

Description of eight new species and one new genus of Muricidae (Gastropoda) from the Indo-West Pacific

Roland HOUART

Research associate

Institut royal des Sciences naturelles de Belgique

and

Muséum national d'Histoire naturelle, Paris, France

UMR7205 ISyEB

roland.houart@skynet.be

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ABSTRACT. Eight new species of Muricidae are described from Mozambique, South Africa and Papua New Guinea. A new genus, *Tylothais* n. gen. is described for the species formerly included in *Thalassa* H. & A. Adams, 1853, a subjective junior synonym of *Volema* Röding, 1798, a genus of Melongenidae. A neotype is designated for both *Murex plicatus* Gmelin, 1791 and *Murex virgatus* Dillwyn, 1817 and a lectotype is designated for *Purpura distinguenda* Dunker, 1866.

Five subfamilies are represented in this paper: Muricinae (*Aspella aclydis* n. sp., from Papua New Guinea), Ergalataxinae (*Spinidrupa aethes* n. sp., from Papua New Guinea), Trophoninae (*Leptotrophon fusiformis* n. sp., from the Solomon Sea), Typhinae (*Laevityphis libos* n. sp., from Papua New Guinea) and Rapaninae (*Tylothais* n. gen. *akidotos* n. sp., *T. funilata* n. sp., *T. inhacaensis* n. sp. and *T. ovata* n. sp., from Mozambique and South Africa).

RESUME. Huit nouvelles espèces de Muricidae sont décrites du Mozambique, d'Afrique du Sud et de Papouasie-Nouvelle-Guinée. Un nouveau genre, *Tylothais* n. gen., est décrit pour les espèces auparavant incluses dans *Thalassa* H. & A. Adams, 1853, synonyme subjectif plus récent de *Volema* Röding, 1798, un genre appartenant aux Melongenidae. Un néotype est désigné à la fois pour *Murex plicatus* Gmelin, 1791 et *Murex virgatus* Dillwyn, 1817 et un lectotype est désigné pour *Purpura distinguenda* Dunker, 1866.

Cinq sous-familles sont représentées dans cet article: Muricinae (*Aspella aclydis* n. sp. de Papouasie-Nouvelle-Guinée), Ergalataxinae (*Spinidrupa aethes* n. sp. de Papouasie-Nouvelle-Guinée), Trophoninae (*Leptotrophon fusiformis* n. sp. de la mer des Salomon), Typhinae (*Laevityphis libos* n. sp. de Papouasie-Nouvelle-Guinée) et Rapaninae (*Tylothais* n. gen. *akidotos* n. sp., *T. funilata* n. sp., *T. inhacaensis* n. sp. et *T. ovata* n. sp. du Mozambique et d'Afrique du Sud).

INTRODUCTION

New species of Trophoninae from Papua New Guinea have been recently described from deep water by Houart & Héros (2016) from the BIOPAPUA and NIUGINI campaigns. Two additional species of Muricidae are here described from those same expeditions. One additional shallow water species from Papua New Guinea is described from the KAVIENG campaign and a deep water trophonine is described from the Solomon Sea, from the MADEEP campaign. Species of Muricidae from the western Indian Ocean were also described by Houart & Héros (2013 and 2015). The species described in this paper from the western Indian Ocean all belong to Rapaninae, originate from Mozambique and South Africa and are shallow water or coastal species, mainly found in sand and on rocks at low tide.

Several studies pertaining to the new classification of Muricidae, based on genetic results were published recently. Six of those cover Indo-West Pacific species

or genera that are included here: Claremont et al., 2008 (Ergalataxinae and Rapaninae); Barco et al., 2010 (overall classification); Barco et al., 2012 (Pagodulinae and Trophoninae); Claremont et al., 2013a (Ergalataxinae); Claremont et al., 2013b (Rapaninae) and Barco et al., 2015 (Haustrinae and Pagodulinae).

Material and methods

Material

The material studied here originates from expeditions in the West Pacific, in the vicinity of Papua New Guinea and the Solomon Islands and in the Western Indian Ocean, from Inhaca Island, Mozambique. Other material originates from the Natal Museum, Pietermaritzburg, South Africa and from the author's personal collection.

The following expeditions of MNHN/IRD are involved:

BIOPAPUA: from August 22 to October 18, 2010. This expedition explored parts of the Bismarck Sea and of the Solomon Sea (see also Houart & Héros, 2016).

INHACA: from November 23 to December 12, 2011. The island of Inhaca (26°S, 33°E) is about thirty kilometers off the continent. It extends from the peninsula of Machangulo towards the north and is separated from it by the strait of Ponta Torres. The island measures 12 km in its greatest length from north to south and less than 7 km from east to west. It consists mainly of an extremely fragile sand dune. The few underlying rocks encountered around the island are made up of beach-rock sand dating from the late Pleistocene glaciation. At low tide, the exposed areas cover an area larger than that of the island (P. Maestrati, unpublished report).

PAPUA NIUGINI: from October 25 to December 26, 2012. Intensive study of the Madang region, with MADANG, a deep-sea cruise off the Bismarck Sea coast, from Vitiaz Strait to the border with West Papua (Irian Jaya) (see also Houart & Héros, 2016).

MADEEP: from April 6 to May 8, 2014 in Papua New Guinea. This deep-sea cruise was dedicated to the study of the deep sea biodiversity in the Bismarck and Solomon seas, in continuation of the PAPUA NIUGINI project.

KAVIENG: from June 1 to 30 (Kavieng Lagoon Biodiversity Survey) and from August 27 to September 7, 2014 (deep water). During the lagoon survey, a total of 404 stations were surveyed covering the entire Kavieng lagoon between 0 and 45 meters.

The PAPUA NIUGINI, MADEEP and KAVIENG expeditions were part of the Our Planet Reviewed program, conducted by the National Museum of Natural History (MNHN), Pro-Natura International (PNI), the Institute for Research for Development (IRD), and their in-country scientific partners, the University of Papua New Guinea (UPNG) and the National Fisheries Authority.

Methods

The characters used to describe the shell morphology are the general aspect of the shell, its shape and size, colour, shape of the spire and number of protoconch and teleoconch whorls, features of the protoconch, shape of the teleoconch whorls and features or form of the suture and of the subsutural ramp, of axial and spiral sculpture, the aperture and siphonal canal. When known, the characters of the operculum and radula are also used. Unless otherwise mentioned, the species descriptions are based on the holotype and the paratypes.

The morphology of the radula is described starting from the rachidian tooth followed by the lateral teeth.

The method for determining diameter, height and counting the number of protoconch whorls is explained in Fig. 1.

The bathymetric range given here is provided using the inner values of the recorded depth: the largest value of the minimum values and the lowest value of the maximum values of all the recorded ranges.

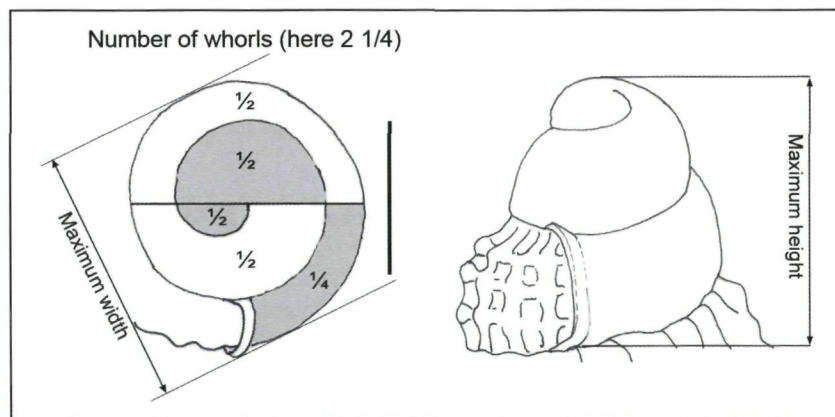


Fig. 1. Method for determining diameter, height and counting the number of protoconch whorls (scale bars: 500 μ m).

Abbreviations

Repository

IRSNB: Institut royal des Sciences naturelles de Belgique, Bruxelles, Belgium.

MNHN: Muséum national d'Histoire naturelle, Paris, France.

NMSA: The KwaZulu-Natal Museum, Pietermaritzburg, South Africa.

RH: collection of Roland Houart.

NHMD: Natural History Museum of Denmark (Zoology), Copenhagen.

ZMB: Museum für Naturkunde der Humboldt Universität zu Berlin, Zoologisches Museum, Germany.

Other abbreviations

CP: chalum à perche (beam trawl)

DW: drague Warén (Warén dredge)
 lv: live collected specimen(s)
 dd: empty shell(s).

Terminology used to describe the radula (Fig. 2)

cc: central cusp
 ild: inner lateral denticle
 lc: lateral cusp
 LT: lateral teeth
 mc: marginal cusp
 md: marginal denticles.

Terminology used to describe the spiral cords and the apertural denticles (after Merle 2001 and 2005) (Fig. 3). Terminology in parentheses: variable feature.

Convex part of teleoconch whorl and siphonal canal

ab: abapical (or abapertural);
 abis: abapical infrasutural secondary cord (on subsutural ramp);
 ABP: abapertural primary cord on the siphonal canal;
 ad: adapical (or adapertural);

adis: adapical infrasutural secondary cord (on subsutural ramp);
 ADP: adapertural primary cord on the siphonal canal;
 ads: adapertural secondary cord on the siphonal canal;
 IP: infrasutural primary cord (primary cord on subsutural ramp);
 MP: median primary cord on the siphonal canal;
 ms: median secondary cord on the siphonal canal;
 P: primary cord;
 P1: shoulder cord;
 P2-P6: primary cords of the convex part of the teleoconch whorl;
 s: secondary cord;
 s1-s6: secondary cords of the convex part of the teleoconch whorl (example: s1 = secondary cord between P1 and P2; s2 = secondary cord between P2 and P3, etc.);
 SP: subsutural cord.

Aperture

D1 to D5: abapical denticles;
 ID: Infrasutural denticle.

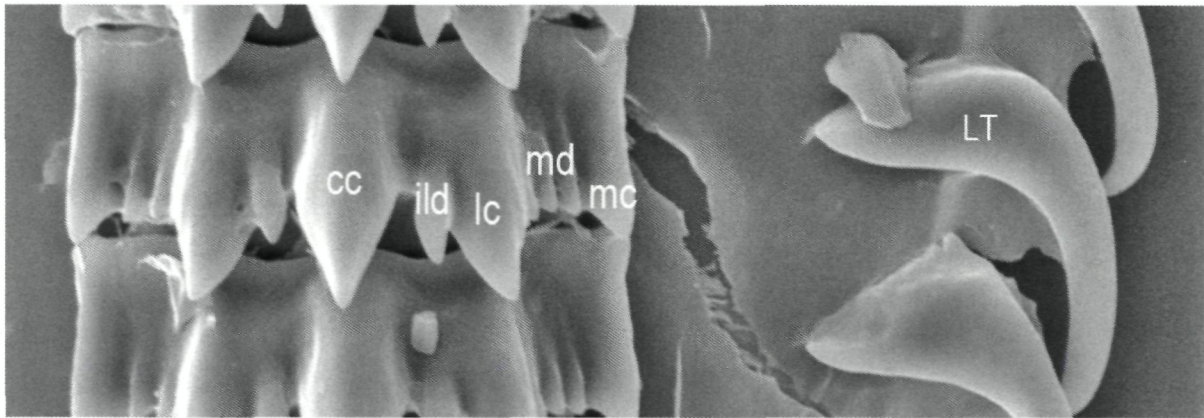


Fig. 2. Radula of *Tylothais akidotos* n. sp.

Family **MURICIDAE** Rafinesque, 1815
 Subfamily **MURICINAE** Rafinesque, 1815
 Genus *Aspella* Morch, 1857
 Type species by monotypy: *Ranella anceps* Lamarck, 1822, Mediterranean.

Aspella aclydis n. sp.
 Figs 3A, 5A-G, L, O

Type material. Holotype MNHN IM-2013-54542; 1 paratype MNHN IM-2013-53620; 3 paratypes Reg. No. MSF mx214 (a, b, c), Molluscan Science Foundation, Inc., Owings Mills, Maryland, USA, 1 paratype RH (as listed below).

Material examined. KAVIENG, stn KB48, type

locality, 18 June 2014, 1 lv (holotype); stn KZ02, Kavieng Lagoon, Edamago Id, 02°37' S, 150°44' E, 9 m, soft corals, rocks, sand, 1 lv (paratype MNHN IM-2013-53620); Albatross Passage east of Manne Island, Kavieng area, 02°45' S 150°43' E, with grit at 30-40 m (3 paratypes Molluscan Science Foundation, Inc.).

Type locality. Papua New Guinea, Kavieng Lagoon, west side of Tsoilaunung Island, 02°33' S, 150°31' E, 6 m, coral block in middle of sand.

Distribution. Papua New Guinea, Kavieng, living at 6-30 m.

Description. Shell large for the genus, 21.1 mm in length (paratype MSF mx214, Molluscan Science Foundation, Inc.). Length/width ratio 2.3-2.5. Slender,

lanceolate, flattened, smooth. Subsutural ramp very narrow, almost horizontal, strongly concave. Shell entirely covered by a thick, dirty white intritacalx. Aperture white.

Spire very high with 2.15 protoconch whorls and 8 elongate, flattened, weakly shouldered teleoconch whorls. Suture strongly impressed, ventrally and dorsally partially obscured by broad buttress connecting preceding whorl. Protoconch (Fig. 5O) small, conical. Whorls smooth, glossy, penultimate whorl with narrow keel abapically. Maximum width 500 μm , height 550 μm . Terminal lip erect, of sinusigera type.

Axial sculpture of teleoconch whorls consisting of high and low, narrow, lightly nodose varices and low intervariceal ribs. First and second whorl with 6 narrow, low ribs; third whorl starting two high, expanded, lateral varices, one additional low varix between lateral varices and a low intervariceal rib; fourth to last whorl with two high, expanded, narrow, lateral varices, two lower varices and two broad, low buttresses connecting preceding whorl. Spiral sculpture almost indistinct, consisting of P1-P6, ADP, MP and ABP (Fig. 3A), only distinct on lateral varices covered by thick, very weakly axially and spirally striate, intritacalx (Fig. 5L).

Aperture narrow, ovate. Columellar lip narrow, smooth, adherent. Anal notch indistinct. Outer lip weakly erect, smooth with 5 obvious denticles within: D1-D5. Siphonal canal short, straight, narrowly open. Operculum (Fig. 5G) dark brown, ovate with apical nucleus. Radula unknown.

Remarks. There are 12 extant species of *Aspella* known from the Indo-West Pacific but only two with a conical, multispiral protoconch, attesting to a planktotrophic larval development, *Aspella hildrunae* Houart & Tröndlé, 2008 from French Polynesia and *A. producta* (Pease, 1861), living throughout the Indo-

West Pacific. All the other species have a rounded, paucispiral protoconch of 1.5 whorls.

Aspella hildrunae (Figs 5H-J, M, P) differs in having a reticulate, strongly spirally and axially striate intritacalx (Fig. 5M), a broader shell with a lower spire, a comparatively broader aperture, narrower but more obvious buttresses and a strongly dorsally bent siphonal canal.

Aspella producta (Fig. 5K, N) differs in many ways, having a comparatively broader and larger, strongly nodose shell, reaching 23 mm in length. It also differs in having a thick, strongly cancellate intritacalx (Fig. N).

In total three species of *Aspella* were collected in Papua New Guinea during the KAVIENG expedition: *A. producta*, *A. media* Houart, 1987 (Fig. 5Q) and *Aspella aclydis* n. sp.

Etymology. *Aclydis* (L): small javelin or spear, refers to the lanceolate form of the shell.

Subfamily **Ergalataxinae** Kuroda, Habe & Oyama, 1971

Genus *Spinidrupa* Habe & Kosuge, 1966

Type species by original designation: *Murex euracanthus* A. Adams, 1853, Indo-West Pacific.

Spinidrupa aethes n. sp.

Figs 3B-C, 6A-D

Type material. Holotype MNHN IM-2000-32835 and 1 paratype MNHN IM-2000-32836 (as listed below).

Material examined. PAPUA NIUGINI, stn PD54, type locality, 2 dd (holotype and paratype MNHN).

Type locality. Papua New Guinea, Madang Lagoon, West of Panab Island, 05°11' S, 145°48' E, 15 m.

Distribution. Only known from the type material.

Figure 3. Spiral cords and apertural denticles morphology

A. *Aspella aclydis* n. sp. Papua New Guinea, Kavieng Lagoon, west side of Tsoilaunung Island, 02°33' S, 150°31' E, 6 m, holotype MNHN IM-2013-54542.

B-C. *Spinidrupa aethes* n. sp. Papua New Guinea, West of Panab Island, 05°11' S, 145°48' E, 15 m. B. Paratype MNHN IM-2000-32836; C. Holotype MNHN IM-2013-32835.

D. *Leptotrophon fusiformis* n. sp. Solomon Sea, Budibudi Island, north of Archipel Laughlan Islands, 09°11' S, 153°55' E, 380-411 m, holotype MNHN IM-2013-45607.

E. *Tylothais akidotos* n. sp. Inhaca Island, Mozambique, Maputo Bay, Xixuana, 25°60' S, 32°56' E, 0-1 m, holotype MNHN IM-2013-43791.

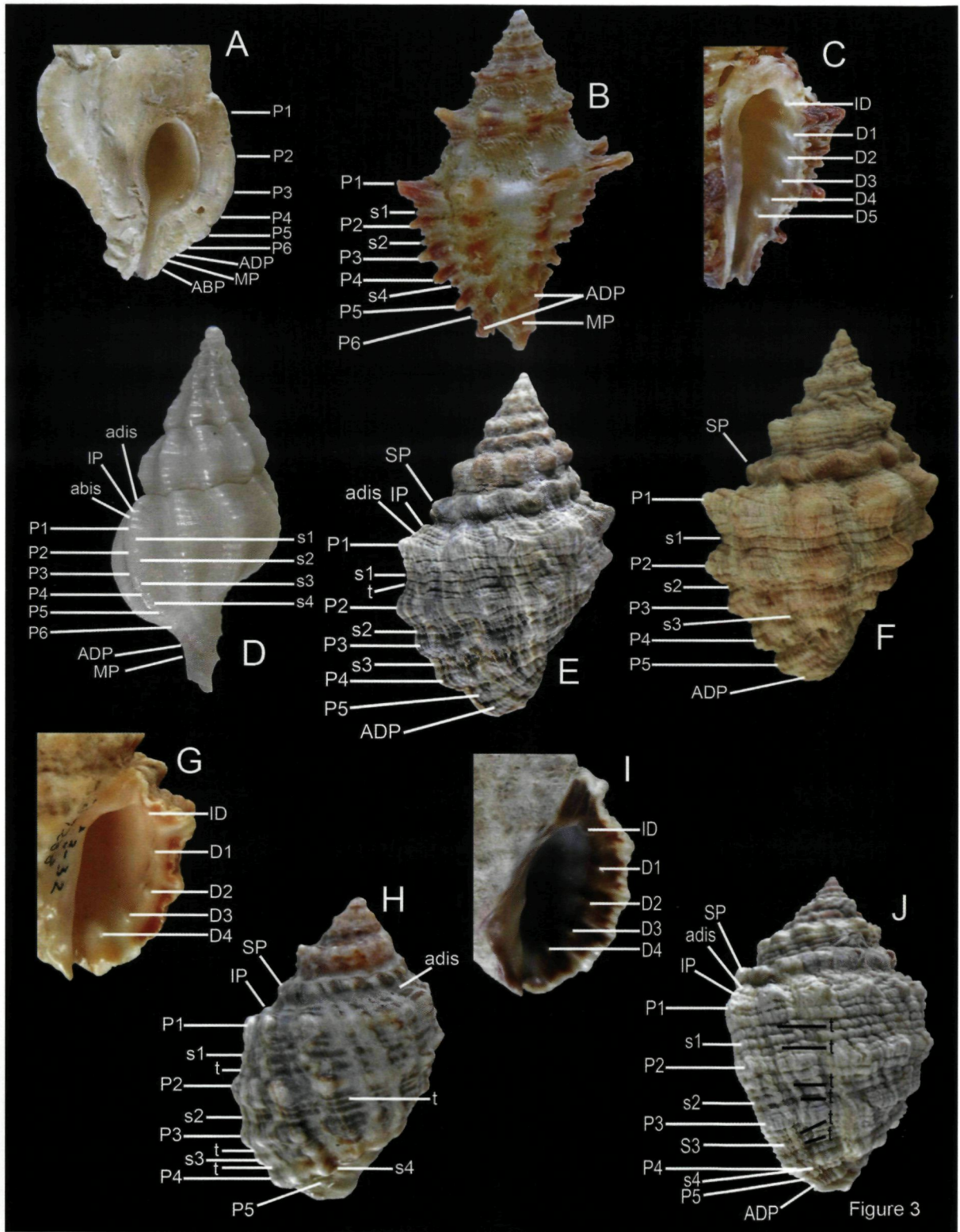
F-G. *Tylothais funilata* n. sp.

F. Mozambique, south of Vilanculos, mangroves, paratype NM G1300/T4222; G. Holotype NM L2726/T4221.

H. *Tylothais inhacaensis* n. sp. Inhaca Island, Mozambique, Ponta do Farol, 25°58' S, 32°59' E, holotype MNHN IM-2000-32843.

I-J. *Tylothais ovata* n. sp.

I. Paratype RH; J. Holotype NM P0992/T4224.



Description. Shell medium-sized for the genus, holotype 19.8 mm in length. Length/width ratio 1.6. Biconical, broadly ovate, heavy, spinose and squamous. Subsutural ramp broad, strongly sloping, strongly convex. Shell light tan with partially dark and light brown coloured spines, primary cords and siphonal canal. Aperture dirty white. Spire high. Teleoconch of 7 angulate, strongly shouldered, spinose whorls. Suture strongly adpressed. Protoconch unknown, eroded in both specimens.

Axial sculpture of teleoconch whorls consisting of moderately high, strong, broad ribs and varices. Other axial sculpture of numerous, weak, growth lamellae. First and second teleoconch whorls with 10 ribs, third and fourth with 9, fourth and fifth whorls with 8 varices, last with 7 varices. Spiral sculpture of high, strong, narrow, squamous, primary, secondary and tertiary cords (Fig. 3B). Last teleoconch whorl with

high, narrow P1, P3, P5 and ADP; P2, P4 and P6 low, narrow. Tertiary cords lower and narrower, of equal strength. P1 and P3 highest, P6 narrow and low. Previous teleoconch whorls with visible P1, s1; P2 visible from antepenultimate whorl. Subsutural ramp with 3 or 4 low, narrow, squamous threads of same strength.

Aperture large, narrow, ovate. Columellar lip narrow, smooth in juvenile paratype, Columellar lip of holotype with 3 elongate, weak knobs, decreasing in strength abapically and weak, low parietal knob at adapical extremity. Rim adherent. Anal notch deep, broad. Outer lip with 6 strong, moderately high, narrow denticles within: ID, D1-D5 (Fig. 3C), extended as narrow lirae into aperture. Siphonal canal short, broad, very weakly dorsally recurved, broadly open, with ADP and MP.

Operculum and radula unknown.

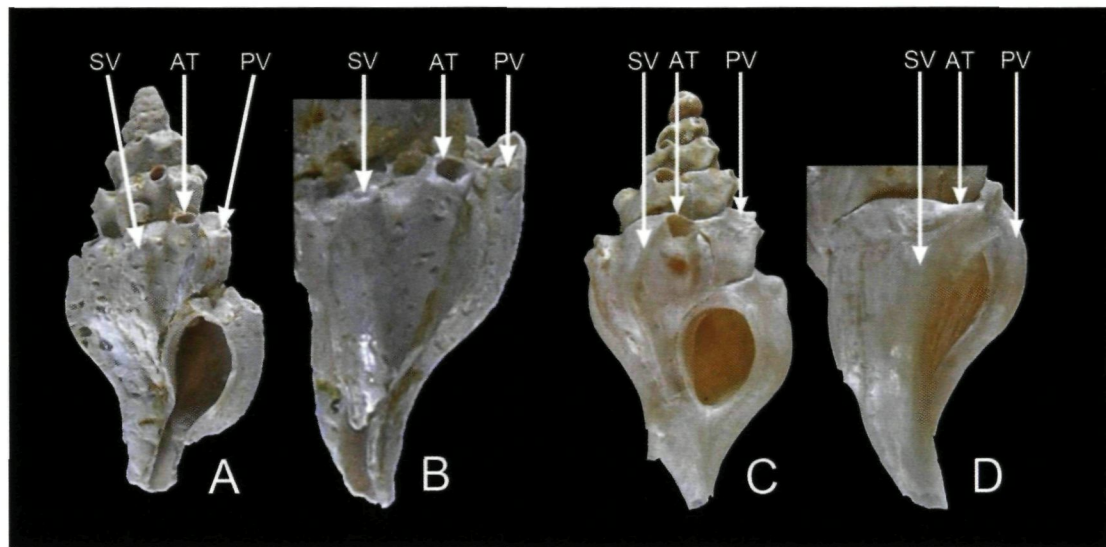


Figure 4

A-B. *Laevityphis coronarius* Deshayes, 1865. Barisis-au-Bois, Paris Basin, Lower Eocene, France, RH, 6 mm.

C-D. *Siphonochelus arcuatus* (Hinds, 1843). Algoa Bay, South Africa, live in crayfish trap, 100 m, RH, 12.8 mm (type species of *Siphonochelus*).

(SV: succeeding varix; AT: anal tube; PV: preceding varix)

Figure 5 (scale bars 500 μ m)

A-G, L, O. *Aspella aclydis* n. sp.

A-C, G, L, O. Papua New Guinea, Kavieng Lagoon, west side of Tsoilaunung Island, 02°33' S, 150°31' E, 6 m, coral block in middle of sand (all holotype); A-C. Holotype MNHN IM-2013-54542; G. Operculum; L. Detail of intritacalx; O. Protoconch.

D-F. Papua New Guinea, Kavieng, Albatross Passage east of Manne Island, Kavieng area, 2°45' S 150°43' E, with grit at 30-40 m, paratype MSF mx214, 21.1 mm.

H-J, M, P. *Aspella hildrunae* Houart & Tröndlé, 2008

H-J. French Polynesia, Society Archipelago, Tahiti, Punaauia, Amiral reef, coral fragments, holotype MNHN IM-2000-20165, 15.1 mm; M. French Polynesia, Society Archipelago, Huahine Island (RH), detail of intritacalx; P. Protoconch (RH).

K, N. *Aspella producta* (Pease, 1868)

K. Kavieng Lagoon, Papua New Guinea, Northwest tip of Big Nusa Island, 02°34' S, 150°46' E, 6-20 m, MNHN IM-2013-54683, 12.5 mm; N. Touho, New Caledonia (RH), detail of intritacalx.

Q. *Aspella media* Houart, 1988. Protoconch (RH).

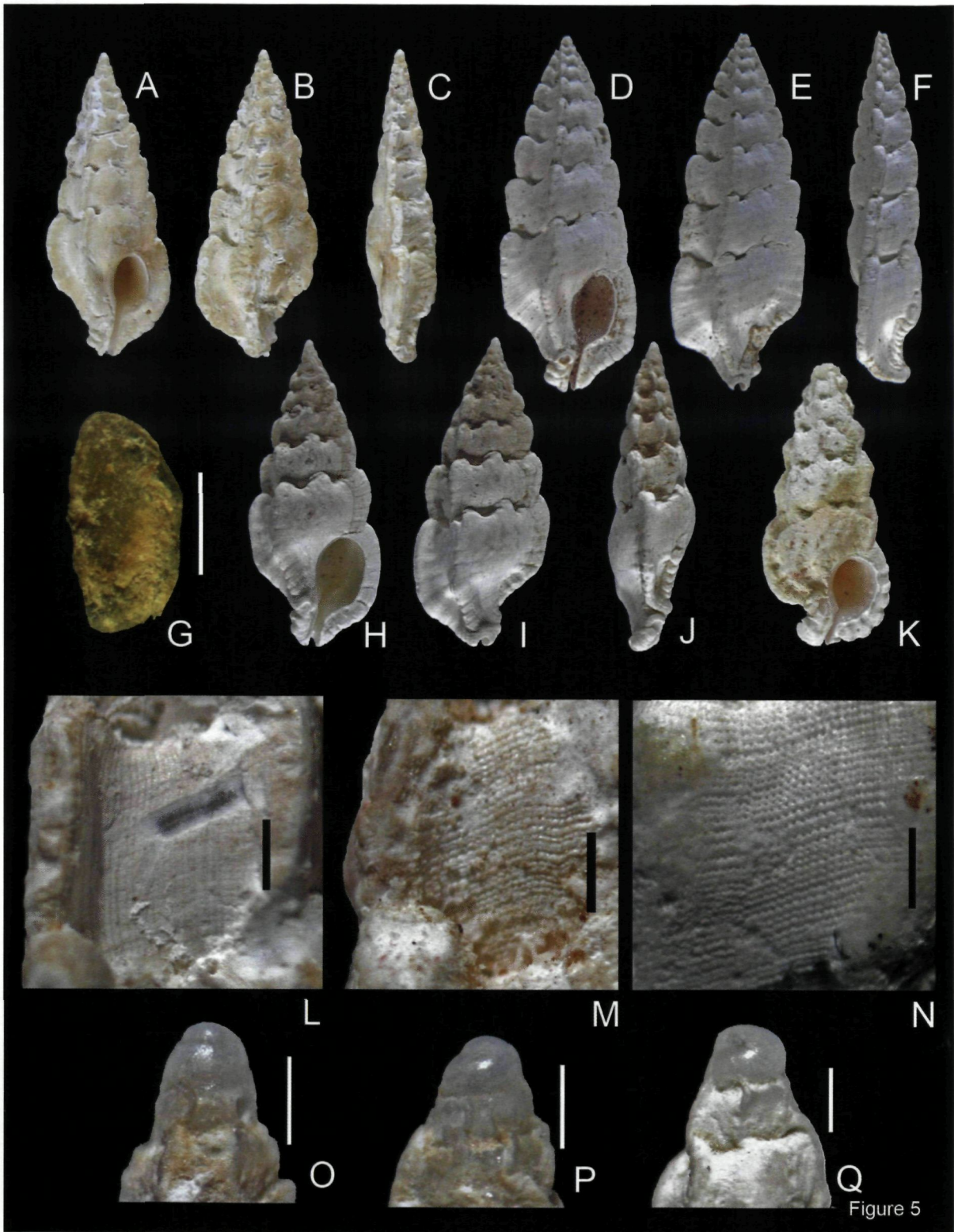


Figure 5

Remarks. The shell morphology of *Spinidrupa aethes* n. sp. is particular in its spiny, narrow, high primary cords and broad, elongate columellar denticles, close to *S. euracanthus* (A. Adams, 1853) (Fig. 6E-F). However, *S. euracanthus* has a comparatively broader and a more rounded last teleoconch whorl, usually with broader, more rounded primary cords, a quite shorter, narrower siphonal canal and 2 or 3 small nodes at abapical extremity of the columellar lip instead of 3 broad elongate nodes almost all along the columella in *S. aethes* n. sp. *Spinidrupa infans* (E. A. Smith, 1884) (Fig. 6G) is a smaller species with the same differences as between *S. euracanthus* and *S. aethes* n. sp.

The genus *Orania* Pallary, 1900 was another possibility for this new species. While the new species seems closer to *Spinidrupa* it is instructive to compare it with *O. rosadoi* Houart, 1998, *O. fischeriana* (Tapparone Canefri, 1882) and *O. rosea* Houart, 1996. *Orania rosadoi* also has a spiny shell but more rounded and broader primary cords, a narrower siphonal canal, a smooth columellar lip and a uniform colour. *Orania fischeriana* also bears 3 elongate denticles on the columellar lip but they are more obvious and narrower, while the shell morphology strongly differs from *Spinidrupa aethes* n. sp. *Orania rosea* is a spiny shell but differs in many ways from *O. aethes* n. sp. in having a uniform colour, a higher spire, a broadly convex last teleoconch whorl, a shorter and narrower siphonal canal and much narrower elongate denticles on the abapical part of the columellar lip. Lastly, due to the particular morphology of the aperture the new species was also compared with some buccinids, in particular with some *Clivipollia* species. However some features such as a strongly spiny shell and a straighter columellar lip, less concave adapically, separate it from those species.

Etymology. *Aethes* (G): unusual, strange, refers to its particular morphology, unusual in *Spinidrupa*.

Subfamily **Trophoninae** Cossmann, 1903
Genus ***Leptotrophon*** Houart, 1995

Type species, by original designation: *Leptotrophon caroae* Houart, 1995, New Caledonia.

Leptotrophon fusiformis n. sp.
Figs 3D, 6H-L

Type material. Holotype MNHN IM-2013-45607, 6 paratypes MNHN IM-2013-43633, IM-2013-43634, IM-2013-43635, IM-2013-45608 and MNHN IM-2013-45610, MNHN IM-2000-32837 and 1 paratype coll. RH (as listed below).

Material examined. **MADEEP**, stn DW4285, Solomon Sea, Budibudi Island, north of Laughlan Archipelago, 09°11'S, 153°55'E, 380-411 m, 7 lv, 7 dd (holotype MNHN IM-2013-45607, 6 paratypes MNHN IM-2013-436333, MNHN IM-2013-43634, MNHN IM-2013-43635, MNHN IM-2013-45608, MNHN IM-2013-45610, MNHN IM-2000-32837), 1 lv, 6 dd, (1 paratype RH, dd); stn DW4286, Budibudi Island, north of Laughlan Archipelago, 09°12'S, 153°55'E, 306-365 m, MNHN IM-2013-4616, 1 lv; stn DW4287, Budibudi Island, north of Laughlan Archipelago, 09°12'S, 153°56'E, 340-375 m, MNHN IM-2013-45623, 1 lv.

Type locality. Solomon Sea, Budibudi Island, north of Laughlan Archipelago, 09°11'S, 153°55'E, 380-411 m.

Distribution. Solomon Sea, Budibudi Island, north of Laughlan Archipelago, living at 365-380 m.

Description. Shell large for the genus, up to 16.2 mm in length (holotype). Length/width ratio 2.2. Lanceolate, broadly ovate, smooth, lightly built. Subsutural ramp moderately broad, strongly sloping, straight or weakly convex. Shell entirely white. Spire high with 1.5 protoconch whorls and teleoconch up to 5 broad, convex, weakly shouldered whorls. Suture weakly adpressed. Protoconch large, broad, whorls rounded, smooth, glossy. Maximum width and height 1000 μ m. Terminal lip shallow, delicate, thin, almost straight.

Figure 6 (scale bar 500 μ m)

A-D. *Spinidrupa aethes* n. sp. Papua New Guinea, West of Panab Island, 05°11' S, 145°48' E, 15 m.

A-B. Holotype MNHN IM-2000-32835, 19.8 mm; C-D. Paratype MNHN IM-2000-32836, 16.4 mm.

E-F. *Spinidrupa euracantha* (A. Adams, 1853)

E. Gulf of Eilat, Red Sea, RH, 19.6 mm; F. Guam, Hapra Harbour, RH, 18.8 mm.

G. *Spinidrupa infans* (E. A. Smith, 1884). Pemba, Mozambique, RH, 15.8 mm.

H-L. *Leptotrophon fusiformis* n. sp. Solomon Sea, Budibudi Island, north of Archipel Laughlan Islands, 09°11' S, 153°55' E, 380-411 m.

H-J. Holotype MNHN IM-2013-45607, 16.2 mm; J. Protoconch; K-L. Paratype MNHN IM-2013-43634, 14.6 mm.

M-N. *Leptotrophon marshalli* Houart, 1995. New Caledonia, Grand-Passage, 18°55' S 163°24' E, 460 m, holotype MNHN IM-2000-199, photo M. Caballer 2014, 9 mm.

O-P. *Leptotrophon surprisensis* Houart, 1995. North of New Caledonia, 18°56' S, 163°22' E, 444-452 m, RH, 12.1 mm.

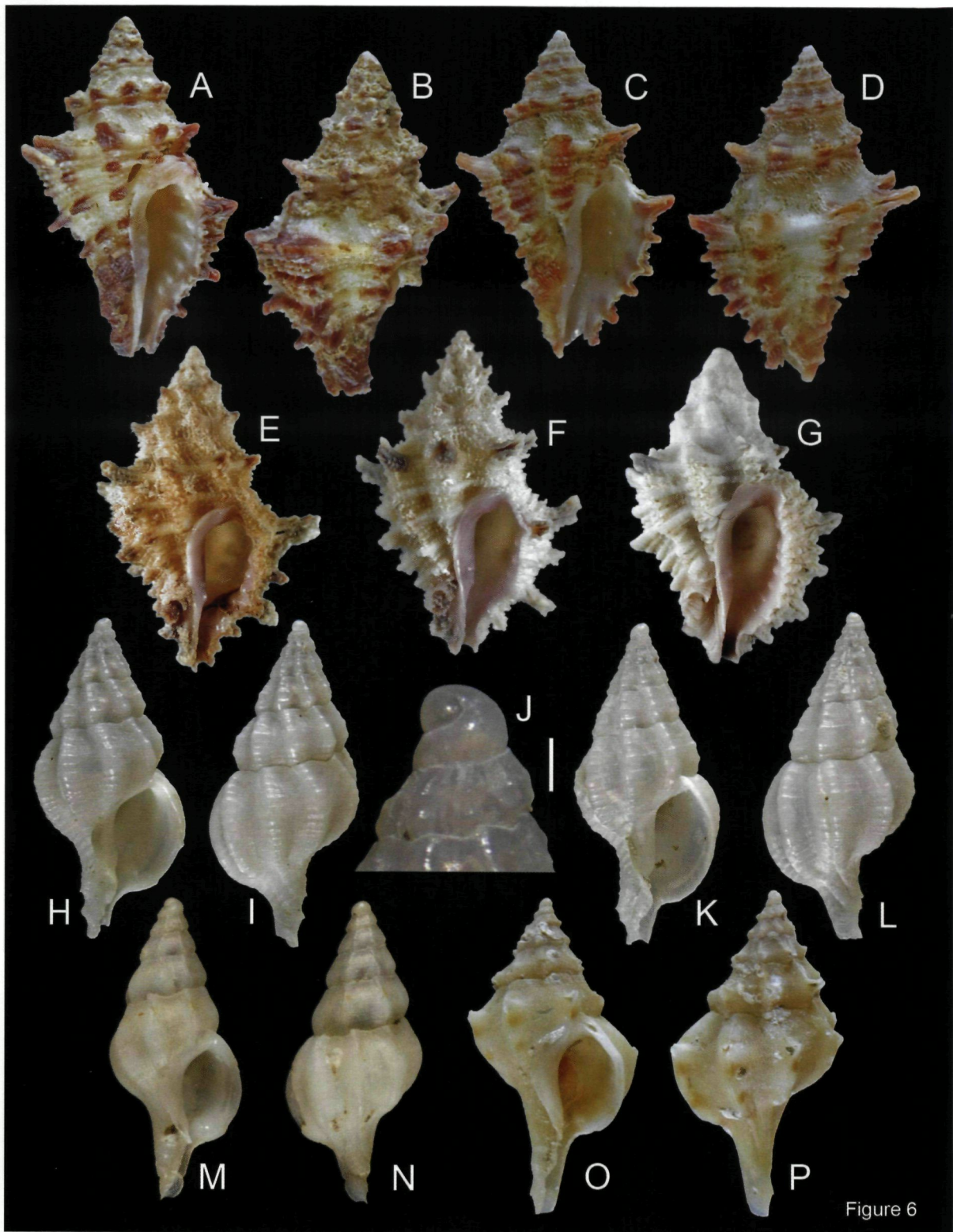


Figure 6

Axial sculpture of teleoconch whorls consisting of high, strong, narrow, rounded ribs and numerous, minute, growth striae. First teleoconch whorl with 9 ribs, second and third with 8, penultimate with 8 or 9 ribs, last whorl with 7 or 8. Spiral sculpture of low, rounded, narrow, barely visible primary and secondary cords, more obvious on early whorls. Last teleoconch whorl with adis, IP, abis, P1, s1, P2, s2, P3, s3, P4, s4, P5, s5, P6, s6 and 3-5 cords on siphonal canal, probably ADP, (ads), MP, (ms), (ABP).

Aperture large, broadly ovate. Columellar lip broad, strongly flaring, smooth or with minute node abapically. Rim partially erect, adapically adherent. Anal notch shallow, broad. Outer lip smooth with very low denticles or smooth within. Holotype with only D1 visible. Siphonal canal short, narrow, very weakly dorsally recurved, narrowly open.

Operculum light brown, thin, fragile, ovate, with apical nucleus and numerous concentric ridges.

Radula unknown.

Remarks. Only two species, both from north New Caledonia can be reasonably compared with *Leptotrophon fusiformis* n. sp., all others are strongly dissimilar.

Leptotrophon marshalli Houart, 1995 (Fig. 6M-N) is a smaller species with less rounded whorls, narrower, less numerous axial ribs and without spiral sculpture except numerous, minute lirae all over the shell.

Leptotrophon surprisensis Houart, 1995 (Fig. 6O-P) is also smaller, with an obviously smaller protoconch, a broader last teleoconch whorl with a smaller aperture, shell without obvious spiral sculpture except P1 with small spinelets formed at the intersection with the axial ribs.

Etymology. *Fusiformis* (L): Spindle-shaped, named for its fusiform shape.

Subfamily **Typhinae** Cossmann, 1903

Genus ***Laevityphis*** Cossmann, 1903

Type species by original designation: *Typhis coronarius* Deshayes, 1865 (= *Typhis muticus* J. Sowerby, 1834). Lower Eocene, France and England.

DISCUSSION

The genus *Laevityphis* is morphologically close to *Siphonochelus* Jousseaume, 1880 but differs constantly from it in having the anal tube clearly separated from the varix, nearer to the preceding one, while in *Siphonochelus* the anal tube originates directly from the axial varix or is directly connected to it (Fig. 4A-D).

There are currently three species classified in *Laevityphis*: *L. bullisi* (Gertman, 1969) from the western Atlantic (Colombia), *L. tillierae* (Houart, 1986), from New Caledonia, and *L. tubuliger* (Thiele, 1925) from the Zanzibar Channel.

Typhis transcurrens Martens, 1902 was first included in *Laevityphis* by Keen (1944) followed by Radwin & D'Attilio (1976), by D'Attilio & Hertz (1988) and then by Houart et al. (2011) but I do not agree any longer because the anal tubes in *T. transcurrens*, strongly expanded and flattened at the base, are directly connected to the axial varices, typical for *Siphonochelus* s.s.

Laevityphis libos n. sp.

Fig. 7A-G

Type material. Holotype MNHN IM-2013-58289, 7 paratypes MNHN IM-2000-32838 - IM-2000-32841 and 1 paratype RH (as listed below).

Material examined. **BIOPAPUA**, stn CP3709, off Madang, 04°58'S, 145°52'E, 640-675 m, 1 lv (paratype MNHN IM-2000-32838).

PAPUA NIUGINI, stn CP4033, Cape Croisiles, 04°52'S, 145°53'E, 780-780 m, 2 lv (paratypes MNHN IM-2000-32839); stn CP4038, east Kotakot, 04°27'S, 145°34'E, 800-840 m, 4 lv (3 paratypes MNHN IM-2000-32840, 1 paratype coll. RH).

KAVIENG, stn CP4436, New Ireland, 02°16'S, 150°45'E, 1128-1135 m, 1 lv (holotype MNHN IM-2013-58289).

MADEEP, stn DW4318, Solomon Sea, off Marshall Bennett Island, west Woodlark Island, 08°37'S, 151°47'E, 705-817 m, 1 lv (paratype MNHN-IM-2000-32841).

Figure 7

A-G. *Laevityphis libos* n. sp.

A-C. Papua New Guinea, New Ireland, 02°16' S, 150°45' E, 1128-1135 m, holotype MNHN IM-2013-58289, 8.2 mm; D-G. Papua New Guinea, off Madang, 04°58' S, 145°52' E, 640-675 m, paratype MNHN IM-2000-32838, 9.8 mm.

H-J. *Laevityphis tillierae* (Houart, 1985). South of New Caledonia, 825-860 m, RH, 7.3 mm.

K-M. *Laevityphis tubuliger* (Thiele, 1925). Zanzibar Channel, 465 m, syntype ZMB 109314, 5.1 mm.

N-Q. *Tylothais akidotos* n. sp.

N-O. Inhaca Island, Mozambique, Maputo Bay, Xixuana, 25°60' S, 32°56' E, 0-1 m, holotype MNHN IM-2013-43791, 33.7 mm; P. Maputo Bay, Xixuana, 25°60' S, 32°56' E, Inhaca Island, paratype MNHN IM-2013-43792, 34.3 mm; Q. Mozambique, Inhaca Island, Delagoa Bay, paratype NM 7346/T4220, 40.3 mm.

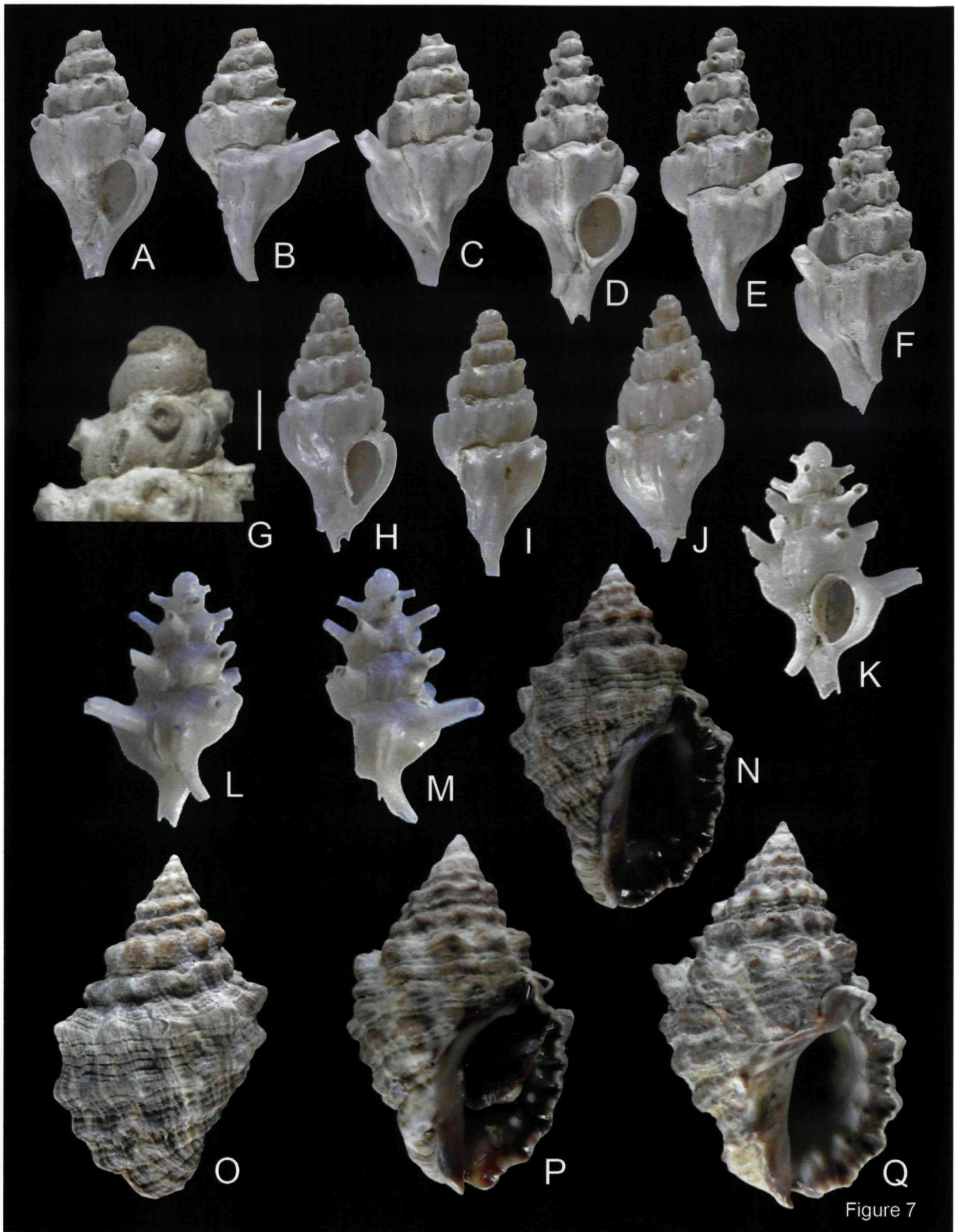


Figure 7

Type locality. Papua New Guinea, New Ireland, 02°16'S, 150°45'E, 1128-1135 m.

Distribution. 02°16' - 08°37' S, 145°34' E - 150°45' E, living at 780-1128 m.

Description. Shell small for the genus, up to 11 mm in length (paratype MNHN IM-2000-32839). Length/width ratio 2.1-2.2. Slender, lanceolate, narrowly ovate. Subsutural ramp narrow, weakly sloping, weakly concave. Shell entirely white. Spire high with 1.5 protoconch whorls and teleoconch up to 5 narrow, weakly convex, strongly shouldered whorls. Suture impressed. Protoconch large, broad, whorls rounded, smooth. Maximum width 1000 μ m, height 1100 μ m. Terminal lip broken.

Axial sculpture of teleoconch whorls consisting of 4 low varices with rounded, narrow, oblique, raised fold, from first to last teleoconch whorl. Other axial sculpture of low, narrow, rounded intervariceal ribs connecting base of anal tubes at abapertural part. Spiral sculpture of very shallow, almost invisible P1 with anal tubes and P2 (shoulder). Anal tubes broad at base, weakly tapered at extremity, ovate, separated from axial varices and closer to preceding varix.

Aperture small, ovate, forming a continuous peristome. Columellar lip narrow, flaring, smooth. Outer lip erect, smooth within. Siphonal canal short, broad, straight, ventrally sealed, weakly tapered abapically.

Operculum light brown, ovate, with subapical nucleus in lower right, with numerous concentric ridges.

Radula unknown.

Remarks. The shell of *Laevityphis tillierae* from New Caledonia (Fig. 7H-J) is smaller and narrower, being half the size of *L. libos* n. sp. for the same number of teleoconch whorls, with a narrower siphonal canal and with the anal tubes being less flattened and narrower, less tapered at extremity.

Laevityphis tubuliger (Fig. 7K-M) is also smaller but has a comparatively broader shell with a less elongate spire, a narrower, more strongly dorsally recurved siphonal canal, narrower anal tubes and a rounded protoconch.

Etymology. *Libos* (G): drop, tear, in reference to the drop-shaped shell.

Subfamily **Rapaninae** Gray, 1853

Tylothais n. gen.

Type species, here designated: *Purpura savignyi* Deshayes, 1844, western Indian Ocean.

Description.

Shell broad, spire high or moderately high, nodose, with 7-11 axial ribs, crossed by broad, low, primary cords and several secondary and tertiary cords. Primary cords

forming low to high knobs at their intersection with axial ribs; subsutural cord broad, occasionally high.

Aperture broad, with rim of columellar lip adherent to shell and low, elongate parietal node at adapical extremity; anal notch narrow, moderately deep. Outer apertural lip crenulated with low to moderately high, narrow denticles within. Siphonal canal broad, very short, broadly open.

Radula consisting of a rachidian bearing a broad, long, central cusp, a narrower, somewhat shorter lateral cusp on each side with a short lateral inner denticle. Marginal area with 2-4 strong folds, ending as small denticles, and of a short bifid marginal cusp. Lateral teeth narrow and sickle shaped.

Included species

Tylothais savignyi (Deshayes, 1844) new comb.

T. aculeata (Deshayes, 1844) new comb.

T. virgata (Dillwyn, 1817) new comb.

T. akidotos n. sp.

T. funilata n. sp.

T. inhacaensis n. sp.

T. ovata n. sp.

Etymology: from *Tylos* (G), meaning knob, for the knobby morphology of the shell and *Thais*, the type genus of the former Thaidinae, now synonym of Rapaninae. The genus *Thais* was named after Thais, a famous Athenian courtesan who lived during the time of Alexander the Great.

Note: The species included here in *Tylothais* were previously included by Claremont et al. (2013b) in *Thalessa* H. & A. Adams, 1853.

F. C. Baker (1895: 183) designated *Murex hippocastanum* Linnaeus, 1758 as type species of *Thalessa*, and this designation was confirmed by ICZN, Opinion 911 (1970: 20). Dodge (1957: 137-139) designated as lectotype of *Murex hippocastanum* Linnaeus, 1758, a specimen inscribed with the serial number of *Murex hippocastanum* in Linnaeus' hand, and concluded that *Murex hippocastanum* as described by Linnaeus in the "Systema" was conspecific with *Pyrula galeodes* Lamarck, 1822 (= *Volema myristica* Röding, 1798). This conclusion was also followed by Cernohorsky (1969: 295) and Tröndlé & Houart (1992: 98).

Thalessa is thus a subjective junior synonym of *Volema* Röding, 1798 [family Melongenidae] and cannot be used further to classify the muricids considered here (G. Rosenberg, in litt.).

Claremont et al. (2013b) recognized four species of *Tylothais* (as species of *Thalessa*):

Thalessa aculeata (Deshayes, 1844) (Figs 10H-I, 11G), *T. savignyi* (Deshayes, 1844) (Figs 8A-D, 11E), *T. distinguenda* (Dunker, 1866) = *T. virgata* (Dillwyn, 1817) (Fig. 10A-F, 11F) and a fourth unnamed species close to *T. savignyi*. The name *Purpura distinguenda* Dunker, 1866 has been considered (Houart,

unpublished, as indexed in WoRMS) a junior subjective synonym of *Murex virgatus* Dillwyn, 1817, a substitute name for *Murex plicatus* Gmelin, 1791, non Lightfoot, 1786. When he established the name *Murex plicatus*, Gmelin (1791: 3551) referred to Lister (*Conchology* t. 939, fig. 34.a), Klein (t. 3, fig. 56), Seba (t. 49, fig. 70) and Chemnitz (t. 23, fig. 1141-1142). Of these illustrations, Lister's and Klein's represent the same shell, probably an ergalataxine; Seba's figure could be anything, even a ranellid. Only Chemnitz illustrated a shell similar to what is now known as "*Thalessa*" *virgata*. Dillwyn (1817: 732) referred only to these last figures but mis-citing them as "1441 and 1442" rather than 1141 and 1142. However as pointed out by D. Reid (in litt.) a doubt exists as to what the shell illustrated by Chemnitz really is; it could also be *Tylothais aculeata*, of which some forms are close to *T. virgata*.

The illustrations from Martini & Chemnitz (figs 1141 and 1142) are reproduced here (Fig. 10A) and compared to a similar shell of *T. virgata* from Southwest Thailand (Fig. 10B).

The name *Murex virgatus* Dillwyn, 1817 is the oldest available name and has priority over *Purpura distinguenda* Dunker, 1866. Moreover, the conditions of ICZN Article 23.9 (reversal of precedence) are not met, as *Thais virgata* has been used as valid by a number of authors in recent years (see below).

In order to preserve the name *Murex virgatus*, I designate the specimen illustrated by Chemnitz (fig. 1141-1142) as the lectotype for both names, *Murex plicatus* Gmelin, 1791 and *Murex virgatus* Dillwyn, 1817. Chemnitz figured a shell from his own collection: "In museo nostro".

The shell collection of Johann H. Chemnitz is housed in part at the Zoological Museum in Copenhagen.

Some of his muricids there were illustrated by Cernohorsky (1974). Other specimens of the Chemnitz collection were purchased for the Russian Imperial Academy of Sciences at a public auction in Copenhagen in 1802 (Martinov, 2002) and are now housed at the Zoological Institute of Russian Academy of Sciences, St. Petersburg.

The shell illustrated by Chemnitz could not be located in either of those institutions, therefore I here designate the specimen illustrated in Fig. 10B as the neotype for both names.

Chemnitz's material originated from the East Indies and the type locality of *Murex plicatus* is India so that the locality of the neotype (Phuket, SW Thailand) fulfills the ICZN art. 75.3.6 which states that the neotype should come as nearly as practicable from the original type locality. "East Indies" is here referred to in its broadest context as defined by *Encyclopaedia Britannica*: <https://www.britannica.com/place/East-Indies>

The neotype is deposited in the Zoological Museum, Copenhagen because a few rapanines from the Chemnitz collection are already housed there as illustrated by Cernohorsky (1974).

Tylothais virgata (Dillwyn, 1817)

Figs 10A-F, 11F

Murex plicatus Gmelin, 1791: 3551, ref. to Chemnitz, figs. 1141, 1142 (not *M. plicatus* Lightfoot, 1786)

Murex virgatus Dillwyn, 1817: 732 (new name for *Murex plicatus* Gmelin, 1791, p. 3551). Neotype NHMD-189923, here designated.

Purpura distinguenda Dunker, in Dunker & Zelebor, 1866: 910. Two syntypes ZMB /Moll 9542, here selected as lectotype ZMB/Moll 9542a and paralectotype ZMB/Moll 9542b.

Purpura pseudohippocastanum Dautzenberg, 1929: 427 (new name for *Purpura hippocastanum* KIENER, 1836 (non Linné, nec Lamarck), Icon. coq. viv., p. 52, pl.12, fig. 33; TRYON, 1880 (pars, non Lin. nec Lam.), Manual, II, p. 162, pl. 45, fig. 42, 43 (both = *Murex virgatus* Dillwyn, 1817).

Additional references

Thais aculeata — Cernohorsky, 1967: 130, pl. 28, fig. 172; 1969: 295, pl. 47, fig. 1; Wilson & Gillett, 1971: 90, fig. 5; Hinton, 1972: 40, pl. 20, fig. 13; Wells & Bryce, 1985: 90, fig. 303; Lai, 1987: 68, pl. 32, fig. 7; Wilson, 1994: 238, pl. 4, fig. 12 (not *Tylothais aculeata*).

Thais hippocastanum — Abbott & Dance, 1982: 147, text fig.; Subba Rao, 2003: 243, pl. 57, fig. 4 (not *Murex hippocastanum* Linnaeus, 1758 = *Volema myristica* Röding, 1798).

Thais distinguenda — Tan, 2000: 499; Tan & Kastoro, 2004: 50.

Thais (Mancinella) savignyi — Tsuchiya, 2000: 397, pl. 197, fig. 172 (not *Tylothais savignyi*).

Thais virgatus — Hylleberg & Kilburn, 2003: 77; Thach, 2005: 129, pl. 35, fig. 15; Dharma, 2005: 170, pl. 60, fig. 7; Houart, 2008: 218, pl. 404, fig. 2; Houart & Héros, 2008: 478.

Mancinella aculeate (sic) — Zang, 2008: 182, text fig. (not *Tylothais aculeata*).

Thais (Thalessa) virgatus — Houart et al., 2010: 264, text fig.

Thalessa distinguenda — Claremont et al., 2013b: 94.

Thalessa virgata — Tsuchiya, 2017 (I): 298, pl. 254, fig. 1, (II): 961.

Type locality. East Indies.

Description of the neotype. Shell 26.6 mm in length, 19.4 mm in width, biconical, broad, heavy, nodose. Subsutural ramp broad, strongly sloping, concave. Spire moderately high.

Shell blackish brown with white spots or lines between axial ribs and spiral cords. Aperture bluish white within with 5 dark brown, narrow spiral lines; inner edge of outer apertural lip blackish brown. Columellar lip light brown with whitish band in center.

Axial sculpture of last teleoconch whorl consisting of 8 broad, low, rounded ribs, each with high nodes at intersection with spiral cords. Spiral sculpture of 5 strong, broad, low primary cords (P1-P5), decreasing in strength and width abapically and 2 or 3 narrow, secondary cords between each pair of primary cords.

Aperture broadly ovate. Columellar lip smooth, adherent to shell. Outer lip crenulated with 5 narrow denticles within (ID, D1-D4). Siphonal canal very short, broadly open.

Remarks. *Tylothais aculeata* and *T. virgata* live throughout the Indo-West Pacific while *T. savignyi* is confined to the western Indian Ocean, from Zululand in South Africa to Somalia and then throughout the Red Sea, Yemen, Oman and the Persian Gulf.

Another species, *Purpura tumulosa* Reeve, 1846, assigned to "*Thalessa*" in WoRMS was not included in the phylogeny by Clément et al. (2013b). Its classification in "*Thalessa*" in WoRMS was based only on the shell characters. However, the radula (Fig. 11I) is much closer to the dagger type radula (Herbert et al. 2007) of *Thaisella* (Fig. 11H) than to *Tylothais* (Fig. 11A-G). That species is therefore better included in *Thaisella* pending further research.

Tylothais akidotos n. sp.

Figs 2, 3E, 7N-Q, 11A-B

Thais distinguenda (Dunker) — Kensley, 1973: 146, fig. 509 (not *Purpura distinguenda* Dunker, 1866).

Type material. Holotype MNHN IM-2013-43791 and 2 paratypes MNHN IM-2013-43790 and MNHN IM-2013-43792; 4 paratypes NM 7346/T4220; 1 paratype RH (as listed below).

Material examined. **INHACA 2011**, stn MM11, Inhaca Island, Mozambique, Maputo Bay, Xixuana, 25°60' S, 32°56' E, 0-1 m, 3 and 9 December 2011, 3 lv (holotype MNHN IM-2013-43791 and 2 paratypes MNHN IM-2013-43790 and MNHN IM-2013-43792); Inhaca Island, Mozambique, Delagoa Bay, 14 lv (10 ex NM7346 and 4 paratypes NM 7346/T4220, 1 paratype RH); **Mozambique**, south of Vilanculos, mangrove, June 1971, 1 lv, NM L2726; 3 miles south of Vilanculos, mangrove, 2 lv, NM G1300.

Type locality. Inhaca Island, Mozambique, Maputo Bay, Xixuana, 25°60' S, 32°56' E, 0-1 m.

Distribution. Inhaca Island and in the vicinity of Vilanculos, Mozambique.

Description. Shell medium-sized for the genus, up to 40.3 mm in length (paratype NM 7346/T4220). Length/width ratio 1.4-1.6. Biconical, broadly ovate, heavy, nodose and weakly squamous. Subsutural ramp broad, weakly sloping, lightly concave. Shell dirty white with brown or blackish brown spiral cords, dirty white between cords and on nodes. Aperture bluish white with dark brown axial band within outer apertural lip rim; columellar lip bluish white, dark brown abaperturally and adaperturally near of anal notch.

Spire high, acute, up to 6 broad, convex, strongly shouldered, nodose teleoconch whorls. Suture impressed, obscured by broad subsutural cord. Protoconch unknown, eroded in all examined specimens.

Axial sculpture of teleoconch whorls consisting of low, narrow, nodose ribs with high, narrow, pointed nodes at intersection with primary spiral cords. Other axial sculpture of numerous growth lamellae. Axial sculpture of two first teleoconch whorls eroded, third with 11 ribs, fourth with 11-13, fifth with 10 or 11, last whorl with 10 ribs. Spiral sculpture of moderately high, rounded, nodose, primary cords. Cords longitudinally grooved, forming 3-5 narrow, weakly squamous, low threads on crest. Secondary and tertiary spiral sculpture of low, narrow cords of different magnitude. All whorls with broad, nodose SP. Early whorls with visible P1, s1 and tertiary cord; P2 almost always covered by next whorl. Last teleoconch whorl with broad, nodose SP followed by adis, IP, P1-P5, ADP, with s1 or s1 and tertiary cord between each pair of primary cords.

Aperture moderately large, ovate. Columellar lip narrow, smooth, rim completely adherent with low parietal tooth at apical extremity. Anal notch moderately deep, narrow. Outer lip erect, crenulated, with 5 low, narrow denticles within: ID, D1-D4; D2 occasionally split. Siphonal canal very short, broad, straight, broadly open, with broad P5 and occasionally narrow ADP.

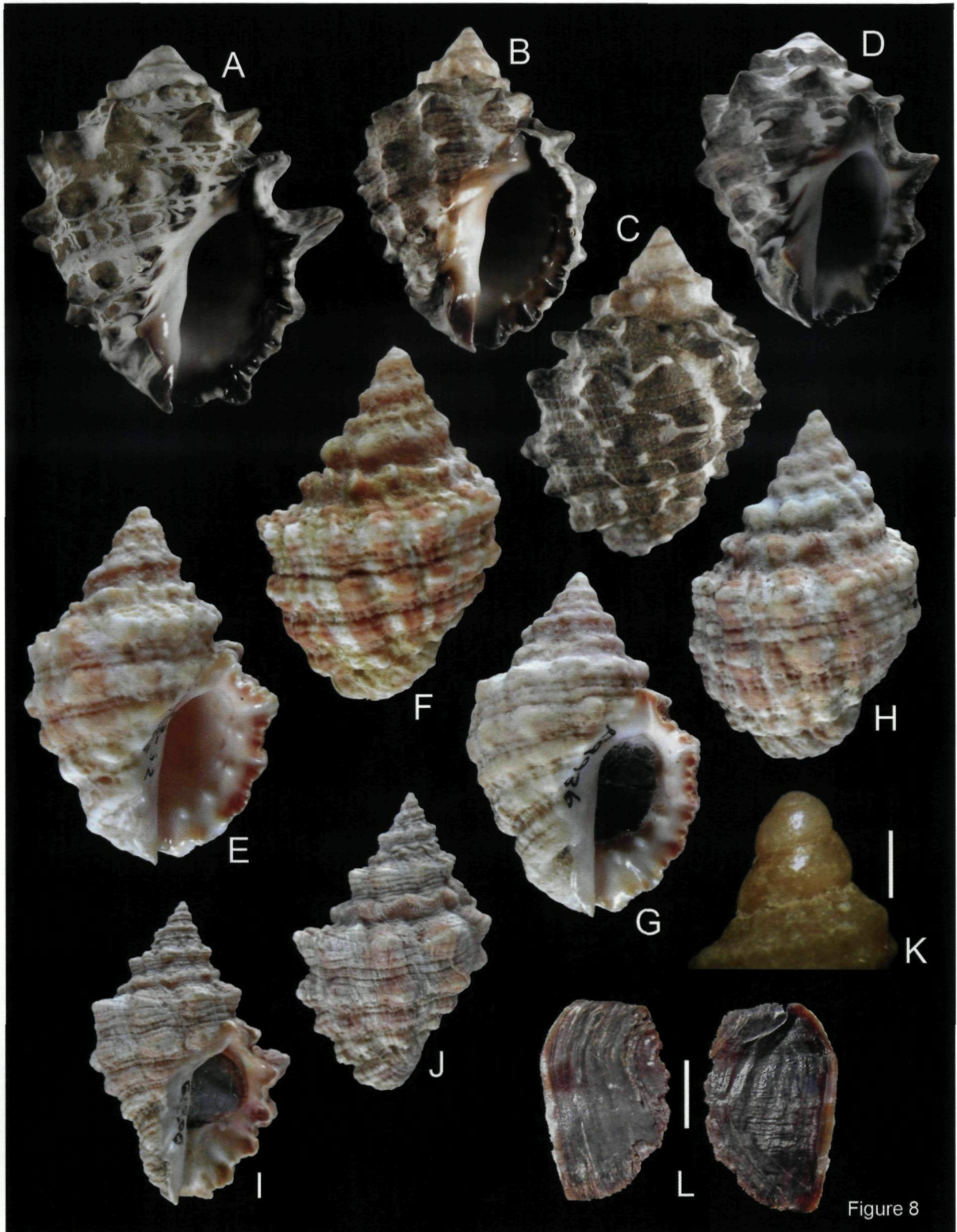
Figure 8

A-D. *Tylothais savignyi* (Deshayes, 1844)

A. Sinai, Gulf of Suez, Egypt, RH, 41.6 mm; B-C. Kenya, RH, 31.2 mm; D. Mozambique (no other data), RH, 28.2 mm.

E-L. *Tylothais funilata* n. sp.

E-F. Mozambique, south of Vilanculos, mangroves, holotype NM L2726/T4221, 34.9 mm; G-H. Mozambique, south of Macoque, mangrove, paratype NM F9936/T4223, 31.3 mm; I-J. Mozambique, south of Vilanculos, mangrove, June 1973, paratype NM G1300/T4222, 29.2 mm; K. Protoconch. INHACA, stn MM13, Inhaca Island, 26°04' S, 32°54' E, sand, mud and rocks, paratype MNHN IM-2000-32842 (scale 500 µm); L. Operculum (holotype) (scale 2 mm).



Operculum dark brown D-shaped with lateral nucleus in upper right.

Radula (Fig. 11A-B) consisting of a rachidian with broad, long, central cusp, a narrower lateral cusp on each side flanked by a short lateral inner denticle. Marginal area with 2 or 3 strong folds, ending as small denticles, and a short marginal cusp. Lateral teeth narrow and sickle shaped.

Remarks. *Tylothais akidotos* n. sp. resembles *T. savignyi* (Fig. 8A-D) but differs in having a narrower and higher spire, a slightly narrower, lower, last teleoconch whorl, a narrower, more horizontal subsutural ramp, the suture of the last whorl in *T. savignyi* reach the P1 spiral cord of preceding whorl while only covering P2 in the new species, s1 and one or two threads remaining visible. *Tylothais akidotos* n. sp. also has shorter and narrower nodes at intersection of spiral and axial sculpture.

The holotype and 2 paratypes were preserved in ethanol (95%) for future genetic studies.

Etymology. *Akidotos* (G): pointed, named in reference of its pointed, acute spire.

Tylothais funilata n. sp.

Figs 3F-G, 8E-L

Type material. Holotype NM L2726/T4221, 3 paratypes NM G1300/T4222 and NM F9936/T4223, 1 paratype MNHN IM-2000-32842, 1 paratype RH (as listed below).

Material examined. **Mozambique**, south of Vilanculos, Mangroves, June 1971, lv (holotype NM L2726/T4221); south of Macoque, mangrove, lv (1 paratype NM F9936/T4223); 3 miles south of Vilanculos, mangrove, lv (2 paratypes NM G1300/T4222, 1 paratype RH); **INHACA 2011**, stn MM13, 26°04' S, 32°54' E, Inhaca Island, west of Ponta Punduine, intertidal, sand, mud and rocks, 05 December 2011, dd (1 paratype MNHN IM-2000-32842).

Type locality. Mozambique, south of Vilanculos, mangrove.

Distribution. From Inhaca Island to south of Vilanculos, Mozambique.

Description. Shell medium sized for the genus, up to 34.9 mm in length (holotype). Length/width ratio 1.4-1.5. Biconical, broad, heavy, nodose and squamous. Subsutural ramp broad, weakly sloping, weakly concave. Shell creamy white with broad, orange brown axial bands, more obvious on nodes of spiral cords. Aperture white or light orange with orange-brown narrow band within outer lip rim. Columellar lip white.

Spire high with 2.5 protoconch whorls and teleoconch up to 6 broad, strongly shouldered, nodose whorls. Suture impressed, obscured by broad subsutural cord. Protoconch (Fig. 8K) small, conical, elongate, whorls smooth but weakly eroded in examined specimen. Maximum width 900 μ m, length 1000 μ m.

Axial sculpture of teleoconch whorls consisting of low, narrow, nodose ribs, each rib with low, narrow nodes. Other axial sculpture of few growth lamellae. First whorl eroded, second with 12 ribs, third and fourth with 9-12, penultimate whorl with 9 or 10 ribs, last with 8-10. Spiral sculpture of low, rounded, broad, squamous and nodose primary cords, strongly longitudinally grooved, forming 3 narrow, squamous threads on crest, and squamous, narrow, secondary cords and threads between primary cords. First teleoconch whorl of paratype with visible, narrow P1 and P2, second with narrow SP, adis, IP, abis, P1, s1, t, P2. Primary cords becoming broader from second or third to last whorl. Adapical shoulder cords partially covered by SP. Last whorl with broad SP, narrow IP, broad P1-P5 with narrow secondary cords and threads between primary cords.

Aperture large, ovate. Columellar lip narrow, smooth, rim completely adherent with weak, broad, parietal tooth at adapical extremity. Anal notch moderately deep, narrow. Outer lip erect, crenulated, with 5 low, narrow denticles within: ID, D1-D4. Siphonal canal very short, broad, straight, broadly open, with broad P5 and occasionally narrow ADP.

Operculum (Fig. 8L) dark brown, D-shaped with lateral nucleus in upper right. Attached surface with broad, callused rim.

Radula unknown.

Figure 9 (scale bar 2 mm)

A-E. *Tylothais inhacaensis* n. sp. Inhaca Island, Mozambique, Ponta do Farol, 25°58' S, 32°59' E, rocks, sand and algae.

A-B. Holotype MNHN IM-2000-32843, 24.4 mm; C-D. Paratype MNHN IM-2000-32844, 20.6 mm; E. Operculum (holotype).

F. *Neothais intermedia* (Kiener, 1836). Japan, Onna Point, Okinawa, 1963, RH, 33.4 mm.

G-J. *Tylothais ovata* n. sp. South Africa, Mission Rocks, Zululand, on rocks at low tide.

G-H. Holotype NM P0992/T4224, 32 mm; I-J. Paratype RH, 32 mm.

K-L. *Thaisella coronata* (Lamarck, 1816). Lagos, Nigeria, RH, 33.7 mm.

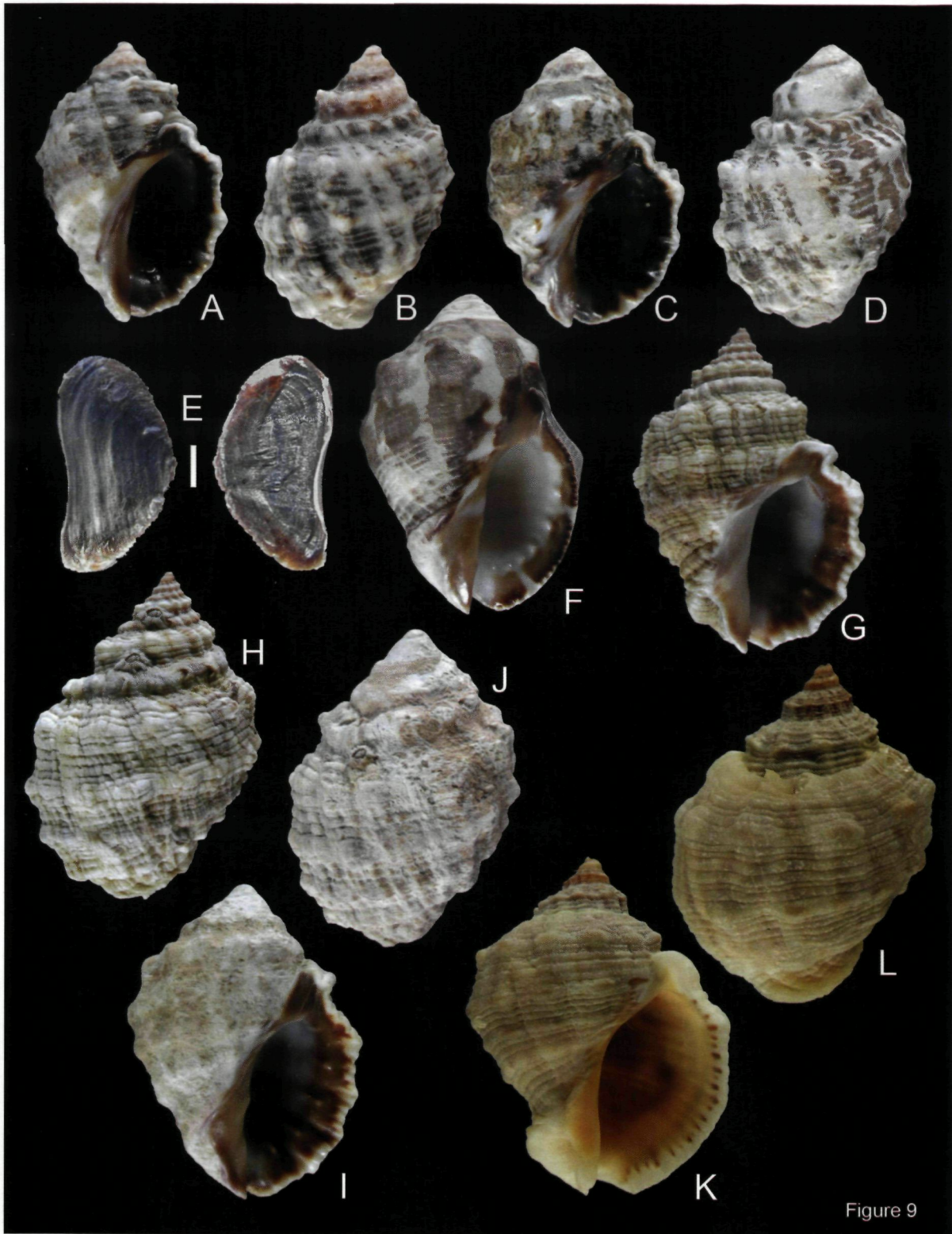


Figure 9

Remarks. *Tylothais akidotos* n. sp. is close but *Tylothais funilata* n. sp. differs in having a broader last teleoconch whorl and a comparatively lower and less pointed spire in adult specimens; it also has broader primary spiral cords with lower, blunter nodes except SP which is broader and more conspicuous in *Tylothais akidotos* n. sp. The colour also strongly differs, orange-brown, broad axial bands, a whitish aperture with a white columellar lip and orange-brown narrow band within the outer apertural lip in *Tylothais funilata* n. sp., compared to brown or blackish brown spiral cords in *Tylothais akidotos* n. sp., with a bluish white aperture and dark brown band within the outer apertural lip rim and a bluish white columellar lip, dark brown abaperturally and near the anal notch. Both species are sympatric and the holotype of *Tylothais funilata* n. sp. was syntopic with *Tylothais akidotos* n. sp.

Etymology. *Funis* (L): cord and *lata* (L): broad, in reference to the broad spiral cords.

Tylothais inhacaensis n. sp.
Figs 3H, 9A-E

Type material. Holotype MNHN IM-2000-32843 and 1 paratype MNHN IM-2000-32844 (as listed below).

Material examined. **INHACA 2011**, stn MM6, type locality, 27 November, 8 and 10 December 2011, 2 dd (holotype MNHN IM-2000-32843 and paratype MNHN IM-2000-32844).

Type locality. Inhaca Island, Mozambique, Ponta do Farol, 25°58'S, 32°59'E, rocks, sand and algae.

Distribution. Known only from the type locality.

Description. Shell small for the genus, 24.4 mm in length for holotype. Length/width ratio 1.5. Broadly ovate, nodose, lightly built. Subsutural ramp broad, weakly sloping, straight. Shell dirty white with dark brown axial coloured spiral cords interrupted by dirty white blotches or striae. Aperture dark bluish white within with dark blackish brown broad axial band within outer apertural rim. Columellar lip suffused with different shades of brown, darker on abapertural tip.

Spire moderately high with probably 5 broad, convex, weakly angulate, shouldered, nodose teleoconch whorls (early whorls partly eroded). Suture impressed, obscured by broad subsutural cord. Protoconch unknown, first whorls eroded in both examined specimens.

Axial sculpture of teleoconch whorls consisting of very low, narrow, nodose ribs with low, moderately broad and high nodes at intersection with primary spiral cords. Last whorl with 10 unequidistantly spaced ribs. Previous whorls partly eroded. Spiral sculpture of high, rounded, nodose primary cords and low, narrow secondary and tertiary cords. Primary cords longitudinally grooved, forming 2 or 3 low threads on crest, partly eroded. Last whorl with (adis), broad, high SP, IP, broad, high P1-P4; P5 narrower and lower. Three secondary and tertiary cords between P1 and P2, two between P2 and P3, one (paratype) or three (holotype) between P3 and P4, one between P4 and P5.

Aperture large, broad, ovate. Columellar lip broad, smooth, adherent, with very weak, low parietal tooth at adapical extremity. Anal notch moderately deep, narrow. Outer lip crenulated, smooth within. Siphonal canal very short, broad, straight, broadly open.

Operculum (Fig. 9E) dark brown, D-shaped, with lateral nucleus in center right. Attached surface with broad callused rim.

Radula unknown.

Remarks. *Tylothais savignyi* differs from *T. inhacaensis* n. sp. in having a larger, more solid and heavier shell with a smaller aperture and heavier, broader primary spiral cords with higher and broader nodes.

Tylothais inhacaensis n. sp. could be also confused with young specimens of *Menathais intermedia* (Kiener, 1836) (Fig. 9F), but the shell morphology in *M. intermedia* is different in being thicker and more solid with broader primary spiral cords and nodes, higher, more strongly sloping subsutural ramp with absent or less obvious subsutural cord (SP), a usually higher spire, a smaller aperture, white within instead of dark bluish white in *T. inhacaensis* n. sp.

Etymology. Named after Inhaca Island where the species was collected.

Figure 10

A-G. *Tylothais virgata* (Dillwyn, 1817)

A. *Murex plicatus* Gmelin, 1791. Original figures 1141 and 1142 from Chemnitz; B. Surin Beach, west coast of Phuket, SW Thailand, neotype NHMD-189923, 26.6 mm; C-D. Nha Trang, Vietnam, RH, 40 mm; E-F. Nicobar Islands, lectotype and paralectotype of *Purpura distinguenda* (Dunker, 1866) — E. Lectotype ZMB/Moll 9542a, 35.5 mm; F. Paralectotype ZMB/Moll 9542b, 22.5 mm; G. New Caledonia, Bay of Touho, RH, 36.7 mm.

H-I. *Tylothais aculeata* (Deshayes, 1844). Masbate Island, Philippines, RH, 45.5 mm.

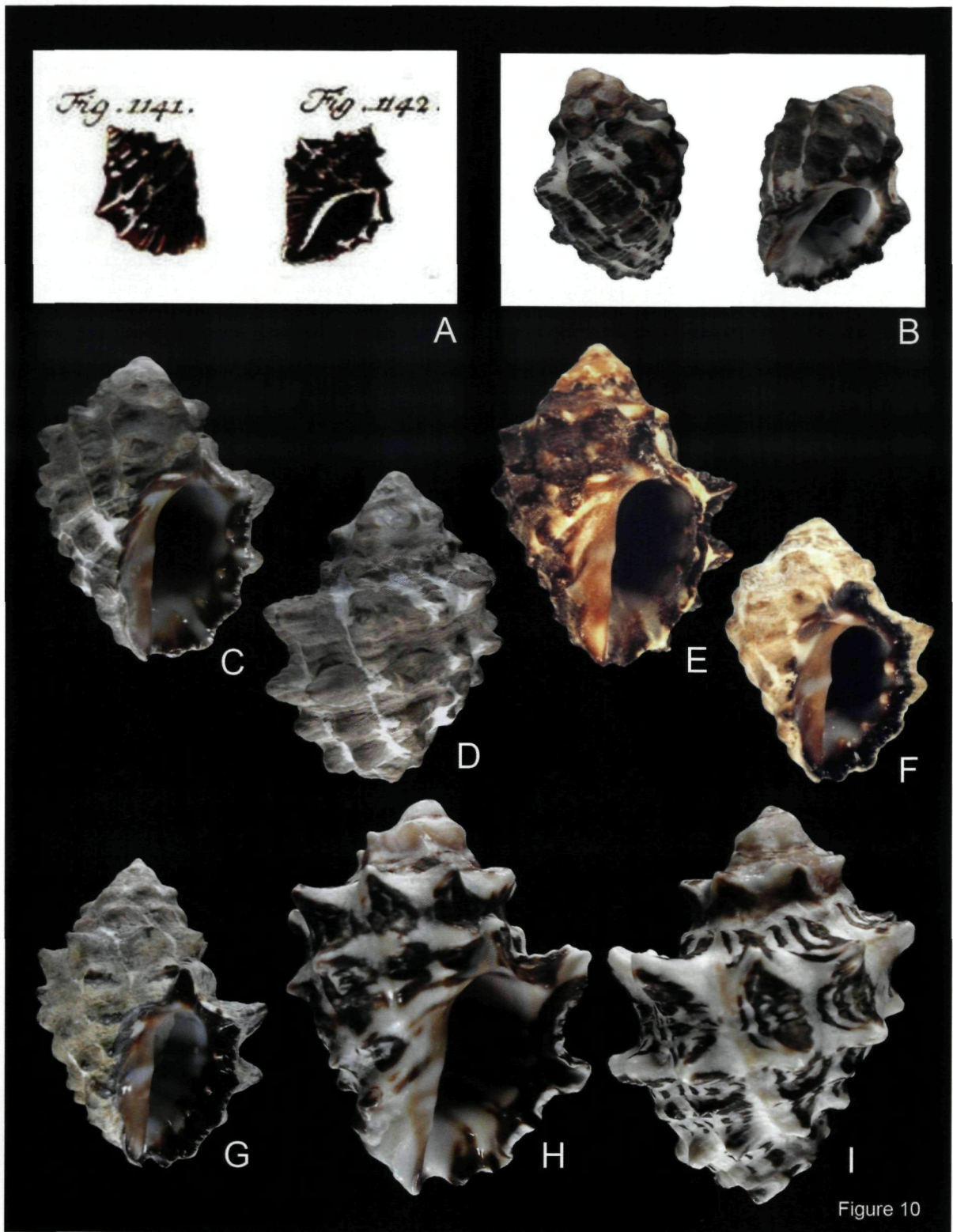


Figure 10

Tylothais ovata n. sp.
Figs 3I-J, 9G-J, 11C-D

Thais distinguenda (Dunker, 1852) — Richards, 1981: 56, pl. 29, fig. 233 (not *Purpura distinguenda* Dunker, 1866)

Thais (Thalessa) sp. — Houart et al. 2010: 269, Text figs (holotype NM and paratype RH).

Type material. Holotype NM P0992/T4224. Paratypes: 1 MNHN IM-2000-32845; 1 IRSNB I.G. 33404/MT. 3465; 4 RH (as listed below).

Material examined. South Africa, Mission Rocks, Zululand, on rocks at low tide, February 1989, 1v (holotype NM P0992/T4224 and 2 paratypes RH); Mission Rocks, Zululand, in shallow water, 1986, 1v (1 IRSNB I.G. 33404/MT. 3465; 1 RH); St Lucia Light House, Zululand, January 1974, 1lv (paratype MNHN IM-2000-32845); Park Rynie, Natal, on rock in crevices, low tide, 1986, 1lv (paratype RH); Durban, Natal, on reef at 1-4 m, 1lv, RH; Mission Rocks, Natal, live on rocks at low tide, 1lv, RH.

Type locality. South Africa, Mission Rocks, Zululand, on rocks at low tide.

Distribution. South Africa, KwaZulu-Natal, from Park Rynie to Mission Rocks.

Description. Shell medium sized for the genus, up to 32 mm in length (holotype). Length/width ratio 1.3-1.4. Broadly ovate, heavy, nodose. Subsutural ramp broad, weakly sloping, straight. Shell greyish brown. Aperture bluish white within; columellar lip light tan, darker coloured on outer border and abapertural extremity; inner side of outer apertural lip with broad brown axial band and narrow whitish axial band near edge.

Spire high, up to 5 broad, convex, strongly shouldered, nodose teleoconch whorls. Suture obscured by broad subsutural ramp cord. Protoconch unknown, eroded in all specimens, partly broken in holotype.

Axial sculpture of teleoconch whorls consisting of very low, narrow ribs, more obvious on early whorls, with low, narrow nodes at intersection with primary cords. Other axial sculpture of numerous growth

lamellae and striae. Holotype with partly eroded sculpture on first and second whorl, third and fourth whorls with 14 ribs, last with 12. Paratypes with 10 or 11 axial ribs on last whorl; other whorls with eroded sculpture. Spiral sculpture of moderately broad, nodose, primary cords and weakly squamous secondary and tertiary cords. Last teleoconch whorl of holotype with SP, adis, IP, P1, t, s1, t, P2, t, s2, t, P3, t, s3, t, P4, s4, P5, ADP. Primary cords longitudinally grooved, forming 3 or 4 lightly squamous, rounded threads on crest. All whorls with broad, nodose SP, P1-P4 of similar width and height, P5 and ADP narrower and lower.

Aperture large, ovate. Columellar lip moderately broad, smooth; rim adherent, very weakly partially erect on a small portion abapically, with low, elongate parietal tooth at adapical extremity. Anal notch moderately deep, broad. Outer lip crenulated, with 5 weak, low denticles within: ID, D1-D4; ID occasionally obsolete. Siphonal canal very short, broad, straight, broadly open, with ADP.

Operculum dark brown, D-shaped with lateral nucleus in center right. Attached surface with large callused rim.

Radula (Fig. 11C-D) with a rachidian tooth bearing a long, moderately broad central cusp, a broad lateral cusp on each side, flanked with inner lateral denticle. Marginal area with 3 or 4 small, obvious denticles, and marginal cusp at extremity.

Remarks. The shell characters of *Tylothais ovata* n. sp. are very close to *Thaisella coronata* Lamarck, 1816 (Fig. 9K-L), the type species of *Thaisella*, an amphi-Atlantic species, living along the West African coast, from south Mauritania to Angola (Houart, 1997: 62), but also in several localities in the Western Atlantic. However, the morphology of the radula in the new species differs from the typical *Thaisella* species in having a rachidian with a long, narrow central cusp compared to the dagger-type morphology of *Thaisella* (Fig. 11H) in which the rachidian bears a very long, broad, triangular cusp. The lateral cusps in the new species differ also from *Thaisella* in being slenderer and shorter in opposition to the long, triangular cusps turned outwardly at their distal ends in *Thaisella*. The radula of *T. ovata* n. sp. is closer to *Tylothais*, the species is therefore here included in that genus.

Figure 11. Radulae

A-B. *Tylothais akidotos* n. sp., Mozambique, Inhaca Island, RH (scale bars: A. 100 μ m; B. 20 μ m); C-D. *Tylothais ovata* n. sp., South Africa, Zululand, RH (scale bars: C: 200 μ m; D: 50 μ m); E. *Tylothais savignyi* (Deshayes, 1844), Mozambique, Inhaca Island, RH (scale bar: 100 μ m); F. *Tylothais virgata* (Dillwyn, 1817), New Caledonia, RH (scale bar: 50 μ m); G. *Tylothais aculeata* (Deshayes, 1844), New Caledonia, RH (scale bar: 50 μ m); H. *Thaisella coronata* (Lamarck, 1816), Benin, West Africa, RH (scale bar: 50 μ m); I. *Thaisella tumulosa* (Reeve, 1846), South Korea, RH (scale bar: 50 μ m).
A-E: SEM Y. Kantor; F-I: SEM A. Warén.

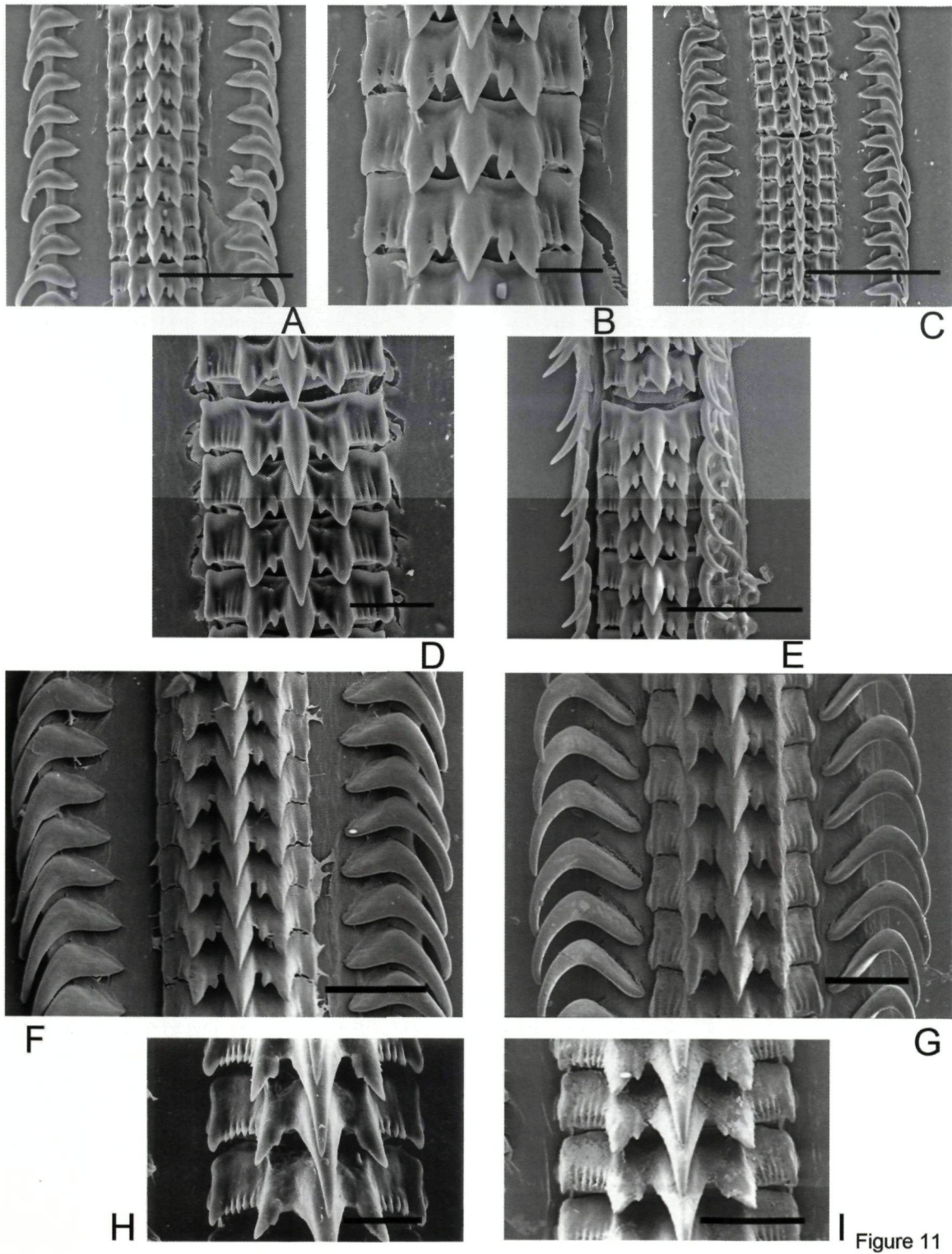


Figure 11

Other differences in the shell morphology are also obvious, *Thaisella coronata* is usually broader, the anal notch is deeper, the inner outer apertural lip is sculptured by numerous, low lirae extending into the aperture, instead of 5 low denticles in *Tylothais ovata* n. sp. The colour of the aperture is also different.

No other related or similar species have been found in *Tylothais* or in any of the other rapanine genera.

Etymology. *Ovata* (L): egg-shaped, named after the broadly ovate form of the shell.

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REFERENCES

- Abbott, R.T. & Dance, S.P. 1982. Compendium of Seashells, E.P. Dutton, Inc. New York: i-ix, 1-410.
- Baker, F.C. 1895. Preliminary outline of a new classification of the Muricidae. *Bulletin of the Chicago Academy of Sciences* 2: 169-189.
- Barco, A., Claremont, M., Reid, D.G., Houart, R., Bouchet, P., Williams, S.T., Cruaud, C., Couloux, A., Oliverio, M. 2010. A molecular phylogenetic framework for the Muricidae, a diverse family of carnivorous gastropods. *Molecular Phylogenetics and Evolution* 56: 1025-1039.
- Barco, A. Schiaparelli, S., Houart, R & Oliverio M. 2012. Cenozoic evolution of Muricidae (Mollusca, Neogastropoda) in the Southern Ocean, with the description of a new subfamily. *Zoologica Scripta*. The Norwegian Academy of Science and Letters, 41(6): 596-616.
- Barco A., Marshall B., Houart R. & Oliverio M. 2015. Molecular phylogenetics of Haustrinae and Pagodulinae (Neogastropoda: Muricidae) with a focus on New Zealand species. *Journal of Molluscan Studies* 81: 476-488. doi:10.1093/mollus/eyv0.
- Cernohorsky, W.O. 1967. *Marine Shells of the Pacific*. Pacific Publications, Sydney, Australia: 1-248
- Cernohorsky, W.O. 1969. The Muricidae of Fiji. Part II- subfamily Thaidinae. *Veliger* 11(4): 293-315.
- Cernohorsky, W.O., 1974. Type specimens of Mollusca in the University Zoological Museum Copenhagen. *Records of the Auckland Institute and Museum* 12: 175-211.
- Claremont, M., Reid, D.G. & Williams, S.T. 2008. A molecular phylogeny of the Rapaninae and Ergalataxinae (Neogastropoda: Muricidae). *Journal of Molluscan Studies* 74: 215-221.
- Claremont M., Houart, R., Williams S.T. & Reid D.G. 2013a. A molecular phylogenetic framework for the Ergalataxinae (Neogastropoda: Muricidae). *Journal of Molluscan Studies*, 79: 19-29.
- Claremont, M., Vermeij, G.J., Williams, S.T. & Reid, D.G. 2013b. Global phylogeny and new classification of the Rapaninae (Gastropoda: Muricidae), dominant molluscan predators on tropical rocky seashores. *Molecular Phylogenetics and Evolution*, 66: 91-102.
- D'Attilio, A. & Hertz, C.M. 1988. An illustrated catalogue of the family Typhidae Cossmann, 1903. *The Festivus* 20 (supplement): 1-73.
- Dautzenberg, P. 1929. Mollusques testacés marins de Madagascar. *Faune des colonies françaises*, III. Société d'Éditions géographiques, maritimes et coloniales: Paris. 321-636,

- Dharma, B. 2005. *Recent and Fossil Indonesian shells*. Conchbooks, Hackenheim, Germany: 1-424.
- Dillwyn, L.W. 1817. *A Descriptive Catalogue of Recent Shells, arranged according to the Linnean method; with particular attention to the synonymy*. London, 2 vols: 581-1092.
- Dodge, H. 1957. A historical review of the mollusks of Linnaeus, part 5. The genus *Murex* of the class Gastropoda. *Bulletin of the American Museum of Natural History* 13(2): 73-224.
- Dunker, W. in Dunker, W. & Zelebor, J. 1866. Bericht über die von der Novara-Expeditionen mitgebrachten Mollusken. *Verhandlungen der kaiserlich-königlichen zoologisch-botanischen Gesellschaft in Wien* 16: 909-916.
- Herbert, G., Merle, D & Gallardo, C.S. 2007. A developmental perspective on evolutionary innovation in the radula of the predatory neogastropod family Muricidae. *American Malacological Bulletin* 23: 17-32.
- Gmelin, J.F. 1791. *Caroli a Linné Systema Naturae per Regna Tria Naturae, Editio decima tertia, aucta, reformata*, 1(6), cl. 6, Vermes: 3021-3910, Leipzig.
- Hinton, A. 1972. Shells of New Guinea and the Central Indo-Pacific. Robert Brown & Associates, Port Moresby and Jacaranda Press, Milton: i-xviii, 1-94.
- Houart, R. 1997. Les Muricidae d'Afrique Occidentale - II. Ocenebrinae, Ergalataxinae, Tripterotyphinae, Typhinae, Trophoninae & Rapaninae. *Apex* 12(2-3): 49-91.
- Houart, R. 2008. Muricidae. In: Poppe G. (ed.), *Philippine Marine Mollusks*, Conchbooks, Hackenheim, Germany: 132-220.
- Houart, R. & Héros, V. 2013. Description of new Muricidae (Mollusca: Gastropoda) collected during the ATIMO VATAE expedition to Madagascar "Deep South". *Zoosystema* 35(4): 503-523.
- Houart, R. & Héros, V. 2015. New species of Muricidae Rafinesque, 1815 (Mollusca: Gastropoda) from the Western Indian Ocean. *Zoosystema* 37(3): 481-503.
- Houart, R. & Héros, V. 2016. New species and records of deep water muricids (Gastropoda: Muricidae) from Papua New Guinea. *Vita Malacologica* 15: 7-34.
- Houart, R., Kilburn, R.N. & Marais, A.P. 2010. Muricidae. In Marais, A.P and Secombe, A.D. *Identification Guide to the Seashells of South Africa*. Vol. 1: 177-270. Centre for Molluscan Studies, Groenkloof, South Africa: 1-376.
- Hylleberg, J. & Kilburn, R.N. 2003. Marine molluscs of Vietnam. Annotations, voucher material, and species in need of verification. *Phuket Marine Biological Center Special Publication* 28: 1-300.
- Keen, A.M. 1944. Catalogue and revision of the gastropod subfamily Typhinae. *Journal of Paleontology* 18(1): 50-72.
- Kensley, B. 1973. *Sea-shells of Southern Africa - gastropods*. Maskew Miller, Cape Town: 1-255.
- Lai, K.Y. 1987. *Marine Gastropods of Taiwan* (2), Taipei, Taiwan Museum: 1-116.
- Martynov, A.V. 2002. The shell collection of J. H. Chemnitz in the Zoological Institute, St.-Petersburg. *Ruthenica* 12(1): 1-18.
- Merle, D. 2001. The spiral cords and the internal denticles of the outer lip in the Muricidae: terminology and methodological comments. *Novapex* 2(3): 69-91.
- Merle, D. 2005. The spiral cords of the Muricidae (Gastropoda, Neogastropoda): importance of ontogenetic and topological correspondences for delineating structural homologies. *Lethaia* 38: 367-379.
- Radwin G. & A. D'Attilio 1976. *Murex Shells of the World. An Illustrated Guide to the Muricidae*. Stanford University Press, Stanford: 1-284.
- Richards, D. 1981. *South African Shells, a collector's guide*. C. Struik, Cape Town: 1-98, pls 1-60.
- Subba Rao, N.V. 2003. Indian Seashells (Part 1) Polyplacophora and Gastropoda. *Records of the Zoological Survey of India*, occasional paper n° 192: i-x, 1-416.
- Tan, K.S. 2000. Species checklist of Muricidae (Mollusca: Gastropoda) in the South China Sea. *The Raffles Bulletin of Zoology* Suppl. n° 8: 495-512.
- Tan, K.S. & Kastoro, W.W. 2004. A small collection of gastropods and bivalves from the Anambas and Natuna Islands, South China Sea. *Raffles Bulletin of Zoology*, Supplement 11: 47-54.
- Thach, N.N. 2005. *Shells of Vietnam*. Conchbooks, Hackenheim, Germany 1-337, pl. 1-91.
- Tröndlé J. & Houart R. 1992. Les Muricidae de Polynésie Française. *Apex* 7(3-4): 67-149.
- Tsuchiya, K. 2000. Muricidae. In: Okutani, T. (ed.), *Marine Mollusks in Japan*, Tokai University Press, Tokyo: 364-421.
- Tsuchiya, K. 2017. Muricidae. In: Okutani, T. (ed.) 2nd edition, *Marine Mollusks in Japan*, Tokai University Press, Tokyo, I. Atlas: 1-711; II. Text: 715-1375.
- Wells, F.E. & Bryce, C.W. 1985. *Seashells of Western Australia*. Perth, Western Australian Museum: 1-207.
- Wilson, B. 1994. *Australian Marine Shells*. Vol. 2. Odyssey Publishing, Kallaroo: 1-370.
- Wilson, B.R. & Gillett, K. 1971. *Australian Shells*. Sydney, A.H. & A.W. Reed: 1-168.
- Zhang, S. 2008. *Atlas of Marine Mollusks in China*. Oceanpress, China: i-iv, 1-383.