

Fig. 19 Distributions of *Cytor* species within New Zealand. A, *Cytor septentrionalis* (Suter, 1907); B, *Cytor tokerau* n.sp.; C, *Cytor tawhiti* n.sp.; D, *Cytor tepakiensis* Gardner, 1967; E, *Cytor torquillum* (Suter, 1894); F, *Cytor tuarua* n.sp.

conical (spire angle 41–58°), spire 1.17–1.43 times as high as aperture, narrowly umbilicate. Protoconch and teleoconch deep reddish brown, protoconch typically darker, periphery of teleoconch with narrow, pale yellowish-brown band. Periostracum on teleoconch produced at summits of collabral riblets as rather prominent, thin lamellae on spire and base, numbering about 15 per mm at end of third whorl, alternate second-fourth lamella strongly elevated adapically to form broad, elevated, subsutural band.

Protoconch of 1.65–1.80 convex whorls, 670–730 µm wide, first whorl smooth and glossy, remainder traversed by rounded collabral riblets that are more closely spaced and more strongly prosocline than axial sculpture on immediately succeeding teleoconch.

Teleoconch of 3.5–4.5 broadly convex whorls at maturity; first three whorls with peripheral angulation that is obscured by succeeding whorls, periphery becoming broadly rounded on fourth whorl; spire whorls rather evenly expanding, last adult whorl very slightly constricted and insertion point gently descending; suture well defined. Base more broadly rounded than periphery, smoothly and tightly curving into narrow umbilicus. Sculptured throughout with fine, rounded, crowded, typically more or less wavy, spiral threads; and weak, weakly sigmoidal, prosocline, collabral riblets; additionally with fine collabral growth lines that may form a faintly malleate pattern where intersecting wavy spiral threads. Aperture roundly D-shaped, rim weakly but distinctly flared.

DISTRIBUTION: Northern North Island, from Doubtless Bay to vicinity of Waipu Caves, Hunua Ranges, Coromandel Range and northern Kaimai Mamaku State Forest Park (Fig. 19A).

BIOLOGY: Detritivore living in litter of broadleaved-conifer and *Agathis* forests, from near sea-level to c. 620 m elevation.

CONSERVATION STATUS: Not of immediate conservation concern.

REMARKS: *Cytora septentrionalis* is distinctive in the combination of narrowly conical spire, smooth first protoconch whorl, pale peripheral spiral band on otherwise deeply pigmented shell; sculpture of crowded, typically wavy, spiral threads; and well-developed periostracum, with elevated subsutural band. Specimens from the western part of the distribution attain larger size than specimens from Hunua Ranges, Coromandel Peninsula and the type locality, the height of specimens with adult facies (i.e. rounded periphery, narrowed last whorl) in the range

of 4.15–6.25 mm, as opposed to 3.60–4.30 mm. They are otherwise indistinguishable in shell morphology. Comparison of gene sequences is desirable.

***Cytora solitaria* (Powell, 1935)**

(Figs 2H, 16F, 17G, 18K,L)

Murdochia solitaria Powell, 1935: 244, pl. 26, figs 1, 2; Powell, 1948: 274.

Cytora solitaria.- Powell, 1957: 91; Climo, 1973: 574, figs 9D, 19E, I, 20A, B; Climo, 1975: 468; Powell, 1979: 86; Gardner, 1994: 23, text fig.; Brook, 2002a: 20; Brook, 2002b: 71; Hitchmough, 2002: 115.

Cytora kiama Climo, 1973: 573, fig. 9E; Powell, 1979: 87.

Cytora kaima [*sic*].- Gardner, 1994: 23, text fig.

TYPE MATERIAL: *Murdochia solitaria* – Holotype AIM AK 70498: Three Kings Islands, Great King Island, 150 yards [164 m] up valley to SW of provision depot, A.W.B. Powell, Feb. 1935.

Cytora kiama – Holotype NMNZ M.29211: Three Kings Islands, Great Island, Tasman Valley, 200 m below *Tecomanthe* vine, in stable scree under a small grove of broadleaf trees below and right of rock steps in stream bed, F.M. Climo, 16 Nov. 1972.

MATERIAL EXAMINED (54 lots): Type material (see above), M.16820 (4), M.29244 (2), M.29245 (8), M.29246 (5), M.29247 (3), M.29248 (8), M.29249 (4), M.29250 (6), M.29251 (15), M.29252 (2), M.29253 (3), M.29254 (7), M.29255 (1), M.29256 (7), M.29257 (6), M.29258 (1), M.29259 (6), M.29260 (8), M.29261 (15), M.29262 (8), M.29263 (many), M.29264 (25), M.29265 (25), M.37068 (2), M.37768 (12), M.47239 (18), M.47287 (10), M.124876 (12), M.155490 (13), M.155507 (35), M.155519 (1), M.155527 (9), M.155555 (13), M.155575 (20), M.155587 (many), M.155597 (12), M.155619 (21), M.155627 (2), M.155670 (3), M.155676 (17), M.155685 (8), M.155694 (30), M.155713 (20), M.155722 (15), M.155745 (8), M.155755 (3), M.155796 (28), M.155810 (13), M.155820 (17), M.155829 (24), M.156444 (2), M.177693 (4).

REDESCRIPTION: Shell up to 4.70 mm wide, most specimens wider than high (height/width ratio 0.92–1.09), broadly conical (spire angle 83–93°), spire 0.81–0.91 times as high as aperture, widely umbilicate (width 14.6–17.4% of adult shell diameter). Typically reddish brown, teleoconch with white peripheral band; some specimens uniformly whitish beneath darker periostracum. Periostracum on teleoconch rather thick, produced at summits of

collabral riblets as thin, low but distinct lamellae on spire and base, numbering seven to ten per mm at end of third whorl; five or six rows of short spines on axial lamellae on inner base curving into umbilicus.

Protoconch of 1.55–1.85 convex whorls, 670–830 μm wide, first three-quarter whorl smooth, remainder traversed by rounded collabral riblets that are more closely spaced and more strongly prosocline than axial sculpture on immediately succeeding teleoconch.

Teleoconch of up to 3.50 broadly convex whorls, periphery broadly rounded at all stages of growth; spire whorls rather evenly expanding, end of last adult whorl slightly but distinctly flared at maturity; suture well defined. Base evenly rounded from periphery into umbilicus. Sculpture of weak, faintly sigmoidal, widely spaced, prosocline, collabral riblets that are surmounted by periostracal lamellae; some specimens with well-defined spiral threads or traces of them, numbering about six on spire and 6–12 on base; additionally with fine collabral and more or less obscure spiral growth lines. Aperture at maturity subcircular with double peristome, rim thin and markedly radially flared.

Radula (Fig. 2H) with characteristics of the genus.

DISTRIBUTION: Three Kings Islands, Great Island (Fig. 17G).

BIOLOGY: Detritivore, living on the ground in litter, under stones and among ground-layer plants. Habitats comprise coastal shrublands and forests.

CONSERVATION STATUS: Not mentioned as being of conservation concern by McGuinness (2001). Listed as 'range restricted (one location; recovering)' by Brook (2002a) and Hitchmough (2002). The species was extremely scarce on Great Island during the early part of the twentieth century (Powell 1935, 1948, 1951) but, as noted by Climo (1973) and Brook (2002a,b), has exhibited remarkable recovery since the eradication of goats from the island in 1946. The species is now widely distributed and locally abundant on Great Island. According to the criteria of Molloy *et al.* (2002), *Cytora solitaria* should be ranked 'range restricted'.

REMARKS: *Cytora solitaria* is extremely distinctive in the combination of relatively large size, low spire, broad umbilicus, pale peripheral band, and the flared mature outer lip with double peristome.

We concur with Brook (2002b) in recognising that the holotype of *Cytora kiama* is merely an old eroded shell of *C. solitaria*, and thus treating *C. kiama* as a junior synonym of *C. solitaria*.

Cytora taipa new species

(Figs 17H, 20A,B)

TYPE MATERIAL: Holotype NMNZ M.179677 and paratypes M.156646 (2): North Island, NE of Kaitaia, E side of Taipa River estuary, hillside S of quarry, 40 m (NZMS 260 O04/538883), in open scrub litter, D.J. Roscoe, 9 Oct. 1976. Additional paratype: M.177736, North Island, N of Mangonui, W of Kaiwheru trig, gully head of Wairua Stream (O04/601939), B.A. Marshall & F.J. Brook, 25 Oct. 2004.

MATERIAL EXAMINED (three lots): Type material (see above).

DESCRIPTION: Shell up to 1.80 mm high at maturity, higher than wide (height/width ratio about 1.25), broadly conical (spire angle 56–62°); 1.33–1.45 times as high as aperture, narrowly umbilicate. Pale yellowish brown. Periostracum on teleoconch produced at summits of collabral riblets as low, thin lamellae on spire and base.

Protoconch of 1.75 convex whorls, 470 μm wide, first whorl essentially smooth, last half of last half-whorl traversed by weak collabral riblets.

Teleoconch of up to 2.80 broadly convex whorls; whorls rather evenly expanding, last adult whorl slightly constricted and insertion point gently descending; suture deeply impressed. Base more broadly rounded than periphery, smoothly and tightly curving into narrow umbilicus. Sculptured throughout with weak, weakly sigmoidal, prosocline, collabral riblets, superimposed on fine, densely crowded, vermicular threads that are oblique relative to direction of growth, and malleations; additionally with fine collabral growth lines. Aperture roundly D-shaped, rim thin and simple.

ETYMOLOGY: After Taipa (Māori), the type locality (noun in apposition).

DISTRIBUTION: North Island, eastern Northland, east side of Taipa River estuary and north of Mangonui (Fig. 17H).

BIOLOGY: Litter-dwelling detritivore in coastal shrubland and forest.

CONSERVATION STATUS: *Cytora taipa* should be ranked as 'nationally critical' according to the criteria of Molloy *et al.* (2002). The species is range restricted, occupying coastal habitat that is subject to development. The forest at the type locality has been partly subdivided for housing in the last few decades.

REMARKS: *Cytora taipa* is extremely distinctive in its minute size, rather broadly conical spire, and the teleoconch sculpture of crowded vermiculate threads. *Cytora climoi* from the northwestern South Island has similar teleoconch

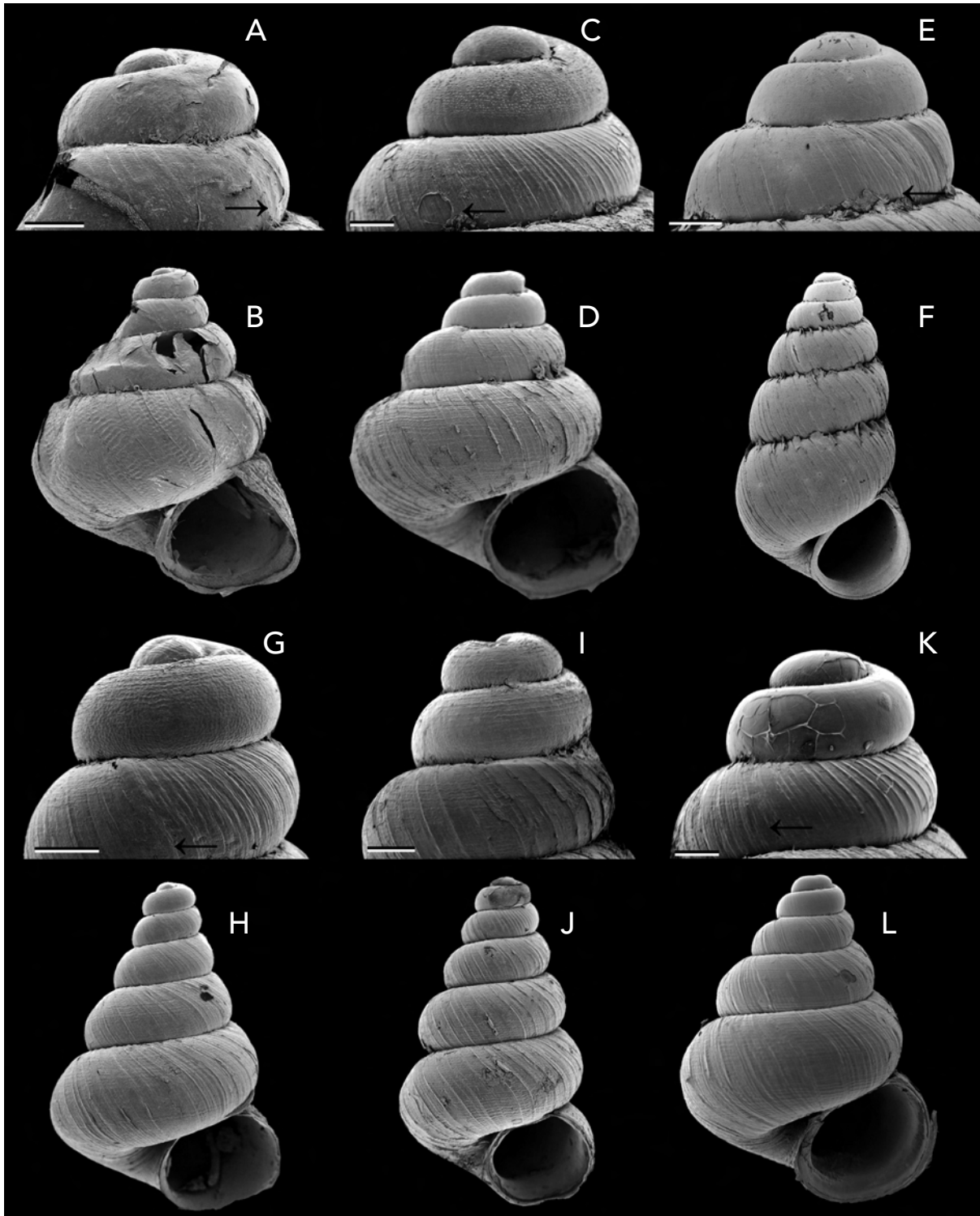


Fig. 20 Lateral views of whole shells and protoconchs (protoconch–teleoconch boundary arrowed) of *Cytora* species (SEM). A, B, *Cytora taipa* n.sp., NE of Kaitaia, E side Taipa River estuary, holotype, M.179677 (B, 1.72 × 1.50 mm); C, D, *Cytora tawhiti* n.sp., Auckland Islands, North Harbour, paratype, M.79152 (C), and Rose Island, holotype, M.146024 (D, 1.58 × 1.35 mm); E, F, *Cytora tepakiensis* N. Gardner, 1967, SE of Cape Reinga, Tapotupotu, M.156446 (F, 3.12 × 1.65 mm); G, H, *Cytora tokerau* n.sp., S of Kaeo, Puketi Forest, paratype, M.165121 (G), and holotype, M.179678 (H, 2.20 × 1.50 mm); I, J, *Cytora torquillum* (Suter, 1894), W of Auckland, Huia, Jackie Hill, M.156941 (J, 2.10 × 1.22 mm); K, L, *Cytora tuarua* n.sp., N of St Arnaud, Big Bush, paratypes, M.121789 (L, 2.45 × 1.85 mm). Scale bars 100 μ m.

sculpture, but *C. taiapa* is smaller, paler and lacks reticulate sculpture on the first protoconch whorl.

***Cytora tawhiti* new species**

(Figs 19C, 20C,D)

Cytora cf. *hedleyi*.- Mayhill & Goulstone, 1986: 88; Mayhill & Goulstone, 2000: 16, 22, text fig.

Cytora cf. *chiltoni*.- Mayhill & Goulstone, 1986: 89.

Cytora new species.- Mayhill & Goulstone, 2000: 16, 22, text fig.

Cytora sp. 13 Spencer *et al.*, in press.

TYPE MATERIAL: Holotype NMNZ M.146024: Auckland Islands, Rose Island, 30 m (NZMS 260 AI/059167), P.C. Mayhill, Dec. 1983. Paratypes: M.79130 (5), AIM AK 73304 (1), Auckland Islands, Rose Island, P.C. Mayhill, Dec. 1983; M.79152 (2), Auckland Islands, Auckland Island, North Harbour, P.C. Mayhill, Dec. 1983.

MATERIAL EXAMINED (four lots): Type material (see above).

DESCRIPTION: Shell up to 1.80 mm high at maturity, higher than wide (height/width ratio 1.14–1.25), rather broadly conical (spire angle 57–76°), spire 1.13–1.57 times as high as aperture, narrowly umbilicate. Translucent yellowish brown. Periostracum thin, produced at summits of widely spaced collabral riblets as short lamellae on spire and base.

Protoconch of 1.75–1.85 convex whorls, 570 µm wide, first 1.25 whorls sculptured with minute hemispherical granules, last half-whorl traversed by weak, rounded, regularly spaced, collabral riblets that are more strongly prosocline than collabral growth lines on immediately succeeding teleoconch.

Teleoconch of up to 2.80 whorls: spire whorls strongly convex and rather evenly expanding, last adult whorl contracted and descending; base rather evenly rounded from periphery into umbilicus; suture well defined. Sculpture of weak, prosocline, collabral riblets, crowded spiral threads, and fine collabral growth lines. Aperture at maturity ovate, rim thin and simple, slightly thickened within.

ETYMOLOGY: Far off (Māori).

DISTRIBUTION: Auckland and Rose islands, Auckland Islands (Fig. 19C).

BIOLOGY: Litter-dwelling detritivore of subantarctic *Dracophyllum* shrublands and forests.

CONSERVATION STATUS: *Cytora tawhiti* should be ranked 'range restricted' according to the criteria of Molloy *et al.* (2002).

REMARKS: Mayhill & Goulstone (1986, 2000) recognised two *Cytora* species among the material they collected from the Auckland Islands in 1983. However, we find this material belongs to a single species, here named *C. tawhiti*. Compared with the Stewart Island species *C. rakiura*, which it most resembles, *C. tawhiti* differs principally in having stronger granules on the first whorl of the protoconch, and stronger, more extensive periostracal blades on the teleoconch.

Cytora rakiura and *C. tawhiti* are evidently phylogenetic sister species, sharing not only similar size and sculpture (particularly the granular sculpture on the first protoconch whorl), but also southern distributions.

***Cytora tepakiensis* N. Gardner, 1967**

(Figs 16G, 19D, 20E,F)

Cytora tepakiensis Gardner, 1967: 216, fig. 2; Powell, 1979: 86; Parrish & Sherley, 1993: 48; Gardner, 1994: 13, text fig.; Brook, 1999d: 389; McGuinness, 2001: 567; Brook, 2002a: 21; Hitchmough, 2002: 115.

TYPE MATERIAL: Holotype AIM AK 71294 and paratypes NMNZ M.31963 (4): North Island, near Cape Reinga, Taputaputa Bay, in small bush remnant, N.W. Gardner, Apr. 1965.

MATERIAL EXAMINED (49 lots): Type material (see above), M.21970 (2), M.25429 (2), M.29622 (17), M.30680 (4), M.38134 (1), M.38602 (4), M.47951 (2), M.54247 (4), M.55468 (8), M.72437 (1), M.72443 (1), M.76594 (many), M.76986 (5), M.77014 (7), M.77042 (30), M.77049 (5), M.77148 (12), M.87803 (1), M.87824 (6), M.87834 (6), M.87878 (1), M.87886 (4), M.87897 (2), M.87910 (2), M.88471 (2), M.88696 (3), M.89820 (5), M.103999 (many), M.116157 (4), M.124336 (13), M.124546 (3), M.127941 (5), M.156445 (many), M.156446 (13), M.156640 (8), M.156641 (32), M.156660 (1), M.161074 (3), M.161156 (2), M.161825 (3), M.161850 (18), M.161852 (2), M.161876 (2), M.162033 (6), M.162098 (1), M.162273 (3), M.175374 (1).

REDESCRIPTION: Shell up to 3.50 mm high, higher than wide (height/width ratio 1.67–2.00), narrowly and weakly cyrtocoid (spire angle 30–44°), spire 1.55–2.20 times as high as aperture, very narrow umbilical chink. Periostracum on teleoconch dull olive to deep reddish brown, glossy, produced at summits of collabral riblets as prominent lamellae in narrow subsutural band, 10–11 at end of third whorl, very weakly produced elsewhere.

Protoconch of 1.60–2.00 convex whorls, 530–630 µm wide, first whorl smooth, last half-whorl traversed by weak, rounded, collabral riblets that are more closely spaced and slightly more strongly prosocline than axial sculpture on immediately succeeding teleoconch.

Teleoconch of up to 4.50 convex whorls; periphery broadly rounded at all stages of growth; spire whorls expansion rate slowing so that adult spire weakly cyrtocoid, aperture in few specimens slightly but distinctly constricted at maturity; suture strongly impressed. Base smoothly and tightly curved into umbilical chink. Sculpture of weak, more or less straight, widely spaced, prosocline, collabral riblets; and fine collabral and more or less obscure spiral growth lines. Aperture ovate, thin at rim, rapidly but lightly thickened within.

DISTRIBUTION: North Island, northern Aupouri Peninsula (Fig. 19D). Known also as fossils from Holocene dunes at Te Werahi (Brook 1999d).

BIOLOGY: Litter-dwelling detritivore of shrublands and forests.

CONSERVATION STATUS: *Cytora tepakiensis* was ranked as 'declining' by McGuinness (2001), and listed as 'range restricted' by Brook (2002a) and Hitchmough (2002). Brook (2002a) remarked, 'This species has a fragmented, relict distribution as a result of extensive habitat destruction caused by anthropic land clearance for gum-digging, pastoral farming and exotic forestry. The total population is probably still declining as a consequence of continued modification and loss of habitat, and there is a risk that some local populations could become extinct if historical trends continue.' Our assessment is that *Cytora tepakiensis* continues to be of immediate conservation concern because the habitat is vulnerable to disturbance. Accordingly, a rank of 'range restricted' on the Molloy *et al.* (2002) criteria is appropriate.

REMARKS: The shell of *Cytora tepakiensis* is highly distinctive in the combination of small size, narrowly conical and weakly cyrtocoid spire, broadly convex teleoconch whorls, dark pigmentation, weak sculpture, and the enlargement of the periostracal lamellae in a narrow sub-sutural band. *Cytora tepakiensis* resembles *C. aranea* (allopatric) in shape and size, but differs in having more broadly convex whorls and in that the periostracal blades are enlarged subsuturally. It also resembles *C. kerrana* and *C. hispida* in shape, but is immediately separable by the lack of periostracal spines. All three are locally sympatric.

Cytora tokerau new species

(Figs 16H, 19B, 20G,H)

Cytora pallida.- Rees, 1961: 15 (in part).

Cytora sp. 7 Spencer *et al.*, in press.

TYPE MATERIAL: Holotype NMNZ M.179678 and paratypes M.165121 (3), AIM AK 73305 (1): North Island, S of Kaeo, Puketi Forest, Waipapa Track, 220 m (NZMS 260 P05/827659), P.C. Mayhill, Nov. 1989. Additional paratypes: M.62501 (2), North Island, SE of Kaeo, P.C. Mayhill, Oct. 1978; M.97910 (5), North Island, SE of Kaeo, Waiare Road, P.C. Mayhill, Nov. 1987; M.164696 (8), North Island, SE of Kaeo, Waiare Road, P.C. Mayhill, Oct. 1978; M.114477 (3), M.164857 (6), North Island, Whangaroa, N of Totara North, Ranfurly Bay Track, P.C. Mayhill, Nov. 1989; M.127987 (many), North Island, S of Ahipara, Herekino N head, above Waiatua Stream, F.J. Brook, 21 Apr. 2004; M.156805 (1), North Island, Doubtless Bay, Bushy Point, B.F. Hazelwood, 29 Aug. 1998; M.163142 (3), S of Kaitaia, Larmers Road, P.C. Mayhill, Oct. 1978.

MATERIAL EXAMINED (163 lots): Type material (see above), M.25441 (2), M.36938 (4), M.37139 (2), M.37703 (4), M.38502 (2), M.48696 (4), M.55481 (1), M.55792 (1), M.58140 (1), M.61829 (1), M.61924 (5), M.62515 (5), M.69806 (1), M.69880 (1), M.69917 (2), M.74033 (2), M.75712 (21), M.76554 (1), M.76581 (1), M.76755 (1), M.77098 (1), M.78590 (5), M.79004 (1), M.80329 (12), M.82451 (1), M.82664 (2), M.82840 (1), M.83143 (3), M.97636 (1), M.97657 (1), M.97959 (1), M.97965 (1), M.98037 (2), M.98345 (1), M.99173 (2), M.101611 (1), M.101667 (1), M.104231 (7), M.104257 (5), M.104403 (2), M.114423 (2), M.114532 (1), M.116106 (1), M.124275 (9), M.124276 (1), M.124277 (2), M.124278 (3), M.124279 (1), M.124314 (4), M.124315 (4), M.124358 (1), M.124364 (2), M.124366 (1), M.124367 (1), M.124389 (1), M.124393 (9), M.124522 (12), M.124547 (1), M.124548 (1), M.124675 (2), M.124747 (18), M.124766 (1), M.124767 (1), M.124768 (11), M.124769 (1), M.124796 (8), M.124859 (10), M.124860 (1), M.124861 (5), M.124909 (1), M.124970 (1), M.124993 (6), M.127985 (15), M.156644 (1), M.156647 (1), M.156650 (1), M.156651 (1), M.156653 (4), M.156655 (3), M.156656 (4), M.156657 (9), M.156659 (11), M.156661 (7), M.156662 (30), M.156663 (8), M.156665 (1), M.156666 (1), M.156667 (1), M.156668 (1), M.156669 (1), M.156671 (2), M.156672 (1), M.161107 (1), M.162074 (1), M.162324 (1),

M.162353 (1), M.163120 (7), M.163180 (2), M.163210 (5), M.163226 (1), M.163288 (2), M.163323 (1), M.163363 (1), M.163414 (4), M.163445 (4), M.163483 (1), M.163603 (2), M.163632 (2), M.163703 (1), M.163729 (1), M.163742 (1), M.163807 (1), M.163874 (3), M.163927 (2), M.164086 (1), M.164301 (2), M.164352 (1), M.164769 (4), M.164883 (5), M.164917 (7), M.165079 (1), M.165166 (2), M.165399 (1), M.165598 (1), M.165642 (3), M.165876 (1), M.166794 (7), M.166942 (1), M.167075 (2), M.167262 (1), M.167308 (3), M.167707 (1), M.167847 (1), M.167958 (1), M.168078 (3), M.168198 (2), M.168390 (1), M.169075 (1), M.169205 (6), M.169453 (1), M.174328 (30), M.174329 (5), M.174332 (2), M.175140 (1), M.175163 (1), M.177722 (20), M.177727 (4), M.177733 (9), M.178067 (7), M.178070 (2), M.178074 (1), M.178083 (1).

DESCRIPTION: Shell up to 2.60 mm high, higher than wide (height/width ratio 1.49–1.82), narrowly conical (spire angle 45–52°), spire 1.81–2.67 times as high as aperture, frequently weakly coeloconoid; narrow umbilical chink. Translucent, deep reddish brown. Periostracum produced as low lamellae at summits of axial riblets that number 6–12 per mm at end of third whorl.

Protoconch of 1.70–1.80 convex whorls, 430–450 µm wide, sculptured throughout with numerous fine, crisp, slightly wavy, spiral threads, forming reticulate pattern on last half-whorl by intersecting rounded collabral riblets that are more closely spaced and more strongly prosocline than axial sculpture on immediately succeeding teleoconch; first whorl additionally very finely malleate.

Teleoconch of up to 4.50 strongly convex whorls; periphery rounded at all stages of growth, most broadly and evenly rounded on last adult whorl; whorls typically expanding slightly but distinctly more rapidly than protoconch (weakly coeloconoid), some specimens expanding as rapidly as protoconch (evenly conical); last adult whorl typically weakly contracted at maturity; suture well defined. Base broadly rounded, evenly rounded into umbilical chink. Sculpture of weak, crowded, spiral threads; weak, weakly sigmoidal, prosocline, collabral riblets; and fine collabral and spiral growth lines. Aperture subcircular, rim thin and rapidly thickened within at maturity.

ETYMOLOGY: Northern (Māori).

DISTRIBUTION: North Island, Northland, Hunua Ranges, Great Barrier Island, Coromandel Peninsula, Mercury Islands and Ohinau Island (Fig. 19B).

BIOLOGY: A detritivore living among litter of shrublands, broadleaved-conifer and *Agathis* forests, from near sea-level to c. 560 m elevation.

CONSERVATION STATUS: Not of immediate conservation concern.

REMARKS: Compared with *Cytora torquillum*, which is locally sympatric (e.g. Hokianga, M.156662 and M.174786), *C. tokerau* differs in attaining larger size, in being larger relative to the number of whorls, in having a more darkly pigmented shell, and in having finer, straighter, more numerous spiral threads on the first protoconch whorl.

Cytora torquillum (Suter, 1894)

(Figs 16I, 19E, 20I,J)

Lagochilus torquillum Suter, 1893: 149 (*nude name*).

Lagocheilus torquillum.- Hedley & Suter, 1893: 622 (*nude name*).

Lagochilus torquillum.- Suter, 1894b: 140 (*nude name*); Suter, 1894c: 485, pl. 22, figs 2, 2b; Suter, 1894d: 225.

Lagochilus (Cytora) torquillum.- Kobelt & Möllendorff, 1897: 86; Suter, 1913: 184, pl. 35, fig. 8.

Japonia (Cytora) torquilla.- Kobelt, 1902: 67.

Murdochia torquillum.- Powell, 1937: 67.

Cytora torquilla.- Powell, 1957: 91; Whitten, 1957: 2; Rees, 1959: 21; Powell, 1979: 84 (in part = *C. motu*), fig. 12/4; Solem *et al.*, 1981: 477; Ballance, 1982: 30; Goulstone, 1990: 21, text fig.; Gardner, 1994: 16 (in part = *C. motu*), text fig.; Brook & Goulstone, 1995: 9; Brook, 1999b: 130; Brook, 1999c: 156; Brook, 1999d: 389; Barker, 2006: 134.

NOT *Cytora torquilla*.- Climo, 1971: 68 (= *C. motu*).

TYPE MATERIAL: Lectotype (here selected) NMNZ M.125191 and paralectotype M.125192: North Island, Auckland, 'Howick', T. Broun (from original label).

MATERIAL EXAMINED (134 lots): Type material (see above), M.32168 (1), M.36401 (12), M.37076 (15), M.39255 (15), M.45672 (8), M.48099 (4), M.51793 (many), M.55215 (4), M.57147 (2), M.57349 (1), M.57654 (5), M.57839 (many), M.61971 (1), M.62715 (2), M.68114 (2), M.70629 (3), M.72488 (2), M.76162 (3), M.76261 (1), M.76957 (4), M.77456 (14), M.77784 (2), M.78557 (many), M.79405 (2), M.79504 (5), M.80277 (2), M.80364 (2), M.82193 (2), M.85052 (1), M.85930 (1), M.89390 (1), M.89757 (1), M.97726 (1), M.99343 (9), M.100239 (2), M.101606 (2), M.102721 (3), M.104168 (5), M.114270 (1), M.114340 (7), M.114380 (1), M.114560 (3), M.114904 (1), M.124333 (7), M.124349

(3), M.124556 (23), M.124771 (34), M.124785 (3), M.129431 (3), M.156599 (8), M.156637 (4), M.156638 (2), M.156639 (1), M.156642 (7), M.156648 (1), M.156652 (2), M.156658 (2), M.156933 (1), M.156934 (2), M.156941 (16), M.156942 (2), M.156943 (8), M.156944 (26), M.156945 (1), M.156946 (1), M.156979 (1), M.163501 (8), M.164167 (1), M.166729 (3), M.167188 (6), M.168447 (1), M.168484 (1), M.168770 (2), M.169064 (1), M.169065 (5), M.169066 (3), M.169067 (1), M.169068 (1), M.169069 (3), M.169070 (2), M.169071 (1), M.169072 (2), M.169073 (1), M.169074 (2), M.169076 (2), M.169077 (30), M.169078 (2), M.169079 (3), M.169080 (3), M.169081 (6), M.169082 (2), M.169083 (1), M.169084 (1), M.169085 (1), M.169087 (3), M.169088 (8), M.169089 (1), M.169090 (10), M.169091 (15), M.169092 (3), M.169093 (2), M.169094 (20), M.169095 (3), M.169096 (12), M.169245 (1), M.169246 (many), M.169247 (4), M.169248 (30), M.169249 (1), M.169250 (many), M.169251 (4), M.169252 (many), M.169253 (30), M.169254 (many), M.169255 (6), M.169256 (1), M.169257 (1), M.169258 (1), M.169259 (3), M.169260 (6), M.169261 (6), M.169997 (1), M.170140 (4), M.174327 (many), M.174783 (2), M.174786 (10), M.175108 (2), M.175345 (1), M.175365 (1), M.176122 (1), M.177724 (3), M.177730 (3).

REDESCRIPTION: Shell 1.70–2.30 mm high at maturity, higher than wide (height/width ratio 1.49–1.78), narrowly to rather broadly conical (spire angle 40–52°), spire 3.00–3.55 times as high as aperture, very narrow umbilical chink. Translucent, periostracum yellowish to reddish brown, typically produced as prominent lamellae at summits of axial riblets that number 12–15 per mm at end of third whorl.

Protoconch of 1.60–1.80 convex whorls, 430–470 µm wide, first whorl sculptured with fine wavy spiral threads, last whorl traversed by rounded, collabral riblets that are more closely spaced and more strongly prosocline than axial sculpture on immediately succeeding teleoconch.

Teleoconch of 3.10–3.60 strongly convex whorls at maturity, periphery broadly rounded at all stages of growth; spire whorls evenly expanding, last adult whorl typically weakly expanded at maturity, weakly contracted in some specimens; suture well defined. Base broadly rounded, evenly rounded into umbilical chink. Sculpture of weak, weakly sigmoidal, prosocline, collabral riblets, with or without well-defined to extremely weak, fine, crowded, slightly

wavy, spiral threads. Additionally with collabral and spiral growth lines. Aperture subcircular, rim thin, weakly thickened within, and typically weakly flared at maturity.

DISTRIBUTION: Northern North Island, from northwestern Northland to west of Waimarama, south of Hastings (Fig. 19E). Known also as fossils from Holocene sand dunes at several localities in Northland (Brook 1999b,c,d), and from karst caves in the western Waikato (e.g. M.39255, M.45672).

BIOLOGY: Litter-dwelling detritivore that seems to prefer viable, finely granulated humus on slopes. Occurs in coastal *Metrosideros* forests and broadleaved-conifer forests to c. 670 m elevation.

CONSERVATION STATUS: Not of immediate conservation concern. The species is apparently no longer extant in the few small patches of bush remaining in the vicinity of the type locality at Howick, Auckland (B.F. Hazelwood, pers. comm. 2005).

REMARKS: *Cytora torquillum* is characterised by the combination of small, uniformly pigmented shell, elevated spire, strongly convex whorls, and the presence of wavy spiral threads on the first protoconch whorl. Specimens from the western side of the North Island all have well-defined spiral sculpture on the teleoconch, whereas spiral sculpture tends to be weaker or absent in specimens from the eastern side of the island. *Cytora torquillum* most closely resembles *C. motu* from the Poor Knights Islands (see above).

Cytora tuarua new species

(Figs 16J, 19F, 20K,L)

Murdochia chiltoni.- Dell, 1954: 138 (not Suter, 1896);

Dell, 1955: 1136 (not Suter, 1896).

Cytora chiltoni.- Mason, 1988: 90 (not Suter, 1896);

Gardner, 1994: 14 (in part + *C. maui*).

Cytora sp. 2 Spencer *et al.*, in press.

TYPE MATERIAL: Holotype NMNZ M.179688 and paratypes M.121941 (12), AIM AK 73306 (2): South Island, NW of St Arnaud, Big Bush (NZMS 260 N29/934393), I. Millar, 19 Jun. 1986. Additional paratypes: M.121611 (25), South Island, St Arnaud Village, D.J. Roscoe, 19 Oct. 1983; M.162757 (2), South Island, St Arnaud, P.C. Mayhill, Feb. 1981; M.121789 (26), M.121821 (5), South Island, N of St Arnaud, Big Bush, Department of Conservation, 5 Mar. 1986.

MATERIAL EXAMINED (260 lots): Type material (see above), M.14493 (1), M.15139 (11), M.20371 (5), M.20480 (1),

M.20727 (3), M.25474 (1), M.32793 (1), M.36604 (6), M.37026 (1), M.37314 (2), M.37681 (13), M.38850 (1), M.38852 (1), M.38854 (3), M.38857 (2), M.38858 (2), M.46839 (11), M.47065 (1), M.47221 (14), M.55596 (1), M.55691 (1), M.56401 (1), M.56436 (6), M.58170 (2), M.61851 (6), M.63104 (1), M.63188 (3), M.63197 (1), M.68222 (4), M.68299 (2), M.68314 (1), M.68334 (3), M.68360 (2), M.68369 (8), M.68377 (1), M.69168 (4), M.69388 (4), M.69669 (3), M.69808 (5), M.69949 (4), M.70609 (many), M.72190 (1), M.72193 (1), M.72948 (1), M.75391 (1), M.77242 (6), M.77254 (2), M.78992 (4), M.79301 (4), M.79314 (2), M.80904 (2), M.81624 (2), M.82539 (5), M.82644 (2), M.82766 (2), M.87480 (30), M.88869 (2), M.88995 (1), M.89031 (20), M.89036 (many), M.89161 (1), M.89286 (6), M.89659 (many), M.92846 (4), M.92987 (2), M.98397 (3), M.99029 (13), M.99709 (1), M.99728 (1), M.99981 (2), M.100070 (1), M.100093 (4), M.100182 (30), M.100222 (4), M.102056 (6), M.102667 (20), M.102926 (1), M.102971 (5), M.103099 (3), M.103231 (many), M.103278 (1), M.103425 (2), M.103436 (1), M.103545 (5), M.103730 (2), M.103745 (1), M.104637 (1), M.104670 (1), M.104868 (5), M.104948 (2), M.105173 (2), M.105181 (6), M.105233 (1), M.105376 (1), M.105598 (6), M.105675 (2), M.105761 (1), M.105880 (2), M.105948 (14), M.106047 (6), M.106200 (4), M.106431 (6), M.106471 (2), M.106577 (6), M.106736 (2), M.106793 (1), M.106817 (8), M.107139 (4), M.107221 (3), M.107408 (3), M.107469 (6), M.107948 (10), M.107973 (1), M.108063 (4), M.108153 (1), M.108443 (2), M.108565 (10), M.108599 (4), M.108635 (1), M.108659 (6), M.109577 (1), M.109682 (30), M.109707 (2), M.109764 (3), M.109960 (15), M.113974 (4), M.116408 (2), M.120262 (2), M.120383 (2), M.120629 (8), M.120710 (many), M.120887 (2), M.120964 (3), M.121117 (10), M.121312 (3), M.121471 (1), M.121513 (3), M.121560 (2), M.121627 (3), M.121642 (1), M.121753 (2), M.121770 (4), M.121833 (2), M.121854 (8), M.121916 (8), M.121919 (5), M.121930 (6), M.121959 (4), M.122051 (2), M.122087 (9), M.122190 (5), M.122225 (2), M.122354 (1), M.122420 (15), M.122544 (2), M.122559 (4), M.122663 (1), M.122788 (4), M.122830 (1), M.123831 (1), M.122847 (10), M.122950 (2), M.123083 (1), M.123339 (3), M.123963 (1), M.124000 (6), M.124147 (1), M.124447 (3), M.124640 (3), M.124641 (2), M.124642 (13), M.124643 (2), M.124644 (7), M.124658 (5), M.124659 (1),

M.124660 (8), M.124664 (4), M.124665 (4), M.124667 (14), M.124669 (1), M.124672 (2), M.124673 (6), M.124676 (1), M.124678 (2), M.124854 (13), M.124881 (1), M.124884 (2), M.124889 (1), M.124916 (2), M.124923 (1), M.124941 (1), M.124950 (1), M.124954 (many), M.124955 (many), M.124966 (1), M.124967 (4), M.124997 (1), M.125446 (2), M.125866 (18), M.125869 (30), M.126045 (30), M.126073 (1), M.126139 (7), M.126178 (5), M.126274 (many), M.127944 (1), M.128611 (6), M.129233 (3), M.129268 (6), M.129400 (7), M.146103 (1), M.146494 (5), M.146545 (2), M.146567 (1), M.146589 (3), M.146643 (3), M.146668 (1), M.146692 (1), M.146749 (1), M.146793 (2), M.146881 (2), M.146910 (3), M.146987 (1), M.156810 (3), M.157018 (6), M.157039 (7), M.157095 (2), M.157126 (3), M.157137 (1), M.157291 (7), M.157920 (1), M.157996 (1), M.159319 (1), M.159351 (1), M.159792 (1), M.161309 (1), M.161442 (many), M.161457 (1), M.161510 (1), M.162525 (1), M.162789 (1), M.162853 (2), M.169850 (1), M.175066 (3), M.175077 (13), M.175095 (9), M.175100 (1), M.175116 (1), M.175118 (3), M.175133 (1), M.175282 (2), M.175812 (7), M.177697 (3).

DESCRIPTION: Shell 2.30-2.85 mm high at maturity, higher than wide (height/width ratio 1.33-1.54), narrowly conical (spire angle 48-58°), spire 1.40-1.60 times as high as aperture, narrowly umbilicate. Translucent, yellowish to reddish brown, last two whorls in adults with or without whitish, broad median spiral band on spire and/or narrower band on base. Periostracum produced as thin, widely spaced lamellae at summits of axial riblets, including peripheral row of prominent, broadly rounded projections, numbering 4-5 per mm at end of third whorl.

Protoconch of 1.75-1.80 convex whorls, 530-570 mm wide, first 1.1-1.3 whorls smooth and polished, last part traversed by fine, crisp, collabral riblets that are more closely spaced and more strongly prosocline than axial sculpture on immediately succeeding teleoconch.

Teleoconch of 3.20-3.75 strongly convex whorls at maturity; periphery rounded at all stages of growth; spire whorls evenly expanding; last adult whorl weakly contracted at maturity; suture well defined. Base broadly rounded, evenly rounded into umbilicus. Sculpture of fine, crowded, spiral threads; weak, weakly sigmoidal, prosocline, collabral riblets; and fine collabral and spiral growth lines. Aperture ovate, rim thin and simple, rapidly thickened within at maturity.

ETYMOLOGY: Second (Māori), the name derived from our number for the species during preliminary study.

DISTRIBUTION: South Island and Stewart Island (Fig. 19F). Known also as Holocene fossils from karst caves at Takaka (M.72948, M.113974).

BIOLOGY: Detritivore of forest floor litter and woody debris, and of humus suspended in epiphytes. Species occurs from sea level to ca. 1300 m elevation, in broad-leaved shrublands, and in mixed broadleaved-conifer, conifer, and *Nothofagus* forests.

CONSERVATION STATUS: Not of immediate conservation concern.

REMARKS: *Cytora tuarua* is characterised by the combination of smooth first protoconch whorl, spirally lirated teleoconch, narrowly conical spire, narrow umbilicus, and peripheral row of broadly rounded periostracal lamellae. *Cytora tuarua* is closely similar to *C. chiltoni* in teleoconch facies, including periostracal ornamentation, but differs in the sculpture of the first whorl of the protoconch, which is smooth rather than spirally lirated: the two species are locally sympatric.

Discussion

In the present revision, a total of 42 species are recognised, of which 23 are described as new. Climo (1975) alluded to undescribed diversity in *Cytora* and the probable existence of infrageneric groupings. Our analyses have confirmed both previously unrecognised taxon diversity and considerable conchological diversity in *Cytora*. *Cytora* is conchologically distinct from *Liarea* (the presumed sister taxon), but phylogenetics analyses based on molecular data are needed to determine properly the relationships between the two genera, and to establish whether intrageneric groupings of *Cytora* are warranted.

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