




A new species of *Penion* P. Fischer, 1884 from northern New Zealand (Mollusca: Neogastropoda: Buccinoidea)

Bruce A. Marshall^a, Simon F. K. Hills ^b and Felix Vaux ^b

^aMuseum of New Zealand Te Papa Tongarewa, Wellington, New Zealand; ^bEcology Group, Institute of Agriculture and Environment, Massey University, Palmerston North, New Zealand

ABSTRACT

We describe a new, morphologically distinct species of *Penion* found off the Three Kings Islands, Middlesex and King banks, and Cape Reinga, in the far north of New Zealand.
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Introduction

The siphon whelk genus *Penion* P. Fischer, 1884 (Mollusca: Neogastropoda: Buccinoidea) is a group of large, morphologically diverse marine snails (Ponder 1973; Powell 1979; Beu and Maxwell 1990; Nielsen 2003). *Penion* is closely related to the genera *Antarctoneptunea* Dell, 1972 and *Kelletia* Bayle, 1884 (Vaux et al. 2017b; Vaux et al. 2018). Five extant species and one subspecies are currently recognised as being endemic to New Zealand waters (Powell 1979; Spencer et al. 2017), and another two living species occur off south-eastern Australia (Ponder 1973). The fossil record for *Penion* is rich, with numerous species recorded from New Zealand (Beu and Maxwell 1990), Australia (Ponder 1973), Antarctica (Beu 2009), and Argentina and Chile (Nielsen 2003; Reichler 2010). Most fossils are of Miocene age, but the earliest known species is *P. proavitus* (Finlay & Marwick, 1937) from the Paleocene (Turonian stage) of New Zealand (66.04–55.80 Ma; Beu and Maxwell 1990). All species are benthic, predator-scavengers (Spencer et al. 2009; Vaux et al. 2017a).

Here we describe a new, morphologically distinct species of *Penion* from the Three Kings Islands and Middlesex and King banks and Cape Reinga (Figure 1). These locations are in close proximity to one another in the far north of New Zealand; Middlesex Bank is on the South Maria Ridge to the northwest of the Three Kings Islands, and King Bank is on the North Maria Ridge to the northeast of the Three Kings Islands and Cape Reinga (Figure 1). The Three Kings Islands and the Middlesex and King banks are surrounded by deep water and swept by strong, eastward-flowing,

cold upwelling currents. The marine mollusc fauna occurring off the Three Kings Islands and on Middlesex and King banks is highly distinctive and strongly homogenous, with some taxa ranging onto the shelf off Cape Reinga (> 6000 NMNZ species lots studied by B.A.M.). This region is a biodiversity 'hotspot' with many endemic organisms, especially among the Mollusca (Marshall 1977, 1978, 1979, 1988, 1993, 1994, 1995a, 1995b, 1998a, 1998b, 1999, 2000, 2002; Willan 1978, 1987; Donald et al. 2015). Unless specified, all material examined is stored at the Museum of New Zealand Te Papa Tongarewa (NMNZ).

Systematics

Superfamily BUCCINOIDEA Rafinesque, 1815

Family BUCCINIDAE Rafinesque, 1815

Genus *Penion* P. Fischer, 1884

Penion P. Fischer, 1884: 625. Type species (by monotypy): *Fusus dilatatus* Quoy & Gaimard, 1833 (= *Fusus sulcatus* Lamarck, 1816); living, New Zealand.

Verconella Iredale, 1914: 175. Type species (by original designation): *Fusus dilatatus* Quoy & Gaimard, 1833; living, New Zealand.

Penion lineatus n. sp.

Figures 1, 2, Table 1

Type material

Holotype NMNZ M.322937 and 31 paratypes M.080439; 'off Three Kings Islands' (i.e. NW of Cape Reinga),

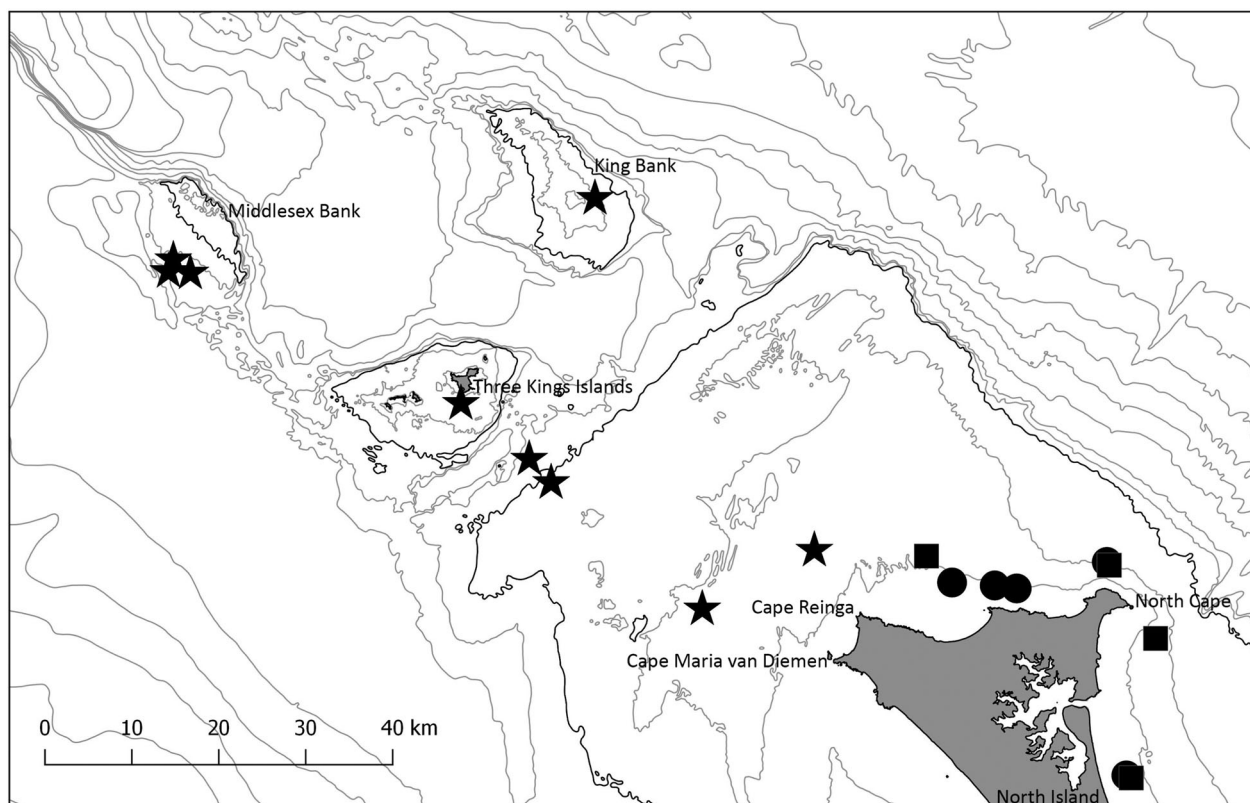


Figure 1. Map showing the distribution of precisely localised *Penion lineatus* n. sp. (★), *Penion cuvierianus* (Powell, 1927) (●) and *Penion sulcatus* (Lamarck, 1816) (■) in the far north of New Zealand. Scale bar shows 40 km and the 150 m isobath is illustrated in bold.

craypots, some taken alive, pres. H. and M. Seelye and P.R. Jamieson. Additional paratypes: 34°11.0'S, 172°08'E, off Great Island, Three Kings Islands, alive, 73–77 m (1 male, NIWA 73511); 34°14.8'S, 172°13.6'E, SE of Great Island, alive, 173–178 m (4 juveniles, M.075095); 34°21'S, 172°37'E, NE of Cape Reinga, 88 m (1, M.036036); 34°25.0'S, 172°27.8'E, W of Cape Reinga, alive, 78 m (1 subadult, M.072007); 'off Three Kings Islands', craypots (2, M.075237, 4, M.132411).

Material examined

Type material (see above). *Other material*. 33°57.0'S, 172°19.0'E, King Bank, NE of Three Kings Islands, 128 m (1 juvenile, M.153271); 34°01.2'S, 171°44.4'E, Middlesex Bank, NW of Three Kings Islands, 206–211 m (2 juveniles, M.153268); 34°02.0'S, 171°44.0'E, Middlesex Bank, 246–291 m (1 juvenile, M.153267); 34°02.1'S, 171°45.8'E, Middlesex Bank, 221–206 m (1 juvenile, M.153269); 34°16.4'S, 172°15.4'E, SE of Three Kings Islands, 138–143 m (2 juveniles, M.075084).

Description

Diagnosis

Shell fusiform, adults 68–172 mm long, spire 0.70–0.85 times higher than aperture in adults, diameter/height

ratio 0.32–0.51 (mean 0.42, $n = 14$), thickness variable. Protoconch white; teleoconch creamy white, fine yellowish brown bands at summits of some or all larger spiral cords, interior porcellaneous white (Figure 2). Protoconch of 2.75–3.00 whorls, smooth or with indistinct spiral lines, width 3.4–4.5 mm (typically about 4 mm), first half whorl rapidly expanding (Table 1). Teleoconch of up to 7.5 whorls, typically all with rounded, nodular, median, peripheral angulation and concave ramp; the side more or less flat on spire, broadly convex below, smoothly merging with broadly concave canal (Figure 2). Some specimens with angulation and nodules vanishing after fourth or fifth whorl, after which whorls rather evenly convex. Angulation and nodules in some (intermediate) specimens vanishing after fourth whorl then reappearing and progressively enlarging on last adult whorl. Axial costae strong, rounded, 10–12 on fourth whorl, occupying abapical two-thirds on first 4 or 5 whorls, thereafter as progressively enlarging peripheral nodules, or vanishing. Numerous crowded spiral cords throughout, multiplying by intercalation, low, narrow, broadly angulate in section, separated by grooves. Aperture plus canal narrowly pyriform. Outer lip rapidly thickened and strongly and extensively lirate within. Inner lip smooth, thickened or with rounded callous near insertion, elsewhere thin or of moderate thickness. Anterior siphonal canal of moderate length, straight or gently

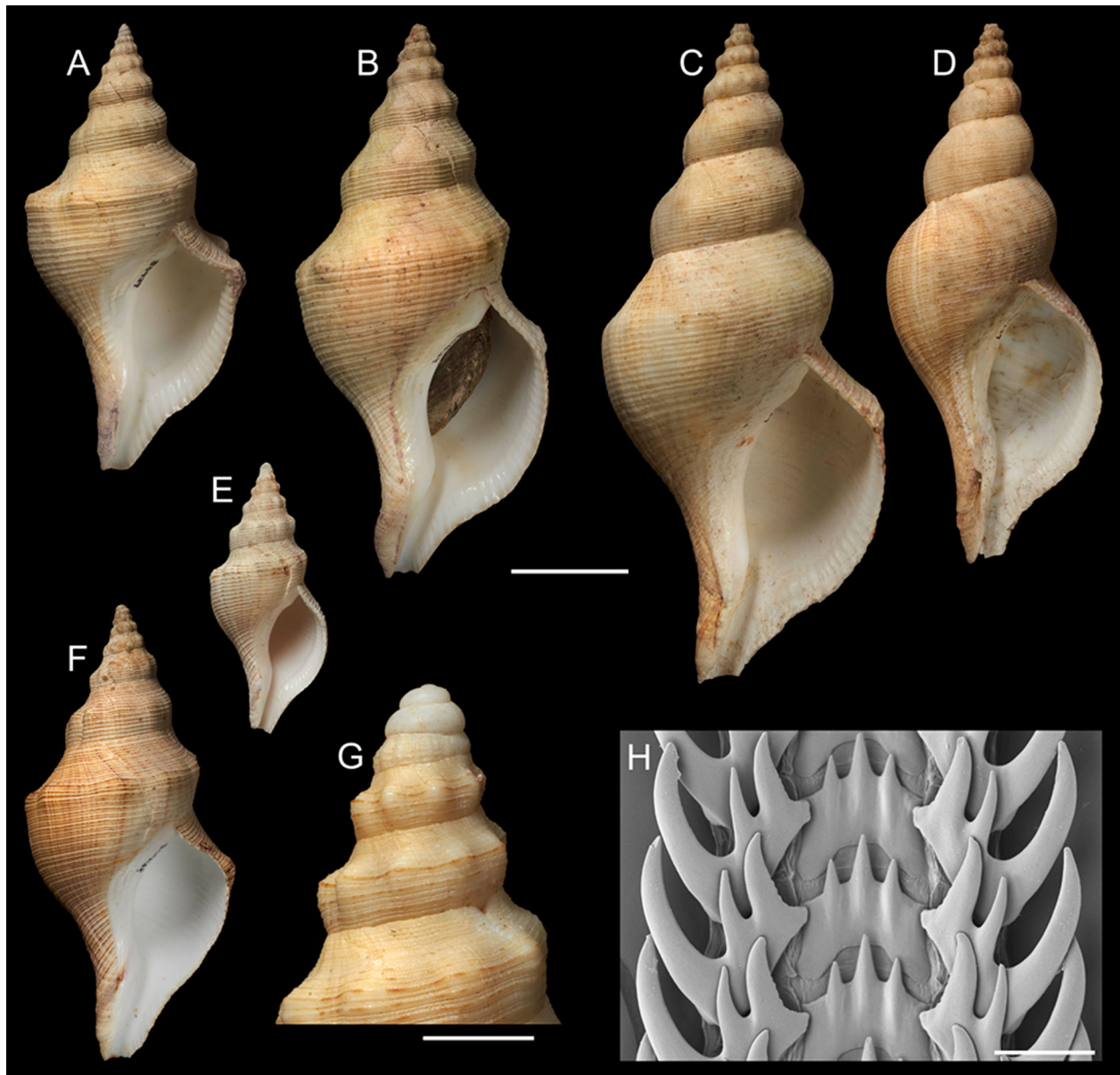


Figure 2. Shells and radula of *Penion lineatus* n. sp. Adult shells to scale (scale bar = 3 cm) (A–F). **A**, Holotype, NW of Cape Reinga, M.322937; **B–D, F**, paratypes, NW of Cape Reinga, M.080439; **E**, paratype male, off Great Island, Three Kings Islands, 73–77 m, NIWA, 73511; **G**, protoconch and early teleoconch whorls, paratype, off Great Island, 173–178 m, M.075095 (scale bar = 5 mm); **H**, radula of paratype male, off Great Island, 73–77 m, NIWA, 73511 (scale bar = 100 μ m).

flexed. Fasciole very weak. Operculum and gross radular morphology typical of the genus. Central tooth with 3 small cusps, lateral teeth with 3 strong cusps, outermost cusp of lateral teeth long and slender, inner edge of inner cusp weakly crenulate.

Distribution

King Bank, Middlesex Bank, Three Kings Islands and northwest of Cape Reinga (with certainty not further south than 34°25.0'S, 172°27.8'E), 77–246 m, taken alive at 77–173 m (Figure 1).

Remarks

Penion lineatus differs from *P. sulcatus* in having a larger protoconch (width 3.65–4.40 mm, versus 2.25–

3.00 mm; Table 1), finer spiral sculpture, less crowded axial costae on the early teleoconch whorls, which are more evenly developed across the whorls (stronger adapically), a more weakly flexed anterior siphonal canal, and typically a weaker fasciole. *Penion lineatus* differs further from *P. sulcatus* in having a morphotype similar in both shape and size to the common form of the southern species *P. ormesi* (Powell, 1927). *Penion lineatus* resembles *P. cuvierianus* (Powell, 1927) in protoconch size and shape (Figure 2D; Table 1), but differs from the northern forms of that species in having a considerably less prominent peripheral angulation and weaker spiral sculpture, especially on the early whorls. The outer cusp on the lateral teeth of the radula of *P. lineatus* is considerably longer and narrower than in *P. cuvierianus*, *P. sulcatus* and *P. jeakingsi* (Powell, 1947) (Powell 1929, figs 122–124; Ponder 1973,

Table 1. Protoconch whorl counts and measurements (mm) for seven *P. cuvierianus*, six *P. lineatus* n. sp. and six *P. sulcatus* specimens.

Species	Whorls	Diameter	Specimen
<i>P. cuvierianus</i>	3.20	4.40	M.061315
<i>P. cuvierianus</i>	3.50	3.85	M.061315
<i>P. cuvierianus</i>	2.80	4.00	M.061315
<i>P. cuvierianus</i>	3.30	4.00	M.061315
<i>P. cuvierianus</i>	3.00	3.90	M.061315
<i>P. cuvierianus</i>	2.80	4.00	M.061315
<i>P. cuvierianus</i>	3.00	3.90	M.061315
<i>P. lineatus</i> n. sp.	3.00	4.10	M.075095
<i>P. lineatus</i> n. sp.	2.90	3.65	M.075095
<i>P. lineatus</i> n. sp.	2.75	4.10	M.075095
<i>P. lineatus</i> n. sp.	3.30	4.20	M.075095
<i>P. lineatus</i> n. sp.	3.20	4.40	M.153268
<i>P. lineatus</i> n. sp.	2.80	4.30	M.153268
<i>P. sulcatus</i>	3.20	2.40	M.309447
<i>P. sulcatus</i>	3.00	2.40	M.309447
<i>P. sulcatus</i>	3.10	2.45	M.309447
<i>P. sulcatus</i>	3.50	3.00	M.315600
<i>P. sulcatus</i>	3.75	2.85	M.305126
<i>P. sulcatus</i>	2.50	2.25	M.145034

fig. 2/1, 2; Dell 1956, radula B fig. 7—radulae of other local taxa not compared). To date the three species (*P. lineatus*, *P. sulcatus* and *P. cuvierianus*) have not been collected together, but since there are no separating physical barriers they eventually may prove to occur sympatrically off Cape Reinga and Spirits Bay.

Etymology

With lines (Latin).

Discussion

The identification of a new, extant species of *Penion* increases the diversity of the genus in New Zealand. *Penion lineatus* n. sp. has the smallest, most restricted distribution of any living member of the genus, whereas all other local *Penion* species have much larger geographic ranges (Ponder 1973; Powell 1979; NMNZ <http://collections.tepapa.govt.nz/>). Future research should acquire molecular data from *P. lineatus* n. sp. in order to determine its evolutionary relationship with other taxa.

The identification of a new species of *Penion* restricted to the cold waters north of Cape Maria van Diemen supports the view of the region as a marine biodiversity 'hotspot'. The region is home to the present *Penion* species, as well as three endemic species of *Cominella* Gray, 1850 (Willan 1978; Donald et al. 2015) which, like *Penion*, is a buccinoid genus with many otherwise widely distributed species in New Zealand and Australia (Ponder 1973; Powell 1979; Donald et al. 2015). The presence of these and many additional endemic species in the region suggests that there is a significant drive for speciation there, whether through local opportunity and adaptation, or by a restriction of dispersal and gene flow. A main dispersal limiter seems likely to be the local

cooling due to upwelling. Some of the endemic marine taxa may be derived from cold-adapted southern lineages that moved northward during the glacial maxima and persisted in local cool conditions following recovery during interglacials. High marine invertebrate diversity and endemism north of Cape Maria van Diemen warrants further investigation.

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ORCID

Simon F. K. Hills  <http://orcid.org/0000-0002-9115-0375>

Felix Vaux  <http://orcid.org/0000-0002-2882-7996>

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