The New Zealand Recent species of *Cantharidus* Montfort, 1810 and *Micrelenchus* Finlay, 1926
(Mollusca: Gastropoda: Trochidae)

Bruce A. Marshall

Museum of New Zealand Te Papa Tongarewa
P.O. Box 467, Wellington, New Zealand

Abstract
The New Zealand Recent species of *Cantharidus* Montfort, 1810 (3 species) and *Micrelenchus* Finlay, 1926 (10 species) are revised, illustrated and keyed. A new species of *Cantharidus* and a new *Micrelenchus* species are described from north of Cape Reinga. *Micrelenchus huttonii* (Smith, 1876) is resurrected from synonymy under *M. tenebrosus* (A. Adams, 1853). The following seven taxa are newly synonymised: *Cantharidus opalus cannoni* Powell, 1933 with *C. opalus* (Martyn, 1784); *Cantharidus coruscans* Hedley, 1916 with *M. capillaceus* (Philippi, 1848); *Cantharidus sanguineus elongatus* Suter, 1897, *Gibbula micans* Suter, 1897 and *M. sanguineus bakeri* Fleming, 1948 with *Canthiridus artizona* A. Adams, 1853; *M. oliveri cryptus* Powell, 1946 with *M. sanguineus* (Gray, 1843); *Canthiridus parviceps* A. Adams, 1853; *M. oliveri cryptus* Powell, 1946 with *M. tenebrosus* (A. Adams, 1853); *M. caelatus moriora* Powell, 1933 and *M. caelatus archibenthicola* Dell, 1956 with *M. mortenseni* (Odhner, 1924). A new subgenus of *Cantharidus* is introduced for *C. purpureus* (Gmelin, 1791). *Plumbelenchus* Finlay, 1926 is interpreted as a subgenus of *Micrelenchus*, and 7 species are newly transferred there. Lectotypes are designated for *Cantharidus tenebrosus* A. Adams, 1853, *Trochus (Cantharidus) huttoni* Smith, 1876, *Cantharidus zealandicus* A. Adams, 1853, *Cantharidus pruninus minor* Smith, 1902, *Photinula coruscans* Hedley, 1916, *Canthiridus artizona* A. Adams, 1853, *Canthiridus rufozona* A. Adams, 1853, *Cantharidus sanguineus caelatus* Hutton, 1884, and *Gibbula mortenseni* Odhner, 1924. Neotypes are designated for *Linax opalus* Martyn, 1784, *Trochus iris* Gmelin, 1791 and *Trochus acuminatus* Perry, 1811 (= *Cantharidus opalus*); *Helix purpurea* Gmelin, 1791, *Trochus rostratus* Gmelin, 1791 and *Trochus elegans* Gmelin, 1791 (= *Cantharidus purpureus*); and *Gibbula plumbea* Hutton, 1878 (= *Micrelenchus huttonii*).

Key words: Recent, New Zealand, Mollusca, Gastropoda, Trochidae, Cantharidini, *Cantharidus*, *Micrelenchus*, Plumbelenchus, lectotypes, neotypes, new taxa.

Introduction
*Cantharidus* and *Micrelenchus* species are small to medium-sized trochid gastropods that are a significant component of the New Zealand marine biota. Several species live on algae and under stones in the intertidal zone and shallow sublittoral, one lives in estuaries, whilst others are exclusively sublittoral. Judging from gut contents, all are detritivores. Though all are common, some of the *Micrelenchus* species have been notoriously difficult to identify because of their small size and uncertainty regarding limits of variation in shell morphology, colour and colour pattern. As a consequence, distinct species have been interpreted either as synonyms or obscured in a confusion of regional or "bathymetric" subspecies. The present contribution is an attempt to rectify these problems, being based on study of the most extensive collections available, and all extant type material. All species are discussed and illustrated, and an identification key is provided.
Abbreviations and text conventions:
AIM - Auckland Institute and Museum;
BMNH - The Natural History Museum, London;
CM - Canterbury Museum, Christchurch;
H/D - height/diameter ratio;
MNHN - Muséum National d'Histoire Naturelle, Paris;
NMNZ - Museum of New Zealand Te Papa Tongarewa, Wellington;
NZGS - Institute of Geological and Nuclear Sciences, Lower Hutt;
NZOI - National Institute of Water and Atmospheric Research, Wellington;
SD - standard deviation.
Height dimension precedes diameter in measurements of shells. All material is at NMNZ unless specified (registration numbers preceded by “M.”).

Systematics

Superfamily TROCHOIDEA Rafinesque, 1815
Family TROCHIDAE Rafinesque, 1815
Subfamily TROCHINAE Rafinesque, 1815
Tribe CANTHARIDINI Cotton, 1959

Cantharidinae Cotton, 1959: 104.

Some New Zealand Cantharidini exhibit strong clinal variation in shell morphology, whereas other species are rather similar throughout wide distributions, probably at least in part due to interspecific differences in dispersal potential of eggs or larvae. Nothing is known of the early life history of any New Zealand Cantharidini other than Cantharidus coruscans Hedley, 1916 (= Micrelenchus capillaceus (Philippi, 1848)), which is a broadcast spawner (Simpson, 1977). The few other Cantharidini for which development is known lay their eggs in a string in a mass of jelly attached to algae, stones or shells (Hickman, 1992). All New Zealand species have a small protoconch with a narrowly pinched tip, suggesting that each embryo has a particularly small yolk volume. All New Zealand Cantharidini have three pairs of epipodial tentacles, a characteristic of the group.

Genus Cantharidus Montfort, 1810

Cantharidus Montfort, 1810: 251.
Type species (by original designation): Trochus iris Gmelin, 1791 = Limax opalus Martyn, 1784; Recent, New Zealand. Canthiridus (Gray, 1853) and Cantharidium (Schäufuss, 1869) are incorrect subsequent spellings.
Elenchus Swainson, 1840: 351.
Type species (by subsequent designation of Herrmannsen, 1847): "Trochus iridis
Chemnitz” = Limax opalus Martyn, 1784. Eleuchus (Gray, 1853) is a spelling variant.

Diagnosis: Shell 20-53 mm high at maturity, higher than broad, anomphalous, axial sculpture strong or absent, spiral cords smooth or surmounted by finer spiral cords; inner lip with moderate or very weak flexure at base, smooth. Three pairs of relatively small epipodial tentacles. Left neck lobe smooth or digitate. Side of foot weakly or strongly pustulose. Central radular tooth with broad or very broad tip, and broad lateral projections.

Remarks: New Zealand species are here referred to two subgenera, one of which is new.

Subgenus Cantharidus Montfort, 1810

Diagnosis: Shell up to 53 mm high at maturity, moderate flexure at base of inner lip. Early teleoconch whorls sculptured with low, smooth spiral cords, later whorls with fine spiral grooves, no axial sculpture. Left neck lobe smooth. Side of foot weakly pustulose. Central radular tooth with broader tip than in Mawhero or Micrelenchus.

Remarks: Cantharidus (s. str.) is here considered to be monotypic. Phasianotrochus Fischer, 1885 (type species Trochus badius Wood, 1828 = Bulinus eximius Perry, 1811; Recent, southern Australia) appears to be closely related. Whether or not Australian species currently referred to Cantharidus (Wilson, 1993) and Japanese species such as Cantharidus japonicus (A. Adams, 1853) belong in Cantharidus (s. str.) remains to be determined.

Cantharidus (Cantharidus) opalus (Martyn, 1784) (Figs 1-4, 9, 12, 15, 82, Graph 1)

Walch, 1774: 42, pl. 1, fig. 6 (fig. 5 = C. purpureus?). Not binomial. Zorn, 1775: 161, pl. 2, fig. C1, C2. Not binomial. Chemnitz, 1781: 27, pl. 161, fig. 1522, 1523. Not binomial. Limax opalus Martyn, 1784: fig. 24. (ICZN op. 479) Trochus iris Gmelin, 1791: 3580 (Refers toWalch, 1774, pl. 1, fig. 5, 6; Zorn, 1775, pl. 2, fig. C1, C2; Chemnitz, 1781, pl. 161, fig. 1522, 1523; and (variety B) Martyn, 1784, fig. 24); Spalowsky, 1795: 49, pl. 8, fig. 2a, b; Philippi, 1847: 9, pl. 2, fig. 7, 8, pl. 46, fig. 9; Kiener, 1850: pl. 51, fig. 4; Fischer, 1877: 157, pl. 51, fig. 4. Cantharidus iris.- Montfort, 1810: 251. Trochus acuminatus Perry, 1811: pl. 47, fig. 1. Elenchus iris.- Swainson, 1840: 351; Gray, 1843: 239; Fischer, 1885: 819, pl. 10, fig. 8. Trochus (Elenchus) iris.- Woodward, 1851: 144, pl. 10, fig. 8. Canthiridus [sic] iridis A. Adams, 1853: 169 (unjustified emendation of iris). Cantharidus iris.- Hutton, 1873: 39; Hutton, 1880: 99; Pilsbry, 1889: 122, pl. 34, fig. 15; Suter, 1897: 268.
*Cantharidus opalus.*—Hedley, 1906: 49; Suter, 1913: 124, pl. 8, fig. 10; Finlay, 1928: 238; Hickman and McLean, 1990, fig. 61a.

*Cantharidus opalus biangulatus.*—Suter, 1908: 22.

*Cantharidus (Cantharidus) opalus.*—Finlay, 1926: 370; Thiele, 1929: 51, fig. 33; Wenz, 1938: 302, fig. 667.

*Cantharidus opalus cannoni.*—Powell, 1933: 194, pl. 36, fig. 15, 16; Powell, 1979: 54, pl. 18, fig. 2. New synonym

*Cantharidus (Cantharidus) iris.*—Keen, 1960: 253, fig. 163/19.

*Cantharidus opalus opalus.*—Powell, 1979: 54, pl. 11, fig. 1, pl. 18, fig. 1.

**Type data:**

*Limax opalus* ("New Zealand"), *Trochus iris* ("Neu-Seeland") and *Trochus acuminatus* ("New Zealand"): Neotype NMNZ M.138236, off Matakaoa Point, Hicks Bay, on algae, 9-12 m, scuba, A.L. Stewart;

*Cantharidus opalus biangulatus*: Holotype (see below) NZGS TM438, paratype NMNZ M.2030, Cook Strait;

*Cantharidus opalus cannoni*: Holotype AIM AK70133, Kaingaroa, Chatham Islands.

**Other material examined:** Several hundred specimens in 80 lots NMNZ.

**Distribution:** (Fig.15). Three Kings, North, South, Stewart, Snares and Chatham Islands, New Zealand, 0-121 m, living on algae from low tide level to 27 m.

![Graph 1](image-url). Shell width plotted against height in *Cantharidus opalus* (Martyn) from the Chatham Islands (□) and elsewhere (●).
Figures 1-14.
Shells of *Cantharidus* species. 1-4,9,12. *C. opalus* (Martyn). 1. Neotype (of *Limax opalus*, *Trochus iris* Gmelin and *Trochus acuminatus* Perry), off Matakaoa Point, Hicks Bay, 9-12 m, M.138236 (42.5 x 25.5 mm). 2. Mollymawk Bay, Snares Islands, 27 m, M.48811 (47.0 x 26.5 mm). 3. Cape Palliser, M.15907 (38.5 x 28.5 mm). 4. Taupeka Point, Chatham Islands, 2-5 m, M.111872 (50.0 x 36.5 mm). 9, 12. Early whorls (9) and protoconch (12), Port Pegasus, Stewart Island, 37-44 m, M.44804. 5-7,10,13. *C. purpureus* (Gmelin). 5. Aurere Point, Doubtless Bay, M.91727 (19.0 x 12.0 mm). 6. Neotype (of *Helix purpurea, Trochus rostratus* Gmelin, and *Trochus elegans* Gmelin), Port Underwood, Marlborough Sounds, M.138237 (25.3 x 16.0 mm). 7. Longlookout, Banks Peninsula, M.81219 (26.3 x 19.0 mm). 10. Early whorls, off Whangaroa, 9-17 m, M.41560. 13. Protoconch, Waewaetorea Passage, Bay of Islands, 4 m, M.49352. 8,11,14. *C. burchorum* n. sp. 8. Southeast Bay, Great Island, Three Kings Islands, 13-15 m, holotype, M.127017 (27.0 x 18.3 mm). 11,14. Early whorls (11) and protoconch (14), between Great Island and Farmer Rocks, Three Kings Islands, 33 m, paratypes, M.93947. Scale 9-11 = 1 mm, 12-14 = 170 μm.
Remarks: This common, well known species is the type species of *Cantharidus* and the largest living member of Tribe Cantharidini. *Cantharidus opalus* was one of the species obtained by Cook's ship Endeavour, and has the distinction of being the first New Zealand animal to have been illustrated, along with *C. purpureus* (Gmelin, 1791) (Walch, 1774, pl. 1, fig. 6).

*Cantharidus opalus* is very variable in colour and colour pattern and ranges in shape from narrowly to broadly conical (H/D 1.26-1.81, Graph 1) both within and between populations (Figs 1-4). The most broadly conical specimen seen (H/D 1.26) is from Houghton Bay, Wellington (NMNZ M.1118), the most narrowly conical (H/D 1.81) from The Snares (NMNZ M.48811) (Fig. 2). The holotype and paratype of *C. opalus biangulatus* Suter, 1908 (H/D 1.37 and 1.27) have grown abnormally following damage, as suggested by Suter (1908). Specimens with adult shell morphology range from 27.0-53.0 mm (est.) in height, the largest specimen seen originating from the Chatham Islands (NMNZ M.12297), the smallest from Katiki Beach, Otago (NMNZ M.110853). The whorls may remain weakly convex throughout or the last few whorls may become rather strongly convex. Specimens from the Chatham Islands attain large size and are consistently broadly conical (H/D of mature specimens 1.27-1.43, mean 1.35, SD 0.050, n = 16; as against 1.26-1.81, mean 1.50, SD 0.110, n = 55) (Graph 1, Fig. 4), although some specimens from the North and South islands approach them closely in shape (Fig. 3). Divergence of the Chatham Islands population is presumably the result of response to the local environment and/or geographic isolation. Larval recruitment to the Chatham Islands may have occurred or been facilitated in periods of lowered sealevel during Pleistocene glacial maxima via “stepping-stone” populations on shallow banks on the Chatham Rise. The Chatham Islands form has been interpreted as a subspecies, and some may prefer to use the trinomial *C. opalus cannoni* Powell, 1933 for this local population of *C. opalus*.

*C. opalus* is rare at the Three Kings Islands, and only a few juveniles and an apertural fragment of a large adult have been seen from there (NMNZ).

In the absence of recognisable type material of *Limax opalus*, *Trochus iris*, and *Trochus acuminatus*, and to obviate confusion with superficially similar species from elsewhere in the world, a single specimen is designated as neotype for all three taxa (Fig. 1). Boreham (1959) selected the specimen of *C. opalus biangulatus* in the Suter collection (NZGS) as “lectotype” because Suter based the variety on two specimens (he did not unequivocally designate holotypes prior to 1914). Suter (1908), however, stated “type in my collection” (now at NZGS), and since the second specimen was in the Bollons collection in the Colonial Museum (now NMNZ), the NZGS specimen must be the holotype rather than a syntype.

Figures 15, 16.
Maps of New Zealand region showing distributions of *Cantharidus* and *Micrelenchus* species: 200 and 1000m contours indicated. 15. *C. opalus* (Martyn). 16. *C. purpureus* (Gmelin) (●) and *C. burchorum* n. sp. (★).
Figure 15

Figure 16
Mawhero new subgenus

Type species: *Helix purpurea* Gmelin, 1791; Recent, New Zealand.

*Diagnosis:* Shell 20-31 mm high at maturity, very weak flexure at base of inner lip. Teleoconch sculptured with rounded spiral cords and axial riblets or lamellae, spiral cords surmounted by finer spiral cords on later whorls. Left neck lobe digitate. Side of foot strongly papillose. Central radular tooth with narrower tip than in *Cantharidus* (s. str.) and broader tip than in *Micrelenchus*.

*Remarks:* This new subgenus is introduced for *C. purpureus* (Gmelin, 1791) and *C. burchorum* n. sp. alone, which differ from type species of other genus-groups of Cantharidini in having relatively strong axial sculpture on the early teleoconch coupled with strong spiral cords surmounted by finer spiral cords. The type species of *Thalotia* Gray, 1847 (*Trochus pictus* Wood, 1828 = *Monodonta conica* Gray, 1827; Recent, southern Australia), for example, is superficially similar but differs in having finer, more crowded axial sculpture, nodular spiral cords without secondary spiral sculpture, a stronger flexure at the base of the inner lip, denticles on the inner lip, and much stronger spiral sculpture within the aperture. Although New Zealand and Australian Cantharidini are likely to have common ancestry, it is quite likely that the two regional groups have had independent histories since at least the Early Eocene, when seafloor spreading in the Tasman Sea ceased (commenced Late Cretaceous). The absence in Australia of Cantharidini with sculptural characteristics of *Mawhero* species, suggests that the group originated following isolation of the two faunas. New Zealand Cantharidini have no fossil history prior to the Pleistocene, other than records of a *Cantharidus* species from the Early Miocene, and a Late Oligocene *Micrelenchus* species (Beu and Maxwell, 1990). *Levella* Marwick, 1943 (Early Miocene to Early Pliocene), introduced as a subgenus of *Cantharidus*, is most unlikely to belong in Trochidae, though it probably does belong in Trochoidea (pers. obs.).

*Etymology:* *Mawhero* - Pink (Maori), alluding to the common colour of the type species.

*Cantharidus (Mawhero) purpureus* (Gmelin, 1791)

(Figs 5-7, 10, 13, 16)

?Walch, 1774: 42, pl. 1, fig. 5. Not binomial.
Zorn, 1775: 167, pl. 2, fig. D1, D2. Not binomial.
Chemnitz, 1781:161, fig. 1524, 1525. Not binomial.
*Limax purpuratus* Martyn, 1784: fig. 68 (rejected name - ICZN op. 479).
*Helix purpurea* Gmelin, 1791: 3656 (refers to Martyn, 1784, fig. 68).
*Trochus rostratus* Gmelin, 1791: 3580 (refers to Chemnitz, 1781, fig. 1524, 1525);
Kiener, 1850: pl. 46, fig. 1.
*Trochus elegans* Gmelin, 1791: 3581 (refers to Zorn, 1775, pl. 2, fig. D1, D2);
Dillwyn, 1817: 807.
Phasianella rubella Menke, 1828: 28 (refers to Trochus rostratus Gmelin, 1791).
Elenchus purpuratus.- Gray, 1843: 239.
Trochus purpuratus.- Philippi, 1847: 10, pl. 2, fig. 9, 10; Fischer, 1879: 366, pl. 112, fig. 3.
Trochus texturatus Gould, 1849: 90; Gould, 1852: 181, pl. 12, fig. 206, a-b; Fischer, 1876: 133, pl. 46, fig. 1.
Trochus torosus Kiener, 1850: pl. 46, fig. 3; Fischer, 1876: 136, pl. 46, fig. 3.
Trochus pallidus Hombron and Jacquinot, 1854: 55, pl. 14, fig. 12, 13.
Cantharidus purpuratus.- Hutton, 1873: 39; Hutton, 1880: 99; Hutton, 1883: 124, pl. 14, fig. o; Hutton, 1884: 361; Pilsbry, 1889: 124, pl. 45, fig. 44; Suter, 1897: 270; Suter, 1913: 126, pl. 39, fig. 7.
Cantharidus elegans.- Hutton, 1873: 39.
Cantharidus texturatus.- Hutton, 1880: 99.
Cantharidus pallidus.- Hutton, 1880: 100.
Cantharidus purpuratus var. texturatus.- Pilsbry, 1889: 125, pl. 45, fig. 41-43; Suter, 1897: 270.
Cantharidus purpuratus var. torosus.- Pilsbry, 1889: 125, pl. 45, fig. 45.
Cantharidus purpureus.- Powell, 1962: pl. 8, fig. 2; Powell, 1979: 55, pl. 18, fig. 3.

Type data:
Helix purpurea ("New Zealand"), Trochus rostratus ("Neu-Seeland") and Trochus elegans ("Neuseeland"): Neotype NMNZ M.138237, Port Underwood, Marlborough Sounds, on algae, 1977, M.H.B. O’Neill (Fig. 6);
Trochus texturatus: Syntypes (9), including the originally figured specimen USNM 16518, "New Zealand";
Trochus torosus: Syntypes (2), including the originally figured specimen MNHN, "Nouvelle-Zélande";
Trochus pallidus: Holotype (23.0 x 16.5 mm) MNHN, "Nouvelle-Zélande".
Other material examined: Several hundred specimens in 97 lots NMNZ.

Distribution: (Fig. 16). North Island and South Island as far south as Banks Peninsula, New Zealand, 0-121 m, living on algae from low tide level to 49 m.

Remarks: Cantharidus (Mawhero) purpureus is common throughout its range and characterised by large size (height up to 31 mm) and extremely distinctive teleoconch sculpture. This comprises broad, close, rounded spiral cords (5 on spire, 4 or 5 on base), each of which is surmounted by a number of finer spiral threads, and prosocline, more or less imbricating, collabral axial lamellae between the primary spirals. On the last few whorls of mature specimens the spiral threads typically extend into the interspaces and the axial lamellae extend onto the primary spiral cords. In most specimens the primary spiral cords remain strong throughout, but in others they may become more or less obsolete on the last few adult whorls, though the secondary threads remain (Figs 5-7). Northern shells tend to be more narrowly conical than southern ones. The shell colour is typically either rather uniform pink or shades of green, a combination of these colours, or axially banded, and the early teleoconch whorls are marbled
or axially banded with white. A closely related (allopatric) species occurs at the Three Kings Islands and is described below.

In the absence of recognisable type material of Helix purpurea, Trochus rostratus and Trochus elegans, and to obviate potential confusion with superficially similar species from elsewhere in the world, a single specimen is designated as neotype for all three taxa (Fig. 6).

**Cantharidus (Mawhero) burchorum** n. sp.  
(Figs 8, 11, 14, 16)

*Description:* Shell 20.5-27.5 mm high at maturity, weakly cyrtoconoid, higher than broad, stout, glossy, anomphalous, height/diameter ratio 1.42-1.55. Protoconch white. First teleoconch whorl pink, second whorl and first half of third whorl alternately axially maculated with pink and white; next few whorls predominantly pink, variably spotted and axially banded with combinations of lighter and darker shades of pink and white, occasional specimens with addition of green or lavender spots; last few whorls rather uniform dull pink or dull greenish pink, grading to pale, milky green on last whorl or penultimate whorl in adults; spiral interspaces more deeply pigmented than primary spiral cords on last few adult whorls. Protoconch 250 μm wide, smooth, tip narrowly pinched. Teleoconch with up to 8 convex whorls, periphery broadly rounded, base weakly convex. Primary spiral cords rounded, 5 on spire whorls and 5 on base, adapical spiral at first weaker than others but gradually enlarging to resemble them, abapical spire spiral peripheral and almost entirely covered by succeeding whorls, all about as high as broad with interspaces about as wide as each spiral on early whorls, progressively lowering and broadening until almost obsolete, interspaces on last few adult whorls almost imperceptible and defined by differential pigmentation. Primary spirals simple on first 4 whorls, then surmounted by finer, similar secondary spiral threads that commence on fifth whorl and multiply by intercalation to number 5-9 on each primary spiral, covering last few whorls at maturity. Axial riblets commencing on fourth whorl, rounded; interstitial, narrow with broader interspaces at first, progressively broadening until separated by shallow, narrow grooves that traverse last few whorls at maturity. Aperture ovate, lips simple, insertion of outer lip descending slightly at maturity.

*Type data:* Holotype NMNZ M.127017, and 3 paratypes M.100396, Southeast Bay, Great King Island, Three Kings Islands, alive on algae, 13-15 m, scuba K. Burch, May 1988. Paratypes (NMNZ): Tasman Bay, Great King Island, alive on algae, scuba, A.N. Baker, J. Moreland and B. Stephenson, 19 February 1974 (2, M.36071); Northwest Bay, dead, 5-7 m, scuba G.S. Hardy and A.L. Stewart, 30 November 1983 (7, M.75137); Princes Rocks, alive, 15 m, G.S. Hardy and A.L. Stewart, 2 December 1983 (1, M.75140); Princes Rocks, alive, 18 m, scuba K. Burch, 1993 (1, M.117893); reef between Great Island and Farmer Rocks, dead, 33 m, scuba G.S. Hardy, 17 February 1983 (many juveniles, M.93947).

*Other material examined:* >100 specimens from 15 stations off Three Kings Islands, Middlesex Bank and King Bank, mostly juveniles (NMNZ).
Figures 17-28.
Figures 29.
Maps of New Zealand region showing distributions of *Micrelenchus* species: 200 and 1000 m contours indicated. 29. *M. sanguineus* (Gray).
Figures 30.
Maps of New Zealand region showing distributions of *Micrelenchus* species: 200 and 1000 m contours indicated. 30. *M. tenebrosus* (A. Adams).
Distribution: (Fig. 16). Off Three Kings Islands, Middlesex Bank and King Bank, northern New Zealand, 7-805 m, taken alive from algae at 13-18 m. Restricted endemic.

Remarks: Cantharidus (Mawhero) burchorum differs from the allopatric species C. purpureus in that the axial riblets are rounded throughout and do not at any stage become crisp imbricating lamellae, and in that the second to fifth teleoconch whorls are far more brightly, extensively and variably coloured and patterned, as opposed to axially maculated in shades of pink (predominantly) or green on a white ground, the pigmentation being typically confined to the summits of the spiral cords in C. purpureus. In most specimens of C. purpureus the primary spiral cords and axial lamellae remain strong onto the last adult whorl, though occasional specimens undergo sculptural transformation on the last few adult whorls as in C. burchorum (Fig. 7). Note that the most extreme of the latter forms of C. purpureus are from Banks Peninsula, at the southern limit of the geographic range.

C. burchorum joins a considerable number of mollusc species endemic to the Three Kings Islands. Additional endemic Three Kings trochids, are known (Marshall, in prep.). Although situated only about 57 km north-west of Cape Reinga, the Three Kings Islands support a large number of restricted endemic species, due to isolation by bathymetry, strong eastward tidal flow, and locally cool sea temperature and decreased salinity due to upwelling (Stanton, 1973). Powell (1937) described a rich molluscan fauna from 92-260 m depth off the Three Kings Islands, comprising 214 species, of which 124 (60%) were new to science, and a high proportion of which appear to be restricted endemics. Additional endemics or apparent endemics from depths greater than 50m have been described by Crozier (1966), Marshall (1977, 1978, 1979, 1983, 1988, 1993, 1995a, b), Ponder (1965a, b, 1968), and Powell (1940 - includes summary of earlier records). The molluscan fauna from depths shallower than 50 m is also rich in endemic species, very few of which, however, have been named (Marshall, 1995b; Willan, 1978, 1988). From an unpublished study, F.J. Brook (pers. comm.) estimated molluscan endemism at the Three Kings Islands to be in the order of 15-20% among the more than 400 species (NMNZ) now known to occur there at depths shallower than 50 m. There are also a number of endemic algae, including a species of Sargassum and the monotypic genus Pterisporochthus (Adams and Nelson, 1985). Whereas endemism is high among shelled Mollusca, it is low in nudibranchs (Willan, 1988) and there are no endemic fishes (C.D. Paulin and A.L. Stewart, pers. comm.). Some of the species endemic to the Three Kings Islands and off the extreme tip of the North Island between Cape Maria van Diemen and North Cape, are related to species that were more widely distributed in the New Zealand region during the Pliocene (e.g. Venericardia reinga Powell, 1933, Gomphina maorum Smith, 1902, and Sigapatella superstes Fleming, 1958) (Fleming, 1958), or that currently live in cooler waters to the south (e.g. Kidderia aupouria Powell, 1933, Perrierina substriata Powell, 1935, Calliostoma (Maurea) jamiesoni Marshall, 1995, and C. (M.) gibbsorum Marshall, 1995). Some of the latter may be descended from ancestors that range-expanded northwards during glacial maxima. Fleming (1958) considered that relict species...
survived in the extreme north because the sea is warm there, but the converse is more likely since they are absent from the warmer waters of north-eastern Northland. The Three Kings Islands support a far higher number and proportion of endemic marine Mollusca than the Chatham Islands or the subantarctic islands, which are at considerably greater distance from mainland New Zealand and from each other.

**Etymology:** After Kevin and Judy Burch of Whangarei, who provided the holotype, and in recognition of their fostering of amateur malacology in New Zealand.

**Genus Micrelenchus** Finlay, 1926

*Gibbium* Gray, 1843: 238.
Type species (monotypy): *Trochus sanguineus* Gray, 1843; Recent, New Zealand.
Not *Gibbium* Scopoli, 1777.

*Micrelenchus* Finlay, 1926: 355.
Type species (by original designation): *Trochus sanguineus* Gray, 1843; Recent, New Zealand.

**Diagnosis:** Shell small (height 3.40-28.70 mm at maturity), slightly higher than broad, narrowly umbilicate or (most species) anomphalous. Teleoconch sculptured with rounded spiral cords, with or without interstitial axial riblets. Three pairs of relatively large epipodial tentacles. Left neck lobe strongly digitate or smooth. Side of foot weakly pustulose. Central radular tooth with narrow tip and relatively short lateral projections.

**Remarks:** *Micrelenchus* was interpreted as a subgenus of *Cantharidus* by Thiele (1929), Wenz (1938) and Keen (1960), though local workers and Hickman and McLean (1990) have treated them as distinct genera. Apart from smaller shell size, species here referred to *Micrelenchus* differ in having relatively larger epipodial tentacles, and in that the central radular tooth has a much more narrowly tapered tip (Figs 82-84). *Micrelenchus* species are here referred to *Micrelenchus* (s. str.) and subgenus *Plumbelenchus*, both of which appear to be local (endemic) radiations within the New Zealand region.

**Subgenus Micrelenchus** Finlay, 1926

**Diagnosis:** Shell small (height 4.10-15.00 mm at maturity). Teleoconch sculptured without interstitial axial riblets. Left neck lobe strongly digitate.

*Micrelenchus (Micrelenchus) sanguineus* (Gray, 1843)
(Figs 17-19, 26, 29, 84)

*Trochus (Gibbium) sanguineus* Gray, 1843: 238.
*Trochus (Gibbula) sanguineus*—Smith, 1874: 4, pl. 1, fig. 12.
*Cantharidus pupillus* (Gould).—Hutton, 1880: 100; Hutton, 1884: 362; Pilsbry, 1889:
Cantharidus sanguineus.—Hutton, 1884: 362; Pilsbry, 1889: 131, pl. 47, figs 92, 93; Suter, 1897: 271, in part = M. mortenseni, text fig. = M. caelatus; Suter, 1913: 128, in part = M. mortenseni, pl. 33, fig. 8 = M. caelatus.


Micrelenchus sanguineus.—Finlay, 1926: 355.

Micrelenchus oliveri.—Powell, 1946b: 138, pl. 11, fig. 8.

Micrelenchus oliveri cryptus Powell, 1946b: 139, pl. 11, fig. 7. New synonym.

Micrelenchus sanguineus sanguineus.—Fleming, 1951: 136, pl. 18, fig. 3, pl. 20, fig. 3; Boreham, 1959: 26; Powell, 1979: 57, pl. 18, figs 7, 8.

Micrelenchus sanguineus cryptus.—Fleming, 1951: 137; Powell, 1979: 57, pl. 18, fig. 13.

NOT Cantharidus sanguineus.—Suter, 1897: 272 text fig. (only); Suter, 1913: pl. 33, fig. 8 (only) = M. caelatus.

NOT Micrelenchus sanguineus.—Finlay, 1928: 238 = M. mortenseni.

NOT Cantharidus (Micrelenchus) sanguineus.—Wenz, 1938: 303, fig. 670 = M. caelatus.

NOT Micrelenchus sanguineus sanguineus.—Fleming, 1948: 85, pl. 7, fig. 13 = M. artizona.

Type data:
Trochus (Gibbium) sanguineus: Lectotype ("holotype" Fleming, 1951) BMNH 1842.11.16.125 (6.60 x 6.00 mm) and 1 paratype BMNH 1842.11.16.126, "New Zealand, Dr Stanger" on tablet, type locality here designated as Takapuna Reef, Auckland;

Cantharidus oliveri: Lectotype (Boreham, 1959) NZGS TM450, Takapuna, Auckland;

Micrelenchus oliveri cryptus: Holotype AIM AK71040, 6.4 km south of Clarence River mouth, Marlborough.

Other material examined: >500 specimens in 94 lots NMNZ.

Distribution: (Fig. 29). North, South and Stewart islands, New Zealand, 0-13 m, common living on algae intertidally to at least 13 m, and from under Durvillea holdfasts at low tide.

Remarks: This common, widely distributed species is variable in size, shape and sculpture, and exceedingly variable in colour and colour pattern. The spiral cords, which multiply by division, are broad, smooth and polished. Mature specimens range from 4.10 to 10.80 mm in shell height. Height diameter ratio of mature specimens ranges from 0.98 to 1.32, the highest specimens occurring north of East Cape, the lowest being southern shells and small adults from throughout the range. Adult specimens from north of Castlepoint typically have six to eight (rarely up to 10) spiral cords on the penultimate whorl at maturity, whereas specimens from Kaikoura and southward have four to six.
Figures 31-39.
Specimens from north of Castlepoint have weakly convex spire whorls and a narrowly rounded periphery, whereas specimens from south of Kaikoura have markedly convex whorls and a more broadly rounded periphery. Specimens from geographically intermediate localities, particularly the Wellington area, typically have six or seven cords on the penultimate whorl, and intergrade in shape (Fig. 18).

Since the southern form smoothly intergrades with the nominate northern one in the area between Castlepoint and Kaikoura, there is no point in maintaining cryptus as a geographic subspecies.

_M. sanguineus_ is known from north of Cape Reinga by a single worn specimen (NMNZ M.119167), which occurred in a sample of sand and old-looking worn shells from a current-swept bottom at 121 metres depth. This sample included abundant worn specimens of _M. rufozona_, which apparently lived there when the sea was lower and cooler than at present (see below). The specimen of _M. sanguineus_ is accordant with this interpretation because it more closely resembles the low, heavily sculptured southern cryptus form than any extant North Island shells.

The specimen discussed and illustrated by Fleming (1951) as “holotype” of _M. sanguineus_ is actually one of two syntypes that have since been separated from a tablet (retained with the types), so he effectively selected it as lectotype. The lectotype and paralectotypes are perfectly accordant with specimens from Takapuna Reef, Auckland, which is here designated as the type locality. The specimen illustrated by Suter (1897, 1913 - the latter illustration is a poor engraver’s rendition of the former) as “Cantharidus sanguineus” clearly represents _M. caelatus_, and was probably from Suter Collection lot 1301 (NZGS, 5.50 x 4.70 mm).

Iredale (1915) introduced _C. oliveri_ explicitly “for the species described by Suter [1913, p. 126] under the name _Cantharidus pupillus_ Hutton, 1884”. Whereas Suter (1913) described both North Island and South Island shells, he illustrated what is clearly a North Island one. Powell (1946) selected a North Island shell (Takapuna) as “neotype” of _M. oliveri_, but since this specimen was not among the material referred to by Suter, Boreham (1959) correctly designated a specimen in the Suter collection (NZGS) as lectotype. The dimensions of this specimen closely match the published measurements, though as noted by Boreham (1959) it is not the figured specimen. Again, Suter’s (1913, pl. 33, fig. 7) illustration is a crude plate-maker’s reproduction of an earlier, more life-like rendition (Suter, 1897, p. 271, text fig.). A sample of eight specimens from Lyttelton in the Canterbury Museum (M.9929) labelled as both “Cantharidus pupillus Hutton....type” and “= syntypes of Cantharidus oliveri Iredale, 1915” represent the cryptus form, as do specimens identified as _Cantharidus pupillus_ (Gould, 1849) “from Bank’s Peninsula to Dunedin” from Hutton’s collection (NMNZ M.1050). There is no reason to doubt that the Canterbury Museum specimens are syntypes of _M. oliveri_, but they have no type status with respect to _Cantharidus pupillus_, since Hutton (1880) was merely using Gould’s name.
**Micrelenchus (Micrelenchus) tenebrosus** (A. Adams, 1853)

(Figs 20-23, 27, 28, 30)

*Canthiridus* [sic] *tenebrosus* A. Adams, 1853: 170.

*Gibbula dolorosa* Tenison Woods, 1877: 143; Tate and May, 1901: 404, 446, pl. 24, fig. 31.

*?Trochus* (*Gibbula*) *scannatus* Fischer, 1878: 66.


*?Trochus scannatus* - Fischer, 1879: 394, pl. 117, fig. 4.

*Cantharidus tenebrosus* - Hutton, 1880: 101; Hutton, 1884: 361, Pilsbry, 1889: 123, pl. 34, fig. 3; Suter, 1897: 269 (in part = *M. huttonii*).

*Gibbula scannata* - Pilsbry, 1890: 220, pl. 30, fig. 6; Suter, 1897: 278; Suter, 1913: 138, pl. 38, fig. 23.

*Cantharidella dolorosa* - Hedley, 1920: 54.

*Micrelenchus tenebrosus* - Finlay, 1926: 370; Finlay, 1928: 238; Dell, 1963: 175, fig. 13.

*Micrelenchus parcipictus* Powell, 1946a: 138, pl. 11, fig. 1; Powell, 1979: 56, pl. 18, fig. 12. New Synonym.

*Micrelenchus tenebrosus* - Powell, 1976: 83, pl. 15, fig. 5; Powell, 1979: 57, pl. 18, fig. 9 only (in part = *M. huttonii*).

**Type data:**

*Canthiridus tenebrosus*: Lectotype (10.2 x 8.50mm, here selected) BMNH 196854/1 and 1 paralectotype BMNH 196854/2, described from unknown locality, type locality here designated as Cape Campbell;

*Gibbula dolorosa*: Holotype Tasmanian Museum, Hobart TM5532, "Bass' Straits" = New Zealand;

*Trochus (Gibbula) scannatus*: Type material apparently no longer extant, not at MNHN (V. Heros, pers. comm.), "Oceania";

*Micrelenchus parcipictus*: Holotype AIM AK71041, Sealer's Beach, between Otago's Retreat and Puysegur Point, Fiordland, under stones, low tide.

**Other material examined:** >600 specimens in 49 lots NMNZ.

**Distribution:** (Fig. 30). North Island as far north as Tauranga, South Island and Stewart Island, New Zealand, 0-446 m; living under clean rocks at low tide on exposed coasts, or (Tauranga Harbour) possibly on shell banks in harbour channels. Common, but local south of Cape Egmont. Unknown living (extinct?) north of Wanganui.

**Remarks:** *Micrelenchus tenebrosus* is rather variable in adult size, shape, colour, colour pattern, and in the size and number of spiral cords (6-8 on penultimate whorl, 6-10 on base) (figs 20-23). The largest specimens seen are from Stewart Island (height up to 11.50mm), whilst the smallest adults are from the east coast of the North Island (largest 6.90 mm high). The umbilicus remains open at all stages of growth in most specimens from throughout the geographic range, though it may become closed through over-growth by the inner lip in some narrowly conical specimens. The early teleoconch whorls are at first axially banded then marbled on a paler ground. Later whorls are shades of olive green, grey or brown, rarely with irregular axial maculations or bands. The spiral cords are typically more deeply pigmented than the interspaces, and may be
uniformly pigmented or spotted. *M. tenebrosus* has an extremely patchy distribution (Fig. 30), and is generally rare (shells only - extinct?) north of Wanganui though well preserved shells wash ashore in Tauranga Harbour and at Mount Maunganui, and have been obtained in considerable numbers together with *M. rufozona* from suction dredge spoil from extensions to the Port of Tauranga container wharf (M.119945). Although the species has not been taken alive in Tauranga Harbour (despite intensive searching for it intertidally and by dredging by myself and N.J. Peterson), it is possibly still living there subtidally on shell banks in the channels.

Finlay’s (1928) Chatham Islands record, based on a single poorly preserved shell (AIM AK14826), requires confirmation as the species has not been recollected there (locally extinct?).

The syntypes of *C. tenebrosus* most closely resemble specimens from Cape Campbell in shape, size and sculpture, and the specimen selected as lectotype is the shell illustrated by Dell (1963, pl. 2, fig. 13). *M. parcipictus* is based on strongly patterned specimens from Puysegur Point, which otherwise fall within the range of variation of *M. tenebrosus* from East Otago, Preservation Inlet and Stewart Island. Contrary to Powell’s (1946) statement, the umbilicus remains open at maturity in all but the most narrowly conical specimens. For additional remarks, see under *M. huttonii* (below).

Suter’s (1897, 1913) records of *Gibbula scamnata* (Fischer, 1878) are based on typical, well preserved specimens of *M. tenebrosus* from Te Onepoto and Brighton (Suter collection, NZGS). In the absence of type material, and from the original description and subsequent illustration (Fischer, 1878, 1879), it is impossible to be sure whether or not *Trochus scamnatus* is really a synonym of *M. tenebrosus* as implied by Hedley (1920), who placed it as a synonym of *Gibbula dolorosa* Tenison Woods, 1877 (= *M. tenebrosus*). Suter’s material identified as *Cantharidus tenebrosus* includes specimens of *M. huttonii* (NZGS, Suter colln. 1326, 2647).

**Micrelenchus (Micrelenchus) huttonii** (Smith, 1876)
(Figs 24, 25, 31-33, 40)

*Gibbula nitida*.- Hutton, 1873: 40 (not A. Adams and Angas, 1864).
*Trochus (Canthiridus) [sic] huttonii* Smith, 1876: 558, pl. 30, fig. 20.
*Gibbula plumbea* Hutton, 1878: 33 (new name for *Gibbula nitida* Hutton, 1873 not A. Adams and Angas, 1864).
*Cantharidus huttonii*.- Hutton, 1880: 100.
*Cantharidus tenebrosus*.- Suter, 1897: 269 (in part); Suter, 1913: 129 (in part)
*Cantharidus tenebrosus var. huttonii*.- Hutton, 1884: 362; Pilsbry, 1889: 123, pl. 34, fig. 2; Suter, 1897: 269.

*Figures 40, 41.*
**Figure 40**

**Figure 41**
Cantharidus tenebrosus huttoni.- Suter, 1913: 129, pl. 38, fig. 16.
Micrelenchus tenebrosus huttoni.- Finlay, 1926: 370; Finlay, 1928: 238.
Micrelenchus huttoni.- Dell, 1963: 175, pl. 2, fig. 12.
Micrelenchus tenebrosus.- Powell, 1976: 83, pl. 15, fig. 5; Powell, 1979: 57, pl. 18, fig. 14 only (in part).

Type data:
Trochus (Canthiridus) huttonii: Lectotype (here selected: 14.0 x 12.1 mm) BMNH 1994021/1 and 3 paralectotypes BMNH 1994021/2-4, "New Zealand", type locality here designated as Stewart Island (see below);
Gibbula plumbea: Neotype here selected, NMNZ M.138214, Ngawhakawhita Bay, Tennyson Inlet, Marlborough, December 1956, W.F. Ponder (Fig. 33).

Other material examined: Several hundred specimens in 49 lots NMNZ.

Distribution: (Fig. 40) North Island as far north as Bay of Islands, South Island and Stewart Island, New Zealand, 0-7 m, living on intertidal mudflats and locally in sheltered intertidal rock pools.

Remarks: Micrelenchus huttonii has been mistakenly interpreted as an ecotype of M. tenebrosus (Powell, 1976; Walsby and Morton, 1982). Both species are very variable in shape and size, and in the size and number of spiral cords, and both have brown axial bands on a paler ground on the earliest teleoconch whorls, though not all populations of M. huttonii have them. Compared with M. tenebrosus, the shell of M. huttonii differs principally in attaining larger size (height up to 15.00 mm instead of 11.50 mm), in that the spiral cords commence at the start of the second teleoconch whorl instead of after the second whorl, in that the shell is thinner at equivalent size, and in that the inner edge of the rim of the outer lip is black at maturity. The shell of M. huttonii is almost invariably lustreless due to solution etching, but it is typically glossy in M. tenebrosus. The spiral cords are very variable in width and the interspaces may be wider than each spiral or much narrower. They range in number from six to nine on the penultimate whorl (lowest partly covered by the last whorl) and eight to thirteen on the base in adults. Despite variation in the width of the spiral cords in both species, they are typically higher with correspondingly deeper interspaces in M. tenebrosus, consistently so in North Island populations. Specimens of M. huttonii from south of the Firth of Thames typically have dark grey to intense black spiral cords with paler interspaces, whereas northern populations typically include a proportion of paler specimens with some or all spiral cords alternately lightly and darkly spotted. The head and side of the foot in M. huttonii are uniform intense black, whereas M. tenebrosus has longitudinal and transverse lines on the side of the foot, and transverse lines on the dorsal surface of the head.

M. huttonii and M. tenebrosus have almost fully overlapping geographic ranges but have different ecological preferences. M. huttonii is abundant on estuarine Zostera flats and locally in sheltered rock pools (e.g. Governors Bay, Banks Peninsula NMNZ M.17176; Potato Point, Otago Peninsula, NMNZ
M.109176). M. tenebrosus lives under clean stones on exposed rocky shores, though in Tauranga Harbour it apparently lives or lives on clean sand and shell in channels.

Finlay’s (1928) record of M. tenebrosus huttoni from the Chatham Islands, based on 2 beach shells (AIM AK14825), requires confirmation as the species has not been recollected there (locally extinct?).

Of the four syntypes (BMNH), the two larger resemble Stewart Island shells in shape and size, whilst the two smaller are definitely from the North Island, possibly Tauranga Harbour. The specimen chosen as lectotype (Stewart Island) seems most likely to have been the subject of the original illustration, and the given dimensions (“Alt. 14½ mill., diam. 10½”) are accordant. Potential syntypic material of G. plumbea labelled in Hutton’s handwriting could not be traced. Since Hutton (1880) regarded G. plumbea as a synonym of C. huttonii, and clearly differentiated between C. huttoni and C. tenebrosus, a specimen of M. huttonii is selected as neotype of G. plumbea.

Note that the original spelling of the specific epithet was “huttonii”, and “huttoni” is an incorrect subsequent spelling (ICZN art. 33d).

Subgenus Plumbelenchus Finlay, 1926

Plumbelenchus Finlay, 1926: 356.

Type species (by original designation): Trochus capillaeus Philippi, 1848; Recent, southern New Zealand.

Diagnosis: Shell small (height 3.40-28.70 mm at maturity), slightly higher than broad, anomphalous. Teleoconch sculptured with rounded spiral cords, with or without interstitial axial riblets. Three pairs of relatively large epipodial tentacles. Left neck lobe smooth. Side of foot weakly pustulose. Central radular tooth with narrow tip and narrow lateral projections.

Remarks: Species here referred to Plumbelenchus differ from species of Micrelenchus (s. str.) in that the left neck lobe is smooth instead of digitate. Moreover, M. dilatatus and M. festivus n. sp. are closer to M. (P.) capillaceus than to species of Micrelenchus (s. str.) in gross shell morphology (Figs 34-37, 42-47), and there is a rather fluid morphological transition between species with many weak spiral cords and those with few strong ones via M. artizona. All Micrelenchus (Plumbelenchus) species other than M. (P.) capillaceus, M. (P) dilatatus and M. (P) festivus have crowded interstitial axial riblets, unlike species of Micrelenchus (s. str.) in which interstitial axial sculpture is lacking. Plumbelenchus has consistently been treated as a subgenus of Cantharidus, primarily because the type species is larger than species formerly referred to Micrelenchus. The type species, however, more closely resembles Micrelenchus species in shell and radular morphology than it does C. opalus. Since Micrelenchus and Cantharidus are here treated as distinct genera, Plumbelenchus is interpreted as a subgenus of Micrelenchus.
**Micrelenchus (Plumbelenchus) capillaceus** (Philippi, 1849)
(Figs 34-39, 41, 42, 48, 83)

*Trochus* (Osilinus?) *capillaceus* Philippi, 1849: 102.

*Trochus pruninus* Gould, 1849: 90; Gould, 1852: 180, pl. 12, fig. 205a, b.


*Trochus episcopus* Hombron and Jacquinot, 1854: 55, pl. 14, fig. 9-11; Kiener, 1850: pl. 52, fig. 3.

*Trochus capillaceus.* - Philippi, 1855: 275, pl. 40, fig. 7; Fischer, 1877: 161, pl. 52, fig. 3.

*Cantharidus episcopus.* - Hutton, 1880: 100.

*Cantharidus pruninus [sic].* - Pilsbry, 1889: 122, pl. 46, fig. 60, 61.

*Cantharidus pruninus var. minor* Smith, 1902: 207.

*Cantharidus pruninus.* - Hutton, 1884: 361; Suter, 1898: 268; Suter, 1913: 125, pl. 39, fig. 5.

*Cantharidus pruninus [sic] var. perobtusa* Pilsbry, 1889: 123, pl. 34, fig. 1.

*Cantharidus pruninus var. perobtusa.* - Suter, 1898: 269.

*Cantharidus pruninus [sic].* - Suter, 1904: 82.

*Cantharidus pruninus perobtusus.* - Suter, 1913: 125, pl. 39, fig. 6

*Photinula coruscans* Hedley, 1916: 340, pl. 5, fig. 60. 61. New synonym.

*Cantharidus (Plumbelenchus) capillaceus.* - Finlay, 1926: 356, 370; Powell, 1955: 53;

*Dell, 1964: 279, fig. 7; Cernohorsky, 1977: 91, figs. 7, 8.

*Cantharidus (Plumbelenchus) coruscans.* - Finlay, 1926: 356, 370; Tomlin, 1948: 225;

*Powell, 1955: 52; Powell, 1957: 139; Dell, 1964: 279, fig. 11, 12.

*Cantharidus (Plumbelenchus) minor.* - Finlay, 1926: 356, 370.

*Cantharidus (Plumbelenchus) pruninosus [sic].* - Wenz, 1938: 303, fig. 669.

*Cantharidus (Plumbelenchus) capillaceus capillaceus.* - Powell, 1979: 55, pl. 18, fig. 4.

*Cantharidus (Plumbelenchus) capillaceus coruscans.* - Powell, 1979: 55, pl. 18, fig. 5.

**Type data:**

*Trochus capillaceus:* Repository of type material unknown, “Nova Hollandia” = Auckland Islands;

*Trochus pruninus:* Holotype USNM 5605, Auckland Islands;

*Canthiridus zealandicus:* Lectotype (here selected, 27.0 x 19.0 mm) BMNH 196849/1 (Cernohorsky, 1977, fig. 7, 8) and 2 paralectotypes BMNH 196849/2-3, “New Zealand”;

*Trochus episcopus:* Syntype, and apparently the figured specimen, MNHN, îles Auckland;

*Cantharidus pruninus perobtusus:* Holotype Academy of Natural Sciences, Philadelphia 40560, no locality data, either Auckland Islands or Antipodes Islands (see below);

*Cantharidus pruninus minor:* Lectotype (here selected, 8.10 x 6.60 mm) BMNH 1902.5.16.85, and 4 paralectotypes BMNH 1902.5.16.86-89, Auckland Islands, 18 m;

*Photinula coruscans:* Lectotype (apparently the figured shell and separated head/foot, here selected, 23.0 x 22.8 mm) AMS C.308983 and 10 paralectotypes AMS C.46643, C.46719, north end of Macquarie Island.

**Other material examined:** Several hundred specimens in 50 lots from throughout the geographic range (NMNZ), and several lots NZOI.
Figures 42-50.

Distribution: (Fig. 41). Macquarie, Auckland, Campbell and Antipodes Islands, southern New Zealand, 0 - 103 m, living on algae at low tide to 20 m. Formerly living at The Snares, probably during the last glacial maximum (see below).

Remarks: Dell (1964) showed that specimens from the Auckland Islands (height/diameter ratio 1.30-1.39, mean 1.34, SD 0.036, n = 8) and Campbell Island have considerably higher spires than specimens from Macquarie Island (0.90-1.06, mean 0.96, SD 0.044, n = 22) (Figs 34-37, cf. 39). Further data based on...
larger samples were supplied by Cernohorsky (1977) (diameter as a percentage of height here converted to height/diameter ratio): Auckland Islands (mean height/diameter ratio 1.32, n = 106), Campbell Island (1.26, n = 68). Most specimens from the Antipodes Islands resemble Macquarie Island shells (Figs 38, 39), though as indicated by Dell (1964, p. 279) the spire height is more variable and intermediate between that of shells from Macquarie Island and the Auckland Islands (0.91-1.26, mean 1.08, SD 0.081, n = 17) (mean 1.07, n = 24 from Cernohorsky, 1977). All other specimens seen from these islands are accordant with the published data with the exception of a beach shell obtained during January 1993 by M.S. Morley at Derry Castle Reef, Enderby Island, Auckland Islands (Fig. 37). This has a height/diameter ratio of 1.22 (21.0 x 17.2 mm) and falls within the range of specimens from the Antipodes Islands. The holotype of Cantharidus pruininus perobtusa Pilsbry, 1889 (Fig. 42) has a height/diameter ratio of 1.14 (21.6 x 19.0 mm) and thus resembles shells from the Antipodes Islands, but in the light of Morley’s specimen it is unclear whether it came from the Antipodes Islands or the Auckland Islands. As implied by Dell (1964), it would seem that eggs or larvae are transported from Macquarie Island to the Antipodes Islands by the Antarctic Circumpolar Current, which bypasses to the south of geographically intermediate Campbell Island (Fig. 41). The intermediate morphology of Antipodes Islands shells is presumably due to influx of genes via eggs or larvae from the downstream Campbell Island population as well.

Although M. capillaceus is known to be a broadcast spawner (Simpson, 1977), the duration of the interval between fertilisation of the egg and settlement is unknown. Unable to detect any other differences between high and low-spired specimens, I conclude that they represent extreme forms of a single polymorphic species, the earliest name for which is Trochus capillaceus Philippi, 1848. The ecology of this species has been discussed by Simpson (1976).

Two small, old-looking juvenile shells (width 2.95 mm and fragment of larger shell) were obtained at NZOI station D139, south of The Snares at 150 m (48°20.5’S, 167°46.5’E) from a substratum of rocks, bryozoans and shell. Also present in the sample, and in similar condition, were two specimens of a form of M. mortenseni with banded rather than spotted spiral cords as in fresh specimens from the area (see below). These presumably date from the last glacial maximum, and lived at The Snares when the sea was cooler and at a lower level.

None of the syntypes of Photinula coruscans are exactly accordant with Hedley’s given dimensions (“height 21 mm, major diameter 23 mm” - in text, no dimensions or scale in figure legend), and the shell and separated head/foot chosen as lectotype are considered to be those originally figured as “shell and animal (from alcoholic specimen) ...Type specimen”.

_Micrelenchus (Plumbelenchus) dilatatus_ (Sowerby, 1870)
(Figs 43, 45, 49, 51)

_Chrysostoma simulata_ Hutton, 1873: 36.
Cantharidus dilatatus.- Hutton, 1884: 363; Suter, 1897: 272, text fig.; Suter 1913: 123, pl. 33, fig. 5.
Cantharidus simulatus.- Hutton, 1884: 363.
Photinula sutera Smith, 1894: 58, pl. 7, fig. 3.
Gibbula sutera.- Suter, 1897: 278, text fig.; Suter, 1913: 138, pl. 33, fig. 10
Micrelenchus dilatatus.- Finlay, 1926: 355, 370; Habe, 1959: 37, text fig. 4; Powell, 1979: 56, pl. 18, fig. 6; Hickman and McLean, 1990: fig. 61i.

Type data:
Elenchus dilatatus: Holotype Australian Museum, Sydney C.11505 "New Zealand", type locality here designated as Russell, Bay of Islands (see below);
Chrysostoma simulata: Syntypes (2) NMNZ M.208, Chatham Islands;
Photinula sutera: Syntypes (18) BMNH 1893.5.27.24-26 (3), BMNH 1893.5.27.27-41 (15), Academy of Natural Sciences, Philadelphia 73817 (21), Lyttelton Harbour, H. Suter.

Other material examined: >1000 specimens in 85 lots NMNZ.

Distribution: (Fig. 51). North, South, Stewart and Chatham Islands, New Zealand, 0 - 73 m, living on algae intertidally to about 5 m.

Remarks: Micrelenchus dilatatus is characterised by the combination of a sculpture of numerous fine spiral grooves, and a large, flared, D-shaped aperture. Colour and colour pattern are exceedingly variable. It is the most widely distributed Micrelenchus species, and is common around North, South and Chatham islands. It has not been recorded from south of Stewart Island, and does not occur north of Cape Reinga, where a closely related species occurs at greater depths (see below). There is considerable variation in the size at which the species attains maturity both within populations and from population to population, shells with fully developed apertural features ranging from 3.40 to 11.50 mm in height. Specimens that attain maturity at small size tend to be more broadly conical than larger adults because the spire angle decreases with increasing shell size (cyrtocoonid) before expansion of the last part of the last whorl. All mature specimens seen from the South Island are small (height 3.40-6.70 mm), the smallest adults occurring in Dusky Sound, Fiordland (NMNZ M.94514). Specimens from the North Island, Stewart Island and the Chatham Islands attain large size.

The holotype of Elenchus dilatatus (Fig. 43) is perfectly accordant with specimens from Russell, Bay of Islands (NMNZ), which is thus designated type locality. Photinula sutera is based on small adults and juveniles of M. dilatatus.

Micrelenchus (Plumbelenchus) festivus n. sp.
(Figs 44, 46, 47, 50, 51)

Description: Shell up to 6.20 mm high, higher than wide, anomphalous; spire narrowly conical, weakly cyrtocoonid, 0.90-1.09x higher than aperture, at maturity last quarter whorl expanding more rapidly and apertural profile more
Figures 51.
Maps of New Zealand region showing distributions of *Micrelenchus* species: 200 and 1000 m contours indicated. 51. *M. dilatatus* (Sowerby) (●) and *M. festivus* n. sp. (★).
Figures 52.
Maps of New Zealand region showing distributions of *Micrelenchus* species: 200 and 1000 m contours indicated. *52. M. artizona* (A. Adams).
strongly tangential than before. Colour and colour pattern extremely variable, spotted, streaked and axially banded in various combinations of shades of pink, red, yellow, orange, or brown, some specimens with a greenish flush or predominantly white. Axial bands prosocline, shape, size and number variable, area occupied varying from narrow subsutural band to whole shell. Nacreous layer brilliantly iridescent. Protoconch 270 μm wide, sharply delineated, smooth, apical fold tip tapered. Teleoconch of up to 4.25 broadly convex whorls; last adult whorl more broadly convex than before, last quarter whorl more rapidly expanding and more strongly convex. Sculptured with numerous fine, crowded spiral threads that are variable in size and number and that multiply by fission, 20 - 30 on adult penultimate whorl, 15 - 20 on base. Adult aperture large; peristome D-shaped, continuous, thickened.

_Type data:_ Holotype NMNZ M.127084 (4.25 x 3.80 mm: 3.8 teleoconch whorls) and 15 paratypes M.35914: 34°21′S, 172°37′E, NW of Cape Reinga, alive, 88 m, 19 February 1974, r.v. Acheron. Paratypes (64 NMNZ): Tasman Bay, Great Island, Three Kings Islands, alive, sublittoral algae washings, A.N. Baker, 19 February 1974 (3, M.21184); Elingamite wreck, off West Island, Three Kings Islands, 37 m, 16 March 1981, airlifted K. Tarlton (13, M.127175); off N face of Hinemoa Island, Three Kings Islands, dead, 23 m, 11 February 1986, scuba G.S. Hardy (50, M.112538); off Hinemoa Island, dead, 15 m, 17 January 1985, scuba F.J. Brook (1, M.109278); off Princes Rocks, Three Kings Islands, dead, 15 m, 2 December 1983, scuba G.S. Hardy and A.L. Stewart (1, M.127174); off Princes Rocks, dead, 14 m, 4 January 1976, scuba A. Watson (3, M.49801); between Great Island and Farmer Rocks, dead, 53 m, 17 February 1983, scuba G.S. Hardy (8); off Southwest Rocks, Three Kings Islands, dead, 33 m, 3 January 1976, scuba A. Watson (5, M.54018).

_Other material examined:_ 34°09.1′S, 172°08.4′E, Northwest Bay, Great Island, Three Kings Islands, alive, airlifted from low mixed algae on boulders (mostly coralline), 23 m, 3 March 1997, K. Burch and D. Crosby (30, M.134666); 34°09.5′S, 172°08.8′E, Southeast Bay, Great Island, 20-22 m, airlifted from low mixed algae on boulders (mostly coralline), 4 March 1997, K. Burch and D. Crosby (many, M.134681); 34°09.5′S, 172°08.8′E, Southeast Bay, Great Island, airlifted from under boulders, 13-15 m, 5 March 1997, K. Burch and D. Crosby (25, M.134853).

_Distribution:_ (Fig. 51). Off Three Kings Islands and off Cape Reinga, northern New Zealand, 13-88 m, taken alive with algae at 20-88 m. Restricted endemic.

_Remarks:_ Compared with _Micrelenchus dilatatus_, which it closely resembles in shape, _M. festivus_ differs principally in attaining smaller size (specimens with mature shell facies 3.75-6.20 mm versus 3.40-11.50 mm), in having weaker teleoconch sculpture, and in that the protoconch in most specimens is smaller (width 285-300 μm, mean 288 μm, n = 10, as against 285-330 μm, mean 311 μm, n = 10). Adults of _M. dilatatus_ within its shell size range are more broadly conical, although large adults of both species have the same shell shape.

Despite its similarity to _M. dilatatus_, which lives intertidally only about 10km south-east of the type locality, _M. festivus_ is considered to be a distinct
allopatric species that has evolved from a common ancestor isolated (perhaps originally at the Three Kings Islands) by strong tidal flow and bathymetry northwest of Cape Reinga. This is suggested by its greater habit depth (20-88 m, versus intertidally to 5 m for *M. dilatatus*) in an area where sea temperature is cool and salinity is reduced due to upwelling, and in which there is pronounced regional endemism (see remarks on *Cantharidus burchorum* n. sp.). Given their close proximity, *C. festivus* and *C. dilatatus* may well prove to have overlapping distributions on rocky shores between Cape Reinga and North Cape, but collections from appropriate depths (20-88 m) there are currently inadequate.

**Etymology:** Delightful (Latin).

*Micrelenchus (Plumbelenchus) artizona* (A. Adams, 1853)  
(Figs 52-57, 61)

*Canthiridus* [sic] *artizona* A. Adams, 1853: 170.  
*Canthiridus* [sic] *rufozona* A. Adams, 1853: 170 (in part).  
*Cantharidus sanguineus* var. *elongata* Suter, 1897: 272. New synonym.  
*Cantharidus sanguineus* *elongatus*.- Suter, 1913: 128, pl. 38, fig. 14.  
*Gibbula micans* Suter, 1897: 279, text fig.; Suter, 1913: 137, pl. 33, fig. 9. New synonym.  
*Cantharidus rufozona*.- Smith, 1915: pl. 1, fig. 19 only (not A. Adams, 1853).  
*Micrelenchus sanguineus* *elongatus*.- Finlay, 1926: 370.  
*Micrelenchus micans*.- Finlay, 1926: 370; Fleming, 1948: 85, pl. 7, fig. 16; Fleming, 1950: 26; Boreham, 1959: 26; Powell, 1979: 56.  
*Micrelenchus sanguineus* *sanguineus*.- Fleming, 1948: 85, pl. 7, fig. 13 (not Gray, 1843).  
*Micrelenchus caelatus* *bakeri*.- Fleming, 1951: 137; Boreham, 1959: 26; Powell, 1979: 56.  
*Micrelenchus caelatus* *elongatus*.- Fleming, 1951: 137; Boreham, 1959: 26; Powell, 1979: 56, pl. 18, fig. 11.  
*Micrelenchus rufozonus*.- Dell, 1963: 175, fig. 14 (not A. Adams, 1853).

**Description:** Shell up to 9.50 mm high, weakly cyrtoconoid, anomphalous, spire height variable within populations (height/diameter ratio 1.10-1.37). Colour and colour pattern extremely variable within populations, though one combination of characteristics may predominate in some populations. Protoconch and first 1-2 teleoconch whorls typically yellow, pink in some specimens. Subsequent whorls shades of red, pink, greenish brown, grey or black, typically on a paler ground, either as continuous bands, alternate spots, or a variable combination on spiral cords. Some specimens irregularly mottled or axially maculated with shades of greenish brown on a paler or white ground, others with maculations and/or paler or darker spots in variable combinations with pigmented spiral cords. Protoconch 230 µm wide, smooth, tip narrowly pinched. Teleoconch whorls weakly to rather strongly convex, sculptured with
smooth spiral cords; periphery evenly rounded to angulate, typically with a prominent peripheral bulge surmounted by peripheral spiral and adjacent spire spiral. Spiral cords glossy, multiplying by intercalation in majority of specimens, by fission in others; about as high as wide, smooth, narrow and closely spaced, typically numbering 9-15 on adult penultimate whorl (including peripheral spiral, which is more or less covered by last whorl), occasional specimens with as few as 7 or 8; 8-13 on base. Spiral interspaces not glossy, with very fine, crowded axial lamellae on last whorl. Aperture roundly subquadrate, simple, a prominent bulge on columella.

Type data:
*Canthiridus artizona*: Lectotype (here selected, 9.30 x 6.70 mm, fig. 54) BMNH 196852/1 and 4 paralectotypes BMNH 196852/2-5, described from unknown locality, type locality here designated as Tasman Bay, New Zealand;
*Cantharidus sanguineus elongatus*: Lectotype (Fleming, 1951) NZGS TM447 and 2 paralectotypes NZGS TM448 and NMNZ M.69356, Lyall Bay, Wellington;
*Gibbula micans*: Lectotype (Boreham, 1959) NZGS TM451 and paralectotype TM452, near Resolution Island, Dusky Sound;
*Micrelenchus sanguineus bakeri*: Holotype NZGS TM439, Northport, 0.4 km NE of anchorage, Chalky Sound, 7-15 m.

Other material examined: > 500 specimens in 81 lots NMNZ.

Distribution: (Fig. 52) Southern half of North Island, South Island and Stewart Island, New Zealand, 0-585 m, living at 15-446 m on bryozoan/shell substrata, once taken alive at low tide (Chalky Inlet, Fiordland, M.132047).

Remarks: Comparison of the type specimens revealed that *Canthiridus artizona* A. Adams, 1853 (lectotype Fig. 54) is the earliest name for *Cantharidus sanguineus var. elongata* Suter, 1897, *Gibbula micans* Suter, 1897, and *Micrelenchus sanguineus bakeri* Fleming, 1948. The syntypes of *Canthiridus artizona* closely resemble shells from Tasman Bay beaches (e.g. Nelson, NMNZ M.87286), which suggests that they were obtained offshore (alive) there, probably by Frederick Strange during the survey by H.M.S. Acheron.

Some specimens from the Cook Strait area and Stewart Island have as few as seven or eight spire spirals (typically 9-15), though there is complete gradation to specimens with more numerous spiral cords within samples. Specimens from within the fiords of Fiordland are distinctive in being consistently smaller at maturity than specimens from the fiord entrances and elsewhere (maximum height 7.00 mm as against 9.50 mm), thin, and are predominantly rather uniform grey, or grey and spotted or banded in paler shades or white. These include the type material of *Gibbula micans* and the specimen illustrated as *M. micans* by Fleming (1948, pl. 7, fig. 16). More typical specimens, including the type material of *M. sanguineus bakeri*, occur at or nearer the fiord entrances. Unable to convince myself that more than a single highly variable species is involved, I interpret specimens from the inner fiords as ecophenotypic variants induced by the unusual local hydrological conditions there (Grange et al., 1981). The type material of *M. sanguineus bakeri* is indistinguishable from specimens of *M.*
Figures 53-62.
artizona from the Cook Strait area. Fleming (1950) listed M. micans and M. sanguineus bakeri as occurring together in New Golden Hind Expedition stations 36 and 80. All specimens from station 36 (entrance to Northport) are the bakeri form. The specimens from station 80 cannot be traced (A.G. Beu, pers. comm.).

Despite being one of the most common sublittoral Micrelenchus species off southern New Zealand, M. artizona and its synonyms have been poorly known and have seldom, if at all, been correctly identified in collections, primarily due to confusion with the superficially similar species M. caelatus and M. rufozona. M. artizona occurs sympatrically with M. rufozona off the southern North Island and northern South Island, and with M. caelatus off east Otago (see below).

One of the two paralectotypes of C. rufozona (BMNH 196853/3) (Smith, 1915, pl. 1, fig. 19; Dell, 1963, fig. 14) is a fresh, live-taken specimen of M. artizona (Fig. 55). It is perfectly accordant with specimens from Stewart Island from 15-18 m depth, and was perhaps obtained there during the 1849-50 survey by H.M.S. Acheron, and sent to Cuming by Frederick Strange.

**Micrelenchus (Plumbelenchus) rufozona** (A. Adams, 1853)

(Figs 58-60, 62, 63, 65)

Cantharidus rufozona.- Hutton, 1880: 101; Suter, 1897: 273, text fig.; Suter, 1913: 127, pl. 39, fig. 21.  
Cantharidus rufozonas [sic].- Suter, 1904: 82.  
Cantharidus rufozona.- Smith, 1915: 79 (text only, figured specimen = M. artizona)  
Micrelenchus rufozonus.- Finlay, 1926: 370; Powell, 1937: 63, pl. 8, fig. 4; Powell, 1979: 56, pl. 18, fig. 15.  
NOT Cantharidus rufozona.- Hutton, 1884: 362 = Thalotia conica (Gray, 1827).  
NOT Cantharidus rufozona.- Smith, 1915, pl. 1, fig. 19 = M. artizona.  
NOT Micrelenchus rufozonus.- Dell, 1963: 175, pl. 2, fig. 14 = M. artizona.

**Type data:**
Canthiridus rufozona: Lectotype (here selected, 6.05 x 5.15 mm, Fig. 58) BMNH 196853/1, and 2 paralectotypes BMNH 196853/2-3, ex H. Cuming, described from unknown locality, type locality here selected as off south-western North Island (see below). BMNH paralectotype 196853/3 is a specimen of M. artizona (A. Adams, 1853) (see above).

**Other material examined:** About 1000 specimens in 69 lots NMNZ.

**Distribution:** (Fig. 63) Off Three Kings Islands, 100-550 m (old worn shells only). North-eastern and south-western North Island, and off D’Urville, northern South Island, New Zealand, 0-94 m, living at 4-64 m on clean sand and shell substrata with low algae.

**Remarks:** M. rufozona is variable in size at maturity (height 4.20-8.80 mm), number and thickness of the spiral cords, and colour and colour pattern. The spire ranges from narrowly to broadly conical (height/diameter ratio 1.08-1.37).
and the spire whorls may be strongly or weakly convex. The spiral cords may be smooth throughout or very finely beaded on the early whorls. Uninjured specimens have five to seven similar primary spiral cords on the spire before the last adult whorl (where secondary spirals may arise by intercalation), this number includes the abapical (peripheral) spiral, which is more or less covered by succeeding whorls but that frequently becomes fully exposed at the end of the penultimate whorl in adults. Most specimens have an additional, weaker subsutural spiral cord. Where present the sixth and seventh spirals typically arise by intercalation between the subsutural spiral and the adjacent primary spiral, and between the two adapical primaries. Specimens from the north-eastern North Island typically have five primary spiral cords before the last adult whorl, occasionally six through early intercalation of a secondary. All specimens from off the south-western North Island have six or seven primary spiral cords before the last adult whorl, and approach high-spired Chatham Island forms of M. mortenseni (see below). The spiral cords on all but the first few whorls are typically uniform deep red or pink, with paler or white interspaces (Fig. 59). Some specimens from the north-eastern North Island, however, may be spirally or axially banded in shades of greenish brown or grey on a predominantly white ground, and others may have some or all cords spotted in paler or darker shades.

Forms from the north-eastern and south-western North Island are interpreted as disjunct local populations of a single species that formerly had a continuous distribution, probably prior to the last glacial maximum.

_M. rufozona_ most closely resembles _M. artizona_, differing in having five to seven spiral cords on the penultimate whorl instead of seven to fifteen (typically 9-15, counts include peripheral spiral), in lacking a peripheral bulge (typically present in _M. artizona_), and in having higher spiral cords with correspondingly deeper interspaces. Although some specimens of _M. artizona_ resemble _M. rufozona_ in the number of spiral cords and periphery shape, most specimens from within or very near to the zone of geographical overlap have more numerous spirals and the peripheral bulge. The exception is a sample from Tahunanui Beach, Nelson (M.87286), a small proportion of which resemble _M. rufozona_ in shape and number of spiral cords, though the spiral cords are accordantly weaker. The distributions _M. artizona_ and _M. rufozona_ overlap in respectively the northern and southern parts of their ranges, and they have been taken alive together (i.e. sympatrically) at 62 m depth off the western side of D'Urville Island, northernmost South Island (M.50386, M.120147).

_Micrelenchus rufozona_ is common in carbonate sediments off the Three Kings Islands, although all specimens seen are worn, and it probably lived there when the sea level was lower than at present (Nelson et al., 1982; Nelson and Hancock, 1984).

The specimen mentioned and illustrated by Dell (1963, p. 175, fig. 14) (Fig. 55) as "the type" and "type" of _M. rufozona_ is one of three syntypes that is in fact conspecific with _Micrelenchus artizona_ (A. Adams, 1853). The same specimen was illustrated by Smith (1915), though its type status was not indicated. The two other syntypes are _M. rufozona_ as normally interpreted (e.g. Suter, 1897, 1913; Powell, 1937, 1946a, 1957, 1962, 1976, 1979; herein). On the face of it, by
application of ICZN article 74, it might seem that Dell inadvertently designated a lectotype, thereby rendering *M. rufozona* a synonym of *M. artizona* and leaving the common species long and well known as *M. rufozona* (of authors, not A. Adams) without a name. However, R.K. Dell has informed me (pers. comm.) that he had no intention of designating lectotypes in his 1963 paper, and that each specimen indicated as “type” in the legends was a type specimen in a loose sense. Moreover, no other indications of “type” or “the type” with respect to specimens of other species mentioned or illustrated as in this paper have been interpreted as lectotype designations by subsequent authors. According to Dell’s original notebook (NMNZ) and as confirmed by K.M. Way (pers. comm.), the lot studied by Dell comprised three specimens as it does now. To avoid having to rename *M. rufozona* of authors, I have chosen one of the previously unillustrated syntypes as the lectotype (Fig. 58).

The lectotype and conspecific paralectotype were collected dead and are perfectly accordant in morphology and condition with specimens taken at 33-40 m depth off Patea, south-western North Island (Fig. 59). They certainly could not have originated from a north-eastern North Island population. These were presumably obtained by the naturalist Frederick Strange while aboard H.M.S. Acheron (Natusch, 1978) during the 1849 survey of the area off Patea, either by dredging or from tallow on the sounding weight.

Hutton’s (1884) record of *Cantharidus rufozona* is based on mislocalised specimens of *Thalotia conica* (Gray, 1825) (recorded as such by Suter, 1897, 1913), which is endemic to southern Australia - specimen illustrated by Suter (1913, pl. 39, fig. 8) NMNZ M.536.

The specific epithet is derived from the Latin *zona* (belt), a feminine first declension nominative, so the termination must be “a” rather than “us” as it has been since the species was referred to *Micrelenchus*.

*Micrelenchus (Plumbelenchus) caelatus* (Hutton, 1884)
(Figs 63, 66-68)

*Cantharidus sanguineus* var. *caelatus* Hutton, 1884: 363.
*Cantharidus sanguineus* var. *caelata*.- Suter, 1897: 272, text fig. (in part = *M. mortenseni*).

*Cantharidus sanguineus caelatus*.- Suter, 1913: 128. (in part = *M. mortenseni*)
*Cantharidus sanguineus*.- Suter, 1913: pl. 33, fig. 8 (only).
*Micrelenchus sanguineus caelatus* [sic].- Finlay, 1926: 355, 370.
*Cantharidus (Micrelenchus) sanguineus*.- Wenz, 1938: 303, fig. 670 (not Gray, 1843).
*Micrelenchus caelatus caelatus*.- Fleming, 1951: 137; Powell, 1955: 54; Powell, 1979: 55, pl. 18, fig. 10.
NOT *Micrelenchus caelatus caelatus*.- Powell, 1955: 54 (= *M. mortenseni*).

Figures 63, 64.
Maps of New Zealand region showing distributions of *Micrelenchus* species: 200 and 1000 m contours indicated. 63. *M. rufozona* (A. Adams) (●) and *M. caelatus* (Hutton) (▲). 64. *M. mortenseni* (Odhner).
Type data: Lectotype (here selected: 4.60 x 4.10 mm) CM M.9927 and 2 paralectotypes (the larger = M. mortenseni) CM M.9928, Foveaux Strait.

Other material examined: Several hundred specimens in 24 lots NMNZ.

Distribution: (Fig. 63) Off East Otago and Stewart Island, New Zealand, 15-420 m, living at 15-200 m on bryozoan/sand/shell substrata.

Remarks: Micrelenchus caelatus most closely resembles M. rufozona, from which it differs principally in having considerably narrower spiral interspaces. Unlike M. rufozona, most specimens of which have the spiral cords on the spire and base uniformly pigmented, M. caelatus typically has the spiral cords on the last one or two whorls alternately spotted with pink and white, though occasional specimens have uniform pink spires and spotted bases. The two species are allopatric (Fig. 63). Compared with M. artizona, with which occurs sympatrically off East Otago (e.g. M.112294, 112308), M. caelatus differs principally in having much stronger spiral cords and, where their ranges overlap, a considerably thicker outer lip at maturity. M. caelatus also occurs sympatrically with M. mortenseni off East Otago.

As noted above, the specimen illustrated by Suter (1897, 1913 - the latter illustration is a poor engraver’s rendition of the former) as “Cantharidus sanguineus” clearly represents M. caelatus, and was probably from Suter collection lot 1301 (NZGS, 5.50 x 4.70 mm).

Suter’s (1913) record of this species from “Whangaroa Harbour (C. Traill)” is based on mislocalised Stewart Island material.

*Micrelenchus (Plumbelenchus) mortenseni* (Odhner, 1924)
(Figs 64, 69-81)

*Cantharidus sanguineus.* - Suter, 1897: 271 (in part).
*Cantharidus sanguineus caelatus.* - Suter, 1913: 128 (in part)
*Gibbula mortenseni* Odhner, 1924: 14, pl. 1, fig. 3.
*Micrelenchus sanguineus morioria* Powell, 1933: 194, pl. 36, figs 10, 11. New synonym.
*Micrelenchus caelatus caelatus.* - Powell, 1955: 54 (not Hutton, 1884).
*Micrelenchus caelatus archibenthicola* Dell, 1956: 45, pl. 6, fig. 56; Powell, 1979: 55. New synonym.

Type data:
*Gibbula mortenseni:* Lectotype (GAS-203: the originally figured specimen here selected) and 1 subadult paralectotype (GAS-204), Zoological Museum, Copenhagen, Carnley Harbour, Auckland Islands, 82 m.
Figures 65-74.
Shells of *Micrelenchus* species. 65. *M. rufozona* (A. Adams), detail of teleoconch microsculpture, off Matata, M.61215. 66-68. *M. caelatus* (Hutton). 66. Protoconch, off Poutama Island, Big South Cape, Stewart Island, 55 m, M.19802. 67. Off Otago Heads, 220 m, M.66896 (6.10 x 5.40 mm). 68. Foveaux Strait oyster beds, 33-35 m, M.70835 (5.15 x 4.50 mm). 69-74. *M. mortenseni* (Odhner). 69. Off Owenga, Chatham Islands, 18 m, paratype of *M. morioria* Powell, AIM AK71531 (5.80 x 5.60 mm). 70, 71. Off The Sisters, Chatham Islands, 70 m, M.12700 (70, 5.65 x 5.00 mm; 71, 5.50 x 5.35 mm). 72. Mervoo Bank, western Chatham Rise, M.15508 (4.10 x 3.25 mm). 73. Off Otago Heads, 220 m, M.66897 (5.30 x 4.50 mm). 74. Between Dea's Head and Tucker Cove, Auckland Island, 26-27 m, M.16755 (6.45 x 5.45 mm). Scale 65 = 100 μm, 66 = 170 μm.
**Micrelenchus sanguineus morioria**: Holotype AIM AK70471, off Owenga, Chatham Islands, alive, 18 m.

**Micrelenchus caelatus archibenthicola**: Holotype NMNZ M.9323, 45°45.4'S, 171°05'E, off East Otago, 549 m.

**Other material examined**: 1000+ specimens (36 lots NMNZ, 55 lots NZOI, 5 lots AIM)

**Distribution**: (Fig. 64) Mernoo and Veryan banks, western Chatham Rise; East Otago, and Stewart, Chatham, Snares, Auckland, Campbell, Bounty, and Antipodes Islands, and Macquarie Ridge, southern New Zealand, 20-244 m, living at 10-244 m on coarse bryozoan/shell substrata.

**Remarks**: As here interpreted, *M. mortenseni* is exceptionally variable and widely distributed off southern New Zealand. *M. mortenseni* has long been confused with *M. caelatus*, which occurs within its range off East Otago and Stewart Island. The two species have been dredged together in substantial quantities (sympatrically alive at 200 m, NMNZ M.45443 and M.119173). Compared with specimens of *M. caelatus* from within its geographic range, *M. mortenseni* differs principally in being much more strongly nodular, in that the earliest teleoconch whorls are pink rather than yellow, and in that the interior behind the outer lip of mature specimens is much more strongly thickened and weakly but distinctly channelled beside the insertion. Widely separated local populations of *M. mortenseni* have distinctive combinations of shell morphology, colour and colour pattern. The Chatham Islands form is the most variable, and includes the type material of *M. morioria*, here considered a junior synonym of *M. mortenseni*.

Specimens from East Otago and Stewart, Snares, Campbell and Auckland islands have five or six strong, similar, nodular spiral cords on the spire (including abapical spiral, summit of which is more or less covered by succeeding whorls); and eight or nine similar, weakly nodular cords on the base. The first 2.0-2.5 teleoconch whorls are pink, the later ones are translucent white with pink axial bands, the colour being limited to the spiral cords. Specimens from the Auckland Islands (Fig. 74, 80) and Campbell Island are the most strongly nodular, and specimens from off The Snares (e.g. NZOI stns D139, D144) are sculpturally (and geographically) intermediate between Otago and Auckland Islands shells.

Specimens from Mernoo Bank (Fig. 72), at the extreme north-west of the geographic range, are distinctive in that the early teleoconch whorls are white rather than pink, and in that the later whorls of most specimens are white with brown axial bands, though otherwise identical pink-spotted specimens occur with them. Most Mernoo Bank specimens are also more narrowly conical and finely nodular than any others, though the broader shells are indistinguishable from narrow Otago shells in shape, and some are as strongly nodular. The few specimens available from adjacent Veryan Bank (NZOI stn D1) also have white early teleoconch whorls, but otherwise resemble narrow Otago shells in colour, shape and sculpture.

Most available specimens from the Chatham Islands are worn or broken
Figures 75-84.
Shells (75-81) and radulae (82-84) of *Cantharidus* and *Micrelenchus* species. 75-81. *M. mortensen* (Odhner). 75. Off Bounty Islands, 73 m, M.8521 (4.80 x 4.65 mm). 76. Off Bounty Islands, 62 m, NZOI stn A748 (4.95 x 4.90 mm). 77. Off Antipodes Islands, 150 m, NZOI stn A727 (5.80 x 5.60 mm). 78. Off Otago Heads, 220 m, M.66897 (5.00 x 4.25 mm). 79. Macquarie Ridge, 128 m (5.90 x 5.55 mm). 80. Off Tucker Point, Auckland Islands, 26-27 m, M.16755 (5.45 x 5.00 mm). 81. Protoconch of juvenile paratype of *M. norioria* Powell, off Owenga, Chatham Islands, 18 m, AIM AK71531. 82. *C. opalus* (Martyn), Castlepoint, littoral. 83. *M. capillaceus* (Philippi), Ranui Cove, Auckland Islands. 84. *M. sanguineus* (Gray), McGregor's Bay, Whangarei Heads. Scale 81 = 170 μm, 82, 83 = 200 μm, 84 = 100 μm.
shells from beaches, and the few well preserved examples seen were obtained by dredging at 18-70 m (Figs 69-71). Chatham Islands shells show exceptional mosaic variation in shape, sculpture and colour pattern. The spire ranges from low to tall (height/diameter ratio 0.93-1.16), and the spiral cords are very variable in thickness and weakly nodular, gently undulant, or almost smooth. There are five to seven (usually 5 or 6) spiral cords on the penultimate whorl—this number including the abapical spiral, the summit of which is more or less covered by succeeding whorls—and six to ten on the base. The spiral cords may be uniform pink or red throughout; or pink on the first 1.25-1.75 whorls, buff on the next one to two whorls, then pink or red on subsequent whorls, or alternately spotted pink and white on the last two whorls on both the spire and base, or uniform pink or red on the spire and spotted on the base. Three fresh shells taken at 60 m off The Sisters, western Chatham Islands (NMNZ M.69353), are distinctive in having the first 1.5 teleoconch whorls pale pink, and subsequent whorls white with irregular brown maculations, thus resembling some Mernoo Bank specimens. Specimens with very strong spiral cords predominate in samples from beaches, whereas most specimens obtained alive or as unabraded shells by dredging are more weakly sculptured.

Specimens from off the Bounty Islands (Fig. 75) are all broadly conical and resemble Chatham Islands shells in that the spiral cords may be either fully pigmented or spotted, but differ in having seven or eight spiral cords on the adult penultimate whorl instead of five to seven. They combine characteristics of specimens from Chatham Islands (512 km to the north-east) and the Antipodes Islands (205 km to the south).

Specimens from the Antipodes Islands (Fig. 77) and Macquarie Ridge (Fig. 79) are all broadly conical, have eight or nine spiral cords on the adult penultimate whorl, and are distinctive in that the spiral cords are consistently fully pigmented rather than alternately spotted, and in that the outer lip is weakly thickened within at maturity. Specimens from the Antipodes Islands attain the largest size (width up to 7.70 mm). Specimens from Macquarie Ridge are further distinctive in being the most lightly built and finely sculptured, and in that the spiral interspaces are pink, though a paler shade than the spiral cords.

To some degree specimens from the Bounty Islands, Antipodes Islands and Macquarie Ridge are more similar to each other in colour pattern and sculpture than they are to specimens from geographically intermediate Auckland and Campbell islands, whilst specimens from the Antipodes Islands and Macquarie Ridge (1450 km apart) are to some extent more similar to each other than to specimens from the Bounty Islands (only 205 km north of the Antipodes Islands). Unless the differences/similarities are associated with local environmental conditions, they may indicate that there is or has been some eastward gene flow via eggs or larvae carried in currents from Macquarie Ridge, which largely pass south of Campbell Island. This interpretation is accordant with the known circulation pattern of the Antarctic Circumpolar Current (Nowlin and Klinck, 1986) (Fig. 41), which evidently accounts for the distribution of forms of *M. capillaceus* (see above). Exceptional variation in the Chatham Islands population may be due to intermittent genetic input from both the west (Otago and western Chatham Rise via the Southland Current) and the
Two old-looking shells obtained at NZOI station D139, south of The Snares at 150 m (48°20.5'S, 167°46.5'E), from a substratum of rocks, bryozoans and shell, differ from fresh specimens from the same sample and other shells from the vicinity in having banded rather than spotted spiral cords and finer nodules. Colour pattern and sculpture resemble that of shells from the Bounty and Antipodes Islands and Macquarie Ridge, and the outer lip is heavily internally thickened as in specimens from localities other than the Antipodes Islands and Macquarie Ridge. These occurred together with two specimens of *M. capillaceus* in similar condition (see above) and presumably date from the last glacial maximum when the sea was cooler and at a lower level.

Since it seems impossible to justify taxonomic segregation of the Chatham Islands or Otago forms from topotypes and other forms of *M. mortenseni*, *M. sanguineus morioria* and *M. caelatus archibenthicola* are interpreted as synonyms.

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Key to New Zealand *Cantharidus* and *Micrelenchus* species

1. Shell with strong flexure at base of inner lip, height up to 53 mm - *Cantharidus opalus* (Figs 1-4, 9).
   Shell with weak flexure or no flexure at base of inner lip, height less than 32 mm - 2

2. Shell with strong axial sculpture between spiral cords on early teleoconch whorls (Figs 10, 11), and spiral threads on strong spiral cords - 3
   Shell with no axial sculpture, or fine, crowded axial riblets between spiral cords (Fig. 65) - 4

3. Axial riblets rounded at first, transforming into crisp imbricating lamellae, pigmentation on early whorls typically confined to summits of spiral cords, up to 31 mm high - *Cantharidus purpureus* (not at Three Kings Islands) (Figs 5-7, 10).
   Axial riblets rounded throughout, pigmentation on early whorls traversing spiral interspaces, up to 27.5 mm high (Three Kings Islands only) - *Cantharidus burchorum* (Figs 8, 11)

4. Spiral sculpture weak (as in Figs 45, 47) - 5
   Spiral sculpture of strong cords - 7

5. Shell up to 29 mm high, never maculated, spiral cords typically blackish, occasionally reddish (subantarctic islands only) - *Micrelenchus capillaceus* (Figs 34-39, 42).
   Shell less than 12 mm high, typically maculated, never blackish - 6

6. Shell up to 11.50 mm high (not north of Cape Reinga) - *Micrelenchus dilatatus* (Figs 43, 45)
   Shell up to 6.20 mm high, weaker sculpture than *M. (P.) dilatatus* (north of Cape Reinga only) - *Micrelenchus festivus* (Figs 44, 46, 47).

7. Spiral cords greenish, brownish or black, early teleoconch whorls not yellow or pink - 8
   Spiral cords variably coloured; if greenish, brownish or black, early teleoconch whorls yellow or pink - 9

8. Dull. Spiral cords black, commencing at start of second teleoconch whorl (littoral, typically on intertidal *Zostera* flats) - *Micrelenchus huttonii* (Figs 25, 31-33).
Glossy. Spiral cords green, grey or brown, commencing after second teleoconch whorl (littoral, never living on intertidal mudflats) - *Micrelenchus tenebrosus* (Figs 20-23, 28).

9. Spiral cords distinctly nodular - 10
   Spiral cords smooth or at most very weakly beaded on early whorls - 11
10. Early teleoconch whorls yellow, or pinkish with a yellow flush, spiral cords on later whorls red-spotted, nodules weak (sublittoral, south-eastern South Island only) - *Micrelenchus caelatus* (Figs 67, 68).
   Early teleoconch whorls white or pink, spiral cords on later whorls typically red or red-spotted, nodules weak or strong (sublittoral, Chatham Rise, south-eastern South Island, and subantarctic islands) - *Micrelenchus mortenseni* (Figs 69-80).

11. Spiral interspaces smooth, colour and colour pattern variable - *Micrelenchus sanguineus* (Figs 17-19).
   Spiral interspaces on last few whorls with fine, crowded axial riblets (Fig. 65) - 12

12. Periphery evenly rounded, 5-7 spiral cords on penultimate whorl, spiral interspaces considerably wider than spiral cords, spiral cords typically red (sublittoral, north-eastern and south-western North Island, and western Cook Strait) - *Micrelenchus rufozona* (Fig. 58-60, 65)
   Periphery evenly rounded or bulging, 6-14 spiral cords on penultimate whorl (typically 8-14), spiral interspaces typically narrower than spiral cords, colour and colour pattern variable (sublittoral, southern North Island, South Island, and Stewart Island) - *Micrelenchus artizona* (Figs 53-57).

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