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Recent and Tertiary Trochaclididae from the Southwest Pacific (Mollusca: Gastropoda: Trochoidea)

by

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Abstract. Twenty-three species of the Trochaclididae (15 new species) are recorded, 17 from the New Zealand region, five from Australia, and one from New Caledonia. These taxa are referred to *Trochaclis* Thiele, 1912 (Early Miocene–Recent), *Acremodonta* Marshall, 1983 (Recent), ***Acremodontina*** gen. nov. (Early Miocene–Recent), and ***Austrotrochaclis*** gen. nov. (Recent). Trochaclidid radulae with central and lateral teeth that are strongly differentiated from the marginal teeth are recorded for the first time.

INTRODUCTION

The Trochaclididae are a group of marine gastropods with small, rather undistinguished shells, yet with radular teeth that are extremely distinctive in having repeatedly divided tips. Most of the few species that have been taken alive were living in cavities of glass sponges (Porifera: Hexactinellida) or occurred loose in dredge samples that included these sponges or abundant spicules (Warén, 1989; Hain, 1990; Hickman & McLean, 1990; personal observation). Gut contents indicate spongivory (S. Hain in Warén, 1992; personal observation).

Trochaclis antarctica Thiele, 1912 was the only trochaclidid known until recently, when *T. islandica* Warén, 1989, and *T. versiliensis* Warén, Carrozza & Rocchini, 1992, were named, based on North Atlantic and Mediterranean material. Two undescribed species were recorded from the north-eastern Pacific by Hickman & McLean (1990). The New Zealand species *Acremodonta crassicosta* (Powell, 1937) has also proved to be a trochaclidid. In the present contribution I introduce a further 22 species, of which 15 are new and seven are transferred from the other families.

Abbreviations and Text Conventions: AMS—Australian Museum, Sydney; BMNH—The Natural History Museum, London; LACM—Los Angeles County Museum of Natural History; MNHN—Muséum National d'Histoire Naturelle, Paris; MV—Museum of Victoria, Melbourne; NMNZ—Museum of New Zealand, Wellington; NZGS—Institute of Geological and Nuclear Sciences, Lower Hutt; NZOI—National Institute of Water and Atmospheric Research, Wellington. In references to dimensions height precedes diameter.

SYSTEMATICS

Order Archaeogastropoda Thiele, 1925

Suborder Vetigastropoda Salvini-Plawen, 1980

Superfamily TROCHOIDEA Rafinesque, 1815

Family TROCHACLIDIDAE Thiele, 1929

Trochaclididae Thiele, 1929:179.
Trochaclisidae Wenz, 1939:650 (incorrect spelling variant).
Acremodontinae Marshall, 1983:127.

Diagnosis: Shell turbiniform, 1.30–ca. 9 mm in maximum dimension. Marginal teeth very slender, tips repeatedly divided. Central and lateral teeth short and scalelike (***Acremodontina***), or similar to marginals (*Trochaclis, Acremodonta*). Edge of oral disc (*Acremodonta*) set with dendritic papillae, operculum chitinous.

Remarks: *Trochaclis* Thiele, 1912 was originally referred to Ptenoglossa by Thiele (1912) because the radula seemed to him to resemble that in *Aclis* Lovén (Janthinoidea, Aclididae). Thiele (1929) later grouped his new family Trochaclididae *incertae sedis* among the lower Mesogastropoda (i.e., Caenogastropoda) where it long resided (Wenz, 1939; Boss, 1982; Vaught, 1989). Recently Warén (1989) illustrated the radula of *Trochaclis* for the first time and showed that it differs from those of Ptenoglossa in various details,

including the presence of repeatedly divided tips. He referred the family to Archaeogastropoda because the shell morphology and Thiele's (1912, 1929) description of the animal were not discordant with this interpretation. The presence of a well-developed nacreous layer in *Acremodonta* Marshall, 1983, and of a thin scattering of platelets (probably a vestigial nacreous layer) on the inner shell surface of all of the other species discussed below (personal observation), and of short multiple lateral radular teeth in some of them, are strong support evidence for a position in Trochoidea.

When introducing Acremodontinae (Marshall, 1983), I was misled by Thiele's misinterpretation of the radular morphology of *Trochaclis,* which is in fact fundamentally similar to that in *Acremodonta* Marshall, 1983, the type genus. The type species of *Acremodonta* and *Trochaclis* have respectively strong spirally sculptured and essentially smooth teleoconchs, whereas the radular teeth in *Acremodonta* are much more slender. Despite these differences, the genera are evidently confamilial because some of the species described below have intermediate shell and radular morphologies.

In this contribution I introduce a new genus (***Acremodontina***) in which the central and lateral teeth are short, scalelike and morphologically strongly differentiated from the slender marginal teeth, which exhibit the terminal branching characteristic of the family (Figure 68). This hitherto unknown radular plan differs markedly from that in *Trochaclis* (Warén, 1992:figs. 37A, 37B, 38A, 38B) and *Acremodonta* (Marshall, 1983:figs. 2A–E), in which the teeth in the central field, though shorter than the outer marginals, grade insensibly with the inner marginals. The central and lateral teeth in ***Acremodontina*** resemble those of Umboniinae (Trochidae—Hickman & McLean, 1990) and *Dillwynella* Dall, 1889 (Skeneidae?—Marshall, 1988). Assuming that the outer lateral teeth in Trochaclididae arise through progressive morphological transformation of inner marginal teeth as in Trochoidea (other than *Calliostoma* Swainson, 1840) (Warén, 1990), it would seem that the degree of transformation is strongest in ***Acremodontina*** and totally retarded in *Acremodonta,* in which all of the teeth in the central field are morphologically marginals. The adult radula in *Trochaclis* exhibits an intermediate state of transformation in that the central tooth and positionally lateral teeth are relatively shorter and broader than the outer marginals, though longer and narrower than in ***Acremodontina***. Since all of the teeth in the *Acremodonta* radula are relatively by far the longest and narrowest of any trochaclidid, and are also exceptionally slender for a trochoidean, this is evidently a derived state (apomorphic). Whether or not the wide central and lateral teeth in ***Acremodontina*** are physically involved in food processing, they may be a developmental legacy from a source group that had a different diet and feeding mode. Whatever the case, they are probably a developmentally economical means of enhancing width of the marginal fields, which has been achieved in *Acremodonta* by extreme elongation of all of the teeth.

Hickman & McLean (1990) ranked Trochaclidinae as a subfamily of uncertain affinity in Trochidae. As these authors admitted, the radula and oral disc papillae are highly distinctive, and, in my opinion, the group is worthy of familial status within Trochoidea. While Trochaclididae almost certainly belongs in Trochoidea, its relationships within the superfamily are obscure. The marginal tooth morphology is so distinctive that it does not suggest a sister-group relationship with any other specific taxon of Trochoidea. Trochaclidid marginal tooth morphology, especially in ***Acremodontina*** is strongly convergent with that in *Perotrochus* Fischer, 1885 (Vetigastropoda, Pleurotomariidae) and *Seila* A. Adams, 1861 (Caenogastropoda, Cerithiopsidae) (Hickman, 1984:figs. 10, 17), which are also spongivores (compare with Figures 62, 69, 72).

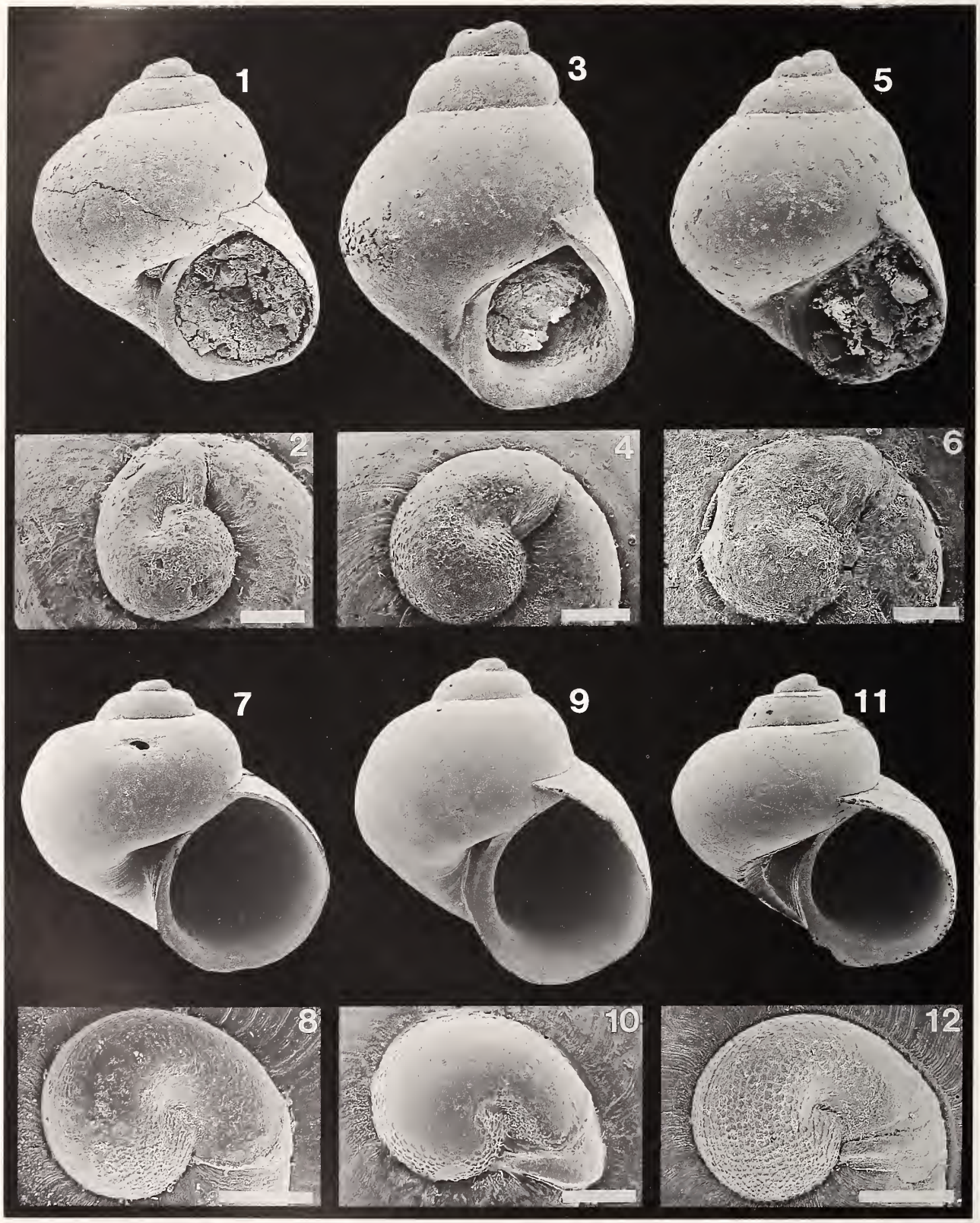
Genus *Trochaclis* Thiele, 1912

Trochaclis Thiele, 1912:192 Type species (by monotypy): *Trochaclis antarctica* Thiele, 1912; Recent, Antarctica.

Diagnosis: Shell turbiniform, up to about 2.00 mm wide, narrowly umbilicate or anomphalous, white. Interior surface set with scattered platelets, presumably aragonite, and representing vestigial nacreous layer. Protoconch of less than one whorl, sculptured with fine network of crisp threads that enclose irregularly polygonal spaces, tip of apical fold pinched. Teleoconch whorls convex, a rounded varix early on first whorl, with or without shoulder angulation on first one or two whorls or (one species) with shoulder and peripheral keel on all whorls, with or without few basal spiral threads. Radular formula $\infty + 1 + \infty$. Central tooth slender, with fine terminal cusps. Lateral(s) and marginals slender, morphologically intergrading, narrowing outward, each with long series of fine cusps, cusps at tips repeatedly divided. Operculum chitinous, multispiral. Animal (Thiele, 1912): eyes on processes at bases of cephalic tentacles, ctenidium consisting of few lamellae, osphradium a narrow, longitudinal fold, no salivary gland, esophagus with a glandular swelling; cerebral ganglia united, connected with pedal ganglia via long commissures.

Remarks: Although Warén (1992) considered that *Trochaclis* species lack a central tooth, it seems likely that this tooth is in fact shown in one of his illustrations of the radula of *T. antarctica* (Warén, 1992:fig. 37A, tooth at exact center). If so, the central tooth in *Trochaclis* is similar to the lateral teeth, which in turn grade insensibly into the marginal teeth.

None of the *Trochaclis* species described below has been collected alive; they are referred to this genus because of the extreme similarity of the shells to those of species for which the radula is known. Shells of typical *Trochaclis* species are distinctive in combining a finely reticulate protoconch, a varix shortly after the protoconch, and subse-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quent whorls that are smooth apart from (usually) a shoulder spiral on first one or two whorls, and one or more spiral threads beside umbilical area. Of the numerous skeneimorph genera with superficially similar type species, the one they are most likely to be confused with is *Moellerіopsis* Bush, 1897 (type species *M. abyssicola* Bush, 1897), the protoconch of which, however, is spirally lirate, whereas the radula is entirely different (see Warén, 1992).

Trochaclis bucina (Laws, 1941)

(Figures 3, 4; Table 1)

Notosetia bucina Laws, 1941:141, fig. 31.
"*Notosetia*" *bucina*. Fleming, 1966:44.
Powellisetia (*?*) *bucina*. Beu & Maxwell, 1990:405.

Description: Shell turbiniform, up to 2.12 mm high, higher than wide, spire up to 0.86× as high as aperture, of moderate thickness, anomphalous, glossy.

Protoconch 300 μm wide, tip of apical fold pinched, sculptured with network of fine, crisp threads that enclose irregular polygonal spaces; rim sharply defined, not thickened.

Teleoconch of up to 2.75 convex whorls; a strong rounded varix immediately after protoconch, first whorl strongly convex, subsequent whorls more weakly convex, periphery rounded, base almost flat. Smooth apart from fine, crowded collabral growth lines. Aperture subcircular, peristome strongly discontinuous; outer lip thin at rim, thicker within; parietal glaze of moderate thickness; inner lip thick, especially abapically.

Type data: Holotype NZGS TM 1275, Pakaurangi Point, Kaipara Harbour; Otaian (Early Miocene).

Other material examined: (9 specimens). Pakaurangi Point, Kaipara Harbour, C. R. Laws (2 paratypes of *Dolicrossea atypica* Laws); GS 9730, tuffaceous siltstone, small bay ca. 1.6 km NW of Pakaurangi Point, map ref. Q8/262513 (f9828), March, 1979, B. A. Marshall and P. A. Maxwell (2 NMNZ, 5 NZGS)—Otaian (Early Miocene).

Table 1

Trochaclis bucina (Laws, 1941). Shell measurements (mm) and countings. Holotype in italics.

Height	Diameter	Height/ diameter	Teleoconch whorls (*n*)	Station no.
1.15	0.93	1.24	2.30	GS 9730
1.35	1.03	1.31	2.60	GS 9730
1.40	1.10	1.27	2.60	GS 9730
1.40	1.10	1.27	2.70	GS 9730
1.40	1.13	1.24	2.60	GS 9730
1.50	*1.10*	*1.36*	*2.75*	*GS 9730*
2.12	1.75	1.21	3.30	GS 9730

Distribution: Early Miocene (Otaian), Pakaurangi Point, Kaipara Harbour, northern New Zealand.

Remarks: Among previously described *Trochaclis* species, *T. bucina* is distinctive in having a tall, narrow spire. Two similar Recent species are described below.

Two of the specimens examined are paratypes of *Dolicrossea* (i.e., *Trochaclis*) *atypica* from the C. R. Laws collection (NZGS).

Although superficially similar to the type species of *Notosetia* Iredale, 1915, the type species of that genus (*Cirsonella neozelanica* Murdoch, 1899) has a smooth protoconch and lacks a varix on the first teleoconch whorl, while the radular teeth are not dentritically branched (personal observation).

Trochaclis atypica (Laws, 1939)

(Figures 1, 2; Table 2)

Dolicrossea atypica Laws, 1939:480, fig. 61.
(*?*)*Dolicrossea atypica*. Fleming, 1966:41, Beu & Maxwell, 1990:403.

Description: Shell turbiniform, up to 1.55 mm high, slightly higher than wide at maturity, spire 0.65–0.83× as high as aperture, of moderate thickness, glossy, with small, narrow umbilical chink.

←

Explanation of Figures 1 to 12

Figures 1–12. *Trochaclis* species. Scales 100 μm.

Figures 1, 2. *Trochaclis atypica* (Laws, 1939), topotype (NZGS TM 7681), Early Miocene, Pakaurangi Point, Kaipara Harbour, New Zealand, shell height 1.40 mm.

Figures 3, 4. *Trochaclis bucina* (Laws, 1941), topotype (NZGS TM 7680), Early Miocene, Pakaurangi Point, Kaipara Harbour, New Zealand, shell height 1.35 mm.

Figures 5, 6. *Trochaclis* ***kaiparica*** Marshall, sp. nov., holotype, Early Miocene, Pakaurangi Point, Kaipara Harbour, New Zealand, shell height 1.70 mm.

Figures 7, 8. *Trochaclis* ***morningtonensis*** Marshall, sp. nov., holotype, Late Miocene, Fossil Beach, Port Phillip, Victoria, Australia, shell height 1.75 mm.

Figures 9, 10. *Trochaclis* ***calva*** Marshall, sp. nov., holotype, off Three Kings Islands, northern New Zealand, 805 m, shell height 1.95 mm.

Figures 11, 12. *Trochaclis* ***regalis*** Marshall, sp. nov. Figure 11. Holotype, off Three Kings Islands, northern New Zealand, 710 m, shell height 1.58 mm. Figure 12. Paratype (NMNZ M.117511), off Three Kings Islands, 310 m.

Table 2

Trochaclis atypica (Laws, 1939). Shell measurements (mm) and countings. Holotype in italics.

Height	Diameter	Height/ diameter	Teleoconch whorls (*n*)	Station no.
1.20	1.20	1.00	2.20	GS 9730
1.25	1.20	1.04	2.30	GS 9730
1.30	1.25	1.04	2.40	GS 9730
1.32	1.23	1.07	2.40	GS 9730
1.40	1.23	1.14	2.50	GS 9730
1.40	1.30	1.07	2.60	GS 9730
1.40	1.30	1.07	2.50	GS 9730
1.45	1.28	1.13	2.50	GS 9730
1.55	*1.42*	*1.09*	*2.70*	*GS 9730*

Protoconch 280–300 μm wide, tip of apical fold pinched, a distinct angulation on last quarter whorl, sculptured with network of fine, crisp threads that enclose irregular polygonal spaces; rim sharply defined, not thickened.

Teleoconch of up to 2.70 convex whorls, a strong rounded varix immediately after protoconch, periphery rounded, base almost flat, most of first whorl with pronounced shoulder angulation. Smooth apart from fine, crowded collabral growth lines. A narrow angulate spiral thread descending steeply from umbilical chink and coalescing with apertural rim. Aperture subcircular, outer lip thin at rim, thicker within; parietal lip rather thin; inner lip thick, especially abapically.

Type data: Holotype NZGS TM 1311: Pakaurangi Point, Kaipara Harbour; Otaian (Early Miocene).

Other material examined: (12 topotypes). GS 9730, tuffaceous siltstone, small bay ca. 1.6 km NW of Pakaurangi Point, map of ref. Q8/262513 (f9829), March 1979, B. A. Marshall and P. A. Maxwell—Otaian, (Early Miocene) (4 NMNZ, 8 NZGS).

Distribution: Early Miocene (Otaian), Pakaurangi Point, Kaipara Harbour, northern New Zealand.

Remarks: *Trochaclis atypica* is characterized by its low spire, angulate protoconch and first teleoconch whorl, narrow umbilical chink, and lack of basal spiral cords. The protoconch angulation is a particularly distinctive feature. As noted above, the two paratypes represent *T. bucina.*

Species of *Dolicrossea* Iredale, 1924, with which *T. atypica* was formerly associated, differ in having a spirally lirate teleoconch, a strong swelling outside the umbilicus, a sinuous apertural profile, and in other details.

Trochaclis ***kaiparica*** Marshall, sp. nov.

(Figures 5, 6)

Description: Shell turbiniform, up to 1.72 mm high, higher than wide at maturity, spire 0.85× as high as aperture, of moderate thickness, glossy, with tiny umbilical chink.

Protoconch 300–330 μm wide, tip of apical fold pinched, sculptured with network of fine, crisp threads that enclose irregular polygonal spaces; rim sharply defined, not thickened.

Teleoconch of up to 2.75 convex whorls, a strong rounded varix immediately after protoconch, first whorl strongly convex, subsequent whorls more weakly convex, periphery rounded, base almost flat, tightly rounded into umbilical chink. Smooth apart from fine, crowded collabral growth lines. Aperture subcircular; outer lip thin at rim, thicker within; parietal glaze of moderate thickness; inner lip thick, especially abapically.

Type data: Holotype TM 7667 (1.70 × 1.53 mm, 2.75 teleoconch whorls) and immature paratype NZGS: GS 9730 tuffaceous siltstone, small bay ca. 1.6 km NW of Pakaurangi Point, Kaipara Harbour, map ref. Q8/262513 (f9828), March 1979, B. A. Marshall and P. A. Maxwell; Otaian (Early Miocene).

Distribution: Early Miocene (Otaian), Pakaurangi Point, Kaipara Harbour, northern New Zealand.

Remarks: *Trochaclis* ***kaiparica*** occurs in the same beds as *T. bucina* and *T. atypica,* differing from the former in having a more broadly angulate spire, and from the latter in lacking angulations on the protoconch and first teleoconch whorl and in being anomphalous.

Etymology: From Kaipara Harbour.

Trochaclis ***morningtonensis*** Marshall, sp. nov.

(Figures 7, 8)

Description: Shell turbiniform, up to 1.80 mm wide, slightly broader than high, spire about 0.64× as high as aperture, of moderate thickness, glossy, narrowly umbilicate.

Protoconch 270 μm wide; sculptured with network of fine, crisp threads that enclose irregular polygonal spaces; rim sharply defined, not thickened.

Teleoconch of up to 2.60 convex whorls, a weak varix immediately after protoconch, smooth apart from crowded collabral growth lines, base evenly rounded into umbilicus. Umbilicus deep, narrow, not invaded by inner lip, a weak thread descending steeply from within. Aperture subcircular. Inner and outer lips thin. Parietal area of moderate width, glaze very thin.

Type data: Holotype MV.143573 (1.75 × 1.80 mm, 2.60 teleoconch whorls) and paratype AMS C.160405 (1.70 × 1.80 mm, 2.50 teleoconch whorls): Fossil Beach, Balcombe Bay, near Mornington, Port Phillip, Victoria, R. Lukey and J. Kerslake; Balcombian (Late Miocene).

Distribution: Late Miocene (Balcombian) of Victoria, Australia.

Remarks: *Trochaclis* ***morningtonensis*** is distinctive among *Trochaclis* species in the combination of small protoconch

(width 270 μm), lack of an angulation on the first teleoconch whorl, lack of basal spiral cords, and narrow deep umbilicus with broadly rounded rim.

Etymology: From the township near the type locality.

Trochaclis ***calva*** Marshall, sp. nov.

(Figures 9, 10; Table 3)

Description: Shell up to 2.20 mm high, about as high as broad, spire about 0.60× as high as aperture, of moderate thickness, narrowly umbilicate, glossy, translucent white.

Protoconch 300–330 μm wide, tip of apical fold pinched, sculptured with network of fine, crisp threads that enclose irregular polygonal spaces; rim sharply defined, not thickened.

Teleoconch of up to 2.75 convex whorls, a broad, rounded varix immediately after protoconch, smooth apart from crowded collabral growth lines. Umbilicus narrowly crescentic, rim tightly rounded and with fine angulate thread that descends steeply from within. Aperture subcircular; outer lip thin at rim, thicker within; parietal lip thin; inner lip thick.

Animal unknown.

Type data: Holotype (M.117512) and 2 paratypes NMNZ: AUZ53 34°00′S, 171°55′E, Three Kings Trough, north of Three Kings Islands, dead, 805 m, 17 September 1962, R.N.Z.F.A. *Tui.*

Distribution: Off Three Kings Islands, northern New Zealand, 805 m, on comminuted bryozoan/shell substratum.

Remarks: *Trochaclis* ***calva*** resembles the Mediterranean species *T. versiliensis* Warén, Carrozza & Rocchini, 1992 in shape, differing primarily in lacking a spiral thread on the first teleoconch whorl, and in having only a single spiral thread beside the umbilicus.

Etymology: Smooth (Latin).

Trochaclis ***regalis*** Marshall, sp. nov.

(Figures 11, 12, 15; Table 4)

Description: Shell turbiniform, up to 1.68 mm wide, about as wide as high, spire about 0.60× as high as aperture, of moderate thickness, narrowly umbilicate, glossy, translucent white.

Protoconch 230–280 μm wide, tip of apical fold pinched, sculptured with network of fine, crisp threads that enclose irregular polygonal spaces; rim sharply defined, not thickened.

Teleoconch of up to 2.6 convex whorls, a broad rounded varix immediately after protoconch. First 1.5–1.75 whorls with rounded spiral cord that surmounts shoulder angulation, subsequent whorls smooth, fine, crowded collabral growth lines throughout. Umbilicus narrow, deep, fully

Table 3

Trochaclis ***calva*** Marshall, sp. nov. Shell measurements (mm) and countings. Holotype in italics.

Height	Diameter	Height/ diameter	Teleoconch whorls (*n*)	Station no.
1.95	*1.90*	*1.02*	*2.50*	*AUZ 53*
2.20	2.10	1.04	2.75	AUZ 53
2.20	2.15	1.02	2.70	AUZ 53

open, rim tightly rounded, encircled by two crisp, rounded spiral cords with broad, shallowed concave interspace, innermost cord descending steeply from within. Aperture subcircular; outer lip thin at rim, thicker within; parietal glaze thin; inner lip of moderate thickness.

Animal unknown.

Type data: Holotype M.117510 and paratype NMNZ: BS 640 (P543), 34°05.9′S, 171°55.1′E, off Three Kings Islands, dead, 710 m, 27 June 1978, R/V *Tangaroa.* Paratypes (2 NMNZ): BS 642 (P574), 34°06.5′S, 172°04.7′E, dead, 310 m, 30 June 1978, R/V *Tangaroa*; BS 634 (P462), 34°17.6′S, 171°45.3′E, dead, 427 m, 21 June 1978, R/V *Tangaroa.*

Distribution: Off Three Kings Islands, northern New Zealand, 310–710 m, dead on comminuted bryozoan/shell substratum.

Remarks: *Trochaclis* ***regalis*** is exceedingly similar to *T. versiliensis* Warén, Carrozza & Rocchini, 1992 (*in* Warén, 1992:180, figs. 26E, 36A–D) from the Mediterranean and adjacent Atlantic. The only difference that I am able to detect is in the degree of persistence of the spiral thread on the early teleoconch whorls, which extends over 1.5–1.75 whorls in *T.* ***regalis*** as against about 1.25 whorls in *T. versiliensis.* Since no Atlantic archaeogastropods are known to be conspecific with New Zealand ones, it is anticipated that additional differences will be found when the animals can be compared.

Etymology: Royal (Latin), alluding to the type locality.

Trochaclis ***elata*** Marshall, sp. nov.

(Figures 13, 14; Table 5)

Description: Shell turbiniform, up to 1.62 mm high, higher than broad, spire 0.52–0.71× as high as aperture, of moderate thickness, anomphalous, glossy, translucent white.

Protoconch 270–300 μm wide, tip of apical fold pinched, apertural rim slightly flared, sculptured with network of fine, crisp threads that enclose irregular polygonal spaces.

Teleoconch of up to 2.70 convex whorls, a broad, rounded varix immediately after protoconch, first whorl strongly convex, subsequent whorls more weakly convex, periphery evenly rounded, base weakly convex. Smooth apart from fine, crowded collabral growth lines. Aperture subcircular;

Table 4

Trochaclis ***regalis*** Marshall, sp. nov. Shell measurements (mm) and countings. Holotype in italics.

Height	Diameter	Height/ diameter	Teleoconch whorls (*n*)	Station no.
1.22	1.27	0.96	2.10	BS 634
1.50	1.68	0.89	2.50	BS 640
1.58	*1.63*	*0.97*	*2.60*	*BS 640*

outer lip thin at rim, thicker within; parietal glaze of moderate thickness; inner lip thick.

Animal unknown.

Type data: Holotype NMNZ M.92197: BS 633 (P461), 34°20.4′S, 171°48.2′E, off Three Kings Islands, dead, 440 m, 21 June 1978, R/V *Tangaroa.* Paratypes (3 NMNZ): AUZ53, 34°00′S, 171°55′E, dead, 805 m, 17 September, 1962, R.N.Z.F.A. *Tui* (2); BS 642 (P574), 34°06.5′S, 172°04.7′E, dead, 310 m, 30 June 1978, R/V *Tangaroa.*

Distribution: Off Three Kings Islands, northern New Zealand, 310–805 m (dead) on comminuted bryozoan/shell substratum.

Remarks: *Trochaclis* ***elata*** is extremely similar to the Lower Miocene species *T. bucina* (Laws) from which it differs in being more broadly conical and in having a more open sculptural network on the protoconch.

Etymology: High (Latin).

Trochaclis ***attenuata*** Marshall, sp. nov.

(Figures 18, 19)

Description: Shell (holotype) turbiniform, 1.70 mm high, higher than wide, spire slightly higher than aperture, of moderate thickness, anomphalous, glossy, translucent white.

Protoconch 270 μm wide, tip of apical fold pinched, sculptured with network of fine, crisp threads that enclose irregular polygonal spaces; rim sharply defined, not thickened.

Teleoconch of 3.3 convex whorls, a broad, rounded varix immediately after protoconch, first whorl strongly convex, subsequent whorls more weakly convex, periphery rounded, base weakly convex. Smooth apart from fine, crowded collabral growth lines. Aperture subcircular; outer lip thin at rim, thicker within; parietal glaze of moderate thickness; inner lip thick.

Animal unknown.

Type data: Holotype NMNZ M.117516 (1.70 × 1.25 mm, 3.30 teleoconch whorls): BS 633 (P461), 34°20.4′S, 171°48.2′E, off Three Kings Islands, dead, 440 m, 21 June 1978, R/V *Tangaroa.*

Distribution: Off Three Kings Islands, northern New Zealand, 440 m (dead), on comminuted bryozoan/shell substratum.

Remarks: Compared with *Trochaclis* ***elata,*** which it much resembles, *T.* ***attenuata*** differs in being more narrowly conical, in being smaller relative to the number of whorls (height 1.70 mm : 3.3 teleoconch whorls instead of 1.62 mm : 2.70 teleoconch whorls), and in having a considerably more open sculptural network on the protoconch.

Etymology: Drawn out (Latin).

Trochaclis ***cristata*** Marshall, sp. nov.

(Figures 16, 17)

Description: Shell turbiniform, up to 1.55 mm wide, slightly wider than high, spire 0.90× as high as aperture, of moderate thickness, narrowly umbilicate, glossy, translucent white.

Protoconch 250–270 μm wide, tip of apical fold pinched, apertural rim simple, sculptured with network of fine, crisp threads that enclose irregular polygonal spaces.

Teleoconch of up to 2.80 whorls, a strong rounded varix immediately after protoconch, with sharp projecting shoulder and peripheral angulations; sutural ramp broad, more or less flat, horizontal on first whorl, shoulder angulation gently descending to about adapical third; side shallowly concave, almost vertical; outer base flat, tightly rounded at inner third. Spire whorls with extremely fine granules, most densely crowded on ramp; fine, crowded collabral growth lines throughout. Umbilicus deep, very narrow, fully open, rim a sharp angulation that descends steeply from within. Aperture subcircular; outer lip thin at rim, thicker within; parietal glaze very thin; inner lip thin, strongly thickened abapically.

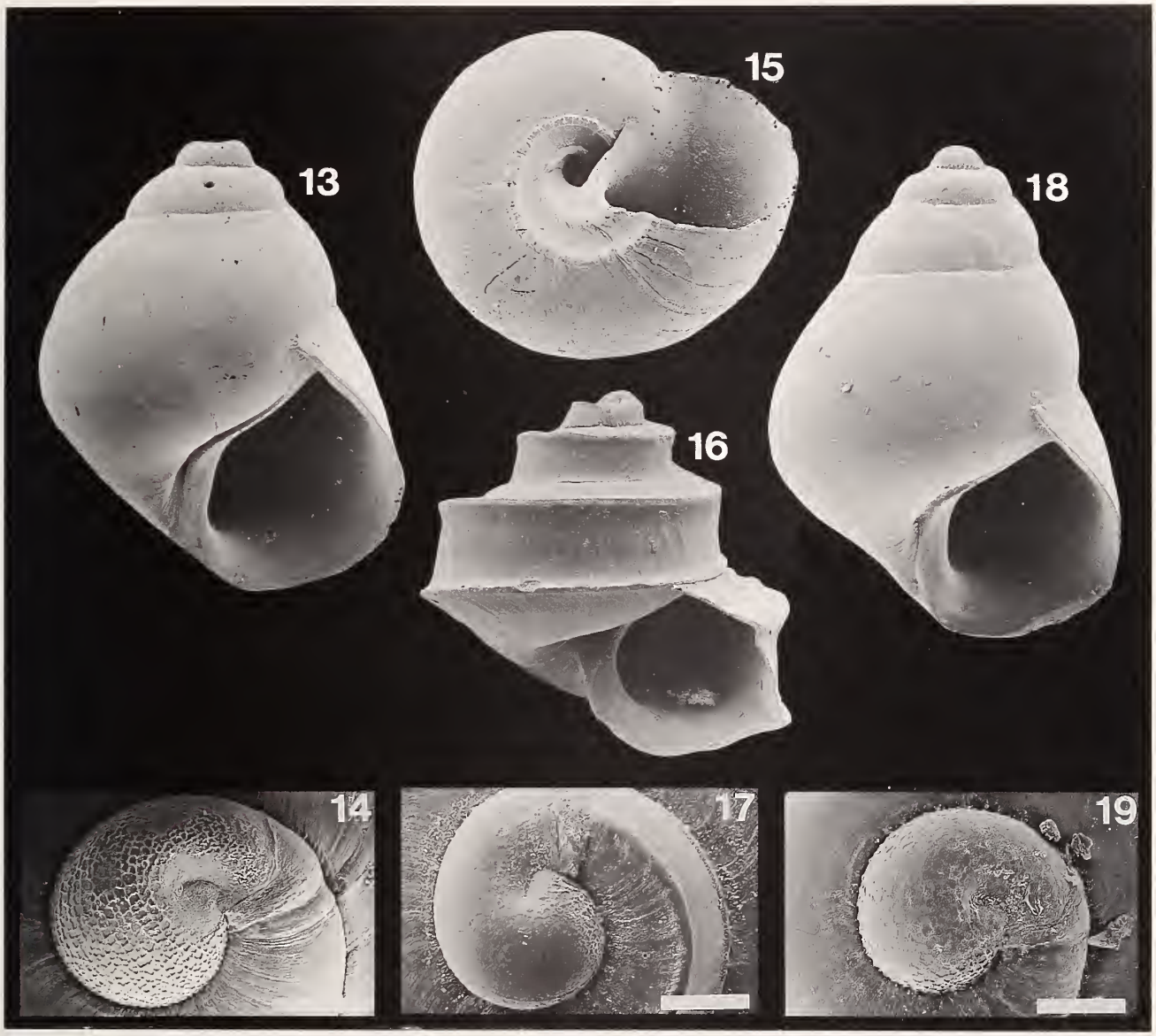
Animal unknown.

Type data: Holotype M.117518 (1.47 mm × 1.55 mm, 2.80 teleoconch whorls) and juvenile paratype (1.18 mm × 1.23 mm, 2.25 teleoconch whorls) NMNZ: BS 640 (P543), 34°05.9′S, 171°55.1′E, 24 km NW of Three Kings Islands, dead, 710 m, 27 June 1978, R/V *Tangaroa.*

Distribution: Off Three Kings Islands, northern New Zealand, 710 m, dead on comminuted bryozoan/shell substratum.

Remarks: *Trochaclis* ***cristata*** has a much stronger shoulder angulation than any known *Trochaclis* species, and is unique in having a peripheral keel. Shell features are otherwise typical of the genus. If this species is indeed referable to *Trochaclis,* the teleoconch sculpture may indicate derivation of the genus from strongly sculptured stock resembling ***Acremodontina*** and *Acremodonta* species, perhaps their stem group. Confirmation of its relationships, however, must await discovery of living specimens and study of the radula.

Etymology: Ridged (Latin).



Explanation of Figures 13 to 19

Figures 13–19. *Trochaclis* species. Scales 100 μm.

Figures 13, 14. *Trochaclis* ***elata*** Marshall, sp. nov. Fig. 13. Holotype, off Three Kings Islands, northern New Zealand, 440 m, shell height 1.62 mm. Figure 14. Paratype (NMNZ M.117514), off Three Kings Islands, 310 m.

Figure 15. *Trochaclis* ***regalis*** Marshall, sp. nov., holotype, off Three Kings Islands, northern New Zealand, 710 m, shell width 1.63 mm.

Figures 16, 17. *Trochaclis* ***cristata*** Marshall, sp. nov., holotype, off Three Kings Islands, northern New Zealand, 710 m, shell height 1.47 mm.

Figures 18, 19. *Trochaclis* ***attenuata*** Marshall, sp. nov., holotype, off Three Kings Islands, northern New Zealand, 440 m, shell height 1.70 mm.

Acremodontina Marshall, gen. nov.

Type species: *Conjectura carinata* Powell, 1940; Recent, northern New Zealand.

Etymology: Diminutive of genus group name *Acremodonta* Marshall.

Diagnosis: Shell turbiniform, up to 2.67 mm high, glossy, umbilicus invaded by inner lip, extremely thin internal aragonitic layer present, not visibly nacreous. Protoconch with minute granules, punctations and/or few spiral threads. Teleoconch smooth or with spiral cords, threads, or dashlike spiral grooves. Radula formula ∞ + (2?)4 −

Table 5

Trochaclis ***elata*** Marshall, sp. nov. Shell measurements (mm) and countings. Holotype in italics.

Height	Diameter	Height/ diameter	Teleoconch whorls (*n*)	Station no.
1.52	1.27	1.19	2.50	AUZ 53
1.57	1.37	1.15	2.50	AUZ 53
1.62	*1.37*	*1.18*	*2.70*	*BS 663*

Table 6

Acremodontina maxwelli Marshall, gen. & sp. nov. Shell measurements (mm) and countings. Holotype in italics.

Height	Diameter	Height/ diameter	Teleoconch whorls (*n*)	Station no.
0.83	0.87		1.60	GS 9730
0.87	0.90		1.70	GS 9730
0.87	0.93		1.60	GS 9730
1.23	*1.30*		*2.10*	*GS 9730*

$5 + 1 + 5 - 4(2?) + \infty$; central and lateral teeth scalelike, cuspless, longer than broad; tips of marginal teeth deeply split to form two primary branches, one in front of the other, each primary branch with terminal fan of fine, repeatedly branched cusps.

Remarks: The radula in ***Acremodontina*** species differs from those in *Trochaclis* and *Acremodonta* in having short, scalelike central and lateral teeth. The radula differs further from that in *Trochaclis* (Warén, 1992:fig. 37A) in that each of the marginal teeth has a double terminal cusp fan, and from that in *Acremodonta* in that the teeth are considerably less slender with less finely divided cusps. The protoconch in ***Acremodontina*** species lacks the crowded wavy threads of *Acremodonta* and the fine reticulate sculpture of *Trochaclis* species. Although several ***Acremodontina*** species have an axial varix on the first quarter teleoconch whorl, the varix is much further from the protoconch than in any *Trochaclis* species. This group is somewhat intermediate between *Trochaclis* and *Acremodonta* in shell morphology.

A. carinata (Powell, 1940), *A. atypica* (Powell, 1937), and *A. poutama* (E. C. Smith, 1962) were originally referred to *Conjectura* Finlay, 1926, the type species of which (*Crossea glabella* Murdoch, 1905), however, has a vitreous shell and a smooth protoconch of 1.5 whorls (personal observation). Although the animal of *C. glabella* is unknown, it is almost certainly a vitrinellid.

A. simplex (Powell, 1937) and *A. translucida* (May, 1915) were originally referred to *Cirsonella* Angas, 1877 (type species *Cirsonella australis* Angas, 1877), but the shell, radula, and operculum are entirely different in that genus (Warén, 1992).

Acremodontina maxwelli Marshall, sp. nov.

(Figures 23, 24; Table 6)

Description: Shell turbiniform up to 1.30 mm wide, about as wide as high, rather thin, spire up to 0.54× as high as aperture, glossy, umbilicus a narrow chink.

Protoconch 230 μm wide, distinctly tilted, rim slightly flared, minutely granulate, with three fine spiral threads.

Teleoconch of up to 2.10 whorls. Shoulder angulation sharp, becoming obsolete on last adult whorl; ramp flat, horizontal at first, becoming gently sloping, side and base rather evenly convex. End of first eighth whorl traversed by a strong, rounded axial varix that is closely followed by sharply defined growth scar. Sculpture of strong, rounded, widely spaced spiral cords that multiply by intercalation, interspaces concave. Shoulder angulation, suprasutural, and intermediate spirals similar, commencing immediately, continuity disrupted at varix and growth scar on first whorl. Secondary spirals enlarging to resemble primaries, three on ramp, one in each primary spiral interspace on side. Median ramp spiral commencing late on first half whorl, other ramp spirals and side spirals commencing on second whorl. Basal spirals numbering nine in holotype (adult?), innermost two weaker, innermost bordering umbilicus. Umbilicus narrow, partly invaded by

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Explanation of Figures 20 to 31

Figures 20–31. *Acremodontina* species. Scales 100 μm.

Figures 20–22, 29, 30. *Acremodontina carinata* (Powell, 1940). Figures 20, 22, 29, 30. Off Three Kings Islands, northern New Zealand, 221–206 m, NMNZ M.92195, shell heights 1.60 mm and 1.53 mm respectively. Figure 21. Off Three Kings Islands, 310 m, NMNZ M.92420, shell height 1.12 mm.

Figures 23, 24. *Acremodontina maxwelli* Marshall, gen. & sp. nov., holotype, Early Miocene, Pakaurangi Point, Kaipara Harbour, New Zealand, shell height 1.23 mm.

Figures 25–28, 31. *Acremodontina varicosa* Marshall, gen. & sp. nov. Figures 28, 31. Holotype, off Three Kings Islands, northern New Zealand, 710 m, shell height 1.50 mm. Figure 25. Paratype (NMNZ M.92198), off Three Kings Islands, 710 m, shell height 1.90 mm. Figure 26. Early Pliocene, Motutapu Point, Pitt Island, Chatham Islands, New Zealand, NZGS TM7669, shell height 1.00 mm. Figure 27. Paratype (NMNZ M.92448), off Three Kings Islands, 805 m, shell height 2.67 mm.

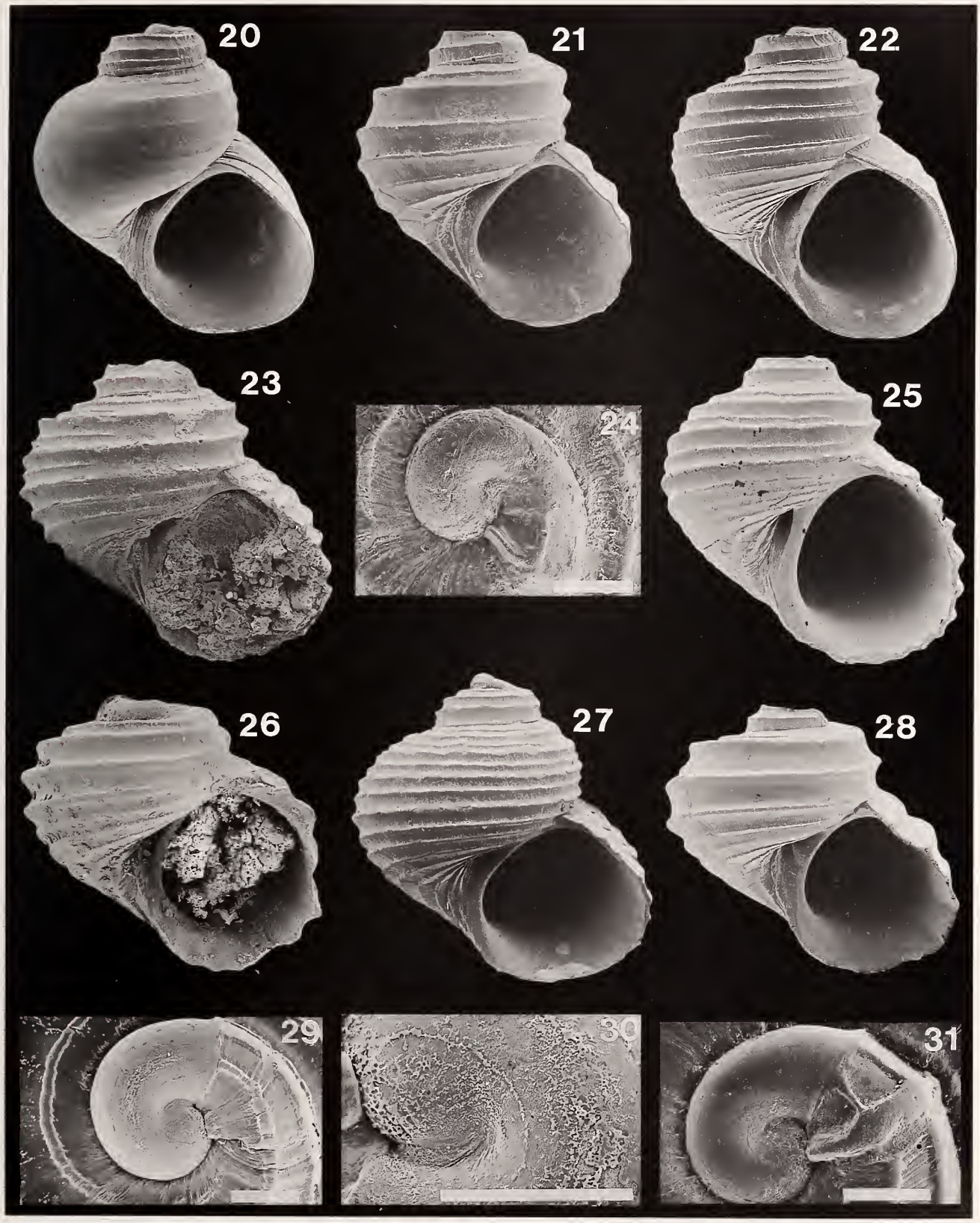
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Table 7

Acremodontina carinata (Powell, 1940).
Shell measurements (mm) and countings.

Height	Diameter	Height/ diameter	Teleoconch whorls (*n*)	Station no.
1.47	1.45	1.01	2.10	BS 897
1.53	1.60	0.96	2.20	BS 897
1.58	1.47	1.07	2.25	BS 897
1.60	1.53	1.04	2.30	BS 897
1.62	1.50	1.08	2.25	BS 897
1.73	1.65	1.05	2.30	BS 894
1.73	1.71	1.01	2.30	BS 897
1.85	1.70	1.09	2.50	BS 897
2.17	1.98	1.09	2.50	BS 894

inner lip. Aperture subcircular; outer lip thin at rim, thicker within; inner lip of moderate thickness.

Type data: Holotype NZGS TM7668 and 3 paratypes (1 NMNZ, 2 NZGS): GS 9730, tuffaceous siltstone, small bay ca. 1.6 km NW of Pakaurangi Point, Kaipara Harbour, northern New Zealand, map ref. Q8/262513 (f9828), March 1979, B. A. Marshall and P. A. Maxwell; Otaian (Early Miocene).

Distribution: Early Miocene (Otaian), Pakaurangi Point, Kaipara Harbour, northern New Zealand.

Remarks: ***Acremodontina maxwelli*** closely resembles ***A. varicosa*** n. sp. in general facies, including the presence of a strong varix on the first quarter whorl, but differs from this Recent species in having three spiral cords on the ramp instead of one or occasionally two, and in being substantially smaller relative to the number of whorls.

Etymology: After Philip Maxwell of Waimate (formerly NZGS).

Acremodontina carinata (Powell, 1940)

(Figures 20–22, 29, 30, 56–59; Table 7)

Conjectura carinata Powell, 1940:223, pl. 28, fig. 8; Powell 1979:74, pl. 20, fig. 22.

Description: Shell turbiniform, up to 2.17 mm high, usually slightly higher than broad, rather thin but not fragile, spire 0.62–0.68× as high as aperture, glossy, translucent, umbilicus a crescentic chink. Protoconch pale buff or colorless, most of first teleoconch whorl colorless, subsequent whorls pale pink, occasionally white.

Protoconch 250–270 μm wide, slightly tilted, rim slightly flared. Sculpture of minute irregular granules that coalesce to form few spiral lirae and broader median spiral band, coalescent granules at outer side of tip of apical fold enclosing minute circular spaces, elsewhere more finely granulate.

Teleoconch of up to 2.50 whorls, last part of last whorl descending at maturity; shoulder angulation sharp, usually becoming obsolete early on last adult whorl, occasionally persisting; ramp flat, almost horizontal on first whorl, becoming gently sloping; side and base rather evenly rounded. Two close, more or less distinct, simple growth scars on first quarter whorl. Sculpture of narrow, prominent, rounded, crisply defined spiral cords that multiply by intercalation, usually becoming obsolete early on last adult whorl, occasionally persisting to adult apertural rim. Shoulder angulation, suprasutural and intermediate spirals commencing immediately, similar, remaining at similar size throughout. Secondary spirals commencing at varying stages of growth, becoming almost as large as primaries, one or two on ramp, one between median and suprasutural spiral, occasionally one between shoulder and median spiral. Basal spirals similar to spire spirals, numbering up to seven in adults with persistent spirals, though absent in most adults. Umbilicus invaded by inner lip callus at early stage of growth, a narrow crescentic chink; rim tightly rounded, surmounted by spiral thread, often another thread immediately within. Aperture subcircular; outer lip thin at rim, thicker within; inner lip of moderate thickness.

Animal (partially reconstituted from dry). Head dorsoventrally flattened; snout subrectangular, longer than broad; cephalic tentacles stout, large black eyes at outer bases. Operculum pale buff, thin.

Radula (Figures 56–59) with the formula ∞ + 4 + 1 + 4 + ∞. Central and lateral teeth thin in section, subtrapezoidal, tips bevelled and irregular. Marginals numerous, very slender; innermost pair shorter than others and with smaller cutting area. Tips of inner marginal teeth deeply split to form two primary branches, one in front of the other, each primary branch with curved terminal fan of slender, repeatedly dividing cusps, shorter frontal fan overhanging a prominent projection. Outermost four teeth fused at bases, repeatedly and very deeply divided to form long, slender cusps.

Type data: Holotype (1.13 × 1.10 mm, 2.00 teleoconch whorls) Auckland Institute and Museum 72052: between Spirits Bay and Three Kings Islands, northern New Zealand, 91 m, J. A. Bollons.

Other material examined: Off Three Kings Islands northern New Zealand (93 specimens in 19 lots NMNZ); BS 869, 34°42.6′S, 173°14.4′E, off Rangaunu Bay, dead, 63 m, 27 January 1981, R/V *Tangaroa* 1 (NMNZ); NE of Uruapukapuka Island, Bay of Islands, dead, 27–37 m, February 1970, J. & M. Hancock (1 NMNZ); BS 770, 37°33.4′S, 178°48.3′E, Ranfurly Bank, East Cape, dead, 106–103 m, 25 January 1979, R/V *Tangaroa* (1 NMNZ).

Distribution: Vicinity of Three Kings Islands, and northeastern North Island, New Zealand, 27–805 m, living at 88–221 m on bryozoan/shell substratum with abundant sponges, hydroids, corals, and gorgonians.

Remarks: Compared with the Australian species *Acremodontina alazon* (Hedley, 1905), which it much resembles, *A. carinata* differs in having a broader protoconch (width 250–270 μm instead of 200 μm) and in being smaller relative to the number of whorls.

Acremodontina varicosa Marshall, sp. nov.

(Figures 25–28, 31; Table 8)

Description: Shell turbiniform, up to 2.67 mm high, usually slightly wider than high, summit flattened, protoconch and often start of first teleoconch whorl distinctly tilted, spire 0.52–0.70× as high as aperture, thin but not fragile, glossy, translucent white, umbilicus a narrow chink.

Protoconch 230–250 μm wide, rim slightly flared, with two fine spiral lirae, minutely pitted, tip of apical fold minutely roughened.

Teleoconch of up to 2.70 whorls. Shoulder angulation sharp, becoming obsolete on last adult whorl; ramp flat, horizontal at first, becoming gently sloping; side and base rather evenly convex. End of first quarter whorl traversed by strong, rounded axial varix that is closely followed by sharply defined growth scar. Sculpture of strong rounded, widely spaced spiral cords that multiply by intercalation, interspaces concave. Shoulder angulation, suprasutural and intermediate spirals similar, commencing immediately, slightly offset at growth scar. Secondary spirals enlarging to resemble primaries one on ramp, or occasionally two in each primary spiral interspace, ramp spiral commencing late on first or early on second whorl, other secondaries commencing early or late on last adult whorl. Basal spirals numbering six to eight in adults; innermost weak, bordering umbilicus, others similar. Umbilicus narrow, partly invaded by inner lip. Aperture subcircular; outer lip thin at rim, thicker within; inner lip of moderate thickness.

Animal unknown.

Type data: Holotype (M.117559) and 4 paratypes NMNZ: BS 640 (P543), 34°05.9′S, 171°55.1′E, Three Kings Trough, dead, 710 m, 27 June 1978, R/V *Tangaroa*. Paratypes (23): AUZ 53, 34°00′S, 171°55′E, 805 m, 17 September 1962, R.N.Z.F.A. *Tui* (12 NMNZ, 1 AMS, 1 LACM, 1 MNHN); BS 898 (0644), 34°01.2′S, 171°44.4′E, 206–211 m, 31 January 1981, R/V *Tangaroa* (1 NMNZ); BS 895 (0641), 34°02.0′S, 171°44.0′, 246–291 m, 31 January 1981, R/V *Tangaroa* (3 NMNZ); BS 642 (P574), 34°06.5′S, 172°04.7′E, 310 m, 30 June 1978, R/V *Tangaroa* (2 NMNZ); BS 901 (0647), 34°14.1′S, 172°09.0′E, 192–202 m, 1 February 1981, R/V *Tangaroa* (1 NMNZ).

Other material examined: (1 specimen). GS 12163, Whenuataru Tuff, Motutapu Point, Pitt Island, Chatham Islands (CH/f13B), P. A. Maxwell, January 1981; Waipipian (Early Pliocene).

Distribution: Early Pliocene (Waipipian), Pitt Island, Chatham Islands, New Zealand. Recent off Three Kings Islands, northern New Zealand, 192–805 m (dead) on comminuted bryozoan and shell substrata with sponges, corals, hydroids and gorgonians.

Table 8

Acremodontina varicosa Marshall, gen. & sp. nov. Shell measurements (mm) and countings. Holotype in italics.

Height	Diameter	Height/ diameter	Teleoconch whorls (*n*)	Station no.
1.20	1.30	0.92	1.75	BS 642
1.37	1.67	0.82	2.00	BS 642
1.50	*1.77*	*0.85*	*2.10*	*BS 640*
1.53	1.73	0.88	2.20	BS 642
1.67	1.80	0.93	2.25	BS 642
1.77	1.87	0.95	2.30	BS 895
1.93	2.05	0.94	2.40	BS 640
2.67	2.57	1.04	2.70	BS 642

Remarks: Compared with *Acremodontina carinata,* which it most resembles, *A. varicosa* differs primarily in having a strong varix on the first quarter teleoconch whorl, in having a smaller protoconch (mean width 230 μm instead of 260 μm), and in being consistently white instead of predominantly pale pink. It differs further in that the spiral cords do not become obsolete on the last adult whorl as in most specimens of *A. carinata,* while the shell is usually slightly broader relative to its height. Both species exhibit considerable variation in the number of secondary spiral cords, and in the stage of growth at which particular spirals appear. The two species have overlapping bathymetric ranges and locally occur together as empty shells. Present collections suggest that *A. carinata* ranges into shallower depths (minimum 88 m as against 192 m). The single Early Pliocene specimen from Pitt Island (Figure 26) falls within the range of variation exhibited by Recent specimens and is specifically indistinguishable. *A. carinata* differs from the Australian species *A. alazon* (see below) in having more numerous spiral cords on the spire and base, and a larger protoconch (width 230–250 μm instead of 200 μm).

Etymology: With dilated veins (Latin), alluding to the flared protoconch rim and the varix on the first teleoconch whorl.

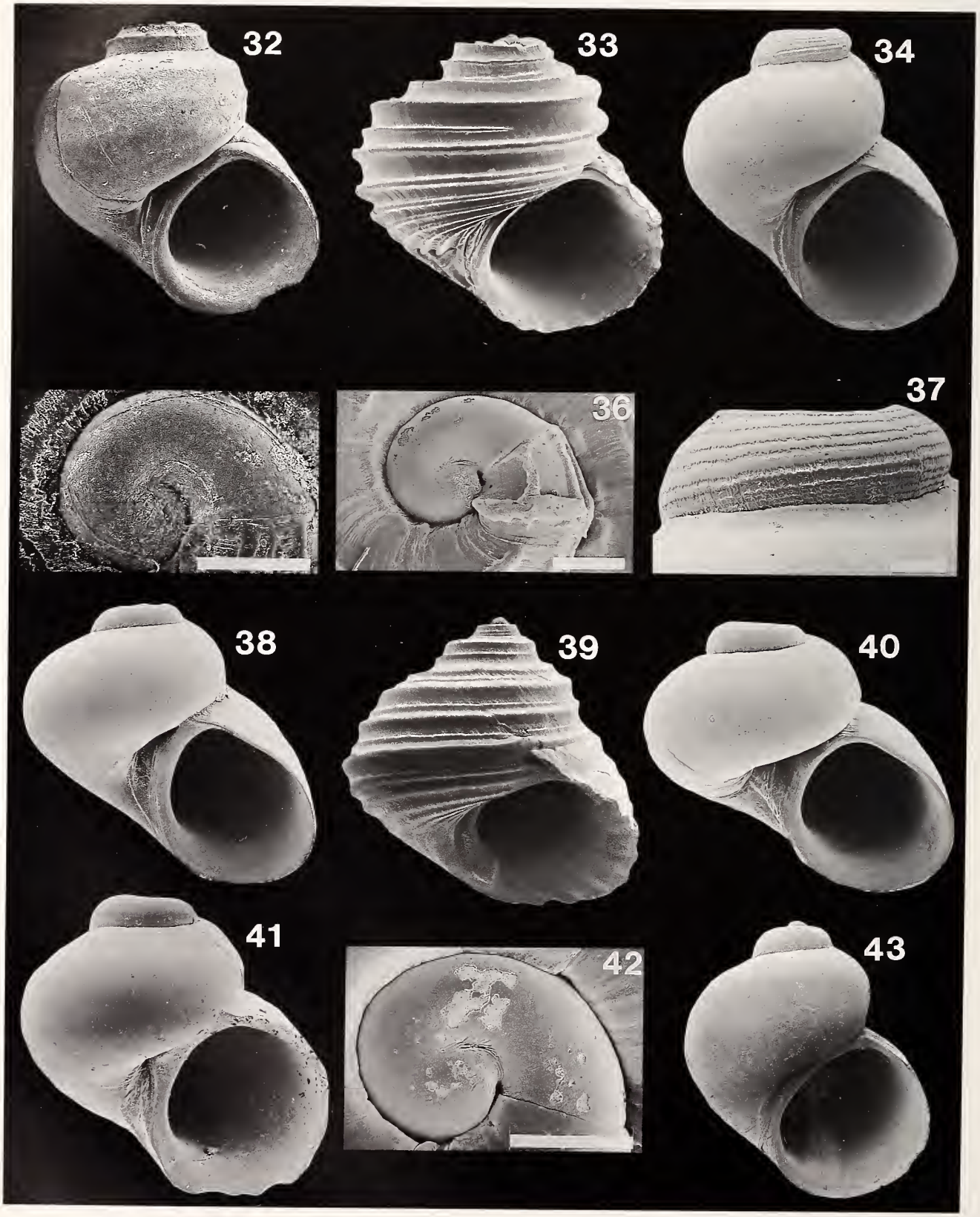
Acremodontina kermadecensis Marshall, sp. nov.

(Figures 32, 60–62)

Description: Shell turbiniform, up to 1.83 mm wide, slightly broader than high, of moderate thickness, spire 0.53–0.70× as high as aperture, protoconch and start of first teleoconch whorl gently tilted, glossy, narrowly umbilicate, white.

Protoconch eroded, about 200 μm wide.

Teleoconch of up to 2.4 convex whorls, last part of last whorl descending at maturity. End of first eighth whorl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with prominent axial varix followed by growth scar. Sutural ramp more or less horizontal on first whorl, shoulder angulation descending to about adapical third. Whorls angulated by smooth similar spiral cords, three on side, three on base, becoming obsolete early on last adult whorl. Spire spirals commencing immediately, first surmounting shoulder angulation, second median, third peripheral and bordering suture. Umbilicus narrow, deep, a sharp spiral thread close beside inner edge of tightly rounded rim descends steeply from within. Aperture subcircular; outer lip thin at rim, thicker within; parietal lip thick, becoming almost detached at maturity, continuous with thick inner lip.

Operculum thin, yellowish brown, multispiral.

Radula (Figures 60–62) with the formula ∞ + 5 + 1 + 5 + ∞. Central and lateral teeth simple, cuspless, laminar, longer than broad, laterals outwardly decreasing in size. Innermost pair of marginal teeth short, without cutting area. Other marginal teeth similar to those of *A. carinata* (see above).

Type data: Holotype M.262496 (1.77 × 1.83 mm, 2.40 teleoconch whorls) and paratype (1.32 × 1.40 mm, 2.10 teleoconch whorls) NMNZ: BS 309, off Bell's Flat, Raoul Island, Kermadec Islands, alive on hard, rugged substratum, 165–220 m, 4 April 1973, R/V *Acheron*.

Distribution: Off Raoul Island, Kermadec Islands, living at 165–220 m, with abundant alcyonarians, gorgonians and sponges.

Remarks: ***Acremodontina kermadecensis*** resembles *A. alazon* and differs from other species of ***Acremodontina*** in having only three spiral cords on the spire. It differs from *A. alazon* in having considerably weaker spiral cords, and in having an extra cord on the base. It resembles *A. carinata* in that the spiral cords become obsolete early on the last adult whorl, yet resembles ***A. varicosa*** and ***A. maxwelli*** in having a varix early on the first teleoconch whorl. The protoconch, though eroded, appears to be similar in width (ca. 200 μm) to that in *A. alazon*, and smaller than those in other species of ***Acremodontina***.

Etymology: From the Kermadec Islands.

Acremodontina boucheti Marshall, sp. nov.

(Figures 33, 36, 63, 64; Table 9)

Description: Shell turbiniform, up to 3.25 mm high, about as broad as high, of moderate thickness, stout, summit flattened, protoconch and early first teleoconch whorl distinctly tilted, spire 0.57–0.61 × as high as aperture, glossy, translucent, colorless, narrowly umbilicate.

Protoconch 230–270 μm wide, rim weakly flared, surface of tip of apical fold finely roughened, elsewhere smooth.

Teleoconch of up to 2.60 convex whorls. Shoulder angulation sharp, becoming obsolete on last adult whorls, which is rather evenly convex; ramp flat, horizontal on first whorl, thereafter gently sloping; side and base rather evenly convex. End of first eighth whorl traversed by strong, rounded axial varix that is closely followed by sharply defined growth scar. Sculpture of strong, rounded, widely spaced spiral cords that multiply by intercalation, interspaces concave. Shoulder angulation, suprasutural, and intermediate spirals similar, commencing immediately, continuity disrupted by varix and growth scar on first whorl. Secondary spirals rapidly enlarging to resemble primaries, all spirals similar on last adult whorl. Adapical ramp spiral commencing on second half of first whorl; abapical ramp spiral (when present) commencing late second or early third whorl. Secondary spiral between shoulder and median spiral (seldom absent) and that between median and suprasutural spiral commencing on second half of second whorl or early on third whorl. Basal spirals numbering four to, six innermost weaker and bordering umbilicus. Aperture subcircular; outer lip thin at rim, rapidly thickened; inner lip of moderate thickness.

Radula (Figures 63, 64). Central and lateral teeth subrectangular, longer than broad, thin in section, tips cusp-

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Explanation of Figures 32 to 43

Figures 32–43. ***Acremodontina*** species. Scales 100 μm.

Figure 32. ***Acremodontina kermadecensis*** Marshall, gen. & sp. nov., holotype, off Raoul Island, Kermadec Islands, 165–220 m, shell height 1.77 mm.

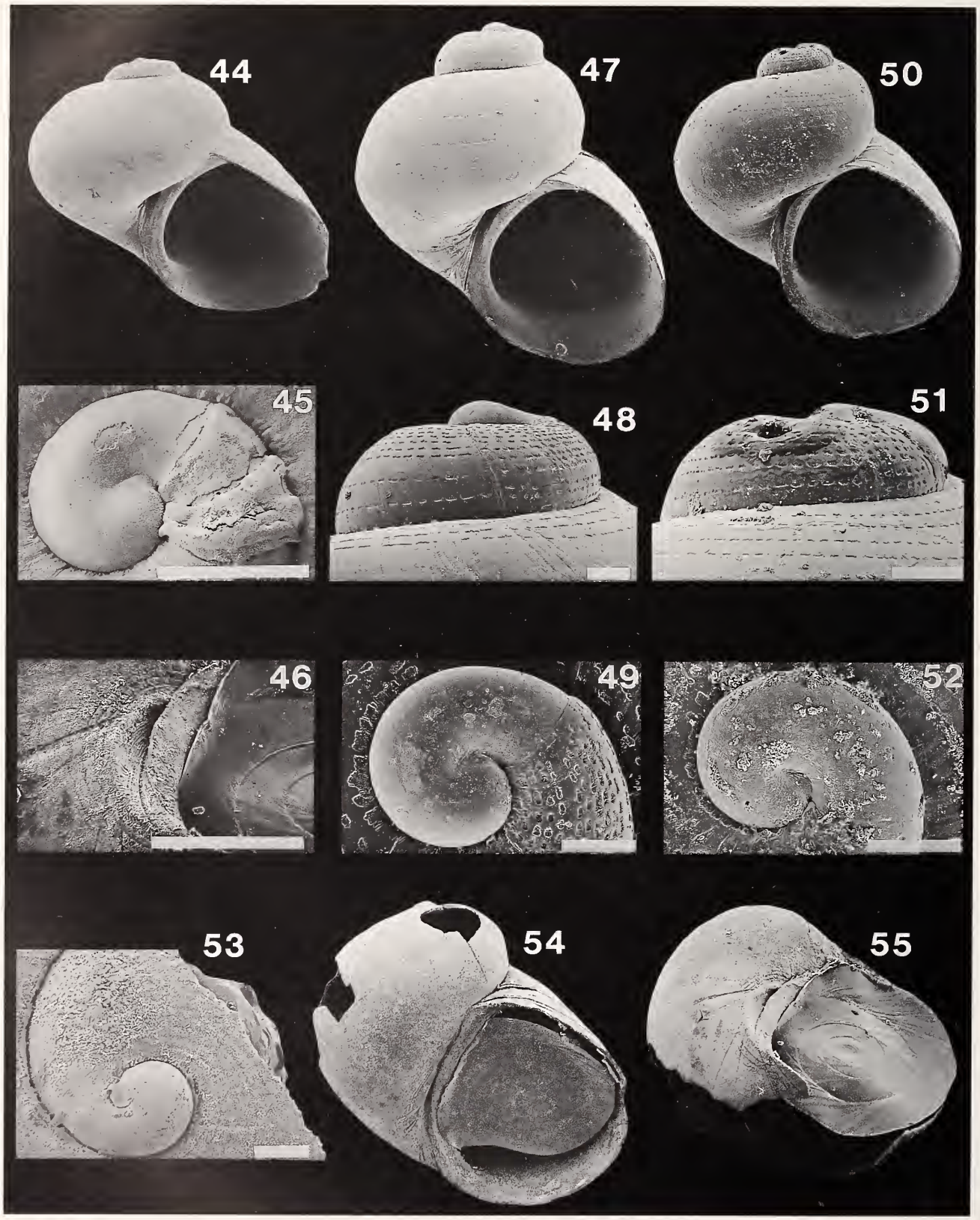
Figures 33, 36. ***Acremodontina boucheti*** Marshall, gen. & sp. nov., holotype, off southern New Caledonia, 505–515 m, shell height 2.10 mm.

Figures 34, 35, 37. ***Acremodontina*** *atypica* (Powell, 1937). Figures 34, 37. Off Three Kings Islands, northern New Zealand, 201–216 m, NMNZ M.92206, shell height 1.50 mm. Figure 35. Off Three Kings Islands, 206–211 m, NMNZ M.92196.

Figures 38, 40–42. ***Acremodontina*** *simplex* (Powell, 1937). Figure 38. Off Three Kings Islands, northern New Zealand, 310 m, NMNZ M.92200, shell height 1.65 mm. Figures 40, 42. Off Three Kings Islands, 173–178 m, NMNZ M.92199, shell height 1.10 mm. Figure 41. Off Three Kings Islands, 102 m, NMNZ M.34279, shell height 1.30 mm.

Figure 39. *Acremodonta crassicosta* (Powell, 1937), off Three Kings Islands, northern New Zealand, 102 m, NMNZ M.34244, shell height 4.05 mm.

Figure 43. ***Acremodontina*** *translucida* (May, 1915), paratype, off Thouin Bay, Tasmania, 73 m, AMS C.39470, shell height 2.55 mm.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less. Apparently four pairs of lateral teeth (poorly separated in preparation). Marginal teeth similar to those of *A. carinata* (see above).

Type data: Holotype MNHN, paratype NMNZ: BIOCAL stn DW 66, 24°55′S, 168°22′E, off S New Caledonia, alive, 505–515 m, 3 September 1985, N.O. *Jean-Charcot*. Paratypes (4 MNHN): MUSORSTOM 4 stn DC 168, 18°48′S, 163°11′E, off N New Caledonia, dead, 720 m, 16 September 1985, N.O. *Vauban* (1); BIOCAL stn DW 48, 23°00′S, 167°29′E, off S New Caledonia, dead, 775 m, 31 August 1985, N.O. *Jean-Charcot* (1); CHALCAL 2 stn DW 76, 23°41′S, 167°45′E, off S New Caledonia, dead, 470 m, 30 October 1986, N.O. *Coriolis* (1); SMIB 3 stn DW 01, 24°56′S, 168°22′E, off S New Caledonia, alive, 520 m, 20 May 1987, N.O. *Vauban* (1).

Distribution: Off northern and southern New Caledonia, 470–720 m, living at 505–520 m.

Remarks: Compared with ***Acremodontina varicosa,*** which it most resembles, ***A. boucheti*** differs in having a narrower postlarval varix, in attaining larger size, and in that the secondary spiral cords enlarge to resemble the primaries when the shell is larger.

Etymology: After Philippe Bouchet (MNHN).

Acremodontina alazon (Hedley, 1905)

Liotia alazon Hedley, 1905:49, fig. 14.
?Liotia alazon. Iredale & McMichael, 1962:678.

Description: Shell (holotype) turbiniform, 1.70 mm wide, slightly broader than high, of moderate thickness, stout, protoconch and early first teleoconch slightly tilted, spire 0.69× as high as aperture, glossy, translucent, colorless, umbilicate.

Protoconch 200 μm wide, rim slightly thickened, sculpture unknown.

Teleoconch of 2.25 convex whorls. End of first eighth whorl with massive axial varix, area between protoconch and varix with three crisp spiral cords. Subsequent spire whorls sculptured with three strong, similar, growth spiral keels. Adapical keel forming strong shoulder angulation, rising above level of protoconch on first whorl; median keel peripheral; summit of abapical keel partly covered by succeeding whorls, becoming fully exposed through descent of last half whorl at maturity. Base with three rounded spiral cords, outermost median, innermost weakest and bordering deep, narrow umbilicus. Aperture subcircular. Outer lip thin at rim, thicker within. Inner lip thick, very thick abapically.

Animal unknown.

Type data: Holotype (1.52 × 1.70 mm, 2.25 teleoconch whorls), AMS C.19854, off Cape Byron, northern New South Wales, 203 m.

Distribution: Off Cape Byron, northern New South Wales, Australia, 203 m (dead).

Remarks: *Liotia alazon* is extremely similar to ***A. carinata, A. varicosa, A. boucheti, A. kermadecensis,*** and ***A. maxwelli,*** and despite the absence of the diagnostic radula, there can be little doubt that it is a species of ***Acremodontina.*** The holotype, which remains the only known specimen, was well illustrated by Hedley (1905:fig. 14).

Acremodontina atypica (Powell, 1937)

(Figures 34, 35, 37, 65–67; Table 10)

Conjectura atypica Powell, 1937:187, pl. 41, fig. 10, 11; Powell, 1979:73, pl. 20, fig. 21.

Description: Shell turbiniform, up to 1.70 mm high, usually slightly higher than broad, of moderate thickness, summit flattened, protoconch and early first teleoconch whorl distinctly tilted, spire 0.54–0.80× as high as aperture, glossy, translucent, umbilicus a narrow chink. Apical fold tip and adaxial side of protoconch yellowish brown, elsewhere white.

Protoconch 230 μm wide, rim simple, tip of apical fold finely roughened, elsewhere minutely pitted.

Teleoconch of up to 2.20 whorls, end of last whorl descending at maturity; whorls either rather evenly convex or first 1–1.5 whorls with flat, more or less horizontal ramp, and weak to strong shoulder angulation. First half whorl sculptured with numerous, close, similar, smooth,

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Explanation of Figures 44 to 55

Figures 44–55. ***Acremodontina*** and ***Austrotrochaclis*** species. Scale in Figure 46, 500 μm, others 100 μm.

Figures 44, 55. ***Acremodontina magna*** Marshall, gen. & sp. nov., holotype, off Three Kings Islands, northern New Zealand, 805 m, shell height 3.35 mm.

Figures 47–49. ***Acremodontina*** *poutama* (E. C. Smith, 1962), paratype NMNZ M.19424, off Poutama Island, Stewart Island, 55 m, shell height 1.90 mm.

Figures 50–52. ***Acremodontina balcombiana*** Marshall, gen. & sp. nov., holotype, Late Miocene, Fossil Beach, Port Phillip, Victoria, shell height 1.50 mm.

Figures 46, 53–55. ***Austrotrochaclis ponderi*** Marshall, gen. & sp. nov., off Long Reef, Sydney, New South Wales, 38 m. Figures 46, 55. Paratype NMNZ M.262660, shell width 1.70 mm. Figure 53. Paratype AMS 174898. Figure 54. Holotype, shell height 2.00 mm.

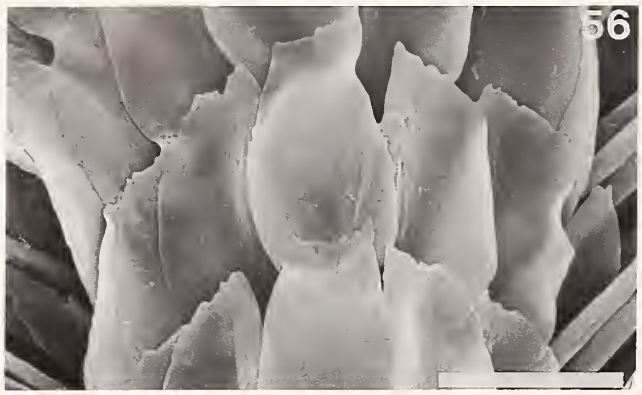
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Table 9

Acremodontina boucheti Marshall, gen. & sp. nov. Shell measurements (mm) and countings. Holotype in italics.

Height	Diameter	Height/ diameter	Teleoconch whorls (*n*)	Station no.
1.30	1.52	0.85	1.90	SMIB3 DW01
1.90	2.10	0.90	2.25	BIOCAL DW66
2.10	*2.20*	*0.95*	*2.40*	*BIOCAL DW66*
2.40	2.40	1.00	2.30	CHALCAL 2 DW76
2.82	2.95	0.95	2.50	BIOCAL DW48
3.25	3.15	1.03	2.60	MUSORSTOM 4 DC168

Table 10

Acremodontina atypica (Powell, 1937). Shell measurements (mm) and countings.

Height	Diameter	Height/ diameter	Teleoconch whorls (*n*)	Station no.
1.25	1.28	0.98	2.00	BS 392
1.25	1.20	1.04	2.00	BS 392
1.35	1.30	1.04	2.00	BS 394
1.42	1.37	1.04	2.10	BS 895
1.42	1.38	1.03	2.10	BS 898
1.43	1.40	1.02	2.00	BS 895
1.50	1.40	1.07	2.20	BS 906
1.57	1.53	1.03	2.20	BS 895
1.63	1.57	1.04	2.10	BS 391
1.70	1.60	1.06	2.20	BS 395

irregularly wavy spiral threads that multiply by intercalation, interspaces with fine, irregular axial riblets and collabral growth lines. Occasional specimens with spiral threads and shoulder angulation persisting onto last adult whorl, and with enlarged spirals, one surmounting shoulder angulation, one or two on side, and two on outer base. Base with two narrow smooth spiral cords beside umbilicus. Umbilicus narrow, partly invaded by inner lip. Aperture subcircular, outer lip thin at rim, thicker within; parietal lip rather thick.

Animal (partially reconstituted from dry). Head dorsoventrally flattened. Snout subrectangular, longer than broad. Cephalic tentacles short, broad, tips rounded, large black eyes at outer bases. Foot medially cleft anteriorly. Operculum thin, chitinous, pale yellowish brown, multispiral.

Radula (Figures 65–67) with the formula $\infty + 4 + 1 + 4 + \infty$. Central and lateral teeth narrowly subrectangular, longer than broad, thin in section, tips smooth, cuspless. Marginal teeth similar to those of *A. carinata* (see above).

Type data: Holotype BMNH 1962985 (1.70 × 1.68 mm, 2.20 teleoconch whorls), R.R.S. *Discovery II* sta. 933, 34°13.3′S, 172°12.0′E, off Three Kings Islands, northern New Zealand, 260 m, 17 August 1932.

Other material examined: 25 specimens (12 lots NMNZ) from vicinity of Three Kings Islands.

Distribution: Off Three Kings Islands, northern New Zealand, 91–622 m, living at 206–211 m on comminuted bryozoan/shell substratum with sponges, hydroids, corals and gorgonians.

Remarks: *Acremodontina atypica* is strongly characterized by the yellowish brown protoconch, and the numerous fine spiral threads on the early teleoconch. These characters facilitate separation of occasional specimens that approach weakly sculptured forms of *A. carinata* (Figure 20), and that in turn suggest that the species belongs in *Acremodontina*.

Acremodontina magna Marshall, sp. nov.

(Figures 44, 45)

Description: Shell (holotype) 3.80 mm wide, slightly broader than high, of moderate thickness, spire 0.6× as high as aperture, glossy, translucent white, umbilicus a narrow chink.

Protoconch 300 μm wide, surface slightly etched away, rim thickened.

Teleoconch of 2.75 convex whorls, end of last (adult)

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Explanation of Figures 56 to 64

Figures 56–64. Radulae of *Acremodontina* species.

Figures 56–59. *Acremodontina carinata* (Powell, 1940), adult, off Three Kings Islands, northern New Zealand, 221–206 m, NMNZ M.92195. Figure 56. Central and lateral teeth, scale 10 μm. Figure 57. Tips of inner marginal teeth, scale 5 μm. Figure 58. Outermost marginal teeth, scale 10 μm. Figure 59. Innermost marginal tooth, scale 10 μm.

Figures 60–62. *Acremodontina kermadecensis* Marshall, gen. & sp. nov., ex adult holotype. Figure 60. Central, lateral and inner marginal teeth. Figure 61. Inner marginal teeth. Figure 62. Tips of outermost marginal teeth. Scales 5 μm.

Figures 63, 64. *Acremodontina boucheti* Marshall, gen. & sp. nov., ex adult holotype. Figure 63. Tips of outermost marginal teeth. Figure 64. Width of radula. Scales 10 μm.

whorl descending. End of first quarter whorl traversed by a strong, rounded axial varix that is closely followed by sharply defined growth scar. Area between protoconch and varix with three spiral cords. Shoulder spiral strong, vanishing near end of first whorl; median and suprasutural spirals vanishing on first quarter whorl after varix. Subsequent whorls smooth. Umbilical chink bordered by spiral thread that descends steeply from within. Aperture subcircular. Outer lip thin at rim, thicker within. Inner lip and parietal glaze rather thick.

Animal unknown.

Type data: Holotype (3.35 × 3.80 mm, 2.75 teleoconch whorls) NMNZ M.117521: AUZ 53, 34°00′S, 171°55′E, off Three Kings Islands, northern New Zealand, dead, 805 m, 17 September 1962, R.N.Z.F.A. *Tui*.

Remarks: ***Acremodontina magna*** is rendered highly distinctive by its large size, strong postlarval varix, and absence of sculpture after the first teleoconch whorl. In the absence of the diagnostic radula, this species is referred to ***Acremodontina*** because the first teleoconch whorl is similar to those of ***A. maxwelli, A. varicosa,*** and ***A. boucheti.***

Etymology: Large (Latin).

Acremodontina simplex (Powell, 1937)

(Figures 38, 40–43, 68, 69; Table 11)

Cirsonella simplex Powell, 1937:185, pl. 50, fig. 12; Powell, 1979:71.

Description: Shell turbiniform to depressed-turbiniform, up to 2.17 mm wide, usually slightly wider than high, spire 0.44–1.00× as high as aperture, summit flattened, protoconch and start of first teleoconch whorl often slightly tilted to varying degrees, of moderate thickness, glossy, stout; umbilicus narrow, becoming partly or entirely infilled by inner lip; translucent white.

Protoconch 200–260 μm wide (mean 230 μm), smooth apart from fine wrinkles at tip of rounded apical fold, apertural rim simple.

Teleoconch of up to 2.50 smooth, convex whorls, usually slightly flattened above and below rounded periphery, end of last adult whorl descending, occasionally becoming dissolute. First quarter whorl usually delineated by pronounced growth scar. Umbilical rim tightly rounded, usually defined by fine spiral angulation, usually another fine angulation within; umbilicus narrow, deep, becoming narrowly crescentic and almost or entirely infilled by inner lip callous at varying stages of growth, occasionally remaining open in dissolute adult specimens. Aperture subcircular; outer lip thin at rim, thicker within; parietal and inner lips continuous, thick.

Animal (reconstituted from dry). Foot anteriorly bilobate. Snout dorsoventrally flattened, subrectangular, longer than broad. Cephalic tentacles dorsoventrally flattened, broad, tips rounded; large, deeply pigmented eyes at outer bases. Operculum pale yellowish brown, thin, multispiral.

Radula (Figures 68, 69) with the formula ∞ + 5 + 1 + 5 + ∞. Central and lateral teeth scalelike, thin in section, subrectangular, cutting edges smooth. Marginal teeth slender, at least 60 per transverse row, similar to those of *A. carinata* (see above).

Type data: Holotype BMNH 1962977 (1.30 mm × 1.52 mm): R.R.S. *Discovery II* st. 933, 34°13.3′S, 172°12.0′E, off Three Kings Islands, dead, 260 m, 17 August 1932.

Other material examined: 79 specimens in 19 lots NMNZ.

Distribution: Off Three Kings Islands and off Great Exhibition Bay, northern New Zealand 78–805 m, living at 78–178 m on comminuted shell and bryozoan substratum with sponges, corals, hydroids and gorgonians.

Remarks: ***Acremodontina simplex*** is characterized by its smooth, glossy, translucent white shell, and thick inner lip that tends to invade the narrow umbilicus. The species is variable in shape and in the stage at which the umbilicus becomes infilled by the inner lip, and there is complete gradation between extremes. Although Powell's (1937:pl. 50, fig. 12) illustration of the holotype shows what appear to be two spiral cords entering an open umbilicus, the umbilicus in the holotype is in fact filled by the thick inner lip as stated in the original description. Powell's subsequent (1979:71) statement that the umbilicus is almost filled by two crescentic ridges of callus bordering the inner lip is clearly an attempt to reconcile the discrepancy between the original illustration and the description.

Acremodontina translucida (May, 1915)

(Figure 43)

Cirsonella translucida May, 1915:97, pl. 7, fig. 38; May, 1923, pl. 20, fig. 12.

Description: Shell up to 2.65 mm high, slightly higher than broad at maturity, of moderate thickness, spire 0.32–0.60× as high as aperture, glossy, umbilical chink narrow; translucent white with narrow, pale pinkish brown subsutural band.

Protoconch 300 μm wide, no obvious microsculpture, apertural rim slightly thickened.

Teleoconch of up to 2.25 evenly convex whorls, last half whorl descending at maturity. Sculpture consisting of spiral rows of narrow, dashlike pits that elongate with increasing shell size, row number progressively reducing in number soon after appearance. Sculpture restricted to first whorl in most specimens, occasionally persisting below periphery onto last adult whorl. Umbilical chink bounded by fine spiral thread. Aperture subcircular, lips simple, parietal and inner lips contiguous, thick.

Animal unknown.

Type data: Holotype (Tasmanian Museum, Hobart, E292/7633) and 5 paratypes (AMS C.39470): off Thouin Bay, eastern Tasmania, dead, 73 m.

Table 11

Acremodontina simplex (Powell, 1937).
Shell measurements (mm) and countings.

Height	Diameter	Height/ diameter	Teleoconch whorls (*n*)	Station no.
1.02	1.27	0.80	1.90	BS 392
1.10	1.27	0.87	2.00	BS 906
1.33	1.33	1.00	2.10	BS 392
1.33	1.37	0.97	2.25	BS 894
1.40	1.30	1.08	2.30	BS 392
1.52	1.52	1.00	2.10	BS 642
1.65	1.83	0.90	2.30	BS 642
1.70	1.87	0.90	2.25	BS 642
1.80	1.78	1.01	2.30	BS 642
1.83	1.97	0.93	2.40	BS 640
1.85	2.00	0.92	2.30	BS 640
1.93	2.07	0.93	2.25	BS 640
2.00	2.17	0.92	2.50	BS 640

Distribution: Off Tasmania, 73 m.

Remarks: This species is rendered highly distinctive by its rounded teleoconch whorls and sculpture of spiral rows of dashlike pits. It is extremely similar to ***Acremodontina*** *poutama* (E. C. Smith, 1962) from off southern New Zealand, and ***A. morningtonensis*** from the Late Miocene of Victoria (see below). It is referred to Trochaclididae because of the similarity of the shell to that of *A. poutama,* the radula of which is characteristic of the family (Figure 70).

Cotton (1959) recorded the species from King George Sound, Western Australia, and from off South Australia, but not having seen the specimens, I am unable to confirm their identity. I am grateful to Anders Warén, who drew my attention to the probable relationships of this species.

Acremodontina balcombiana Marshall, sp. nov.

(Figures 50–52)

Description: Shell (holotype) 1.50 mm wide, as high as broad, thin, spire 0.75× as high as aperture, glossy, anomphalous.

Protoconch 250 μm wide, minutely roughened at tip of apical fold, elsewhere minutely pitted, rim simple.

Teleoconch of 2.00 convex whorls, end of last whorl descending at maturity. First whorl sculptured with fine spiral rows of dashlike pits, weakening and vanishing on first half of second whorl, next half whorl smooth. Base with fine, steeply descending spiral angulation close beside inner lip. Aperture subcircular, peristome continuous, lips simple.

Type data: Holotype MV P.143574 (1.50 × 1.50 mm, 2.00 teleoconch whorls): Fossil Beach, Balcombe Bay near Mornington, Port Phillip, Victoria, R. Lukey and J. Kerslake; Balcombian (Late Miocene).

Table 12

Acremodontina poutama (E. C. Smith, 1962).
Shell measurements (mm) and countings (paratypes).

Height	Diameter	Height/ diameter	Teleoconch whorls (*n*)
1.48	1.58	0.92	2.10
1.73	1.88	0.92	2.00
1.80	1.73	1.04	2.10
1.80	1.77	1.02	2.10
1.83	1.87	0.98	2.00
1.87	1.80	1.04	2.20
1.90	1.78	1.07	2.25
1.90	2.03	0.93	2.00
1.93	2.10	0.92	2.20
2.60	2.23	1.17	2.70
2.63	2.45	1.07	2.40

Distribution: Port Phillip, Late Miocene (Balcombian), Fossil Beach, Victoria, Australia.

Remarks: Compared with ***Acremodontina*** *poutama* and *A. translucida* from which it is otherwise indistinguishable, ***A. balcombiana*** differs in having a smaller protoconch (width 250 μm instead of 270–330 μm mean 300 μm) and a narrower nucleus.

Etymology: From the Balcombian Stage.

Acremodontina poutama (E. C. Smith, 1962)

(Figures 47–49, 70; Table 12)

Conjectura poutama E. C. Smith, 1962:50, fig. 1, 1a; Powell, 1979:74.

Description: Shell up to 2.63 mm high, about as high as broad, thin but not fragile, spire 0.57–0.88× as high as aperture, narrow umbilicus invaded by inner lip, glossy, translucent, colorless.

Protoconch 270–330 μm wide (mean 300 μm), usually slightly tilted, minutely roughened at outer part of tip of apical fold, elsewhere minutely punctate, rim simple.

Teleoconch of up to 2.70 rather evenly convex whorls, end of last whorl descending at maturity. First half whorl, first whorl, or sometimes all whorls with spiral rows of narrow dashlike pits, rows beginning to reduce in number soon after their appearance, pits gradually elongating. Umbilicus narrow, a fine spiral thread at rim, reduced to an elliptical chink through partial or complete invasion by inner lip. Aperture subcircular; outer lip thin at rim, thicker within; inner lip of moderate thickness.

Radula (Figure 70). Central and lateral teeth narrowly rectangular, scalelike, at least two pairs of lateral teeth (poorly separated in preparation). Marginal teeth similar to those in *A. carinata* (see above).

Type data: Holotype (M.20251) and many paratypes NMNZ: off Poutama Island, South Cape, Stewart Island,


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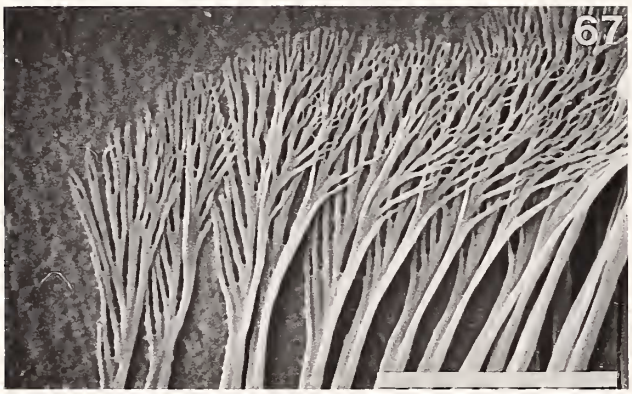
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New Zealand, 55 m, June 1955, bryozoan shell-sand (1 paratype taken alive).

Other material examined: (8 specimens NMNZ). BS 974, Charles Sound, 26 m, 10 February 1987, G. S. Hardy (1); off Port Adventure, Stewart Island, dead, 55 m, October 1952 (5); off Puysegur Point, SW Otago, dead, 183 m, J. Bollons (1); BS 938, off Snares Islands, dead, 33–37 m, 6 December 1984, G. S. Hardy & A. L. Stewart (1).

Distribution: Southern Westland, Stewart Island, and Snares Islands, southern New Zealand, on comminuted bryozoan/shell substratum, 55–183 m, living at 55 m.

Remarks: This species is referred to Trochaclididae because the radula is similar to that of ***Acremodontina*** species. ***A. poutama*** is exceedingly similar to *A. translucida,* and the only difference I am able to detect is the presence of a subsutural color band in the Tasmanian species. They may in fact be conspecific, though I prefer to maintain the separation until animals and radulae can be proven to be identical.

Genus *Acremodonta* Marshall, 1983

Acremodonta Marshall 1983:127. Type species (by original designation): *Thoristella crassicosta* Powell, 1937; Recent, northern New Zealand.

Diagnosis: Shell very large for the family (up to 6.10 mm wide), trochiform, anomphalous, stout, glossy, internally strongly nacreous. Protoconch sculptured with wavy spiral threads, teleoconch with rounded spiral cords that multiply by intercalation. Central and lateral teeth (if actually present) similar to marginals. Marginal teeth very slender, tips repeatedly branching. Edge of oral shield with elongate, dendritic papillae. Ctenidium bipectinate, with free tip and relatively long afferent membrane.

Acremodonta crassicosta (Powell, 1937)

(Figure 39)

Thoristella crassicosta Powell, 1937:178, pl. 49, figs. 14, 15; Powell, 1979:59, pl. 17, fig. 5.

Table 13

Austrotrochaclis ponderi Marshall, gen. & sp. nov. Shell measurements (mm) and countings. Holotype in italics.

Height	Diameter	Height/ diameter	Teleoconch whorls (*n*)
1.43	1.68	0.85	1.50
1.57	1.73	0.90	1.50
2.05	*2.07*	*0.99*	*1.80*

Acremodonta crassicosta. Marshall, 1983:127, figs. 1A, B, 2A–E; Hickman & McLean, 1990, figs. 93a–f.

Type data: Holotype BMNH 1962958, 34°13.3′S, 172°12.0′E, off Three Kings Islands, 260 m, 17 August 1932, R.R.S. *Discovery II.*

Other material examined: 105 specimens in 22 lots NMNZ.

Distribution: Off Three Kings Islands, northern New Zealand, 102–805 m, living at 173–256 m on comminuted bryozoan-shell substrata with sponges, hydroids, gorgonians and corals.

Remarks: The shell and radula were described and illustrated by Marshall (1983), and the external anatomy by Hickman and McLean (1990). Although *Acremodonta crassicosta* is exceptionally large for a trochaclidid (shell width up to 6.10 mm), it is overshadowed by a probable congener from Wanganella Bank, southern Norfolk Ridge (NZOI sta. P13, 32°10.5′S, 167°21.2′E; 442–449 m). This species is known only by part of a last adult whorl from a shell that must have been at least 9 mm wide. It has much wider spiral cords with correspondingly narrower interspaces than in *A. crassicosta.*

Austrotrochaclis Marshall, gen. nov.

Type species: ***Austrotrochaclis ponderi*** n. sp.; Recent, New South Wales.

Etymology: Southern *Trochaclis* (Latin).

Diagnosis: Shell minute, up to 2.07 μm wide, thin, teleoconch of up to 1.8 rapidly expanding convex whorls, mi-

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Explanation of Figures 65 to 72

Figures 65–72. Radulae of *Acremodontina* and ***Austrotrochaclis*** species.

Figures 65–67. ***Acremodontina*** *atypica* (Powell, 1937), adult, off Three Kings Islands, northern New Zealand, 206–211 m, NMNZ M.92196. Figure 65. Central, lateral and inner marginal teeth, scale 10 μm. Figure 66. Outer marginal teeth, scale 10 μm. Figure 67. Tips of outermost marginal teeth, scale 5 μm.

Figures 68, 69. ***Acremodontina*** *simplex* (Powell, 1937), adult, off Three Kings Islands, northern New Zealand, 173–178 m, NMNZ M.92199. Figure 68. Width of radula, scale 10 μm. Figure 69. Tips of inner marginal teeth, scale 5 μm.

Figure 70. ***Acremodontina*** *poutama* (E. C. Smith, 1962), ex adult paratype, NMNZ M.19424, off Poutama Island, Stewart Island, New Zealand, 55 m, scale 5 μm.

Figures 71, 72. ***Austrotrochaclis ponderi*** Marshall, gen. & sp. nov., ex adult paratype, off Long Reef, Sydney, New South Wales, 38 m, AMS C.174898. Figure 71. Tips of outermost marginal teeth, scale 5 μm. Figure 72. Tips of inner marginal teeth, scale 2 μm.

nutely umbilicate, fine spiral grooves on first half teleoconch whorl and on inner third of base. Operculum chitinous, thin, multispiral. Central and lateral teeth presumably present (though indistinguishable from marginals in preparation); marginals log and narrow, tip of each tooth deeply split to form two primary branches, one before the other, each branch with terminal fan of fine, repeatedly branched cusps.

Remarks: The type species of *Austrotrochaclis* differs from all other trochaclidids in its more rapidly expanding teleoconch whorls, and in being sculptured with fine spiral grooves on the first teleoconch whorl and on the inner part of the base. It most closely resembles *Acremodontina* species in having a deep primary bifurcation at the tip of each marginal tooth, but differs in that the central and lateral teeth are apparently slender like the marginals, unlike *Acremodontina* species in which the central and lateral teeth are short and laminar.

Austrotrochaclis ponderi Marshall, sp. nov.

(Figures 46, 53–55, 71, 72; Table 13)

Description: Shell turbiniform, up to 2.07 mm wide, slightly broader than high, spire 0.40–0.51× as high as aperture, thin, chalky white (etched), umbilical chink very small.

Protoconch 230 μm wide, tip of apical fold pinched at inner extremity, apertural rim simple, sculpture unknown (etched).

Teleoconch of up to 1.80 strongly convex, rapidly expanding whorls, end of last whorl descending at maturity. First half whorl and inner third of base with fine spiral grooves, grooves on spire becoming obsolete, elsewhere smooth. Umbilicus narrow, bounded by sharp angulation, invaded by inner lip to form small, shallow, crescentic chink. Aperture subcircular; outer lip thin at rim, slightly thicker within; parietal glaze continuous with inner lip, thin.

Animal unknown (dried).

Radula (Figures 71, 72). Central and lateral teeth not distinguishable in preparation, apparently slender like marginals. Teeth numerous, very slender, shafts laterally compressed, tip of each deeply split from side to side to form two primary branches, each of which has a curved terminal fan of slender, repeatedly divided cusps. Frontal branch shorter and its terminal fan narrower and with fewer cusps than rear branch, cusps overhanging angulate projection at innermost edge of tooth. Outermost four marginals on each side with shafts fused from based to about mid-length, cusps very slender, deeply and repeatedly branched.

Type data: Holotype AMS C.154371 (2.00 × 2.10 mm, 1.8 teleoconch whorls) and 2 paratypes (1 AMS, 1 NMNZ): Off Long Reef, Sydney, New South Wales, alive amongst sponges (identity unspecified), 38 m, 28 May 1972, Shelf Benthic Survey.

Distribution: Off Long Reef, Sydney, New South Wales, Australia, 38 m, living amongst sponges.

Remarks: *Austrotrochaclis ponderi* is distinctive in its low spire, rapidly expanding teleoconch whorls, and teleoconch sculpture of spiral lirae on the first whorl and inner base.

Etymology: After Dr. Winston F. Ponder (AMS).

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