ZOOTAXA

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New species of Australian Scissurellidae (Mollusca: Gastropoda: Vetigastropoda) with remarks on Australian and Indo-Malayan species

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Abstract

Three new species of Scissurellidae from Australia are described: *Incisura auriformis* n. sp., *Scissurella quadrata* n. sp., and *Sci. spinosa* n. sp. They are compared to other species occurring in Australian waters: *I. remota* (Iredale, 1924) [+ *I. vincentiana* (Cotton, 1959)], *I. rosea* (Hedley, 1904), *Sci. cyprina* Cotton & Godfrey, 1938, *Sci. declinans* Watson, 1886, *Sci. evaensis* Bandel, 1998 [+ *Maxwellella unispirata* Bandel, 1998], *Sinezona plicata* (Hedley, 1899), *Sukashitrochus atkinsoni* (Tenison-Woods, 1877), *Suk. indonesicus* Bandel, 1988 [+ *Suk. simplex* Bandel, 1998], *Suk. pulcher* (Petterd, 1884), and *Trogloconcha tesselata* Kase & Kano, 2002. As under-appreciation of intraspecific variability has resulted in the introduction of synonyms, multiple specimens are illustrated here, along with radulae and distributional maps.

Key words: microgastropods, biodiversity, Australasian, tropical, temperate, distribution

Introduction

Scissurellidae (Mollusca: Gastropoda: Vetigastropoda) is a family of basal snails, formerly classified in the archaeogastropod grade, and now placed in Vetigastropoda (Salvini-Plawen & Haszprunar 1987; Haszprunar 1993). Members of the family occur in all oceans, from the shallow intertidal to the abyss, including hydrothermal vents. The monophyly of the family is questionable, as pointed out by Bouchet & Warén (2001), who consider the vent subfamilies Temnocinclinae and Sutilizoninae more closely related to Lepetodrilidae. Recent molecular data (Geiger & Thacker unpubl. data) also suggest that Anatominae and Scissurellinae not to be monophyletic; Scissurellinae is sistergroup to Lepetodrilidae plus Clypeosectidae in a crow clade with Haliotidae, whereas Anatominae is amongst the most basal Vetigastropoda. Despite these new developments with respect to the higher classification of scissurellid lineages, we treat the group here in the traditional sense at the family level.

Approximately 163 Recent species have been described, but the number of undescribed species may be close to twice of its present day known diversity (Geiger 2003). The small size of the species, 0.5–10 mm, has certainly contributed to the poor knowledge of this family. The first species was described by Fleming in 1828 from Europe. Only the advent of scanning electron microscopy (SEM) has permitted to fully investigate these organisms. The more important studies include Yaron's (1983) revision of the Red Sea species, Herbert's (1986) revision of the South African species, McLean's (1989) description of discrete forms from the hydrothermal vent environment, Marshall's (1993) description of slit-less groups, Bandel's (1998) description of new genera and species, Marshall's (2002) description of New Zealand species, Geiger's (2003) phylogenetic assessment of characters used for generic classification, and Geiger & Jansen's (2004) revision of the Australian *Anatoma* and *Thieleella* species.

Scissurellids are known from the Australian fauna since 1877 (Tenison-Woods 1877). To date, all assessments of the fauna have been based on light microscopy (Cotton & Godfrey 1933; Jansen 1999), with the exception of our recent treatment (Geiger & Jansen 2004). Here we present a more detailed analysis of Australian Scissurellidae, based on extensive use of SEM. Many species are here illustrated for the first time using SEM. We also provide indications as to the intraspecific variability of species illustrating multiple specimens from throughout their ranges, and provide supplemental information on radula as much as the available material permitted. Lack of documented range of intraspecific variability has resulted recently in the introduction of synonyms (*Scissurella evaensis* Bandel, 1998 = *Maxwellella unispirata* Bandel, 1998; *Sukashitrochus indonesicus* Bandel, 1998 = *Suk. simplex* Bandel, 1998). This contribution is based primarily on the holdings of the Australian Museum, Sydney, and was supplemented with selected specimens from other collections.

Materials and Methods

All specimens were first inspected and identified using light microscopy. Suitable specimens for SEM were cleaned in sonicator in a mild detergent solution. Radulae were extracted from specimens by treatment in approximately 10% NaOH or KOH at 35°C overnight. Shells from which the radulae were extracted were also photographed by SEM, but were not sonicated, because the hydroxide treatment weakens the shell, which usually breaks during sonication. [In hindsight, shells should not have been treated with hydroxide. Better handling and preparation techniques will be discussed by Geiger *et al*., in prep.] Specimens were mounted on double-sided carbon adhesives or using coloidal graphite. Shells were attached at the periphery of the last adult whorl opposite the aperture. It permitted to obtain the apertural view, as well as the apical (including protoconch) and basal views of every specimen using tilt and rotate of the stage. All images were captured as digital .tif files and processed in Photoshop (Adobe 1998). File manipulation was restricted to removal of background, local contrast adjustment, and unsharp masking; shells were not "improved" or cleaned from dirt.

Distribution data are given as found on specimen labels or institutional databases; some depth indications were provided to the nearest meter. Distribution maps were generated from raw maps obtained from the Xerox-Parc site (defunct, see Geiger, 1998a for details), on which distribution data were plotted using iMap (Schols & Dessein 2001).

All material examined is cited. The term "complete" denotes samples containing animals. We consider this term superior to "live taken" used by authors, because in many live taken specimens the animal has been discarded.

Protoconch whorls are counted in apical view by extending the imaginary spiral starting in the middle of the apertural margin of the protoconch towards the tip of the embryonic cap. At the intersection between this imaginary spiral and the border of the embryonic

cap an imaginary line is placed at right angles to the imaginary spiral. One whorl is counted when half of the apertural margin crosses the above line towards the outside, i.e. centripetally from intersection of spiral with embryonic cap.

Abbreviations

OD	Original designation.
M	Monotypy.
SD	Subsequent designation.
NT	Northern Territory, Australia.
QLD	Queensland, Australia.
NSW	New South Wales, Australia.
VIC	Victoria, Australia.
TAS	Tasmania, Australia.
SA	South Australia, Australia
WA	Western Australia, Australia.
AMS	Australian Museum Sydney, NSW, Australia.
BMNH	The Natural History Museum, London, Great Britain.
DLG	Daniel L. Geiger collection, Los Angeles, USA [to be deposited in SBMNH].
LACM	Los Angeles County Museum of Natural History, California, USA.
NMSZ	National Museum of Scotland, Zoology, Edinburgh, Great Britain.
NSMT	National Science Museum, Tokyo, Japan.
SAM	South Australian Museum, SA, Australia.
SBMNH	Santa Barbara Museum of Natural History, California, USA.
SGPIH	Collection [= Sammlung] Geological-Paleontological Institute and Museum of the University Hamburg, Germany.
TMAG	Tasmanian Museum, Hobart, Australia.
USNM	United States National Museum, Smithsonian Institution, Washington (DC), USA.
WAM	Western Australian Museum, Perth, WA, Australia

Conventions used in synonymy

Genus species Author date: pagination, figures. Denotes the original description of the species considered valid.

Genus species: Author, date: pagination, figures. Denotes a genus and species name given to a specimen by that author. If the species epithet is not identical to the species discussed, then it is a misidentification by that author after the colon.

+ *Genus species* Author, date: pagination, figures. Denotes a synonym of the species discussed.

not *Genus species*: Author, date, pagination, figures. Denotes a misuse of the species name discussed.

Systematics

Incisura Hedley, 1904

For discussion of *Incisura* see Geiger (2003).

Incisura auriformis new species: Figures 1–2, 3A–C, 3G

Sinezona "auriform": Jansen, 1999: 55, figs. 73–75.

Type material. HOLOTYPE AMS C.402714: mounted on AMS stub 4366. PARATYPES: AMS C.402714: 7, 8: complete. AMS C.402716, 18, 11: complete. AMS C.406357.

Type locality. 0–4 m, Cape Peron, 30 mls [= 56 km] S of Perth, WA, Australia, 32.270°S, 115.685°E. *Posidonia* & algae, sheltered S side.

FIGURE 1. *Incisura auriformis* n. sp., holotype. AMS C.402714. 0 m, Cape Peron, 56 km South of Perth, WA, Australia, 32.270°S, 115.685°E. Scale bar shell = 200 µm. Scale bars spire and protoconch = 50 µm.

Etymology. *Auris-*: Latin for ear, *-formis*: Latin shaped like, referring to the ear-shape of the shell.

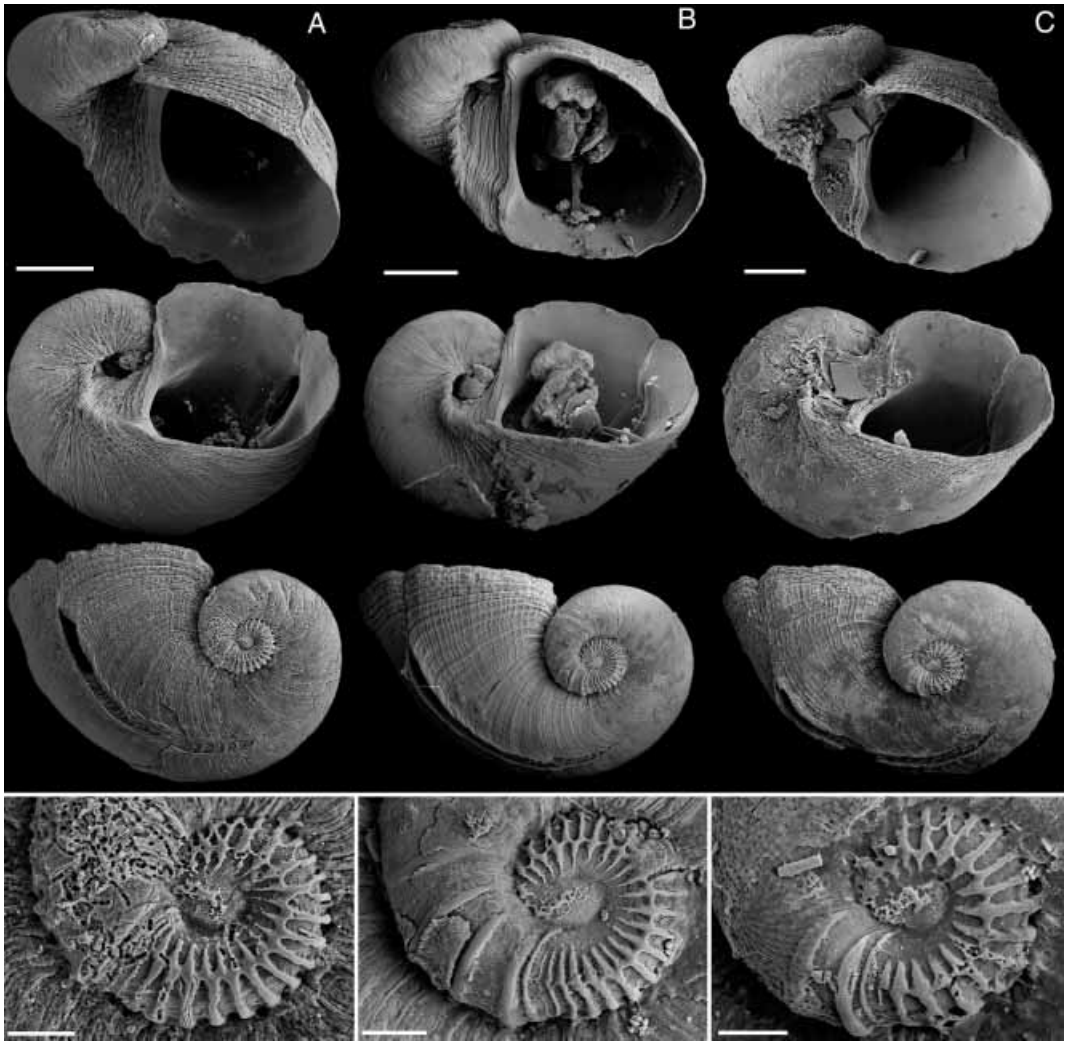

FIGURE 2. *Incisura auriformis* n. sp., paratypes. A. AMS C.406357. Kilcarnup, N side of Margaret River, WA, Australia, 33.950°S, 114.983°E. B–C. AMS C.402716. 0 m, Garden Island, S of Perth, WA, Australia, 32.233°S, 115.683°E. Scale bars shell = 200 µm. Scale bars protoconch = 50 µm.

Description. Shell small to medium size (1.0 mm). Protoconch 0.75 whorls, with fine axials, apical area of axials connecting forming spiral cord, no apertural varix, apertural margin convex. Teleoconch I 0.8–0.9 whorls, immediately following protoconch 2–3 axials, otherwise smooth. Teleoconch II approximately 0.5 whorls, shoulder with approximately 20 fine spirals, irregular axials. Base smooth, with spirals towards umbilicus. Umbilicus broad, deep, walls almost vertical, umbilical walls at strong angle to base, bor-

dered by strong spiral cord. Selenizone above periphery, keels hardly developed; foramen narrow, lanceolate; suture anterior to foramen as long or longer than foramen in fully mature specimens. Aperture subrotund, adumbilical portion straight, parallel to coiling axis; small, distinct shelf at end of periumbilical cord. Operculum round, smaller than outline of apertural rim. Radula n-5-R-5-n, rachidian tooth with triangular cusp, lateral teeth 1–3 similar, lateral tooth 4 reduced hook-shaped, lateral tooth 5 broadened enlarged, inner marginal teeth with broad cusp, outer marginal teeth spoon-shaped.

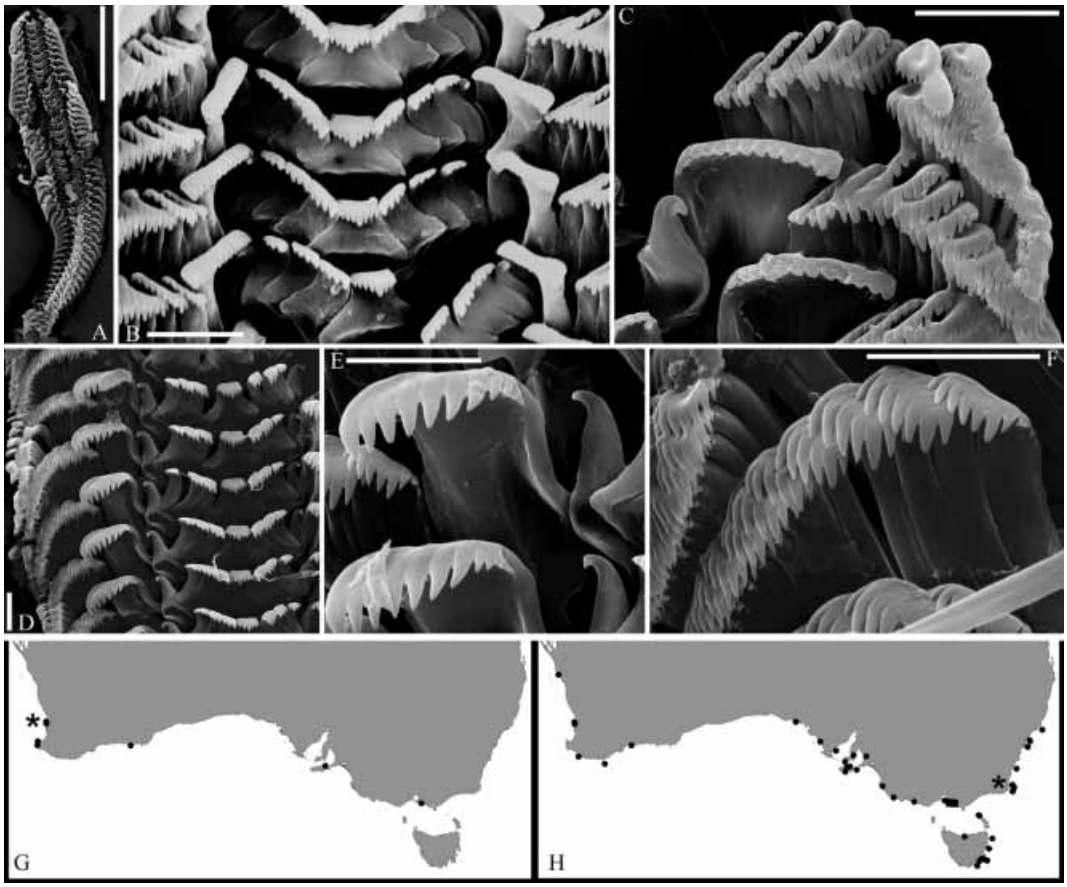

FIGURE 3. A–C, G: *Incisura auriformis* n. sp., radula, AMS C.402716 [paratype]. 0 m, Garden Island, S of Perth, WA, Australia, 32.233°S, 115.683°E. A. overview of entire radula. Scale bar = 100 µm. B. Central field enlarged with hook-shaped lateral tooth four. C. Hook-shaped lateral tooth 4, broad lateral tooth 5, and marginal teeth. Scale bars B–C = 10 µm. D–F, H: *Incisura remota* radula. Scale bars = 10 µm. D. Overview showing well-exposed, hook-shaped lateral teeth 4. E. Hook-shaped lateral tooth 4 and enlarged lateral tooth 5. F. Marginal teeth. G. Distribution map of *I. auriformis* n. sp. H. Distribution map of *I. remota*. Dots: specimen records. Squares: literature records. Star: type locality.

Differential diagnosis. *Incisura remota* (Iredale, 1924) from southern Australia, has an open slit and has an indistinct apertural shelf at the end of the periumbilical cord. *Incisura rosea* (Hedley, 1904) from New Zealand (Fig. 5C) has distinct spirals on base from the level of the suture to the umbilicus, lacks the periumbilical cord, and the protoconch has more dense axials that extend into the inner portion of the protoconch.

Distribution. Endemic to southern Australia: SA to WA, Perth (32–38.5°S. 115.5–145°E. Fig. 3G). 0–8 m depth, live on various algae.

Specimen records.

Australia, SA. Kangaroo Island, Emu Bay, 35.583°S, 137.517°E (AMS C.404523, 0, 4: complete).

Australia, VIC. 0 m, Western Port Bay, West Head, Flinders, 38.508°S, 145.020°E (AMS C.79–47, 1).

Australia, WA. 0 m, Mississippi Bay, 56 km E of Esperance, 33.983°S, 122.283°E (AMS C.402715, 4). Kilcarnup, N side of Margaret River, 33.950°S, 114.983°E (AMS C.406357, 1). Yallingup, 33.650°S, 115.017°E (AMS C.404989, 0, 1: complete). 0 m, Point Peron, 56 km S of Perth, 32.270°S, 115.685°E (AMS C.402714, 8, 8: complete). 2 m, Point Peron, 56 km S of Perth, 32.267°S, 115.683°E (AMS C.402960, 1). 0 m, Garden Island, S of Perth, 32.233°S, 115.683°E (AMS C.402716, 18, 11: complete). 4 m, Carnac Island, W side, off Freemantle, 32.117°S, 115.667°E (AMS C.402961, 2, 8: complete).

Remarks. We place the current species in *Incisura*, a genus characterized by a smooth shell and rapidly expanding whorls. The other two species in *Incisura* have a slit, as opposed to a foramen. We are aware that the slit/foramen distinction has been used to classify species into genera (Geiger 2003), but consider overall shell shape and absence of sculpture the overriding classification feature in this case.

***Incisura remota* (Iredale, 1924):** Figures 3D–F, 3H, 4, 5A–B

Scissurella obliqua: Pritchard & Gatliff, 1902: 181 [not *Sci. obliqua* Watson, 1886].
Scissurona rosea remota Iredale, 1924: 215, not illustrated.
Scissurella obliqua: Verco, 1910: 115–116 [not *Sci. obliqua* Watson, 1886].
Scissurona remota: Cotton & Godfrey, 1933: 21–22, pl. 1, fig. 9.
Scissurona rosea remota: Iredale & McMichael, 1962: 30.
Scissurella remota: Macpherson & Gabriel, 1962: 34.
Scissurella rosea remota: Jansen, 1995: 11.
Scissurella rosea remota: Jansen, 1999: 52, figs. 31–33.
+ *Scissurona vincentiana* Cotton, 1945: 150, pl. 12, figs. 5–6. Type material. HOLOTYPE (SAM D.14109), 1.2 × 1.35 mm. Type locality. Glenelg, Gulf of St. Vincent, South Australia, Australia (OD). Etymology. Named for its provenance from Gulf of St. Vincent.
Scissurona vincentiana: Cotton, 1959: 46–47, fig. 17.
Scissurona vincentiana: Cotton, 1963: pl. 9, fig. 165.
Incisura vincentiana: Wilson, 1993: 46.

Types material. HOLOTYPE (whereabouts unknown).

Type locality. Twofold Bay [NSW, Australia, 37.083°S, 149.900°E] (OD).

Etymology. ?

Description. Shell small (0.8 mm), broad. Protoconch of 0.8–0.9 whorls, distinct axials, broad apically, forming spiral band, no varix, aperture convex to weakly sinusoid. Teleoconch I usually slightly >1 whorl, with more or less developed axials, usually present near suture, sometimes extending over entire shell as broad, low cords in portion closer to protoconch. Teleoconch II up to 0.5 whorl, shoulder smooth, sometimes with faint axials near suture. Base usually smooth, sometimes with partial axials near umbilicus. Umbilicus open, deep, walls steep, bordered by periumbilical cord, walls of umbilicus and base at distinct angle. Selenizone above periphery, keels faint, growth increments indistinct; slit open, margins parallel. Aperture rounded, no distinct shelf at end of periumbilical cord. Operculum round, central nucleus, smaller than aperture at apertural rim, approximately 10 indistinct growth rings visible. Radula n-5-R-5-n, rachidian with triangular cusp, lateral teeth 1–3 similar with asymmetrical cusps, lateral tooth 4 reduced hook-shaped, lateral tooth 5 broadly enlarged, inner marginal teeth broad, outer marginal teeth spoon-shaped cusps.

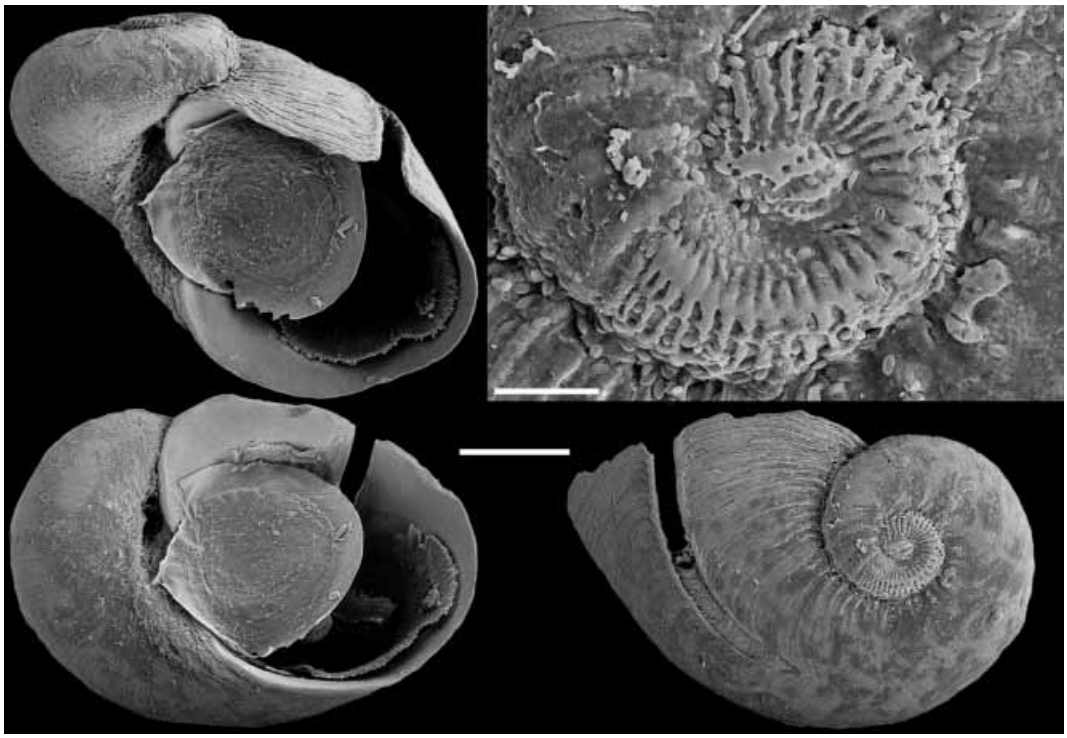

FIGURE 4. *Incisura remota.* AMS C.402700. Kangaroo Island, N coast, Western River Cove, SA, Australia, 35.683°S, 136.967°E. Scale bars shell = 200 µm. Scale bars protoconch = 50 µm.

Differential diagnosis. *Incisura auriformis* n. sp. from WA and SA has a distinct shelf in the lower aperture at the end of the periumbilical cord, even as a juvenile with open slit, and closes the slit to form a foramen in adults. *Incisura rosea* (Hedley, 1904) from New Zealand (Fig. 5C) has distinct spiral bands on the base from the level of the suture towards the umbilicus.

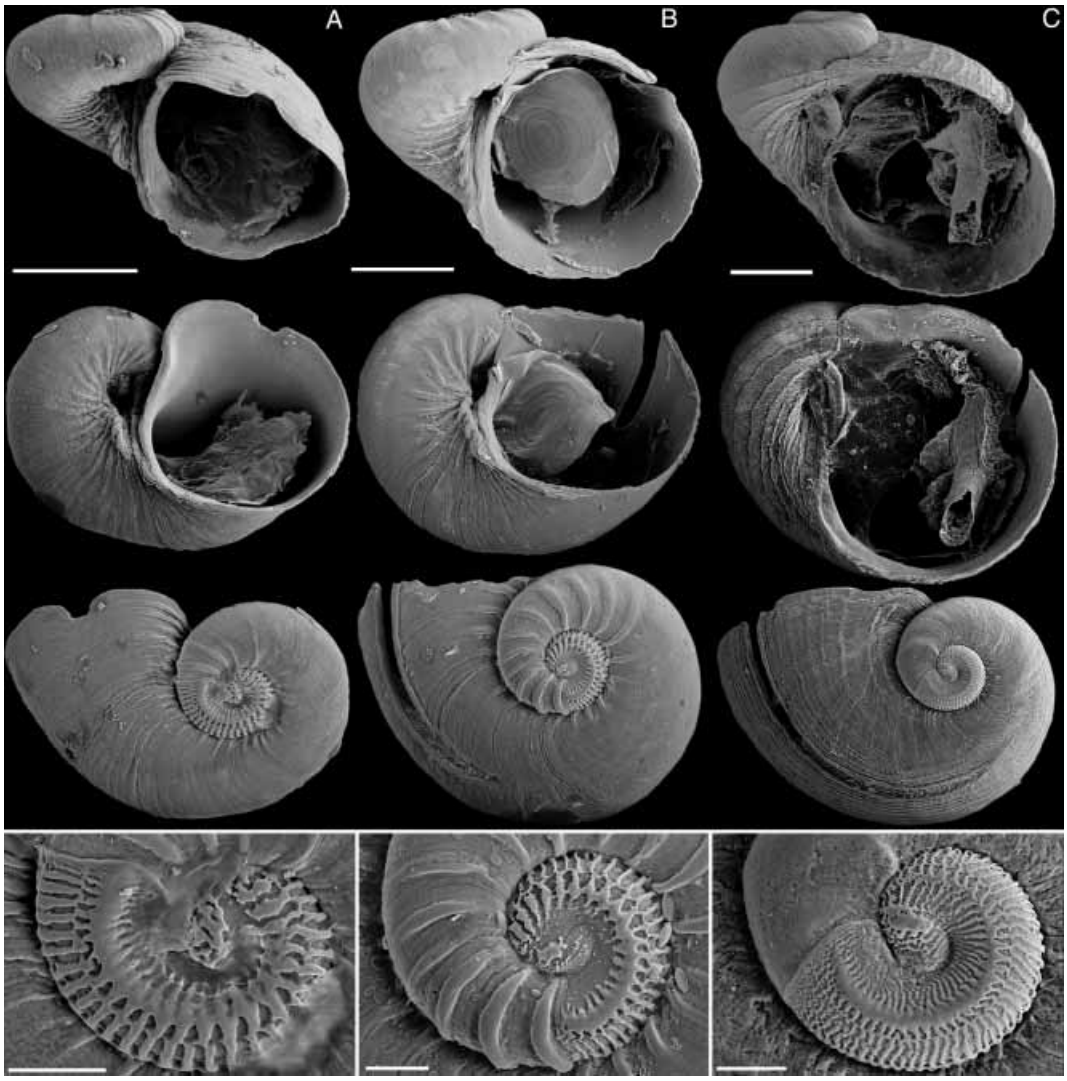

FIGURE 5. A–B: *Incisura remota*. A. AMS C.402701. 8 m, Gabo Island, near Monument Bay, VIC, Australia, 37.567°S, 149.917°E. B. AMS C.402699. 22 m, Maria Island, Shoal Halfmoon Bay, TAS, Australia, 42.075°S, 148.075°E. C. *Incisura rosea*. AMS C.406341. 55 m, Stewart Island, Port Adventure, New Zealand, 47.083°S, 168.183°E (AMS C.406341, 1). Scale bars shell = 200 µm. Scale bars protoconch = 50 µm.

Distribution. Endemic to southern Australia: south from central NSW (33°S) to WA, south of Shark Bay (27.5°S. 115.5–152°E. Fig. 3H). 0–50 m depth, live, on various algae.

Specimen records.

Australia, NSW. Bittangabee, N of Green Cape, 37.217°S, 150.017°E (AMS C.402702, 5; AMS C.404917, 10: complete). 2–4 m, Green Cape, S side of tip, 37.267°S, 150.050°E (AMS C.402774, 2). 45.5–73 m, Port Stephens, 32.708°S, 152.250°E (AMS C.402956, 1). Patonga, Broken Bay, 33.550°S, 151.267°E (AMS C.402616, 2). Port Hacking, 34.067°S, 151.100°E (AMS C.403742, 1). Sydney, Broken Bay, Pittwater, 33.617°S, 151.300°E (AMS C.402955, 1). Twofold Bay, 37.083°S, 149.900°E (AMS C.402775, 2). Twofold Bay, Eden, Aslings Beach, 37.050°S, 149.908°E (AMS C.403663, 4). Wimbie Beach, Batemans Bay, 35.783°S, 150.233°E (AMS C.402698, 13; AMS C.402773, 2).

Australia, SA. Cape Dombey, Robe, below Obelisk, 37.150°S, 139.750°E (AMS C.402820, 9). 0–5 m, Elliston, 33.650°S, 134.883°E (AMS C.402803, 3). Elliston Reef, 33.650°S, 134.883°E (AMS C.402801, 3, 14: complete). Gulf St. Vincent, Largs Bay, 34.817°S, 138.483°E (AMS C.402813, 1). Kangaroo Island N coast, Stokes Bay, 35.617°S, 137.200°E (AMS C.402776, 2; AMS C.402804, 5). Kangaroo Island N coast, Western River Cove, 35.683°S, 136.967°E (AMS C.402700, 1; AMS C.402807, 1; 402808, 2; AMS C.402809, 1). Kangaroo Island S coast, Hanson Bay, 36.033°S, 136.850°E (AMS C.402805, 8, 10: complete). Kangaroo Island S coast, Pennington Bay, 35.867°S, 137.750°E (AMS C.404887, 0, 1: complete). 6 m, Middle Point, 600 m offshore, near Cape Northumberland, 38.050°S, 140.617°E (AMS C.402819, 1). 13 m, Middle Point, near Cape Northumberland, 38.050°S, 140.617°E (AMS C.402818, 1). 0–1 m, Point Sinclair, 32.100°S, 132.983°E (AMS C.402822, 1; AMS C.402823, 3). 0–3 m, Pondalowie & Marion Bays, Yorke Peninsula, 35.233°S, 136.833°E (AMS C.402810, 1). Spencer Gulf, Tumby Bay, The Heap, 34.367°S, 136.133°E (AMS C.402812, 1). W side Cape Northumberland, Port Macdonnell, 38.050°S, 140.650°E (AMS C.402815, 1). Yorke Peninsula, Bluff Beach, 34.733°S, 137.483°E (AMS C.402619, 2).

Australia, TAS. 6 m, Bass Strait, Erith Deal Island, 39.450°S, 147.283°E (AMS C.402777, 4). Eaglehawk Bay, Eaglehawk Neck, 43.017°S, 147.917°E (AMS C.17704, 3). Eaglehawk Neck, N end Pirates Bay, 43.017°S, 147.950°E (AMS C.402643, 2; AMS C.402779, 1; AMS C.404892, 0, 18: complete). Pirates Bay, Eaglehawk Neck, 43.017°S, 147.933°E (AMS C.402778, 1; AMS C.404889, 0, 15: complete; AMS C.404890, 0, 3: complete). 10–30 m, Little Squally Cove, Deal Island, Bass Strait, 39.500°S, 147.333°E (AMS C.402781, 2, 1: complete). 22 m, Maria Island, Shoal Halfmoon Bay, 42.075°S, 148.075°E (AMS C.402699, 7, 9: complete). 30–50 m, Murray Pass, Deal Island, Bass Strait, 39.467°S, 147.300°E (AMS C.404888, 0, 1: complete). Primrose Point, E side of Frederick Henry Bay, 42.900°S, 147.683°E (AMS C.402782, 20, 5: complete; AMS C.402784, 7, 7: complete; AMS C.402785, 12, 5: complete). Roches Beach, W side of Frederick Henry Bay, 42.900°S, 147.500°E (AMS C.402780, 2). 8 m, S Bruny Island, Great Taylor Bay, 43.450°S, 147.167°E (AMS C.404903, 0, 1: complete). 5 m, St. Helens

Point, 41.280°S, 148.345°E (AMS C.404219, 0, 1: complete). Tinderbox Bay, S of Hobart, 43.050°S, 147.333°E (AMS C.402786, 3). Ulverstone, Picnic Point, 41.133°S, 146.167°E (AMS C.402697, 4).

Australia, VIC. 8–12 m, Gabo Island, near Monument Bay, 37.567°S, 149.917°E (AMS C.402701, 3). Mallacoota, 37.567°S, 149.933°E (AMS C.50399, 5; 50565, 1). Mornington Peninsula, Queenscliffe, 38.283°S, 144.667°E (AMS C.402795, 2; 402796, 3, 2: complete). Point Lonsdale, near Geelong, 38.300°S, 144.617°E (AMS C.402798, 1; AMS C.402799, 1; AMS C.404891, 0, 1: complete). Port Fairy, 38.383°S, 142.233°E (AMS C.402792, 7). Port Fairy, 0.25ml W of town, 38.383°S, 142.233°E (AMS C.402794, 1, 1: complete; AMS C.404884, 0, 1: complete; AMS C.404886, 0, 2: complete). 12–14 m, SSE side Gabo Island, 37.567°S, 149.917°E (AMS C.404218, 0, 1: complete). Western Port, West Head, near Flinders, 38.487°S, 145.025°E (AMS C.14474, 7).

Austalia, WA. 4–8 m, Carnac Island, W side, off Freemantle, 32.117°S, 115.667°E (AMS C.402829, 1). Hopetoun, Two Mile Beach, 33.950°S, 120.117°E (AMS C.402826, 1). Horrocks Beach, N of Geraldton, 28.383°S, 114.433°E (AMS C.402832, 1). 0.5–2 m, Near Hopetoun Jetty, 33.950°S, 120.117°E (AMS C.402827, 3). 150 m, Albany, 35.407°S, 118.047°E (AMS C.402712, 1). 2–3 m, Cape Peron, 30ml S of Perth, 32.267°S, 115.683°E (AMS C.402621, 2). Windy Harbour, 34.833°S, 116°E (AMS C.402831, 1).

Literature records. Flinders [38.483°S, 145.017°E], San Remo [38.517°S, 145.367°E], Point Nepean, Victoria (Macpherson & Gabriel, 1962).

Remarks. We elect here to use *I. remota* as a full species, not as a subspecies of *I. rosea* from New Zealand. There is no evidence of peripheral mixing of populations or of specimens with intermediate characters, hence, the shell morphospaces as indicators of genepools are distinct. Puslednik (2004) also demonstrated with molecular tools the distinctness of New Zealand and Australian gastropod clades previously considered a single, implicitly panmyctic, species.

Incisura vincentiana (Cotton, 1945) seems to be based on large, partially eroded specimens lacking any further distinctive characters. We here synonymize *I. vincentiana* under *I. remota*.

Scissurella d'Orbigny, 1824

For discussion of *Scissurella* see Geiger (2003).

Scissurella cyprina Cotton & Godfrey, 1938: Figures 6–8, 9A–C.

Scissurella ornata: Cotton & Godfrey, 1933: 21, pl. 1, fig. 8 [not *Sci. ornata* May, 1908].
Scissurella cyprina Cotton & Godfrey, 1938: 199, not illustrated.
Scissurella cyprina: Cotton, 1959: 45–46, fig. 16.

Scissurella cyprina: Wilson, 1993: 46.
Scissurella cyprina: Jansen, 1999: 50–51, figs. 19–21.
Scissurella cyprina: Geiger, 2002: 1, text-fig [shell, radula].

Type material. HOLOTYPE (SAM D9674), 2 × 1.5 mm (OD: SAM presently does not hold any scissurellid types: B. Smith, pers. comm. 5. 2002). HOLOTYPE (TAM E219), damaged (pers. comm. L. Turner).

Type locality. Venus Bay, South Australia, Australia (OD).

Etymology. Latin *cypris*, a title of Venus; a shell from Venus Bay.

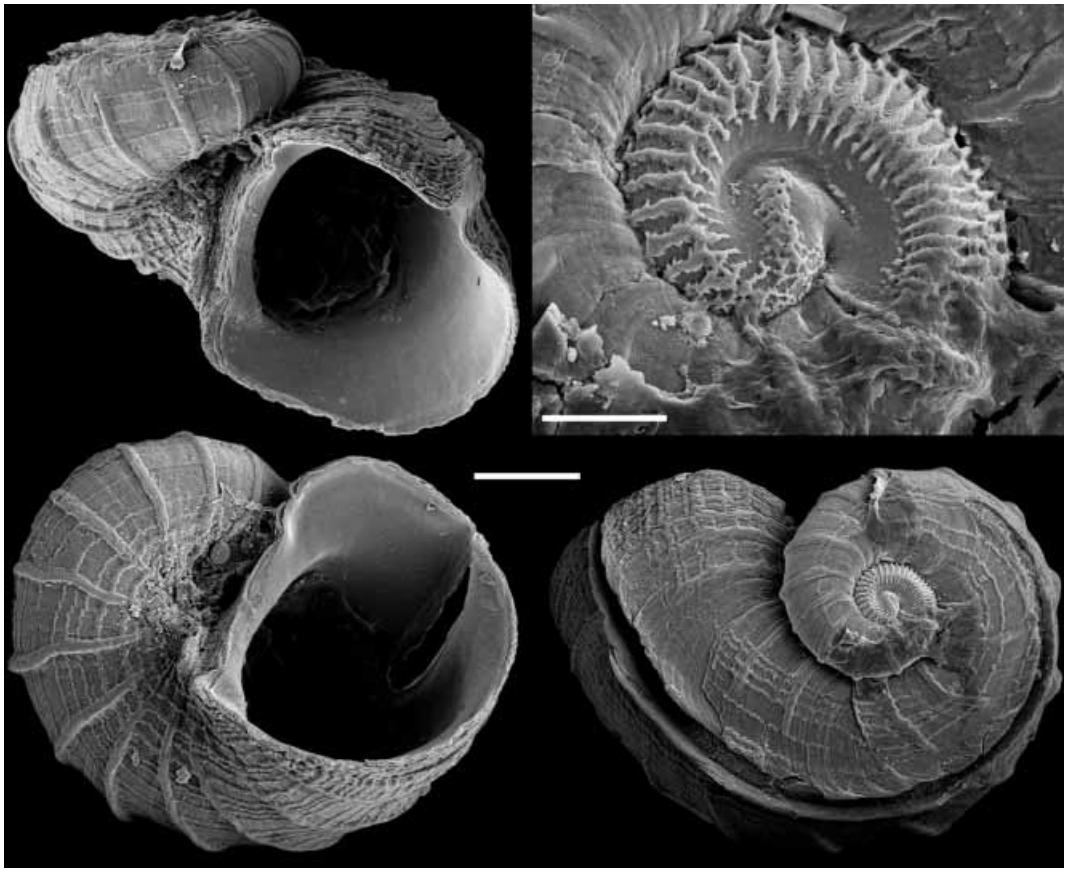

FIGURE 6. *Scissurella cyprina*. 0–4 m, Cape Peron, 56 km S of Perth, WA, Australia, 32.270°S, 115.685°E (AMS C.377559, 2). Scale bar shell = 200 µm. Scale bar protoconch = 50 µm.

Description. Shell small (to 2 mm, usually slightly less than 1 mm), depressed trochiform. Protoconch 1.25 whorls, with dense (approximately 30) strong axials on outer and top portion of whorl, inner portion smooth, tops of axials thickened, touching one another, forming spiral cord, no varix, aperture curved. Teleoconch I 0.75 to 0.875 whorls, 8–13 (usually 11–12) strong axials, interstices with irregularly spaced fine growth increments, usually faint spiral in position of selenizone (may easily erode), additional spiral develop-

ing on shoulder towards end of teleoconch I growth phase. Teleoconch II of >0.5–0.75 whorls, shoulder with strong axials of approximately equal spacing as on teleoconch I, up to 10 narrow but distinct spirals at aperture of mature specimen. Base sculpture variable: axials usually as distinct as on shoulder, sometimes becoming fainter towards umbilicus. Spirals from zero to a few towards the umbilical region to 12 equally spaced ones. Umbilicus deep, smooth transition to base, no keel. Selenizone on outer shoulder, moderately elevated keels often abraded, slit open. Aperture subquadrate, often detached from previous whorl. Operculum present, with few concentric growth lines.

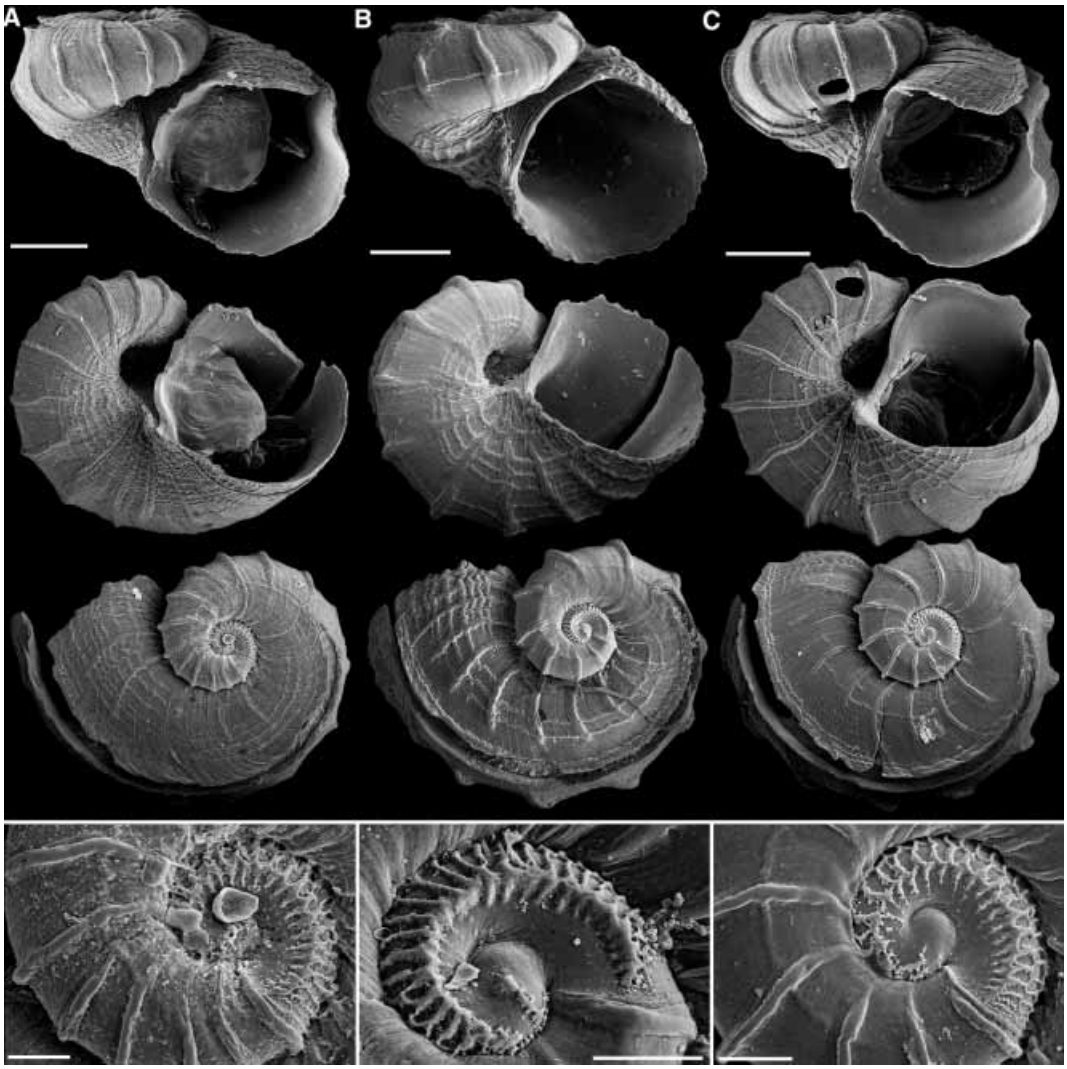

FIGURE 7. *Scissurella cyprina*. A. Port Lincoln, Billy Lights Point, SA, Australia, 34.750°S, 135.883°E (AMS C.377571, 6). B. 57 m, Albany, WA, Australia, 35.167°S, 117.878°E (AMS C.377547, 1). C. 3 m, Point Turton, W Yorke Peninsula, SA, Australia, 34.950°S, 137.350°E (AMS C.377569, 3). Scale bars shell = 200 µm. Scale bars protoconch = 50 µm.

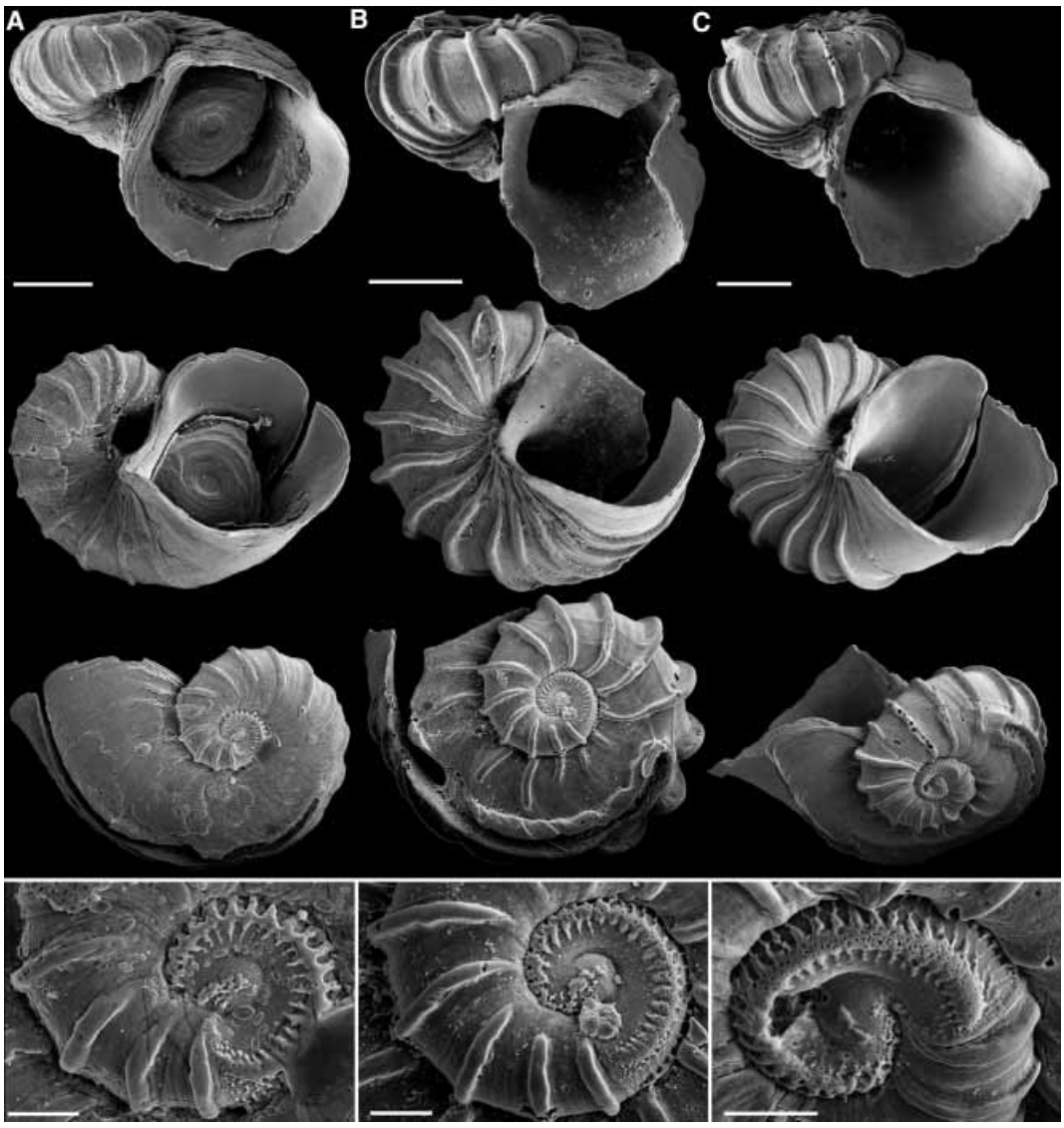

FIGURE 8. *Scissurella cyprina*. A. 5 m, off Narooma, Montague Island, NSW, Australia, 36.253°S, 150.225°E (AMS C.377575, 3). B. AMS C. 406361. C. 3 m, Point Turton, W Yorke Peninsula, SA, Australia, 34.950°S, 137.350°E (AMS C.377569, 3). Scale bars shell = 200 µm. Scale bars protoconch = 50 µm.

Radula n-5-R-5-n, rachidian tooth with slightly triangular cusp, central denticle strongest, three smaller ones on each side; lateral teeth 1-3 similar each with three denticles on cusp, lateral tooth 4 hook-shaped, lateral tooth 5 broad, tips of cusps almost parallel with base; inner marginal teeth broad, outer marginal teeth spoon-shaped.

Differential diagnosis. *Scissurella cyprina* is characterized by the distinct spirals on the shoulder that markedly increase in strength on teleoconch II towards the apertural mar-

gin. *Scissurella declinans* Watson, 1886 from the Indo-Malayan Archipelago and Western Pacific is more inflated and proportionally wider than *Sci. cyprina*. *Scissurella evaensis* Bandel, 1998 from the Indo-Malayan Archipelago and Central Pacific has a characteristic spiral row of elevated lamellae on the mid-base. *Scissurella quadrata* n. sp. from Indo-Malayan Archipelago is overall more square in outline, has fine axial and spiral sculpture that is evenly distributed over the entire shell. *Scissurella spinosa* n. sp. from the Indo-Malayan Archipelago has spirals and axials of equal strength and evenly distributed over the entire shell; where spirals and axials intersect its characteristics strong points are formed giving it an overall spiny appearance.

Distribution. Southern Australian endemic: from NSW south of 34°S to WA, south of North West Cape (22.5°S. 113.5–151.5°E. Fig. 9C).

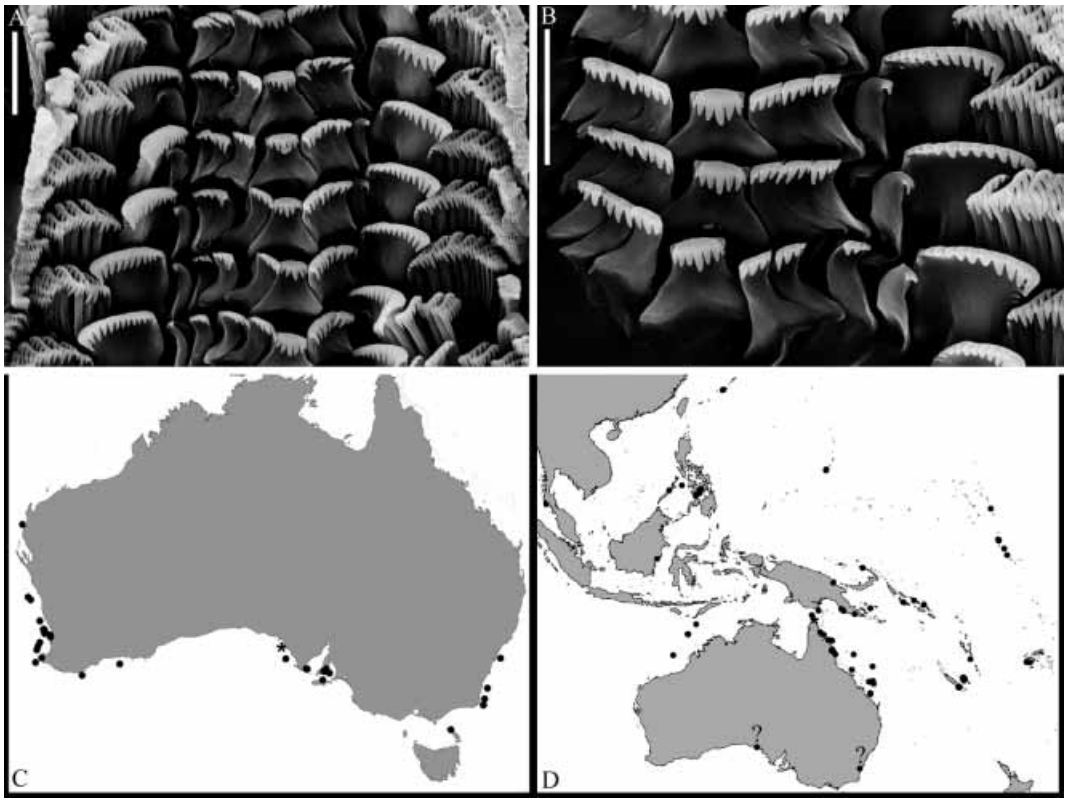

FIGURE 9. A–C. *Scissurella cyprina*. A. Full width of radula. Scale bar = 10 µm. B. Central field enlarged with more prominent hook-shaped lateral tooth 4. Scale bar = 10 µm. C. Distribution of *Sci. cyprina*. D. Distribution map of *Sci. declinans*. Dots: specimen records. Star: type locality. Question mark: doubtful locality data.

Specimen records.

Australia, NSW. Little Coogee Bay, S of Sydney, 33.921°S, 151.262°E (AMS

C.346336, 1). Off Eden, 37.083°S, 150.000°E (AMS C.377578, 1). 5 m, off Narooma, Montague Island, 36.253°S, 150.225°E (AMS C.377575, 3).

Australia, SA. 7 m, Edithburgh Jetty, Yorke Peninsula, 35.083°S, 137.750°E (AMS C.404233, 0, 5: complete). Fisherman Point, Cape Donnington, 34.758°S, 135.983°E (AMS C.377572, 1; AMS C.377574, 2). 7 m, Kangaroo Island N coast, Stokes Bay, 35.617°S, 137.200°E (AMS C.377598, 1, 2: complete). 18 m, Pearson Island, 33.967°S, 134.283°E (AMS C.404988,). Point Souttar, Yorke Peninsula, 34.900°S, 137.267°E (AMS C.377595, 1). 3 m, Point Turton, W Yorke Peninsula, 34.950°S, 137.350°E (AMS C.377569, 3). 1–4 m, Point Turton, W Yorke Peninsula, 34.950°S, 137.350°E (AMS C.377573, 2). Port Lincoln, Billy Lights Point, 34.750°S, 135.883°E (AMS C.377571, 6). Venus Bay, 33.233°S, 134.683°E (SAM , 1). Yorke Peninsula, Bluff Beach, 34.733°S, 137.483°E (AMS C.402703, 1).

Australia, TAS. 10–30 m, Little Squally Cove, Deal Island, Bass Strait, 39.500°S, 147.333°E (AMS C.404901, 0, 1: complete).

Australia, VIC. 24 m, SSE end of Gabo Island, 37.567°S, 149.910°E (AMS C.377570, 1). 28 m, SSE end of Gabo Island, 37.567°S, 149.917°E (AMS C.404987,).

Australia, WA. 92 m, 50ml N of Boolbarly, 23.467°S, 113.467°E (AMS C.377576, 1). 4–8 m, Carnac Island, W side, off Freemantle, 32.117°S, 115.667°E (AMS C.377278, 3). Carnac Island, W side, off Freemantle, 32.123°S, 115.658°E (AMS C.377548, 1). 4–8 m, Carnac Island, W side, off Freemantle, 32.117°S, 115.667°E (AMS C.377579, 1; AMS C.379972, 2). 120 m, Direction Bank, off Rottnest Island, 31.768°S, 115.203°E (AMS C.377543, 1). 130 m, Direction Bank, off Rottnest Island, 31.703°S, 115.170°E (AMS C.377563, 1). 120 m, Direction Bank, off Rottnest Island, 31.723°S, 115.230°E (AMS C.377568, 1). Ellensbrook, S Cowaramup, near Margaret River mouth, 33.883°S, 114.983°E (AMS C.379975, 1). 161–165 m, NW of Bunbury, 33.250°S, 114.600°E (AMS C.377593, 2). 71 m, Albany, 35.245°S, 118.173°E (AMS C.377592, 6). 170 m, Bunbury, 33.000°S, 114.683°E (AMS C.377565, 2). 70–90 m, off Esperance, 34.360°S, 121.160°E (AMS C.377282, 1). 150 m, Rottnest Island, 31.778°S, 115.170°E (AMS C.377283, 1). 140 m, Rottnest Island, 31.633°S, 115.133°E (AMS C.377285, 2). 124 m, Rottnest Island, 31.650°S, 115.167°E (AMS C.377286, 3). 155 m, Rottnest Island, 31.732°S, 115.158°E (AMS C.377287, 1). 148 m, Rottnest Island, 31.688°S, 115.143°E (AMS C.377566, 1). 124 m, Rottnest Island, 31.940°S, 115.285°E (AMS C.377596, 1). 150 m, Rottnest Island, 31.703°S, 115.137°E (AMS C.377597, 2). 138 m, Rottnest Island, 31.737°S, 115.195°E (AMS C.377599, 1). 150 m, Rottnest Island, 31.663°S, 115.118°E (AMS C.377602, 2). 134 m, Rottnest Island, 31.777°S, 115.213°E (AMS C.377603, 2). 148 m, Rottnest Island, 31.688°S, 115.143°E (AMS C.403739, 1). 0–4 m, Cape Peron, 30ml S of Perth, 32.270°S, 115.685°E (AMS C.377559, 2; AMS C.404907, 0, 1: complete). 146–150 m, SW of Mandurah, 32.683°S, 114.850°E (AMS C.377601, 2). 274–219 m, W of Cape Hamelin, 34.250°S, 114.500°E (AMS C.377280, 1). 146 m, W of Dongara, 29.350°S, 114.117°E (AMS C.377281, 3). 183 m, W of Dongara, 29.142°S, 113.913°E (AMS C.377545, 4).

201–214 m, W of Rottnest Island, 31.992°S, 115.217°E (AMS C.377279, 3). 146 m, W of Rottnest Island, 31.000°S, 114.850°E (AMS C.377567, 1).

Literature records. Cape Borda [35.750N, 136.567°E], Minlacowie, SA (Cotton 1959).

***Scissurella declinans* Watson, 1886:** Figure 9D, 10–12

Scissurella declinans Watson, 1886: 115–116, pl. 8, fig. 2.
Scissurella declinans: Pilsbry, 1890: 57, pl. 65, figs. 6–8.
Scissurella declinans: Thiele, 1912: 18, pl. 2, figs. 17–19 [copy figures Watson].
Scissurella declinans: Batten 1975: fig. 13.
Scissurella declinans: Jansen, 1999: 51, figs. 25–27.
Misidentification
not *Sukashitrochus declinans*: Bandel, 1998: 54–55, pl. 19, figs. 1–3 [is *Suk. atkinsoni*].

Type material. 2 SYNTYPES (BMNH 1887.2.9.404–405: A. Campbell, pers. comm.), 0.044″ × 0.063″ [1.8 × 2.5 mm].

Type locality. Station 185b, Raine Island, Cape York, North Eastern Australia [Queensland, Australia]. 11°38′15″S 143°59′38″E, 55 fms. (100 m), coral sand (OD).

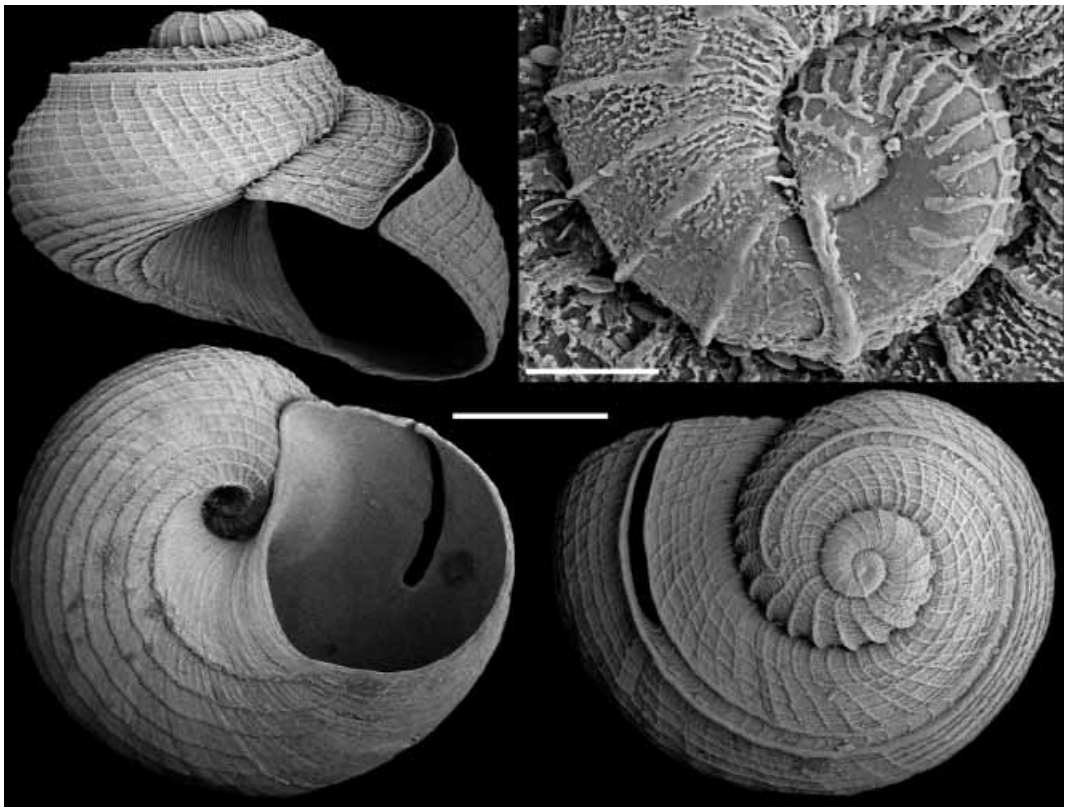

FIGURE 10. *Scissurella declinans*. AMS C.406355. Sovi Bay Souvi, SW coast Viti Levu, Fiji, 18.183°S, 177.600°E. Scale bar shell = 200 µm. Scale bar protoconch = 50 µm.

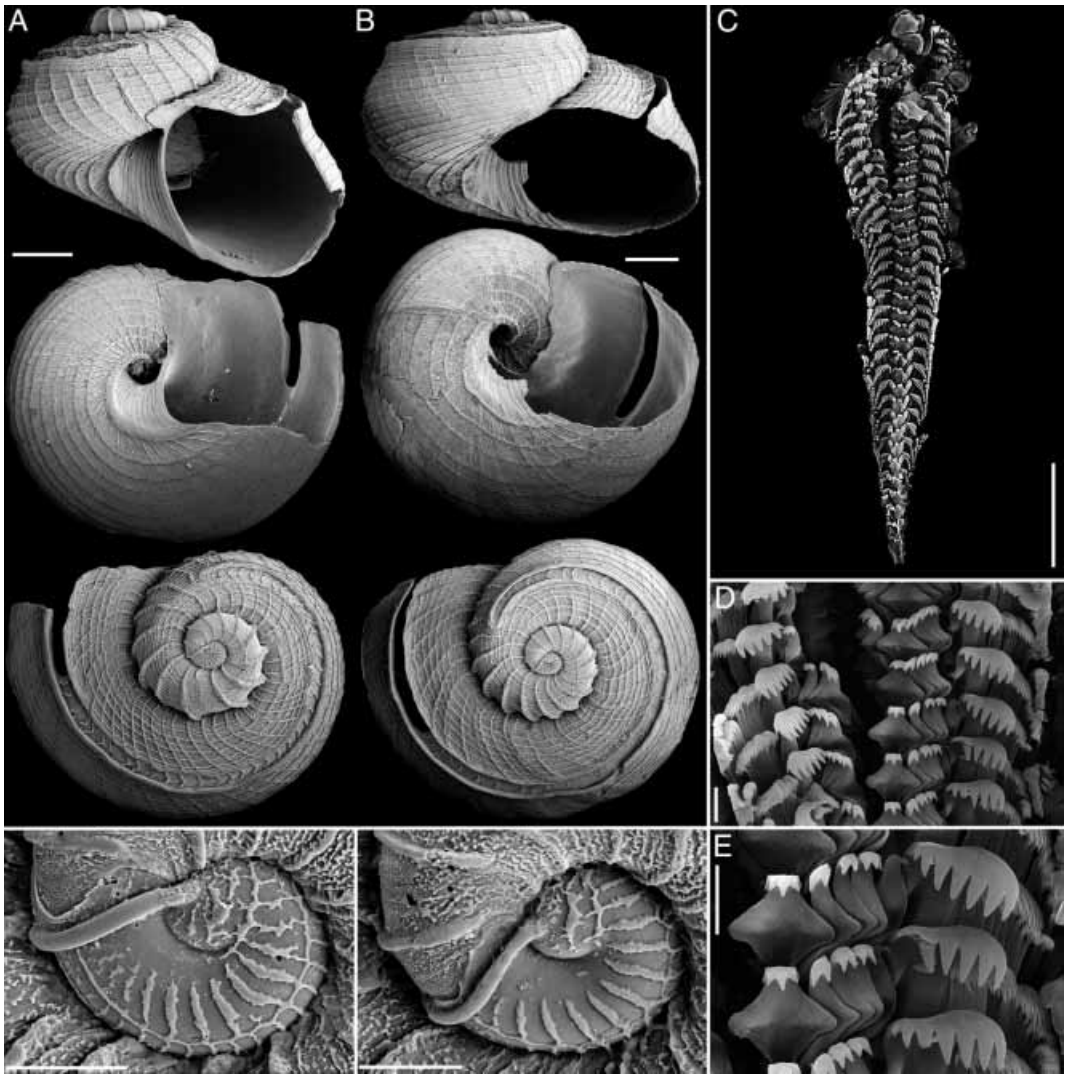

FIGURE 11. *Scissurella declinans*. A. AMS C.348640. GBR, Michaelmas Cay, QLD, Australia, 16.600°S, 145.983°E. B.–E. AMS C.348872. Viti Levu S coast, Korotongo, Fiji, 18.183°S, 177.533°E. Scale bar shell = 200 µm. Scale bar protoconch = 50 µm. C. Full radula. Scale bar = 100 µm. D. Full rows of radula. Scale bar = 20 µm. E. Blow-up of central field. Notice small, hook-shaped lateral four in top row, adjacent to hypertrophied lateral tooth 5. Scale bar = 20 µm.

Etymology. Named for the descending aperture of the shell (OD).

Description. Shell medium size (to 1.75 mm), trochiform. Protoconch 0.75 whorls, with fine axial sculpture, apertural varix connected to embryonic cap, apertural margin sinusoid. Teleoconch I 1.125–1.25 whorls, 15–19 axials, approximately a dozen weaker, evenly spaced spirals. Teleoconch II up to 1.33 whorls, shoulder slightly convex, axials weaker than on teleoconch I, slightly stronger than spirals; spirals of similar strength over entire teleoconch. Base proximal to selenizone with axials and spirals; axials not coordi-

nated with those on shoulder; 14–18 spirals from selenizone to umbilicus forming tiny knobs at intersection with axials portion proximal to selenizone; adumbilical portion of base without axials. Base and wide umbilicus at sharp angle; keel at most weak. Umbilical wall smooth, straight. Slit open in fully mature specimens, moderately elevated keels of slit almost touching at aperture. Growth marks on selenizone distinct, not coordinated with axials. Operculum round, with few irregular concentric growth rings. Radula with pentacuspid rachidian tooth, bi- or tricuspid lateral teeth 1–3 hook-shaped lateral tooth 4, hypertrophied lateral tooth 5. Marginal teeth with fine bristles, finer with increasing distance from rachidian tooth.

Differential diagnosis. *Scissurella staminea* (A. Adams, 1862) from Japan has stronger and less dense sculpture, with elevated axial cords, and finer spiral threads, forming small but distinct points at their intersections. All other *Scissurella* species in the Australian region have much more prominent sculpture and/or are not as inflated as *Sci. declinans*.

Distribution. Indo-Malayan Archipelago, western Pacific: Thailand to Fiji (98–178°E), Southern Japan to Queensland (26.5°N–23.5°S. Fig. 9D). 0–6 m depth, live, in algae and coral rubble of reefs.

Specimen records. Australia NSW. Batemans Bay, Surf Surfside Beach, 35.708°S, 150.200°E (AMS C.346286, 2).

Australia, NT. 9 m, Hibernia Reef, in lagoon, east side, NT, Australia, 11.979°S, 123.359°E (SBMNH , 1).

Australia, QLD. GBR, Capricorn Group, Heron Island, 23.433°S, 151.950°E (AMS C.406378, 1). 15 m, GBR, Capricorn Group, Heron Island, 23.433°S, 151.950°E (AMS C.348698, 1). 6 m, GBR, Capricorn Group, Heron Island, 23.433°S, 151.950°E (AMS C.348855, 1). GBR, Capricorn Group, Wilson Island, N side, 23.300°S, 151.950°E (AMS C.348647, 1). GBR, Swain Reefs, Bylund Gillett Cay, 21.717°S, 152.417°E (AMS C.348692, 4). 64 m, GBR, Swain Reefs, 3km NE of W side of Bylund Gillett Cay, 21.700°S, 152.433°E (AMS C.348635, 4). 3 m, GBR, Swain Reefs, Reef 21–189, 21.450°S, 151.683°E (AMS C.348700, 4, 17: complete). 10 m, GBR, Swain Reefs, Centennary Reef, 21.283°S, 152.333°E (AMS C.404208, 0, 1: complete). GBR, Gould Reef, NE of Bowen, 19.433°S, 148.867°E (AMS C.348696, 1, 1: complete). 20 m, Marion Reef, Coral Sea, off GBR, 18.950°S, 152.308°E (LACM 77–120, 1). GBR, Briggs Reef, E of Cairns, 16.950°S, 146.183°E (AMS C.404211, 0, 2: complete). GBR, 200 m SE of Michaelmas Cay, 16.600°S, 145.983°E (AMS C.404952, 0, 4: complete). GBR, Michaelmas Cay, 16.600°S, 145.983°E (AMS C.348640, 16). GBR, 200 m SE of Michaelmas Cay, 16.600°S, 145.983°E (AMS C.348695, 3). 16 m, GBR, Low Isles, 16.383°S, 145.567°E (AMS C.348701, 1). GBR, Undine Reef, 16.133°S, 145.667°E (AMS C.404201, 0, 4: complete). GBR, Lizard Island, Eagle Island, 14.700°S, 145.383°E (AMS C.403661, 1). GBR, Lizard Island, W side Eagle Island, 14.700°S, 145.383°E (AMS C.348646, 1). GBR, E side of Eagle Island, 14.700°S, 145.383°E (AMS C.348693, 2). 2 m, Between Lizard &

Palfrey Island, Lizard Island, GBR, 14.683°S, 145.450°E (AMS C.404953, 0, 1: complete). GBR, Lizard Island, Casuarina Research Station Beach, 14.683°S, 145.450°E (AMS C.406399, 1). 1 m, GBR, Lizard Island, Casuarina Beach, 14.683°S, 145.450°E (AMS C.348854, 1). GBR, Lizard Island, N side of Palfrey Island, 14.683°S, 145.450°E (AMS C.348856, 2). 615 m, near lagoon entrance, SE Lizard Island, 14.683°S, 145.458°E (LACM 79–55, 1). 20 m, GBR, Lizard Island, off SE side Bird Islet, 14.683°S, 145.467°E (AMS C.348699, 1). 15 m, 0.4 km off Anchor Bay, W Lizard Island, 14.670°S, 145.433°E (LACM 79–56, 1). 0 m, SW side Lizard Island, 14.670°S, 145.442°E (LACM 79–53, 9). 6 m, GBR, Lizard Island, off Osprey Island, 14.667°S, 145.433°E (AMS C.404203, 0, 20: complete). 5 m, GBR, Lizard Island, off Rocky Point, 14.667°S, 145.433°E (AMS C.404416, 1). GBR, Lizard Island, Bird Islet, 14.667°S, 145.467°E (AMS C.404206, 0, 4: complete). 19 m, GBR, No Name Reef, SW end, 14.667°S, 145.650°E (AMS C.348639, 1). 8 m, GBR, Lizard Island, North Point, 14.650°S, 145.450°E (AMS C.348857, 1). 15 m, GBR, Howick Group, Coquet No.1 Howick Island, 14.542°S, 144.992°E (AMS C.41226, 1). 8 m, GBR, No.5 Sandbank reef 13–120, SW end, 13.750°S, 144.267°E (AMS C.348636, 1). 19 m, GBR, off Bow Reef, near Cape Sidmouth, 13.333°S, 143.667°E (AMS C.2661, 1). Torres Strait, Wednesday Island, 10.533°S, 142.317°E (AMS C.348702, 1). 9 m, Torres Strait, off Murray Island, 9.933°S, 144.067°E (AMS C.48356, 7). Torres Strait, Yorke Island, S side, 9.733°S, 143.417°E (AMS C.404418, 1).

Australia, SA. 25 m, Petrel Bay, N of St. Francis Island, 32.200°S, 133.292°E (LACM 73–157, 1).

Australia, WA. 18–20 m, N end Mermaid Reef, Rowley Shoals, 17.050°S, 119.600°E (LACM 86–250, 5). 10 m, Seringapatam reef, inside lagoon, 13.642°S, 122.019°E (SBMNH , 1). 28 m, Seringapatam Reef, 13.628°S, 122.016°E (SBMNH uncatalogued, 2). 21 m, Seringapatam reef, N side, 13.624°S, 122.005°E (SBMNH , 4).

Coral Sea. NE Herald Cay, 16.933°S, 149.183°E (AMS C.406345, 1; AMS C.348637, 2).

Fiji. 1 m, S coast Viti Levu, Deuba, 18.250°S, 178.083°E (AMS C.348868, 7; AMS C.348869, 4). Komave, S coast Viti Levu, 18.217°S, 177.767°E (AMS C.402842, 2; AMS C.402849, 3, 6: complete; AMS C.348871, 3). Viti Levu S coast, Korotongo, 18.183°S, 177.533°E (AMS C.348872, 4; AMS C.349135, 18, 17: complete). Sovi Bay Souvi, SW coast Viti Levu, 18.183°S, 177.600°E (AMS C.406355, 15).

Indonesia. Kalimantan: Sembuga, ca 14 km by road E of Balikpapan, 1.233°S, 116.950°E (AMS C.349125, 1).

Thailand. 15 m, Koh Samah, SE Koh Phiphidon, SE of Phuket Island, 7.717°N, 98.783°E (SBMNH , 9).

Japan. 52 m, Okinawa, Zampa misaki, 26.435°N, 127.708°E (LACM 78–100, 1). 50 m, Okinawa, Onna Village, 26.495°N, 127.843°E (LACM 78–99, 4).

Kiribati. 11 m, Gilbert Islands, Nonouti Atoll, 0.667°S, 174.350°E (AMS C.402845, 1). 8 m, Apamana Lagoon Abemama, Gilbert Islands, 0.400°N, 173.867°E (AMS

C.402844, 1). 10 m, North Gilbert Islands, Abaiang, Point Bolton, 1.717°N, 172.983°E (AMS C.348638, 1). 10 m, North Gilbert Island, Abaiang Atoll, 0.5 km N of Tedio Island, 1.850°N, 172.967°E (AMS C.402852, 2). 2 m, North Gilbert Islands, Abaiang Atoll, NW end of lagoon, 1.917°N, 172.867°E (AMS C.402851, 1).

Mariana Islands. 1 m, 100 m, N marina dock, Merizo, Cocos Lagoon, Guam, 13.265°N, 144.665°E (LACM 78–17, 1). 1 m, S end Piti Bay, Guam, 13.456°N, 144.693°E (LACM 77–14, 2).

Marshall Islands. Arno Atoll, Ine, Lagoon Side, 7°N, 171.667°E (SBMNH , 1).

New Caledonia. 13 m, ESE of Ile de Crouy, SW of Noumea, 22.413°S, 21.300°E (LACM 86–361, 1). 0 m, Croissant Reef, off Noumea, 22.317°S, 166.367°E (AMS C.404954, 0, 2: complete; AMS C.349118, 2). Noumea, Ile St. Marie, SW point, 22.300°S, 166.483°E (AMS C.348643, 3). Noumea, 22.267°S, 166.450°E (AMS C.348860, 1). 0 m, Baie de Magenta, Nouma, 22.267°S, 166.483°E (AMS C.404950, 0, 1: complete). 400 m, S coast, 21.250°S, 167.250°E (AMS C.348859, 2). Loyalty Islands, SE side Lifou Island, Luengoni, 21.033°S, 167.417°E (AMS C.348864, 7, 8: complete). Loyalty Islands, SE side Lifou Island, Luengoni, 21.033°S, 167.417°E (AMS C.348865, 1). Wassagne, Lifou Island, Loyalty Islands, 21.000°S, 167.383°E (AMS C.348642, 22, 20: complete; AMS C.349134, 7). 0 m, Loyalty Islands, Lifou, Doueolou, 20.933°S, 167.083°E (AMS C.402848, 1). Loyalty Islands, Lifou, Doueolou, 20.933°S, 167.083°E (AMS C.348862, 8). We, Lifou Island, Loyalty Islands, 20.900°S, 167.267°E (AMS C.348867, 10). Doking, Lifou Island, Loyalty Islands, 20.700°S, 167.167°E (AMS C.348645, 7). 0 m, Doking, Lifou Island, Loyalty Islands, 20.700°S, 167.167°E (AMS C.348861, 2).

New Guinea. 13 m, Papua, Milne Bay District, Amazon Bay, 10.317°S, 149.350°E (AMS C.406395, 2). Papua, Milne Bay District, Amazon Bay, 10.300°S, 149.333°E (AMS C.348923, 6). Kapa Kapa, ca 83 km SE of Port Moresby, 9.800°S, 147.500°E (AMS C.348641, 2; AMS C.348875, 7, 4: complete). Papua, Taurama, W side Pyramid Point, 9.542°S, 147.242°E (AMS C.349122, 1). 18 m, PAPUA:Off Port Moresby, Manubada Local Island, off W end, 9.517°S, 147.167°E (AMS C.404944, 6). 23 m, PAPUA:Off Port Moresby, Manubada Local Island, off NW side, 9.517°S, 147.167°E (AMS C.404974, 4). 1 m, Milne Bay, Egum Island, 9.367°S, 151.933°E (AMS C.402847, 2). 1 m, Madang, Kranket Island, N end, 5.200°S, 145.850°E (AMS C.348876, 1). Madang, N end Kranket Island, 5.200°S, 145.850°E (AMS C.349123, 3). 15–35 m, Baudisson Bay, Kavieng, New Ireland, 2.743°S, 150.658°E (DLG , 5).

Philippines. 20 m, Bohol Island, Pamilacan Island, 9.500°N, 123.917°E (AMS C.349128, 1). Panglao Island, Cebucao Beach, 9.633°N, 123.817°E (AMS C.349131, 5). Palawan Island, Hondo Bay, N of Fondeado Island, 9.950°N, 118.917°E (AMS C.349129, 13). 2 m, Palawan Island, N of Fondeado Island, 9.950°N, 118.917°E (AMS C.349130, 2). Palawan Island, N Hondo Bay, Tadio Island, 9.950°N, 118.933°E (AMS C.349132, 1). 0 m, Buyong Beach, Mactan Island, Cebu, 10.083°N, 124.000°E (AMS C.349127, 1). NW Bohol Island, Danajon Bank, Banacon Island, 10.200°N, 124.167°E (AMS C.348644, 3,

4: complete). Cuyo Island, San Carlos, 10.800°N, 121.043°E (USNM 808074, 1). Dumaguete City, Bantayan Beach, Negros Oriental, 9.328°N, 123.314°E (USNM 812251, 1). 15–20 m, Apo Island, Negros Oriental, 9.083°N, 123.275°E (USNM 812461, 1). 33 m, Malavatuan Island, W Luzon (USNM 278258, 2).

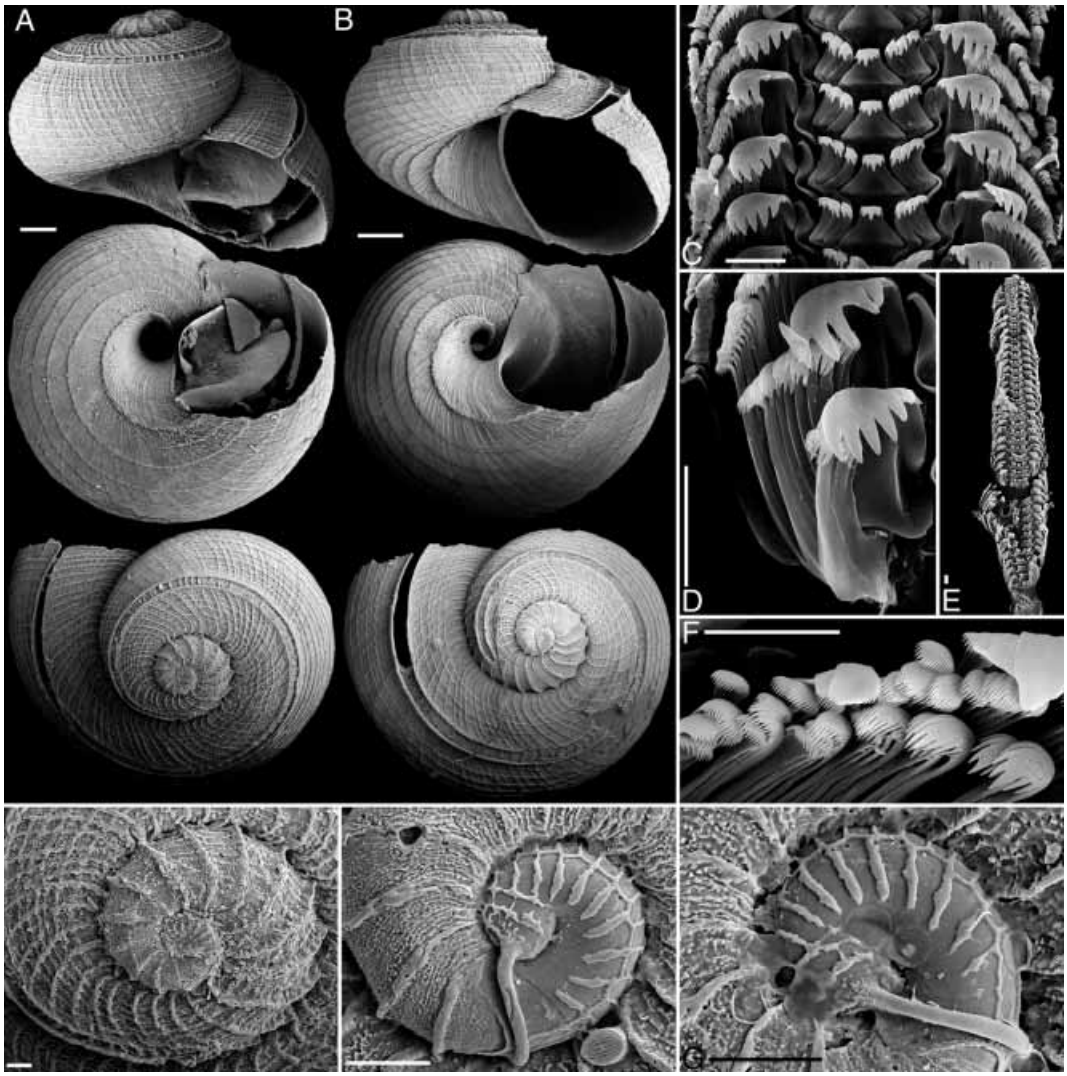

FIGURE 12. *Scissurella declinans*. A. AMS C.348865. Loyalty Islands, SE side Lifou Island, Luengoni", New Caledonia, 21.033°S, 167.417°E. B–F. AMS C.348642. Wassagne, Lifou Island, Loyalty Islands, New Caledonia, 21°S, 167.383°E. Scale bar shell = 200 µm. Scale bar protoconch = 50 µm. C. Full rows of radula. Scale bar = 20 µm. D. Entire lateral tooth 5 with base. In top right corner, hook-shaped lateral tooth 4. Note articulation in base for tooth interlock of central field. Scale bar = 20 µm. E. Entire radula. Scale bar = 20 µm. F. Cusps of marginal teeth. Scale bar = 10 µm. G. Protoconch from additional, conspecific specimen from same lot. Scale bar = 50 µm.

Solomon Islands. 3 m, Aoki Auki Harbour, W coast Malaita Island, 8.767°S, 160.700°E (AMS C.404914, 0, 1: complete). 23 m, New Georgia Islands, Marovo Rukiana Island, 8.367°S, 157.283°E (AMS C.402846, 1). 2 m, Santa Isabel Island, Furona Island, 8.117°S, 159.100°E (AMS C.402843, 1).

Vanuatu. Port Vila, Efate Island, 17.733°S, 168.300°E (AMS C.405021). Efate Island, Port Vila, Point Ardel Malapoa, 17.733°S, 168.300°E (AMS C.349120, 1, 7: complete; AMS C.349121, 1).

Remarks. The specimen from NSW and SA are suspicious for their geographic data and are marked with a question mark on the distribution map (Fig. 9D).

***Scissurella evaensis* Bandel, 1998:** Figures 13, 17C

Scissurella evaensis Bandel, 1998: 15–16, pl. 3, fig. 8, pl. 4, figs. 1–2.
+ *Mawellella unispirata* Bandel, 1998: 22–23, pl. 7, fig. 8, pl. 8, figs. 1–2. Type material. Holotype (SGPIH Nr. 3873), 0.7 × 0.6 mm. Type locality. Sediments of the shallow sea near Satonda, Indonesia [8.100°S, 117.750°E] (OD). Etymology: ?.

Type material. HOLOTYPE (SGPIH Nr. 3871/3872: see remarks), 0.8 mm.

Type locality. Indonesian Sea near Satonda [8.100°S, 117.750°E] (OD).

Etymology. Named after Mrs. Eva Vinx of Hamburg, Germany (OD).

Description. Shell small to medium size (1.2 mm), depressed trochiform. Protoconch 0.75 whorls, with fine axial sculpture, apertural varix connected to embryonic cap, apertural margin sinusoid. Teleoconch I 1.125–1.25 whorls, 13–14 axials, interstices with fine irregular axial sculpture. Teleoconch II to 1.25 whorls, shoulder rather flat with approximately 25 axials, axials growing fainter towards aperture, mid point of axials often raised as flattened tubercle; a few fine spirals added centripetally from adjacent to keel of slit/selenizone only occupying up to 0.2 of shoulder. Base with distinct channel under slit/selenizone. Axials on base with prominent scale on ridge below channel, below with approximately four spirals; intersection of base spirals and axials with tubercle. Base and narrow, deep umbilicus at sharp angle; edge slightly thickened, umbilical wall smooth. Slit open with distinct keels, keels at slight angle towards apex. Aperture subrotund, roof strongly projecting. Operculum with few irregular concentric growth rings.

Differential diagnosis. This is one of the species that is easier to recognize under the light microscope than under the SEM. The axials that are raised on the mid base into a series of lamellae will readily identify this species. There is no other similar species.

Distribution. Indo-Malayan Archipelago and Central Pacific: Ryukyu through Queensland (26°N–14.6°S), Thailand through Cook Islands (98.5°E–160°W. Fig. 17C). 0–60 m depth (25–33 m, live), usually in coral reef assemblages.

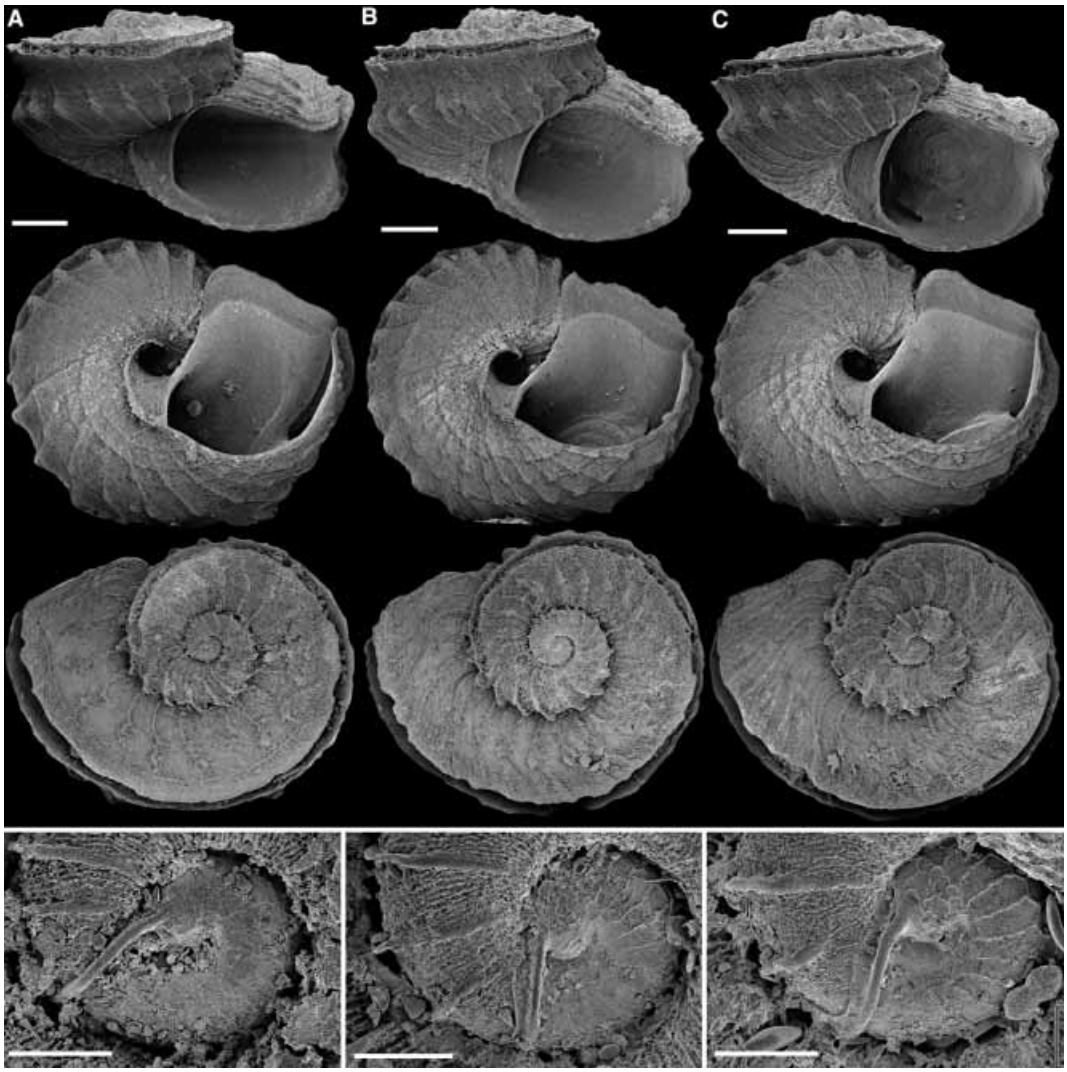

FIGURE 13. *Scissurella evaensis*. SBMNH 348010. Australia, NT, Hibernia Reef, east side of lagoon; dead *Acropora* rubble and sand. 7–10 m. Scale bars shell = 200 µm. Scale bars protoconch = 50 µm.

Specimen records.

Japan, Okinawa. 20 m, 5 km W Tsuken-jima (= Admiral's Island), 26.268°N, 127.920°E (LACM 78–21, 2). 50 m, 0.5 km ESE Zampa-misaki (Bolo Point), 26.435°N, 127.708°E (LACM 78–25, 5). 49 m, 0.5 km ESE of Zampa-misaki, 26.435°N, 127.875°E (LACM 78–100, 5). 58 m, 1 km W Onna Village, 26.493°N, 127.842°E (LACM 78–101, 17). 60 m, 1 km W Onna Village, 26.493°N, 127.842°E (LACM 79–76, 15). 51 m, 1 km NWN of Onna Village, 26.493°N, 127.842°E (LACM 79–75, 13). 33 m, 1 km W Onna Village, 26.495°N, 127.843°E (LACM 78–20, 5). 50 m, 1 km W Onna Village, 26.495°N, 127.843°E (LACM 78–99, 2). 46 m, 1 km WNW Onna Village, 26.495°N, 127.843°E (LACM 78–26, 1). 60 m, 1 km NWN of Onna Village, 26.497°N, 127.843°E (LACM 78–

29, 1; LACM 78–29, 1). 50 m, 1 km WNW of Onna Village, 26.497°N, 127.843°E (LACM 78–99, 3). 33 m, Nakijin, Motobu Peninsula, 26.703°N, 127.942°E (LACM 78–22, 2). 16 m, 1 km NNW Oku, 26.847°N, 128.287°E (LACM 77–64, 4).

Philippines. 14 m, E end Santa Cruz Island, Zamboanga, 6.865°N, 122.073°E (LACM 81–7, 4). 7 m, off Tambuli resort, Mactan, 10.283°N, 124.017°E (LACM 81–2, 1).

Thailand. 0 m, S tip of Phromthep Cape, Phuket, 7.758°N, 98.322°E (LACM 85–6, 1). 4 m, Mai Thon island, off Phuket, 7.762°N, 98.488°E (LACM 85–8, 6). 15 m, Hin Hmu-sang, rock near Pee-Pee Island, Phuket, 7.792°N, 98.550°E (LACM 85–14, 3). 15 m, Koh Samah, SE Koh Phiphidon, SE of Phuket Island, 7.717°N, 98.783°E (SBMNH , 2).

Indonesia. 15 m, off Ajer and Meno Islets, Lombok, 8.367°S, 116.067°E (LACM 88–63, 2). 5–20 m, Sulawesi, Bunaken & Siladen Islets, 1.603°N, 124.767°E (LACM 88–55, 9).

Marshall Islands. 25 m, Anemwanot lagoon, Majuro, 7.133°N, 171.317°E (SBMNH , 1).

New Guinea. 9 m, Yassi II reef, offshore from Nagada, Astrolabe Bay, 5.158°S, 145.837°E (LACM 80–13, 1). 30 m, channel between Wongat Island and barrier reef at Astrolabe Bay, Madang Province, 5.135°S, 145.845°E (LACM 80–26, 1). 1535 m, Baudisson Bay, Kavieng, New Ireland, 2.743°S, 150.658°E (DLG, 5).

Solomon Islands. 23 m, Matui Island, 8.495°S, 158.200°E (LACM, 4).

Cook Islands. 22 m, Rarotonga, N of Matavera, 21.212°S, 159.725°W, (LACM 87–81, 1).

Australia, NT. 20–30 m, Hibernia reef, 11.967°S, 123.349°E (SBMNH 348009, 1). 7–10 m, Hibernia reef, in lagoon east side, dead Acropora rubble, 11.967°S, 123.349°E (SBMNH 348010, 3).

Australia, QLD. 15 m, 0.4 km off Anchor Bay, W Lizard Island, 14.670°S, 145.433°E (LACM 79–56, 1).

Remarks. The number of the holotype in the body of text is given as “3871” (Bandel 1998: 16). According to the text, the illustrated specimen is the holotype. However, the caption to the plate 3, figure 8, page 78, gives the specimen number of the illustrated specimen as “3872”. The etymology mentions explicitly that the species is named in honor of Mrs. Eva Vinx. The construction of the species epithet with suffix -ensis instead of feminine genitive evae suggest a place name. We maintain the original spelling as an intentional error of the original author, and abstain from emending the name.

Maxwellella unispirata Bandel, 1998 was synonymized under *Sci. evaensis* by Geiger (2003). The two taxa share a protoconch with fine axials and an apertural varix, the shell sculpture dominated by strong axials in between which finer irregular axials are found, and a row of raised tubercles on the strong axials on the shoulder and the base. The only difference is that in *M. unispirata* the apparent position of the last adult whorl with respect to the remainder of the spire is somewhat lower. However, the angles at which the SEMs were taken also differ and can account for this apparent difference.

***Scissurella quadrata* new species:** Figures 14–16, 17A–B, 17D.

Scissurella "square": Jansen, 1999: 53, figs. 40–41.

Type material. HOLOTYPE (AMS C.402642). PARATYPES (AMS C.403659, 10; AMS C.377699, 13; AMS C.377645, 8).

Type locality. 21 m, GBR, Euston Reef, SW side, QLD, Australia, 16.667°S, 146.217°E.

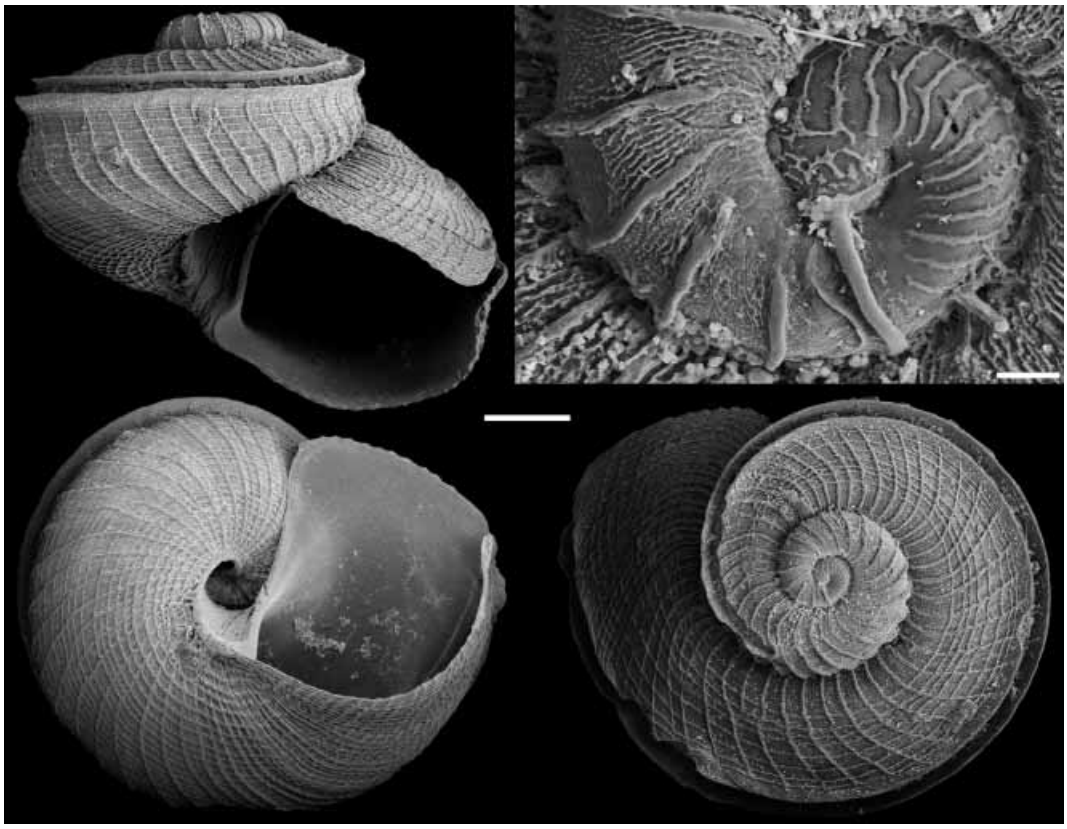

FIGURE 14. *Scissurella quadrata*. AMS C.402642. Holotype. 21 m, GBR, Euston Reef, SW side, QLD, Australia, 16.667°S, 146.217°E. Scale bar shell = 200 µm. Scale bar protoconch = 50 µm.

Etymology. Quadratus, Latin adjective: square, referring to the squared aperture of the species.

Description. Shell medium size (1.1 mm), squat. Protoconch 0.75 whorls, sculpture of fine axials, varix present connecting to embryonic cap, aperture strongly sinusoid. Teleoconch I >1 to 1.33 whorls, 13 to 21 axial ribs, interstices with fine irregular axials, no spiral sculpture. Teleoconch II of up to 1.33 whorls. Shoulder with approximately 45–50 axials becoming fainter, more crowded on last 0.25 whorl; spirals weaker than axials,

commencing shortly after onset of selenizone, increasing in number with growth, approximately 10–12 at apertural margin of mature specimen; 15–20% of shoulder closest to suture devoid of spirals on first teleoconch II whorl. Base rounded to slightly flared, axials stronger than spirals, number of axials similar to those on shoulder, with keel bordering steep, open umbilicus with smooth, flat walls. Selenizone with distinct keels, growth marks weak, not coordinated with axials, slit open. Aperture subquadratic.

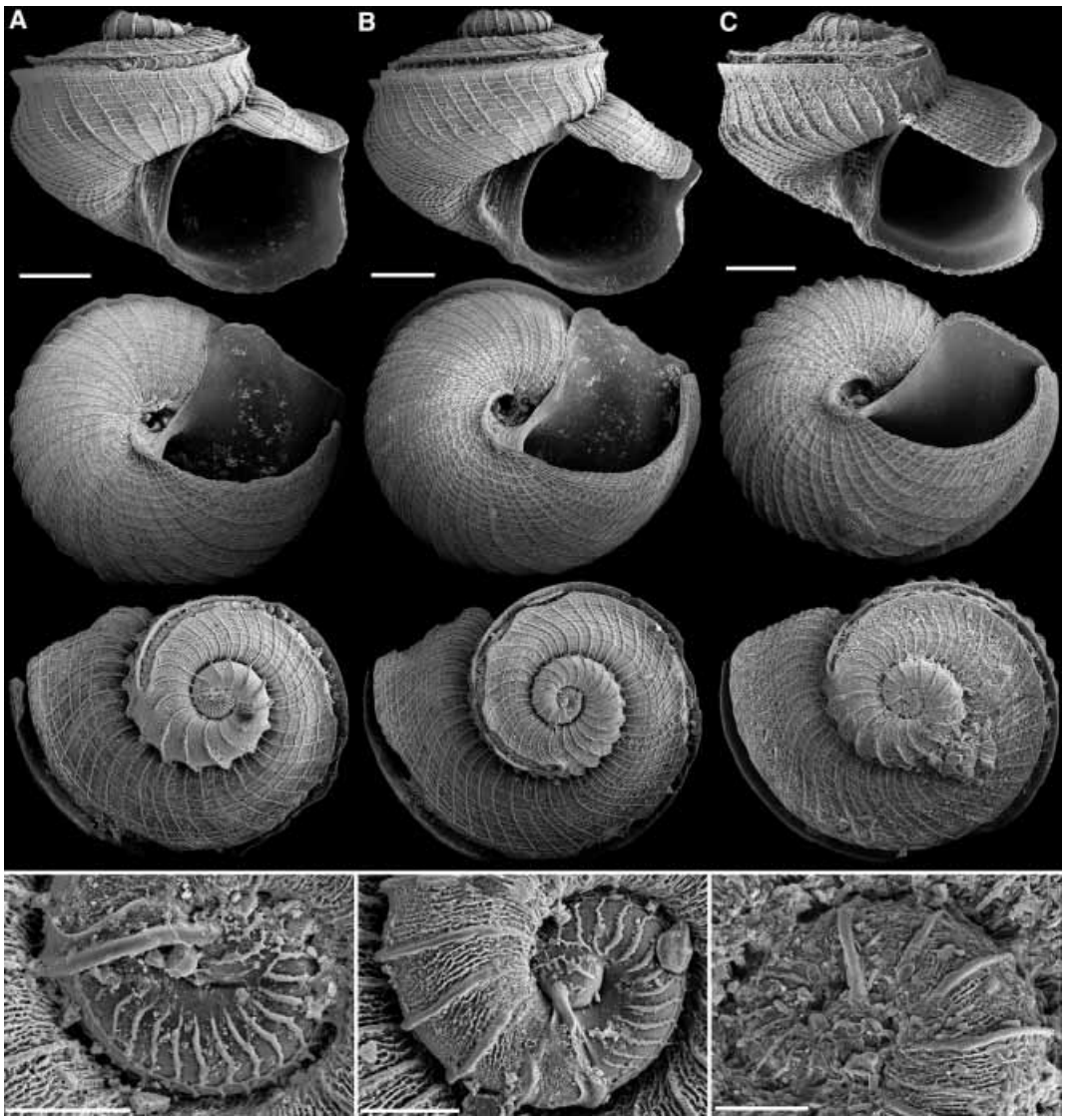

FIGURE 15. *Scissurella quadrata*. A–B. Paratype AMS C.403659. 21 m, GBR, Euston Reef, SW side, QLD, Australia, 16.667°S, 146.217°E. C. AMS C.377702. 6 m, GBR, Lizard Island, off Chinamans Point, QLD, Australia, 14.667°S, 145.450°E. Scale bars shell = 200 µm. Scale bars protoconch = 50 µm.

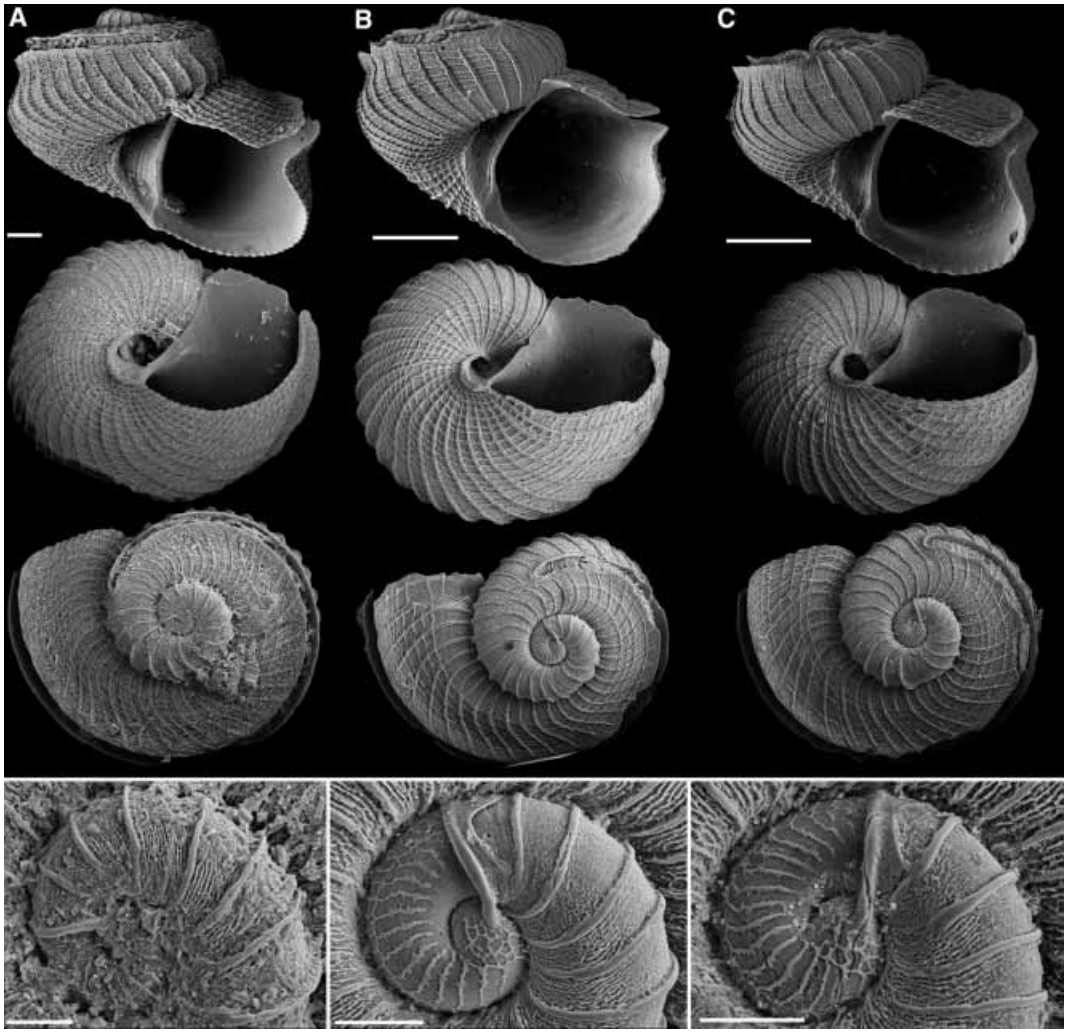

FIGURE 16. *Scissurella quadrata*. A. Paratype AMS C.377699. 12 m, GBR, Heron Island, PAMS Point, QLD, Australia, 23.433°S, 151.950°E. B. Paratype AMS C.377645. 12 m, North West Cape, WA, Australia, 21.742°S, 114.327°E. C. AMS C.377547. 57 m, off Albany, WA, Australia, 35.167°S, 117.878°E. Scale bars shell = 200 µm. Scale bars protoconch = 50 µm.

Radula n-5-R-5-n, rachidian tooth with triangular cusp, middle cusp largest, four additional cusps on either side, lateral teeth 1–3 with tricuspid teeth, lateral tooth 4 hook-shaped, lateral tooth 5 enlarged with 6 cusps in a line, marginals spoon-shaped.

Differential diagnosis. *Scissurella quadrata* is characterized by the strongly angular aperture, particularly in the lower adumbilical corner, and rather delicate axials and spirals. *Scissurella cyprina* from temperate southern Australia is more turbinate in outline, and has a different sculpture consisting of spirals on the shoulder that markedly increase in strength on teleoconch II towards the apertural margin. *Scissurella staminea* from Japan has stronger and less numerous axials and spirals, as well as a protonch with strong axials,

as opposed to the fine axials in *Sci. quadrata*. The largely sympatric *Sci. spinosa* shares the overall shell shape, but has fewer and more prominent spirals and axials that form its characteristic points at the intersections. The also mostly sympatric *Sci. evaensis* has the typical spiral row of axial lamellae on the mid-base.

Distribution. Indo-Malayan Archipelago and Central Pacific: Western Australia to 22.5°S, Queensland to 23.5°S, to Philippines (9.5°N); Indonesia (119°E) through Society Islands (to 150°W. Fig. 17D). 0–37 m, live, in coral rubble and algae.

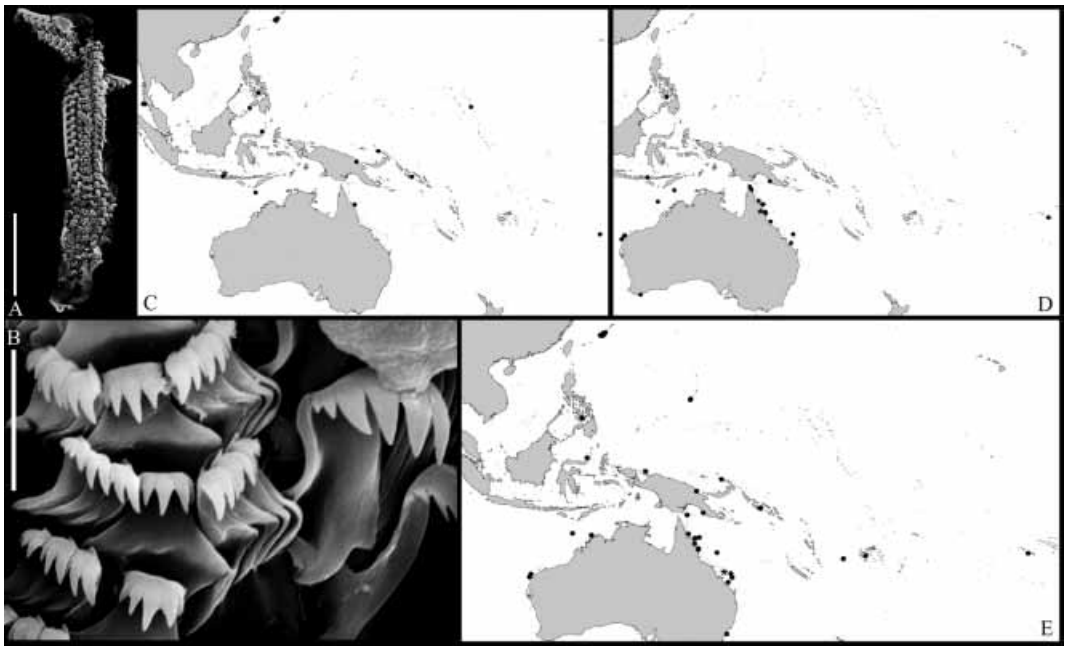

FIGURE 17. A–B. Radula of *Sci. quadrata*. AMS C.376855. Point Aroa ou de Tiaia, NE corner Moorea Island, Society Islands, 17.467°S, 149.767°W. A. Whole radula. Scale bar = 100 µm. B. Central field enlarged. Scale bar = 10 µm. C. Distribution of *Sci. evaensis*. D. Distribution of *Sci. quadrata*. E. Distribution of *Sci. spinosa*. Dots: specimen records. Star: type locality.

Specimen records (non-type material).

Australia, QLD. 12 m, GBR, Heron Island, PAMS Point, 23.433°S, 151.950°E (AMS C.377699, 13). 15 m, GBR, Capricorn Group, Heron Island, 23.433°S, 151.950°E (AMS C.404427, 1). GBR, Capricorn Group, Heron Island, S side, 23.433°S, 151.950°E (AMS C.404979, 0, 1: complete). 11 m, GBR, Swain Reefs, Reef 21-468, NW side, 21.500°S, 152.417°E (AMS C.377698, 5). 14 m, GBR, off Cairns, Thetford Reef, 16.750°S, 146.167°E (AMS C.377652, 1). 21 m, GBR, Euston Reef, SW side, 16.667°S, 146.217°E (AMS C.402642, 2). 21 m, GBR, Euston Reef, SW side, 16.667°S, 146.217°E (AMS C.403659, 10). 37 m, GBR, Spur Reef, off Cairns, 16.400°S, 146.050°E (AMS C.377653,

3, 1: complete). 2 m, GBR, Lizard Island, between Lizard & Palfrey Island, 14.683°S, 145.450°E (AMS C.377696, 1). 5 m, GBR, Lizard Island, between South & Bird Islands, 14.683°S, 145.467°E (AMS C.377697, 1). 3 m, GBR, Lizard Island, off Rocky Point, 14.667°S, 145.433°E (AMS C.377637, 4). 10 m, SE side Lizard Island, 14.683°S, 145.458°E (LACM 79-55, 8). 19 m, GBR, No Name Reef, SW end, 14.667°S, 145.650°E (AMS C.377640, 3). 8 m, GBR, Lizard Island, Rocky Point, 14.667°S, 145.433°E (AMS C.377650, 1). 6 m, GBR, Lizard Island, off Chinamans Point, 14.667°S, 145.450°E (AMS C.377702, 3). 3 m, GBR, Reef 14-034, 13.933°S, 144.600°E (AMS C.377639, 2). 4 m, Halfway Island, Cape York Peninsula, 11.383°S, 142.950°E (AMS C.377643, 1). 7 m, Cape York Peninsula, Albany Passage, 10.750°S, 142.617°E (AMS C.377700, 1). Helix Reef, 18.617°S, 147.283°E (LACM 83-41, 2).

Australia, WA. 57 m, off Albany, 35.167°S, 117.878°E (AMS C.377547, 1). 80 m, North West Cape, 22.650°S, 113.580°E (AMS C.377636, 3). 92 m, off North West Cape, 22.553°S, 113.620°E (AMS C.377638, 1). 97 m, off North West Cape, 21.783°S, 114.167°E (AMS C.377648, 1). 12 m, North West Cape, 21.742°S, 114.327°E (AMS C.377645, 8). 11 m, Scott Reef, 14.083°S, 121.833°E (AMS C.404491, 0, 2: complete). 27 m, Sahul Banks, Timor Sea, 11.500°S, 125.500°E (AMS C.377647, 1).

Indonesia. 3 m, Komodo Island, E arm of Slawi Bay, 8.583°S, 119.500°E (AMS C.377701, 2).

New Guinea. 23 m, Off Port Moresby, Manubada Local Island, off NW side, 9.517°S, 147.167°E (AMS C.404976, 3).

Philippines. 2 m, Bohol, Panglao Island, SW side, 9.600°N, 123.750°E (AMS C.403630, 1).

Society Islands. 4 m, Paevaeva, W side Moorea Island, 17.533°S, 149.883°W, (AMS C.404433, 8). Moorea Island, Baie de Papetoai, Passe Tareu, W side, 17.508°S, 149.850°W, (AMS C.404437, 2).

Remarks. All known records of this species are from tropical waters, with the exception of a single specimen from Albany, on the southern, temperate, coast of Western Australia (Fig. 16C). The shell is in excellent condition and is indistinguishable from tropical specimens. Although there is no evidence that the specimen is mislocalized, we remain suspicious of the locality until further material from temperate waters is found. We have figured this specimen, but have not included it in the type series.

***Scissurella spinosa* new species:** Figures 17E, 18–20

Scissurella "spikey": Jansen, 1999: 53, figs. 37–39.

Type material. HOLOTYPE AMS C.348694. Paratypes (AMS C.376853, 2).

Type locality. 27 m, GBR, Swain Reefs, Bylund Gillett Cay, QLD, Australia, 21.717°S, 152.417°E.

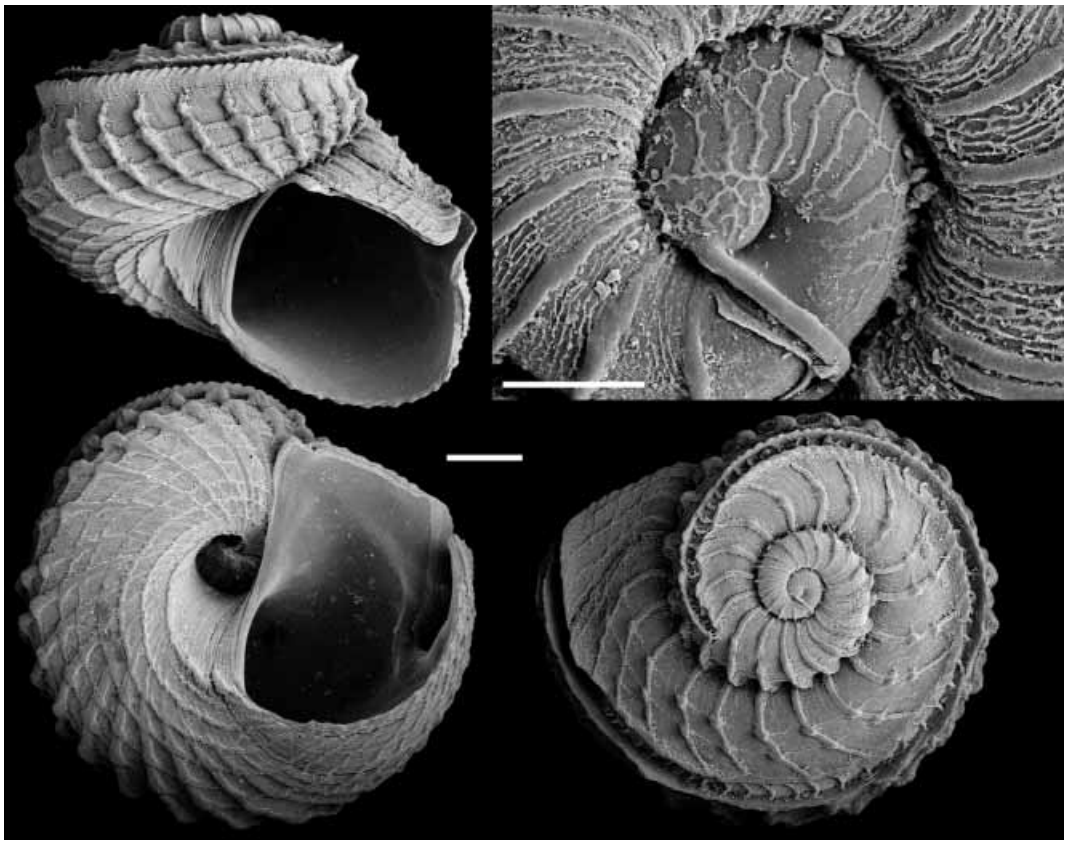

FIGURE 18. *Scissurella spinosa* n. sp. Holotype AMS C.348694. 27 m, GBR, Swain Reefs, Bylund Gillett Cay, QLD, Australia, 21.717°S, 152.417°E. Scale bars shell = 200 µm. Scale bars protoconch = 50 µm.

Etymology. Spinosus, Latin, thorny, referring to the pronounced spines at the intersection of axials and radials both on the shoulder and the base.

Description. Shell medium size (1.2 mm), trochiform to depressed trochiform. Protoconch 0.75 whorls, sculpture of fine axials, varix present, connected to embryonic cap, apertural margin sinusoid. Teleoconch I of >1 to 1.25 whorls, approximately 14–24 axials, interstices with fine irregular axial lamellae, on outer shoulder from position of selenizone towards base on last 0.25 whorl up to five fine spirals. Teleoconch II of 1.25 whorls, shoulder with approximately 19 distinct axials growing fainter on last 0.25 whorl, intersected by usually two, occasionally three, fainter spirals in the middle third of shoulder, at intersection of axials and spirals strong knobs; additional fine spirals adjacent to selenizone not forming knobs. Base rounded to somewhat inflated, same number of axials as shoulder, intersected by approximately 8 or 9 spirals, top two or three spirals forming distinct knobs at intersection with axials, second spiral approximately at level of suture. Umbilical wall at angle with base, keel faint, wall of umbilicus smooth, flat, umbilicus of medium width. Selenizone with distinct keels; walls of keels in fresh specimens finely undulating, growth

marks of selenizone distinct, not coordinated with axials, slit open. Aperture subquadratic, shoulder strongly overhanging.

Operculum corneus, nucleus central, with approximately 8 concentric rings.

Radula n-5-R-5-n, rachidian triangular, central cusp largest three smaller cusps on both sides, lateral teeth 1–3 similar with 3 cusps, lateral tooth 4 hook shaped, lateral tooth 5 enlarged with 5 cusps, triangular, edge of cusps at angle to base, marginals spoon-shaped.

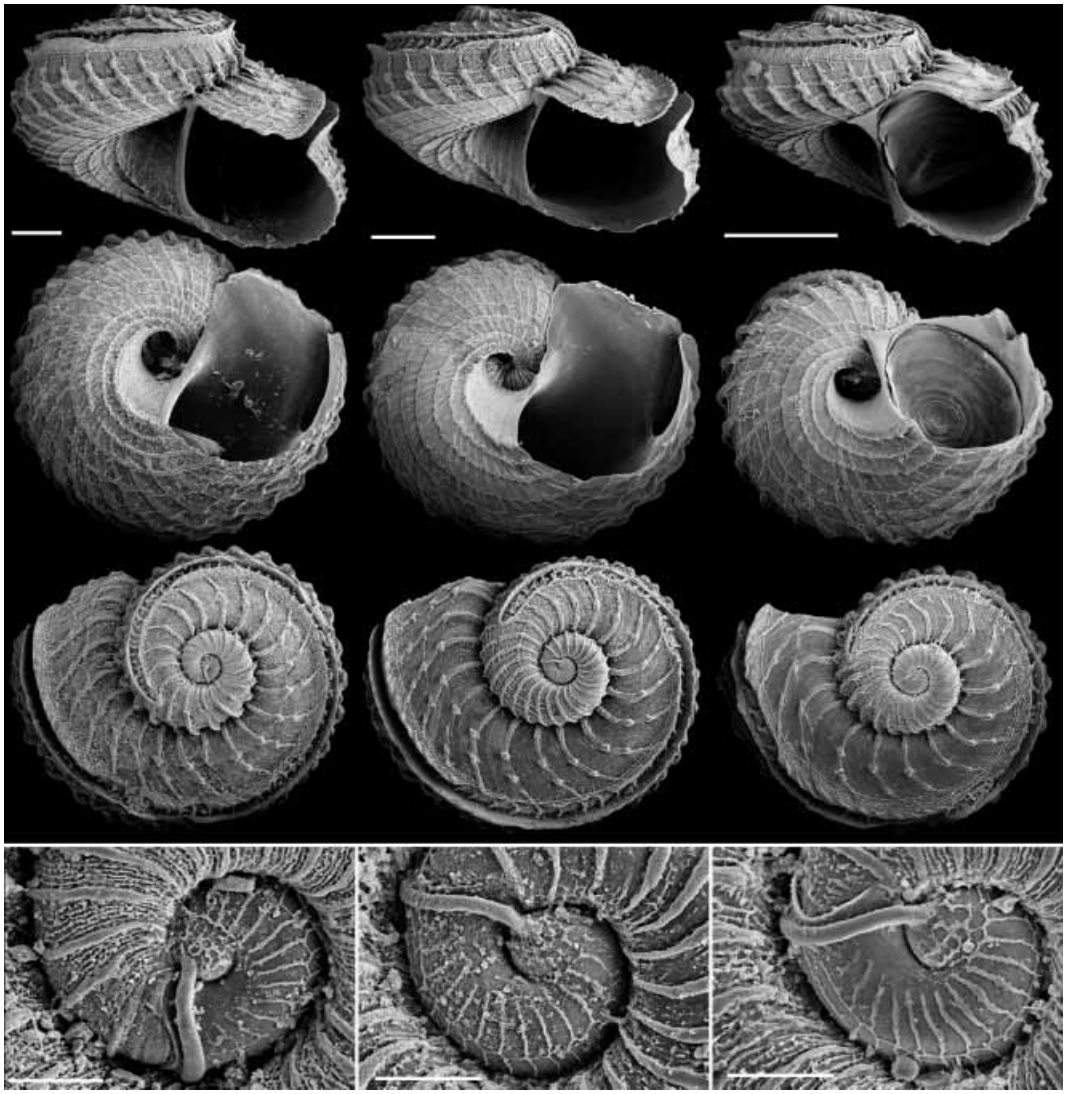

FIGURE 19. *Scissurella spinosa* n. sp. A. AMS C.379073. 64 m, GBR, Swain Reefs, 3km NE of W side of Bylund Gillett Cay, QLD, Australia, 21.700°S, 152.433°E. B. AMS C.376853, 3 m, Christensen Research Institute, Madang, New Guinea, 5.117°S, 145.817°E. C. AMS C.376854. 2 m, Bohol, Panglao Island, SW side, Philippines, 9.600°N, 123.750°E.Scale bars shell = 200 µm. Scale bars protoconch = 50 µm.

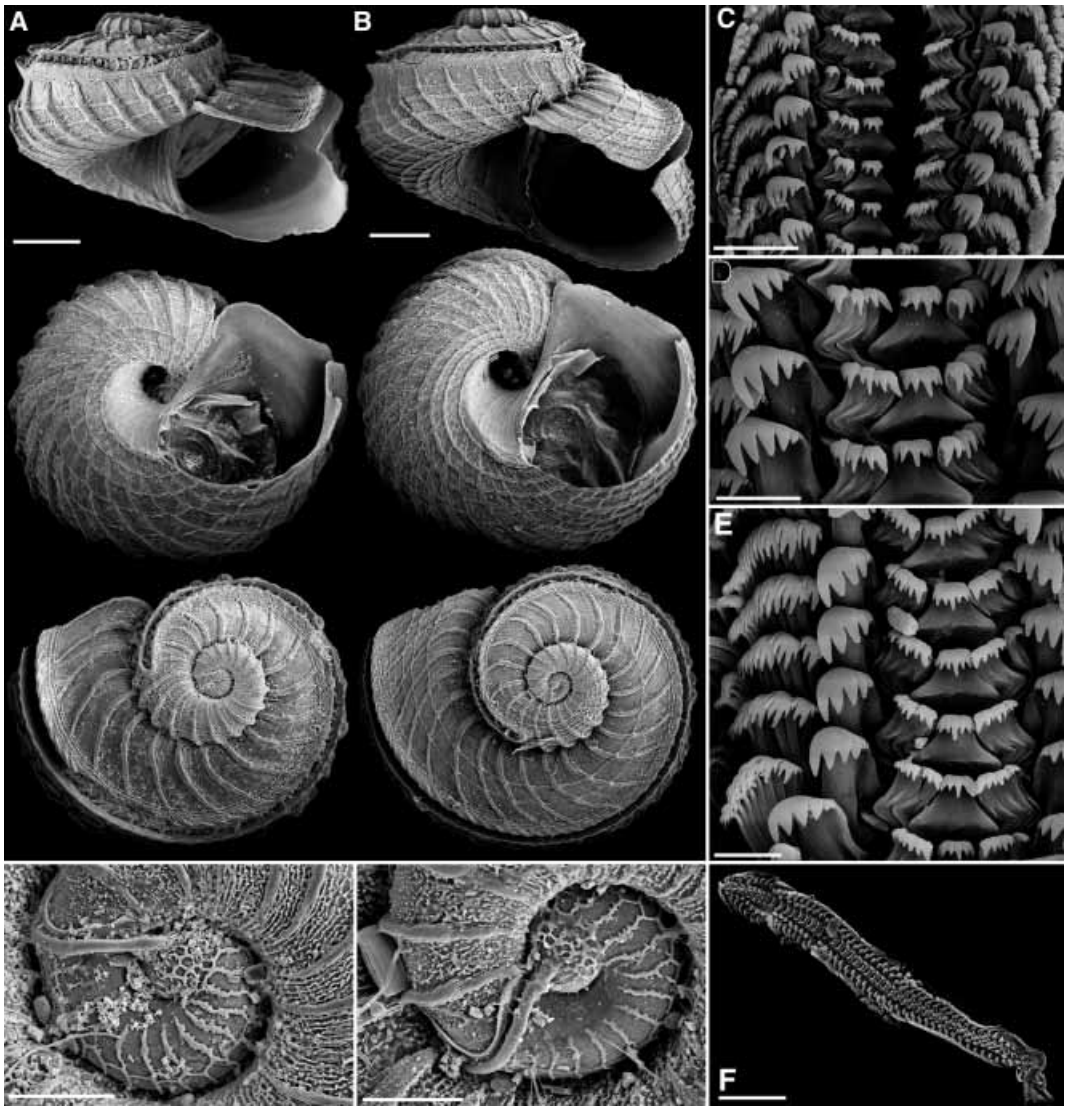

FIGURE 20. *Scissurella spinosa* n. sp. A–B: Shells. Scale bars shell = 200 µm. Scale bars protoconch = 50 µm. A. AMS C.402983. 8 m, Tiahura Island, NW Moorea Island", Society Island, 17.483°S, 149.917°W. B. AMS C.376855. Point Aroa ou de Tiaia, NE corner Moorea Island, Society Islands, 17.467°S, 149.767°W. C–E. Radulae. Scale bars = 20 µm. C–D. AMS C.376855. Point Aroa ou de Tiaia, NE corner Moorea Island, Society Islands, 17.467°S, 149.767°W. E. AMS C.376854. 2 m, Bohol, Panglao Island, SW side, Philippines, 9.600°N, 123.750°E. F. Whole radula. Scale bar = 100 µm. AMS C.376854. 2 m, Bohol, Panglao Island, SW side, Philippines, 9.600°N, 123.750°E.

Differential diagnosis. *Scissurella spinosa* is characterized by the rather coarse sculpture of strong axials intersected by weaker spirals that form characteristic points at their intersections. These spiny points are also found on the shoulder, in one or usually two spi-

ral rows. *Scissurella staminea* from Japan is quite similar, however is broader in overall outline, lacks the spiny protrusions on the shoulder, and has a protoconch with strong axials as opposed to the weak axials in *Sci. spinosa*. The largely sympatric *Sci. quadrata* has much weaker and denser sculpture and has a somewhat more square aperture. The also largely sympatric *Sci. evaensis* has its typical spiral row of elevated axial lamellae on the mid base.

Distribution. Indo-Malayan Archipelago: Southern Japan (27°N) to Sydney, NSW (34°S), Thailand (98.5°E) to Fiji (178.5°E: Fig. 17E). 0–73 m, live, in coral rubble and algae.

Specimen records.

Australia, NSW. 200 m, Sydney, 33.872°S, 151.667°E (AMS C.402611, 1).

Australia, QLD. 6 m, GBR, Capricorn Group, Heron Island, S side opposite marine station, 23.433°S, 151.950°E (AMS C.379454, 1). 78 m, SE of Swain Reefs, 22.518°S, 152.710°E (AMS C.402609, 1). 27 m, GBR, Swain Reefs, Bylund Gillett Cay, 21.717°S, 152.417°E (AMS C.348694, 20). 64–73 m, GBR, Swain Reefs, 3km NE of W side of Bylund Gillett Cay, 21.700°S, 152.433°E (AMS C.379073, 1). 7 m, GBR, off Cairns, Moore Reef, 16.900°S, 146.200°E (AMS C.376861, 1). 21 m, GBR, Euston Reef, SW side, 16.667°S, 146.217°E (AMS C.376856, 6). 9 m, GBR, Cairns Reef lagoon & between Cairns Reef & Hope Island, 15.700°S, 145.500°E (AMS C.404964, 2, 1: complete). 11 m, Lizard Island, 14.683°S, 145.458°E (LACM 79-55, 2). 27 m, GBR, Carter Reef, N end, 14.550°S, 145.600°E (AMS C.376860, 2). 8 m, GBR, No.5 Sandbank reef 13-120, SW end, 13.750°S, 144.267°E (AMS C.404486, 0, 1: complete). 9 m, Torres Strait, off Murray Island, 9.933°S, 144.067°E (AMS C.402704, 1).

Australia, WA. 190 m, North West Cape, 22.387°S, 113.677°E (AMS C.376857, 2). 80 m, North West Cape, 21.783°S, 113.990°E (AMS C.376859, 11). 10–20 m, Cassini Island, W side, 13.952°S, 125.623°E (SBMNH 348012, 1). 18–25 m, Seringapatam Reef, N side, 13.624°S, 122.005°E (SBMNH 348011, 1).

Fiji. 1 m, Suva Point, Viti Levu, 18.170°S, 178.420°E (LACM 79-40, 1).

Society Islands. 2 m, Moorea, 17.500°S, 149.767°E (LACM 74-36, 14). 1 m, Ahe Atoll, Tuamotus, 14.467°S, 146.367°E (LACM 73-94, 8). Point Aroa ou de Tiaia, NE corner Moorea Island, 17.467°S, 149.767°W, (AMS C.376855, 4).

Indonesia. 0 m, Biak, Irian Jaya, 1.150°S, 136.050°E (LACM 88-43, 1). 5–20 m, Sulawesi, Bunaken & Siladen Islets, 1.603°N, 124.767°E (LACM 88-55, 2).

Japan, Okinawa. 0 m, 2 km SSW Fitzwoody Beach, Naha Air Force Base, 26.185°N, 127.633°E (LACM 77-59, 2). SW side Gishifu Shima, Kerama Retto, 26.223°N, 127.360°E (LACM 77-72, 1). 20 m, 5 km W Tsuken-jima (= Admiral's Island), 26.268°N, 127.920°E (LACM 78-21, 4). 53 m, 0.5 km ESE Zampa-misaki (Bolo Point), 26.435°N, 127.708°E (LACM 78-100, 6). 50 m, 0.5 km ESE Zampa-misaki (Bolo Point), 26.435°N, 127.708°E (LACM 78-25, 16). 51 m, 1 km WNW Onna Village, 26.493°N, 127.842°E (LACM 79-75, 25). 63 m, 1 km WNW Onna Village, 26.493°N, 127.842°E (LACM 78-

101, 20). 60 m, 1 km WNW Onna Village, 26.493°N, 127.842°E (LACM 79-76, 20). 50 m, 1 km W of Onna Village, 26.495°N, 127.843°E (LACM 78-99, 8). 60 m, 1 km WNW of Onna Village, 26.497°N, 127.843°E (LACM 78-29, 3). 60 m, 1 WNW of Onna Village, 26.497°N, 127.843°E (LACM 78-29, 4). 50 m, 1 km WNW of Onna village, 26.497°N, 127.843°E (LACM 78-99, 12). 77 m, Horseshoe Cliffs, Onna Village, 26.500°N, 127.848°E (USNM 822094, 5). 0 m, 1 km N of Nakijin village, 26.703°N, 127.942°E (LACM 78-22, 5). 16 m, 1 km NNW Oku, 26.847°N, 128.287°E (LACM 77-64, 6). 1 m, 1 km NNW Oku, 26.847°N, 128.287°E (LACM 77-61, 1). 33 m, 1 km W Onna Village, 127.843°N, 127.843°E (LACM 78-20, 5).

Mariana Islands, Guam. 1 m, Merizo Cocos lagoon, 13.253°N, 144.665°E (LACM 77-18, 1). 6 m, Piti Bay, E of Apra Harbor, 13.465°N, 144.690°E (LACM 77-11, 1).

New Guinea. 23 m, Port Moresby, Manubada Local Island, off NW side, 9.517°S, 147.167°E (AMS C.404977, 2). 15–35 m, Baudisson Bay, Kavieng, New Ireland, 2.743°S, 150.658°E (DLG, 5). 5 m, Christensen Research Institute, Madang, 5.117°S, 145.817°E (AMS C.376853, 2). 20 m, Wongat Island, Madang Province, 5.137°S, 145.845°E (LACM 80-20, 1). 30 m, Wongat Island, Madang Province, 5.135°S, 145.845° E (LACM 80-26, 2).

Philippines. 20 m, Bohol Island, Pamilacan Island, 9.500°N, 123.917°E (AMS C.376858, 1). 2 m, Bohol, Panglao Island, SW side, 9.600°N, 123.750°E (AMS C.376854, 1).

Solomon Islands. 23 m, Vangunu Island, S end Porepore Island, 8.583°S, 158.200°E (LACM 89-75, 4). 23 m, Matui Island, Vangunu Island, New Georgia Group, 8.495°S, 158.200°E (LACM, 7).

Thailand. 0 m, S tip of Phromthep Cape, Phuket, 7.758°N, 98.322°E (LACM 85-6, 1).

Tonga. 18 m, Langitau island, Vaka'eitu Island, Vava'a Group, 18.717°S, 174.083°E (LACM 85-90, 1). Naupapu Island, Vava'a Group, 18.700°S, 174.100°E (LACM 85-89, 3). 27 m, Hunga Island, Vava'a Goup, 18.692°S, 174.133°E (LACM 85-91, 2).

Sinezona Finlay, 1926

For discussion of *Sinezona* see Geiger (2003).

Sinezona plicata (Hedley, 1899): Figures 21–23, 24

Schismope plicata Hedley, 1899: 552, fig. 62.
Schismope plicata: Thiele, 1912: 32, pl. 4, fig. 6 [copy figure Hedley].
Reussella plicata: Bandel, 1998: 46–47, pl. 15, fig. 8, pl. 16, figs. 1–2.
Sinezona plicata: Jansen, 1999: 5, figs. 58–60.
Scissurella sp. 2. Hasegawa et al., 2001: 4, pl. 1, fig. 2.
Sinezona plicata: Geiger, 2003: 15c [*Sci. plicata* in caption in error].
Misidentification

Scissurella coronata: Habe, 1963: 229 [Japanese], 233 [English], textfigs 3–4 [is *Sin. plicata*, slightly juvenile with open slit].
Scissurella coronata: Okutani & Hasegawa, 2000: 37, pl. 18, fig. 10 [Is *Sin. plicata*, slightly juvenile with open slit].
Sinezona padangensis: Yu & Feng, 1996: pl. 1, figs. 5–7 [is *Sin. plicata*].

Type material. HOLOTYPE (AMS C.5640), 2.3 × 1.7 × 2 mm. PARATYPES: 7 (AMS C.5641); 5 (AMS C.5642); 1 (AMS C.170414 ex AMS C.5640).

Type locality. Off Beacon Islet (Funamanu), Funafuti Atoll, 150 fms. [= holotype, 274 m], and off Tutaga in 150 and 50–60 fms [= paratypes, 274 and 91–110 m] (OD).

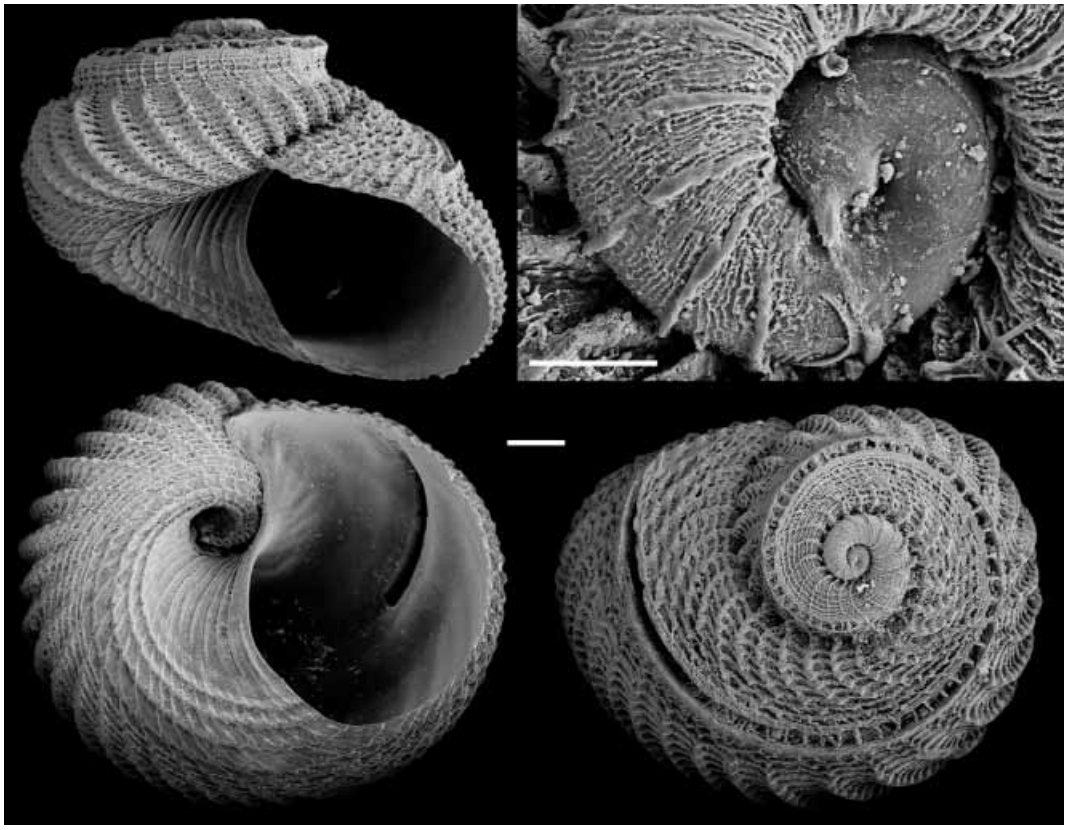

FIGURE 21. *Sinezona plicata*. AMS C.379083. 21 m, GBR, Euston Reef, SW side, QLD, Australia, 16.667°S, 146.217°E. Scale bar shell = 200 µm. Scale bar protoconch = 50 µm.

Etymology. Plicatus, Latin adjective, folded, referring to the strong axial folds on the shell.

Description. Shell large (2.3 mm), heavy, depressed trochiform. Protoconch 0.75 whorls, smooth or with single fine spiral towards periphery, varix connected to embryonic cap, aperture sinusoid. Teleoconch I 0.9–1.25 whorls, 15 axials, interstices with fine densely packed irregular axial lamellae. Teleoconch II up to 1.5 whorls, shoulder profile S-shaped, with ridge towards suture, with channel towards selenizone. Shoulder sculpture

with strong axials crossed by 14–16 distinct but somewhat weaker spirals. Base with indistinct groove below selenizone; axials in groove rather weak, abapical margin of groove forming suture in early teleoconch; suture descends in last 0.25 whorl to base of penultimate whorl at level of aperture in fully mature shells. Whorls distinctly inflated in juveniles, less in mature shells, lateral margin always extending beyond selenizone and keels. Lower part of base with pronounced axial lamellae, crossed by distinct spiral threads. Umbilicus shallow, wide, walls smooth, with sharp edge towards base. Aperture rotund, roof projecting. Selenizone with distinct and strong keels, strong growth increments not coordinated with axials, foramen elongated tear-drop-shaped. Operculum with fine, irregular growth rings.

Differential diagnosis. This species is readily distinguished from other species by the pronounced expansion of the base below the selenizone, in combination with the strong axials folds crossed by strong and dense spirals giving the shell the appearance of a filigree. Juveniles, although having an open slit and not a foramen, also display these sculptural characteristics. The usually smooth protoconch, which occasionally also shows the spiral element, is rare in Scissurellidae, although caution should be taken not to confuse an eroded protoconch with a genuinely smooth one.

Distribution: Japan to 27°N [Okinawa] to Western Australia (to 26°S) and Queensland (to 22°S); Seychelles to Tuamotus (to Ahe Atoll: 146°W), 0–366 m, in sand and coral rubble, as well as on coral reef algae.

Specimen Records.

Australia, WA. Shark Bay, Monkey Mia, E side Peron Peninsula, 25.800°S, 113.717°E (AMS C.404990, 0, 1: complete). 78 m, North West Cape, 22.967°S, 113.687°E (AMS C.379091, 6). 40 m, North West Cape, 22.313°S, 113.765°E (AMS C.379090, 2). 65 m, North West Cape, 22.025°S, 113.962°E (AMS C.379088, 5; AMS C.406398, 11). 8 m, Bundegi Reef, Exmouth Gulf, 21.817°S, 113.183°E (AMS C.379089, 3). Turtle Beach, W side of North West Cape, 21.800°S, 114.167°E (AMS C.378277, 1). 19 m, N end Mermaid Reef, WA, Australia, 17.050°S, 119.600°E (LACM 86-250, 8). 13 m, SE side, North Reef, Scott Reef, WA, Australia, 14.021°S, 121.977°E (SBMNH uncatalogued, 3).

Australia, NT. 5 m, Oxley Island, W end, 11°S, 132.817°E (AMS C.379087, 1). 25 m, Hibernia Reef, N side, NT, Australia, 11.967°S, 123.349°E (SBMNH uncatalogued, 3).

Australia, QLD. 64 m, GBR, Swain Reefs, 3 km NE of W side of Bylund Gillett Cay, 21.700°S, 152.433°E (AMS C.379073, 20). Helix Reef, 18.617°S, 147.283°E (LACM 83-41, 7). 10 m, SE side Lizard Island, 14.683°S, 145.458°E (LACM 79-55, 6). 0 m, SW side Lizard Island, 14.670°S, 145.442°E (LACM 79-53, 1). 21 m, GBR, Euston Reef, SW side, 16.667°S, 146.217°E (AMS C.379083, 14). 20 m, GBR, Michaelmas Cay, 16.600°S, 145.983°E (AMS C.379072, 1). GBR, Michaelmas Cay, 16.600°S, 145.983°E (AMS C.379076, 2). GBR, Outer Barrier Reef, St. Crispins Reef, 16.117°S, 145.867°E (AMS C.46044, 3). 9 m, GBR, Cairns Reef lagoon & between Cairns Reef & Hope Island, 15.700°S, 145.500°E (AMS C.404963, 3, 1: complete). 20 m, GBR, Lizard Island, off SE

side Bird Islet, 14.683°S, 145.467°E (AMS C.379074, 1). 3 m, GBR, Lizard Island, between Bird & South Islets, 14.683°S, 145.450°E (AMS C.379078, 2). GBR, Lizard Island, Casuarina Research Station Beach, 14.683°S, 145.450°E (AMS C.379082, 2). 5 m, GBR, Lizard Island, off Rocky Point, 14.667°S, 145.433°E (AMS C.379075, 2). 9 m, Torres Strait, off Murray Island, 9.933°S, 144.067°E (AMS C.48355, 13). Torres Strait, Yorke Island, S side, 9.733°S, 143.417°E (AMS C.379080, 1).

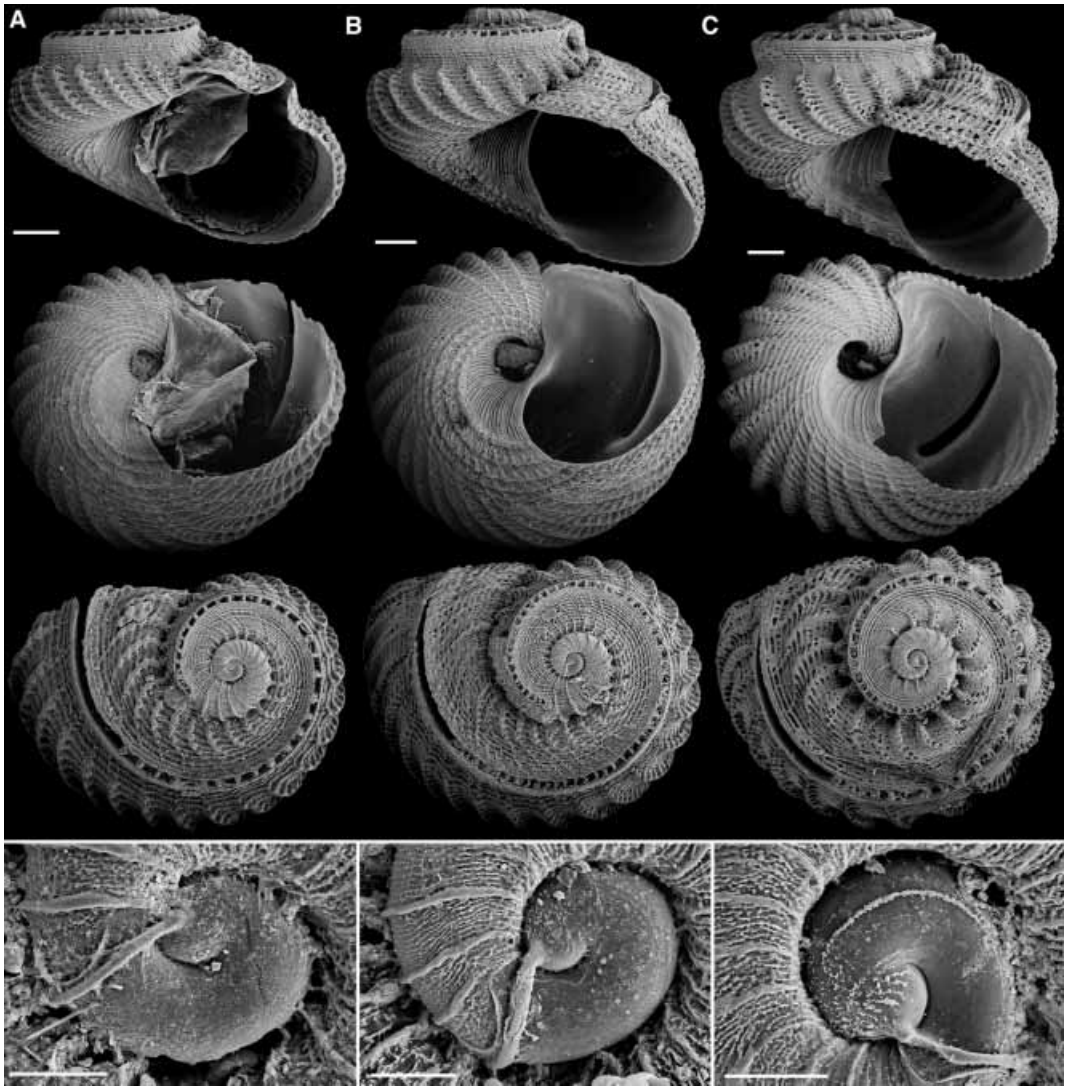

FIGURE 22. *Sinezona plicata*. A. AMS C.379421. Moorea Island, Baie de Papetoai, Passe Tareu, W side, Society Islands, 17.508°S, 149.850°W. B. AMS C.379078. 3 m, GBR, Lizard Island, between Bird & South Islets, QLD, Australia, 14.683°S, 145.450°E. Juvenile specimen; notice the open slit, the less developed spirals keels on the base, and the little developed umbilicus, while the protoconch and early teleoconch sculpture is identical to the mature specimens. C. AMS C.28241. Marutea Atoll, Tuamotu Archipelago, 17°S, 143.167°W. Scale bars shell = 200 µm. Scale bars protoconch = 50 µm.

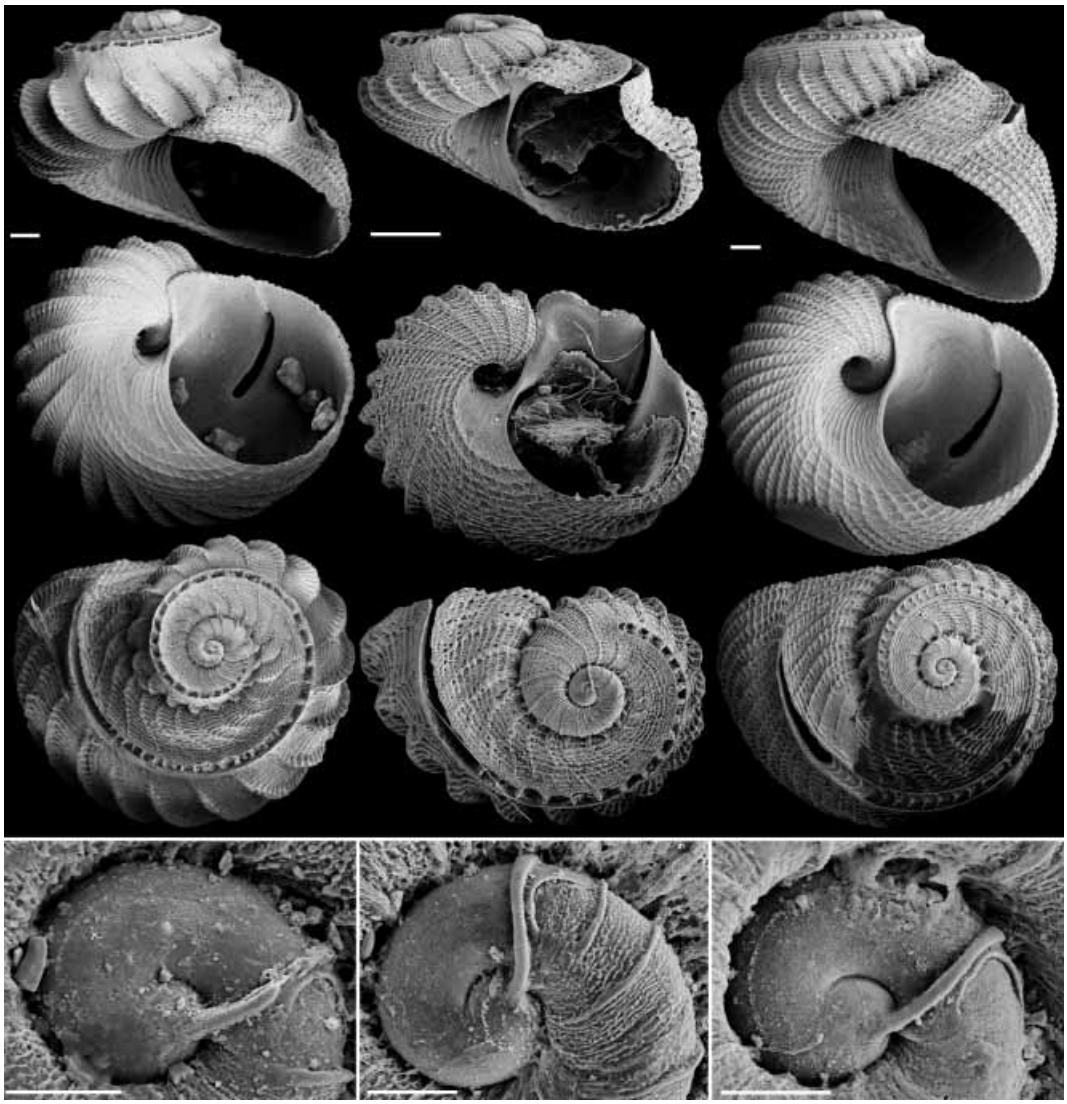

FIGURE 23. *Sinezona plicata*. A. AMS C.379091. 78 m, North West Cape, WA, Australia, 22.967°S, 113.687°E. B. AMS C.380674. 2 m, Bohol, Panglao Island, SW side, Philippines, 9.600°N, 123.750°E. C. AMS C.334062. North East Herald Cay, Coral Sea, 16.933°S, 149.183°E.Scale bars shell = 200 µm. Scale bars protoconch = 50 µm.

Lord Howe Island. 31.550°S, 159.063°E (AMS C.404393, 2).

Christmas Island. 27 m, 10.433°S, 105.667°E (AMS C.406385, 3). 183 m, NE point, 10.417°S, 105.700°E (AMS C.404925, 1; AMS C.406362, 4; AMS C.406381, 2).

Coral Sea. NE Herald Cay, 16.933°S, 149.183°E (AMS C.334062, 57).

New Caledonia. Loyalty Islands, SE side Lifou Island, Luengoni, 21.033°S, 167.417°E (AMS C.379412, 1). Loyalty Islands, SE side Lifou Island, Luengoni, 21.033°S, 167.417°E (AMS C.379426, 2). Loyalty Islands, Lifou, Doueolou, 20.933°S, 167.083°E (AMS C.379410, 1). Beach at E side of Mt. Panie, 20.600°S, 164.833°E (AMS C.4107, 1).

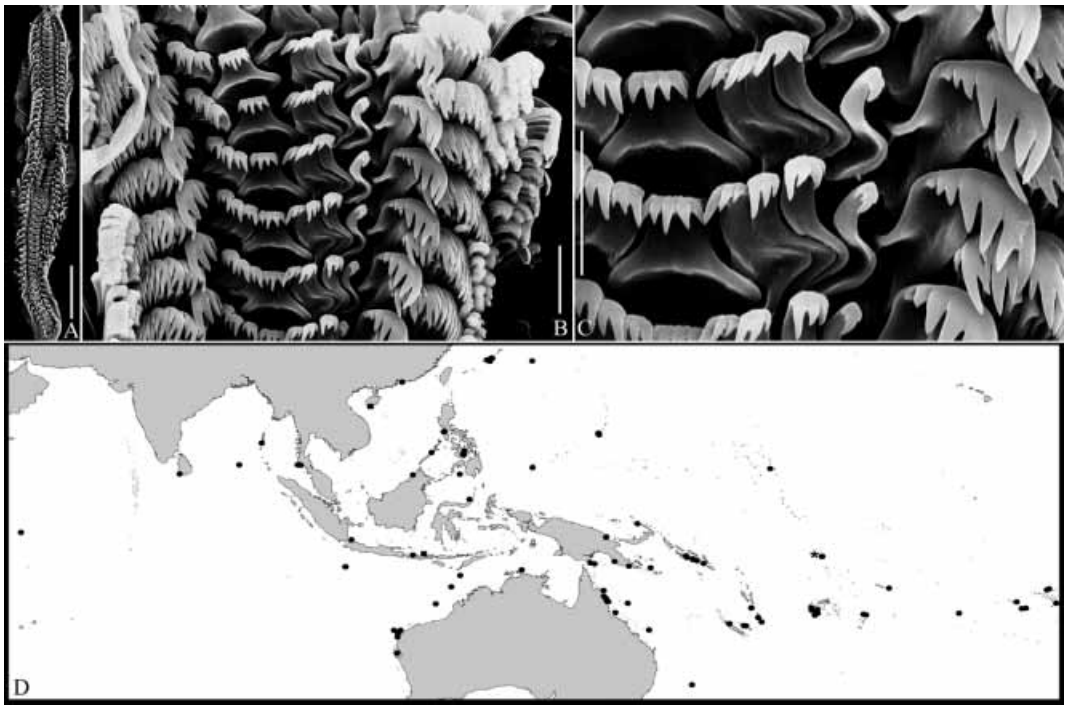

FIGURE 24. A–C. Radula of *Sin. plicata*. A. AMS C.379418. Tanna Island, Hotel Tanna, Vanuatu, 19.533°S, 169.267°E. Scale bar = 100 µm. B–C. AMS C.380658. E side Ilot Tiahura, NW corner Moorea, Society Islands, 17.483°S, 149.917°W. Scale bars = 10 µm. D. Distribution of *Sin. plicata*. Dots: specimen records. Star: type locality.

Vanuatu. 55 m, Aneityum Island, 20.283°S, 169.800°E (AMS C.379414, 1). Tanna Island, Hotel Tanna, 19.533°S, 169.267°E (AMS C.379418, 2, 1: complete). 2 m, Efate, Erakor Reef, 17.780°S, 168.193°E (LACM 77-37, 1). 20 m, Efate, Mele Bay, 17.778°S, 168.257°E (LACM 77-40, 1).

Marshall Islands. 8 m, Majuro, Mile 8, Laura Road, 7.083°N, 171.133°E (SBMNH , 1).

Indonesia. 13 m, Lombok, off Ajer, 8.367°S, 116.067°E (LACM 88-63, 4). 20 m, Java, Pelangi and Putri Islets, 5.600°S, 106.583°E (LACM 86-163, 20). 1.25 m, Java, Pelangi & Putri Islets, 5.600°S, 106.583°E (LACM 86-162, 12). 5–20 m, Sulawesi, Bunaken & Siladen Islets, 1.603°N, 124.767°E (LACM 88-55, 15).

New Guinea. Misima Island, Lousisade Archipelago, 10.650°S, 152.700°E (AMS C.379433, 1). 13 m, Papua, Milne Bay District, Amazon Bay, 10.317°S, 149.350°E (AMS C.379419, 2). Papua, Milne Bay District, Amazon Bay, 10.300°S, 149.333°E (AMS C.379432, 1). 18 m, PAPUA:Off Port Moresby, Manubada Local Island, off W end, 9.517°S, 147.167°E (AMS C.404943, 1). 25 m, PAPUA: Port Moresby, Horseshoe Reef, 9.467°S, 147.167°E (AMS C.379415, 1). Madang, N end Kranket Island, 5.200°S, 145.850°E (AMS C.379420, 1). Madang Province, Astrolabe Bay, off Nagda, 5.158°S, 145.837°E (LACM 80-13, 5). 20 m, Madang Province, Astrolabe Bay, Wonsat Island,

5.137°S, 145.845°E (LACM 80-20). 15–35 m, Baudisson Bay, Kavieng, New Ireland, Papua New Gunea, 2.743°S, 150.658°E (DLG , 5).

Malaysia. 8 m, Police Bay, Palau Gaya, off Kota Kinabalu, Sabah, 5.983°N, 116.067°E (SBMNH , 1). 7 m, N Palau Sapi, off Kota Kinabalu, Sabah, 5.983°N, 116.067°E (SBMNH , 1).

Solomon Islands. 10 m, Central District, Guadalcanal, Marau Sound, 9.817°S, 160.867°E (LACM 78-68.10, 1). 3 m, Central District, Guadalcanal, Ndoma, 9.283°S, 159.817°E (LACM 78-64, 1). 20 m, Central District, Russell Islands, Dry Sand Cay, 9.150°S, 159.192°E (LACM 78-75, 4). 20 m, Central District, Russell Islands, Hanavisi Island, 8.988°S, 159.225°E (LACM 78-73, 1). 18 m, Vangunu Island, Kicha Island, 8.767°S, 158.317°E (LACM 89-78, 1). 20 m, Vanguni Island, Minjanga Island, 8.667°S, 158.233°E (LACM 89-74, 4). Vangunu Island, Karunjou Island, 8.650°S, 158.233°E (LACM 89-76, 2). 23 m, Vangunu Island, S end Porepore Island, 8.583°S, 158.200°E (LACM 89-75, 5). 23 m, Vangunu Island, Kokoana Passage, Marovo Lagoon, Matiu Island, 8.497°S, 158.200°E (LACM 89-77, 12).

Fiji. Sovi Bay Souvi, SW coast Viti Levu, 18.183°S, 177.600°E (AMS C.379430, 5). Viti Levu S coast, Korotongo, 18.183°S, 177.533°E (AMS C.404598, 0, 1: complete). 9 m, Viti Levu, Nadi Bay Tomba Ko Nandi, 17.733°S, 177.417°E (AMS C.379431, 1). 18 m, Kandavu, Cape Washington, 19.108°S, 177.967°E (LACM 85-138, 4). Astrolabe Reef, Kadavu Group, 18.767°S, 178.453°E (LACM 91-189, 2). 23 m, Kadavu Group, Astrolabe Reef, 18.763°S, 178.472°E (LACM 91-188, 2). 1 m, Viti Levu, Korolevu, 18.220°S, 177.718°E (LACM 79-42, 1). 5 m, Viti Levu, 1 km S of Suva Point, 18.170°S, 178.420E (LACM 79-40, 2).

Tonga. Vava'a group, Nuapapu Island, 18.700°S, 174.100°W, (LACM 85-89, 8). 27 m, Vava'a Group, Hunga Island, 18.692°S, 174.133°W, (LACM 85-91, 1).

Society Islands. 4 m, Paevaeva, W side Moorea Island, 17.533°S, 149.883°W, (AMS C.379428, 7). 3 m, Society Islands, Moorea, Club Mediterranean, French Polynesia, 17.500°S, 149.767°W, (LACM 74-36, 10). 25 m, Society Islands, Moorea, Pt. Hauru, French Polynesia, 17.485°S, 149.920°W, (LACM 71-114, 1). Moorea Island, Baie de Papetoai, Passe Tareu, W side, 17.508°S, 149.850°W, (AMS C.379421, 1; AMS C.380675, 2). 29 m, Tahiti, 17.533°S, 149.567°W, (AMS C.379434, 2). 15 m, Tiahura Island, NW Moorea, 17.483°S, 149.917°W, (AMS C.379422, 1). 8 m, Tiahura Island, NW Moorea Island, 17.483°S, 149.917°W, (AMS C.380657, 8). E side Ilot Tiahura, NW corner Moorea, 17.483°S, 149.917°W, (AMS C.380658, 2; C.404426, 1). 18 m, Tahiti, 1 km NW of Mahina (Pt. Venus), offshore seamount, 17.483°S, 149.450°W, (SBMNH, 14). 2 m, Huahine, off Tereva, 16.688°S, 151.026°W, (SBMNH , 2). 1 m, Tahiti, Mahina (Pt. Venus), 17.483°S, 149.450°W, (SBMNH , 5).

Tuamotu. Marutea Atoll, 17°S, 143.167°W, (AMS C.28241, 1). Manihi Atoll, King George Islands, French Polynesia, 15.542°S, 146.058°W, (LACM 83-34, 1). 1 m, Ahe Atoll, French Polynesia, 14.467°S, 146.367°W, (LACM 73-94, 6).

American Samoa. 15 m, Leone Bay, Tutuila Island, 14.338°S, 170.793°W, (LACM 99-89, 2).

Japan, Okinawa. Onna Flats, 1.5 km WNW Onna, 26.488°N, 127.837°E (AMS C.405177, 2). 20 m, Tsuken Jima, 26.268°N, 127.920°E (LACM 78-21, 3). 0 m, Kadena, 26.337°N, 134.467°E (LACM 77-55, 1). 42 m, Zampa-misaki, 26.427°N, 127.718°E (LACM 78-24, 4). 50 m, Zampa misaki, 26.435°N, 127.708°E (LACM 78-25, 20). 52 m, Zampa misaki, 26.435°N, 127.708°E (LACM 78-100, 1). 60 m, Onna Village, 26.493°N, 127.842°E (LACM 79-76, 20). 50 m, Onna Village, 26.493°N, 127.842°E (LACM 79-75, 20). 92 m, Onna Village, 26.493°N, 127.493°E (LACM 78-101, 11). 46 m, Onna Village, 26.495°N, 127.843°E (LACM 78-26, 5). 33 m, Onna Village, 26.495°N, 127.843°E (LACM 78-20, 6). 50 m, Onna Village, 26.495°N, 127.843°E (LACM 78-99, 4). 55 m, Onna Village, 26.497°N, 127.843°E (LACM 78-27, 12). 60 m, Onna Village, 26.497°N, 127.843°E (LACM 78-29, 12). 33 m, Motobu Peninsula, Nakijin, 26.703°N, 127.943°E (LACM 78-22, 7). 16 m, Oku, 26.847°N, 128.287°E (LACM 77-64, 10). 2 m, Oku, 26.847°N, 128.287°E (LACM 77-61, 2). 10 m, Oku, 26.847°N, 128.287°E (LACM 77-63, 1). 17 m, Hedo Point, Japan, 26.863°N, 128.250°E (LACM 78-23, 2). 73 m, Horseshoe Cliffs, Onna Village, 26.500°N, 127.848°E (USNM 822020, 1).

China. 0 m, Hong Kong, E side Mirs Bay Tai Pang Wang, SE of Ping Chau Island, 22.550°N, 114.400°E (AMS C.404425, 1).

Cook Islands. 22 m, Aitutaki, off Arutanga, 18.872°S, 159.792°W, (LACM 87-79, 10).

Philippines. 20 m, Bohol Island, Pamilacan Island, 9.500°N, 123.917°E (AMS C.379417, 1). 2 m, Bohol, Panglao Island, SW side, 9.600°N, 123.750°E (AMS C.380674, 4). 3 m, Palawan Island, N Hondo Bay, Tadio Island, 9.950°N, 118.933°E (AMS C.379416, 3). 2 m, Palawan Island, N of Fondeado Island, 9.950°N, 118.917°E (AMS C.379424, 2). Palawan Island, N Hondo Bay, Tadio Island, 9.950°N, 118.933°E (AMS C.379425, 3). 7 m, Cebu, Mactan Island, 10.283°N, 124.017°E (LACM 81-2, 3). 20 m, Luzon, Manig Point, 13.683°N, 120.892°E (LACM 84-163, 4). 25 m, Luzon, Ligpo Point, 13.825°N, 120.898°E (LACM 84-161, 2). Apo Island, Negros Oriental, 6.083°N, 123.275°E (USNM 808394, 3). 33 m, Malavatuan Island, W Luzon (USNM 278258, 13).

Tuvalu. 366 m, Funafuti Atoll, off Tutanga Tutaga Island, 8.617°S, 179.083°E (AMS C.5641, 7). 91 m, Funafuti Atoll, off Tutanga Tutaga Island, 8.617°S, 179.083°E (AMS C.5642, 5). 274 m, Funafuti Atoll, off Funamanu Beacon Island, 8.567°S, 179.150°E (AMS C.5640, 1; C.170414, 1).

Belau. 11 m, Mutomdu Reef, 7.266°N, 134.500°E (LACM 78-37, 1).

Guam. 1 m, NE Part of Tumon Bay, 13.143°N, 144.750°E (LACM 77-1, 5). 2 m, Bile Bay, 13.275°N, 144.660°E (LACM 77-7, 1). 2 m, Western Shoal, 13.450°N, 144.670°E (LACM 77-20, 2). 1 m, S end Piti Bay, 13.456°N, 144.693°E (LACM 77-14, 2). 6 m, Piti Bay, 13.465°N, 144.690°E (LACM 77-11, 3).

Seychelles. 15 m, Anse Lasio, Chevalier Bay, Praslin Island, 4.283°S, 55.683°E (AMS C.404924, 1).

Andaman Islands. 3 m, Snake Island, off Corbyn's Cove, 11.633°N, 92.750°E (LACM 89-138, 3).

Sri Lanka. 1 m, Hikkaduawa, 6.137°N, 80.095°E (LACM 84-9, 5).

Thailand. 2 m, Phuket, Kaew Yai Island, 7.745°N, 98.308°E (LACM 85-5, 2). 1 m, Phuket, Hey Island, 7.747°N, 98.370°E (LACM 85-1, 1). 4 m, Phuket, Mai Thon Island, 75.000°N, 98.488°E (LACM 85-8, 2). Phuket, S tip Phromthep Cape, 7.758°N, 89.322°E (LACM 85-6, 2). 15 m, Koh Samah, SE Koh Phiphidon, SE of Phuket Island, 7.717°N, 98.783°E (SBMNH , 2).

Literature records. Okinawa. Satonda, Indonesia [8.100°S, 117.750°E] (Bandel, 1998). Xiaodonghai, Hainan, China. Dadonghai, Hainan, China [18.221°N, 109.510°E] (Hasegawa et al., 2001).

Remarks. *Sinezona plicata* Hedley should not be confused the European *Scissurella plicata* Philippi, 1836. The protoconch of Hedley's species has superficially two morphologies: smooth, and smooth with single spiral. The spiral is easily eroded (e.g., Bandel 1998: pl. 16 fig. 2), and it is possible that this character is in fact not polymorphic but highly susceptible to erosion.

Sukashitrochus Habe & Kosuge, 1964

For discussion of *Sukashitrochus* see Geiger (2003)

Sukashitrochus atkinsoni (Tenison-Woods, 1877): Figures 25–27, 32A

Scissurella atkinsoni Tenison-Woods, 1877: 149–150, not illustrated.
Schismope atkinsoni: Tenison-Woods, 1878: 43.
Schismope atkinsonii [sic]: Petterd, 1884: 139.
Schismope atkinsoni: Pilsbry, 1890: 66.
Schismope atkinsoni: Tate & May, 1902: 407.
Schismope atkinsoni: Pritchard & Gatliff, 1902: 181.
Schismope atkinsoni: Hedley, 1903: 329.
Schismope atkinsoni: Hedley, 1905: 42.
Schismope atkinsoni: Anonymous, 1906: 367.
Schismope atkinsoni: Hedley, 1907a: 288.
Schismope atkinsoni: Hedley, 1907b: 478.
Schismope atkinsoni: Hedley & May, 1908: 109.
Schismope atkinsoni: Verco, 1910: 116.
Schismope atkinsoni: Verco, 1912a: 191.
Schismope atkinsoni: Verco, 1912b: 201.
Schismope atkinsoni: Thiele, 1912: 28–29, pl. 3, fig. 26.
Schismope atkinsoni: Cotton & Godfrey, 1933: 23–24, pl. 1, fig. 12.
Schismope atkinsoni: Cotton, 1959: 42–43, fig. 12.
Schismope atkinsoni: Allen, 1959: 51, text-fig. 9.
Schismope atkinsoni: Macpherson & Gabriel, 1962: 33–34, fig. 46.

Schismope atkinsoni: Iredale & McMichael, 1962: 30.
Sinezona atkinsoni: Wilson, 1993: 46.
Sinezona atkinsoni: Jansen, 1995: 11, fig. 13.
Sinezona atkinsoni: Jansen, 1998: 4, figs. 1–3.
Sukashitrochus atkinsoni: Bandel, 1998: 53–54, pl. 18, figs. 5–8.
Sinezona sp.: Hickman, 1998: fig. 15.52 C–D.
Sinezona atkinsoni: Jansen, 1999: 53, figs. 43–45.
Sukashitrochus atkinsoni: Geiger, 2003: fig. 15I [umbilicus].

Synonyms

+ *Schismope carinata* Watson, 1886: 119, pl. 8, fig. 6 [non *Sci. carinata* A. Adams, 1862 = *Suk. carinatus*]. Type material. Two syntypes (BMNH 1877.2.9.414a-417, both destroyed by Bynes' Disease: A. Campbell, pers. comm.).), 0.052 × 0.062" [= 2.1 × 2.5 mm]. Type locality: Recent, April, 23, 1874, Port Jackson, Sydney, [New South Wales,] Australia [33.855°S, 151.247°E]. 6–15 fathoms [= BMNH 1877.2.9.414a, 15–27 m]. Recent, Station 185B, August 31 1874. 11°38'15"S, 143°59'38"E. Raine Island, Cape York, [Queensland,] North-Eastern Australia. 155 fathoms [= 283 m], coral Sand [= BMNH 1877.2.9.415-417] (OD). Etymology. Carina, Latin for rim.

Schismope carinata Watson: Pilsbry, 1890: 65, pl. 65–66, figs. 17–19.

+ *Schismope tasmanica* Petterd, 1879: 104, not illustrated. Type material. Four syntypes (TMAG E222), broken (pers. comm. L. Turner), 2 × 2 mm. Type locality. Blackman's Bay, Tasmania [Australia, 43.017°S, 147.317°E] (OD).

Schismope tasmanica: Tate & May, 1902: 407, pl. 24, fig. 23.
Schismope tasmanica: Pilsbry, 1890: 68.
Schismope tasmanica: Thiele, 1912, 30, pl. 3, fig. 31.
Sukashitrochus tasmanica [sic]: Bandel, 1998: 55–56, pl. 19, figs. 4–5.

Misidentification

Sukashitrochus declinans: Bandel, 1998: 54–55, pl. 19, figs. 1–3 [not *Sci. declinans* Watson, 1886].
not *Schismope atkinsoni*: Suter, 1909: 7. [is *Suk. lyallensis*].
not *Schismope atkinsoni*: Suter, 1913: 90, pl. 6, fig. 12. [is *Suk. lyallensis* or *Sin. iota*].
not *Schismope atkinsoni*: Suter, 1896: 268. [fide Suter, 1913; is *Suk lyallensis*].
not *Schimope atkinsoni*: Suter, 1909: 7 [is *Suk. lyallensis*].

Type material. "TYPE" (Tasmanian Museum, Hobart: Suter, 1913), 2 × 1 mm (OD) 2.5 × 2.25 mm (Suter 1913). 3 SYNTYPES (TMAG E222A), one broken (pers. comm. L. Turner).

Type locality. Blackman's Bay [Tasmania, 43.017°S, 147.317°E] (OD).

Etymology. Named for Rev. H. D. Atkinson (OD).

Description. Shell medium size to large (to 2.1 mm, usually 1–1.5 mm) trochiform. Protoconch almost 1 whorl, flocculant sculpture on outer half, inner half smooth, varix present, connected to embryonic cap, aperture sinusoid. Teleoconch I 0.875–1.125 whorls, 18–31 axials, interstices with irregular crenulations with tendency to form axial pattern, no spirals. Teleoconch II to 1.3 whorls, shoulder with moderately distinct to weak axials, axials most distinct near suture, interstices with fine crenulated axials, spirals usually present, first after 1/4 teleoconch II whorl, approximately 8–9 at apertural margin. Suture sunken in. Base with usually 8 distinct spiral keels, first keel at level of suture before drop of aperture in final 0.25 whorl of mature specimens, first keel of highest elevation above base but dullest, keels becoming less elevated but sharper towards umbilicus. Keels often less to

hardly developed in juveniles. Umbilicus narrow, open, with keel separating base from straight walls of umbilicus. Umbilicus in juveniles hardly present. Selenizone with strong keels, keels rather elevated around foramen, selenizone with strong growth marks not coordinated with axial sculpture of shoulder or base. Aperture rotund, roof overhanging.

Radula. Rachidian tooth trapezoid, cutting edge straight, central denticle 10–20% larger than 4 denticles on each side. Lateral teeth 1–3 similar, first denticle at tip largest of four. Lateral tooth 4 reduced, hook-shaped with 1–2 weak subterminal denticles. Lateral tooth 5 broadened, enlarged, 6 denticles facing towards center of radula. Inner marginal teeth with approximately 5–6 denticles predominantly towards periphery of radula. Outer marginal teeth with spoon-shaped cusp bearing many fine denticles. Radular interlock moderate, strongest between rachidian tooth to lateral tooth 2.

Differential diagnosis. The largely sympatric *Suk. pulcher* has strong cancellate sculpture, particularly with raised knobs on the spiral keels. *Sukashitrochus indonesicus* Bandel, 1998 from the Indo-Malayan Archipelago has a similar overall shell morphology, but has a protoconch with fine axial sculpture as opposed to the flocculant sculpture in *Suk. atkinsoni*.

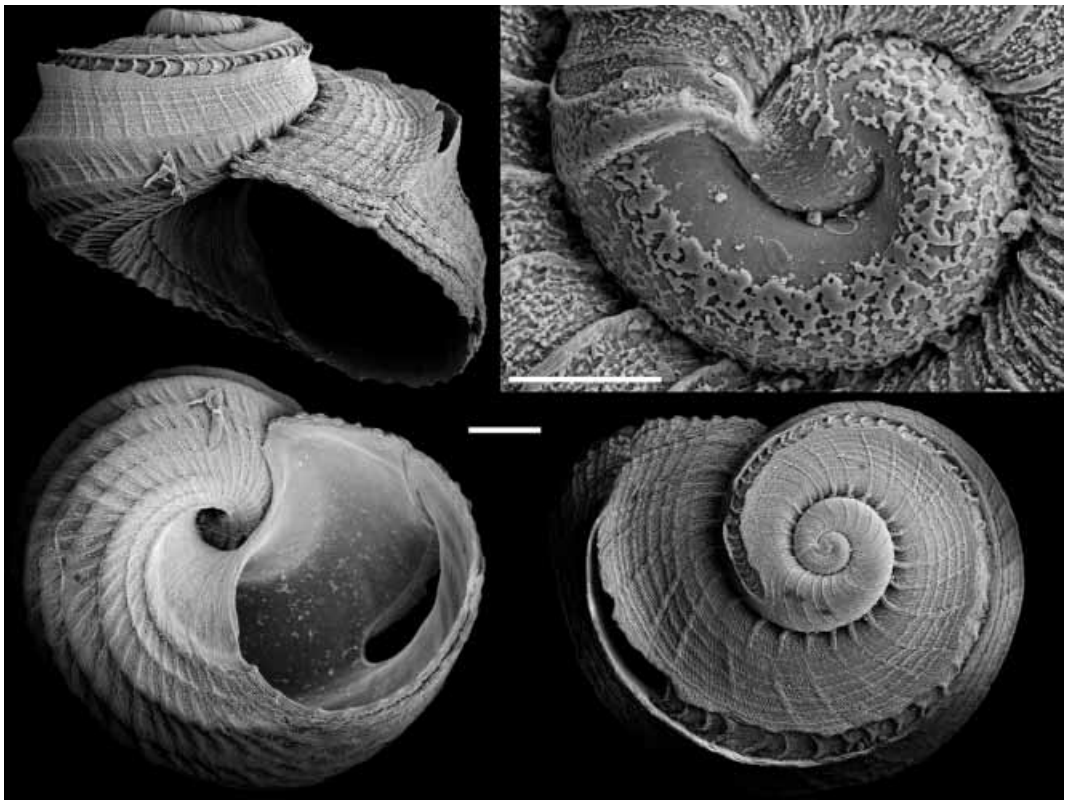

FIGURE 25. *Sukashitrochus atkinsoni*. AMS C.37829050, m, W of Green Head, WA, Australia, 29.750°S, 114.713°E. Scale bar shell = 200 µm. Scale bar protoconch = 50 µm.

Distribution. Mostly in temperate southern Australia: QLD, NSW, SA, VIC, TAS, WA from 46.8°S to 11°S, and from 114°E to 153.8°E (Fig. 32A). 0–165 m, live, under stones, and in algae, on semi-exposed shores.

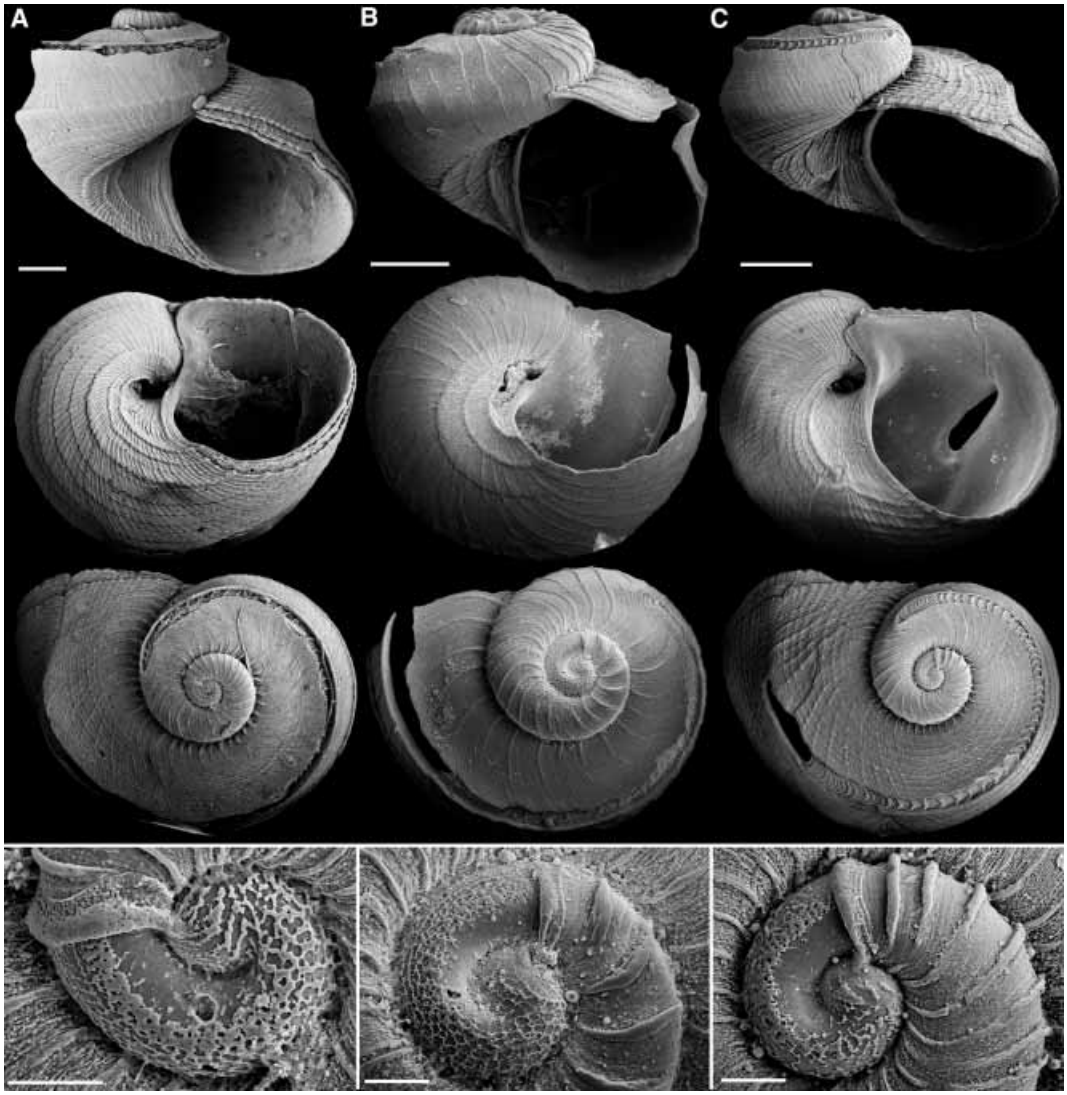

FIGURE 26. *Sukashitrochus atkinsoni*. A. AMS C.346309. Bittangabee, N of Green Cape, NSW, Australia, 37.217°S, 150.017°E. B. AMS C.378547. 667 m, Cape Martin, SA, Australia, 38.125°S, 140°E. C. AMS C.346273. Woody Head, near Iluka, NSW, Australia, 29.367°S, 153.375°E. Scale bars shell = 200 µm. Scale bars protoconch = 50 µm.

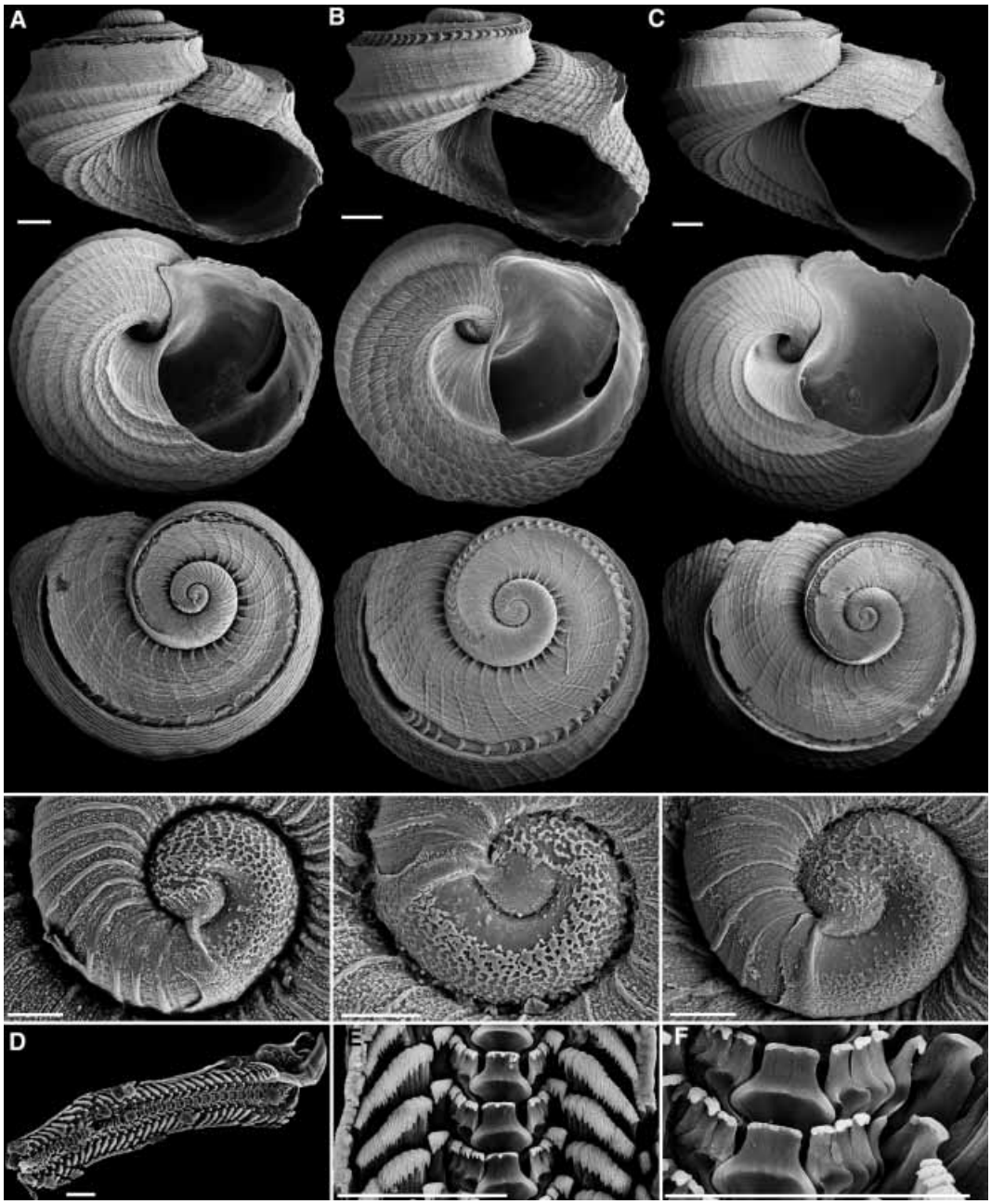

FIGURE 27. *Sukashitrochus atkinsoni*. A, D–F. AMS C.377973. 8 m, Sandy Point, Western Port, just N of North Arm, VIC, Australia, 38.405°S, 145.237°E. B. AMS C.379071. S Cowaramup, WA, Australia, 33.883°S, 114.983°E. C. AMS C.31843. 174 m, 74 km S of Cape Wiles, SA, Australia, 35.650°S, 136.667°E. D. Whole radula. E. Full width of radular row. F. Central field radula in anterior portion of used teeth, showing hook-shaped lateral tooth 4. Scale bars shell = 200 µm. Scale bars protoconch = 50 µm. Scale bars radula = 50 µm.

Specimen records.

Australia, NSW. 10 m, Green Cape, S side, 37.267°S, 150.050°E (AMS C.346287, 3). Bittangabee, N of Green Cape, 37.217°S, 150.017°E (AMS C.346309, 11). 37 m, Twofold Bay, 37.083°S, 149.950°E (AMS C.346299, 1). Twofold Bay, 37.083°S, 149.900°E (AMS C.346316, 2). 0 m, Murrumbulga Point, Twofold Bay, 37.079°S, 149.885°E (AMS C.404225, 0, 2: complete). 2 m, Murrumbulga Pt, Twofold Bay, 37.079°S, 149.885°E (AMS C.404230, 0, 2: complete). 37 m, 19 km N of Eden, 36.950°S, 150.000°E (AMS C.346291, 1). Merimbula Jetty, Merimbula, 36.900°S, 149.925°E (AMS C.346334, 1). 9 m, Montague Island, Narooma, 36.250°S, 150.217°E (AMS C.346328, 1). Batemans Bay, 35.717°S, 150.200°E (AMS C.346275, 2). Pebbly Beach, 35.613°S, 150.328°E (AMS C.346340, 6). Ulladulla, 35.358°S, 150.475°E (AMS C.346313, 1; AMS C.346333, 9). 0 m, S Jervis Bay, 35.125°S, 150.753°E (LACM 79-43, 3). Honeymoon Beach, Jervis Bay, 35.058°S, 150.775°E (AMS C.346345, 1). Jervis Bay, Huskisson, 35.042°S, 150.667°E (AMS C.346349, 1). Jervis Bay, Callala Point, 35.008°S, 150.722°E (AMS C.404224, 0, 2: complete). Werri Beach, Gerringong, 34.738°S, 150.833°E (AMS C.346297, 3). Shellharbour, 34.583°S, 150.867°E (AMS C.346280, 4). 115 m, 9–15 km off Port Kembla, 34.465°S, 151.075°E (AMS C.16222, 2). Port Hacking, Bundeena, Simpsons Beach, 34.083°S, 151.133°E (AMS C.346314, 1). Sydney S, Port Hacking, SW end of Gunnamatta Bay, 34.072°S, 151.145°E (AMS C.346337, 1). Port Hacking, 34.067°S, 151.100°E (AMS C.403740, 20). 6 m, Sydney, Port Hacking, Gunnamatta Bay, 34.066°S, 151.142°E (AMS C.406400, 1; AMS C.346318, 2; AMS C.346341, 2). Sydney, N of Cronulla, Boat Harbour, 34.042°S, 151.200°E (AMS C.404228, 0, 2: complete). Sydney, Little Coogee Bay, 33.922°S, 151.260°E (AMS C.346278, 1; AMS C.346339, 3). Little Coogee Bay, S of Sydney, 33.921°S, 151.262°E (AMS C.346336, 1). 33 m, Between Balls Head & Goat Island, Port Jackson, 33.852°S, 151.197°E (AMS C.346276, 3). 33 m, Sydney, Port Jackson, off Balls Head, 33.850°S, 151.192°E (AMS C.346274, 5). Port Jackson, 33.855°S, 151.247°E (NMSZ, 8). Sydney Harbour, Nielson Park, Bottle & Glass Rocks, 33.849°S, 151.269°E (AMS C.17545, 2). 9 m, Sydney Harbour, Nielson Park, off Bottle & Glass Rocks, 33.849°S, 151.269°E (AMS C.346348, 16). Sydney, Port Jackson, Watsons Bay, Green Point, 33.842°S, 151.275°E (AMS C.2704, 5). Off Georges Head, Port Jackson, Sydney, 33.842°S, 151.262°E (AMS C.346296, 1). 6 m, Sydney, Port Jackson, Watsons Bay, off Green Point, 33.842°S, 151.275°E (AMS C.346305, 3). 22 m, Georges Head, Port Jackson, Sydney, 33.842°S, 151.262°E (AMS C.346344, 1). 3 m, Sydney, Port Jackson, off Sow & Pigs Reef, 33.838°S, 151.268°E (AMS C.404154, 1). Sydney Harbour, off Sow & Pigs Reef, 33.838°S, 151.268°E (AMS C.346279, 3; AMS C.346281, 2). 11 m, Sydney, Port Jackson, off Sow & Pigs Reef, 33.838°S, 151.268°E (AMS C.346288, 5; AMS C.346347, 1). Sydney Harbour, Western Channel, off Sow & Pigs Reef, 33.838°S, 151.268°E (AMS C.346308, 1). 27 m, Sydney, Western Channel, Port Jackson, 33.833°S, 151.267°E (AMS C.346302, 3). Sydney, Middle Harbour, Balmoral Beach, 33.828°S, 151.250°E (AMS C.403662, 4; AMS C.346272, 1). Sydney, Middle Harbour, N end Bal-

moral Beach, 33.825°S, 151.251°E (AMS C.404967, 0, 1: complete). 4 m, Sydney, Middle Harbour, off Balmoral, 33.825°S, 151.257°E (AMS C.346301, 1). 4 m, Sydney, Middle Harbour, off Chinamans Beach, 33.816°S, 151.248°E (AMS C.346271, 21). Sydney, North Harbour, SE side of Reef Bay, 33.808°S, 151.273°E (AMS C.404970, 0, 7: complete). Sydney, North Harbour, 33.808°S, 151.275°E (AMS C.346335, 13). Sydney, Middle Harbour, Clontarf, 33.808°S, 151.252°E (AMS C.346342, 1). Sydney, North Harbour, Fairlight, 33.803°S, 151.273°E (AMS C.346294, 1). Sydney, Manly, 33.803°S, 151.283°E (AMS C.346295, 2). 0 m, Shelly Beach, Manly, Sydney, 33.803°S, 151.283°E (DLG 234, 10: complete). 4 m, Sydney, North Harbour, Fairlight, 33.803°S, 151.273°E (AMS C.346306, 10). Sydney, Manly Beach, 33.803°S, 151.283°E (AMS C.346311, 3). Sydney, North Harbour, off Fairlight, 33.803°S, 151.273°E (AMS C.346338, 2). Sydney, Manly, Shelly Beach, outer coast, 33.802°S, 151.297°E (AMS C.404227, 0, 2: complete). Sydney, Middle Harbour, 33.802°S, 151.233°E (AMS C.32585, 9). 5 m, Sydney, Middle Harbour, 33.802°S, 151.233°E (AMS C.346304, 1). 3 m, Sydney, Manly, Shelly Beach, 33.802°S, 151.297°E (AMS C.346310, 1). 4 m, Sydney, Manly, Shelly Beach, 33.802°S, 151.297°E (AMS C.346332, 1). Sydney, Middle Harbour, 33.802°S, 151.233°E (AMS C.346350, 18). Sydney, Manly, Shelly Beach, 33.802°S, 151.297°E (AMS C.346356, 9). Sydney, Manly, Cabbage Tree Bay, 33.800°S, 151.295°E (AMS C.346277, 6). Sydney, Manly Beach, 33.800°S, 151.283°E (AMS C.346312, 9). Sydney N, Collaroy, Long Reef, 33.743°S, 151.310°E (AMS C.161107, 0, 2: complete). Sydney N, Collaroy, Long Reef, 33.743°S, 151.310°E (AMS C.346292, 20). Sydney N, Collaroy, Long Reef, E end, 33.743°S, 151.320°E (AMS C.346303, 1). Sydney N, Collaroy, Long Reef, 33.743°S, 151.310°E (AMS C.346320, 1). 0 m, Long Reef, Sydney, 33.742°S, 151.320°E (LACM 79-58, 2). Sydney N, Collaroy, Long Reef, Fishermans Beach, 33.738°S, 151.310°E (AMS C.404258, 0, 1: complete). Sydney N, Collaroy, Long Reef, N side, 33.738°S, 151.310°E (AMS C.404969, 0, 12: complete). Sydney N, Collaroy, Long Reef, N side of platform, near Fishermans Beach, 33.738°S, 151.310°E (AMS C.346329, 12, 3: complete). Sydney, S end of Collaroy Beach, 33.733°S, 151.300°E (AMS C.346290, 1). Collaroy Beach, N of Sydney, 33.733°S, 151.300°E (AMS C.346317, 10). Collaroy Beach, N of Sydney, 33.728°S, 151.300°E (AMS C.346289, 1). N of Sydney, Collaroy Beach, 33.728°S, 151.300°E (AMS C.346331, 20). 146 m, 41 km E of Narrabeen, N of Sydney, 33.700°S, 151.717°E (AMS C.25793, 1). Sydney, Broken Bay, Pittwater, 33.617°S, 151.300°E (AMS C.346298, 11). Fingal Head, Port Stephens, 32.758°S, 152.175°E (AMS C.404226, 0, 2: complete). Fingal Head, Port Stephens, 32.758°S, 152.175°E (AMS C.404231, 0, 2: complete). Fingal Head, Port Stephens, 32.757°S, 152.175°E (AMS C.346269, 1). Port Stephens, Fingal Bay, 32.750°S, 152.175°E (AMS C.346319, 6). Port Stephens, Fingal Bay, 32.750°S, 152.175°E (AMS C.346343, 1). North Fingal Bay, near Port Stephens, 32.746°S, 152.175°E (AMS C.346285, 2). 46 m, Port Stephens, 32.708°S, 152.250°E (AMS C.346270, 20). 35 km S of Forster, Seal Rocks, 32.439°S, 152.530°E (AMS C.346330, 1). 0 m, Port Stephens, North Head, Yacaaba, 31.700°S, 152.208°E (LACM 82-

51, 2). Nambucca Heads, 30.642°S, 153.017°E (AMS C.346307, 1). 13 m, E of Yamba, 29.500°S, 153.367°E (AMS C.346327, 1). Clarence River mouth, 29.425°S, 153.350°E (AMS C.346300, 1). Woody Head, near Iluka, 29.367°S, 153.375°E (AMS C.346273, 1). 185 m, 24 km E of Ballina, 28.827°S, 153.855°E (AMS C.402612, 1). 203 m, 23 km E of Cape Byron, 28.633°S, 153.867°E (AMS C.19842, 5).

Australia, QLD. GBR, Michaelmas Cay, 16.600°S, 145.983°E (AMS C.348640, 16).

Australia, SA. 667 m, Cape Martin, 38.125°S, 140°E (AMS C.378302; AMS C.378547, 8). 75 m, Between Cape Jaffa & Kangaroo Island, 36°S, 138.167°E (AMS C.377985, 1). 174 m, 74 km S of Cape Wiles, 35.650°S, 136.667°E (AMS C.378307, 7). 174 m, 74 km S of Cape Wiles, SA, Australia, 35.650°S, 136.667°E (AMS C.31843, 7). Holdfast Bay, 35.000°S, 138.500°E (AMS C.11803, 4). Henley Beach, 34.933°S, 138.517°E (AMS C.378317, 1). Point Souttar, Yorke Peninsula, 34.900°S, 137.267°E (AMS C.378306, 1). Spencer Gulf, Hardwicke Bay, 34.750°S, 137.300°E (AMS C.13409, 7). Spencers Gulf, Hardwicke Bay, 34.750°S, 137.300°E (AMS C.13410, 7). Yorke Peninsula, Bluff Beach, 34.733°S, 137.483°E (AMS C.378314, 1; AMS C.402637, 2). Spencer Gulf, Tumby Bay, 34.367°S, 136.133°E (AMS C.378300, 5). Spencer Gulf, Eyre Peninsula, Arno Bay, 33.933°S, 136.583°E (AMS C.378303, 2; AMS C.378305, 1). Whyalla, mangrove forest near town, 33.033°S, 137.583°E (AMS C.378298, 1).

Australia, TAS. D'Entrecasteaux Channel, 43.045°S, 147.347°E (AMS C.378009, 3). 212 m, S of Storm Bay, 43.783°S, 147.808°E (AMS C.402635, 3). 73 m, 4 km S Tasman Head, S Bruny Island, 43.563°S, 147.323°E (AMS C.377968, 1). 7 m, S Bruny Island, Great Taylor Bay, 43.450°S, 147.167°E (AMS C.404904, 0, 2: complete). 15 m, Tinderbox Bay, S of Hobart, 43.050°S, 147.333°E (AMS C.377974, 6). Derwent Estuary, 42.917°S, 147.392°E (AMS C.377969, 3). Frederick Henry Bay, 42.917°S, 147.583°E (AMS C.10770, 1). 83 m, Maria Island, 5 km NE Beaching Bay, 42.458°S, 148.200°E (AMS C.377975, 1). 45 m, Great Oyster Bay, 42.333°S, 148.217°E (AMS C.377970, 1). 28 m, S of Cape Lodi, 42.000°S, 148.300°E (AMS C.377963, 1). 113 m, Long Point, N of Bicheno, 41.758°S, 148.517°E (AMS C.377987, 3; AMS C.406336, 15). 113 m, N of Great Oyster Bank, 41.758°S, 148.517°E (LACM 73-156, 3). 88 m, S of West Point, 41.153°S, 144.403°E (AMS C.377967, 1). 12 m, Horseshoe Reef, off Devonport, 41.150°S, 146.417°E (AMS C.378008, 2). 399 m, Cape Naturaliste, 40.843°S, 148.775°E (AMS C.377977, 5). 64 m, N of Hummock Island, 40.158°S, 145.425°E (AMS C.377976, 1).

Australia, VIC. 16 m, Western Port, NE of Cowes, 38.439°S, 145.253°E (AMS C.377980, 1). 8 m, Sandy Point, Western Port, just N of North Arm, 38.405°S, 145.237°E (AMS C.377973, 2). Port Fairy, 38.383°S, 142.233°E (AMS C.377978, 14). 10 m, between Stony Point and French Island, Western Port Bay, 38.372°S, 145.240°E (LACM 87-89, 17). 6 m, Western Port, 38.367°S, 145.533°E (AMS C.18667, 4). 47 m, Bass Strait, SW of Lakes Entrance, 38.283°S, 147.667°E (AMS C.377984, 1). 50 m, Bass Strait, 20 km S of Lakes Entrance, 38.250°S, 148.000°E (AMS C.377979, 1). 165 m, Bass Strait, ca.

50 km SE of Cape Everard, 38.250°S, 149.200°E (AMS C.378299, 2). 75 m, Between Cape Howe & Lakes Entrance, 37.917°S, 149.000°E (AMS C.404966, 2). 95 m, 15 km S of Gabo Island, 37.717°S, 149.957°E (AMS C.377981, 1). Mallacoota, 37.567°S, 149.933°E (AMS C.50390, 20).

Australia, WA. 150 m, Albany., 35.407°S, 118.047°E (AMS C.378294, 1). 62 m, Albany, 35.150°S, 117.767°E (AMS C.378279, 1). 1 m, Near Hopetoun Jetty, 33.950°S, 120.117°E (AMS C.378293, 1). Kilcarnup, N side of Margaret River, 33.950°S, 114.983°E (AMS C.406359, 4). S Cowaramup, 33.883°S, 114.983°E, (AMS C.379071, 7). S of Cowaramup Bay, near mouth of Margaret River, 33.883°S, 115.017°E (AMS C.378295, 4). 155 m, NW of Bunbury, 33.250°S, 114.617°E (AMS C.378278, 1). 220 m, SW of Mandurah, 32.750°S, 114.783°E (AMS C.378292, 2). 192 m, SW of Mandurah, 32.717°S, 114.800°E (AMS C.378283, 1). Cockburn Sound, Jervoise Groyne, 2 km S of Woodmans Pt, 32.150°S, 115.767°E (AMS C.378282, 1). 164 m, Rottnest Island, 31.793°S, 115.157°E (AMS C.379970, 2). 150 m, Rottnest Island, 31.778°S, 115.170°E (AMS C.378275, 1). 93 m, Direction Bank, off Rottnest Island, 31.750°S, 115.273°E (AMS C.378291, 3). 118 m, Rottnest Island, 31.747°S, 115.230°E (AMS C.378271, 1). 155 m, Rottnest Island, 31.732°S, 115.158°E (AMS C.378284, 1). 158 m, Direction Bank, off Rottnest Island, 31.730°S, 115.163°E (AMS C.378274, 4). 143 m, Rottnest Island, 31.708°S, 115.187°E (AMS C.378276, 4). 110 m, Rottnest Island, 31.702°S, 115.222°E (AMS C.377965, 1). 148 m, Rottnest Island, 31.688°S, 115.143°E (AMS C.378288, 4). 100 m, Direction Bank, off Rottnest Island, 31.677°S, 115.160°E (AMS C.378659, 1). 62 m, Rottnest Island, 31.633°S, 115.227°E (AMS C.378280, 1). 154 m, WNW of Lancelin, 30.967°S, 114.883°E (AMS C.378287, 2). 50 m, W of Green Head, 29.750°S, 114.713°E (AMS C.378290, 2). 137 m, W of Cliff Head, 29.563°S, 114.283°E (AMS C.378286, 1). 219 m, Wof Dongara, 29.183°S, 113.900°E (AMS C.378273, 7). 256 m, NW Shelf, ca 278 km N of Cape Leveque, 14.117°S, 122.867°E (AMS C.378289, 1). 15 m, W side, Cassini Island, 13.952°S, 125.623°E (SBMNH uncatalogued, 1). 20 m, N side, North Reef, Scott Reef, 13.877°S, 121.859°E (SBMNH uncatalogued, 1). 21 m, Seringapatam Reef, N side, 13.624°S, 122.005°E (SBMNH, 4). 10 m, Ashmore Reef, 12.240°S, 122.983°E (AMS C.378285, 1).

Literature records. Flinders [38.483°S, 145.017°E], off Rhyll [38.467°S, 145.300°E], Western Port [38.367°S, 145.533°E]; Cape Schanck [38.500°S, 144.883°E]; Puebla Coast, Victoria (Pritchard & Gatliff, 1902). Port Kembla [34.500°S, 150.900°E], 63-75 fms. (115–137 m) (Hedley, 1903). Bunbury [33°S, 114.683°E]. Guichen Bay [37.167°S, 139.750°E], Beachport [37.500°S, 140.017°E], St. Francis Island [32.533°S, 133.333°E], Arno Bay [33.933°S, 136.583°E] (Weeding): SA. Blackman's Bay, TAS. (Cotton, 1959). Rhyll, Western Port, Flinders, Cape Schanck, Portarlington [38.117°S, 144.650°E], Victoria (Macpherson & Gabriel, 1962).

Remarks. The New Zealand records of *Suk. atkinsoni* most likely refer to *Suk. lyallensis* (Finlay, 1926) (cf. Powell 1979. more likely) or *Sin. iota* (cf. Powell 1933).

The publication date for *atkinsoni* is usually given as 1876. Although the species was described in the volume for the year 1876, that volume was published only in 1877.

Suter (1913: 90) referred to the "type" as a singular in the Tasmanian Museum, Hobart and gave dimensions of the specimens that are different from those cited in the original description. Bruce Marshall (pers. comm.) pointed out that Suter never visited Tasmania and never saw the type specimens. We do not regard Suter's indiation as a lectotype designation, and do not know how about the source of Suter's measurements.

Most specimens have been obtained from temperate Australia. In tropical Australia, mostly *Suk. indonesicus* Bandel, 1998 (= *Suk. simplex* Bandel, 1998) is found. The two species are quite similar in overall shell morphology, but the protoconch sculpture readily distinguishes them. *Sukashitrochus atkinsoni* shares with *Suk. lyallensis* (Finlay, 1926) flocculant sculpture, whereas *Suk. indonesicus* has fine axials. Some specimens from tropical QLD show the typical *Suk. atkinsoni* protoconch (AMS C.348640 from Michaelmas Cay, GBR). We cannot discount mislabeling of those specimens, although there are no indications to such problems. A cryptic species could also be postulated, although nothing else beyond the distributional anomaly points to that possibility.

Sukashitrochus indonesicus Bandel, 1998: Figure 28, 32B

Sukashitrochus indonesicus Bandel, 1998: 51–52, pl. 17, figs. 7–8, pl. 18, fig. 1.
+ *Sukashitrochus simplex* Bandel, 1998: 52–53, pl. 18, figs. 2–4. Type material. Holotype (SGPIH 3882), 1.4 × 1 mm. Type locality. Near Satonda, Indonesia [8.100°S, 117.750°E] (OD). Etymology. Simplex, Latin for the simple shape of the shell (OD).

Type material. Holotype (SGPIH 3881), 1.7 mm.

Type locality. Near Satonda, Indonesia [8.100°S, 117.750°E] (OD).

Etymology. Named for its provenance from Indonesia (OD).

Description. Shell medium size (to 1.7 mm), trochiform depressed. Protoconch of 0.75 whorls, embryonic cap with reticular sculpture, then with fine axials, axials connected with very fine spiral thread, apertural varix connected to embryonic cap, apertural margin deeply sinusoid. Teleoconch I of slightly more than one whorl, approximately 18 strong axials, interstices with fine, dense, irregular axial sculpture, spirals absent. Teleoconch II of at least 1.33 whorls. Shoulder more or less flat, slightly undulating, almost at right angle to shell axis. Axials finer than on teleoconch I, approximately 37 on first whorl. Spiral threads increasing in number with growth, approximately 13 at apertural margin, forming faintest nodules at intersection with axials. Base with three to four spiral keels, upper most strongest, just below suture, density and strength of axials comparable to shoulder, spirals stronger, forming small, more distinct crenulations at intersections with axials. Umbilicus wide, walls smooth, transition to base with strong carina. Aperture subquadratic, roof overhanging. In mature specimens, apertural margin dipping below level of

first, strongest keel on base. Selenizone at uppermost margin of whorl, inside of periphery, pointing at 45° angle towards axis of shell, with strong lamellae not coordinated with axials; keels strong, of moderate elevation. Slit closed to elongated, teardrop-shaped foramen, length of foramen approximately 0.125 whorl.

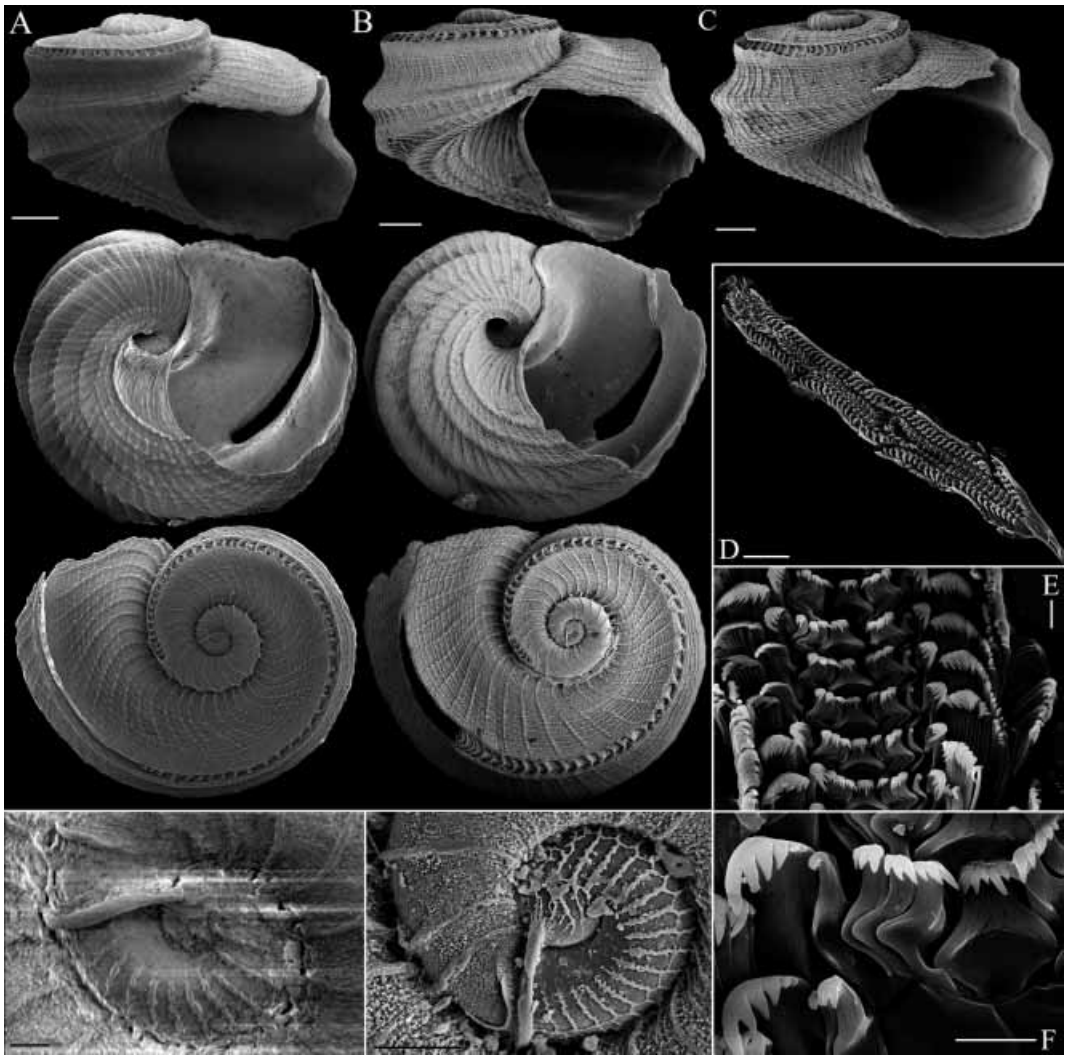

FIGURE 28. *Sukashitrochus indonesicus* 1. A. 15–35 m, Baudisson Bay, Kavieng, New Ireland, Papua New Guinea, 2.743°S, 150.658°E, leg. F. Lorenz, Jr. (SBMNH). B. AMS C.378318. Norfolk Island, 29.033°S, 167.950°E. C–F. AMS C.378673. Malaita Island, S of Aoki Auki, Laulasi Island, Solomon Islands, 8.867°S, 160.733°E. C. Shell in apertural view, protoconch eroded, identification tentative. D–F. Radula of specimen shown in C. D. overview. Scale bar = 100 µm. E. Width of radula. Scale bar = 10 µm. D. Central field enlarged. Scale bar = 10 µm. Scale bar shell = 200 µm. Scale bar protoconch = 50 µm.

Radula n-5-R-5-n, rachidian tooth triangular, cusp with central denticle largest, five peripheral denticles in arch. Lateral teeth 1–3 with 3–4 denticles on cusp, base extended outward. Lateral tooth 4 reduced, hook-shaped with 1–2 minute denticles on cusp. Lateral tooth 5 broadly enlarged, cusp with approximately 6 denticles, distalmost largest. Inner marginal teeth reduced mirror image of lateral tooth 5, outer marginals spoon-shaped with frilly margins. Radular interlock moderate.

Differential diagnosis. *Sukashitrochus atkinsoni* from temperate Australia has a protoconch with flocculant sculpture towards the outer portion, and more numerous spiral keels of variable strength. *Sukashitrochus pulcher* from temperate Australia has a strongly cancellate sculpture with elevated knobs at the intersection of axials and spiral keels on the base. *Sukashitrochus carinatus* from Southern Japan has a protoconch with flocculant sculpture.

Distribution. Indo-Malayan Archipelago: Hong-Kong (22.5°N) to Norfolk Islands (29°S), central Indonesia (116°E) to Norfolk Islands (168°E: Fig. 32B). 14 m depth, live, in muddy sand.

Specimen records.

Australia, NT. 14 m, Oxley Island, W side, 11°S, 132.817°E (AMS C.404490, 0, 2: complete).

Australia, QLD. 9–18 m, GBR, Cairns Reef lagoon & between Cairns Reef & Hope Island, 15.700°S, 145.500°E (AMS C.27172, 20). 21 m, GBR, Euston Reef, SW side, 16.667°S, 146.217°E (AMS C.405198, 2). 20 m, GBR, Michaelmas Cay, 16.600°S, 145.983°E (AMS C.348697, 16). 9–15 m, Torres Strait, off Murray Island, 9.933°S, 144.067°E (AMS C.48356, 7).

Australia, WA. 18–20 m, N end Mermaid Reef, Rowley Shoals, 17.050°S, 119.600°E (LACM 86-250, 1). 20 m, N side, North Reef, Scott Reef, 13.877°S, 121.859°E (SBMNH, 1). 256 m, NW Shelf, ca 278 km N of Cape Leveque, 14.117°S, 122.867°E (AMS C.378289, 1). 21 m, Seringapatam Reef, N side, 13.624°S, 122.005°E (SBMNH , 4). 15 m, W side, Cassini Island, 13.952°S, 125.623°E (SBMNH uncatalogued, 1).

China. 0 m, Hoi Sing Wan, Tolo Channel, New Territories, Hong Kong, 22.435°N, 114.247°E (LACM 85-12, 1).

Indonesia. 5–20 m, off Ajer (Gili Air) and Meno Islet, NW side Lompok, 8.367°S, 116.067°E (LACM 88-63, 4). 8–40 m, Pisok Point, N of Manado, N Celebes, 1.567°N, 124.792°E (LACM 82-39, 1). 5–20 m, Sulawesi, Bunaken & Siladen Islets, 1.603°N, 124.767°E (LACM 88-55, 13).

Norfolk Islands. 29.033°S, 167.950°E (AMS C.378318, 1; AMS C.378319, 1).

New Guinea. 15–35 m, Baudisson Bay, Kavieng, New Ireland, 2.743°S, 150.658°E (DLG, 5). 30 m, Wongat Island, Madang Province, 5.135°S, 145.845°E (LACM 80-26, 1).

Solomon Islands. 20–25 m, Matiu Island, Kokoana Passage, Marovo Lagoon, NE side Vangunu Island, New Georgia Group, 8.495°S, 158.200°E (LACM 89, 2). Malaita Island, S of Aoki Auki, Laulasi Island, 8.867°S, 160.733°E (AMS 378673, 1).

Remarks. *Sukashitrochus simplex* is here synonymized under *Suk. indonesicus*. Bandel (1998) cited as sole difference the stronger basal keels in *Suk. indonesicus* as compared to *Suk. simplex*. The degree to which keels are developed varies considerably in *Sukashitrochus*, as seen in the most abundant material available for *Suk. atkinsoni* from Australia. Shared similarities of the two species include reticulate sculpture on embryonic cap and fine axials on protoconch, protoconch varix connected to embryonic cap, apertural margin of protoconch sinusoidal, the slightly more than one whorl of teleoconch I, number of axials on teleochonch I, absence of spiral sculpture on teleonconch I, 1.33 teleoconch II whorls, density of sculpture on shoulder and base, position of first keel that is strongest, dipping of apertural roof just below first keel on base in mature specimens. Both species were described by Bandel (1998). We apply first reviser's principle and use as valid name the one described earlier in the work.

***Sukashitrochus pulcher* (Petterd, 1884):** Figures 29–31, 32C

Schismope pulchra Petterd, 1884: 139.
Schismope pulchra: Pilsbry, 1890: 68 [fide Thiele, 1912].
Schismope pulchra: Hedley, 1901: 726, fig. 25.
Schismope pulchra: Tate & May, 1902: 407.
Schismope pulchra: Thiele, 1912: 31, pl. 4, figs. 2–3.
Schismope pulchra: Cotton & Godfrey, 1933: 24.
Schismope pulchra: Cotton, 1959: 43–44, fig. 14.
Schismope pulchra: Macpherson & Gabriel, 1962: 34.
Sinezona pulchra: Wilson, 1993: 46.
Sinezona pulchra: Jansen, 1999: 55, figs. 61–63.

Type material. TYPE(S) (whereabouts unknown), 2 × 1 mm.

Type locality. North West coast [Tasmania, Australia] (OD).

Etymology. Latin adjective pulcher, pulchra, pulchrum = beautiful.

Description. Shell medium size (to 2.2 mm), wider than tall. Protoconch almost 1 whorl, reticulate sculpture on outside with spiral apical thickening, smooth inside; varix present connecting to embryonic cap; aperture sinusoid. Teleoconch I of approximately 1 whorl (0.8–1.2), with approximately 16–18 axials, no spirals, interaxials smooth, base without spiral keels. Teleoconch II approximately 1.5 whorls. Sculpture on flat shoulder with approximately 28 axials on last adult whorl more prominent than approximately 6 indistinct spirals. Profile of shoulder with one, and sometimes one secondary, spiral fold; axials at intersection with fold usually with elevated projection. Base with 6–7 spiral keels decreasing in prominence from below selenizone to umbilical margin, intersected with approximately 28 axial cords on last adult whorl, axials running over spiral keels; axials on shoulder and base poorly coordinated. Umbilicus prominent, deep, bordered by last spiral keel on base, wall of umbilicus at steep angle to base. Selenizone inside periphery, keels at approximately 45° angle to coiling axis, growth marks not coordinated with axials on shoulder or base. Foramen elongated lanceolate. Aperture subrotund; interior margin

almost straight, roof overhanging. Operculum and anatomy unknown. Radula typical for genus.

Differential diagnosis. The strong cancellate sculpture of *Suk. pulcher* with the elevated knobs at the intersection of axials and spiral keels on the base sets it apart from any other scissurellid species. *Sukashitrochus atkinsoni* from temperate Australia lacks the axial component and does not form elevated points on the spirals. *Sukashitrochus indonesicus* from the Indo-Malayan Archipelago also lacks the strong sculpture and has a protoconch with fine axial sculpture.

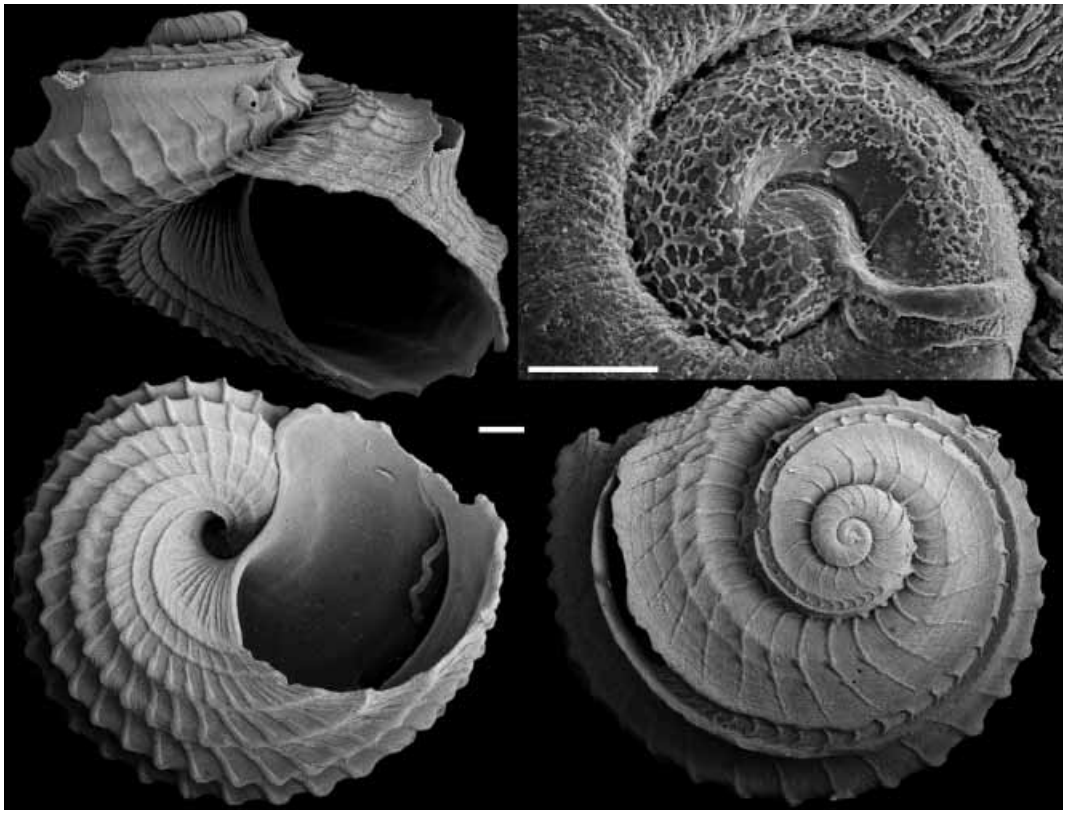

FIGURE 29. *Sukashitrochus pulcher*. AMS C.379967, 80 m, W of West Point, TAS, Australia, 41.020°S, 144.358°E. Scale bar shell = 200 µm. Scale bar protoconch = 50 µm.

Distribution. Ryukyu to Tasmania (26.5°N–43.5°S), Western Australia through Vanuatu (115°E–170°E: Fig. 32C). 0–667 m depth, 0–80 m depth, live, from algae covered rocks.

Specimen records.

Japan, Okinawa. 92 m, Onna Village, 26.493°N, 127.493°E (LACM 78-101, 1).

Vanuatu. 85 m, Aneityum Island, 20.267°S, 169.850°E (AMS C.404505, 0, 9: complete).

Australia, NSW. Bittangabee, N of Green Cape, 37.217°S, 150.017°E (AMS

C.404918, 0, 1: complete).

Australia, QLD. 2 m, GBR, E of Lizard Island, Yonge Reef, N end, 14.583°S, 145.617°E (AMS C.404493, 0, 1: complete).

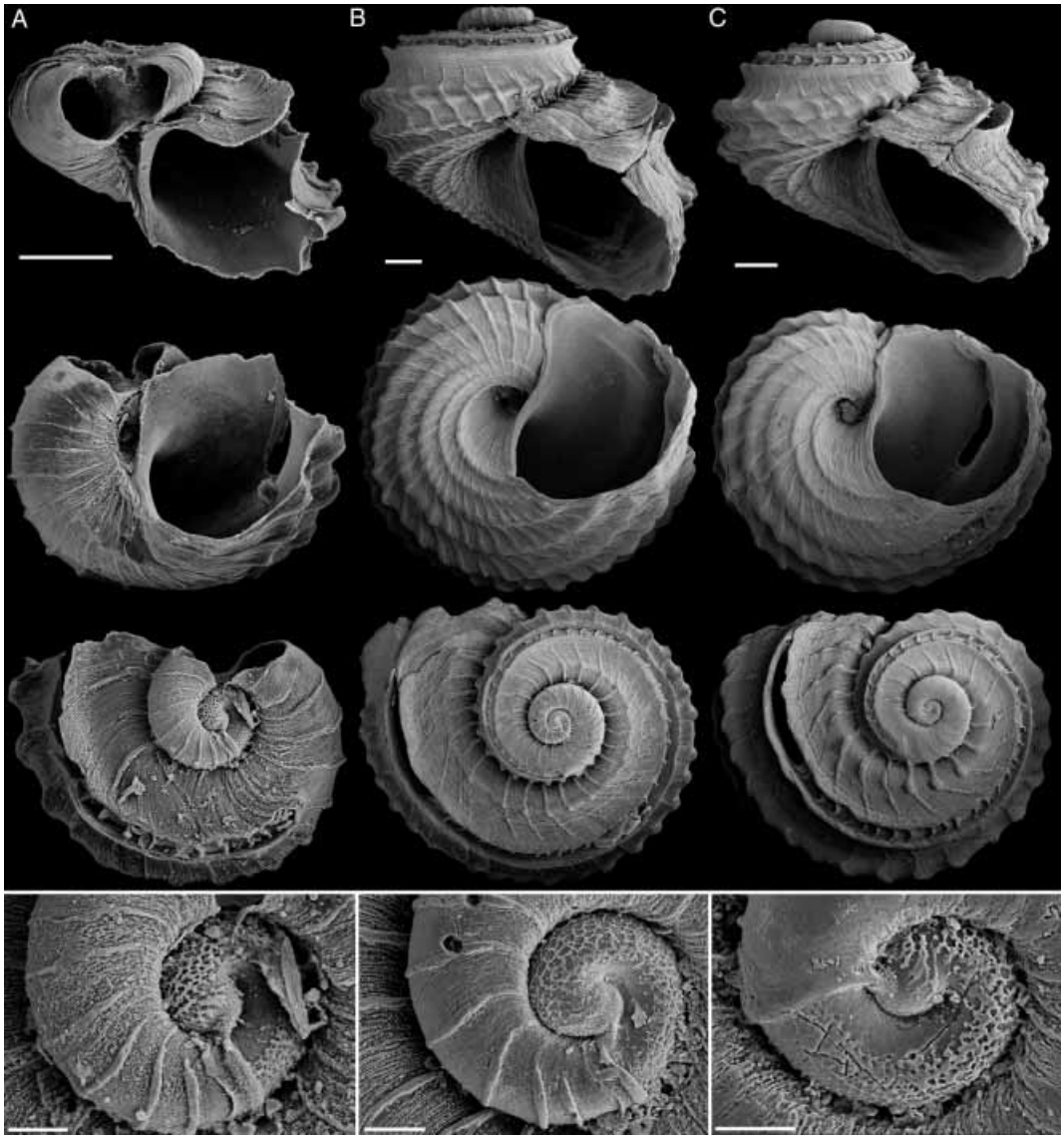

FIGURE 30. *Sukashitrochus pulcher*. A. AMS C.378297, 18 m, Knob Bluff, N coast Kangaroo Island, SA, Australia, 35.617°S, 137.233°E. Notice the smooth base of the juvenile shell. B. AMS C.379964, 82 m, W of Port Davey, TAS, Australia, 43.338°S, 145.803°E. C. AMS C.026706, St Vincents Gulf, SA, Australia, 35°S, 138°E. Scale bars shell = 200 µm. Scale bars protoconch = 50 µm.

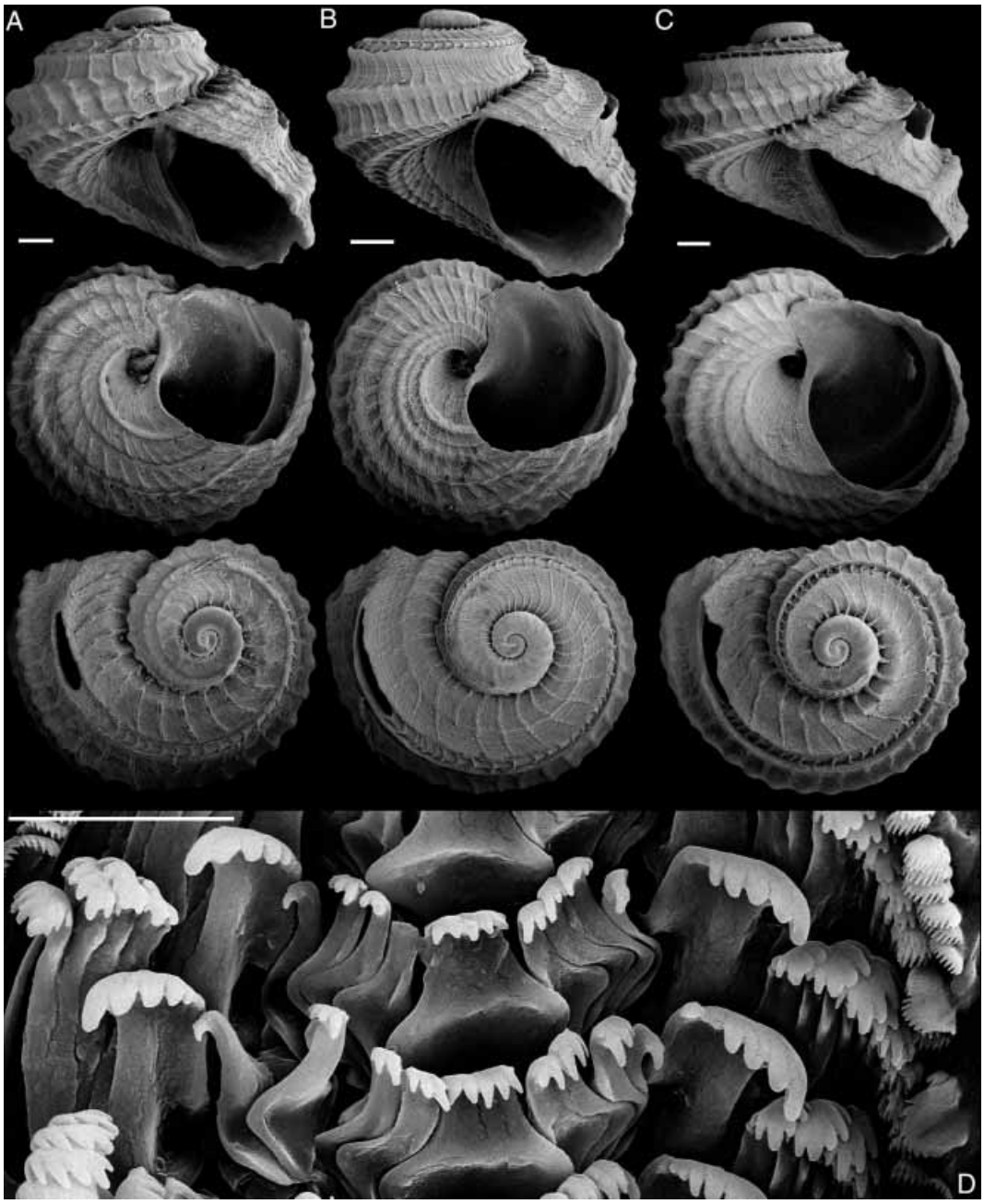

FIGURE 31. *Sukashitrochus pulcher*. A. AMS C.379974, Hopetoun, Two Mile Beach, WA, Australia, 33.950°S, 120.117°E. B. AMS C.378609, 35 m, E of Mackay, GBR, QLD, Australia, 20.867°S, 149.483°E. C. AMS C.379958, Port Fairy, VIC, Australia, 38.383°S, 142.233°E. D. Radula from AMS C.378279 from specimen shown in Figure 30A. Scale bars shell = 200 µm. Scale bars protoconchs = 50 µm. Scale bar radula = 10 µm.

Australia, SA. 667 m, Cape Martin, 38.125°S, 140.000°E (AMS C.379961, 2). 13 m, Middle Point, near Cape Northumberland, 38.050°S, 140.617°E (AMS C.380166, 2). 174 m, 74 km S of Cape Wiles, 35.650°S, 136.667°E (AMS C.380169, 3; AMS C.31844, 3). 18 m, Knob Bluff, N coast Kangaroo Island, 35.617°S, 137.233°E (AMS C.378297, 1). St Vincents Gulf, SA, Australia, 35.000°S, 138.000°E (AMS C.26706, 3). Adelaide, Glenelg Beach, 34.967°S, 138.533°E (AMS C.380165, 2). Spencers Gulf, Hardwicke Bay, 34.750°S, 137.300°E (AMS C.13408, 3). Yorke Peninsula, Bluff Beach, 34.733°S, 137.483°E (AMS C.380167, 1; AMS C.380168, 1). 20 m, Petrel Bay, N of St Francis Island, 32.483°S, 133.300°E (AMS C.378304, 1).

Australia, TAS. 144 m, Port Davey, 43.375°S, 145.742°E (AMS C.379966, 1). 82 m, W of Port Davey, 43.338°S, 145.803°E (AMS C.379964, 1). Ulverstone, 41.158°S, 146.183°E (AMS C.4939, 2). 88 m, S of West Point, 41.153°S, 144.403°E (AMS C.379963, 1). 80 m, W of West Point, 41.020°S, 144.358°E (AMS C.379967, 2). 399 m, Cape Naturaliste, 40.843°S, 148.775°E (AMS C.379962, 1). 10 m, Little Squally Cove, Deal Island, Bass Strait, 39.500°S, 147.333°E (AMS C.379969, 1, 1: complete). 6 m, East Cove, Deal Island, Bass Strait, 39.500°S, 147.333°E (AMS C.404982, 0, 1: complete). 6 m, Bass Strait, Erith Deal Island, 39.450°S, 147.283°E (AMS C.379968, 2).

Australia, VIC. Flinders, Ocean Beach, 38.483°S, 145.017°E (AMS C.379957, 2). Port Fairy, 38.383°S, 142.233°E (AMS C.379958, 20). 11 m, Western Port, 38.367°S, 145.533°E (AMS C.16006, 1).

Australia, WA. Kilcarnup, N side of Margaret River, 33.950°S, 114.983°E (AMS C.379973, 1). Hopetoun, Two Mile Beach, 33.950°S, 120.117°E (AMS C.379974, 8). 1 m, Hopetoun Jetty, 33.950°S, 120.117°E (AMS C.379977, 1). Ellensbrook, S Cowaramup, near Margaret River mouth, 33.883°S, 114.983°E (AMS C.379975, 1). S of Cowaramup Bay, near mouth of Margaret River, 33.883°S, 115.017°E (AMS C.404156, 4). Myalup, 33.100°S, 115.700°E (AMS C.379971, 1). 154 m, WNW of Lancelin, 30.967°S, 114.883°E (AMS C.378296, 1).

Literature records. Robe [37.217°S, 139.767°E], Largs [34.817°S, 138.483°E], Venus Bay [33.233°S, 134.683°E], Beachport [37.500°S, 140.017°E], St. Franchis Island [32.500°S, 133.300°E], 35–50 fms (64–91 m). Gulf of St. Vincent (Cotton & Godfrey 1933). Off Rhyll [38.467°S, 145.300°E], Western Port [38.367°S, 145.533°E], Victoria (Pritchard & Gatliff 1902; Macpherson & Gabriel 1962).

Remarks. The species has a predominantly temperate Australian distribution. There are some additional, dispersed records from more tropical localities. These specimens are indistinguishable from the temperate ones.

Trogloconcha Kase & Kano, 2002

For discussion of *Trogloconcha* see Geiger (2003).

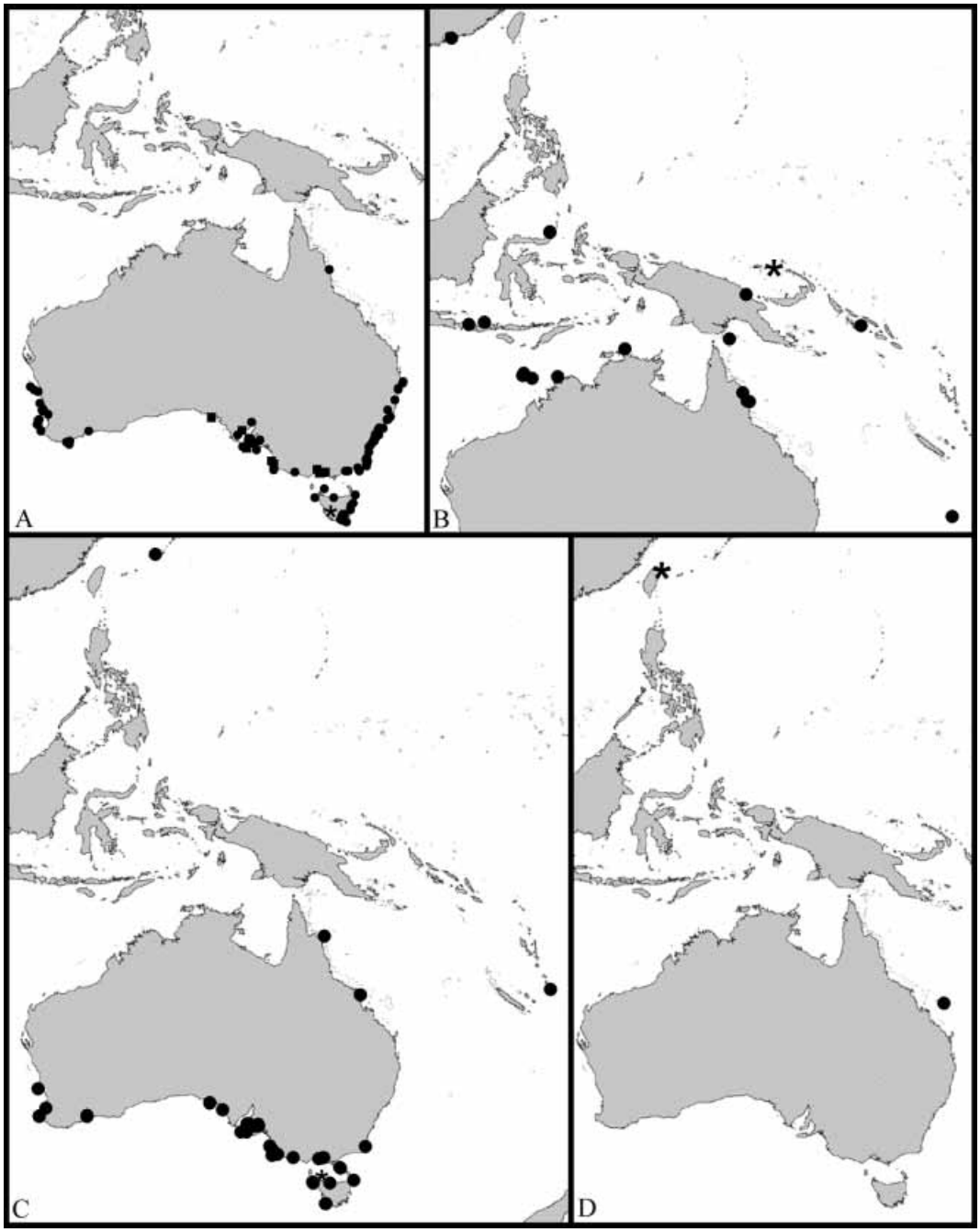

FIGURE 32. A. Distribution of *Suk. atkinsoni*. B. Distribution of *Suk. indonesicus.* C. Distribution of *Suk. pulcher.* D. Distribution of *T. tesselata*. Dots: specimen records. Squares: literature records. Star: type locality.

***Trogloconcha tesselata* Kase & Kano, 2002:** Figures 32D, 33

Trogloconcha tesselata Kase & Kano, 2002: 31, figs. 1D–F, 2C–D.
Trogloconcha tesselata: Marshall, 2002: 179.
Misidentification
Larochea miranda: Bandel, 1998: 66–67, pl. 23, figs. 4–5 [is *T. tesselata*].

Type material. HOLOTYPE (NSMT Mo72830), 1.02 × 1.11 mm. PARATYPES 7 (NSMT Mo72831).

Type locality. North of Kohama Island, Yaeyama Group, Okinawa (24°21.5'N 123°58.9'E); 15–20 m; crevices, coral sand (OD).

Etymology. Latin, tesselatus: tesselate, reticulate. Named for the sculpture of crossed spirals and axials (OD).

Description. Shell small (Holotype: 1.1 × 1.02 mm, maximum 1.14 × 1.02 mm), as wide as high (width/height ratio 1.04–1.11). Teleoconch with 1.75–2 whorls. Sculpture with dense axials and spirals of equal strength producing fine reticulate pattern, approximately 70 axials on last adult whorl. Anomphalous. Aperture round. Selenizone, slit, or foramen absent. Protoconch approximately 240 µm in diameter, 1.25 whorls, mostly smooth (eroded?) with some traces of flocculant sculpture, apertural varix absent, apertural margin curved. Animal unknown.

Differential Diagnosis. *Trogloconcha christinae* Geiger, 2003 from South Western Australia lacks spiral sculpture. *Trogloconcha ohashii* Kase & Kano, 2002 from the Indo-Malayan Archipelago is umbilicate.

Distribution. Okinawa, Queensland (Fig. 32D). 15–73 m.

Specimens Records.

Japan, Okinawa. N of Kohama Island, Yaeyama Group, 24°21.5'N 123°58.9'E: holotype and paratypes.

Australia, QLD. Swains Reef, (Bandel, 1998; repository unknown). 64–73 m, 3 km NE of W side Bylund Gillett Cay, 21.700°S 152.433°E (AMS C.377895: AMS SEM stub 4391).

Remarks. Kase & Kano (2002) referred the specimen illustrated by Bandel (1998: pl. 23, figs. 4–5) as *"Larochea miranda"* to *T. ohashii* Kase & Kano, 2002. Bandel's specimen, however, represents *T. tesselata* Kase & Kano, 2002, not *T. ohashii* (cf. Marshall, 2002). *Trogloconcha ohashii* is characterized by pustules at the intersection of the axials and the spirals, which are not evident in Bandel's illustration. *Trogloconcha ohashii* seems also to be wider than Bandel's specimen. Bandel's specimen shares with *T. tesselata* that the axials are stronger than the spirals, whereas in *T. ohashii* axials and spirals are of equal strength.

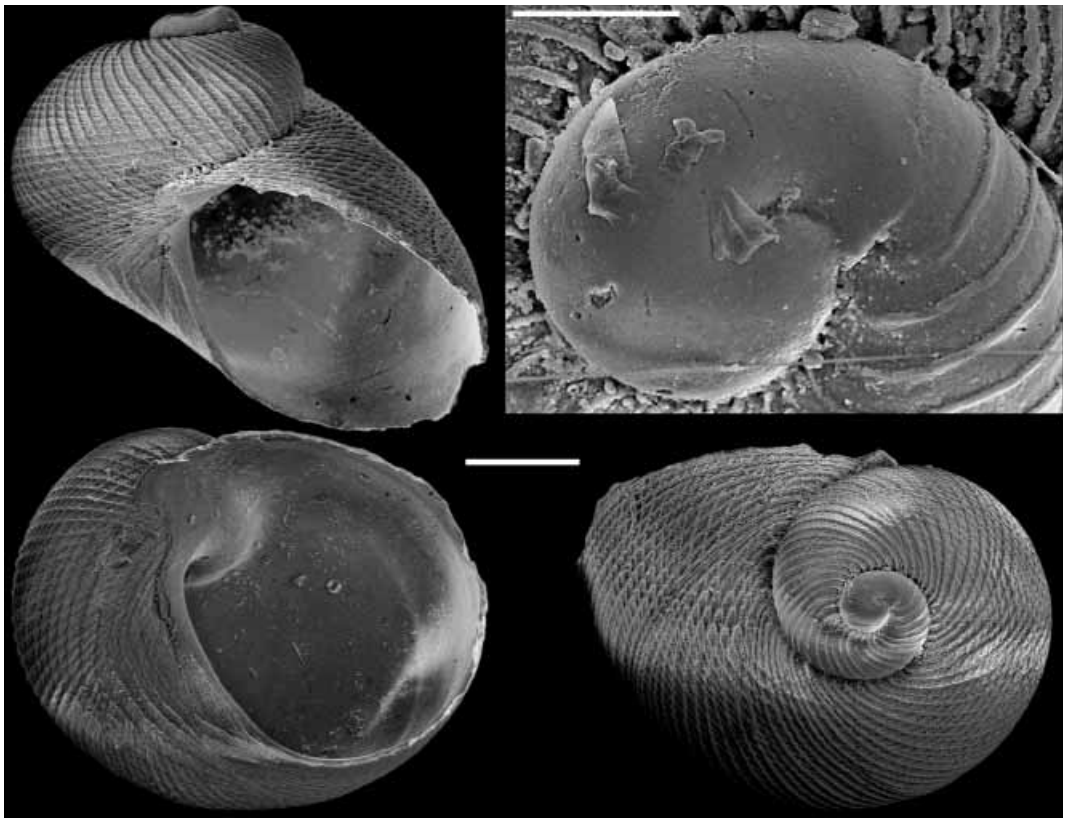

FIGURE 33. *Trogloconcha tesselata*. AMS C.406375. 64 m, GBR, Swain Reefs, 3 km NE of W side of Bylund Gillett Cay, QLD, Australia, 21.700°S, 152.433°E. Scale bar shell = 200 µm. Scale bar protoconch = 50 µm.

Discussion

We have documented here the morphological variation as well as the geographic distribution of several scissurellid species occurring in Australian waters. Careful analysis of shell morphology allowed us to identify constant and variable characters that are suitable for generic classification and the delineation of species. Particular shell morphological features are assigned to different types of characters in the various genera. The present study confirms and amplifies the conclusions of Geiger (2003). In *Incisura*, the smooth, flared shell is used as a generic classification character, while the condition of the slit/foramen seems to be variable. The condition of the slit/foramen, however, is distinguishing clearly between *Scissurella* and *Sinezona*, whereas in these two genera the protoconch sculpture is utmost variable within the genera, though diagnostic for species. In *Sukashitrochus*, the presence of the basal keels clearly diagnoses the genus. However, the distinctness of the basal keels varies significantly within species, and protoconch morphology is species-specific. The strength of the keels varies continuously and no breaks in the distribution could

be identified. Accordingly, *Sukashitrochus* species distinguished solely on the basis of the distinctness of basal keels cannot be retained, and we have here synonymized *Suk. simplex* under *Suk. indonesicus*.

The radulae are mostly of the same type, and agree with one another to a great extent. The one aberration of this basic plan is found in *Suk. atkinsoni*, in which the rachidian tooth has a cusp with denticles arranged in a row parallel to the tooth rows (Fig. 27F), whereas both in *Suk. indonesicus* (Fig. 28F) and *Suk. pulcher* (Fig. 31D) the rachidian has a cusp with the denticles arranged in an arch. The rachidian type of *Suk. atkinsoni* is shared with *Suk. lyallensis* (Finlay, 1926) from New Zealand (Marshall 1993: fig. 3), that has also the same protoconch sculpture (USNM 610425: Geiger, unpubl. data). This intriguing covariation of characters awaits more detailed analysis based on all *Sukashitrochus* species.

Most species are found either in temperate or in tropical waters. In several species, there are outliers in that distributional pattern. These outliers are found in either of the two groups (*Sci. quadrata*, *Suk. atkinsoni*, *Suk. pulcher*). The outlier specimens can not be distinguished from those from the predominant region. All scenarios that may explain these specimens are unsatisfactory. Anthropogenic transport is unlikely for microshells, and passive sediment transport of those distances is equally far fetched, particularly as some of the outlier specimens have detailed protoconch sculpture preserved. Swimming behavior has been reported for *Sukashitrochus* by Haszprunar (1988) and for three species of Japanese scissurellids by Hasegawa (2004), and is implied by collection of large numbers of scissurellids in floating light traps (Porter & Hickman personal communication). However, such behaviors do not seem to have the potential to account for the geographic distances in question. Lack of collection effort and seasonal variation in abundance as found in *Sin. rimuloides* (Carpenter, 1865) from California (Geiger, pers. obs.), could also explain some of the disjunct distributions. Although a possibility in the larger Indo-Malayan Archipelago, the coast from QLD to NSW has been extensively sampled by AMS staff. Curatorial mishaps may be blamed for some of the outliers.

We abstain from cleaning our data to make the specimen records fit the assumed distributional pattern. As scissurellids are still a poorly known group of mollusks, these currently unexplained data points may provide a starting point for further investigation; the re-discovery of the overlooked abalone *Haliotis stomatiaeformis* Reeve, 1846 in the exceedingly well-studied Mediterranean was initiated by a single erratic specimen (Geiger 1998b; Geiger & Owen 2001). There may also be shell-morphologically cryptic scissurellid species that may only be distinguished by either live animal observations or molecular data.

Some species that have been reported from Australia (Jansen 1999) await further treatment. These include *Sin. beddomei* (Petterd, 1884), *Sin. ferriezi* (Crosse, 1867), *Sin. pacifica* Oliver, 1915, *Sci. coronata*, and *Sci. ornata* May, 1908. Paucity of material, unresolved lectotype designations, and multispecies complexes require additional investi-

gations. The genus *Satondella* with new species from Australian waters will be treated elsewhere (Luque, Rolàn & Geiger, unpubl. data).

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