas imperfecta King	x	x	x	–	x	x
Comitas aff. *latescens* (Hutton)	–	–	x	–	–	–
Cosmasyrinx marwicki n.sp.	–	x	T	–	–	x
Macrosinus flemingi n.gen., n.sp.	–	–	–	–	–	T
Marshallena curtata (Marwick)	–	–	x	x	x	–
Gemmula peraspera Marwick	x	x	x	–	x	x
Lucerapex pulcherrimus (Vella)	–	–	–	T	x	x
Turridrupa mangaoparia n.sp.	x	–	–	T	–	–
Awateria miocenica Vella	–	–	x	T	x	x
Awheaturris echinata n.gen., n.sp.	x	–	x	–	T	x
Bathytoma (*Bathytoma*) *coweorum* n.sp.	–	–	–	–	T	–
Bathytoma (*Micantapex*) *media* (Marwick)	x	–	x	x	x	x
Eoscobinella secunda n.sp.	T	–	–	–	–	–
Inquisitor flemingi (Vella)	x	–	–	T	x	x
Maoricrassus carinatus Vella	x	–	–	T	x	–
Mauidrillia incerta n.sp.	–	–	–	–	–	T
Splendrillia (*Splendrillia*) *elongata* n.sp.	–	–	–	–	–	T
Splendrillia (*Hauturua*) *vellai* n.sp.	x	x	T	x	–	–
Splendrillia (*Wairarapa*) *rebecca* (Vella)	–	–	–	T	x	–
Mangaoparia powelli Vella	–	–	–	T	x	–
Antigluraleus rishworthi Vella	–	–	–	T	–	x
Miowateria pahaoaensis (Vella)	–	–	–	x	–	–
Puha cf. *fulgida* Marwick (frag.)	–	–	x	–	–	–
Thatcheria pagodula (Powell)	x	x	x	–	–	–
?*Eulimella* sp. (no protoconch)	–	–	–	x	–	–
Odostomia sp. (juvenile)	–	–	–	x	–	–
Acteon sp. (frags.)	–	–	–	x	–	–
Cylichnania sp. (frag.)	–	–	–	x	–	–
Scaphander sp. (frags.)	–	–	x	–	–	–
Dentalium (*Fissidentalium*) *solidum* Hutton	x	x	x	x	x	x
Dentalium (*Laevidentalium*) *pareorense* Pilsbry and Sharpe	x	x	x	x	x	x

TAXONOMY

Family NUCULIDAE

Genus NUCULA Lamarck, 1799

1799. *Nucula* Lamarck, Mem. Soc. Hist. nat. Paris 1799: 87.

Type species (by monotypy): *Arca nucleus* Linnaeus, 1758, Recent, Europe.

Nucula n.sp.

A single small, articulated individual of *Nucula* from N162/873, V1360, Mangaoriki Stream, resembles the Recent *N. hartvigiana* (Dorhn, 1864) more closely than any described fossil species, but is considerably more inflated, has a longer anterior end, and has finer concentric sculpture. The hinge is unknown. It appears to represent a new species, but additional specimens are needed before it can be named.

Length, 5.20mm; height, 4.45mm.

Specimen lodged in Geology Department, Victoria University of Wellington (VM423).

The large *Nucula otamaringaensis* Marwick is represented at all localities (Table I). Three small, incomplete valves of *Nucula* were collected by Mr D. Cowe from Bell's Creek; they are considerably less inflated and more finely sculptured than the specimen collected at V1360, but are too incomplete to compare with described species.

Family NUCULANIDAE

Genus ZEALEDA Marwick, 1924

1924. *Zealeda* Marwick, Proc. malac. Soc. Lond. 16: 25.

Type species (by original designation): *Zealeda hamata* Marwick, 1924, Upper Miocene, New Zealand.

Zealeda cf. **inflatella** Marwick, 1931

1931. *Zealeda inflatella* Marwick, Paleont. Bull. N.Z. geol. Surv. 13: 54, pl. 2, figs. 30, 33.

A single valve from N165/945, V1949, Bell's Creek, resembles *Z. inflatella* in shape and inflation, but has slightly different sculpture. The radial sculpture consists of irregular riblets on an anterior and a posterior area, like the areas of *Z. hamata* Marwick, and there are three weak concentric grooves over the outer half of the valve. It is possible that the specimen represents a new species of *Zealeda,* but the variation of the four described species is not known, and it is considered inadvisable to name a fifth species from one specimen.

DIMENSIONS: length, 2.25mm; height, 1.75mm.

Specimen lodged in Geology Department, Victoria University of Wellington (VM424).

Family LIMOPSIDAE

Genus LIMOPSIS Sassi, 1827

1827. *Limopsis* Sassi, Giorn. Sci. Ligustico 1: 476.

Type species (by subsequent designation, Gray, 1847): *Arca aurita Brocchi,* 1814, Miocene and Pliocene, Italy; Recent, Denmark to Madeira, and the Mediterranean Sea.

Limopsis cf. **retifera** Marwick, 1931

1931. *Limopsis retifera* Marwick, Paleont. Bull. N.Z. geol. Surv. 13: 59, pl. 3, figs. 48, 49, 54.

A single very incomplete valve from N165/947, V1951, another from GS10201 (= V1951), and a small fragment from N165/946, V1950 resemble *L. retifera* Marwick in most respects but have slightly weaker sculpture. Better specimens are needed before adequate comparisons are possible.

The most complete specimen, from V1951, is registered in the collection of the Geology Department, Victoria University of Wellington (VM584).

Family PECTINIDAE

Genus PARVAMUSSIUM Sacco, 1897

1897. *Parvamussium* Sacco, I molluschi dei Terreni Terziari del Piemonte e della Liguria (24): 48.

Type species (by original designation): *Pecten duodecimlamellatus* Bronn, 1831, Miocene and Pliocene, Italy.

The taxonomy of *Parvamussium* in New Zealand is obscure, largely because the shells are exceedingly thin and fragile and are rarely well preserved as fossils. Dell (1956: 20) stated that juveniles of the Recent *P. maoria* have internal radial ribs extending to the margin of the disc, while specimens about 13mm high have the radial ribs extended over only two-thirds of the disc. Dell (1963: 206) later noted that the species reaches at least 22mm in diameter, and in specimens of this size the radial ribs extend over only the inner one-third of the valve. Most useful fossils of *Parvamussium* are steinkerns, in which the internal ribs are the only visible taxonomic character, and the variation in rib length with shell size greatly complicates taxonomy.

From Marwick's (1931: pl. 4, figs. 66, 67) figures, *Parvamussium zitteli* (Hutton) appears to be easy to recognise, as the internal ribs reach the outer margin of the shell regardless of size. No specimens larger than 25mm high have been seen with this character, and the specimen with ribs extending over about two-thirds of the disc identified as *P.* aff. *zitteli* by Marwick (1931: 64, pl. 4, fig. 69) is probably the adult form of *zitteli*. This specimen closely resembles the figure of the holotype of *P. papakurense* given by Clarke (1905: pl. 32, fig. 4). A specimen of *Parvamussium* 43mm high, collected by the writer from cliffs of the upper Mata River 200 yards above Ihungia Road bridge, Gisborne (?Altonian) has the ribs extending over only two-thirds of the shell, and is probably a large adult *P. zitteli*. The status of all named species is obscure, and in the present state of our knowledge small fossil specimens of *Parvamussium* appear to be impossible to identify.

Many fragments of large specimens of *Parvamussium*, from shells that must have been up to about 30mm high, were collected at N165/947, V1951, McLeod's Stream, and three small fragments were collected at N165/945, V1949, Bell's Creek. Their internal ribs extend over about two-thirds of the valve, and they are tentatively placed in *P. zitteli* (Hutton).

Parvamussium zitteli has a time range of at least Whaingaroan to Tongaporutuan (Oligocene to Upper Miocene) in New Zealand, and it is unlikely that *P. papakurense* (Clarke) is a distinct species. *P. maorium* Dell appears to be a direct descendant of *P. zitteli* (Hutton).

Family CRASSATELLIDAE

Genus CUNA Hedley, 1902

1902. *Cuna* Hedley, Mem. Aust. Mus. 4: 314.

Type species (by original designation): *Cuna concentrica* Hedley, 1902, Recent, Tasmania.

Cuna awheaensis n.sp. Pl. 3, a, b.

Shell small, roundly trigonal, with lightly rounded posterior margin and vertical umbones. Sculpture of 14 narrow, flat-topped, widely spaced radial riblets with square-cut sides and broad, flat interstices, becoming weak over the outer quarter of the valve, crossed by many very weak concentric growth lines. Interior of ventral margin lightly corrugated by the exterior ribs. Prodissoconch worn. Hinge typical of the genus.

DIMENSIONS: height, 3.10mm; length, 2.80mm (Holotype); height, 3.50mm; length, 3.10mm (largest paratype, VM442).

LOCALITY: N165/945, V1949, Bell's Creek, trib. of Mangaopari Stream, holotype and 20 paratypes.

HOLOTYPE (VM441) and fifteen paratypes in Geology Department, Victoria University of Wellington; five paratypes in D. Cowe collection.

Fleming (1955: 1053) discussed specimens from Bell's Creek in relation to his *C. caerulea,* from Bluecliff, Te Waewae Bay (Kapitean). However, the species at Bell's Creek is readily distinguished from *Cuna caerulea* by its narrower and more numerous ribs and by its broader outline. The large number of ribs, their square section, and their wide, flat interstices separate the species readily from all other New Zealand members of the genus. The Recent *Cuna carditelloides* Suter, 1907 has 15 ribs, but they are lower, broader, and more closely spaced than in *C. awheaensis.*

Family LUCINIDAE

Genus LUCINOMA Dall, 1901

1901. *Lucinoma* Dall, Proc. U.S. natl. Mus. 23: 806.

Type species (by original designation): *Lucina filosa* Stimpson, Recent, Western Atlantic.

?Lucinoma sp.

Many fragments of a very thin-shelled bivalve with high, thin, widely-spaced concentric ribs have been collected from V1951, McLeod's Stream. The shape appears to be typically lucinid, and the sculpture is typical of *Lucinoma,* but the hinge and internal features have not been seen.

Family PERIPLOMATIDAE

Genus PERIPLOMA Schumacher, 1817

1817. *Periploma* Schumacher, Essais d'un noveau système des habitations des vers testacés: 115.

Type species (by subsequent designation, Deshayes): *Periploma inaequivalvis* Schumacher, 1817 (= *Anatina trapezoides* Lamarck, 1816), Recent, Brazil.

Periploma macphersoni Marwick, 1931

1931. *Periploma macphersoni* Marwick, Paleont. Bull. N.Z. geol. Surv. 13: 83, pl. 6, fig. 96.

A single specimen from N165/945, V1949, Bell's Creek, is comparable with the holotype of *Periploma macphersoni* in all significant features. The time range of the species was given by Fleming (1966: 34) as Waiauan (Middle Miocene) to ?Kapitean (uppermost Miocene). The species can now be definitely recorded from the Tongaporutuan, at least; a specimen from Palliser Bay (Mangapanian, upper Pliocene) recorded by the writer (Beu, 1967) as *Periploma* sp. probably also belongs in this species. The genus is a characteristic bathyal and outer neritic element of many Recent faunas around the world, but is not known Recent in New Zealand.

Family TROCHIDAE

Subfamily SOLARIELLINAE

Genus SOLARIELLA S. V. Wood, 1842

1842. *Solariella* Wood, Ann. Mag. nat. Hist., ser. 1, 9: 531.

Type species (by monotypy): *Solariella maculata* Wood, 1842, Pliocene, England.

Subgenus ZETELA Finlay, 1927

1927. *Zetela* Finlay, Trans. N.Z. Inst. 57: 359.

Type species (by original designation): *Minolia textilis* Murdoch and Suter, 1906, Recent, New Zealand.

Solariella (Zetela) aff. castigata (Marwick, 1931)

1931. *Antisolarium castigatum* Marwick, Paleont. Bull. N.Z. geol. Surv. 13: 88, pl. 17, figs. 125, 126.

1966. *Solariella (Zetela) castigata*: Fleming, Bull. N.Z. Dept. scient. Ind. Res. 173: 39, pl. 67, figs. 771, 772.

A single, small, fragmentary, largely decorticated specimen from N162/873, V1360, Mangaoriki Stream, and a single fragmentary spire from N165/945, V1949, Bell's Creek, have the sculpture and shape of the upper surface and periphery of the whorls as in *S. castigata* (Marwick). No other features are preserved, and specific identity with *S. castigata* is not definite. The species was stated to range from Altonian to Lillburnian by Fleming (1966: 39). The subgenus *Zetela* is characteristic of outer neritic and upper bathyal faunas in New Zealand.

The specimen from V1360 is lodged in the Geology Department, Victoria University of Wellington (VM420); the specimen from Bell's Creek is in the D. Cowe collection.

Family CYCLOSTREMATIDAE

Genus CONJECTURA Finlay, 1927

1927. *Conjectura* Finlay, Trans. N.Z. Inst. 57: 373.

Type species (by original designation): *Crossea glabella* Murdoch, 1905, Recent, New Zealand.

The genera *Conjectura* Finlay, 1927, and *Elachorbis* Iredale, 1915, were (presumably inadvertently) not included in the revision of Archaeogastropoda in the *Treatise on Invertebrate Paleontology*. They are among the many Australasian genera formerly included in the Liotiidae, of which all but these two were placed in the Cyclostrematidae in the *Treatise*. They appear to be similar to other genera included in the Cyclostrematidae, and are here placed in that family.

Elachorbis could well belong in a family of the Mesogastropoda, such as the Vitrinellidae, but a position outside the Cyclostrematidae does not seem reasonable for *Conjectura*. Thus *Elachorbis* may appear in a further volume of the *Treatise*.

Conjectura proava Marwick, 1931

1931. *Conjectura proava* Marwick, Paleont. Bull. N.Z. geol. Surv. 13: 86, pl. 7, figs. 118, 119.

A single slightly incomplete specimen from N165/945, V1949, Bell's Creek, closely resembles *C. proava* in apertural and umbilical characters, but is slightly more compressed dorsoventrally. The holotype of *C. proava,* from GS1340, Ngatapa S.D., Gisborne (Lillburnian, Middle Miocene), is the only other known specimen.

DIMENSIONS: diameter, 2.15mm; height, 1.60mm.

Specimen lodged in Geology Department, Victoria University of Wellington (VM751).

Family RISSOIDAE

Genus IHUNGIA Marwick, 1931

1931. *Ihungia* Marwick, Paleont. Bull. N.Z. geol. Surv. 13: 89.

Type species (by original designation): *Ihungia luteophila* Marwick, 1931, Middle Miocene, New Zealand.

Ihungia cf. **acantha** Marwick, 1965

1965. *Ihungia acantha* Marwick, Paleont. Bull. N.Z. geol. Surv. 39: 29, pl. 10, fig. 3.

A single specimen from N165/945, V1949, Bell's Creek, has a worn protoconch and a decorticated outer lip. The sculpture consists of one spiral cord just below the suture, one around the periphery, and (on the last whorl) two and a very weak third below the periphery. The specimen is close to *I. acantha* Marwick, an Opoitian (lower Pliocene) form, but probably represents a new species, differing in having the peripheral spiral cord lower down on the whorls. It resembles the Nukumaruan (lower Pleistocene) *I. moniliata* Marwick in shape, but has fewer basal spirals.

The genus *Ihungia* has not previously been recorded from Tongaporutuan rocks but has a time range of at least Otaian to Nukumaruan (Fleming, 1966: 43), so that its occurrence in the Tongaporutuan is not surprising.

DIMENSIONS: height, 2.70mm; diameter, 1.55mm.

Specimen lodged in Geology Department, Victoria University of Wellington (VM422).

Family NATICIDAE

Genus TANIELLA Finlay and Marwick, 1937

1937. *Taniella* Finlay and Marwick, Paleont. Bull. N.Z. geol. Surv. 15: 48.

Type species (by original designation): *Natica notocenica* Finlay, 1924, Lower Miocene, New Zealand.

Subgenus PRISTINACCA Finlay and Marwick, 1937

1937. *Pristinacca* Finlay and Marwick, Paleont. Bull. N.Z. geol. Surv. 15: 51.

Type species (by original designation): *Uber senisculus* Marwick, 1924, Danian, New Zealand.

Finlay and Marwick (1937: 51) erected *Pristinacca* as a full genus, without comparing it with *Taniella*. From their diagnosis it appears to be distinguished from *Taniella* by its protoconch, by its smaller, narrower funicle, and by the growth lines being retracted to the suture rather than antecurrent as in *Taniella*. Marwick (1960: 19) later described a Lower Eocene elongate species of *Taniella* with a weak funicle and noted that, as *Pristinacca* could now be distinguished from *Taniella* only by its protoconch and its retracted growth lines, it should be treated as a subgenus of *Taniella*. Fleming (1966: 53) placed the Awamoan (Lower Miocene) *"Polinices" motutaraensis* Powell, 1935, in *Pristinacca,* ranking *Pristinacca* as a subgenus of *Taniella*. This gave a broadened definition to *Pristinacca,* as *P. motutaraensis* has a larger semicircular funicle than those of middle and upper Tertiary species of *Taniella,* completely filling the umbilicus, fused to a thickened columellar callus like that of *Polinices,* and bearing two transverse ridges.

As *P. motutaraensis* is similar to the type species of *Pristinacca* in size, shape, and growth lines, the two species are undoubtedly closely related.

The following new species from the Wairarapa bathyal Tongaporutuan has similar funicle, callus and growth lines to *P. motutaraensis,* and seems to be a further species of *Pristinacca*. Some subadult specimens of the new species resemble *Taniella notocenica* in all features except their retracted growth lines, having a slightly smaller funicle than adults, not fused to the walls of the umbilicus, and having much weaker transverse ridges and a much thinner columellar callus than adults. This seems to confirm the close relationship of *Pristinacca* to *Taniella*. Thus, although calcerous operculae of *Pristinacca* have not been found, it seems likely that it is a calcerous–operculate group, correctly assigned subgeneric rank under *Taniella,* in the Naticinae. It appears that *Taniella* and *Pristinacca* evolved along similar lines from the Paleocene and Lower Eocene ancestors, developing similar large funicles but retaining initial shape and outer lip (i.e., growth line) differences.

Taniella (Pristinacca) poliniciformis n.sp. Pl. 3, g

Shell small, smooth, and lightly polished, with a moderately tall mamillate spire and lightly concave shoulders. Growth lines slightly prosocline for most of their height, curving around high on the shoulder to become retracted to the suture. Funicle broadly semicircular, completely filling the umbilicus and fused to the body whorl in adult specimens, but slightly smaller and separated from the umbilical walls by a groove in some subadult specimens, bearing two clearly marked, prominent transverse ridges of the columellar callus that increase in prominence during shell growth. Columellar callus thin in young specimens, becoming very thick and resembling that of *Polinices* in adults.

DIMENSIONS: height, 7.65mm; diameter, 6.80mm (holotype); height, 8.85mm; diameter, 9.0mm (largest paratype, VM498).

LOCALITIES: N165/945, V1949 (= GS10200), Bell's Creek, tributary of Mangaopari Stream, holotype and many paratypes; N165/946, V1950, Mangaopari Stream, two paratypes; N165/947, V1951, McLeod's Stream, eight paratypes; N162/916, V1419, Wainuioru River, five paratypes; N162/872, V1359, Mangaoriki Stream, two paratypes.

HOLOTYPE (VM457), 31 paratypes from Bell's Creek (VM458–489), two paratypes from V1950 (VM504, VM505), six paratypes from V1951 (VM491–496), five paratypes from V1419 (VM498–502), and one paratype from V1359 in Geology Department, Victoria University of Wellington; 11 paratypes from GS10200, Bell's Creek (TM4599–4609), and two paratypes from GS10201, McLeod's Stream (TM4597, TM4598) in New Zealand Geological Survey; three paratypes from Bell's Creek in Dominion Museum; 10 paratypes from Bell's Creek, and one paratype from V1359, Mangaoriki Stream, in D. Cowe collection.

As previously noted, the species is very similar to *T. motutaraensis* (Powell), differing in its smaller size, its considerably more prominent funicular ridges, its larger aperture, and its shorter spire. The larger of two specimens of *T. motutaraensis* in the New Zealand Geological Survey is 11.9mm high and 9.4mm in diameter.

Genus FRIGINATICA Hedley, 1916

1916. *Friginatica* Hedley, Rep. Aust. Antarctic Exp., ser. C, 4(1): 61.

Type species (by original designation): *Natica beddomei* Johnston, Recent, south-eastern Australia.

Friginatica marwicki n.sp. Pl. 3, h.

Shell small, with relatively tall spire, narrow sutural channel, and small umbilicus. Body whorl large and well inflated, with well-rounded sides, and a straight base sloping to a rather sharply rounded point below the aperture. Aperture semicircular, with outer lip projecting slightly from the columellar callus, slightly prosocline at the suture. Inner lip moderately thickened, rather long, slightly reflected lower down. Umbilicus a very narrow, oval perforation beneath the columellar callus. Growth lines faintly visible over whole shell, incised to form weak radial grooves for a short distance below the suture. Sutural canal very narrow and shallow, with a rounded outer margin.

DIMENSIONS: height, 8.0mm; diameter, 7.4mm (holotype); height, 10.7mm; diameter, 10.1mm (largest paratype, VM559).

LOCALITIES: N165/945, V1949, Bell's Creek, tributary of Mangaopari Stream, holotype (VM546) and 12 paratypes (VM547–558); N162/873, V1360, Mangaoriki Stream, five paratypes (VM559–563); N162/916, V1419, Wainuioru River, one paratype (VM564); N165/947, V1951, McLeod's Stream, one paratype (VM565); N162/872, V1359, Mangaoriki Stream, four paratypes (VM566–569).

HOLOTYPE (VM546) and 23 paratypes (VM547–569) in Geology Department, Victoria University of Wellington.

The species is similar to the Pliocene and Recent *F. amphialis* (Watson), recorded from the Mangapanian at Palliser Bay by Beu (1969), but differs in its slightly taller spire, its shorter and thicker columellar callus, its consistently small umbilicus (highly variable in size in *F. amphialis*), its much narrower and shallower sutural canal with a rounded (rather than a sharply keeled) border, and in the presence of shallow radial grooves below the suture. *F. marwicki* and *F. amphialis* differ from the Recent south-eastern Australian *F. beddomei* (Johnston) (figured by Dell, 1956: pl. 9, fig. 89) in having more inflated body whorls and a smaller umbilicus.

The shape, umbilicus, and sutural canal of *F. marwicki* are intermediate between those of *F. amphialis* and those of the Awamoan "*Uberella*" *pukeuriensis* (Finlay), which may be an early species of *Friginatica* s.str.

Family CASSIDIDAE

Genus GALEODEA Link, 1807

1807. *Galeodea* Link, Beschr. Nat. Sammlung. Univ. zu Rostock (3):113.

Type species (by subsequent designation, Herrmannsen, 1847): *Buccinum echinophorum* Linnaeus, 1758, Recent, Mediterranean Sea.

?Galeodea sp.

Fragments and unidentifiable crushed specimens of a cassid were collected from N165/945, V1949; N165/946, V1950; and N165/947, V1951, all in the Mangaopari Stream area. The shell is sculptured with many narrow threads and several rows of small nodules, and seems to belong to *Galeodea* rather than to the more coarsely sculptured *Echinophoria*. The writer (Beu, 1967) has recorded fragments that are probably of *Galeodea triganceae* Dell from Palliser Bay (Mangapanian) and noted that *Galeodea* is largely a bathyal genus in New Zealand.

Family CYMATIIDAE

Genus AUSTROSASSIA Finlay, 1931

1931. *Austrosassia* Finlay, Trans. N.Z. Inst. 62: 7.

Type species (by original designation): *Septa parkinsonia* (Perry, 1811), Pleistocene and Recent, Australasia.

Austrosassia sp.

A small fragment of a body whorl from N162/916, V1419, and part of an outer lip from N162/872, V1359, have the sculpture of *Austrosassia*. They are not identifiable in themselves, but the only species of *Austrosassia* known from the Tongaporutuan Stage is *A. pahaoaensis* Vella. *Austrosassia* is not known from depths greater than about 100m today, so that its occurrence in a bathyal siltstone is rather surprising. The fragments may have been washed down from a shallower environment, but if so would provide the only evidence (apart from *Alcithoe hurupiensis*) of such transport in the faunas studied.

Genus CYMATONA Iredale, 1936

1936. *Cymatona* Iredale, Rec. Aust. Mus. 17: 177.

Type species (by original designation): *Nassaria kampyla* Watson, 1885, Pliocene to Recent, Australasia.

Cymatona n.sp.

An incomplete, moderately large specimen from N162/875, V1362, Manga-a-whanaki Stream, Wainuioru Valley (the only species collected at this locality), and a small apex from N162/916, V1419, Wainuioru River, have the fine sculpture and large protoconch characteristic of *Cymatona*. The species is being described in a review of New Zealand Cymatiidae, in press. This is the first record of a species of *Cymatona* older than Pliocene. As *Cymatona* lives almost entirely in bathyal waters in New Zealand today, its occurrence in Wairarapa Tongaporutuan rocks helps confirm their bathyal depth of deposition.

Family TRIPHORIDAE

Genus INELLA Bayle, 1869

1843. *Ino* Hinds, Ann. Mag. nat. Hist., ser. 1, 11: 17 (non *Ino* Leach, 1819; nec Laporte, 1835; nec Koch, 1850).

1879. *Inella* Bayle, J. Conch. Paris 27: 35. New name for *Ino* Hinds, preoccupied.

Type species (by subsequent designation, Gray, 1847): *Triphora* (*Ino*) *gigas* Hinds, 1843, Recent, New Guinea.

Species of *Inella* figured by Kosuge (1962a, 1962b) have extremely tall, gradually tapering spires, an angulation formed by a projecting spiral cord at the base of each whorl, and nodular sculpture. *Viriola* Jousseaume, 1884 (figured by Kosuge,

1961), contains a varied group of species, some of which are similar in shape to *Inella,* and all of which have smooth or only faintly nodulous spiral cords. The following new species lacks the protoconch and early spire whorls, but Kosuge does not treat the protoconch as fundamental in the classification of the Triphoridae.

Inella zeattenuata n.sp. Pl. 3, c.

Shell sinistral, tall and very narrowly conical, top of spire and part of body whorl missing. Spiral sculpture of one weak subsutural cord, two lower, narrow, widely spaced cords, a massive, projecting cord forming the periphery at about a quarter of the whorl height, and one lower suprasutural thread. Interstices are smooth and lightly polished, except for a further weak cord between the peripheral and suprasutural cords appearing first on the penultimate whorl. A further fine cord appears from under the inner lip callus on the body whorl, below the former suprasutural cord, so that there are three closely-spaced cords in the lowest interspace on the last whorl. Base smooth. Spirals crossed by about 13 broad, high, rounded, but ill-defined prosocline axial folds per whorl, causing low, vertically compressed nodules on the subsutural cord, larger ones on the two weak lower cords, and large, strongly projecting nodules on the peripheral cord. Axials die out rapidly over the lower part of each whorl, and do not nodulate the suprasutural cord. Whorl outline slightly concave, both above and below the peripheral cord. Teleoconch presently of seven whorls; probably originally of about 12 whorls.

DIMENSIONS: height, 10.8mm; diameter, 3.9mm (incomplete holotype).

LOCALITY: N162/872, V1359, Mangaoriki Stream, unique holotype.

HOLOTYPE (VM426) in Geology Department, Victoria University of Wellington.

This is the first species of *Inella* recorded from New Zealand. It is characterised by its extremely tall form, by its whorls being strongly carinate at about a quarter of their height, with concave outlines above and below the carina, by its three narrow cords above and one below the carina, and by having about 13 vertically compressed nodules per whorl formed by broadly rounded prosocline axial folds on all cords except the lowest one.

Family EPITONIIDAE

Genus TURRISCALA Boury, 1890

1890. *Turriscala* Boury, Rev. Scal. d'Italie: 31.

Type species (by original designation): *Turbo torulosus* Brocchi, 1814, Pliocene, Italy.

Turriscala n.sp.

A single incomplete specimen of three and a quarter whorls from N165/947, V1951, McLeod's Stream, appears to represent a new species of *Turriscala.* It is comparatively large, and bears three varices at intervals of one and a quarter whorls. Three poorly known species of *Turriscala* occur in the Paleogene of New Zealand, and little can be done with this specimen until all New Zealand members of the family are revised.

The specimen is lodged in the Geology Department, Victoria University of Wellington (VM419).

Family BUCCINIDAE

Genus AENEATOR Finlay, 1927

1927. *Aeneator* Finlay, Trans. N.Z. Inst. 57: 414.

Type species (by original designation): *Verconella marshalli* Murdoch, 1924, Lower Pleistocene, New Zealand.

Subgenus ELLICEA Finlay, 1927

1927. *Ellicea* Finlay, in Marwick, Trans. N.Z. Inst. 58: 432.

Type species (by original designation): *Siphonalia orbita* Hutton, 1885, Pliocene, New Zealand.

Aeneator (Ellicea) willetti (Fleming, 1955). Pl. 2, figs. 14, 16.

1955. *Ellicea willetti* Fleming, Trans. R. Soc. N.Z. 82: 1057, pl. 41, figs. 13, 14.

1966. *Aeneator (Ellicea) willetti*: Fleming, Bull. N.Z. Dept. scient. ind. Res. 173: 59.

Specimens of *Ellicea* from several localities studied are similar to *A.* (*E.*) *willetti* (Fleming), having relatively few, very prominent, high, narrow spiral cords with broad, flat interspaces. They are smaller than the Kapitean *willetti* and have taller spires, axial folds as low down as the penultimate whorl on about half the specimens, and lightly shouldered whorls on about a quarter of the specimens. There is considerable variation in the height of the spire, the prominence of the axial folds, and the prominence of the shoulder angulation, and in view of the usual variability of species of *Ellicea* (Beu, 1967), the form is not considered to be separable from *willetti.* The Tongaporutuan *A.* (*E.*) *conformatus* (Marwick, 1931) is similar but has more numerous and more closely spaced, much lower, and narrower spiral cords. The Wairarapa Tongaporutuan form is probably intermediate between *A. conformatus* and *A. willetti* in an evolutionary lineage.

Genus PENION Fischer, 1884

1884. *Penion* Fischer, Manuel de Conchyliogie (6): 625.

1914. *Verconella* Iredale, Proc. malac. Soc. Lond. 11: 175. Type species (by original designation): *Fusus dilatatus* Quoy and Gaimard, 1833.

Type species (by original designation): *Siphonalia dilatata* Quoy and Gaimard (= *Fusus dilatatus* Quoy and Gaimard, 1833), Recent, New Zealand.

Penion aff. **brazieri** Fleming, 1955

1955. *Penion brazieri* Fleming, Trans. R. Soc. N.Z. 82: 1057, pl. 41, fig. 22.

A single medium-sized spire of *Penion* from N165/945, GS10200 (= V1949), Bell's Creek, is very similar to the Kapitean (uppermost Miocene) *P. brazieri* Fleming, from Te Waewae Bay, Southland. It has strong, rounded axial folds beginning suddenly at the periphery, a strongly concave shoulder, and a spiral sculpture of alternating strong and weak spiral cords. Together with *P. brazieri* Fleming it belongs in the same group as the Recent *P. fairfieldae* (Powell, 1947), which should probably be placed in the subgenus *Berylsma* Iredale, 1924. It has a considerably shorter and broader spire than *P. brazieri* and the two older similar species *P. interjunctus* (Finlay, 1930) and *P. imperfectus* (Powell, 1947).

More fragmentary specimens of *Penion* from other localities (Table I) are unidentifiable, but are more elongate than *P.* aff. *brazieri,* are similar in shape and sculpture to *P. benthicolus* Dell, 1956 and *P. ormesi* (Powell, 1927), and are not related to the *P. fairfieldae* group.

Genus AUSTROFUSUS Kobelt, 1879

1879. *Austrofusus* Kobelt, Kuester Conch. Cab., *Fusus*: 127.

1915. *Aethocola* Iredale, Trans. N.Z. Inst. 47: 465 (as a subgenus of *Verconella*). Type species (by original designation): *Buccinum nodosum* Martyn, 1784 (non binomial) = *Drupa glans* Röding, 1798.

Type species (by subsequent designation, Martens, 1881): *Drupa glans* Röding, 1798, Pleistocene and Recent, New Zealand.

Subgenus NEOCOLA Finlay, 1926

1926. *Neocola* Finlay, Trans. N.Z. Inst. 56: 232.

Type species (by original designation): *Austrofusus* (*Neocola*) *beta* Finlay, 1926, Middle Miocene, New Zealand.

Austrofusus (Neocola) cliftonensis (Marwick, 1926). Pl. 1, Fig. 6.

1926. *Aethocola cliftonensis* Marwick, Trans. N.Z. Inst. 56: 321, pl. 73, fig. 15.

1966. *Austrofusus* (*Neocola*) *cliftonensis*: Fleming, Bull. N.Z. Dept. scient. Ind. Res. 173: 61, pl. 106, fig. 1294.

A single slightly incomplete specimen from N165/945, V1949, Bell's Creek, agrees closely in all details with topotypes of *A. cliftonensis* (Marwick), a common species in the deep-water siltstone on the coast near Tongaporutu, North Taranaki (type Tongaporutuan). The time range and geographic range are given by

Fleming (1966: 61) as Tongaporutuan, Taranaki and Westland. This is the first specimen recorded from Wairarapa District.

DIMENSIONS: height (incomplete), 23.4mm; diameter, 15.9mm.

Specimen lodged in the Geology Department, Victoria University of Wellington (VM411).

Genus COMINELLA M. E. Gray, 1850

1850. *Cominella* M. E. Gray, Figs. Moll. Anim. 4: 72.

Type species (by subsequent designation, Iredale, 1918): *Buccinum testudineum* Bruguière, 1789 (= *Buccinum maculosum* Martyn, 1784; valid I.C.Z.N. opin. 479), Recent, New Zealand.

Subgenus EUCOMINIA Finlay, 1926

1926. *Eucominia* Finlay, Trans. N.Z. Inst. 56: 239.

Type species (by original designation): *Buccinum nassoides* Reeve, 1846, Recent, southern New Zealand.

Cominella (Eucominia) aff. mirabilis Powell, 1929

1929. *Cominella* (*Eucominia*) *mirabilis* Powell, Trans. N.Z. Inst. 60: 93, pl. 4, fig. 76.

1956. *Fax mirabilis*: Dell, Bull. Dom. Mus. Wellington 18: 94.

1968. *Cominella* (*Eucominia*) *mirabilis*: Ponder, Rec. Dom. Mus. Wellington 6(4): 40.

A single fragmentary spire from N162/916, V1419, Wainuioru River, has a cominelloid protoconch, and has strongly angled whorls and fine sculpture similar to those of the Recent *Eucominia mirabilis* complex. It probably represents a new species of *Eucominia* ancestral to the *mirabilis* group, but full description must await better specimens.

The specimen is lodged in the Geology Department, Victoria University of Wellington (VM421).

The placing of New Zealand species previously included in *Fax* Iredale, 1925 in *Eucominia* Finlay follows Ponder (1968a: 36).

Family FASCIOLARIIDAE

Genus FALSICOLUS Finlay, 1930

1930. *Falsicolus* Finlay, Trans. N.Z. Inst. 61: 262.

Type species (by original designation): *Fusinus kaiparaensis* Suter, 1917, Lower Miocene, New Zealand.

Falsicolus aff. tangituensis (Marwick, 1926)

1926. *Euthriofusus tangituensis* Marwick, Trans. N.Z. Inst. 56: 320, pl. 73, fig. 9

1966. *Falsicolus tangituensis*: Fleming, Bull. N.Z. Dept. Scient. Ind. Res. 173: 63, pl. 111, fig. 1357.

Several fragments of a *Falsicolus* have been collected at each of localities N162/872, V1359; N162/873, V1360; N162/916, V1419; and N165/945, V1949. They are too fragmentary to identify with accuracy; all that can be stated is that an incomplete spire from V1949, Bell's Creek, resembles that of the Tongaporutuan *F. tangituensis* (Marwick). *Falsicolus* has not previously been recorded from Wairarapa District.

Family CANCELLARIIDAE

Genus OAMARUIA Finlay, 1924

1924. *Oamaruia* Finlay, Trans. N.Z. Inst. 55: 514.

Type species (by original designation): *Admete suteri* Marshall and Murdoch, 1920, Lower Miocene, New Zealand.

Oamaruia elegantula n.sp. Pl. 3, f.

Shell large for the genus, with short spire and ovate, elongate body whorl. Protoconch eroded. Teleoconch whorls prominently but roundly angled, with shoulder slightly convex

and gently sloping. Five or six weak, ill-defined spiral threads on sides and shoulder of spire whorls, and about twenty on body whorl, base, and canal; with faint traces of interstitial threads in all interspaces, the interstitial threads increasing in strength over the base to become as prominent as the primary threads. Axial folds prominent, high, narrow, with rather sharply rounded crests, slightly prosocline on the shoulder, 11 on penultimate whorl and 10 on last whorl. Canal short, with well-developed fasciole and slight notch. Inner lip a rather widely spread thin glaze, bearing three strong oblique plaits, the lowest at the top of the canal.

DIMENSIONS: height, 10.6mm; diameter, 6.0mm (holotype).

LOCALITY: N165/947, V1951, McLeod's Stream, tributary of Mangaopari Stream.

HOLOTYPE (VM574) and five paratypes (VM575–479) in Geology Department, Victoria University of Wellington.

The new species has much weaker and more numerous spiral threads than any other species of the genus. *O. major* Marwick, 1965 is similar in size, shape, and axial sculpture, but has only two spirals on spire whorls, six on the upper part of the body whorl, and none at all on the base or canal. The two species appear to be closely related, and have much finer spiral sculpture than any other species of *Oamaruia*.

Genus INGLISELLA Finlay, 1924

1924. *Inglisella* Finlay, Trans. N.Z. Inst. 55: 513.

Type species (by original designation): *Ptychatractus pukeuriensis* Suter, 1917, Lower Miocene, New Zealand.

Inglisella culminata n.sp. Pl. 1, Figs. 4, 5.

Shell large for the genus, elongate and oval, with many small sharp nodules but other sculpture weak. Whorls prominently shouldered very high up, with a narrow, gently sloping, slightly concave shoulder. Spiral sculpture of four narrow, slightly-raised, flat-topped spiral cords on spire whorls and seven primary cords on the body whorl, the upper three of which bear small, prominent, round-tipped nodules; there is a single extremely weak thread in each interspace. Axial folds low, rather widely spaced, 13 on the penultimate whorl, becoming irregular and then obsolete on the last quarter-whorl of the largest specimen. Aperture oval, with strongly prosocline, arcuate outer lip and axial folds, and two weak oblique plaits on the columella. Anterior canal short, not notched, very weakly differentiated from the body whorl, with a weak fasciolar fold. Protoconch eroded.

DIMENSIONS: height, 11.7mm; diameter, 5.4mm (holotype, the largest specimen).

LOCALITY: N162/917, V1420 (= 1419), Wainuioru River near Admiral Road, holotype (VM542); N162/916, V1419, same locality, two paratypes (VM544, VM545); N162/873, V1360 (= GS10202), Mangaoriki Stream, two paratypes (VM543, TM4635).

HOLOTYPE (VM542) and three paratypes (VM543–545) in Geology Department, Victoria University of Wellington; one paratype (TM4635) in New Zealand Geological Survey.

The species resembles *I. parva* Laws, 1935, from Clifden, Southland (Middle Miocene), but reaches a considerably larger size, has one more spiral cord on spire whorls, has very much weaker interstitial spiral sculpture, and has much sharper and more prominent nodules than those of *I. parva,* which are of a different shape. The protoconch is missing from all specimens, so that the generic position is tentative, but the close resemblance to, and apparent descent from, *I. parva* Laws strongly suggests that *I. culminata* belongs in *Inglisella* rather than in *Anapepta*.

Genus DELLINA n.gen.

Type species: *Waipaoa munida* Ponder, 1968, Recent, New Zealand.

"Waipaoa" munida Ponder differs from *Waipaoa* in its considerably larger size, its finer sculpture, and its taller form and is not congeneric with other species

placed in *Waipaoa*. Thus the new genus *Dellina* is erected for it. *Waipaoa munida* Ponder (Ponder, 1968a: 46, pl. 4, fig. 57) is formally designated as the type species, as it is based on a much larger and more complete specimen than the holotype of *Antizafra aoteana* Dell (Dell, 1956: 111, pl. 11, fig. 110). Ponder (1968b: 124) has pointed out that *A. aoteana* Dell is an earlier name for *Waipaoa munida* Ponder. The new genus is named for Dr R. K. Dell, Director of the Dominion Museum, in recognition of his many fundamental contributions to the study of New Zealand Mollusca, and of his personal kindness and inspiration to the writer.

Three genera of Australasian cancellariid-like shells, *Dellina* n.gen., *Waipaoa* Marwick, 1931, and *Pallidonia* Laseron (Laseron, 1955: 272, fig. 13), lack columellar plaits. In this they resemble *Paradmete* Gardner, 1916, from the Upper Cretaceous of the southern United States, and some species such as *Paradmete cancellaria* (Conrad) (Sohl, 1964: pl. 45, figs. 28–34) are very similar to *Waipaoa* in shape, sculpture, and apertural features. According to Sohl (1964: 270), Stephenson erected the family Paradmetidae for *Paradmete* in 1941 without giving any diagnosis; Sohl (1964) continued to use the family for *Paradmete* alone. It is very difficult to say whether the three Australasian genera are primitive groups that have never developed plaits, or whether they have secondarily lost their plaits; the extremely weak columellar folds visible on a few specimens of *Waipaoa delli* n.sp. suggest that the latter possibility is the more likely. More detailed study of the living species, particularly to see if their radulae differ significantly from those of other Cancellariidae, will be necessary before their family position is finalised. Meanwhile they are retained in the Cancellariidae.

Genus WAIPAOA Marwick, 1931

1931. *Waipaoa* Marwick, Paleont. Bull. N.Z. geol. Surv. 13: 122.

Type species (by original designation): *Admete cristata* Marwick, 1926, Upper Miocene, New Zealand.

Waipaoa delli n.sp. Pl. 4, e.

Shell very small, crisply sculptured, with narrow axial and spiral ribs. Shape parallel-sided as in *W. grata* Marwick and *W. affectata* Marwick, but less elongate, prominently shouldered at the periphery. Spiral cords very narrow, with rounded cross-section, raised into small, sharp, vertically compressed nodules where they cross the narrow-crested, widely spaced axial folds. Six spirals on body whorl, with two very weak ones on the canal and two on spire whorls, and with a very weakly defined subsutural cord that is not crossed by the axial folds. The third spiral below the suture on the last whorl is weaker than the others, and develops as an interstitial thread on the penultimate whorl. A further fine interstitial thread sometimes develops in the uppermost interspace over the last quarter-whorl. Uppermost interspace relatively wide, second and third relatively narrower, and fourth and fifth again relatively wide. Axial folds about 10 per whorl, slightly retrocline on the sides of the whorls, but strongly prosocline on the broad, gently sloping, slightly concave shoulder. Nodules occur on all main spirals but decrease in strength downwards from the periphery. Traces of very faint axial and spiral threads occur in all interspaces. Aperture short and broadly oval, with a distinct but very short anterior canal. Inner lip smooth. Protoconch not seen.

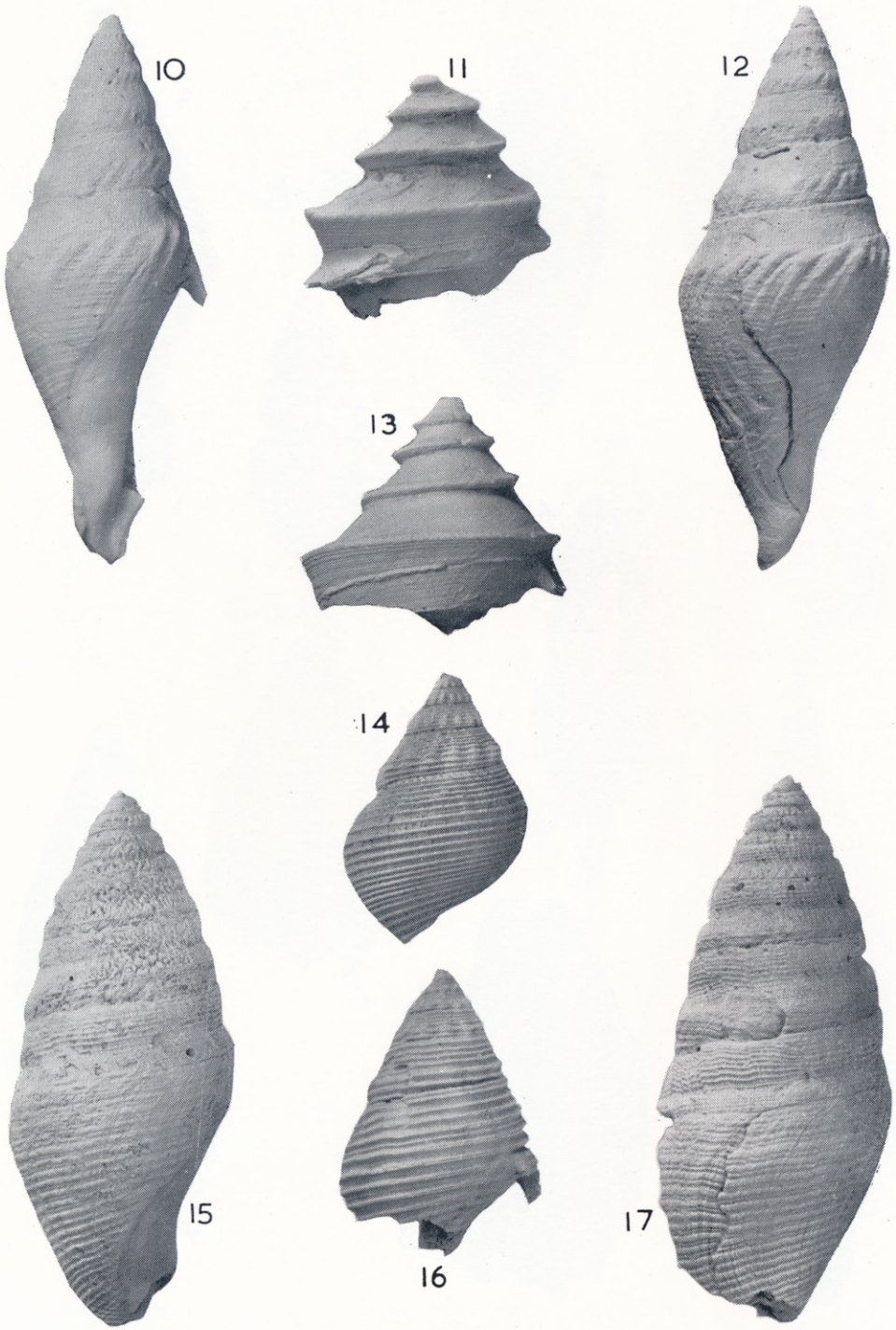
DIMENSIONS: height, 4.0mm; diameter, 2.75mm (holotype).

LOCALITY: N165/945, V1949, Bell's Creek, tributary of Mangaopari Stream.

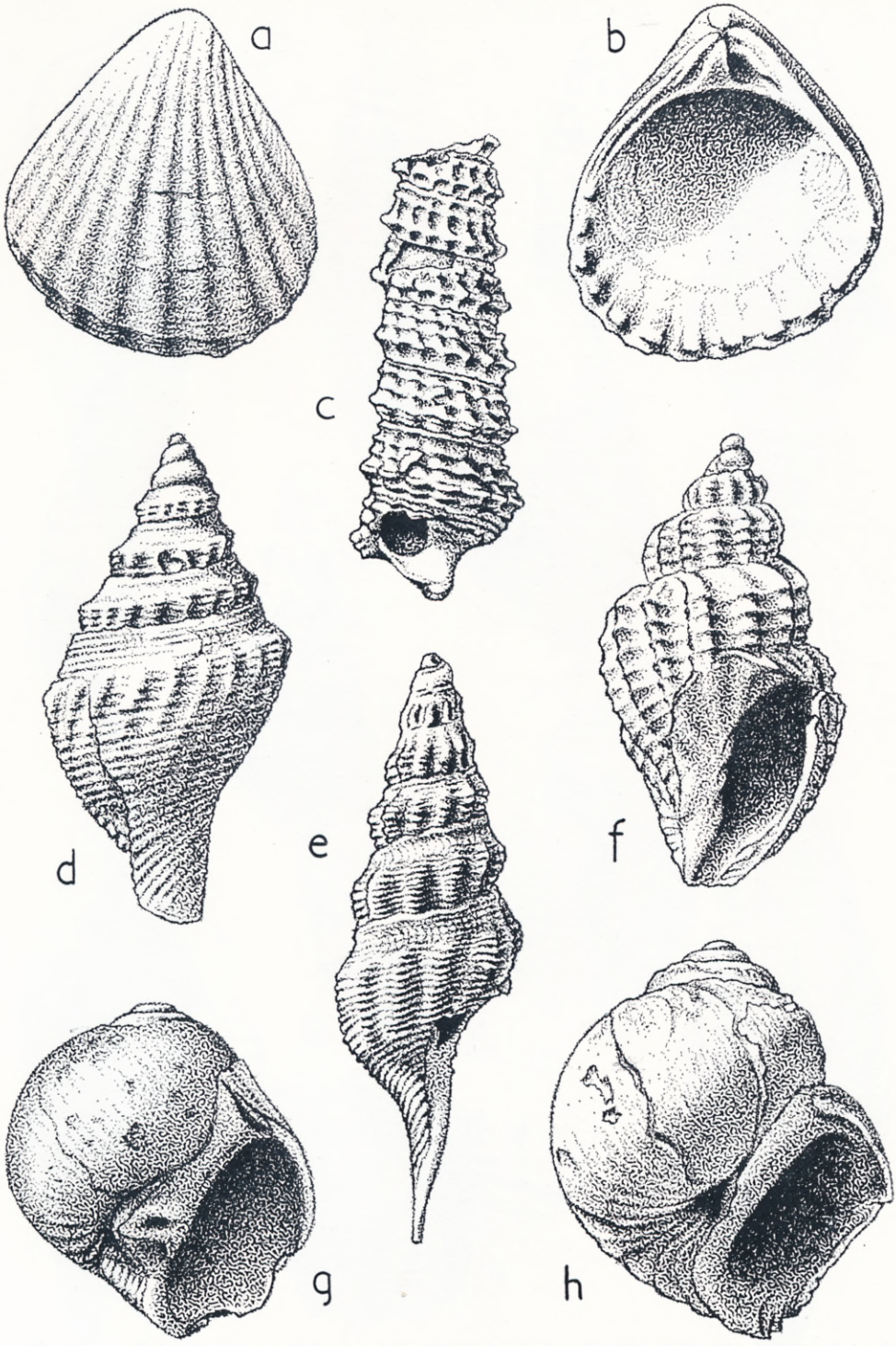
HOLOTYPE (VM533) and eight paratypes (VM534 to 541) in Geology Department, Victoria University of Wellington; one paratype (TM4636) in New Zealand Geological Survey; two paratypes in D. Cowe collection.

This species lacks the many fine basal spiral threads of all other species ot *Waipaoa*. It differs from *W. cristata* (Marwick) in lacking the prominent moniliform subsutural cord, and in being slightly narrower and more parallel-sided as in *W. grata* and *W. affectata*. It differs from *W. grata* and *W. affectata* in its shorter form and fewer spirals. It has fewer spiral cords, more nodules, and a narrower shape and is smaller when adult than *W. marwicki* Dell.

FIGS. 1, 3.—*Alcithoe* (*Leporemax*) *rugosa* (Marwick), V1949, Bell's Creek, Mangaopari Stream; Geology Department, Victoria University. Fig. 1, VM886, 57.5 × 22.8mm; Fig. 3, VM887, 64.5 × 27.1mm. Specimens to illustrate range of variation of sculpture. FIG. 2.—*Alcithoe* n.sp.?, N165/947, McLeod's Stream, Mangaopari Stream; D. Cowe collection: 38.2 × 17.9mm. FIGS. 4, 5.—*Inglisella culminata* n.sp., holotype, V1420, Wainuioru River; Geology Department, Victoria University, VM542: 11.7 × 5.4mm. FIG. 6.—*Austrofusus* (*Neocola*) *cliftonensis* (Marwick), V1949, Bell's Creek, Mangaopari Stream; Geology Department, Victoria University, VM411: 23.4 × 15.9mm. FIGS. 7, 9.—*Teremelon knoxi* Dell, V1419, Wainuioru River; Geology Department, Victoria University, VM413: 55.6 × 17.6mm. FIG. 8.—*Teremelon knoxi* Dell, N159/511814, road north of Tinui along Whareama River, Central Wairarapa; Geology Department, Victoria University, VM414: 38.4 × 20.3mm.

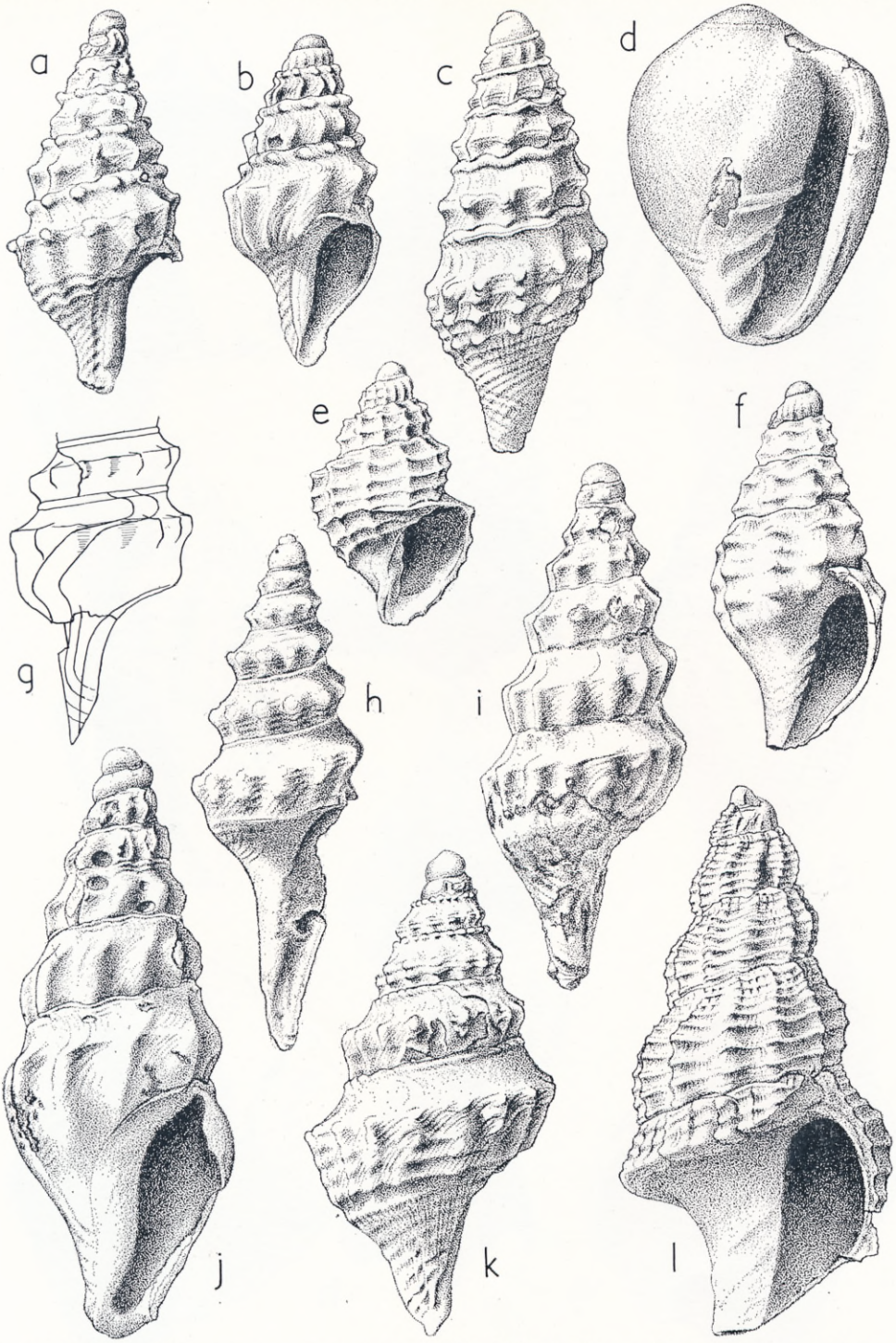


FIGS. 10, 12.—*Apiotoma zelandica* n.sp., holotype, V1949, Bell's Creek, Mangaopari Stream; Geology Department, Victoria University, VM416: 55.3 × 20.0mm. FIGS. 11, 13.—*Thatcheria pagodula* (Powell), Wainuioru Valley. Fig. 11, GS10203, Wainuioru River, New Zealand Geological Survey, TM4653: 14.6 × 14.8mm; Fig. 13, V1359, Mangaoriki Stream, Geology Department, Victoria University, VM412: 16.9 × 13.1mm. FIGS. 14, 16.—*Aeneator* (*Ellicea*) *willetti* (Fleming), Mangaopari Stream, D. Cowe collection; extreme end-members of Wairarapa populations. Fig. 14, N165/945, Bell's Creek, 24.7 × 16.5mm; Fig. 16, N165/946, Mangaopari Stream, 25.0 × 17.4mm. FIGS. 15, 17.—*Bathytoma* (s.str.) *coweorum* n.sp., holotype, N165/946, Mangaopari Stream; New Zealand Geological Survey, TM4655: 60.7 × 26.6mm.



a, b.—*Cuna awheaensis* n.sp., holotype, exterior and interior; V1949, Bell's Creek, Mangaopari Stream; Geology Department, Victoria University, VM441: 3.1 × 2.8mm. Enlarged approx. × 16. c.—*Inella zeattenuata* n.sp., holotype, V1359, Mangaoriki Stream, Wainuioru Valley; Geology Department, Victoria University, VM426: 10.8 × 3.9mm. d.—*Apiotoma zelandica* n.sp., paratype, V1949, Bell's Creek, Mangaopari Stream; Geology Department, Victoria University, VM417: 11.3 × 5.8mm. e.—*Mauidrillia incerta* n.sp., holotype, GS10201, McLeod's Stream, Mangaopari Stream; New Zealand Geological Survey, TM4650: 12.9 × 4.3mm. f.—*Oamaruia elegantula* n.sp., holotype, V1951, McLeod's Stream, Mangaopari Stream; Geology Department, Victoria University, VM574: 10.6 × 6.0mm. g.—*Taniella* (*Pristinacca*) *poliniciformis* n.sp., holotype, V1949, Bell's Creek, Mangaopari Stream; Geology Department, Victoria University, VM547: 7.65 × 6.80mm. h.—*Friginatica marwicki* n.sp., holotype, V1949, Bell's Creek, Mangaopari Stream; Geology Department, Victoria University, VM546: 8.0 × 7.4mm. (All figures except a, b, enlarged × 6.)

—*R. C. Brazier, del.*



a.—*Awheaturris echinata* n.gen., n.sp., paratype, V1951, McLeod's Stream, Mangaopari Stream; Geology Department, Victoria University, VM530: 6.20 × 3.50mm. b—*Awheaturris echinata* n.gen., n.sp., holotype, V1950, Mangaopari Stream; Geology Department, Victoria University, VM525: 5.32 × 2.60mm. c.—*Turridrupa mangaoparia* n.sp, holotype, V1949, Bell's Creek, Mangaopari Stream; Geology Department, Victoria University, VM580: 7.25 × 2.80mm. d.—*Euliginella bellensis* n.sp., holotype, V1949, Bell's Creek, Mangaopari Stream; Geology Department, Victoria University, VM585: 5.45 × 4.25mm. e.—*Waipaoa delli* n.sp., holotype, V1949, Bell's Creek, Mangaopari Stream; Geology Department, Victoria University, VM533: 4.0 × 2.75mm. f.—*Austromitra tricordata* n.sp., holotype, V1949, Bell's Creek, Mangaopari Stream; Geology Department, Victoria University, VM427: 6.10 × 2.35mm. g, h.—*Macrosinus flemingi* n.gen., n.sp., McLeod's Stream, Mangaopari Stream: g, paratype, V1951, sketch of growth lines: Geology Department, Victoria University, VM518: h, holotype, GS10201; New Zealand Geological Survey, TM4651: 8.4 × 2.9mm. i.—*Splendrillia (Hauturua) vellai* n.sp., holotype, V1419, Wainuioru River; Geology Department, Victoria University, VM519: 8.7 × 3.3mm. j.—*Splendrillia* (s.str.) *elongata* n.sp., holotype, V1951, McLeod's Stream, Mangaopari Stream; Geology Department, Victoria University, VM506: 9.1 × 3.8mm. k.—*Cosmasyrinx marwicki* n.sp., holotype, V1419, Wainuioru River; Geology Department, Victoria University, VM570: 7.95 × 4.20mm. l.—*Eoscobinella secunda* n.sp., holotype, V1359, Mangaoriki Stream, Wainuioru Valley; Geology Department, Victoria University, VM439: 8.85 × 4.30mm. (All figures enlarged approx. × 9.)

—*R. C. Brazier, del.*

Family MITRIDAE

Genus PROXIMITRA Finlay, 1927

1927. *Proximitra* Finlay, Trans. N.Z. Inst. 57: 410.

Type species (by original designation): *Vexillum rutidolomum* Suter, 1917, Lower Miocene, New Zealand.

Proximitra banksi Dell, 1951

1951. *Proximitra banksi* Dell, Rec. Canterbury (N.Z.) Mus. 6: 54, pl. 1, fig. 7.

1956. *Proximitra banksi*: Dell, Bull. Dom. Mus. Wellington 18: 88, pl. 17, fig. 170.

1967. *Proximitra banksi*: Beu, Trans. R. Soc. N.Z. geol. 5(3): 110, pl. 2, fig. 16.

This large, smooth, lightly polished species of *Proximitra* has been recorded from bathyal upper Pliocene siltstone at Palliser Bay (Beu, 1967), and later from bathyal upper Pliocene siltstone near Mangaopari Stream (Beu, 1969). A single immature specimen from N162/916, V1419, Wainuioru River, is indistinguishable from Pliocene and Recent specimens of *P. banksi,* thus considerably extending the time range of the species.

DIMENSIONS: height, 14.8mm; diameter, 7.6mm.

Specimen lodged in Geology Department, Victoria University of Wellington (VM583).

Genus AUSTROMITRA Finlay, 1927

1927. *Austromitra* Finlay, Trans. N.Z. Inst. 57: 410.

Type species (by original designation): *Columbella rubiginosa* Hutton, 1873, Pleistocene and Recent, New Zealand.

Austromitra tricordata n.sp. Pl. 4, f.

Shell small, with moderately tall, lightly angled spire and with base rapidly contracted to a moderately long, straight, unnotched canal. Shoulder smooth, narrow and gently sloping, with a weak subsutural fold. Protoconch globose, of two smooth rounded whorls. Outer lip with a very weak sinus on the shoulder; inner lip bearing three strong, oblique, parallel plaits of equal strength, situated rather high on the parietal region. Sculpture of 10 widely spaced, narrow, sharply crested axial folds per whorl, extending from periphery to beginning of basal contraction; crossed by two broad, low, indistinct spiral cords on sides of spire whorls and three on the body whorl, becoming obsolete over the last quarter-whorl of large specimens; raised into low, slightly vertically compressed nodules where they cross the axial folds. Growth lines ill-defined, so that shell surface is almost smooth and lightly polished.

DIMENSIONS: height, 6.10mm; diameter, 2.35mm (holotype, the largest specimen).

LOCALITIES: N165/945, V1949, Bell's Creek, tributary of Mangaopari Stream, holotype and 16 paratypes; N162/916, V1419, Wainuioru River, one paratype (VM438).

HOLOTYPE (VM427), 10 paratypes from Bell's Creek (VM428–437), and one paratype from Wainuioru River in Geology Department, Victoria University of Wellington; three paratypes (TM4637–4639) in New Zealand Geological Survey; three paratypes in D. Cowe collection.

The spiral sculpture of three broad, low, ill-defined cords is unique, and the species is not closely related to any other described members of *Austromitra.*

Family MARGINELLIDAE

Genus EULIGINELLA Laseron, 1957

1957. *Euliginella* Laseron, Aust. J. mar. freshwat. Res. 8: 282.

Type species (by original designation): *Marginella angasi* Crosse, 1870, Recent, New South Wales.

Characteristic features of *Euliginella* are the short spire, the unglazed shell surface and exposed sutures, and the presence of a callus on the columellar lip of the aperture. As pointed out by Dr W. F. Ponder (pers. comm.), these features indicate that the shell is not covered by mantle lobes in *Euliginella,* unlike almost

all other Marginellidae; Dr Ponder is also describing several unique features of the visceral anatomy of *Euliginella*. Thus *Euliginella* is here treated as a full genus, rather than as a subgenus of *Marginella*.

Euliginella bellensis n.sp. Pl. 4, d.

Shell small, broadly ovate, with a low, conic, straight-sided spire, faintly impressed sutures, and a large, oval body whorl that is lightly shouldered high up and contracted to a slight spout at the base. The greatest diameter is at half the whorl height, well below the shoulder angle. Shell surface almost smooth, lightly polished, with faint axial growth lines. Outer lip strongly varied, tapering to a relatively sharp outer edge and a thin, sharp inner edge, with a shallow posterior sinus, and with a deep anterior sulcus and a very shallow anterior sinus. Inner lip callus thin, rather broad, with a distinct outer margin and sometimes with a very slight groove at the lower edge, extending the whole height of the aperture; bearing four high, thin, elongate plaits, the uppermost horizontal and half-way up the aperture, and the lower three increasing in obliquity downwards, the lowest at the almost vertical termination of the columella.

DIMENSIONS: height, 5.45mm; diameter, 4.25mm (holotype).

LOCALITIES: N165/945, V1949 (= GS10200), Bell's Creek, Mangaopari, holotype and many paratypes (VM586–716; TM4616–4632; and 49 in D. Cowe collection); N162/872, V1359, Mangaoriki Stream, four paratypes (VM717–720); N162/873, V1360 (= GS10202), Mangaoriki Stream, seven paratypes (VM737–742 and TM4633); N162/916, V1419 (= GS10203), Wainuioru River, five paratypes (VM721–723; VM749; and TM4634); N165/946, V1950, Mangaopari Stream, 16 paratypes (VM724–736; and three in D. Cowe collection); N165/947, V1951 (= GS10201), McLeod's Stream, Mangaopari, eight paratypes (VM743–748; TM4614, TM4615).

HOLOTYPE (VM585) and 164 paratypes (VM586–749) in Geology Departmen, Victoria University of Wellington; 21 paratypes (TM4614–4634) in New Zealand Geological Survey; 52 paratypes in D. Cowe collection.

The new species is very similar to *Marginella whitecliffensis* Marwick, 1926, a species that was (correctly, in the writer's opinion) placed in *Euliginella* by Fleming (1966: 69). It differs from *E. whitecliffensis* in having slightly more angled whorls, in being more constricted at the base to form a narrower spout, by the inner lip callus extending for the full height of the aperture (only around the plaits in *E. whitecliffensis*), and by the groove at the base of the inner lip callus being considerably shallower and shorter than in *E. whitecliffensis*. The two species are evidently closely related.

Euliginella bellensis is the most common mollusc at Bell's Creek, and is common at all Tongaporutuan localities studied here.

Family VOLUTIDAE

Genus ALCITHOE H. and A. Adams, 1853

1853. *Alcithoe* H. and A. Adams, Genera of Recent Mollusca 1: 164.

Type species (by subsequent designation, Cossmann, 1899): *Voluta pacifica* Perry, [1810] (= *Voluta arabica* Gmelin, 1791), Pleistocene and Recent, New Zealand.

Subgenus ALCITHOE s.str.

Alcithoe (Alcithoe) hurupiensis Marwick, 1926

1926. *Alcithoe hurupiensis* Marwick, Trans. N.Z. Inst. 56: 292, pl. 64, fig. 3.

A single fragmentary large specimen of *Alcithoe* from N165/947, V1951, McLeod's Stream, has the large, smooth, rather sharply rounded, widely spaced nodules of *A. hurupiensis*. The species is normally found in the shallow-water sandstone and shellbeds of the Hurupi Formation (mostly Lower Tongaporutuan) in Wairarapa District. As volutes usually have a relatively small depth range, the specimen in the bathyal mudstone at McLeod's Stream is best explained as having been transported from the shelf.

Specimen lodged in the Geology Department, Victoria University of Wellington (VM750).

Alcithoe (Alcithoe) n.sp? Pl. 1, Fig. 2

A small, squat, short-spired volute collected at N165/947, V1951, McLeod's Stream, by Mrs K. Cowe, has low, sharp nodules on the shoulder, and a weak, sharp angulation running around the shoulder angle, over the apices of all nodules. It is similar to small species of *Alcithoe* like *A. concisa* Marwick and *A. solida* Marwick, and also resembles some of the species placed in *Mauithoe*, such as *M. parva* (Marwick) and *M. dilatata* (Marwick). The latter two species do not belong in *Mauithoe* s.str. Analysis of the relationships of the species must await a review of Cenozoic Volutidae of New Zealand.

Specimen in D. Cowe collection.

Subgenus LEPOREMAX Iredale, 1937

1937. *Leporemax* Iredale, Rec. Aust. Mus. 20: 105.

1937. *Carolluta* Iredale, Rec. Aust. Mus. 20: 105. Type species (by original designation): *Voluta hedleyi* Suter, 1905, Recent, New Zealand.

Type species (by monotypy): *Voluta gracilis* Swainson, 1835 (= *Voluta fusus* Quoy and Gaimard, 1833), Pleistocene and Recent, New Zealand.

Fleming (1966: 68) raised *Leporemax* to full generic rank, but there are so many "genera" of very similar New Zealand fossil volutes that probably most of them should be ranked as subgenera of *Alcithoe*. *Leporemax* in particular is very similar to *Alcithoe* s.str., differing only in its smaller size and correspondingly small protoconch. The writer considers that if it is recognised at all *Leporemax* should be ranked as a subgenus of *Alcithoe*.

Alcithoe (Leporemax) rugosa (Marwick, 1926). Pl. 1, Figs. 1, 3

1926. *Waihaoia rugosa* Marwick, Trans. N.Z. Inst. 56: 278, pl. 70, fig. 4.

Marwick (1926a: 279) has noted: "*W. rugosa* differs from the typical *Waihaoia* in having a well-developed fasciole. The sinus which forms it, however, is fairly shallow". The columella bears four or five plaits. The sculpture is of many narrow, sharply-crested, concave-sided axial ribs over the whole shell surface, vertical below the prominent shoulder angle but strongly prosocline over the shoulder. The fasciole and the type of sculpture are very similar to those of Upper Miocene and Lower Pliocene species of *Leporemax*, such as *A. gatesi* Marwick, and the rather shallow sinus and twisted axials appear to be merely specific characters distinguishing *rugosa* from other species of *Leporemax*. Thus *W. rugosa* is here transferred to *Alcithoe* (*Leporemax*).

The culmination of the *Waihaoia* lineage seems to be represented by *W. phymatius* (Finlay), from the Middle Miocene at Clifden, Southland, and the Upper Miocene at Hurupi Stream, South Wairarapa. It is a tall-spired species with prominent shoulder nodules developed on widely-spaced axial ribs, and it is unlikely to be closely phylogenetically related to *A. rugosa*.

Several incomplete large specimens of *A. rugosa* were collected at N165/945, V1949, Bell's Creek, and several fragments and incomplete small specimens at N162/916, V1949; N165/946, V1950; and N165/947, V1951.

Genus MAUITHOE Finlay, 1930

1930. *Mauithoe* Finlay, Trans. N.Z. Inst. 61: 251.

Type species (by original designation): *Mauia insignis* Marwick, 1926, Middle Miocene, New Zealand.

Mauithoe strongi (Marwick, 1931)

1931. *Alcithoe strongi* Marwick, Paleont. Bull. N.Z. geol. Surv. 13: 126, pl. 14, fig. 260.

1966. *Mauithoe strongi*: Fleming, Bull. N.Z. Dept. scient. Ind. Res. 173: 66, pl. 116, fig. 1420.

Fleming (1966: 330) has noted: "The generic placing is new, based on similarity with *M. insignis* (Marwick)". The position in *Mauithoe* is justified, because *M. strongi* is the only species other than the type that has the characteristic short, broadly conic spire and narrow-crested axial ribs. *M. parva* (Marwick) and *M. dilatata* (Marwick) have short spires, but do not belong in *Mauithoe*. *Mauithoe strongi* has previously been reported only from the Gisborne District, but is known from Eketahuna (G. Neef, pers.comm.), and now by a single slightly incomplete specimen from N165/946, V1950, Mangaopari Stream.

DIMENSIONS: height, 51.9mm; diameter, 24.9mm.

Specimen lodged in the Geology Department, Victoria University of Wellington (VM415).

Genus TEREMELON Marwick, 1926

1926. *Teremelon* Marwick, Trans. N.Z. Inst. 56: 279.

Type species (by original designation): *Scaphella tumidior* Finlay, 1926, Oligocene and Lower Miocene, New Zealand.

The correct placing of this group is problematical; it is probably no more than a subgenus of *Alcithoe*.

Teremelon knoxi Dell, 1956. Pl. 1, Figs. 7–9

1956. *Teremelon knoxi* Dell, Bull. Dom. Mus. Wellington 18: 121, pl. 17, figs. 169, 172.

A moderately complete specimen from N162/916, V1419, Wainuioru River, and fragments from N162/872, V1359, and N162/873, V1360, are indistinguishable from the Recent *T. knoxi* Dell. The species has not yet been collected from the Mangaopari Stream area, but a moderately complete specimen was presented to me by Mr P. Wellman, from a road cutting at grid reference N159/511814, road north of Tinui along Whareama River, eastern central Wairarapa (of Middle Tongaporutuan age—M. R. Johnston, pers. comm.). There was previously a gap of Lillburnian to Recent in the time range of *Teremelon* that is partially filled by the collection of these specimens. However, *T. knoxi* is absent from the fauna of the bathyal Mangapanian siltstone at Palliser Bay, listed by the writer (Beu, 1967).

DIMENSIONS (both incomplete): height, 55:6mm; diameter, 17.6mm (VM413); height, 38.4mm; diameter, 20.3mm (VM414).

Figured specimens lodged in Geology Department, Victoria University of Wellington (VM413, from V1419; VM414, from road north of Tinui).

Family TURRIDAE

In a review of the genera of the Turridae, Powell (1966) instituted several desirable changes in subfamily position and in generic rank from those in his earlier (Powell, 1942) revision of the New Zealand Turridae. Changes relevant here are as follows:

Cochlespirinae synonymised with Turriculinae;
Comitas Finlay, 1926, transferred to Turriculinae;
Carinacomitas Powell, 1942, synonymised with *Comitas;*
Bathytoma Harris and Burrows, 1891, and similar genera transferred to Borsoniinae, and *Micantapex* Iredale, 1936, classed as a subgenus of *Bathytoma;*
Pseudoinquisitor Powell, 1942, synonymised with *Inquisitor* Hedley, 1918;
Syntomodrillia Woodring, 1928, and *Hauturua* Powell, 1942, classed as subgenera of *Splendrillia* Hedley, 1922;
Turridrupa Hedley, 1922, transferred to Turrinae.

Subfamily TURRICULINAE

Genus APIOTOMA Cossmann, 1889

1889. *Apiotoma* Cossman, Ann. Soc. malac. Belgique 24: 263.

Type species (by original designation): *Pleurotoma pirulata* Deshayes, 1834, Eocene, Paris Basin.

Apiotoma zelandica n.sp. Pl. 2, Figs. 10, 12; Pl. 3, d

Shell large, thick, elongate–biconic, with a well-developed fasciole and a relatively short spire. Whorls weakly angled at mid height, with lightly concave steeply sloping shoulders. Body whorl long, lightly convex, and gradually tapered below the periphery. Spiral sculpture of many fine, closely spaced threads on the shoulder, five or six coarse, flat-topped threads on sides of spire whorls and about 50 on the body whorl, base, and canal, with one fine thread in each interspace. Axial sculpture of short, low, rounded, closely spaced, oblique ribs commencing at the periphery and dying out shortly below it, arcuate in conformity with the sinus, and cut off by the sinus at the shoulder. Sinus deep, broadly curved, occupying most of the width of the shoulder but with a distinct short, convex, sutural limb, followed below the shoulder by a moderately large forward sweep of the outer lip. Protoconch of about two and a half smooth whorls, narrowly conical, with a raised asymmetrical tip.

DIMENSIONS: height, 55.3mm; diameter, 20.0mm (holotype); height, 11.3mm; diameter, 5.8mm (figured juvenile paratype).

LOCALITY: N165/945, V1949, Bell's Creek, tributary of Mangaopari Stream, holotype and three juvenile paratypes.

HOLOTYPE (VM416) and one paratype (VM417) in Geology Department, Victoria University of Wellington; one paratype in Auckland Institute and Museum; one paratype in New Zealand Geological Survey (TM4654).

The holotype is a large adult with the outer lip broken away, the surface badly eroded, and no protoconch. The three juvenile paratypes are also broken, but are well-preserved and have complete protoconchs.

Apiotoma has not previously been recorded from New Zealand. The several Australian members of the genus have been discussed by Powell (1944: 19). They form a rather heterogeneous group, united by the fusiform shape, the weak sculpture, the broad sinus on the shoulder, and the conical smooth protoconch. The New Zealand species is quite distinct from all in detail, but in the gradually tapering body whorl resembles the type species *A. pirulata* and *A. bassi* Pritchard, and in sculpture most closely resembles *A. pritchardi* Powell; it differs from the latter in the gently tapered body whorl and in the axials persisting over the body whorl. The rather large sutural limb of the sinus and the well-developed fasciole appear to be unique features of the new species. The protoconch is exactly as described by Powell (1966: 36) for *Apiotoma*.

Apiotoma n.sp. B

A single incomplete spire from N162/872, V1359, differs from *A. zelandica* n.sp. in having a shallower, broader sinus, broader and stronger spiral cords, and short, prominent axial nodules that die out after about five whorls. The protoconch is missing. It represents a new species that seems more closely related to *A. pritchardi* Powell than to *A. zelandica*.

Specimen lodged in Geology Department, Victoria University of Wellington (VM418).

Genus COMITAS Finlay, 1926

1926. *Comitas* Finlay, Trans. N.Z. Inst. 56: 251.

1942. *Carinacomitas* Powell, Bull. Auckland Inst. Mus. 2: 60. Type species (by original designation): *Pleurotoma clarae* Tenison–Woods, 1880, Miocene, Australia.

Type species (by original designation): *Surcula oamarutica* Suter, 1917 (= *Drillia fusiformis* Hutton, 1877), Lower Miocene, New Zealand.

Comitas imperfecta King, 1933

1933. *Comitas imperfecta* King, Trans. N.Z. Inst. 63: 349, pl. 35, fig. 2.
1942. *Comitas imperfecta*: Powell, Bull. Auckland Inst. Mus. 2: 59.
1966. *Comitas imperfecta*: Powell, Bull. Auckland Inst. Mus. 5: 29.

The common large species of *Comitas* at all Wairarapa deep-water Tongaporutuan fossil localities, including relatively poorly fossiliferous ones such as the Palliser Bay coast west of Hurupi Stream, the Turanganui River near Palliser Bay

(type locality of *C. imperfecta*), and the Pahaoa River near Hinakura, as well as all localities listed here except Bell's Creek, agrees closely with the holotype of *C. imperfecta* King. It is a relatively large, tall and narrow species with a weak subsutural fold, many fine spiral threads, and short oblique axial folds. It is similar in shape and sculpture to *C. fusiformis* (Hutton) and *C. onokeana* King, differing mainly in its slightly stronger spiral sculpture, and seems to be on a line between *fusiformis* and *onokeana*.

Comitas terrisae Vella, 1954

1954. *Comitas terrisae* Vella, Trans. R. Soc. N.Z. 81: 548, pl. 27, figs. 24, 25 (as *terrissae* on pl. 27).

1966. *Comitas terrisae*: Powell, Bull. Auckland Inst. Mus. 5: 29.

Three specimens of *Comitas* collected at Bell's Creek agree closely with the holotype and paratype of *C. terrisae* Vella, described from the same locality, and differ from *C. imperfecta* in being considerably smaller and shorter, with a strong subsutural fold, few rather coarse spiral threads, and only slightly oblique axial folds. It is the only form of *Comitas* collected at Bell's Creek, and seems worth recognition as a distinct species from *C. imperfecta*. The species has not been collected at any other localities.

Comitas aff. **latescens** (Hutton, 1873)

1873. *Pleurotoma latescens* Hutton, Catalogue Tertiary Mollusca of N.Z.: 4.

1942. *Comitas latescens*: Powell, Bull. Auckland Inst. Mus. 2: 58, pl. 13, fig. 7.

1966. *Comitas latescens*: Powell, Bull. Auckland Inst. Mus. 5: 29.

A single small specimen from N162/916, V1419, Wainuioru River, is similar in shape to *C. latescens* (Hutton), of which Mr P. A. Maxwell has collected topotypes from the *Struthiolaria* shellbed in Weka Creek, Weka Pass, North Canterbury (Altonian, Middle Miocene). It has the short nodules, the strongly concave shoulder reaching to the base of the nodules of the preceding whorls, and the squat form of *C. latescens*, but differs in its slightly more elongate form and in its finer and more regular spiral sculpture. It may be within the range of variation of *C. imperfecta* (King).

DIMENSIONS: height, 11.9mm; diameter, 5.8mm.

Specimen lodged in Geology Department, Victoria University of Wellington (VM440).

Genus COSMASYRINX Marwick, 1931

1931. *Cosmasyrinx* Marwick, Paleont. Bull. N.Z. geol. Surv. 13: 138.

Type species (by original designation): *Cosmasyrinx monilifera* Marwick, 1931, Miocene, New Zealand.

Cosmasyrinx marwicki n.sp. Pl. 4, k

Shell small, biconic–fusiform, with lightly pagodiform spire and rapidly contracted base. Shoulder broad, smooth, lightly concave, gently sloping, with a single gemmate subsutural cord. One or two low, rounded cords on sides of spire whorls and about twelve over the body whorl, base and canal, of which the upper four or five are more prominent and more widely spaced than lower ones, but are rather ill-defined. Whorls sharply angled, with an ill-defined peripheral carina formed by a sharp backward flexure of the growth lines at the base of the sinus. Nodules narrowly crested, rather widely spaced, with regularly concave interspaces, commencing at the periphery and extending to the lower suture on spire whorls and over the upper two spirals on the last whorl; about 20 per whorl. Sinus broad and moderately deep, occupying the full width of the shoulder, with a rather large forward-swinging limb of the outer lip below it. Protoconch typical of the genus. Canal and outer lip incomplete.

DIMENSIONS of holotype: height, 7.95mm; diameter, 4.20mm.

LOCALITIES: N162/916, V1419, Wainuioru River, holotype (VM570) and two paratypes (VM571 and one in Auckland Museum); N162/873, V1360, Mangaoriki Stream, one paratype (VM572); N165/947, V1951, McLeod's Stream, one paratype (VM573).

HOLOTYPE (VM570) and three paratypes in Geology Department, Victoria University of Wellington; one paratype in Auckland Institute and Museum.

The new species resembles *C. latior* Marwick in having a gemmate subsutural cord, and resembles *C. tereumera* Marwick in having comparatively long axial ribs, a rapidly contracted base, and a more pagodiform spire than on other members of the genus. *C. tereumera* differs from *C. marwicki* in having markedly coarser sculpture and a simple subsutural cord. Thus *C. marwicki* forms a link between the rather aberrant *C. tereumera* and the more typical members of the genus, *C. ardua, C. latior* and *C. monilifera,* all of Marwick, 1931. *C. tereumera* has been reported only from the Altonian or Clifdenian of Waihora River, near Gisborne (Fleming, 1966: 366).

Genus MACROSINUS n.gen.

Type species: *Macrosinus flemingi* n.sp.

Shell small, with a moderately tall spire, a strongly contracted base, and a moderately long, narrow, straight canal. Whorls strongly angulate, bearing short nodules around the periphery, with a weak subsutural fold, a smooth shoulder, and several low spiral threads around and below the periphery. Protoconch globular, of two smooth whorls, the second whorl tall, with parallel, lightly convex sides, enclosing most of the first whorl. Sinus deep, broad, occupying the full width of the shoulder, with a long upper sutural limb, and made to appear exceedingly deep by a very large forward-swinging limb of the outer lip, below the sinus.

The genus appears to be closely related to *Paracomitas* Powell, but differs in the protoconch, which is strongly keeled in *Paracomitas,* and in the deeper sinus and much larger forward-swinging portion of the outer lip. The sinus of *Paracomitas* was described by Powell (1966: 29) as being " very broad and shallow, occupying the shoulder slope ".

Macrosinus flemingi n.sp. Pl. 4, g, h

Shell small, elongate, with strongly angled whorls, a moderately tall spire, a sharply contracted base, and a moderately long, narrow, straight siphonal canal. Subsutural fold weak and simple. Shoulder rather broad, gently sloping, concave and smooth. Sculpture of prominent, short, slightly oblique axial folds around the periphery, 10 on penultimate whorl; spiral sculpture of six low, broadly rounded, closely spaced cords on spire whorls and about 30 on body whorl, base and canal, three crossing the peripheral axials, and four more prominent than the others around a lower angulation on the body whorl. Protoconch and sinus as described for the genus.

DIMENSIONS of holotype: height, 8.4mm; diameter (incomplete), 2.9mm.

LOCALITY: N165/947, V1951 (= GS10201), McLeod's Stream, tributary of Mangaopari Stream, holotype and one paratype.

HOLOTYPE (TM4651) in New Zealand Geological Survey; single paratype (VM518) in Geology Department, Victoria University of Wellington.

Subfamily TURRINAE

Genus GEMMULA Weinkauff, 1875

1875. *Gemmula* Weinkauff, Jahrb. Deutsches Malac. Gessel. 2: 287.

1931. *Eugemmula* Iredale, Rec. Aust. Mus. 18: 226. Type species (by original designation): *Eugemmula hawleyi* Iredale, 1931, Recent, Australia.

Type species (by subsequent designation, Cossmann, 1896): *Pleurotoma gemmata* Reeve, 1843 (non Conrad, 1835) = *Gemmula hindsiana* Berry, 1958, Recent, central western America.

Gemmula peraspera Marwick, 1931

1931. *Gemmula peraspera* Marwick, Paleont. Bull. N.Z. geol. Surv. 13: 133, pl. 15, fig. 276.

1942. *Gemmula peraspera*: Powell, Bull. Auckland Inst. Mus. 2: 50.

1964. *Gemmula peraspera*: Powell, Indo-Pacific Mollusca 1(5): 267, pl. 206, left fig.

1966. *Gemmula peraspera*: Powell, Bull. Auckland Inst. Mus. 5: 47.

1966. *Gemmula peraspera*: Fleming, Bull. N.Z. Dept. scient. ind. Res. 173: 70, pl. 132, fig. 1547.

This distinctive, tall, narrowly keeled species was considered to be probably Tongaporutuan at its type locality by Fleming (1966: 70), but he did not have any other definite records of the species from Tongaporutuan rocks. It is common in McLeod's Stream (N165/947), where over 30 specimens have been collected during this study, and is the most common large turrid at Mangaopari Stream (N165/946), Wainuioru River (N162/916), and Mangaoriki Stream (N162/872 and N162/873). All these localities are of Middle Tongaporutuan age. An interesting feature is its absence at Bell's Creek, where intensive collecting of many hundreds of specimens of Turridae has not brought to light a single specimen of *G. peraspera*. The Mangaopari Stream locality, where six specimens of *G. peraspera* have been collected, is approximately along the strike from the outcrop in Bell's Creek. This is presumably a paleontological example of the erratic distribution of bathyal benthic invertebrates mentioned by Dell (1956: 198).

Genus LUCERAPEX Iredale, 1936

1936. *Lucerapex* Iredale, Rec. Aust. Mus. 19: 337.

Type species (by original designation): *Pleurotoma casearia* Hedley and Petterd, 1906, Recent, Australia.

Lucerapex pulcherrimus (Vella, 1954)

1954. *Micantapex pulcherrimus* Vella, Trans. R. Soc. N.Z. 81: 547, pl. 25, fig. 1; pl. 26, fig. 17.

This species is abundant at Bell's Creek, the type locality, and also occurs sporadically at the two localities in Mangaopari Stream and McLeod's Stream. The only species of "*Micantapex*" of similar tall, narrow shape to "*M.*" *pulcherrimus* described from New Zealand, *M. angustatus* Powell, has recently been transferred to *Lucerapex* Iredale on the basis of shape and radula (Powell, 1966: 50). "*Micantapex*" *pulcherrimus* much more closely resembles *Lucerapex* (Turrinae) in shape than it does *Micantapex* (Borsoniinae), and seems best regarded as a species of *Lucerapex* with strong, nodulous sculpture below the periphery.

Genus TURRIDRUPA Hedley, 1922

1922. *Turridrupa* Hedley, Rec. Aust. Mus. 13: 226.

Type species (by original designation): *Pleurotoma acutigemmata* E. A. Smith, 1877, Recent, Indo-Pacific.

Turridrupa mangaoparia n.sp. Pl. 4, c

Shell small, strongly sculptured, with a tall spire and a short siphonal canal. Protoconch of two smooth rounded whorls followed by a single whorl with arcuate axial ribbing. Spiral sculpture of a single narrow, well-raised subsutural cord and three lower cords on spire whorls, the uppermost large and sharp-crested, placed high on the shoulder immediately below the subsutural cord, in the sinus area, the second at the periphery, and the other at the lower suture. About five widely spaced cords on sides of body whorl, and another eight fine, closely spaced ones on the base and canal. On paratype VM581 a second very weak thread is developed below the large one, in the centre of the sinus area. Axial sculpture of many fine arcuate threads on the shoulder, only just showing between the subsutural cord and the next cord below it; rather prominent, slightly oblique axial ribs begin just above the periphery and descend to the base of the body whorl, forming three rows of rather sharp, slightly vertically compressed nodules where they are crossed by the major spiral cords. Nine axial ribs on penultimate whorl. Sinus broad and rather shallow, occupying the shoulder slope, its apex in the centre of the area below the prominent cord, followed below by a forward swinging arc of the outer lip.

DIMENSIONS: height, 7.25mm; diameter, 2.80mm (holotype); height, 4.70mm; diameter, 2.10mm (paratype VM581); height, 8.50mm; diameter, 3.35mm (paratype VM582).

LOCALITIES: N165/945, V1949, Bell's Creek, Mangaopari, holotype, and two paratypes (VM581 and D. Cowe collection); N162/872, V1359, Mangaoriki Stream, Wainuioru, one paratype (VM582).

HOLOTYPE (VM580) and two paratypes (VM581, VM582) in Geology Department, Victoria University of Wellington; one paratype in D. Cowe collection.

The sinus of *T. mangaoparia* is broader than in other described species of *Turridrupa,* but this is apparently due to the sinus rib being nearer to the subsutural cord, and the area below the cord being consequently broader, than in other species. The species differs from the only other species yet described from New Zealand, the Tongaporutuan *T. maoria* Powell, in having a more elongate form, in having the sinus cord much nearer to and almost fused to the subsutural cord, and in the greater development of axial sculpture and consequently much more numerous nodules.

The discovery of this undoubted species of *Turridrupa* seems to confirm the generic position of *T. maoria* Powell, the unique holotype of which has a damaged protoconch. *Turridrupa* is an Indo-Pacific immigrant known so far in New Zealand only from the Middle and Upper Miocene.

Subfamily BORSONIINAE

Genus AWATERIA Suter, 1917

1917. *Awateria* Suter, Paleont. Bull. N.Z. geol. Surv. 5: 57.

Type species (by original designation): *Awateria streptophora* Suter, 1917, Pliocene, New Zealand.

Awateria miocenica Vella, 1954

1954. *Awateria miocenica* Vella, Trans. R. Soc. N.Z. 81: 551, pl. 27, fig. 28.

1954. *Awateria striata* Vella, Trans. R. Soc. N.Z. 81: 551, pl. 25, fig. 2.

1966. *Awateria miocenica*: Powell, Bull. Auckland Inst. Mus. 5: 70.

1966. *Awateria striata*: Powell, Bull. Auckland Inst. Mus. 5: 70.

As stated by Vella (1954: 551, 552), specimens resembling the holotype of *A. miocenica* are more common at the type locality, Bell's Creek, than are specimens resembling the holotype of *A. striata.* Several hundred specimens have now been examined from Bell's Creek. They are highly variable in the height of the spire, the strength of the subsutural cord, the strength of the axial and spiral sculpture, and the relative strength of the various elements of the spiral sculpture. Many specimens resemble the holotype of *A. striata,* but more specimens are intermediate between the two named forms than are similar to the holotypes, and on a population basis two species cannot be separated. The name *miocenica* appears higher on the page than *striata,* and thus *Awateria miocenica* is here selected as the name to be used for the species described by Vella (1954: 551) under the names *Awateria miocenica* and *Awateria striata.*

Genus AWHEATURRIS n.gen.

Type species: *Awheaturris echinata* n.sp.

Shell small, biconic fusiform, with a moderately tall spire, a moderately contracted base, and a rather short, straight, unnotched siphonal canal. Whorls prominently angled at about two-thirds of their height and lightly angled at the base of the last whorl, with a very heavy, strongly nodulous subsutural cord, a rather broad, concave, smooth shoulder, six spirals on the canal, and, in some specimens, low obscure spirals below the periphery on the last whorl. Narrow, high, axial ribs extend from the periphery to the basal angulation and are raised into sharp nodules at the periphery. Protoconch globular, of two whorls, the first smooth and the second bearing four or five brephic arcuate axial ribs on the last quarter whorl. Sinus shallow and broad, occupying the full width of the shoulder slope, with a short sutural limb and a rather narrow, arcuate, forward swinging lower limb of the outer lip.

The genus is rendered very distinctive by its prominent, strongly nodulous subsutural cord, its broad shallow sinus, and its globular two-whorled protoconch with brephic axials. *Awheaturris* resembles *Scrinium* Hedley in most features, but is readily differentiated by the brephic axials, by the deeper sinus with a forward-swinging outer lip, and by the heavy, nodulous subsutural cord. The shape is also similar to that of *Awateria* Suter, and the subsutural cord is often very prominent

in *Awateria,* but in that genus it never bears the row of large, oblique, moniliform nodules that resemble those of the daphnelline genus *Eubela* Dall. Some species of *Mioawateria* with nodulous subsutural cords (e.g., *M. expalliata* Laws, 1947: 538, pl. 55, fig. 2) are very similar in shape and sculpture to *Awheaturris echinata,* but if they are correctly referred to *Mioawateria* they must have cancellate-sculptured daphnellid protoconchs (Beu, 1969). However, the protoconchs of *M. experta* (Laws, 1947) and *M. expalliata* (Laws, 1947) have not been described, and the species may belong in *Awheaturris* rather than in *Mioawateria.*

Awheaturris echinata n.sp. Pl. 4, a, b

Characters as for the genus, with the following details.

The nodules on the subsutural cord are in line with lower axial ribs, but do not correspond with them in position of growth, as the growth lines that are near the base of each axial rib pass up and slightly backward towards the rib behind, follow arcuately around the sinus, and then pass on to the subsutural cord halfway between two of its large nodules. The nodules are very prominent, and are oval with the long axis inclined parallel to the upper limb of the posterior sinus. There are 10 nodules on the penultimate whorl, and six low, broad, closely spaced spirals on the canal of most specimens. One paratype has about 14 low, broad, indistinct spirals on the sides of the body whorl below the periphery and on the base and canal.

DIMENSIONS: height, 5.32mm; diameter, 2.60mm (holotype); height, 6.55mm; diameter, 3.0mm (paratype VM526); height, 6.20mm; diameter, 3.50mm (paratype VM530).

LOCALITIES: N165/946, V1950, Mangaopari Stream, holotype; N165/947, V1951 (= GS10201), McLeod's Stream, nine paratypes (VM526–529; TM4640–4643; and one in D. Cowe collection); N162/916, V1419, Wainuioru River, two paratypes (VM530, VM531); N162/872, V1359, Mangaoriki Stream, two paratypes (VM532 and one in Auckland Museum).

HOLOTYPE (VM525) and seven paratypes (VM526–532) in Geology Department, Victoria University of Wellington; four paratypes (TM4640–4643) in New Zealand Geological Survey; one paratype in Auckland Institute and Museum; one paratype in D. Cowe collection.

Genus BATHYTOMA Harris and Burrows, 1891

1875. *Dolichotoma* Bellardi, Boll. Soc. Malac. Ital., p. 21, non Hope, 1839.

1891. *Bathytoma* Harris and Burrows, Eoc. Olig. Beds Paris Basin: 113. New name for *Dolichotoma* Bellardi, 1875, non Hope, 1839.

Type species (by monotypy): *Murex cataphractus* Brocchi, 1814, Pliocene, Italy.

Subgenus BATHYTOMA s.str.

Bathytoma (s.str.) **coweorum** n.sp. Pl. 2, Figs. 15, 17

Shell large, tall and narrow, with an unusually tall spire. Shoulder very steeply inclined, markedly concave, reaching to the periphery of preceding whorl on the early whorls of the spire, descending a little on later whorls. Apex and surface of venter corroded. Spiral sculpture of about 15 fine, often indistinct threads on the shoulder, and about 20 slightly coarser and more marked ones at and below the periphery of the last whorl; there is one interstitial thread in each interspace below the periphery, increasing gradually in strength down the shell so that primary and secondary spirals are of similar size on the top of the canal. Axial sculpture of fine, irregular growth lines only, sinuate in conformity with sinus, sometimes lightly beading the spiral sculpture, particularly on the shoulder; no peripheral or subsutural nodules present. Sinus a broadly open V, contracting to a narrow U-shape at its apex, which is situated on the lower third of the shoulder, immediately above the periphery; the sinus apex occupies the out-curving part of the concave shoulder, which becomes a slightly raised, broad, rounded ridge on the last half whorl. Outer lip and most of canal broken away.

DIMENSIONS: height (incomplete), 60.7mm; diameter, 26.6mm (holotype).

LOCALITY: N165/946, Mangaopari Stream, collected Mrs K. Cowe, 1968, unique holotype.

HOLOTYPE (TM4655) in New Zealand Geological Survey.

The new species is the only one known to the writer that lacks all nodules. The spire is taller than in most species of *Bathytoma,* and the shape is similar to those of *B. hokianga* Laws (Laws, 1947: pl. 55, fig. 3) and *B. cataphracta* (Brocchi) (Powell, 1966: pl. 9, fig. 13). The species differs from all others in having the sinus immediately above the periphery, instead of forming the peripheral carina, and this may explain why it lacks peripheral nodules. An undescribed species from the Waitakere Range, Auckland (?Otaian), in the New Zealand Geological Survey, is the only other species seen that lacks peripheral nodules; that species has subsutural gemmae, and all sculpture is slightly coarser than in *B. coweorum.*

The species is named for Mr and Mrs D. Cowe, frequent collecting companions in Wairarapa District, who collected many interesting specimens used in this study.

Genus EOSCOBINELLA Powell, 1942

1942. *Eoscobinella* Powell, Bull. Auckland Inst. Mus. 2: 122.

Type species (by original designation): *Eoscobinella tahuia* Powell, 1942, Middle Eocene, New Zealand.

This genus was previously known only by the holotype of the type species, from McCullough's Bridge, South Canterbury (Bortonian).

Eoscobinella secunda n.sp. Pl. 4, 1

An incomplete spire from V1359, Mangaoriki Stream, Wainuioru, resembles *Eoscobinella tahuia* in most features, and seems to represent a new species of *Eoscobinella.* It shares with *E. tahuia* the tall, *Exilia*-like shape, the prominent, rounded axial ribs running almost from suture to suture but weak and sinuous on the shoulder in conformity with the broad, rather deep sinus. While the spiral sculpture resembles that of *E. tahuia,* it consists of nine raised, flat-topped, widely spaced cords on each spire whorl rather than the nine incised grooves of *E. tahuia.* The portion of the columella remaining is very short but shows that there were at least two narrow, rounded plaits on it, beginning much higher up than in *E. tahuia,* at the base of the parietal region; obliquity of the plaits increases markedly down the columella, whereas in *E. tahuia* all plaits are parallel and highly oblique. The protoconch is missing.

DIMENSIONS of holotype: height, 8.85mm; diameter, 4.30mm.

LOCALITY: N162/872, V1359, Mangaoriki Stream, Wainuioru.

HOLOTYPE (VM439) in Geology Department, Victoria University of Wellington.

The species certainly belongs in one of the elongate genera of the Borsoniinae having prominent columellar plaits. The position in *Eoscobinella* is tentative, as the columellar sculpture and the protoconch are inadequately known; however, the resemblance in shape and sculpture to *E. tahuia* is so great as to leave little doubt of generic position.

Subfamily CLAVINAE

Genus MAUIDRILLIA Powell, 1942

1942. *Mauidrillia* Powell, Bull. Auckland Inst. Mus. 2: 85.

Type species (by original designation): *Mangilia praecophinodes* Suter, 1917, Lower Miocene, New Zealand.

Mauidrillia incerta n.sp. Pl. 3, e

Shell of moderate size, with a tall, narrow spire, and a relatively short siphonal canal. Shoulder moderately wide, steep, lightly concave. Sinus typical of the genus. Twelve axial folds on both the penultimate and the last whorls are bluntly rounded at the periphery, fade out rapidly over the shoulder, and reach to the lower suture on spire whorls and to the beginning of the unusually well-marked basal constriction on the last whorl; axials moderately high, rounded, spaced their own width apart, slightly oblique. Spiral sculpture consisting of a relatively very prominent subsutural cord, six low, weak cords on the shoulder, increasing in strength towards the periphery, nine more prominent ones at and below the periphery on sides of penultimate whorl, and about 30 on sides, base, and canal of last whorl, of which

about 10 occupy the sides; the two peripheral cords are slightly more prominent than any others, and have a single interstitial thread. Protoconch missing. Outer lip broken away for the whole of its length, so that the shape of the tip of the canal is not known.

DIMENSIONS: height, 12.9mm; diameter, 4.3mm (holotype).

LOCALITY: N165/947, GS10201 (= V1951), McLeod's Stream, Mangaopari, unique holotype.

HOLOTYPE (TM4650) in New Zealand Geological Survey.

This species is similar to the Waitakian and Otaian *M. inaequalis* Powell, 1942, and the Hutchinsonian or Otaian *M. imparilirata* Powell, 1942, in general appearance, in having nodules reaching the lower suture but not the upper one, and in having weak spirals over the whole shoulder; however, it differs from both in having a taller spire and a more prominent subsutural cord, from *M. imparilirata* in having rounded nodules at the periphery and a much more elongate form, and from *M. inaequalis* in having a markedly more contracted base and a shorter siphonal canal. The lack of the protoconch and of the tip of the canal leave some doubt of the generic position, but the inner lip lacks the callus pad of *Splendrillia*. The new species is placed in *Mauidrillia* because of its close resemblance to the other species mentioned.

Mauidrillia has not been reported above the Awamoan before, apart from the Opoitian (early Pliocene) *M. acuta* (Marwick); the new Tongaporutuan species helps fill a large gap in its time range in New Zealand.

Genus SPLENDRILLIA Hedley, 1922

1922. *Splendrillia* Hedley, Rec. Aust. Mus. 13: 250.

Type species (by original designation): *Drillia woodsi* Beddome, 1883, Recent, Australia.

Subgenus SPLENDRILLIA s.str.

Splendrillia (s.str.) **elongata** n.sp Pl. 4, j

Shell small, elongate, with a weak subsutural fold and no spiral sculpture. Spire tall and narrow, body whorl contracted rapidly to a moderately long, slightly twisted siphonal canal. Sculpture of 10 narrow-crested, slightly oblique axial folds on the penultimate whorl, becoming more irregular and reduced to about eight on the last whorl, extending a short distance on to the shoulder and down on to the base, flexed strongly to the right and raised into sharper crests at the periphery, in conformity with the sinus. Shoulder lightly angled at the periphery, narrow, concave, steeply sloping. Outer lip broken away. Protoconch and sinus typical of the genus.

DIMENSIONS of holotype: height, 9.10mm; diameter, 3.80mm.

LOCALITY: N165/947, V1951 (= GS10201), McLeod's Stream, Mangaopari, holotype and several paratypes.

HOLOTYPE (VM506) and 10 paratypes (VM507–516) in Geology Department, Victoria University of Wellington; six paratypes (TM4644–4649) in New Zealand Geological Survey; two paratypes in Auckland Institute and Museum; two paratypes in D. Cowe collection.

The species is distinguished by its narrow-crested axials sinuated in conformity with the sinus. *S. filiculosa* (Marwick, 1931) has thicker, more rounded, and more numerous axials, stopping sharply at the shoulder, and the only other species of comparable age, *S. clifdenensis* Powell, 1942, is a shorter species with axials extending further on to the shoulder and further down over the base, and with a heavier subsutural cord.

Subgenus HAUTURUA Powell, 1942

1942. *Hauturua* Powell, Bull. Auckland Inst. Mus. 2: 105.

Type species (by original designation): *Syntomodrillia* (*Hauturua*) *vivens* Powell, 1942, Recent, New Zealand.

Splendrillia (Hauturua) vellai n.sp. Pl. 4, i

Shell small, elongate, without subsutural cord, prominently angled at about half the whorl height. Spire tall, stepped; body whorl rapidly contracted below to a narrow, straight, rather long, unnotched canal. Protoconch typical of the subgenus. Shell surface almost smooth, with no spiral sculpture. Axial sculpture of 13 narrow-crested, closely-spaced, slightly oblique folds beginning at the periphery and extending over most of the height of the body whorl, raised into prominent, sharp, triangular nodules at the periphery. Sinus typical of the subgenus. Inner lip with a lightly thickened callus pad at the top; outer lip broken away.

DIMENSIONS of holotype: height, 8.70mm; diameter, 3.30mm.

LOCALITIES: N162/916, V1419, Wainuioru River, holotype and one paratype (VM520); N162/872, V1359, Mangaoriki Stream, three paratypes (VM522, VM523, and one in Auckland Museum); N162/873, V1360, Mangaoriki Stream, one paratype (VM521); N165/945, V1949, Bell's Creek, Mangaopari, two paratypes (VM524 and TM4652).

HOLOTYPE (VM519) and five paratypes (VM520–524) in Geology Department, Victoria University of Wellington; one paratype in New Zealand Geological Survey (TM4652); one paratype in Auckland Institute and Museum.

The new species is similar to *S. laevella* and *S. exiguescens,* both of Marwick, 1931, but differs in its longer axials that are raised into larger nodules at the periphery, and in its much more rapidly contracted base. The shape is more like that of *S. laevella* than that of *S. exiguescens,* but the angulation of the whorls is higher up than in *S. laevella.*

Subgenus WAIRARAPA Vella, 1954

1954. *Wairarapa* Vella, Trans. R. Soc. N.Z. 81: 549.

Type species (by original designation): *Wairarapa rebecca* Vella, 1954, Upper Miocene, New Zealand.

Splendrillia (Wairarapa) rebecca (Vella, 1954)

1954. *Wairarapa rebecca* Vella, Trans. R. Soc. N.Z. 81: 549, pl. 27, fig. 20.
1966. *Wairarapa rebecca*: Powell, Bull. Auckland Inst. Mus. 5: 88, pl. 13, fig. 14.

This species, the only one so far referred to *Wairarapa,* differs from *Splendrillia* only in its nodulous subsutural cord and in the lack of a stromboid notch. More than 20 specimens have been examined, and are found to be very variable in the degree of nodulation of the subsutural fold, some specimens closely resembling *Splendrillia* (s.str.). Also, very few of the specimens examined have the axials and the subsutural nodules aligned up the sides of the spire, as in the holotype. Thus the differences from *Splendrillia* seem slight, and *Wairarapa* is best reduced to a subgenus of *Splendrillia.*

Subfamily DAPHNELLINAE

Genus PUHA Marwick, 1931

1931. *Puha* Marwick, Paleont. Bull. N.Z. geol. Surv. 13: 150.

Type species (by original designation): *Puha fulgida* Marwick, 1931, Middle Miocene, New Zealand.

Puha cf. **fulgida** Marwick, 1931

1931. *Puha fulgida* Marwick, Paleont. Bull. N.Z. geol. Surv. 13: 150, pl. 16, fig. 312.
1942. *Puha fulgida*: Powell, Bull. Auckland Inst. Mus. 2: 164.
1966. *Puha fulgida*: Powell, Bull. Auckland Inst. Mus. 5: 130, pl. 21, fig. 8.

A single specimen from N162/916, V1419, Wainuioru River, lacks the upper spire whorls and most of the body whorl. The remaining portion shows no features by which it can be distinguished from *Puha fulgida.* The species was recorded by Fleming (1966: 372) from Waikohu S.D., Gisborne (Altonian or Clifdenian), only, and *Puha* has not previously been reported from beds younger than Clifdenian.

Specimen lodged in Geology Department, Victoria University of Wellington (VM425).

Subfamily THATCHERIINAE

Genus THATCHERIA Angas, 1877

1877. *Thatcheria* Angas, Proc. zool. Soc. Lond. 1877: 529.

1928. *Cochlioconus* Yokoyama, J. Fac. Sci. Tokyo Imp. Univ. 2: 338. Type species (by monotypy): *Cochlioconus gradatus* Yokoyama, 1928, Pliocene, Japan (= *Thatcheria mirabilis* Angas, 1877).

Type species (by monotypy): *Thatcheria mirabilis* Angas, 1877, Pliocene to Recent, Japan.

Thatcheria pagodula (Powell, 1942). Pl. 2, Figs. 11, 13

1942. *Waitara pagodula* Powell, Bull. Auckland Inst. Mus. 2: 168, pl. 14, fig. 7.

1963. *Thatcheria pagodula*: Charig, Bull. Brit. Mus. (Nat. Hist.), geol. 7(9): 292, fig. 5.

1966. *Thatcheria pagodula*: Powell, Bull. Auckland Inst. Mus. 5: 140.

1966. *Thatcheria pagodula*: Fleming, Bull. N.Z. Dept. scient. Ind. Res. 173: 77.

Three incomplete but well-preserved spires of *Thatcheria,* one each from N162/872, V1359; N162/873, V1360; and N162/916, GS10203, Wainuioru Valley, do not differ significantly from *T. pagodula* (Powell). They are highly variable in spire height, in the height of the sides of the whorls, and thus in the number of spiral cords exposed on the sides of the whorls. They have from two to four narrow threads on the outer edge of the gently sloping, lightly concave shoulder, a prominent roundly keeled periphery, and from two to seven flat, broad, closely spaced cords below the periphery, the number depending on the amount of the whorl exposed. The specimens from V1359 and V1360 have very low spires, with very low sides to the whorls, so that on early whorls the peripheral keel only just projects from the outline of the spire and no spirals show. Later the suture descends progressively, so that the spire is more markedly stepped and two to five cords show on the sides of the whorls. The specimen from GS10203 has a spire of similar height to that of the holotype of *T. pagodula,* so that the whole spire is markedly stepped, and there are four to seven spirals on the sides of the whorls. Again the suture descends progressively with increasing shell size. The shape of the spire from GS10203 is very similar to that of the holotype of *T. pagodula* except that the sutures are more deeply contracted, and thus the overall appearance is intermediate between that of *T. pagodula* and that of the Opoitian *T. liratula* (Powell, 1942).

It seems that species of *Thatcheria* are quite variable in spire height and shape, and it is not possible to distinguish the Wairarapa specimens from *T. pagodula* (Powell), the holotype of which comes from GS1975, sandstone, Moutara Point, between Whangara and Tolaga Bay, north of Gisborne (Tongaporutuan *fide* Fleming, 1966: 77).

DISCUSSION

Many Mollusca in the faunas described above are of interest because they are found in deep water today and in rocks of deep-water facies. Genera and species in the faunas that are useful in considering the depth of deposition are *Pectunculina, Parvamussium, Periploma, Cymatona, Galeodea, Ellicea, Waipaoa, Proximitra banksi, Teremelon knoxi, Gemmula, Scaphander,* and *Comitas imperfecta* (related to the Recent *C. onokeana vivens* Dell, 1956). All these except *Periploma* and *Gemmula* were found by Dell (1956) in Recent bathyal faunas from the area between Banks Peninsula, Otago Peninsula, and the Chatham Islands. The same species of *Proximitra* and *Teremelon* live today in that area. The fauna is also very similar to that in the late Pliocene siltstone at Palliser Bay, South Wairarapa, described by the writer (Beu, 1967; 1969). The writer concluded that the beds at Palliser Bay had been deposited in about 200 to 400 m., in the upper part of the bathyal zone, in conditions similar to those on the Chatham Rise today. Many of the elements of the present-day fauna are missing in Wairarapa Tongaporutuan faunas, and there are many elements in the latter faunas that are not present in

the modern fauna, but such differences can be attributed to either the difference in age or the warmer water temperatures during the Miocene. The close similarity of Wairarapa Tongaporutuan faunas, Palliser Bay Mangapanian faunas, and Chatham Rise living faunas at the generic level leads to the conclusion that the three faunas were deposited at a similar depth. Thus the middle Tongaporutuan siltstone in the Wainuioru River and Mangaopari Stream areas seems to have been deposited in about 200 to 400 m., in the upper bathyal zone. The high proportion of Turridae and shelled opisthobranchs (together making up 38.6 percent of the total fauna) helps confirm this order of depth.

Tongaporutuan genera other than those mentioned above are either extinct in New Zealand or are now represented by species unrelated to those in the Wairarapa faunas. *Nucula otamaringaensis, Neilo sublaevis, Austrofusus cliftonensis, Falsicolus tangituensis* and *Marshallena curtata* were described by Marwick (1926b) from the Tongaporutuan of North Taranaki, and *Euliginella bellensis* n.sp. and *Vexillitra marwicki* Vella are very similar to species from North Taranaki. Almost all Marwick's other species listed here were described by him (Marwick, 1931) from Gisborne District. The implication is that bathyal faunas are probably widespread in North Taranaki and in Gisborne. Bathyal molluscan faunas have also been described from the Opoitian to Nukumaruan of Wairoa District by Marwick (1965), but many bathyal faunas of Miocene to Pliocene age remain to be described from northern Wairarapa District, from North Canterbury, and in particular from the west coast of South Island.

Dell (1956: 201) commented that many shallow-water Lower and Middle Miocene genera that had previously been thought extinct had been found in Recent bathyal faunas from the east coast of New Zealand, and noted that they appeared to have been able to survive in the relatively stable, cold waters of the bathyal zone while the temperature and other ecological factors of shallow water changed markedly. The Palliser Bay Mangapanian faunas (Beu, 1967) show the same trend in the occurrence of the Miocene genus *Vesanula* and in the partial filling of gaps in formerly highly discontinuous time ranges. Further examples of the extension of time ranges in the bathyal zone are provided by *Myrtea* (Tongaporutuan, Mangaopari, and North Taranaki; Opoitian, Wairoa); *Pristinacca; Falsicolus tangituensis* (North Taranaki and Westland, and probably Mangaopari); and possibly *Turriscala.* Examples suggested by Dell from Recent evidence and now confirmed by Upper Miocene species are *Galeodea, Proximitra,* and *Teremelon.* Other genera such as *Pectunculina, Parvamussium, Cymatona, Mauithoe, Waipaoa,* and several of the Turridae seem always to have been bathyal during their occurrence in New Zealand and are potentially the most useful genera for recognition of a bathyal depth of deposition.

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