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Eight new species of Scissurellidae and Anatomidae (Mollusca: Gastropoda: Vetigastropoda) from around the world, with discussion of two new senior synonyms

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Abstract

Eight new species of Scissurellidae and Anatomidae are described: *Scissurella kaiserae* new species from the Panamic; *Scissurella lorenzi* new species from the Indo-Malayan archipelago; *Scissurella maraisorum* new species from South Africa; *Sinezona garciai* new species from the Caribbean; *Sinezona globosa* new species from the tropical Western Pacific; *Sinezona macleani* new species from the Philippines; *Sinezona singeri* new species from the Red Sea; and *Anatoma jansenae* new species from southern Australia. Radulae of *Scissurella kaiserae* and *Sinezona singeri* are illustrated. *Anatoma munieri* (Fischer, Oct. 1862) is identified as a senior synonym of *Anatoma turbinata* (A. Adams, Nov. 1862), and *Sukashitrochus morleti* (Crosse, 1880) is shown to be a senior synonym of *Sukashitrochus indonesicus* Bandel, 1998, and *Sukashitrochus simplex* Bandel, 1998. These synonymies are based on examination of type material in the Muséum Nationale dHistoire Naturelle, Paris; scanning electron microscope images of the types are provided, and lectotypes are here selected.

Key words: microgastropods, SEM, protoconch

Introduction

Scissurellidae is a family of small (1–11 mm), exclusively marine snails occurring world wide from the intertidal to the deep sea, including hydrothermal vents. There are 169 described species from the Recent, yet there are a number of undescribed ones. Here I describe eight new species in the context of a world-wide monograph of the family. Geiger (2003) recently provided an overview of the family, including an assessment of the various generic names used. The diagnoses of all supraspecific taxa given in Geiger (2003) is followed here. The family rank for Scissurellidae and Anatomidae is based on the conclusions of a molecular phylogeny of Vetigastropoda by Geiger & Thacker (2005).

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Materials and methods

Specimens were prepared by standard methods for scanning electron microscopy (SEM, e.g., Geiger 2003). Specimens were sonicated with a ultrasonic cleaner as much as their preservational condition permitted; types from described species were not sonicated. Most specimens were sputter coated with gold; types from described species were not coated and observed in variable pressure SEMs using dedicated secondary electron detectors (Variable Pressure Secondary Electron detector, VPSE, Carl Zeiss, Ltd, Cambridge, UK). Animals were pulled out of water-soaked shells. Radula were obtained by 1M NaOH treatment of the animal for at least 1 day, washed in water, and mounted on double sided carbon tabs (Ted Pella) using tungsten needles.

Locality data are provided in a sequence from most specific information (depth) to most general (province/state), arranged by country. Inferred locality data and coordinates are given in square brackets.

Abbreviations: AMNH, American Museum of Natural History, New York City, New York, USA; DLG: Daniel L. Geiger collection, Los Angeles, California USA; HLC: Harry Lee Collection, Jacksonville, Florida, USA; KLK, Kirstie L. Kaiser Collection, Puerto Vallarta, Mexico; LACM, Natural History Museum of Los Angeles County; Los Angeles, California, USA; NMNZ: Museum of New Zealand, Te Papa Tongarewa, Wellington New Zealand; SBMNH, Santa Barbara Museum of Natural History, California, USA; UMML: University of Miami Marine Laboratory, Rosenstiel School of Marine and Atmospheric Sciences, Miami, Florida, USA; UMUT: University Museum University of Tokyo, Japan; USNM, National Museum of Natural History, Smithsonian Institution, Washington, DC, USA; ZMA, Zoologisch Museum, Amsterdam, The Netherlands.

OD: original designation. M: monotypy. SD: subsequent designation.

Systematics

Scissurellidae Gray, 1847

Scissurella d'Orbigny, 1824

Type Species: *Scissurella laevigata* d'Orbigny, 1824 (SD Gray, 1847)

Scissurella kaiserae new species: Figures 1–4

Type Material. Holotype (SBMNH 348769: Fig. 1). Paratypes (SBMNH 359438, 14: three shown in Figure 2), from type locality. Paratype (KLK, 1: 10–21 m, Roca Próspera Islet, Golfo de Chiriqui Coiba National Park, Panama, 7.776°N, 81.759°W. Fig. 2A). Paratype (KLK, 1: 12–18 m, E side Lava Bay, Isla San Benedicto, Islas Revillagigedo,

Mexico, 19.300°N, 110.790°W: Fig. 2B). Paratypes (KLK, 5: 16–23 m, Isla Maria Cleofa, Islas Tres Marias, Mexico, 21.300°N, 106.276°W. One figured: Fig. 3C).

Unfigured paratypes, all from 16–23 m, Isla Maria Cleofa, Islas Tres Marias, Mexico, 21.300°N, 106.276°W, ex KLK: (AMNH 314981, 2), (USNM 1081938, 3), (ZMA Moll. 4.05.019, 2).

Type Locality. 30–35 m, Baja Alcyone, Isla del Coco, Costa Rica, 5.533°N, 86.983°W.

Etymology. The name honors the discoverer of the species and longtime student of the Panamic micromolluscan fauna, Kirstie Kaiser, Puerto Vallarta, Mexico.

Description. Shell small (0.4–0.6 mm), trochiform depressed, off-white. Protoconch of one whorl, with fine axial sculpture from apicalmost portion to periphery, adapical surface smooth, no apertural varix, apertural margin sinusoid. Teleoconch I of 0.825 whorls, 17 – 20 distinct axial cords, interstices filled with fine irregular growth marks, no spiral sculpture. Teleoconch II of 0.333 – 0.4 whorls. Shoulder flat, axial cords of same spacing as on teleoconch I, interstices filled with fine irregular growth lines, no spiral sculpture, suture distinct. Base with distinct constriction below selenizone, same sculpture as on shoulder. Umbilicus open, moderately wide, bordered by strong spiral cord, walls straight, with axial growth marks, underside of protoconch visible through umbilicus. Selenizone above periphery, at 45° angle to coiling axis, keels moderately strong, moderately elevated, growth marks distinct; slit open, with parallel margins. Aperture subquadratic, roof overhanging. Operculum round, thin, covering aperture, multispiral with central nucleus.

Radula (Fig. 4) rhipidoglossate. Rachidian triangular, cusp with seven denticles, central one largest, arranged in V. Lateral teeth 1–3 similar, three denticles on outer margin of cusp. Lateral tooth 4 reduced, with two points on cusp. Lateral tooth 5 broadened enlarged, with approximately six denticles on inner margin of cusp. Radular interlock of central field moderate. Inner marginal teeth spoon-shaped, with one to two denticles on inner margin, six to seven denticles on outer margin; outer marginal teeth spoon-shaped, with many fine denticles on each side of cusp.

Differential diagnosis. The species shows little intraspecific variation, both within population as well as between populations. Figure 2 shows three specimens from the same population, and Figure 3 shows three specimens from three distinct islands. *Sinezona rimuloides* (Carpenter, 1865) from the Panamic and Southern and Central California, has a more elevated spire, strong axial sculpture on the protoconch, and closes the slit to a foramen.

Scissurella lobini (Burnay & Rolán, 1990) from the Caribbean has a similar overall shape, but has fewer axials (13 vs. 17–20 on teleoconch I), and has a protoconch with strong axial sculpture.

Scissurella maraisorum new species from South Africa has a similar overall shape, but has somewhat fewer axials (14–18 vs. 17–20 on teleoconch I) and on the shoulder of

teleococh II the axials are becoming indistinct, while they remain well-developed on the base.

Distribution. Pacific coast of Panamic Province and its offshore islands from 4°N to 28.5°N.

Specimen records. Colombia, Isla de Malpelo. 38 m, 4.002°N, 81.611°W (KLK, 1). 26–50 m, Hammerwall, 4.007°N, 81.604°W (KLK, 3). 13–30 m, North Rock, Little Bob Islet, 4.003°N, 81.602°W (KLK, 1). 33–62 m, Tiger Mount, 4.007°N, 81.602°W (KLK, 1). 10–43 m, NE Coral Gardens, 4.987°N, 81.604°W (KLK, 2).

Costa Rica, Isla del Coco. 10–16 m, Punta Rodrigues, 5.510°N, 87.090°W (KLK, 8). 26–35 m, SSW Punta Rodrigues, 5.510°N, 87.090°W (KLK, 17). 20–33 m, North Islet, Islas dos Amigos, 5.515°N, 87.102°W (KLK, 9). Baja Alcyone, 5.533°N, 86.983°W (SBMNH 348769, 16). 23–30 m, Sharkfin Rock, SSW Punta Rodriguez, 5.533°N, 86.983°W (KLK, 8). 10–13 m, Bahía Westion, Isla Pajara, 5.547°N (KLK, 2).

Costa Rica. 9–13 m, N side Isla del Caño, Puntarenas, 8.721°N, 83.885°E (LACM 72–63, 1). 13–17 m, Guanacaste, Punta Santa Elena, Costa Rica, 10.893°N, 85.964°W (LACM 72–30).

FIGURE 1. Holotype of *Scissurella kaiserae* new species Baja Alcyone, Isla del Coco, Costa Rica (SBMNH 348769). Scale bar shell = 500 µm. Scale bar protoconch = 100 µm.

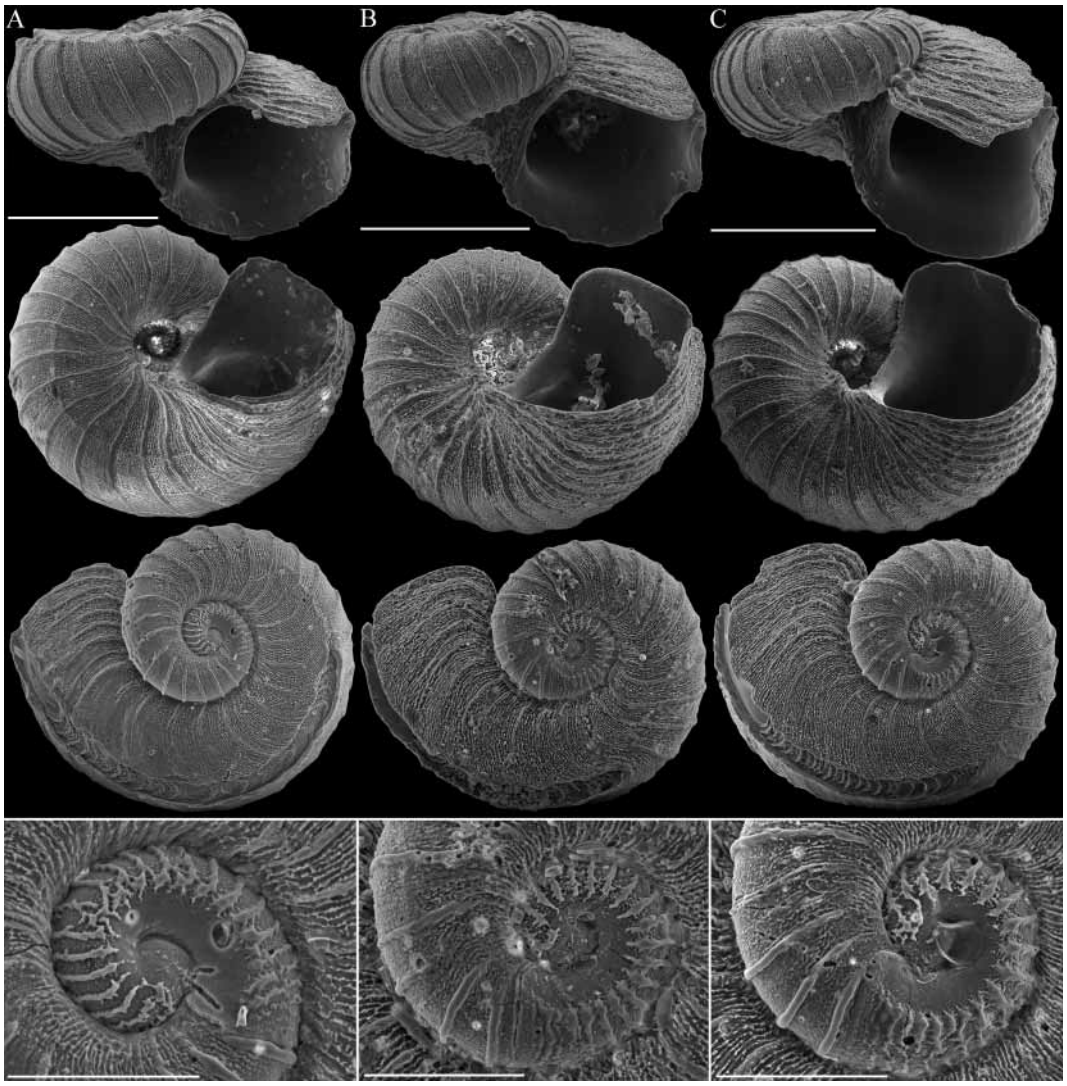

FIGURE 2. Paratypes of *Scissurella kaiserae* new species Baja Alcyone, Isla del Coco, Costa Rica (SBMNH 359438). Scale bars shell = 250 µm. Scale bars protoconch = 100 µm.

France, Clipperton Island. 12–15 m, 10.305°N, 109.198°W (KLK, 3).

Mexico. Islas Revillagigedo, Isla Socorro, 19.300°N, 111.650°W (SBMNH). 15–19 m, Cabo Middleton, Isla Socorro, Islas Revillagigedo, 18.780°N, 110.990°W (KLK, 2). 12–18 m, E side Lava Bay, Isla San Benedicto, Islas Revillagigedo, 19.300°N, 110.790°W (KLK, 50). 16–23 m, Isla Maria Cleofa, Islas Tres Marias, 21.300°N, 106.276°W (KLK, 20). 8–11 m, Roca Blanca, Isla San Juanito, Islas Tres Marias, 21.738°N, 106.700°W (KLK, 3). 13–30 m, SW side Guadalupe Island (Isla Afeura, Adentro, 5 fm bank, & basalt arches), Baja California, 28.900°N, 118.292°W (LACM 72–120, 1). 10–25 m, Isla San Pedro Nolasco, Sonora, 70.600°N, 111.367°W (LACM 67–4). Baja California, Bahía de Los Angeles (28.917°N, 113.500°W), 15 fms, May 1975 (LACM 75–9). 3–17 m, Baja California Sur, Bahía Magdalena, 24.540°N, 112.067°W (LACM 71–14). 10–17 m, Baja

California Sur, Isla Ceralvo, 24.167°N, 109.867°W (LACM 71–24). 18–37 m, Baja California Sur, Rancho Palmilla, 22.967°N, 109.800°W (LACM 66–17). 18–37 m, Baja California Sur, Punta Gorda, 23.133°N, 109.583°W (LACM 66–18). 5–10 m, Jalisco, Islas Marietas, 20.750°N, 105.500°W (LACM 65–14).

Panama. 10–21 m, Roca Próspera Islet, Golfo de Chiriquí, Coiba National Park, 7.776°N, 81.759°W (KLK, 20). 0 m, Canal Zone, Farfan Beach, 8.933°N, 79.567°W (LACM 75–56).

FIGURE 3. Paratypes of *Scissurella kaiserae* new species A. 10–21 m, Roca Próspera Islet, Golfo de Chiriqui Coiba National Park, Panama, 7.776°N, 81.759°W (KLK). B. 12–18 m, E side Lava Bay, Isla San Benedicto, Islas Revillagigedo, Mexico, 19.300°N, 110.790°W (KLK). C. 16–23 m, Isla Maria Cleofa, Islas Tres Marias, Mexico, 21.300°N, 106.276°W (KLK). Scale bar shells = 500 µm. Scale bars protoconch = 100 µm.

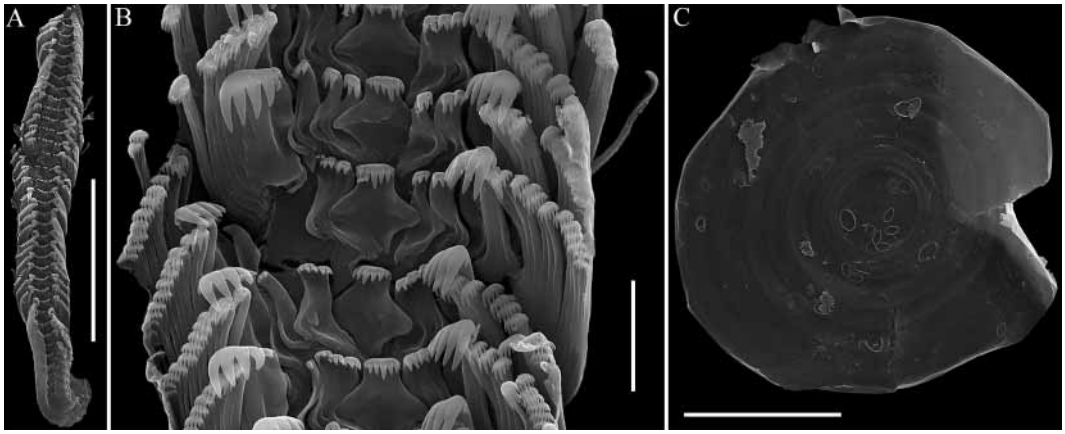

FIGURE 4. *Scissurella kaiserae* new species. 16–23 m, Isla Maria Cleofa, Islas Tres Marias, Mexico, 21.300°N, 106.276°W (KLK). A. Entire radula. Scale bar = 100 µm. B. Section of radula enlarged. Scale bar = 10 µm. C. Operculum. Scale bar = 100 µm.

Scissurella lorenzi new species: Figures 5–6

Type material. Holotype SBMNH 350876. Paratype SBMNH 350879, from type locality.

Type locality. 15–35 m, Baudisson Bay, Kavieng, New Ireland, Papua New Guinea, 2.743°S, 150.658°E.

Etymology. Named for the collector of the type material, Felix Lorenz jr., Germany.

Description. Shell globular, to 1.22 mm (holotype). Protoconch of 0.75 whorls, fine axial sculpture, broadly anastomosing on embryonic cap, with faint spiral zigzag line; apertural varix well developed, connected to embryonic cap; apertural margin sinusoid. Teleoconch I 1.125–1.3 whorls (1.25 in holotype), approximately 29–35 axials (30 in holotype), spirals absent to indistinct towards beginning of selenizone. Teleoconch II of 1.0–1.25 whorls (1.25 in holotype), shoulder with axials becoming weaker and/or more widely spaced with distance from start of selenizone, 2–4 irregular spirals, 2–6 additional very weak spirals gaining prominence towards apertural margin. Under light microscope, on shoulder of teleoconch II darker and lighter radial bands, approximately eight pairs on last half of body whorl. Base with more distinct axials compared to teleoconch II shoulder, less distinct compared to teleoconch I, axials on shoulder and base mostly coordinated; approximately 15 spirals of unequal strength, on average similar to axials, producing reticulate pattern. Base sloping continuously to narrow, open umbilicus. Umbilicus with very thin funiculus from broadened parietal wall of aperture. Selenizone above periphery, slit open, margins parallel, keels moderately strong, moderately elevated. Aperture round with overhanging roof. Animal unknown.

Differential diagnosis. *Scissurella staminea* (A. Adams, 1862) from Japan has a protoconch with strong axials, the axial sculpture on teleoconch II remains the same strength, while there are fewer axials per whorl, the transition of the base to the umbilicus

is bordered by a distinct carina, and there is no banding pattern on the shoulder of teleoconch II. *Scissurella declinans* Watson, 1886, with broad tropical Pacific distribution, has a protoconch with strong axials, the transition of the base to the umbilicus is bordered by a distinct carina, and there is no banding pattern on the shoulder of teleoconch II. *Scissurella evaensis* Bandel, 1998 and *Sci. cebuana* (Bandel, 1998) from the Indo-Malayan Archipelago both have strong projecting sculpture not seen in *Sci. lorenzi*.

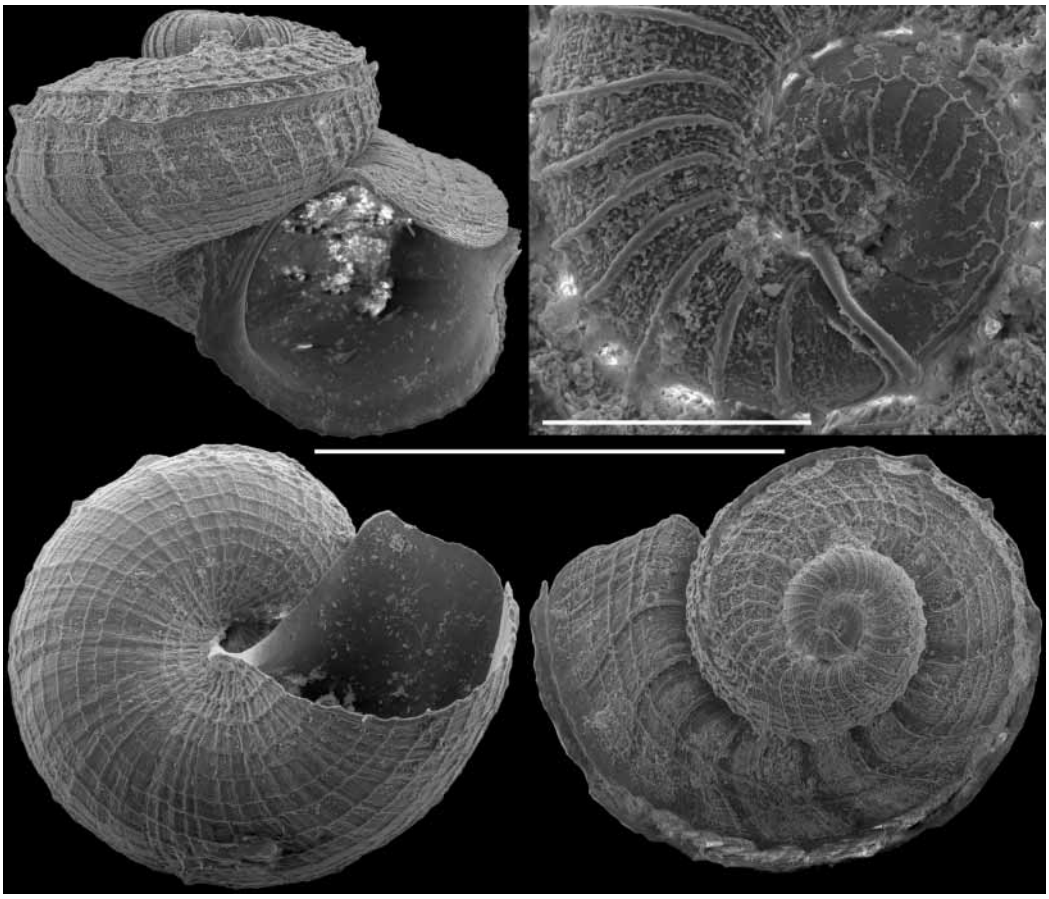

FIGURE 5. Holotype of *Scissurella lorenzi* new species (SBMNH 350876). Uncoated specimen, low kV SEM (1 kV). Scale bar shell = 1 mm. Scale bar protoconch = 100 µm.

Distribution. Indo-Malayan archipelago from southern Japan to Papua New Guinea (26.5°N to 5°S).

Specimen records (including non-type material). 1 km WNW of Onna Village (moon rock entry point), Okinawa, Japan, 26.497°N, 127.843°E (LACM 78–29, 1). 1 km WNW of Onna Village (Horseshoe South), Okinawa, Japan, 26.495°N, 127.843°E (LACM 78–99, 1). 46–55 m, 1 km WNW of Onna Village (Horseshoe Cliffs), Okinawa, Japan, 26.493°N, 127.842°E (LACM 79–75, 2). 33 m, 1 km W Onna Village, Okinawa, Japan, 127.843°N, 127.843°E (LACM 78–20, 1). 92 m, Okinawa, Onna Village, Japan,

26.493°N, 127.493°E (LACM 78–101, 2). Naupapu Island, Vavaa Group, Tonga, 18.7°S, 174.1°E (LACM 85–89, 1). 15–35 m, Baudisson Bay, Kavieng, New Ireland, Papua New Guinea, 2.743°S, 150.658°E (SBMNH 350876, 1; SBMNH 350879, 1). 28 m, off Big Malu Malu Island, Kimbe Bay, New Britain, Papua New Guinea, 5.231°S, 150.098°E (DLG 399, 1).

Remarks: The species is easier to recognize under the light microscope due to the unique pattern of dark and light radial bands on teleoconch II. This banding pattern is often not discernible in the SEM. All specimens have been found in sand and coral rubble.

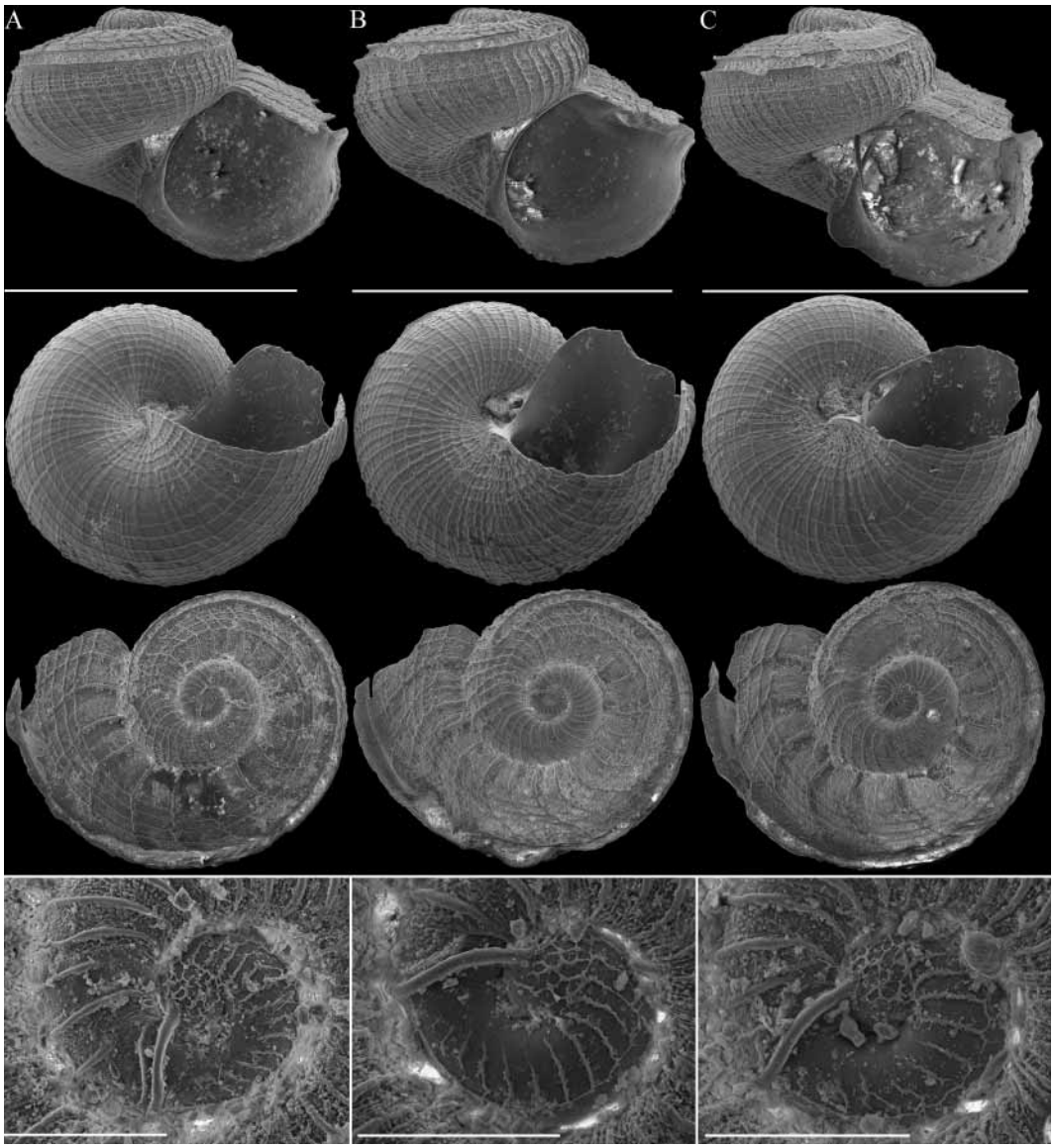

FIGURE 6. *Scissurella lorenzi* new species. A. Non-type specimen LACM 79–75. Okinawa, Japan. B–C. Paratypes SBMNH 350879. From type locality. Scale bars shell = 1 mm. Scale bars protoconch = 100 µm.

***Scissurella maraisorum* new species: Figures 7–8**

Type material. Holotype (NMSA W3498/T1616: Fig. 7). Paratypes (NMSA W3499/T1617, 2). Paratypes (Coll. A & J.P. Marais, 3: including Fig. 8A). Paratypes (SBMNH 359327, 2. Fig. 8B. SBMNH 359324: Fig. 8C). Unfigured paratypes (AMS C.447877, 1; BMNH 20050274, 1; MNHN type collection, 1; UMUT RM29043, 1; USNM 1081939, 1).

Type locality. 20 m, Aliwal Shoal, Kwazulu-Natal south coast, Republic of South Africa. June 2003. 30.250°S, 30.817°E.

Etymology. Named after Dr. Johan P. and Alwyn P. Marais of South Africa, who collected the specimens and generously made them available for study, and for their continuing accomplishments to further the understanding the South African malacofauna. Genitive masculine plural of surname.

FIGURE 7. Holotype of *Scissurella maraisorum* new species (NMSA W3498/T1616). Aliwal Shoal, Kwazulu-Natal south coast, SCUBA 20 m. June 2003. 30.250°S 30.817°E. Uncoated specimens, variable pressure, VPSE detector. Scale bar shell = 500 µm. Scale bar protoconch = 100 µm.

Description. Shell small (to 0.72 mm: holotype), trochiform depressed. Protoconch of 1 whorl, fine axial sculpture with median ridge, no apertural varix, apertural margin

convex. Teleoconch I of 1–1.125 whorls, approximately 14–18 strong axial cords, no spirals, interstices with fine irregular axials. Teleoconch II of 0.33 whorls. Shoulder flat, suture deep, near suture indistinct axial cords of same spacing as on teleoconch I, mainly fine irregular axials. Base with strong axial cords of same spacing as on teleoconch I from selenizone to lowermost base, fading towards umbilicus; no spirals; interstices with fine irregular axials; base continuously sloping with umbilical wall. Umbilicus wide, open, protoconch visible through umbilicus. Selenizone above periphery, keels moderately strongly elevated, strong, inclined approximately 45° towards coiling axis. Aperture subquadratic, adumbilical wall straight, roof almost straight, base curved with adumbilical projection.

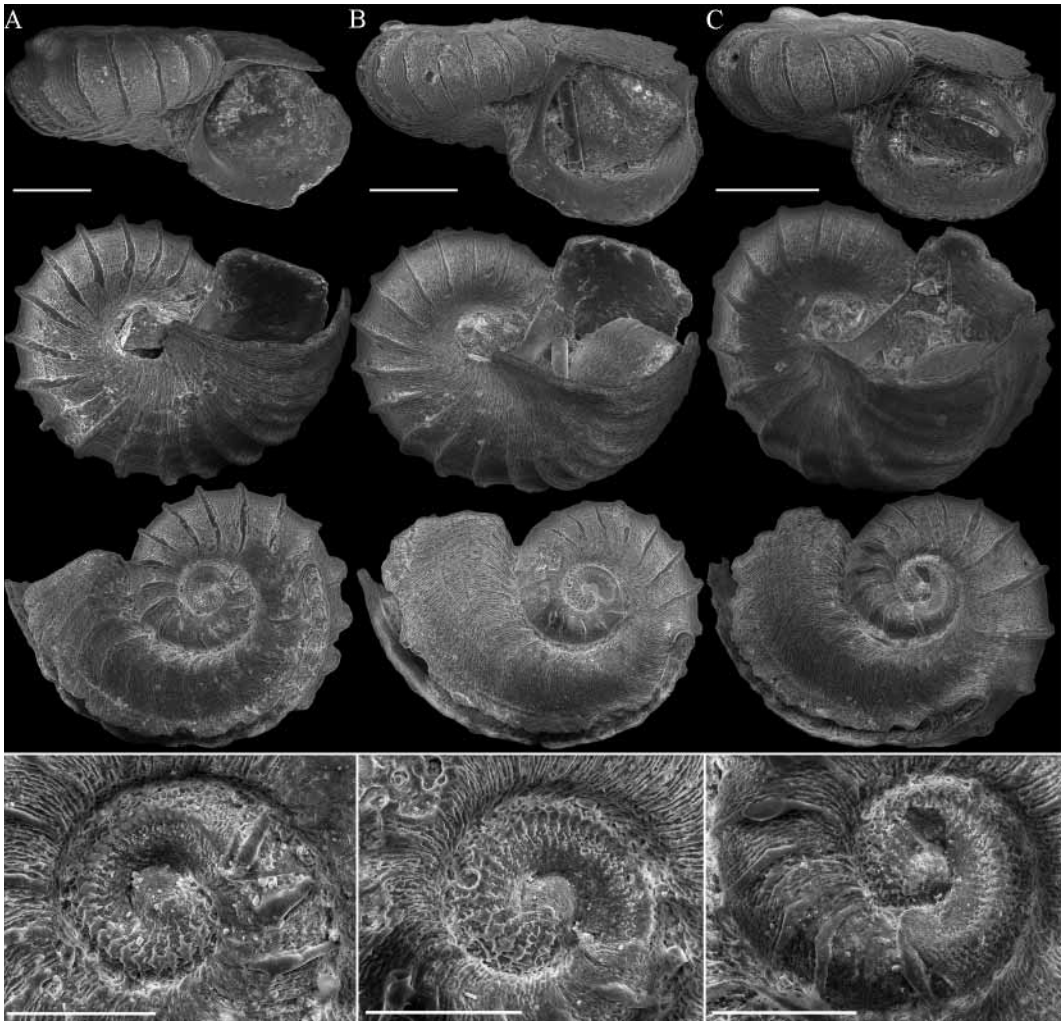

FIGURE 8. Paratypes of *Scissurella maraisorum* new species. A. Collection J.P. & A.P. Marais, South Africa. B. (SBMNH 359327). C. (SBMNH 359324). All specimens from Aliwal, Kwazulu-Natal south coast, SCUBA 20 m. June 2003. 30.250°S 30.817°E. Uncoated specimens, variable pressure, VPSE detector. Scale bars shell = 200 µm. Scale bars protoconch = 100 µm.

Differential diagnosis. *Scissurella maraisorum* is characterized among the African species by its flat spire, the absence of spiral sculpture, and the widely open umbilicus which shows the lower surface of the protoconch. *Scissurella jucunda* Smith, 1890 from South Africa has a distinctly elevated spire, a closed umbilicus, and some spiral sculpture on shoulder as well as base. *Scissurella rota* Yaron, 1983 from East Africa has spirals on shoulder and base, the umbilicus is bordered by an edge towards base. *Scissurella sudanica* Bandel, 1998 from East Africa has an elevated spire, spirals on shoulder and base, and a narrower umbilicus that is bordered by a strong cord towards the base. *Sinezone doliolum* Herbert, 1986 from South Africa has the slit closed to a foramen in adults, has an elevated spire, has indistinct spirals on shoulder and base, and an almost closed umbilicus. *Sinezona insignis* (Smith, 1890) from South Africa has a closed foramen in adults, fewer but stronger axial cords to low lamellae, has strong axials on the protoconch, and has a much more narrow umbilicus bordered by a cord towards base. *Sukashitrochus maraisi* Herbert, 1986 from South Africa has distinct spiral keels on base, a closed foramen in mature specimens, and the umbilicus is bordered by a keel.

Distribution. Known from type locality only.

Sinezona garciai new species: Figures 9–10

Type material. Holotype (USNM 1081940: ex UMML 30.12043. Fig. 9). Paratypes (SBMNH 359317, 2: ex UMML 30.12043. Fig. 10A, B), same data as holotype. Paratype (UMML 30.12043, 1), same data as holotype. Paratype: 16 m, St. Croix, US Virgin Islnads, 17.800°N, 64.800°W (UMML 30.12051, 1. Fig. 10C).

Type locality. 1.5 m, behind outer reef, Courtown Cays, San Andres y Providencia, Colombia, 12.383°N, 81.433°W.

Etymology. Named for Emilio Garcia of Lafayette, Louisiana, USA, for his continuing contribution to the knowledge of the Caribbean malacofauna, and his generous support of ongoing research.

Description. Shell small (to 0.76 mm), trochiform depressed, last 0.125 whorl distinctly descending. Protoconch of one whorl, fine, sharp axials in outer half of whorl, inner half smooth, no apertural varix, apertural margin convex. Teleoconch I of 0.66 whorls. Shoulder slightly convex, suture distinct; approximately 10–12 axial cords, no spirals, interstices with fine irregular growth marks. Teleoconch II of 0.66 whorls, same density and strength of axials as on teleoconch I, onset of broad, low axial cords slightly after onset of selenizone, increasing in number to approximately 10–12, somewhat unevenly spaced. Base with distinct constriction below selenizoen, same density of more distinct axial cords as on shoulder, crossed by approximately 16–18 weaker spiral cords, cords mirror increase in strength and number with growth to those on shoulder. Selenizone above periphery, keels strong, moderately elevated, growth marks very distinct; foramen elongated. Umbilicus wide, bordered by strong spiral cord, walls straight, with fine axial growth marks. Aperture obliquely D-shaped, roof overhanging. Animal unknown.

Differential diagnosis. *Sinezona confusa* Rolán & Luque, 1994 [= *Sin. columbiana* (Bandel, 1998)] from the Caribbean has a more elevated overall shape and spire, a very narrow, barely open umbilicus, and a protoconch with fewer and broader axials as well as an apertural varix. *Scissurella electilis* Montouchet, 1972 from Brazil has a much narrow umbilicus, lacks the strong cord separating the umbilicus from the base, and retains an open slit at maturity. *Satondella brasiliensis* (Mattar, 1987)[= *Sat. tabulata* (Watson, 1886)?] from Brazil and *Sat. tabulata* from the Caribbean have a more strongly descending aperture on the last quarter whorl and the foramen is drawn out into a strongly elevated chimney. *Satondella tabulata* has microhexagonal microsculpture, which is often eroded and looks smooth; the protoconch sculpture of the nominal taxon *Sat. brasiliensis* is unknown.

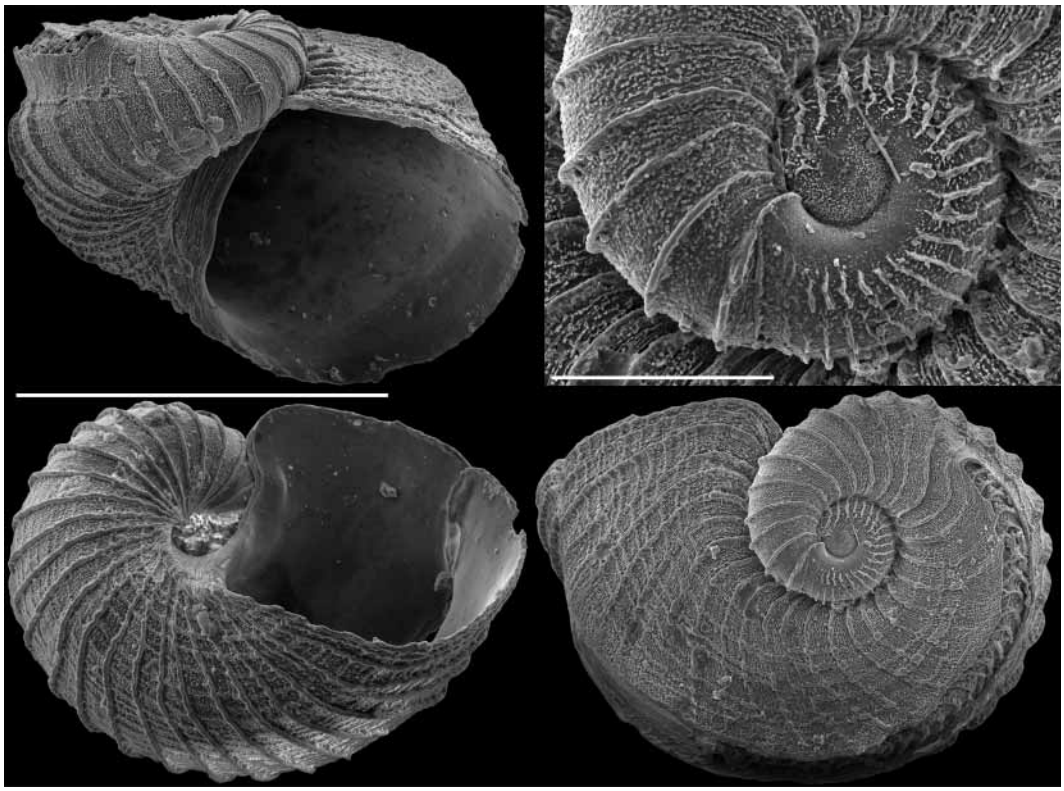

FIGURE 9. Holotype of *Sinezona garciai* new species. Behind outer reef, Courtown Cays, W. Caribbean, Colombia, 12.383°N, 81.433°W (USNM 1081940: ex UMML 30.12043). Scale bar shell = 500 µm. Scale bar protoconch = 100 µm.

Distribution. Colombia to Bahamas.

Specimen Records. 18 m, Samphire Cay, NW Nassau, Bahamas, 25.183°N, 77.017°W (HLC, 1).

Remarks. *Sinezona garciai* is considered distinct from *Sin. confusa*, and not simply a

form with more depressed shells. All five specimens of *Sin. garciai* available show highly congruent features with very little intraspecific variability. The same applies to 68 lots of *Sin. confusa* inspected ranging from Bermuda to Venezuela.

Sinezona columbiana is a synonym of *Sin. confusa*, showing all features of that species, which also distinguish it from *Sin. garciai*: overall more elevated shell, more narrow umbilicus, and a protoconch with fewer and broader axials as well as an apertural varix.

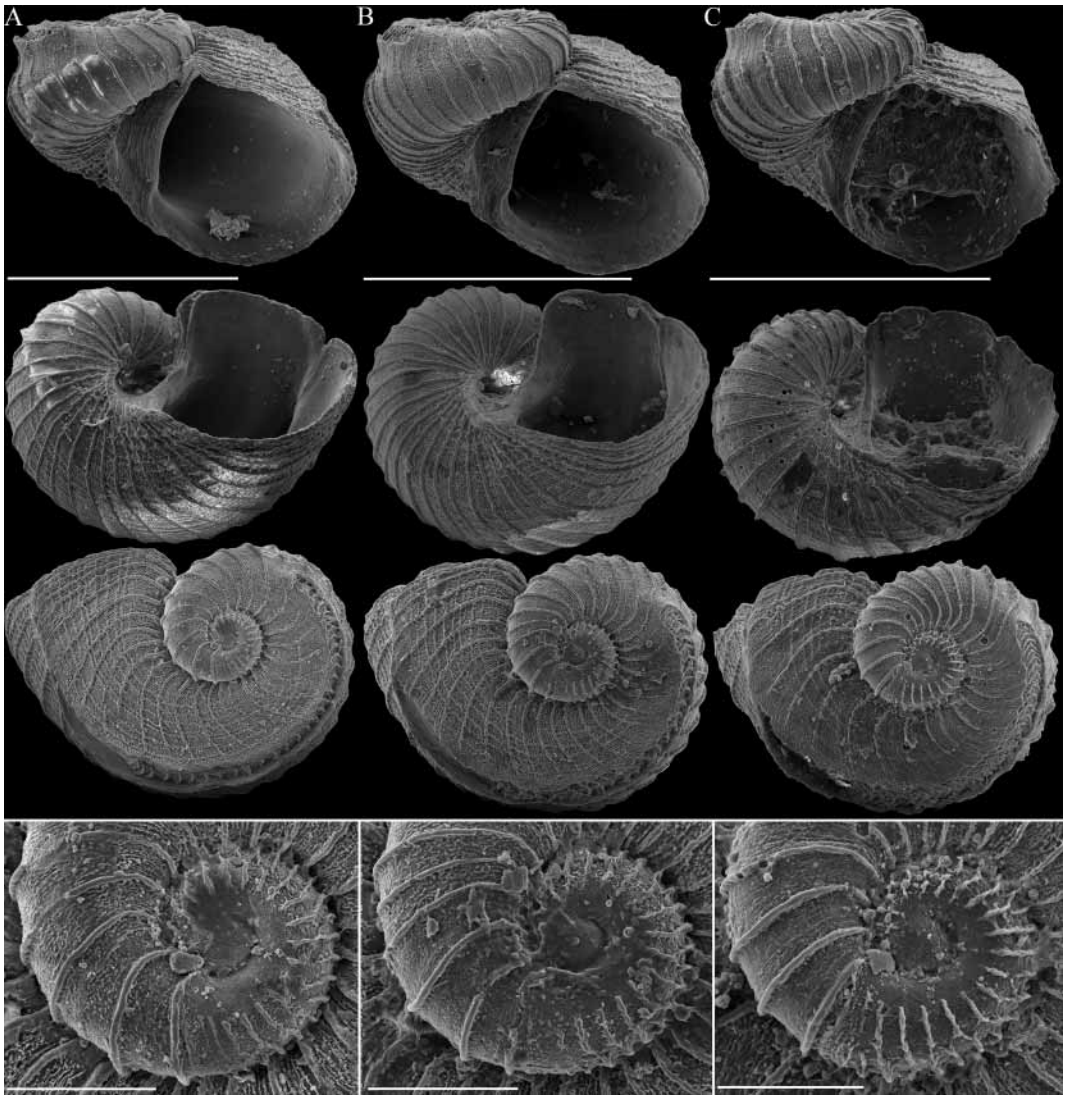

FIGURE 10. Paratypes of *Sinezona garciai* new species. A-B. 1.5 m, Behind outer reef, Courtown Cays, W. Caribbean, Colombia, 12.383°N, 81.433°W (SBMNH 359317: ex. UMML 30.12043). C. 16 m, St. Croix, 17.800°N, 64.800°W (UMML 30.12051). Scale bars shell = 500 µm. Scale bars protoconch = 100 µm.

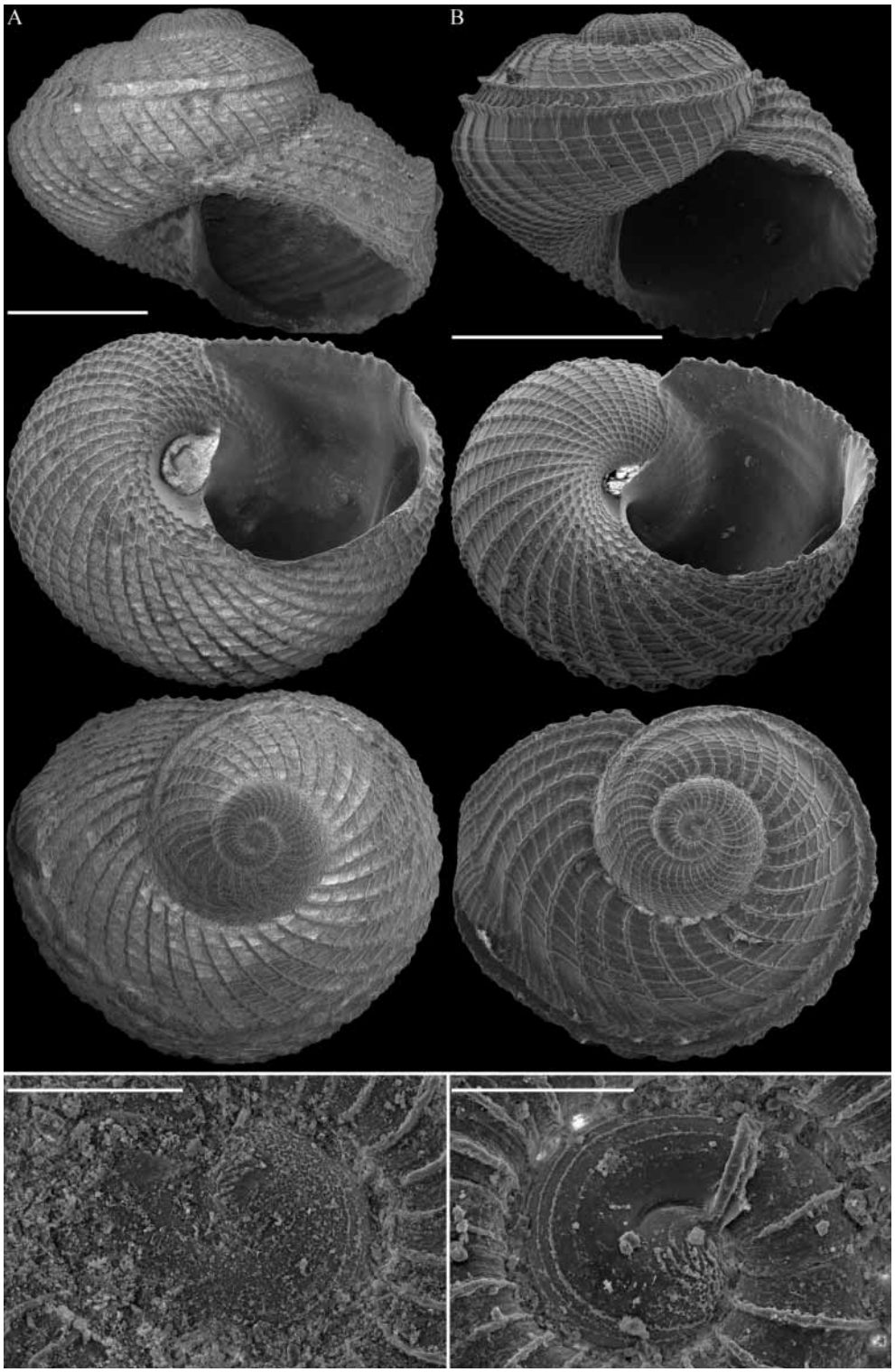

FIGURE 11. *Sinezona globosa* new species. A. Holotype. 310-315 m, Loyality Basin, New Caledonia, 21.533°S, 166.483°E (MNHN). B. Paratype 415-420 m, Wallis Island, 13.350°S, 176.133°W (MNHN). Scale bar shell = 1 mm. Scale bar protoconch = 100 µm.

***Sinezona globosa* new species: Figure 11**

Type material. Holotype (MNHN). Paratype (MNHN, 1). 415–420 m, Wallis Island, 13.350°S, 176.133°W.

Type locality. 310–315 m, Loyality Basin, New Caledonia, 21.533°S, 166.483°E.

Etymology. Globosa, Latin adjective, noting the overall globular shape of the shell.

Description. Shell large (to 3.1 mm), trochiform globular. Protoconch of 0.875 whorls, embryonic cap with flocculant sculpture, remainder smooth with 3–4 fine spiral threads, apertural varix connected to embryonic cap, apertural margin unknown. Teleoconch I of 1.66 whorls, approximately 46–50 distinct axial cords, run over equaly spaced spiral lines, first spiral after 0.33 whorls, 14 at beginning of selenizone, interstices with broad growth marks. Teleoconch II of 1.125 whorls. Shoulder quite convex, suture modrately impressed, axials of same density as on teleoconch I, forming small points at intersection with spiral lines. Base slightly constricted below selenizone, with same density and strength of axials, approximately 20 spiral lines, becoming stronger and more closely spaced towards umbilicus. Umbilicus narrow in small specimens (paratype), moderately wide in large specimens (holotype), bordered by last spiral line of base, walls straight, smooth. Selenizone above periphery, keels elevated but often eroded due to their fragility, growth marks distinct, slit closed to elongated foramen. Aperture suborbicular, lip inflated, roof overhanging. Animal unknown.

Differential diagnosis. *Sinezona macleani* new species from the Philippines is more depressed, less globular, has a protoconch with flocculant sculpture, lacks an apertural varix, has a sharp elevated keel bordering the umbilicus, and usually a projecting shelf in the basal adumbilical corner of the aperture. *Sinezona plicata* (Hedley, 1899) with broad tropical Pacific distribution is overall more depressed, has a smooth protoconch occasionally with fine spiral lines, and has strong, elevated lamellae on the teleconch.

Distribution. Only known from type material.

Remarks. The paratype is slightly immature evidenced by the hardly descending aperture on the last quarter whorl, while the holotype is a fully grown specimen. It appears that the closure of the foramen occurs early on.

***Sinezona macleani* new species: Figures 12–13**

Type material. Holotype: USNM 289748. Paratypes (USNM 276829, 2), from type locality. Paratype 820–863 m, Fiji, 17.300°S, 179.550°W (MNHN, 1: Fig. 13A). Paratypes 675–680 m, New Caledonia, 23.167°S, 167.167°E (MNHN, 2: Figs. 13B–C). Paratype 1000 m, off Curtis Island, Kermadec Islands, New Zealand, 30.467°S, 178.622°W (NMNZ M257059, 1).

Type locality. 534 m, Station 5584, Sibuko Bay, off Si Amil Island, Borneo, Indonesia [3.773°N, 118.364°E].

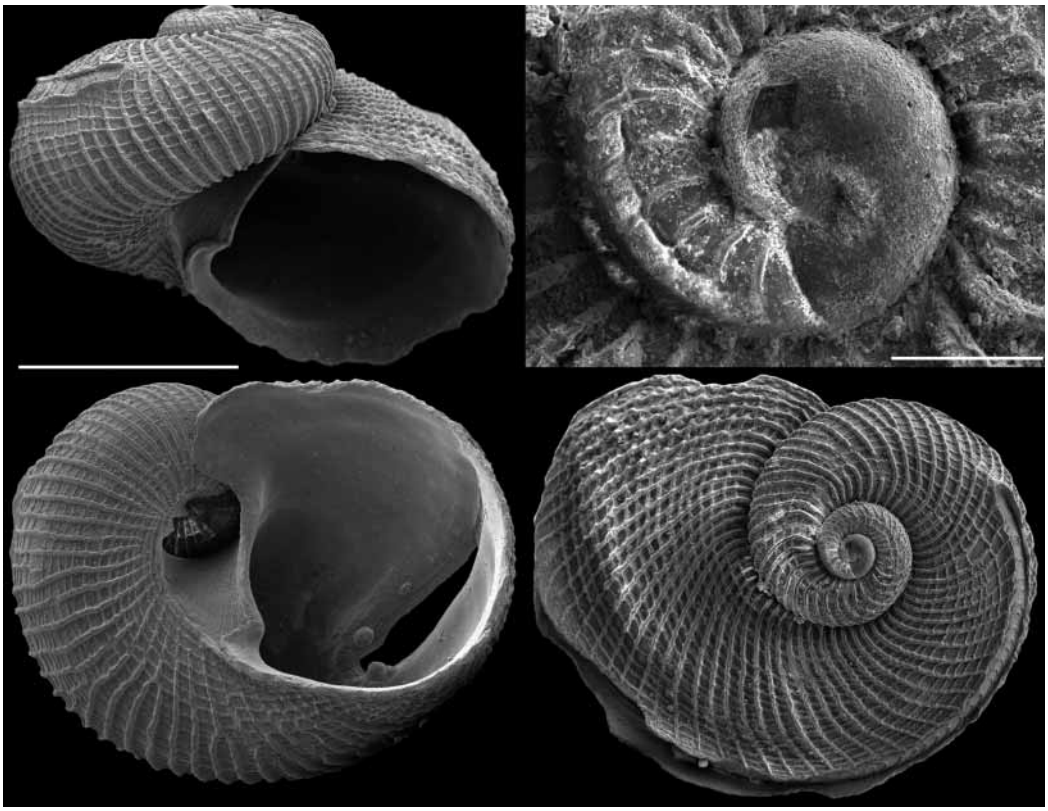

FIGURE 12. Holotype of *Sinezona macleani* new species. USNM 289748. 534 m, Station 5584, Sibuko Bay, off Si Amil Island, Borneo, Indonesia, 3.773°N, 118.364°E, (USNM 289748, 1). Scale bar shell = 1 mm. Scale bar protoconch = 100 µm.

Etymology. Named for James H. McLean, my graduate co–advisor, mentor, and friend.

Description. Shell medium size (holotype 2.3 mm wide), depressed trochiform, inflated. Protoconch of 0.75 whorls, flocculant sculpture (eroded in holotype), no apertural varix, apertural margin straight. Teleoconch I of 1.75 whorls, 27 distinct axial cords on first whorl, spiral threads equispaced, increasing in number with growth, approximately 10 on shoulder at onset of selenizone. Teleoconch II of 0.66 whorls. Shoulder irregularly convex, axials of similar density as on teleoconch I, slightly increasing in strength with growth, spirals increasing somewhat in strength, always weaker than axials, forming minute tubercles at intersection with axials, most prominent near apertural margin. Base inflated, axials of similar strength and density as on shoulder, axials becoming weaker towards umbilicus, some terminating before reaching umbilicus. Umbilicus open, wide, bordered by sharp lamella, walls smooth. Selenizone above periphery, keels of moderate height and strength, foramen elongate-teardrop-shaped. Aperture subquadratic, with indentation in lower corner of parietal wall, roof overhanging; past indentations visible inside umbilicus.

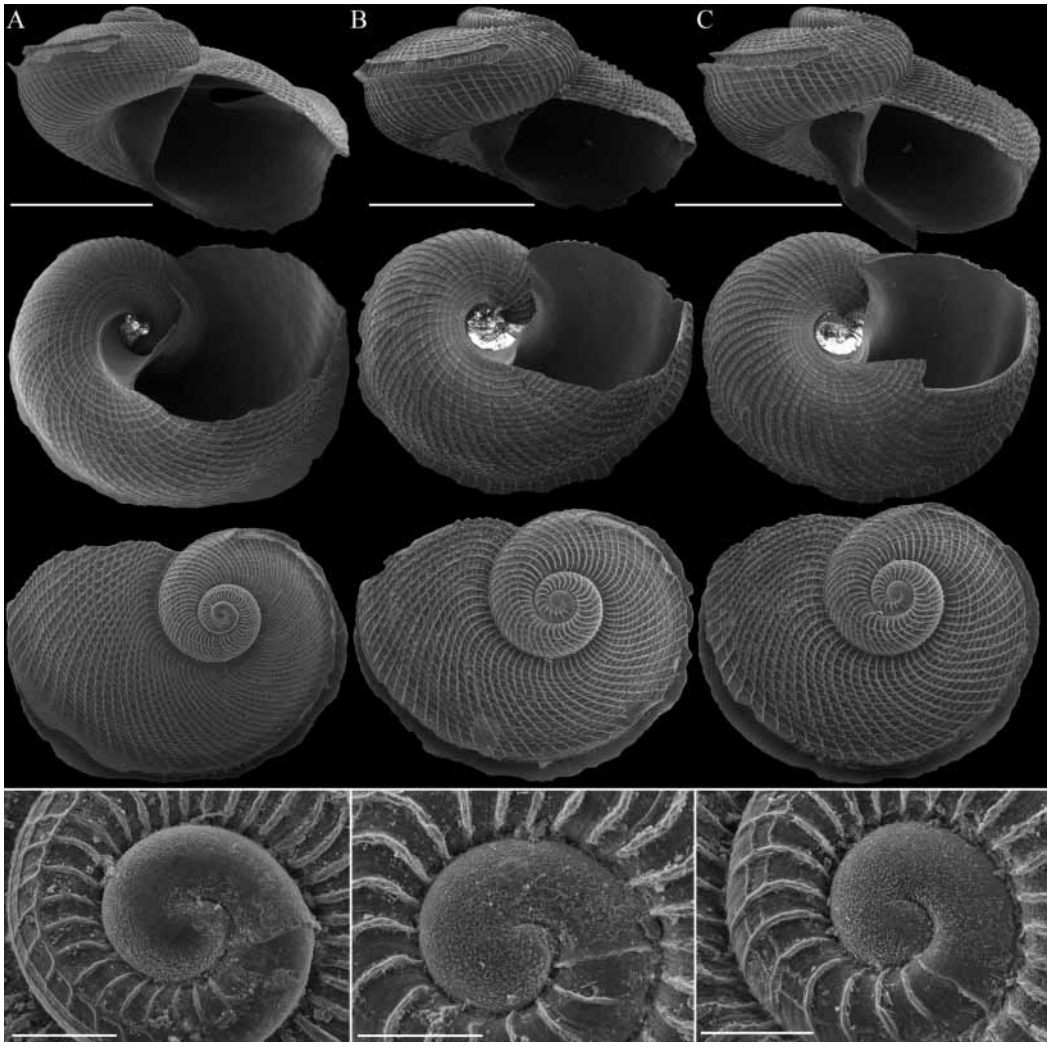

FIGURE 13. Paratypes of *Sinezona macleani* new species. A. 820-863 m, Fiji, 17.300°S, 179.550°W (MNHN). B-C. 675-680 m, New Caledonia, 23.167°S, 167.167°E (MNHN). Scale bar shell = 1 mm. Scale bar protoconch = 100 µm.

Differential diagnosis. Surprisingly, there are very few described *Sinezona* species from the Indo-Malayan Archipelago. *Sinezona globosa* from the Western Pacific is more globular in general outline, lacks the periumbilical lamella and the adumbilical indentation of the aperture, and has a protoconch with spiral lines and a well-formed apertural varix. *Sinezona plicata* (Hedley, 1899), widely distributed in the Indo-Pacific, has strong axial folds and a well-developed apertural varix on the protoconch. *Sinezona ferriezi* (Crosse, 1867), described from New Caledonia, of similar size (to 2.1 mm) and widely distributed in the Indo-Malayan Archipelago has an almost flat shoulder, more raised axial cords, a rounded aperture in the basal-adumbilical portion, a protoconch with an apertural varix, and a teleoconch I of slightly more than one whorl. *Sinezona modesta* (A. Adams, 1862),

described from Japan, has never been illustrated, and there are no type specimens in the BMNH (Thiele, 1912; Geiger, pers. obs. II. 2003). It is described as being very depressed and similar in shape to a *Stomatella*. The only very depressed form in Scissurellidae is *Depressizona exorum* Geiger, 2003 from Easter Island, which is rather calyptraeiform than stomatelliform.

Sinezona concinna (Sowerby I, 1831) [not *Anatomus concinnus* A. Adams, 1862], of unknown provenance, has markedly decreasing strength of the axials towards the aperture, whereas in *Sin. macleani* the axials are rather increasing in strength towards the aperture. The identity of *Sin. concinna* is uncertain. The species was introduced as a nomen et figura and has not been mentioned in the literature since. Given that the first scissurellid was described only in 1824 by d'Orbigny (*Scissurella costata*), it is very likely that *Sin. concinna* was also an European species. The rather well executed drawing agrees well with the European *Sin. cingulata* (O. G. Costa, 1861). Particularly the number, strength, and spacing of the axials, decreasing in strength close to the aperture, and the very fine spirals are clearly shown in Sowerbys illustration. Given the rather uncertain status of this synonymy, I prefer to treat *Sin. concinna* as a *nomen dubium*; a case for a *nomen oblitum/ protectum* cannot be made as the synonymy with *Sin. cingulata* is at best circumstantial, though *Sin. cingulata* has been used as a valid species at least 25 times by 10 different authors in the preceeding 10–50 years.

Distribution. Indo-Malayan archipelago to western Pacific, 25–1600 m.

Specimen records. 25–30 m, Santal Bay, Lifou, New Caledonia, 20.820°S, 167.173°E (MNHN, 1). 425–430 m, Southern, New Caledonia, 22.283°S, 167.233°E (MNHN, 1). 775 m, New Caledonia, 23.000°S, 167.483°E (MNHN, 1; MNHN, 1).770–830 m, Loyality Ridge, New Caledonia, 24.733°S, 170.133°E (MNHN, 2). 440 m, New Caledonia, 22.783°S, 167.233°E (MNHN, 14). 825–830 m, New Caledonia, 23.050°S, 167.533°E (MNHN, 1). 675–680 m, New Caledonia, 23.167°S, 167.167°E (MNHN, 1). 1575–1600 m, New Caledonia, 20.783°S, 55.633°E (MNHN, 1: complete). 441–443 m, S. of Viti Levu, Fiji, 18.320°S, 177.862°E (MNHN, 1).

Remarks. The holotype was chosen as the specimen showing a fully mature shell, with well formed umbilical and apertural features, while the protoconch is eroded. The MNHN and NMNZ paratypes (Fig. 13) have the flocculant protoconch sculpture, while also showing the periumbilical lamella as well as a hint of the adumbilical indentation, both unique features in Scissurellidae.

Sinezona singeri new species: Figure 14–16

Type material. Holotype SBMNH 359439, ex DLG 101. Figure 14A. Paratype SBMNH 359440, 1, ex DLG 101, from type locality. Figure 14B.

Type locality. Intertidal, Blue Hole, Dahab, Janub Sina, Egypt, 28.483°N, 34.533°E. Leg. B. Singer Oct. 1990.

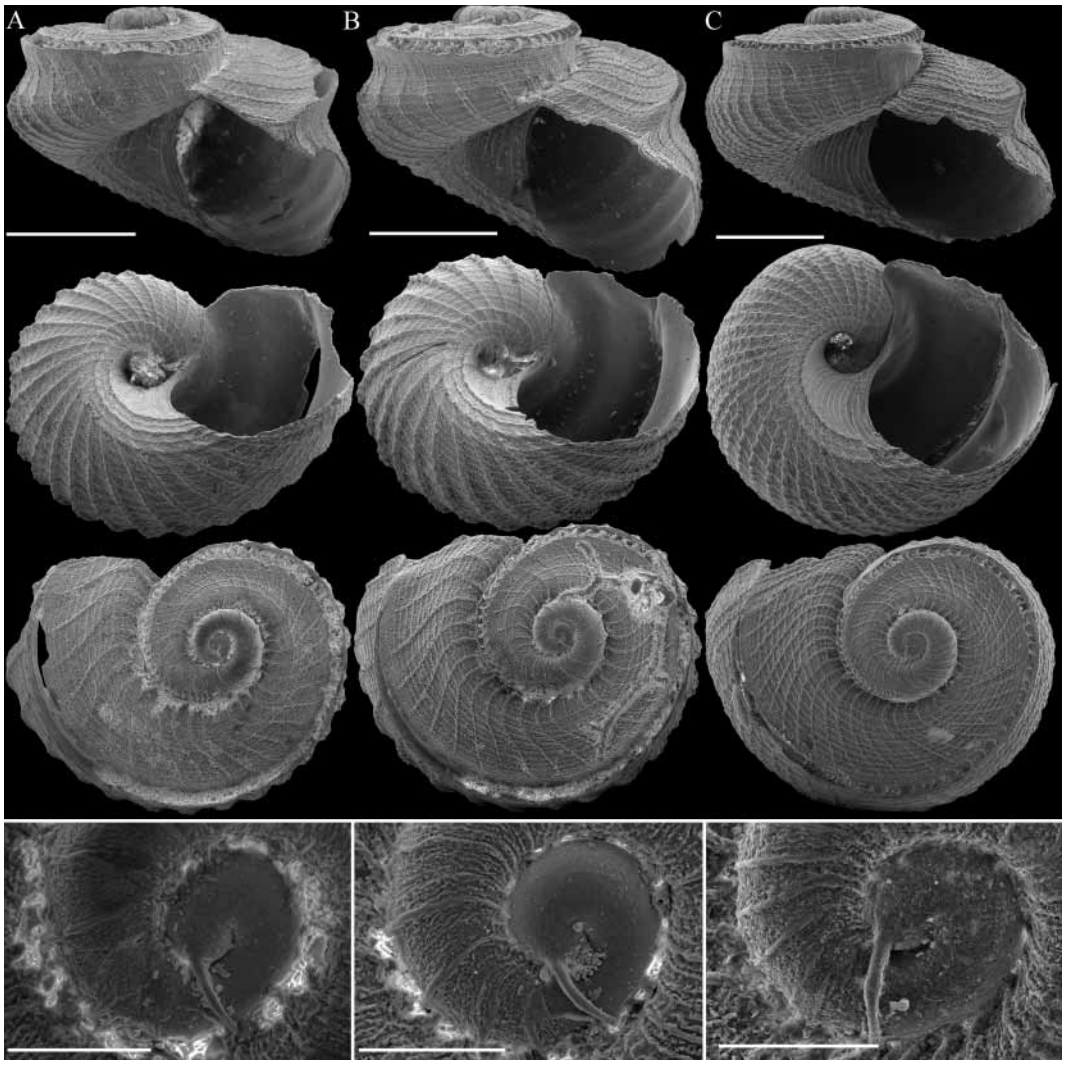

FIGURE 14. *Sinezona singeri* new species A. Holotype (SBMNH 359439). B. Paratype (SBMNH 359440). A-B. Blue Hole, Dahab, Janub Sina, Egypt, 28.483°N, 34.533°E. C. LACM 89-50. 0-3 m, Baye de Ranobe, near Mora Mora, N of Tulear, Toliara Province, Madagascar, 23.083°S, 43.500°E Specimen used for radula extraction. Scale bars shells = 500 µm. Scale bars protoconch = 100 µm.

Etymology. Named for Benjamin (Solly) Singer, of Rehovot, Israel, the collector of the type material, for his continuing contributions to Red Sea malacology and in recognition of his service to the malacological community at large, particularly that of Israel.

Description. Shell mediums size (1.6 mm = holotype, paratype), trochiform depressed. Protoconch of 0.75 whorls, smooth, apertural varix connected to embryonic cap, apertural margin deeply sinusoid. Teleoconch I of approximately 1.125 whorls, 12–13 distinct axial cords, interstices filled with fine irregular axials, no spirals. Teleoconch II of 1.33 whorls. Shoulder slightly convex, approximately 23–26 fine axials opn first whorl, approximately half as strong as axials on teleoconch I, interstices with finest growth lines;

approximately a dozen somewhat irregularly spaced fine spirals forming barely noticeable points at intersection with axials. Base with strong constriction below selenizone, then inflated; 21–26 axials starting as thin thread on keels of selenizone, becoming strong elevated costae at periphery, thinning out to threads towards transition to umbilicus; approximately 20 finer spirals, becoming stronger from selenizone towards umbilicus, running over axials; no keels. Umbilicus open, wide, bordered by spiral cord towards base, walls smooth. Selenizone above periphery, keels moderately elevated, moderately strong, strong growth lamellae; foramen narrow treadrop-shaped, extending approximately 0.16 whorl. Aperture rounded, roof strongly overhanging.

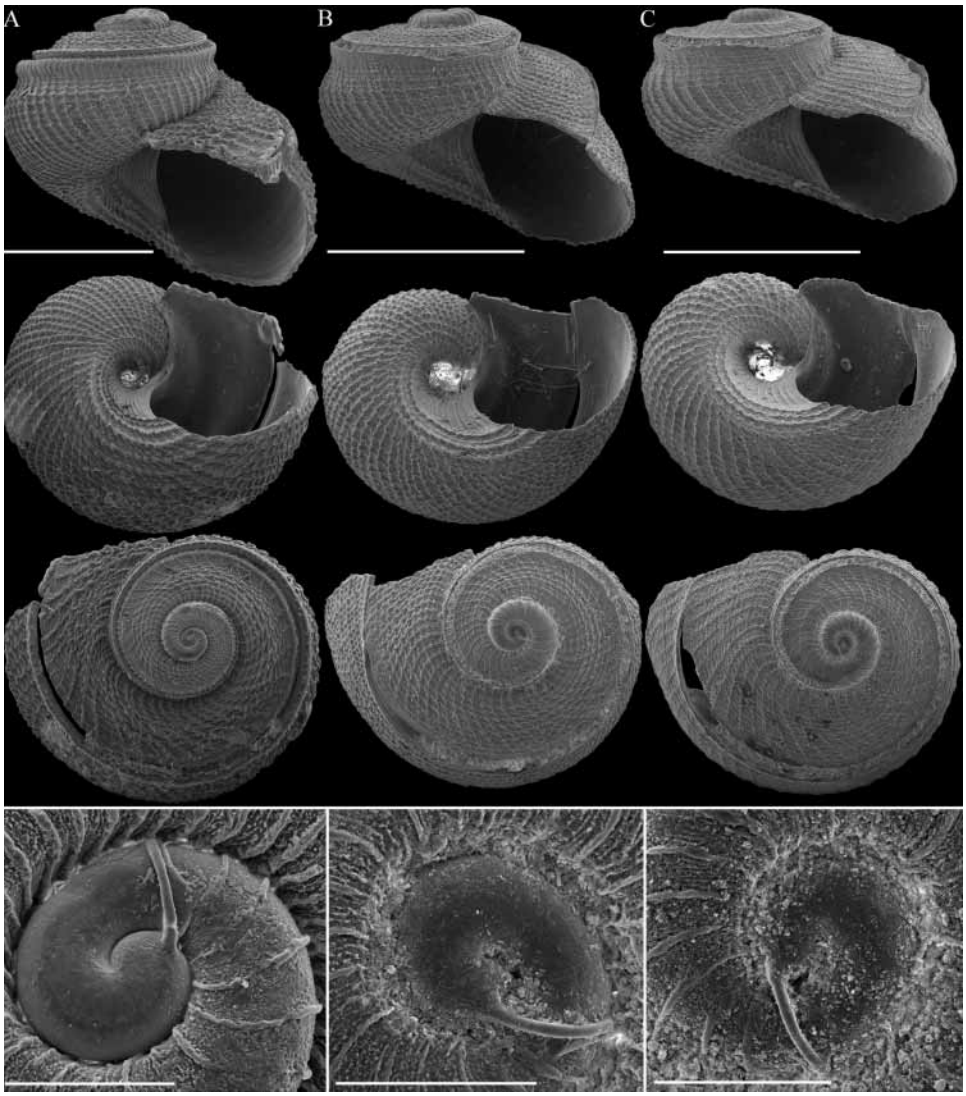

FIGURE 15. Paratypes of *Sinezona singeri* new species. A. 170-225 m, Reunion Island, 21.083°S, 55.200°E (MNHN). B. 1300-1480 m, Mayotte, E Bandele Reef, France, 12.933°S, 45.303°E (MNHN). 200-500 m, Mayotte, E. Bandele Reef, France, 12.902°S, 45.252°E (MNHN). Scale bars shell = 1 mm. Scale bars protoconch = 100 µm.

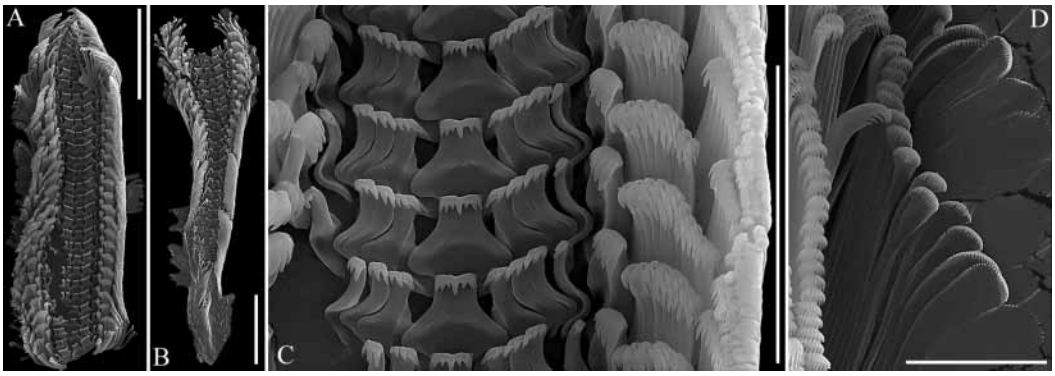

FIGURE 16. Radula of *Sinezona singeri* new species. From LACM 89-50. 0-3 m, Baye de Ranobe, near Mora Mora, N of Tulear, Toliara Province, Madagascar, 23.083°S, 43.500°E shown in Figure 14C. A. Anterior half of radular ribbon. Scale bar = 100 µm. B. Posterior half of radula ribbon. Scale bar = 100 µm. C. Full width of radula. Scale bar = 50 µm. D. Outer marginal teeth. Scale bar = 10 µm.

Radula rhipidoglossate. Rachidian tooth triangular, seven denticles on cusp, central one largest, parallel to radular ribbon. Lateral teeth 1–3 similar, three denticles on outer margin. Lateral tooth 4 reduced, hook shaped, with three minute points at cusp. Lateral tooth 5 broadened enlarged, approximately five denticles on inner margin. Radular interlock of central field moderate. Inner marginal teeth with spoon shaped cusp with three to four denticles on each side; outer marginals spoon shaped, with many fine denticles on cusp.

Differential diagnosis. *Sukashitrochus dorbignyi* (Audouin, 1826) and *Suk. tricarinatus* (Yaron, 1983) from the Red Sea share the closed foramen, but show distinct spiral keels on the base. *Scissurella rota* Yaron, 1983 from the Red Sea has an open slit, fewer spirals on the base that form pronounced hollow points at the intersection whith the axials, and has a protoconch with fine axial sculpture. *Scissurella reticulata* Philippi, 1853 and *Sci. sudanica* Bandel, 1998 have an open slit, a less pronounced constriction below the selenizone, and a protoconch with fine axial sculpture. The species is superficially most similar to *Sci. hoernesi* Semper, 1865 from the Indo-Malayan Archipelago, which however has an open slit and stronger axial sculpture on the shoulder that maintains its strength on teleoconch I and II.

Distribution. Red Sea to Mascarene Islands, western Indian Ocean.

Specimen records. 0–3 m, Baye de Ranobe, near Mora Mora, N of Tulear, Toliara Province, Madagascar, 23.083°S, 43.500°E (LACM 89–50, 1). Mayotte, E. reef Bandele, France, 12.902°S, 45.252°E (MNHN, 4). 520–830 m, Mayotte, E. Bandele reef, France, 12.897°S, 45.270°E (MNHN, 1). 1300–1480 m, Mayotte, E. Bandele reef, France, 12.933°S, 45.300°E (MNHN, 1). 500 m, Mayotte, E Bandele reef, France, 12.895°S, 45.268°E (MNHN, 3). 1300–1480 m, Mayotte, E Bandele reef, France, 12.933°S, 45.303°E (MNHN, 1). 330–530 m, Glorieuses, N. Ile du Lys, 11.440°S, 47.372°E (MNHN, 1). 170–225 m, Reunion Island, 21.083°S, 55.200°E (MNHN, 4; MNHN, 2).

Sukashitrochus morleti (Crosse, 1880): Figure 17

Schismope morleti Crosse 1880: 144–146, pl. 4, fig. 3.
Schismope morleti: Paetel 1888: 289.
Schismope morleti: Pilsbry 1890: 62, pl. 22, figs. 37–39.
Schismope morleti: Thiele 1912: 29, pl. 3, figs. 27–28 [copy figures Crosse].
Schismope morleti: Fischer-Piette 1950: 152.
Scissurella ? (*Sukashitrochus*) *morleti*: Lozouet 1986: 109.
Scissurella (*Sukashitrochus*) sp.: Lozouet 1986: Fig. 29A.
Sinezona morleti: Geiger 2003: 78.
Synonyms
+ *Sukashitrochus indonesicus* Bandel 1998: 51–52, pl. 17, figs. 7–8, pl. 18, fig. 1. 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).
Sukashitrochus indonesicus: Geiger 2003: 79.
Sukashitrochus indonesicus: Geiger & Jansen 2004b: 55–58, figs. 28 [shell, radula], 32b [map].
Sukashitrochus indonesicus: Geiger 2004: text-fig. p. 6.
+ *Sukashitrochus simplex* Bandel 1998: 52–53, pl. 18, figs. 2–4. Type material. Holotype (SGPIH 3882), 1.4 x 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).
Sukashitrochus simplex: Geiger 2003: 79.
Misidentifications
Sinezona carinata: Jansen 1999: 54, figs. 49–51 [is *Suk. morleti*].

Type material. Syntype (MNHN), 1.5 x 1.25 mm. Here designated as lectotype (see remarks).

Type locality. New Caledonia, intertidal sands (OD).

Etymology. Name after L. Morlet (OD).

Description and differential diagnosis. The species was recently treated by Geiger & Jansen (2004b) as *Sukashitrochus indonesicus*.

Remarks. *Sukashitrochus simplex* Bandel, 1998 was synonymized under *Suk. indonesicus* Bandel, 1998 by Geiger & Jansen (2004b), applying first reviser's principle. 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* (Tenison Wood, 1976) 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 teleoconch I, absence of spiral sculpture on teleoconch 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.

The syntype of *Sukashitrochus morleti* (Crosse, 1880) is conspecific with Bandel's *Suk. indonesicus*; the shared similarities are protoconch with fine reticulate sculpture (visible in type of *Suk. morleti*), teleoconch I of approximately 1 whorl, overall sculpture

of axials, spirals and keels. Bandel (1998) did not compare either of his species to *Suk. morleti*. Thiele (1912) noted the similarities with *Suk. atkinsoni*, however, the protoconch of *Suk. atkinsoni* shows strong flocculant sculpture, whereas *Suk. morleti* has fine axials.

The single specimen in MNHN is labeled as "syntype", because Crosse did not designate a single specimen to be the name bearer. Fischer-Piette (1950: 152) used the term "holotype" inappropriately, and this use should not be construed as a lectotype designation (ICZN Art. 74.5). The specimen is here designated as the lectotype for the express purpose of taxon stabilization in case other non-conspecific syntypes should be located. There are currently no known paralectotypes.

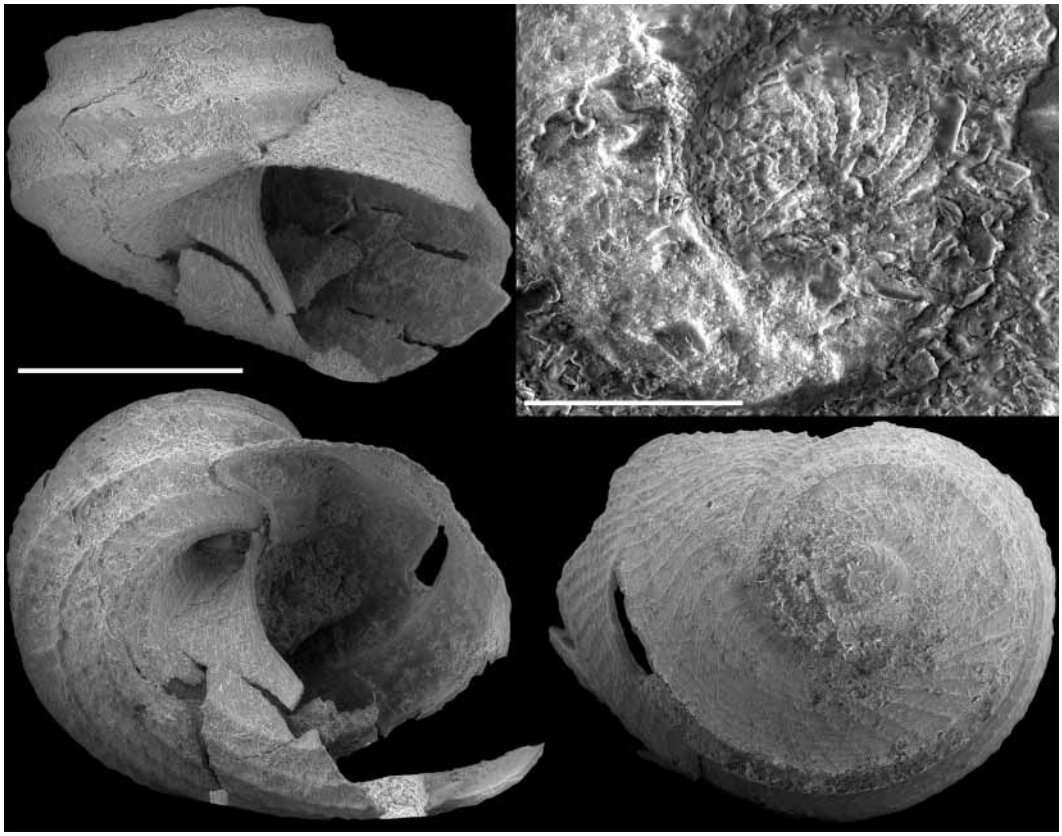

FIGURE 17. Lectotype (here designated) of *Sukashitrochus morleti* (MNHN) from New Caledonia. Scale bar shell = 1 mm. Scale bar protoconch = 100 µm.

Anatomidae McLean, 1989

Anatoma Woodward, 1859
Type species: *A. crispata* (Fleming, 1828) (M)

Anatoma jansenae new species: Figure 18

Anatoma SWA: Jansen 1999: 50, figs. 16–18.

Anatoma australis partim: Geiger & Jansen 2004a: fig. 5 (*A. jansenae*), not figs. 3–4 (*A. australis*).

Type material. Holotype (AMS C.402717). Paratypes (AMS C.450272, 7; AMS C.402720, 7; AMS C.402721, 1).

Type locality. 238–183 m, SW of Cape Naturaliste, Western Australia, Australia, 33.742°S, 114.435°E.

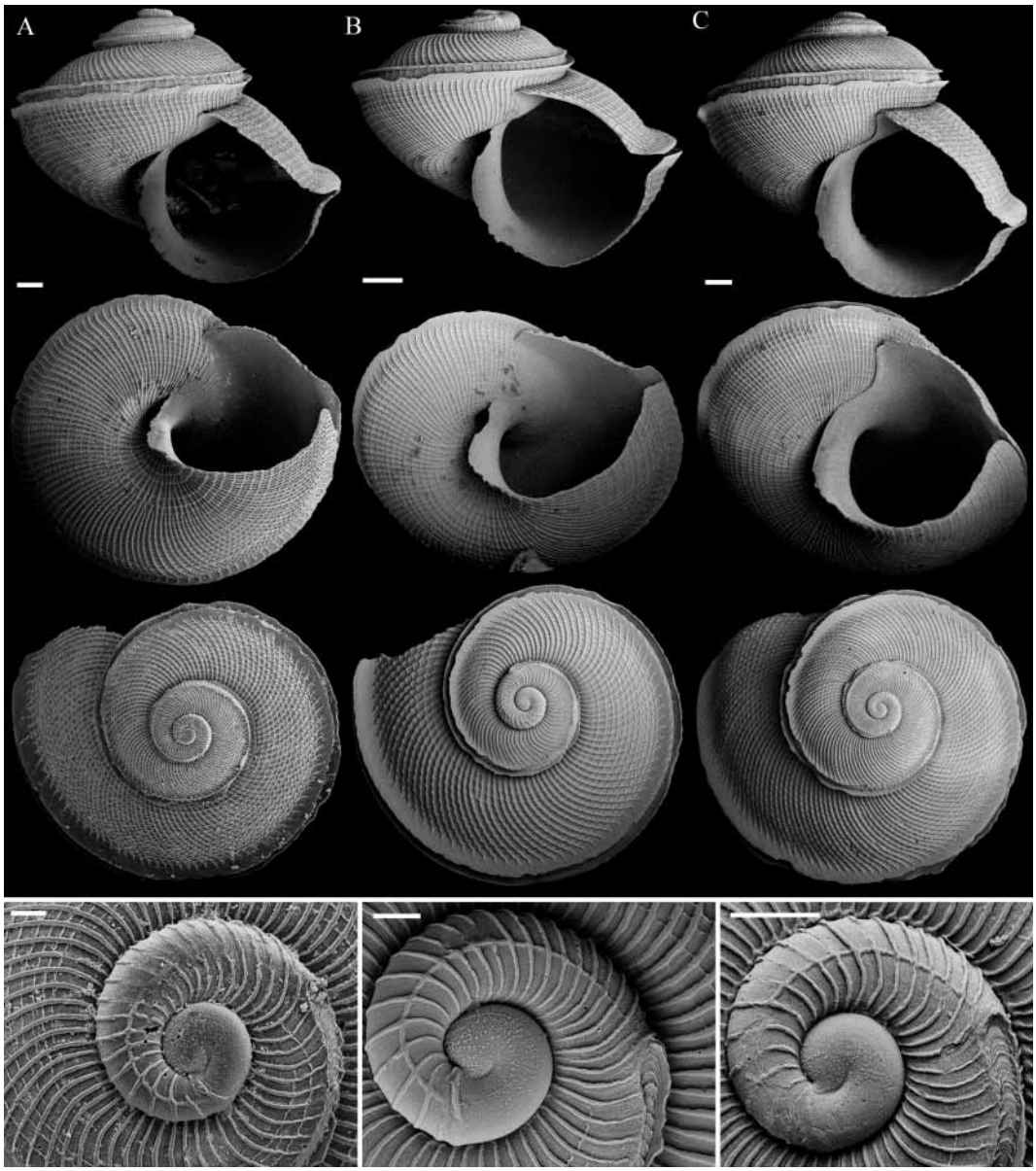

FIGURE 18. *Anatoma jansenae* new species. A. Holotype AMS C.402717. 238 m, SW of Cape Naturaliste, Western Australia, Australia. B. Paratype AMS C.402720. 274 m, NW of Beagle Island, Western Australia, Australia. C. Paratype AMS C.402721. 197 m, NW of Green Head, Western Australia, Australia. Scale bars shell = 200 µm. Scale bars spire and protoconch = 50 µm.

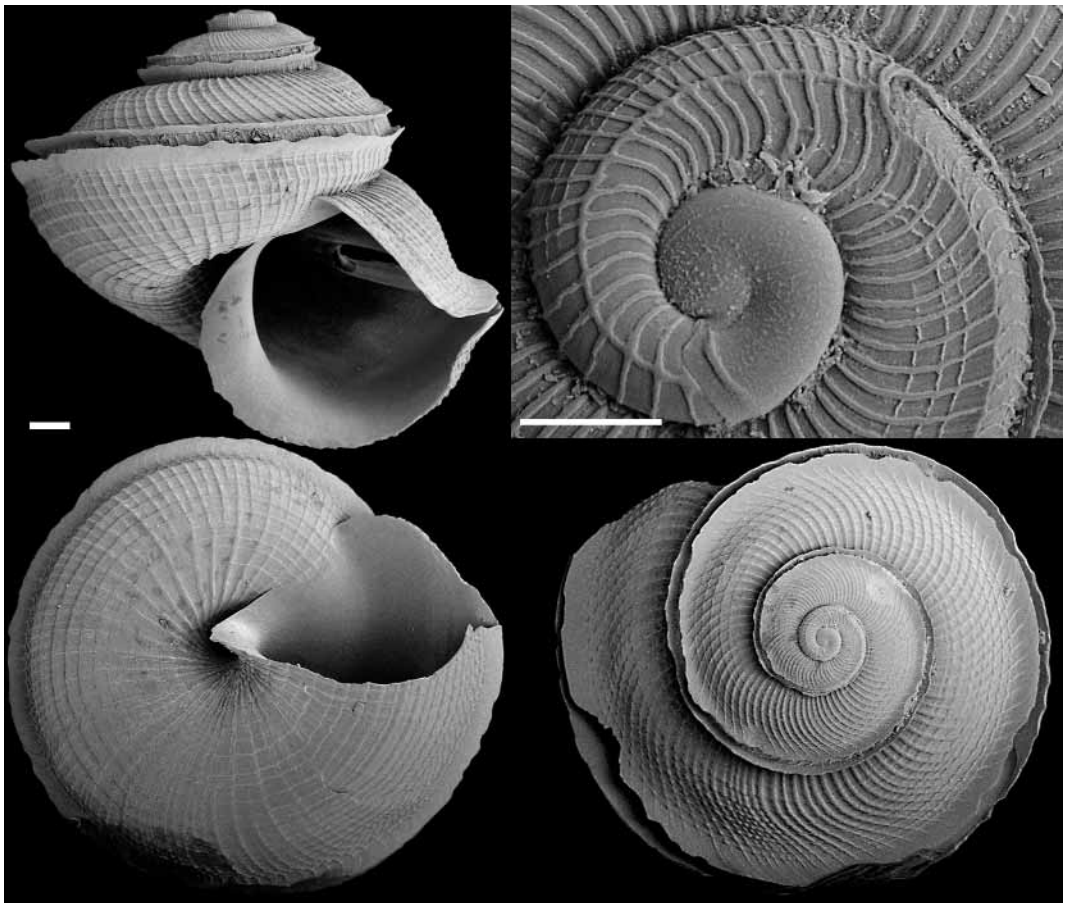

FIGURE 19. *Anatoma australis* (Hedley, 1903). AMS C.400817. Capricorn Channel, 16.8 miles NE of North Reef, Queensland, Australia. Scale bar shell = 200 µm. Scale bar protoconch = 100 µm. From Geiger & Jansen (2004a).

Etymology. Named after Patty Jansen, New South Wales, Australia, who first recognized the distinctness of the species, and for her contributions to the knowledge of Australian micromolluscs.

Description. Shell trochiform globular, medium size (to 2.5 mm). Protoconch of 0.75 whorls, with flocculant sculpture, apertural varix not connected to embryonic cap, apertural margin somewhat sinusoid. Teleoconch I of 0.75 whols, 17–21 distinct axials, spiral of same strength as axial in position of selenizone. Teleoconch II of up to 2.25 whorls. Shoulder somewhat convex, approximately 75 distinct axials on last whorl, 12–18 fine spirals forming at intersection with axials minute, dull points. Base with similar sculpture as shoulder, approximately 20 somewhat stronger spirals; spirals always cords, not as shingles. Umbilicus narrow, continuously sloping with base. Selenizone at periphery, keels moderately strong, moderately elevated; slit open margins converging towards apertural rim. Aperture rounded in lower portion, suborbicular under shoulder.

Differential diagnosis. *Anatoma australis* (Hedley, 1903: Fig. 19) from the eastern Australia has coarser sculpture on the base, particularly with a decrease in density of the spirals in the third closest to the umbilicus; adumbilical margin of adumbilical spirals usually not fully differentiated from surface giving shingle-like appearance. *Anatoma tobeyoides* Geiger & Jansen, 2004 from southeastern Australia lacks the protoconch varix, and on teleoconch I of less than 0.5 whorls lacks a spiral cord in the position of the selenizone. *Anatoma funiculata* Geiger & Jansen, 2004 from Queensland is less globular and more angular in overall shape, has a teleoconch I of approximately 0.5 whorls, and a distinct shell strand (funiculus) running into the umbilicus.

Distribution. Western Australia, Coral Sea.

Specimen records. Coral Sea. 6 m, Saumarez Reef, 21.817°S, 153.667°E (AMS C.402669, 1).

Timor Sea. 27 m, Sahul Banks, 11.5°S, 125.5°E (AMS C.377600, 1).

Australia, Western Australia. 75 m, Off Albany, 35.240°S, 118.342°E (AMS C.378550, 7). 158 m, Great Australian Bight, E of Hood Point, 34.417°S, 121.333°E (AMS C.378551, 2). South Cowaramup, 33.883°S, 114.983°E (AMS C.379071, 7). 238–183 m, SW of Cape Naturaliste, 33.742°S, 114.435°E (AMS C.402717, 1: holotype; AMS C.ex. C.402717, 7: paratypes). 155 m, NW of Bunbury, 33.250°S, 114.617°E (AMS C.402719, 1). 200–221 m, NW of Bunbury, 33.000°S, 114.617°E (AMS C.402747, 6). 176–182 m, W of Garden Island, 32.262°S, 115.112°E (AMS C.402741, 1). 210–212 m, W of Garden Island, 32.250°S, 115.117°E (AMS C.402750, 2). Minim Cove, Mosman Park, Swan River, 32.017°S, 115.767°E (AMS C.379070, 1). 116 m, off Rottnest Island, 31.673°S, 115.198°E (AMS C.378552, 8). 160 m, off Rottnest Island, 31.650°S, 115.080°E (AMS C.402749, 1). 110 m, off Rottnest Island, 31.630°S, 115.178°E (AMS C.378549, 3). 732 m, W of Rottnest Island, 31.083°S, 114.767°E (AMS C.402751, 1). 237–274 m, W of Green Head, 30.750°S, 114.767°E (AMS C.402748, 1). 238–247 m, off Cervantes Island, 30.533°S, 114.683°E (AMS C.402752, 2). 256–192 m, NW of Cervantes, 30.500°S, 114.633°E (AMS C.402718, 10). 223–245 m, off Jurien Bay, 30.133°S, 114.500°E (AMS C.402745, 1). 197–219 m, NW of Green Head, 29.967°S, 114.450°E (AMS C.402721, 1: paratype). 183 m, NW of Beagle Island, 29.725°S, 114.333°E (AMS C.402746, 1). 274–283 m, NW of Beagle Island, 29.717°S, 114.283°E (AMS C.402720, 7: paratypes). 146 m, W of Dongara, 29.350°S, 114.117°E (AMS C.402742, 1). 219 m, W.of Dongara, 29.183°S, 113.900°E (AMS C.402744, 1). 183 m, W of Dongara, 29.142°S, 113.913°E (AMS C.402743, 1). Point Quobba, N of Carnarvon, 24.483°S, 113.417°E (AMS C.379976, 1). 108 m, Off North West Cape, 22.705°S, 113.540°E (AMS C.402644, 1; 402645, 1). 2 m, Ningaloo Reef, off Neds Camp, 21.992°S, 113.908°E (AMS C.377284, 2). 238 m, North West Shelf, ca 230 ml W Roebuck Bay, 18.500°S, 118.050°E (AMS C.402676, 1).

Remarks. Geiger & Jansen (2004) noted that there was no consistent difference in the eastern and western specimens of *A. australis* and *Anatoma* "SWA" of Jansen (1999).

Recent re–examination of the material showed the above indicated subtle differences.

***Anatoma munieri* (Fischer, 1862):** Figure 20

Scissurella munieri Fischer October 1, 1862: 390–391, not illustrated.
Scissurella munieri: Munier Chalmas 1865: 397.
Scissurella munieri: Fischer 1867: 305, 468, pl,. 9, fig. 4 [The figure caption on plate 9 for figure 4 reads *Scissurella munieriana*, an error noted on the errata page 468 of the volume].
Scissurella munieri: Paetel 1888: 289.
Scissurella munieri: Pilsbry 1890: 54.
Scissurella munieri: Thiele 1912: 14–15.
scissurellid: Bandel 1991: pl. 2, fig. 7.
Scissurella munieri: Higo & Goto 1993: 15.
Scissurella ? *munieri*: Geiger 2003: 77.
Synonyms
+ *Anatomus turbinatus* A. Adams November, 1862: 347–348, not illustrated. Type material. Holotype (BMNH 1874.5.19.62. Higo *et al*. 2001: G82), 2.5 mm. Type locality. Mino-sima, [= Mishima Island, Hagi City, Yamaguchi Prefecture, Japan (34.767°N, 131.166E): see also Kawamoto and Tanabe (1956)] 63 fms. [= 115 m] (OD). Etymology. Turbinatus: Latin adjective: that which whirls; whirlwind, tornado; spinning top; spiral. Referring to the high spired shell shape.
Scissurella turbinata: Crosse 1863: 109.
Scissurella turbinata: Paetel 1888: 289.
Anatomus turbinatus: Pilsbry 1890: 59.
Scissurella turbinata: Pilsbry 1895: 106.
Scissurella turbinata: Thiele 1912: 15, pl. 2, figs. 9–10 [after a specimen in the British Museum: type?].
Schizotrochus turbinatus: Habe 1951: 68, pl. 11, figs. 12–13.
Scissurella turbinata: Kuroda & Habe 1952: 85.
Scissurella (*Schizotrochus*) *turbinata*: Kawamoto & Tanabe 1956: 3, pl. 2, fig. 11 [copy figure Thiele 1912. fide T. Sasaki pers. comm. 2005].
Anatoma turbinata: Habe & Kosuge, 1964: 4.
Anatoma turbinata: Higo 1973: 13.
Anatoma turbinata: Tsuchida *et al.* 1991: 5–6, pl. 1, figs. 2–3, 5.
Anatoma turbinata: Higo & Goto 1993: 15.
Anatoma turbinata: Yu &Feng 1996: pl. 1,figs. 1–4.
Anatoma turbinata: Okutani & Hasegawa 2000: 37, fig. 5.
Anatoma turbinata: Higo *et al.* 2001: G82 [holotype].
Anatoma turbinata: Geiger 2003: 74.
Anatoma turbinata: Geiger & Jansen 2004a: 18–21. figs. 9–10, 18 [map].
Anatoma turbinata: Geiger 2004: text-fig. p. 5.
Misidentifications
Anatoma agulhasensis: Bandel 1998: 34–35, pl. 11, figs. 4–6. [is *A. munieri*].
Anatoma agulhasensis: Jansen 1999: 48,figs. 1–3. [is *A. munieri*].
not *Scissurella turbinata*: Yokoyama (1924: 35–36, pl. 5, fig. 21) [is *Sci. staminea*. Fide Oyama 1973: 10. plate reprinted in Taki & Oyama 1954: pl. 42: shows *Sci. staminea*. Specimen in UMUT CM21891 fide T. Sasaki pers. comm. 2005).

FIGURE 20. Former syntypes of *Scissurella munieri* (MNHN). A. Lectotype (here designated). B. Paralectotype. Protoconchs are eroded (not shown). Scale bars = 1 mm.

Type material. Syntypes (MNHN, 2), 1.5 x 1.66 mm. Lectotype here designated (see remarks).

Type locality. Seas of China, in bottom sands (OD).

Etymology. Named after E. Munier Chalmas (OD).

Description and differential diagnosis. The species was recently treated by Geiger & Jansen (2004a) as *A. turbinata*.

Remarks. *Anatoma munieri* and *A. turbinata* are clearly synonymous. Supporting characters include the overall turreted shape of the shell, the strong constriction below the selenizone with a subsequent spiral edge, a minor spiral edge on the base 0.66 towards the umbilicus, the shell ornamentation showing a regular reticulate pattern composed of spiral and axial cord, and the open umbilicus, which slopes continuously with the base.

Anatoma munieri has only one month priority over *A. turbinata*. The date on the first page of the issue in which *Sci. munieri* was described, agrees with the publication dates given by Winckworth (1936). Although the latter species name is somewhat better known, the general rule of priority should be enforced in this case. It is not possible to apply the *nomen oblitum/protectum* rules, because *munieri* has been used as a valid species after 1900.

Fischer-Piette (1950: 69) indicated there to be a holotype and one paratype. The holotype was not specifically designated in the original description, hence, the two specimens constitute syntypes. The subsequent holotype indication can not be viewed as a lectotype designation (ICZN Art. 74.5). The specimen shown in Figure 20A is here designated as the lectotype with the express purpose of taxon stabilization in case other non-conspecific syntypes should be located.

Bandel (1991) showed an unidentified “scissurellid”, which is here identified as *A. munieri*. Bandel (1998: 42) referred in his discussion of *Hainella pulchella* (= *A. pulchella*: see Geiger, 2003 for discussion of generic taxa) to an illustration in his 1991 publication that illustrated the species with a specimen from Cebu. There was no specific reference to pagination, plate or figure number, and three Bandel (1991) references were used, but only one dealing with specimens from the Philippines: Bandel (1991) of this contribution. Although *A. pulchella* is very distinct from *A. munieri*, it is likely that the reference by Bandel (1998) was a *lapsus calami*.

Discussion

The present contribution underscores some previous observation on the value of diagnostic characters in Scissurellidae and Anatomidae. Protoconch sculpture was shown to be highly variable in most genera by Geiger (2003). *Sinezona macleani* with flocculant sculpture and *Sin. globosa* with spiral ridges do not have the for *Sinezona* supposedly diagnostic strong axial ribs; *Sin. singeri* has the smooth protoconch once considered diagnostic for *Sukashitrochus*, while *Sin. garciai* has fine axials.

Although some type material has been destroyed by the vagaries of time and inappropriate storage conditions, extant type material can be identified and assist in assembling formal synonymies. Technological advances such as variable pressure scanning electron microscopy (VPSEM), which allows uncoated specimens to be observed with few effects of charging, are greatly facilitating investigations on microgastropods. Of the two modern design VPSEMs used, the Zeiss EVO40 XVP with variable pressure secondary electron detector (VPSE) provides far superior results compared to the Hitachi 3000N with environmental secondary electron detector (ESED), both in terms of resolution and particularly in terms of native image contrast.

The number of new scissurellid and anatomid species to be discovered is expected to be significant. Even well-studied regions such as the Panamic and South Africa yield new species. For one, very small species with shell lengths less than 1 mm have been inadequately sampled, and the lack of detailed study of multiple specimens by SEM can be identified as the cause for overlooking distinct species.

The diversity of scissurellids is still far from being completely assessed. Currently, approximately 60 species await description. The single most diverse area is the Indo-Malayan archipelago, where at least 23 undescribed anatomids have been found. New Zealand harbors approximately 18 undescribed scissurellids, anatomids and larocheids. Additional new taxa have been located throughout the world and at all depths, from the intertidal to at least 4000 m. Microfossil taxa are also being added to the inventory (A. Nützel & D. Geiger unpubl. data), while phylogenetic relationships remain to be further analyzed (see Geiger & Thacker, 2005). The group will certainly yield a number of surprises and provide greater insight into vetigastropod evolution.

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